INTERNATIONAL CONFERENCE ON

EMERGING TRENDS IN MULTIDISCIPLINARY RESEARCH FOR SUSTAINABLE FUTURE-2026

March 12-13, 2026

BOOK OF ABSTRACTS

Organised by

Centre for Multidisciplinary Research (CMDR),
School of Multidisciplinary Studies

In collaboration with Department of Design, School of Engineering,
Tezpur University, Sonitpur, Assam-784028, India

International Conference on Emerging Trends in Multidisciplinary Research for Sustainable Future (ICETMRSF - 2026)

Editor

Professor Debendra Chandra Baruah
Dean, School of Multidisciplinary Studies, Tezpur University

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International Conference on Emerging Trends in Multidisciplinary Research for Sustainable Future (ICETMRSF - 2026)

The abstracts included in this book are as received from the participants and presented at International Conference on Emerging Trends in Multidisciplinary Research for Sustainable Future (ICETMRSF - 2026) held on 12th March and 13th March 2026 at Tezpur University, Tezpur, Assam.

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About Tezpur University

The University was established in 1994 through an Act of Parliament with the aim of providing quality higher education that is employment-oriented and interdisciplinary in nature. Its foundation was laid with a vision to meet the educational aspirations of the North-East region of India while promoting excellence in teaching, research, and innovation.

Tezpur University is a premier Central University located at Napaam, about 15 km east of Tezpur town in the Sonitpur district of Assam, India. The academic structure of the University includes several schools of studies offering undergraduate, postgraduate, and doctoral programmes in disciplines such as science, engineering, humanities, social sciences, management, and environmental studies.

The University emphasizes innovation, creativity, and leadership, encouraging students and scholars to engage in meaningful research that addresses both regional and global challenges. The campus of Tezpur University is spread across a large scenic area surrounded by natural landscapes of the Brahmaputra valley, providing an ideal environment for academic pursuits and research activities. The institution is equipped with modern infrastructure including advanced laboratories, libraries, research centres, hostels, and cultural facilities that support both academic and extracurricular development.

In recognition of its academic achievements and institutional excellence, Tezpur University received the Visitor's Best University Award in 2016, which is one of the highest recognitions granted by the President of India to central universities. The University has also consistently performed well in national rankings and was placed 5th among Indian universities by the National Institutional Ranking Framework (NIRF) under the Ministry of Human Resource Development (MHRD), Government of India.

Furthermore, the University has been accredited with an "A" Grade by the National Assessment and Accreditation Council (NAAC), reflecting its high standards in teaching, research, governance, and infrastructure. Tezpur University has also gained international recognition and has been ranked among the top 800 universities in the world by the Times Higher Education (THE) World University Rankings.

With its commitment to academic excellence, interdisciplinary research, and regional development, Tezpur University continues to play a significant role in shaping skilled professionals, researchers, and leaders who contribute to society and sustainable development.

About Centre for Multidisciplinary Research (CMDR)

Multidisciplinary has been a unique feature of educational programmes offered by Tezpur University since the beginning. This feature is further strengthened with the introduction of open electives/ CBCS (Choice based credit system). The courses of discipline-specific programmes are designed integrating courses of several other disciplines covering STEM, Humanities, and Social sciences. Similarly, the research carried out as per academic requirements (viz., PhD, PG and UG) also integrates disciplines other than parent disciplines. The majority of the externally funded research projects are also multidisciplinary in nature, with the involvement of more than one Department. The Centres and Chairs of Tezpur University are functioning with multidisciplinary set-up. There are many research publications of Tezpur University have Multidisciplinary authorship. With such a proven background, Tezpur University formally instituted the Centre for Multidisciplinary Research (CMDR) in the year 2020 to widen up multidisciplinary education further.

Vision of CMDR is to contribute development of human resource catalyzing multidisciplinary research and education through the provision of an integrated and holistic platform. The missions are (i) promotion of multidisciplinary research and education required to handle 21st century issues and challenges, with special reference to regional context, through meaningful integration of Arts, Languages, Humanities & Social Sciences, Management Sciences, Sciences, Engineering and Vocational fields and (ii) to facilitate multidisciplinary activities covering key thematic areas, viz., ethics of social engagement, sustainability, and soft skills for learners engaged in rigorous specialization in a chosen field or fields.

About Department of Design

Tezpur University is starting this new department "Department of Design" under the School of Engineering considering the importance of design in the success of any product. India represents a huge market and an "Atmanirbhar Bharat" needs enormous range of well-designed products for its own population as well as the rest of the world. That needs training and preparing future generations of technocrats with the right design perspective.

Initially, the department will be offering elective courses to the B. Tech. and M. Tech. programmes with the objective of providing the students, of the engineering disciplines in particular, with the perspectives of design thinking and the necessary training. Soon these will be extended to students of other programmes. That will be followed by starting of UG/ PG programmes on design in phases. We also envisage the need for catering to students/ project specific requirements. This will add a new perspective to design and innovation of various engineering product design development initiatives by adding a human centric focus.

A centre of excellence in Design and Innovation for creating competent professionals capable of integrating traditional and modern knowledge, concepts and styles for eco-friendly products and for addressing the challenges of India becoming a manufacturing hub.

Objectives:

- To promote design thinking and hands-on approach to learning through academic projects on industrial challenges among the students.
- To make students aware of real-life socio-economic problems and to solve using technology learning.
- To develop professional attitude and expertise among the students for addressing industrial challenges.
- To contribute to the Governmental regional/ national development policy and road map for Industrial revolution in the domain of design.

About Conference

The International Conference on Emerging Trends in Multidisciplinary Research for Sustainable Future (ICETMRSF-2026) aims to provide a dynamic platform for scholars, researchers, academicians, industry professionals, policymakers, and students to exchange ideas and share knowledge across diverse academic disciplines. The conference focuses on addressing emerging global and regional challenges such as climate change, digital transformation, sustainable development, and inclusive education.

The conference encourages interdisciplinary dialogue and collaboration among participants from fields including Science, Technology, Social Sciences, Management, and other related disciplines. By bringing together experts and young researchers from different backgrounds, the conference promotes innovative research approaches and practical solutions to complex real-world problems.

Through keynote lectures, technical sessions, and interactive discussions, participants will have opportunities to present their research findings, exchange experiences, and build academic collaborations. The conference also seeks to strengthen partnerships between academia, industry, and policymakers so that research outcomes can contribute effectively to sustainable development and societal progress.

Objectives:

- To share recent advances in multidisciplinary research among academicians and industry professionals.
- To promote collaborative research across disciplines such as Science, Technology, Social Sciences, and Management.
- To encourage the application of multidisciplinary knowledge in addressing real-world challenges.
- To highlight the role of multidisciplinary research in promoting sustainable development and innovation.

Broad Thematic Areas:

- Track 1: Scientific Innovation, Engineering & Digital Transformation
- Track 2: Health, Life Sciences & Environmental Sustainability
- Track 3: Society, Legal Studies, Policy, Education & Global Governance
- Track 4: Creative Media, Design & Interdisciplinary Innovation

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Prof. Amarendra Kumar Das
Pro-Vice-Chancellor

Message from the Pro-Vice-Chancellor

I am pleased to welcome you to ICETMRSF-2026, the International Conference on Emerging Trends in Multidisciplinary Research for Sustainable Future. This conference is being organized jointly by the Center for Multidisciplinary Research (CMDR) and the Department of Design at Tezpur University for two days from March 12th to March 13, 2026.

It is our understanding that the challenges of the 21st century cannot be resolved within the confines of one particular discipline. A sustainable future cannot be achieved without a mix of ideas woven from science, engineering, policy, design, and humanities. This conference would provide a much-needed platform for the scientists, designers, engineers, artists, educators, and policy thinkers to gather ideas and come up with solutions to global challenges by refusing to adhere to neat disciplinary boundaries.

I express my sincere thanks to the conference organizing committee, collaborators, and all participants who have worked hard to make this academic event possible. I hope that ICETMRSF-2026 achieves great success and anticipate the impactful outcomes and innovative insights it will generate.

2/3/2026

Date: 02.03.2026 **(Prof. Amarendra Kumar Das)**

Dean, School of Multidisciplinary Studies
ডিন, স্কুল অফ মাল্টিডিচিপ্লিনাৰী ষ্টাডিজ
Professor, Department of Energy | অধ্যাপক, শক্তি বিভাগ
Tezpur University | **তেজপুৰ বিশ্ববিদ্যালয়**

Debendra Chandra Baruah
দেবেন্দ্র চন্দ্র বৰুৱা

06 March 2026

It gives me immense pleasure to greet all the delegates while presenting this Abstract Book of the **International Conference on Emerging Trends in Multidisciplinary Research for a Sustainable Future** (*ICETMRSF-2026*) organised during 12-13 March 2026.

Multidisciplinary approach of research becomes inevitable to face the complexity of the new age, especially when uncertainty is the most certain everywhere, when partitioning into highly specialised micro-domains is now universal norm.

The researchers of Centre for Multidisciplinary Research (CMDR) of Tezpur University deserve sincere appreciation for organizing this conference which is one of the academic events organised by the Centre since its inception in 2020.

I wish all success of the event.

(Debendra Chandra Baruah)

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कुलाध्यक्ष का सर्वोत्तम विश्वविद्यालय पुरस्कार, २०१६ और एनआईआरएफ़ भारत रैंकिंग २०१६ : नं .०५
Visitor's Best University Award 2016 *and* No. 05 in NIRF India Ranking 2016

Message from the Dean, School of Engineering, Tezpur University

It gives me great pleasure to learn that the Centre for Multidisciplinary Research, School of Multidisciplinary Studies, in collaboration with Department of Design, School of Engineering, Tezpur University is going to organize an International Conference on *"Emerging Trends in Multidisciplinary Research for Sustainable Future"* to be held on 12th – 13th March, 2026.

Multidisciplinary Research integrates knowledge from many diverse fields – such as Environmental Science, Bioscience, Engineering, Economics and Sociology to address complex global challenges like climate change, global health crises, resource depletion and inequality. Multidisciplinary Research, therefore, seems to be the need of the hour to move toward a more sustainable future.

I hope the deliberations in the conference will immensely help the participants in acquiring the knowledge in the field of Multidisciplinary Research and apply these for achieving the Sustainable Development Goals.

I wish the conference a grand success.

Date: 03.03.2026

(Professor Jiten Chandra Dutta)

Message from Dean
Faculty of Archaeology, Silpakorn University, Thailand

It is with profound honor and great pleasure that I extend my warmest greetings to the distinguished organizers, esteemed delegates, and participants of the "International Conference on Emerging Trends in Multidisciplinary Research for Sustainable Future" (ICETMRSF-2026). This remarkable event is convened by the Centre for Multidisciplinary Research in collaboration with the Department of Design, Tezpur University. This gathering thoughtfully stands as a testament to our shared commitment to advancing scholarly exchange and multidisciplinary collaboration.

In our rapidly evolving global landscape, the pursuit of a sustainable future demands concerted, multidisciplinary efforts. Archaeology teaches us that understanding our past is essential for navigating our future. Similarly, merging diverse disciplines —from design and technology to environmental sciences—fosters innovative solutions to contemporary challenges. This conference represents a vital nexus for such collaborative inquiry.

I applaud Tezpur University for initiating this vital conversation. May this gathering serve as a catalyst for transformative ideas, forge enduring partnerships, and yield actionable insights that propel us toward a more sustainable and equitable world.

I am looking forward to the deep intellectual contributions that will arise from your discussions and wish the ICETMRSF-2026 a triumphant success.

Damrongphon Inchan, PhD
Dean, Faculty of Archaeology
Silpakorn University
Bangkok, Thailand

Message from Chief General Manager, NABARD

It is my pleasure to extend my warm greetings and best wishes to the organizers and participants of the International Conference on Emerging Trends in Multidisciplinary Research for Sustainable Future (ICETMRSF-2026).

In today's rapidly evolving world, addressing complex developmental and environmental challenges requires collaborative and multidisciplinary approaches. Platforms like ICETMRSF-2026 play a vital role in bringing together academicians, researchers, policymakers, and professionals from diverse fields to exchange ideas, share innovative research, and explore sustainable solutions for the future.

Such initiatives contribute significantly to promoting knowledge sharing, innovation, and evidence-based decision-making, which are essential for sustainable and inclusive development. I am confident that this conference will generate meaningful discussions and valuable insights that will help shape policies and practices for a better and more resilient future.

I congratulate the organizers for this commendable initiative and wish the conference great success.

-Sd-
Shri Loken Das
Chief General Manager
NABARD, Assam Region

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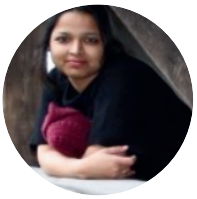

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Track 1: Scientific Innovation, Engineering & Digital Transformation

Keynotes

KN-1 ***Keynote Speaker***

Knowledge of Tai Studies from Multidisciplinary Research: An Integrated Regional and Global Perspective

Dr. Damrongphon Inchan, Ph.D.
Dean, Faculty of Archaeology
Department of Anthropology, Silpakorn University, Bangkok, Thailand
Correspondence: inchan_d@su.ac.th

Abstract

Tai Studies represents a dynamic and swiftly expanding field of scholarly inquiry that elucidates the historical trajectories, linguistic foundations, genetic heritage, and cultural identities of approximately 93 million individuals of Tai descent located in South China, Southeast Asia, and Northeast India.

This keynote address examines how integrative, multidisciplinary research approaches spanning historical-comparative linguistics, molecular anthropology, archaeology, ethnography, and cultural analysis—generate more nuanced and comprehensive understandings of Tai peoples than any single disciplinary approach could achieve independently. Recent bibliometric analyses reveal that Tai-related research has experienced significant international growth, with scholarly contributions extending beyond traditional China-focused perspectives to encompass sophisticated investigations into mechanisms of cultural adaptation, genetic admixture patterns, linguistic divergence timing, and the dynamic construction of ethnic and co-cultural identities across transnational communities. By synthesizing evidence from linguistic reconstruction demonstrating that Kra-Dai language divergence occurred approximately 4,000 years before present in the Guangxi-Guangdong region, phylogeographic findings supporting southwestward migration patterns into mainland Southeast Asia, archaeological evidence of settlement patterns and technological development, and ethnographic documentation of contemporary identity maintenance practices, we gain unprecedented insight into Tai knowledge systems as dynamic, historically-grounded, and regionally-interconnected phenomena. In order to move beyond externally imposed analytical frameworks and toward collaborative, community-engaged research that honors both scholarly rigour and cultural particularity, this presentation makes the case that advancing Tai Studies requires deliberate knowledge integration across disciplinary boundaries while remaining attentive to the voices, epistemologies, and self-representations of Tai communities themselves,

Keywords: Tai Studies, multidisciplinary research, linguistic anthropology, cultural identity, migration history, regional integration

KN-2 ***Keynote Speaker***

Human-Centric Sustainability: Integrating Technology, Health, Policy, and Design

Dr. Manas Ranjan Pradhan
Professor, School of Computing, Horizon University College, Ajman, UAE
Correspondence: manas.pradhan@hu.ac.ae

Abstract

Human-centric sustainability is an emerging paradigm that considers health and technology in sustainable development leveraging on technology, policy, and design.

This article, based on a conceptual framework, focuses on complex social and environmental challenges by addressing the digital and other technologies that can act as functional enablers for users and communities to easily access, maintain safety, and build trust on organization system and technology. Making health the primary driver of sustainability in positioning public health as a key factor for evaluating long-term enhancements to system performance. The role of policy and governance is in designing or shaping ecosystems through regulation, standards, and operational mechanisms that foster interoperability and resilience. The suggested framework is based on human-centered design act as the methodological approach to gather the data and information in a systematic approach that enhance the scalable and contextual solutions to problem in hand.

Leveraging on computing or allied technology, health, policy and design around human needs, the human-centric sustainability has a holistic approach for an adaptive and future-ready systems. With rapidly changing technological innovation, the proposed framework aims to guide researchers, practitioners and policy makers in developing community, infrastructure and institutions that are not only technologically advanced and environmentally suitable but also socially responsible to the people's need.

Keywords: Sustainable development, Human-centered design, Digital technologies, Regulatory frameworks, User accessibility

KN-3 ***Keynote Speaker***

Interdisciplinarity: Overcoming the Dichotomies of Natural and Social Sciences

Prof. Sambit Mallick
Department of Humanities and Social Sciences, Indian Institute of Technology Guwahati, Indian Institute of Guwahati, Guwahati, Assam
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Abstract

The 19th century idea of progress aimed at integrating natural philosophy and moral philosophy. Natural philosophers or scientists in the present sense of the term were engaged in epistemological questions whereas moral philosophers were engaged in ethical questions. The 19th century idea of progress did not treat these two domains in isolation. Rather, its attempt to overcome the dichotomy between natural philosophy (science) and moral philosophy (ethics) and particularly integrating the two resulted in modern philosophy of science. The World War II, in more senses than one, reiterated that the distinction between science and ethics is not rigid but opaque. Disciplines are historical formations. No discipline can stand alone today. The changing contexts of knowledge production and application have taught us how important it is to overcome such dichotomies. In the 21st century, it is germane to understand the bases of collaborative networking (integrating natural and social sciences) in terms of complementarities of expertise, physical facilities, sharing of materials for research and institutional mandates regarding funding and ownership over research. This lecture purports to highlight these changes in the context of knowledge production and its application and to focus on interdisciplinary and inter-institutional collaborative networking aiming towards concrete deliverable solutions.

Keywords: Natural sciences, Epistemology, Social sciences, Ethics, Collaborative networking

KN-4 ***Keynote Speaker***

Indigenous Knowledge Systems and Technology-Assisted Nāḍī Parīkṣā: The Nadi Tarangini Approach

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Abstract

Indigenous Knowledge Systems (IKS) constitute a rich body of experiential and context sensitive knowledge that has guided health practices in India for centuries. A central component of this tradition is *Nāḍī Parīkṣā* (pulse diagnosis), which interprets physiological states through the assessment of the three fundamental doṣas—**Vāta, Pitta,** and **Kapha—** representing the principles of movement, metabolism, and structural stability respectively. In classical practice, variations in pulse quality are used to understand doṣic balance or imbalance, offering a holistic view of health and disease. However, traditional Nāḍī Parīkṣā remains largely subjective and practitioner-dependent, limiting its standardization and wider clinical adoption.

This abstract presents the Nadi Tarangini approach as a technology-assisted framework that integrates Indigenous Knowledge Systems with modern bio-sensing and analytical tools to objectively capture pulse waveforms. By converting qualitative pulse characteristics associated with Vāta, Pitta, and Kapha into quantifiable parameters, Nadi Tarangini enables systematic analysis, reproducibility, and digital documentation while respecting the epistemological foundations of indigenous diagnostics.

Keywords: Indigenous Knowledge Systems, Vāta, Pitta, and Kapha, Nadi Tarangini approach, epistemological foundations

KN-5 ***Keynote Speaker***

Role of Emerging Technologies in Multidisciplinary Research for Sustainable Development

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Abstract

We are living in a paradoxical era where rapid advances in emerging computing and intelligent technologies coexist with complex ethical, social, and human challenges. This keynote presentation offers a reflective and forward-looking perspective on the evolving role of Artificial Intelligence (AI) and other futuristic technologies in shaping education, research, industry, and society at large. It positions AI not merely as a technological advancement, but as a transformative force that demands responsible design, thoughtful deployment, and strong alignment with human values.

The presentation explores the convergence of emerging computing paradigms—such as data-driven intelligence, automation, and intelligent systems—with multidisciplinary thinking and sustainable development goals. Emphasis is placed on capacity building, future-ready skills, and the changing responsibilities of higher education in preparing learners, researchers, and leaders for an AI-driven world. The talk highlights the importance of embedding ethics, inclusivity, and social responsibility into AI ecosystems to ensure that innovation leads to equitable and meaningful impact.

A central theme of the keynote is collaboration, underscoring how partnerships across disciplines, sectors, and geographies can accelerate innovation while addressing real-world challenges. The discussion advocates a shift from technology-centric approaches toward purpose-driven, human-centered AI that balances efficiency with empathy, and innovation with accountability.

Overall, the presentation calls for conscious leadership and collective action to harness emerging computing and intelligent technologies in ways that are ethical, inclusive, and sustainable, ensuring that technological progress ultimately serves humanity and society.

Keywords: Artificial Intelligence; Emerging Computing; Human-Centered AI; Multidisciplinary Education; Ethical and Sustainable Technologies

KN-6 ***Keynote Speaker***

Issues and Challenges in Multidisciplinary Research for a Sustainable Development in India

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Abstract

The twenty-first century has stepped into the era of sustainable development. This concept of 'sustainable development' is the millennium goal of the UN to be followed by all. The Holocene epoch, representing more than 10,000 years, was an epoch of stable and warm climate, in which human history experienced the rise of civilization. The Holocene epoch is on the cross road. Research in contemporary years on issues of climate change, reason behind rising of temperature in the industrial era, overuse of natural resources, accumulation of Carbon in the atmosphere, determine the approaching of 'Anthropocene' the manmade epoch challenging environmental realities of epoch 'Holocene'. People in the twentieth century contributed to establishments of independent nations.

Postcolonial nation building processes indoctrinated technological development combined with unplanned urban growth, use of non-renewable energy, over dependence of modified high yielding variety of seeds, deforestation, use of non- eco-friendly products like plastics, synthetic materials, overuse of pesticides and fertilizers created side effects to a large extent which not only rise temperature and polluted the atmosphere, cultural geographies have lost vitality in rapid rates; ground water levels are lowering down and have been posed new threats to many places in our nation. The Indian peninsula blessed by the Almighty Himalaya and origin of so many perennial rivers as well as monsoon rain suffers from water crises at different levels.

Multidisciplinary research engagements need to be critique of all scientific productions antagonized life and living of people on earth. No nation can solve the global problem of climate change and carbon emission, over dependence of modified seeds, and unplanned growth in the name of progress singularly. Collective efforts in research may create a turning point. Invariably, Sustainable approach cannot be a reality without promoting the value of coexistence of all living organisms, equity, and eco-friendly utilization of inorganic elements that have nourished life on earth for so long.

Key Words: Holocene; Anthropocene; Ecology; Sustainable Development; Gender; Equity, Environment, Traditional Ecological Knowledge, Indigenous Knowledge

KN-7 ***Keynote Speaker***

Societal Transformation through Adoption and Value Addition in Agro- and Micro-Entrepreneurship

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Abstract

Any societal transformation largely depends on how receptive society is to new ideas and its dynamism in accepting change. In this context, willingness to adopt and capability both play significant roles. The adoption of a technology, a crop, or a management practice can be a discrete decision to use or not to use, a proportional indicator, an index of scale or extent of use, the level of choice or intensity of use, or the frequency of use. The value addition grounded in indigenous knowledge is crucial to agro- and micro-entrepreneurship for promoting income and livelihood generation, where adoption is an essential prerequisite. In the value-addition process, a series of activities is required to bring a product from its origin to its final consumer, adding value at each production phase. This presentation discusses a few fundamental questions on entrepreneurship and its importance in societal transformation. It discusses the importance of adoption in entrepreneurship, with on-the-ground examples and photographs relevant to North East India. It also discusses the importance of value addition for successful entrepreneurship, with examples and pictures of products with comparative advantage, particularly relevant to North East India. Finally, it discusses a roadmap to foster value-added entrepreneurship and generate income and livelihoods in the region.

Keywords: Agro- and micro-entrepreneurship; adoption; value addition; comparative advantage.

KN-8 ***Keynote Speaker***

Re-defining Wildlife-Human Interactions Through Technology

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Abstract

The present-day research on wildlife conservation is heavily influenced by advanced technology and profoundly shapes our understanding of the human and nonhuman 'natural' world. My talk examines how technology is shaping our understanding of nature, focusing on wildlife conservation in India. The use of smartphones for recording field notes, the sharing of bird images on social media platforms, and the use of high-definition video screens to observe endangered species have enhanced our understanding and also transformed our connection with nature. In the field of Ornithology, DSLR cameras and smartphones have changed how bird-watchers observe birds and how bird scientists work. Similarly, radio-telemetry and camera-trapping revolutionised wildlife research in novel ways, but also draws our attention to the debate over the intrusiveness of modern technology.

I address this question in three sections: (1) In what ways does knowledge mediated through technology differ from other forms of experiential knowledge about the nonhuman world? (2) What are the ethical dilemmas of technological applications in wildlife research and their impact on both humans and nonhumans? (3) Are the Images of rare animals and indigenous people widely used for awareness and public support, making them 'commodities', raising serious ethical questions? Drawing on experience in wildlife conservation and examples from across the country, I aim to present an anthropological perspective on the role of technology and how it has redefined wildlife-human interactions.

Keywords: Wildlife, technology, nature, conservation, biologists, rural communities, ethics

KN-9 ***Keynote Speaker***

AI in Malware Defence

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Abstract

The expansion of the digital ecosystem has significantly transformed the means for data collection, storage and exchange across critical sectors such as healthcare, finance, e-commerce, and public sectors. While these advancements improve efficiency and accessibility, it also intensify cybersecurity risks. Theft of personal and confidential data followed by large-scale data breaches have emerged as persistent and high-impact threats. Malware-driven attacks are prominent ones among those thefts for compromising sensitive information. This talk aims at focusing the evolving malware-based threats within the cybercrime landscape and possible defense development using AI based approaches and their validation. It analyzes how modern malware (obfuscated) exploits vulnerabilities in operating systems and applications to bypass traditional detection mechanisms. Key attack stages, including initial infection, command-and-control communication, execution and data exfiltration will be discussed. The talk further highlights how malware enables credential theft and unauthorized identity misuse by using advanced technologies. Furthermore, for a practical overview on occurrences of such malware enabled attack, a test-bed development will also be discussed to facilitate (a) creation and launching of oligomorphic and polymorphic malware, (b) monitoring the runtime behavior, and (c) detection using deep learning approaches. The talk finally emphasizes the need for a proactive, multi-layered cybersecurity defenses and stronger data protection strategies to mitigate the risks due to any malware-driven attacks.

Keywords: AI, Machine learning, Malware, Oligomorphic, Polymorphic, Deep Learning, Test-bed.

KN-10 ***Invited Speaker***

Engineering Trust in an Intelligent World: Innovation at the Intersections for a Sustainable Future

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Abstract

As our world transitions from tools that execute to systems that sense, decide, and anticipate, the traditional conception of trust has become obsolete. This keynote addresses a critical multidisciplinary mandate: engineering trust not as a subjective experience, but as a technical metric integrated into the technical lifecycle of every intelligent system. The core proposition of this address is that while technology creates capability, it is trust that determines adoption.

Drawing from the multidisciplinary lens of Research, Industrial Design and Human-Machine Interaction (HMI), I examine three foundational transitions required for a sustainable future: the shift (of design & development) from object architecture, static optimization and passive automation to behavioral stewardship, adaptive sovereignty and active agency. Central to this discourse is the imperative of "Reflex-Preserving Design" which is the argument that technological progress must amplify rather than "dumb" human situational reflex to prevent "out-of-the-loop" performance problems.

Aligned with the goals of Industry 5.0 and Society 5.0, this address demonstrates that sustainability is fundamentally relational, focusing on the enduring resilience of human-machine partnerships. True innovation occurs at the intersections of engineering, design, ethics, and policy. By positioning the designer as the steward of these relationships, we can move beyond fragile efficiency toward adaptive sovereignty. The vanguard of this movement will be those who possess the multidisciplinary courage to ensure that when systems think, humans are empowered to think deeper.

Keywords: Trust Engineering, Human-Machine Interaction (HMI), Relational Sustainability, Agentic AI, Reflex-Preserving Design, Industry 5.0, Society 5.0

KN-11 ***Invited Speaker***

Biodiversity Conservation as a Multidisciplinary Imperative in the Era of the Triple Planetary Crisis

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Abstract

Humanity has already transgressed seven of the nine planetary boundaries, with biodiversity loss emerging as one of the most critical and potentially irreversible dimensions of the Triple Planetary Crisis. While climate change and pollution exacerbate ecological instability, the rapid erosion of species, habitats, and ecological interactions threatens the very foundation of ecosystem resilience and human well-being. Biodiversity loss is therefore not solely a biological concern; it is deeply embedded within political economies, governance systems, cultural values, and patterns of human behaviour. Conservation is fundamentally a multidisciplinary enterprise. Ecological science enables us to measure species decline, understand ecosystem dynamics, and design recovery strategies. Yet evidence alone does not secure conservation outcomes. Effective biodiversity protection requires integration with social sciences, behavioural psychology, economics, ethics, and public policy. Political will, institutional commitment, and community participation often determine whether scientific recommendations translate into meaningful action. At the same time, species recovery efforts grounded in rigorous research demonstrate the indispensable role of sustained scientific intervention.

Conservation functions as a crisis-driven, action-oriented discipline that cannot afford disciplinary silos. Addressing biodiversity loss demands collaboration across fields and active engagement with citizens in their everyday contexts. By reconnecting people with ecological realities and involving them in co-creating solutions, conservation can evolve from fragmented interventions into a cohesive societal response to the biodiversity crisis.

Keywords: Biodiversity Loss; Multidisciplinary Conservation; Planetary Boundaries; Political Will and Governance; Conservation Science; Environmental Behaviour Change

KN-12 ***Invited Speaker***

Nanocellulose: Material for a Sustainable Future

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Abstract

Growing ecological concerns have made it essential to develop sustainable materials for a range of technological applications. As a result, the research community showed considerable increase in developing materials that offer high performance while minimizing environmental impact. Cellulose, the most abundant biopolymer derived from biomass, possesses distinctive properties such as high mechanical strength, numerous functional groups, biocompatibility, biodegradability, and stability in chemical environments. Currently, the research community is focusing on the development of advanced functional materials using cellulose nanofibers (CNF), including membranes, cellulose nanopapers (CNP), cellulose hydrogels, and aerogels. Among these, nanocellulose aerogels and CNP have attracted particular interest as promising candidates for high-performance functional materials. These materials demonstrate exceptional porosity, often exceeding 90%. Hence, they find wide applications in water purification by removing the oil, organic dyes and pharmaceutical ingredients etc. They can also be effectively modified for inducing non-flammability and thermal insulation. Incorporating nanocellulose with other functional and active nanomaterials can introduce a range of new functionalities to cellulose nanopapers. This approach broadens their applications, extending beyond traditional uses into advanced fields like packaging, electronic devices, clean energy, biomedicine, and water treatment.

KN-13 ***Invited Speaker***

Threading Memory- Indigenous Craft as Living Archive and Public Good/Digital Public Good

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Abstract

Across Northeast India and Southeast Asia, indigenous craft knowledge moves from hand to hand, voice to voice, generation to generation. When a master weaver passes without transmitting their techniques, entire vocabularies of pattern, colour, and cultural meaning vanish forever. This oral transmission system, once resilient, now faces unprecedented fragility as younger generations migrate, markets shift, and traditional apprenticeship models collapse.

This keynote examines the critical tension between preservation and practice in indigenous craft ecosystems, focusing on textile traditions from Nagaland to Myanmar. What happens when craft knowledge skips a generation? Can digital technologies serve as bridges rather than museums? And how do we navigate the ethics of archiving living traditions without extracting their soul? Drawing on fieldwork with Muga silk rearers/weavers, wood carvers, and textile artisans, this talk explores emerging models of digital documentation- from collaborative video archives to pattern databases built with community consent. It interrogates both the promises and perils: accessibility versus appropriation, democratization versus decontextualization, preservation versus petrification.

As we stand at the intersection of ancestral knowledge systems and technological possibility, this presentation asks: Can craft knowledge become a Public Good/Digital Public Good while remaining culturally sovereign? Can we thread memory across generations without breaking the living continuity that gives craft its meaning? The future of indigenous craft may depend on how we answer.

Key Words: Indigenous Craft Preservation, Tacit Pedagogy, Craft Sovereignty, Intergenerational Memory, Ethnographic Ephemerality, Living Archives, Digital Public Good

Track 1: Scientific Innovation, Engineering & Digital Transformation

Paper ID: 14

CoMKG: Code-Mixed Knowledge Graph for Hate Speech Detection with Embedding Aggregation Techniques

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Abstract

Anti-religious hate speech detection on social media platforms presents significant challenges due to contextual nuances, cultural references, and implicit expressions of hatred. This paper presents CoMKG (Code-Mixed Knowledge Graph), which is a novel knowledge graph for code-mixed religious data incorporating religious entities, texts, figures, practices, concepts, places, groups, and hate speech terms with their contextual relationships and comprehensive comparative analysis of two embedding aggregation techniques (averaging and concatenation of entity embeddings) for knowledge graph-enhanced hate speech detection. Experimental results demonstrate that concatenated embeddings preserve entity-specific information more effectively than averaged embeddings, achieving superior performance across all evaluation metrics with F1-scores improving by 1-3% across different classifiers.

Keywords: Hate Speech Detection, Knowledge Graph, Code-mixed text, Embeddings, Anti-Religious Content, CoMKG

Paper ID: 20

A Lightweight Hybrid Transformer Model for Panoramic Dental X-Ray Segmentation

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Abstract

Accurate segmentation of dental structures in panoramic X-rays is vital for early diagnosis, treatment planning, and automated dental analysis. Although CNN-based U-Net models have shown promising performance, their limited ability to capture long-range dependencies and global contextual information restricts accurate delineation of overlapping teeth and low-contrast regions. To address this limitation, this study proposes MobileViTUNet, a lightweight hybrid Transformer architecture that integrates a MobileViT encoder into the U-Net framework. The model combines convolutional layers for precise local feature extraction with transformer blocks for effective global context modeling, enabling more reliable and anatomically consistent segmentation. MobileViT-UNet was evaluated on a curated dataset of 8,188 panoramic dental X-ray images, as a binary segmentation task separating dental structures from the background. Its performance was compared with CNN based U-Net variants using VGG16, SEResNet18, MobileNetV1, MobileNetV2, DenseNet121, and InceptionV3 backbones. The proposed model achieved a Dice score of 0.9854, IoU of 0.9713, precision of 0.9854, and recall of 0.9854, while maintaining computational efficiency with only 7.79M parameters and a model size of 90.4 MB. Visual evaluation further confirmed its ability to accurately delineate complex dental structures. These results highlight the effectiveness of MobileViT-UNet as a robust, accurate, and light weight solution for panoramic dental X-ray segmentation.

Keywords: MobileViT-UNet, Semantic Segmentation, Hybrid Transformer, UNet Variants, Lightweight Model, Dental X-Ray

Paper ID: 31

Biodiesel Production and Characterization from Pinus Kesiya bark and Azadirachta Indica Seed

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Abstract

Biodiesel in recent times has become a promising and convenient alternative fuel for power machines especially for C.I engines. Biodiesel which is mostly derived from natural renewable sources has got environmental and engine operational benefits. In the present work, biodiesel is obtained from Pine bark oil (Pinus kesiya) and Neem seed oil (Azadirachta indica) which are non-edible or second-generation feedstocks using a double stage transesterification process. It is followed by determination of the physio-chemical properties by confirming the fatty acid methyl esters by titration of both the biodiesel blends with varied percentages of the two bio-oils. The biodiesel properties are evaluated using specific property apparatus. The properties are compared to evaluate the most suitable biodiesel and biodiesel blends for the performance enhancement. A simple cost analysis is then performed to evaluate and compare the cost of methyl ester per litre of raw oils. It has been found that production of methyl ester from pine bark is costlier as compared to that from neem seed oil. The calorific value of pine oil is found to be higher than neem oil, but each is less than that of standard diesel fuel.

Keywords: Biodiesel, Transesterification, Methyl ester, Calorific value

Paper ID: 34

Use of Speech Technology in Medical Practice: A review

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Abstract

Early detection of any disease is very important. Early detection leads to more chances for recovery. Advanced technology is playing crucial role for identifying disease now a day, and so early detection is increasing. There are different types of technological approaches for monitoring, recording, analysis and management of health. Speech technology is one of the powerful approaches to use in both physical and mental health care. Analysis of features extracted from speech may inform about the physical and mental health status, and that features may be used in feature vector forms to Machine and Deep Learning approaches to make machine intelligent enough to draw conclusion and predict of possible diseases. That way speech data is gradually becoming a future digital biomarker for disease detection. Easy diagnosis, monitoring of symptom, cost effectiveness, diagnostic with more accuracy are the direct benefits of use of speech technology integrated with Artificial Intelligence (AI) approaches. In this study, a notable effort has been initiated to attempt an extensive survey of use of speech technology in medical practice for taking care of health. Research in this field has a wide scope because of its multidimensional importances.

