



PIONEERING SUSTAINABLE SOLUTIONS FOR A BETTER TOMORROW

**PROCEEDINGS OF 1ST SCHOLARS'
CONFERENCE ON
SUSTAINABLE TRENDS IN
ENGINEERING, LAW,
MANAGEMENT AND LIBERAL ARTS
RESEARCH 2025**

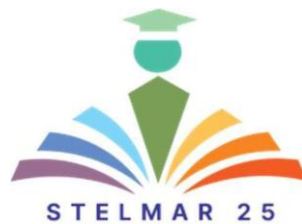


Proceedings of the 1st Scholars' Conference on

**Sustainable Trends in Engineering,
Law, Management and Liberal Arts Research**

STELMAR 2025

19th April 2025



Editor

[Ananya Aggarwal]

Foreword

Message from the President



It gives me immense pleasure to reflect on the resounding success of STELMAR 2025, BML Munjal University's first-ever student-led conference. This remarkable initiative, focused on "Pioneering Sustainable Solutions for a Better Tomorrow," truly embodies our university's commitment to fostering innovation and interdisciplinary collaboration. STELMAR 2025 provided a great platform for students, researchers, and academicians to engage in insightful and meaningful dialogue across the diverse. I was particularly impressed by the depth of the discussions, and the innovative approaches presented to address the challenges of sustainability. The emphasis on sustainability is not merely an academic pursuit; it is a moral imperative. Our world faces unprecedented environmental and societal challenges, demanding innovative solutions and collaborative action. BMU's vision is based on training future problem solvers, innovators, ethical leaders who work through the 3I's – Inquire, Innovate and creating Impact. This conference addressed the need of the society, and I commend the participants for their dedication. I am particularly proud of the student organizers, who demonstrated exceptional leadership, teamwork, and event management skills in bringing this ambitious vision to life. This conference exemplified the power of community involvement and the importance of providing students with opportunities to shape the academic landscape. I am confident that the proceedings of STELMAR 2025 will serve as a valuable resource for the academic community, inspiring further research, and innovation in the pursuit of a sustainable and prosperous future. I extend my heartfelt congratulations to everyone involved in making this conference a success.

Ms. Swati Munjal
President

Message from the Vice Chancellor



It gives me immense pleasure to introduce the proceedings of STELMAR 2025 – the 1st Scholar’s Conference on Sustainable Trends in Engineering, Law, Management, and Liberal Arts Research at BML Munjal University. STELMAR 2025 stands as a remarkable testament to the spirit of academic inquiry and collaboration that defines our university. Conceived and executed under the dynamic leadership of our students and the guidance of the Research and Development Cell, this interdisciplinary conference embodies BMU’s mission to foster impactful, socially responsible research that addresses the pressing challenges of our times. With a unifying theme - “Pioneering Sustainable Solutions for a Better Tomorrow” - the conference brought together a vibrant community of scholars, faculty, and professionals from across the country. The diversity of research - from artificial intelligence and legal systems to public health, green innovation, and gender sensitization - reflects the breadth of intellectual engagement that STELMAR aimed to inspire. I am particularly heartened by the platform this conference provided for emerging researchers to present their work, receive critical feedback from esteemed juries, and engage with peers and mentors in meaningful dialogue. These interactions are the cornerstone of scholarly growth and the advancement of knowledge. As we present this collection of proceedings, I extend my congratulations to all contributors, organizers, and participants. Your dedication has not only enriched this academic endeavour but has also laid a strong foundation for future editions of STELMAR. May this be the beginning of a long and impactful tradition.

Prof. (Dr.) Shyam B. Menon
Vice Chancellor

Message from the Research and Development Cell



It gives me immense pleasure to present the conference proceedings of STELMAR 2025, the inaugural scholars' conference dedicated to sustainable and interdisciplinary research across the domains of engineering, law, management, and liberal arts. I extend my heartfelt congratulations to the organizing team of STELMAR 2025. This conference is entirely student-led, yet executed with remarkable thoughtfulness and academic rigor. At its core, STELMAR stands as a vibrant platform where young minds present pioneering ideas, explore cutting-edge technologies, and engage in meaningful dialogue across disciplines. I am particularly delighted that this year's conference proceedings are being formally published. This is an important milestone in building a credible and lasting body of knowledge that future scholars and professionals can benefit from. This year's edition features abstracts, covering a wide range of topics while remaining focused on the common goal of sustainability. I wish STELMAR 2025 great success and a lasting impact on the academic journey of everyone involved.

Prof. (Dr.) Abhimanyu Singh Rana
Director
Research & Development Cell

Message from the Conference Chairs



It is with immense pride and enthusiasm that I welcome you to STELMAR 2025, an initiative envisioned by the students, for the students. This conference stands as a testament to the power of interdisciplinary collaboration and the boundless potential of student-led research. At STELMAR, we aim to create a dynamic platform where young minds from diverse domains converge to address real-world challenges with fresh perspectives and innovative ideas. This year's theme emphasizes the role of research in shaping a sustainable and technologically progressive future. Our focus extends beyond disciplines — drawing from Engineering, Business Management, Law, Liberal Arts, and Emerging Technologies — to encourage impactful dialogue and forward-thinking solutions. Through engaging oral and poster presentations, thought-provoking interactive discussions, and valuable networking opportunities, STELMAR 2025 promises to ignite curiosity, foster critical thinking, and promote academic excellence. We are also proud to publish selected proceedings in our official STELMAR Magazine, celebrating the intellectual efforts of participants. What makes STELMAR truly special is its student-driven spirit — from ideation to execution. It is a space where young researchers not only present their work but also shape the academic discourse of tomorrow. The journey of building this conference has been as enriching as the event itself, and I am deeply grateful to every contributor who helped bring this vision to life. Thank you for being a part of this journey. I hope your time with us at STELMAR 2025 inspires new ideas, encourages collaboration, and fuels your passion for research.

Aditya Rastogi
SOET



Witnessing the successful conclusion of the STELMAR Conference is a source of great pleasure and happiness. The theme of this year's event - Sustainable Trends in Engineering, Law, Management, and Liberal Arts Research — resonates deeply with the mission of the Research & Development Cell. The quality and diversity of contributions we received reflect the growing enthusiasm among students and scholars to engage meaningfully with pressing challenges and emerging opportunities across disciplines. Initiatives like STELMAR play an important and critical role in nurturing a vibrant research culture, encouraging young minds to think beyond conventional boundaries and articulate their ideas with rigor and creativity. I am particularly impressed by the depth of inquiry and originality demonstrated by the participants, and the organizing team of our students in BMU, reaffirming the importance of providing platforms that celebrate and mentor early research endeavours. I extend my heartfelt congratulations to all contributors, mentors, and organizers whose collective efforts made this conference a resounding success. May STELMAR continue to inspire future cohorts to pursue academic excellence and innovation with even greater passion both inside and outside BMU.

Prakhar K. Srivastava
SOET

Chief Patrons	
<p>Ms. Swati Munjal President, BMU</p> <p>Prof. Shyam B. Menon Vice Chancellor, BMU</p>	
Conference Chairs	
<p>Aditya Rastogi Prakhar Srivastava</p>	
Session Chairs	
<p>Sumit Kumar Jyoti Raghuvansh Pandey Junaid ul Shafi</p>	
Conference Conveners	
<p>Divit Maggo Hunarpreet Kaur Mistu Paul Mukundan Balajee Divyansh Verma Guneet Chawla</p>	
Advisory Committee	
<p>Col. Mohit Bawa Dr. Maneek Kumar Dr. Pritam Baruah Dr. Pratik Modi Dr. Arindam Banerjee Dr. Ziya Uddin Dr. Abhimanyu Rana Mrs. Shubhangi Pandey Dr. Jaskiran Arora Dr. Sangita Dutta Gupta Dr. Anandini Dar Dr. Suneet Soni</p>	<p>Director, Administration Dean, SOET Dean, SOL Dean, SOM Dean, SOLS Professor & Dean, Student Welfare Director, R&D Cell Senior Executive, R&D Cell Professor & Dean, Education Quality Professor, SOM Associate Professor, SOLS Registrar</p>

