

CS 850 Advanced Topics in Computer Architecture: System Support for Next-Generation Computer Architectures

Term: Fall 2024

Instructor: Sihang Liu

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Class Meetings: 9:00 - 11:50 AM on Fridays

Class Room: DC 2585

Office Hours: By appointment

Overview

As the demand for computing grows, especially with the new AI/ML applications, modern computer systems feature higher heterogeneity. New architectural designs, such as multi-tier memory systems, heterogeneous processors, accelerators for specific tasks, and smart memory, storage, and network devices with computing capabilities, have been introduced. This seminar-based course will cover various areas of future-generation computer architectures and the system and programming support that enables applications to utilize the new capabilities.

Class Structure

The primary goal of this course is to introduce state-of-the-art research in computer architecture and systems, with a focus on emerging and next-generation systems. Students will present a variety of papers, covering the following topics such as:

1. Systems and architectural support for machine learning applications
2. Machine learning for architecture and systems design
3. Architecture for datacenter applications
4. Security and reliability
5. Sustainability computing

Paper presentation is a major component of this course. Each presentation will be 30 min + Q&A/discussion. Students may also choose to present their preferred papers that cover other topics in the area of computer architecture and systems.

Course Project

This course will have a term-long research project. The research project is expected to be novel and related to computer architecture and systems. Both individual and group projects are allowed but the expectations for a group project will be higher.

The course project will have the following checkpoints:

1. Project proposal:
Students are expected to finalize project groups (or individually) by the time of the

proposal submission. Each student/group needs to submit a proposal document to the instructor and present the proposed idea in class.

2. Mid-term checkpoint:

This checkpoint aims to track the progress of each research project. Each student/group needs to present the main ideas of their project and demonstrate some initial results that support the ideas. Students are expected to provide feedback to other groups after each presentation.

3. Final report and presentation:

Each group will submit their final report and present the project to the whole class at the end of the term. The final report will be in the form of a research paper. The score of the course project will be primarily based on the final report and presentation.

Grading

Grades for this seminar class will be calculated as follows:

10%	In-class discussion
10%	Paper reviews
30%	Paper presentations
50%	Course project

Course Schedule

The course schedule is available in [this spreadsheet](#). The schedule will be updated as the class moves forward.

Academic Integrity

This course strictly follows the [academic integrity](#) policy of the Faculty of Math. Any [academic misconduct](#) will be reported to the Office of Academic Integrity.

Specific to this course:

- Students should complete paper reviews on their own without referring to other students' ideas. Sharing paper reviews with other students before assignment submission is prohibited.
- Students may reuse or refer to the presentation from the authors but needs to explicitly mention the origin of the slides.
- Course projects should be original. Any ideas learned from other students or the literature needs to be properly cited.
- Collaboration and discussion are encouraged but every student or group (for the project) needs to complete the assignment or project on their own.