Optimisation for Industry - 2025

Group Project

Overview: Businesses such as bakeries, restaurants, travel agencies, supermarkets, grocers, colleges, hotels, etc. often have realistic (and still easy to model/solve) optimisation problems. As OR/MS consultants, you are commissioned to evaluate an activity of a business of your choice and propose improvements that could be made to this activity. You are expected to understand the problem and propose an OR approach.

In this group project, students will work in groups of 6 and come up with a practical optimisation problem. The goal is to find and describe an optimisation problem and associated instance(s). The problem must then be formulated as one or more mixed-integer programming models. The model(s) must be implemented in Python with the Gurobipy API. Computational experiments and analysis, including managerial insights are expected. Evaluation will consider the originality/applicability of the problem selected, quality of the data colection, correctness of the model and the explanations presented, design of experiments and analysis. The quality of the presentation is also an important evaluation criteria.

Submissions: Via canvas. One submission per group. Each submission should contain a pdf document and a companion Jupyter notebook with the implementations. Other submissions include the list of group members, slides and project proposal. (Deadlines are listed on Canvas).

- Group definition: the group is formed by the end of week 3 on Canvas. Students in a group must be from the same tutorial session (2 points).

- Project proposal: an initial idea of the problem is presented (2 points).

- Slides: the slides for the presentation (2 points).

- Presentation: a brief 5 - 10 minutes presentation (4 points).

- Final report and Jupyter Notebook (30 points).

Proposal: The goal of the proposal is to present a summary of the problem to be tackled. The idea is that the Lecturer will be able to guide the groups on the feasibility of solving/approaching the problem in the timeframe available. The proposal should use a maximum of one page and should explain the context in which the problem occurs, the data available and, mostly, what is the set of decisions to be made (e.g.: we want to find a rostering for workers at the ECR Library; we want to find the best locations for a new bike-sharing parking; etc.).

Presentation: Groups will present their work during the last week of the subject, during tutorials and lecture.

Report: A typical report should contain the following sections:

1. Introduction: Motivate the problem. Present any relevant associated literature. Explain the goals of the project and which analysis you wish to make.

2. Problem definition: Formally define the problem. Which kind of simplifications are made? Which kind of problem variants do you wish to tackle?

3. Data: Present the data you are using. How was it collected/generated?

4. Model formulation and solution strategy: Present your model(s). Present your solution strategy: black box solver, iterative generation of constraints, decomposition method...

5. Results and analysis.

6. Conclusions and recommendations: Present a summary of analysis and conclusions to your stakeholders.

7. Individual contributions: the contributions of each member are clearly described.

The report should be as brief as possible, but still present the most interesting developments and conclusions. Your report should not have more than 7500 words.