EE595 / EEP569: Next Generation Wireless Networks
Fall — 2024

Instructor Information

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Office Hours: TBD
TA: TBD

Class Information

Time: TUES/THUR 4:00-5:50
Classroom: ECE003
Recordings: Will be Available

Assessment

The overall grade will be based on
(i) 4 Homework assignments [60%]
(ii) Final Class Project [40%]
*GenAI tools are encouraged to use in this course.

Course Description

Dive into the dynamic world of wireless communication with our cutting-edge course tailored for future engineers and researchers. This course offers a robust introduction to key topics in Wi-Fi and advanced 5G/6G technologies. Students will engage with a blend of lectures covering fundamental principles and design aspects of wireless networks and hands-on network performance evaluations using ns-3 simulations (available at https://www.nsnam.org). In this course, you expect to learn:

- **Industry-Relevant Tools and Applications:** Utilize the open-source ns-3 network simulator, a tool widely used within the industry for developing and testing real-world wireless network projects. This practical experience will provide insights into how leading companies like Meta, Intel, Apple, Nokia, etc., leverage technology to enhance wireless communication systems.
- **AI/ML Integration in Wireless Networks:** Explore the transformative role of Artificial Intelligence and Machine Learning in optimizing and advancing wireless communication. Learn to apply these technologies to real-world scenarios, enhancing your ability to innovate in the field.
- **Practical Experience with Simulation:** Gain hands-on experience through a series of structured experiments in ns-3 that involve basic wireless protocols, 802.11, and 5G stacks, providing a practical understanding of the concepts discussed. Copilot tools like ChatGPT will be introduced and encouraged to accelerate the coding process so students can focus on the design and analysis.

Pre-requisites

These are desirable requirements, but we will make everyone learn these quickly by using LLM tools.

- C/ C++ /Python programming and running Bash line commands.
- Undergraduate Probability Digital/Wireless Communications.
- Exposure to concepts of TCP/IP protocol stack & Internet architecture (e.g. UW EE 461 Intro to Computer Networks or equivalent)

Course Objectives

After this course, you should be able to achieve the objectives:

- **Industry Preparedness:** Equip yourself with the knowledge and skills used by professionals in the wireless communication industry.
- **Innovative Skillset:** Learn to integrate AI/ML techniques into wireless networks, placing you at the forefront of technological innovation.
- **Career Advancement:** Prepare for advanced studies or a rewarding career in technology and telecommunications sectors, where demand for skilled professionals continues to grow.

References

Materials and references for the course:

- T. Rappaport, “Wireless Communications," Prentice Hall, 2002 2nd. ed. (ch 4, 5: radio propagation)
- D. Tse and P. Viswanath, “Fundamentals of Wireless Communication," Cambridge Univ. Press, 2005 (ch. 3 - diversity, ch 6&7: multi user communications, MIMO)
- M. Gast, “802.11 Wireless Networks: The Definitive Guide," O’Reilly, 2002.
- J. Heiskala and J. Terry, “OFDM Wireless LANs: A Theoretical & Practical Guide," SAMS Publishing, 2002.
- A. Tanenbaum, “Computer Networks," Prentice Hall, 4th edition or later.
- E. Dahlmann, S. Parkvall & J. Skold “4G: LTE/LTE-A for Mobile Broadband," Acad. Press, 2013, 2nd ed.
- “ns-3 Tutorial“: https://www.nsnam.org/docs/tutorial/ns-3-tutorial.pdf