

CSE 521 Project

Spring 2003

1 Introduction

The purpose of this algorithms project is for students to explore the algorithms literature and experimental algorithms platforms. Often students outside of theory rely solely on the literature from their own field in their studies, while the theory literature may hold the key to what they need. Conversely, students in theory are often motivated only by asymptotic results and never bother to implement or test their algorithm on real or synthetic data. This project will help both theory and non-theory students develop stronger research methodologies in algorithms.

2 Process

1. Students will divide themselves into teams of two students each in the first week of the quarter.
2. By the end of the third week of the quarter each team should prepare a written proposal. The proposal will be reviewed and feedback given.
3. By the end of the seventh week each team will meet with the instructor with an interim report.
4. Each team will prepare a maximum 10 page paper and 30 minute talk describing the results of their project. The paper is due the last week of the quarter, and the talk will be given sometime during finals week.

3 The Teams

It is desirable that members of a team have similar interests. In particular theory students should pair up with other theory students and non-theory students should pair up if they have plans to work in the same subarea. In this way the teams will be well motivated to work together.

4 The Proposal (due before April 18, 2003)

The proposal must have a title, objective, and list of references and resources that will be used. There are several kinds of proposals that can be made: experimental and theoretical. In an experimental proposal, students can compare experimentally several algorithmic approaches to the same problem. The experiments should be explained in the proposal. Students are welcome to use algorithms packages like LEDA, CGOL, and CPLEX in their research. Student can also implement algorithms on their own. In a theoretical proposal students can compare theoretically several algorithmic approaches to the same problem. In this case, students gain a deeper understanding of

analysis and verification techniques. A theoretical proposal can also look into computational complexity aspects of problems such as NP-hardness. In either kind of proposal students are encouraged to report analytically and critically on the algorithmic approaches.

An important requirement of the project is that the literature used come from the theoretical community, not the specialist community. With this in mind here are some general guidelines for students looking for things to do.

1. AI: computational learning theory algorithms; algorithms from mathematical logic.
2. Software engineering: verification algorithms; model checking algorithms.
3. Hardware: computational geometry algorithms; verification algorithms.
4. Graphics: computational geometry algorithms.
5. Databases: streaming algorithms.
6. Systems: distributed computing algorithms.
7. Programming languages: graph algorithms.
8. Theory: lots to choose from.

5 Interim Report (before May 16, 2003)

Each team should make an appointment with the instructor for a discussion of progress on the project.

6 Final Report (before June 6, 2003)

The final report will be at most 10 type written pages including figures and references. The report should explain the algorithms and other results found, and report on any experiments. A critical evaluation of the algorithms should be included.

7 Talk (before June 13, 2003)

Each team should prepare a half-hour PowerPoint presentation that will be open to all students. The talks will be scheduled during finals week.

8 Assistance

Please see the instructor and/or TA for any advice you need in preparing the proposal, final report, or talk.

9 Evaluation Criteria

The evaluation criteria will depend on the kind of project done. However, all project reports must be well organized with well thought out sections and subsections. The report should contain all the references used in the project. Mathematical notation should be clear and concise. Please use LaTeX because it produces much better math than any competitors. Complete proofs are not required, but well crafted explanations are. If experiments are used they should be justified and the experimental apparatus should be explained. All reports should have some critical evaluation of the algorithms. All talks should be prepared in PowerPoint or similar presentation system. The talk should complement the report, by adding some value.