ECE 602: Introduction to Optimization

Final Project Report

Project Overview

Your final project consists of two interconnected parts aimed at deepening your understanding of numerical optimization and its application in solving real-world engineering problems:

Part 1: Reproducible Research

- Each project team has been assigned a peer-reviewed journal publication.
- Your task is to carefully study the paper, understand the optimization method used, and **reproduce the key results**.
- You may use either real or simulated data (as in the original paper or a close approximation).
- Compare your results to those in the paper and **comment on any discrepancies**, difficulties encountered, or assumptions made.
- Reflect critically on the method: What are its strengths and limitations? Is it robust to parameter changes or noise? Would you trust this method in a real-world scenario?

Part 2: Code Recycling & Extension

- Use the method (or a variant of it) from Part 1 to solve a **different engineering or applied science problem**.
- You may draw on existing datasets, simulation tools, AI models, or recent literature to define your new problem.
- Creativity and originality are encouraged. The aim is to produce novel insights or results that could be the seed for future research or publication.
- Justify your choice of the new problem and explain how the method applies to it.
- If modifications were necessary, describe them and explain why.

Report Format and Submission Guidelines

1. **Title Page**
    - Project title
    - Team members (names and student IDs)
    - Assigned paper citation
    - Date of submission
2. **Abstract** (150–200 words)
    - A concise summary of the report, including objectives, methodology, and key outcomes.
3. **Introduction**
    - Background on the optimization method
    - Summary of the assigned paper
    - Objectives of the project
4. **Reproducible Research (Part 1)**
    - Description of the algorithm and implementation
    - Tools/libraries used
    - Results and comparisons with original paper
    - Observations and analysis
5. **Extension via Code Recycling (Part 2)**
    - Description of the new problem
    - Justification for using the original method (or a variant)
    - Adjustments to the original algorithm (if any)
    - Implementation details, results, and insights
    - Critical discussion
6. **Conclusion**
    - Summary of what was learned
    - Reflections on both parts of the project
    - Potential for future work
7. **References**
    - Full citations of all sources used

8. **Appendix (Optional)**
    - Source code (or a link to a GitHub repository)
    - Additional figures or tables
    - Data descriptions

Please use the template below to format your final report.

Abstract

A brief summary of the objectives, methods, and main findings of the project. (150–200 words)

1. Introduction

Provide background on the optimization method, summarize the assigned paper, and outline the objectives of your project.

2. Reproducible Research (Part 1)

2.1. Method Overview

Describe the optimization algorithm used in the assigned paper.

2.2. Implementation Details

Detail your implementation approach, tools, and any assumptions.

2.3. Results and Comparison

Present and compare your results with those in the original paper. Use figures/tables as needed.

2.4. Analysis and Discussion

Discuss discrepancies, difficulties, and insights. Comment on the method's strengths and weaknesses.

3. Code Recycling and Extension (Part 2)

3.1. New Problem Description

Describe the new engineering or applied science problem.

3.2. Method Justification and Adaptation

Explain why and how the original method applies or was modified.

3.3. Implementation and Results

Provide implementation details, results, and analysis.

3.4. Critical Discussion

Reflect on what was learned, the effectiveness of the approach, and possible future improvements.

4. Conclusion

Summarize your findings and learning outcomes from both parts of the project.

References

Include full citations for all papers, datasets, and tools used.

Appendix (Optional)

Include any code snippets, extra figures, or data explanations. You may also provide a GitHub link to your project repository.