Ph.D. in Information Technology
Thesis Defense

December 17th, 2025
at 1:30 p.m.
Alpha Room – Building 24

Vineeth TEEDA – XXXVII Cycle

Jamming Detection and Localization Techniques for Next-Generation Wireless Systems

Supervisor: Prof. Maurizio Magarini

Abstract:

The omnipresence and commercialization of Software Defined Radios (SDRs) have enabled significant research, innovation, and cost-effective development in the field of telecommunications. This also lowered barriers to developing affordable and capable jammers that disrupt the same wireless communication systems. Open access nature of unlicensed spectrum poses significant risks concerning Physical Layer Security (PLS). The first step in countering any security threat is to identify that a system is under attack. This thesis confronts this issue first by presenting the effect of modern jammers on wireless networks operating in unlicensed networks. It shows how an SDR jammer can disable networks operating on the 2.4 GHzWiFi band. Experimental jamming detection by an access point using machine learning is proposed for WiFi networks in various scenarios. Then, the impact of jamming on Reconfigurable Intelligent Surfaces (RIS) aided indoor communication is presented using a digital twin 3D office model. Simulation analysis shows that when the jammer forms a Line of Sight (LOS) path between the transmitter and RIS, the RIS reflects jamming signals, causing significant SNR degradation. Finally, Unmanned Aerial Vehicle (UAV) aided localization of jammers using Received Signal Strength Indicator (RSSI) measurements along predefined trajectories is presented. Experimental results show a mean absolute localization error of 5m (with legitimate transmissions) and 4m (without) for a single jammer. For multiple transmitters, k-means clustering autonomously identifies jammers, enhancing accuracy. Additionally, the UAV flight path and data collection are validated using the QuaDRiGa radio impulse channel model.

PhD Committee

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