Keywords: Speech technology, Deep learning, Machine learning, Artificial Intelligence, Healthcare

Paper ID: 41

Bio-Waste Based Chitosan Composite Film for Sustainable Packaging

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Abstract

Bio-waste is environmentally friendly, sustainable, biodegradable, and non-toxic. They may be used as filler to prepare biocomposite with biopolymer to tailor the properties of the biopolymer. Chitosan (Cs) is an exceptionally versatile and promising biopolymer. Chitosan is highly biocompatible, biodegradable, and has antibacterial properties. The incorporation of bio-waste mediated materials like pistachio shell powder and leaves extract into the Cs biopolymer matrix may lead to a hybrid biocomposite with numerous intriguing properties. In this work, we present a series of Cs biocomposites prepared by the incorporation of different amounts of pistachio shell powder, neem, sonaru, and papaya leaf extracts. The elemental analysis of these composites is carried out using FTIR and XRD techniques. The incorporation of bio-waste filler ensured good integrity in Cs biocomposite films. The water barrier and mechanical properties of Cs biocomposites have undergone a significant improvement, which are essential attributes for packaging materials. The moisture content of Cs films has been reduced to 9.6%. Films made from Chitosan/pistachio shells powder biocomposite exhibit tensile strength ~26 MPa, whereas films made with sonaru leaf extract exhibited the highest strength ~80 MPa. The thermal stability of Cs increases in its biocomposites. The neem leaf extract incorporated Cs films demonstrate good antimicrobial efficacy against E. coli and B. subtilis pathogens. Furthermore, the use of pistachio shells powder and leaf extracts of neem, sonaru, and papaya extends the value of the composite. These materials are environmentally friendly, sustainable, biodegradable, non-toxic, cost-effective, renewable, and sustainable. The developed biocomposites have the potential to be used as a suitable alternative for packaging materials.

Keywords; Chitosan; biopolymer, pistachio shell, biocomposite, leaf extract, and antimicrobial

Paper ID: 43

Superhydrophobic ZnO Nanorod-Polystyrene Hybrid Films for Self-Cleaning Applications

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Abstract

Superhydrophobic surfaces are of growing scientific and technological interest because of their water repellency, self-cleaning, anti-corrosion, and low-drag functionalities that support sustainable and low-maintenance technologies. Particularly, metal oxide-based nanostructures offer a robust platform for hydrophobic surface design due to their chemical stability, tunable morphology, and scalability. In this work, highly dense and asymmetric 1D ZnO nanorods were successfully grown on glass substrates using a simple and scalable two-step process consisting of vacuum evaporation of Zn thin films followed by controlled thermal oxidation. Thermal oxidation of Zn films at 700 °C in an air ambient produced well-defined ZnO nanorods with enhanced surface roughness, yielding a water contact angle (CA) of about 130°, indicative of strong hydrophobic behavior. To further decrease surface free energy, a thin polystyrene layer (1 wt%) was deposited via spin coating, driving the surface toward superhydrophobicity (CA ~160°). The resulting polystyrene coated ZnO surface synergistically combines nanoscale texturing and eco-friendly chemical modification. This approach provides a practical route to durable, water repellent and self-cleaning coatings without relying on fluorinated compounds. Such surfaces can contribute to reduced water and chemical consumption as well as lower maintenance demands. Potential applications of this work include self-cleaning architectural coatings, corrosion-resistant layers, and biomedical interfaces. Overall, this study highlights the importance of superhydrophobicity and metal oxide nanostructuring in advanced sustainability-oriented functional surfaces through a multidisciplinary integration of materials science and surface engineering towards sustainability-oriented design for future functional coatings.

Keywords: Superhydrophobic surface, ZnO nanorods, Polystyrene coating, Self-cleaning, Surface engineering.

Paper ID: 44

Design and Implementation of an IoT-Enabled Battery Management System for Electric Vehicle Safety and Thermal Protection

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Abstract

The increasing adoption of electric vehicles is expanding very rapidly, which has resulted in a very high demand for reliable safety mechanisms in battery systems, particularly challenges associated with over charging, deep discharge and thermal instability. Our research work is mainly focused on design and development of a smart battery management system (BMS) with the integration of Internet of Things (IoT) features for real time charge monitoring and fire risk reduction for electric vehicle battery packs. Our research work proposed a system which continuously monitors key battery parameters, including voltage, state of charge and temperature, and will take protective actions if the measured conditions exceed predefined safety limits. A NodeMCU ESP8266 controller, a lithium-ion battery pack, temperature sensors and also used a protection circuitry which do the automatic cutoff, visual alerts and also a cloud-based monitoring for the system. Our research work shown that it has successfully detected an abnormal charging cycle, discharging and overheating condition of the battery packs in order to provide improved reliability of the batteries and also the user safety. The integration of IoT with the BMS architecture allows for the continuous monitoring of the battery pack and all operating conditions, both locally and remotely. The research work demonstrates how the employment of Internet of Things (IoT) assisted battery management system (BMS) architectures could significantly improve the capability of proactive safety features and also improve operational performance in electric vehicle applications.

Keywords: Battery Management System, Charging, Discharging, Internet of Things, Safety, Battery, Lithium-ion

Paper ID: 48

Performance Evaluation of Classical Machine Learning Models for Tea Leaf Quality Classification under Varying Class Imbalance Conditions

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Abstract

Assessment of green tea leaf quality is a very important step in ensuring consistency and market value in tea production, particularly in large-scale tea estates where manual inspection is subjective and difficult to scale. In this paper, we are trying to investigate the effectiveness of classical machine learning (ML) algorithms for automated tea leaf quality classification under varying dataset scales and class imbalance conditions. A real-world image dataset comprising approximately 35,000 green tea leaf images (30,000 good and 5,000 bad) collected from tea estates in Assam, India, was utilized. Multiple experimental datasets were constructed with both balanced and imbalanced good–bad leaf ratios, ranging from 500–500 to 3000–2000, to analyze model scalability and robustness. Six widely used ML classifiers—Logistic Regression, Support Vector Machine (SVM), Random Forest, K-Nearest Neighbors, Naïve Bayes and Decision Tree, —were evaluated for precision, accuracy, recall and F1-score metrics. The analysis confirms that SVM and Random Forest reliably outperform other models across varying dataset scales and imbalance conditions, with classification performance remaining stable. In contrast, KNN and Naïve Bayes exhibit reduced effectiveness under increasing data volume and class imbalance. The findings highlight the continued relevance of classical ML approaches for tea leaf quality assessment, particularly in resource-constrained or real-time deployment scenarios, and provide a strong baseline for future integration of deep learning techniques.

Keywords: Logistic Regression, Random Forest, SVM, KNN, Naïve Bayes, Decision Tree, Accuracy.

Paper ID: 50

Application of Machine Learning in Neutrino Physics Experiments

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Abstract

Machine learning (ML) refers to a class of data driven methods that learn patterns and relationships directly from data to support prediction and decision making without explicit rule based models. It encompasses supervised, unsupervised, and reinforcement learning approaches, with deep learning using multi-layered neural networks to model complex and high dimensional data. In scientific research, machine learning is increasingly used to automate analysis tasks, improve performance in noisy conditions, and enable efficient processing of large datasets. ML is particularly relevant for particle physics, where detector data are complex, high dimensional, and difficult to process with traditional reconstruction and event selection algorithms. In recent years, machine learning methods have emerged as powerful tools for enhancing performance across several core tasks, including detector hit clustering, track and vertex reconstruction, particle identification, and calorimetric energy estimation. This contribution presents an overview of recent ML-based workflows for neutrino physics experiments, with emphasis on deep learning methods that naturally handle complex detector layouts and correlations in detector signals. In particular, graph neural networks have demonstrated strong performance for particle tracking in regions with overlapping detector hits, while convolutional neural networks have been successfully applied to reconstruction and classification tasks in calorimeters. We also discuss the growing role of ML in real time event filtering under strict latency and hardware constraints. Finally, we outline key challenges that must be addressed for reliable use of ML in precision measurements, including mismatches between simulation and real data, uncertainty estimation, and systematic validation. These developments highlight the growing role of ML as an integral component of both data analysis and detector operation in modern neutrino physics experiments.

Keywords: Neutrino Physics Experiments, Deep Learning, Convolutional Neural Network, Graph Neural Network.

Paper ID: 62

RATRP-Mediated Synthesis of Poly(butyl acrylate)-grafted-SBR with Superior Mechanical Properties

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Abstract

This study presents the synthesis of poly(butyl acrylate) grafted styrene butadiene rubber (SBR-g-PBA) via reverse atom transfer radical polymerization (RATRP) with the aim of evaluating their microstructures and various properties. The structural characterization of this prepared graft copolymer was carried out using various analytical techniques such as FT-IR and NMR. Type of protons (CH, CH2 and CH3), their positions, and couplings with carbon and other protons, etc. in the SBR-g-PBA are investigated using 1H NMR, 13C NMR, and Distortionless enhancement by polarization transfer (DEPT). The investigation of thermal stability was carried out by Thermogravimetric Analysis (TGA). Universal Testing Machines (UTM) was used to analyze the mechanical properties. These analyses showed that SBR-g-PBA is superior to pristine SBR in terms of mechanical properties, moisture resistance, and thermal properties.

Keywords: Grafting, SBR, butyl acrylate, RATRP, NMR, UTM

Paper ID: 64

BionetCDD: A Critical Disease Detection Prototype using Deep Learning Approaches

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Abstract

Early and accurate detection of critical diseases at low cost is essential for effective clinical care and improved patient survival. As healthcare data continues to advance, deep learning has emerged as an important tool to automate complex diagnostic tasks. This paper presents an experimental prototype called BionetCDD that uses five prominent deep learning architectures, such as EfficientNetB4, ResNet (50), ResNet (101), DenseNet169, and VGG-16, for handling diverse disease datasets with high precision. The study recommends the consistent performer in terms of classification accuracy across all datasets. BioNetCDD also includes a robust unsupervised module to address the persistent challenge of scarce or expensive expert annotations. Our unsupervised module combines a Convolutional Autoencoder with K-Means clustering to extract latent representations for precise identification of disease clusters without relying on labeled ground truth. This dual approach provides a practical road map for researchers, offering a scalable solution that remains effective even in data-sparse clinical environments. The performance of BioNetCDD was validated using three benchmark datasets, and the results are highly satisfactory. The inclusion of explainability features makes our prototype more attractive from the perspective of the acceptability of end users.

Keywords: Medical Image Classification, Deep Learning, Transfer Learning, Convolutional Neural Networks, Autoencoder, Unsupervised Learning, K-Means Clustering.

Paper ID: 65

Starch graft Copolymers as Biodegradable TPE: Thermal, Mechanics and Degradation Study

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Abstract

The flexibility, processability, and recyclability of thermoplastic elastomers (TPEs) make them widely used in various sectors, like pharmaceuticals, food packaging, cosmetics, beverage industry, automotive, agriculture, and more. However, conventional petroleum-based TPEs can pose challenges during their end-of-life degradation process. Rising environmental pressures have encouraged research on bio-based alternatives. In this context, starch has emerged as an ideal candidate for its abundance, low cost, and amenable granular structure. The limitations of native starch in mechanical strength and hydrophilicity make it difficult to use it for broader applications. However, these limitations may be overcome by chemical modifications. Chemical modification entails using its ample hydroxyl groups of starch by etherification, esterification, crosslinking, and graft copolymerization. Graft copolymerization stands one such for imparting TPE-like elastomeric properties, yielding copolymers with a starch backbone covalently linked to polymer through "grafting from," "grafting to," or "grafting through" approaches. This study focuses on grafting vinyl functionalized starch with vinyl monomers using a grafting-through approach to achieve enhanced mechanical properties and TPE-like thermal behaviour. It would be advantageous to develop sustainable TPE that is more biodegradable and suitable for multiple applications.

Keywords: Starch modification, Thermoplastic Elastomers, Graft copolymerization, Biodegradability, Mechanical strength.

Paper ID: 66

BioNet ITD: Identity Theft Detection Using Deep Learning- An Experimental Prototype

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Abstract

The expansion of the digital ecosystem has significantly transformed the means for data collection, storage and exchange across critical sectors such as healthcare, finance, e-commerce, and public sectors. While these advancements improve efficiency and accessibility, it also intensify cybersecurity risks. Digital identity theft and large-scale data breaches have emerged as persistent and high-impact threats, with malware-driven attacks remaining one of the most effective vectors for compromising sensitive information. This study examines the growing problem of identity theft within the cybercrime landscape, focusing specifically on malware-based attacking approaches. It analyzes how modern malware exploits vulnerabilities in operating systems and applications to bypass traditional detection mechanisms. Key attack stages, including initial infection, command-and-control communication, execution and data exfiltration, are experimentally examined and attempts to develop an experimental prototype called BioNet_ITD. The prototype has been validated using multiple benchmark datasets. The study further highlights how malware enables credential theft and unauthorized identity misuse by using advanced technologies. Furthermore, for a practical hands-on experience on occurrences of such malware enabled attack, a test-bed is created for (a) creating and launching polymorphic malware, (b) monitoring its behavior, and (c) its detection using deep learning approaches. This study emphasizes the need for proactive, multi-layered cybersecurity defenses and stronger data protection strategies to mitigate identity theft risks.

Keywords: Malware, Identity-theft, Polymorphic Malware, Deep Learning, Test-bed

Paper ID: 67

Enhanced Stability Prediction of Smart Grid using Machine Learning techniques

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Abstract

The growing electricity demand with population rise and economic growth led to the emergence of efficient power systems. Smart Grid has come up as a promising system for improving the reliability, efficiency and stability of the grids. In recent times, the stability of smart grids has been a major concern due to integration of renewable energy sources, distributed generation, and dynamic load behaviour. Conventional evaluation techniques are not adequately equipped to meet with the increasing complexity, size, and unpredictability of grid operations. With the integration of machine learning techniques in smart grids, the overall performance of the grids can be enhanced. In this study, machine learning techniques such as Random Forests (RF), Extreme Gradient Boosting (XGBoost), and Multi-Layer Perceptron (MLP) are proposed for predicting smart grid stability utilizing accuracy, Root Mean Square Error (RMSE), and R-squared (R2) metrics in predicting grid states. From the results obtained, it is found that XGBoost outperformed with 95.37% accuracy, lowest RMSE value of 0.007167, and highest R-squared (R2) value of 0.962303. All the models performed well in predicting smart grid stability.

Keywords: Machine learning, Stability, Smart Grids, Reliability, Sustainability.

Paper ID: 68

SAR image despeckling in Wavelet domain using bivariate shrinkage function

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Abstract

Synthetic Aperture Radar (SAR) imaging systems are all-weather systems that operate at all times. Due to the speckle that results from every coherent imaging system, the tasks of computer-assisted scene analysis and human interpretation become highly difficult. Therefore, the speckle reduction of SAR images is considered an important pre-processing step for the follow-up tasks like segmentation, recognition of target, etc. In this paper, a novel wavelet domain framework in homomorphic structure is proposed to suppress speckle noise in SAR images. Assuming interscale dependencies among wavelet coefficients, a locally adaptive bivariate shrinkage function is employed to modify the subband coefficients. For preserving the details, the coefficients inside the subbands are classified into significant and non-significant coefficients using an appropriate threshold. The significant coefficients are then further classified into edge and non-edge ones. The edge coefficients are kept unchanged, but the non-edge and insignificant coefficients are modified in magnitude using the bivariate shrinkage rule. The performance of this technique is evaluated by comparing Equivalent Number of Looks (ENL) and Edge Saving Index (ESI) with many existing techniques. The results reveal that the proposed despeckling method yields better speckle suppression performance in homogeneous regions of SAR images and preserves the true image details.

Keywords: SAR Images, Speckle Noise, Wavelet Transform, ENL, ESI

Paper ID: 101

A Compact Transmission-Line Unit-Cell Loaded Laptop Antenna Covering the Wi-Fi 6E/7/8 Bands.

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Abstract

A compact transmission-line unit-cell loaded internal antenna for Wi-Fi 6E/7/8 laptop computers is presented in this paper. The antenna is implemented on a 0.8 mm thick single-sided FR-4 substrate and consists of a compact inverted-L strip that excites a transmission-line unit-cell formed by a capacitive coupling gap and an inductive shorting strip. The overall antenna size is only 12.1 mm × 5.9 mm and is electrically connected to the laptop ground plane measuring 355 mm × 215 mm. Full-wave simulations performed in HFSS demonstrate two operating bands ranging from 2.35 GHz – 2.50 GHz, and 5.10 GHz – 7.50 GHz with |S11| better than –10 dB, corresponding to one lower and two upper resonant modes. These bands fully cover the Wi-Fi 2.4 GHz (2.400 GHz – 2.484 GHz), 5 GHz (5.150 GHz – 5.925 GHz), and 6 GHz (5.925 GHz – 7.250 GHz) used in Wi-Fi 6E and Wi-Fi 7 systems. The antenna achieves total efficiency above 80 % and peak realized gain exceeding 5 dBi across the operating bands. Surface current density distributions and radiation patterns indicate monopole-like behavior at the lower resonance and loop-like modal behavior at the upper resonant frequencies. The presented design offers a compact and efficient solution for integration into modern thin-bezel laptop computers supporting Wi-Fi 6E/7 and future Wi-Fi 8 standards.

Keywords: Wi-Fi 6E/7/8 antenna; Compact antenna, Triple-band antenna, Transmission-line metamaterial loaded antenna, Laptop antenna.

Paper ID: 125

Comprehensive Comparative Analysis of the Personalization-Diversity Trade-off in News Recommendation Systems: Deep Learning Model Evaluation on MIND Dataset with Hybrid Framework Optimization

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Abstract

News Recommendation Systems (NRS) face a fundamental challenge: optimizing for personalization accuracy inevitably exacerbates filter bubbles by reducing content diversity. This study presents a comparative evaluation of five models on the Microsoft News Dataset (MIND) containing 1 million users and 24.3 million interaction logs. We evaluate Content-Based Filtering (CBF), Collaborative Filtering (CF), Deep Neural Networks (DNN), Recurrent Neural Networks (RNN), and Attention-Based Neural Networks (ABNN) using twelve metrics spanning personalization accuracy, diversity, and system-level properties. Results demonstrate that ABNN achieves superior personalization (Precision@10 = 0.401) but severely reduces diversity (ILD = 0.387), a 47.6% decrease from CBF's diversity baseline (ILD = 0.738). We propose a novel hybrid framework incorporating diversity-aware loss functions and multi-objective optimization that achieves 91% of maximum personalization while improving diversity by 45.2% at less than 5% computational overhead. Our findings indicate that practitioners should deliberately occupy specific Pareto-optimal positions based on use-case requirements, and that filter bubble effects disproportionately harm specialist users while intensifying over time.

Keywords: News Recommendation Systems; Personalization-Diversity Trade-off; Deep Learning; MIND Dataset; Filter Bubbles; Hybrid Recommender Systems; Multi-Objective Optimization.

Paper ID: 136

Analysis and Evaluation of Progress Toward Affordable and Clean Energy (SDG 7) using LSTM

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Abstract

Availability of modern energy renewable resources contributes in reducing the carbon footprint and promoting social development, shaped over time by inequalities, policy driven decisions and socio-economic transformations. As there have been reliance on energy-based technologies and infrastructure, various differences in universal access to energy have been prevalent in economies as in India. This paper examines the effects of longterm energy trends and policy dynamics that define. Indias progress towards Sustainable Development Goal 7, which refers to universal access to dependable, affordable and sustainable energy sources. The research is a longitudinal study around two objectives: initially analyzing long-term trends in village electrification, availability of clean cooking fuels and per capita renewable energy consumption, exploring the role and impact of financial flows in promoting energy development within India. It analyses the differences by examining the last 20 years(2000-2020) data from open government databases paying particular attention to rural-urban differences.It examines domestic public sector investments and their collective impact on improving conditions in places that are energy deficient.The research studies the issues related to bridge the accessibility and efficiency gap.The proposed research also predicts the future trends in electrification , access to clean cooking fuels using LSTM with an accuracy of around 97%. The expected outcomes suggest nearly universal electrification,a slower adoption of clean cooking initiatives and stale growth in renewable capacity.Also,there have been persistent challenges in grid energy, decentralized renewable sources and access to green finance,with reliance on fossil fuels and CO2 emissions presenting critical sustainability challenges. The study concludes that for maintaining progress, data-driven strategies for strong infrastructure, inclusive financing, and region-specific policies are required.

Keywords: SDG7, Clean energy, Renewable Energy, Data analytics, predictive analysis, Longitudinal data.

Paper ID: 143

Effect of Overlap Strategy on Microstructure and Mechanical Performance of Slot-Assisted Multi-Track Multi-Layer Friction Stir Welding of 20 mm-Thick AA6061-T6 Alloy

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Abstract

This study investigates how the overlap strategy affects the microstructure, phase development, and mechanical performance of slot-assisted multi-track, multi-layer friction stir welding (FSW) of 20 mm-thick AA6061-T6 aluminium alloy. A new slot-based design was created in which 6 mm plates are inserted into a machined slot and joined through multiple passes of multi-track FSW using a cost-effective tool steel. Two overlap methods—50% pin overlap and 50% shoulder overlap—were systematically tested. Infrared thermography showed peak temperatures below 0.8 Tm, confirming the process occurs in the solid state. Microstructural examination revealed significant grain refinement in the stir zone due to dynamic recrystallisation. The pin-overlap method promoted uniform material flow throughout the thickness and better bonding between passes. Conversely, the shoulder-overlap approach caused surface-dominated stirring, tunnel defects, hooking features, and uneven microstructure at mid-thickness. Mechanical tests demonstrated better performance with the pin-overlap setup, including improved hardness distribution and a maximum impact energy of 32 J in the top region. The shoulder-overlap joints showed lower strength and less impact toughness because of insufficient subsurface bonding. XRD and EDS analyses confirmed the presence of the α-Al matrix and Mg_2Si strengthening phase without forming harmful intermetallic compounds, although partial precipitate dissolution led to localised softening in the stir zone. Overall, the slot-assisted pin-overlap strategy offers a reliable and cost-effective method for fabricating and repairing thick aluminium sections.

Keywords: Multi-Track FSW; Thick-Section FSW, 6061-T6 Aluminium Alloy, Microstructure, Mechanical Characterization.

Paper ID: 158

Effect of Endogenous Silica Content on the Physicochemical and Electrochemical Behavior of Natural Graphite

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Abstract

Graphite, a critical mineral with excellent conductivity, thermal stability, and natural lubricity, makes it indispensable for wide applications. However, raw graphite contains a minimal Fixed Carbon (FC) content and a large amount of silica and other impurities. Hence, this work aims to evaluate the effect of silica on the electrochemical properties of graphite. The raw graphite obtained from Tai region of Arunachal Pradesh was crushed, sieved to 1 mm, and beneficiated with different concentrations of Hydrofluoric acid (20 – 40 %) at different reaction times (4 – 6 h) and temperatures (30 – 45 °C). Proximate analysis was carried out for three samples: raw (R), beneficiated (B), and commercial (C) graphite, which have FC content 6.35 ± 0.37%, 83.15 ± 0.62%, and 99%, respectively. XRD was performed to confirm the hexagonal graphitic structure (002) plane at $2\theta \approx 26.4\text{-}26.7°$ for all the samples. FESEM EDS analysis has shown the change in surface morphology and elemental composition. XPS exhibited an increased C1s peak and decreased O1s peak for B and C. Further XRF of the samples was done to determine the inorganic impurities. The sample was analyzed using FTIR for the identification of functional groups, and Raman spectroscopic analysis showed the improved D, G and 2D bands in beneficiated sample. The Overpotential and Tafel Slope value of Hydrogen Evolution Reaction (HER) confirm that beneficiation improved the electrochemical activity.

Keywords: Graphite, Beneficiation, Fixed Carbon, Overpotential, Tafel Slope

Paper ID: 166

Estimation of Distribution Function of Non Negative Data

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Abstract

Estimation of distribution function based on non-negative data finds wide applicability in fields such as finance, seismology, hydrology, reliability analysis etc. A traditional kernel distribution function estimator supported on R or [−1, 1], based on non-negative data can assign positive probabilities outside the support [0, ∞) of the underlying distribution. Using a kernel supported on [0, ∞) alleviates this problem at the expense of increased bias. We propose a new kernel-based distribution function estimator for non-negative data by truncating a traditional kernel estimator. We derive the asymptotic bias, variance and limiting distribution of the studentized estimator as the sample size increases. Comparisons of asymptotic efficiencies show that the proposed estimator exhibits same asymptotic bias, asymptotic variance as the traditional kernel estimator for any choice of the bandwidth and with the optimal bandwidth choice, the proposed estimator is more accurate than the empirical estimator. Additionally, we prove the strong uniform and L2 convergence of the proposed estimator. Simulations indicate that for sample size not exceeding 500, the proposed estimator outperforms the traditional kernelestimator, when the point of estimation is near the left boundary and less than or equal to the0 to 10th percentile of the underlying distribution. The proposed estimator is also implemented on two real data sets on remission times and survival times of two different types of cancer patients.

Keywords: Non negative data, kernel distribution function estimation, optimal bandwidth selection, near boundary performance.

Paper ID: 174

CrackFusion: Multi-Model Fusion Framework for Automated Crack Detection and Severity Classification

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Abstract

Structural integrity assessment of civil infrastructure is essential for ensuring public safety, operational reliability and long-term sustainability. Early detection of surface cracks and related defects enables timely maintenance, prevents catastrophic failures and reduces repair costs. However, traditional inspection still relies largely on manual visual assessment by engineers, which is time-consuming, subjective and difficult to scale to large or hazardous sites. These challenges are pronounced for heritage temples, where complex geometries and weathered surfaces make damage interpretation even harder.This paper presents CrackFusion v6, a learning-free multi-model framework for automated crack and efflorescence detection and severity estimation in thermal images of temple structures. The system emulates three modern vision paradigms using only classical image processing: (1) a YOLOv8-inspired multi-scale detector based on Gaussian pyramids, dark-region analysis and edge cues, (2) a U-Net-inspired encoder–decoder module realised via image pyramids and skip-like blending, and (3) a Vision Transformer-inspired patch-attention module that assigns patch-wise crack scores from local intensity, contrast and edge density. Their outputs are fused by an adaptive weighted Hybrid module with consensus-based confidence boosting to produce the final damage mask and severity class.

Keywords: Crack detection; efflorescence; thermal imagery; temple structures; image processing; multi-model fusion; YOLOv8-style; U-Net-style; Transformer-style

Paper ID: 186

An Offline-First Geolocation-Enabled QR-Based Attendance Management System for Rural Schools

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Abstract

Rural schools in developing regions rely on manual attendance due to intermittent connectivity and low-cost device constraints, making them vulnerable to proxy fraud — where absent students are marked present using shared QR screenshots. Existing systems fail to simultaneously address offline operation, proxy resistance, and location privacy, leaving a critical gap for resource-constrained environments. This paper proposes an offline-first, geolocation-enabled QR attendance framework integrating four algorithms: (1) HMAC-SHA256 rotating session tokens expiring within Δt {30–120} s, bound to Android Keystore secrets, rendering screenshot ∈ replay infeasible; (2) Geohash Level-7 geo-zone validation encoding GPS into ~153 m × 153 m cells, discarding raw coordinates as stack-local variables to preserve location privacy; (3) append-only SQLite event sourcing with SHA-256 hash chains ensuring tamper-evident audit records; and (4) idempotent store-and-forward batch synchronization with exponential backoff guaranteeing exactly-once delivery under any connectivity pattern. A formal acceptance function V(e) = Q^{B}IL Z^{B}IL Session Open Device Consistent ∧ ∧ ∧ combines all validation predicates, and Theorem 1 formally proves exactly-once, tamper-detectable recording under this model. Simulation over n = 5,000 scans and 500 sessions yields a 94% proxy reduction (87 → 5attempts per 1,000 scans), 100% offline availability, class marking within 2–3 minutes for 40 students, p95 sync latency of 17.8 hours, and a V(e) pass rate of 91.2% — meeting all five design targets. STRIDE threat analysis confirms low residual risk across all threat categories. All results are simulation-derived; field deployment across rural schools constitutes primary future work.

Keywords: HMAC-SHA256, Geohash geo-zone, offline-first, event sourcing, federated privacy; proxy prevention, idempotent synchronization, rural schools, Android, QR attendance management

Paper ID: 204

CFD-Based Thermal Performance Evaluation of a Solar Water Distillation System

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Abstract

The increasing scarcity of potable water and the rising demand for sustainable treatment technologies have accelerated research into low-cost and energy-efficient desalination systems. Solar distillation is a simple and environmentally sustainable method that utilizes renewable solar energy to convert saline or contaminated water into potable water. This study presents a numerical investigation of a passive basin-type solar still designed for rural and remote applications. A three-dimensional computational fluid dynamics (CFD) model was developed using ANSYS Fluent to simulate the coupled heat and mass transfer processes governing evaporation and condensation inside the system. The solar still configuration includes an absorber basin, transparent glass cover, thermal insulation layer, and condensate collection channel. Solar radiation increases the basin water temperature, promoting evaporation, while vapor condenses on the inner surface of the glass cover and is collected as distilled water. The predicted basin water temperature and freshwater productivity were validated against published experimental data, showing good agreement. Convective and evaporative heat transfer coefficients were evaluated using established literature correlations and compared with numerical results.

Keywords: Solar desalination; ANSYS Fluent, CFD simulation, Heat and mass transfer, Basin-type solar still

Paper ID: 207

Numerical Study for Improved Batteries for Electric Vehicles Using Phase-Change Materials

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Abstract

The widespread adoption of Electric Vehicles (EVs) depends on the performance and safety of their lithium-ion batteries, which face significant thermal challenges that can lead to performance degradation and safety risks. This study focuses on passive thermal management using Phase Change Materials (PCMs), which offer a compact solution over active cooling systems. However, the effectiveness of common PCMs is hindered by low thermal conductivity. While enhancing PCMs with conductive additives like Expanded Graphite, Graphene Nanoplatelets, and Copper Foam is a known strategy, a significant research gap exists in the slow, computationally expensive cycle of designing and optimizing these advanced composites using simulation methods alone. The primary objective of this research is to bridge this gap by creating an agile, data-driven framework integrating high-fidelity numerical simulation with machine learning. This work systematically investigates paraffin-based PCMs enhanced with the three distinct additives to generate a comprehensive dataset linking composite material properties to key performance metrics. Subsequently, a supervised machine learning model is developed and validated to accurately and rapidly predict these metrics, thereby bypassing the need for a full simulation for every new design configuration. To achieve this, comprehensive transient thermal simulations were conducted using ANSYS 2025 R1. The numerical simulations confirmed that all three composite PCMs effectively managed battery temperatures by absorbing and distributing thermal energy. This validated framework provides a clear, data-driven pathway for rapidly optimizing PCM composites, accelerating the development of next-generation EV thermal management solutions.

Keywords: Phase change materials, supervised learning, composite materials, electric vehicle

Paper ID: 229

Feasibility Study on Effective Allocation of EV Charging Loads in IEEE-9 Bus System

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Abstract

The speedy growth in the adoption of electric vehicles (EVs) can impose significant technical challenges to the reliable operation of electric power systems. A significant development in the allotment of electric vehicle charging stations (EVCS) in the power system is essential to minimize network disturbances and maintain system stability. Considering the local peak load and prolonged EV charging durations, the optimal allocation of EVCS within a power system has become a critical research challenge. In this paper, the accurate allocation of EVCS in the IEEE-9 bus system is deliberated. The Newton-Raphson method used for load flow solution and, subsequently, the particle swarm optimization (PSO) algorithm is used to decide an appropriate location for allowing maximum allowable charging capacity. The aim is to maximize EV charging capacity while reducing real power losses and maintaining bus voltages within limits (0.9–1.1 p.u.). MATLAB-based simulation results are presented with a clear assessment of bus strength in terms of EV charging power capability.

Keywords: Electric vehicle charging stations, Newton–Raphson, Particle swarm optimization, Power loss minimization, IEEE 9-bus System.

Paper ID: 230

Parametric evaluation of slope stability under critical conditions using HYRCAN 3.0

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Abstract

Climate change and rapid urbanization demand sustainable slope design approaches that ensure long-term infrastructure resilience while minimizing environmental impact, as slope failures lead to economic losses, environmental degradation, and safety risks. This study presents a parametric slope stability evaluation using HYRCAN 3.0 software, which applies Bishop's Simplified Method for limit equilibrium analysis. Four critical parameters were systematically investigated: slope height (5–20 m), external water level variation due to adjacent water bodies such as rivers or ponds, soil properties (cohesion and soil type), and loading conditions across clay, clayey silt, clayey sand, and silt. The results indicate that the factor of safety decreases significantly with increasing slope height, for instance from 4.369 to 1.114 in clayey silt. External water level variation was found to considerably influence stability due to changes in hydraulic pressure conditions. Cohesion variations (20–30 kPa) substantially affected safety margins, while loading near the slope crest reduced stability compared to toe loading. The study demonstrates how parametric analysis using HYRCAN 3.0 supports optimized slope design and material selection while maintaining adequate safety margins, contributing to climate-resilient infrastructure and sustainable urban development.

Keywords: Slope Stability, Bishop's Simplified Method, HYRCAN 3.0, Factor of Safety, Climate-Resilient Infrastructure

Paper ID: 243

Extreme Active Matter at High Densities: Classical Matter for Sustainable Applications

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Abstract

Active matter systems, composed of self-propelled particles that convert internal energy into motion, operate far from equilibrium and exhibit emergent collective phenomena that challenge conventional thermodynamic descriptions while offering new possibilities for sustainable applications. We investigate the dynamical behaviour of dense extreme active matter at large Péclet numbers, focusing on the interplay between propulsion strength (f) and persistence time (τ_p). Using simulations of a model active Brownian particle system in the athermal limit, we construct a comprehensive nonequilibrium phase diagram in the ($f - \tau_p$) plane. The results reveal 3 distinct dynamical regimes. At low persistence times, reducing activity induces a glass transition characterised by slowing density relaxation consistent with an active generalisation of random first-order transition theory. At intermediate persistence times, a novel intermittent phase emerges between the liquid and dynamically arrested states, marked by bursts of kinetic energy, stress accumulation, and plastic yielding. Individual yielding events exhibit quadrupolar displacement fields with 1/r decay, identifying them as Eshel by deformations. Near the liquid–intermittent boundary, correlated plastic events generate large-scale vorticity and an inverse energy cascade with a Kolmogorov $k^{-5/3}$ spectrum, indicating plastic turbulence in a densely packed active system. In the infinite persistence limit, the system undergoes a jamming transition at a critical propulsion force f, forming force-balanced configurations with stresses concentrated along force chains and exhibiting critical scaling of force-chain lifetimes. Dense extreme active matter unifies glass physics, jamming, plasticity, and turbulence in one driven system. This framework explains high-density active materials (e.g. cellular monolayers, colloids, synthetic assemblies) and guides design of adaptive, resilient, energy-dissipative sustainable technologies.

Keywords: Active Matter, Jamming Transition, Glassy Dynamics, Plastic Yielding, Active Turbulence

Paper ID: 262

Numerical Analysis of the Hydraulic Behaviour of a Single-Bladed Archimedean Screw Turbine

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Abstract

Among the most popular and effective low-head hydropower generation technologies that are environmentally friendly are Archimedean screw turbine (AST). They are really ideal for small and decentralized energy productions. The study presented here is a numerical work focused on the investigation of the hydraulics of a single-bladed Archimedean screw turbine at the low-head condition. The conceptualization of the 3D model of the turbine is performed in ANSYS Fluent where the steady turbulent flow is simulated by the SST k-ω turbulence model. For the purpose of numerical stability and correctness of the results, a mesh independence study is done. Through the paper, the authors explore pressure distribution, velocity contour, streamline pattern, and torque developed at an inlet velocity of 3 m/s and an inclination of 30°. The findings shows a pressure gradient along the axis of the screw which is a sign of good hydraulic energy extraction. Due to rotation, there are local velocity accelerations at the blade tips. Besides, torque values have shown convergence once the refinement level of the chosen mesh is surpassed. The outcomes demonstrate orderly flow and good momentum transfer within the turbine, thus providing a reliable numerical base for the further enhancement and experimental verification of the single-bladed AST setups.

