World Forum for Women in Science (WFWS) – 2025
India

(10th Forum for Women in Science without Borders (WISWB) Initiative)

International Conference

on

Empowering Women in Science, Technology, Engineering, Arts and Management

(Bridging Gaps and Building Future)

ABSTRACT BOOKLET

In collaboration with

School of Physical and Biological Sciences
Faculty of Science, Technology and Architecture

MANIPAL UNIVERSITY
JAIPUR

(ICEWSTEAM 2025)
October 6-7, 2025

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MANIPAL UNIVERSITY JAIPUR

(ICEWSTEAM 2025)
October 6-7, 2025

PREFACE

It gives us immense pleasure to present the Book of Abstracts for the International Conference on "Empowering Women in Science, Technology, Engineering, Arts and Management" (ICEWSTEAM-2025), scheduled on October 6–7, 2025 at Manipal University Jaipur, India.

This conference is envisioned as a platform not only to celebrate the achievements of women in STEAM fields but also to advocate for gender inclusivity as an essential driver of progress. We believe that meaningful innovation and sustainable development can only be achieved when diverse voices and perspectives are welcomed, respected, and empowered to contribute equally. ICEWSTEAM 2025 strives to bridge existing gaps and create a future where opportunities are not limited by gender but expanded by collaboration and shared vision.

The abstracts featured in this volume capture a wide spectrum of research ideas, practical insights, and thought-provoking perspectives. They address challenges and solutions, while showcasing the resilience, creativity, and leadership of individuals committed to making STEAM disciplines more inclusive and equitable.

We extend our heartfelt gratitude to all the contributors for sharing their work, the reviewers for their valuable inputs, and the distinguished speakers and participants for enriching this dialogue. A special word of appreciation goes to the organizing team and partner institutions whose dedication has made this conference possible.

We hope this Book of Abstracts not only serves as a record of the discussions at ICEWSTEAM 2025 but also inspires ongoing efforts to foster gender balance, inclusivity, and empowerment in academia, industry, and society at large.

Conveners

ICEWSTEAM 2025

SPONSORS/PUBLISHERS/ EXTERNAL PARTNERS

nova science publishers

Sigma Journal of Engineering and Natural Sciences

Indexed in

EMERGING SOURCES CITATION INDEX

Journal of Thermal Engineering

Indexed in

EMERGING SOURCES CITATION INDEX

Scopus Google Scholar

A C S

IOP Publishing

INDIAN NATIONAL SCIENCE ACADEMY

WOMEN IN SCIENCE WITHOUT BORDERS

SCIENCE FOR SUSTAINABLE DEVELOPMENT

SCIENCE FOR HUMANITY

GLOBAL SOCIETY

INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

EDUCATION · ENLIGHTENMENT · EMPOWERMENT

TRACES OF DREAMS

ORGANIZING COMMITTEE

Chief Patron
Mr. S. Vaitheeswaran, Chairperson, MUJ

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Dr. Sakshi Shringi, Dept. of Computer Science & Engineering, FoSTA, MUJ
Dr. Shilpi Gupta, Dept. of Economics, FoMCA, MUJ

External Partners
Prof Amal Amin
National Research Centre-Egypt & founding Chair of WISWB, WFWS, SHGS

Dott. Nerina Finetto
Founder and Director of Traces & Dreams, Sweden, Co-founder and Managing Director of SHGS, Italy

Prof. Arun Sharma
Dean (Academic Affairs), Indira Gandhi Delhi Technical University for Women (IGDTUW)

Messages from Dignitaries

Innovate. Inspire. Lead

Prof. Ashutosh Sharma
Padma Shri Awardee
President, Indian National Science Academy (INSA)
Chief Guest

Message

It gives me great pleasure to convey my warm greetings to all participants of the International Conference on Empowering Women in Science, Technology, Engineering, Arts and Management (ICEWSTEAM 2025).

This conference highlights an important dimension of our collective journey, the empowerment and full participation of women in knowledge creation, innovation, leadership, and entrepreneurship. Diversity in perspectives is the true strength of science and society, and fostering gender equity is not only about inclusion, but also about enriching the quality, creativity, and impact of outcomes.

I am confident that ICEWSTEAM 2025 will provide a dynamic platform for sharing research, exchanging ideas, and building collaborations that translate into meaningful action. The deliberations here will surely inspire fresh insights and open new opportunities for advancing inclusive growth in STEAM and allied fields.

I congratulate the organizers, contributors, and young scholars for their efforts and commitment in bringing together such a vibrant and purposeful initiative. I wish the conference great success and all participants fruitful and memorable engagements.

With warm regards,

(Prof. Ashutosh Sharma)

Dr. Angela Liberatore
Science Diplomacy Fellow at
the European University Institute, former Head of
Scientific Department at the European Research Council

Message

It is a great pleasure to extend my greetings to all participants of the International Conference on Empowering Women in Science, Technology, Engineering, Arts and Management (ICEWSTEAM 2025).

The European Research Council (ERC) -where I worked for many years- is deeply committed to supporting frontier research driven by excellence, curiosity, and creativity, regardless of gender or background. Yet, we know that persistent gaps remain in ensuring full participation and leadership of women in science and innovation across the globe. Addressing these challenges is essential not only for equity, but also for the advancement of knowledge and the capacity of research to respond to the needs of our societies. This is why I will address ICEWSTEAM on science diplomacy -the focus of my past and current work- and women empowerment.

ICEWSTEAM 2025 provides an important platform for dialogue, reflection, and collaboration. By bringing together diverse perspectives, this conference strengthens our collective ability to design strategies, policies, and practices that expand opportunities for women in STEM and research more broadly. It also offers inspiration to the younger generation, who will carry forward the values of inclusivity, excellence, and integrity in research.

I commend the organizers and participants for their commitment to this important cause, and I look forward to the ideas and collaborations that will emerge from your deliberations. May this conference inspire lasting progress toward a more inclusive and vibrant global research ecosystem.

Looking forward to a successful and impactful conference!

(Dr. Angela Liberatore)

Prof. Mary B. Chan-Park
President Chair Professor of Chemistry,
Chemical Engineering and Biotechnology, NTU

Message

It is my privilege to extend warm greetings to all participants of the International Conference on Empowering Women in Science, Technology, Engineering, Arts and Management (ICEWSTEAM 2025).

As researchers, educators, and leaders, we know that advancing science and innovation depends on diversity of thought and participation. The active inclusion and empowerment of women in STEM fields is not only an issue of equity but also a catalyst for creativity, excellence, and transformative impact. By recognizing and addressing the barriers that women often face, we unlock the full potential of talent that can shape solutions to the most pressing challenges of our time.

ICEWSTEAM 2025 provides a valuable platform to share experiences, highlight achievements, and foster collaborations that extend beyond borders and disciplines. Such exchanges are essential to building resilient ecosystems where women can thrive in laboratories, classrooms, industries, and leadership roles alike.

I commend the organizers for their vision in convening this timely conference, and I applaud the contributions of all participants. May your discussions inspire new opportunities, partnerships, and pathways that bring us closer to a truly inclusive and sustainable future in science and beyond.

With best wishes for a stimulating and successful conference.

(Prof. Mary B. Chan-Park)

Mary B Chan-Park

Sept 2025

MANIPAL UNIVERSITY
JAIPUR

Prof. N.N. Sharma
President
Manipal University Jaipur

Message

It is a matter of great pride and privilege to extend a warm welcome to all participants of the International Conference on *Empowering Women in Science, Technology, Engineering, Arts and Management (ICEWSTEAM 2025)*, organized by Manipal University Jaipur. This prestigious event brings together eminent scholars, researchers, industry leaders, policymakers, and students from across the globe to deliberate on one of the most pressing challenges of our times — the need to empower women in Science, Technology, Engineering, Arts, and Management.

At MUJ, we firmly believe that knowledge without inclusivity is incomplete. Women constitute half of our society's talent pool, and their full participation in STEAM is not only a matter of equity but also a prerequisite for achieving excellence, innovation, and global competitiveness. The conference theme "Bridging Gaps and Building the Future" resonates deeply with our institutional vision of fostering diversity, equity, and leadership in every sphere of learning and research.

I am confident that the deliberations over the two days will generate transformative ideas, offer actionable strategies, and strengthen international collaborations. Together, let us commit ourselves to creating ecosystems that enable women to thrive as scientists, technologists, engineers, artists, managers, and innovators.

I extend my best wishes to the Organizing Committee, resource persons, and participants. May ICEWSTEAM 2025 mark the beginning of new partnerships and pathways towards a more inclusive and sustainable future.

(Prof. N.N. Sharma)

MANIPAL UNIVERSITY
JAIPUR

Prof. Karunakar A Kotegar
Pro President
Manipal University Jaipur

Message

It is my privilege to extend warm greetings to all participants of the International Conference on Empowering Women in Science, Technology, Engineering, Arts and Management (ICEWSTEAM 2025), organized by Manipal University Jaipur.

This conference marks an important step in advancing the global dialogue on gender equity and inclusive excellence. By bringing together scholars, researchers, practitioners, and thought leaders from diverse disciplines, ICEWSTEAM 2025 provides a distinguished platform to deliberate on critical issues, share innovative perspectives, and build collaborations that can shape future directions in education, research, and professional practice.

At Manipal University Jaipur, we firmly believe that the empowerment of women in STEM, Arts, and Management is not only a matter of equity but also a catalyst for societal transformation. The themes of this conference align with our institutional vision of promoting interdisciplinary scholarship and nurturing talent that contributes meaningfully to national and global development. I am confident that the discussions and outcomes of ICEWSTEAM 2025 will enrich academic discourse, strengthen networks, and inspire impactful initiatives in the years to come.

I extend my best wishes for the success of the conference and for meaningful exchanges among all participants.

(Prof. Karunakar A Kotegar)

MANIPAL UNIVERSITY
JAIPUR

Prof. Amit Soni
Registrar
Manipal University Jaipur

Message

It is my great pleasure to welcome all participants to the International Conference on Empowering Women in Science, Technology, Engineering, Arts, and Management (ICEWSTEAM 2025)

This conference is a remarkable platform that brings together scholars, researchers, innovators, and leaders to share knowledge, exchange ideas, and inspire new directions for inclusive growth in STEAM and related fields. It reflects our collective commitment to academic excellence, diversity, and empowerment.

I sincerely congratulate the organizers on their efforts in creating this meaningful forum and extend my best wishes for the success of the conference. May ICEWSTEAM-2025 open new opportunities for collaboration and contribute to building a more equitable and progressive future.

(Prof. Amit Soni)

MANIPAL UNIVERSITY
JAIPUR

Provost
Manipal University Jaipur

Message

It is with great delight that I extend my warm greetings to the participants of the International Conference on Empowering Women in Science, Technology, Engineering, Arts and Management.

This event exemplifies the spirit of Manipal University Jaipur — a spirit rooted in academic excellence, inclusivity, and global engagement. As Provost, I am proud to witness this campus transform into a hub of international collaboration where leading minds converge to deliberate on the advancement of women in Science, Technology, Engineering, Arts, and Management.

The significance of International Conference on Empowering Women in Science, Technology, Engineering, Arts and Management (ICEWSTEAM 2025) lies in its holistic approach. It does not merely celebrate achievements but also engages critically with challenges that persist. It reminds us that empowering women is not the responsibility of a single institution or sector, but a collective global mission that requires academia, industry, government, and civil society to work hand in hand.

I am confident that the outcomes of this conference will extend beyond the walls of MUJ, influencing policies, inspiring educational practices, and strengthening global networks. I encourage all participants to take this opportunity not only to share their expertise but also to learn from diverse perspectives.

Let this conference be remembered as a turning point in building an equitable, innovative, and sustainable future.

(Prof. Nitu Bhatnagar)

MANIPAL UNIVERSITY
JAIPUR

Prof. Kuldip Singh Sangwan
Dean
Faculty of Science, Technology and Architecture
Manipal University Jaipur

Message

It is a privilege to welcome you all to International Conference on Empowering Women in Science, Technology, Engineering, Arts and Management (ICEWSTEAM 2025) at Manipal University Jaipur. As Dean of Faculty of Science, Technology & Architecture, I see this international conference as a moment of pride, but also as a reminder of the responsibilities we share as educators and mentors.

Our institutions play a vital role in shaping young minds and guiding them towards impactful careers. For women in STEAM, this journey has often been more challenging due to structural, cultural, and societal barriers. Conferences such as ICEWSTEAM 2025 provide an essential platform for dialogue and reflection on how we can create more equitable academic and professional ecosystems.

The broad range of themes covered, from research innovations to policy frameworks, from curriculum reforms to industry linkages-ensures that every participant finds value and inspiration. More importantly, it offers opportunities to carry forward new ideas into classrooms, laboratories, workplaces, and communities.

I hope the discussions held here will strengthen the commitment of all stakeholders to dismantle barriers and foster inclusive practices. The future of STEAM is diverse, and by empowering women, we enrich the very fabric of knowledge creation and dissemination.

I commend the organizers and extend best wishes to all delegates for a fruitful and enriching experience.

K. S. Sangwan

(Prof. Kuldip Singh Sangwan)

MANIPAL UNIVERSITY
JAIPUR

Prof. Lalita Ledwani
Dean
Research, International Affairs and Academic Administration
Manipal University Jaipur

Message

I am delighted to welcome you to the Conference on Empowering Women in Science, Technology, Engineering, Arts and Management. Research and academics are enriched by diversity. Women bring unique insights, approaches, and innovations that broaden the horizons of knowledge. Yet, for too long, systemic barriers have limited their participation and recognition. This conference is an important step in reaffirming our collective commitment to inclusive research ecosystems.

ICEWSTEAM 2025 is not only about academic exchange but also about building bridges between theory and practice, between classrooms and industries, and between local challenges and global solutions. The cross-disciplinary nature of the event ensures that every dialogue contributes to a richer understanding of how inclusivity can accelerate progress in every domain.

As Dean Research, International Affairs and Academic Administration, I particularly look forward to the collaborations and publications that will emerge from this platform. I encourage participants to engage actively, explore interdisciplinary synergies, and initiate projects that can create tangible social impact.

Let us together envision a future where women are not just participants in STEAM but leaders and trailblazers whose contributions shape societies and economies worldwide.

Lalita
29/09/2025
(Prof. Lalita Ledwani)

MANIPAL UNIVERSITY
JAIPUR

Prof. Ashima Bagaria
Associate Dean, SoPBS, FoSTA
Conference Chair, ICEWSTEAM,2025

Message

On behalf of the Organizing Committee, it is my immense pleasure to welcome all participants to the International Conference on Empowering Women in Science, Technology, Engineering, Arts and Management. This conference is a milestone in our collective journey towards inclusiveness and equality in education, research, and professional practice.

The chosen theme "Empowering Women in STEAM: Bridging Gaps and Building the Future" is both timely and essential. Despite remarkable progress, women continue to face systemic barriers in accessing equal opportunities in science, technology, engineering, arts, and management. Through this conference, we aim to highlight success stories, identify persistent challenges, and most importantly, generate collaborative solutions.

This event is more than a platform for presenting research-it is a space to build networks, share experiences, and inspire each other. I believe that ICEWSTEAM 2025 will create ripples that extend beyond these two days, influencing policies, curricula, and institutional practices.

We chose Jaipur, Rajasthan as the host city for this conference because of its unique blend of heritage, culture, and emerging academic ecosystem. As a place that symbolizes resilience, creativity, and inclusivity, Jaipur provides the perfect backdrop for conversations on empowering women and shaping a more equitable future.

I extend my gratitude to our esteemed speakers, delegates, sponsors, and my colleagues on the organizing team who have worked tirelessly to make this event possible. To the participants, I encourage you to actively contribute to the discussions and carry forward the spirit of this conference into your academic, professional, and personal spheres.

(Prof. Ashima Bagaria)

Prof Amal Amin
National Research Centre-
Egypt & founding Chair of WISWB,
WFWS, SHGS

Message

Dear Esteemed Participants of The International Conference on **"Empowering Women in Science, Technology, Engineering, Arts and Management"** (ICEWSTEAM 2025) and the World forum for women in science 2025-India

Dear All
Greetings
It is of my great pleasure as a founding chair of women in science without borders initiative (WISWB) to welcome you all. The current version of world forum for women in science-India 2025 is the 9th edition of the regular meetings of WISWB, the dream which becomes true to found global inclusive scientific initiative adopting the theme of science for sustainable development as sustainable development goals (SDGs) are global human needs including gender equality (SDG5) which I prefer to call for gender equity where justice and equitable cooperation may lead to sustainable future.

WISWB was founded years ago as gender inclusive multi-and trans-disciplinary movement gathering scientists with all stakeholders from all walks of life including policy makers, industry, public, youth and others to work and discuss together taking science as common language for the sake of sustainable development and humanity worldwide. Now, WISWB distributes over 92 countries and is recognized by UNESCO and registered on their website in 2025 on the international day for women in science in February as gender inclusive global successful initiative.

Women in science without borders initiative (WISWB) was founded in 2017 in Egypt as global initiative to connect people and the world with science across all borders for the sake of humanity. World forum for women in science was held twice in Egypt, once in Brazil, South Africa, Kenya, Italy and we had special event held in Duhok in Iraq which was dedicated to refugee and at-risk scholars and scientists. Via WISWB, we confirm the role of science, scientific international relations and science diplomacy in solving the critical problems with common and global concerns.

WISWB activities from the beginning were supported by big international organizations, industry and stakeholders as international science council (ISC)& United nations` bodies (UN)& The World Academy of sciences (UNESCO-TWAS) & IAP (Inter-academy partnership) & global young academy (GYA), national science academies & Media, non-governmental organizations (NGOs) and others.
For our current event in India, the Great Country, I would like to thank, recognize and acknowledge the efforts of University of Manipal University-Jaipur, Indira Gandhi Delhi Technical University for Women and the organizers especially Prof Dr. Ashima Bagaria and her team who I would like to thank to organize such great event opening the door for fruitful future collaboration. I would like also to thank guests, participants and the audience.

That dream would not happen without the support of all friends and collaborators.
Thank you all

The interesting theme of the current forum is "Empowering Women in Science, Technology, Engineering, Arts and Management" gathering diverse groups of scientists and other stakeholders in Science, Technology, Engineering and Mathematics (STEM).

Finally, I may repeat my favorite previous statement as (We as scientists are responsible more than before for the continuation and development of humanity where the challenges are huge and serious and we should face them bravely and effectively together where I may repeat the say of Stephen Hawking (the great scientist) that
(Scientists have become the bearers of the torch of discovery in our quest for knowledge).
At the end, I would like to thank my family, friends, colleagues who always support me.
And thank you all

With warm regards,

(Prof Amal Amin)

Message

It gives us great pleasure to welcome you to the International Conference on "Empowering Women in Science, Technology, Engineering, Arts and Management" (ICEWSTEAM-2025), scheduled on October 6–7, 2025 at Manipal University Jaipur, India.

As Conveners of this conference, we have envisioned ICEWSTEAM-2025 as a platform to celebrate the achievements of women in STEAM fields and to advocate for gender inclusivity as a key driver of progress. We strongly believe that meaningful innovation and sustainable development can only be realized when diverse voices and perspectives are welcomed, respected, and empowered to contribute equally. Through this initiative, we aspire to bridge gaps, foster collaboration, and build a future where opportunities are shaped by shared vision rather than limited by gender.

This conference brings together a wide spectrum of research ideas, practical insights, and thought-provoking perspectives. The deliberations will highlight challenges as well as solutions and stand as a testament to the resilience, creativity, and leadership of individuals committed to making STEAM disciplines more inclusive and equitable.

We take this opportunity to extend our heartfelt gratitude to all contributors, reviewers, speakers, and participants whose support and engagement have enriched this conference. We also acknowledge with deep appreciation the efforts of the organizing team and partner institutions whose dedication has made ICEWSTEAM-2025 a reality.

We sincerely hope that this conference serves as a catalyst for continued efforts to foster inclusivity, empowerment, and gender balance across academia, industry, and society.

With warm regards

Dr. Veena Dhayal
Convener, ICEWSTEAM

Dr. Neha Chaudhary
Convener, ICEWSTEAM

Dr. Monika Saini
Convener, ICEWSTEAM

MANIPAL UNIVERSITY
JAIPUR
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International Conference
on
"Empowering Women in Science, Technology, Engineering, Arts and Management"
(ICEWSTEAM 2025)
In collaboration with
World Forum for Women in Science (WFWS)

October 6-7,2025

SCIENTIFIC SCHEDULE

Day 1: October 06, 2025 (MONDAY)	
Time (IST: Indian Standard Time)	
10:00 AM – 11:00 AM	**INAUGURATION** **Venue: Smt. Sharada Pai Auditorium** **Live Link:** https://youtube.com/live/pm2GqJANu8A?feature=share
High tea: 11:00 AM – 11:30 AM **Venue: Old Food Court**	
Venue: Smt. Sharada Pai Auditorium **Live Link:** https://youtube.com/live/pm2GqJANu8A?feature=share	
11:30 AM – 12:15 PM	**Plenary Talk** **Prof. Ashutosh Sharma, Padma Shri Awardee** President, Indian National Science Academy (INSA), India ***Title: What Makes S&T Work?***
12:15 PM – 01:00 PM	**Keynote address 1** **Prof. Angela Liberatore** Science Diplomacy Fellow at the European University Institute, former Head of Scientific Department at the European Research Council ***Title: Science Diplomacy and Women Empowerment: some reflections***
Lunch Break: 01:00 PM – 02:00 PM (Poster Session 1) **(Venue: Old food Court)**	

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Day 1: October 06, 2025 (MONDAY)				
	Session Chair: Prof. Angela Liberatore **Co-Chair: Prof. Praveen K. Surolia** **Venue: Smt. Sharada Pai Auditorium**		**Session Chair: Dr. Teena Shivnani** **Co-Chair: Dr. Pushp Kumar** **Venue: Board Room, 3rd floor, 3AB**	
02:00 PM – 02:30 PM	**Keynote address 2** **Prof. Mary B. Chan-Park** President Chair Professor in Chemistry, Chemical Engineering and Biotechnology (NTU Singapore)	**Link:** https://teams.microsoft.com/l/meetup-join/19%3ameeting_MzZjMzAzZjEtZTBhMy00YjcxLTg4OWMtYzdmNmY1OWJmYzQ2%40thread.v2/0?context=%7b%22Tid%22%3a%227d0726e8-bf4b-4ac1-99f1-010fb11f1d3f%22%2c%22Oid%22%3a%22229c6b4b-e661-4507-9805-5e1feeee866c%22%7d	**Keynote Address 3** **Prof. Devika Sangwan** Department of Humanities and Social Sciences BITS Pilani, Pilani Campus, India	**Link:** https://teams.microsoft.com/l/meetup-join/19%3ameeting_NWZiYjU2YmYtNGE1Yi00YTUyLWE1MjYtMDNmOTIxNmRjOWVl%40thread.v2/0?context=%7b%22Tid%22%3a%227d0726e8-bf4b-4ac1-99f1-010fb11f1d3f%22%2c%22Oid%22%3a%229c6befb0-2c05-4fbf-ba18-66ea986e4aaf%22%7d
02:30 PM – 03:00 PM	**Invited Talk 1** **Prof Amal Amin** National Research Centre-Egypt & founding Chair of WISWB, WFWS, SHGS **Dott. Nerina Finetto** Founder and Director of Traces & Dreams, Italy. Co-founder of SHGS		**Invited Talk 2** **Prof. Sandeep Kaur** Department of Economic Studies Dean, School of Social Sciences Central University of Punjab, Bathinda, India	
Tea break: 03:00 PM – 03:30 PM				
	Venue: Meeting Room, 3rd floor, LHC		**Session Chair: Prof. Sandeep Kaur** **Co-Chair: Dr. Aditi Soni** **Venue: Board Room, 3rd floor, 3AB**	
03:30 PM – 04:30 PM	**Panel Discussion** **"STEM ke Rang, Nari ke Sang"** ***(The Colores of STEM with the Power of Women)*** **Moderator: Dr. K. P. Misra**	**Link:** Panel Discussion | Meeting-Join | Microsoft Teams	**Invited Talk 3** **Prof. Manju Singh** Professor, Economics, MNIT, Jaipur	**Link:** https://teams.microsoft.com/l/meetup-join/19%3ameeting_NWZiYjU2YmYtNGE1Yi00YTUyLWE1MjYtMDNmOTIxNmRjOWVl%40thread.v2/0?context=%7b%22Tid%22%3a%227d0726e8-bf4b-4ac1-99f1-010fb11f1d3f%22%2c%22Oid%22%3a%229c6befb0-2c05-4fbf-ba18-66ea986e4aaf%22%7d
04:30 PM – 06:30 PM	**Session Chair: Dr. Dalip S. Shekhawat** **Co-Chair: Dr. Ajay Saini** **Venue: Conference Room, 3rd floor, 2AB, FB-06** **Technical session 1** **PP IDs: ET 1-12**	**Link:** https://teams.microsoft.com/l/meetup-join/19%3ameeting_MzZjMzAzZjEtZTBhMy00YjcxLTg4OWMtYzdmNmY1OWJmYzQ2%40thread.v2/0?context=%7b%22Tid%22%3a%227d0726e8-bf4b-4ac1-99f1-010fb11f1d3f%22%2c%22Oid%22%3a%22229c6b4b-e661-4507-9805-5e1feeee866c%22%7d	**Session Chair: Dr. Priyanka Sharma** **Co-Chair: Rishi Vaidya** **Venue: Board Room, 3rd floor, 3AB** **Technical session 2** **PP IDs: MHS 1-13**	
GALA DINNER and CULTURAL PROGRAMME				

