MEng Design Project Announcement – 2018-19

Project Title: Implementation and Evaluation of Parallel Applications on Sharing Architectures

Brief Description of Design Project Goals:

Overview:
The problem of underutilized hardware resources has been a long-standing challenge for computer architects who are tasked with efficient management at the software-hardware boundary. A well-known approach to address this problem is to collect underutilized resources (caches, networks, compute) into a small pool of highly utilized shared resources that are accessible to many workers at once. Our research group is developing novel sharing-based architectures. The goal of this MEng design project is to implement, verify, and evaluate various parallel applications executing on these new sharing-based architectures. The student will have access to research-grade hardware simulation platforms for evaluating the detailed performance of these applications. Near the end of the project, the student will have the opportunity to experiment with mapping parallel microbenchmarks to a recently fabricated test chip which includes a simple sharing-based architecture.

Specific MEng Contribution:
The student(s) will work closely with PhD students currently exploring sharing-based architectures. A tentative list of tasks includes: (1) specify which parallel applications will be implemented; (2) develop a baseline implementation that executes on traditional architectures; (3) develop a more sophisticated implementation that is able to take advantage of sharing-based architectures; (4) develop an effective testing strategy to ensure the functional correctness of all implementations; and (5) conduct a broad design-space exploration of the applications across many different configurations of sharing-based architectures. Weekly meetings with the field advisor will be held to assess progress; note that insufficient progress after the fall semester will likely result in canceling the project.

ECE Field Advisor:
- Name – Christopher Batten
- Email – cbatten@cornell.edu
- Phone – 607-255-2672
- Office – 323 Rhodes Hall

Number of MEng Students Needed:
One to two students.
Required Skills:

- Self-motivation and the ability to independently research an engineering design problem
- Experience with standard software-engineering best practices including version source control, test-driven development, and object-oriented programming (e.g., CS 2110 or ECE 2400)
- Experience with Unix/Linux and using command-line interfaces
- Experience with parallel application development is a strong plus but not required

Estimated Project Time Frame:

Fall 2018 and Spring 2019 semesters

Application Procedure

Interested students are strongly encouraged (although not required) to enroll in ECE 4750. Applicants should email a cover letter, resume, and unofficial transcript to cbatten@cornell.edu if they are interested. The cover letter should highlight the applicant's qualifications, why the applicant is interested in this project, and the courses they intend to take in the fall and spring semesters. Your resume should highlight course work, industry experience, and extracurricular activities relevant to the project. Strong candidates will be contacted for a one-on-one meeting with the field advisor.