Keywords: Archimedean screw turbine; low-head hydropower; SST k–ω model; mesh independence; hydraulic performance; torque analysis

Paper ID: 276

Deep Learning Based Multi Class Disease Classification From Structured Blood Sample Data

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Abstract

Routine blood tests contain a lot of clinical clues for the early detection of many diseases. However, a few emerging machine learning methods attempt to predict with limitations which restrict their possible implication in real clinics. A deep learning framework is proposed herein to perform multi-class disease classification, where each blood sample is assigned to one of several possible disease categories using structured blood sample data. The synthetic dataset, derived from 10,000 patient records, includes 24 normalized blood, chemical and body-parameter measurements to identify five health states: Anaemia, Diabetes, Healthy, Thalassemia and Thrombocytopenia. Two state-of-the-art deep learning models were used: the One-Dimensional Convolutional Neural Network (1D-CNN) and TabNet. Both models learn complex relationships within structured clinical data. On one hand, 1D-CNN learns local and sequential patterns among blood parameters. On the other hand, TabNet uses attention-based feature selection, which enhances interpretability and supports clinical decision-making. The results demonstrate that both models achieve high classification accuracy, thus suggesting that standard blood markers can distinguish between multiple conditions. Moreover, TabNet points out clinically meaningful features contributing to the predictions, enhancing trust and usefulness in medical decision-support tools. Results suggest that deep learning applied to routine blood parameters can serveas an efficient and interpretable tool for multi-class disease classification in healthcare settings.

Keywords: Blood Sample Data, Multi-class disease Classi-fication, Deep Learning Models, 1D-CNN, TabNet, Healthcare AI

Paper ID: 157

Mechanical and Hygrothermal Investigation of Jute–Bamboo Fibre Reinforced Epoxy Hybrid Composites

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Abstract

Natural fibre-reinforced polymer composites are increasingly studied as sustainable, eco-friendly alternatives to traditional synthetic fibre composites. Hybridization of natural fibres is an effective strategy to synergistically enhance mechanical performance and environmental durability. In this study, jute and bamboo fibre-reinforced epoxy hybrid composites were fabricated using a manual hand lay-up technique. Four distinct 7-layer laminate configurations – pure jute (JJJ), pure bamboo (BBB), and hybrid sequences (JBJ and BJB) – with a constant thickness of 4 mm were prepared using Araldite LY 556 epoxy resin and Aradur HY951 hardener. Mechanical characterization included tensile (ASTM D638), flexural (ASTM D790), and Charpy impact testing. Furthermore, hygrothermal studies were carried out to assess the kinetics of moisture absorption by submerging samples in water at high temperatures. The BBB arrangement offered the maximum tensile and flexural strengths, according to the results. For structural applications, the BJB arrangement exceeded the JBJ hybrid in terms of flexural strength and moisture resistance. According to hygrothermal data, the outer layers of bamboo serve as an excellent barrier to prevent the hydrophilic swelling of the jute core. Hybridization greatly enhances interfacial bonding and stress distribution, according to the morphological analysis. These results imply that lightweight structural and semi-structural vehicle applications are ideal for jute-bamboo hybrids.

Keywords: Natural fiber composites; Hybrid laminate; Epoxy resin; Thermo-mechanical characterization

Paper ID: 213

Synthesis and Characterization of TiO_2 /SBA-15 Nanocomposites for Water Treatment

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Abstract

For the synthesis of titania–silica nano-composites, mesoporous silica with controlled pore size, ordered frameworks, and particular surface area offers many possibilities. To improve SBA-15's properties, TiO2 is put upon it. The anatase to rutile phase transformation and crystal grain growth are inhibited by the presence of mesoporous SBA-15, and it has been observed that TiO2 did not obstruct the SBA-15 pores. The mesostructured anatase TiO2 grains exhibit a comparatively high degree of thermal stability, and the size of the resulting titania particles can be controlled with the appropriate pore diameter. This is shown by the fact that calcining the composites in air up to 500^0C only marginally increased the domain size and had no effect on the nanocrystal phase.The elements that are present in contaminated water, including arsenic, cobalt, copper, zinc, and cadmium, are subsequently removed using the created TiO2/SBA-15 composite. The effectiveness of SBA-15 on several heavy metallic ions that are typically found in water is investigated using XRD, UV Vis Spectroscopy, FTIR, and TEM characterisation. According to experimental findings, the composite's absorption capacity and the titania's photocatalytic activity determine the titana/silica mixed material's photocatalytic activity.

Keywords: SBA-15, Titanium Dioxide, Water Purification.

Paper ID: 83

Topology Optimization of PCM-Based Finned Heat Sink for Cooling a System-on-Chip

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Abstract

PCM (Phase Change Material) based finned heat sinks represent a cutting-edge solution for addressing the intricate challenges of electronic cooling. These heat sinks leverage the unique properties of phase change materials, substances that undergo a phase transition between solid and liquid states while maintaining a constant temperature. By exploiting the latent heat absorbed or released during the phase transition, PCM-based heat sinks effectively buffer temperature fluctuations, preventing electronic components from reaching critical thermal thresholds. The incorporation of fins in the heat sink design enhances heat dissipation by maximizing the surface area available for convective cooling. This synergistic combination of PCM and finned architecture ensures a more sophisticated and reliable means of dissipating heat generated by electronic devices, thus improving overall system Performance. In this study, we have considered a System-on-Chip (SoC) comprising a single CPU, two GPUs, and one RAM module. The average heat flux generated from the SoC is approximately 20 W/cm2. Optimizing the material distribution within the PCM-based heat sink domain is critical for enhancing the thermal performance of the system. Utilizing a topology optimization methodology facilitates the generation of innovative designs devoid of predetermined assumptions regarding fin structures. This numerical study employs the Solid Isotropic Material with Penalization (SIMP) technique to formulate the optimization problem, wherein a fictitious material is introduced whose thermophysical properties are interpolated using a continuous density parameter ranging between 0 and 1. The optimization problem incorporates solely the applied heat load and boundary conditions. The Method of Moving Asymptotes (MMA) solver, implemented in the COMSOL Multiphysics commercial software, is utilized to solve the optimization problem, leading to the creation of innovative fin designs. Initial simulation results indicate roughly a 12% increase in the time required to achieve the set-point temperature on the chip compared to the unfinned System-on-Chip (SoC).

Keywords: Heat Transfer, Topology Optimization, PCM, Electronic Cooling, TCE, Heat Sink, SoC.

Paper ID: 109

Experimental Study of Multiwalled Carbon Nanotubes and Eicosane-based Heat Sink

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Abstract

This study evaluates the use of nano enhanced phase change materials by using multi-walled carbon nanotubes and eicosane for thermal management of electronic chips. As the speed and capability of electronics increases so does the power and heat generated by them. High temperatures are harmful for the electronic components affecting their performance and longevity, and are responsible for 55% of the failures. Phase change materials form a useful thermal management system during power surges but have a low thermal conductivity which often leads to the creation of thermal hotspots. Nano particles have very high thermal conductivity and thus are gaining attention to be used as filler materials with PCMs. In this research, 0.1,0.5 and 1 weight% composition of MWCNT and n-Eicosane are made using ultrasonication. Stability test by repetitive heating and cooling cycles, constant heat load analysis at 8W and 10W power and cyclic heat load analysis are performed on the compositions. An analysis to verify the increased thermal conductivity by addition of MWCNT is also conducted. 85% better distributed temperature was observed in case of 0.5 wt% MWCNT as compared to pure eicosane. As the amount of MWCNT increased; the compositions were observed to perform better under cyclic loads. A scope for this future work is to functionalize or chemically alter the surface of MWCNT for better binding with n-Eicosane as in case of functionalization.

Keywords: Cyclic heat load, Electronics cooling, MWCNT, n-Eicosane, Nano-enhanced phase change materials (NePCM), Thermal conductivity, Thermal management.

Paper ID: 152

Stimuli-Responsive 4D Bio-printed Scaffolds for Controlled Tissue Regeneration

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Abstract:

An extremely advanced form of bioprinting is 4D bio-printing, in which the bio-printed structure can change shape or characteristics in response to environmental factors, such as temperature, pH, and moisture. It is achieved through the use of the stimuli-responsive materials, which react and alter with the action of the bioprinting process, and the 4D scaffolds can then become much more akin to the manner in which real tissues grow and regenerate, as compared with the conventional 3D bio-printed scaffolds. Most 4D bio-printed scaffolds are made of shape-memory polymers and smart hydrogels, which, on stimulation, either expand, contract, or alter shape. These types of modifications can help regulate cell development in the right direction, leading to the regeneration of tissues such as skin, cartilage, or bone. This characteristic of the scaffold renders it more adaptive when it has the capacity to release growth factors whenever it is necessary and helps in the production of a new tissue that is more efficient and effective compared to the traditional scaffold. Nevertheless, they also possess certain challenges, such as the mass production of these scaffolds, the safety of these scaffolds to be implanted in the body, and the strength of these scaffolds. Altogether, the application of stimuli-responsive 4D bioprinting is a novel procedure in medical regeneration because it leaves the possibility of an intelligent, flexible, and less invasive cure. It can be envisaged that multi-stimuli systems, bio-ink optimization, and smart bio-materials will be brought out in more rapid strides, and dynamic tissue constructs of therapeutically viable status will be brought on board.

Keywords: 4D bioprinting, smart hydrogels, shape-memory polymers, tissue engineering, regenerative medicine

Paper ID: 173

A Visual Digital Twin Framework for Real-Time Vehicle Health Monitoring and Predictive Maintenance

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Abstract

The increasing complexity of modern fleet operations has made traditional schedule-based and reactive maintenance practices inefficient and costly, because they often fail to detect potential failures in advance. Therefore, this study proposes a visual digital twin framework for real-time vehicle health monitoring and predictive maintenance, so that fleet operators can make proactive and informed decisions. The primary objective is to improve maintenance planning by continuously assessing component health and presenting the information in an intuitive manner. The proposed framework integrates vehicle telemetry data, component life models, and cloud-based analytics to generate a dynamic digital representation of physical vehicles. Because direct access to component images was limited, illustrated component models were developed, which allowed scalable and standardized visualization. Each component is classified into four health states: normal, warning, urgent, and critical, based on predictive and threshold-based indicators. As a result, the system enables real-time synchronization between physical vehicles and their digital counterparts within an enterprise fleet management platform. A case-based evaluation conducted in an industrial development environment shows improved visibility of component conditions, faster maintenance response, and enhanced operational transparency. Consequently, the results indicate that the proposed framework supports early fault detection and reduces unplanned downtime. The study concludes that integrating visual digital twins with predictive analytics can significantly improve fleet maintenance efficiency and decision support, and that is why this approach can contribute to more reliable and sustainable vehicle operations.

Keywords: Digital Twin, Predictive Maintenance, Vehicle Health Monitoring, Fleet Management, Real-Time Analytics, Industrial IoT, Decision Support Systems

Paper ID: 189

Colorimetric Paper-based Point-of-care Testing for Disease Biomarkers

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Abstract

Paper-based colorimetric sensors have shown to be very valuable for point-of-care testing (POCT) due to their ability to detect illness biomarkers in real-time, with results becoming visible to the human eye in as little as a few minutes. These devices streamline healthcare by eliminating time-consuming and error-prone laboratory work and facilitating rapid clinical decision-making, thereby benefiting patients. An extensive search was carried out for suitable literatures upon Paper-based colorimetric sensors. Information was gathered from scientific journals via PubMed, Research Gate, Google Scholar, Springer and Web of Science. Paper-based colorimetric sensors have shown their worth in identifying biomarkers associated with diseases such COVID-19, HIV, diabetes, and cancer, in addition to their use in fertility and pregnancy tests. These devices are ideal for resource-poor areas since they are inexpensive, portable, user-friendly, and disposable; they also take advantage of paper's capillary action, porosity, and adaptability The use of paper-based colorimetric sensors has great promise for both decentralized healthcare and rapid diagnosis. There are still issues with standardization, sensitivity, and usability, despite their cheapness, ease of usage, and quick response time. More research and improved technology are needed to make them more dependable and applicable in more therapeutic contexts.

Keywords: Paper-based colorimetric sensors, point-of-care testing (POCT), cancer, COVID-19, fertility, diabetes, capillary action

Paper ID: 197

Pharmacogenomics In Preventing Adverse Drug Reactions

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Abstract:

Unwanted and harmful effects of medications, known as adverse drug reactions (ADRs), are a major cause of illness, death, and increasing healthcare costs all over the world. Genetic variability is a major factor that explains why people respond to drugs differently. The field of pharmacogenomics investigates the effects of genetic traits on medication efficacy and safety. By enabling the optimal medicine and dose selection, this makes tailored therapy feasible. A comprehensive review of recent advancements in Pharmacogenomics in preventing adverse drug reactions was collected from the literature available in online scientific databases such as PubMed, Google Scholar, Springer, and Science direct. Genetic variations that influence drug metabolism and transport are common in the population. Evidence indicates that about 9% of reported ADRs may be averted with pre-prescription genetic testing. Modifications to the CYP2C19, CYP2D6, and SLCO1B1 genes explain a large portion of these reactions. People over the age of 65 are at increased risk due to the widespread use of psychotropic and cardiovascular medications. Pharmacogenomics may improve patient safety by personalizing medication and reducing ADRs. Panel-based genetic testing may minimize ADRs, healthcare cost, and therapy effectiveness, especially in mental health.

Keywords: Adverse Drug Reactions, Pharmacogenomics, Genetic Variation, Personalized Medicine, Drug Safety

Paper ID: 206

The Dosage Form Revolution: Artificial Intelligence Meets Advanced 3D Printing for Future-Ready Drug Delivery

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Abstract

The pharmaceutical industry still depends on traditional manufacturing methods that produce standard dosage forms. These methods often overlook individual patient differences. Using Artificial Intelligence (AI) along with advanced three-dimensional (3D) printing technology provides a significant solution to this issue. This poster explains the idea of a dosage form revolution, where AI-driven design meets 3D printing to create patient-specific, intelligent drug delivery systems. AI is crucial in designing formulations, predicting outcomes, and optimizing processes. Machine learning algorithms evaluate drug and excipient compatibility, improve geometric structure, and anticipate drug release rates. Predictive models based on 614 drug-loaded formulations show a printability accuracy of 76% and a filament property prediction accuracy of 67%. AI also allows for better dosage form design by creating systems with immediate, delayed, and step-wise release through changes in internal structure. In addition to formulation design, AI improves quality assurance through machine vision-based inspection, predictive maintenance, and adherence to FDA and EMA guidelines. The combination of smart polymers, nanotechnology, and AI-assisted bioprinting supports targeted drug delivery and applications in regenerative medicine. Ethical issues like data privacy, intellectual property, model validation, and human oversight are important for responsible use. Future plans include using deep learning for formulation optimization, generative AI for creating new drugs, reinforcement learning for controlling processes layer by layer, and 4D printing for drug release that responds to stimuli. Together, AI and 3D printing offer a promising platform for precision and personalized treatment.

Keywords: Artificial Intelligence; 3D Printing; Personalized Medicine; Predictive Modelling; Smart Polymers; Bioprinting; Process Optimization; Drug Delivery Systems.

Paper ID: 211

Next-generation Genomic Medicine- CRISPR technology for fighting Rare Disease

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Abstract

Rare genetic diseases are life- threatening disorders that collectively affect millions worldwide, including a significant population in India. Advances in genome engineering, particularly the emergence of CRISPR–Cas9 technology (Clustered Regularly Interspaced Short Palindromic Repeats), pioneered by researchers such as Jennifer Doudna and Emmanuelle Charpentier, have revolutionized genetic medicine by enabling precise, efficient, and targeted DNA modification. These innovations mark a transformative shift toward curative genomic interventions. A comprehensive review of recent advancements in CRISPR-based genome editing platforms was collected from the literature available in online scientific databases such as PubMed, Google Scholar, Springer, and Science Direct. This study aims to explore the transformative potential of CRISPR-based genome editing as a next-generation therapeutic strategy for rare pathologies, emphasizing its precision, versatility, and clinical applicability within emerging healthcare systems. The analysis focuses on classical CRISPR-Cas9 systems, as well as advanced derivatives including base editing and prime editing technologies. This poster will focus on current efforts to develop the CRISPR-based toolbox for various rare diseases and compare the pros and cons of different tools and delivery methods. This poster will also discuss the therapeutic applications of CRISPR-based tools for fighting different rare diseases.

Keywords: CRISPR-Cas, gene therapy, delivery system, rare disease, mutation correction, prime editing.

Paper ID: 264

Connecting Quantum Foundations and Particle Physics: A Multidisciplinary Study of Decoherence

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Abstract

Quantum decoherence, a fundamental phenomenon at the interface of quantum mechanics and statistical physics, describes the loss of coherence in a quantum system due to its interaction with the surrounding environment. This concept plays a crucial role across multiple domains of physics, including quantum information theory, condensed matter physics, cosmology, and particle physics. The loss of quantum interference between mass eigenstates of neutrinos as a result of fundamental or environmental quantum effects is known as decoherence in neutrino oscillation. In this work, we study the impact of decoherence on standard three flavor neutrino oscillation probabilities by introducing dissipation term to the standard density matrix evolution equation which results in exponential suppression factors of oscillation. Using the Deep Underground Neutrino Experiment (DUNE) as a benchmark long-baseline setup, we examine how damping parameters modify oscillation behavior. This study highlights how neutrino experiments serve as sensitive probes of quantum decoherence, offering a unique multidisciplinary connection between quantum foundations, open system dynamics, and experimental particle physics.

Keywords: Quantum decoherence; Neutrino oscillation; Mass eigenstates; Superposition; Quantum interference; Density matrix evolution; Dissipation term; Exponential suppression

Paper ID: 300

A Multiobjective Mathematical Transportation Model to Optimize the Total Cost and Time in Flood Prone Areas under Uncertain Conditions

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Abstract: Flood disasters often disrupt transportation systems and make it difficult to deliver relief supplies to affected communities on time. Efficient planning is therefore essential to ensure that emergency resources reach victims quickly while keeping transportation costs manageable. This study develops a multiobjective mathematical transportation model to support relief distribution in flood-affected areas under uncertain conditions. The model focuses on two main objectives: minimizing total transportation cost and minimizing response time during disaster relief operations.To address uncertainty in disaster situations, some parameters of the model are represented using trapezoidal neutrosophic numbers, while others are considered in crisp form. Since the model involves two conflicting objectives, the Neutrosophic Compromise Programming Approach (NCPA) is used to convert it into a single compromise optimization model. The model is solved using both deterministic and non-deterministic methods, where LINGO is applied for the deterministic solution and a Genetic Algorithm (GA) is used for the non-deterministic approach. A numerical example is provided to demonstrate the effectiveness of the proposed model in improving decision-making for flood disaster relief logistics.

Keywords: Floods, Multiobjective transportation, NCPA, Genetic Algorithm, Mathematical Model

Track 2: Health, Life Sciences & Environmental Sustainability

Paper ID: 13

Omics Perspectives on Urban Heat and Plastic-Associated Environmental Stress in Cardiovascular Disease

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Abstract

Urbanization and climate change are intensifying everyday environmental stressors such as extreme heat, air pollution, and exposure to plastics, collectively contributing to the rising burden of cardiovascular disease (CVD), particularly in urban populations. This review examines how multiple environmental stressors act together to influence cardiovascular health at the molecular level. The paper focuses on two common urban pollutants: Bisphenol A (BPA), a plastic-derived chemical frequently detected in food and water, and Benzo[a]pyrene (BaP), a toxic compound released from vehicular emissions. When combined with urban heat stress and particulate air pollution, these exposures disrupt normal cellular and metabolic functions. Environmental stress from heat and pollutants affects key molecular targets, including heat shock protein 70 (HSP70) involved in cellular stress adaptation, inflammatory markers such as C-reactive protein (CRP), and lipid-regulating proteins such as apolipoprotein E (APOE), collectively promoting inflammation, metabolic imbalance, and increased cardiovascular risk. Proteomic and metabolomic studies over the past decade consistently report impaired energy production, mitochondrial dysfunction, disrupted lipid metabolism, and elevated inflammatory signaling, which are linked to atherosclerosis, cardiac arrhythmias, and heart failure. This review synthesizes recent evidences and highlights the importance of integrative omics approaches, including genomics, proteomics, metabolomics, metagenomics, epigenomics, RNA sequencing, and molecular docking, in understanding how environmental and climate-related exposures interact with human biology. Overall, the study emphasizes the potential of multi-omics strategies to provide mechanistic insights into climate-driven disease dynamics and to support climate-adaptive public health and cardiovascular risk-reduction strategies.

Keywords: Urban heat stress, Bisphenol A, Benzo[a]pyrene, HSP70, Proteomics, Metabolomics

Paper ID: 55

Antibiotic Susceptibility, Virulence Traits, and Molecular Characterization of Methicillin Resistance staphylococcus aureus from a tertiary care hospital, Gangtok, Sikkim.

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Abstract

Methicillin Resistant Staphylococcus aureus (MRSA) is a significant human pathogen associated with nosocomial infections. MecA in the S. aureus is a marker of MRSA. The ability of this strain to swiftly spread, evolve and acquire resistance genes and virulence factors such as pvl genes has further rendered this strain difficult to treat. Fourty one clinical samples (pus, blood, sputum, urine, body fluid and tissue) were collected from July 2024 to June 2025 which were isolated by using the selective media from Microbiology Laboratory of Sikkim Manipal University, Gangtok, Sikkim. Bacterial isolates were tested for antimicrobial susceptibility test (AST), the finding indicated that the sensitivity of Vancomycin 41(100%), clindamycin 41(100%), doxycycline 41(100%), linezolid 41(100%), minocycline 41(100%), teicoplanin 41(100%), were as azithromycin showed 0(0%), within respect to ciprofloxacin 1(2.43%), cefoxitin 0(0%), clarithromycin 0(0%), erythromycin 0(0%), gentamicin 37(90.24%), levofloxacin 20(48.8%), moxifloxacin 26(63.41%), nitrofurantoin 1(2.43%), penicillin 0(0%) and quinupristin-dalfopristin 0(0%). For screening of MRSA, it was carried out by cefoxitin disc diffusion method. The following virulence factors like haemolysis, lecithinase, caseinase, gelatinase and DNase were also detected. All isolates were tested for β-lactamase production and also the isolates were tested for inducible-clindamycin resistance. For the detection of high-level mupirocin resistance in MRSA all the isolates were also tested. Polymerase chain reaction was done to carried out the pvl genes, mecA gene and fem-A gene, the finding indicates that 11 isolates were positive for fem-A gene, were as 4 isolates were positive for mecA gene and 2 isolates were showed positive for pvl genes.

Keywords: Methicillin resistant Staphylococcus aureus, panton-valenttine leukocidin gene, factor-essential for methicillin resistance A, methicillin resistance gene A, Antibiotic susceptibility test.

Paper ID: 58

Prevalence and antimicrobial resistance pattern of Enterococcus species from Urine samples with special reference to Vancomycin Resistance

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Abstract

Objective: Enterococcus species have emerged as important uropathogens due to increasing antimicrobial resistance, including vancomycin resistance. This study aimed to determine the prevalence, species distribution, and antimicrobial resistance patterns of Enterococcus species isolated from urine samples, with special reference to vancomycin resistance.Methods: A laboratory-based cross- sectional study was caried out in the Department of Microbiology Central Referral Hospital Sikkim Manipal institute of medical science (SMIMS), Tadong. 104 Enterococci were isolated from urine samples from both IPD & OPD patients were included in this study. Urine samples were processed & identified as per routine laboratory protocol. Enterococci isolates were identified to species level, and antimicrobial susceptibility testing was performed by VITEK-2 System using AST-P628 card. The VITEK -2 antibiotic susceptibility card were tested against the following 11 antibiotics: Ciprofloxacin, Erythromycin, Gentamicin (HLG), Levofloxacin, Linezolid, Nitrofurantoin, Teicoplanin, Tetracycline, Tigecycline, Vancomycin & Daptomycin according to the Clinical laboratory standard institution (CLSI) guideline 2024. Results: Out of 2502 urine samples processed, 104(4.15%) yielded Enterococcus species. Enterococcus faecalis (63.5%) was the predominant species, followed by Enterococcus faecium (36.5%). High susceptibility was observed to linezolid, tigecycline, nitrofurantoin, and vancomycin. Resistance was commonly seen against erythromycin, tetracycline, and fluoroquinolones, particular among E. faecium isolates. Vancomycin resistance was detected in 10(9.6%) isolates. Conclusions; The study highlights the growing resistance among Enterococcus species causing urinary tract infections and emphasizes the need for continuous surveillance and judicious antimicrobial use.

Keywords: Enterococci, urinary tract infection, antimicrobial resistance, vancomycin-resistance

Paper ID: 59

Microbial solution in waste management: Global challenges and Eastern Himalayan Perspectives.

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Abstract

Global waste generation has increased markedly due to urbanization, population growth and changing consumption patterns. This has resulted in pronounced disparities between developed, developing and least developed nations. Poor waste disposal practices, particularly open dumping and poorly managed landfills, contribute heavily to environmental pollution and health risks, especially in ecologically fragile regions. This review provides an overview of global waste burdens and associated challenges with emphasis on waste management in the Eastern Himalayan regions. It critically assesses the contribution of microorganisms in managing solid waste such as composting, anaerobic digestion, biotransformation, bioremediation that reduce waste and recover resources.Special focus is placed on the Eastern Himalayas, a biodiversity hotspot characterized by unique and indigenous microbial communities with high bioremediation potential. These "ingenious microbes," adapted to extreme environmental conditions offer promising solutions for the degradation and detoxification of diverse waste streams. In parallel, the review highlights community-driven initiatives in the Eastern Himalayan region, including the efforts of non-governmental organizations which promote decentralized and participatory waste management practices. The review concludes by outlining future prospects and policy support to develop sustainable waste management strategies for sensitive ecosystems.

Keywords: Bioremediation, Eastern Himalayas, Indigenous microbial communities, Community-driven initiatives, Sustainable Waste management

Paper ID: 85

Ergonomic Design Modification and Biomechanical Analysis of Fulcrum Position in Hoe Based on Third-Class Lever Principles

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Abstract

Small and Marginal farm workers of Assam rely on manual tool such as hoe in land preparation in paddy cultivation. Repetitive digging exposed to high biomechanical stress due to third-class lever action of the upper limbs. The hoe which farmers used are not standardized which in long run will leads to Musculoskeletal Disorders. The present study aimed to ergonomically modify an existing hoe and subsequently analyze the optimal fulcrum position based on third-class lever principles. A total of 300 households were selected from Jorhat and Dima Hasao districts using Probability Proportionate to Size techniques. Experimental trials were conducted with 30 farm workers (three replications, 30 minutes each) to determine optimal blade size, angle, handle length, and handle circumference. The finalized improved hoe was compared with the existing hoe. The improved hoe reduced average working heart rate by 8.46%, energy expenditure by 15.38%, physiological cost of work by 18.3%, and grip fatigue substantially, while improving digging efficiency (84% vs. 70%) and comfort ratings. Regression analysis revealed a significant negative correlation ($r = -0.94^{**}$) between effort force and fulcrum position. The findings indicate that ergonomic redesign combined with biomechanical optimization can effectively reduce physical strain and enhance efficiency in manual agricultural tasks.

Keywords; Biomechanics, Lever, Agriculture, Traditional tool, Musculoskeletal Disorder

Paper ID: 87

Perception of Menstruation and Its Association with Mental Health among Adolescents

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Abstract

Menstruation is a natural physiological process. However, adolescents' perceptions of menstruation are often shaped by socio-cultural beliefs, taboos, and lack of adequate information. When a girl attains menarche, she is taught about menstruation as a pollution, a kind of taboo (Bhorali, D & Thakur, B., 2020). These perceptions can significantly influence their mental health and overall wellbeing. Mental health is a fundamental part of overall well-being influencing success in all spheres of life, from studies to careers. The present study aims to know the perception of menstruation and its association with mental health among adolescent girl students. The present study includes three objectives. These are- 1) To know the perception of menstruation among adolescent girls. 2) To know the mental health status of the adolescent girls, and 3) To find out the relationship between perception of menstruation and mental health among adolescent girls. For conducting the study descriptive survey research method has been applied. The adolescent girls studying in school are selected as sample by using purposive sampling technique. A mental health status scale and questionnaire have been applied to collect the required data and these data will be analysed using both qualitative and quantitative methods. The study will help us know the perception of adolescent girls towards menstruation and the findings of the study are expected to reveal a significant association between adolescents' perception of menstruation and their mental health. The study will contribute to understanding the need for educational and psychological interventions aimed at improving adolescent girls' mental health and overall well-being.

Keywords: Menstruation, Perception, Mental Health, Adolescent.

Paper ID: 88

Community-Based Traditional Knowledge and Health Practices associated with *Nanorana liebigii* (*Mann Paa*) in the Sikkim Himalayas: A Preliminary Study

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Abstract

The Sikkim Paa Frog (*Nanorana liebigii* Günther, 1860), locally known as *Mann Paa* is a high-altitude amphibian predominantly found nearby streams under the rocky stream beds. According to various indigenous communities of Sikkim, it is believed to have significant ethnomedicinal and ecological value in traditional health practices. The present study aims to document community-based traditional knowledge related to *N. liebigii* among the indigenous communities of Sikkim (Lepcha, Bhutia and Nepali) and to identify different parts and products, preparation method, modes of administration for treating different diseases and ailments treated. Data were collected through informal interviews and semi-structured household surveys involving elderly community members and traditional healers. A total of 50 informants were interviewed from November 2025-January 2026. The study revealed the use of different parts and products of *N. liebigii* for its ethnomedicinal purposes. Parts such as skin and meat along with product (eggs) were utilized. The mode of administration was oral and topical. In oral applications, *Paa* meat was boiled and given to individuals recovering from illness and to women in the post-partum period as it is believed to restore strength. Freshly cooked meat was consumed to relieve bodyache, stomachache, diarrhoea, and to enhance immunity. The study reported the preparation of soup by cooking the meat with horse gram (Gahat /गहत) that was given to patients suffering from measles. The animal was smoked dried and stored for long term use. For its topical application, the skin and eggs were applied on cuts and wounds. Overall, the findings indicate that *N. liebigii* is traditionally significant for supporting community health systems in Sikkim. Therefore, this study provides baseline information on *N. liebigii* emphasizing the need to integrate traditional knowledge with future research focusing on exploring bioactive components and their therapeutic potentials.

Keywords: Traditional knowledge, Indigenous communities, Animal-based therapy, Amphibians, Sikkim

Paper ID: 91

Sericulture and Sustainable Development: A Case Study of Chirang District, Assam

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Abstract

Sericulture is an important agro-based cottage industry which has been practiced since time immemorial in Assam, particularly in the Chirang district of the Bodoland Territorial Region (BTR). Sericulture is the rearing of silkworms for the purpose of cocoons production and the manufacture of various silk products. Sericulture plays a significant role in building the infrastructure of the rural economy. It provides significant socio-economic benefits to rural people. Hence, sericulture not only provides income but also helps develop the rural economy. Moreover, sericulture is connected with the traditions and cultural lives of the people, particularly the Bodo community. The climate and fertile soil of the area are also the reasons for the thriving of eri and muga silkworms in the area. The objectives of the study are to examine livelihood generation and women's empowerment in Chirang and examine the environmental sustainability of the rearers, such as how they are dealing with the problem of weather and changing climate conditions. The required information was collected from 100 households, including eri and muga rearers, through interviews using a structured questionnaire. This study will use both quantitative and qualitative methods to analyze the data. The findings of the study reflect how the rearers are coping with the problems while rearing the silkworms, such as defective host plant leaves and death of silkworms.

Keywords: Sericulture, Eri, Muga, Silkworms and Sustainable Development.

Paper ID: 108

An ergonomic approach to study occupational risk factors among workers in food processing enterprises of Assam

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Abstract

Workers in small-scale enterprises are among the most vulnerable segments, often engaging in heavy, repetitive, and poorly designed workstation that demands long hours, which can lead to work-related musculoskeletal disorders. Food processing workers under MSME were engaged in the activities which were performed manually, as machines might be impractical or incompatible with established traditional skills. The present paper investigates the prevalence of occupational risk factors, analyse postural and work related Musculo-skeletal problems of the workers in food processing enterprises. A multistage sampling design was followed for selection of the respondents of 115 workers from micro and small-scale food processing enterprises. Subjective ergonomic scales were used to assess the worker's discomfort level. Objective ergonomic assessment tools such as QEC, WERA, Job strain Index and Ergomaster were used for the study. Data revealed that cutting (rank I) was the highly involved activity, followed by bottling/packaging (rank II) and peeling (rank III). Cutting was reported as the heavy activity with a mean score of 3.11, which was followed by extraction of pulp and peeling. The findings on postural analysis showed that forward flexion of head and neck was highest in cutting activity during sitting posture and in packaging/bottling at standing posture, wrist flexion was highest in cutting and ulnar deviation was highest during washing. The highest QEC and WERA scores was observed while performing cutting fruits and vegetables. Wrist followed by lower back, neck and upper back are consistently reported as the body parts with highest discomfort scores both in micro and small-scale enterprises. Workers were exposed to musculoskeletal and safety risks from physically demanding tasks in food processing enterprises. Therefore, a strategy to decrease WMSDs and mitigate other occupational health issues in food processing environments is to implement ergonomic interventions.

Keywords: Occupational risk factors, Ergonomics, work related musculoskeletal disorders, postural deviation, food processing enterprises.

Paper ID: 138

A Review on PDE4 Inhibitor-Loaded Nanostructured Lipid Carriers for Attenuating Neuroinflammation in Parkinson's Disease

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Abstract

Parkinson's disease (PD) is a slowly progressing neurodegenerative condition associated with motor disability and loss of dopaminergic neurons, mainly associated with chronic neuroinflammation. More recently, neuroinflammation has been reported to be involved in PD pathogenesis largely due to oxidative stress, as well as via the activation of microglia and release of pro-inflammatory cytokines. Phosphodiesterase 4 (PDE4), that hydrolyzes cyclic adenosine monophosphate (cAMP), plays an important role for the regulating of inflammatory responses in the central nervous system (CNS). Many therapeutic approach have been emerged, out of these inhibiting PDE4 has become a therapeutic approach to increase cAMP levels and reduces inflammatory responses mainly by decreasing pro inflammatory cytokines such as TNF-α and IL-1β and NF-κB expression. Although, clinical use of these agents as therapeutics have been hampered due to their relatively poor blood-brain barrier (BBB) penetration and development of systemic side-effects. Nanostructured lipid carriers (NLCs) have recently been considered as a potential option for the delivery of drugs as they mitigate the drawbacks associated with classical PDE4 inhibitors formulations. The combined administration of PDE4 inhibitors reducing inflammation and NLCs targeting the brain represents another strategy to fight neuroinflammation and dopaminergic neurons degeneration in PD. This review covers the recent progress in the formulation and development of NLCs encapsulating PDE4 inhibitors for the treatment of PD.

Keywords: Parkinson's disease, PDE4, Oxidative stress, Neuroinflammation, Neuroprotection.

Paper ID: 148

A Review on Psychosocial Needs among Persons with Severe Mental Illness

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Abstract

Behaviours and development of individuals is often shaped by the environment they live in like immediate home and school environment, cultural values, legal frameworks, customs, and their socio-economic conditions. These environments shape the needs of individuals. Hence understanding individual's needs is pertinent in the context of mental health for effective psychosocial interventions. Methodology- Articles related to psychosocial needs, psychosocial factors pertaining to mental health, persons with severe mental illness were searched. Comprehensive literature review will be undertaken which will include academic journals, articles, reports, data sets that are available in several databases and search engines like PubMed, Scopus, Research Gate and Google Scholar. Unpublished articles and case studies were not included in the review. Results- Existing literature reveal several factors influencing the mental health of an individual. It highlights how the various psychosocial factors such as social support, family dynamics, stigma, discrimination, environment, socio-economic conditions etc. play an active role in the mental well-being of individuals with severe mental illnesses. This review paper emphasizes on the several psychosocial needs of the persons with severe mental illness.

