

E56: Modeling and Optimization

Final Project

Overview

This final project contains 3 parts. It must be completed *individually*.

Part I contains analytical exercises from the book. *Part II* involves exercises that require Python programming. Finally, in *Part III* you will pick a paper from a peer-reviewed journal or conference that applies a least squares optimization technique covered in this class (Ch. 12 - 19). You will prepare and give a 5-minute presentation on your paper (3-minute presentation, 2 minutes for Q&A).

Objectives

The learning objectives for the final project are:

- Strengthen oral presentation skills
- Learn to critically analyze a scientific literature
- Strengthen programming skills
- Strengthen understanding of the technical aspects and applications of least-squares techniques

Deadlines

November 21st - Come to class with your journal paper for Part III picked out. You will have an opportunity to individually meet with the instructor and make sure that your paper meets the guidelines for the project. You will also sign up for a final project presentation day.

December 5th and 10th - Final project presentations for Part III. Slides for the presentation must be uploaded to a shared Google Drive folder before class, see Moodle for the link.

December 10th, 5 pm - Writeups for Parts I and II due. See "Logistics" below for further details on deliverables.

Logistics

Solutions to exercises in *Part I* should be typeset with LaTeX, or written clearly and legibly and scanned as a single PDF (please do not take photos with your phone, points will be deducted for hard-to-read solutions).

For *Part II*, you should use a Jupyter notebook to write your code and generate plots. For all code, include descriptive comments. To save your Jupyter notebook as a PDF, go to File --> Download as --> PDF via LaTeX (.pdf)

Submit 3 items to Moodle: (1) PDF of solutions to Part I, (2) Jupyter notebook for solutions to Part II, and (3) PDF of Jupyter notebook.

Part I

Solve the following from the textbook. Please either typeset in LaTeX, or print clearly and legibly in blue or black ink. Submit a single PDF of legible solutions for this part.

13.5

13.9

15.1

15.4

15.6

16.11

Part II

Solve the following from the textbook in a Jupyter notebook using Python. Submit your Jupyter notebook and a PDF of the notebook for this part.

13.3

16.5

17.6

18.1

18.4

18.8

Bonus (optional): 19.1, only (a)

Part III

Pick a paper from a peer-reviewed journal or conference that applies a least squares optimization technique covered in this class (Ch. 12 - 19). You will prepare and give a 5-minute presentation on your paper (3-minute presentation, 2 minutes for Q&A). Presentation times will be determined on November 21; upload slides to Google Drive before class on your presentation day.

Please actively participate in your classmate's presentations by asking questions. We will go over techniques for finding an appropriate journal paper in class.

Your presentation should include:

1. Description of the problem solved in the paper
2. Key figures from the paper and their significance.
3. How the paper ties into concept(s) covered in class, with a brief review of those concepts.
4. Strengths and weaknesses of the paper.

The presentation will be graded as follows:

You will be graded on the following bullet points, each on a scale of 0 - 4.

- Is the presentation clear and is the presenter knowledgeable about the work?
- Does the presenter put the paper in the context of least squares optimization concepts learned in class?
- Are the explanations of the technical concepts understandable?
- Are the strengths and weaknesses of the work elucidated through the presentation?
- Are questions answered knowledgeably?
- Are slides polished and easy to understand?
- Are key figures from the paper explained?
- Are you an active participant in other classmates' presentations, asking questions?