MANIPAL UNIVERSITY
JAIPUR
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<table>
<tr><th colspan="5">Day 2: October 07, 2025 (TUESDAY)</th></tr>
<tr><td></td><td colspan="2">Session Chair: Prof. Kalpana Sharma
Co-Chair: Dr. Ashish Kumar
Venue: Conference Room, 3rd floor, 2AB</td><td colspan="2">Session Chair: Prof. Sandeep K. Srivastava
Co-Chair: Dr. Nitesh Poddar
Venue: Smt. Sharada Pai Auditorium</td></tr>
<tr><td>09:30 AM–
10:00 AM</td><td>Invited talk 4
Dr. Pooja Devi
CSIR-CSIO, India</td><td rowspan="2">Link:
https://teams.microsoft.com/meet/3446449900064?p=aRS2xh5THjuoNJfssE</td><td>Invited talk 5
Prof. Kakoli Bose,
PI/Scientific Officer ‘G’, Integrated Biophysics & Structural Biology (IBSB) Lab, ACTREC,
Tata Memorial Centre, India</td><td rowspan="2">Link:
https://tinyurl.com/herccw6s</td></tr>
<tr><td>10:00 AM–
10:30 AM</td><td>Invited Talk 6
Prof. Gajendra K. Vishwakarma
Indian Institute of Technology (ISM)
Dhanbad, India</td><td>Invited Talk 7
Dr. Shweta Jha
Assistant Professor- Botany
Jai Narain Vyas University, Jodhpur</td></tr>
<tr><td colspan="5">High Tea: 10:30 AM – 11:00 AM</td></tr>
<tr><td></td><td colspan="2">Venue: Conference Room, 3rd floor, 2AB
Session Chair: Prof. Neha Choudhary
Co-Chair: Dr. Sakshi Shringi</td><td colspan="2">Venue: Room no. 230, 2nd floor, 2AB
Session Chair: Prof. Mousumi Debnath
Co-Chair: Dr. Rajeev Nema</td></tr>
<tr><td>11:00 AM –
11:30 AM</td><td>Invited Talk 8
Mr. Vishal Bhargava
Principal Engineer
MediaTek, Noida</td><td rowspan="3">Link:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_MjIwYTNjOGUtOTdkNS00YWEyLTk5ZGYtOTQ5MmNhOGNlNTNl%40thread.v2/0?context=%7b%22Tid%22%3a%227d0726e8-bf4b-4ac1-99f1-010fb11f1d3f%22%2c%22Oid%22%3a%223974ef33-edc3-4098-a8dc-104388c77d66%22%7d</td><td>Technical Session 3
PP IDs: BLS 1-13</td><td rowspan="2">Link:
https://tinyurl.com/4zpcehw3</td></tr>
<tr><td>11:30 AM –
12:00 Noon</td><td>Invited Talk 9
Dr. Madhurima Kahali
Head, Academic Relations and Partnerships (South Asia, Africa)
Taylor and Francis Group</td></tr>
<tr><td>12:00 Noon
– 01:00 PM</td><td>Session Chair: Prof. Sunita Singhal
Co-Chair: Dr Satyabrata Roy
Venue: Conference Room, 3rd floor, 2AB
Technical session 4
PP IDs: GAI 1-6</td><td>Session Chair: Prof. Gajendra K. Vishwakarma
Co-Chair: Dr. Ashish Kumar
Venue: Room no. 216, 2nd floor, 2AB
Technical session 5
PP IDs: MSS 1-6</td><td>Link:
https://teams.microsoft.com/meet/3588198371323?p=jOFeAqGoOPxMXkbPnQ</td></tr>
<tr><td colspan="5">Lunch Break: 01:00 PM – 02:00 PM (Poster Session II)</td></tr>
</table>

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02:00 PM – 04:30 PM	**Technical Session-6** **Session Chair: Dr. Ashish Kumar** **Co-Chair: Dr. Vijay Singh Maan** **Venue: Conference Room, 3rd floor, 2AB** **PP IDs: MSS 7-19**	**Link:** https://teams.microsoft.com/meet/3588198371323?p=jOFeAqGoOPxMXkbPnQ	**Technical Session-7** **Session Chair: Dr. Saikat** **Co-Chair: Dr. Sriparna Ray** **Venue: Room no. 230, 2nd floor, 2AB** **PPIDs: CS 1-13, PFS 1-4**	**Link:** https://teams.microsoft.com/meet/3379876306275?p=BEwCJR4yXzyXX8hL2e	**Technical Session -8** **Session Chair: Dr. Dinesh** **Co-Chair: Dr. Neha Janu** **Venue: Room no. 216, 2nd floor, 2AB** **PP IDs: ET 13-23, GAI 7-10**	**Link:** https://teams.microsoft.com/l/meetup-join/19%3ameeting_MjIwYTNjOGUtOTdkNS00YWEyLTk5ZGYtOTQ5MmNhOGNlNTNl%40thread.v2/0?context=%7b%22Tid%22%3a%227d0726e8-bf4b-4ac1-99f1-010fb11f1d3f%22%2c%22Oid%22%3a%223974ef33-edc3-4098-a8dc-104388c77d66%22%7d
Tea Break: 04:30 PM –05:00 PM						
05:00 PM – 05:30 PM	**VELIDICTORY SESSION and AWARD DISTRIBUTION** **Venue: Smt. Sharada Pai Auditorium**					**Link:** Valedictory Session and Award Distribution | Meeting-Join | Microsoft Teams

CONFERENCE TRACKS

Track 1 Physics and Frontier Sciences

Track 2 Chemical Sciences

Track 3 Biological & Life Sciences

Track 4 Mathematical & Statistical Sciences

Track 5 Engineering and Technology

Track 6 Management, Humanities & Social Impact

Track 7 Geospatial AI, Earth Observation Data and Industrial Applications

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Navigation Guide for Abstracts and Presentations

*We are pleased to present this **Book of Abstracts**, which highlights diverse research contributions across seven thematic tracks.*

*To facilitate smooth navigation, each paper has been assigned **two identifiers**:*

- ***CMT Submission ID** – The unique number generated by the CMT portal at the time of submission, primarily for authors to recognize their submitted work.*
- ***Paper Presentation ID** – Assigned by the Organizing Committee, track-wise, for oral presentations. This identifier will be used in the technical program, session schedules, and during presentations, and should be referred to when identifying or locating a paper in the sessions.*

*Since all accepted papers are scheduled for **Oral Presentation**, the tables that follow list the papers under their respective tracks, with both IDs clearly mentioned.*

This format is intended to help participants easily connect each abstract with its corresponding presentation during the sessions.

Organizing Committee

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LIST OF CONTRIBUTORY PAPERS

TRACK 1: PHYSICS AND FRONTIER SCIENCES (PFS)

S. No.	CMT ID	Paper Presentation ID	Title	Name of the Authors	Affiliation
1	6	PFS-01	Synthesizing PVDF/AlN Nanofibers for Sustainable Flexible Dielectrics	K.Rani[1], Pooja[2],A. Sharma[1], Y.Dwivedi[2], S. Lal[3]	[1]Department of Electronic Science, Kurukshetra university, Kurukshetra, Haryana, India [2]Department of Physics, National institute of Technology, Kurukshetra, Haryana, India [3]Department of Chemistry, Kurukshetra university Kurukshetra, Kurukshetra, Haryana, India
2	47	PFS-02	Curvature Effect on the Flow Dynamics through a Toroidal Vertical Microtube	R. Dia[1], C. B. Ndao[2], C. Mbow[2], and M. C. Ba[3]	[1]Ingineering Sciences Department, Iba Der Thiam University, Thiès [2]Department of Physics, Faculty of Science and Technology, Cheikh Anta Diop University, Dakar [3]Faculty of Medecine, Cheikh Anta Diop University/Neurosurgery Fann Healthcare Center, Dakar
3	122	PFS-03	Influence of Copper Doping on the Structural and Optical Properties of Cerium Oxide Nanoparticles	V. Choudhary	Department of Physics, School of Physical and Biological Sciences, Manipal University Jaipur, Jaipur, Rajasthan, India
4	131	PFS-04	Biogenic Nanogels for Articular Cartilage Regeneration	S. Pareek[1], M. Saran[2], Y. K. Verma[3] and A. Bagaria[1]	[1]Department of Physics, Manipal University Jaipur, Jaipur, 303007, India. [2]Department of Health Science, University of the People, USA. [3]Regenerative Biology Research Lab, CRMM, INMAS, DRDO, Delhi, India.

TRACK 2: CHEMICAL SCIENCES (CS)

S. No.	CMT ID	Paper Presentation ID	Title	Name of the Authors	Affiliation
1	13	CS-01	Fabrication Techniques of Cellulose Derived Nano Composites Materials and Their Versatile Applications: A Review	D. Sharma[1], J. Prakash Mishra[2] and V. Dhayal[3]	[1]Department of Biosciences, Manipal University Jaipur, India [1]Department of Zoology, S.S. Jain Subodh PG (Autonomous) College Jaipur, India [2]Department of Electronics & Communication Engineering, JECRC, Jaipur, India [3]Department of Chemistry, Manipal University Jaipur, India
2	15	CS-02	Enhancing Corrosion Protection of Mild Steel Using Epoxy Coatings Modified with Acetoxime Modified Aluminum(III) Isopropoxide	S.K. Ola[1], I. Choprab[1], Triveni[2] and V. Dhayal[3]	[1]Department of Chemistry, B K Birla Institute of Higher Education, Pilani, Jhunjhunu, Rajasthan, India [2]Department of Chemistry, Manipal University Jaipur, Jaipur, India [3]Department of Chemistry, Smt. Indramani Mandelia Shiksha Niket, Pilani, Jhunjhunu, Rajasthan, India
3	16	CS-03	Functionalization and Characterization of Tebuconazole-Graphene Oxide Composites for Enhanced Anti-Corrosive properties	P. Choudhary[1] and V. Dhayal[1]	[1]Department of Chemistry, Manipal University Jaipur, Jaipur, Rajasthan,
4	19	CS-4	Development of Multi Component Zinc Phosphate Coatings on Mild Steel Role of Organic and Inorganic Modifiers	P. Gosh[1], A. Kumar[1] and [1]V. Dhayal[1]	[1] Department of Chemistry, Manipal University Jaipur, India
5	30	CS-05	Synthesis and Functional Assessment of Metal and Hetero-Metal Oxide Nanocatalysts	J. Jain[1] and M. Bishnoi[1]	[1]Department of Chemistry, University of Rajasthan, Jaipur Rajasthan
6	34	CS-06	Tailoring Epoxy Coatings with Hybrid Inhibitors for Superior Corrosion Protection on Zinc Phosphatized Steel	I. Chopra[1], Kumari Ola[2]. and V. Dhayal[1]	[1]Department of Chemistry, Manipal University Jaipur, Jaipur, India [2]Department of Chemistry, B K Birla Institute of Higher Education, Pilani, India
7	87	CS-7	Dietary Carotenoids and Their Impact on Breast Cancer Therapeutics	Geetanjali Maurya	Manipal University Jaipur, Jaipur, Rajasthan
8	100	CS-08	Ruthenium-NHC Complexes with Dual Applications Catalytic C-	S. I. Sisodia[1] and S. Ray[1]	[1]Catalytic Applications Laboratory, Department of Chemistry, School of Physical and

			H Bond Functionalization and Anticancer Potential		Biological Sciences, Faculty of Science, Technology and Architecture, Manipal University Jaipur, Dehmi Kalan, Jaipur 303007, Rajasthan, India.
9	101	CS-09	Utilizing Heterogeneous and Homogeneous Catalysts to Convert Carbondioxide to Useful Chemicals: A Brief Overview	R. Malav[1], A. Yadav[1] and S. Ray[1]	[1]Catalytic Applications Laboratory, Department of Chemistry, School of Physical and Biological Sciences, Faculty of Science, Technology and Architecture, Manipal University Jaipur
10	117	CS-10	Green Sonochemical Synthesis of QuinolineDerivative Using Biogenic TiO_2 Nanocatalyst	S. Sharma[1] and R. Singh[1]	[1]Department of Chemistry, Jaipur National University, Jaipur, Rajasthan, India
11	126	CS-11	From single use to circular solution: a dual-benefit strategy for paper cup recycling and mortar enhancement	Avni Kothari[1], Sury Prakash[1], Veena Dayal[1]	[1]Manipal University Jaipur, Jaipur, Rajasthan
12	133	CS-12	Advances in the Classification and Engineering of Surface Grafted Smart Hydrogels for Targeted Applications	Nehal[1], S.Awasth[2] and Komal[1]	[1]Research scholar, Department of Chemistry, Manipal University Jaipur, Jaipur, India [2]Associate Professor, Department of Basic Sciences, IES University, Bhopal, Madhya Pradesh, India
13	135	CS-13	Structure-Based Virtual Screening of Indolyl-Azole Derivatives for Antimicrobial Agents- An Overview	Vartika Vaishya[1], Meenakshi Pilania[1]	[1]Manipal University Jaipur, Jaipur, Rajasthan
14	149	CS-14	Synthesis of Thiazolidine Engrafted New Dispiro[indeno[1,2-b]Quinoxalinone-Pyrrolidine Hybrids	Ankita[1] and R. Singh[1]	[1]Department of Chemistry Jaipur National University, Jaipur, Rajasthan, India
15	179	CS-15	PVDF-HFP and Azole-Based Polymers in Advanced Coating Technologies: Corrosion, Bioactivity, and Emerging Functional Applications	Nitish Kumar Sharma and Veena Dhayal*	[1]Department of Chemistry, Manipal University Jaipur, India, 303007 * Corresponding author. E-mail: veena.dhayal@jaipur.manipal.edu; dhayal21v@gmail.com

TRACK 3: BIOLOGICAL & LIFE SCIENCES (BLS)

S. No.	CMT ID	Paper Presentation ID	Title	Name of the Authors	Affiliation
1	23	BLS-01	Comparative Evaluation	R.Thakur	Department of Life Sciences,

			of Three Ethnomedicinal Plants of Assam, India, Using Untargeted Metabolomics, Network Pharmacology,and in Vitro Antithrombotic Assays: A Systems-Based Approach		Dibrugarh University, Dibrugarh-786004, Assam, India
2	45	BLS-02	Bioconversion of Agricultural Wastes to Bioethanol: Harnessing Bacterial Cellulases for Hydrolysis of Cellulolytic Biomass	E. Keny[1] and G. Kinyanjui[1]	[1]Department of Biological Sciences, University of Embu, P. O. Box 6 – 60100, Embu, Kenya
3	66	BLS-03	Computational Analysis of Intrinsically Disordered Regions in Ribosomal Assembly Using Molecular Dynamics Simulations	K. Mahata[1] and .Barik[1]*	[1]Department of Biotechnology, National Institute of Technology, Durgapur, India
4	95	BLS-04	Polyhydroxyalkanoate Biopolymer Production Using Consortium From Different Extremophiles and its Bioplastic Characteristics	N. Rajgadia[1] and M. Debnath[1*]	[1]Department of Biosciences, Manipal University Jaipur, Dehmi Kalan, Jaipur-303007, Rajasthan, India
5	98	BLS-05	Plastic Pollution-Driven Antimicrobial Resistance(AMR) in Marine Ecosystems Emerging Threats to Ocean and Public Health	Aswathi Pacha[1],Rachen Diamary[1], Mousumi Debnath[1]	Manipal University Jaipur, Jaipur, Rajasthan
6	99	BLS-06	Reusable Nano Biosurfactant- Chitosan-Zeolite System for Dye Decolourization	S. Kumari[1] and M. Debnath[1]	[1] Department of Biosciences, Manipal University Jaipur, Dehmi Kalan, Jaipur-303007, Rajasthan, India
7	102	BLS-07	Ecofriendly Coproduction and Characterization of PHA and Biosurfactant Using Novel Bacterial Consortia using Renewable Agro Waste Carbon Sources a Step towards Sustainable Biocomposites	S. Joshi[1] and M. Debnath[1]	[1]Department of Biosciences, Manipal University Jaipur, Rajasthan, 303007, India
8	105	BLS-08	Harnessing the Potential of Pomegranate Peels and SCOBY for the Development of Functional Beverage and Bacterial Cellulose	D. Aneja[1] and M. Debnath[1]	[1]Department of Biosciences, Manipal University Jaipur
9	112	BLS-09	Olive- Derived HDAC Inhibitors in Nanoformulation: Advancing Efficient Therapeutics	M. Debnath[1], D. Aneja[1], S. Sharma[1], S. Joshi[1] and R. Ranjan[1]	[1]Department of Biosciences, Manipal University, Jaipur, Rajasthan-303007, India
10	141	BLS-10	Mitochondrial Dysfunction in	A. Prajapat[1] and S. Giri[1]	[1]Manipal University Jaipur, Jaipur-Ajmer Express

			Neurodegeneration: Mechanisms Pathophysiological Impact,and Therapeutics		Highway, Dehmi Kalan 303007, India
11	152	BLS-11	Antifungal Activity and Phytochemical Analysis of Few High -Altitude Medicinal Plants of Western Himalayan Regions	U. Chauhan[1], V. P. Bhatt[2], S.M. Rudramurthy[3] and I. K. Maurya[1]	[1]Department of Biosciences, Manipal University Jaipur, Jaipur, Rajasthan-303007, India. [2] Herbal Research and Development Institute (HRDI), Gopesh war, Uttarakhand-246401, India [3]Department of Medical Microbiology, Postgraduate Institute of Medical Research and Education (PGIMER), Chandigarh-160012, India.
12	171	BLS-12	Harnessing Bacillus Chitinases for Sustainable Detoxification and Decolorization of Industrial Textile Dyes	N. Sharma[1], S. Kaura[2] and N. K. Poddar [1]	[1]Department of Biosciences, Manipal University Jaipur, Ajmer Express Highway, Dehmi Kalan, Near GVK Toll Plaza, Jaipur, Rajasthan [2]Dr. B. Lal Institute of Biotechnology, 6-E, Central Road, Malviya Nagar Industrial Area, Malviya Nagar, Jaipur, Rajasthan

TRACK 4: MATHEMATICAL & STATISTICAL SCIENCES (MSS)

S. No	CMT ID	Paper Presentation ID	Title	Name of the Authors	Affiliation
1	8	MSS-01	RAM Analysis and Performance Optimization of Paper Manufacturing Plant using Nature Inspired Algorithms	S. Rasool[1], M. Saini[1], A.Kumar[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur-303007, India
2	12	MSS-02	Probabilistic Analysis and Availability Prediction of Coal Handling Units in Thermal Power Plants with Artificial Neural Networks and Regression Analysis	J. S. Chundawat[1], M. Saini[1] and A. Kumar[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur-303007, India
3	35	MSS-03	Availability Improvement in PV Solar Power Plants using Stochastic Methods	K. Saini[1], A. Kumar[1], M. Saini[1], and D. K. Saini[2]	[1]Department of Mathematics & Statistics [2]Department of Io T and Intelligent Systems Manipal University Jaipur, Jaipur-303007, India
4	40	MSS-04	Reliability Optimization of Cloud Infrastructure using Dragonfly and Grey Wolf Algorithms	Monika Saini[1] and Vijay Singh Maan[2]	[1]Department of Mathematics & Statistics, Manipal University Jaipur, jaipur-303007, India [2]Centre for Distance and Online Education, Manipal University Jaipur, jaipur-303007, India
5	48	MSS-05	Semi Markov Reliability Modelling of Multi Pump Water Treatment Systems for Improved Operational Continuity	Vibhu Singhal[1], Indeewar Kumar[1], and Gitanjali[2]	[1]Manipal University Jaipur, jaipur-303007, India [2]Department of Applied Sciences, MSIT, GGSIPU, Delhi
6	53	MSS-06	Reliability Measures Estimation of Single Unit Repairable System with Server Arrival Time	Nikita[1,2], Monika Saini[1] and Ashish Kumar[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur-303007, India [2]Chandigarh University Mohali, Punjab, India
7	57	MSS-07	RAM Analysis of a 1-out-of-3: G System using Markovian Approach	J. Rathee[1] and S.C. Malik[1]*,	[1]Department of Statistics, Maharshi Dayanand University, Rohtak – 124001, India
8	58	MSS-08	Enhanced Software Reliability Modeling Under Dynamic Testing	Komee[1] and B. Pachauri [1]	[1]Department of Mathematics and statistics Manipal University Jaipur, Jaipur, (Raj.), India
9	59	MSS-09	An Enhanced Exponential-Ratio Estimator of Memory Type under Simple Random Sampling	R. Bhatt[1] and M. Saini[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur-303007, India

10	64	MSS-10	Analyzing Barriers To STEAM Education: A Stress-Strength Reliability Study on Rural Female Learners in Kerala	M. T. Nair[1] and Rachana B.P[2]	[1]Department of Statistics, NSS College, Rajakumari, Idukki, Kerala. [2]Department of Statistics, St. Thomas College, Pala, Kottayam, Kerala.
11	76	MSS-11	WIVSF-VIKOR Approach for Parcel Locker Location Selection Incorporating Trigonometric Similarity and Distance Measures for Interval-Valued Spherical Fuzzy Sets	Chanchal	Department of Statistics, M.D. University, Rohtak, Haryana-124001
12	92	MSS-12	Empowering Women`s Decision Making with Hesitant Fuzzy Sets	S. Pujara[1] and S. Kumar[1]	[1]Department of Mathematics, Maharishi Markandeshwar (Deemed to be University), Mullan-Ambala, 133207, Haryana (INDIA)
13	118	MSS-13	Bianchi Type V String Cosmological Model applying Functional Relation on Hubble Parameter in Lyra Geometry	M. Vijayvargiya[1] and L. Poonia[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur-303007, India
14	119	MSS-14	Bianchi Type-I String Cosmological Model in General Relativity with Time-Decaying Term and Bulk Viscosity	M Khowal[1] and L. Poonia[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur-303007, India
15	120	MSS-15	Reliability Modeling of Smart Grids Using Markovian Approach Under Provision of Spare Components	R. Agrawal[1], M. Saini[1] and A. Kumar[1]	[1]Department of Mathematics and Statistics Manipal University Jaipur, Jaipur-303007, India
16	123	MSS-16	Reliability Modeling of a Multi state System: A Data Center Perspective	A. Khandelwal[1], A. Kumar[1] and M. Saini[1]	[1]Department of Mathematics and Statistics Manipal University Jaipur, Jaipur-303007, India
17	128	MSS-17	Equilibrium Points and Stability in a Perturbed Five-Body Problem	B. Jangid[1] and A. Kumar Pal[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur, 303007, India
18	129	MSS-18	Effect of Continued Fractional Potential on Invariant Manifolds in the CRTBP	L. Kumari Bairwa[1] and A. Kumar Pal[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur, 303007, India
19	136	MSS-19	Stochastic Software Reliability Model in Imperfect Debugging	A. Choudhary[1] and B. Pachauri[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur
20	143	MSS-20	RAMD Based Availability Assessment of Steam Generating System	M. Saini[1], A. Kumar[1] and J. S. Chundawat[1]	[1]Department of Mathematics & Statistics Manipal University Jaipur, Jaipur-303007, India

TRACK 5: ENGINEERING AND TECHNOLOGY (ET)

S. No	CMT ID	Paper Presentation ID	Title	Name of the Authors	Affiliation
1	4	ET-01	Eyesight: Integrative AI for Non-Invasive Diabetic Retinopathy Detection using Pupillometry and Ensemble Deep Learning	P. J. Saranya[1], I. Jasfer[2], R. Keerthana[3], T.S. Mohammed Shebeeb[4]	[1] Assistant Professor, Department of Artificial Intelligence and Data Science, KGISL Institute of Technology, Coimbatore, India [2,3,4] Student, Department of Artificial Intelligence and Data Science, KGISL Institute of Technology, Coimbatore, India
2	21	ET-02	Rainfall-Runoff Modelling using HEC-HMS for Umngot River, Meghalaya	T. Talukdar[1], S. Patowary[1], U.M. Hazarika[1], S. Bhattarjee[1], S. Kurbah[2], D. Barman[2]	[1] North Eastern Regional Institute of Water and Land Management, Tezpur, Assam, India [2] North Eastern Space Application Centre, Umiam, Meghalaya, India
3	22	ET-03	Quantitative Assessment of Flood Risk of Lower Reaches of Bhogdoi River	D. Borah [1], L.M. Das[1], U.M. Hazarika[1], S. Patowary[1], B. Buragohain[1], S. Bhattacharjee[2]	[1] 1nerwalm, Dolabari, Assam
4	37	ET-04	Classification of Ransomware using Machine Learning	G. Dhongade[1], O. Chandrakar[1], R. Khande[2]	[1] MATS University, Raipur CG (IN) [2] Balaji Institute of Technology & Management, Pune MH (IN)
5	42	ET-05	Modular LLM Pipelines with Long Chain: A Survey and Application	Yugakiruthika A B	PepsiCo*
6	44	ET-06	Impact of Learning Behaviour, Social Media, and Psychological Traits on Students, Academic Success in Higher Education	Nisha Madaan[1] and S.K. Sharma[1]	[1] Banasthali Vidyapith, Jaipur 304022, Rajasthan, India
7	46	ET-07	Bridging the Gender Digital Divide Integrating AI and Digital Skills in Higher Education Curricula for Women in STEAM	Sokyna Alqatawnah	Arden University*
8	79	ET-08	Hardware Implementation of a Novel Optimum	S. Sangelkar[1], D. S. Bhandare[1], A. Jadhav[1], P. Jadhav[1],	[1] PES's Modern College of Engineering Pune,

			Controller and its Comparison with PI Controller	A. Munder[1], L. Gavali[2]	India [2]Neilsoft pvt.ltd Pune, India
9	82	ET-09	Advanced Hybrid Deep Learning Approach for Orange Disease Detection using Segmentation Techniques	J. Jyotsana[1], R. Tondon[1]	[1]Department of Computer Science and Engineering Sage University Indore
10	83	ET-10	Crop Yield Prediction using Satellite and Tabular Dataset through Deep Learning Models	Smaranika Mohapatra[1], Kusumlata Jain[1], and Ketan Mathu[1]r	[1]Manipal University Jaipur, India
11	96	ET-11	Stellar Classification through Machine Learning Models	Kusumlata Jain[1] and Smaranika Mohapatra[1]	[1]Manipal University Jaipur, India
12	104	ET-12	Generation and Storage of Portable Green Hydrogen	N. Singh[1], D. S. Bhandare[1], V.V. Khatavkar[1], M. Jadhav[1], A. Shrigondekar[1], M. Sheth[2]	[1] PES's Modern College of Engineering Pune, India [2] Opulence Power Pune, India
13	106	ET-13	Load Curtailment Controller with Kalman Filter as Frequency Estimator for Power Congestion Management	Deepa Bhandare[1] and Vrushali Khatavkar[1]	[1]PES's Modern College of Engineering Pune, India
14	111	ET-14	Debugging The Code: Empowering Women in Technological Starups	K. Verma[1], K. Papney[2]	[1] MCM DAV Women College, Chandigarh, India [2] DSB Campus, Kumaun University, Nanital, India
15	144	ET-15	Ensemble Driven Approach for Adulteration Detection in Ghee Using XGBoost Classifier	Aditya Upadhyay[1] and Dr. Neha Chaudhary[1]	[1] Manipal University Jaipur, Jaipur, India
16	145	ET-16	Observing the Privacy-Utility Trade off in Differentially Private Medical Text Classifiers	V. Verma[1], V. Kohli[1], S. Mundra[1], A. Mundra[1], S. Shringi[1]	[1] Department of CSE, Manipal University Jaipur, Jaipur, India
17	146	ET-17	Retrieval-Augmented Generation Based Medical Question Answering Chatbot	S. Mundra[1], U. R. Mishra[1], A. Mundra[1], S. Shringi[1]	[1] Department of CSE, Manipal University Jaipur, Jaipur, India
18	157	ET-18	Trends and Insights in DDoS Detection using Machine Learning in SDN: A Bibliometric Perspective	A. Gupta[1], B. K. Joshi[1]	[1] ICFAI Tech School,The ICFAI University Dehradun, India
19	158	ET-19	Heal-IO: An AI Powered Dermatological Diagnostic System	H. Nautiyal[1], B. Singh[1], K. Gaur[1]	[1] Manipal University Jaipur, Jaipur,Rajasthan,

					India
20	159	ET-20	Spatiotemporal Land Use and Land Cover Change Assessment Using Random Forest and Sentinel-2 Data: A Geospatial AI Approach	Aaditi Patel[1], Mohammad Imroz[1,] Md Parwez Akhtar[2,]Meena Kumari Sharma[1]	[1] Manipal University Jaipur, Jaipur, India, [2]University of Bisha
21	168	ET-21	BLIP-Finetuning for Textual Explanation of Radiology Images	N. Sharma[1], S. Chaurasia[1]	[1] Manipal University Jaipur, Rajasthan,
22	169	ET-22	The AI-Driven Evolution of User Interface Design	Emmanuel Yusufu	Independent
23	170	ET-23	Multi-Modal Summarization for Accessible and Searchable Mobile Interfaces	Emmanuel Yusufu	Independent
24	175	ET-24	Real-Time Malicious Node Detection using Bayesian Neural Network in Mobile Ad-Hoc Networks (MANETs)	Arpana Sinhal[1], Budesh Kanwer[2], and Vikas Kumar[2]	[1] Manipal University Jaipur, Rajasthan, [2]Poornima Institute of Engineering & Technology, Jaipur, Rajasthan
25	176	ET-25	Hybrid Deep Learning Framework for Accurate Brain Cancer Diagnosis using MRI Images	A. Sinhal[1]	[1]Department of Computer Applications, Manipal University Jaipur, Rajasthan-303007, India
26	178	ET-26	Neuromorphic Computing fo Real-Time Sensor Fusion in Autonomous Engineering Systems	S. Gupta[1], B. Kanwer[1], A. Rani[1], R. Jain[2]	[1] Department of Artificial Intelligence and Data Science, Poornima Institute of Engineering and Technology, Jaipur, India [2] Department of Computer Applications, Manipal University Jaipur, Jaipur, India
27	166	ET-27	A Spatio-Temporal Analysis of Air Pollution in Jaipur, India: Drivers, Trends, and Public Health Implications	Karishma Chauhan[1], Anil Dutt Vyas*[2], Meena Kumari Sharma[2]	[1]Research Scholar, Department of Civil Engineering, Manipal University Jaipur, Rajasthan-303007, India [2]Department of Civil Engineering, Manipal University Jaipur, Rajasthan-303007, India.

