IMU 2021 meeting,
Probability session

14:00-14:50 Ron Peled, Tel Aviv University

Title: Fluctuations of random surfaces and concentration inequalities for log-concave distributions

Abstract: Random surfaces in statistical physics are commonly modeled by a real-valued function on a d-dimensional lattice, whose probability density penalizes nearest-neighbor fluctuations according to an interaction potential U. The case U(x)=x^2 is the well-studied lattice Gaussian free field, while one-dimensional random surfaces are equivalent to random walks. Our focus is on dimensions d>=2 and general U. Brascamp-Lieb-Lebowitz conjectured in 1975 that such random surfaces are localized in dimensions d>=3 under mild assumptions on U. Their work establishes the conjecture when U is uniformly convex (its second derivative is uniformly bounded from zero), as a consequence of the Brascamp-Lieb concentration inequality. To date, this remains the main case for which the conjecture is verified, with the result missing even when U(x) = x^4. We establish new concentration inequalities for log-concave distributions, extending the Brascamp-Lieb inequality, and use them to prove localization in many new cases, including the family U(x) = |x|^p with p>1. Further consequences regard the maximum height for a class of random surfaces discussed by Deuschel-Giacomin (2000).
The talk will be a gentle introduction to the model and the results. No prior knowledge of random surfaces or log-concave distributions will be assumed. Joint work with Alexander Magazinov.

15:00-15:50 Ofer Busani, University of Bristol

Title: Non-existence of bi-infinite geodesics in Exponential Last Passage Percolation

Abstract: To each vertex x\in Z^2 assign a positive weight \omega_x. A geodesic between two ordered points on the lattice is an up-right path maximizing the cumulative weight along itself. A bi-infinite geodesic is an infinite path taking up-right steps on the lattice and such that for every two points on the path, its restriction to between the points is a geodesic. Assume the weights across the lattice are i.i.d., does there exist a bi-infinite geodesic with some positive probability?
In the case the weights are exponentially distributed, we answer this question in the negative. Joint work with Marton Balazs and Timo Seppalainen.

16:20-17:10 Gady Kozma, Weizmann Institute

Title: Large deviations for subgraph counts - an entropy approach

Abstract: What is the probability that a random graph has much more or much less triangles than the expected? It is exponential in the size of the graph, but determining the constant in the

exponential turned out to be a tricky question. We will discuss the history of the problem and a new result, based on conditioned entropy, which allows to get sharp results for some of the parameters. Joint work with Wojciech Samotij.