

ISYE 6669A/Q
Deterministic Optimization
Course Project (Due dates listed below)

Introduction

For the course project, I would like you to find, model, solve, analyze, and report on an optimization problem that you encounter in real life. I would like you to work in groups of 3 or 4 people. Form your groups as soon as possible (today right after class would be a great time!).

⇒ **Hand in a list of your group members on or before Monday, September 16th.**

Part I – Problem Definition

- Find an optimization that you encounter in real life. The only requirements are that it should involve finding the best (optimal) solution subject to some set of constraints, and that it should be large enough that you can't get the solution easily without using optimization. **Be creative!** We all encounter optimization problems every day, whether we realize it or not!

⇒ **Hand in a short (1 page or less) description of your problem on Monday, Oct. 7th.**

Part II – Analysis

- Investigate the problem. Collect the problem data, and formulate an optimization model. This might not be as easy as it sounds – as you develop your formulation, you may find that you need more data than you thought.
- Solve the problem using your favorite solver. Make sure your solution makes sense! If you've missed a small problem with your formulation, a great way of catching it is to check that the solution makes sense.
- Analyze your answer. For example, think about certainty. What pieces of data might change or be inexact? How might the optimal solution and/or optimal strategy change if the data is slightly different? I don't just want a huge printout of the solution report and sensitivity analysis, you should decide which parameters are important, analyze them, and report on your results.

⇒ **Hand in a short (1 page or less) progress report on Monday, Nov. 4th.**

Part III – Report (Due Friday, November 29th.)

- Write a report. The report should be written as if you were presenting it to your boss, not to me. Most of the mathematics should be placed in an appendix; the bulk of the report should be text, written for a reader who is only slightly familiar with optimization.
 - a. Executive Summary. Give a short, non-technical overview of the problem and your conclusions.
 - b. Introduction. Present the optimization problem, as if I knew nothing about it beforehand.
 - c. Model. Describe the way you have chosen to model the problem. What are your variables, objective, and constraints? Do not just write out the formulation – explain each part, as if the reader was only slightly familiar with optimization. [In a real report to your boss, you might not even use any mathematical notation... but I want to see it here.]
 - d. Solution and Analysis. Describe (in words as well as numbers) your optimal solution. How robust is the solution? Discuss the sensitivity analysis in words as well as numbers.
 - e. Conclusions. Summarize the conclusions of your study, in terms of the problem you have set out to analyze.
 - f. Appendix. Include your mathematical formulation, as well as the input and output of the solver.

⇒ **Hand in your final report on Friday, November 29th.**

Grade:

The grade of your group will be based upon:

- The novelty of the decision problem that you chose.
- The ingenuity of the mathematical formulation.
- Your analysis of the solver output.
- Quality of the written report.