Keywords: Psychosocial needs, severe mental illness, persons with severe mental illness.

Paper ID: 151

Assessing Flood-Resilient Housing Strategies in Majuli, Assam

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Abstract

Majuli, the most heavily populated river island in the world, is located on the Brahmaputra River in Assam, India. Its livelihood, cultural identity, and physical infrastructure are seriously threatened by frequent, severe flooding and ongoing riverbank erosion. This study explores the design of a flood-resilient community centre intended to serve as a multipurpose centre for emergency refuge, healthcare, education, and the preservation of indigenous cultural practices in response to these problems. The study combines modern resilience techniques like modular and flexible construction systems, amphibious or floating foundations, and integrated rainwater harvesting and filtration mechanisms with traditional Mising architectural wisdom like elevated stilt houses (chang ghar), bamboo joinery techniques, and the use of locally sourced renewable materials. Using detailed site analysis, climate-risk assessment, and participatory inputs from local communities, the research develops a prototype that is structurally adaptive, environmentally sustainable, and culturally grounded. The model emphasizes low-carbon construction, reduced environmental footprint, and community ownership of the design. Ultimately, the findings demonstrate that the synergy between vernacular knowledge and modern engineering innovation can lead to robust, context-sensitive infrastructures capable of enhancing disaster preparedness and long-term resilience. Such an approach not only strengthens the adaptive capacity of flood-prone regions like Majuli but also safeguards the island's socio-ecological heritage for future generations.

Keywords: flood-resilient, amphibious foundation, chang ghar, low-carbon construction, environmental footprint, disaster preparedness

Paper ID: 176

A cost-effective electrochemical approach for colistin sulfate detection in environmental water samples using 2,2-Dihydroxyindane-1,3-dione as a reactive probe

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Abstract

A cost-effective and sensitive electrochemical detection method has been developed for the detection of colistin sulfate (CLS) in water using 2,2-dihydroxyindane-1,3-dione as a reactive probe. The method relies on the interaction between colistin sulfate and 2,2-dihydroxyindane-1,3-dione, which leads to a measurable decrease in the electrochemical response of 2,2-dihydroxyindane-1,3-dione. Differential pulse voltammetry (DPV) was employed as the primary detection technique, supported by cyclic voltammetry (CV), chronoamperometry, and potentiostatic electrochemical impedance spectroscopy (PEIS). A calibration curve was established over the CLS concentration range of 2–24 mM, with a strong linear correlation (R^2 = 0.99298). The limit of detection (LOD) was determined to be 22.02 μM. Spectroscopic techniques (FTIR and UV–Vis) further supported the interaction, indicating chemical modification of the 2,2-dihydroxyindane-1,3-dione structure upon reaction with colistin. The method was successfully applied to spiked real water samples, demonstrating good recovery and practical applicability. This approach offers a rapid, reagent-efficient, and economical alternative for monitoring colistin residues in environmental water sources. The developed platform holds promise for use in routine analysis aimed at controlling antibiotic contamination in waterbody which is believed to be one of the major causes of antimicrobial resistance.

Keywords: Colistin sulfate 2,2-dihydroxyindane-1, 3-dione, nephrotoxicity, neurotoxicity, electrochemical sensor, DPV

Paper ID: 177

A Study of Household E-Waste Management: An Analysis of Public Awareness Level, Disposal Practices, Key Challenges and Suggestions: In Nasik City, Maharashtra, India

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Abstract

The rapid advancement of technology and increasing consumption of electronic devices have led to a significant rise in electronic waste (e-waste). Household e-waste, including discarded mobile phones, computers, televisions, and small electronic appliances, poses serious environmental and health hazards if not properly managed and disposed. This research paper examines household awareness, disposal practices, and challenges related to e-waste management at household level. Primary data has been collected through a structured questionnaire, and secondary data were obtained from journals, reports, and government websites. The findings indicate limited awareness, improper disposal methods, lack of government interventions and lack of accessible recycling facilities. The study emphasizes the need for public awareness programs, effective collection systems, and stricter government policy implementation. Electronic waste, or "e-waste," has significantly increased as a result of the quick development of technology and rising use of electronic devices. At household level in Nasik city Maharashtra, India, Demographic and socio-economic characteristics of respondents. Were studied, Knowledge and awareness of electronic wastes, Willingness to segregate e waste, Disposal practices of e waste, challenges and suggestions for the disposal. This study looks at the problems associated with managing of e-waste, household awareness, and disposal methods. The results show a lack of accessible recycling facilities, inappropriate disposal techniques, and low awareness. The study highlights the necessity of more stringent policy implementation, efficient collection methods, and public awareness campaigns.

Keywords: E-waste, Household waste, awareness, E waste disposal, Recycling, Environmental sustainability.

Paper ID: 179

Isolation, identification, and antibiotic susceptibility of diarrheagenic E. coli in fecal samples from diarrheal patients at the tertiary care hospital of Gangtok, Sikkim

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Abstract

Diarrhea remains the third leading cause of global morbidity and mortality, disproportionately affecting children under five years, particularly in developing countries like India. Among etiologic agents of diarrhea, diarrheagenic Escherichia coli (DEC) is reported as one of the leading causes, which is categorized into distinct pathotypes—ETEC, EPEC, EAEC, EIEC, and EHEC, delineated by their specific virulence factor-encoding genes. DEC pathotypes and their antibiotic resistance patterns differ markedly by geographic region, highlighting a key knowledge gap in local data. Misuse of antibiotics has further driven the emergence of multidrug-resistant (MDR) strains, worsening public health risks. This study fills this gap by determining the prevalent DEC pathotype in diarrheal patients at a tertiary care hospital in Gangtok and assessing its antibiotic susceptibility profile. For one year (January 2025-December 2025), 234 diarrheal stool samples were collected from the Microbiology Laboratory of Central Referral Hospital (CRH) and the Bacteriology Laboratory, Dept of Microbiology, SMIMS. Samples collected were cultured on MacConkey agar. The resulting E. coli isolates were subjected to Multiplex PCR analysis for determination of diarrheagenic E. coli (DEC). The antibiotic susceptibility test (AST) of confirmed DEC isolates was assessed using the Kirby-Bauer disc diffusion method, adhering to the CLSI guidelines. Among the 234 samples, 27 samples (11.53%) were found to be DEC positive, and EPEC (16/27,59.25%) was prevalent, followed by ETEC (5/27, 18.51%), EAEC (3/27, 11.11%), EIEC (2/27, 7.40%), and EHEC (1/27, 3.70%). Notably, the AST results for DEC isolates indicated that 23 of 27 isolates (85.2%) exhibited multidrug resistance (≥3 antibiotic classes), highlighting the increasing prevalence of MDR DEC among diarrheal patients attending the Tertiary care hospital, Gangtok.

Keywords: DEC, EPEC, ETEC, EAEC, EHEC, EIEC, AST.

Paper ID: 183

NCD Burden and Functional Decline among older Adults in Northeast India

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Abstract

Non-communicable diseases (NCDs) are collectively responsible for more than 74 percent of all deaths worldwide and 61.8 percent of deaths in India. It includes heart disease, stroke, cancer, chronic respiratory diseases, and diabetes (WHO). NCDs affect activities of daily living (ADLs), which are crucial for self-care and everyday life. With the rising trend of NCDs coupled with aging, the elderly are faced with acute vulnerability. This study aims to examine the association of comorbidities related to NCDs with the functional status, viz., ADL. This study uses secondary data from the Longitudinal Ageing Study in India (LASI Wave I, 2017–18). The study found that state-level variations in tobacco use and physical activity influence non-communicable diseases (NCDs), with high tobacco use and low activity in Mizoram and Tripura. Sikkim shows significant cardiovascular risks, while Nagaland has low cardiovascular disease rates but inadequate hypertension management. Poor disease management correlates with increased dependency risks. The study advocates early detection, improved treatment for better NCD management, and preventing functional decline among older adults in India's northeastern states.

Keywords: Activities of Daily Living, Hypertension, Cardiovascular Disease, Older Adults, Northeast India

Paper ID: 187

Bis(4-Fluorobenzyl) Trisulfide Restricts *In Vitro* Replication of The Japanese Encephalitis Virus by Modulating The Wnt/Beta-Catenin Pathway And H_2s Release

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Abstract

Japanese encephalitis is a neurological disorder caused by the mosquito-borne flavivirus Japanese encephalitis virus (JEV). Till now, there is no remedy, and FDA-approved drugs against JEV aren't available. In this study, we screened the natural compound dibenzyl trisulfide and its derivatives, i.e., Bis(4-fluorobenzyl) trisulfide, Bis(4-chlorobenzyl) trisulfide and Bis(4-bromobenzyl) trisulfide for their anti-viral activity against JEV. All the compounds inhibited JEV at a 2 μM concentration in Neuro2a cells. The most potent compound was found to be Bis(4-fluorobenzyl) trisulfide. Dibenzyl trisulfide was found to be the least active among these compounds. Bis(4-fluorobenzyl) trisulfide reduced JEV titre in a dose- and time-response manner. The mechanistic study showed that JEV activated the Wnt/beta-catenin pathway by upregulation of beta-catenin, NF-kB, and its downstream proteins such as cyclin D1 and c-myc. There was no significant change in GSK3β. Upon adding Bis(4-fluorobenzyl) trisulfide, there was downregulation of beta-catenin, NF-kB, cyclin D1 and c-myc. Moreover, Bis(4-fluorobenzyl) trisulfide was also found to be the highest H_2S donor from UV-Vis and Fluorescence spectroscopy study. H_2S might be playing a role in the anti-viral activity of JEV. These results showed that Bis(4-fluorobenzyl) trisulfide inhibited JEV by modulating the Wnt/beta-catenin signaling pathway and release of H_2S.

Keywords: Japanese encephalitis virus, Dibenzyl Trisulfide, Wnt/beta-catenin signalling pathway, H_2S release

Paper ID: 214

Effect of a Mind-Body Technique on State Relaxation and Mindfulness

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Abstract

Technological advancements and a changing lifestyle create a mental state occupied with stress and constant physiological arousal leading to fatigue and restlessness. Lack of time and complexity of techniques often foster procrastination to manage such conditions and weigh on wellbeing. Thus, a traditional and evidence-based mind-body intervention is needed in current times. Here, a pre-validated, time-effective mind-body relaxation and rejuvenation technique (MBRRT) was tested for the 10-minute follow-up effect on state relaxation and mindfulness levels. Twenty-eight (calculated sample size) university students were selected through a consecutive sampling method. It was a pre-post-study design. Participants completed two validated scales (i) Relaxation state questionnaire (RSQ) and (ii) Mindful attention awareness scale (MAAS-state) before and after MBRRT practice. Data were analyzed using the Wilcoxon signed-rank and paired sample t test. Nine of them were also assessed for their pre- and post-arterial blood pressure and heart rate using the Nidek Aurus 50 Patient Monitor. Among participants, 17 (60%) were male and 11 (40%) were female (p=0.25); age range: 18-30 years. They were pursuing programs as follows: Graduation: 5, Postgraduation: 10, PhD: 13. A significant effect was found on the perceived level of total relaxation ($p < 0.001$), general relaxation ($p = 0.007$), and muscle relaxation ($p = 0.001$). Feelings under the item 'refresh and awake' enhanced significantly ($p = 0.003$) after MBRRT. There was a slight increase of 8.6% in mean score of mindfulness level, but this was not statistically significant ($p = 0.14$). There was a decrease in the post-practice sleepiness score (24.2%), though this was not statistically significant ($p = 0.53$). Individual variations in their pre- and post-blood pressure emerged; overall, no significant difference was found for the group. A slight decrease of 2.5% in mean heart rate was evident, though not statistically significant. The study provided evidence for the instant perceived relaxation-rejuvenation benefits of an easy-to-follow mind-body technique derived from mala japa tradition. A larger sample size and involving participants from different backgrounds is needed in future studies.

Keywords: Relaxation, Rejuvenation, Meditation, Mind-body, Mindfulness

Paper ID: 228

Analysis of Anthropometric Variables between Recurve and Compound Archers and their Impact on Shooting Performance

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Abstract

The purpose of the study is to compare selected anthropometric variables between recurve and compound archers and their impact on shooting performance. Method: Total o sixty (N=60) male archers, thirty (N=30) each from recurve and compound archers, were randomly selected. The ages ranged from 16 to 22 years, from different reputed clubs and the SAI of Manipur. The players represented in at least state and national championships. A stadiometer, a weighing machine, body weight and height, and a measuring tape are used to collect data on body height, body weight, body mass index (BMI), and arm span length. The pertaining data for body height, body weight, body mass index (BMI), and arm span length were expressed in the units of centimetres, kilograms, kg/m2, and centimetres, respectively. Descriptive analysis, independent sample t-test, and Pearson's product-moment method statistical techniques are used to analyse the data. The significance level was set at 0.05. Results: No significant differences in body height, body weight, body mass index, and arm span length between recurve and compound archers, as the calculated t values of 0.09, 0.22, 0.50, and 0.36 are all less than the tabulated t = 2.00. Further, for recurve archers, significant relationships were found between shooting performance and body height (r = 0.42), and arm span length (r = 0.58), as the obtained calculated r-ratios were greater than the tabulated r-values of 0.35. However, no significant relationships were found between shooting performance and body weight (r = 0.18), and body mass index (BMI) (r = 0.13), as the obtained calculated r-ratios were less than the tabulated r-values of 0.35. For compound archers, significant relationship was found between the shooting performance and body height (r = 0.46), body mass index (BMI) (r = 0.38), and arm span length (r = 0.38), as the obtained calculated r-ratios were greater than the tabulated r-values of 0.35. However, no significant relationship was found between the shooting performance and body weight (r = 0.08), as the obtained calculated r-ratios were less than the tabulated r-values of 0.35 at 0.05 level of confidence. Conclusion: No significant differences in body height, body weight, body mass index, and arm span length between recurve and compound archers. Further, for recurve archers, shooting performance is significantly related to body height and arm span length. However, no significant correlation with body weight and body mass index (BMI). For compound archers, shooting performance is significantly related to body height, body mass index, and arm span length. However, no significant relationship with body weight.

Keywords: Anthropometric Variable, Recurve, Compound, Archers.

Paper ID: 231

Aerosol Transport and Its Impact on Climate in Northeast India- A review

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Abstract

The North Eastern Region (NER) of India is a climatically sensitive zone where aerosol concentrations critically influence air quality, visibility, and regional climate. Recent studies indicate that a substantial fraction of aerosols observed in NER originates from long-range transport rather than local emissions. Based on satellite-derived aerosol optical depth (AOD) and ground-based measurements, this paper presents a critical review of the seasonal variability of AOD. Available data reveal that during the pre-monsoon season, dust from western deserts and the Middle East is advected eastward by strong westerlies, while winter months are dominated by emissions from the Indo-Gangetic Plain. These transported aerosols significantly elevate particulate matter concentrations, thereby degrading air quality and altering radiative forcing. The review underscores that regional and transboundary aerosol transport is a key driver of atmospheric composition in Northeast India, with implications for climate projections, monsoon dynamics and public health. The study highlights the essential role of integrated AOD monitoring in NER and identifies promising directions for advancing research in this field.

Keywords: Atmosphere, Aerosol optical depth, Aerosol transport, Radiative forcing

Paper ID: 235

Impact of Specific Exercises on the Physical Fitness Level of University Students

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Abstract

The purpose of the study is to investigate the impact of specific exercises on the physical fitness level of university students. Method: Thirty (N=30) male students, fifteen (N=15) each from experimental and control groups, were randomly selected. The ages range from 20 to 23 years, and they are post-graduate students of Tezpur University. The experimental group conducted six (6) weeks of specific exercises. The Cooper 1.5/2.4 km run test, vertical jump with the Sayers formula, sit-up test, sit-and-reach test, and body mass index (BMI) are administered to collect data on aerobic capacity, explosive strength, muscular endurance, flexibility, and body composition. The obtained variables are expressed in units of $ml.kg^{-1}.min^{-1}$, watt, number, inches, BMI (kg/m^2), respectively. Descriptive analysis, paired-samples t-tests, and covariance (ANCOVA) statistical techniques are used. The significance was set at 0.05 level of confidence. Result: In the experimental group, significant improvement in specific exercises on aerobic capacity, explosive strength, muscular endurance, and flexibility. No significant improvement in body mass index (BMI). However, no significant differences in physical fitness variables of the control groups. Further, applying the ANCOVA, the pre- and post-mean comparisons found significant differences between the experimental and control groups in aerobic capacity, explosive strength, muscular endurance, and flexibility. However, no significant differences in body composition (BMI) were found in the pre- and post-mean comparisons. Conclusion: The finding shows that six (6) weeks of specific exercises improved the aerobic capacity, explosive strength, muscular endurance, and flexibility, respectively.

Keywords: Specific exercise, Physical fitness.

Paper ID: 259

Cloud-Based Multi-Temporal Flood Extent Delineation of Sonitpur District 2023 Using Sentinel-1 SAR and Google Earth Engine

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Abstract

Flood is one of the most frequent natural disasters which affect both the Brahmaputra and Barak Valley of Assam, causing widespread socio-economic impact annually. The monsoon season of the year 2023 witnessed three major flood waves from April to October in Sonitpur District of Assam, which causes extensive flood extent and damages to the infrastructure, agriculture, and livelihoods of the people. This study presents a temporal analysis of Sonitpur floods 2023 to delineate flood extent using Sentinel-1 Synthetic Aperture Radar (SAR) data processed on the Google Earth Engine (GEE) and ArcGIS platform. The cloud penetration capability of SAR imagery addressed the typical limitation of optical remote sensing during monsoon conditions. Three distinct flood waves were mapped and quantified: the first wave (April 6 - June 12, 2023) inundated 204.50 km², the second wave (June 13 - September 16, 2023) affected 297.05 km² representing the peak flooding event, and the third wave (October 7-28, 2023) covered 184.00 km². To process this data, we used GEE for handling large amounts of satellite imagery efficiently and then performed detailed analysis in ArcGIS. Pre-flood and multi-temporal post-flood Sentinel-1 C-band SAR images were acquired and processed using change detection techniques. The methodology involved speckle filtering, radiometric calibration, and threshold-based water extraction to delineate flood-affected areas across different temporal phases. The study demonstrates the effectiveness of combining cloud-based and desktop GIS platforms for multi-temporal flood mapping and provides crucial information for disaster management authorities. The methods used in this study can be replicated for monitoring flood events in other flood-prone regions of the Brahmaputra basin. Understanding these temporal patterns may improve both disaster preparedness and emergency response.

Keywords: Flood Inundation mapping, Sentinel-1 SAR, Google Earth Engine, Multi-temporal analysis, Disaster management, Assam Floods

Paper ID: 265

Bridging the Gap Between Smartphone Addiction Research and Public Health Implementation in India: A Narrative Review - Based Commentary

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Abstract

Background**:** Smartphone addiction is being increasingly recognised as a behavioural public health concern in India, with evidence of high prevalence among adolescents and college students. At the same time, national health portals and programme documents show a scarcity of information, education and communication (IEC) materials or structured interventions that specifically target phone addiction across the life course. Using a narrative review approach, the paper synthesizes Indian and global literature on smartphone/mobile phone addiction and its interventions, and policy and programmatic documents are mapped from the National Health Mission (NHM), National Mental Health Programme (NMHP), school health initiatives and selected state level campaigns. Multiple Indian studies report smartphone or mobile phone addiction prevalence ranging from roughly one third to almost one half among children and young people, with consistent associations with sleep problems, mental distress and impaired functioning. Evidence from trials and meta-analyses supports behavioural, counselling, "nudge based" and exercise based interventions for problematic smartphone use. However, national IEC repositories showcase only generic materials on emotional wellbeing and "safe use of social media". NMHP/Tele MANAS documents lack explicit guidance on screening or managing digital addiction. Additionally, emerging concerns about smartphone overuse among older adults remain almost entirely unaddressed. A clear gap exists in India's response to research and implementation of policy responses towards smartphone addiction. The paper proposes integrating digital use assessment and IEC into NHM and NMHP platforms, explicitly including older adults within digital wellbeing and healthy ageing agendas.

Keywords: smartphone addiction; behavioural addiction; elderly; IEC materials; India

Paper ID: 268

Unravelling The SNP Dynamics In the Rotavirus Genome

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Abstract

Rotavirus is a double-stranded RNA virus and the prime aetiological agent responsible for acute gastroenteritis in young children, mainly under five years of age. Its genome is fragmented into eleven segments, each encoding a distinct gene. Despite the inclusion of RV vaccines in the immunization schedule, a significant disease burden still persists worldwide as well as in India. This raises us concern to better understand its mutation dynamics and evolutionary adaptation towards its host. As a dsRNA virus, it is known to exhibit a relatively higher mutation rate. To understand further, we investigated polymorphisms within the coding regions of all the eleven RV gene segments and analysed the single nucleotide polymorphism (SNP) patterns across numerous rotavirus genome sequences. Our findings highlighted significant differences in the substitution pattern across the eleven RV genes with VP7 and NSP4 exhibiting distinct variations. To the best of our knowledge, such findings have not been reported previously. These results will provide deeper insights into the rotavirus evolution and emphasize the role of mutation and substitution trends in shaping viral adaptation and emergence.

Keywords: Base substitution, RNA virus, viral proteins, point mutation

Paper ID: 272

Length-weight relationship, condition factor of *Puntius chola*, from Jia Bharali River, a tributary of the Brahmaputra basin, Assam, India

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Abstract

Small indigenous fish species (SIS) contribute significantly to dietary animal protein source and essential micronutrient intake due to their rich nutritional composition. The state of Assam in India harbors a variety of SIS, which constitute an integral component of the traditional diet and nutritional security of the local populations. Length-weight relationships (LWR) and condition factors are essential in understanding the growth patterns, biology, and health status of fish populations. The present study describes the length-weight relationship and condition factor (K) of the swamp barb, *Puntius chola* collected from the Jia Bharali River, a tributary of the Brahmaputra River in Assam, India, between November 2023 and March 2024. A total of 420 individual specimens, ranging in total length from 4.00 to10.10 cm and weighing between 2.03 and 16.42 g, were measured. The LWR was described by the equation $W = aL^b$, where W is the total body weight, L is the total length, a is the intercept, and b is the slope. The coefficient of determination (r^2) for length and weight was found to be 0.864. The estimated b value was 2.54, indicating a negative allometric growth pattern ($b < 3.0$) for *P. chola* in the study area. The relative condition factor was slightly greater than 1 ($K = 1.013$), suggesting that the fish population is in good physiological condition. These findings provide a baseline of biological data crucial for the sustainable management and conservation of *P. chola* in the Brahmaputra River basin.

Keywords: Small Indigenous Fish Species (SIS), Swamp barb, *Puntius chola*, Length-Weight Relationship (LWR), Condition Factor.

Paper ID: 286

Beyond the 'Black Art': Understanding the Ethnopharmacology of Mayong's Herbal Remedies and Magical Curing

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Abstract

Magic and medicine have remained deeply intertwined since the earliest phases of human civilization, forming the foundation of many indigenous healing systems across the world. In South Asia, particularly in India, folk medicine represents a complex synthesis of herbal knowledge, ritual practice, spiritual belief, and empirical observation. This research paper examines the ethnopharmacological traditions of Mayong, Assam—popularly known as the "Land of Black Magic"—to move beyond sensationalized narratives and explore its enduring folk medical practices as an intangible cultural heritage. The study investigates how herbal remedies, mantra-based healing, ritual performance, and indigenous diagnostic systems function collectively within Mayong's traditional healing culture. Drawing upon ethnographic fieldwork, textual analysis, and secondary literature, the paper situates Mayong's folk medicine within broader frameworks of traditional healing, Ayurveda, and ethnopharmacology. It also analyzes cultural beliefs regarding disease causation, the role of supernatural agents, and the symbolic significance of mantras and spells in healing processes. By examining specific herbal remedies, modes of transmission of medicinal knowledge, and the sociocultural authority of healers (bej), this paper highlights the relevance of folk medicine in contemporary times. It argues that Mayong's healing traditions are not merely relics of superstition but represent a sophisticated, culturally embedded medical epistemology deserving of scholarly recognition and preservation.

Keywords: Folk Medicine, Ethnopharmacology, Mayong, Tantra, Mantra, Traditional Healing.

Paper ID: 290

Spatial Pattern and Determinants of Cooking Fuel in India: A District-Level Analysis

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Abstract

Access to clean cooking energy is central to achieving Sustainable Development Goal 7 and addressing the intertwined challenges of energy poverty, health risk, gender inequality, and environmental degradation in India. Despite significant expansion of Liquefied Petroleum Gas (LPG) access under government initiatives, the transition from traditional biomass to clean fuels remains spatially uneven and socio-economically stratified. This study examines the spatial pattern and determinants of clean cooking fuel adoption in India at the district level, using data from the National Family Health Survey (NFHS-5, 2019–21), covering 707 districts. The analysis integrates socio-economic modeling with spatial statistical techniques. Binary logistic regression is employed to identify household-level determinants of clean fuel use, while spatial autocorrelation methods Global Moran's I and Local Indicators of Spatial Association (LISA) are used to detect geographic clustering and regional disparities. High–high clusters of clean fuel use are concentrated in Southern India and parts of the Northeast, while extensive low-low clusters dominate the central and eastern belt, including Jharkhand, Bihar, Odisha, Chhattisgarh, Madhya Pradesh, and Uttar Pradesh. These spatial patterns reflect broader regional inequalities in development, infrastructure, and public service delivery. Regression findings highlight pronounced socio-economic gradients. Wealth emerges as the strongest determinant: households in higher wealth quintiles exhibit dramatically lower odds of relying on unclean fuels. Education-particularly secondary and higher education-significantly increases the likelihood of clean fuel adoption. Female-headed households are less likely to depend on traditional fuels, underscoring the gendered dimension of energy transition. Rural households face substantially higher odds of unclean fuel use, reflecting supply-chain constraints and infrastructural gaps. Caste-based disparities further indicate structural marginalization in access to clean energy. The study concludes that India's clean cooking transition is neither uniform nor purely income-driven; rather, it is shaped by overlapping economic constraints, demographic characteristics, infrastructure availability, and spatial spillover effects. The presence of strong regional clustering suggests that district-level interventions must be complemented by regionally coordinated strategies

Keywords: Cooking Fuel; Household Energy Transition; Spatial Autocorrelation; Energy Poverty; Fuel Stacking

Paper ID: 299

Green Innovation, ESG Moderation and Firm Performance: Evidence from Top Listed Indian Manufacturing Firms

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Abstract

This study investigate how Green Innovation (GI) influences the market based financial performance of top listed manufacturing companies of India and examines the moderating role of Environmental, Social, and Governance (ESG) can be used to enhance this relationship. With the growing trend and policy push towards sustainability and the increasing expectations of the investors for responsible business conduct, this study provides empirical evidence on whether Green based Innovation, which is enabled by good ESG practices, leads to an increase firm value in the Indian manufacturing industry. Trend analysis indicates that there is a constantly increasing trend of green patent applications and grants in the leading manufacturing companies, which indicate that there is a growing interest in the development of green technologies. The trends of ESG are ambivalent: the score on the environment is decreasing, the social score is stable, and the governance score is rather high. The regression outcomes show that GPA and GPG become significant in enhancing the value of the firm which implies that the market has a positive perception to green innovation. Profitability (ROA) is also a significant boost to market valuation and firm size has a negative relationship to both GI and FP and most crucial, the study concludes that ESG performance acts as a significant moderator between GI and FP. Companies that are better placed in terms of ESRs are better placed in terms of developing green innovation into better market values. The three ESG elements, namely Environmental, Social, and Governance are identified to be positively and significantly stronger in improving the relationship between GI- performance and all three components with the most significant influence being that of governance.

Keywords: Green Innovation, Environmental, Social and Governance (ESG), Firm Performance, Tobin's Q, Green Patents, Indian Manufacturing Sector**.**

Paper ID: 22

Phytochemical analysis, antioxidant and antimicrobial activity of the leaf extract of Ficus altissima

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Abstract

Ficus altissima, a lesser-known Ficus species, is of considerable ethnopharmacological importance owing to its rich composition of therapeutically active phytochemicals, including flavonoids, tannins, alkaloids, and phenolic compounds. Traditionally, this species has been utilised in several Asian countries for managing inflammatory conditions, dermatological problems, and associated health disorders. The present investigation aimed to evaluate the phytochemical composition, antioxidant capacity, and antimicrobial efficacy of F. altissima leaf extracts. Qualitative phytochemical screening revealed solvent-dependent variation in metabolite distribution. Non-polar extracts were rich in flavonoids, phytosterols, terpenoids, tannins, and alkaloids, whereas polar extracts were predominantly positive for phenolic compounds. Antioxidant potential, assessed through DPPH and ABTS radical scavenging assays, demonstrated appreciable activity. Antimicrobial evaluation indicated that acetone and aqueous extracts exhibited the strongest antibacterial efficacy against Staphylococcus aureus, Salmonella enterica, Bacillus anthracis, and Shigella flexneri. Antifungal assays further showed significant inhibition of Alternaria alternata and Cercospora beticola, particularly with acetone, toluene, and methanol extracts. Overall, the findings highlight the promising pharmacological and agricultural potential of F. altissima leaves as a natural source of broad-spectrum antimicrobial agents.

Keywords: Ficus altissima, antimicrobial activity, Antioxidant

Paper ID: 71

Understanding Occupational Risk Factors and Cognitive Impacts under Heat Stress among Workers: A Systematic Review of Field-Based Studies

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Abstract

Occupational heat stress poses significant risks to cognitive function in hot-humid work environments, potentially compromising workplace safety and productivity. While laboratory studies confirm heat-induced impairments, field-based evidence from real-world occupational settings remains limited. This systematic review aimed to synthesize field evidence on occupational heat exposure and cognitive function among workers to inform the development of preventive strategies. By following the PRISMA guidelines PubMed, Web of Science, ScienceDirect, and Google Scholar were searched (2014-2025) for English-language original research on human participants in field settings assessing heat exposure (WBGT, HSDD, weather data), and cognitive function. Study quality was evaluated using a modified 13-item QuADS checklist. Ethical approval was obtained from the Institutional Ethics Committee.The synthesized evidence from the 14 included studies (n=59,112) demonstrated consistent cognitive impairment among outdoor workers, including middle-aged women (>40 years) exposed to occupational heat stress in hot-humid environments across China, Iran, Australia, and India. The findings indicate significant deficits across processing speed, sustained attention, and executive function under heat exposure, particularly during hot season (WBGT>28-32°C). Occupational heat stress consistently impairs cognitive function among workers in hot-humid climates, with processing speed and attention most vulnerable. Field evidence supports WBGT >30°C as actionable threshold for cognitive safety. Urgent need exists for standardized field protocols and mitigation trials to protect heat-vulnerable workers globally.

Keywords: heat stress, Wet Bulb Globe Temperature, cognition, occupational health, cognitive function, systematic review

Paper ID: 79

Climate Change-Induced Occupational Heat Stress and Renal Health: Current Challenges and Future Opportunities in India

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Abstract

Climate change has intensified occupational heat stress in India, particularly affecting workers in unorganized sectors exposed to prolonged extreme heat. Heat exposure combined with dehydration increases the risk of kidney injury, even among young and healthy individuals. Despite emerging evidence, there is scarcity of studies on the impact of occupational heat stress on renal health in Indian workers, revealing a critical gap that confines inclusive understanding and effective interventions. This review synthesizes evidence on heat stress and kidney health in Indian workers, advocating for biomarker-based early detection of kidney injury exacerbated by climate change. Following PRISMA guidelines, a systematic search of PubMed, Science direct, and Google Scholar (2015-2025) was conducted for studies on Indian occupational workers, using keywords, heat stress, hydration, and renal health. We included original studies that measured heat exposure (WBGT), physiological strain (e.g., core temperature, heart rate), hydration status, or renal biomarkers (e.g., Urea, creatinine, Cystatin-C, NGAL, KIM-1, L-FABP). Reviews, preprints, and non-occupational studies were excluded. Among 484 identified studies on Indian occupational heat stress, only 17 addressed renal health. Research gaps remain significant, with inconsistent use of heat exposure measures like WBGT and a focus on basic dehydration markers rather than novel renal biomarkers. Evidence indicates a progression from subclinical kidney injury to chronic kidney disease, though heterogeneity in methods and a lack of longitudinal data limit clear conclusions. Climate change mediated occupational heat stress constitutes an emerging determinant of renal morbidity in India, yet current evidence is constrained by methodological heterogeneity and limited biomarker integration. Advancing research through standardized heat exposure assessment, integration of novel renal biomarkers, and longitudinal designs is essential to clarify causal pathways, enable early detection and prevention, and inform evidence-based policies to protect vulnerable workers under rising global temperatures.

Keywords: Heat stress, Renal biomarkers, India, Occupational health, Climate change.

Paper ID: 95

Identification of dietary polyphenols from Indian spices targeting TNF-α mediated inflammation: An *in silico* approach

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Abstract

Inflammation is a biological defence mechanism and its primary function is to protect and restore body homeostasis. Acute inflammation efficiently clears pathogens and promotes tissue repair but the shift to chronic inflammation contributes significantly to the development of various diseases including cardiovascular diseases and cancer. Tumor necrosis factor-alpha (TNF-α), a key proinflammatory cytokine, regulates various inflammatory pathways. While TNF-α signalling is essential for immune response, its persistent activation promotes pathological inflammation, leading to activation of chronic inflammatory signalling pathways. Therefore, targeting TNF-α-mediated signalling can prove to be an important strategy for controlling chronic inflammation. Current treatments for chronic inflammation involve steroidal and non-steroidal anti-inflammatory drugs (NSAIDs), which have several adverse side effects, thus limiting their application. Polyphenols found in Indian spices are known for their antioxidant and anti-inflammatory properties, making them potential candidates for preventing and managing chronic inflammatory conditions. In the present study, we shortlisted 100 spice-specific polyphenols through comprehensive literature and database surveys. Among these, 78 compounds passed the Lipinski's Rule of Five and Veber's rule for drug-likeness. Further through ADME screening, we selected 42 compounds with optimum pharmacokinetic properties. Finally, through toxicity evaluation we selected top 20 candidate polyphenols. Molecular docking was performed between the selected 20 polyphenols and major proteins involved in TNF-α-induced inflammation, namely TNF-α, TNFR1 and TNFR2, using AutoDock Vina and HDOCK server. We found that Alpinumisoflavone, Apigenin and Pinocembrin exhibited the most favourable binding affinities with stable interactions with key functional residues and thus may serve as potential natural modulators of TNF-α-mediated inflammation.

Keywords: Inflammation, TNF-α, Polyphenols, Spices, Molecular Docking, Therapeutics.

Paper ID: 98

Turning Aquatic Waste into Healing Scaffolds: A Comparative Microarchitectural Study of Fish Skin-Based Dermal Matrices

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Abstract

Biologically active dermal matrix scaffolds provide structural support and a favorable extracellular microenvironment for tissue repair. Fish skin represents a promising biomaterial due to its abundance of collagen-I. This study focuses on the development of skin-based dermal matrices from fish species, Cyprinus carpio and Heteropneustes fossilis, followed by a comparative evaluation of their ultrastructural characteristics. The dermal matrices are fabricated through decellularisation using 1% Triton X-100 and 1% SDS. The degree of decellularization is assessed through hematoxylin and eosin (H&E) staining. Ultrastructures of the derived dermal matrices are evaluated using scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). Differential scanning calorimetry (DSC) is used to determine the thermal stability. Successful decellularisation and preservation of extracellular matrix materials in both C. carpio dermal matrix (CDM) and H. fossilis dermal matrix (HDM) have been determined by the analyses of H&E and SEM ultrastructural results. DSC analysis revealed a higher denaturation temperature in CDM, indicating greater thermal stability. FTIR spectra demonstrated preservation of native collagen in both matrices. The results encourage further translational research for the development of eco-friendly, cost-effective dermal matrix scaffold.

