

University of Chicago and Toyota Technological Institute at Chicago Machine Learning Seminar Series

PRESENTS:



Mina Karzand, Postdoc
UW-Madison

Title: Focused Learning in Tree-Structured Graphical Models

Abstract: This talk is about the predictive power of learned graphical models where we show that an incorrect or incomplete combinatorial structure (graph) can nevertheless yield accurate predictions. In particular, in the first half of the talk, I look into learning tree structured Ising models in which the learned model is used subsequently for prediction based on partial observations (given the realization of a subset of variables, predict the value of the remaining ones). The vast majority of previous work on learning graphical models aims to correctly recover the underlying graph structure. In the data-constrained regime, learning the entire graph structure correctly is usually impossible. I show that it is possible to efficiently learn a tree model that gives accurate predictions even when there is insufficient data to learn the correct structure.

The second half of the talk is about speciation rate estimation in phylogenetic trees. This problem is essentially one of inferring features of the model (in this case, the speciation or extinction rate) from partial observations (the sequences at the leaves of the tree) of a latent tree model (phylogeny). I show that to estimate the speciation rate efficiently, it is not necessary to follow the popular approach of reconstructing the complete tree structure as an intermediate step, which requires long DNA sequences. Instead, one can extract precisely the right type of information about the rates by zooming into carefully chosen local structures. My results show that an incomplete and partially incorrect summary of the tree structure is enough to estimate the speciation rate with the minimax optimal dependence on the length of observed DNA sequences.

Joint work with Guy Bresler, Sebastien Roch and Robert Nowak.

Bio: Mina Karzand is a postdoctoral associate in University of Wisconsin-Madison. Before that, she was a postdoctoral research associate in MIT where she received her PhD in Electrical Engineering and Computer Science. Her research interests are on the design and analysis of data driven inference and decision making systems in the intersection of areas of machine learning, probability, and information theory.

Host: Eric Jonas

Friday, January 10, 10:30 – 11:30 am
TTIC Rm 526
(Remote broadcast at JCL Rm 390)