

**“From Causal Inference to Autoencoders and Gene Regulation”**

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# Abstract

Recent progress in genomics makes it possible to perform perturbation experiments at a very large scale. This motivates the development of a causal inference framework that is based on observational and interventional data. We characterize the causal relationships that are identifiable and present the first provably consistent algorithm for learning a causal network from such data. I will then couple gene expression with the 3D genome organization. In particular, we will discuss approaches for integrating different data modalities such as sequencing or imaging via autoencoders. We end by a theoretical analysis of autoencoders linking overparameterization to memorization. In particular, we will show that overparameterized autoencoders trained using standard optimization methods implement associative memory and provide a mechanism for memorization and retrieval of real-valued data.

# 12:00 Noon, Tuesday, March 3, 2020

# 47 College Street, 106B

# 11:45 AM Lunch served outside Rm. 106B

