

Department of Mathematics, BGU

Colloquium

On *Tuesday, December, 15 2015*

At *14:30 – 15:30*

In *Math 101-*

Allen Tannenbaum (Stony Brook University)

will talk about

Graph Curvature for Differentiating Cancer Networks

Abstract: Cellular interactions can be modeled as complex dynamical systems represented by weighted graphs. The functionality of such networks, including measures of robustness, reliability, performance, and efficiency, are intrinsically tied to the topology and geometry of the underlying graph. Utilizing recently proposed geometric notions of curvature on weighted graphs, we investigate the features of gene co-expression networks derived from large-scale genomic studies of cancer. We find that the curvature of these networks reliably distinguishes between cancer and normal samples, with cancer networks exhibiting higher curvature than their normal counterparts. We establish a quantitative relationship between our findings and prior investigations of network entropy. Furthermore, we demonstrate how our approach yields additional, non-trivial pair-wise (i.e. gene-gene) interactions which may be disrupted in cancer samples. The mathematical formulation of our approach yields an exact solution to

calculating pair-wise changes in curvature which was computationally infeasible using prior methods. As such, our findings lay the foundation for an analytical approach to studying complex biological networks.