

Third Year Projects

Supervisor: Dr Ida Pu

My research interest is mainly in algorithmics but I am willing to supervise any project that involves some design, implementation/programming and analysis. Please find a list of proposed projects below. If you decide to take any of the projects available, please let me know by email (to i.pu@gold.ac.uk.) with your name and the project title. I will mark it as “**taken**”.

1 Traversing Graphs

This project is to investigate and write code for two classic ways to traverse a graph: by Eulerian or Hamiltonian circuits. To study the relative difficulty of generating these circuits (if they exist) for an arbitrary graph. To investigate related problems like the travelling sales man problem and the problems of the Chinese postman. If time permits, to look at various approximation heuristics for the Traveling Sales Man Problem.

2 Spanning Trees of Graphs

This project is to review the properties and applications of example for (a) depth first (b) breadth first (c) least depth (d) bushiest spanning trees, to determine which properties of (a) and (b) have led to efficient sequential algorithms, and which of (c) and (d) to efficient parallel algorithms. What are the relative difficulties of providing algorithms for (a) and (b) as opposed to (c) and (d)? In the remaining time the project may investigate related problems involving, for example, Steiner trees.

3 Matching in Graphs

This project is to review and motivate problems related to various matchings in graphs, for example, maximal and maximum matching problems and their various weighted versions; and to write programs for some of the easier problems, e.g. for maximal matchings in general graphs and maximum matchings in bipartite graphs). From looking at sequential algorithms, time permitting, the project may go on to look parallel algorithms such as the celebrated probabilistic maximum matching algorithm of Vazirani, Vazirani and Mulmuley.

4 Text Data Compression

Huffman coding is a classic technique mainly for text compression. This project is to investigate other similar techniques for text compression. The student could, for example, compare the different techniques by empirical implementation of different algorithms. She/He could also evaluate the different techniques by other criteria, for example, by arguments in business, management, by the reliability or the degree of ease-of-use, etc.

5 When a Simple Cat and Mouse Meet

This project is to simulate the behaviour of a simple cat and mouse on a computer. The behaviour could be modeled, for instance, by two random walks on a simple graph. The student will study and implement some interesting randomized algorithms. There are many applications based on this abstracted problem. If She/He is interested, the student could also investigate some applications of the problem. The student needs to know or be interested in learning some basic Probability Theory.

6 Distributed Searching Algorithms

This project is to investigate the practical behaviour of different searching algorithms on a distributed model. By implementing known searching algorithms, the student would study the difference between the time (space) complexity in theory and in practice.

7 Web Crawling

This project is to review the various crawlers on the Internet. The student would investigate their working processes, operations from a number of machines around the Internet etc. If she/he is interested, the student could write codes to conduct preliminary experiments to explore the different behaviours of these algorithms.

8 On Network Performance Management

The main responsibilities of the performance management are ensuring accuracy (error-free transmission), timeliness (speed), and economic feasibility (cost-effective networks) of the network. The manager has to be adept at performing the five key management tasks, i.e. planning, organizing, directing, controlling and staffing. This project is to conduct a survey on the performance management to a real network. The student would investigate the management work and analyse the potential problems and suggest the possible improvements. The student needs to have a good background on network management and data modeling.

9 Network Security

This project is to investigate the security issues on a real network, the current state, the potential problems, tools and methods for the security management. The student may identify some problems/algorithms of interest and then conduct some implementation and analysis.

10 Searching algorithms in practice

This project is to investigate the practical behaviours of different searching algorithms. By implementing known searching algorithms, the student will study the difference between the time (space) complexity in theory and in practice.

11 An On-line Tutorial System for Primary Schools

This project is to design and implement an on-line tutorial system in a chosen subject, e.g. mathematics, physics, music, computing etc., (a collection of subjects if the time permits) for national primary schools. The system would be used by both children and teachers. It will be Web based and user friendly with a good connection of some databases using Java language. It may also include some contemporary features such as sound and images depends on the tutorial subject.

12 Testing and Marking in a Coursework Handling System

This project is to develop software for the testing and marking part of a Coursework Handling System to support the on-line coursework submission.

The system was developed by two CIS graduates in 1999-2000 and in 2000-1 independently and has already had some main functions. For example, the system can issue a receipt to each

submitor. The submitor is allowed to submit repeatedly an updated version of a coursework before the deadline, but only the latest submission will be marked. The system can then collect the courseworks, produce a register table about the submission for the markers.

The new functions to develop in this project is to add into the current system a testing and marking abilities for programming courseworks. For example, the system would provide a convenient way for the marker to run a submitted programme and prepare some test data. After the marker issues the marks for each question, the system can produce the total marks for each submission and finally collect the individual marks and print a list of all the coursework marks. The system should allow any structural changes later on.

13 Handling Email Enquiries for Admissions

This project is to develop a piece of software to handle the admissions enquiries from potential students via email. She/he will initially design and implement an administration software system for dealing with enquiry emails. The system should be able to reply to certain kinds of enquires automatically or with minimum human supervision. The student will need to learn some Perl first for the project.

14 Encryption Techniques for the Internet

In this project, the student will investigate the main techniques used for the Internet. She/He will study the principles and algorithms behind the techniques, analyse the advantages and disadvantages demonstrated in various environments, implement some selected encryption algorithms and conduct experiments to gain the first-hand experience on the performance of these algorithms.

Note

I would also be happy to supervise any projects in a suitable topic initialised by students. Please feel free to discuss your interests with me.