

The Hong Kong University of Science and Technology
Dept of Information Systems, Business Statistics
and Operations Management
Frontiers in Operations Management Workshop



**Supermodularity in Two-Stage
Distributionally Robust Optimization**

by

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Engineering Management**

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Date : **3 December 2021 (Friday)**
Time : **2:00 - 2:30 PM**
Venue : **Room G012, LSK Business Building, HKUST**



Abstract:

Many Operations Management problems involve two-stage decision-making and hence are computationally difficult to be solved in general. In this work, we solve a class of two-stage distributionally robust optimization problems which have the property of supermodularity. We exploit the explicit worst-case expectation of supermodular functions and derive the worst-case distribution for the robust counterpart. This enables us to develop an efficient method to obtain an exact optimal solution of these two-stage problems. We also show that the optimal scenario-wise segregated affine decision rule returns the same optimal value in our setting. Further, we provide a necessary and sufficient condition for checking whether any given two-stage optimization problem has the supermodularity property. We apply this framework to several classic problems, including the multi-item newsvendor problem, the facility location design problem, the lot-sizing problem on a network, the appointment scheduling problem and the assemble-to-order problem. While these problems are typically computationally challenging, they can be solved efficiently using our approach.

Bio:

Dr Daniel Zhuoyu Long is an Associate Professor in the Department of Systems Engineering & Engineering Management at The Chinese University of Hong Kong. He earned his PhD in the Department of Analytics and Operation, National University of Singapore in 2013. Before that, Long received his bachelor degree from Tsinghua University, and master degree from Chinese Academy of Science. His research interests are in inventory control, project management, risk management, and robust optimization.

All interested are welcome!
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