

Department of Mathematics, BGU

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# BGU Probability and Ergodic Theory (PET) seminar

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*On Thursday, May, 8 2025*

*At 11:10 – 12:00*

*In 101-*

Shlomo Hoory (Tel-Hai College)

will talk about

## **Entropy and the growth rate of universal covering trees**

**Abstract:** This work studies the relation between two graph parameters,  $\rho$  and  $\lambda$ . For an undirected graph  $G$ ,  $\rho(G)$  is the growth rate of its universal covering tree, while  $\lambda(G)$  is a weighted geometric average of the vertex degree minus one, corresponding to the rate of entropy growth for the non-backtracking random walk (NBRW).

It is well known that  $\rho(G) \leq \lambda(G)$  for all graphs, and that graphs with  $\rho = \lambda$  exhibit some special properties. In this work we derive an easy to check, necessary and sufficient condition for the equality to hold. Furthermore, we show that the variance of the number of random bits used by a length  $k$  NBRW is  $O(1)$  if  $\rho = \lambda$  and  $\Omega(k)$  if  $\rho < \lambda$ . As a consequence we exhibit infinitely many non-trivial examples of graphs with  $\rho = \lambda$ .

Joint work with Idan Eisner, Tel-Hai College