



Causal Inference Program Opening Workshop December 9-11, 2019

SPEAKER TITLES/ABSTRACTS

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“From Causal Inference to Gene Regulation”

A recent break-through in genomics makes it possible to perform perturbation experiments at a very large scale. The availability of such data motivates the development of a causal inference framework that is based on observational and interventional data. We first characterize the causal relationships that are identifiable from interventional data. In particular, we show that imperfect interventions, which only modify (i.e., without necessarily eliminating) the dependencies between targeted variables and their causes, provide the same causal information as perfect interventions, despite being less invasive. Second, we present the first provably consistent algorithm for learning a causal network from a mix of observational and interventional data. This requires us to develop new results in geometric combinatorics. In particular, we introduce DAG associahedra, a family of polytopes that extend the prominent graph associahedra to the directed setting. We end by discussing applications of this causal inference framework to the estimation of gene regulatory networks.