TRACK 6: MANAGEMENT, HUMANITIES & SOCIAL IMPACT (MHS)

S. No.	CMT ID	Paper Presentation ID	Title	Name of the Authors	Affiliation
1	9	MHS-01	Navigating Heat and Bias A Perspective on Research and Development Challenges Faced by Women in Thermal Systems Engineering	T. Samarasinghe[1,2]	[1]Department of Mechanical Engineering, University of Moratuwa, Katubedda, Sri Lanka [2]Department of Mechanical and Aerospace Engineering, Brunel University London, Kingston Ln, Uxbridge, UB8 3PH, United Kingdom
2	41	MHS-02	Urban Gender Inequity in Jordan: Legal, Economic, and Sociopolitical Dimensions	L. M. Ismail [1]	[1] Institute of Geosciences, Faculty of Science and Informatics, University of Szeged, [2] Egyetem utca, H-6722 Szeged, Hungary
3	63	MHS-03	An Overview of Dichotomy Faced by women in the Field of Education in South Asia and Southeast Asia	Sangeeta[1] and Suvidha[1]	[1]Department of Home Science (Human Development), Banasthali Vidyapith, Tonk, Rajasthan, India,
4	70	MHS-04	Leave No One Behind: A Comprehensive Study on the Interrelations of the Sustainable Development Goals (SDGs)	Priyanka Sharma[1], Dr. Rishi Vaidhya[1], Aditi Soni[1]	[1]Manipal University Jaipur
5	74	MHS-05	Sangeet and Selfhood: The Role of Hindustani Classical Music in Fostering Identity Empowerment and Wellbeing Among Women Learners	A. Narayan[1] and R.Srivastava [2]	[1]Manipal University Jaipur, Dehmi Kalan, Off Jaipur-Ajmer Expressway, Jaipur, Rajasthan–303007, India [2]Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra, UP–282005, India
6	86	MHS-06	Gendered Advertising and Sustainable Beauty the Economics of Pink Marketing in India	M. Rajput[1], S. Sandhu[1] and A. Singh[2]	[1]Amity University, Punjab, India [2]Lovely Professional University, Jalandhar, India
7	90	MHS-07	Digital Empowerment for Women: Combating Cyber Bullying Perpetration to Build a Safer Future	Suman	Dept. of Education, B.P.S.M.V. Khanpur Kalan, Sonipat, Haryana
8	94	MHS-08	Mountain Daughters River Mothers Tribal Women and Empowerment in the Northeast India	H. Herchandani[1] and Y. Kumari [1]	[1]Department of Languages, Literature and Cultural Studies, Manipal University Jaipur, India

9	97	MHS-09	Is India ready for Smart Cities?	Mansi Mathur[1],Dr. Priyanka Sharma[1],Dr. Vini Kewaliya[1]	[1]Manipal University Jaipur
10	130	MHS-10	Gender Empowerment Through Science Pedagogy An Empirical Analysis of Girls Learning Outcomes and Barriers in Delhi Government Schools	S. Yadav[1], G. Rao[1]	[1]Department of Education (CIE), University of Delhi
11	137	MHS-11	Empowerment through Skills: An Evaluation of Vocational Training for Sustainable Employment in Rajasthan	M. Goyal[1] and R. Jadon[2]	[1]Manipal University Jaipur, Jaipur, India; [2]St. Xavier's College Jaipur, Jaipur, India
12	139	MHS-12	Digital Feminism for Identity in Americanah by Chimamanda Ngozi Adichie	Y. Kumari[1]	[1]Manipal University Jaipur
13	140	MHS-13	Comprehensive Comparative Analysis of Female Swimmers and Female Para Swimmers: A Deep Dive into Physiological and Psychological Profiles	K. Kumar[1], R. Poonia[1] and V. K. Grover[1]	[1]Department of Liberal Arts and Social Sciences, Manipal University Jaipur, Rajasthan, India
14	73	MHS-14	Psycho-analytical Impact of Online Education on the Students using Machine Learning Models	[1]Priyanka Sharma, [2*]Smaranika Mohapatra	[1]Department of Business Administration, Manipal University Jaipur, India. priyanka.sharma@jaipur.manipal.edu [2]Department of Information Technology, Manipal University Jaipur, India. Corresponding author: smaranika.mohapatra@jaipur.manipal.edu

TRACK 7: GEOSPATIAL ARTIFICIAL INTELLIGENCE, EARTH OBSERVATION DATA AND INDUSTRIAL APPLICATIONS (GAI)

S. No.	CMT ID	Paper Presentation ID	Title	Name of the Authors	Affiliation
1	28	GAI-01	Integrating Cloud Computing and Geospatial AI for Scalable Satellite Image Analysis	Lipika Dudeja[1], Vaishali Chauhan[1]	[1] Manipal University Jaipur, Jaipur, India

2	85	GAI-02	Computation of Complex Software Using Neural Network	Neha Bharani[1], Shubha Dubey[1], Shivani[1], NidhiMowarSingh[2], NehaTiwari[3], Mubeen Ahmed Khan4	[1] Associate Professor SOC, IPS Academy, [2]Lecturer DPS, Kolar Road, Bhopal, [3]Lecturer Jawaharlal Nehru School, Bhopal, Assistant Professor CSE(Cybersecurity), [4]Dayananda Sagar University, Ramanagara, Bengaluru
3	151	GAI-03	Explainable GeoAI Framework for Public Mental Health Analysis	Nitya Gupta[1]	[1] Manipal University Jaipur, Jaipur, India
4	154	GAI-04	A Survey on Remote Sensing Image Analysis Using Advanced Learning Frameworks	Rudra Pratap Singh[1], Shashwat Rana[1], Aryan Gupta[1]	[1] Manipal University Jaipur, Jaipur, India
5	156	GAI-05	Advancing Urban Development through Mobile GIS Application	Rudra Pratap Singh[1], Shashwat Rana[1], Aryan Gupta[1]	[1] Manipal University Jaipur, Jaipur, India
6	161	GAI-06	AWS-Ne T: An automated Weed Segmentation Approach Based on Deep Learning Using Attention Mechanism for Precision Agriculture	Ritik Mittal[1], Pradeep Kumar[1], Kuntal Gaur[1]	[1] Manipal University Jaipur, Jaipur, India
7	162	GAI-07	Evolution of the AIML/DL Techniques for the Plant Diseases Detection at Early Stage	Harshita Acharya[1], Dr. Pradeep Kumar[1], Dr. Ashish Kumar[1]	Manipal University Jaipur, Jaipur, India
8	163	GAI-08	A Survey of Diverse Models for Remote Sensing Image Classification	C Krishna Ghrini	Manipal University Jaipur, Jaipur, India
9	172	GAI-09	Survey and Systematization of GIS Techniques for Water Reservoir Modeling	Ayush Jain	Manipal University Jaipur, Jaipur, India
10	173	GAI-10	Geospatial Modeling Approaches for Educational Survey Analysis A Systematic Review	Anushka Kothiyal[1], Anurag Bijalwan[1], Pranshu Gautam[1]	[1] Manipal University Jaipur, Jaipur, India

Plenary Speaker

Prof. Ashutosh Sharma

Padma Shri Awardee

President, Indian National Science Academy (INSA)

Keynote Speakers

Dr. Angela Liberatore

Science Diplomacy Fellow at the European University Institute, former Head of Scientific Department at the European Research Council

Dr. Mary B. Chan-Park

President Chair Professor in Chemistry, Chemical Engineering and Biotechnology (NTU Singapore)

Dr. Devika Sangwan

Professor, Department of Humanities and Social Sciences

BITS Pilani, Pilani Campus, India

Invited Speakers

Dr. Sandeep Kaur

Professor, Department of Economic Studies

Dean, School of Social Sciences Central University of Punjab, Bathinda, India

Dr. Manju Singh

Professor, Economics, MNIT, Jaipur

Dr. Pooja Devi

CSIR-CSIO, India

Prof. Kakoli Bose,

PI/Scientific Officer 'G', Integrated Biophysics & Structural Biology (IBSB) Lab,

ACTREC, Tata Memorial Centre, India

Professor Gajendra K. Vishwakarma

IIT (ISM) Dhanbad

Dr. Shweta Jha

Jai Narain Vyas University, Jodhpur

Vishal Bhargava

Principal Engineer, MediaTek, Noida

Dr. Madhurima Kahali

Head, Academic Relations and Partnerships (South Asia, Africa), Taylor and Francis Group

Dr. Amal Amin

National Research Centre-Egypt & founding Chair of WISWB, WFWS, SHGS

Dr. Dott. Nerina Finetto

Founder and Director of Traces & Dreams, Sweden, Co-founder and Managing

Director of SHGS, Italy

Innovate. Inspire. Lead

Plenary Lecture

What Makes S&T Work (or not!)

Ashutosh Sharma

Institute Chair Professor, IIT Kanpur

&

President, Indian National Science Academy

Abstract

What Makes S&T Work (or not!) is not merely having intelligent and trained scientists and lab infrastructure! Some of the other essential ingredients are invention (Saraswati) and innovation (Lakshmi) ecosystems working together with strong interfaces; flexibility and ease of doing R&D; rules, regulations and policies; creativity and risk taking; irreverence, relevance and direction; and last but not the least, cultural and behavioral aspects including promotion of diversity, equity and inclusion.

Keynote Lectures

KS-01

Science Diplomacy and Women Empowerment: some reflections

Angela Liberatore

Science Diplomacy Fellow at the European University Institute, Florence, Italy

Abstract

Science Diplomacy is a field of analysis and a practice that gained increasing attention since the AAAS/Royal Society report of 2010 on '*New Frontiers of Science Diplomacy*'. More recently such report was updated and a "*European Framework for Science Diplomacy*" was developed and published in February 2025.

'Science' is meant to include all areas of knowledge production, including physical sciences, life sciences, engineering and social sciences and humanities.

In addition to the classical definition of science diplomacy including 'diplomacy for science', 'science for diplomacy' and 'scienced in diplomacy', the emerging focus is on mapping and strengthening the various 'practices' to make science diplomacy more strategic and also more inclusive. Inclusiveness involves acknowledging not only 'top down'/governmental approaches but also 'bottom up' ones/lead by scientists -some seen as 'track-2 diplomacy' as in initiatives related to water management or climate change. It also involves acknowledging the rich diversity of perspectives and skills, and an association of women in science diplomacy was established in this regard.

In the context of the *International Conference on Empowering Women in Science, Technology, Engineering, Arts and Management (ICEWSTEAM 2025)* I will focus on the issue of inclusivity in science diplomacy and why it matters. Examples related to the role of women in international scientific cooperation (e.g. International Space Station), in diplomatic work related to science (e.g. WISDA), on scientific diasporas and cross-border bottom up initiatives will illustrate the already significant contribution of women to science diplomacy as well as the potential for this to be enhanced and for science diplomacy to be -in turn- a vehicle for further women empowerment in the scientific and diplomatic fields.

KS-02

Cationic Polymers as Antibacterial Agents and RNA carriers

Mary B. Chan-Park

President Chaired Professor of Chemistry,
Chemical Engineering and Biotechnology, NTU, Singapore

Abstract:

Cationic Polymers can be dangerous, but they are needed for various biomedical applications. Here we introduce a new kind of cationic polymer that form N-heterocyclic carbene that aids translocation across membranes. Unlike traditional antibiotics or AMPs, Oilgoimidazoliums (OIMs) do not cause membrane lysis. Using biochemical and biophysical assays, we demonstrate that carbene formation facilitates a hydrophobic shift in OIMs which are rather hydrophilic with multiple positive charges, enabling them to traverse bacterial membranes and target intracellular DNA. These findings underscore the importance of carbene-mediated internalization as a distinguishing feature of OIMs. We demonstrate the applicability a wide range of polyimidazoliums and OIMs as antibacterial agents. We also demonstrate the applicability of this class of compounds for RNA delivery.

KS-03

Bridging Baps, Building Futures: Women as Change Makers

Devika Sangwan

Birla Institute of Technology and Science, Pilani

Women, across time and place, have remained significant contributors to affairs of mankind, following, challenging, and regulating the very way of life, conditioned by conventions and perspectives. Their contributions, driven by passion and dedication, have helped shape knowledge across diverse fields. They built houses along with homes. In the fields of science, technology, engineering, arts, and management, they uncovered truths, innovated practical solutions, designed structural buildings, creatively expressed themselves, and led strategically to translate ideas into realities. Their struggles might have been singular, but they stood as a collective force, conditioning and regulating alterations. An understanding that gaps will always be there, directed their efforts. They shifted boundaries, relying on their own faith to guide them through their struggles. There was no dearth of talent, perseverance, and vision. Embracing their own recognition, they continued contributing. Efforts yielded results, which led to achievements, and these achievements ultimately resulted in accolades. Then came empowerment. Their journey, tough and tumultuous, has contributed to the welfare of society and mankind, inclusively. They were never less, but always capable of working with less – a trait that established them as change-makers who wield the power to reshape the future.

Invited Speakers

IS-01

Environmental Degradation and Sustainable Development Goals: Cases from Punjab

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Abstract

The fast pace of industrialization for achieving economic development has led to environmental degradation, which has become a challenge for economies to achieve certain sustainable development goals. The sustainable development goals, i.e. no poverty, reduced inequalities, etc, are also required to be achieved along with the goals of environmentally friendly development. The development has raised questions about certain concerns, especially in the agrarian economies. The excessive use of pesticides in agriculture, the fast pace of extraction of groundwater to get the maximum returns, etc, are many issues that require understanding.

IS-02

Ethical Artificial Intelligence for Social Impact

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Abstract

Ethical Artificial Intelligence for Social Impact (EAI4SI), a dedicated field of work that goes beyond simply using AI for good. EAI4SI is a crucial and evolving area of focus for academics, researchers, and students, recognizing that it is not enough to simply "do good" with AI; there must be a layer of accountability for how AI is developed and deployed. While traditional AI applications are often driven by private sector interests to optimize performance, EAI4SI prioritizes measurable, real-world benefits to society, aligning with goals such as the UN Sustainable Development Goals (SDGs).

This approach distinguishes EAI4SI from the broader concept of AI for Social Good (AI4SG). While AI4SG focuses on what AI can do, EAI4SI is concerned with how AI is built, and integrating principles like fairness, transparency, and accountability from the very beginning. This approach is fundamentally human-centric, proactively identifying and mitigating risks such as bias and data misuse. EAI4SI is presented as a shared responsibility that academia, industry, and policymakers must collectively uphold to ensure AI's positive influence and prevent unintended negative consequences. The main aim to explore the conceptual grounding, applications, and ethical considerations of EAI4SI to promote a democratic, impactful, and ethical use of AI.

IS-03

2D MXenes Pioneering Green Hydrogen Production

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Abstract

The global pursuit of sustainable energy solutions has positioned hydrogen as a pivotal clean fuel for a decarbonized future. However, efficient, cost-effective, and durable materials for hydrogen production and storage remain critical challenges. MXenes, two-dimensional transition metal carbides, nitrides, and carbonitrides—have emerged as highly promising candidates in this domain owing to their tunable surface terminations, high electrical conductivity, hydrophilicity, and layered structures. This talk will highlight the role of MXenes in advancing hydrogen energy technologies, focusing on their application in photoelectrochemical (PEC) water splitting, electrocatalytic hydrogen evolution reaction (HER), and hydrogen storage. The underlying structure, property and function relationships that govern charge transport, catalytic activity, and interfacial dynamics will be discussed, along with recent progress in heterostructure engineering and surface functionalization strategies to enhance activity and stability. Additionally, challenges related to large-scale synthesis, environmental stability, and integration into practical devices will be critically addressed. By bridging material design and energy applications, this presentation will provide insights into how MXenes can accelerate the transition toward a hydrogen-powered sustainable future.

Keywords: MXene, Hydrogen, Emerging Material, Structure-Activity Relation, Catalysis, Electrochemistry

IS-04

Unraveling Macromolecular Activation Mechanism and Protein-Protein Interactions in Health and Disease

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ACTREC Tata Memorial Centre, NAVI MUMBAI, India;
[2]*Homi Bhabha National Institute, Mumbai, India*

Abstract

The human mitochondrial serine protease High-temperature requirement A2 (HtrA2) is associated with various diseases including neurodegenerative disorders and cancer. Our lab revisited its existing functional model and established unique allosteric activation involving both its N-and C-termini. Each monomeric subunit of the trimeric enzyme comprises an N-terminal region that is responsible for its trimerization, a serine protease domain, and a C-terminal regulatory domain. Despite the availability of structural details, the reports on HtrA2's mechanistic allosteric regulation that varies with the type of activation signals still remain non-concordant. Therefore, to expound the role of the regulatory PDZ (Postsynaptic density-95/Discs large/Zonula occludens-1) domains in multimodal activation of HtrA2, we used a unique protein engineering approach to generate heterotrimeric HtrA2 variants comprising different numbers of PDZs (W denotes full-length monomeric protease and Δ denotes variant that lacks PDZ-as shown in the figure) and/or active-site mutations. Sequential deletion of PDZs from the trimeric ensemble significantly

affected its residual enzymatic activity that is studied using fluorescently labeled biosensor probes. These experimental data helped proffer a hypothesis advocating inter-subunit allosteric cross-talk via PDZs in $HtrA_2$. Furthermore, structural (X-ray crystallographic) and computational snapshots affirmed the role of PDZs in secondary structural element formation around the regulatory loops and coordinated reorganization of the N-terminal region. This study establishes a physiologically relevant working model of complex allosteric regulation through a trans-mediated cooperatively shared energy landscape. This, along with understanding its interactions with its natural substrates and modulators will provide cues for devising structure-guided tailor-made therapeutic strategies against associated diseases.

IS-05

Bayesian Approaches and its Applications in Data Science

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Abstract

Bayesian approaches have emerged as a powerful framework in data science for addressing uncertainty, incorporating prior knowledge, and enabling probabilistic inference in complex problems. By combining prior beliefs with observed data through Bayes' theorem, these methods provide a coherent way to update knowledge and make predictions under uncertainty. Their flexibility allows applications across diverse domains such as machine learning, survival analysis, natural language processing, image recognition, and decision-making under risk. Furthermore, Bayesian methods are well-suited for high-dimensional and sparse data settings, where traditional frequentist techniques often face limitations. This talk highlights the core principles of Bayesian approaches and their growing importance in advancing modern data science applications.

Keywords: Bayesian approaches, data science, probabilistic inference, predictive modeling, high-dimensional data, machine learning applications.

IS-06

Functional Genomics Approaches in Xero-halophytes: a Step towards Climate-Resilient Agriculture

Shweta Jha

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Abstract

Increasing soil salinity of agricultural lands leads to continued deterioration of the yield, posing a serious threat to global food security. Halophytic plants exhibit high tolerance for salinity by reprogramming gene expression. In the present study, we have investigated the salt-adaptation mechanism of an important xero-halophytic species- *Atriplex griffithii*. Our results indicated *A. griffthii* can tolerate high concentrations of NaCl, upto 400 mM. It has been shown to contain higher concentrations of osmolytes and evolved with an advanced antioxidant system to quench

the toxic reactive oxygen species (ROS). To elucidate the mechanism of salinity tolerance in the A. griffithii, a 2-DE based proteomic approach combined with MS/MS was used. We have identified a total of 29 differentially expressed proteins (DEPs), which were further analyzed in-silico for their subcellular location, biological functions, and metabolic pathways. The identified DEPs belong to five functional categories: photosynthesis/response to light stimulus, carbohydrate and energy metabolism, stress response, amino acid metabolism, and miscellaneous or unknown functions. Protein-protein interaction (PPI) networks were also constructed for the identified DEPs using the STRING web tool. The expression pattern for the selected genes involved in diverse biological functions was measured by qRT-PCR, which displayed a significant correlation with the proteomics data. This study has provided insights into molecular mechanism of salt-stress response in *A. griffithii* using proteomics-based approaches. The novel candidate genes identified in this study are being further explored for developing climate-resilience in the selected crops.

IS-07

AI in Wi-Fi: Game Changer or Just Hype?

Mr. Vishal Bhargava
Principal Engineer, MediaTek, Noida

Abstract

AI in Wi-Fi: revolutionizes the wireless network. It promises smarter networks with easy configuration, optimized performance, predictive load balancing, and adaptive security. This presentation examines whether AI is truly a game changer for wireless connectivity or just another layer of hype.

IS-08

The Future Is Inclusive: Increasing Gender Representation in STEM Scholarship

Dr. Madhurima Kahali
Head, Academic Relations and Partnerships (South Asia, Africa)
Taylor and Francis Group

Abstract

The future of science depends on the diversity of voices that shape it. Yet women in STEM remain largely underrepresented in scholarly literature, limiting the visibility of their ideas and the impact of their discoveries. As publishers, we have the opportunity—and responsibility—to change this. By championing gender equity in authorship, peer review, and editorial leadership, we can ensure that the research record reflects the full spectrum of human potential. This talk explores how greater representation is not only a matter of fairness, but a catalyst for stronger, more inclusive innovation that shapes a better tomorrow.

IS-09

Science for Humanity – Global Society (SHGS): Reframing Science for an Inclusive Future

Prof. Amal Amin[1] and Prof. Nerina Finetto[2]
1National Research Centre-Egypt & founding Chair of WISWB, WFWS, SHGS
2Founder and Director of Traces & Dreams, Sweden, Co-founder and Managing Director of SHGS, Italy

Abstract

Science for Humanity – Global Society (SHGS) is a new Italian NGO headquartered in Molveno that advances a simple idea with ambitious reach: science should serve the collective well-being of all people. SHGS replaces the outdated North–South divide with a truly global, transdisciplinary community where diverse knowledge systems—academic, local, and Indigenous—co-create solutions to shared challenges.

SHGS raises science's impact through three levers: (1) capacity building that equips scientists—especially women, youth, and underrepresented groups—with soft skills, futures and narrative literacy, and impact-driven mindsets; (2) inclusive networks that connect researchers, policymakers, entrepreneurs, and communities across regions; and (3) science diplomacy that uses evidence and collaboration to build trust, inform governance, and accelerate progress on and beyond the SDGs.

Flagship and partner initiatives include Women in Science Without Borders and the World Forum for Women in Science, alongside programs in Africa and global development, entrepreneurship support, mentoring, public engagement, and international collaborations that translate research into tangible benefits. By enabling knowledge to flow across disciplines, sectors, and borders, SHGS fosters equitable, sustainable development and a culture of innovation that is globally informed and locally grounded—shaping a humane future where science works for everyone.

