CSI 4105 Project Winter 2017

Size of Groups: To be completed in groups of 2 or 3.

Dates: Project proposal due: Wednesday February 15, presentations will be in class near the end of term, and the final report is due April 28th.

Marking scheme: Total 25%: 2% project proposal, 3% project presentation, 20% Project report.

Project: guidelines

Main advice: find some problem you have an interest or have fun learning more about (application you studied in another course, puzzle type problem, search problem, etc)

type I
The typical project will underline a problem (application or abstract).
Discuss what is know about the problem (after some research).
Implement two different algorithmic strategies to solve the problem.
Do experimental testing, comparing the methods for the data set of instances.
Write all the findings in a professional report.

type II
Alternatively, the project may verse on theory of NP-completeness.
Study several known reductions for a known problem. Do more research, read a lot of papers, survey the ideas.
Study a new application and study its NP-completeness (create a new reduction).
This is less straight forward, but may interest some theoretically inclined students.

Below are some guidelines for type I projects

1) Picking the Problem:
a) pick a real world application that interests you: scheduling, sudoku puzzles, network problems, DNA sequencing, etc. (some you may have studied in other courses or have a personal interest)
OR
b) pick an abstract problem that interests you: finding cliques in graphs, solving travelling salesman problem, formula satisfiability, graph colouring, etc.

The main characteristic of the problem is that it should be some hard problem,
e.g. NP-hard or harder.
a) may involve modeling of the problem (transforming from real world to a model such as the ones in b) or variations of them)

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2) Choose solution strategies:

Part of the course deals with several solution strategies (backtracking, local search, approximation algorithms, randomized algorithms; there are also greedy heuristics).
For each problem of the type b), many people tried various solution strategies, and you can find papers about them as a starting point.

Typically, you would study 2 different methods.
For example:
Solve TSP via backtracking and via tabu search (type of local search).
Solve cliques via greedy heuristic, and simulated annealing.
Do 2 different approximation algorithms for a problem.
Use randomized algorithms plus another method for a cryptographic application.
Solve Sudoku via exhaustive search, comparing various different strategies
etc.

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3) Specify your experimental design:

How you will obtain data (use standard problem repositories, problem databases, benchmarks, using real world data (if applicable), etc.

Which sort of quantities/stats you would use to compare the effectiveness of your algorithms.

About the proposal:
With the project proposal, you sort of give yourself your own assignment.
I can judge whether it is enough, too much. I can also give you some guidance(ideas, pointers), given my experience in the area. I can give ideas on how to expand a good idea that was not so well developed in the proposal.
The objective is that you communicate well what you plan to do, so that we can discuss and revise it before you go to deep into the doing.

csi4105 Project report guidelines

A) Length
Approximately 10 pages; appendixes with data/tables/graphs may take up more space if needed.
Your report should contain much more details than your talk;
Your talk slides may be appropriate for the talk, but do not try to recycle a talk into the report, as much more detail is expected in the report that should read more like an article/paper.

B) Organization
Make sure your report contains all required parts:
1) Introduction,
2) Additional sections as required by your topic
(for example - problem definition, related work, description of algorithms)
3) Experimental analysis (unless your project is theoretical)
including explanation of experimental design
and discussion of experimental results)
4) conclusion
5) complete references.

C) Extra remarks
1) It is important to define your problem precisely, explain it well, and give examples. Before you explain algorithms, the problem should be well defined.
2) List any resources you have used. Any figures, graphs or excerpts from other sources must be acknowledged and reference given. If you paraphrase what is said in another resource,

include the reference right after the phrase. If you include identical phrases found in a resource, you need to put quotes around those phrases: "bla bla" followed by a reference to the resource. Failure in complying with these guidelines is considered plagiarism. Please do not include too many phrases between quotes.
3) Explain well how you obtained or created your data, how many different data tests you used, and the value of any parameter you fixed or varied for your tests.

What you will hand-in for your report:

1) project report in pdf format

2) project slides (your talk), preferably in pdf format (normally you can save a powerpoint into a pdf)

3) A file called "code" (where all programs and relevant testing files are included)