

Department of Mathematics

University of Houston

# Analysis Seminar

**FRIDAY, November 9, 2018**

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**13:00-14:00 – Room 646 PGH**

**Speaker:** Gregory Berkolaiko (Texas A&M University)

**Title:** Nodal statistics of graph eigenfunctions

**Abstract:** We start by reviewing the notion of “quantum graph”, its eigenfunctions and the problem of counting the number of their zeros. The nodal surplus of the  $n$ -th eigenfunction is defined as the number of its zeros minus  $(n-1)$ , the latter being the “baseline” nodal count of Sturm-Liouville theory. It appears from numerics that the distribution of the nodal surplus of large graphs has a universal form: it approaches Gaussian as the number of cycles grows. We will discuss our recent progress towards proving this conjecture.

When the graph is composed of two or more blocks separated by bridges, we propose a way to define a “local nodal surplus” of a given block. Since the eigenfunction index  $n$  has no local meaning, the local nodal surplus has to be defined in an indirect way via the nodal-magnetic theorem of Berkolaiko, Colin de Verdiere and Weyand. By studying the symmetry properties of the distribution of the local nodal surpluses we show that for a graphs with disjoint cycles the distribution of (total) nodal surplus is binomial.

Based on joint work with Lior Alon and Ram Band.