MTH203 Coursework 2
Group Project

Start: April 28, 2023

Report Submission Deadline: 16:00 May 12, 2023

Poster Presentation: 1 pm-5 pm May 17, 2023

Report Submission…

Each group (not each person) should submit a report:

- **Hard copy (A4 size)** to the mailbox (Min's or Ruonan's) on the 5th floor MB building
- **1000-1500 words (including tables & figures, excluding references and appdendix).**
- Include a **cover page**, specifying your team name and which topic you choose

Poster Presentation…

Tentative plan:

- Time: 1 pm – 5 pm, Wednesday, May 17th
- Venue: Entrance of MB Building
- Each group should prepare a poster
- Printing options:
  - We print it for you (send the file to our TA Xueqi.Yao20@student.xjtlu.edu.cn by May 14th)
  - Print it out yourself and bring it to the poster presentation

Your team could choose one from the three topics

Topic 1. Optimization using Computer Simulation

Topic 2. Algorithm Development for Large MIP Problems

Topic 3. Modeling of Real-world MIP Problems

(MIP: Mixed Integer Programming)

Topic 1: Optimization using Computer Simulation

Use computer simulation to solve a real-life optimization problem.

Examples include but are not limited to:

- Applications of a Queuing system with multiple servers and a large number of replications.
- Applications in supply chain logistics management, Risk/Revenue management, etc.

Report outline sample for Topic 1:

- Introduction
- **Problem description**

  (how the system operates, what are the assumptions, random events, performance measures, etc.)
- **Computer Simulation**

  (Explain your method, pseudo-code/flowchart; important implementation details if any, etc.)
- **Computational experiment**

  (data, result and explanation, what-if analysis, etc.)
- Conclusion
- References
- Appendix (codes, etc.)

Topic 2: Algorithm development for large MIP problems

Use your favorite computer programming language to implement the algorithm(s) for solving a large MIP problem.

Heuristic algorithms include but are not limited to

- Greedy heuristics (e.g. insertion heuristic…)
- Improvement heuristics (e.g. 2 opt, relocation…)
- Metaheuristics (e.g. Simulated Annealing, Tabu Search, …)

MIP examples include but are not limited to

- Network Flow Problem
- Facility Location Problem
- Vehicle Routing Problem
- Traveling Salesman Problem

Report outline sample for Topic 2:

- Introduction
- Mathematical Model

(sets, parameters, objective function, constraints, and necessary explanation)

- **Solution method**

(explain your algorithm(s), use flowcharts or pseudo code if needed)

- **Computational results**

(Data (benchmark instances or self-generated data), parameters, results (in table or figures) and analysis, comparisons if you have more than one algorithm, etc.)

- Conclusion
- References
- Appendix (main code, extra data/results, etc.)

Topic 3: Modelling of real-life MIP problems

Search or designed by yourself to investigate a real-life MIP problem. Formulate the general model for the problem and solve it using existing solvers, such as Excel, LINGO, CPLEX, etc.

CPLEX download: https://www.ibm.com/products/ilog-cplex-optimization-studio

LINGO download: https://lindo.com/

Report outline sample for Topic 3:

- Introduction

  (the background of your problem, the story)

- **Problem description**

  (what are the inputs, the assumptions, the objective, and the constraints; a toy example, figure illustrations if possible; etc.)

- **MIP Model**

  (Notations for sets, parameters, variables; explain how to model each constraint, present the entire model)

- **Computational Results**

  (data, software/solver used to solve the MIP model, sensitivity analysis and other interesting results, etc)

- Conclusion
- References
- Appendix (snapshot of models and results in the solver, etc)

Marking Criteria

Report

- (15%) Structure
- (10%) Creativity
- (30%) Methodology
- (20%) Coherent account in own words
- (15%) Ease of reading and grammar
- (10%) Word count

Poster presentation

- (40%) Preparation of poster
- (20%) Clarity of voice and spoken language
- (40%) Logic and structure of the contents

Lecturer's marks will be given to the entire team (same for all the members) considering report and presentation, each with 50%

- Peer Review: Everyone to give a mark for your teammates to indicate their contribution, an average will then be taken. Instructions will be sent later.

- The final grade takes 80% from the lecturer's mark and 20% from the peer review mark.