

# **ECE 587/687: Advanced Computer Architecture I**

## **Fall 2019 Term Project**

Proposal due: October 20

Status report due: November 10

Project presentations: Dec 2 – Dec 5

Report due: December 6

The project is to conduct some original research in a group of two or three students. For example, you could analyze one of the topics listed below by modifying SimpleScalar or by writing your own simulator (with prior instructor approval).

The project will include both a written report and a project presentation. The projects will be graded on: i) problem definition and motivation, ii) survey of related work, iii) experimental methodology, iv) presentation of results.

## **Proposal**

Proposals should be one to two pages long and should include:

- A description of the topic,
- A statement of why the topic is interesting or important,
- A description of the methods to be used for evaluating the proposed idea,
- References to at least two relevant papers you have obtained and read. The course readings cite many papers. You can find more relevant papers in Proceedings of the International Symposium on Computer Architecture (ISCA), Proceedings of the conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), Proceedings of the International Symposium on Microarchitecture, Proceedings of International symposium on High Performance Computer Architecture, IEEE Transactions on Computers.

## **Status Report**

To help with keeping the projects on schedule, a one-page status report is due 3 weeks into the project. This report should clearly describe the progress you are making. It will allow feedback and possible path adjustments. The status report will not be graded, but should be viewed as an important part of the project.

## **Final Report**

The final report should be styled after the conference papers that have been covered in the class. They should consist of an abstract, body and optional appendices. The abstract should summarize the contributions of the report in less than 300 words. The length of the body should

be the equivalent of 10-15 pages of single-column text. Additional supporting material can be put in appendices.

## Possible Research Topics

**You are encouraged to come up with your own topic.** Ideally, the topic will be related to your current research interests. You can use the provided SimpleScalar simulator and SPEC95 benchmarks to carry out simulation studies for your project.

A list of example project topics is as follows.

- Implement and evaluate one recently published branch prediction algorithm (see [Branch prediction championship](#) for reference)
- Propose and evaluate your own novel branch prediction algorithm
- Study the impact of increasing pipeline width and instruction window size on processor performance
- Implement and compare two different cache prefetching techniques (for example, next-line prefetching vs. stream prefetching)
- Implement and evaluate recently proposed prefetchers from the [data prefetching championship](#)
- Implement and compare two recently proposed cache replacement algorithms (see [Cache replacement championship](#) for reference)
- Evaluate different cache insertion policies (see Qureshi and Patt's paper on cache insertion policies from ISCA2007)
- Study of different cache-related enhancements, such as victim caches, skewed-associative caches, stream buffers etc.
- Analyze the interaction between cache prefetching and cache insertion/replacement policies (see Wu et al's paper on prefetch-aware cache management from MICRO2011)