Track 1: Physics and Frontier Sciences (PFS)

PFS-01

Synthesizing PVDF/AlN Nanofibers for Sustainable Flexible Dielectrics

K. Rani[1], Pooja[2] Uttam, A. Sharma[1], Y. Dwivedi[2] and S. Lal[3]
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Abstract
The proposed work presents the synthesis of Aluminium Nitride (AlN) dispersed Polyvinylidene Fluoride (PVDF) nanofibers for sustainable flexible dielectrics. Structural, electrical, and morphological properties of the nanofibers are examined. The novelty of work is synthesizing a nanocomposite of PVDF with AlN by electrospinning to achieve significant improvements in PVDF's dielectric and piezoelectric properties at a very low concentration of 0.3% of AlN. Electrospun PVDF/AlN nanofibers have not been reported in existing literature. Fourier Transform Infrared Spectroscopy (FTIR) revealed a enhancement to β-phase content from 45% to 46.13%. SEM-EDS analysis showed noticeable changes in surface texture and a reduction in fiber diameter upon AlN addition. X-ray Diffraction (XRD) indicated increased crystallinity from 51% to 70.5%. UV-visible spectroscopy confirmed a red shift in the bandgap from 6.1 eV to 4.06 eV, confirming the interaction between AlN and PVDF. The piezoelectric coefficient (d_{33}) improved from 4 pC/N to 7 pC/N. Dielectric analysis at room temperature showed an increase in dielectric constant from 9.4 to 17.7 and a significant reduction in dielectric loss from 23 to 0.05 at 100 Hz. These results demonstrate the effective role of AlN in enhancing the dielectric and piezoelectric characteristics of PVDF nanofibers, suggesting promising potential in flexible dielectric devices for sustainable development.

Keywords: Polymers, PVDF, Piezoelectric, Energy Harvesting, Nanofibers.

PFS-02

Curvature Effect on the Flow Dynamics through a Toroidal Vertical Microtube

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[3]*Faculty of Medecine, Cheikh Anta Diop University/Neurosurgery Fann Healthcare Center, Dakar*
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Abstract
In this study, we investigate the curvature effect on the flow dynamics along a toroidal micropipe placed in a vertical plane. The curvilinear geometry of the tube can be visualized as a quarter donut-shaped slice. We consider an incompressible fluid flow with a low Reynolds and Froude numbers ratio. A 3D fluid flow theoretical model with dimensionless Navier-Stokes equations expressed in toroidal coordinates, conservative form and physical components was developed. The topology of the flow is governed by several simulation constants including the Reynolds number Re, the Froude number Fr and the curvature parameter which is the ratio between the inner and the major radius r0 . R To find an alternative to the impossibility to analytically solve the nonlinear Navier-Stokes partial differential equations, and to avoid the difficulty to compute the pressure gradient term, numerical tech- niques such as finite difference method

and fractional step method were chosen to discretize the spatial and temporal derivatives with an iterative method for the numerical resolution. The velocity components and the pressure computations were also decoupled over a staggered grid to ensure the stability of the numerical scheme [1–7]. Our numerical investigations helped us on understanding the impact of curvature on the flow properties and the friction coefficient, by testing the ratio r R for a constant value of Re. The intensities of both the velocity field and the friction coefficient increase with this curvature parameter.

Keywords: Navier-Stokes equations, Curvilinear geometry, Toroidal micropipe, Reynolds number, Froude num- ber, Computational Fluid Dynamics (CFD), Staggered grid, Fractional steps method, Finite difference method. F

PFS-03

Influence of Copper Doping on the Structural and Optical Properties of Cerium Oxide Nanoparticles

V. Choudhary

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Abstract

In this study, pure CeO_2 and copper-doped CeO_2 nanoparticles with doping concentrations of 1, 3, and 5 wt.% were synthesized using the sol-gel method. The study is planned to examine how copper (Cu) affects the structural and optical properties of CeO_2 nanoparticles. All the samples are of single phase with no impurity phase and showing cubic fluorite structure, verified by X-ray diffraction (XRD) technique. UV-visible spectroscopy is used to investigate the optical properties, like band gap and absorption characteristics. There is a noticeable decrease in band gap energy, along with a red-shifted nature in the absorption spectra, with increasing Cu concentration. Such a decrease in band gap may relate to the charge carrier transition enhancement and formation of localized defect states produced by Cu doping. The work suggests that adding Cu to CeO_2 nanoparticles can effectively modify their structure and optical properties. The improved band gap modulation and visible light absorption of these materials make them ideal for photocatalytic and optoelectronic applications.

Keywords: CeO_2, Doping, XRD, Band gap

PFS-04

Biogenic Nanogels for Articular Cartilage Regeneration

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[2]*Department of Health Science, University of the People, USA.*

[3]*Regenerative Biology Research Lab, CRMM, INMAS, DRDO, Delhi, India.*

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Abstract

In recent years, tissue engineering has emerged as a promising method for cartilage repair. Articular cartilage injuries and osteoarthritis pose significant clinical issues due to cartilage tissue's low regeneration capacity and the invasive techniques like osteochondral autograft transplantation (OATs) and palliative procedures with limited or no regeneration in hyaline cartilage. Here, we are proposing a green and sustainable and less invasive approach to articular cartilage regeneration that employs plant-based injectable green nanogels. The nanogels will be made by the combination of plant secondary metabolites isolated from Moringa oleifera, which are known for their anti-inflammatory, antioxidant, and regenerative characteristics. These

bioactive chemicals will be designed with a marine-derived biomaterial that has natural biocompatibility and the mechanical strength of nearly 0.8 to 25MPa required for soft tissue regeneration. The combination of these two natural sources is expected to enhance cell proliferation, extracellular matrix deposition, cartilage-specific tissue development and ultimately new tissue formation.

The designing and application of this green nanogels approach will provide an environmentally friendly alternative to the already existing scaffolds. Also, by using marine waste materials responsibly, this strategy would likely contribute to several Sustainable Development Goals, including excellent health and well-being, responsible consumption and production, and life below water.

Overall, the goal of this study is to bridge the gap between natural product-based therapies and current tissue engineering, providing a green, unique, cost-effective, and less invasive alternative for arthritis treatment and cartilage regeneration.

Keywords: Chondral injury; Regeneration; Tissue engineering; Nanogels; Marine waste; Sustainable development goals.

Track 2: Chemical Sciences (CS)

CS-01

Fabrication Techniques of Cellulose Derived Nano Composites Materials and Their Versatile Applications: A Review

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Abstract

A novel class of environmentally friendly materials, cellulose-derived Nano composites incorporate Nano scale reinforcements into cellulose matrices to greatly improve their physicochemical characteristics. The state-of-the-art fabrication techniques that allow for fine control over Nano filler dispersion and interfacial compatibility such as in-situ synthesis, sol-gel processes, electro spinning, ultra sonication-assisted dispersion, and green chemical routes are critically examined in this study. Multifunctionality, including enhanced mechanical strength, thermal stability, barrier performance, antimicrobial activity, and photo catalytic behavior, is imparted by the incorporation of functional nanomaterials, such as metal/metal oxide nanoparticles (e.g., ZnO, TiO_2), graphitic carbon nitride, graphene derivatives, and biodegradable polymers. These Nano composites wide range of applications in various fields, including drug delivery systems, tissue engineering scaffolds, environmental remediation through adsorption and photo catalysis, active and intelligent food packaging, and parts for flexible electronics and energy storage devices, demonstrate their adaptability.

The basic structure property linkages, scaling issues, and the necessity of lifecycle evaluations to guarantee environmental compliance are also included in this analysis. Future research areas and

emerging trends are suggested in order to maximize the industrial viability and performance of cellulose-based Nano composites in next-generation sustainable technologies.

Keywords: Cellulose, Nano composite, Fabrication, Applications, sustainable

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CS-02

Enhancing Corrosion Protection of Mild Steel Using Epoxy Coatings Modified with Acetoxime Modified Aluminum (III) Isopropoxide

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Abstract

In the work, epoxy nanocomposite coating modified by acetoxime-modified aluminium(III) isopropoxide (AMA) is introduced to offer better corrosion resistance of mild steel in a saline environment. It also caused the more crosslinking networks (Al-O-Al and Al-O-C) due to the incorporation of AMA into the epoxy matrix, which induced the increase in coating density, decrease in porosity, and improvement of hydrophobicity. These changes greatly reduced water and corrosive ion penetration. Mechanical and surface characterization gave coating uniformity and adhesion that was better. Electrochemical experiments such as EIS and Tafel revealed that the corrosion current density decreased significantly and the barrier performance was enhanced, with epoxy-AMA5 providing the best protection. The findings illustrate the promise of AMA-based epoxy coating as a lasting and efficient approach of long-term protection ofsteel corrosion in severe conditions.

Keywords: Corrosion, Epoxy coatings, steel, AMA.

CS-03

Functionalization and Characterization of Tebuconazole-Graphene Oxide Composites for Enhanced Anti-Corrosive properties

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Abstract

Graphene oxide (GO) is gradually becoming an efficient choice for corrosion protection applications due to its remarkable barrier qualities and exclusive layered structure. However, its actual performance is hindered by its fundamental hydrophilicity and low chemical stability in harsh conditions. Tebuconazole (Tb), a triazole-based substance widely recognized for its potent corrosion-inhibiting capabilities, was chemically functionalized with GO in order to overcome these constraints. This work uses a wide range of characterisation methods to examine the corrosion resistance of graphene oxide functionalized with Tebuconazole (GO-Tb) composites. The successful addition of tebuconazole to the GO matrix was verified by Fourier-transform infrared spectroscopy (FTIR). SEM study of the surface morphology showed the development of

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a homogeneous and compact protective layer, while EDX and XRD verified the successful alteration and structural stability. Significant increases in corrosion protection were shown by electrochemical performance as assessed by electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization. The GO-Tb composite decreased the corrosion rate from 116.95 mpy to 35.00 mpy and the corrosion current density from 87.55 µA (bare Al) to 27.33 µA. Both anodic and cathodic processes were effectively inhibited, according to Tafel slope analysis. GO-Tb composite demonstrated better corrosion resistance than GO and tebuconazole alone, indicating a synergistic interaction between GO and the tebuconazole molecule. Thermogravimetric analysis (TGA) also showed that the composite had improved thermal stability. These results demonstrate the potential of tebuconazole-functionalized graphene oxide for efficient corrosion protection applications by showing that it offers noticeably enhanced corrosion resistance.

Keywords: Electrochemical Studies, Graphene Oxide (GO), Azole Compounds, Corrosion Resistance

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CS-04

Development of Multi-Component Zinc Phosphate Coatings on Mild Steel: Role of Organic and Inorganic Modifiers

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Abstract

The work is based on the modification of zinc phosphatization bath to enhance the steel corrosion protection. Zinc phosphatization is widely used for enhancing corrosion resistance and paint adhesion of steel substrates. There are certain phosphate coatings which often suffer from environmental concerns and limited protective efficiency. This study investigates the modification of zinc phosphatization bath through the incorporation of environmental friendly additives and more protective efficacy like aluminum, calcium nitrate, nitric acid and oxime derivatives to improve coating performance. The modified baths were inspected for coating weight, morphology, contact angle, phase composition and corrosion resistance using FTIR (Fourier Transform Infra-red), OCP (Open Circuit Potential), EIS (Electrochemical Impedance Spectroscopy) and TAFEL readings. Results indicate that the modified baths form more compact and uniform phosphate layers with finer crystal structures, leading to significantly enhanced corrosion protection in adverse environments. The results simplify that the formulized baths can serve as a vital strategy to optimize phosphate coatings while addressing sustainability and performance challenges.

Keywords: Corrosion protection, zinc phosphatization, ceramic coatings, calcium nitrate, nitric acid, oxime, electrochemical studies.

CS-05

Synthesis and Functional Assessment of Metal and Hetero-Metal Oxide Nanocatalysts

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Abstract
Nanostructured metal and hetero-metal oxide nanoparticles have garnered significant attention in catalysis due to their unique physicochemical properties, such as high surface area, tunable band gaps, and enhanced reactivity. Materials like zinc oxide (ZnO), copper oxide (CuO), and mixed oxides—particularly copper-doped ZnO—demonstrate great potential for catalytic applications. Their tunable composition, morphology, and thermal properties offer considerable flexibility in tailoring performance for specific needs. These nanoparticles are especially promising in environmental and industrial catalysis, thanks to their ability to promote efficient electron transfer, facilitate redox reactions, and function under relatively mild conditions. This research is centered on the synthesis and development of ZnO, CuO, and Cu-doped ZnO nanoparticles through scalable chemical methods. The resulting nanomaterials exhibit improved surface activity, adjustable electronic properties, and superior charge transport behavior, making them highly effective in catalytic processes. Under visible or solar light, these nanoparticles can generate reactive oxygen species that drive the degradation of harmful dye pollutants into non-toxic, environmentally safe by-products. Ongoing research aims to optimize the design of these nanostructures for practical applications in large-scale industrial wastewater treatment. Future efforts will focus on enhancing photocatalytic efficiency, increasing long-term stability, and improving material recyclability. Ultimately, the development of such advanced metal-oxide Nanocatalysts offers a sustainable path forward in combating water pollution and supporting eco-friendly industrial practices.

Keywords: Metal and hetero-metal oxide nanoparticles, wastewater treatment, photocatalytic efficiency

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CS-06

Tailoring Epoxy Coatings with Hybrid Inhibitors for Superior Corrosion Protection on Zinc Phosphatized Steel

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Abstract

The work describes synthesizing and characterizing zinc phosphate (ZP) coating on mild steel (MS) for better corrosion protection. The ZP coating was formed on the surface of the MS (ZP-MS), which was subsequently followed by the deposition of a novel epoxy coating system (diglycidyl ether of bisphenol A-polyamide; DGEBA-PA) and epoxy modified with hybrid inhibitor, acetoxime derivative of zinc chloride (ZA) referred to as DGEBA-PA-ZA. Pull-off adhesion tests and potentiostatic polarization tests determined adhesion and the anticorrosion performance of these coatings. The findings showed that the ZP pre-treatment enhanced the

corrosion protection capability of the epoxy coating by increasing its surface roughness and resulting in improved coating adhesion. The adhesion strength of the coating measured 10.94 MPa for the DGEBA-PA-ZA epoxy coating while the corrosion inhibition efficiency (IE) of 79.05%, along with a reduced corrosion rate (CR) of 0.593 g/m²h in a 3.5% NaCl solution for 720 hours. As Fourier-transform infrared spectroscopy (FT-IR) proves, the in-situ generation of the Zn-O framework and acetoxime increases the crosslink density, reduces the porosity, and enhances the protective characteristics of the coating. Thus, there was a decreased porous structure and enhanced anticorrosion property of the modified epoxy confirmed with Scanning electron microscope (SEM) and other analyses. These results support the positive impact on corrosion and adhesion by introducing ZP before applying epoxy-ZA coatings to mild steel substrates.

CS-07

Dietary Carotenoids and Their Impact on Breast Cancer Therapeutics

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Abstract

Breast cancer is a malignant cell growth within breast tissue and second most common cancer affecting millions of individuals accounting for a substantial proportion of cancer-related fatalities. The Global Cancer Observatory (GCO) reported that globally approximately 2.3 million/year new cases were identified and over 685,000/year deaths. The dietary nutrition intake of bioactive compounds present in plants such as fruits and vegetables are crucial avenues in cancer prevention. Carotenoids are naturally occurring pigments that have emerged as promising chemo preventive agents due to their free radical scavenging and anti-inflammatory properties. The therapeutic potential of these natural pigments is notably underscored by their ability to combat oxidative stress, a critical factor in the pathogenesis of numerous diseases. We aim to offer a holistic and evidence-based perspective on the potential role of carotenoids in breast cancer via prevention, therapeutic and management.

CS-08

Ruthenium–NHC Complexes with Dual Applications: Catalytic C–H Bond Functionalization and Anticancer Potential

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Abstract

N-Heterocyclic carbene ligands have a proven track record in assisting catalysis and bioactivity studies in presence of transition metals. In this regard, transition metal-catalyzed C-H functionalization techniques have become a cutting-edge tool for effective fine-chemical synthesis using easily accessible starting materials and without producing unwanted byproducts. In our study, N-heterocyclic carbene (NHC) complexes of silver (I) and ruthenium (II) have been synthesized and utilized in C-H functionalization reactions. In addition, their cytotoxic effects on

a range of lung cancer cell lines have been assessed. 2-methyl-7-(1H-1,2,4-triazol-1-yl)-1,8-naphthyridine ligand precursor was synthesized for the formation of a set of triazolium-based NHC ligands. The ruthenium complexes were prepared by the reaction of dimeric ruthenium-p-cymene complex with 2-(4-benzyl-4,5-dihydro-1H-1,2,4-triazol-1-yl)-7- methyl-1,8-naphthyridine bromide (L1) and water soluble sodium 3-(1-(7-methyl-1,8- naphthyridin-2-yl)-1H-1,2,4-triazol-4(5H)-yl)propane-1-sulfonate (L2) ligands. Different spectroscopic and analytical investigations have been used to characterize the ligands and their corresponding metal complexes. This study aims to explore the catalytic activity and bioactivity of different ruthenium-NHC complexes.

Keywords: N-Heterocyclic carbene ligand; ruthenium-NHC complexes; silver-NHC complexes; C-H functionalization reaction, anticancer activity.

CS-9

Utilizing Heterogeneous and Homogeneous Catalysts to Convert CO2 to Useful Chemicals: A Brief Overview

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Abstract

Carbon dioxide, a notable greenhouse gas, is available in large amounts and is also increasing day-by-day due to various human activities. An interesting area of research has, therefore, evolved to capture this CO2 and transform it into useful and value-added products. Different research groups are probing into this area and have found out that metal-based catalysts are extremely efficient in converting CO2 to industrially beneficial molecules like methanol, formic acid, glycerol carbonate, etc. Researchers have investigated the use of both homogeneous and heterogeneous catalysts to carry out the conversion of CO2. Among the homogeneous catalysts, main group-based catalysts like dibutyltin (IV)oxide have catalyzed the formation of glycerol carbonate, while transition metal-based hydride complexes of nickel and ruthenium have converted CO2 into formic acid. Among the heterogeneous catalysts, the oxides and carbonates of transition metals and lanthanides have been found useful. Also, zeolites doped with different metal oxides have successfully converted CO2 to glycerol carbonate. Herein, a brief overview is presented to survey the synthesis, characterization and catalytic efficiency of different metal-based complexes to carry out functionalization reactions of CO2.

Keywords: CO2 functionalization reaction; homogeneous catalysts; heterogeneous catalysts; glycerol carbonate, CO2 utilization.

CS-10

Green Sonochemical Synthesis of Quinoline Derivatives Using Biogenic TiO_2 Nanocatalyst

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Abstract

A green, aqueous-mediated Sonochemical approach has been developed for synthesis of benzo[h]quinoline-3-carbonitrile derivatives *via* a one-pot, four-component domino Knoevenagel–Michael condensation involving benzaldehyde, malononitrile, α-tetralone, and ammonium acetate the first-time. The reaction proceeds efficiently under high-power ultrasonic irradiation in the presence of a catalytic amount of TiO_2 nanoparticles. Initially, the TiO_2 NPs were synthesized through a biogenic route using the leaf extract of *Raphanus sativus* as both a reducing and capping agent under sonication. The biosynthesized TiO_2 NPs exhibited excellent catalytic activity for the target transformation, affording a series of benzo[h]quinoline-3-carbonitrile derivatives in high yields under environmentally benign, simple, and scalable reaction conditions. The structural and morphological characteristics of the TiO_2 NPs were thoroughly investigated using FT-IR, SEM, TEM, XRD, and EDX analyses.

Keyword: Green synthesis; Sonochemistry, TiO_2 nanoparticles, *Raphanus sativus* leaf extract; benzo[h]quinoline-3-carbonitrile.

CS-11

From single use to circular solution: a dual-benefit strategy for paper cup recycling and mortar enhancement

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Abstract

Paper cups, considered as a boon for the environment, are actually a threat due to their limited recyclability. This study investigates a solution to this problem which can be applied commercially. By using different concentrations of sodium hydroxide (NaOH) and hydrogen peroxide (H_2O_2), we were able to identify an optimal combination of 0.25 M NaOH and 10 ml H_2O_2 that enabled efficient separation of pulp and plastic film with a yield of 73% of cellulose. The recovered plastic film with cellulose residue was incorporated into mortar mixtures at different concentrations (0%-1.5%). to make mortar blocks. Compressive strength testing revealed that composite with 0.5% plastic-cellulose residue demonstrated a increase in compressive strength compared to the control. These findings highlight a dual-benefit strategy of waste minimization and sustainable material innovation for construction applications.

CS-12

Advances in the Classification and Engineering of Surface-Grafted Smart Hydrogels for Targeted Applications

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Abstract

The exceptional biocompatibility and high-water concentration of hydrogels have made them flexible biomaterials with tremendous potential in biomedical applications. Hydrogels decompose naturally and are not harmful. This review looks at the different properties and types of hydrogel nanocomposites reinforced with different ceramic and metallic elements. A clear emphasis was

placed on carefully considering surface modification methods, paying particular attention to manufacturing, patterning, and their uses in biomedicine. The review explains the benefits of new cross-linking methods for customizing hydrogel properties for particular uses, such as physical, chemical, and physical-chemical dual cross-linking. This review also explains the major bio-application of functionalized hydrogels. It emphasizes the importance of nanocomposite hydrogels and multifunctional self-assembled monolayers in solving contemporary biological difficulties such as infection control, medication delivery, and tissue regeneration. It explains the need for interdisciplinary collaboration and ongoing research efforts to realize the full potential of hydrogels and nanomaterials in biomedical applications. Overall, this review gives useful insights into current advances and future possibilities for hydrogels grafted with metals and ceramic additives in biomedical applications, highlighting the need for multidisciplinary cooperation and ongoing research in nano(bio)technology.

CS-13

Structure-Based Virtual Screening of Indolyl-Azole Derivatives for Antimicrobial Agents- An Overview

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Abstract

Indole is recognized as a multifaceted heterocyclic precursor due to its diverse pharmacological properties and exhibits a significant likelihood of success in the pursuit of therapeutic candidates.[1] Numerous natural compounds, alkaloids, and bioactive heterocycles[2] incorporate indole as the active pharmacophore. These motivate researchers to investigate it as a potential molecule in the process of developing medicines.[3-4] The present review will illuminate the structurally varied class of indole-based azole derivatives with significant pharmacological action.[5] The review aims to assist researchers in selecting leads for particular targets while offering essential insights into the construction of a hybrid pharmacophore-based methodology in drug development with improved efficacy.[6] The current reviews on indole-based azole derivatives correlate structures with biological activity and emphasize important pharmacophores. This review mainly highlights in-silico antimicrobial activities of indole-based azoles via molecular docking and various distinct pharmacological targets for indole derivatives, which could provide comprehensive insights essential for ligand-based drug design via a molecular docking protocol.

CS-14

Synthesis of Thiazolidine Engrafted New Dispiro[indeno[1,2-b] Quinoxalinone-Pyrrolidine Hybrids

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Abstract

Cycloaddition reactions are one of the most important classes of reactions in organic synthesis and have been extensively used over the past several years. Within this class, 1,3-dipolar cycloaddition reactions which involved the chemical reaction between a 1,3-dipole and a dipolarophile to form a five-membered ring have been studied widely owing to their ability to form multiple bonds with high regio- and stereochemical selectivity. By carrying out the reaction in an intramolecular manner, it can produce two rings and up to a total of four new chiral centers, making it a powerful method for organic synthesis with specific regio- and stereochemical selectivity. As our continuing effort to the construction of structurally complex spiro hybrids, we report here in the regio- and diastereoselective synthesis of a new hybrid dispiro-thiazolidinones cores form the multi-component 1,3-dipolar cycloaddition reaction of dipolarophile (2Z)-methyl-2-[(Z)-4-oxo-3-aryl-2-(arylimino)thiazolidin-5-ylidene] acetate as key dipolarophile and azomethine ylide derived from reaction of L-phenylalanine and heterocyclic ketone indenoquinoxalinone. The present study involves the generation of three new bonds and more than three stereogenic centers in a single operation under mild reaction conditions with high yields in shorter reaction time. The structure elucidation is based on NMR spectroscopic studies. The details of present work and mechanism will be discussed during the conference.

CS-15

PVDF-HFP and Azole-Based Polymers in Advanced Coating Technologies: Corrosion, Bioactivity, and Emerging Functional Applications

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Abstract

Corrosion and biofouling are major challenges in marine, industrial, and biomedical environments, demanding coating strategies that combine passive durability with active surface protection. Poly(vinylidene fluoride-co-hexafluoropropylene) (PVDF-HFP) is a fluoropolymer with excellent barrier, dielectric, and mechanical properties, while azoles such as benzotriazole, triazole, and imidazole provide site-specific corrosion inhibition and bioactivity. Their integration yields hybrid systems that extend the functionality of PVDF-HFP beyond conventional coatings, offering dual anticorrosion and antifouling performance. This review summarizes advances in PVDF-HFP/azole hybrids, spanning protective coatings, bioactive membranes, and electrochemical devices. Design strategies, including dual-layer assemblies, covalent functionalization, nanocontainer reservoirs, and multifunctional composites are critically discussed with emphasis on interfacial mechanisms and performance metrics. Current challenges remain in ensuring long-term retention of azoles, scaling up fabrication, and developing environmentally benign formulations. Looking forward, PVDF-HFP/azole hybrids hold promise not only for anticorrosion and bioactive coatings but also as versatile platforms in energy storage, catalysis, and biomedical applications, underscoring their potential as multifunctional polymer materials.

Keywords: PVDF-HFP coatings; Azole Polymers; Corrosion inhibition; Antifouling; Antimicrobial coatings.

