

'396' Undergraduate Research Project Application Form

Office for Undergraduate Research in Science
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tel 514-398-5964, fax 514-398-8102
Form version 200603

Instructions for students

- *All fields are required, unless indicated otherwise.*
- Download and print this form. Complete Section 3 and sign.
- See “How students can apply” instructions in Section 2.10.
- Your supervisor or department will tell you if you are selected for this project. If so, you will receive a code to register for a ‘396’ course on MINERVA.

1 Supervisor Information

Name: Prof. Clark Verbrugge
Email: clump@cs.mcgill.ca
Phone: 514-398-2411
Website: <http://sable.mcgill.ca/~clump>
Department or Unit: Computer Science
Course number: COMP396

2 Project Information

2.1 Term:

Summer 2008

2.2 Project start & end dates:

May 1 - June 30, 2008

2.3 Project title:

Optimizing Multi-Level Instruction Caches

2.4 Project description:

Computer programs can easily exhibit +/- 10% speed changes due to characteristics of their individual use of *instruction caches*. This is largely due to the poor use of optimization approaches that try to optimally place a procedure in memory. Various techniques have been developed for procedure placement, but in practice few compilers/linkers actually employ them. Moreover, these designs are primarily developed for simple, single-level, *direct-mapped* caches. The applicability, performance and value of these optimizations on a modern computer architecture using multi-level, set-associative caching is far from clear. This work involves developing improved heuristic algorithms and investigating how performance can be increased in such a complex environment. The student would be required to implement a (simple) multi-level instruction cache simulation tool, gather external runtime profiles of benchmarks, and apply the profiles to the simulation in order to evaluate cache performance. This will be compared with the behaviour of an existing algorithm for procedure placement. As well as implementation and analysis of these different techniques, the student will help in the design and further evaluation of new layout algorithms that further reduce instruction cache misses.

2.5 Prerequisites:

1 term completed at McGill + CGPA ≥ 3.0 ; or permission of instructor.

Must have some understanding or interest in low-level hardware components. Ability to program well in Java (or any other high-level language) is also required.

2.6 Grading scheme:

Attending Meetings: 10%

Interim report: 10%

Final Presentation: 10%

Final Report: 70%

2.7 Other:

2.8 Status:

This project is:

Open to applicants

Already taken; no more positions available this term

Taken, but contact me for other possible projects this term

2.9 Ethics, safety, & training:

Which of the following, if any, is involved?

Animal subjects

Human subjects

Biohazardous substances

Radioactive materials

Handling chemicals

Using lasers

For undergraduate students, ethics and safety compliance is the supervisor's responsibility.

2.10 How students can apply:

Bring this application form and your advising transcript to me during office hours.

3 Student Information. (1) Print legibly and sign. (2) See ‘How students can apply’ in Section 2.10.

Name:

McGill ID:

Email (first.last@mail.mcgill.ca):

Phone:

Program (e.g., B.Sc. Maj. Chem. Minor
Biology):

Level: (circle one) U0 / U1 / U2 / U3

*I have not applied for another 396 course this
term. Student signature:*

Date:

4 Approvals. (1) Print names and sign. (2) Notify Office for Undergraduate Research in Science. (3) Give student code to register for course on MINERVA.

Supervisor:

Date:

*I certify that this project conforms to depart-
mental requirements for 396 courses. Unit
Chair, Director, or designate*

Date: