

This homework consists of four problems. The first two involve implementing pairwise interchange-based heuristics that we discussed in class, the third involves generating some random test problems and comparing the heuristic results with the optimal solutions, and the fourth involves discussing the results.

1. Using the lap.py code (and lap\_h1.py and lap\_h2.py as needed), implement the *random pairs pairwise interchange* heuristic for the LAP. Use 100,000 random pairs for your procedure.
2. Using the code developed as part of Problem 1, implement the *steepest descent, pairwise interchange* (SDPI) heuristic for the LAP.
3. Generate 10 random problems using randomLAP.py. The problems should each have 200 tasks (you can select any values that you would like for the minimum and maximum task times). Compare the results of running lap\_h2, the code developed in Problems 1 and 2, and the optimal solutions (from lap\_optimal.py). For presenting the results, create a table with one row for each of the 10 random test problems. The table should have an appropriate header row that identifies the columns (i.e., the table should have 11 total rows). The columns for the table should be:
  - a. Problem Number (1-10)
  - b. (Min, Max) – the minimum and maximum values for the tasks times (the parameters you used when you generated the problems)
  - c. lap\_h2 solution
  - d. random pairs pairwise-interchange solution
  - e. SDPI solution
  - f. Optimal solution
4. Discuss the results – In particular, discuss the performance of the heuristics as compared to the optimal solutions.

We will test your problems using lap.py, lap\_optimal.py, lap\_h2.py (my code) and your code. Please do not modify my code – make any changes that you need to make in your files. For the table and discussion, “neatness” and “writing/English” count – be sure to edit your work so that it is grammatically correct and “sounds good.”

The deliverables are the Python scripts for Problems 1 and 2, the 10 randomly generated test problems (name the files p1.csv – p10.csv), and the results comparison table for Problem 3 and discussion for Problem 4 (in Word).

You can do this assignment in groups of up-to 4. Your document should include the names of all members of your team. ALL MEMBERS OF THE TEAM SHOULD SUBMIT THE **EXACT SAME** ZIP FILE TO CANVAS (i.e., each team member submits the file via Canvas – we’re not going to setup groups).

*This assignment involves many different files. Please make sure that you include the correct files in your zip archive and that you all submit the same file to Canvas. We will not accept late submissions or “replacement files” – so take care and don’t wait until the last second to put the submission together.*