Track 3: Biological & Life Sciences (BLS)

BLS-01

Comparative Evaluation of Three Ethnomedicinal Plants of Assam, India, using Untargeted Metabolomics, Network Pharmacology, and in Vitro Antithrombotic Assays: A Systems-Based Approach

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Abstract

The identification of antithrombotic agents from natural sources, such as plant extracts, is gaining momentum due to the limitations of conventional drugs, such as bleeding risks and resistance. Many traditionally relevant medicinal plants used for cardiovascular conditions have demonstrated inhibitory effects on platelet function and blood coagulation. This study aims to scientifically validate the therapeutic importance of three ethnomedicinal plants of Assam, India, namely, *Melastoma malabathricum, Solanum violacium,* and *Ageratum conyzoides,* with particular reference to the antithrombotic potential of their leaf extracts. A comparative assessment of the antithrombotic effects of the plant extracts has been evaluated by integrating untargeted metabolomics, *in vitro* assays, and a network pharmacology-based approach. Several bioactive metabolites with potential anticoagulants and antiplatelet effects were identified in the three leaf extracts using GC-MS-based untargeted metabolomics, thereby corroborating the use of these plants in traditional medicine. *In vitro,* studies suggested that all three plant extracts demonstrated significant anticoagulant properties on mammalian platelet-poor plasma. In addition to differential antiplatelet activity, the plant extracts also demonstrated selective fibrinogenolytic activity and dissimilar effects on the prothrombin activation property of factor Xa, suggesting differences in their mechanism of antithrombotic action. Network pharmacology-based analyses identified several common bioactive components in the three extracts, providing insight into their putative targets and pathways involved in platelet function and thrombosis. This integrative approach presents a robust platform for elucidating the multi-target actions of plant- based antithrombotic agents. These findings pave the way for further pharmacokinetic and clinical studies, supporting plant-based interventions in thrombotic disorders.

Keywords: Ageratum conyzoides, Anticoagulant, Antiplatelet, Melastoma malabathricum, Solanum violacium.

BLS-02

Bioconversion of Agricultural Wastes to Bioethanol: Harnessing Bacterial Cellulases for Hydrolysis of Cellulolytic Biomass

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Abstract

The increasing demand for clean and sustainable energy in Kenya has sparked interest in biofuel production, aiming to reduce the country's overdependence on fossil fuels and mitigate greenhouse gas emissions and environmental degradation. Biofuels are renewable energy sources derived from various biomass feedstocks. Among these biofuels, second-generation bioethanol produced from agricultural residues such as rice husks and sugarcane bagasse, which are rich in lignocellulose, presents a promising pathway for clean energy generation while simultaneously addressing the challenges of agricultural waste management. Additionally, the bioconversion of lignocellulosic biomass to bioethanol can generate lignin-rich residues for biochar production, create job opportunities and contribute to a more sustainable and circular bioeconomy in Kenya. To achieve success in biochemical conversion of agricultural residues to bioethanol, it is necessary to have efficient cellulolytic enzymes, such as microbial cellulases, for the hydrolysis of cellulosic biomass into fermentable sugars. This study highlights the potential application of cellulase-producing bacteria in technologies that convert lignocellulosic biomass into bioethanol. Several species of cellulolytic soil bacteria were isolated from Gazi Bay mangrove forest and Kakamega rainforest. These bacteria exhibited high cellulolytic activity against various substrates, including carboxymethylcellulose (CMC), cellulose and Avicel. Molecular characterization using 16S rRNA sequencing revealed that the bacterial isolates with the highest cellulolytic activity belong to the genus Bacillus, specifically B. subtilis and B. amyloliquefaciens. The physical-chemical parameters required for optimal growth of these bacteria, including temperature, pH, and salinity, were also determined. The findings underscore the potential of leveraging cellulolytic soil bacteria in lignocellulosic bioethanol technology. However, inherent challenges, such as technological and financial limitations, must be addressed for technology to realize its full potential as a source of clean and sustainable bioenergy.

Keywords: Bioethanol production, Organic wastes, Cellulolytic soil bacteria, Circular bioeconomy

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BLS-03

Computational Analysis of Intrinsically Disordered Regions in Ribosomal Assembly Using Molecular Dynamics Simulations

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Abstract

Macromolecular assemblies, such as ribosomes, are essential cellular organelles involved in key biological processes, including protein synthesis, RNA splicing, and protein degradation. These complexes frequently incorporate intrinsically disordered proteins (IDPs) and intrinsically disordered regions (IDRs), which lack a fixed tertiary structure yet play a crucial role in mediating protein-protein and protein-macromolecule interactions. In this study, we employed computational approaches to systematically identify IDPs across 366 curated ribosomal structures from the Protein Data Bank (PDB), based on key features such as amino acid composition and the percentage of disordered residues predicted by tools like PONDR and AIUPred. To validate the role of disorder in ribosomal protein complexes, we selected one representative structure for in-depth comparative analysis: Crystal structure of ribosomal proteins S15, S6, S18, and 16S Ribosomal RNA (PDB ID: 1G1X), identified as the least number of disordered region present.

This structure was subjected to comprehensive structural and energetic assessments using all-atom molecular dynamics (MD) simulations. Several parameters were analyzed, RMSD, RMSF including radius of gyration, electrostatic repulsion, solvent accessible surface area, hydrogen bonding patterns, per-residue binding energy and the free energy landscape. Our analysis states that the least disordered region complex showed that RNA association reduces conformational fluctuations, increases compactness, and strengthens overall stability. These results show the contribution of intrinsic disorder to the structural diversity of ribosomal assembly, supporting their ability to form dynamic and transient interactions. Overall, this study shows quantitative insights into how protein disorder enhances both the dynamic versatility and the stability of large macromolecular systems such as ribosomes.

Keywords: Ribosomes, Intrinsically Disordered Proteins, Conformation, Simulations, Protein Disorder.

BLS-04

Polyhydroxyalkanoate biopolymer production using consortium from different extremophiles and its bioplastic characteristics

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Abstract

Polyhydroxyalkanoates (PHAs), also known as bioplastics or green plastics, can serve as an alternative to synthetic plastics. This biopolymer can be derived from bacteria. In this present study, many different strains were screened for PHA production. The strains were screened by nile blue and nile red staining. To produce a larger amount of PHA from the same amount of media, it is crucial to select bacteria with high PHA production efficiency. Bacteria from extremophilic habitats have a higher adaptability and resilience which are crucial for maximum PHA production. Extremophilic bacteria are a diverse group of bacteria that thrive in extreme environments and produce this type of biopolymer. Phylogenetic profile of the mixed microbial culture showed the dominance of Bacillus, from various sources, a known PHA accumulator. PHA obtained from individual bacteria was mostly PHB. The yield ranged from 0.2-0.6 g/L, with consortium producing reached 0.8 g/L after 72 hours of incubation. The PHA produced from this consortium was characterized using chemical and functional methods to understand the understand the crystallinity and structural properties of the polymer.

Keywords: Polyhdroxyalkanoate, Bioplastic, Biomaterial

BLS-05

Plastic Pollution Driven Antimicrobial Resistance in Marine Ecosystems Emerging Threats to Ocean and Public Health

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Abstract

Antimicrobial resistance (AMR) is a growing danger to marine ecosystems, driven by the evolution and spread of antibiotics as well as heavy metals, microplastics, and untreated effluents. A major environmental contaminant that has an impact on human health is microplastics (MPs). MPs provide an environment in which bacterial biofilms can grow. AMR biofilms have been known to be transported by plastics during their usage, collection, or disposal in clinical, residential, agricultural, or aquatic environments. In addition to transferring antibiotic-resistance genes (ARGs), these biofilms offer a favourable environment for horizontal gene transfer (HGT), which includes ARG transfer. Resistant infections have been found in higher concentrations in coastal waters close to urban and industrial areas, especially in areas with poor sanitation systems. In addition to posing serious dangers to human populations and marine species through seafood intake and recreational water usage, this disturbs the ecology of marine microbes. Through increased runoff from extreme weather events, climate change can further worsen these concerns by facilitating the spread of AMR. The combination of AMR and plastic pollution in the marine environment is a difficult problem that cuts across conventional sectoral lines. An integrated One Health strategy that incorporates improved antibiotic stewardship, cutting-edge wastewater treatment technology, ongoing environmental monitoring, and robust intersectoral policy cooperation is required to address this epidemic. The goal of this review is to highlight new research on the trends and causes of AMR in maritime environments.

BLS-06

Reusable Nano Biosurfactant-Chitosan-Zeolite System for Dye Decolourization

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Abstract

Nano-biosurfactant and dye decolorizing enzymes were immobilized in chitosan-zeolite composite for effective decolourisation of textile effluent wastewater. The objective of the current study is to investigate the ability of nano biosurfactant entrapped in chitosan-zeolite composite beads for dye removal. Silver nano biosurfactant are alternative breakthroughs for the above purposes as they are easily synthesized and cost effective. Optimal pH for silver nano biosurfactant production was 10 where biosurfactant act as stabilizer. It was further characterized by UV-spectrophotometer, DLS, Zeta, FTIR, SEM. The characteristic peak of nano biosurfactant was observed at the 425 nm by UV-spectroscopy and FESEM analysis was conducted for the morphology analysis and confirmation of attachment of all components of composites. The size of the nano particles population was 193.76 nm while hydrodynamic diameter was 204.0 nm. Zeta potential of the nano biosurfactant was -24.9 mv indicating strong electrostatic repulsion. Composites were highly effective in dye decolourisation and shown potential for removal of dye and other pollutants. Nano biosurfactant-zeolite-chitosan composite beads were used as bed in column for dye removal and it can be reused as sustainable process. The immobilized biosurfactant and enzyme exhibited good reusability, operational stability, and storage stability properties that could have real-world uses.

Keywords: Immobilization, Nano biosurfactant, Chitosan-zeolite composite, dye decolourisation,

BLS-07

Eco-Friendly Co-Production and Characterization of PHA and Biosurfactant using Novel Bacterial Consortia using Renewable Agro-Waste Carbon Sources – A Step towards Sustainable Biocomposites.

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Abstract

The urgent need for the development of sustainable alternatives to convectional plastics has been increased and has driven interest in manufacturing bio-based multifunctional materials. This study focuses on the novel approach for the simultaneous production of polyhydroxyalkanoates (PHA) and biosurfactant from novel bacterial consortia derived from geographically distinct regions of Ladakh and Andaman Islands, India. Renewable Agro-waste substrates such as canola oil cake and olive oil cake were selected due to their composition, making them suitable for the fermentation. The aim is to develop high-quality PHA with desirable properties for bioplastic fabrication and biosurfactants with excellent stability, emulsification capacity and surface tension reducing ability. The characterization can be done using fourier transform infrared spectroscopy (FTIR), dynamic light scattering (DLS), zeta potential and x-ray diffraction to confirm the functional properties. This integrated approach not only demonstrates cost-effective, eco-friendly, sustainable and efficient route for value-added product development using potential bacteria and renewable agro-industrial substrates but also enables agro-industrial waste valorization. The dual production of PHA and biosurfactant opens new doors for the development of PHA-biosurfactant based Biocomposites. This strategy aligns with the circular bioeconomy goals and represents a step forward in advancing sustainable polymer research.

Keywords: PHA, biosurfactant, Agro-waste valorization, renewable sources, sustainable Biocomposites, bacterial consortia

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BLS-08

Harnessing the Potential of Pomegranate Peels and SCOBY for the Development of Functional Beverage and Bacterial Cellulose

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Abstract

Agro-waste valorization is emerging as a promising avenue for crafting innovative functional foods. The vibrant peels of Punica granatum L., also known as pomegranate, are treasure troves of bioactive compounds, brimming with considerable therapeutic potential. In this exploration, these colorful and nutrient-dense peels are harnessed as a valuable substrate for the creation of a refreshing fermented drink The resulting beverage bursts with health-boosting antioxidant and antimicrobial properties. Phytochemical profiling of the pomegranate peels reveals a wealth of phenolic compounds, vibrant flavonoids, and robust tannins, all of which significantly enrich the beverage's phytochemical composition. Moreover, the symbiotic culture of bacteria and yeast (SCOBY) used during fermentation opens exciting doors for the biosynthesis of exquisite

bacterial cellulose. This remarkable bacterial cellulose was thoroughly examined for its physicochemical characteristics, revealing intriguing properties. This study illuminates an innovative approach to food waste valorization, transforming what was once discarded into a functional food powerhouse, while also paving the way for various biotechnological applications.

Keywords: Nutrition, Waste Valorization, Pomegranate Peels, SCOBY, Bacterial Cellulose

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BLS-09

Olive-Derived HDAC Inhibitors in Nanoformulation: Advancing Efficient Therapeutics

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Abstract

Nano-herbal compositions have garnered a lot of interest in the last ten years. By using the potential advantages of nanotechnology to improve bioavailability, therapeutic efficacy, and customized administration of herbal components, these products provide possible treatments for a variety of illnesses. This study explores the potential of olive-derived bioactive compounds, specifically oleuropein, hydroxytyrosol, and oleanolic acid, as natural histone deacetylase (HDAC) inhibitors. HDAC inhibitors play a crucial role in regulating gene expression and have therapeutic potential in treating diseases associated with epigenetic alterations. Given the toxicity and adverse effects of synthetic HDAC inhibitors, natural alternatives are being sought. Olive-derived compounds, known for their anti-inflammatory, antioxidant, and anticancer properties, show promise as efficient HDAC inhibitors. Olive leaf extract and olive oil are abundant in natural HDAC inhibitors that contribute to the antioxidant and UV-protective phytochemicals. This study also investigated the green synthesis of zinc oxide nanoparticles (ZnO NPs). The addition of these ZnO NPs containing the HDAC inhibitors paved the path for the formulation of an efficient skin care cream with a promising sun protective factor. The intricate relationships among herbal extracts, nanoparticles, and other formulation components could have a detrimental impact on the physical, chemical, and biological stability of the finished product. The formulation and stability of these nano-herbal compositions will be improved, their therapeutic efficacy in clinical settings will be examined, and their potential uses in the prevention and treatment of various diseases will be the main focus of future research. Finally, the development of novel, all-natural, and efficacious skincare products is made possible by this research.

Keywords: Good heath, Histone deacetylases, HDAC Inhibitors, Oleuropein, Hydroxytyrosol, Oleanolic Acid, Skin Cream, Therapeutics.

BLS-10

Mitochondrial Dysfunction in Neurodegeneration: Mechanisms, Pathophysiological Impact, and Therapeutics

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Abstract

Mitochondria, the cell's energy-producing organelle, are central regulators of neuronal survival, energy homeostasis, and redox balance. Their structural and functional impairment is increasingly recognized as a critical event in the onset and progression of neurodegenerative disorders, including Alzheimer's disease, Parkinson's disease, and Huntington's disease. Mitochondrial dysfunction contributes to neuronal vulnerability through impaired oxidative phosphorylation (OXPHOS), elevated reactive oxygen species (ROS) production, disrupted calcium homeostasis, and altered mitochondrial dynamics. These events activate pathways that trigger synaptic failure, axonal degeneration, and cell death, ultimately leading to neurodegeneration. In this review, we highlight the mechanisms linking mitochondrial dysfunction to neurodegeneration and discuss how mitochondrial dysfunction interacts with other pathological processes, such as protein aggregation and neuroinflammation, thereby amplifying disease progression. This impairment arises from both internal factors, such as genetic mutations, and external factors, including environmental toxins, which induce oxidative stress and promote mitochondrial dysfunction. By emphasizing mechanistic insights and disease implications, this work provides insights into potential approaches to preserve neuronal integrity by restoring mitochondrial health. Current therapeutic directions include the use of antioxidants, modulators of mitochondrial dynamics, and emerging gene and drug-based approaches. By integrating evidence from cellular studies and disease models perspectives, this review underscores the central role of mitochondria in neuronal fate and points toward avenues for reducing the progression of neurodegenerative diseases.

Keywords: Mitochondrial Dysfunction, Neurodegenerative diseases, Reactive oxygen species, Oxidative stress, External factors, Internal Factors

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BLS-11

Antifungal Activity and Phytochemical Analysis of Few High-Altitude Medicinal Plants of Western Himalayan Regions

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Abstract

The limited number of antifungal drugs and emerging thread of multidrug resistant fungal pathogens has forced the scientific community to develop novel antifungal agents particularly from natural resources[1]. In this present study, the different organic solvent extracts of few medicinal plants collected from different Himalayan regions of India were found to inhibit the growth of opportunistic fungal pathogens such as *Candida albicans* and *non-albicans* species. The crude extract was subjected to thin layer chromatography (TLC) in an organic solvent methanol and chloroform (7:3). TLC-bioautography was used to determine the lead bioactive compounds present in crude extract[2]. Based on the GC-MS and FTIR analysis of the lead bioactive extract showed 13-docosenamide/9-octadecenamide as the predominant compounds (89.70%)[2]. The time-kill kinetics of *Candida glabrata* (*C. glabrata*) demonstrated that the killing was rapid and concentration dependent fungicidal activity. The killing was associated with significant change in the surface morphology of *C. glabrata* cells, as observed under Scanning Electron Microscope (SEM). Notably, a combination of lead bioactive extract with clinically approved drugs amphotericin B, nystatin and fluconazole showed significant synergic effect in

killing *C. glabrata* cells[3]. Interestingly, the bioactive extract showed less cytotoxicity at minimum inhibitory concentration (MIC) concentration against mammalian cell lines (HeLa and HEK 293). Taken together, these high-altitude medicinal plants extract represent a good template for further designing and developing anti-fungal agents.

Keywords: Himalayan medicinal plants, *Candida* species, Thin Layer Chromatography (TLC), Minimum inhibitory concentration (MIC)

BLS-12

Harnessing Bacillus Chitinases for Sustainable Detoxification and Decolorization of Industrial Textile Dyes

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Abstract

This research used two chitinase enzymes derived from Bacillus species for eco-friendly decolorization of toxic textile dyes. Many different species of Bacillus produce unique enzymes, and chitinase has been studied extensively because it can degrade chitin, a major structural polysaccharide found in many products, including the exoskeleton of arthropods and the cell wall of fungi. Chitinase enzymes are recognized for their ability to facilitate bioremediation by degrading chitin-based products, detoxifying chitinous substances, and also hydrolysing them into N-acetylglucosamine. Here, B. subtilis and B. anthracis were isolated and optimized for chitinase production under varying temperatures and varying substrate conditions. Under these conditions, the highest activity for B. subtilis was at 25 °C and 0.5% chitin, where there was a high amount of protein at around ~45 kDa. The purified enzymes effectively decolorized the dyes malachite green, alizarin red, brilliant green, and methyl red. B. anthracis also decolorized malachite green and alizarin red, along with brilliant green and methyl red, with >98% decolorization of malachite green and alizarin red in 3–15 days. The B. subtilis chitinase showed sustained decolorization efficiency over long durations. Overall, Bacillus chitinases are seen as viable and renewable biocatalysts for controlling dye pollution in industrial settings and wastewater treatment.

Keywords: Wastewater treatment, Dye Decolorization, Chitinase, Bacillus

Track 4: Mathematical & Statistical Sciences (MSS)

MSS-01

RAM Analysis and Performance Optimization of Paper Manufacturing Plant using Nature Inspired Algorithms

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Abstract

The present study is designed to optimize the performance of paper manufacturing plants (PMP) using nature inspired algorithms. The paper manufacturing plant is a very complex entity configured using several subsystems. All the subsystems configured in the series structure and failure of anyone causes the complete system failure. To achieve the objective of the proposed study, initially RAMD investigation of each subsystem as well as complete power plant is performed and later a mathematical model is developed for performance prediction of the paper plant using nature inspired algorithms. The Markov birth-death process is used to develop the CK differential-difference equations. All the failure and repair rates are considered as exponentially distributed random variables. The random variables are statistically independent. The repairs are perfect and sufficient repair facility available in plant. Various system effectiveness measures derived for a particular case at various population sizes at several iterations. The numerical results highlight importance of the proposed model.

Keywords: Paper Manufacturing Plant, Performance Analysis, Genetic Algorithm, Particle Swarm Optimization, Markovian Approach.

MSS-02

Probabilistic Analysis and Availability Prediction of Coal Handling Units in Thermal Power Plants with Artificial Neural Networks and Regression Analysis

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Abstract

This research paper explores the modeling of a coal handling unit in a thermal power plant through the application of neural networks and regression techniques to improve the accuracy of actual measurement data. Neural networks are computational models composed of interconnected algebraic equations that simulate the way the human brain processes information. In this paper, a feed forward back propagation neural network technique is used to train the data in SPSS environment. Regression analysis is a statistical technique employed to estimate and analyze the relationships between variables. It includes a range of methods designed to model and evaluate interactions between a dependent variable and one or more independent variables. This approach enables a detailed understanding of how changes in independent variables affect the dependent variable, thereby providing insights into their interdependence and influencing factors. Regression

technique Used in this paper implemented in SPSS environment. To meet the objectives, initial efforts focused on the statistical modeling of the coal handling unit, specifically incorporating components such as the wagon tippler and conveyor. This preliminary analysis provided a foundation for understanding and optimizing the system's performance. The effectiveness of the developed model is assessed using analytical methods such as R2 analysis and ANOVA analysis.

Keywords: Availability, Coal-Handling Unit, Artificial Neural Network (ANN), Linear Regression

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MSS-03

Availability Improvement in PV Solar Power Plants using Stochastic Methods

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Abstract

This study focuses on improving the availability of photovoltaic (PV) solar power plants. These plants are made up of three key subsystems—PV modules, inverters, and transformers, arranged in a series configuration. The system's steady-state availability is analyzed using normalizing and Chapman-Kolmogorov equations. It is assumed that all subsystems have statistically independent failure and repair rates, which follow an exponential distribution. The numerical results show that increasing the repair rate improves the overall availability of the plant, raising it from 0.983005 to 0.984553.

Keywords: Availability, Photovoltaic (PV) Solar Power Plants, Stochastic Modeling

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MSS-04

Reliability Optimization of Cloud Infrastructure using Dragonfly and Grey Wolf Algorithms

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Abstract

Cloud infrastructure provides a real time computing environment to customers and has wide applicability in healthcare, medical facilities, business, and several other areas. Most of the data was recorded and saved on the cloud. The cloud infrastructure is configured using several components and that makes it a complex structure. The high value of availability and reliability is essential for satisfactory operation of such systems. So, the present study is conducted with the prominent objective of assessing the optimum availability of the cloud infrastructure. For this purpose, a novel stochastic model is proposed and optimized using dragonfly algorithm (DA) and Grey Wolf optimization (GWO) algorithms. The Markovian approach is employed to develop the Chapman-Kolmogorov differential difference equations associated with the system. It is

considered that all failure and repair rates are exponentially distributed. The repairs are perfect. The numerical results are derived to highlight the importance of the study and identify the best algorithm. The system attains its optimum availability 0.9998649 at population size 120 with an iteration 700 by GWO. It is revealed that grey wolf optimization algorithm performed better than the Dragonfly algorithm in assessing the availability, best fitted parametric values and execution time.

Keywords: Availability, Cloud Infrastructure, Dragonfly Algorithm, Grey Wolf Optimization Algorithm, Markov Process

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MSS-05

Semi-Markov Reliability Modelling of Multi Pump Water Treatment Systems for Improved Operational Continuity

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Abstract

Reliable access to clean water is a critical component of public health infrastructure, especially in regions facing supply volatility or resource constraints. Modern water treatment facilities often rely on complex pumping systems to maintain uninterrupted operations. This study focuses on the reliability analysis of a multi-pump water treatment configuration comprising two identical displacement pumps and one distinct dynamic pump. The system is designed such that at least two pumps must be functional at any given time to ensure continuous water treatment and delivery. To accurately capture the system's stochastic behaviour, a semi-Markov process integrated with regenerative point techniques is employed. The model assumes all components operate within a finite warranty period, during which repair priority is given to the displacement pumps to enhance system availability. Repair times are modeled using exponential distributions, while the analysis explores the effects of varying failure rates and warranty durations on overall system performance. The study aims to quantify the system's reliability under different operational scenarios, providing key performance indicators that are crucial for planning, maintenance, and minimizing supply disruptions. The findings have significant implications for enhancing water infrastructure resilience in both urban and rural environments.

Keywords: Non-identical, Water treatment Plant, Reliability, Warranty, Semi Markov process, Regenerative point technique.

MSS-06

Reliability Measures Estimation of Single-Unit Repairable System with Server Arrival Time

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Abstract

The present study estimates the reliability measures of single unit systems under the concept of maximum operating time, preventive maintenance and server arrival time. For this purpose, two

stochastic models developed to analyse the impact of preventive maintenance on reliability measures of single unit systems. The system may be either in operative or failed state. All the time dependent random variables are Weibull distributed with different scale parameters but equal shape parameters and statistically independent. Various system effectiveness measures for both the models are obtained by using semi-Markovian approach (SMA) and regenerative point technique (RPT). Later on, estimation methodologies viz. Maximum likelihood estimation and Bayesian estimation, are employed to estimate the reliability characteristics of both the models. A Markov Chain Monte Carlo simulation study is conducted to show the efficacy of the proposed estimating methods in different situations, validating the theoretical findings and providing valuable insights for the under-consideration system models. It is revealed that without using the concept of preventive maintenance availability increase due to reduced downtime. The numerical and graphical results are derived to highlight the importance of the study for a particular case.

Keywords: Single Unit Ssystem, Preventive Maintenance, Maximum Likelihood Estimation, Bayesian Eestimation, MCMC Aalgorithm.

MSS-07

RAM Analysis of a 1-out-of-3: G System using Markovian Approach

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Abstract

A reliability model of 1-out-of-3: G configuration has been developed using Markovian approach. There are three units working in parallel out of which the working of one unit is sufficient for the proper functioning of the entire system. Reliability measures such as system reliability, mean time to system failure (MTSF), availability, steady-state availability, mean time to repair (MTTR) and maintainability are determined by using the Chapman-Kolmogorov equations and Laplace transformation technique. The cost-benefit function is also derived for the system model. The concept of load sharing is considered for the redistribution of operational load among surviving units when one or more unit in a multi-unit system fails. The failure and repair rates of the units follow negative exponential distribution. The sensitivity analysis has also been carried out to examine the effect of change in parameter values of the units on the performance measures of the system. The results are also visualized with the help of tables and graphs for better understanding of behavior of the system.

