

Oman Mathematics Committee Weekly Research Webinar- OMC-WRW
Fall 2025 – Spring 2026
Season 2 (S2 – #9)

Date: Wednesday 22/10/2025

Time: 20:00 Muscat meantime (+4GMT)



Speaker: Prof. Alireza Abdollahi, Department of Mathematics – University of Isfahan - Iran

Biography:

Dr. Alireza Abdollahi received the B.Sc., M.Sc., and Ph.D. degrees in Mathematics from the University of Isfahan, Iran, in 1996, 1997, and 2000, respectively, and the second Ph.D. degree in Mathematics from the Universite de Provence, CMI, France, in 2001. Since 2001, he has been with the Department of Mathematics, University of Isfahan, as a Faculty Member, and since 2009, he has been a professor of mathematics with the University of Isfahan. He is currently the author of more than 120 articles. His research interests include group theory and combinatorics. He was a recipient of the Alkharazmi Young Prize in 1999 and the Sheikh Bahaei Prize in 1999. He also received the “Institute for Studies in Theoretical Physics and Mathematics (IPM)” Young Mathematician Prize of 2005. He is the Editor-in-Chief of Journal of the Iranian Mathematical Society and the Founder and the Editor-in-Chief of International Journal of Group Theory and Transactions on Combinatorics. He was the Head of the Distinguished Center of Excellence in Basic Sciences selected by the Ministry of Science and Education of Iran in 2010.

Title: Rank-Modulation Codes for DNA Storage in Shotgun Sequencing: Structure & Distance Properties

Abstract:

Shotgun sequencing is a widely used method for decoding information stored in DNA molecules. This technique generates a histogram or profile vector displaying the occurrence frequencies of all substrings of a specified length l within DNA molecules. To improve resilience against reading errors, a rank-modulation scheme has been proposed. In this scheme, information is encoded as a permutation based on the relative ranking of substring frequencies, rather than their absolute values in a profile vector. For a given alphabet Σ of size q , it is known that not all permutations in $\mathcal{S}_\Sigma^l$ (the set of all permutations of strings of length l over Σ) are feasible; some permutations do not correspond to a ranking of a profile vector for any given sequence. In this talk, we will speak of these feasible permutations. We answer one of the open problems related to finding the minimum distance of feasible permutations, a question previously discussed in [IEEE Transactions on Information Theory, 68(2022), no. 6, 3719-3730], and also investigate their maximum distance. Additionally, by identifying a subgroup of order $2q!$ in $\mathcal{S}_\Sigma^l$, we prove that the set of feasible permutations forms a disjoint union of some right cosets of this subgroup. This structure restricts the search for feasible permutations to a set of right coset representatives of the subgroup in $\mathcal{S}_\Sigma^l$, rather than examining all permutations in $\mathcal{S}_\Sigma^l$.

This is a joint work with J. Bagherian, F. Jafari, M. Khatami, A. Orak, F. Parvaresh and R. Sobhani.

Moderator: Dr. Mohammad Shahryari – Sultan Qaboos University – Oman