UNIVERSITY OF ALBERTA

CPA Speaker Series - Business Analytics

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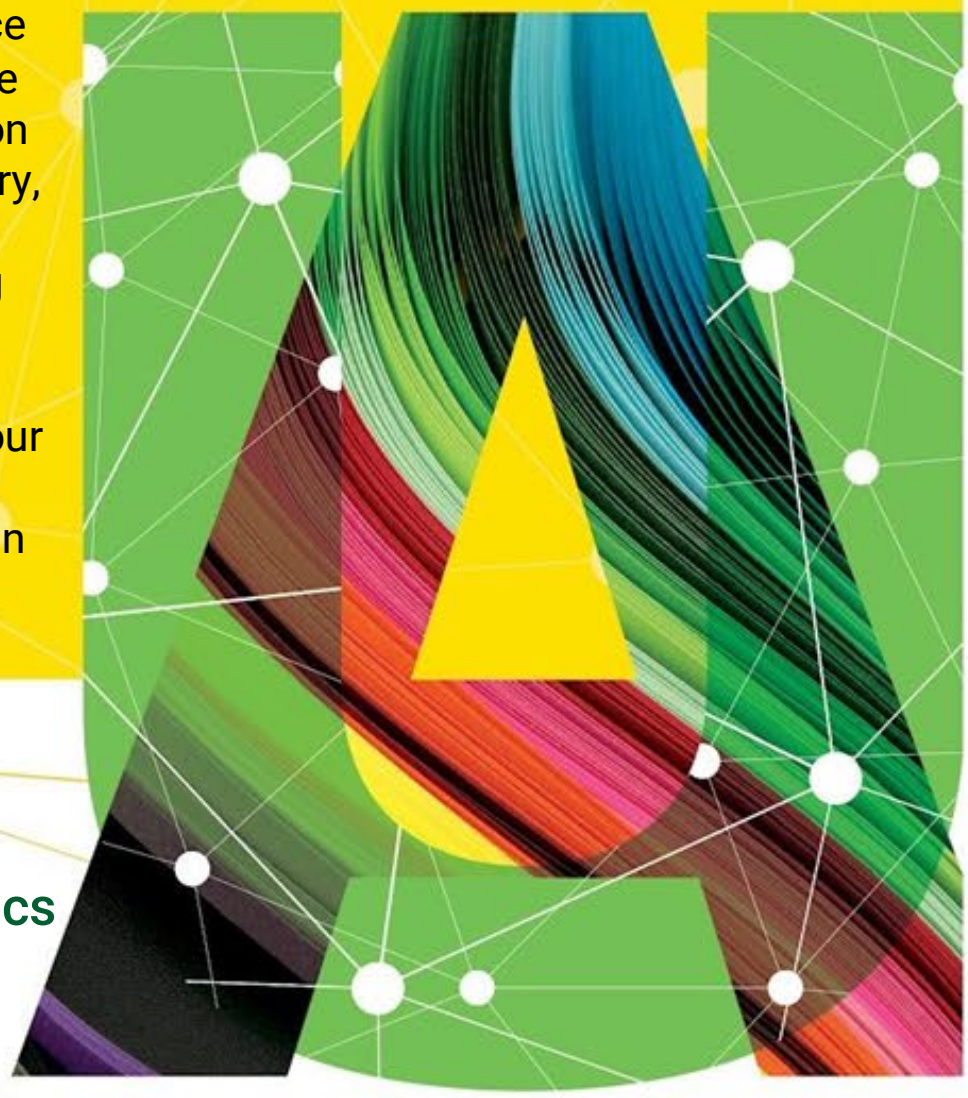
Friday, December 1, 2023
10:00 AM - 11:30 AM
Location: BUS 4-04

Exact and Approximate Solution Methods for a Class of Discrete Optimization with Uncertain and Correlated Data

ABSTRACT

In this talk, we explore a group of stochastic discrete optimization involving uncertain cost parameters from the class of multivariate distributions with known mean and covariance information. The problem is aptly modeled as a mixed-integer non-linear program for which we present alternative reformulations and leverage principal component analysis (PCA) to create insightful approximate models. The quality of these approximate solutions is assessed through the determination of a worst-case optimality gap. Additionally, we show how to enhance these models through the integration of linearization and cutting plane techniques to derive an optimal solution to the original problem. We apply our method to address two routing optimization challenges characterized by uncertain and correlated travel times. In the first scenario, our primary objective is to minimize both the expected time and the variance for multiple vehicle routes in the capacitated vehicle routing problem. In the second problem, we focus on designing precise time windows for last-mile delivery, ensuring reliable route planning while respecting these time window constraints. Our novel modeling and solution frameworks showcase the ability to produce high-quality approximate solutions, demonstrating the efficiency and effectiveness of our approach in tackling these intricate problems. Furthermore, we illustrate how optimal solutions can be derived with significantly less computational effort.



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