Keywords: dermal matrix scaffold, fish skin, decellularisation, extracellular matrix, regeneration, sustainable biomaterial.

Paper ID: 104

Reimagined Brahmaputra Valley Through Hydro-Geomorphologic and Socio-Ecologic System Modelling

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Abstract

Brahmaputra River Basin (BRB), lifeline of the northeast India, is yielding to socio-ecological inefficiencies which attributes to the increasing systemic risks due to limitation of traditional structural measures. This study evaluates such hydro-geomorphic and socio-ecologic aspects and reflects, necessitating the shift in paradigm towards adaptive management. Present work resonates with the use of system dynamic model by introducing a socio-ecological system approach. The model sets a boundary object to encompass rudimentary knowledge and stakeholders' collaboration to address the vulnerability of the ethnic people and thereby facilitating experimental policy insights. In a data restricted and uncertain areas of BRB region, system thinking and system dynamic modelling bridges between science and policy. The methodology uses a nested three scale: macro, meso and micro systematic divisions, starting with basin level hydrodynamic and geomorphologic studies in macro scale; administrative level flood prevention policy and infrastructure in meso scale and grassroot village level socio economic conditions in micro scale. The outcome of the study explains the need of continuous evolution of the flood management approach with scientific backing, evaluating the impacts of different policies and understanding the indigenous adaptation needs. There is a necessity for better focus on utilization of the riparian lands in developmental policies.

Keywords*:* Hydro-geomorphology, Systems thinking, Brahmaputra River basin, River science, Climate change

Paper ID: 159

Antimicrobial Resistance: A Growing Global Health Challenge

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Abstract

One of the biggest risks to global public health in the twenty-first century is antimicrobial resistance (AMR). AMR is a significant issue that compromises the efficient prevention and management of diseases caused by bacteria, viruses, fungi, and parasites, according to the World Health Organization. Although resistance develops naturally over time, the overuse and abuse of antibiotics in agriculture, animal care, and human health have expedited its spread. The issue is exacerbated by weak surveillance methods, poor infection control, poor cleanliness, and subpar medications. The World Health Organization estimates that if nothing is done, AMR could kill 10 million people a year by 2050. According to a thorough research that was published in The Lancet, bacterial AMR was directly responsible for over 1.27 million deaths worldwide in 2019, with resistant infections being linked to almost 5 million of those deaths (Murray et al., 2022). Due to a lack of adequate healthcare infrastructure and limited access to second-line medicines, low- and middle-income nations are disproportionately affected. A coordinated, multisectoral "One Health" strategy that integrates environmental, animal, and human health systems is needed for the worldwide response. Antimicrobial stewardship initiatives, the creation of novel antibiotics and alternative treatments, immunization, enhanced diagnostics, public education, and fortified surveillance systems like the Global Antimicrobial Resistance and Use Surveillance System (GLASS) are important tactics. AMR must be addressed in order to protect contemporary medicine, which depends on efficient antimicrobial therapy for procedures like organ transplantation, chemotherapy, and surgery.

Keywords: Antimicrobial resistance (AMR); One Health; antimicrobial stewardship; public health; global health; infectious diseases; antibiotic resistance.

Paper ID: 208

Stimuli-Responsive Hydrogel Actuators in Transdermal Therapeutics: Emerging Trends and Future Directions

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Abstract

Although transdermal drug delivery improves compliance and facilitates the controlled release of drugs, conventional methods can often be unresponsive to physiological conditions. Stimuli-responsive hydrogels have developed into sophisticated innovative biomaterials for transdermal treatments to overcome these limitations. Polymeric networks capable of reversible changes in structure or volume due to external stimuli such as temperature, pH, light, electric and magnetic fields, glucose, enzymes, redox environments, and ultrasound have been termed as stimuli-responsive hydrogel actuators. Hydrogels are promising biomaterials for transdermal applications owing to their high water content, biocompatibility, porous structure, and similarity to the extracellular matrix. The hydrogels undergo sol-gel transition, swell, or shrink in response to specific triggers, resulting in site-specific and controlled drug release. These system have shown potential in the treatment of diabetes, inflammatory skin conditions, wound healing, and localized drug delivery. Even with promising improvements, there are still challenges with enhancing mechanical stability, responsiveness, and scalability. To obtain far more precise and personalized transdermal therapy, future research needs to focus on creating multi-stimuli responsive devices, improving drug-loading capacity, and incorporating wearable or intelligent platforms.

Keywords: Stimuli responsive hydrogels, sol-gel transition, controlled drug release, biocompatibility, multi- stimuli responsive, personalized therapy, TDDS.

Paper ID: 209

The Interplay of Metabolic Dysfunction and Ovarian Dysfunction In PCOS: A Narrative Review of The Impact on Infertility

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Abstract

Polycystic ovary syndrome is a most common endocrine disorder in a woman and a major cause of anovulatory infertility. The pathophysiology of PCOS involves insulin resistance, obesity, which causes errors in hormonal cross-talk between the hypothalamus, pituitary gland, and ovaries and becomes a major factor of infertility affecting 1 in 5 reproductive-aged women. This review discusses a holistic approach to managing PCOS infertility integrates lifestyle modifications, pharmacological interventions, multidisciplinary care, and psychological support to address metabolic and ovarian dysfunctions. Insulin resistance and elevated androgens disrupt normal follicular maturation, leading to anovulation and polycystic ovarian morphology. Obesity worsens endocrine imbalance and endometrial receptivity. Metabolic dysfunction reduces oocyte quality, increases miscarriage risk (20–40%), and lowers live birth rates, even with assisted reproduction. Infertility in PCOS is caused by the combined effects of metabolic and ovarian dysfunction. Proper understanding of the underlying mechanisms is essential for effective management. A holistic approach to managing PCOS infertility integrates lifestyle modifications, pharmacological interventions, multidisciplinary care, and psychological support to address metabolic and ovarian dysfunctions. This strategy improves ovulation rates, pregnancy outcomes, and long-term health while minimizing risks like Ovarian Hyperstimulation Syndrome (OHSS) and multiple pregnancies.

Keywords: PCOS, Anovulatory infertility, Metabolic dysfunction.

Paper ID: 212

Development Of Functional Food from Pat Shak (*Corchorus Olitorius*) Leaf, Mucilage, And Its Application in Food Systems

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Abstract

Corchorus olitorius, also known as tossa jute, is a good source of protein. India is the largest producer of jute but mostly used for the fibre production. Approximately 91% of India's jute production is tossa jute. A new functional food ingredient could be obtained by drying the leaf of *C. olitorius* and utilise the leaf and its extract. In this study the complete characterization of jute leaf powder was done. As per proximate analysis, jute leaves have a high protein content (28.06±0.27g/100 g). The solubility of jute leaf powder was 22.68±1.2% at 80ºC, the water holding capacity (WHC) and oil-binding capacity (OBC) were 4.6±0.05 and 3.4±0.11g/g, respectively. *C. olitorius* also contained a significant amount of minerals like calcium (1282.10 mg/100 g), iron (61.81mg/100 g) and magnesium (536.44 mg/100 g) which may show potential application of leaf powder for fortification in food products. Mucilage was extracted from jute leaf powder by using hot water extraction method and complete characterization of the mucilage was also done to find out its possible applications in various food system. The solubility and swelling index were 75.3±1.08% and 18.5±2.54% at 65ºC, and the water-holding capacity and oil-binding capacity were 25.5±0.72 and 7.1±0.25 g/g, respectively. The total phenolic content of mucilage was 33.65±0.2 mg GAE/ g dry mucilage. After complete characterization of both jute leaf powder and extracted mucilage dried jute leaf powder was used in gluten free noodle development with different formulations. The quality attributes of noodle samples were investigated.

Keywords: pat shak, mucilage, protein, minerals.

Paper ID: 216

Infiltration of Bacteria into the Leaves Results in Necrotic Scar Development: A General Approach to Study Phytotoxicity

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Abstract

Ralstonia pseudosolanacearum F1C1 causes a lethal wilt disease in many plants, including the common fruit tomato. It is a vascular pathogen that colonizes the entire plant through the xylem before causing death by wilting. Interestingly, leaf infiltration of the bacterium results in the development of a necrotic lesion in the infiltrated area within 48 hours post-infiltration. At different concentrations of the pathogen, ranging from 10^9 to 10^6 cfu/ml, a distinct necrotic scar forms, limited to the infiltrated region of the leaf. However, the leaflet gradually turns yellow due to senescence. This stimulated us to further investigate how other non-pathogenic bacteria affect plants *via* leaf infiltration. Strikingly, *Pseudomonas aeruginosa* SPT08, an endophyte, also elicited a necrotic lesion within the infiltrated area. To better understand this behaviour due to virulence, we infiltrated virulence-deficient *phcA::*Ω and *hrpB::*Ω mutants of *R. pseudosolanacearum*. Remarkably, the *hrpB::*Ω-infiltrated leaf did not develop any necrotic lesions, while the *phcA::*Ω-infiltrated leaf exhibited necrotic lesions similar to those caused by the wild-type F1C1 strain. *phcA::*Ω is a well-known virulence-deficient mutant in tomato seedlings and mature tomato plants, but causes disease in a highly sensitive host like eggplant seedlings. This suggests that leaf infiltration may serve as a sensitive assay for studying virulence functions. We believe our findings underscore the importance of leaf infiltration as an easy and convenient method to study plant cell toxicity, paving the way for further exploration of complex abiotic stress responses.

Keywords: *Ralstonia pseudosolanacearum* F1C1, Wilt Disease, Leaf Infiltration, Necrotic Scar, *Pseudomonas aeruginosa* SPT08, phcA::Ω, hrpB::Ω, Sensitive Assay, Toxicity

Paper ID: 234

Role of Artificial Intelligence in Impurity Profiling and Stability Prediction of Pharmaceutical Compounds

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Abstract

Impurity profiling and stability assessment are critical components to ensure the safety, efficacy, and regulatory compliance of drug products. Traditional methods of analysis, including high-performance liquid chromatography (HPLC), liquid chromatography-mass spectrometry (LC-MS) and spectroscopy, can generate incredibly complex and vast amounts of data, which must be interpreted manually. Artificial Intelligence (AI) and Machine Learning (ML) have become the new method of transformation that allows improving the efficiency and quality of analytical procedures. Models based on AI may be useful in automated detection of the peaks, categorizing impurities, predicting degradation pathways, and identifying the patterns in chromatographic and spectral data. Predictive algorithms are used in stability to predict degradation behaviour at the different stress conditions and can be useful in estimating shelf-life and risk assessment in line with the guidelines that are set by the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH). AI based tools are much more beneficial than traditional methods by their ability to minimize the errors by humans, reduce the time spent on analysis, and enhance the data reliability. It addresses the recent developments, uses, and prospects of AI in impurity profiling and stability prediction and its current and increasing importance in the contemporary pharmaceutical quality control and regulatory science.

Keywords: Artificial intelligence (AI), Impurity Profiling, Stability Prediction

Paper ID: 237

Benzopyrans: a novel moiety with versatile uses

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Abstract

Benzopyran (chromene) derivatives are an important class of bioactive heterocyclic compounds that have attracted significant attention in medicinal chemistry and drug discovery. Structurally, they possess a bicyclic system formed by the fusion of a benzene ring with a pyran ring, typically existing as 2H- or 4H-isomers. These frameworks are widely distributed in nature and are found in biologically important compounds such as coumarins, flavonoids, and tocopherols. Numerous studies have demonstrated their varied pharmacological potential. Derivatives of benzopyran exhibit anticancer properties via encouraging apoptosis and preventing tubulin polymerization. Additionally, they show anti-inflammatory properties by suppressing TNF-α and selectively inhibiting COX-2. Furthermore, these substances have antiviral, antifungal, antioxidant, antidiabetic, antibacterial, and antitubercular qualities. Their use in cardiovascular treatment is especially remarkable. By opening ATP-sensitive potassium (KATP) channels, benzopyran-based potassium channel openers like Cromakalim and its active enantiomer Levcromakalim have antihypertensive, anti-ischemic, vasodilatory, antiarrhythmic, and smooth muscle relaxant properties. Studies on the link between structure and activity highlight the significance of hydrogen bond-accepting substituents at position C-4 and electron-withdrawing groups at position C-6 for increased activity. Moreover, Ketanserin provides cardiovascular benefits through 5-HT2A receptor antagonism, while tocotrienols support cardioprotection and improved lipid profiles. They're made using classic methods like Pechmann condensation, Fries rearrangement, aldol reactions with cyclization, solid-phase synthesis, combinatorial chemistry libraries (e.g., natural product-like benzopyran libraries), or greener one-pot tricks. Their cell-friendly fat-loving nature and easy tweaking make benzopyrans perfect compound for tomorrow's breakthrough drugs across major diseases. Overall, the structural versatility and synthetic accessibility of benzopyrans make them privileged scaffolds for the development of novel therapeutics, particularly for cardiovascular and other chronic diseases.

Keywords: Benzopyran, chromene, potassium channel openers, Cromakalim, Levcromakalim, Ketanserin, antihypertensive, antiarrhythmic, cardioprotection, structure–activity relationship, medicinal chemistry.

Paper ID: 239

Elaeagnus Latifolia Fruit Extract as A Promising Natural Antioxidant Therapeutic: An *In Vitro* And *In Vivo* Evaluation with Phytochemical Profiling

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Abstract

Oxidative stress, a major contributor to the pathogenesis of chronic and degenerative disorders, results from excessive generation of reactive oxygen species (ROS) and impairment of endogenous antioxidant defense systems, leading to cellular and molecular damage. Growing evidence indicates that medicinal plants rich in bioactive phytochemicals can effectively counteract oxidative injury. *Elaeagnus latifolia*, a wild edible fruit from Northeast India, is recognized for its diverse bioactive composition; however, comprehensive validation of its antioxidant efficacy remains limited. The present study first evaluated the *in vitro* antioxidant activity of *Elaeagnus latifolia* fruit extract (ELFE) using DPPH radical scavenging and FRAP assays, along with qualitative and quantitative phytochemical screening to determine major phytoconstituents, including total phenolic and flavonoid contents, followed by detailed phytochemical profiling using GC–MS and LC–MS analyses. Subsequently, the *in vivo* protective potential of ELFE was assessed against tert-butyl hydroperoxide (t-BHP)-induced oxidative stress in Swiss albino mice, where animals were pretreated with the extract prior to oxidative challenge. Multi-organ biochemical analyses of liver, kidney, and pancreatic tissues were performed by estimating lipid peroxidation (malondialdehyde, MDA) and endogenous antioxidant markers including reduced glutathione (GSH), superoxide dismutase (SOD), catalase (CAT), and Glutathione peroxidase (GPx). The results demonstrated significant *in vitro* antioxidant capacity and phytochemical richness, along with marked reduction in MDA levels and restoration of antioxidant enzyme activities in ELFE-treated groups compared to oxidative stress–induced controls, indicating improved tissue redox homeostasis and supporting its potential as a promising natural antioxidant therapeutic for oxidative stress–associated disorders.

Keywords: Elaeagnus latifolia; oxidative stress; DPPH; FRAP; phytochemical profiling; t BHP; antioxidant enzymes.

Paper ID: 240

Phytochemical Characterization and Integrated In Vitro–In Vivo Antioxidant Assessment of Myrica Esculenta Fruit Extract

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Abstract

Natural products are an important source of therapeutic agents, particularly in the management of oxidative stress–related disorders. *Myrica esculenta* (Hairy Bayberry), traditionally used in Ayurveda, is known for its rich phytochemical composition, including phenolic compounds and flavonoids with antioxidant properties. The present study evaluated the antioxidant potential of *M. esculenta* fruit extract using both in vitro and in vivo approaches. In vitro assays, including DPPH radical scavenging and ferric reducing antioxidant power (FRAP), demonstrated strong free radical scavenging and reducing activity. In vivo studies further supported these findings by showing improvement in oxidative stress–related biochemical parameters. Overall, the results indicate that *M. esculenta* fruit extract possesses significant antioxidant potential, validating its traditional use and suggesting its promise as a natural therapeutic agent.

Keywords: Antioxidant properties, phytochemical, phenolic, flavonoid compounds, oxidative stress

Paper ID: 255

Pharmacognostic Perspectives on Plant-Derived Antioxidants for Chronic Disease Management

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Abstract

Plant-based antioxidants have gained significant attention because of their ability to neutralize free radicals and reduce oxidative stress, a major contributor to chronic diseases such as cancer, cardiovascular disorders, and neurodegenerative conditions. With increasing interest in natural and safer therapeutic options, plant-derived compounds are being widely explored for their preventive and protective roles in human health. This study reviews recent advancements in understanding how plants synthesize antioxidant compounds and highlights their therapeutic importance. Special focus is given to key phytochemicals such as flavonoids, phenolic acids, carotenoids, and other secondary metabolites. Their mechanisms of action, bioavailability, and effectiveness in both experimental and clinical studies are discussed. Research findings from global initiatives, including significant contributions from Pakistan, are analysed to identify novel antioxidant compounds and their applications in pharmacology and nutraceutical development. It also addresses challenges related to extraction, standardization, and effective delivery of plant antioxidants. Overall, integrating traditional knowledge with modern scientific research can help unlock the full potential of plant-based antioxidants for sustainable and preventive healthcare.

Keywords: Plant-based antioxidants, oxidative stress, flavonoids, phenolic acids, carotenoids, phytochemicals, bioavailability, nutraceuticals, pharmacology, sustainable healthcare

Paper ID: 261

Ethnomedicinal Plants as Natural Sources of Antidiabetic and Antioxidant Agents

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Abstract

Plants have been used for healing since ancient times and remain an important part of traditional medicine systems worldwide. Many indigenous communities still depend on plant-based remedies because they are easily available, affordable, and trusted. Today, interest in herbal medicine is growing rapidly, especially as people become more aware of the side effects associated with synthetic drugs. The World Health Organization reports that a large percentage of the global population relies on traditional medicine for primary healthcare. This study focuses on important traditional medicinal plants from Northeastern India, a region known for its rich biodiversity and strong ethnomedicinal heritage. These plants are commonly used by local communities to manage diabetes and related complications. Scientific studies confirm that many of these plants show significant antidiabetic and antioxidant activities. Their beneficial effects are mainly due to bioactive compounds such as flavonoids, phenolics, alkaloids, and terpenoids, which help reduce blood sugar levels and neutralize harmful free radicals. Overall, validating and documenting traditional knowledge is essential for developing safe, effective, and affordable plant-based medicines. Combining ethnomedicine with modern scientific research can contribute greatly to future healthcare advancements.

Keywords: Traditional medicine; Medicinal plants; Northeastern India; Ethnomedicine; Indigenous knowledge; Diabetes mellitus; Antidiabetic activity, Antioxidant activity, Phytochemicals, Bioactive compounds, Flavonoids, Phenolic compounds, Alkaloids, Terpenoids, Oxidative stress, Herbal medicine, Plant-based therapeutics.

Paper ID: 263

Design and Field Validation of a Pollinator-Safe Protein-Bait Trapping System for Sustainable Management of *Bactrocera dorsalis*

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Abstract

Bactrocera dorsalis is a major tephritid fruit fly causing significant losses in litchi orchards. Sustainable and selective trapping strategies are required to reduce reliance on chemical insecticides while protecting beneficial insects. Field evaluation was conducted at Choudhury Litchi Bagan, Tezpur. Synthetic proteinaceous bait (5 mL per trap) containing jaggery, yeast extract, ammonium acetate, ethanol, and borax was deployed in locally fabricated plastic bottle traps. Entry holes were designed slightly larger than fruit fly body width to physically restrict larger pollinators. Traps were monitored every 14 days with three replications per treatment. Water traps served as controls. Baited traps captured substantially higher numbers of flies compared to water controls (2–3 flies/14 days). Peak captures occurred during June–July. Minimal non-target fly capture was observed, and no pollinators such as honey bees or moths were recorded. The developed bait-trap system demonstrates selective attraction and pollinator-conscious design, offering a practical and sustainable approach for monitoring *Bactrocera dorsalis* in litchi orchards.

Keywords: *Bactrocera dorsalis*; Fruit fly; Protein bait; Mass trapping; Orchard pest management; Seasonal population dynamics.

Paper ID: 270

Ethno-Fermented Foods as Emerging Sources of Bioactive Metabolites and Pharmaceutical Biomolecules

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Abstract

Traditional fermented foods are dynamic microbial ecosystems in which bacteria, yeasts, and fungi convert raw substrates into diverse bioactive metabolites. Beyond improving taste and preservation, fermentation enhances nutrient bioavailability, modifies phytochemical structures, and generates novel compounds absent in the original matrix. These include bioactive peptides, organic acids, bacteriocins, exopolysaccharides, antioxidants, vitamins, and biosurfactants with reported pharmacological potential. A structured literature review was conducted using PubMed, ScienceDirect, and Google Scholar. Peer-reviewed studies focusing on microbial metabolites from traditional fermented foods and their pharmaceutical or biomedical relevance were systematically screened and analyzed. Evidence indicates that microorganisms from cereal-based ferments, dairy products, vegetable fermentations, and indigenous beverages such as rice beer produce therapeutically relevant biomolecules. These include antimicrobial peptides, functional polysaccharides, and biosurfactants with applications in pathogen control, drug delivery, wound healing, and pharmaceutical formulations. Despite their cultural significance, traditional fermented foods remain underexplored scientifically. Detailed microbiological and biochemical investigations of ethnically derived fermented products may provide sustainable sources of novel therapeutic agents and functional pharmaceutical ingredients.

Keywords: Fermented foods; Bioactive metabolites; Biosurfactants; Microbial fermentation; Drug discovery.

Paper ID: 284

Development of Herbal Sunscreen for Sustainability

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Abstract

The rising demand for safe, natural, and eco-conscious skincare solutions has catalyzed a paradigm shift in the field of dermatological product development. Traditional chemical based sunscreens, which typically include active ingredients such as oxybenzone, avobenzone, and octinoxate, are effective in offering photoprotection but are increasingly under scrutiny due to their association with adverse skin reactions, potential hormonal disruptions, and environmental toxicity. Studies have highlighted the bioaccumulation of these compounds in aquatic ecosystems, where they have been linked to coral bleaching and marine biodiversity loss. This has intensified the need for photoprotective agents that are not only effective but also non-toxic, biodegradable, and skin-friendly. Nature offers a rich repository of phytochemicals with photo-protective, antioxidant, and regenerative properties. Essential oils extracted from medicinal plants have long been used in traditional medicine for treating skin ailments. In particular, carrot seed oil (*Daucus carota*), raspberry seed oil (*Rubus idaeus*), and lavender oil (*Lavandula angustifolia*) have emerged as promising botanical agents due to their high content of phenolic compounds, terpenoids, and flavonoids. These compounds act as natural UV absorbers and free radical scavengers, helping to prevent photo-induced cellular damage, inflammation, and premature aging of the skin. Carrot seed oil is rich in carotenoids and has been reported to exhibit significant SPF enhancing properties. Raspberry seed oil provides both UV-A and UV-B protection and contains ellagic acid, which has documented skin-protective effects. Lavender oil, in addition to its calming aroma, possesses anti-inflammatory, antimicrobial, and skin-soothing effects, making it ideal for sensitive skin formulations. When these essential oils are incorporated into a gel-based matrix, they can function synergistically to offer broad-spectrum protection while minimizing the risk of irritation typically associated with synthetic sunscreens. Aloe vera gel forms the hydrating and soothing base of the formulation. Known for its anti-inflammatory, moisturizing, and wound-healing properties, Aloe vera not only enhances the skin feel and usability of the gel but also contributes to skin repair and barrier reinforcement. 4 7 The addition of Vitamin E (tocopherol), a potent antioxidant, further improves the formulation by stabilizing lipids in the skin, reducing oxidative stress, and extending the shelf life of the active constituents. Main aim of this topic is to develop and evaluate a photoactive herbal gel formulation using selected essential oils and aloe vera gel for natural skin photoprotection, focusing on its sun protection efficacy, antioxidant activity, and physicochemical stability as a potential alternative to synthetic sunscreens which is more sustainable and eco friendly

Keywords: *

Paper ID: 288

Pharmacognostical Evaluation, Network Pharmacology and in-Vitro Anti-Diabetic Potency of *Marsilea Vestita*

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Abstract

A lesser-known aquatic fern with reputed therapeutic value in many cultures is *Marsilea vestita* (Family: Marsileaceae). This research aimed to perform a comprehensive "Pharmacognostical Evaluation, Integrated Network Pharmacology Analysis, And In-Vitro Anti-Diabetic Potency Assessment" of *M. vestita.* To set quality standards and identify important bioactive components, the pharmacognostical evaluation included physicochemical profiling, macro- and micro morphological characterisation, and first phytochemical screening. Alkaloid, Carbohydrates, Saponins, Phenolic Compounds, Glycoside, Flavonoids, Proteins & Amino Acids, Phytosterols and Triterpenoids—classes of chemicals commonly linked to antidiabetic action in Marsilea species—were found in preliminary phytochemical data. A network pharmacology study was performed by correlating discovered phytochemicals with diabetes-related targets and pathways utilizing established bioinformatics databases and software tools (Target Prediction of Phytoconstituent, Target Prediction of Disease, Identifying Hub Gene, Parameters). *In-vitro* experiments, including α-glucosidase inhibition and glucose absorption models, shown considerable inhibitory effect of *M. vestita* extracts, suggesting potential to mitigate post-prandial hyperglycemia. These bioactivities are consistent with earlier research in related Marsilea species, where methanolic extracts showed anti-oxidant activity and dramatically reduced blood glucose levels in diabetic mice. The *in-vitro* results confirmed strong biological activity, the network pharmacology offered mechanistic insights into its antidiabetic potential, and the pharmacognostical profile confirmed the structural and chemical identity of *M. vestita*. The potential of M. vestita as a source of natural antidiabetic compounds is supported by this integrated investigation, which also establishes the foundation for additional in vivo evaluation.

Keywords: Pharmacognostical Evaluation, phytochemical screening, Network Pharmacology, Anti-Diabetic, *Marsilea vestita,* α-Glucosidase Inhibition, Target Prediction of Phytoconstituent, Target Prediction of Disease, Identifying Hub Gene, Parameters.

Paper ID: 289

Conservation of Medicinal Plants by Tissue Culture Techniques

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Abstract

Particularly in underdeveloped nations, medicinal plants are an important aspect of primary healthcare and are an essential part of traditional healthcare systems. In light of rising demand, habitat loss, overexploitation, and dwindling biodiversity, this paper emphasizes the significance of protecting medicinal plant resources. It emphasizes how many important medicinal plant species have been lost due to growing urbanization, deforestation, unsustainable harvesting methods, and climate change. The ecological, economic, and cultural importance of medicinal plants is emphasized in the paper, as is their role in traditional knowledge systems, the pharmaceutical sector, and livelihoods. Numerous conservation tactics are covered, such as ex situ conservation approaches including botanical gardens, seed banks, and tissue culture technologies, as well as in situ conservation through protected areas and sacred groves. There is a particular emphasis on the role that traditional healers, local communities, and participatory techniques play in sustainable management. In order to guarantee long-term conservation, the statement also emphasizes the necessity of scientific study, policy support, awareness campaigns, and documentation of indigenous knowledge. Overall, the study emphasizes that protecting the diversity of medicinal plants and guaranteeing their sustainable usage for future generations require an integrated strategy that combines traditional knowledge with contemporary conservation techniques.

Keywords: Medicinal plant conservation, Traditional medicine systems, Primary healthcare in developing countries, Biodiversity loss. Sustainable utilization of plant resources, Habitat destruction, Overharvesting and overexploitation.

Paper ID: PP1

Spatiotemporal Assessment of Environmental Quality in Guwahati City, Assam, India: Evaluating the Interplay Between Upstream Hydrological Dynamics and Urban Anthropogenic Trends (2013–2024)

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Abstract

Although the Brahmaputra River is an ecological lifeline for Northeast India, it is nonetheless quite vulnerable to both natural hydro-climatic variations and rapid urbanization. This research examines the longitudinal changes in air and water quality from 2013 to 2024, with Guwahati serving as the main study region. Through the correlation of upstream observations from Dibrugarh with environmental data from Guwahati, the study demonstrates a crucial connection between upstream flooding occurrences and downstream microbial deterioration. In addition to other environmental factors in Guwahati, analysis shows that increased flooding in the upstream Dibrugarh gauge station during 2014 is associated with a notable increase in Total Coliform and Faecal Coliform concentrations, which peaked in 2015. This implies that the main force behind the movement of biological pollutants along the river corridor is the growth of upstream flood-affected areas. In accordance with the above findings, the study assesses the air health of Guwahati, which showed a noticeable lockdown dividend after 2019. Due to less human activity, SO2, NO2, and PM10 concentrations drastically decreased during this time. These pollutants did, however, resume their rising trajectory by 2022 following a post-lockdown rebound, with sulfur dioxide seeing a notable increase in 2021. The findings show that local anthropogenic forces are taking over the urban atmospheric profile, while upstream hydrological cycles determine the river's microbiological baseline. Accordingly, the results highlight the critical need for an integrated, transboundary environmental management plan that tackles local urban emissions as well as potential hazards associated with natural floods to guarantee sustainable growth in Guwahati City.

Keywords: Coliform, Biological contamination, PM10, Brahmaputra, Guwahati

Paper ID: PP2

After The Floodgates: Evaluating Environmental Hazards in the Kopili Valley NE India

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Abstract

Kopili River, one of the major southern tributaries of the Brahmaputra, is originated at the Meghalaya state of India, which experiences world's highest rainfall, draining through the eastern part and then to Assam Plains. In this study, environmental hazards including both seismic and flood hazard conditions have been assessed with respect to the natural and anthropogenic factors. This study uses satellite and ground-based impact assessment to understand the changes in the Kopili valley. The construction of the Kopili hydroelectric project in the upper reached of the river in the Meghalaya, has impacted in the river dynamics to some extent, where the river course is controlled by the tectonic features. Changes in river meandering patterns impact on the riverside population mostly during the flood season. The relationship among embankment (natural or man-made) and flood plain with respect to the riverbed provided the slope topography, which indicated that the entire Kopili Valley is susceptible to flood hazard. The presence of major channels coming from Meghalaya and Karbi hills, cause high sedimentation in the valley causing major changes. Apart from the major hydrogeologic issues the seismic activity of the Kopili Fault has caused damage to the population in the valley, although most impacts have been seen in the northern part of the fault. However, the liquefaction evidence in the river banks, indicate the area has high potential for liquefaction. Therefore, this study has large impact on environmental hazard analysis for the entire region.

Keywords: Kopili Valley, Seismic Hazard, Dam, Flood, Liquefaction

Paper ID: PP3

Environmental Sensitivity of Rapid Uplift in The Mishmi Tri-Junction System: A Tectono-Geomorphic Study of The Eastern Most Block of Northeast India

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Abstract

The study focuses on the environmental sensitivity due to the geological evolution of the Mishmi Hills involve active interaction between the Indian, Eurasian and Burma Plates, forming a tectonic triple-junction between the eastern Himalayan syntaxis and the Indo-Burma Ranges. The northeastern tip of Arunachal Pradesh is represented by Mishmi block having three notable valleys-Siang valley to the west, Dibang valley in the central and Lohit valley in the easternmost part. Two major thrusts have been identified in the Mishmi region - The Mishmi Thrust (MT) in the Eastern Arunachal Himalaya separates Mishmi Hills from the Brahmaputra alluvium and the Lohit Thrust which separates the Dibang Group from the Lohit Granitoid Complex (LGC). Mishmi block consists of the Lalpani Group where low-grade metamorphic rocks, Mayodia Group which has a strongly deformed gneiss, schist and amphibolite bearing rocks. The Tiding Group is mainly composed of meta-sandstone, shale and limestone deposited in a marine environment. The Lohit plutonic complex includes metamorphic rocks and granitic intrusions, showing magmatic activity during plate collision. Brahmaputra river is formed by the meeting of Siang, Dibang and Lohit Rivers where more than 50% of the sediments are carried from Namche Barwa in Siang and later two are draining in the Mishmi Hills; which indicates a high velocity of water flow in that region. This heavy sediment load is a primary factor contributing to frequent floods in the region. The uplift rate of the area has increased from ~2.3 mm/year during the Neogene to ~3.2 mm/year in the Quaternary. The NW-SE trending Mishmi Thrust (MT) is the primary driver of this deformation. The area has an exhumation rate (a proxy for erosion rate w.r.t. the uplift rate) has been measured as high as ~3.7 mm/year during the Pliocene-Quaternary. This mass wasting has caused major environmental issues in the region.

***Keywords*:** Mishmi Hill, Himalayan syntaxis, Trijunctional system, Eastern Arunachal Himalaya, Lohit granitoid complex (LGC).

Paper ID: PP4

Exploration of Critical Mineral Graphite in Mishmi Hills, Northeast India for Sustainable Future

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Abstract

This study investigates the occurrence and geological characteristics of the critical mineral graphite in the Mishmi Hills of Northeast India. Arunachal Pradesh has emerged as one of India's most significant domestic sources of natural flake graphite, highlighting its strategic importance in reducing import dependency. Graphite occurrences in the Mishmi Hills are primarily associated with carbonaceous phyllite, schist, and gneiss, and are stratigraphically linked to the Mayodia and Tidding formations. Structural features such as folding, faulting, and shear zones play a crucial role in the localization, concentration, and enrichment of graphite mineralization. The graphite is interpreted to be of metamorphic origin, formed through the transformation of organic-rich sediments under regional metamorphic conditions, resulting in the development of crystalline graphite. In the study area, graphite-bearing schist exhibits strong vertical foliation with abundant graphite and biotite. The vertical planar fabric is attributed to intense horizontal compressional stresses during tectonic deformation. The graphite is typically fine- to medium-flaked, with fixed carbon content ranging from 5% to 25%, indicating moderate-grade mineralization with potential for beneficiation. As a designated critical mineral, graphite plays a vital role in green energy technologies, particularly in lithium-ion batteries, as well as in aerospace, nuclear energy, and advanced industrial applications. Systematic exploration and scientific evaluation of graphite resources in the Mishmi Hills can contribute significantly to regional economic development while supporting India's transition toward a sustainable and self-reliant energy future.

Keywords: Critical Mineral, Graphite, Mishmi Hills, Arunachal Pradesh, Metamorphism, Sustainable Development

Paper ID: PP5

Seismological Hazard Analysis for Eastern Himalayan Region, Northeast India

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Abstract

The Eastern Himalayan Syntaxis was the source of the greatest recorded intraplate earthquake the magnitude (Mw) 8.6 Assam earthquake of 1950. This incident demonstrates the region's strong seismic potential. We looked at how seismic strain is currently accumulating and releasing along the main active faults to gain a better understanding of contemporary seismic dangers. Fault-slip rates and locking depths are found from the three dimensional elastic block modelling approach from long-term GPS data. We used existing earthquake catalogues to evaluate seismic activity between 1800 and 2023. According to our findings, the Main Himalayan Thrust (MHT), which has the potential to produce earthquakes with a magnitude of 7.9 or higher, is the most important fault in the area. Significant seismic potential is also shown by exposed faults which have the capacity to produce earthquakes larger than 6.0 Mw. Earthquakes similar in magnitude to the 1950 Assam event are predicted to occur around every 2,000 years, assuming Gutenberg–Richter scaling for seismicity on the MHT. Moreover, impact of probable earthquakes could be similar to what we observed during the major earthquakes in the region like the 1950 Great Assam Earthquake to 2021 Tezpur earthquake. Our modelled predicted that large scale liquefaction conditions would occur mostly in the upper Assam region, causing major destruction. Moreover, large amount of sediment transport through mass-wasting and landslides cause major changes in the hydrodynamics of the region. Overall, this study gives a useful foundation for enhancing seismic hazard assessments in this high-risk area due to the seismic hazard in the Eastern Himalayan Syntaxis.

