Department of Mathematics, BGU

AGNT

On *Wednesday, January ,7 2026*

At *14:10 – 15:10*

In *201*

Lior Bary-Soroker (TAU)

will talk about

Irreducibility of the Characteristic Polynomial of Random Tridiagonal Matrices

Abstract: We examine the arithmetic properties of eigenvalues of random matrices with integer entries, focusing on the irreducibility of their characteristic polynomials and their Galois groups. Rivin, Jouve-Kowalski-Zywina, and Lubotzky-Rosenzweig previously studied characteristic polynomials arising from random walks on the Cayley graphs of Zariski-dense finitely generated subgroups of linear groups, such as SL_n(Z) . Eberhard, resolving conjectures of Babai and Vu-Wood assuming ERH, analyzed discrete random matrices and established that the characteristic polynomial of a matrix with independent entries (say taking the values 0,1 with equal probabilities) is irreducible and has a large Galois group with high probability as the matrix dimension grows. Ferber, Jain, Sah, and Sawhney proved a counterpart of these results to symmetric matrices.

In this talk, I will present recent results joint with Daniele Garzoni and Sasha Sodin on random tridiagonal matrices where the main diagonal consists of independent Bernoulli entries, the superdiagonal and subdiagonal entries are identically one, and all other entries are zero. We show that the characteristic polynomial of such matrices is irreducible and analyze the structure of its Galois group. If time permits, we will discuss applications to the localization of the eigenstates in Anderson's 1-dim localization model.

A key feature of our approach lies in combining techniques from both the above random walk framework and the above discrete matrix setting. The latter leverages the Extended Riemann Hypothesis (ERH) to reduce the problem to analyzing the distribution of eigenvalues modulo primes p. To achieve strong error bounds in these computations, we exploit the powerful mixing properties of simple groups such as PSL_2(p) , a central tool in the above-mentioned random walk results.