BMU Organizing Committee	
Shrey Jaiswal	Co-Chair
Preet Jhagekar	Chair, Technical Support Committee
Suvansh Sehgal	Chair, Design & Creative Committee
Purvanshu Dhariwal	Chair, Operations & Logistics Committee
Ansh Askandani	Chair, Jury & Panel Coordination Committee
Kavya Goswami	Chair, Content & Communications Committee
Vaishali Mundra	Chair, Entry & Registrations Committee
Laksh Sharda	Member, Technical Support Committee
Raghav Yadav	Member, Technical Support Committee
Aryan Nair	Member, Jury & Panel Coordination Committee
Abhishek Mishra	Member, Jury & Panel Coordination Committee
Namokar Jain	Member, Jury & Panel Coordination Committee
Yashika Gambhir	Member, Jury & Panel Coordination Committee
Anyarajan	Member, Jury & Panel Coordination Committee
Kartika Joshi	Member, Jury & Panel Coordination Committee
Shreya Singh	Member, Jury & Panel Coordination Committee
Vidushi Saxena	Member, Jury & Panel Coordination Committee
Zahra Rakhshan	Member, Jury & Panel Coordination Committee
Mehul Vig	Member, Design & Creative Committee
Asmi	Member, Design & Creative Committee
Eshaan Chandra	Member, Design & Creative Committee
Prisha Jain	Member, Design & Creative Committee
Mehak Bhardwaj	Member, Design & Creative Committee
Prachi Aggarwal	Member, Entry & Registrations Committee
Neha	Member, Entry & Registrations Committee
Anjel Minj	Member, Entry & Registrations Committee
Khushboo Jan	Member, Entry & Registrations Committee
Shivani	Member, Marketing & Outreach Committee
Basundra Soni	Member, Operation & Logistics Committee
Aditya	Member, Operation & Logistics Committee
Eshaan Chandra	Member, Operation & Logistics Committee
Shivi Sharma	Member, Operation & Logistics Committee
Aanchal Kukreti	Member, Operation & Logistics Committee
Nirmala Rathore	Member, Operation & Logistics Committee
Ved Khandelwal	Member, Content & Communications Committee
Kashish Khan	Member, Content & Communications Committee
Parth Sharma	Member, Content & Communications Committee

Contents

❖ Foreword	2
❖ Messages	3
❖ Committees	6

PLENARY TALKS

- 1. Innovating Mobility: The Role of Edge AI in Shaping the Future of Automotive Technology**
Dr. Amod Jai Ganesh Anandkumar
- 2. Unleash The Power Within: Cultivating Resilience, Self-Awareness, and Leadership**
Ms. Narinder Kaur

INVITED PAPERS

- 3. Indoor Air Quality and Health**
Arun Srivastava 14
- 4. Pushing the Limits with Additive Manufacturing**
Lavish Kumar 15

CONTRIBUTED PAPERS

- 5. AI in Legal Operations – Driving Simplification and Reducing Institutional Overhead**
Aaditya Vikram Agrawal and Mihir Katoch 17
- 6. Gender Sensitisation in Law: Addressing an oversight of male-centric legal structures**
Atharva Dubey 18
- 7. Enhanced Portfolio Optimization using Reservoir Computing**
Diya Rawal 19
- 8. Green and Sustainable Cloud Computing**
Janvi Chandra 20
- 9. Comparison of Emotional Maturity between Teenagers and Young Adults**
Jiya Poddar 21
- 10. A thematic and bibliometric analysis of behavioral economics in the era of computational intelligence for sustainable decision-making**
Kanav Benipuri 22
- 11. Bioprinting at the Nexus of Engineering and Medicine: A Review of Sustainable Solutions for Tissue Engineering and Regenerative Therapies**
Kashish Chauhan 23

12. MINIMAL: A Boring Interface for a Better Life – Leveraging Intentional Boredom and BehaviOral Psychology to Promote Digital Well-Being <i>Kushal Yadav</i>	24
13. BhookhBuddy: An AI-Powered Platform for Affordable Essentials and Donation Facilitation <i>Madhav Ojha</i>	25
14. A Review of Transfer Learning Techniques for Cross-Domain Adaptation <i>Mehul Vig</i>	26
15. Meta-Analysis on Green Marketing: Trends, Effect, and Consumer Response <i>Monika Gahlawat and Dr. Garima Dadhich</i>	27
16. Digital Human Simulation in Work Ergonomics <i>Munindra Jain</i>	28
17. Between the Algorithm and Abuse: Assessing the Efficacy of Cyberbullying Detection Tools, Laws, and User Safety <i>Niharika Talan and Rishika Singh</i>	29
18. Blank Slate, Bold Ideas: Motivational Drivers of First-Gen Entrepreneurs in Indian Colleges <i>Pallavi Jyoti and Dr. Vibha</i>	30
19. Statistical analysis of nano-mechanical property evaluation of Duplex Stainless Steel's Phases <i>Priyansh Singh</i>	31
20. Cognitive Load Measurement Utilizing EEG and Machine Learning Algorithms <i>Purvanshu Dhariwal</i>	32
21. A Case Study of the Menendez Brothers: Childhood Trauma, Violence, and Implications for Sustainable Social Systems <i>Rafa Hasan</i>	33
22. Investigation of PDMS-ZnO Nanocomposites for application to nano-generators <i>Ritu, Ranbir Singh, Anubhav Agarwal and Abhimanyu Singh Rana</i>	34
23. AI-Powered Sustainability Consulting: Transforming Business Strategy for a Greener Future <i>Rohit Kumar</i>	35
24. Water Security of Small Islands and the path to achieve SDG 6 in 2030: A Comparative Analysis of Sri Lanka and Maldives <i>Rosario Mervin Thabooshan</i>	36

25. Novel framework using armstrong numbers for encryption of multimedia data <i>Shradha Aggarwal</i>	37
26. Integrating AI into CSR: A study of initiatives of Indian Banks for Transforming Agriculture <i>Sonia Sharma</i>	38
27. गृहकर्मी: A Digital Revolution to transform Housewives into Economic Contributors: A study of feasibility for developing tech enabled platform for Housewives in Delhi <i>Sujal Sharma</i>	39
28. Perceived Causes of Women Rape in India <i>Sunidhi Parmar</i>	40
29. Amazon product recommendation system using machine learning <i>Tanya Aggarwal</i>	41
30. Multimodal Learning for Image Caption Generation: A Deep Learning Approach <i>Winster Pereira</i>	42
31. Heat exchanger analysis for PWR Nuclear Reactor <i>Yaksh Dharod</i>	43
32. USTART: Redefining India's Ride hailing Industry with Transparency and Fairness. <i>Yash Gupta and Rishabh Goel</i>	44
33. Harvesting Energy the Green Way: Piezoelectric Nanogenerator Derived from Green-Synthesized ZnO Nanoparticles <i>Anushka Sharma</i>	45
34. Smart Scaling: Efficient Promoter Identification in Genomic Sequences with ModernBERT <i>Siddharth</i>	46
35. A Comprehensive Approach to Addressing Challenges in Net Zero Building Development and Implementation <i>Ashu Kalra and Renu Dhupper</i>	47
36. Jotto Problem: A new Perspective <i>Prakhar Srivastava, Dakshi Arora and Ranjib Banerjee</i>	48
37. Before Green was a Trend, India's Timeless Sustainability! <i>Mahi Vashisth</i>	49
AUTHOR INDEX	50

INVITED SPEAKERS PROFILE

Invited Speakers Profile

Dr. Amod Jai Ganesh Anandkumar

Director

HARMAN Automotive (Samsung)



Dr. Amod Jai Ganesh Anandkumar is the Director of Engineering at HARMAN Automotive, a subsidiary of Samsung Electronics. He leads a multinational research team focused on developing efficient deep learning solutions for advanced mobility and audio systems. His work emphasizes Edge AI innovations, particularly in enhancing in-cabin health and wellness experiences.

Prior to his current role, Dr. Anandkumar served as the Director of Curriculum and Applications at Skill-Lync, where he was instrumental in shaping educational content in areas such as autonomous and electric vehicles, embedded systems, and VLSI. His earlier positions include Application Engineering Manager at MathWorks, where he led teams across AI, autonomous systems, and signal processing domains. He has also held research roles at Samsung R&D and GE Global Research, contributing to wireless communications and biomedical signal processing applications. Dr. Anandkumar earned his Ph.D. from Loughborough University, UK, where he was recognized with the Graduate School Research Student Prize for outstanding academic performance. He holds a B.Tech in Electronics & Communications from the National Institute of Technology Karnataka. An active contributor to the academic and professional community, he is an ACM Eminent Speaker and a Senior Member of IEEE. He frequently delivers keynotes and serves on advisory committees, bridging the gap between industry innovation and academic research.

Ms. Narinder Kaur

Founder

SURTA AJ Special Children Foundation

Dr. Narinder Kaur is the Founder of the SURTA AJ Special Children Foundation, a transformative initiative dedicated to empowering children with special needs and supporting their families. Drawing from over 24 years of corporate experience, she has transitioned into a multifaceted role as a mental health counselor, life coach, Bach Flower therapist, and POSH enabler. Her personal journey as a mother to a child with special needs has deeply informed her mission. Currently pursuing a Ph.D. focused on the psychological impact on parents of special children, Dr. Kaur combines academic research with heartfelt advocacy. Through SURTA AJ, she provides counseling, community support, and platforms for storytelling, aiming to foster inclusion and resilience among families navigating similar challenges. An accomplished author of *The Phoenix (From Ashes to Rebirth)*, she shares narratives of transformation and empowerment. Her contributions have been recognized with accolades such as the Women Icon of the Year Award 2025 for Social Work, presented by the Achievers Forum. Beyond her foundation, Dr. Kaur serves as the National President of the Women's Indian Chamber of Commerce and Industry (WICCI), where she champions initiatives for women's empowerment and mental health awareness. Her unwavering commitment to turning personal adversity into collective strength continues to inspire many.