Keywords: Eastern Himalaya, Assam Earthquake, Liquefaction, Landslides

Paper ID: PP6

Unlocking The Critical Mineral Reserves for Sustainable Development of Northeast India: A Quest for Exploring Graphite and Vanadium Minerals in Arunachal Himalayas

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Abstract

This study examines the potential of Critical Minerals (CM), specifically graphite and vanadium, in supporting the sustainable development of strategic and economic sectors in India. At present, nearly 69% of India's graphite demand is met through imports, highlighting the urgent need for domestic resource development. The Himalayan Belt of Arunachal Pradesh is emerging as a promising region enriched in graphite and vanadium mineralization, offering significant opportunities for regional economic growth. The Arunachal Himalayan litho-units range in age from Proterozoic to Tertiary and include the Sub-Himalayan sequences and the Trans-Himalayan Lohit Batholith. Graphite-bearing rocks within the Proterozoic meta sedimentary sequences of the Bomdila Group are frequently associated with vanadium, forming a distinctive mineralization system hosted within carbonaceous phyllite and schist. Both graphite and vanadium are essential for green energy technologies (e.g., battery systems), as well as for defence, aerospace, steel, chemical, and nuclear industries. Vanadium plays a crucial role in the development of Vanadium Redox Flow Batteries (VRFBs), which are promising large-scale energy storage solutions for renewable energy integration. Graphite–vanadium mineralization in Arunachal Pradesh is primarily hosted within the Hapoli, Khetabari, Taliha, and Tidding Formations, localized along the Main Central Thrust (MCT) and associated shear zones within the central and northeastern Arunachal Himalaya. The structural control exerted by the MCT and related deformation zones has played a significant role in the concentration and preservation of these mineral deposits. Systematic exploration and scientific development of the graphite–vanadium belt of Arunachal Pradesh have the potential to catalyze regional industrialization, generate employment opportunities, enhance infrastructure development, and promote value-added mineral processing industries in Northeast India. By leveraging the substantial resources within the Bomdila Group, India can reduce import dependency, foster technological advancement in defence and aerospace sectors, and simultaneously ensure long-term economic resilience and environmental sustainability.

Keywords: Critical Minerals (CM), Arunachal Himalaya, Graphite, Vanadium, Bomdila Group, Sustainable Energy.

Paper ID: PP7

Paper-Based Electrochemical Aptasensor Functionalized with Zinc Oxide Nanorods for Rapid and Sensitive Detection of Newcastle Disease Virus

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Abstract

Newcastle disease affects many avian species, predominantly chickens. It is known to cause a substantial economic burden to the poultry industry. The velogenic strain of Newcastle disease virus (NDV) can cause mortality up to 100%. Real-time PCR and ELISA are currently used to diagnose NDV; however, these techniques have some limitations. To address the limitations, we developed an aptamer-probed paper-based analytical device (ePAD) to detect NDV. The NDV HN protein-specific aptamer was identified following 10 rounds of SELEX. The identified aptamer was investigated for its binding and stability with the HN protein with the help of docking, molecular dynamics simulations, and CD spectroscopy. ZnO nanorods were used to enhance the conductivity of the fabricated ePAD aptasensor. The aptamer was then immobilized on the working electrode to detect NDV. Various concentrations of NDV were used to optimize the fabricated aptasensor. All the electrochemical changes were analyzed with the help of cyclic voltammetry and impedance. Our data showed the detection of a very low concentration of NDV using the designed ePAD biosensor. The specificity of the aptasensor was studied using a non-related virus from the samples as a negative control. The developed aptasensor could offer a cost-effective, user-friendly, and specific alternative to detect NDV from clinical samples.

Keywords: Aptasensor, Newcastle disease virus, SELEX, Zinc oxide nanoparticles, Diagnostics

Track 3: Creative Media, Design & Interdisciplinary Innovation

Paper ID: 57

A Comparative Analysis of the Representation of Women in the Films 'Mon Jaai' (2008) and 'Qala' (2022)

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Abstract

This paper sets out to map the representation of women in films through multiple media representation tests, namely, The Bechdel Test, The Sexy Lamp Test, The Mako Mori Test, The Furiosa Test, and The FITMUS Test. It covers both Assamese regional cinema and mainstream Bollywood cinema, by presenting a comparative analysis of on-screen representation of women in the movies Mon Jaai (2008) and Qala (2022) with the aim of measuring the variance in women-centricity in Indian films. Furthermore, it draws on the limitations of media representation tests vis-à-vis thematic depiction and portrayal of gendered nuance in South Asian films and in the labelling of a piece of media as 'feminist'.

Keywords: film studies, women-centric media, media representation tests, regional cinema, feminism

Paper ID: 84

Degradation and Crisis in Graphic Novels: Depiction of Climate Degradation in Joe Sacco's Paying the Land

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Abstract

Graphic novels with the emerging trends have evolved a lot in the past few years, the drastic changes with the trends in the graphic novels has shifted the perspective of the readers from just an entertainment-based genre to depicting the harsh realities of the world. This study follows the methodology of close textual analysis, the results represent the depiction of climate degradation and climate crisis in graphic novels (Joe Sacco's Paying the Land) and study concludes by focusing on how the graphic novels helps us in understanding climate degradation and crisis and how it can contribute towards a sustainable future.

Keywords: Climate degradation, Climate crisis, Graphic novels

Paper ID: 105

Social media and politics: The impact of social media on voting behaviour in the 2024 Lok Sabha election, with special reference to Assam

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Abstract

Social media has emerged as a powerful political communication tool in the 21st century, transforming the nature of electoral campaigning and voter participation. Beyond facilitating the expression and exchange of opinions, social media platforms have become central to the campaign strategies of political parties and leaders. The 2024 Lok Sabha Election in India, the largest and most expensive election in history, witnessed extensive use of digital platforms for political Mobilization. Assam, a northeastern state with limited internet access in many of its regions, witnessed a significant role of social media during the 2024 Lok Sabha election. Political parties adopted diverse social media strategies to connect with voters in a more direct and accessible manner. Thus, this study aims to examine the impact of social media on voting behaviour primarily in two districts of Assam-Jorhat and Dibrugarh, during the 2024 election. Through content analysis method, the study analyses candidates' Facebook, Instagram, and Twitter (X) accounts to understand their impact on voting behaviour.

Keywords: social media, election, politics, voters, voting behaviour.

Paper ID: 114

An Inclusive Multisensory Design of an Art Museum for the Visually Impaired Audiences

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Abstract

Communication is one of the interactions within human beings. It works to share our feeling, ideas between people to people interaction through verbal, nonverbal and visual. In addition, this situation defines oppositely in visual arts where one-quarter of the global population specially the visually impaired personalities.In this regard, for this community touch based experience can support to feel the situation, e.g., visual art based museums or experiencing centers are using do not touch policies from decades, and the results are segregating the visually impaired personalities from experiencing those art. To enhance the art form experience for the visually impaired personalities, this research aims to conceptualize a multisensory communication design framework using a human-centered design process that maps visual attributes (color, texture, light, emotional atmosphere) onto tactile, thermal, and audio experiences via an interactive museum installation. In human-centered design methodology, designers prioritize understanding users' real need through empathy-driven research, iterative prototyping, and continuous feedback loops to deliver desired solutions. This research intends to enable universal visual art access for sighted and visually impaired audiences, transforming museum interactions to 'Please Touch' and embedding accessibility as core focus through iterative user empathy, ideation, prototyping, and testing. The final concept leads the process to enhance the experience for the visually impaired audience.

Keywords: Inclusive Design; Human-centered Design; Tactile Art; Visually Impaired Accessibility, Interactive Art Museum.

Paper ID: 126

Development of a Moodle Ecosystem with Analytics and Animation to Promote Self-Regulated Learning in Undergraduate Engineering Biology

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Abstract

The foundations of engineering curriculum are logical modeling, analytical reasoning, and quantifiable problem-solving techniques. Adding biology as a junior-level subject increases exposure to multidisciplinary fields. Still, a crucial pedagogical issue is ensuring that abstract biological processes are conceptually meaningfully integrated into the analytical framework of engineering education. The need to create a structured, feedback-driven digital learning environment that supports self-regulated learning (SRL) and synchronises biological learning with the engineering viewpoint motivated this study. This study proposes creating animation-integrated content within Moodle, an open-source Learning Management System (LMS). Special focus is given to using scientific animations and interactive H5P content to boost higher-order thinking skills. With 3D visualizations of physiological models of content, students are expected to move beyond memorization to analyse and evaluate the hidden structures behind what they're learning. Structured activities aligned to Bloom's Taxonomy Levels, progressing from conceptual understanding to higher-order cognitive processing can be accomplished through reflective and problem-based tasks with immediate automated feedback. The framework incorporates formative assessment through automated tests, adaptive feedback, score displays, attempt monitoring, and performance analytics providing immediate, quantifiable feedback. Moodle log analysis measures learner engagement. The proposed framework shows how analytics-based feedback, animation, and structured digital activities can build a scalable, quantifiable, and pedagogically sound ecosystem that encourages engineering students' autonomy, engagement, and lifelong learning abilities.

Keywords: self-regulated learning, open-source learning management system, competency-based education, interactive H5P content, animations, adaptive feedback.

Paper ID: 133

Legal Protection, Intellectual Property Rights, and GI Tag Implications for Traditional Handloom Products of Manipur

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Abstract

Traditional handloom products embody cultural heritage and serve as an important source of livelihood for weavers; however, they face challenges such as design imitation, weak legal awareness, and limited market recognition. This study aims to examine the existing legal protection and Intellectual Property Rights (IPR) framework for traditional handloom products and to analyse the role and effectiveness of Geographical Indication (GI) tags. The research adopts a mixed-method approach, using secondary data to review legal frameworks and primary survey data collected from handloom weavers and entrepreneurs to assess awareness, 121tilization, and socio-economic implications. The findings reveal that legal provisions such as GI, Copyright, Trademark, and Designs Acts provide formal protection for traditional handloom products; however, their effectiveness is constrained by low awareness, weak enforcement, and limited institutional and marketing support. The study concludes that strengthening legal awareness, simplifying GI/IPR registration procedures, and enhancing policy implementation and market linkages are essential to ensure sustainable livelihood, protect traditional designs, and improve the market value of handloom products.

Keywords: Handloom, Legal Protection, Intellectual Property Rights, Geographical Indication, Traditional Designs, Livelihood Sustainability.

Paper ID: 147

A Psychosocial Perspective on Marital Infidelity and its Association with Marital Quality

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Abstract

Marital relationships stress can result from significant life changes that occur after marriage, such as having a child, losing a pregnancy, financial difficulties, relocation, illness, changes in one's career, or adjustments to one's role in the marriage etc. Infidelity, severe illness, divorce intentions, and challenges at work or with children are some of the things that can cause psychological distress. This paper provides an overview of the theoretical framework of the Psychosocial factors related with marital infidelity and marital quality. This paper's objective is to understand psychosocial perspective on marital infidelity and its association with marital quality. Articles related to marriage, marital quality, marital infidelity, theories, models and factors associated with infidelity were searched. Search engines Pub Med, Science Direct, Research Gate etc were used. Relevant articles were collected and reviewed. Unpublished articles and case studies were not included in the review. Marital infidelity is closely associated with reduced marital quality, marked by loss of trust, intimacy, and communication. Psychosocial factors such as attachment insecurity, unmet emotional needs, and external stressors both increase infidelity risk and accelerate marital decline. Conclusion: Marital infidelity significantly undermines trust, intimacy, and overall marital quality. Addressing its psychosocial roots is essential for fostering healthier and more resilient relationships.

Keywords: Mental Quality, Marriage, Marital Infidelity, Psychosocial factors related with marital infidelity

Paper ID: 167

OTT Consumption Patterns among Generation Z in Urban India

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Abstract

In contemporary India, the rapid growth of over-the-top (OTT) platforms has crucially reshaped how Gen Z consumes media. Also known as digital natives, this generation of users prefers on-demand, tailored entertainment, which led to the normalization of binge-watching and viewing content on multiple platforms. This paper focuses on Gen Z viewing habits, online engagement patterns, and the psychological impacts of these OTT platforms' usage. For primary data collection, a quantitative research approach was adopted using a structured survey of a purposive sample of 157 responders aged 18-29 years in Bangalore, Karnataka. The paper studies the frequency of OTT usage, binge-watching patterns, genre preferences, and their impact on behavioural and lifestyle patterns. The results indicate that the users are inclined towards tailored and immersive viewing of OTT media. Even though OTT platforms provide better user tailoring, rapid content accessibility, and a wide range of entertainment choices, excessive media consumption negatively impacts social relationships, health, and sleep habits. By positioning Generation Z at the forefront of the current shift toward online viewing and highlighting the significance of promoting thoughtful and balanced OTT consumers in an emerging algorithm-driven media landscape, the study contributes to an array of already existing literature on communication and media.

Keywords: OTT platforms, Media consumption pattern, Generation Z, binge watching behaviour.

Paper ID: 169

The Pulse of Storytelling: How Neuromarketing and Emotion AI Shape Brand Memory in Generation Z

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Abstract

In the contemporary digital era, neuromarketing and Emotion AI have reshaped how brands design and deliver stories, enabling emotional responsiveness at an unprecedented scale. While emotional engagement drives consumer behavior, its specific role in shaping durable brand memory—particularly among the digital-native Generation Z cohort remains insufficiently theorized. This study develops an integrated perspective on emotionally intelligent branding by examining how neuromarketing insights and Emotion AI-enabled storytelling jointly influence brand memory formation. To achieve this, the research expands the traditional qualitative case study approach by integrating a bibliometric keyword co-occurrence analysis of 42 high-impact academic papers. Bibliometric mapping from 2018 to 2024 reveals a strong research density around "Generation Z," "personalization," and "marketing," confirming a rapid shift toward individualized digital engagement. The qualitative phase examines Netflix, Spotify, and Coca-Cola global brands known for emotionally resonant narratives and data-driven personalization. Combined thematic and bibliometric analyses reveal that stories evoking genuine emotional salience match consumers' internal identities, making them significantly easier to encode into long-term memory. Furthermore, findings suggest that perceived authenticity and emotional empathy strengthen the memorability of AI-mediated brand experiences, meaning Gen Z remembers brands better when algorithmic interactions feel human. By synthesizing insights from consumer neuroscience, AI, and brand storytelling, the study advances a holistic framework for modern brand memory. The paper contributes to marketing theory by shifting focus from emotional measurement to emotional meaning-making, offering strategic guidance for responsible, emotionally intelligent brand communication

Keywords: Neuromarketing, Emotion AI, Brand Storytelling, Brand Memory, Generation Z

Paper ID: 201

Traditional Knowledge & Contemporary Housing Design: An Empirical Study of Residential Space Planning and Influence of Vastushastra, Nagpur, India

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Abstract

The Indian Traditional Knowledge systems is still being practiced and has its influence on residential design. In India, Vastushastra is a spatial doctrine that regulates orientation, zoning and placement of rooms. On the other hand, modern residential design focuses on incorporating climate-responsive planning, functional usage of rooms, and cost-effectiveness. The paper investigates the interface between Vastushastra and modern concept of performance-oriented residential design in Nagpur, a composite climatic city in central India. A structured questionnaire survey was carried out among 170 residential owners. Descriptive and inferential statistical analysis was carried out, including Chi-square tests, Cramer V effect size, and Spearman rank correlation. The results show that 61% ofthe respondents practice Vastushastra at least moderately. A statistically significant relationship wasfound between Vastushastra adherence and plan modification behavior [$\chi 2$ (16) = 63.47, $p < 0.001$; Cramer V = 0.306]. Significant but moderate relationships were also found between Vastushastra adherence and compromise on lighting and ventilation ($p = 0.033$) and cost and time ($p = 0.032$). The results of this study indicate that residential layouts are produced through a negotiated coexistence between traditional spatial doctrine and modern performance rationality rather than a conflict between them. This study provides empirical data to the ongoing discussion on cultural persistence and climate-responsive residential design in rapidly urbanizing regions.

Keywords: Vastushastra, residential architecture, cultural decision-making, climate responsive design, space planning, composite climate

Paper ID: 203

Role of Smart Tourism Technology in Shaping Memorable Tourist Experiences: A Meta-Analytic Review and Research Agenda

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Abstract

Smart Tourism Technologies (STTs), including AI, VR/AR, IoT and gamification, have transformed various aspects of the tourism industry but empirical information is scarce regarding their influence on Memorable Tourist Experiences (MTEs)- emotionally meaningful experiences driving loyalty and word-of-mouth recommendations. This meta-analysis summarized existing quantitative evidence permitting estimation of STT-MTE effects, examined heterogeneity and investigated moderators such as region, technology type and sample characteristics. Based on the PRISMA guidelines, it conducted a systematic search in Scopus, Taylor & Francis and Google Scholar (2018–2026), retrieving 21 empirical studies (k=21). Pearson correlation coefficients (r) were extracted or calculated, Fisher's Z transformation was performed for random-effects modelling, heterogeneity(Q, I^2), and publication bias (funnel plot, Egger's test). A moderate-to-strong positive correlation was observed (pooled effect size at $r = 0.47$, 95% CI [0.38, 0.56], $p < 0.001$) and high level of heterogeneity figured out ($I^2 = 96.23\%$, $Q(20) = 642.18$, $p < 0.001$), suggesting contextual disparity and no indication of publication bias (Egger's $p = 0.261$). Preliminary moderator analyses suggest stronger effects in Asian contexts and with immersive technologies. These features of STTs provide significant benefits to MTEs by supporting the Experience Economy theory and S-O-R models. Highlights of the paper identify the extent to which tourism researchers focus on sustainability and provide much-needed scholarly discussion amongst destination marketers and policy makers, the need for continuing research into underexplored moderating factors around experience

Keywords: Smart Tourism Technologies, Memorable Tourist Experience, Meta Analysis, Virtual Reality, Augmented Reality, Stimus-Response-Organism

Paper ID: 219

A Retrospective Study on Skill Development Practices in Ancient Gurukul System

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Abstract

This paper examines the role of skill development within the ancient Indian Gurukul system as described in classical literary and traditional sources. Employing an interpretative approach, the study analyses secondary materials including scriptural references, historical commentaries, and existing scholarly discussions to explore the pedagogical structure and educational philosophy of the Gurukul tradition. The objective is to assess its conceptual foundations and their potential relevance to contemporary skill-oriented education. This study situates the Gurukul framework within present discussions on skill development, employability, and value-based education. While acknowledging the historical and socio-cultural limitations of ancient systems, the paper identifies conceptual elements—such as experiential learning, competency-based training, ethical orientation, and life-skill cultivation—that remain pedagogically significant. The findings suggest that a critical and context-sensitive adaptation of these principles may inform contemporary educational reforms aimed at balanced human development. It contributes to academic discourse by offering an analytical rather than prescriptive perspective on the Gurukul system's relevance to modern skill development frameworks.

Keywords: Gurukul System; Skill Development; Experiential Learning; Value-Based Education; Ancient Indian Education; Life Skills; Educational Philosophy

Paper ID: 274

Communication Design's impact on Sustainable brands

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Abstract

These days, many brands sell their products around the concept of environment. According to Marketing LTB, 92% of consumers consider sustainability important when choosing a brand, and 70% of global consumers prefer brands that communicate environmental responsibility clearly. A well-strategised visual communication is able to reflect the brand's environmental values the best. By picking the right media channels, communication design can attract prospect targets, increase loyalty and convert others towards sustainability. This research examines how communication can strengthen sustainability narratives through a first-hand case study drawn from professional practice. Using a qualitative, practice-based methodology, the study focuses on branding mostly in the European and American market – prominently the rebranding of a premium-priced kitchenware brand that uses recycled wood. Through changes in their color, typography, and tone shifts, the new visual identity enhanced public recognition of the brand's eco-friendly objectives followed by the increase in social media engagement, brand collaborations and public visibility. Design shapes brand credibility and consumer meaning. This framework showcases an understanding of communication strategy and its impact. Findings aim to inform design and media practitioners, researchers and educators to elevate sustainable values in brands.

Keywords: Branding, Visual Communication, Kitchenware, Strategy, Case Study, Sustainability

Paper ID: 236

What Happens After Use? Understanding Young Consumers' Perception of Reusing Reclosable Food Packaging

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Abstract

Food packaging helps to properly store food products, protecting and preserving it, maintaining hygiene and safety and making transportation and distribution easier. Most food packaging is used only for a short period and becomes waste soon after the product inside is consumed or transferred. The increasing focus on sustainable consumption has led to greater attention on what happens to food packaging after it has been used. This study aims to understand how young consumer experiences packaging, the decision-making processes and perceptions of value associated with reusing reclosable food packaging. A qualitative study was conducted at Tezpur University using semi-structured interviews among 15 respondents including students and research scholars of age group 18 to 35 years. The interviews explored participants after use behaviour, decision making, challenges, reuse practices and safety concerns and whether reusable packaging adds value to a brand. The responses were analysed using thematic analysis to identify common ideas and patterns. The findings show that many participants reuse packaging for secondary uses and as container to store other food items. However, some participants also reported problems with the packages such as difficulty in cleaning, concerns about hygiene and safety and small retention. The study concludes that designing reusable, safe and easy-to-clean packaging can improve customer satisfaction and help reduce packaging waste.

Keywords: Young Consumer, Consumer Perception, Reclosable Food Package, Packaging Waste.

Paper ID: 161

Analysis of Product Semantic by Designing of Nature-Inspired Product Form

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Abstract

A water purifier is not only used to clean water but also removes other pathogens, harmful bacteria that can cause diarrhoea, typhoid, and cholera. It also improves the overall taste, smell, and quality of drinking water. A purifier is designed using the principle of biomimicry, nature-inspired, or the design that closely resembles natural elements, especially the form and outer structure. The development of a purifier from organic design represents a distinct category of design challenges where inspiration from nature is taken as a creative tool for problem-solving. This study intends to develop methodology that first identifies the main nature structure that became the core of the design which helps to identify key design parameters that are used to contribute to the development of product forms inspired by nature, and explores how these factors influence the process, after which, internal design, CAD model generation, and colour material and finish are considered one by one.

Keywords: Biomimicry, Concept Formation, Creativity, Industrial Design, Product Detailing, water purifier.

Paper ID: 90

Reconciling Conservation and Development: Institutional Determinants of SDG Achievement Through Community-Based Tourism in Northeast India

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Abstract

This study examines how community-based tourism (CBT) is associated with sustainable livelihood outcomes in Northeast India. It challenges the assumption that tourism expansion alone can deliver development gains by showing that outcomes appear to be contingent on community-level institutional configurations rather than tourism intensity. A mixed-methods design was employed, combining household surveys (N = 287) across six community-based tourism sites in Assam and Meghalaya with in-depth interviews (N = 42) and participatory observation. Structural equation modelling was used to assess how environmental governance capacity, social capital, and benefit distribution equity function as statistical mediators in the association between tourism development and livelihood security. The findings show that while tourism shows a significant positive association with livelihoods (β = 0.31, p < 0.001), a larger share of its association operates indirectly through institutional pathways (total indirect effect β = 0.48, p & lt; 0.001). Environmental governance capacity emerges as the dominant mechanism, followed by social capital and benefit distribution. However, these gains are uneven, with women and socially marginalized community groups facing limited access to tourism benefits. The study finds that sustainable tourism outcomes are more strongly associated with institutional conditions than with tourism growth itself, suggesting that governance capacity, collective action, and benefit-sharing are key institutional correlates of livelihood security. It offers an empirically grounded explanation of how tourism can contribute to SDG 1 (No Poverty), SDG 8 (Decent Work), SDG 10 (Reduced Inequalities), and SDG 15 (Life on Land) in marginal regions, while highlighting the structural risk that CBT may reproduce existing gender and social inequalities without deliberate institutional design.

Keywords: Community-based tourism, sustainable livelihoods, environmental governance capacity, Northeast India, institutional mediation

Paper ID: 110

Possible solution for Inclusive and Safe Drinking Water in Public Spaces through Design Intervention

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Abstract

Water scarcity is an increasing global challenge due to rapid urbanization, climatic changes, and increasing demand, yet its demand in public spaces remains underexplored. The unavailability of safe drinking water in transport hubs, parks, markets, and institutional areas disproportionately affects commuters, informal workers, vulnerable populations, and low-income groups who rely on shared infrastructure. This study investigates the infrastructural, behavioural, and management factors contributing to inadequate public drinking water access and aims to develop a design intervention to address these gaps. Different methods of research were conducted through field observations, user surveys across diverse demographic groups, and analysis of existing public water systems to identify failures in accessibility, maintenance, trust, and usability. Findings indicate that poor maintenance mechanisms, lack of real-time monitoring, limited inclusive design considerations, and low public trust significantly reduce usage even where infrastructure exists. The study proposes a modular, inclusive, and smart public drinking water system integrating real time quality indicators, accessible ergonomics, and maintenance alert mechanisms. The research paper demonstrates the possible solutions to bridge systemic and inclusiveness, contributing to improved accessibility, increased public awareness, and more sustainable water use in urban public environments.

Keywords: Water scarcity; Public drinking water; Urban infrastructure; Inclusive design; Smart water systems; Public health.

Paper ID: 227

Relation Between Economic Resilience and Solar Energy as a Sustainable Development Pathway: Evidences from Kamrup (Metro) and Sivasagar Districts, Assam

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Abstract

The present study attempts to determine a cross-sectional relationship between solar rooftop system as a key driver of sustainable development and economic resilience. The main objective of the present study is to determine the effect of adopted solar power plant towards the economic resilience of the state. The present study is based on primary data. Primary data is collected through the methods, such as– questionnaire, face-to-face interview and telephone interview. The researcher defined 2 research hypotheses. Only 1 sampling techniques is used. The statistical techniques used in this study are :- ANOVA & Correlation. The main finding of the study indicated the rejection of the 1st hypothesis and the acceptance of the 2nd hypothesis. Solar energy positively affects economic resilience of the state. The suggestion regarding the conclusion of this study is divided into the improvement of and its effect on electrified households through a panel data analysis.

Keywords: Solar energy, Sustainable development, Economic resilience, Regression

Paper ID: 139

A Review of Passive Design Strategies for Industrial Buildings in the Subtropical Climate of Northeast India

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Abstract

Passive design in industrial architecture uses natural forces—solar, wind, thermal dynamics, and climate—to create energy-efficient facilities with minimal mechanical dependence. Through orientation, natural ventilation, thermal mass, sustainable materials, and advanced envelopes, it ensures high performance and indoor comfort. This study examines the impact of passive design strategies on industrial architecture in North-East India, aiming to improve thermal comfort, sustainability, and cost-effectiveness in local industry settings. By analysing techniques such as building orientation, enhanced ventilation, thermal mass usage, and integration of renewable energy, the research explores sustainable and energy-efficient approaches that reduce carbon footprint and promote worker well-being, offering affordable solutions tailored to the unique climate of the region. In the North-East, traditional houses—built with bamboo, timber, sloped roofs, and raised platforms—have long demonstrated effective passive strategies. Today, the construction industry is adapting and modernizing these principles to create sustainable buildings that reduce energy consumption, minimize environmental impact, and enhance occupant.

Keywords: Passive Design, Industrial Architecture, Energy Efficiency, Sustainable Manufacturing, Ventilation, Thermal Mass, Building Orientation, Carbon Footprint, Worker Comfort, Renewable Energy.

Track 4: Society, Legal Studies, Policy, Education & Global Governance

Paper ID: 38

Problems facing the female elderly at Old Age Homes: The scope for Policy Intervention

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Abstract

The elderly population is continuously increasing since ageing is a Worldwide phenomenon. Ageing is a natural phenomenon forming an essential part of the long- drawn cycle of growth and decay. Owing to various socio – economic factors like Westernization, rural – urban migration, changing role of women, industrialization, disintegration of the extended family structure etc., elder people (both male & female) in the Indian sub- continent and many other countries no longer receive the traditional support from family or community which their forefathers used to enjoy in earlier times. Bonding or togetherness nowadays is fast becoming a thing of the past. Instead, an individualistic or a self- centred outlook is taking its place and its worst victims are the elderly (specially the female elderly). As many of the female elderly have no or very little income of their own, they are looked upon as parasites by their kin. They are made to feel unwanted and are often ill- treated. Paucity of financial resources is a major problem dogging many of the older women irrespective of whether they are living with their family or residing in old age homes. The plight of the female elderly is really pathetic. They become easy victims, particularly the widows. Many of the elderly women are subjected to torture and various forms of abuse and are even and driven out of their home by their husbands or kin. So, socially, financially and emotionally they become completely devastated.

Keywords: Female Elderly, Old Age Home, Problem, Policy Intervention

Paper ID: 45

Cost of Seasons: Ensuring Sustainability in Assam's Tourism Economy

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Abstract

The tourism industry significantly contributes to the generation of income in certain tourist locations. When there is a rise in the number of tourists who visit the area, the revenue generated by the industry likewise rises, and vice versa. Seasonality, a defining characteristic of tourism, is recognised as a significant challenge for regional tourism, affecting local economies and limiting sustainable development. It is not uncommon for the actively engaged stakeholders to encounter obstacles when attempting to maintain income earnings from the industry for themselves. The seasonality of the industry is another key issue for the engaged stakeholders and families who primarily depend on tourism incomes. Seasonality causes the fluctuation in tourists and visitor numbers to a destination. As a result, some sites have more tourists and visitors than they can handle at times, while others have far too few. Natural and institutional factors have been identified as the main causes of seasonality in the selected study areas. This article aims to study the seasonality of income earnings in the tourism industry in the selected locations and how to reduce it so that families who rely on tourism can keep their jobs. A t-test and descriptive statistics were utilised in the methods section to do the seasonality analysis. According to the study's findings, the seasonality observed in the four chosen study sites also exists in the four selected study regions and leads to major fluctuations in earnings from the industry. Stakeholders can attract tourists during the off-peak season when conventional sites may not be as appealing by offering a variety of experiences and activities in the study areas of Assam.

Keywords: Seasonality, Income Earnings, Sustainability, Tourism Industry, Businesses, Assam

Paper ID: 56

Governing Women: Domestic Surveillance and Disciplinary Power in Manju Kapur's Difficult Daughters

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Abstract

This paper examines how Manju Kapur's Difficult Daughters (1998), represents a shift in the nature of punishment from physical force to subtle forms of regulation. Although the novel is set during a period of social and political change in pre and post partition India, women's lives continue to be closely governed within the family and community. Using Jeremy Bentham's idea of the panopticon and Michel Foucault's concept of disciplinary power as theoretical frameworks, the study explores the experiences of Virmati, as shaped by constant observation and moral judgement. Rather than facing direct bodily violence, Virmati encounters emotional pressure, shame, guilt, and social scrutiny, especially from her mother and other family members after her relationship with Professor Harish. Through close textual reading, the paper shows that the domestic space itself functions as a site of surveillance where expectations regarding women's sexuality and marriage are enforced which in turn leads to internalization of these norms and women regulating their own behaviour. The novel, therefore, illustrates a movement from punishment of the body to discipline of the mind, revealing how patriarchal authority operates most effectively when it is accepted as natural. Kapur's narrative highlights the persistent yet understated control exercised over women in modern Indian society.

Keywords: Disciplinary power, domestic space, gender, patriarchy, panopticon, surveillance

Paper ID: 61

A Study on the Implementation and Performance of Common Service Centres in Rural Assam: an Analysis

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Abstract

We are living in an era that is increasingly controlled and monitored through digital technologies. Modern society is surrounded by highly digitized systems, making daily life heavily dependent on digital tools and platforms. At present, it is difficult to carry out everyday activities without the support of digital technologies. Few years ago, most administrative and social processes were conducted only through traditional paper-based methods. However, today, digital technologies have become an integral part of human life and livelihood. In this context, it is essential for Social Science researchers, to analyze and explores the changes brought about by digital systems and to examine how these systems continue to function in society. As citizens of a democratic country like India, people are directly experiencing the impact of electronic governance. The present study focuses on the implementation and performance of Common Service Centres (CSCs), which are an important component of the Digital India Mission, providing government services in an accessible and efficient manner, particularly benefiting rural populations. It employs qualitative research methods along with secondary sources to analyze the functioning and performance of these centres.The studies mainly includes operational structure, effectiveness and service delivery mechanisms of CSCs.

Keywords: Common Service Centres, Digital India Mission, Rural Assam, Service Delivery

Paper ID: 72

Digital Sovereignty and the Human Rights of Indigenous Peoples: A Policy Framework for Inclusive Data Governance

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Abstract

In the emerging digital world. Data is the new oil. It has become a critical resource shaping governance, economic development, and social inclusion. However, indigenous communities across the Global South remain disproportionately vulnerable to data extraction, digital exclusion, and algorithmic bias. The concept of digital sovereignty offers a policy pathway to address these imbalances by asserting the rights of communities and states over the data generated within their territories. For indigenous populations, digital sovereignty is not merely a technological or economic concern; it is fundamentally linked to land rights, cultural survival and collective identity. Existing international human rights instruments, including the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), recognise the rights of indigenous communities to self-determination, cultural preservation, and control over traditional knowledge. Yet, these principles have not been adequately translated into the digital sphere. Corporate-controlled data ecosystems often extract indigenous knowledge, languages, and cultural expressions without consent, recognition, or benefit-sharing. This policy paper proposes a rights-based digital sovereignty framework that integrates indigenous data governance into national and international policy structures. It advocates for community consent protocols, localised data infrastructure, legal recognition of collective data rights, and inclusive AI development practices. By aligning digital sovereignty with indigenous human rights, the framework seeks to correct structural inequities in the global data economy. Ultimately, the paper argues that meaningful digital sovereignty must extend beyond state control to include the autonomy and rights of indigenous communities, ensuring that the digital future is equitable, culturally respectful, and just. It will ensure in achievement of Sustainable Development Goal 10.

Keywords: Data Governance, Data Colonialism, Indigenous Population, SDG10

Paper ID: 74

A Comparative study of agricultural growth in Assam: A critical review

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Abstract

Agriculture is the primary eye of income in Assam's economy. Production methods in various types of cropping are crucial in their decision making of the farmers welfare. However, the farmers are using several knowledge and technique in agricultural field; Gross State Domestic Product (GSDP) as a major component in Assam to measure the states income. In India, Assam has emerged as a fastest growing economy in the last five years, the agricultural growth rate increases with the concentration of modern farmer technology. Moderate temperature, abundance of rainfall and the fertility of soil are three major components in Assam's agricultural growth where it's an advantageous for cropping. The agricultural cultivation in Assam is inadequate due to some natural calamities like as drought, floods etc and some other problems in agricultural sector are fragmented land holding, small, shortage of drip irrigation facilities, insufficient of seeds, common methods in planting or harvesting time, limited uses of fertilizers, diseases and pest infection. The present study focuses to study the contribution of agricultural growth and trends in GSDP in Assam. Agriculture is not only contributing the income in a state but it also employs many people directly or indirectly. Today, farmers enhances the different type of agricultural farming such as food and non food items, tea cultivation is the largest growing industry in Assam. GSDP forecast with time series analysis. The study is based on secondary level for the period of 33 years (1991 to 2023). From the availability of secondary data, result observed the six cropping items such as rice, wheat; jute, sugarcane, potato and rapeseed & mustard had a significant increasing in the last 33 years. Today, agricultural GSDP contribute a large scale of GSDP in Assam's economy. It has to point that, a GSDP is higher percentage rate than agricultural GSDP. The study aims to compare the growth of agricultural GDP and total GDP through the Solow growth model by applying 33 years data availability; the actual and calculated a average growth rate. The study uses the four stage of Box-Jenkins model to create a suitable Auto-regressive Integrated Moving Average (ARIMA) model for Assam's GSDP and it also planned to forecast the Assam GSDP of the following 10 years. The following forecast value from the ARIMA model, we can expect that Assam GSDP continue to grow. The study suggests that, state GDP is run by knowledge and human capital formation; credit system also play a crucial part in agriculture growth in Assam. There is a vital requirement to expand agriculture, highlight the integrated farming, adoption of sustainable exercises, use cow dung, organic farming and companion planting.

