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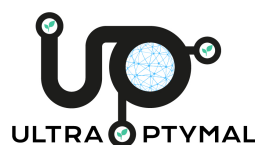
# High-dimensional dependent random variables in optimization

Prof. Stein W. Wallace  
NHH Norwegian School of Economics, Bergen Norway

**Abstract:** Most important decisions are made under uncertainty – there is always something important and unknown about the future. Stochastic programming is being used more and more to handle this uncertainty and thereby help us obtaining decisions that can face future uncertainty in a robust way. But our ability to handle uncertainty from a numerical perspective is limited. In particular, what can we do if the number of random variables is in the tens or hundreds of thousands and they are clearly dependent? A good example is speed data in a large city. Speed is clearly time dependent (if there is a traffic jam at 8.00 am, there is probably one at 8.10 as well) and space (if there is a traffic jam on one road out of an intersection at a certain time, there probably – or possibly – is one on other roads out of the same intersection at the same time). For larger cities, like Hong Kong, this leads to the kind of random variables just described. Assuming independence is very unreasonable as traffic jams will then come and go without any logic. Furthermore, the number of (road, time period) pairs will be huge. I will discuss these problems and suggest ways to think about the issues and possible paths forward. I will exemplify using work with colleagues in Chengdu where we study the patterns of dependency, and solve (approximately) VRPs using real traffic data and handle tens of thousands of dependent random variables. Doing so wisely way can lead to surprisingly efficient approaches, numerically speaking, while maintaining theoretical qualities of solutions. This is a joint work with Zhaoxia Guo, Sichuan University, Chengdu, China,

## Microsoft Teams link:

[https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_ZjJhMGZhZDktZTY4ZC00MzQzLTg4MTYtZG0yNDJlZTRh%40thread.v2/0?context=%7b%22Tid%22%3a%224f0132f7-dd79-424c-9089-b22764c40ebd%22%2c%22Oid%22%3a%228d889b9c-a100-4bee-9e1b-4211b9653ad6%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZjJhMGZhZDktZTY4ZC00MzQzLTg4MTYtZG0yNDJlZTRh%40thread.v2/0?context=%7b%22Tid%22%3a%224f0132f7-dd79-424c-9089-b22764c40ebd%22%2c%22Oid%22%3a%228d889b9c-a100-4bee-9e1b-4211b9653ad6%22%7d)



The online seminar is in the context of the **PRIN 2020 Project** “ULTRAOPTIMAL - Urban Logistics and sustainable TRANsportation: OPTimization under uncertainTY and MACHine Learning”.

Contact info: Prof. Francesca Maggioni ([francesca.maggioni@unibg.it](mailto:francesca.maggioni@unibg.it))