Keywords: Markov Approach, Reliability, Availability, Maintainability and 1-out-of-3: G System

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MSS-08

Enhanced Software Reliability Modeling under Dynamic Testing

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Abstract

This paper presents an enhanced software reliability growth model (SRGM) that integrated a Weibull testing effort function to more accurately capture the dynamics of real-world software testing processes. To further improve modeling accuracy, the model incorporated multiple testing coverages and accounts for change point in the fault detection process, addressing the shifts that commonly occur due to changing test strategies or resource allocation under imperfect debugging environment. The model has been validated using two real-world software defect datasets. Parameter estimation has been performed via non-linear least squares fitting, and its performance has been benchmarked against existing literature. To ensure a comprehensive assessment, the study employed key evaluation metrics: mean squared error (MSE), prediction ratio risk (PRR), and predictive power (PP). These metrics collectively measure the accuracy of model fitting and its ability to predict future fault behavior. Experimental results indicated that the proposed model significantly outperforms existing approach in both the datasets. It consistently yields lower MSE, PRR, and PP values. The incorporation of the Weibull testing effort function, along with change point analysis, validate the proposed model's ability to deliver more realistic and reliable estimates, making it a valuable tool for software project managers and reliability engineers.

Keywords: Weibull Testing Effort, Imperfect Debugging, Change Point, Testing Coverage

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MSS-09

An Enhanced Exponential-Ratio Estimator of Memory Type under Simple Random Sampling

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Abstract

In order to estimate the population, mean under simple random sampling, we propose memory-type exponential ratio estimator. The expression for the bias and mean square error (MSE), are derived up to the first order of approximation. The proposed estimator is shown to utilize past auxiliary information very effectively which results in a significantly lower mean square error (MSE) than other existing estimators. Based on theoretical derivations and real datasets, the proposed estimator was tested, and it was found to continually outperform traditional ratio-type estimators. The results obtained indicate that the use of memory type modifications in exponential-ratio estimators enables the attainment of more accurate estimates of the population mean in sample surveys.

Keywords: Exponential Memory-Type Ratio Estimator, Simple Random Sampling, Mean Square Error (MSE), Auxiliary Variable, Survey Sampling

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MSS-10

Analyzing Barriers to STEAM Education: A Stress-Strength Reliability Study on Rural Female Learners in Kerala

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Abstract

This investigation employs a stress-strength reliability framework to examine educational accessibility challenges faced by girls in rural communities seeking Science, Technology, Engineering, Arts and Mathematics (STEAM) education. The analytical model conceptualizes obstacles such as economic hardship, cultural constraints, geographical isolation, inadequate facilities and psychological barriers as "stress" factors, while supportive elements including family encouragement, government programs, mentoring initiatives, financial assistance and technological access represent "strength" variables. Through the reliability equation $R = P(\text{Strength} > \text{Stress})$, educational achievement is interpreted as the probability that enabling factors exceed existing impediments. The methodology combines theoretical probability modeling utilizing normal distributions with practical case examination to demonstrate how varying intervention levels affect reliability estimates and learning outcomes. Findings reveal that across numerous rural regions, limiting factors currently exceed available support mechanisms, resulting in diminished success probabilities for girls pursuing STEAM disciplines. However, strategic interventions including infrastructure enhancement, mentorship program expansion and financial support provision can substantially alter the equilibrium between obstacles and assistance, consequently increasing educational outcome reliability. This paper emphasizes the essential function of role models and community participation in reducing gender inequalities while offering policy recommendations supported by statistical evidence. By integrating social science insights with reliability engineering principles, this work provides a robust, data-driven foundation for educational strategy development and gender equity promotion. The study contributes an innovative methodology for advancing international objectives such as Sustainable Development Goal 4 (Quality Education) and SDG 5 (Gender Equality), particularly within marginalized and rural populations.

Keywords: STEAM Education, Educational Barriers, Gender Equity, Stress-Strength Reliability, Rural Education Policy

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MSS-11

WIVSF-VIKOR Approach for Parcel Locker Location Selection Incorporating Trigonometric Similarity and Distance Measures for Interval-Valued Spherical Fuzzy Sets

Chanchal

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Abstract

The rapid growth of e-commerce has intensified the need for effective parcel locker location strategies to enhance last-mile delivery efficiency. This task involves evaluating multiple, often conflicting, attributes under uncertainty, imprecision and hesitation. To address this challenge, a novel decision-making framework is proposed based on the newly developed similarity, distance and weighted similarity measures under the interval-valued spherical fuzzy sets. These measures incorporate membership, non-membership and hesitancy degrees, providing a more flexible and comprehensive representation of uncertainty. The mathematical properties and validity of the proposed measures are formally established. A comparative analysis demonstrates their superiority in terms of decision accuracy and robustness over existing measures. To implement the framework, a Weighted Interval-Valued Spherical Fuzzy VIseKriterijumska Optimizacija I Kompromisno Resenje (WIVSF-VIKOR) method is developed for multi-attribute decision-making (MADM), enabling the ranking of parcel locker location alternatives such as public transport stops, private car parking, post office, commercial area, high population density area and

pedestrian area. The results confirm the effectiveness of the proposed approach as a robust and practical decision-making tool in fuzzy environments.

Keywords: Interval-Valued Spherical Fuzzy Set, Distance Measure, Similarity Measure, Multi-Attribute Decision-Making, Parcel Locker Location.

MSS-12

Empowering Women's Decision Making with Hesitant Fuzzy Sets

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Abstract

This paper presents a novel approach to career path selection using hesitant fuzzy sets (HFS) in multi-attribute decision-making (MADM). A woman's career choice is a complex decision involving multiple criteria, such as job satisfaction, growth opportunities, work-life balance, and personal fulfillment. The proposed HFS-MADM model allows for the incorporation of uncertain and hesitant preferences, enabling women to make decisions that align with their values and goals. To validate the model, a numerical example is presented, utilizing suggested knowledge and accuracy measures in the context of HFSs. This research contributes to the development of decision support systems that empower women to make confident and informed career choices.

Keywords: Hesitant Fuzzy Set, Knowledge Measure, Accuracy Measure, Decision Making, TOPSIS

MSS-13

Bianchi Type-V String Cosmological Model applying Functional Relation on Hubble Parameter in Lyra Geometry

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Abstract

A Hubble factor H-centered functional correlation is used to investigate the Bianchi-V cosmology for cloud strings in normal gauge for Lyra's geometry. This relationship produces a decelerating growth initially, subsequently followed by an accelerated stage later. Furthermore, we suggest that the shear σ is directly proportional to the scalar expansion θ, leading to a relationship between the metric coefficients i.e. $C = B^n$, where n is a positive integer. In the normal gauge method, the displacement vector β is used in a way similar to the cosmological term Λ, which is in line with recent findings of supernova Ia. The cosmological parameters including the shear scalar, energy density, expansion scalar, string tension density and Hubble factor have likewise been characterized and examined thoroughly.

Keywords: Bianchi Type-V, Hubble Parameter, Lyra Geometry and String Cosmological Model

MSS-14

Bianchi Type-I String Cosmological Model in General Relativity with Time-Decaying Term and Bulk Viscosity

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Abstract

In this paper, we have examined the spatially homogenous and anisotropic Bianchi-type I string cosmological model with bulk viscous fluid, and an investigation is conducted into a variable cosmic constant Λ. We assume that the expansion θ in the model is proportional to the eigen value σ_1^1 of the shear tensor σ_i^j and that the coefficient of bulk viscosity ξ is inversely proportional to the expansion θ in the model to create the determinate model of the universe. This results in, where α and n are constant, A= α C^n. Additionally, we assume that the cosmological term Λ is inversely proportional to R^3, where R is the scale factor. It discussed how the model behaves in the presence of bulk viscosity. A thorough discussion is also done over the model's physical implications.

Keywords: Bianchi Type-I,String Cosmology, Bulk Viscosity and Cosmological Constant

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MSS-15

Reliability Modeling of Smart Grids using Markovian Approach under Provision of Spare Components

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Abstract

This current study endeavors to examine the reliability measures of smart grids by using an idea of various redundancy strategies. Smart grid is a highly intricate cyber physical system made up of seven subsystems in series structure. It is assumed that all stochastic variables related to failure rate follows exponential distribution while repair rates vary with time. For this purpose, a stochastic model is formulated using Markov Birth-Death process and Chapman Kolmogorov differential-difference equations are derived. These equations are solved by using supplementary variable techniques and langrage method. For a specific condition prominent reliability measures like availability and profit are derived. Furthermore, Variations in failure and repair rates are also taken into consideration. The findings offer practical guidance to improve the performance of smart grids through implementation of redundancies strategies.

Keywords: Reliability, Smart Grids, Markovian Approach, Exponential Distribution.

MSS-16

Reliability Modeling of a Multi-state System: A Data Center Perspective

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Abstract

Data centers serve as a framework for computers and digital infrastructure worldwide. Both developed and developing economies have serious concerns about ensuring data centers are highly available and reliable. Data center operations depend significantly on server clusters. The main objective of this study is to examine how a server cluster system behaves in terms of operational availability when cold standby redundancy is included. The complex system known as the cluster is made up of nine subsystems arranged in series. It is assumed that the subsystems failure and repair rates follow exponential distribution. Therefore, the Chapman-Kolmogorov differential-difference equations are derived using the Markov process methodology. The long-time availability of the server cluster system is evaluated by langrage and supplementary variable techniques. The numerical results derived to highlight the importance of the study.

Keywords: Multi state System, Markovian Approach, Exponential Distribution, Reliability

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MSS-17

Equilibrium Points and Stability in a Perturbed Five-Body Problem

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Abstract

This research investigates the equilibrium points and their stability in a generalized Circular Restricted Five-Body Problem (CR5BP). The model incorporates two small bodies located at the Triangular Lagrange Points (TLPs) of the classical Circular Restricted Three-Body Problem (CR3BP), while also accounting for non-gravitational forces such as solar radiation pressure and Albedo effects. Numerical computations reveal the existence of three collinear and eight non-collinear equilibrium points, with their positions shifting under varying perturbations. Linear stability analysis indicates that all collinear points are unstable, as are four of the non-collinear points, however, four non-collinear points remain stable. Finally, an examination of the system's zero-velocity curve highlights the dynamic influence of these perturbations on orbital motion.

Keywords: Astrodynamics Modeling, Orbital Dynamics, Solar Radiation Pressure (SRP), Albedo Effect, Stability Analysis.

MSS-18

Effect of Continued Fractional Potential on Invariant Manifolds in the CRTBP

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Abstract

This study analyzes the impact of the continued fractional potential (CFP) on the invariant manifolds in the Circular Restricted Three-Body Problem (CRTBP), where the secondary primary is modeled as a non-spherical body. We computed families of Lyapunov orbits around perturbed collinear Lagrange points using differential correction and numerical continuation methods. Stable and unstable invariant manifolds

associated with these orbits were computed, highlighting their role as phase-space transport channels. Results show that CFP perturbations significantly modify manifold geometry, aiding the design of low-energy celestial trajectories.

Keywords: Circular Restricted Three-Body Problem (CRTBP), Continued Fractional Potential, Lyapunov Orbits, Stability Analysis, Invariant Manifolds

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MSS-19

Stochastic Software Reliability Model in Imperfect Debugging

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Abstract

In the domain of software engineering, accurately modelling and predicting software reliability is key to maintaining high-assurance system implementation. Traditional software reliability growth models often based on perfect debugging assumptions, fail to capture the inherent uncertainties and imperfections in fault detection and removal processes. This study presented Stochastic differential equation (SDE) based Software reliability growth model (SRGM) in imperfect debugging environment. The effectiveness of the proposed model has been evaluated using the real software failure dataset. The Expectation Least Square (ELS) algorithm employed to estimate model parameters, and performance is assessed through Mean Square Error (MSE), Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). The proposed models provide better fitting and predictive accuracy over existing literature.

Keywords: SDE, SRGM, ELS Algorithm, Imperfect Debugging

MSS-20

RAMD Based Availability Assessment of Steam Generating System

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Abstract

Thermal power plants are the backbone of the electricity generation industries. In these thermal power plants, the steam generating unit plays an important role by generating the steam. Ensuring the performance and maintenance of this system faces challenges as time grows. RAMD (Reliability, Availability, Maintainability, and Dependability) serves a comprehensive analytical approach for evaluating the performance of system. The main purpose of this study is to assess the RAMD indicators such as reliability, availability, maintainability, dependability, mean time between failure (MTBF) and mean time to repair (MTTR) of the steam generating system. For this purpose, the state transition diagram is derived for each subsystem and further Chapman Kolmogorov differential equations derived with the help of Markov chain approach. Both the failure and repair rates for all subsystems are assumed to be followed by an Exponential distribution. This RAMD analysis shows that the boiler subsystems perform best with highest availability i.e. 0.99912 among all the subsystems. The overall availability of a steam generating system is 0.98008. The main findings of these studies are providing valuable insight for the thermal power plant designers and offering comprehensive knowledge that will promote productivity and efficiency.

Keywords: Thermal Power Plant, Steam Generating System, RAMD Analysis

Track 5: Engineering and Technology (ET)

ET-01

Eyesight: Integrative AI for Non-Invasive Diabetic Retinopathy Detection Using Pupillometry and Ensemble Deep Learning

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Abstract

Diabetic Retinopathy (DR) is a leading cause of vision loss worldwide, and early detection is critical for effective treatment. Traditional diagnostic methods are often invasive, expensive, and inaccessible in many clinical settings. EyeSight proposes a novel, non-invasive, cost- effective system for DR severity classification, leveraging pupillometry and ensemble deep learning models. The system collects standardized pupillary light reflex (PLR) data, preprocesses it to extract key features, and employs an ensemble of three deep learning models—ResNet, DenseNet, and EfficientNet—is trained to classify DR into five categories: Healthy (No DR), Mild DR, Moderate DR, Severe DR, and Proliferative DR. The dataset used consists of 2,750 pupillometry recordings, distributed across Healthy (1000 images), Mild DR (370 images), Moderate DR (900 images), Proliferative DR (290 images), and Severe DR (190 images). The individual model accuracies achieved are 79.7% for ResNet, 99.7% for DenseNet, and 99.9% for EfficientNet. The ensemble model further improves performance, achieving an overall classification accuracy of 99.94%. A web-based interface built with Streamlit enables clinicians to upload pupillometry data and receive real-time DR severity predictions. These results demonstrate that EyeSight offers a promising non-invasive alternative for early DR screening and can be integrated easily into clinical workflows, particularly in resource- limited settings.

Keywords: Diabetic retinopathy [DR], Ensemble models, Resnet, Densenet, Efficientnet, Streamlit.

ET-02

Rainfall-Runoff Modelling using HEC-HMS for Umngot River, Meghalaya

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Abstract

The Umngot River lies within one of the highest rainfall-receiving regions in India, Meghalaya and is highly vulnerable to flash floods. This study focused on development of a rainfall-runoff model using Hydrologic Engineering Centre's Hydrologic Modelling System (HEC-HMS)

4.12 version for the Umngot River catchment. ArcGIS was used for extracting hydrologic parameters. Gridded rainfall data from India Meteorological Department (IMD) spanning ten years (2008–2017) were utilized. A hydrological model of the Umngot river basin with a drainage area of about 820.943 km2 was set up using HEC-HMS. To estimate the rainfall losses, the Soil Conservation Service - Curve Number (SCS CN) method was used, while the Soil Conservation Service Unit Hydrograph (SCS-UH) method was used to transform excess rainfall into a direct rainfall hydrograph. Recession Constant method was used as baseflow method. Muskingum-Cunge method was adopted for routing the total runoff to the outlet point. The model was calibrated from 2008–2014 and validated for the period 2015–2017. Results of model calibration and validation showed very good fit between the simulated and observed data with Nash-

Sutcliffe Efficiency (NSE) as 0.772, Coefficient of determination (R^2) as 0.801, Percent Bias (PBIAS) as 8.25%, and Root Mean Square Error (RMSE) as 0.4. For the Validation period, the results of NSE are 0.754, R^2 is 0.789, PBIAS is 15.12% and RMSE is

0.4. Sensitivity analysis of the model was carried out for the input parameters. The results revealed recession constant as the most sensitive parameter on runoff, followed by lag time, and curve number (CN). This study underscores the applicability of HEC-HMS for hydrological modelling in high-rainfall regions. Also, this model has a future scope of flood forecasting and flood peak simulation using forecasted rainfall data.

Keywords: Hydrological Modelling, HEC-HMS, SCSCN, SCS-UH, Muskingum-Cunge, NSE, PBIAS, RMSE, R2.

ET-03

Quantitative Assessment of Flood Risk of Lower Reaches of Bhogdoi River

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Abstract

Flood is the most devastating and frequent natural disaster in North-East India, particularly in Assam. The Bhogdoi River, located in the North-Eastern region of India, experiences flood every year which cause severe damage to agricultural fields, infrastructure, hampering the livelihoods of hundreds of people. This emphasizes the need for extensive studies on flood risk analysis as well as management. This paper aims to develop an efficient and reliable methodology for preparing flood risk of the Bhogdoi River based on two essential parameters- flood hazard and vulnerability. A total of eight flood hazard indicators, including elevation, slope, drainage density, Topographic Wetness Index, NDVI, rainfall, distance from river and proximity to stream confluence were used. Additionally, land use land cover (LULC), population density, and proximity to roads and hospitals were considered as vulnerability indicators. Spatial layers for every factor were developed and their relative significances were determined through pairwise comparisons in the AHP. The Analytic Hierarchy Process (AHP) applied as a multi-criteria analysis, enabled the integration of multiple factors under two main criteria, hazard and vulnerability for flood risk assessment and mapping in the Bhogdoi River. The results show that 49.79% of the Bhogdoi River falls under high to very high flood hazard zones mainly low-lying and river-side areas. The vulnerability assessment shows that 56.26% of the river is highly vulnerable, exposing population, agriculture and infrastructure. By combining hazard and vulnerability factors, the flood risk map reveals that around 42.98% of the areas falls under high to very high-risk zone. These findings highlight the need to develop effective flood mitigation strategies for future flood events.

Keywords: AHP, Flood Hazard, Vulnerability, Risk, Bhogdoi River.

ET-04

Classification of Ransomware using Machine Learning

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Abstract

Ransomware has become one of the most common cyber threats, encrypting user content and requiring ransom payment to regain access. Conventional signature-based detection techniques will rarely identify

new or obfuscated ransomware samples. This study investigates the use of machine learning algorithms for ransomware classification based on behavioral and system-level characteristics. A publicly available dataset containing benign and ransomware samples was used to train and test various supervised learning models, i.e., Decision Tree, Support Vector Machine, and Ada boost. Preprocessing of data, feature selection, and class balancing methods were used to improve the performance of models. Experimental results show that classifiers perform better than traditional algorithms in identifying ransomware with high accuracy, precision, and F1-score. This research identifies the capability of smart, data-based strategies to improve proactive ransomware discovery mechanisms in real-time systems.

Keywords: Machine Learning, Threats to Cybersecurity, Algorithms, Classifiers.

ET-05

Modular LLM Pipelines with Long Chain: A Survey and Application

Yugakiruthika A B

Abstract

Large Language Models (LLMs) are transforming intelligent applications across diverse domains, enabling advanced capabilities such as search, summarization, planning, and automation. LangChain has emerged as a prominent orchestration framework that facilitates the development of LLM-powered applications through modular components including prompt engineering, tool integration, retrieval augmented generation (RAG), agent workflows, and memory management. Despite its rapid growth— now encompassing over 50 tools, plugins, and design patterns—there remains a lack of unified documentation and systematic comparative analysis within the LangChain ecosystem. This paper provides a comprehensive survey of the LangChain framework and its supporting tools, detailing its architectural flow, core abstractions, and modular design patterns. We categorize key components such as prompt templates, agents, retrievers, memory types, vector stores, output parsers, and deployment frameworks including LangGraph and LangServe. Additionally, we position LangChain relative to related frameworks such as LlamaIndex, Haystack, Semantic Kernel, and DSPy, highlighting their respective strengths and trade-offs. To demonstrate practical applicability, we present a concise case study of an LLM-powered Employee Onboarding Assistant developed with LangChain. This case study showcases how vector retrieval, agent-based task orchestration, and external tool integrations (e.g., Slack, email, calendar systems) can be combined to automate and personalize multi-step onboarding workflows, illustrating LangChain's flexibility and scalability. Our contributions include: (1) a structured survey and taxonomy of LangChain's tool ecosystem and architectural design, and (2) an applied blueprint for building human-centric, agentic LLM applications. This work serves as a valuable resource for researchers and practitioners aiming to design robust, modular, and production-ready language model systems.

ET-06

Impact of Learning Behaviour, Social Media, and Psychological Traits on Students, Academic Success in Higher Education

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Abstract

Knowledge and skill play a major role in a student's success, which are measured by the academic performances achieved during education in the institutions. Academic performance also depends on students' engagement during study. The reputation of the institutions also depends on the quality of

education and the students' success rate. In this paper, we investigate the factors that have an impact on academic performance and design a novel system that predicts performance, using the dataset of 200 engineering students collected through the research design method. The key attributes include learning behavior, social platform usage, and academic performance. The system performance was tested by applying Regression, Decision Tree, Random Forest, and Support Vector Regressor algorithms, and comparing prediction performance using metrics to investigate the best prediction. In this research work, found that the Support Vector Regressor system accuracy (99.7%) is better as compared to others, and also analyzes the factors affecting academic performance using graphic visualization. This system can be used in an educational institution to predict weak students, provide early interventions, and provide timely support to improve academic achievement, increasing the students' success rate in the institution. It will also reduce the student dropout rate of the institutions.
Keywords: Machine Learning, Learning Behavior, Prediction, Higher Education, Sustainability

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ET-07

Bridging the Gender Digital Divide Integrating AI and Digital Skills in Higher Education Curricula for Women in STEAM

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Abstract

The gender digital divide remains a critical barrier to achieving equity in STEAM fields, particularly in the Middle East and North Africa (MENA) region, where structural inequalities can limit women's access to advanced digital skills and emerging technologies. UNESCO (2023) reports that women continue to be significantly underrepresented in areas such as artificial intelligence (AI) and data science, despite the growing global demand for these skills. This work presents a reflective case study of curriculum design and delivery within higher education, demonstrating how targeted efforts to embed AI, data analytics, and digital tools can empower women to participate more fully in the digital economy. This paper will explore strategies for integrating advanced digital competencies into undergraduate curricula, fostering industry partnerships to ensure relevance and employability, and developing inclusive pedagogies that support retention and progression for female students. Key lessons learned will be shared, including challenges related to cultural context, resource constraints and student preparedness. The paper will conclude with evidence-based recommendations for educators and policymakers, aligning with the UN Sustainable Development Goals and UNESCO's Gender Equality Strategy. This contribution aims to provide a replicable framework for institutions seeking to bridge the gender digital divide through curriculum innovation, with a particular focus on the needs and opportunities of women in STEAM in Jordan and the wider MENA region.

ET-08

Hardware Implementation of a Novel Optimum Controller and its Comparison with PI Controller

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Abstract

A single tank system is commonly used in various industries for a range of purposes, including storage, mixing, or processing of fluids and chemicals. The maintenance of liquid level control in a tank at a desired set point is an important requirement in process control applications, such as found in the chemical,

petrochemical, and paper manufacturing industries, as well as in industrial processes like water treatment in desalination plants. The control of liquid level in single capacity tank is essential. The most commonly used controller in such type of controller is proportional- integral-derivative (PID) type controller because of its ease of use. The parameters of this type of controllers are set by using trial and error methods due to which the performance is not optimum. In this paper an optimum controller is proposed to overcome this problem and its hardware implementation. As the controller design is based on an analytical technique, it has a guaranteed convergence in obtaining the optimum controller without the need of trial-and-error approach for selecting the controller parameters. This study presents the hardware implementation of a novel optimum controller designed using a system- theoretic approach, specifically formulated through H- infinity norm optimization. The controller aims to enhance performance in liquid level control systems, particularly in single-capacity (SC) tanks, which are common in chemical and process industries. To validate its effectiveness, the proposed controller is compared with a conventional Proportional-Integral (PI) controller, both through simulation and real-time hardware experimentation. Key performance metrics such as settling time, percentage overshoot, and steady-state error are evaluated. The comparison will focus on key performance indicators such as tracking accuracy, settling time, overshoot, disturbance rejection capabilities, and control effort.

Keywords: Level Control, PI Controller, Robustness, Novel Optimum Controller, Single Tank System

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ET-09

Advanced Hybrid Deep Learning Approach for Orange Disease Detection using Segmentation Techniques

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Abstract

This study presents a novel hybrid deep learning framework for detecting orange disease from leaf images. The proposed system begins with image preprocessing, which includes resizing, conversion to grayscale, and segmentation to isolate regions of interest. The segmentation process identifies local minima and traces boundaries to highlight potential disease regions. For feature extraction, a hybrid model that integrates pretrained VGG16 and DenseNet201 architectures is employed. The original classification layers of both networks are removed and replaced with a common input layer of size 224×224×3. Features are extracted from the final layers of both models and then concatenated, forming a unified representation that is fed into a fully connected layer followed by a softmax classifier. The integration of VGG16 and DenseNet201 leverages the complementary strengths of both networks, enhancing the accuracy and robustness of disease prediction. Transfer learning is applied using defined hyper parameters, and the system's performance is evaluated using metrics such as Accuracy, Sensitivity, Specificity, Precision, Recall, as well as the Jaccard and Dice coefficients. Experimental results demonstrate the effectiveness of the proposed hybrid model in accurately detecting orange disease, thereby supporting timely intervention and improved crop management.

KEYWORDS: Orange Disease, Hybrid Deep Learning, VGG16, DenseNet201, Image Segmentation, Feature Extraction, Transfer Learning.

Innovate. Inspire. Lead

ET-10

Crop Yield Prediction using Satellite and Tabular Dataset through Deep Learning Models

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Abstract

Agricultural productivity is a crucial component of food security and economic stability in many regions. Accurate crop yield prediction enables farmers, policymakers, and agronomists to make informed decisions regarding resource allocation, crop planning, and food supply management. In this research work, a deep learning-based approach for crop yield prediction using a combination of satellite imagery and tabular data. The data is used to predict the crop yield based upon four models — U-Net, Custom CNN, DeepLabV3, and EfficientNet — each designed to extract spatial and contextual features from images while incorporating significant features affecting the crop yield like temperature, rainfall, and soil properties. The SICKLE dataset is used, which provides synchronized satellite and ground-level data for yield estimation for better results and accuracy. The models are trained, tested and evaluated using performance metrics such as Mean Squared Error (MSE), Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and R^2 Score. The train-test set used is 70: 30, and for validation of results is done through k-fold method. Among the models used to make prediction, EfficientNet gives higher accuracy of 96% and low loss of 0.077. After the k-fold cross validation was applied the accuracy of the model has enhanced to 97.67%. Extensive experiments are conducted to compare the effectiveness of each model architecture in terms of prediction accuracy and generalization capability. The findings in the work indicate that deep learning models, particularly those using spatial feature extraction from satellite images in combination with tabular data, significantly outperform traditional regression-based approaches based upon either satellite or tabular methods.