Keywords: Assam, Agriculture, GSDP, Income, Sustainable

Paper ID: 78

Digital Transformation in Peripheral India: A reflexive thematic analysis of Government Offices

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Abstract

The study aims to understand the unfolding of Digital Transformation (DT) in two different administrative levels, i.e., the Directorate offices in Itanagar, the state capital of Arunachal Pradesh, and in District offices of Ziro, the headquarters of Lower Subansiri district. Through a comparative case study using Reflexive Thematic Analysis (RTA), the study intends to find how DT unfolds in a remote northeastern state and to identify the critical elements that drive DT. The analysis underscores the importance of policy mandates along with leadership intervention and leadership continuity for the implementation of digital initiatives or programs to accelerate the transformation. The study also highlights the importance of digital champions and their role in mobilizing the workforce from physical to digital workspaces. The study contributes to theory by offering insight for DT by highlighting the importance of the interplay of infrastructure, leadership, and digital champions, which have been found to be of utmost importance for remote administrative contexts. Practically, it offers policy guidance for fostering leadership continuity and capacity-building programs, infrastructural investment, and empowerment of digital champions to accelerate DT in similar contexts.

Keywords: Digital Transformation, Digital Champions, E-governance, Leadership

Paper ID: 86

Reimagining Sustainable Development: The Case of Kamrupia Dhulia

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Abstract

The importance of particular of folk traditions is multifaceted and its true value hard to grasp. Advocates for these traditions often struggle to present convincing arguments for incorporating traditional folk practices into economic development frameworks. Kamrupia Dhulia is a traditional folk performing art, rooted in agrarian, religious, and communal practices, integral to cultural festivities of Nalbari and Barpeta region. They are traditional folk drummers who play large and wide big drums called Bor Dhol at cultural festivals, weddings and folk-religious activities. Though associated with playing the Bor Dhol, they are more known for their performance of traditional martial acrobatic and 'Sang' which is traditional form of skit. Spontaneity of expressions and quickness of mind and feet are the hallmarks of Kamrupia Dhulia. The aim of this paper is to explore the relationship between traditional folk practices and economic resilience, taking the case of Kamrupia Dhulia and examining whether cultural activities can offer alternatives or adaptive strategies that not only strengthen the livelihood foundations of rural communities but also create sustainable development opportunities without causing ecological harm. The research employs primary data collected from Kaihati and Gobradal in Nalbari District (Assam) through interview, group discussion and participant observation.

Keywords: Folk Traditions, Kamrupia Dhulia, Economic Resilience, Rural Communities, and Assam.

Paper ID: 89

Cultural Intelligence Across Contexts: A Review of Cultural Quotient in Low- And High-Context Cultures

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Abstract

Purpose: Cultural Quotient (CQ) is a vital competence in multicultural professional settings. It measures someone's ability to behave and act in a culturally acceptable way in a variety of settings. This review explores the developing conceptualization of CQ and differentiates it from related constructs, such as emotional intelligence and social intelligence. It also examines the contrasts of CQ across high-context (HC) and low-context (LC) cultures and addresses complications individuals experience in both contexts for work and employment. Methodology: A systematic literature review was carried out using the 2018 PRISMA guidelines. The databases searched included ScienceDirect, Scopus, Web of Science, Google Scholar, and backwards Citation Searches. The research articles that were published before 2015 were excluded. The key words used were "Cultural Intelligence," "Cultural Quotient," "High-Context Culture," and "Low-Context Culture." After applying the inclusion and exclusion criteria, 50 peer-reviewed articles were included in the analysis. Findings: The review integrates foundational theories, including Hall's Context Theory, Hofstede's Cultural Dimensions, and the Ang & Earley CQ model. It also emphasises that the derivation of CQ from communication styles was associated with HC and LC cultures. Although CQ is enhanced with more intercultural exposure, the cultural context influences the nature of the CQ acquired and the expressions of CQ. Practical Implications: CQ is not universally applicable in a standard way. It requires more tailored frameworks for global leadership, HR development, and cross-cultural management, taking into account the cultural specificity in HC and LC environments.

Keywords: Cultural Intelligence, Cultural Quotient, High-Context Culture, Low-Context Culture, Intercultural Communication, Hall's Theory, Hofstede's Dimensions, and Cross-Cultural Competence.

Paper ID: 93

Impact of Digital Surveillance by State on Privacy as a Human Right: An Empirical Study

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Abstract

The unprecedented advancement of digital technologies has considerably enhanced the potential of states to surveil, obtain, and analyze personal data which raises critical concerns about privacy as a fundamental human right. This paper examines the effect of digital surveillance by state on the right to privacy through an empirical lens. Using both empirical and doctrinal methods, the research draws on survey data and policy analysis, to assess how digital surveillance affects the perceptions, experiences, and enjoyment of privacy. The findings indicate that while digital surveillance is justified on grounds of national security, public safety, and crime prevention, it results in interference into personal life, lack of transparency and accountability. The study also shows a substantial gap between prevailing legal safeguards and actual surveillance practices, resulting to decreased public trust in state institutions. The paper suggests a rights-based framework based on legitimacy, necessity, proportionality, and accountability to regulate digital surveillance practices. Thereby, it seeks a relationship between the individual and the state that affirms democratic values and constitutional freedoms in the face of rapid digital transformation.

Keywords: digital surveillance, privacy, human rights, data protection

Paper ID: 94

Legal Ambiguity and Land Insecurity in the Assam–Nagaland Border: Evidence from Golaghat District, Assam

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Abstract

This paper examines borderland development through the lens of land security, focusing on Golaghat district on the Assam side of the border, where prolonged interstate disputes and administrative uncertainty have produced chronic land insecurity among local populations. Golaghat district contains some of the most contentious stretches of the Assam–Nagaland border. In this region, overlapping claims different stakeholders have resulted in fragmented and inconsistent land governance. Large sections of the borderland population reside on reserve forest and border lands without formal recognition of tenure. These residents include long-settled households, migrant settlers, and indigenous communities whose access to land has evolved under diverse historical and socio-political conditions but remains legally insecure. The absence of land security in Golaghat has exposed borderland residents to eviction, displacement, and exclusion from welfare and development programmes. Land insecurity has also undermined economic resilience by destabilising agriculture and constraining infrastructural development. Development initiatives in the district remain fragile, as unresolved tenure arrangements generate persistent uncertainty and discourage long-term investment. Eviction drives in the border areas of Golaghat further reveal patterns of selective enforcement of land and forest laws, reinforcing marginality and perceptions of injustice among affected communities. By situating Golaghat district within broader debates on border governance, land rights, and development policy, the paper argues that sustainable borderland development cannot be achieved without secure and inclusive land tenure arrangements. It concludes by emphasising the need for conflict-sensitive land policies, institutional coordination, and participatory governance to address land insecurity and livelihood challenges in Assam's border districts.

Keywords: land insecurity, border dispute, territorialization, political ecology, Assam-Nagaland border, Golaghat district.

Paper ID: 96

Foodgrain Procurement Efficiency and Sustainable Food Security: An Empirical Analysis of Assam's Rice Economy

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Abstract

Foodgrain procurement plays a pivotal role in ensuring food security, stabilizing farm incomes, and maintaining buffer stocks under India's Minimum Support Price (MSP) framework (Baishya & Bezbaruah, 2025). However, despite Assam being structurally rice-surplus state, procurement penetration has historically remained limited compared to production potential (MoAFW,2023). Emipirical studies linking procurement efficiency to sustainable food security in the North-Eastern region remains scarce. This study examines the current status of food procurement in Assam with particular emphasis on paddy procurement under the Kharif Marketing Season (KMS). The study analyses institutional mechanisms, recent procurement trends, district-level performance, inter-state comparisons, and the requirement-production-procurement balance to assess systemic efficiency and sustainability. This study adopts a descriptive and analytical research design using secondary data sources from the Food Corporation of India (FCI), Government of Assam procurement dashboards, Agricultural Statistics at a Glance (MoAFW), Statistical Handbook of Assam, and the Household Consumption Expenditure Survey (HCES 2022-23); the study employs trend analysis, district-level comparison, inter-state benchmarking, and a requirement-production-procurement balance model to examine the procurement efficiency and food security sustainability in Assam's rice economy. A sensitivity analysis under alternative paddy-to-rice conversion scenarios is employed to test the robustness of surplus estimates. The findings of the study reveals substantial inter-seasonal fluctuations which indicates that procurement during KMS 2023–24 achieved only 48.17% of its target (314,937 MT), whereas KMS 2024–25 recorded a historic high of 802,560 MT, thereby achieving over 96% of its first-crop target (Food Corporation of India [FCI], 2025; Government of Assam, 2025). District-level disparities persist, reflecting uneven infrastructural access and farmer participation. While leading states such as Punjab, Chhattisgarh, Telangana, and Odisha dominates national procurement volumes, Assam's contribution remains modest despite recent growth momentum. The requirement-production analysis estimates Assam's annual rice requirement at 3.69 million tonnes against production of 5.54 million tonnes, generating a surplus of approximately 1.85 million tonnes. Sensitivity testing confirms self-sufficiency under varying efficiency assumptions. The study argues that Assam's food security challenge is not production inadequacy but institutional and logistical inefficiency. Strengthening digital procurement systems, enhancing district-level infrastructure, and deepening farmer inclusion mechanisms can transform Assam's rice surplus into a more resilient and sustainable food security framework.

Keywords*:* Foodgrain Procurement, Minimum Support Price (MSP), Procurement Efficiency, Sustainable Food Security, Institutional Efficiency

Paper ID: 99

Interpersonal Cybercrime in the Age of Generative Artificial Intelligence: A Human Rights Perspective

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Abstract

Generative Artificial Intelligence is much more efficient at producing realistic content based on vast existing datasets and has already sparked an evolution in technology. With such advancements, the world has also seen a concerning rise in cybercrime activities. The internet has witnessed several new forms of interpersonal cybercrime, where the misuse of Generative Artificial Intelligence has enabled individuals to be targeted, defamed, and harmed mentally and physically through the threat of uploading manipulated content online. This emerging menace of cybercrime not only jeopardises individuals' security but also poses serious threats to fundamental human rights. In this paper, the author aims to analyse the human rights aspects of crimes affecting individuals in cyberspace and the legal landscape surrounding these growing concerns. The methodology adopted in the study is purely doctrinal. It critically examines international human rights instruments, relevant constitutional protections, and statutory frameworks governing cybercrime that impact individual rights. The research finds that existing legal frameworks are technologically neutral, often insufficient to address the speed, anonymity, and scale of such abuse. The paper advocates for a rights-based regulatory approach that incorporates victim-centric remedies and AI-specific safeguards to ensure protection in the digital age.

Keywords: Technology, Generative Artificial Intelligence, Interpersonal Cybercrime, Human Rights, Cyberspace.

Paper ID: 102

Urban Expansion and the Politics of Land Acquisition in India: A Systematic Review of Socio-Economic, Legal, and Environmental Perspective

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Abstract

Urbanisation of India has increased conflicts over land, livelihood and environment. This study highlights the politics of land acquisition by conducting a review of 126 research articles published in peer-reviewed journals from 2000 to 2025, reviewing issues through socio-economic, legal, environmental and governance lenses. Drawing upon the PRISMA 2020 framework, literature was retrieved from electronic databases such as Scopus, Web of Science, JSTOR, ScienceDirect and SSRN to examine trends, voids and emergent discourses that have modelled India's land governance reality. The results demonstrate that the process of urbanisation in India entails a continuing struggle between economic development and distributive justice. Industrial land acquisition, CoPs, and livelihood displacement. Large-scale land flows Urban expansion–driven land acquisition has enabled the growth of industrial corridors, urban real estate development, and infrastructure upgradation, but also led to loss of livelihoods (26), gendered exclusion (27) and commons vitiation. The review identifies persistent gaps in implementation of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (LARR) Act 2013 – a result of disjointed state-level amendments, unclear definitions of public purpose and bureaucratic discretion. Environmental reports reveal accelerating food, forest and wetland system conversion with little oversight of impact-assessment procedures.

Keywords: Land acquisition; Urban expansion; Governance and justice; Sustainable development; India.

Paper ID: 103

Understanding the Experiences of Becoming First Time Fathers in India: Insights on the Emerging and Involved Role of Nurturing Fathers in Children's Lives

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Abstract

The role of involved fathers in the holistic development of the child has been a newly emerging phenomena of the 21st century. The experiences of fathers in embracing the journey of fatherhood has been evidently narrated in the previous studies and that marks the significance for shifting the focus of research into understanding the meaning of fatherhood of new fathers. Thus, the present aimed to understand the lived experiences of first-time fathers in India and emerging trends for holistic child development which has also been one of the Sustainable Development Goal 4 that identifies the importance of fathers in the overall development of children. The sample of the study were the 17 first time fathers who were interviewed at Pediatric Department, THRIMS State Hospital, Naharlagun. The data was analysed through Braun & Clarke (2006) thematic analysis. The findings indicated that initial reaction to impending fatherhood included excitement, surprise, anxiety and many fathers began to internalise these roles after the birth of the child. However, in the development of this fatherhood identity, the role of their experiences with their own fathers, support of partner, the caregiving role of fathers overshadowed by gender roles emerged as influencing factors. Furthermore, fathers faced numerous changes such as financial burdens, work-life imbalance, strained marital responsibilities and lack of social and institutional support. An emerging theme that was found across all the fathers was the need for support for new fathers- in the context of recognising the growing role of fathers in child's lives such as healthcare systems, parenting workshops, counseling sessions and comprehensive paternity leave policies. Therefore, the present study calls for policy reforms and a broader cultural shift that recognises fathers not merely as providers but as essential caregivers deserving of equal involvement, recognition and institutional support.

Keywords: fathering, fatherhood, fathers as caregivers, fatherhood identity, challenges of new fathers, social and institutional support, emotional experiences, changes of fatherhood, isolation, parenting, role of paternal figures, paternal leaves, mental health.

Paper ID: 130

The Grammar of Unsustainability: Neoliberal Values in Economics Pedagogy for Indian Schools

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Abstract

This paper investigates the linguistic construction of unsustainability in Indian school textbooks, focusing on how neoliberal ideologies embedded in economics pedagogy perpetuate ecologically harmful narratives. Drawing primarily from Arran Stibbe's work on ecolinguistics, it exposes the "stories we live by" deeply ingrained linguistic patterns that shape perceptions of development and human-environment relations. While multidisciplinary research on sustainability has advanced in areas like policy-making, technology, and environmental science, a significant gap persists in examining the role of language in fostering sustainable futures. Language, as a primary tool for formation of worldview, often naturalizes destructive assumptions such as endless growth and anthropocentrism, yet this dimension remains underexplored in educational critiques, particularly in developing contexts like India where textbooks wield substantial influence on young minds. Employing a critical discourse analysis informed by Stibbe's framework, the study dissects the chapter "The Story of Village Palampur" from NCERT Class IX Economics textbook. Presented overtly as a "story," the narrative normalizes an extractivist ideology where nature is reduced to "factors of production" and "resources," erasing its intrinsic value. Close reading of the chapter reveal anthropocentric framing: land and water are instrumentalized for surplus and efficiency, sustainability is managerial rather than ethical, and non-human agency is silenced, reinforcing human dominance. The chapter prioritizes economic growth through mechanization and market integration, acknowledging environmental limits only when they threaten productivity, thus aligning with Stibbe's critique of ecologically incompatible stories like consumerism and endless expansion. Social inequalities are addressed, but ecological justice is decoupled, highlighting a human-centric bias that overlooks interdependence. By unveiling these invisible narratives, the paper argues for ecolinguistic interventions in pedagogy to promote beneficial stories of coexistence and sufficiency. It calls for integrating language analysis into sustainability research, offering implications for curriculum reform to cultivate ethical, holistic worldviews essential for a sustainable future. This approach bridges the research gap, emphasizing language's transformative potential in multidisciplinary efforts toward ecological harmony.

Keywords: *

Paper ID: 137

Rewriting Gender, Restructuring Society: Towards Sustainable Futures in Feminist Utopian Fiction

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Abstract

To create sustainable futures, it is essential to transform the social institutions that shape inequality and power, alongside implementing technical and economic changes. A critical aspect of this transformation is addressing gender, which remains a foundational framework in how cultures organize authority, labor, and reproduction. This study examines how feminist speculative fiction reimagines gender systems, offering innovative perspectives that inspire the development of more sustainable futures. The study uses feminist theoretical frameworks, including gender as social construction and patriarchy as structural system, through a close textual analysis of Ursula K. Le Guin's The Left Hand of Darkness and Marge Piercy's Woman on the Edge of Time. Both works depict civilizations whose institutional systems are reformed around equity and collective accountability, while also challenging binary gender categories. The study reveals how gender-fluid and non-hierarchical systems promote societal consistency and cohesiveness, whereas patriarchal hierarchies are portrayed as the causes of societal disparity. This paper powerfully asserts that for a sustainable future, we must embrace significant societal transformation. By examining these literary works that challenge and redefine gender relations, it becomes clear that we must overhaul existing societal structures. This restructuring is essential to cultivate inclusive, stable, and enduring communities for all.

Keywords: Gender; Societal Transformation; Sustainable Future; Feminist Speculative Fiction; Institutional Reform

Paper ID: 140

Grassroots Women's Leadership: A Challenge to Patriarchy

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Abstract

This paper critically examines the complex intersection of gender-based labour and patriarchy through the lived experiences of Anganwadi workers. As part of the Integrated Child Development Services (ICDS), Anganwadi workers are responsible for a grueling range of tasks: they provide supplementary nutrition to children and pregnant women, conduct immunization drives, offer health check-ups and run pre-school non- formal education sessions. Beyond these health and education services, they act as the primary bridge between the government and the community, maintaining vital records and conducting home visits to monitor maternal and child health. It argues that, because these tasks are traditionally viewed as "women's work" this labour remains structurally undervalued within the broader economy, despite being the backbone of social welfare and community development. Deep-rooted patriarchal norms often relegate care work to women which unfortunately results in a lack of fair pay, recognition and decision-making power they deserve. By drawing on their daily experiences, this study highlights a significant shift. This paper also examines gender as a social construct, looking at how traditional roles and expectations are both reinforced and challenged in this field. It ultimately asked a question- Does the rise in grassroots women's leadership truly challenged the patriarchy structures or is it simply operating within their existing limits? This paper is based on both primary and secondary data collected from the field of the study and different secondary sources.

Keywords: Anganwadi worker, Patriarchy, Leadership, Gender.

Paper ID: 149

Impact of MGNREGA on women empowerment: Case Studies in Assam

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Abstract

During the last five years, the growth rate of unemployment in India has increased from 5.41% to 7.6%. To mitigate the gap in unemployment, the govt. has introduced various schemes to generate employment and enable people economically by providing sustainable livelihood. The MGNREGA is one such act adopted by the Indian government in 2006. The scheme aims to provide a right based framework for wage employment by restoring rural livelihoods. This act also addresses the gendered wage bias at workplace. However, the program's shoddy implementation, poor coordination among various stakeholders and poor leadership has damaged and hampered the act's basic spirit. This paper focuses on analyzing the efficacy and effectiveness of the Act on rural women in Majuli district of Assam using qualitative as well as quantitative research methods. The result indicates the scheme's impact on the rural labour market, its effects on women's livelihood and its indirect effects on poverty and education. The outcomes imply that the scheme helped women by mitigating the gender wage gap through improved wages, benefitted women to find employment and gave them more decision-making power at home. The scheme also increased the investment on education of women, along with the increase in the amount of time children spent in school resulting in improved performance. Hence this study is helpful to identify such challenges that hinder the proper execution of the act on large scale.

Keywords: MGNREGA, Rural livelihood, Women, Empowerment, Unemployment, Policy, Governance

Paper ID: 153

Employment Resilience During the First Covid-19 Lockdown of 2020 in India

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Abstract

The paper analyzes employment resilience during the first nationwide Covid-19 lockdown in India using individual quarterly data from the Periodic Labor Force Survey dataset for the survey period 2019-20 (July-June). Given the normal employment conditions for the first three quarters from July to March, there is a sudden negative shock to employment with the lockdown in late March, 2020. It resulted in heightened unemployment, which plummeted to the previous rate with the unlocking of the economy in May 2020. Using probit estimation, the study estimates employment probabilities of individuals for July-March quarters and generates counterfactual probabilities for the April-June quarter, assuming no negative employment shock. A resilience index is constructed using the difference between the individual estimated probabilities assuming no lockdown counterfactual and actual quarterly unemployment conditions. Resilience varies substantially over different genders, ages, educations, social groups, and state regions. Individuals with secondary and above education are less resilient. The Scheduled Caste population and the women subgroup are indeed negatively affected. Resilience is also more pronounced across higher age groups than the younger categories. Andaman and Nicobar Islands, Dadra and Nagar Haveli, and Delhi had higher resilience in comparison to other states. This paper finds higher regional inequality and individual difference in employment resilience, highlighting major policy challenges.

Keywords: Covid-19, Employment Resilience, Lockdown, PLFS

Paper ID: 155

From Female Aggression to Solidarity: Reimagining Female Relationships in Children's Literature as a Catalyst for Social Transformation

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Abstract

Female rivalry in fairy tales perpetuates the traditional perspective of power dynamics dictated by patriarchy that controls the narrative of gender roles, stereotypes, and the social perceptions of female interaction in society. Drawing on Feminist Theory and Cultural Studies, this paper examines the causal factors behind female aggression in selected Bengali fairy tales from Thakurmar Jhuli, compiled by Dakshinaranjan Mitra Majumdar, and in Turkish folk narratives translated into English by Ignaz Cunos. The study relies on the methodology of comparative analysis to establish how patriarchy and socio-cultural conditioning use the villainous women as tools of conveying a moral lesson to society to deter women from seeking agency and autonomy. This study identifies and critiques the didactic use of fairy tales as flagbearers of patriarchy and emphasizes the relevance of retelling the conventional stories to usher in socio-cultural transformation and allow discussions on disrupting gender binaries inculcated through storytelling. The study establishes that retellings can break the mould of complicated gender treatment and contribute to a gradual shift in societal attitudes towards gender and power. Hence, the study stresses the reimagining of female relationships in fairy tales as a strategy to influence mindset transformation and promote gender-equitable social change.

Keywords: Female Aggression, Internalized Misogyny, Patriarchy, Retellings

Paper ID: 160

Agarwood in Assam: Regulatory and Strategic concerns of a Developing Agricultural Segment

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Abstract

Agarwood (also known as Aquilaria species / Gaharu) which is also known as the “God of Woods”. The resinous portion of the Aquilaria tree is called agarwood, which is a non- timber product and is being used as a medicine, incenses or in the form of perfumes in Asia, Middle East, and Europe. It is one of the fastest growing evergreen trees. In Assam's agricultural and economic framework, agarwood (Aquilaria malaccensis) holds a special place as a traditional heritage crop and a modern source of rural income. Agarwood, known locally as "sanchi," has been grown and collected in Assam for generations. Its heartwood, which is rich in resin, is valued worldwide for its use in religious rites, traditional medicine, and perfumes. The state is a centre for natural agarwood growth and plantation-based agriculture due to its ideal climate, rich soil, and indigenous knowledge systems. The shift from wild harvest to scientific inoculation and managed plantations in recent decades has made agarwood a viable source of export revenue and a means of subsistence. But the wild populations of A. malaccensis are being shrinking because of the over extraction of the older trees for its valuable ‘agarwood’. Nevertheless, plantations have been grown in the home gardens of upper Assam, functioning as a method of ex- situ protection for the species. This paper will primarily focus upon the economic upliftment of the state, Assam due to the high value of agarwood in the global platform and even speak up about the regulations that are bought upon to limit its high conservation show casting how even with its specific laws it is not able to hold upon the illegal deforestation of the agarwood plant.

Keywords: Agarwood, Economy, Wild Cultivation, Illegal trade, Over Exploitation

Paper ID: 162

Structural and Systemic Barriers to Mental Healthcare In India's North Eastern States: A Multidimensional Analysis of Geopolitical, Socio-Cultural, and Institutional Inequities

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Abstract

The geopolitical situation of the North Eastern States comprises of the states of Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura, have mental health issues as one of the significant concern for public health system across the region. To examine the geopolitical, socio-cultural, and institutional inequities in mental healthcare service utilization in India's North Eastern States. A comprehensive literature was done on databases like; PubMed, Google Scholar, ResearchGate, and ONOS. The review shows a significant treatment gap of between 70% and 92% across the conditions. The region lacks significant number of trained mental health professionals specifically; psychiatrists, psychiatric social workers, psychiatric nursings, and clinical psychologists. Transportation also remains a major issue in reaching to the hospital especially during monsoon season as the roads get blocked due to flooding. The mental health crisis in the region is driven by multiple coexisting factors such as limited mental health services, logistic problems, lack of funding for NGOs, dependency on cultural healing practices, substance abuse, insurgency, ethnic clash, infiltration, evacuation, religious conversion, and human animal conflict. The study highlights that structural and systemic barriers have significant impact in under-utilization of mental health services that significantly widen the treatment gap and dropout rate among persons with mental illness.

Keywords: Mental Health Services, North Eastern States (NES), Structural Barriers, Systemic Barriers

Paper ID: 168

Digital Aesthetics: How AI Trends Reinvent and Amplify Body Image standards

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Abstract

Body image issues have been significantly increasing among adolescents and young adults especially due to overexposure of "idealised body types" and "beauty standards" that is swept across all digital platforms like Instagram, Snapchat, Pinterest and others. Every other day, social media exposes users to thousands of photographs and images of celebrities, models and other influencers which cause a sense of internalized notion that users' need to attain the supposedly idealistic body type or facial feature that is considered to be the seemingly the perfect type. Now with the advent of Artificial Intelligence (AI) body image concerns have further exacerbated due to the constant exposure of heavily edited AI generated images potentially biased towards societal norms and stereotypes especially when certain prompts are used to generate these images. A false perception of beauty is created due to the overwhelming exposure to extremely binary body types and features in digital spaces indicating the unrealistic image as conventionally attractive and appealing despite vast majority having diverse body types and gender identities. In order to understand how AI generated images promotes unrealistic standards the researcher used three AI text to image generation tools to create images using prompts consisting of certain key words. Along with image generation, narratives from individuals using AI filters and features on digital platforms especially Instagram and Snapchat have been examined to understand their perception on using AI in this context. This study thereby, explores how AI generated images are perpetuating body image concerns and gendered stereotypes across various different gender identities and how individuals navigate them in the age of AI.

Keywords: Artificial Intelligence, Body image, Gender Identity, Digital spaces

Paper ID: 170

Performative Pedagogy and Moral Cartography: A Comparative Study of Neo-Vaishnavite *Ankiya Naat* and Medieval European Morality Plays in Value Education

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Abstract

Value Education, in its pre-modern iteration, relied heavily on the "theatre of virtue" to navigate the ethical landscapes of non-literate societies. This paper presents a comparative analysis of two distinct yet pedagogically aligned dramatic traditions: the Neo-Vaishnavite Ankiya Naat (Bhaona) of Assam and the Medieval Morality Plays of Europe. By placing Srimanta Sankardev's dramaturgical innovations alongside Western allegorical traditions (such as Everyman), this study explores how performance serves as a multimodal linguistic tool for character building and social reform. The research focuses on the linguistic strategy of Brajavali and the role of the Sutradhara as a pedagogical anchor, comparing it to the didactic narrators and personified virtues found in Shakespearean precursors. Both traditions effectively utilized the "Semiotic of the Stage"—incorporating music, symbolic costuming, and rhythmic dialogue—to translate complex metaphysical truths into actionable social values. While the Western Morality play focused on the individual's journey toward salvation, the Ankiya Naat emphasized Sravana-Kirtana as a communal path to ethical living, rooted in the Indian Knowledge System (IKS).By synthesizing English literary theory with indigenous performance studies, this paper argues for a "Performative Model" of Value Education. It suggests that modern classrooms can mirror the Namghar's linguistic and dramatic inclusivity to teach ethics in a way that transcends literacy barriers, aligning with the "Holistic Development" goals of the National Education Policy (NEP 2020).

Keywords: Ankiya Naat, Morality Plays, Comparative Dramaturgy, Value Education, Brajavali, Performative Pedagogy, IKS.

Paper ID: 171

Between Protection and Prosecution: Reverse Burden of Proof and Romantic Cases under the POCSO Act

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Abstract

The reverse burden of proof rules under Sections 29 and 30 of the Protection of Children from Sexual Offences Act (POCSO), 2012, created a unique evidentiary framework in Indian criminal law. In contrast to the conventional presumption of innocence that typically guides criminal adjudication, these clauses oblige courts to presume the conduct underlying the alleged offence and the existence of a guilty mental state once the prosecution has presented certain foundational facts. The prosecution faces evidentiary challenges as sexual crimes against minors frequently occur in private and predominantly depend on the testimony of the child victim. But the way these presumptions have been used has led to a new doctrinal contradiction in a category of cases that courts are seeing more and more of: prosecutions resulting from consensual adolescent relationships or "romantic cases".In such cases, the prosecutrix is factually a willing participant but legally a child, and prosecutions are often started by parents or guardians rather than by claims of exploitation or coercion. However, the statutory presumption of guilt is activated once sexual activity and minority status are established, putting the onus of proof on the accused, who is frequently an adolescent himself, to prove innocence. The paper makes the case that the constitutional issue brought up by these prosecutions is more deeply rooted in the way reverse burden provisions function in an adversarial criminal justice system. Therefore, romantic situations serve as a doctrinal stress-test, revealing the boundaries of a presumption intended for exploitative misuse when applied consistently across qualitatively disparate factual contexts. The study assesses the reasonableness of these assumptions through doctrinal analysis of criminal jurisprudence, evidence rules, and guarantees of a fair trial. It argues that although the goal of child protection is justifiable, applying Sections 29 and 30 mechanically runs the risk of eroding the presumption of innocence and may become overly encompassing in situations where there is no evidential vulnerability. The paper argues that victim-centred criminal law must not replace procedural fairness and suggests a more limited judicial interpretation of core facts to balance due process and child safety.

Keywords: child sexual abuse, romantic cases, consensual adolescent relationships, reverse burden of proof

Paper ID: 182

E - Consumer Rights in India: A Trend and Structural Analysis of National Consumer Helpline Data

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Abstract

The fast rise of e-commerce in India has drastically revolutionized consumer markets while concurrently exacerbating difficulties relating to consumer safety and grievance redressal. This study explores structural tendencies in e-commerce-related customer complaints using secondary data from the National customer Helpline (NCH). The analysis covers longitudinal trends (2013-2018), geographical distribution patterns (2019-2021), and category-wise grievance composition (2024). Descriptive statistical approaches, including trend analysis, proportional distribution, and cumulative share evaluation, are applied to study growth dynamics and concentration patterns. The findings demonstrate a strong rising trend in complaint numbers, significant regional concentration across a restricted number of states, and structural dominance of service problems, delivery failures, and refund-related conflicts. The top five grievance categories account for more than two-thirds of total complaints, showing systematic operational issues rather than individual service lapses. The paper underlines key governance and managerial implications, emphasizing the need for greater refund transparency, improved complaint handling mechanisms, and enhanced regulatory monitoring. By exploiting large-scale administrative grievance data, the study contributes to the confluence of consumer rights, digital governance, and e-commerce management in the Indian setting.

Keywords: E-commerce, Consumer Rights, Consumer Grievances, Grievance Redressal, Digital Governance, India

Paper ID: 192

Developing a Trauma-Informed Legal System for Vulnerable Communities in India: A Critical Review of the Implementation Gap for Social Sustainability

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Abstract

Trauma can result from an adverse event(s) that are distressing, frightening, or stressful in nature, leaving deep physical and emotional scars on the victims. People belonging to the vulnerable sections of society, such as the gender and sexually diverse individuals, women, children, individuals with special needs, etc., are at greater risk of facing different kinds of abuse. When these victims of trauma are presented in the courtroom, they are dealt with in a less sensitive way, which triggers their past traumas, making it difficult for them to speak for themselves to get justice; rather, they freeze in that situation and often go numb and mute. This critical review aims to explore and examine the current state of trauma testimony gathering practices in Indian courts, with a focus on vulnerable witnesses, and to explore the potential benefits of adopting trauma-informed approaches, drawing lessons from Western legal systems. The study employs a critical synthesis of existing legal frameworks, specialized guidelines (such as those from NIMHANS and MoHFW), and other relevant scientific literature extracted using various databases. Findings: The current literature describes Indian courtrooms as the most intimidating spaces, where trauma survivors have to go through harsh cross-examinations, long delays, and unfamiliar procedures that automatically retraumatize young survivors, who are already struggling with fear, confusion, and grief, exacerbating their distress. Thus, this paper proposes a *"call for action"* to integrate trauma-informed protocols as a fundamental requirement for "*social sustainability"* and SDG 16 (Peace, Justice, and Strong Institutions), ultimately enhancing the quality of the justice system and better supporting vulnerable witnesses.

Keywords: Trauma, Testimony, Vulnerable Communities, Trauma-Informed System, Indian Studies, and Courtroom Practices.

Paper ID: 195

A Multi-Criteria Evaluation of Financial Resilience in Indian Commercial Banks

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Abstract

This study evaluates the financial resilience of 29 selected Indian commercial banks from 2012 to 2024 by analyzing the relationship between short term performance rankings and long-term monotonic resilience trend. A composite resilience index is established using the MEREC-TOPSIS approach across eleven financial resilience indicators. Then, the MEREC method is used to derive objective weights of each criterion; as well as to rank banks separately on the four resilience dimensions-Solvency, Asset Quality, Efficiency, and Profitability. The TOPSIS approach is used to determine the composite resilience scores and rank the banks accordingly. Finally, the Mann-Kendall non-parametric trend test was applied to identify trends in banks' financial resilience over time. The sensitivity and robustness of the outcome are tested using equal-weighting and other methods such as VIKOR, MARCOS, and RAM. The Kotak Mahindra Bank Ltd. is found to consistently appear at the top in resilience scores. Alternatively, several public-sector banks showed gradual improvement. Most banks exhibited positive trends in the dimensions of asset quality. This reflects a positive impact of the government's initiatives on balance sheet clean-up and assets resolutions. At the same time, a dynamic trend in Profitability is observed, with several institutions experiencing declines. The CSB Bank Ltd., showed notable improvement in aggregate trend analysis. The finding significantly indicates that short-term performance and long-term growth capture different aspects of resilience. The traditional MCDM-based analyses were limited to the ranking of banks' financial performance. However, the proposed framework presents an integrated system which utilizes MCDM along with trend analysis to assess financial resilience trends. The findings provide valuable insights for regulators and bank managers in identify early vulnerabilities and monitor long-term stability in financial resilience of banks in India.

Keywords: Banking Sector, Financial Resilience, MCDM, MEREC, TOPSIS, Mann-Kendall Analysis

Paper ID: 200

Community preferences and wetland conservation: evidence for policy-driven sustainable development

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Abstract

Wetland ecosystems deliver multiple services that support livelihoods, environmental quality, and human well-being. However, increasing anthropogenic pressure and unplanned urban expansion has posed a threat to these fragile systems. Understanding preferences of locals and their willingness to financially contribute to conservation is essential for designing effective, inclusive, and policy-relevant conservation strategies. This study investigates willingness to pay (WTP) of residents for the conservation of Deepor Beel, a peri-urban wetland in Northeast India and identifies the factors influencing conservation support across different user groups. An open-ended question approach of the contingent valuation method was employed to elicit WTP among 219 respondents, and a Tobit regression model was used for estimation. The results show that among the directly dependent group, the socio-economic variable household income is significantly affecting the WTP of residents, and among the variables describing the residents' perception of the wetland, the water quality of Deepor Beel and hope for profitable tourism development were found to be significant. For indirectly dependent residents, age, education, income, and employment status are significant determinants, but variables related to environmental perception are not statistically significant. By providing empirical evidence on residents' preferences, the study is contributing to policy-driven sustainable development by supporting the design of context-specific financing and management mechanisms for peri-urban wetlands in developing countries.

