Poster Session
Asymptotic Limits of Discrete Random Structures
Saturday, September 30, 2023
3:00 pm – 4:00 pm

Restricted Intersections and the Sunflower Problem
Jeremy Chizewer, University of Waterloo

A sunflower with r petals is a collection of r sets over a ground set X such that every element in X is in no set, every set, or exactly one set. Erdos and Rado showed that a family of sets of size n contains a sunflower if there are more than $n!(r-1)^n$ sets in the family. Alweiss et al. and subsequently Rao and Bell et al. improved this bound to $(O(r \log(n))^n$.

This poster will discuss the sunflower problem with an additional restriction, a bound on the size of pairwise intersections in the set family. In particular, it will discuss an improved bound for set families when the size of the pairwise intersections of any two sets is in a set L. This talk is based on https://arxiv.org/abs/2307.01374

Fundamental Limits of Graph Convolutional Networks for Distinguishing Graphons from Samples
Abram Magner, University at Albany, State University of New York

Graph convolutional networks (GCNs) are a widely used method for graph representation learning. To elucidate their capabilities and limitations for graph classification, we investigate their power to generate well-separated embedding vectors for graphs sampled from different random graph models, parameterized by graphons, which correspond to different class-conditional distributions in a classification problem. It has been recognized that metric properties of learned representations are important for reduction of complexity of classifiers trained on them. Additionally, we show that inability to generate well-separated embedding vectors for two different graphons implies information-theoretic indistinguishability of these models based on noise-perturbed embedding vectors of sample graphs. We precisely characterize, in terms of degree profile closeness, the set of graphon pairs that are indistinguishable (in metric and information-theoretic senses) by a GCN with depth at least logarithmic in sample graph size. Outside this set, a very simple architecture suffices for distinguishability. We then exhibit a concrete, infinite set of graphon pairs that are well-separated in cut distance and are indistinguishable by a GCN. These results theoretically match empirical observations of several prior works.

Asymptotic normality of pattern counts in random planar maps
Eva-Maria Hainzl, TU Wien

We consider the number of occurrences of a fixed planar map with simple boundary in a uniformly randomly chosen rooted planar map with n edges and prove a central limit theorem by combining combinatorial arguments with analytic methods applied to generating functions.

On a random that grows its own tree
Rodrigo Ribeiro, University of Denver

We are introducing a novel class of non-Markovian random walk that dynamically constructs its own environment by attaching vertices at its current position as it walks. Our study presents findings on both its transience and recurrence behaviors, as well as insights into the structural evolution of the environment created through this mechanism.