OPM 560 Business Analytics: Introduction to Operations Analytics with Python

Business Analytics helps to optimize decisions for the design and management of operations systems and production processes. This course introduces into the programming language Python. Based on OPM 561, selected concepts and methods from prescriptive and predictive analytics are implemented and numerically assessed. They will be applied to support decisions in capacity management and operations planning.

We apply descriptive analytics to quantify and visualize all three dimensions of variability as introduced in OPM 561. For predictive analytics, we introduce data sampling and perform sensitivity analysis to understand the impact of stochastic variability. For prescriptive analytics, linear and mixed integer optimization models are implemented and solved numerically. During the course the students will work on several case studies and assignments (individual and in groups).

General Information

Lecturer	Prof. Dr. Raik Stolletz
Course Format	integrated (lectures, exercises, self-study)
Credit Points	6 ECTS
Language	English
Grading	Assignments, Programming exam
Term	Spring Semester
Range of Application	M.Sc. MMM, M.Sc. Bus. Edu., M.Sc. Econ.

Learning Goals

Students will learn

- basics in Programming with Python.
- how to numerically analyze capacity planning and operations scheduling problems.
- how to use Python to implement and solve models from predictive and descriptive analytics with standard packages.
- how to deal with the complexity of real-world problems and how to perform sensitivity analyses in order to obtain useful managerial insights.

Prerequisites:

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Recommended Prerequisites:

Successful completion of the course OPM 561 is recommended.

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Registration/Enrolment

The course requires a registration through Portal2. More information can be found there.

Detailed Agenda

I Get started with Python
- Simple types and operators
- Branching programs and conditional statements
- While loops, for loops and ranges
- Python data structure (list, dict, etc.)
- Functions

II Descriptive Analytics
- Read and write datasets
- Univariate and Bivariate analyses
- Quantify & visualize variability in datasets

III Predictive Analytics
- Analyzing functions and sensitivities
- Digital twins and random numbers

IV Prescriptive Analysis
- Implementation of Optimization models
- Design of numerical studies

Literature

- Guttag, J. V. (2016). Introduction to computation and programming using Python: With application to understanding data. MIT Press.
- McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. O'Reilly Media, Inc.
- Journal papers will be announced during the lecture

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