Title:

Preferential attachment trees built from random walks

Abstract:

I will talk about two separate projects where random walks are building a random tree, yielding preferential attachment behaviour from completely local mechanisms.

First, the Tree Builder Random Walk is a randomly growing tree, built by a walker as she is walking around the tree. At each time n, she adds a leaf to her current vertex with probability $n^{-\gamma}$, $\gamma \in (2/3, 1]$, then moves to a uniform random neighbor on the possibly modified tree. We show that the tree process at its growth times, after a random finite number of steps, can be coupled to be identical to the Barabási-Albert preferential attachment tree model. This coupling implies that many properties known for the BA-model, such as diameter and degree distribution, can be directly transferred to our model. Joint work with János Engländer, Giulio Iacobelli, and Rodrigo Ribeiro.

Second, we introduce a network-of-networks model for physical networks: we randomly grow subgraphs of an ambient graph (say, a box of $\Z^d$) until they hit each other, building a tree from how these spatially extended nodes touch each other. We compute non-rigorously the degree distribution exponent of this tree in large generality, and provide a rigorous analysis when the nodes are loop-erased random walks in dimension $d=2$ or $d\ge 5$, using a connection with the Uniform Spanning Tree. Joint work with Ádám Timár, Sigurdur Örn Stefánsson, Ivan Bonamassa, and Márton Pósfai.