INVITED PAPERS

Indoor Air Quality and Health

Prof. (Dr.). Arun Srivastava
School of Environmental Sciences
JNU, New Delhi

Abstract

There has been increasing concern within the scientific community over the effects of indoor air quality on health during last few decades. Indoor air quality (IAQ) plays a significant role in human health, especially considering that people spend around 90% of their time indoors—whether at home, work, or school. Poor indoor air quality can contribute to a range of short- and long-term health problems such as Irritation of eyes, nose, throat, Headaches, dizziness, fatigue, and Allergic reactions ass short term. Whilst long term health effects are Chronic respiratory diseases (e.g. asthma), Heart disease, Lung cancer (due to radon, smoke, etc.), Cognitive decline (from prolonged exposure to pollutants). Indoor air quality is mainly affected by biological contaminants (Mold, bacteria, pet dander, dust mites, pollen) and chemical pollutants (Volatile Organic Compounds (VOCs) from paints, cleaning agents, air fresheners, Carbon monoxide, nitrogen dioxide, black carbon, PM10 and PM2.5 etc.) Of particular significance is Radon, the radioactive gas that arises from outside, yet only presents a serious health risk when found inside buildings. Radon and its decay products are now recognised as important indoor pollutants, and their effects are explored. A phenomenon known as Sick Building Syndrome (SBS), where the occupants of certain affected buildings repeatedly describe a complex range health complaint. These are often attributed to poor air quality. However, many cases of SBS provide a valuable insight into the problems faced by investigators attempting to establish causality. We know much less about the health risks from indoor air pollution than we do about those attributable to the contamination of outdoor air. Apart from these meteorological conditions such as humidity, temperature, ventilation and solar radiations aggravate to the existing indoor air pollution. Increasing ventilation, use of air purifiers, controlling humidity and reducing pollutants can significantly improve the air quality.

Keyword: *Indoor Air Quality (IAQ), Chemical Pollutants, Biological Contaminants, Radon, Sick Building Syndrome (SBS), Particulate Matter (PM2.5 and PM10)*

Pushing the Limits with Additive Manufacturing

Dr. Lavish Kumar
School of Engineering
JNU, Delhi, India

Abstract

This presentation delves into the transformative world of Additive Manufacturing (AM), commonly known as 3D printing, highlighting its rapid advancements and growing impact across various industries. Beginning with a review of notable developments and news stories from 2024, it provides a timely perspective on the current state of AM. The presentation introduces the foundational principles of additive manufacturing, tracing its evolution from early prototyping tools to today's sophisticated production technologies. Various types of AM processes are explored, with a focus on their unique characteristics and applications. The discussion also covers the key advantages of AM—such as design freedom, material efficiency, and rapid prototyping—while addressing current limitations, including cost, scalability, and material constraints. To illustrate the prodigious potential of AM, the presentation features compelling case studies from sectors such as aerospace, healthcare, and construction. These real-world examples underscore how additive manufacturing is reshaping product development, supply chains, and the future of manufacturing itself.

Keyword: *Additive Manufacturing, 3D Printing, Industrial Applications, Design Freedom, Material Efficiency, Manufacturing Innovation, AM Technologies.*

CONTRIBUTED PAPERS

AI in Legal Operations: Driving Simplification, Navigating Challenges, and Shaping the Future

Aaditya Vikram Agrawal
School Of Engineering and
Technology
BML Munjal University

Mihir Katoch
School Of Engineering and
Technology
BML Munjal University

Abstract

The legal industry experiences significant transformations through Artificial Intelligence because the technology resolves classic problems in three main areas: complex legal issues as well as expensive business operations and inefficient systems. Natural Language Processing AI applications integrated with Contract Lifecycle Management automation reduce time costs significantly because contract review reaches 99% efficiency and courts can process cases at twice their normal speed. Through automation legal staff can perform strategic work tasks and achieve efficient execution of administrative repetition. Current law firm business methods face significant danger because their operating model primarily relies on charging hours to clients. Organizations should address ethical challenges arising from data protection and organizational transparency to provide both client data security and appropriate AI implementation. Law practitioners must master artificial intelligence alongside its capabilities to perform strategic responsibilities that accompany learning AI applications. The implementation of AI technology has strong capabilities to enhance justice accessibility through its cost-reducing effect and fair client treatment methods. Carefully designed ethical guidelines provide the ability for legal service advancements while keeping human monitoring as a fundamental requirement to keep accountability present across all improvement projects.

Keyword: *Artificial Intelligence, Legal Industry, Contract Lifecycle Management, Natural Language Processing, Automation, Ethical Challenges, Data Privacy*

Gender Sensitisation in Law: Addressing an oversight of male-centric legal structures

Atharva Dubey
Dyal Singh College
Delhi University

Abstract

The legalised and structured law framework in India has transformed from the age of Manusmriti to the dynamically ostensible Bhartiya Nyay Samhita of 2023. With the due process of this transition, while the litigation and the legal bindings have structurally and evidently changed, the essence of the law remains largely driven by the patriarchal or more specifically, a male-centric approach. This in turn has not just ostracised but also perpetuated the marginalisation of gender identities. Despite progressive measures like The Criminal Law Amendment Act, 2013 and the Transgender Persons act of 2019, and NALSA Judgement, the legislative discourse remains largely driven by a male led and gender-biased perspective. The punitive laws against sexual exploitation like the Article 63 of the BNS shrewdly excludes offenses against queer gendered and other male victims. Drawing from the recent data from NCRB reports, legal case studies and Supreme court observations, this research aims at identifying structural challenges, gendered biases and insensitivity, and recommend a right based, sensitised legal framework that recognises an all-gendered experience, thereby contributing to a more equitable and inclusive legal framework.

Keyword: *Patriarchal legal system, Gender marginalisation, Male-centric legislation, Queer and transgender exclusion, Rights-based legal reform, Inclusive legal framework*

Enhanced Portfolio Optimization using Reservoir Computing

Diya Rawal

School Of Engineering and Technology
BML Munjal University, Gurgaon, Haryana

Abstract

This study presents a novel approach to optimising portfolios based on the NIFTY50 index that employs the concept of chaos theory, machine learning, and financial analytics. The fundamental goal is to generate high-return, risk-balanced portfolios by leveraging effective forecasting and clustering algorithms with theoretical and applied depth. We verify the chaotic nature of the historical data on stock price changes using Lyapunov exponents. We further use reservoir computing techniques, a robust neural network architecture capable of modelling and predicting chaotic time series, to forecast the future prices of all NIFTY50 equities using 20 years of historical data. We then undertake a thorough market study, constructing a correlation matrix to identify patterns and trends among stocks, which are then clustered together based on their correlation profiles, with those displaying similar long-term behaviour. To navigate the whole bunch of possible portfolios, we apply the principles of Design and Analysis of Experiments (DoE) to sample systematically a variety of representative and diversified portfolios across clusters, sectors, and stock types. Every portfolio is then evaluated on a variety of criteria, including overall value, sectoral balance, growth-to-value ratio, and compliance to current market trends. The projected values obtained using the reservoir computing are then compared to existing portfolio values. The Final portfolio recommendation is made based on the best one with the highest expected value and balance after rejecting those with excessive variances or poor structural ratios. This study presents an effective, interpretable, and scalable portfolio optimisation approach that blends data-driven clustering and forecasting with experimental design techniques.

Keyword: *Portfolio Optimization, NIFTY50, Chaos Theory, Reservoir Computing, Machine Learning, Clustering Algorithms, Financial Forecasting*

Green and Sustainable Cloud Computing

Janvi Chandra

Dept. of Computer Science Engineering
VIT, Vellore, Tamil Nadu

Abstract

As enterprises increasingly adopt multi-cloud architectures, optimising energy consumption and reducing carbon footprints have become critical challenges. This paper explores AI-driven strategies for sustainable cloud computing, focusing on energy-efficient scheduling techniques, integration of renewable energy sources, and real-time carbon tracking across cloud service providers (CSPs). Leveraging machine learning, reinforcement learning, and predictive analytics, dynamic workload placement is proposed to minimise environmental impact and operational costs. The study highlights federated carbon accounting systems, API-based real-time tracking mechanisms, and policy-driven sustainability frameworks to enhance transparency and efficiency. Real-world implementations from industry leaders like Google, Microsoft, and AWS demonstrate significant energy reductions of up to 40%. Furthermore, this paper examines the role of blockchain technology in cloud storage as a transformative solution for security, decentralisation, and efficiency. By consolidating findings from multiple studies, it explores AI-enhanced blockchain frameworks that employ predictive analytics, machine learning, and anomaly detection to optimise performance while minimizing costs and energy consumption. This research identifies key gaps in existing approaches and proposes a comprehensive AI-driven framework that integrates sustainability and security considerations for scalable cloud computing.