ET-11

Stellar Classification through Machine Learning Models

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Abstract

This research presents an unsupervised and ensemble-based approach to stellar classification using a selection of machine learning techniques. Leveraging data from the Sloan Digital Sky Survey Data Release 17 (SDSS DR-17), celestial objects are categorized into stars, galaxies, and quasars. The study explores how unsupervised and ensemble learning methods can enhance the efficiency of classification in terms of both time and energy consumption. Multiple machine learning models were employed and evaluated, including Dummy Classifier, Logistic Regression, Support Vector Machine (SVM), K-Nearest Neighbors (KNN), Decision Tree, Random Forest, XGBoost, AdaBoost, Gradient Boosting, and Stacking Classifier. Experiments were conducted using two data splits: (i) 60% training, 20% testing, and 20% validation; and (ii) 70% training, 20% testing, and 10% validation. The study compares the performance of these classifiers and demonstrates that the proposed ensemble approach—particularly the Stacking Classifier—achieves superior accuracy, with a peak performance of 98%. This indicates the effectiveness of ensemble methods in enhancing the correctness and reliability of stellar classification tasks.

ET-12

Generation and Storage of Portable Green Hydrogen

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Abstract

A comprehensive investigation was conducted into the small-scale production and storage of green hydrogen, encompassing experimental methodologies and analytical evaluations. This study presents an experimental investigation into the small- scale generation and storage of green hydrogen utilizing solar energy as a renewable power source. The study aims to validate the operational feasibility of compact hydrogen generation systems and assess their performance in terms of efficiency, cost-effectiveness, and scalability. Key findings highlight the potential of green hydrogen as a clean energy carrier, with emphasis on its production, containment, and practical applications. The experimental framework demonstrates the viability of integrating solar-driven hydrogen technologies to reduce dependence on conventional fossil fuels. These outcomes contribute to the broader pursuit of sustainable energy solutions and offer insights into optimizing decentralized hydrogen systems for future deployment.

Keywords: Green Hydrogen, Electrolysis, Renewable Energy, Hydrogen Storage, Sustainability.

ET-13

Load Curtailment Controller with Kalman Filter as Frequency Estimator for Power Congestion Management

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Abstract

The performance of the power system is analyzed, evaluated and controlled using Voltage & Frequency which are dependent upon loading of the system. Balanced operation of the system is ensured by maintaining the voltage and frequency profile which is possible by balancing the supply power [A1] as per demand. If the power demand goes beyond the availability, the system faces contingencies which may lead to usability of system[A2] [A3] under physical or operational constraints. The scenario is known as power congestion which can lead to cascade Failure of the grid if not addressed in time. The power system may undergo thermal, voltage or stability limiting conditions under congestion. Among the market and non-market-based congestion management methods, congestion alleviation method proposes curtailment of excess load to address frequency instability. This paper proposes a Load Curtailment Controller (LCC) integrated with a Kalman Filter-based frequency estimator to address power congestion management in modern electrical grids. The controller dynamically adjusts load demand in response to real-time frequency deviations, ensuring grid stability and mitigating congestion across transmission corridors. The Kalman Filter serves as a robust estimator for system frequency, compensating for noisy measurements and unobservable states. By continuously estimating frequency from limited sensor data, it enables precise and timely curtailment decisions. The controller operates within a feedback loop, where frequency deviations trigger load shedding actions based on predefined thresholds and system constraints. This paper proposes implementation of Kalman filter as Frequency estimation of different parts of the interconnected system is done using Kalman filter to curtail the load responsible for system instability which can be a cause of power congestion or catastrophic failure of the grid. Proposed load curtailment controller is tested by simulation in MATLAB and SIMULINK results of which verify successful curtailment.

ET-14

Debugging The Code: Empowering Women in Technological Starups

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Abstract

In the digital world, even minor bugs in code or data can produce flawed outputs, highlighting the critical importance of debugging. This concept can be extended metaphorically to the gender imbalance in technology startups, where women remain significantly underrepresented as innovators and leaders. Just as technical bugs hinder system performance, systemic gender biases—rooted in structural, cultural, and societal barriers—impede equitable participation in the tech sector. This research paper explores how entrepreneurial ecosystems, digital platforms, and supportive public and private initiatives can serve as tools to "debug" gender disparities. It examines real-world challenges faced by women in both professional and domestic spaces and highlights how perseverance, opportunity, and education—especially within STEAM fields—can lead to transformative change. The study advocates for a more inclusive and gender-sensitive environment in technology, aiming to contribute to a stronger, more balanced, and innovative digital economy. The data collected from various sectors—ranging from women's participation in digital platforms and tech-based entrepreneurship to their growing presence in online marketing and startup leadership—has been analyzed and presented through graphical representations. These insights clearly reflect the expanding role of women in the technological sphere. The inclusion of women in the technological sector is not just essential but transformative, as they bring unique creativity, innovation, and problem-solving approaches. Across domains such as startups, technology, education, arts, and management, women have continually demonstrated capabilities equal to—or at times exceeding—their male counterparts. The prevailing notion of inferiority that still lingers in some environments must be challenged and reduced. For a truly progressive and inclusive society, it is vital to recognize women not as exceptions, but as equals and leaders in shaping the future. The findings of this study reinforce the vital contribution of women, not only within their homes but also in the broader innovation economy. Women have consistently demonstrated their ability to navigate complex challenges, adapt to evolving digital trends, and lead with vision and resilience. This research concludes with a hopeful outlook: that continued support, equal opportunity, and gender-inclusive innovation policies can pave the way for a more equitable, empowered, and progressive world.

ET-15

Ensemble Driven Approach for Adulteration Detection in Ghee using XG Boost Classifier

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Abstract

Ghee is one of the most valuable fats sold at premium price and having lot of health benefits. Unscrupulous traders make more profit by adding cheap oil/fats with ghee. Ghee adulteration degrade product quality and consumer trust by mixing cheaper oils such as coconut, palm, or soybean oil etc. This study focuses on detecting adulteration in ghee using Fourier Transform Infrared spectroscopy tied with machine learning to accurately classify pure and adulterated samples. A dataset of 180 samples was prepared having 5%, 10%, 15%, 20%, 25%, 30%, and 35% adulteration in ghee using coconut, palm, and soyabean oils. The FTIR spectra of pure ghee, adulterants and contaminated samples were analysed using Machine learning models . An XGBoost classifier was employed, with hyperparameters (learning rate, max_depth, n_estimators, gamma) optimized using GridSearchCV and Stratified K-Fold Cross-Validation (k=5) to ensure fair evaluation despite potential class imbalance. XGBoost model achieved an impressive mean cross-validation

accuracy of 98.33% (±2.22%), with optimal hyperparameters (gamma: 0, learning_rate: 0.1, max_depth: 3, n_estimators: 50) determined after evaluating 405 fits across 81 parameter combinations. Fold-wise accuracies ranged from 94.44% to 100%, demonstrating consistent performance. The study highlights the efficiency of FTIR spectroscopy combined with XGBoost classifier model in detecting adulteration in ghee, offering a reliable, non-destructive method for quality control.

ET-16

Observing the Privacy-Utility Trade off in Differentially Private Medical Text Classifiers

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Abstract

This paper introduces a text classification system by integrating advanced transformers, including BERT, RoBERTa, and DistilBERT, with differential privacy. The system is evaluated in centralized settings, encompassing various privacy budgets, with the primary objective of scrutinizing the trade-off between privacy and utility. The assessment focuses on the system's efficacy in classifying text sequences extracted from medical documents. Commencing with an exploration of the significance of privacy within the medical services industry, the paper addresses the challenges associated with applying differential privacy to natural language processing (NLP) tasks. The authors propose a conceptualization of differential privacy tailored to the nuances of NLP and introduce a text classification system grounded in this conceptual framework. Experimental outcomes underscore the system's capacity to achieve high classification accuracy while maintaining privacy. The paper concludes by deliberating on the broader implications of the research findings and suggesting avenues for future investigation.

ET-17

Retrieval-Augmented Generation-Based Medical Question Answering Chatbot

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Abstract

This study presents a Retrieval-Augmented Generation (RAG) based medical question-answering chatbot that combines semantic retrieval with large language models to improve factual accuracy and reduce hallucinations. Leveraging Gale's Encyclopaedia of Medicine as a reliable domain-specific source, the system integrates FAISS for efficient document retrieval and MiniLM for generating semantic embeddings. The Mistral-7B-Instruct model is used to generate responses grounded in the retrieved context. Extensive evaluation using metrics such as cosine similarity, hallucination score, and classification accuracy demonstrates that the proposed architecture provides relevant and trustworthy answers. This approach holds promise for reliable deployment in medical education and clinical support applications.

ET-18

Trends and Insights in DDoS Detection using Machine Learning in SDN: A Bibliometric Perspective

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Abstract

Distributed Denial of Service (DDoS) attacks cause a severe threat to TCP/IP networks by exhausting resources with traffic from multiple origins, causing disruptions and financial losses. Traditional defenses often fall short due to the increasing sophistication of these attacks. In contrast, Software-Defined Networking (SDN) separates control and data planes, thereby providing a programmable and flexible approach to the network management. Machine Learning (ML) enables intelligent detection and mitigation of DDoS attacks through traffic pattern analysis. This review uses bibliometric analysis to identify that supervised ML models and deep neural networks classify anomalies in better ways, while unsupervised techniques are good in detection of emerging threats using clustering and autoencoders. To conclude, ML-integrated SDN presents a scalable and adaptive solution to DDoS threats, outperforming traditional defenses. Ongoing research must address challenges like adversarial robustness and real-time learning for sustained effectiveness.

Keywords: Distributed Denial of Service (DDoS), TCP/IP, Bibliometric, SDN, Controller, Machine Learning.

ET-19

Heal-Io: An AI-Powered Dermatological Diagnostic System

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Abstract

Heal-Io is a disease diagnosis system on the skin which combines a hybrid U-Net plus MobileNet-V3 architecture [1,3,4], a decision tree based structured symptom analyzer and an ensemble of CNNs to do strong disease classification [11]. ReactJS is a frontend, and that is a system which modularizes services which, using Laravel, coordinate [14,16] and Django, infer models [14], and the system is reported to be better off on all metrics than any single system, including accuracy, precision, recall, and AUC, to all benchmark datasets, including HAM10000 [20]. A careful literature review can reveal that hybrid DL architectures are better than others in the field of dermatology and that DTs allow the symptomatology to be interpreted in addition to scaling [6,9]. A seamless workflow from image and symptom acquisition to diagnostic outcomes is using an end- to-end workflow, and the explainable AI tool (in the present case, Grad-CAM) [18,21] offers more confidence to clinicians. This article talks of operation issues to information heterogeneity, intelligibility and action to implementation and introduces the world of pragmatic insight to actual healthcare. Additional tendencies are discussed through the lens of federated learning, multimodal data fusion, and big data expansion to support reliable and accountable diagnostics.

Keywords: Skin Disease Diagnosis, U-Net, MobileNet-V3, Decision Tree, CNN Ensembles, AI Healthcare Applications.

ET-20

Spatiotemporal Land Use and Land Cover Change Assessment Using Random Forest and Sentinel-2 Data: A Geospatial AI Approach

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Abstract

Land Use and Land Cover (LULC) mapping plays an important role in monitoring and tracking environmental changes across the region, managing the natural resource, and ensuring sustainable development at a regional level. Geospatial artificial intelligence methods were applied in this research work to analyze the spatiotemporal variability in Telangana's change in LULC between the periods 2020 and 2021 out of 10-meter Sentinel-2 Earth Observation (EO) imagery. A Random Forest classifier was integrated into ArcGIS to produce LULC maps across a total of six main categories: Water Body, Barren Land, Shrub Land, Forest, Agriculture, and Built-Up. Accuracy assessment showed strong classification performance, with an overall accuracy of 93.87% and a Kappa coefficient of 89.36% for 2020, and an improved overall accuracy of 94.23% with a Kappa coefficient of 91.69% for 2021. Class-wise commission and omission errors indicated that while agriculture and built-up areas were classified with high precision, moderate misclassifications occurred in water bodies and shrublands. These results identify fast changes in landscapes due to anthropogenic and natural drivers in Telangana. Integrating EO data with machine learning strategies presents a sound methodology for monitoring high-resolution LULC at a frequent schedule throughout a decade, providing insightful information supporting urban planning, agriculture.

ET-21

BLIP- Finetuning for Textual Explanation of Radiology Images

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Abstract

Image captioning is a textual explanation of images. Image captioning is a multimodal model that combines textual and visual do- mains. The field of medicine benefits from automatic captioning because it assists medical professionals in the diagnosis of diseases, treatment of those diseases, and recommendations for follow-up care. The objective of this study was to provide a textual explanation of radiology images. To assist radiologists in developing trust in accepting automated results by providing a textual explanation of image diseases. To generate a textual explanation of the radiology images, Bootstrapping Language-Image Pretraining (BLIP) is fine-tuned using the PEFT (Parameter-Efficient Fine-Tuning) LoRA (Low-Rank Adaptation) concepts. The METEOR of the proposed algorithm was 0.1152.

Keywords: Image Captioning · BLIP · LoRA · Medical Domain · Textual Explanation.

ET-22

The AI-Driven Evolution of User Interface Design

Emmanuel Yusufu
Independent

Abstract

This paper explores the evolving landscape of user interface design with the integration of artificial intelligence. It discusses the transition from traditional UX/UI principles to the development of intelligent user interfaces that leverage AI to enhance user interaction and experience. The study examines the key concepts, definitions, and implications of this shift in design paradigms.

ET-23

Multi-Modal Summarization for Accessible and Searchable Mobile Interfaces

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Independent

Abstract

Designing user experiences that enhance comprehension and accessibility often requires translating complex mobile screens into concise, human-readable descriptions. This research introduces a multi-modal AI framework that analyzes visual layouts, textual elements, and structural hierarchies of mobile interfaces to produce succinct screen-level summaries. By learning from a large corpus of annotated designs, the system generates natural language overviews aimed at supporting interface search, improving accessibility tools such as screen readers, and streamlining design retrieval for UX practitioners. Experimental results, validated through both quantitative metrics and user assessments, demonstrate that combining visual, textual, and structural cues yields more accurate and context-aware descriptions than single-source approaches. This paper highlights new opportunities for bridging interface design and language understanding, enabling richer, more inclusive user experiences in mobile ecosystems.

ET-24

Real-Time Malicious Node Detection using Bayesian Neural Network in Mobile Ad-Hoc Networks (MANETs)

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Abstract

MANETs (Mobile Ad Hoc Networks) enable successful communication in infrastructure-less and dynamic environments by enabling devices to connect and exchange information while moving. These networks provide adaptive, flexible, and efficient communication, particularly useful in scenarios like catastrophe recovery, emergencies, and military maneuvers. MANETs allow efficient communication by dynamically adjusting routes and on-demand connectivity. With ample of advantages MANETs have faced numerous security challenges for successful correspondence among nodes. Thus, various Machine learning models have been applied to overcome varied security issues in MANETs. Existing models of machine learning need adaptability and adequate functionality to seizure the dynamic activities of malicious nodes in unstable networks. Given that current models have unsuccessful to address the challenges linked with MANETs, it

has become crucial to implement complementary methods to meet security issues in these networks. To overcome this gap, the paper proposes a trust-based model based on Machine Learning (ML) and Deep Learning (DL) techniques. This proposed data-driven approach basically addresses security challenges in dynamic MANETs as it innovatively advances pre-existing solutions by abstracting trust as a classification process and extracting meaningful features using a hybrid model, called the Bayesian Neural Network. This model integrates deep learning with probabilistic reasoning to enable intelligent decision-making and robust generalization in trust computation, effectively distinguishing between trustworthy and malicious nodes in the network. The Posterior probabilities used to represent the trust levels of the node if (M|x) & gt; p(H|x) the node is classified as malicious else the node is classified as honest and represented using feature matrix to label the category.

ET-25

Hybrid Deep Learning Framework for Accurate Brain Cancer Diagnosis using MRI Images

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Abstract

Brain cancer poses significant diagnostic and therapeutic challenges due to the heterogeneous nature of tumor formation within cerebral tissue, thereby demanding prompt and accurate identification to enhance treatment outcomes. This study presents the development of an advanced deep learning framework for the automatic detection and classification of brain tumors using MRI data derived from the Brain Cancer MRI Dataset, which comprises 6,056 images stratified into Brain Glioma, Brain Meningioma, and Brain Tumor categories. Leveraging Convolutional Neural Networks (CNNs), the proposed system is designed to efficiently differentiate among tumor types, achieving robust classification through comprehensive model training and validation. Performance benchmarks will be compared with Support Vector Machine (SVM) approaches utilizing a radial basis function (RBF) kernel, previously reported to attain classification accuracy rates near 81.88% on similar tasks. To further refine diagnostic specificity, U-Net segmentation architecture will be implemented for precise delineation of tumor boundaries, capitalizing on its ability to achieve Dice coefficients above 0.9 in medical image segmentation. By integrating classification and segmentation processes, the project aims to augment the diagnostic workflow and provide clinicians with a reliable, automated tool for distinguishing between healthy and tumorous brain tissues, potentially improving overall patient care and prognostic outcomes.

ET-26

Neuromorphic Computing for Real-Time Sensor Fusion in Autonomous Engineering Systems

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Abstract

Various sensor technologies in autonomous engineering systems contribute to significant computational challenges, particularly in real-time scenarios such as latency and power efficiency. This paper reports on a new neural computation framework that was designed for the real-time integration of sensor signals in automobiles and is inspired by the brain's parallel processing capabilities for unprecedented precision and

speed. Multiple, heterogeneous sensor data-streams are processed directly from LiDAR, camera, radar, and inertial measurement units in parallel, according to our recommended model. Our spintronic neuromorphic system uses an event-driven computation that results in significant reduction of power consumption (up to 85 percent), as opposed to traditional approaches based on digital signal processing that require a substantial investment in data processing and sequential operations. The new framework includes adaptive learning technologies that enable the system to control fusion weights in accordance with environmental and sensor reliability requirements. Experimental results on benchmark datasets show an accuracy of 92% in object detection and tracking, up by 40% in comparison to traditional GPU-based implementations for our neuromorphic sensor fusion algorithm. This work can extend beyond autonomous vehicles, to robotics, smart infrastructure, and industrial automation, where real-time decision making with multiple sensor inputs is critical. Our studies contribute to the growing field of bioinspired computation, where a bridge between neuroscience and engineering applications is highly desired.

Keywords: Neuromorphic Computing, Sensor Fusion, Spiking Neural Networks, Autonomous Systems, Real-time Processing, Event-driven Architecture, Bio-inspired Computing, Edge Computing, Multi-modal Integration, Adaptive Learning

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ET-27

A Spatio-Temporal Analysis of Air Pollution in Jaipur, India: Drivers, Trends, and Public Health Implications

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Abstract

Air pollution has emerged as one of the most acute environmental and public health crises of the 21st century. This study undertakes a spatio-temporal analysis of Jaipur, India, over a decade (2013–2023), examining the dynamics of key pollutants, their spatial distribution, and health implications. The findings indicate an alarming deterioration in air quality, with particulate matter ($PM_{2.5}$ and PM_{10}) consistently exceeding national (CPCB) and international (WHO) standards. Industrial zones, notably the Vishwakarma Industrial Area (VKIA), emerged as critical hotspots, while commercial and residential sites also reported pollutant levels beyond permissible limits. Seasonal dynamics, such as winter inversions, Diwali fireworks, and crop residue burning in neighboring states, further aggravate pollution episodes. Health risk assessments demonstrate significant correlations between high pollutant exposure and rising cases of respiratory and cardiovascular diseases. The study highlights the paradox of urban development, where infrastructural projects such as metro expansion, intended to mitigate emissions, contribute substantially to short-term pollution during construction. Policy recommendations emphasize strict regulatory enforcement, expansion of green infrastructure, sustainable transport interventions, and community engagement. The paper concludes that Jaipur requires an urgent paradigm shift in urban governance and environmental management to ensure sustainable and equitable development.

Keywords: Air pollution, particulate matter, Jaipur, spatio-temporal analysis, public health, green infrastructure, environmental policy.

Track 6: Management, Humanities & Social Impact (MHS)

MHS-01

Navigating Heat and Bias: A Perspective on Research and Development Challenges Faced by Women in Thermal Systems Engineering

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Abstract

Thermal systems engineering plays a critical role in advancement of energy technologies, aerospace innovation, and sustainable design. However, despite their growing academic presence, women remain underrepresented in high-impact research and development roles within this field. This perspective sheds light on the layered challenges faced by female researchers navigating thermal systems research, particularly within experimental and design-intensive domains such as battery thermal management and aerospace propulsion. Drawing from my personal journey across academic institution and industrial research and development in both the United Kingdom and South Asia, this contribution examines the structural and cultural barriers that hinder equitable participation, ranging from limited access to lab leadership roles, gendered assumptions during collaborations, and unconscious bias in publication and funding systems. Case contexts involving CFD simulations, thermal characterisation, and performance evaluation of energy-intensive systems are used to frame these challenges within practical engineering environments. The perspective concludes by offering suggestions for institutions and research bodies to bridge these gaps: including structured mentorship, inclusive leadership training, and redefined criteria for evaluating engineering excellence. Through this contribution, a dialogue is initiated around creating enabling environments that not only retain women in thermal sciences but empower them to lead transformative innovation.

Keywords: Women in Engineering, Thermal Systems, Gender Equity in STEM, R&D Challenges, Inclusive Innovation

MHS-02

Urban Gender Inequity in Jordan: Legal, Economic, and Sociopolitical Dimensions

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Abstract

This paper explores the multidimensional nature of gender inequity in urban cities of Jordan, situating it within the broader context of urban social conflicts. Through a detailed analysis of demographic data, legal frameworks, political representation, educational enrollment, and economic participation. Special attention is given to the layered inequities faced by women with disabilities and non-citizen children of Jordanian mothers. The paper concludes that while progress has been made—predominantly in education—systemic and institutional reforms are instantly needed to address the persistent gender gaps in law, politics, and the labor market, promoting a more inclusive and equitable urban society.

Keywords: Gender Inequity, Socioeconomic Disparities, Legal Discrimination

MHS-03

An overview of Dichotomy Faced by Female in the field of Education in South Asia & Southeast Asia

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Abstract

Female education is essential to the growth of communities and the well-being of families. Through influencing the educational opportunities for future generations and making a substantial contribution to the economic, social, and cultural advancement of the nation. There are still obstacles to females in many countries. One of the enduring issues that primarily affects many countries is the education of females. Even though many nations have eliminated systemic obstacles to female's education, ongoing gender disparities still directly impact educational outcomes, quality, and accessibility. These days, a lot of females deal with societal and financial obstacles, early marriage, domestic responsibilities, and prejudice that compromise their right to an education. **Objective:** The main objective of this review paper is to highlight the dichotomy experienced by females in their education in South and Southeast Asia and suggest some strategies on how to overcome them. **Method:** The review paper synthesizing findings of many research from 2010 to 2025. In this review paper there are a total of 15 research included. **Results:** Results indicate that the diverse and interconnected dichotomy that South Asian and Southeast Asian females encounter in obtaining and pursuing education are exposed by this study. Females experience gender-based discrimination, financial issues, social - cultural barriers, early age marriage, female involve in household chores, insufficient female teachers, harassment from teachers & peers, lack of facilities in their institutions, lack of transportation in schools and colleges, level of parents educational, types of family, climatic disaster like flood, and safety concerns that affect the education of females. These are the key barriers that affect female education and lead to lower enrolment and high dropout rates of females in educational institutions. **Conclusion:** This review paper concluded that, campaigns to raise awareness of the benefits of girls' education, the presence of local institutions, improved facilities in institutions, anti-harassment policies in institutions, community awareness on gender equality or domestic violence, financial assistance with scholarship or fellowship, access availability of school transportation, higher level of parents education, encouraged families to more evenly distribute household chores and hiring talented well educated female teachers can all improve the educational outcomes for females and increase their motivation for education.

Keywords: Dichotomy, education

MHS-04

Leave No One Behind: A Comprehensive Study on the Interrelations of the Sustainable Development Goals SDGs

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Abstract

The 2030 Agenda for Sustainable Development, adopted by world leaders at the United Nations sets out an ambitious plan of action for people, planet and prosperity, with the overarching objective of leaving no one behind. At its core are 17 Sustainable Development Goals (SDGs) comprising 169 targets. This study of the distances from the SDGs of selected OECD countries is designed to help governments as they consider developing national action plans, as well as to contribute to SDG mainstreaming across different OECD

Directorates. It leverages the wealth of statistical data collected by OECD members and harmonised through OECD tools and processes.

MHS-05

Sangeet and Selfhood: The Role of Hindustani Classical Music in Fostering Identity, Empowerment, and Wellbeing Among Women Learners

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Abstract

Hindustani (Indian) Classical Music, with its intricate structure and deeply expressive tradition, offers a powerful lens for understanding the formation of identity and emotional resilience among women learners. In a socio-cultural context where women's voices—literally and metaphorically—have been historically constrained, music education presents an alternative mode of empowerment rooted in artistic agency, embodied expression, and cultural continuity. This study investigates how structured training in *Hindustani* music supports self-exploration, confidence-building, and emotional wellbeing for women students in arts and interdisciplinary higher education settings. Drawing from qualitative interviews with female vocalists, music educators, and students across three Indian universities, the research explores the intersection of pedagogy, performance, and personal growth. The findings reveal that regular *riyaz* (practice) enhances discipline and self-regulation, while the emotive interpretation of *ragas* enables learners to navigate and articulate complex emotional states. Moreover, participation in baithaks, *mehfils*, and classroom concerts fosters a sense of community, stage presence, and leadership. Women reported that the *guru–shishya parampara* not only shaped musical excellence but also encouraged mentorship, intergenerational solidarity, and a deeper sense of cultural rootedness. In parallel, the study documents how digital tools—online *tanpura* apps, YouTube learning, and hybrid classrooms—are widening access for women from underrepresented or non-metropolitan backgrounds. The research concludes that *Hindustani* Classical Music functions not merely as an art form but as a transformative pedagogical space where selfhood is composed, voiced, and amplified. By situating music as both heritage and empowerment, the paper contributes to evolving models of arts-based learning, gender-equitable education, and mental wellness in STEAM-aligned curricula.

