

Syllabus for CS590

Title: Embracing 5G and Beyond 5G (B5G)

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Time: Fall 2017

Advertisement (Fall 2017): I am recruiting MS and PhD students with full finance support!

Course description

5G is on the way. What exciting applications are coming to our daily life in a few years? What are stringent demands and technical challenges that arise? What are the cutting-edge technology enablers? What still remain largely unaddressed and call for our research efforts?

In this course, we are going to answer the above questions and explore the ongoing revolution to next-generation mobile network technology. We will focus on three elements. First, we will start with new apps and new demands in a well-connected 5G world. We will examine what challenges and opportunities arise on VR/AR, massive IoT, smart city, autonomous driving, tactile internet, remote healthcare, to name a few. We will cover several critical demands like extremely low latency, reliability, and efficiency/scalability. Second, we then learn the state-of-the-art of the mainstream architecture, protocols and technologies (adopted by the giant players and standardization). We are going to cover advanced topics on NFV, SDN, edge computing, cloudlet, network slicing, RAN innovation and heterogeneous wireless technologies, etc. Finally, we will explore the topics of our interests and gain experience by carrying out original research projects. These topics will cover, not limited to the formal methods to understand and verify networking system design and practice; the data-driven approach to analyze and diagnose networking system behaviors, provable correct re-design which improves network performance and reliability, and many other innovations toward better application experience in 5G and B5G.

Throughout this course, students will learn key principles in mobile networking research, understand the state-of-art and recent trends, master a suite of research skills (e.g., paper reading, critique, critical thinking, problem solving, report writing, team work, communication, and presentation), and gain experience of carry out original research through course projects. Hopefully, through this course, students will generate publishable results from course projects or find some interesting topics for your long-term research.

Prerequisites

As an advanced topic course, we assume that students already have a basic understanding on networking fundamentals. The students must take undergraduate/graduate class CS422/CS536 or equivalent courses before. Project experience and good programming skills are a must, as the course project is an important part of this class.

Many topics in this course are inter-disciplinary and require to apply technologies in distributed systems, programming language, data mining and machine learning. This is a great plus but optional. I also encourage the students in those areas to apply cutting-edge techniques to resolve the problems in 5G and B5G.

Textbook and Course Materials

No textbooks are required. The course materials are mainly from the lecturing slides I've made and research papers from top conferences like SIGCOMM, MOBICOM, NSDI, MobiSys etc.

Grading Policy

- In-class presentation and discussion: 20%
- Homework assignments: 20%
- Mid-term: 20%
- Project: 40%

Assignment

In-class presentation: each student is going to present one paper in class. Each student picks one paper from the reading list or other top conferences (please let me know your pick in advance). It is encouraged to read the paper relevant to your project. I will coordinate the presentation order (in topics).

Homework assignments: 3 homework assignments. Each is assigned as the reading summary (one-page critique) of the paper assigned or the topic to be discussed. It is also encouraged to choose three relevant papers in one topic. If you want to choose this option, please get my approval first.

Midterm: An in-class midterm is to cover the lectures and topics discussed as a regular course.

Course project: the project will be done in a team of 2-4 students. Team and topic will be determined in the first few weeks. A course project report, with an in-class presentation in the final week is required.