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## AM13 - DECISION ANALYTICS & MODELLING

### Group Project

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#### Project Objective

Throughout this semester, you will see examples of real-world problems that are modeled and solved using optimization tools. The purpose of this final project is to find, model, and solve your own real-world problem: First, identify a real-world problem and a potential solution that has an optimization component. Second, work out the exact steps needed to implement an optimization model to solve your problem. Third, actually implement your optimization model. Fourth, pitch your idea in class.

The description above is purposely broad, and you should feel free to craft your project in any way to meet those guidelines. In selecting a problem, it may be useful to narrow the scope by considering one of two “lenses” that have worked well in the past:

1. Solve a problem that directly affects you. Examples have included the assignment of incoming freshmen to on-campus housing based on their preferences, the rescheduling opening hours of dining halls to better accommodate student schedules, the planning of vaccine roll-out in the UK, an optimized strategy to win in a video-game, etc.
2. Pitch a new, optimization-focused venture. Identify a market need and a potential solution that has an optimization component, and pitch your idea. Examples include a meal-kit service with workplace delivery, and an app for on-demand daycare services.

This project is to be done within your study groups. The deliverables are as follows:

#### *Prototype*

You will build and submit a working prototype, using Gurobi, for an optimization tool that addresses your problem. Unlike in homework assignments or tutorials from class, this tool should be built with a general audience in mind — it should be visually appealing and easy to use. It should be obvious where the necessary data should be entered, and where the final solution appears.

Ideally, your project will utilize real-life data (e.g., public data sets posted on Kaggle). For certain projects, implementing and solving the proposed problem at “full-scale” will not be feasible, either because the required data are not easy to collect or because the optimization formulation is too large. In those cases, the prototype you build should solve a smaller, but still realistic, version of the problem.

## *Report*

Your report should be a self-contained document that summarizes your project. If you have managed to solve your problem entirely, it should be written as a project summary; if you have solved a small-scale version, it should be written as a proposal for a full-sized project. In either case, you should seek to do the following:

1. Describe the real-world problem you are addressing
2. What is the exact optimization formulation you would use? How large would the formulation be (number of variables, number of constraints)?
3. What is the exact data you would need to collect and how would you go about collecting it?
4. How exactly would the output of your optimization model inform your decisions?
5. Instructions for using the prototype you have built

The main body of this report should be **at most four pages** using text fonts no smaller than 12; note that this page limit does not include any figures, tables, equations<sup>1</sup>, addendums, etc.

## *Presentation*

During the final week of class, you will deliver a 10-minute presentation of your project. Your target audience for this presentation is your fellow students: describe your problem and why it is interesting, and the steps you have taken to solve it. Make sure that your presentation is **not** overly technical. A good presentation will bear little resemblance to the final report.

Note that I will **not** be grading your slide deck separately, so you will be evaluated solely on the quality of the presentation.

## *Optional Proposal (due Tuesday, Feb. 14)*

A project proposal describing in fairly precise terms the problem you seek to address and the role of optimization in solving that problem. The proposal should **not** include any mathematical formulas or equations, and should be **at most a single page** using text fonts no smaller than 12.

This deliverable should be taken as an opportunity: We will provide feedback and give a sense of my expectations for your project. The proposal itself will not be graded.

## **Evaluation**

For grading purposes, the deliverables will be weighted as follows:

Report

30%

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<sup>1</sup>A note on typesetting equations: handwritten equations often look nicer than equations typed in a word processor, so please feel free to handwrite and scan the mathematical portions of the report.

Prototype	35%
Presentation	35%

**Late Policy**

Nothing will be accepted late.