Keyword: *Sustainable Cloud Computing, Multi-Cloud Architecture, Energy-Efficient Scheduling, Carbon Tracking, AI-Driven Optimization, Federated Carbon Accounting, Blockchain Security*

Comparison of Emotional Maturity between Teenagers and Young Adults

Jiya Poddar
Rayat Bahra University
Kharar, Punjab

Abstract

Emotional maturity refers to an individual's ability to understand, regulate, and express emotions in socially appropriate and constructive ways. It involves emotional awareness, empathy, self-control, and the capacity to respond to challenges with resilience. According to Rafeedali (2017) emotional maturity represents capacity of an individual to manage and to check emotions, to evaluate others' emotional state and to persuade their judgment and actions. It implies controlling emotions rather than letting emotions get the better of. In today's dynamic and demanding social environment, emotional maturity plays a crucial role in shaping behaviour, interpersonal relationships, and mental health. Reports by the World Health Organization (WHO) highlight that adolescents and young adults are particularly vulnerable to emotional disturbances, with emotional regulation being a key protective factor against anxiety, depression, and risky behaviours. Despite its importance, there is limited comparative data exploring how emotional maturity varies across adolescence and early adulthood. This research aims to compare emotional maturity between teenagers and young adults. Data was collected from a sample of 122 participants (76 teenagers and 46 young adults) using a standardized emotional maturity scale (Singh & Bhargava, 1991). For comparing the two groups analysis was done using independent sample t-test. The difference between the mean scores indicated that young adults were higher on emotional maturity than teenagers, thus, having statistically significant difference between the groups. These findings suggest that emotional maturity may develop gradually with age and might be influenced by other factors.

Keyword: *Emotional Maturity, Adolescents, Young Adults, Emotional Regulation, Mental Health, Comparative Study*

A thematic and bibliometric analysis of behavioral economics in the era of computational intelligence for sustainable decision-making

Kanav Benipuri

Dept. of Instrumental Engineering

Thapar Institute of Engineering and Technology, Patiala, Punjab

Abstract

The aim of this paper is to conduct a review of the current academic literature in the fields of computational intelligence and behavioral economics. Both bibliometric and thematic analysis are utilized in the process of conducting this study. For the purpose of doing data analysis, this research makes use of VosViewer, the Bibliometric R program, and the Biblioshiny app. The paper provides an overview of a variety of methodologies, including clustering, coupling, thematic analysis, cooccurrence network, factorial analysis, and others. This article provides an overview of the history of behavioral economics as well as its potential applications in the fields of computational intelligence and artificial intelligence. We looked at the performance analysis based on the authors, countries, institutions, documents, and keywords that were used as sources. Furthermore, we made the observation that behavioral economics was involved in the process of making sustainable decisions throughout a variety of time periods. In addition, we presented the emerging themes that can be the center of attention for scholars in the future. In conclusion, taking into consideration future researchers in the fields of artificial intelligence and behavioral economics will be able to advance their study.

Keyword: *Behavioral Economics, Computational Intelligence, Bibliometric Analysis, Thematic Analysis, Artificial Intelligence, Sustainable Decision-Making, Emerging Research Trends*

Bioprinting at the Nexus of Engineering and Medicine: A Review of Sustainable Solutions for Tissue Engineering and Regenerative Therapies

Kashish Chauhan

Dept. of Computer Science and Engineering

IMS College of Engineering, Ghaziabad, Uttar Pradesh

Abstract

Bioprinting has revolutionized regenerative medicine by enabling the precise fabrication of 3D living tissues using cell-laden bioinks. This review explores cutting-edge advancements in bioprinting technologies, including extrusion-, inkjet-, and laser-based systems, alongside innovations in bioink design (e.g., natural/synthetic hydrogels, decellularized ECM). We highlight key applications such as patient-specific implants, drug screening platforms, and progress toward vascularized organ constructs, addressing critical needs in personalized and sustainable healthcare. The environmental and ethical benefits of bioprinting—such as reducing animal testing and enabling on-demand tissue production—are discussed alongside emerging trends like 4D bioprinting and AI-driven process optimization. However, challenges persist in scaling complex tissues, ensuring long-term functionality, and navigating regulatory pathways. By synthesizing interdisciplinary research, this review underscores the importance of material innovation, vascularization strategies, and standardization to accelerate clinical translation. Collaborative efforts among engineers, biologists, and clinicians will be pivotal in realizing bioprinting's potential as a sustainable solution for global healthcare challenges.

Keyword: *Bioprinting, Bioinks, Regenerative Medicine, 3D Tissue Engineering, 4D Bioprinting, Personalized Healthcare, Vascularization Strategies*

MINIMAL: A Boring Interface for a Better Life – Leveraging Intentional Boredom and Behavioral Psychology to Promote Digital Well-Being

Kushal Yadav
Dept. of Electrical Engineering
UIET Chandigarh, Chandigarh

Abstract

In a hyper-stimulated digital age, excessive screen time has become a widespread concern, leading to cognitive fatigue, reduced attention spans, and an overall decline in mental well-being. This paper introduces MINIMAL, a behavioral design system that intentionally embraces boring, grayscale user interfaces to discourage addictive digital habits and promote mindful device use. Drawing from key psychological frameworks — including hedonic adaptation, stimulus fatigue, dopamine detox, and choice architecture — MINIMAL creates friction against compulsive scrolling and passive consumption. The system removes engaging visual stimuli, limits time on non-essential apps, and replaces distraction with simple, purpose-driven tools such as journaling, to-do lists, and guided breathing exercises. At its core, MINIMAL leverages the concept of intentional boredom — the deliberate creation of unstimulating environments to restore users' natural attention cycles and reduce dependency on digital rewards. Unlike restrictive blockers or surveillance tools, MINIMAL encourages users to build healthier relationships with their devices through self-awareness and environment design. A working prototype was developed using minimal web technologies (HTML, CSS, JavaScript), and early user testing indicated a measurable reduction in screen time and a subjective increase in focus and clarity. By realigning digital interfaces with human cognitive limits, this project offers a sustainable, psychology-backed approach to digital well-being — contributing to both individual mental health and broader goals of digital sustainability.

Keyword: *Digital Well-being, Behavioral Design, Screen Time Reduction, Cognitive Fatigue, Intentional Boredom, Dopamine Detox, Minimalist Interfaces*

BhookhBuddy: An AI-Powered Platform for Affordable Essentials and Donation Facilitation

Madhav Ojha

Aeronautical Engineering

Nalanda College of Engineering

Abstract

BhookhBuddy presents an AI-driven platform aimed at enhancing access to affordable essentials while facilitating seamless donation of surplus food, groceries, and unexpired medicines. This study focuses on addressing resource distribution gaps among underserved communities by leveraging artificial intelligence for real-time donation matching, need-based prioritization, and verification of donation safety. The platform architecture integrates AI-powered chatbots, GIS-enabled logistics optimization, and secure tracking systems, built using React Native, Firebase, and Google Maps API. The development methodology emphasized a user-centric design approach combined with automated validation algorithms to ensure reliability and efficiency. Pilot implementation results indicate significant improvements in donation management efficiency, reduction in resource wastage, and enhanced accessibility for target populations. BhookhBuddy not only simplifies the donation process but also fosters community participation through gamified incentives and social impact tracking. The research demonstrates the platform's potential to contribute meaningfully to food security initiatives, healthcare access, and sustainable community development, highlighting its scalability and adaptability across different socio-economic settings.

Keyword: *AI-powered donation, food security, real-time logistics optimization, surplus resource management, humanitarian technology, affordable essentials, community-driven innovation*

A Review of Transfer Learning Techniques for Cross-Domain Adaptation

Mehul Vig

School of Engineering and Technology
BML Munjal University, Gurugram, Haryana

Abstract

Transfer learning has become an important part of machine learning, especially in situations where there is limited data in the target domain. It enables models to leverage knowledge from a related source domain to improve performance on new tasks. This approach is particularly useful in real-world scenarios where collecting large labelled datasets is challenging. However, despite its benefits, transfer learning often faces difficulties in domain adaptation, where differences between source and target data can reduce model effectiveness. This paper explores various approaches to cross-domain knowledge transfer — including feature transformation methods, adversarial adaptation, and self-supervised techniques. The focus is on understanding what makes these methods effective, identifying their limitations, and analysing the impact of negative transfer when knowledge from the source domain misaligns with the target. Through this review, several key research gaps have been identified: (1) the need for more robust and reliable adaptation methods to handle significant domain shifts, (2) improved techniques for predicting transferability, and (3) standardized evaluation protocols for cross-domain scenarios. Emerging areas such as meta-transfer learning and cross-modal adaptation also appear promising for addressing current challenges and enhancing the practical impact of transfer learning in data-scarce environments.

Keyword: *Transfer Learning, Domain Adaptation, Cross-Domain Knowledge Transfer, Negative Transfer, Meta-Transfer Learning*

Meta-Analysis on Green Marketing: Trends, Effectiveness, and Consumer Response

Monika Gahlawat
PhD Research Scholar
Gurugram University

Dr. Garima Dadhich
Associate Professor
Indian Institute of Corporate Affairs

Abstract

Green marketing, defined as the promotion of products or services based on their environmental benefits, has become an essential business strategy in response to climate change and consumer awareness. This meta-analysis reviews and synthesizes findings from 25 empirical studies published between 2010 and 2024 to evaluate the effectiveness of green marketing strategies. Using statistical methods to measure effect sizes, the study finds that green marketing positively influences consumer purchase intention, brand loyalty, and corporate image. However, greenwashing and price sensitivity moderate these effects. The findings provide insights for policymakers and marketers on how to structure credible and effective green marketing strategies.

