CSCI 377: Computer Algorithms
John Jay College (CUNY)
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Project Description

Objectives:

For the CSCI 377 project, you are expected to propose and implement an algorithm for one of the listed topics. You will learn how to solve a problem, search for an adequate solution, and how to implement an algorithm in your preferred programming language (C/C++, Java, Python). Your project should include the designing of the algorithm, running time analysis, implementation, and experiments.

Team size: 2-3.

Deliverables:

- **Select the topic: 09/22,** you should choose a topic and submit a 1-page discussion of the basic architecture of your system (a draft) such as the data structure, the algorithm, etc.
- **Presentation: 12/04-09,** a demonstration of your project, in which you show the main objectives of your system, the algorithm, the output, the analysis, and a demo of your implementation and the experiments.
- **Peer review Process: 12/04-09,** You need to evaluate another group' project. Your feedback should help them understand their strength and their limitations.
- **Report: 12/12,** you should hand in a completed project report which includes the project design, analysis, and the experimental results.
- **Code: 12/12,** you should return your implementation code and associated documentation (README files), so that everything can be backed up for future reference.

Project Topics:

1. **Banking management system,** you need to create a management system that will replicate banking operations such as account creation, balance inquiry, deposit and withdrawal of funds, transfer of money, etc. In this project, you could use sorting algorithms for account management, search algorithms for account lookup, and trees/graphs for system organization.
2. **City Bike station planner,** you need to develop a system to decide where to put bike-sharing stations in a city. You need to plan optimal routes between different locations to make a useful network. Your planner system should calculate the shortest path between two locations (your position and the bike-sharing stations) considering factors like distance, time, and traffic. In this project, you could use graph traversal algorithms to find possible routes, and shortest path algorithms to find optimal routes.
3. **Traffic Light System:** you need to design a system to control traffic lights based on real-time vehicle flow. This system should use data collected from sensors, cameras, and GPS devices to detect traffic density and adjust light timings. In this project, you could use shortest-path algorithms to calculate optimal routes and travel times,
4. **Library management system:** you have to create a program to manage library operations such as tracking book borrowing and returns, book reservation, member record, etc. You could use sorting algorithms to arrange books, search algorithms for book lookup, and user interface to interact with the system.
5. **Cash flow minimizer:** you have to create a system to minimize the cash flow among a group of friends who have borrowed money from each other. In this project, you can use sorting and searching algorithms for manipulating transactions, and dynamic programming/greedy algorithms to minimize cash flow by rescheduling transactions.

Gen AI Ethical Considerations:

♣ **Use Gen AI to**:

- brainstorming and idea generation
- Clarifying concepts and definitions
- Assisting in programming and software development tasks.

- ♣ **DON'T Use Gen AI to:**
  - Copy AI-text generated and submit it as your own work.
  - Copy AI-code generated without your input.
- ♣ Give credit to AI where applicable helps maintain transparency.

  for example: some ideas for this paper were inspired by brainstorming with ChatGPT.
- ♣ Check for Accuracy: GenAI tools are powerful, but they are not perfect.

Grading criteria:

Presentation 5%	Presentation slides (1pt) clarity, timely, well designed, organized, easy to follow	Communication skills (2pts) presenter spoke clearly, effectively	Demonstration of knowledge (1pt) good understanding of the topic	Presenter responded effectively to audience questions (1pt)	
Report 10 %	Structure of report: (2pts) abstract, introduction, algorithm architecture, data structure, pseudocode, experiments	Writing skills (1pts) well written, no grammar mistakes, etc.	Algorithm analysis (2pts) computing running time correctly	Experiments interpretation (3pts): the output answers the problematic questions.	Complete projects parts (2pts) (design, analysis, implementation, testing)
Code 10%	Program specifications, correctness (2pts)	Readability: (1pts) indentation, organization	Documentation/comments: (2pts) (well documented and adding comments for each function, code part	Code efficiency: (3pts) no errors, some errors, non-functional	Program outputs: appropriate results that solve the business problem chosen (2pts)