



Machine Learning, ICS2207/3222, Course Project 2020

Important – Read before starting

- The deadline for completing and submitting your assignment is strictly Friday 29rd January 2021 at 18:00.
- VLE will be set up to not accept late submissions meaning that you will get zero marks if your submission is late. Please plan ahead (it is recommended that you upload and verify your work a day or two before).
- You must complete the project completion form (shown later) and include it in your report. Submissions without the statement of completion will not be considered.
- You must complete a plagiarism declaration form and include it in your report. Submissions without the form will not be considered.
- Projects must be submitted using VLE only. Physical copies or projects (including parts of) sent by email will not be considered.
- For your convenience, a draft and final submission area will be set up in VLE. Only projects submitted in the *final* submission area will be graded. Projects submitted to the draft area are not considered.
- It is suggested that after submitting your project, you redownload it and check it again. It is your responsibility to ensure that your upload is complete, valid, and not corrupted. You can reupload the assignment as many times as you wish within the deadline.
- Your project must be submitted in ZIP format without passwords or encryption. Project submitted in any other archiving format may not be considered.
- The total size of your ZIP file should not exceed 38 megabytes.
- Your submission should include your report in PDF format, your source code, and executable file(s).
- It is expected that you submit a quality report with a proper introduction, discussion, evaluation of your work, and conclusions. Also, make sure you properly cite other people's work that you include in yours (e.g. diagrams, algorithms, etc...).
- In general, I am not concerned with which programming language you use to implement this project. However, unless you develop your artifact in BASIC, C, C++, Objective C, Swift, Go, Pascal, Java, C#, Matlab, or Python, please consult with me to make sure that I can correct it properly.
- This is not a group project.
- Plagiarism will not be tolerated.

TSP using Simulated Annealing and Ant Colony Optimisation

- As part of your report, write a technical section about how Simulated Annealing (SA) and Ant Colony Optimisation (ACO) work. Discuss why they are especially useful for problems such as the TSP. Three to five pages worth of good material should suffice. Don't rip off Wikipedia or some other blog. In this section, you should convince me that you understand the methods.
- Note regarding any artifacts you develop: you do not need to implement algorithms yourself. You may use existing libraries (for example, in Python).
- You are required to implement:
 1. A simulated annealing algorithm applied to the TSP.
 2. Ant colony optimisation applied to the TSP.
- You may obtain instances of TSP from TSPLIB over here:

<http://elib.zib.de/pub/mp-testdata/tsp/tsplib/tsplib.html>

- You are required to deal with instances of **symmetric** the TSP only.
- Evaluate the performance of both the SA and ACO methods using at least four instance sizes (number of cities) of your choice for each method. Choose your sizes wisely so that your evaluation makes sense. Structure your evaluation as follows:

Instance name: burma14.tsp

SA method: *<setup>*

ACO method: *<setup>*

Results: *<your evaluation, interpretation>*

...

...

Instance name: bays29.tsp

SA method: *<setup>*

ACO method: *<setup>*

Results: *<your evaluation, interpretation>*

...

...

and so on...

- In your report, make sure to discuss your methodology and describe your implementation (e.g. which representation schemes you used and so on).
- Describe some other applications that SA and ACO are suitable for.
- Make sure that your report has a good evaluation section for any artifacts you develop. Also, make sure to discuss the suitability (SA vs ACO) of each method for TSP (e.g. can one method handle larger TSP instances than another?).

Statement of completion – MUST be included in your report

Item	Completed (Yes/No/Partial)
SA and ACO technical discussion	
Artifact 1: TSP with SA	
Artifact 2: TSP with ACO	
Application of SA and ACO to other scenarios	
Experiments and their evaluation	
Overall conclusions	