Keyword: *Green marketing, Eco-friendly marketing, Sustainable fashion, Ethical fashion, Green branding*

Digital Human Simulation in Work Ergonomics

Munindra Jain
Electronics and Computer Engineering
BML Munjal University

Abstract

Digital Human Simulation (DHS) is rapidly changing how ergonomics is applied in workplace design. This study focuses on how DHS helps engineers and designers create safer, more efficient work environments by simulating human tasks in virtual spaces. Using realistic digital avatars, DHS allows for early identification of posture-related risks, task inefficiencies, and physical strain—long before any real-world setup begins. The paper also highlights the use of advanced tools such as RAMSIS and ema Work Designer in both academic settings and industry, demonstrating how these platforms improve learning and professional skills through interactive simulations. By examining posture dynamics, reach zones, and task repetition, DHS supports better decision-making and reduces the chances of work-related injuries. The research further explores how DHS is evolving into intelligent systems that respond to real-time data, helping organizations build adaptive and personalized workplaces. Overall, this paper makes the case for integrating DHS into mainstream ergonomic planning to ensure that future workspaces are not only more productive but also safer and more human-focused.

Keyword: *Virtual Simulation, Human-Centered Engineering, Digital Human Simulation, Metaverse, VR, AR*

Between the Algorithm and Abuse: Assessing the Efficacy of Cyberbullying Detection Tools, Laws, and User Safety

Rishika Singh

School of Law

CHRIST (Deemed to Be University)

Niharika Talan

School of Law

CHRIST (Deemed to Be University)

Abstract

In a world where everybody knows about social media, as much as it is something that has transformed the lives of human beings, it has also given rise to the phenomenon known as Cyberbullying. Cyberbullying has now evolved into a pervasive global menace where detection systems lag behind in combat against its morphing forms and regional dynamics. These systems, being mostly dependent on supervised machine learning models as well as keyword-based filtering techniques, are challenged to tackle cultural, linguistic, and contextual idiosyncrasies, hence failing to pinpoint nuanced or coded types of abuse, thereby diminishing their ability to detect subtle manifestations of abuse in the form of sarcasm, coded messages, or non-verbal cues like exclusion. India is a key case study country with the highest reported cyberbullying in the world and special challenges related to multilingual patterns of abuse, gender inequality, and platform-specific threats. Victims often turn to maladaptive coping strategies such as hiding events or closing down social media profiles because they lack proper support systems. The legal environment complicates matters further; whereas international laws indirectly confront cyberbullying via cybercrime legislation, India does not have a specific anti-cyberbullying law despite the availability of provisions in the IT Act and IPC. This paper promotes localized responses that merge culturally responsive AI models with human moderation, multidisciplinary approaches synthesizing education and technology, and international cooperation to coordinate legal protections. By placing global trends against India's extreme case study, the study emphasizes the insufficiency of universal approaches and demands regionalized strategies to make online safety equitable across different regions.

Keyword: *Cyberbullying, AI detection, Harassment, Social Media, Machine Learning*

Blank Slate, Bold Ideas: Motivational Drivers of First-Gen Entrepreneurs in Indian Colleges

Pallavi Jyoti
College of Business Studies
COER University

Dr. Vibha
College of Business Studies
COER University

Abstract

This study investigates the key motivational factors influencing Generation Z's inclination toward entrepreneurship within the Indian higher education context. Drawing on entrepreneurial motivation theory, the research examines how socio-cultural and economic elements shape students' decisions to pursue business ventures. A structured survey was conducted among 100–150 students from diverse academic backgrounds to assess their entrepreneurial ambitions, motivations, and awareness of support systems. Preliminary findings reveal that students from business disciplines without prior entrepreneurial experience exhibit a higher interest in starting their own ventures compared to their experienced peers. This suggests that a lack of prior exposure may foster greater creativity and openness to innovative ideas, unbound by conventional constraints. The study underscores the importance of mentorship, interdisciplinary entrepreneurial education, and the effective integration of governmental support mechanisms within academic institutions. By exploring the interplay between academic background and motivational drivers, this research offers valuable insights into fostering entrepreneurial mindsets among youth in developing nations.

Keyword: *Entrepreneurial Motivation, Gen Z Entrepreneurship, Socio-cultural Factors, Higher Education in India, Youth Business Intentions*

Statistical analysis of nano-mechanical property evaluation of Duplex Stainless Steel's Phases

Priyansh Singh

Dept. of Computer Science Engineering
BML Munjal University

Abstract

This study addresses the challenge of modelling the reliability of nano-mechanical property data in materials science through advanced statistical analysis. The primary objective is to identify the most suitable probability distributions for characterizing phase-specific hardness and modulus measurements in duplex stainless steel (DSS), a critical material for structural applications. By rigorously comparing statistical models, we aim to enhance the accuracy of reliability assessments, which are pivotal for predicting material performance under operational stresses. Dataset used: The analysis leverages experimentally obtained hardness (H) and modulus (Er) data from DSS samples with a defined chemical composition. The material was heat-treated at 1050°C for 6 hours, followed by two distinct post-treatment processes: annealing (AN) and water quenching (WQ). Each sample group was further divided into longitudinal (LS) and transverse (TS) sides for microstructural evaluation. Nano-indentation experiments were conducted to map phase-specific mechanical properties across these surfaces, generating datasets for statistical modelling. Statistical Analysis: 6 probability distributions—Normal, Log-normal, Gamma, three-parameter Weibull, Inverse-Weibull and Gumbel—were fitted to the experimental data. These models were selected to evaluate their ability to capture the inherent variability in mechanical property measurements, particularly focusing on extreme deviations and skewness in the datasets. To validate the goodness-of-fit, multiple statistical criteria were employed: Chi-Square, BIC, Kolmogorov S, KL Divergence test.

Keyword: Duplex Stainless Steel (DSS), Nano-indentation, Mechanical Properties, Probability Distributions, Statistical Modelling, Reliability Analysis, Goodness-of-Fit Tests

Cognitive Load Measurement Utilizing EEG and Machine Learning Algorithms

Purvanshu Dhariwal
School of Management
BML Munjal University

Abstract

Cognitive load assessment plays a crucial role in evaluating mental effort and fatigue, particularly in high performance tasks. Electroencephalography offers a non-invasive approach to analysing brain activity and identifying variations in cognitive workload. This research paper presents an EEG based cognitive load measurement framework that utilizes a 32-channel EEG dataset to capture brain activity across task and resting states. The study examines EEG frequency band responses to cognitive workload fluctuations, drawing insights from previous research on mental fatigue assessment. A statistical evaluation, including channel wise comparison and correlation analyses, is conducted to determine the cognitive load on neural activity. The research uses machine learning techniques to predict mental fatigue, time-series workload variations, and cognitive state trends. The results indicate significant EEG pattern variation between task and rest conditions, with prominent changes in the alpha and theta correlating with correlating with cognitive workload levels. The proposed approach enhanced EEG-based cognitive state monitoring, contributing to advancements in neuroergonomics, education, and occupational performance optimization.

Keyword: *EEG, Cognitive Load, Mental Fatigue, Brain Activity, Frequency Bands, Machine Learning, Neuroergonomics*

A Case Study of the Menendez Brothers: Childhood Trauma, Violence, and Implications for Sustainable Social Systems

Rafa Hasan Zamir
Department of Social Sciences
Rayat Bahra University

Abstract

This qualitative research aims to examine the Menendez Brothers' case of parricide, committed on August 20 1989 in Los Angeles, through the lens of psychological trauma and its implication for sustainable social systems. This study examines how prolonged childhood trauma and systemic failures in the family institutions contributed to the brothers' violent behaviour. The thematic analysis reveals how unresolved trauma, parental abuse and toxic familial environment undermines social sustainability and community wellbeing, which could lead to increase in violent acts in the society. Furthermore, the study takes a deep dive into the trauma-informed interventions and rehabilitation techniques critical to prevent the violent outbursts and break the destructive pattern. This research focuses on this case in particular, however, setting the foundation for future application and research.

Keyword: *Social Sustainability, Childhood Trauma, Violence, Interventions, Toxic Familial Environment*

Investigation of PDMS-ZnO Nanocomposites for application to nano-generators

Ritu

School of Engineering and Technology
BML Munjal University

Ranbir Singh

School of Engineering and Technology
BML Munjal University

Anubhav Agrawal

School of Engineering and Technology
BML Munjal University

Abhimanyu Singh Rana

School of Engineering and Technology
BML Munjal University

Abstract

The advancement of portable and wearable electronics has intensified the need for efficient, self-sustaining energy harvesting technologies capable of converting mechanical energy into electrical power. Triboelectric and piezoelectric nanogenerators are emerging amongst the most promising approaches to leverage contact electrification and strain-induced polarization to generate electricity from everyday mechanical actions. Zinc oxide (ZnO), renowned for its piezoelectric properties and nano-structural versatility, has been a focal point in this field. When integrated with polydimethylsiloxane (PDMS), a flexible polymer with excellent triboelectric characteristics, ZnO-PDMS nanocomposite has emerged as prominent hybrid nano-generator material exhibiting the hybrid piezo-tribo phenomenon and offers enhanced energy conversion potential. This study investigates the synthesis and characterization of a ZnO-PDMS nanocomposite layer. Literature reveals that electrical performance of the hybrid nano-generator material can be optimized by varying forces and frequencies. Our research findings aim to strengthen the scientific literature in the field of nano-generators for applications in flexible electronics, self-powered systems and sustainable energy.

