

# **Innovations Across Disciplines:**

Advancements in Engineering, Technology, and Sustainability

*Edited by*

**Dr. Ranjan Kumar**

*Head of the Department & Associate Professor  
Department of Mechanical Engineering  
Swami Vivekananda University, Kolkata*

**Dr. Ashes Banerjee**

*Assistant Professor  
Department of Civil Engineering  
Swami Vivekananda University, Kolkata*

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## ***Preface***

This compilation presents a diverse and insightful collection of research works that span across the domains of civil engineering, computer science, environmental science, and biomedical technology. Each paper reflects the innovative thinking and investigative efforts of scholars dedicated to addressing contemporary challenges through scientific inquiry and technological advancement.

Beginning with advancements in soil stabilization and electrokinetic treatment methods, the volume delves into cutting-edge solutions aimed at improving infrastructure and environmental sustainability. It further explores the integration of modern GPS technologies and optimized material recovery facilities, highlighting the intersection of technology with sustainable urban planning.

The compilation then shifts focus to the ever-evolving landscape of digital technology. From the predictive capabilities of recurrent neural networks in financial markets to the complex legal framework of IoT in India, the included works offer a nuanced understanding of how emerging technologies are shaping our present and future. In particular, studies on cloud security, explainable machine learning, and edge computing underscore the growing need for secure and interpretable systems in an increasingly connected world.

Healthcare innovation is another key theme, with research addressing the role of color imaging, biomedical imaging, and digital image processing in diagnosing and understanding medical conditions, such as brain cancer. The collection also includes analyses of virtual reality therapy for mental health and surveys on human activity recognition, both of which showcase the powerful confluence of technology and well-being.

The creative application of technology in education and media is represented through studies on AI-based course recommendation systems, narrative visualization through storyboarding, and character design in video games. These works not only demonstrate technical proficiency but also emphasize user experience and storytelling.

Finally, the role of IoT in agriculture and the broader ecological sustainability metrics offer a reminder of our responsibility to leverage innovation for the benefit of both people and the planet.

Together, these papers serve as a testament to interdisciplinary research and the spirit of discovery. We hope that this collection inspires further exploration, critical thinking, and meaningful contributions across scientific and engineering fields.

***Dr. Ranjan Kumar  
Dr. Ashes Banerjee***

## ***Acknowledgement***

We would like to express our sincere gratitude to all the individuals and institutions who have contributed to the successful compilation of this volume, Innovations Across Disciplines: Advancements in Engineering, Technology, and Sustainability. First and foremost, we extend our heartfelt thanks to the authors whose research and dedication form the foundation of this work. Their commitment to exploring new ideas, solving real-world problems, and pushing the boundaries of knowledge is truly commendable.

We are especially grateful to our mentors, faculty members, and academic advisors for their invaluable guidance, support, and encouragement throughout the preparation of this collection. Their insights and constructive feedback have greatly enhanced the quality and depth of the presented works.

We also acknowledge the efforts of the editorial and review team, whose attention to detail and commitment to academic excellence ensured the smooth and timely completion of this project.

A special thanks goes to the institutions and laboratories that provided the resources and platforms necessary for conducting the research featured in this volume. Their support has been instrumental in turning ideas into impactful contributions.

Lastly, we extend our gratitude to our families and friends for their unwavering support, patience, and motivation during this endeavour.

This collection is a result of collaboration, curiosity, and the shared pursuit of knowledge. We hope it serves as a valuable resource for students, researchers, and practitioners alike.

***Dr. Ranjan Kumar  
Dr. Ashes Banerjee***

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