Keywords: Wetland, contingent valuation, willingness to pay, ecosystem services, sustainable development

Paper ID: 205

Sectoral Employment Shifts and Sustainable Development in India: Evidence from NSSO and PLFS Survey

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Abstract

Structural transformation, defined as the reallocation of labour from agriculture to industry and services, is a fundamental driver of sustainable economic development in emerging economies. This study analysis the sectoral transformation of India's employment structure and its implications for inclusive and sustainable growth using data from the the National Sample Survey Office and successive rounds of the Periodic Labour Force Survey. The study uses Autoregressive Distributed Lag Model (ARDL) Model analysis to examine the effect of sectoral employment transition on chosen indicators of economic development. Employment shares in various sectors are used as explanatory variables to test their effect on employment diversification and structural dynamism. The result shows a statistically significant reduction in agricultural employment and corresponding growth in the service sectors. The study shows that the transition of employment in non-farm sectors has a positive effect on employment restructuring and overall economic dynamism. However, the challenge of informality, underemployment and skills mismatch remains a constraint on the development benefits of long structural transformation. The results suggest that the employment transition in India has great potential for developing sustainable economic development but that appropriate policy making process are required to realize the long-term development benefit of this transition.

Keywords: Structural transformation, Employment diversification, Sustainable development, PLFS

Paper ID: 222

Beyond the Package of Practices: A Multi-Stakeholder Analysis of Systemic Disconnects and Leadership Efficacy in Horticultural FPCs of North-Central Assam

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Abstract

Despite a robust multi-agency support ecosystem in Assam - comprising the Assam Agricultural University (AAU), NABARD, and ICAR - Farmer Producer Companies (FPCs) consistently encounter a "Success Gap" where technical production success fails to translate into commercial viability. Regional studies indicate that FPC Performance Indices in Assam often range between 0.13 and 0.35, revealing systemic weaknesses in market orientation and sustainability despite sustained institutional promotion. While Krishi Vigyan Kendras (KVKs) efficiently disseminate standardized "Packages of Practices" (POPs), preliminary field visits to KVKs in Sonitpur and Biswanath in February 2026 reveal a significant disconnect between these technical repositories and market-linkage agencies like APEDA. This research interrogates this "last-mile" failure by synthesizing two primary bottlenecks: systemic informational asymmetry, where departmental silos prevent the synchronization of centrally sponsored schemes (e.g., MOVCD-NER) with ground-level dissemination; and leadership efficacy, evaluating how CEO management literacy affects the navigation of institutional bureaucracy. Crucially, the study investigates structural barriers such as the lack of digitally accessible, horticulture-specific Indigenous Technical Knowledge (ITK) libraries, which limits the scalability of indigenous horticultural value chains. Situating these findings against existing literature (Bhuyan et al., 2022; NABARD, 2020), the study employs a qualitative 2x2 matrix crossing Systemic Integration with Leadership Capacity to analyse 8 - 12 FPCs. Performance is operationalized through market-linkage frequency and commercial trade cycles rather than grant-dependency. Data triangulation includes semi-structured interviews with institutional actors and Focus Group Discussions (FGDs) with farmer-members to capture the attenuation of information at the ground level. The paper ultimately proposes an "Integrative Business-Communication (IBC) Framework," advocating for KVKs to transition into active "Market-Linkage Hubs". This proposal acknowledges the institutional complexities and policy shifts required to integrate business literacy with agrarian extension.

Keywords: Farmer Producer Companies (FPCs), Institutional Communication, Extension Efficacy, Market Linkage, Horticulture Value-Chain.

Paper ID: 223

AQI 750+ : Constitutional Failure and Policy Reform in Delhi – A Comparative Insight from Beijing

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Abstract

Delhi has emerged as one of the most polluted cities globally, with winter Air Quality Index (AQI) levels reportedly exceeding 750+, posing severe health risks. The right to a clean environment, recognised as a fundamental right under Article 21 since 1991 by the Supreme Court in Subhash Kumar v. State of Bihar, remains inadequately realised for Delhi's residents. Despite recurring crises, policy responses often remain seasonal and temporary. In contrast, Beijing, which faced comparable AQI levels (700+) in 2013 alongside similar geographical and other challenges, has demonstrated significant recovery through sustained reforms. This paper examines whether Delhi can replicate Beijing's long-term corrective model. This study adopts a doctrinal research methodology with a qualitative approach, relying on secondary sources including statutory provisions, judicial decisions, academic literature, policy documents, and verified news reports. Both cities share common pollution sources—vehicular emissions, industrial discharge, construction dust, and stubble burning—compounded by unfavourable geography. However, Delhi predominantly applies short-term emergency measures, whereas Beijing implemented structural, long-term regulatory interventions leading to measurable improvement within a decade. Delhi's continuing air crisis raises concerns about enforcement of environmental rights. Beijing's recovery illustrates that consistent political will, strict regulation, and systemic reform can reverse severe air pollution.

Keywords: Delhi pollution; Beijing air quality reforms; AQI 2.5; environmental rights; comparative environmental governance.

Paper ID: 232

Sustainability, Equity, and Gender in Indian Education Governance: A Political Economy Analysis of Transformative Reform

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Abstract

Sustainability and development in the field of education is a multidimensional governance project that must integrate social inclusion, gender justice, and equity rather than become just a drive for environmental awareness. This paper examines such sustainability-focused educational reforms in India through the lens of decentralised governance theories, gender equality, and international political economy (IPE), to examine their multidimensionality. Using secondary sources such as the National Education Policy 2020, 2030 Agenda for Sustainable Development, and policy analyses of UNESCO and the World Bank, this study also attempts to situate Indian education reforms within the global sustainability governance framework. NEP 2020 promotes inclusion through mechanisms like the Gender Inclusion Fund, Special Education Zones, Competency-Based Curriculum and Digital Expansion Strategy. However, its implementation is beset by many challenges, including structural disparities such as the rural-urban digital divide, gender-based participation gaps in STEM, and caste-based inequalities. Moreover, this study shows that educational sustainability reforms are embedded in the shift in global production towards green and digital economies, which require skills development initiatives, digital public infrastructure, and competitiveness-based reform models. Thus, this paper argues that sustainable education governance in India represents a contested policy arena shaped by global economic pressures, local political priorities, and social justice movements. By integrating sustainability discourse with gender equity analysis and IPE theory, this study contributes to the debate on how public policy can act as a tool for transformative social change in emerging economies.

Keywords: Governance frameworks; Educational innovation; Social transformation; Sustainable practices; India; Policy analysis

Paper ID: 233

Rights, Reformation And Rehabilitation: An In-Depth Analysis of Implementation of Prisoners' Rights in The Context of Assam

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Abstract

Prison stands at the tail end of criminal justice system as a result of which the issues of prisoners' rights and its importance in the process of reformation and rehabilitation is seldom discussed. This paper focusses on the human rights of prisoners for the fact of being born as 'human'. The United Nations, accordingly, recognizes the human rights of the prisoners and India being a signatory state claims to protect the rights of the prisoners, but only an extensive research would reveal to which extent the prisoners' rights are being protected by the jail administration in the world's biggest democracy. Accordingly, the researcher out of six Central Jails of Assam, 80 prisoners were taken as samples from the Tezpur Central Jail and Jorhat Central Jail. The prisoners were divided into four categories-Lifers, Short-Termers, Under-Trials and Women. They were interviewed randomly about their opinion about the diet, visit by relatives, access to furlough, clothing and accommodation. The mixed method of Quantitative and Qualitative analysis revealed that very often the rights of the prisoners are converted into privilege by the prison administrators. The women prisoners are found to be most vulnerable compared to male prisoners. Observation method constituted an important part during the research process. This paper highlights the importance of prisoners' rights in reforming the law-breakers and send back to the society as law-abiding citizens. The study also offers suggestions in regard to the implementation of the Model Prison Act of 2023 that overhauls the age old Prison Act of 1894.

Keywords: Criminal Justice System, Prison, Prisoners, Prison Administration, Human Rights, Reformative Theory, United Nations, Judiciary, Assam

Paper ID: 242

Namghar, Bhakti, and the Public Sphere: Women's Participation in Sankaradeva's Reform Movement

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Abstract

In the fifteenth century, Srimanta Sankaradeva initiated the Ekasarana Nama Dharma within the broader Bhakti tradition in Assam, promoting egalitarian religious ideals in a society marked by hierarchy and ritual orthodoxy. By emphasising congregational devotion, ethical discipline, and spiritual accessibility over ritual exclusivity, the movement advanced a programme of social reorganisation grounded in collective worship. The establishment of the Namghar as an institutional and architectural centre provided a shared devotional space that facilitated participation across caste and social boundaries, thereby widening religious access beyond elite and male-dominated frameworks. As a material and symbolic expression of Sankaradeva's reformist ideals, the Namghar developed into an inclusive arena where women engaged in naam-kirtan and related practices, enabling them to negotiate forms of public presence and constrained agency. This transformation contributed to a broader process of religious democratization in medieval Assam. Drawing on a critical engagement with the historiography of the Bhakti movement in India and Assam, this paper argues that Bhakti operated not merely as a theological reform but as a socially transformative framework that created structured, though limited, avenues for women to contest patriarchal constraints and articulate alternative modes of presence within the devotional and social order

Keywords: Bhakti, Women Legends, Namghar, Naam Kirtan, Patriarchy, Medieval Assam

Paper ID: 245

Digital Extortion and Data Piracy: Assessing the Criminal Law Framework Governing Predatory Lending Apps in India

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Abstract

Abstract: Digital lending applications have become an integral part of the Indian loan infrastructure, mainly after the COVID pandemic. This is unlike the long historical process of approvals needed for a loan. With this easy access to loans comes a threat to privacy, data piracy, unprecedented consumer access to credit, making them vulnerable to various exploitation by the lender, and unethical ways of recovering the loan. This somewhat leads to depression, anxiety, and mental pressure for the consumer abetting him to commit suicide. Despite the RBI guidelines of 2022 and digital lending directions of 2025, significant regulatory blind spots are still prevalent. In fact, it delves into various incidents caused by these lending apps, where laws such as the IT Act, DPDP Act, Indecent Representation of Women Act, and criminal laws come into play. This study adopts a doctrinal and analytical methodology, examining the Indian criminal and cyber laws. It suggests the need for a separate statute to ban unregulated fintech apps, a better regulatory system, and stricter penalties must be prevalent for the unethical recovery agents. There is a need for public awareness among borrowers about the existence of mechanisms to prevent such events of unprecedented extortion.

Keywords: Digital Lending, Cyber Regulation, RBI Guidelines, Borrower Harassment, Extortion by Recovery Agents, Data Privacy, Fintech, Abetment to Suicide

Paper ID: 247

Climate-Induced Internal Migration and Rural Labour Market Distortion: A District-Level Analysis of Assam

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Abstract

Climate change has significantly intensified the frequency and magnitude of floods and riverbank erosion in Assam, generating recurring internal displacement and long-term livelihood instability across rural districts. Situated within the ecologically fragile Brahmaputra basin, Assam experiences annual flood shocks and permanent land loss that undermine agrarian sustainability and reshape labour markets. This study examines the relationship between climate-induced environmental stress and rural labour market restructuring across all districts of the state using district-level secondary data from the Assam State Disaster Management Authority, the Economic Survey of Assam, Census of India 2011, and the Internal Displacement Monitoring Centre. By linking flood and erosion exposure with workforce composition patterns, the analysis demonstrates that districts with higher agricultural dependence such as Majuli, Dhemaji, Lakhimpur, and Dhubri are also among the most climate vulnerable, indicating heightened risks of labour displacement and occupational shifts. Although migration operates as an adaptive response to environmental stress, it simultaneously contributes to labour market distortions, including declining farm engagement, informal sector expansion, and increased gendered labour burdens. The findings underscore the need for integrated climate adaptation, rural employment diversification, and migration governance policies to mitigate structural imbalances in Assam's rural labour economy.

Keywords: climate migration, rural labour markets, flood vulnerability, Assam, internal displacement, agricultural decline

Paper ID: 250

AI Enabled Preventive Counselling Frameworks in Indian Higher Education: An Empirical Study on Student Trust, Governance Gaps, and Policy Integration

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Abstract

The growing mental health crisis among university students has become an urgent governance concern in India, with rising cases of anxiety, depression, academic stress, and institutional dropout across Higher Education Institutions. While the National Education Policy 2020 emphasizes holistic development and student wellbeing, institutional counselling systems remain under-resourced, reactive, and stigmatized. Recent advancements in Artificial Intelligence present opportunities for early identification, predictive support systems, and stigma free digital counselling platforms. However, empirical evidence on student trust, ethical concerns, and policy preparedness within Indian HEIs remains limited. This study proposes an AI-enabled preventive counselling governance framework grounded in empirical data from an Indian Public University. Using a mixed-method design, the researcher collected quantitative survey responses and qualitative interviews with counselling coordinators and administrators from the selected HEI. The study examines three core dimensions: 1. Student trust in AI-assisted counselling systems. 2. Perception of data privacy and psychological safety. 3. Institutional readiness for policy integration. The research is situated within the regulatory landscape shaped by the Digital Personal Data Protection Act 2023, alongside University Grants Commission advisories on student mental health support. Findings reveal significant gaps in policy clarity, data governance, infrastructure, and psychological trust among students. Concerns regarding surveillance, misuse of personal data, and absence of culturally contextual AI models are likely to influence adoption. The study mainly contributes to emerging knowledge at the intersection of AI governance, mental health policy, and higher education reform in India. It proposes a Preventive AI Counselling Governance Framework integrating ethical safeguards, student consent protocols, human-AI hybrid oversight, and UGC aligned implementation guidelines.

Keywords: Artificial Intelligence (AI), Preventive Counselling, Higher Education Institutions (HEIs), Student Mental Health, AI Governance, Digital Personal Data Protection Act 2023, National Education Policy 2020, Algorithmic Ethics, Data Privacy, Policy Integration, Educational Governance, India

Paper ID: 251

Conceptual Understanding and Perceived Significance Of 360-Degree Assessment: Perspectives of In-Service Teachers

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Abstract

The National Education Policy 2020 emphasizes to move beyond an examination culture of rote memorisation and high-stakes testing. The NEP 2020 introduces the idea of 360 degree assessment, a holistic, multi-dimensional framework. It addresses the growing concerns relating examination stress and the narrow measurement of student achievement, promoting the use of Holistic Progress Card, to capture the overall development of the learners. But, there have been limited studies about the 360-degree feedback process relating the field of education, despite the policy's vision and growing popularity. The main purpose of this qualitative study was to explore in-service school teachers' conceptual understanding of 360-degree assessment and its potential benefits for students' holistic development. For the study, in-service school teachers from Tezpur, Assam, were selected using purposive sampling. Face-to-face semi-structured interviews were conducted to collect data regarding the 360-degree assessment. Thematic analysis was used to identify recurring patterns, and themes related to teachers' conceptualization and perceived potential benefits of 360-degree assessment. The findings show that 60% of the school teachers possess limited conceptual clarity regarding 360-degree assessment. Though they acknowledge potential benefits as it promotes holistic development, self-awareness, and reduces examination stress, they also were concerned about reliability of multiple source feedback, potential biases, and lack of operational clarity. The study also highlights a gap between the NEP 2020's vision and classroom readiness, highlighting the importance of orientation programs, capacity-building initiatives and training for the effective implementation of 360-degree assessment. By focusing on the in-service school teachers of Tezpur, Assam, the study contributes to the discussions ongoing for assessment reform and underscores the necessary conditions for sustainable and learner-centered education.

Keywords: 360-degree assessment, NEP 2020, teacher perspectives, school education

Paper ID: 254

Exploring Classroom Management Competency Among Secondary School Teachers: Evidence from Rural and Semi-Urban Contexts

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Abstract

This study explores the Classroom Management Competence of schoolteachers and examines how it differs according to rural and semi-urban contexts. Earlier studies have shown that the competence of classroom management is based on improving students' engagement, academic achievement, and learning outcomes. However, a few studies have been done in the contextual factors that influence teachers' classroom management competencies in different local settings. A total of thirty schoolteachers from both rural and semi-urban schools of Tezpur, Assam have been interviewed as a part of this Qualitative-exploratory research. design. The data was analyzed through a thematic analysis, to identify the techniques and strategies that they used in lesson planning, teaching methods, assessment practices, and classroom management. Teachers of both rural and semi-urban contexts mostly showed similar classroom management skills, but differences varied in terms of availability of teaching resources, classroom environment, and adaptive strategies to show the contextual difficulties. Teachers in rural schools faced more difficulties with limited infrastructure and educational resources, whereas semi-urban schools were more likely to struggle with student diversity and classroom capacity issues. The study gives more importance on context-sensitive teacher training and professional development programs that address the actual realities of diverse school environments. The findings explore a deep analysis of classroom management competencies of both rural and semi-urban teachers and suggest improvements for teacher education, policy, and school support systems.

Keywords: Classroom Management Competency, Secondary School Teachers, Rural Schools, Semi-Urban Schools, Qualitative Research

Paper ID: 277

Teachers' Conceptualizations, Strategies to Promote Critical Thinking in the English Language Classroom: A Systematic Review

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Abstract

In the twenty-first century, critical thinking has been considered as an important life skill which is vital for academic success & other area of life. It has become an important objective in school education as well as higher education particularly in response to the demands of 21st century learning. Critical thinking promotes students higher-order thinking skills and clarity of concepts, which benefits them throughout their lives. Teachers play a crucial role in fostering critical thinking among students. *This systemic review examines a total 20 number of papers to gain insights into how English school teachers conceptualise critical thinking and the instructional strategies they use to promote it in the classroom environment. The review also analyses challenges faced by the teacher in their school.* The findings indicate that English school teachers conceptualise critical thinking as higher-order cognitive skills and meta-cognitive skills. However, conceptual clarity varies among English school teachers. The strategies to foster these skills include reciprocal teaching, questioning, debate, discussion-based and collaborative learning, problem-based learning, reflective writing activity and explicit instruction in thinking processes etc. This review further reveals various constraints like specialized training, curriculum overload, examination, time pressure, and class size which affect consistent implementation. The findings of this review study have important implications towards ongoing discussion on pedagogical reforms in school education, and teacher education.

Keywords: Critical thinking Conceptualization, Instructional strategies, Challenges, English School Teachers.

Paper ID: 279

From Service to Civic Selfhood: Identity Internalization among Volunteers in Spiritual Organizations in India

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Abstract

Democratic resilience and sustainable governance depend not only on civic participation but on the development of enduring civic identities grounded in moral agency, responsibility, and relational connectedness. Although volunteering (service) has been widely linked to prosocial behavior, its role in shaping identity-level civic transformation remains insufficiently theorized, particularly within spiritual organizations in non-Western contexts. This review synthesizes interdisciplinary scholarship from psychology, sociology, and civil society studies to examine how sustained engagement in volunteering may facilitate civic identity internalization and extends these theoretical insights to the comparatively underexplored context of spiritual organizations in India. A thematic analysis of empirical and theoretical literature was conducted to identify mechanisms connecting service participation with moral identity formation, empathy development, and role-based identity salience. Existing research indicates that long-term volunteering is associated with deeper moral internalization and strengthened relational orientation; within spiritual settings, service is often framed as an ethical obligation rather than an episodic activity, potentially reinforcing durable civic responsibility. However, the literature predominantly measures behavioral engagement and remains concentrated in Western populations. Qualitative examinations of how volunteers narratively reconstruct their civic self-understanding over time are notably limited in the Indian context. Accordingly, this review does not claim definitive conclusions but consolidates dispersed theoretical insights to clarify conceptual pathways through which volunteering in a spiritual organisation may shape civic identity, thereby delineating a focused agenda for future empirical inquiry and opening channels for development of policy frameworks seeking community-rooted pathways to sustainable civic participation and stable governance models in plural democracies.

Keywords: civic identity, empathy, identity internalization, moral agency, spiritual organisations, sustainable participation, volunteering

Paper ID: 291

Right To Be Forgotten vis-à-vis Children in Conflict with Law: A Safeguarding Remedy Ensuring Effective Reintegration

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Abstract

In the rapid changing world of data protection and digital privacy Right to be forgotten is a vital point which allows people the right to remove their personal data from the public vision. This study investigates the administration of Right to be forgotten upon Children in Conflict with Law (CCL) that how the digital records of a child's prior legal involvements can cause stigma, obstruct rehabilitation and reintegration in the society. The Europeon Union introduced this ruling for the first time in the case of "Google Spain SL v. Agencia Española de Protección de Datos, 2014", which was later codified under Article 17 of General Data Protection Regulation, 2018. In India, Right to be forgotten can be recognised as a part of a larger frame of right to privacy protected under Article 21 of the Constitution, stated in the case of Justice K. S. Puttaswamy v. Union of India, 2017. Even though India gives right to privacy there is a lack in the application of right to be forgotten particularly for the CCL. This research will emphasise on the protection of dignity, privacy and the rising risk of long-term harm caused to these children. Along with the international framework namely, the United Nations Convention on the Rights of the Children, the Beijing Rules, etc, it will also assess the Indian legal framework including the Juvenile Justice (Care and Protection) Act, 2015 and recently enacted Digital Personal Data Protection Act, 2023. It stipulates a legal prominence that prioritizes rehabilitation rather than punishment, ensure reintegration, as well, promote legal reform and judicial sustainability.

Keywords: Right to be forgotten, Children in conflict with law, Legal framework, Data protection, Right to privacy, Rehabilitation, Reform

Paper ID: 292

Education as a catalyst: Industrialization and Green Growth dynamics in G20 economies

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Abstract

The study aims to explore the relationship between industrialisation and green growth in the G20 nations. Recognising the vital role that education plays in developing human capital and increasing awareness of environmental harm, this study also looks at the moderating effect of education on this relationship. The study examines the correlations between the variables using a Fixed Effect with Driscoll Kraay Standard error and an Instrumental Variable Two-Stage Least Squares (2SLS) estimation framework. The findings demonstrate that industrialisation significantly hinders green development. Education, however, has a moderating influence that enhances environmental sustainability and reduces this negative effect. The findings of the study demonstrated that while industrialisation poses serious environmental challenges, education spending can transform these issues into opportunities and open the door to sustainable green growth. However, the study is limited by its macro-level technique due to the lack of easily available microscale data. As a result, the nuances of institutional governance and policy effectiveness in regard to educational outcomes that affect industrial sustainability could not be sufficiently gathered. The G20 is unique in that it emphasises education as a tool for policy that can transform industry into a driver of sustainable and equitable growth.

Keywords: Industrialization, Education, Green Growth, Fixed effect with Driscoll Kraay Standard error.

Paper ID: 131

Online Gambling in India: A Critical Analysis of Legislative and Judicial Perspectives

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Abstract

In India, the online gambling industry is expanding rapidly, which raises significant legal and social concerns. The article closely examines the adequacy of legal frameworks on online gambling, with no uniform legal definition and a gap between games of skill and games of chance. The research is a doctrinal and analytical work based on information drawn from various legal interpretations of relevant laws. It also examines various state-level regulations related to online gambling. The article examines the position of the judiciary to determine whether there are consistent judgments across the Jurisdictions. The research reveals fragmented enforcement gaps, particularly in regard to consumer protection and public health safeguards for vulnerable groups such as youth. The paper finds that online gambling is a hybrid digital economic activity that cannot be solely regulated by ordinary gambling Acts. It concludes that the online gambling industry needs coordinated regulation by the union and states, which can harmonize definitions, enforceable safeguards, and a constitutionally balanced mechanism.

Keywords: Online Gambling; Games of Skill vs Chance; Digital Intermediaries; Consumer Protection; Gaming Regulation; Promotion and Regulation of Online Gaming Act 2025.

Paper ID: 280

Digital Shackles or Dignified Rest? An Empirical Analysis and Comparative Jurisdictional Perspective on the 'Right to Disconnect' in India

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Abstract

The impossibility of 'opting out' in an 'always on' culture represents a lamentable state of affairs for the current generation. Despite the widespread discourse on mental health issues, little heed is paid to concrete measures for the well-being of employees in India. The pervasive intrusion of technology has blurred the boundaries between work and personal space, turning work-life balance into a frequently invoked yet rarely practised norm. The concept of Right to Disconnect, which is statutorily recognized in countries like France, Australia and several other jurisdictions, aims to shield employees from work-related interactions that take place beyond office hours. However, India lacks an effective policy framework for regulating digital work limits. The present study examines the urgency and practicality of implementing the Right to Disconnect in India's work environment. The study adopts a hybrid approach integrating an empirical survey among public and private sector employees throughout India with doctrinal analysis of globally recognized Right to Disconnect frameworks. Quantitative data was examined using statistical techniques to determine the patterns of after-office-hours engagement, perceived workplace expectations, stress indicators and awareness among employees about the right to disconnect. The findings indicate that frequent work-related communication after office hours substantially elevates stress and undermines work-life balance among employees. The comparative analysis indicated that formal legal recognition of the Right to Disconnect with organizational adherence notably reinforces employee well-being without compromising productivity. The study advocates the formulation of a nuanced and responsive regulatory framework in India that safeguards the dignity and mental well-being of employees while sustaining productivity in the digital age.

Keywords: *

Paper ID: 165

Leveraging law, economics, and social innovation for global transformation

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Abstract

Contemporary society is undergoing rapid transformation under the influence of governance reforms, expanding educational opportunities, legal consciousness and changing economic conditions. These developments require careful analysis to ensure that progress remains inclusive, ethical and sustainable. In this context, humanities and social sciences provide essential frameworks for understanding social realities and guiding effective policy and institutional responses. This study explores how governance systems, educational innovation, human rights protection, economic resilience and public policy collectively contribute to responsible and sustainable social development. Responsive and accountable governance plays a crucial role in ensuring transparency, participation and fairness in decision-making. It helps create public confidence and strengthens democratic institutions. Education, particularly when supported by innovative and inclusive methods, develops awareness, critical thinking and moral responsibility among individuals. Such education enables people to actively engage with social issues and contribute to collective progress. Legal awareness and the protection of human rights further support social stability by ensuring equality, justice and respect for individual dignity. At the same time, economic resilience is necessary for sustaining development in the face of uncertainty and change. Carefully designed public policies help organise development efforts and ensure that resources are utilised in a balanced and equitable manner. Effective management supports the implementation of these policies and enhances institutional efficiency. Humanities and social sciences contribute significantly by offering insights into cultural values, social behaviour and institutional processes, which are essential for shaping practical and people centred policies. This study adopts an analytical and interdisciplinary perspective based on present social realities. It highlights that sustainable development depends on the integration of governance, education, law and economic policy. In conclusion, humanities and social sciences play a transformative role in strengthening governance, promoting justice, and guiding policy based development, thereby contributing to the creation of an inclusive, balanced and sustainable society.

Keywords: Humanities, Social Sciences, Governance, Education, Human Rights, Economic Resilience, Public Policy, Sustainable Development and Social Transformation.

Paper ID: 128

Performing Arts (Sattriya dance) as a Regular subject in School Education under NEP 2020 – A roadmap

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Abstract

The National Education Policy (NEP) 2020 encourages arts-integrated and holistic learning by including the Arts Education within the regular curriculum of state's school education. However, the policy does not define a clear approach for implementation. To address this gap, this study examines the scope of integrating the Arts Education (especially Sattriya dance) as a regular school (from class VI to X) subject in the state of Assam following the NEP 2020 framework. This study adopts a qualitative research methodology by using expert interviews, document analysis and comparative study of arts-integrated learning of other countries. The study also explores the existing curriculum of the Secondary Education Board of Assam (SEBA) approved optional subject on Dance (Sattriya), the teaching practices in the schools under the private Sattriya examination boards of Assam, the comparative analysis of NEP related progress for other classical dance forms of India and the challenges in terms of institutional readiness and inadequate infrastructure. The findings show that Sattriya dance helps improve students' physical fitness, concentration power and opens up a new career domain. This study attempts to propose a roadmap that focuses on the policy planning, syllabus design and mitigate the institutional challenges including the creation of sanctioned teaching posts to integrate Sattriya dance into the formal education system of Assam

Keywords: *

Paper ID: 281 **(Track:2)**

Breeding Indigenous Barbs (Pethia spp.) for the Global Ornamental Fish Trade: Biology and Business Perspectives

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Abstract

Indigenous barbs of the genus Pethia (Family: Cyprinidae) comprise a diverse group of small, brightly coloured freshwater fishes distributed across South and Southeast Asia, including Northeast India. Several species, such as Pethia conchonius, Pethia ticto, Pethia phutunio, and Pethia gelius, are highly valued in the ornamental fish industry due to their vibrant coloration, hardiness, and adaptability to captive environments. Despite their aesthetic and commercial appeal, systematic research on their reproductive biology, captive propagation, and organized trade development remains limited. This study synthesizes existing knowledge on breeding biology, including sexual dimorphism, gonadal maturation, fecundity, spawning behaviour, embryonic and larval development, along with induced breeding techniques and broodstock management practices under controlled conditions. Standardized captive breeding protocols involving environmental manipulation, hormone-induced spawning, and optimized larval rearing strategies were evaluated to enhance seed production and survival. The study further examines market demand, export potential, and the economic feasibility of captive breeding over wild collection, highlighting the role of indigenous ornamental fishes in supporting rural livelihoods and biodiversity conservation. Promoting structured captive breeding programs and streamlined supply chains for native Pethia species can reduce exploitation pressure on natural populations while strengthening sustainable ornamental aquaculture. Integrating biological insights with market-oriented approaches is essential to unlock the full commercial and conservation potential of indigenous barbs in the global ornamental fish trade.

Keywords: Breeding, Conservation, Induced breeding, Ornamental fish trade, Sustainable aquaculture

Paper ID: 150 **(Track:1)**

A Review on Solar Hybrid Dryers: Design, Performance Evaluation, and Future Prospects

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Abstract

The growing worldwide desire for sustainability-oriented technologies has prompted the development of solar hybrid dryers as effective and eco-friendly solutions in agricultural and food processing industries. SHDs integrate solar energy with auxiliary heat sources such as electricity, biomass, LPG, biogas or greenhouse-based systems. The design configuration, thermal performance and techno-economic-environmental evaluations of the systems are critically reviewed for different applications. The reported values for thermal and exergy efficiencies have been within the range of 20–70% and 12.5–49.8%, respectively, depending on system configuration as well as operating conditions. Several studies reported a significant drying time reductions of more than 60% and energy savings of greater than 220,000kWh/yr have been achieved. Economics reveal payback periods of as little as 0.64 years in solar-biomass systems and up to 3.7 years in greenhouse-based systems, where annual savings can rise to $1496.04, with significant carbon credit benefits. Environmental reviews verify CO2 mitigation ranging from 9 tons to over 430,000 tons and significant reduction in methane emissions, especially in food waste management. This review presents some potential future avenues of research, such as computational modelling, exergy-oriented optimization and zone-specific system adaptation. Solar hybrid dryers have strong potential to accelerate rural development, minimizing post-harvest losses and fulfilling the global sustainability goals including SDG 7 and SDG 13.

Keywords: Design, Hybrid Dryer, Performance, Renewable Energy, Solar, Sustainable

Paper ID: 29 **(Track:3)**

Indigenous Craftsmanship by the Local Artisan of Assam with help of Designer to Promote Sustainable Development Goals

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Abstract

The growing worldwide desire for sustainability-oriented technologies has prompted the development of solar hybrid dryers as effective and eco-friendly solutions in agricultural and food processing industries. SHDs integrate solar energy with auxiliary heat sources such as electricity, biomass, LPG, biogas or greenhouse-based systems. The design configuration, thermal performance and techno-economic-environmental evaluations of the systems are critically reviewed for different applications. The reported values for thermal and exergy efficiencies have been within the range of 20–70% and 12.5–49.8%, respectively, depending on system configuration as well as operating conditions. Several studies reported a significant drying time reductions of more than 60% and energy savings of greater than 220,000kWh/yr have been achieved. Economics reveal payback periods of as little as 0.64 years in solar-biomass systems and up to 3.7 years in greenhouse-based systems, where annual savings can rise to $1496.04, with significant carbon credit benefits. Environmental reviews verify CO2 mitigation ranging from 9 tons to over 430,000 tons and significant reduction in methane emissions, especially in food waste management. This review presents some potential future avenues of research, such as computational modelling, exergy-oriented optimization and zone-specific system adaptation. Solar hybrid dryers have strong potential to accelerate rural development, minimizing post-harvest losses and fulfilling the global sustainability goals including SDG 7 and SDG 13.

Keywords: Design, Hybrid Dryer, Performance, Renewable Energy, Solar, Sustainable

Paper ID: 224 **(Track:1)**

Protein-Polyelectrolyte Complexes and Their Optical & Conformational Properties

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Abstract

Polyelectrolytes are ionized polymers with their counterions in the solution; therefore, polyelectrolytes form complexes with the oppositely charged polyelectrolytes due to the combined effect of electrostatic interaction and entropy gain from counterion release in the solutions. If one polyelectrolyte is replaced by a protein, which is a biopolyelectrolyte, then it is called a protein-polyelectrolyte complex (PPC). Proteins exhibit intrinsic optical properties due to the presence of optically active amino acids such as tryptophan, tyrosine, and phenylalanine. PPC shows modification in the optical and functional properties of proteins with their structural variation, depending on different physicochemical parameters. Thus, PPC is found to be a suitable material in the field of biomaterials and biosensing due to its specific structure and properties. The primary objective is to ascertain the state of the art regarding the understanding and prediction of structure-property correlation of polyelectrolyte complexes. Therefore, a common steady understanding is formed about the investigation technique and structure-property correlation of polyelectrolyte complexes in these works.

Keywords: Polyelectrolyte, protein-polyelectroyte complexes, optical property, conformational property

Paper ID: 282 **(Track:3)**

Enhancing Bamboo Handicraft Ecosystems through Design Intervention across Various Clusters

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Abstract

The North-East region of India has a rich tradition of bamboo handicrafts that reflects its diverse cultural heritage. Bamboo is widely used for construction, food, medicine, and a variety of handicrafts in daily life. This study explores the bamboo handicraft ecosystem in the North East Region through detailed visits to four clusters in Tezpur (Assam), Majuli (Assam), Mawsynram (Meghalaya), and Dimapur (Nagaland). Through field visits and interactions with artisans, the four clusters were mapped in detail through loop and cluster diagrams. The study reveals that the significant issues faced by the handicraft sector are a limited design innovation, lack of connectivity, irregular access to suitable raw material despite regional abundance, reduced youth engagement, and restricted market exposure. However, the North East region of India accounts for almost 50% of India's bamboo species, but only a few are suitable for handicrafts. The study points out that there is a gradual shift from traditional face-to-face market interactions to disconnected market exchanges, resulting in weakened connections between artisans and users. A loop- and cluster-based analysis was performed to understand the linkages between material sourcing, skill transfer, production, and engagement across regions. Findings indicate a lack of knowledge exchange, feedback systems, and inter-cluster collaboration. In response, the research proposes a digitally enabled design intervention that strengthens co-learning, documentation, and direct engagement between artisans and broader audiences/users, aiming to promote sustainable livelihoods, cultural continuity, and a more connected bamboo craft ecosystem in Northeast India. The developed application will help connect artisans directly with users and provide comprehensive product and material details.

Keywords: Sustainability, Design Intervention, Handicrafts, User experience study, Bamboo

Paper ID: 296 **(Track:3)**

Ergonomic Assessment of Aquaculture Practices and Tools Used In Sonitpur District Of Assam

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Abstract

In Northeast India, aquaculture is essential for livelihood and food security. Aquaculture primarily relies on labour intensive techniques and involves manual handling of equipment. Fish farm workers face serious musculoskeletal risks due to prolonged manual load handling, repetitive motions, and poor posture. An ergonomic evaluation of current aquaculture equipment and work procedures in fish farms in Assam is presented in this work. This design research project addressed ergonomic challenges faced by aquaculture workers, particularly during repetitive tasks of transporting and feeding fish. The study identifies high-risk postures and significant discomfort regions among workers through field observations, questionnaires, ergonomic assessments (Nordic Body Map analysis and REBA–RULA), anthropometric data collection, and iterative design development. Through comprehensive analysis the study identified critical shortcomings in existing tools and proposed redesigning a fish delivery container used for transferring fishes inside the aquaculture farm. Anthropometric data were gathered from the workers. The final container concept demonstrates improved ergonomic performance with real time working conditions. Overall, the study contributes a practical, low-cost, and ergonomically informed design solution to improve worker health, reduce musculoskeletal risks, and support sustainable aquaculture practices in the region.

Keywords: Aquaculture, Northeast India, Ergonomic Assessment, Musculoskeletal Disorders (MSDs)

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