Abstract: Expected Shortfall (ES), also known as superquantile or Conditional Value-at-Risk, has been recognized as an important measure in risk analysis and stochastic optimization. In finance, it refers to the conditional expected return of an asset given that the return is below some quantile of its distribution. In this talk, we consider a joint regression framework that simultaneously models the conditional quantile and ES of a response variable given a set of covariates, for which the state-of-the-art approach is based on minimizing a joint loss function that is non-differentiable and non-convex.

Motivated by the idea of using Neyman-orthogonal scores to reduce sensitivity with respect to nuisance parameters, we propose statistically robust and computationally efficient two-step procedures for fitting joint quantile and ES regression models under three settings: (i) the classical linear model with $p \ll n$; (ii) high-dimensional sparse models with $p \gg n$, and (iii) nonparametric models with a hierarchical compositional structure. Furthermore, we discuss a more general integrated-quantile regression framework, including ES regression as a special case.