Speaker: Eran Nevo (Hebrew University)

Title: Vertex spanning planar Laman graphs in triangulated surfaces

Abstract: Graphs triangulating surfaces (without boundary) are known to be generically rigid in R^3 (Fogelsanger '88), namely, in every generic embedding of their vertices into R^3, the vertices admit no continuous motion that preserves all the edge lengths but changes the distance between some pair of non-adjacent vertices.
Can these graphs be "rigidified" in R^3, or at least in R^2, using only a constant number of locations for the vertices?
We prove that every triangulation of either of the torus, projective plane and Klein bottle, contains a vertex-spanning planar Laman graph as a subcomplex. Invoking a result of Király, we conclude that every 1-skeleton of a triangulation of a surface of nonnegative Euler characteristic has a rigid realization in the plane using at most 26 locations for the vertices.
The main ideas will be explained by pictures.

Joint work with Simion Tarabykin.

Speaker: Gabriel Nivasch (Ariel University)

Title: Fusible numbers and Peano Arithmetic

Abstract: Fusible numbers are a well-ordered set of rational numbers that naturally arise from a mathematical riddle. Since the order type of the set of fusible numbers is ϵ_0, it turns out that several first-order properties of fusible numbers are unprovable in Peano Arithmetic. In particular, consider the recursively defined algorithm "$M(x)$: if $x < 0$ return $-x$, else return $M(x - M(x-1))/2$". Then M terminates on all real inputs, although PA cannot prove that M terminates on all natural inputs. We also explore some generalizations of fusible numbers that generate larger countable ordinals.

Joint work with Alexander Bufetov, Jeff Erickson, Fedor Pakhomov, and Junyan Xu.

Speaker: Sahar Diskin (Tel Aviv University)

Title: Component Sizes in Percolation in the Product of Many Regular Graphs

Abstract: In the bond (edge) percolation model, a random subgraph G_p is formed by retaining every edge of G independently with probability p. In 1960, Erdős and Rényi showed that $(K_n)_p$ undergoes a fundamental change around $p = 1/n$: with high probability (that is, with probability tending to 1 as n tends to infinity), from components of order at most logarithmic to a unique giant component of linear order, with all other components of logarithmic order.
Similar behaviour has been shown in other models. One well-researched example is the percolated hypercube Q_p^d around the probability $p = 1/d$, as shown by Ajtai, Komlós, and Szemerédi in 1982 and Bollobás, Kohayakawa, and Łuczak in 1991.
We generalise these results and show that such behaviour holds typically for all Cartesian products of many regular graphs of bounded order.

Joint work with Joshua Erde, Mihyun Kang and Michael Krivelevich.

Speaker: Ron Adin (Bar Ilan University)

Title: Matchings, involutions and descents

Abstract: Consider a (partial) matching of an ordered set of points on a line. Its descent set can be defined either directly from the geometry, or via the natural interpretation of the matching as an involution in the symmetric group. These two notions are distinct.

We present a bijection on the set of matchings with a given number of unmatched points, interchanging the above two notions of descent set, as well as the crossing number and the nesting number. This bijection is applied to construct an explicit cyclic extension of the descent set for (almost) all conjugacy classes of involutions, solving a problem posed in previous work with Pál Hegedüs.

Based on joint work with Ira Gessel and Yuval Roichman.