SADRA NEJATI, University of British Columbia
Adjustable Robust Optimization Reformulations for Support Vector Machines

This work introduces new robust optimization reformulations for Support Vector Machines (SVMs) designed to make classification models more reliable when data are uncertain or noisy. We address uncertainty in both labels and features by combining ideas from adjustable and two- stage robust optimization. For label noise, our reformulation simplifies existing robust SVM models by cutting the number of binary variables nearly in half, leading to much faster com- putation without losing accuracy. For feature uncertainty, we propose a two-stage framework with a global uncertainty set that better reflects how data variability occurs in practice, solved efficiently using a Column-and-Constraint Generation algorithm. Across multiple benchmark datasets, our methods achieve up to twofold speed improvements and stronger robustness com- pared to traditional approaches, showing how optimization-based modeling can make machine learning systems both more efficient and more dependable in uncertain environments.