Keyword: ZnO, PDMS, nanocomposites, nano-generators, piezo-electricity, tribo-electricity, Hybrid nano-generators

AI-Powered Sustainability Consulting: Transforming Business Strategy for a Greener Future

Rohit Kumar
Indian School of Business
Noida, Uttar Pradesh

Abstract

In an era where climate change, environmental degradation, and social responsibility are redefining business norms, sustainability has evolved from a peripheral concern to a strategic imperative. This research paper explores the transformative role of Artificial Intelligence (AI) in the field of sustainability consulting, presenting how data-driven insights, automation, and predictive modeling are empowering consultants to revolutionize business strategies across industries. As companies navigate the complexities of Environmental, Social, and Governance (ESG) criteria and Sustainable Development Goals (SDGs), AI offers a cutting-edge toolkit to drive measurable, scalable, and real-time solutions. The study delves into the integration of AI technologies—such as machine learning, natural language processing, and AI-based analytics—into sustainability consulting practices. It presents practical frameworks that consultants can adopt to assess carbon footprints, optimize supply chains, enhance energy efficiency, and embed sustainability into core business models. Through detailed case studies from global consulting firms and green-tech startups, the paper highlights how AI-powered consulting has enabled organizations to transition from compliance-based sustainability to proactive and innovative environmental leadership. Furthermore, the research examines the challenges associated with this shift, including data privacy, technological barriers, skill gaps, and the ethical implications of AI-driven decision-making. It also evaluates the opportunities for consulting firms to develop new services, expand into underserved markets, and collaborate with governments and NGOs on global sustainability agendas. By bridging the gap between advanced technology and sustainable strategy, this paper emphasizes how AI-powered consulting is not only transforming business outcomes but also shaping a greener, more resilient future. The insights presented offer a compelling call to action for consultants, corporates, and policymakers to embrace AI as a powerful enabler of sustainable growth.

Keyword: *Artificial Intelligence (AI), Sustainability Consulting, ESG, SDGs, Predictive Analytics, Green Technology, Sustainable Strategy*

Water Security of Small Islands and the path to achieve SDG 6 by 2030: A Comparative Analysis of Sri Lanka and Maldives

Rosario Mervin Thabooshan
International Relations
South Asian University

Abstract

Water forms the fundamental connection between Human and natural environment. UN has defined the water security as “the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being...and for preserving ecosystems in a climate of peace and political stability.” In fact, small islands are more vulnerable to water security issues. UN resolution SDG 6 ensures the availability and sustainable management of water and sanitation for all. This paper will analyze water security of small islands and the path to achieve SDG 6. The research question of the paper is how do Sri Lanka and Maldives position themselves to achieve the SDG 6 by 2030? As a methodology, I take the comparative case study of Sri Lanka and Maldives. The key objects of the papers are to find out how Sri Lanka and Maldives compete against water crisis and finding out how Sri Lanka and Maldives prepare to achieve SDG 6. The expected out comes are finding whether Sri Lanka and Maldives will be able to achieve SDG 6 by 2030 and finding better ways for small islands to achieve SDG 6.

Keyword: *Water Security, Sustainable Development Goals 6, Small Islands, Sri Lanka, Maldives*

Novel framework using Armstrong numbers for encryption of multimedia data

Shradha Aggarwal

School of Engineering and Technology
BML Munjal University

Abstract

We introduce a hybrid encryption system that uniquely combines Armstrong number-based key generation with Cipher Block Chaining mode to securely encrypt text, images, and audio files. By leveraging the mathematical properties of Armstrong numbers (narcissistic numbers) to generate cryptographic keys—enhanced with SHA-256 hashing and randomized shuffling—the system ensures robust and unpredictable encryption. It adheres to NIST-standard CBC with 16-byte blocks, employing PKCS#7 padding for data integrity, while preserving metadata for images and audio. The implementation guarantees lossless decryption and resists common attacks through IV dependent keys and proper chaining. Designed for versatility, it supports multi-format encryption without compromising security, making it suitable for secure messaging, media protection, and educational demonstrations of cryptographic principles. The system's novelty lies in its fusion of number theory with classical cryptography, offering a unique approach to key generation while maintaining compatibility with industry-tested encryption modes.

Keyword: *Hybrid Encryption, Armstrong Numbers, CBC Mode, SHA-256, Cryptographic Key Generation, Multimedia Encryption, Data Security*

Integrating AI into CSR: A study of initiatives of Indian Banks for Transforming Agriculture

Sonia Sharma

Abstract

In India agriculture plays a vital role. Being an important part of India's economy, it offers job to a number of population and support the growth of the country. Despite of this, agriculture sector is facing various challenges such as low productivity, unpredictable climate conditions, lack of financial support etc. To support farmers in addressing these issues, Indian banks have started providing help through their CSR initiatives in this area. With the rise of digital innovation, AI has emerged as a key driver in full filing these initiatives. Current paper explores how banks in India are leveraging AI as part of their CSR initiatives to bring innovation and advancement in agricultural in a sustainable manner. Focusing on the challenges faced by agriculture in India, banks have adopted innovative, tech-driven approaches to address these problems. Under this study the focus is on five major Indian banks—SBI, Bank of Baroda, HDFC Bank, ICICI Bank, and Axis Bank—alongwith the NABARD, which plays a crucial role in providing finance and other related facilities for rural development. This research analyses how these institutions merge AI into their Corporate Social Responsibility programs to support farmers, enhance crop productivity, and improve rural financial access. In this paper secondary data is used for research and comparative analysis is also performed. This study showcases initiatives of these institutions such as AI-powered credit scoring, recommendations for precision farming, and data-driven risk management approach. The findings reveal a measurable improvement in agricultural outcomes post-AI adoption and provide insights into how CSR-driven banking efforts support to India's sustainable development goals.

Keyword: *Agriculture, Artificial Intelligence (AI), Corporate Social Responsibility (CSR), Indian Banks, Rural Development, Precision Farming, Sustainable Development Goals (SDGs)*

गृहearnि : A Digital Revolution to transform Housewives into Economic Contributors: A study of feasibility for developing tech enabled platform for Housewives in Delhi

Sujal Sharma

Indian Institute of Mass Communication, Dhenkanal

Abstract

This study addresses the socio-economic challenges that prevent many skilled housewives in India from entering the formal workforce. With a focus on Delhi as the pilot region, the research explores entrenched societal restrictions, limited flexible work opportunities, and poor access to economic resources. The study introduces गृहearnि, a sustainable, technology-driven platform designed to transform latent domestic skills into viable professional engagements. Employing a mixed-methods approach, including quantitative surveys and qualitative interviews with housewives, community leaders, and industry experts, the study identifies key skill sets, preferred employment models, and digital literacy gaps. गृहearnि offers tailored services such as skill-matching, remote work projects, digital training, and secure payment systems within an inclusive, user-friendly ecosystem. Collaborations with local enterprises, NGOs, and government schemes enhance the platform's viability. Preliminary findings indicate strong readiness among housewives to participate in remote and part-time roles, provided adequate digital infrastructure and community awareness are ensured. Ultimately, the platform aims to foster gender equality, promote economic self-reliance, and catalyse sustainable social innovation across urban India.

Keyword: *Women's Empowerment, Digital Inclusion, Remote and Flexible Work, Sustainable Innovation, Socio-Economic Development*

Perceived Causes of Women Rape in India

Sunidhi Parmar

Department of Social Sciences

Rayat Bahra University

Abstract

Rape is a social issue, increasing in its severity and prevalence with time, impacting the society and the world. Under Section 375 of the Indian Penal Code (as amended by the Criminal Law Amendment Act, 2013), rape is legally defined as “Penetration to any extent of the penis into the vagina, mouth, urethra or anus of a woman, or making her do so with him or any other person; or insertion of any object or part of the body to any extent into the vagina, urethra or anus of a woman; or applying the mouth to the vagina, anus, or urethra of a woman”. NCRB (2022) reported 31,516 rape cases – an average of 86 per day – with Rajasthan being highest and Delhi leading among metros. The underreporting in cases of sexual violence remains a major concern. According to the National Family Health Survey (2018) around 99% of sexual assault cases go unreported in India. UNICEF (2024) reported over 370 million girls worldwide – approximately one in every eight under the age of 18 – have experienced sexual violence or rape. This exploratory study investigates various causes of women rape as perceived by male and females. Data collected from males and females between age 18-25 years using interviews utilised thematic analysis to identify causes of rape focusing socio-cultural, psychological, emotional, developmental and cognitive vulnerability, family and parenting issues, institutional and legal failures, etc. The study advocates role of men in raising awareness about gender equality, aiming to prevent sexual violence.

