CS8803: GPU HW/SW

Summer 2024

Delivery: 100% Web-Based, Asynchronous

Dates course will run: May 13 – August 1, 2024

Instructor: Prof. Hyesoon Kim

Office Hours: Zoom Tuesday at 11:00 AM ET. (Subject to change) (office hours are optional).

Course Description:

This course explores the software and hardware aspects of GPU development. Through hands-on projects, you'll gain basic CUDA programming skills, learn optimization techniques, and develop a solid understanding of GPU architecture. Additionally, you'll delve into compiler principles to comprehend software-related GPU issues and read research papers on hardware challenges. By the end, you'll have enhanced your knowledge of compilers, programming, and computer architecture for modern GPUs.

Course Objectives:

- Develop foundational CUDA programming skills.
- Optimize the performance of CUDA programs.
- Understand GPU architecture performance issues.

- Acquire static code analysis techniques to identify and address GPU performance issues.

Topics:

- GPU Programming
- Parallel Programming Fundamentals
- Compiler Backgrounds
- GPU Architecture

Prerequisites:

- C/C++ Programming and Python Programming
- No prior CUDA programming experience required.
- Equivalent to CS2200 (undergraduate computer architecture class).

Textbooks:

None required. All reading materials will be provided on Canvas.

Grading Breakdown:

Assessment	Type	Weight	Description
Project 1: CUDA Programming	Programming Assignment	5%	Basic CUDA programming concepts.
Project 2: CUDA Programming II	Programming Assignment	20%	Performance optimization of CUDA programs.
Project 3: GPU Simulator	Programming Assignment	20%	Add GPU warp scheduler policies in a trace-driven GPU simulator
Project 4: GPU Simulator	Programming Assignment	20%	Add execution units in a trace-driven GPU simulator
Project 5: GPU Code Analysis	Programming Assignment	20%	Add GPU code analysis pass in a python based frame

Homework	Multiple-Choice Quizzes	15%	Test your understanding of lecture content and readings.
Final Exam (optional)	Exam	10%	Covers all course topics.
Participation points (optional)	Ed	5%	Ed participation, 0.05 points for each meaningful contribution (post) - maximum of 5% of total grade possible*

Final Grade Algorithm:

- 90-100%: A
- 80-89%: B
- 70-79%: C
- 60-69%: D
- Below 60%: F

Late Policy:

- Homework: No late submissions accepted.
- Projects: Each day late reduces the score by 10%.

Communication:

- Private: Use Ed private messaging for individual questions with the instructor and TAs.
- Public: Use Ed public posting for general questions where classmates can contribute.

Online Platforms:

- Canvas: For assignment submission and lecture note distribution.
- Ed : For class discussions and Q&A.

Academic Integrity:

This course adheres to the Georgia Institute of Technology's academic honor code: https://policylibrary.gatech.edu/student-life/academic-honor-code

Accommodations:

Students with disabilities requiring accommodations should contact Prof. Kim within the first week. For more information, visit the Office of Disability Services: https://disabilityservices.gatech.edu/

Discrimination and Harassment:

Georgia Tech prohibits discrimination and harassment based on any protected class. This class welcomes diverse viewpoints but will not tolerate discriminatory or harassing behavior.

Subject to Change Statement:

The syllabus and course schedule may be subject to change. Changes will be communicated via the Ed announcement tool. It is the responsibility of students to check email messages and course announcements to stay current in their online courses.