Assignment 3 Information

Posted on November 19, 2021
Due: December 3, 2021

Assignment 3

Important Notes

- You should use the same programming language as Assignment 2. If you used Python in Assignment 2, continue to use Python. If you used Java, continue to use Java.
- Zero tolerance policy on plagiarism. The following is **not allowed**
  - copy all or part of another team's work, or allow another team to copy your work,
  - write all or part of a computer program, a report, or a solution to a question jointly with another team
  - use print or internet materials without explicit quotation and/or citation.
- Total marks: 100 marks + 15 bonus marks

In Assignment 3, you will continue to work on the same topic as Assignments 1 and 2. In the first 2 assignments, you

- developed an understanding of the range of decisions and requirements relevant to your topic,
- developed multiple models, starting with basic features and extending to include more complex ones like conflicting goals and nonlinear requirements,
- implemented your models and solved them using a state-of-the-art solver,
- performed numerical analysis to derive insights.

In this assignment, you will develop, implement, and test a heuristic algorithm. You are expected to do the following.

1. Provide a description of the specific problem you will focus on. (10 marks)
   - It is best if you continue to work on the same problem as in Assignment 2.
   - Avoid trivial problems.
   - You are not required to model the problem.
2. Construction heuristic. (60 marks)
   a. Suggest a construction heuristic. Your answer should include a description and a pseudocode of your heuristic. (15 marks)
   b. Implement your heuristic. (45 marks)
3. Numerical testing (30 marks)
   a. Describe your instances. You may use the same instances as Assignment 2 or extend them to increase size and features. The instances are realizations of the problem you are studying.
   b. Solve the instances using your algorithms (construction and simulated annealing).
   a. Analyze the performance of your algorithms in terms of solution quality and computational time.

Bonus (Total 15 marks for a total of 115/100)
Suggest a simulated annealing algorithm. Your answer should include a description and a pseudocode of your algorithm. Implement and test your algorithm.

You need to implement the algorithm for full or partial marks, i.e., no partial marks for suggesting a simulating annealing heuristic without implementation and testing.

Timeline and deliverables

- Assignment start date: November 19, 2021.
- Assignment due date: December 3, 2021, 11:59PM.
- Deliverables: Report, codes, instances, and instructions to run codes.
- Submission instructions:
  - upload **report** in the **Crowdmark dropbox,**
  - upload **codes (in executable form) and code-associated files** in the **LEARN dropbox.**

You will be assessed on the following

- The use of tools (heuristic search methods) learned in the course.
- The validity and correctness of the algorithms.
- The level of design involved.
- The level of realism of the data.
- The quality of the report

To assess the level of design, you may consider these questions.

- Problem studied: Is problem trivial? Does your problem include any complex features?
- Algorithm design: Are algorithmic ideas like construction strategies trivial? Do you consider multiple implementations by varying certain algorithm features like stopping criteria?
- Numerical testing: Do you perform parameter calibration to find best setting for algorithm parameters? Do you compare your algorithms performance to optimal solutions obtained from solver?

You are not expected to do all of these but missing on all questions indicates a low-level design.

The report should include:

- Title page
- Table of contents
- Executive summary
- Main body: problem description, description of algorithms, numerical testing
- References: a list of citations made in the report if applicable
- Appendices if needed: detailed results, example solutions, etc.
- The main body of the report should not exceed 5 pages.
- Format: 1.5 spaces, 12pt font with 2 cm margins on each side.