Bahçeşehir University, Istanbul, Türkiye
Analysis & PDE Center, Ghent University, Ghent, Belgium
Institute Mathematics & Math. Modeling, Almaty, Kazakhstan

"Analysis and Applied Mathematics"

Weekly Online Seminar

Seminar leaders:
Prof. Allaberen Ashyralyev (BAU, Istanbul),
Prof. Michael Ruzhansky (UGent, Ghent),
Prof. Makhmud Sadybekov (IMMM, Almaty)

Date: **Tuesday, March 18, 2025**
Time: 14.00-15.00 (Istanbul) = 12.00-13.00 (Ghent) = 16.00-17.00 (Almaty)

Zoom link: https://us02web.zoom.us/j/6678270445?pwd=SFNmQUIvT0tRaHlDa-VYrN3l5bzJVQT09, **Conference ID:** 667 827 0445, **Access code:** 1

Speaker:

Onur Ağırseven

(Joint work with Dr. M. A. Ollis, Emerson College, USA)

Title: On the Buratti-Horak-Rosa conjecture

Abstract: Consider the complete graph K_v. Label the vertices with the distinct elements of $\mathbb{Z}_v$, the cyclic group of order v. Label each edge with the cyclical distance between its end-vertices. Accordingly, each path in K_v is associated with a multiset of such edge labels. The *Buratti-Horak-Rosa (BHR) conjecture*, initially proposed in 2007 and reformulated several times, asks the reverse question for Hamiltonian paths through K_v. This has certain implications for graph decompositions, which, in return, have applications in computer science, including partitioning networks for structural analysis.

In more precise terms, a Hamiltonian path through K_v is called a *realization* of a multiset L of size $v-1$ if its edge labels are L. The BHR conjecture is that there is a realization for a multiset L if and only if, for any divisor d of v, the number of multiples of d in L is at most $v-d$. It has been shown early on that the conjecture holds for multisets of support at most 2. However, only partial results have been achieved so far for other supports.

We observe that a toroidal lattice of vertices is associated with a given multiset. This allows us to construct certain useful types of realizations as building blocks [1, 2, 3]. Our current focus is mainly on multisets with support of size 3, where certain relevant lattices are cylindrical. The ongoing expansion of our constructions is considerably extending the parameters for which the conjecture is known to hold.

References:

[1] *O. Ağırseven and M. A. Ollis, Grid-based graphs, linear realizations and the Buratti-Horak-Rosa conjecture, submitted, arXiv:2402.08736.*

[2] *O. Ağırseven and M. A. Ollis, A coprime Buratti-Horak-Rosa conjecture and grid-based linear realizations, submitted, arXiv:2412.05750.*

[3] *O. Ağırseven and M. A. Ollis, Construction techniques for linear realizations of multisets with small support, submitted, arXiv:2502.00164.*

Biography:

Onur Ağırseven has BS degrees in Mathematics and Industrial Engineering from Boğaziçi University and an MS degree in Mathematics from Michigan State University. His PhD studies in Algebraic Topology in Michigan State University were interrupted multiple times at the dissertation stage due to health reasons (of himself and others). His stint as the Mathematics Fellow at Marlboro College (which was later absorbed by Emerson College) provided the opportunity for his recent collaboration with Dr. M. A. Ollis, whose research interests are in Combinatorics and Graph Theory. Their joint-work combines some aspects of the topological view of paths with those from graph theory, providing a new approach to attack the Buratti-Horak-Rosa conjecture. The results being produced form an ongoing series of papers, submitted in between presentations in international conferences that allow for feedback from others with published work on the conjecture.