Keyword: *Rape, Sexual Violence, Gender Equality, Socio-cultural Factors, Thematic Analysis, Legal Framework, Youth Perception*

Amazon Product Recommendation System Using Machine Learning

Tanya Aggarwal
Assistant Professor
Lloyd Business School

Abstract

With the rapid increase in demand and popularity for E-Commerce platforms such as Amazon, Flipkart various users find it very difficult to match their preferences among the various available options. To address this issue, we propose a Machine Learning Based Recommendation System that is specifically designed for Amazon's Product Dataset. The Dataset containing Product IDs, User IDs, Ratings, Preferences that can be pre-processed by cleaning the data that will help in improving efficiency. We employed various recommendation techniques such as popularity-based filtering, content based filtering and collaborative filtering. Collaborative filtering was further divided into two parts that is Item-Item based and user-User based collaborative filtering by using the K Nearest Neighbour. After that performance metrics were calculated to determine model accuracy by using MAE (Means Absolute Error) and RMSE (Root Mean Squared Error). After analysing we find that item-item based collaborative filtering is the best model that helps in demonstrated best performance. Our model not only focus on preferences but it also helps in making personalized product recommendation that helps to improve the user satisfaction. In future we plan to integrate various deep learning models and a web interface to further enhance the accuracy of recommendation system.

Keyword: *Machine Learning, Content Based, Amazon, E-Commerce, Collaborative filtering, Data Preprocessing,*

Multimodal Learning for Image Caption Generation: A Deep Learning Approach

Winster Pereira
FRCRCE
Bandra, Mumbai

Abstract

In today's highly visual digital landscape, images have emerged as a common mode of communication across social media platforms. However, attaching meaningful and contextually relevant captions to these images remains a significant challenge. This paper presents an automated image caption generator designed to overcome these hurdles by leveraging the power of deep neural networks. The proposed approach employs a hybrid architecture that combines convolutional neural networks (CNNs) and recurrent neural networks with long short-term memory (LSTM) units. CNNs, specifically the VGG16 and ResNet-50 models, are utilized for their proficiency in extracting salient visual features from images. The Transformer architecture, widely used in natural language processing, is compared against these CNNs for its attention-based mechanisms and language modelling capabilities. LSTMs facilitate the generation of coherent and linguistically accurate textual descriptions. The system demonstrates an excellent performance across standard evaluation metrics like BLEU, METEOR and ROUGE on the Flickr8K dataset. Extensive experiments conducted on the Flickr8K dataset validate the efficacy of the system in capturing the essence of diverse images and producing relevant captions. The modular design and straightforward training methodology enable convenient deployment across various platforms and applications. This work introduces an adaptable framework poised to revolutionize visual storytelling by bridging the gap between imagery and text in our increasingly interconnected visual world. The automated image caption generator represents a significant stride towards enhancing communication and understanding through the seamless fusion of visual and linguistic modalities.

Keyword: *Image Captioning, Deep Learning, CNN, LSTM, Transformer, Visual-Language Integration, Flickr8K Dataset*

Heat exchanger analysis for PWR Nuclear Reactor

Yaksh Dharod
Chemical Engineering
Institute of Chemical Technology

Abstract

Pressurized Water Reactor (PWR) heat exchanger tubes are critical components that maintain the integrity of the primary-to-secondary coolant boundary, preventing radioactive material leakage. Over time, these tubes are susceptible to various degradation mechanisms, such as stress corrosion cracking, intergranular attack, and mechanical damage, which may lead to through-wall tube rupture. This research provides a comprehensive analysis of the optimum heat exchanger for PWR steam generators. Emphasis is placed on understanding dynamic modelling approaches, the role of condition monitoring systems, and operator response strategies to minimize failure risks. The paper aims to improve reactor safety and reduce maintenance downtime. Future research directions are proposed, highlighting the need for enhanced data visualization and decision-making tools to support early fault diagnosis and extend tube life.

Keyword: *Heat exchanger, nuclear power plant, PWR coolant, reactor*

USTART: Redefining India's Ride-Hailing Industry with Transparency & Fairness

Rishabh Goel
School of Management
BML Munjal University

Yash Gupta
School of Engineering and Technology
BML Munjal University

Abstract

This paper explores the emergence and evolution of USTART, a disruptive startup in India's ride-hailing industry that challenges conventional practices through a zero-commission model. USTART aims to empower both drivers and passengers by addressing systemic issues such as high commission fees, inconsistent service quality, and lack of transparency prevalent in traditional platforms. The case study highlights USTART's foundational motivations, stemming from real-world frustrations encountered by its founders, and details its journey from conception to pilot testing. By conducting market research and comparative analysis with established players like Ola, Uber, Rapido, and BluSmart, USTART identifies critical pain points and strategically develops a user- and driver-centric platform. The pilot testing phase at BML Munjal University validates USTART's approach, revealing increased driver satisfaction, user trust, and platform reliability. The financial model centres on sustainability through alternate revenue sources like ads and partnerships, ensuring fairness without compromising profitability. USTART's broader vision encompasses social equity, technological innovation, and environmental responsibility. With ambitious plans for expansion into Tier 2 and Tier 3 cities, USTART presents a compelling blueprint for ethical, inclusive, and scalable urban mobility in India.

Keyword: *Ride-Hailing, Zero-Commission, Driver Empowerment, Urban Mobility, Social Innovation, Ethical Business, Sustainable Transportation, Startup Ecosystem*

Harvesting Energy the Green Way: Piezoelectric Nanogenerator Derived from Green-Synthesized ZnO Nanoparticles

Anushka Sharma

Dept. of Information and Technology
DUCIC, Delhi University, New Delhi

Abstract

The quest for sustainable energy sources has prompted the development of novel nanogenerators that can harvest mechanical energy from ambient sources. In this study, we have fabricated a nanogenerator by integrating a PDMS–resin composite infused with green-synthesized ZnO nanoparticles using beet leaf extract—an agro-waste product—demonstrating a dual-purpose utilization of plant waste and wasted mechanical energy. The synthesized ZnO NPs were characterized using Fourier-transform infrared spectroscopy (FTIR), Ultraviolet–Visible (UV–Vis) spectroscopy, and X-ray diffraction (XRD) analysis. FTIR spectrum revealed functional groups such as O–H, C=O, and C–O, confirming the presence of phytochemicals like flavonoids and polyphenols that facilitate reduction and stabilization during nanoparticle formation. A distinct Zn–O bond peak at 500–600 cm^{-1} affirmed successful nanoparticle synthesis. UV–Vis analysis showed a strong absorption peak at ~ 375 nm with a calculated band gap of ~ 3.31 eV, indicating the formation of pure, nanoscale ZnO. XRD results confirmed the hexagonal wurtzite structure with sharp diffraction peaks and high phase purity. For device fabrication, a PDMS–resin matrix infused with ZnO NPs was drop-cast onto PET sheets layered with aluminum tape, forming a sandwich structure. The resulting piezoelectric nanogenerator envisioned for applications such as footstep power generation in public transit areas and metro stations, where the harvested energy could be used to trigger alarm systems or monitor pedestrian traffic, thus offering smart, sustainable solutions for urban infrastructure.

Keyword: *Nanogenerator, ZnO Nanoparticles, Green Synthesis, PDMS-Resin Composite, Piezoelectric Energy Harvesting, Agro-Waste Utilization, Sustainable Urban Infrastructure*

Smart Scaling: Efficient Promoter Identification in Genomic Sequences with ModernBERT

Siddharth

Dept. of Information and Technology
DUCIC, Delhi University, New Delhi

Abstract

Accurately identifying promoter regions in DNA sequences is vital for understanding gene regulation, influencing research from disease progression to synthetic biology applications. Traditionally, promoter detection relied on motif recognition and statistical methods. Still, recent advancements in transformer-based deep learning models, such as DNABERT (Ji et al., 2021), DNABERT-2 (Zhou et al., 2024), and Nucleotide Transformers (Dalla-Torre et al., 2023), have significantly improved accuracy. However, increasing model complexity has led to disproportionately high computational costs relative to performance gains. This study explores an alternative approach using ModernBERT, a novel transformer architecture trained on the complete, gapless T2T-CHM13v2.0 human genome assembly. Our model employs global-local alternating attention mechanisms, Rotary Positional Embeddings (RoPE), and optimized network layers, substantially reducing computational demands. Although our model does not surpass DNABERT-2 in accuracy, it demonstrates significant computational efficiency and highlights the potential for smarter architectures and better-curated datasets. These findings suggest that scaling smarter, rather than simply scaling larger, may be a more sustainable direction for genomic applications.

