

# **Journal of Discrete Mathematical Sciences & Cryptography**

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*Special Issue on*

**Innovations in Discrete Mathematical Sciences and Computational Techniques for Cryptography, Data Security, and Secure Information Systems**

*Guest Editors*

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## FOREWORD

This special issue, entitled “Innovations in Discrete Mathematical Sciences and Computational Techniques for Cryptography, Data Security, and Secure Information Systems”, brings together a diverse collection of contemporary research contributions in the fields of discrete mathematics, computational techniques, cryptography, and information security. The issue reflects the growing importance of discrete mathematical structures and algorithmic methods in addressing emerging challenges in secure communication, data protection, network vulnerability, and computational problem-solving.

The selected contributions cover several important areas of discrete mathematical sciences. A significant group of papers focuses on graph theory and graph labelling, including equitable labelling, product cordial labelling, prime cordial labelling, domination parameters, and radio numbers associated with different classes of graphs and graph operations. These studies provide theoretical results as well as algorithmic approaches, including MATLAB-assisted analysis and verification, demonstrating the continuing relevance of computational techniques in exploring complex discrete structures.

Another important theme is the development of algebraic and fuzzy mathematical structures. Contributions dealing with alternative rings, potent and nilpotent elements, fuzzy groups, fuzzy approximation spaces, and cubic fuzzy graphs extend the theoretical foundations of discrete mathematics while also examining their potential relevance to network analysis and vulnerability assessment. Such studies illustrate how abstract mathematical structures can provide useful frameworks for modelling and analysing complex systems.

The special issue also brings together significant contributions in cryptography and secure information systems. The included research addresses the mathematical foundations of code-based cryptography for quantum-resistant systems, post-quantum cryptographic schemes over

discrete algebraic structures, authentication based on the discrete logarithm problem in group rings, and advanced image-encryption techniques based on hyperchaotic systems, deep learning, dual-feedback diffusion, and SHA-512-based key generation. These contributions highlight the increasing role of mathematical structures, computational intelligence, and hybrid algorithms in developing robust security mechanisms for contemporary information systems.

In addition, the issue includes research on computational approaches to cyber security, particularly the application of automated machine-learning techniques to intrusion-detection pipelines. The integration of mathematical modelling, algorithmic analysis, machine learning, and cryptographic methods demonstrates the interdisciplinary nature of modern research in discrete mathematical sciences and its expanding applications in secure digital environments.

A notable feature of this collection is the participation of researchers from different academic and geographical institutions, bringing together perspectives from mathematics, computer science, information technology, and related disciplines. This diversity strengthens the interdisciplinary character of the collection and demonstrates the broad applicability of discrete mathematical methods to contemporary computational and security problems.

The papers included in this issue were selected from a total of 280 papers submitted to the International Conference on Applied and Interdisciplinary Mathematical Sciences (ICAIM-2025), held from 20–22 November 2025 at Sharda University, Greater Noida, India. Following a rigorous peer-review and editorial evaluation process designed to ensure their scientific quality, originality, and relevance to the scope of the issue, 15 papers were finally accepted for publication, corresponding to an overall acceptance rate of approximately 5.71%. The selected contributions collectively represent current developments in theoretical discrete mathematics, computational methods, cryptography, cyber security, and secure information systems.

We believe that this special issue will serve as a valuable reference for researchers, academicians, postgraduate students, and practitioners working in discrete mathematics, graph theory, algebraic structures, computational mathematics, cryptography, cyber security, and secure information systems. We further hope that the ideas and methodologies

presented here will stimulate new research directions and encourage continued collaboration between mathematical sciences and emerging computational and security technologies.

We extend our sincere appreciation to all authors for their valuable contributions, to the reviewers for their insightful comments and dedicated efforts, and to the editorial team for their continuous support throughout in bringing out this special issue. We are particularly thankful to Professor B. K. Dass, Chief Editor, for his constant support and encouragement during the publication process in the *Journal of Discrete Mathematical Sciences & Cryptography*, published by Taru Publications, New Delhi.

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