Keywords: Hindustani Classical Music; women empowerment; education; emotional wellbeing; interdisciplinary learning

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MHS-06

Gendered Advertising and Sustainable Beauty the Economics of Pink Marketing in India

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Abstract

This paper investigates the economic consequences of gendered advertising, specifically, pink marketing, on consumer spending behavior and the acceptance of sustainable beauty products in India. As the demand for eco-friendly products increases, brands often adopt female-oriented approaches when targeting women, assuming that advertisements based on emotional and aesthetic factors (such as the use of the colour pink, soft fonts, and nurturing themes) will be more effective. However, there is a need to research the actual economic implications of these strategies concerning spending patterns, brand trust, and environmentally

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friendly product choices in the Indian market. This paper employs a structured survey of 400 women consumers in the states of Punjab and Delhi NCR and applies Python 6.0.3 with the help of the reliability tests (Cronbach alpha, McDonald omega), correlation analysis (Pearson and Spearman), and the use of regression with the robust HC3 factor to ascertain the correlations between perceptions of pink marketing, perceived intentions, perceived product sustainability, and consumer expenditure. The findings show that pink marketing has a positive impact on brand awareness, but its influence on spending is mediated by perceptions of sustainability and purchase intentions. The paper also has a deep understanding of its relationship with gendered marketing in terms of whether it can either support or weaken sustainable consumption patterns and the impact of the same on both marketers and policy makers in terms of scaling up their economic performances to the gender conscious and sustainability objective.

Keywords: Pink Marketing, Gendered Advertising, Behavioral Economics, PLS-SEM, Eco-Consumerism.

MHS-07

Digital Empowerment for Women: Combating Cyber bullying Perpetration to Build a Safer Future

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Abstract

In the rapidly changing digital age, internet platforms provide a wealth of chances for empowerment, education, and expression. These sites have, meanwhile, also turned into places where many women experience targeted abuse and harassment, especially in the form of cyber bullying. The crucial problem of cyber bullying perpetration and its effects on women's digital involvement, safety, and psychological well-being are examined in this study, "*Digital Empowerment for Women: Combating Cyber bullying Perpetration to Build a Safer Future.*" The study emphasises the necessity of addressing both the experiences of victims and the motivations and behavioural patterns of offenders in order to develop long-lasting solutions that guarantee equitable digital empowerment. Using a mixed-method approach, the study asks women of different ages, occupations, and degrees of digital literacy both quantitatively and qualitatively. It looks at the frequency and kinds of cyber bullying that women experience, analyses the main traits of those who engage in it, and assesses the current legal, educational, and community-based approaches to cyber bullying. The prevalence of online harassment is specifically examined in relation to gendered power relations, anonymity, and a lack of digital responsibility. The study also emphasises the psychological toll that victims endure and how these experiences prevent women from utilising digital platforms to their full potential for education, professional growth, and social advocacy.

The study promotes a holistic approach to bridge the digital safety gap by referencing the frameworks of gender justice and digital ethics. Strong reporting procedures, gender-sensitive digital literacy initiatives, cyber ethics instruction in school curriculum, and cooperation between tech companies, civic society, and legislators are among the recommendations. The ultimate goal is to create an online space where women feel strong, heard, and safe. This study advances the larger objective of closing societal and technical divides by tackling the underlying causes of cyber bullying and elevating women's perspectives in discussions about digital safety. It lays the foundation for a safer, more inclusive digital future by imagining a time where digital spaces are no longer only available to women but also egalitarian and empowering.

Keywords: Digital Empowerment, Cyber bullying, Harassment, Digital Literacy, Social Advocacy.

MHS-08

Mountain Daughters, River Mothers: Tribal Women and Empowerment in the Northeast India

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Abstract

The tribal communities of Northeast India are often celebrated for their unique socio-cultural systems, many of which grant women a relatively higher status compared to other parts of India. Matrilineal societies such as the Khasis and Garos of Meghalaya and the Minyongs and Apatanis of Arunachal Pradesh offer women inheritance rights and societal recognition. However, despite these traditional frameworks, tribal women across the Northeast still face multifaceted challenges related to political exclusion, economic dependency, gender-based violence, and limited access to education and healthcare. This study explores the dynamics of women's empowerment within tribal societies of Northeast India, analysing both traditional gender roles and contemporary shifts. It highlights how women navigate the space between cultural expectations and modern aspirations. Through case studies of grassroots movements, women-led organizations, and emerging female leaders in education, literature, and activism, the research uncovers how tribal women are actively reshaping their identities and asserting their rights. Special attention is given to movements like the Meira Paibi (Women Torchbearers) of Manipur, the Naga Mothers' Association in Nagaland, and female artisans and entrepreneurs across tribal communities. These examples demonstrate how tribal women are leading efforts in conflict resolution, social justice, sustainable development, and cultural preservation. The paper concludes that while tribal customs provide a foundation for relative gender balance, true empowerment requires structural reforms, educational access, political representation, and greater awareness of rights.

Keywords: Tribal Narratives, Matriarchy and Matrilineality, Indigenous Communities, Gender and Identity, Women's Agency

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MHS-09

Is India ready for Smart Cities?

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Abstract

The urban population in India is rapidly growing, as per the records of UN Department of Economic and Social Affairs, over 500 million Indians live in urban areas. The reports of 2023-34 economic survey of India forecasted that more than 40 per cent of the population of India will reside in urban areas by 2030. This study thus focusses on SDG Goal (11) to understand the readiness for a country like India which is one of the most populated and few cities being most polluted, for smart sustainable cities. In the budge 2025, Finance Minister Nirmala Sitharaman announced a fund of Rs. 1 lakh crore for growth cities including redevelopment of cities and improved facilities for water and sanitation, various such initiatives were framed before as well. It is necessary to understand whether such initiatives by the Government is actually leading to a safe, smart, resilient and sustainable cities. This study thus tries to have a holistic understanding of the limitations and challenges faced and the policies that need to be framed to deal with complex and dynamic issues. Keywords: Smart, Sustainable, SDG(11), Challenges, Limitations.

MHS-10

Gender Empowerment Through Science Pedagogy: An Empirical Analysis of Girls Learning Outcomes and Barriers in Delhi Government Schools

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Abstract

This study investigates how science pedagogy contributes to gender empowerment by concentrating on learning outcomes and systemic challenges for girl students in Delhi Government schools. The study uses a qualitative case study methodology (semi-structured interviews and classroom observations), connecting with secondary policy documents, which are subjected to thematic analysis. Gender bias limited pedagogical support for teachers, and socioeconomic limitations all contribute to systemic barriers for girls in science courses. On the other hand, it was also found that when a school employed inquiry-based pedagogy, STEM clubs, and gender-sensitive pedagogy, the girls showed higher interest and improved performance results. As illustrated by the Economic Survey of Delhi (2023-24), education accounts for almost 21 percent of the state budget—the highest of all Indian states—and over half of enrolment in Delhi government schools is girls; nevertheless, persistent inequities in science learning outcomes exist. In addition, the STEM initiatives and growth in ICT-enabled classrooms offers a momentous opportunity to close this gap. The study advocates the need for systemic reform in the areas of teacher training, curriculum design, and gender-sensitive intervention to bridge the gender gap in science education. It drove the inquiry within the sociopolitical ideology of the public education system in Delhi, providing evidence that supports action-oriented, targeted policy action for gender equity through science education in urban India.

Keywords: Gender Empowerment, Gender Sensitivity, Science Pedagogy, Delhi Government Schools, Learning Outcomes

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MHS-11

Empowerment through Skills: An Evaluation of Vocational Training for Sustainable Employment in Rajasthan

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Abstract

Governments worldwide are investing heavily in vocational education to empower youth with employable skills. However, the key challenge lies in assessing whether such initiatives translate into sustainable employment. This study evaluates the effectiveness of vocational training programs in Rajasthan, India, in empowering individuals to achieve long-term livelihood opportunities. Using a descriptive research design, data were collected from selected state government departments and NGOs involved in skill development. The analysis focused on training placement rates and the retention of those placed, providing insights into the actual impact of these initiatives. Results indicate a considerable gap between reported placements and sustained employment, underscoring the need for policy and programmatic improvements to ensure that vocational training not only imparts skills but also leads to meaningful and lasting socio-economic empowerment.

Keywords: Vocational Education, Sustainable Employment, Skill Development, Workforce Retention, Socio-economic Growth.

MHS-12

Digital Feminism for Identity in Americanah by Chimamanda Ngozi Adichie

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Abstract

Man is a social being where he needs to assert himself in all the frontiers of life. With the advancement in globalization, the necessity comes for everyone to be a tech savvy. In this fast going and developing nation, women have proven themselves to be an efficient tech savvy. In literature also such assertion is endorsed. In the novel, *Americanah* published in 2013 by Chimamanda Ngogie Adichie explores such digital identity where the Nigerian Immigrant, Ifemulu uses online plateforms for identity and cultural adaptation. The critics, Sadie Plant and Donna Haraway were among the major contributors to the development of digital feminism theory known as cyberfeminism. In the 1990s, Plant is credited with creating the term, "cyberfeminism" to refer to feminist use of technology. The foundation for feminist viewpoints on technology and cyborg theory was established by Haraway's seminal article "A Cyborg Manifesto," published in 1985. The novel, *Americanah* examines the issues of identity, migration, and the influence of technology on feminist movements exploring the identity negotiation for a Nigerian immigrant in the US via internet forums, bringing to light the complexity of the diaspora. The character in the novel creates blog about race in America which helps her succeed there.

Keywords: Cyberfeminism, Diaspora, Women Empowerment, Gender equality, racial discrimination.

MHS-13

Comprehensive Comparative Analysis of Female Swimmers and Female Para Swimmers: A Deep Dive into Physiological and Psychological Profiles

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Abstract

Competitive swimming is an exhausting sport in terms of the extreme physical and mental challenges faced by players. This study focuses on various physiological (peak flow, breath holding, vital air capacity, and blood pressure) and psychological factors (will win, mental toughness, aggression, anxiety) between twenty-six female swimmers and twenty-six para swimmers, which helped in developing systematic insights in India. The present study aimed to bridge the gap in direct comparative analysis of able-bodied and para swimmers, exploring various constraints. Using descriptive analysis and the independent t-test method, it was noted that the average 'Will to Win' in female swimmers was slightly higher (8.27 ± 1.19) than that of para swimmers (7.92 ± 2.13). Para swimmers reported lower anxiety ratings (17.88 ± 3.09) than swimmers (18.46 ± 3.06), swimmers also scored higher in 'Aggression' (78.04 ± 16.14) and 'Mental Toughness' (35.65 ± 5.04). Similarly, swimmers showed higher physiological performance compared to para swimmers. The mean values of peak flow, breath holding, vital air capacity, and blood pressure readings were marginally higher in swimmers (peak flow-246.38 ± 88.17, breath holding-27.11 ± 9.48, vital air capacity-1.55 ± 0.07, systolic BP- 121.88 ± 14.20, diastolic BP- 77.50 ± 10.82) compared to para swimmers (peak flow-224.54 ± 49.43, breath holding-25.15 ± 8.38, vital air capacity-1.53 ± 0.25, systolic BP- 115.77 ± 10.37, diastolic BP- 74.38 ± 5.25). No statistically significant differences were observed in

physiological or psychological factors among these two groups. These findings indicate that although swimmers and para-swimmers both exhibit remarkable levels of psychological strength and physical fitness, swimmers' levels are slightly greater across most categories, indicating that physical ability may influence performance.

Keywords: swimming, para swimming, peak flow, vital air capacity, will to win, mental toughness, aggression.

MHS-14

Psycho-analytical Impact of Online Education on the Students using Machine Learning Models

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Abstract

The study focuses on psychological impact on students with regard to online education, statistical tools of correlation and the consensus factor was used to learn more about the relationship among the variables identified. Correlation was applied to depict and show that the variables depended on each other in a linear way. In the study, primary data was collected for 230 students, a structured questionnaire was shared among students. The algorithms employed were linear regression, Ridge and Lasso regression, decision tree regression, support vector regressor and random forest. The sole unsupervised algorithm employed was K-Nearest Neighbours. Ridge and Lasso's regression was chosen because they tend to respond well to datasets with significant collinearity and assist in reducing overfitting. Support vector, on the other hand, had the highest accuracy of 71% (R2 = 0.708) and was preferred above Ridge regression. Accuracy and performance metrics were analysed for better understanding of the models. The research revealed that there were greater number of students who were dissatisfied with the understanding of the concepts in online classes and that they felt that face-to-face classes are better as it helps them to clearly understand the concepts. Study reveals that taking online classes has made them lazier than what it used to be in offline classes, and it depicted that taking online classes has increased their anxiety and stress. Overall, the percentage of students preferred offline education more in comparison to online programs.

Keywords: Online Education, Psychological impact, Machine learning, Performance metrics, Statistical Tools.

Innovate. Inspire. Lead

Track 7: Geospatial Artificial Intelligence, Earth Observation Data and Industrial Applications (GAI)

GAI-01

Integrating Cloud Computing and Geospatial AI for Scalable Satellite Image Analysis

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Abstract

This paper proposes a novel architectural framework and presents a position on the future of large-scale geospatial analysis. High resolution satellite imagery presents transformative opportunities, but its massive volume necessitates a paradigm shifts away from traditional infrastructure. This paper presents a scalable, cloud-native architectural framework that enables a next-generation Ge- oAI workflow designed to utilize deeply integrated services—including object storage, managed Kubernetes, and serverless computing—to construct fault-tolerant and cost-effective remote-sensing pipelines. The methodology integrates state-of-the-art deep-learning models, including vision transformers. The framework is designed to address key challenges in the field, including prohibitive GPU costs and data privacy constraints, by leveraging architectural patterns that support spot instance utilization and future integration of federated learning. The primary contribution is the detailed architectural blueprint, a component-by-com- ponent justification of its design choices, and a research roadmap for its imple- mentation. We argue that this cloud-native approach is essential for enhancing the efficiency, reproducibility, and collaborative potential of satellite image analytics.

Keywords: Cloud computing, conceptual framework, geospatial AI, deep learning, vision transformer, Kubernetes, serverless, satellite imagery

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GAI-02

Computation of Complex Software sing Neural Networks

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Abstract

Numerous difficulties arise while computing huge software systems, especially when it comes to efficiency, adaptability, and optimization. The ability of neural networks to learn patterns, estimate functions, and dynamically adapted calculations has made them a potent tool for solving these issues. This study investigates the use of neural networks in software computation with an emphasis on complicated task automation, performance optimization, error detection, and code generation. We also give examples of how neural networks speed up software development, improve computing efficiency, and lessen the need for human involvement in problems. solving. In our tool, we have illustrated how the system provides a weight to each program after scanning them. We have developed our own method for determining the weight of MATLAB programming assignments, based on a few well-known complexity indicators. Neural networks

employ these parameters as inputs to more accurately estimate software complexity metrics. We have created methods for recognizing and resolving the challenges that arise during the development of application modules. Our technology also includes complex analysis suggestions system that assists developers in minimizing errors when We have chosen to assess the software complexity of sample Matlab applications using the neural network technique, which is a subset of artificial intelligenc.

Keywords: Complexity, Neural Network, Artificial Intelligence, Software Maintainability, Software Engineering.

GAI-03

Explainable GeoAI Framework for Public Mental Health Analysis

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Abstract

Public health outcomes are strongly influenced by environmental, demographic, and socio-economic factors that exhibit spatial variability. Geospatial Artificial Intelligence (GeoAI) provides a powerful means to analyze such heterogeneous data by integrating remote sensing, geographic information systems (GIS), and advanced machine learning. However, the complexity and black-box nature of deep learning models often limit their adoption in health policy and decision-making. This study proposes an Explainable GeoAI framework that integrates multi-source geospatial datasets with interpretable machine learning techniques to evaluate and predict public health risks. The framework leverages remote sensing indicators (e.g., land use, pollution, climate variables), population health records, and socio-economic data to generate spatially explicit risk maps. Model explainability is achieved through methods such as SHAP (Shapley Additive Explanations) and attention-based visualization, enabling domain experts to understand the contribution of key predictors across regions. Case studies demonstrate the framework's utility in assessing respiratory health risks linked to air quality, vector-borne disease susceptibility, and urban health disparities. The results highlight how explainable GeoAI can bridge the gap between advanced computational models and actionable public health insights, supporting evidence-based decision-making for sustainable healthcare planning and environmental health management.

Keywords: Explainable AI · Depression Prediction · SHAP · Mental Health · Machine Learning · SHAP · CatBoost XGBoost · Random Forest · Logistical Regression

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GAI-04

A Survey on Remote Sensing Image Analysis Using Advanced Learning Frameworks

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Abstract

Remote sensing has entered a data-rich era driven by steadily increasing spatial, spectral and temporal resolution of satellite and airborne sensors. Concurrently, advanced learning frameworks — from convolutional neural networks to vision transformers and modern self-supervised techniques — have dramatically advanced the state of the art across scene classification, semantic segmentation, object detection and change detection. This survey synthesizes results from over thirty recent studies (2015–2025) covering convolutional, attention-based, generative and sample-efficient learning approaches applied to optical, multispectral, hyperspectral and SAR data. We summarize representative datasets (SpaceNet, DeepGlobe, ISPRS, LoveDA, SpaceNet-MT), highlight leading architectures (U-Net variants, ResNet backbones, DeepLab family, Vision Transformers, Siamese networks for change detection and GANs for

data augmentation), and tabulate comparisons of methods, tasks and evaluation protocols. Key trends include the rise of transformer-based encoders for capturing long-range context, the increasing role of self-supervised pretraining on unlabeled Earth observation imagery, and the use of generative methods to mitigate annotation scarcity. Persistent challenges remain domain shifts across sensors and geographies, label sparsity for fine-grained categories, model interpretability, and robustness to adverse atmospheric or acquisition conditions. We conclude with concrete recommendations for dataset standardization, benchmarking practices, and research directions emphasizing multimodal fusion, few-shot learning and operational scalability. This review aims to guide researchers and practitioners entering the field and provide a concise, curated map of recent advances.

GAI-05

Advancing Urban Development through Mobile GIS Applications

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Abstract

Urbanization is accelerating at an unprecedented pace, particularly in developing regions where cities face mounting challenges in infrastructure planning, transportation management, resource allocation, and sustainable growth. Traditional geographic information systems (GIS) have long been central to spatial decision-making, yet their effectiveness is often limited by the need for specialized hardware, desktop-based platforms, and centralized data repositories. The emergence of mobile GIS applications, powered by advances in smartphones, cloud computing, wireless networks, and sensor integration, has transformed the landscape of urban spatial analysis. These tools enable real-time data collection, sharing, and visualization at the point of need, thereby empowering planners, policymakers, and citizens alike. This paper reviews the state-of-the-art in mobile GIS applications for urban development. It surveys technological frameworks, highlights domain-specific applications, and compares major tools and case studies from across the globe. The review further examines challenges related to data accuracy, connectivity, privacy, and adoption, while exploring promising directions such as AI–GIS integration, 5G networks, and citizen-driven participatory mapping. Two comparative tables summarize functionalities of mobile GIS platforms and representative studies in urban contexts. Additionally, policy and ethical considerations are discussed, emphasizing the importance of transparency, inclusivity, and responsible governance. Findings reveal that mobile GIS has become indispensable in advancing smart cities, disaster response, land-use management, and infrastructure monitoring, offering decision-makers a dynamic and cost-effective spatial intelligence framework. However, realizing its full potential requires overcoming socio-technical barriers and ensuring equitable access. By synthesizing insights from over 30 scholarly and applied works, this paper provides a comprehensive review of mobile GIS as a critical enabler of sustainable and data-driven urban development.

GAI-06

AWS-NeT: An Automated Weed Segmentation Approach Based on Deep Learning using Attention Mechanism for Precision Agriculture

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Abstract

Weed detection and management are critical components of precision agriculture, significantly impacting crop yield and sustainability. In this work, we have proposed a Deep learning-based framework for accurate weed segmentation using an Attention based ResNet-101. The model integrates ResNet-101 for feature extraction with attention gates in the U-Net decoder, allowing it to selectively concentrate on pertinent regions while minimizing background interference. The framework is trained and evaluated on the CWFID (Crop-Weed Field Image Dataset), employing standard preprocessing and augmentation techniques. Segmentation performance is quantitatively assessed using metrics including Dice coefficient, IoU, accuracy, precision, recall, and F1-score. Experimental results on selected test im- ages demonstrate that the model achieves Dice scores ranging from 0.982 to 0.994, IoU from 0.965 to 0.989, accuracy up to 0.990, precision up to 0.997, recall up to 0.991, and F1- score up to 0.994, indicating high segmentation accuracy and robust generalization across diverse weed patterns. Moreover, the model provides interpretable attention maps highlighting critical regions influencing predictions. These findings suggest that attention-based deep learning architectures are effective tools for automated weed detection, reducing manual intervention and supporting sustainable agricultural practices.

Keywords: Weed segmentation, Precision agriculture, Deep learning, U-Net, Attention mechanism, ResNet-101,Image preprocessing

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GAI-07

Evolution of the AIML/DL Techniques for the Plant Diseases Detection at Early Stage

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Abstract

Plants play the crucial role in the lives of the human beings. As due to the pathogens, viruses, and fungal infections it is hard to prevent the plants to survive more. Researchers find out their concerns on the plant disease detection at the early stage so they can provide the effective treatments to plants. As plant diseases majorly affect the agriculture section of the society and global food security. In the starting studies find out some traditional and manual methods to detect the disease of the plants, then merge the human intelligence with the Machine Learning. Furthermore, people were using conventional classifiers such as Support Vector Machines (SVM), Random Forests, and k-Nearest Neighbors (k-NN). Conventional classifiers often relied upon features that either were manually sourced from plant images or were taken from spectral data. These methods proved promising, but they were limited as they relied on manual feature engineering and were precisely influenced by changes in light, backgrounds and disease symptoms. Over the time, researchers began focusing on advanced models that learned complex patterns from raw data. In this evolution part the neural networks are introduced. This field further involves the Deep Learning (DL) methods like Convolutional Neural Networks (CNNs) for automatically learn the hierarchical feature, provide more accuracy and robustness. Through the large training datasets and transfer learning, it achieves the data scarcity, reduce training time and improve generalisation. The early detection helps in preventing crops from pathogens and helps the farmers to provide timely treatments to the crops so they can minimize the loss of the crops and provide the best global food security along with the minimum financial losses.

GAI-08

A Survey of Diverse Models for Remote Sensing Image Classification

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Abstract

Remote sensing image classification has become one of the most significant tasks in Earth observation, driving applications in agriculture, land use/land cover mapping, climate change studies, urban planning, and disaster management. Over the years, classification methods have evolved from statistical and traditional machine learning approaches to advanced deep learning and transformer-based architectures. This review surveys the progression of models in remote sensing image classification, highlighting their strengths, limitations, and performance across diverse datasets. We provide comparative analyses of traditional ML models, CNNs, RNNs, Transformers, and hybrid architecture. We also discuss transfer learning, self-supervised approaches, graph neural networks, multimodal fusion, and data augmentation techniques. Key datasets, evaluation metrics, applications, and challenges are elaborated, followed by directions for future research including explainable AI, foundation models, and edge deployment. This comprehensive survey aims to guide both practitioners and researchers in selecting appropriate models and identifying gaps for future exploration.

Keywords: Remote sensing, Image classification, Machine learning, Deep learning, Transformers, Self-supervised learning, Graph Neural Networks.

GAI-09

Survey and Systematization of GIS Techniques for Water Reservoir Modeling

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Abstract

Water reservoirs are critical infrastructure for water supply, hydropower generation, flood control, and ecosystem services. Effective management requires accurate monitoring of surface extent, water level, storage volume, and reliable forecasts across time horizons. This survey presents a comprehensive systematization of GIS techniques for reservoir modeling, integrating Earth Observation imagery, Digital Elevation Model products, in situ data, and hydrologic constraints. We develop a taxonomy across three core tasks: surface extent mapping, level and storage estimation, and short to seasonal forecasting. Our analysis reveals key trends including the integration of deep learning with physical models, multi-sensor fusion, and uncertainty quantification. We provide standardized preprocessing recipes and establish a reproducible benchmark protocol. Through systematic comparison of classical GIS, computer vision, sequence models, graph neural networks, and physics-informed methods, we identify strengths, limitations, and open challenges. We conclude with ethical considerations, societal impacts, and future research directions.

GAI-10

Geospatial Modeling Approaches for Educational Survey Analysis: A Systematic Review

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Abstract

Educational surveys generate large volumes of spatially distributed data that can provide valuable insights into accessibility, equity, and resource allocation in education systems. The integration of Geographic Information Systems (GIS) and advanced geospatial modeling techniques has emerged as a powerful approach for analyzing such data. This systematic review synthesizes existing research on GIS-based models applied to educational survey analysis, highlighting methodological frameworks, data sources, and

analytical tools. The review categorizes studies into key themes, including spatial accessibility modeling, equity mapping, predictive analytics, and decision-support applications. Strengths and limitations of current approaches are critically examined, with particular emphasis on model scalability, data quality, and interdisciplinary integration. Findings reveal increasing adoption of geospatial methods in education research, though challenges remain in standardization, interoperability, and addressing socio-economic complexities. The study concludes by identifying future research directions, including the integration of machine learning with GIS, open-access data utilization, and the development of policy-oriented spatial decision-support systems for advancing educational planning and management.

Keywords: Geospatial Modeling, GIS, Educational Survey, Spatial Accessibility, Equity Mapping, Predictive Analytics, Decision-Support Systems