Keyword: *Promoter Identification, DNA Sequences, Transformer Models, ModernBERT, Computational Efficiency, Gene Regulation, Genomic Deep Learning*

A Comprehensive Approach to Addressing Challenges in Net-Zero Building Development and Implementation

Ashu Kalra
Amity Institute of Environmental
Sciences
Amity University

Renu Dhupper
Amity Institute of Environmental
Sciences
Amity University

Abstract

To achieve sustainability goals, the development of net-zero buildings is essential, but several barriers are impeding their global implementation. The study aims to identify and analyse these barriers, dividing them into three primary categories: regulatory and policy challenges, economic constraints, and behavioural gaps. The research focuses on evaluating the existing frameworks for sustainability, building codes, and environmental certifications to highlight gaps that are hindering the advancements. A mixed-methods approach was used, combining a detailed literature review with survey data collected from organizations actively engaged in the implementation of NZBs. The findings showcased that many of the organizations have established frameworks for sustainability and energy efficiency. Still, gaps remain in building codes and environmental performance certifications, highlighting the need for improved coordination, regulation, and awareness. This paper also explores the practical opportunities and strategic ideas for design, construction, and management for bridging the gaps to enhance environmental conservation across the globe. Recommendations include strengthening the policy framework, upgrading certification standards, providing financial incentives, and encouraging employee engagement through education and training to bridge existing gaps and accelerate transition toward environmentally responsible building practices globally.

Keyword: *Net-Zero Buildings, Sustainable Development, Sustainability, Energy performance monitoring, energy efficiency, Sustainable building designs*

Jotto Problem: A new Perspective

Dakshi Arora
School of Engineering
& Technology
BML Munjal University

Prakhar Srivastava
School of Engineering
& Technology
BML Munjal University

Ranjib Banerjee
School of Engineering
& Technology
BML Munjal University

Abstract

This study extends the classic Jotto problem, a word-based logic puzzle where players infer a hidden word based on the number of shared letters with their guesses. Moving beyond the standard constraint of five-letter isograms, the proposed framework supports variable word lengths from three to six letters and permits duplicate characters, introducing increased combinatorial complexity. A graph-based model is developed wherein nodes represent candidate words and edges reflect shared-letter relationships, enabling efficient filtering, optimal guess strategies, and adaptability across configurations. The approach integrates concepts from graph theory, combinatorics, probability, and set theory to structure the solution space. An interactive web-based solver is also introduced, featuring real-time graph updates, adaptive logic, and auto-suggestion to enhance usability. The work contributes both a generalized algorithmic methodology for Jotto and a tool for exploring applications of discrete mathematics in language-based reasoning.

Keyword: *Jotto Problem, Word puzzle, Graph theory, Combinatorics*

Before Green was a Trend, India's Timeless Sustainability!

Mahi Vashisth

Department of political science
Kalindi college, University of Delhi

Abstract

In a world racing toward technological advancement, the answers to a greener future may lie in the quiet, enduring wisdom of the past. While modern technology works to provide green substitutes, it is the wisdom of our ancestors that holds some of the most rewarding solutions. This paper explores traditional architectural techniques and zero-waste practices rooted in indigenous Indian communities, revealing how ancient lifestyles were guided by a deep respect for ecological harmony. By examining examples such as rainwater harvesting, the use of terracotta jars, biodegradable banana leaves and plates, and bamboo in construction, the study highlights practical, low-impact methods that offer viable alternatives to contemporary environmental challenges. It also touches upon the integration of Ayurveda into modern skincare and medicine, showcasing the potential of chemical-free, plant-based remedies in today's wellness industries. The paper emphasizes that sustainable living is not a new concept but a forgotten heritage. Marrying past knowledge with present innovation is not a choice but a necessity!

Keyword: *Green substitutes, indigenous knowledge, zero waste practices, ecological harmony, ancient lifestyles, sustainable living.*

Author Index

Agrawal, Aaditya Vikram, 17
Aggarwal, Shradha, 37
Aggarwal, Tanya, 41
Arora, Dakshi, 48
Agrawal, Anubhav, 34

Banerjee, Ranjib, 48

Chandra, Janvi, 20
Chauhan, Kashish, 23

Dadhich, Garima, 27
Dharod, Yaksh, 43
Dhariwal, Purvanshu, 32
Dubey, Atharva, 18

Gupta, Yash, 44

Hasan, Rafa, 33

Jain, Munindra, 28
Jyoti, Pallavi, 30

Kalra, Ashu, 47
Kanot, Mihir, 17
Katoch, Mihir, 17
Kumar, Lavish, 15
Kumar, Rohit, 35

Ojha, Madhav, 25

Parmar, Sunidhi, 40
Pereira, Winster, 42
Poddar, Jiya, 21

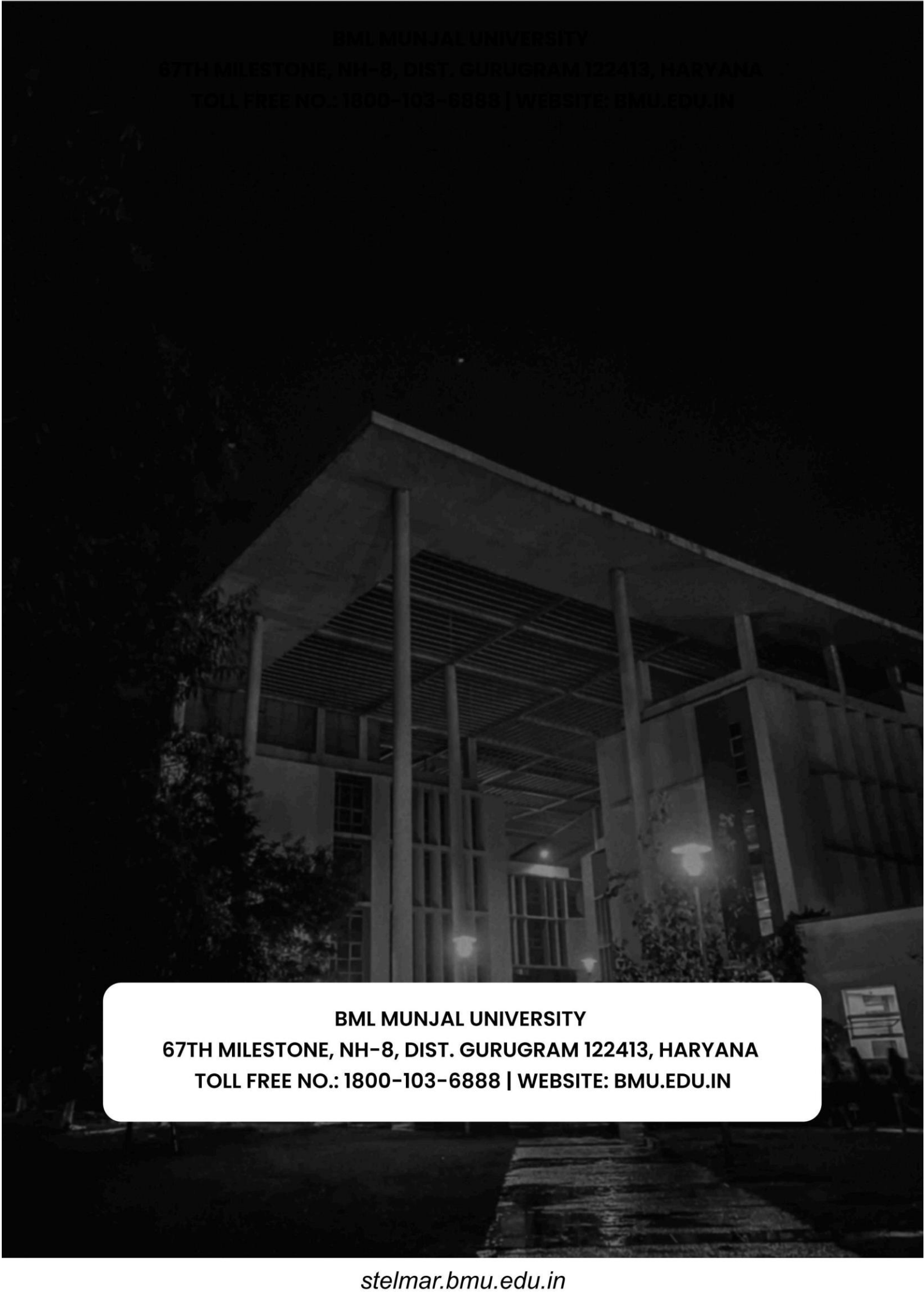
Rana, Abhimanyu Singh, 34
Rawal, Diya, 19

Singh, Priyansh, 31
Singh, Ranbir, 34
Singh, Rishika, 29
Sharma, Anushka, 45
Sharma, Sonia, 38
Sharma, Sujal, 39
Shrivastava, Arun, 14
Srivastava, Prakhar, 48

Talal, Niharika, 29
Thabooshan, Rosario Mervin, 36

Vashisth, Mahi, 49
Vig, Mehul, 26
Vibha, Vibha, 30

Yadav, Kushal, 24



BML MUNJAL UNIVERSITY
67TH MILESTONE, NH-8, DIST. GURUGRAM 122413, HARYANA
TOLL FREE NO.: 1800-103-6888 | WEBSITE: BMU.EDU.IN

BML MUNJAL UNIVERSITY
67TH MILESTONE, NH-8, DIST. GURUGRAM 122413, HARYANA
TOLL FREE NO.: 1800-103-6888 | WEBSITE: BMU.EDU.IN