

CDA 5106 Advanced Computer Architecture I (Fall 2008)
Term Project
Version 1.0

Important dates: October 15, 2008, (One-page proposal)
Nov. 19, 24, 26, Dec. 1, 3, 2008 (tentative presentation dates)
Dec. 8, 2008 (Source code & project report due)

Description

In this project, you will use a computer architecture simulator (e.g., SimpleScalar) to explore some cutting-edge research ideas.

Policy

In this project, the students registered for CDA5106 need to work in a group of 2 or 3 students. You need to specify the contributions of each group member so that appropriate grade can be assigned accordingly.

Tasks

In this project, you will use a computer architecture simulator carry out some research activities in computer architecture.

You first need to identify a research topic and write up a research proposal. Then, you need to discuss your proposal with the instructor. Your proposal should contain the names of group members, the title of your research project, and a detailed plan to carry out the work.

Based on your anticipated progress, you will select a date to present your work to the class. At the time of your presentation, your simulator needs *not* be complete as long as you can produce some preliminary results. If you choose to implement some ideas from a paper, you should NOT copy the original results from the paper. Instead, your results must come from your own simulation. The presentation is about 20 minutes for each group and 5 minutes for questions.

Your final project report should follow a formal paper format, i.e., it should contain the following sections: abstract, introduction, related work, one or more technical sessions, simulation methodology, simulation results, conclusion, and references. *You turn in your source code only if it works.*

Grading

Proposal: 10%

Presentation: 30%

Research: 30% (i.e., the code implementing the research ideas)

Final research report: 30% (you must use your own results.)

You are also responsible to come up with 1 question on the topic you work on. Some of the assembled questions will be used as the final exam questions.

Late submissions will face severe late penalties.

Examples of research ideas

- Major references for ideas: International Symposium on Computer Architecture (ISCA), International Symposium on Microarchitecture (MICRO), International Conference on High Performance Computer Architecture (HPCA), Architectural Support for Programming Languages and Operating Systems (ASPLOS), etc. Also, check the computer architecture website/online publications for more references.
- Microarchitecture for instruction flow, register data flow, or memory data flow
 - Branch prediction (at most 2 groups on this topic. If you would like to work on branch prediction, talk to me first.)
 - Cache design.
 - Value prediction
 - Prefetching techniques,
 - Etc.
- Microarchitecture for throughput computing
 - Multithreaded architecture
 - Multi-core architecture
- Complexity-effective, scalable design such as checkpoint recovery and processing, hierarchical issue queue, clustered architecture, etc.
- Memory hierarchy design
 - Cache design for single-core processors
 - Cache design for multi-core processors, especially how to share the cache among multiple cores in multi-core processors
- Low power architecture
- Architecture support for reliability, availability, and security
- Your own ideas