CSE 551: Project Guidelines

February 2019

This document serves as a general outline for the course project. The project consists of **20%** of the overall grade. Please read the following carefully:

- It is **strictly encouraged** that you form groups consisting of **at most 4 students**. A Google sign up sheet will be made available tonight (02/04). If you want to work alone, then it is your responsibility to implement the tasks yourself.

- You will be given 3 problems and at least one algorithm (per problem) which you will have to implement. You will choose two problems and inform the TAs of your choice. Bear in mind that **your selection is final**. You are also welcome to work on a project of your choice. If that is the case, please submit a one-page write up to the TAs, a week after the detailed project document is out. This write up should consist of a description of your problem, the algorithm(s) you plan to implement, the general challenge of the problem and how you will be overcoming these challenges.

- You will be responsible for implementing the algorithms using any programming language of your choice. A detailed description of the problems, the respective algorithms and the grade distribution of the tasks, will be made available in a week.

- You will be required to submit a midterm report on your project, where the TAs will evaluate your progress. The submission date for this report will be announced in **due course** (You can *ignore* the write up submission on the 28th of February).

- The final submission will include all your code files and a project report. Please note, that **we will be checking for plagiarism**, in the report as well as the code files, therefore please submit your own work.

Outline

For the project, the students are required to implement algorithms for well known problems described below. The project implementation will involve reading a research paper and implementing part of the research. The students are expected to follow the guidelines and tasks highlighted for their respective project. It may be noted that the projects are open ended and the students are free to analyze the problem further. You are at liberty to use any programming language but please **ensure that you code the algorithm and not use any packages**. The topics are:

1 Relay Node Placement Problem with Minimum Number of Connected Components

The study of this problem is conducted in a scenario where a number of sensors (nodes) have been placed in a deployment area and often the objective is to place the fewest number of relay nodes in the deployment area such that the resulting network comprising of sensor and relay nodes is connected. For this problem you will refer to the following research paper:

A. Mazumder, C. Zhou, A. Das and A. Sen, "Budget Constrained Relay Node Placement Problem for Maximal "Connectedness"", MILCOM 2016.

For this project, you will analyze the Budget Constrained Relay node Placement with Minimum Number of Connected Components(BCRP-MNCC) problem. You are tasked with implementing Algorithm 4 in the paper.

2 Relay Node Placement Problem for Maximizing the Largest Connected Component

For this topic, you will refer to the same paper given above. You will analyze the Budget Constrained Relay node Placement for Maximizing the Largest Connected Component problem. You are tasked with implementing Algorithm 5 in the paper.

3 Identifying Codes

Identifying codes were introduced as a means of uniquely identifying faulty processors in a multiprocessor system. For this topic, you will refer to the following paper:

Ray, Saikat, et al. "Robust location detection in emergency sensor networks." INFOCOM 2003. Twenty-Second Annual Joint Conference of the IEEE Computer and Communications. IEEE Societies. Vol. 2. IEEE, 2003.

You are tasked with the implementation of the algorithm in Figure 2.

4   Your Own Project

If you are interested in pursuing your own project, then please indicate so on the sign up sheet. You are required to submit a one page write up to the TAs (via email). The TAs will schedule time with you to go over your projects to identify if they are a good fit for the course. The one page write up should include the following: a brief introduction to the problem, the dataset(s) which you'll be using, the algorithm(s) you wish to implement, the challenge you may face and a list of final deliverables. If you and your group intend to do your own project, then you do not need to select another problem. Correspondingly, please ensure that your work does not end up being too trivial.

5   Datasets

For projects 1-3, the underlying data is a graph. You can create your own graphs to test your algorithm. You are at liberty to create graphs using any packages (for e.g. networkx in python), but you have to code the algorithm by yourself. Post final project submission, we will test your algorithms with our own datasets.

If you elect to do your own project, then you are responsible for collecting, cleaning and processing your dataset, before you can apply your algorithm(s).

6   Submission Deadlines

Please indicate your choice (if working on your own project) or choices (if working with any two algorithms from 1 to 3) in the Google sign up sheet. Here are some of the milestones of the project:

- **12-14th March:** If you are working on topic 4, then please meet with the TAs in the week after the spring break to discuss your project.

- **28th March:** A brief write-up (midterm project report) about the problem statements being addresses and the work you have done thus far. This will carry 5% of the total grade.

- **25th April:** The final project submission should include your code files, midterm project report and a final report in a zip file. This constitutes 15% of the total grade.

7   Report Format

Your report should include the following: Team information, Introduction, Problem Formulation, Problem Solution, Results, Conclusion and Peer Evaluation. In the peer evaluation table, please score yourself and your teammates out of 20. **Every student is required to submit the midterm as well**

as the final report. Your reports may be largely similar with others in your group but please add your own inputs for the project in the report.