
Foreword

Special Issue on Combinatorial Mathematics and Computational Theory

Certainly, Combinatorial Mathematics and Computational Theory are two fields of study that significantly impact computer science and some areas of mathematics and science. Combinatorics is the study of discrete objects and has applications in diverse areas of mathematics and science, including computer science. It borrows tools from various areas of mathematics, such as algebraic geometry and topology, to solve problems in discrete geometry and extremal graph theory. Computational Theory, on the other hand, is concerned with studying algorithms and their efficiency. It has applications in diverse areas, such as artificial intelligence, complexity, and machine learning. In summary, Combinatorial Mathematics and Computational Theory are essential fields of study that have contributed significantly to developing computer science and other areas of mathematics and science.

The 39th Symposium on Combinatorial Mathematics and Computational Theory was held on June 24-25, 2022 at National Chengchi University in Taiwan. This symposium is held annually and brings together experts, researchers, scientists, and engineers worldwide to share experiences and exchange ideas. The symposium aims to promote academic exchanges, enhance information talents' software research and development capabilities, and cultivate innovation and creativity. The symposium hopes to help advance research in combinatorial mathematics and computational Theory.

We are pleased to present this special issue of the Journal of Information Science and Engineering (JISE), devoted to CMCT 2022. We invite some outstanding accepted papers in their extended versions and are widely open for other submissions to this particular issue. Each paper submitted to this special issue was rigorously reviewed by at least two reviewers in the corresponding research areas. Finally, about four papers are selected for this special issue. A summary of these papers is outlined below.

The first paper, "Opinion Optimization for Two Different Social Objectives: Combinatorial Algorithms and Linear Program Rounding," was contributed by Po-An Chen, Yi-Le Chen, and Wei Lo. In this paper, the authors aim to optimize two different social goals of public opinion optimization by controlling some individuals according to the rules of Stackelberg games. They propose com-

binatorial and linear program rounding algorithms as Stackelberg strategies that approximate the objective of optimizing utilitarian social costs for some exceptional cases and the objective of the total expression of opinion on generally directed graphs, respectively.

The second paper, "A New Tree Structure for Local Diagnosis," was contributed by Meirun Chen, Xiao-Yan Li, Cheng-Kuan Lin, and Kung-Jui Pai. Diagnosability is a crucial parameter to assess how well a multiprocessor system can tolerate faults. Local diagnosis, proposed by Hsu and Tan, focuses on the state of a node rather than the whole system. Chiang and Tan used an extended star structure to diagnose a node based on comparisons. In this work, the authors improve the local diagnosability by introducing a tree structure around the node. They also give an algorithm to diagnose the node using the tree structure. Through simulations of different node failure probabilities and percentages of failed nodes in the tree, the performance of the proposed algorithm is better than previous work.

The third paper, "Enumerating Furthest Pairs in Ultrametric Spaces," was contributed by Hui-Ting Chen and Ching-Lueh Chang. This paper considers the problem of enumerating/counting point pairs with the longest distance in an n -point ultrametric space. The problem can be solved trivially in $O(n^2)$ time. The authors propose a deterministic $O(F + n \log n)$ -time algorithm for the problem with total F furthest pairs and a Monte Carlo $O(n/\varepsilon^2)$ -time algorithm for estimating the number of furthest pairs for $\varepsilon > 0$.

The last paper, "Determining the 2-Tuple Total Domination Number of a Harary Graph under Specific Degree Conditions," was contributed by Min-Shu Jao, Hung-Lung Wang, Jou-Ming Chang, and Chia-Wen Wu. A 2-tuple total dominating set is a vertex subset in which every vertex has at least two neighbors. The 2-tuple total domination number of a graph is the cardinality of a minimum 2-tuple whole dominating set of the graph. This paper determines a Harary graph's 2-tuple total domination number $H_{m,n}$ with degree parameter $m \in \{3, 5\}$ and n vertices.

Acknowledgment

As the Guest Editors of this special issue, we would like to express our sincere gratitude to all reviewers and authors for their expertise and efforts in making helpful comments and significant contributions to this particular issue. Without their hard work, this special issue would not have been possible.

• Introduction to Guest Editors •



Sheng-Lung Peng is a Professor at the Department of Creative Technologies and Product Design, and the Dean of the College of Innovative Design and Management, the National Taipei University of Business in Taiwan. He received the Ph.D. degree from the Computer Science Department of National Tsing Hua University in Taiwan. He is an honorary Professor at Beijing Information Science and Technology University and a visiting Professor at Ningxia Institute of Science and Technology in China. He is also an adjunct Professor at National Dong Hwa University in Taiwan and, Mandsaur University and Kazi Nazrul University in India. Dr. Peng has edited several special issues in journals, such as *Frontiers in Public Health*, *Journal of Internet Technology*, *IEEE Internet of Things Magazine*, *Computers and Electrical Engineering*, *Sensors*, and so on. His research interests are algorithm design in the fields of artificial intelligence, bioinformatics, combinatorics, data mining, and networking.



Yen Hung Chen received his Ph.D. degree on Department of Computer Science from National Tsing Hua University in Taiwan. He is currently serving as a Professor and a Chair of Department of Computer Science from University of Taipei. His research interests include algorithms, computer theory, graph theory, information security and operations research.



Jia-Ming Chang, an Associate Professor at National Chengchi University's Department of Computer Science, holds a B.S. and M.S. from the Department of Computer Science, National Tsing Hua University, and a Ph.D. from the Centre for Genomic Regulation in Barcelona, Spain. Post-doctoral research followed at the Institute of Human Genetics, Montpellier, France. He received multiple academic awards, including 4-year La Caixa Ph.D. scholarship, the NCCU College of Science - Young Scholarship Award, the NCCU Academic

Research Awards, and an Excellent Young Scholar Research Grant from the Ministry of Science and Technology. Dr. Chang specializes in bioinformatics, focusing on sequence alignment, molecular evolution, and chromosome organization. He is also an associate editor for NAR Bioinformatics and Genomics.



Wen-Yu Chung received her B.S. and M.S. degrees in Computer Science from National Tsing Hua University, Hsin-Chu, Taiwan, and Ph.D degree in Computer Science and Engineering from the Pennsylvania State University, PA, USA, in 2000, 2002, and 2009, respectively. She is currently an Assistant Professor with the Department of Computer Science and Information Engineering at the National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan. Her research interests include bioinformatics, network biology, graph neural networks and machine learning.



Raylin Tso is currently the Distinguished Professor in the Department of Computer Science, National Chengchi University, Taiwan. He obtained his B.Eng. degree from National Tsing Hua University, Taiwan, in 1995. He received his M.Eng. and PhD degrees in Systems and Information Engineering from Tsukuba University, Japan, in 2004 and 2006, respectively. He has authored or co-authored over 200 papers in referred journals and conferences in the area of information security. His research interests are mainly in the areas of applied cryptography, PQC, FinTech security, privacy preserving data analysis, and blockchain technology. Raylin Tso has received many academic awards including, IPSJ Digital Courier Award for Young Researcher (2006), Dean's Award of the Graduate School of Systems and Information Engineering, University of Tsukuba, Japan (2006), Research Award of College of Science (NCCU) for Early Career Researchers (2015) and Award of WITC 2015 Outstanding Researcher (2015). He has served as the Executive Editor of Internal Journal of Information and Computer Security until 2020 and currently served as the Associate Editor of the Journal of Information Science and Engineering.
