



Department of Computer Science

Systematic Security Analysis of Cellular Network Specifications and Implementations

Imtiaz Karim
Purdue University

Hosted by: Ioannis Koutis

Date: Friday, March 7, 2025
Coffee: 11:15 AM – 11:30 AM
Time: 11:30 AM – 12:30 PM (Eastern Time (US and Canada))
Location: GITC 4402 (4th floor Seminar Lecture Hall)
Zoom Link: <https://njit-edu.zoom.us/j/96117951875?pwd=7TolcUDOUny5asaKjbxKIRrnN0sba.1>

Abstract:

Cellular networks are the bedrock of modern communication. The recent deployment of 5G has generated further enthusiasm and opportunities in both academia and industry. Therefore, the security of cellular networks is critical. In this talk, I will elaborate on the critical challenges of ensuring cellular network security and move on to my research on enhancing the resilience of the networks. I will begin by discussing the analysis of 4G/5G specifications and introduce my recent work, CellularLint. Leveraging state-of-the-art Large Language Models (LLMs), CellularLint identifies inconsistencies within the specifications. On the implementation front, I will detail the methodologies I have developed to check for noncompliance in cellular implementations. Overall, these approaches and the associated vulnerabilities have led to several changes in the design of 4G and 5G cellular standards and have uncovered numerous security and privacy issues in various protocols and system implementations. Lastly, I will discuss the defensive approaches devised to detect/defend against these attacks and conclude by outlining my future research vision for enhancing the resilience of future cellular networks (6G and beyond) and wireless communication protocols in general.

Bio:

Imtiaz Karim is a Postdoctoral Researcher in the Department of Computer Science at Purdue University working with Prof. Elisa Bertino. He received his Ph.D. from the same department in Spring 2023. His research focuses on network and system security, particularly the security and privacy of wireless communication protocols and systems, such as cellular networks (4G/5G), Bluetooth, VoWiFi, vehicular networks, Wi-Fi, and IoT. He has been inducted into the GSMA Mobile Security Research Hall of Fame three times, has received acknowledgments from the Wi-Fi Alliance and the O-RAN Alliance, and has received numerous bug bounties, CVEs, and CVEs. His research has been featured in more than 100+ media outlets worldwide, including Forbes, MIT Technology Review, Wired, and TechCrunch. He received the Best Paper award at ACSAC 2019 and the Best Paper Award nomination at ICDCS 2021.