CS 7260 Syllabus

Internetworking Architectures and Protocols, 3 credit hours

Fall 2026

Instructor Information

Instructor: Jun "Jim" Xu

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General Course Information

Description

This course is about network algorithmics (a.k.a. router/switch architectures and algorithms). We will study algorithms used by modern routers/switches to perform data plane functions including forwarding, IP address/prefix lookups, switching, scheduling, counting, flow classification, flow monitoring and measurement, IP traceback and other security functions. In other words, we will study almost everything about a router/switch except routing, which is a control plane function and therefore out of the scope of this course.

Course Learning Outcomes

Upon successful completion of this course, you will

Learn advanced "algorithmics" (data structures, algorithms, and software/hardware co-designs) needed for performing data-plane functionalities at line speeds (e.g., 100 Gbps per port).

Learn the interdisciplinary "art of algorithmics," which is to apply algorithmic thinking to systems (broadly construed) problems. This course has been interdisciplinary, attracting MS and Ph.D. students with diverse backgrounds such as networking, systems (including also databases, computer architecture, and VLSI), theoretical computer science, machine learning (including also signal processing), and computer engineering.

Gain creative computational thinking skills in the context of network algorithmics, and apply them to one's research topic (for Ph.D. students) or area of concentration (for M.S. students).

Required Course Materials

Network Algorithmics, Second Edition, George Varghese and Jun Xu, Elsevier, available at Georgia Tech Barnes and Noble Bookstore

Grading Policy:

A>85%; B>75%; C>65%; D>60%

Graded components

- Group Project: 50%
- Homework Assignments: 40%
- Class Attendance: 10%.

Description of Graded Components

Group Project

Students shall form groups of three to four people each to work on group projects. Every (group) project MUST be focused on a Network Algorithmics topic. Project reports on unrelated or marginally related topics (e.g., TCP congestion control mechanisms or BGP routing protocols) will receive little or no credit unless it is approved by the instructor. Teams must be formed and one-page project proposal (with names of the group members specified) be submitted by mid September. A project can take one of the following three forms.

1. A research project that produces new network algorithmics solutions, e.g., new packet classification techniques, new network data streaming and sketching algorithms, or new switching algorithms.

2. An in-depth survey of a core or emerging network algorithmics topic, e.g., on new network data sketching algorithms that have emerged in the past several years.

3. I may have some "pet projects" that I need people to work on.

A project report is due around the end of the semester.

Homeworks

Three to four homework assignments will be distributed during the semester. There is no exam in this course. Instead, the homework assignments will contain past exam questions, and as a result account for 40% of the course grade. Hence, you are strictly prohibitted from copying each other's solutions.

Class attendance

This is more a research creativity training course than a content course. It is nearly impossible for one to achieve the former learning objective just by reading the textbook yourself (often just enough to do the homework assignments). In addition, without attending classes to get inspired, your research project is expected to be of low quality. This said, the attendance check targets blatant abusers, and a reasonable number of unexplained absences will be excused. Class attendance is tracked using random unannounced "photo ops."

Course Policies

Attendance and/or Participation

Explained immediately above.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre- &/or Co-Requisites

Although the official pre-requisite listed in OSCAR is CS 6250, you don't need that background to succeed in this course. This official pre-requisite is not enforced for graduate students. The actual pre-requisite is (1) CS 3251 here or equivalent (An undergraduate networking course that covers the five Internet layers and the TCP/IP will suffice); (2) solid undergraduate-level knowledge on algorithms and data structures. I will cover advanced algorithmic techniques and will NOT have time to refresh you on basic algorithms and data structures. Whenever necessary, students are expected to make up the gap on their own.

Collaboration, Group Work, and Use of Generative AI

You are allowed to work in groups only on the class project. You are allowed to synthesize your idea and polish your writing using generative AI when working on the group project, but the project report should be written by you, not by generative AI. Homework assignments must be done individually, without the "help" of web search and generative AI.

Extensions & Late Assignments

Late assignments and project report will not be accepted. Extensions are given only for unexpected circumstances and only with a DSO (Dean of Students' Office) letter, because all homework assignments and their due dates will be posted early in the semester (so that you can plan accordingly in advance).