Raghav Rathi

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EDUCATION

Doctor of Philosophy in Computer Science · *Florida State University* *May 2020 – December 2024(expected)*

Master of Science in Computer Science - Cybersecurity Track · *Florida State University* *August 2017 – December 2019*

Bachelor of Engineering in Computer Science · *RGPV, India* *September 2012 – May 2016*

TECHNICAL SKILLS

Skills: Signal Processing, Wireless Channel Analysis, Spectrum Analysis, RF Generator, LoRa, Zigbee, Sigfox, srsRAN, Software Development, Penetration Testing, Web Application Security, Malware Reverse Engineering, Static Analysis, Dynamic Analysis, Binary Exploitation, Cyber Forensics, Steganography, IDS/IPS, SEIM, Log Analysis, Fuzzing.

Tools & Software:

-*Wireless Communication*: Ettus X310, B210, RTL-SRD v3, Adafruit Feather M0 with RFM95, Semtech LoRa SX1262 development kit, Arduino IDE, RealTerm: Serial/TCP Terminal, gqrx, GNU Radio Companion, POWDER Labs, STM32 ST-LINK Utility, Tektronix MDO.

-*CyberSecurity*: Burp Suit, Nmap, Tcpdump, Wireshark, Metasploit, John the Ripper, Hashcat, Hydra, SQLMap, Kali Linux, Commando VM, Procmon, Process Explorer, Process Hacker, Ffuf, Dig, Dirb, DirBuster, Wpscan. IDA pro, Ghidra, radare2, GDB, GDBpeda, PwnTools.

Programming Languages: C, C++, MATLAB, Python, Arduino, SQL, MIPS, Git.
Scripting Language: JavaScript, Bash, PHP, Powershell.

PROFESSIONAL EXPERIENCE

Research Assistant | Department of Computer Science, Florida State University *August 2019 – Present*

- Capture signals from Starlink satellites to analyze the channel used by them. Funded by NSF
- Improved the channel capacity by 1.66× of existing LoRa networks by increasing the nof confirmed traffic in downlinks.
- Improved the packet detection capability in LoRa networks by introducing a technique to detect collided packets in uplink by 2.46× over the state-of-the-art. Funded by NSF
- Achieved capacity gain of 13.6× over LoRa, 2.93× over Sigfox and 5.17× over RPMA by developing ZCNET, which modulates data on ZC sequences.

RESEARCH AND ACADEMIC PROJECTS

- **User angle estimation using LEO satellites** *September 2023 – Present*
  - Built a home brewed receiver using a KU band LNB and a software defined radio to capture beacon signals transmitted by Starlink satellites. Used 2 receiver antennas to capture signal and calculated user orientation using phase information.

  2-Pipe: Simultaneous Downlink Transmissions in LoRa (Under Review) *April 2022 – August 2023*
  - One of the very first research work done towards improving the overall LoRa channel capacity by enabling simultaneous transmission of the Downlink messages to the respective uplink messages from end devices in a confirmed traffic scenario.
- **TnB**: **Resolving Collisions in LoRa (Published)** *November 2021 – April 2021*
  - A novel algorithm that involves implementing Thrive and Block Error Correction Code to the existing LoRa protocol resulting in significant improvement in its performance without making any change to the LoRa End Nodes.
- **ZCNET: Achieving High Capacity in LPWANS (Published)** *November 2021 – April 2021*
  - A novel LPWAN technology with significantly higher network capacity than existing solutions like LoRa, Sigfox and RPMA by transmitting signals that occupy a small fraction of the signal space, resulting in a low collision probability and by using 8 Zadoff-Chu (ZC) root sequences which allows support for 8 parallel root channels within a single frequency channel.
- **Intrusion Detection Using Deep Active Learning** *August 2019 – December 2019*
  - Applying Deep Active Learning to develop a Deep Neural Network which deals with the scarcity of labeled data and then applying Active Learning Techniques to optimize the model with an end goal of dealing with the problem of class imbalance with Labeled and Unlabeled data. Which in this case will the malware signature from a regular traffic.
- **Malware Classification and Detection using Data Mining** *August 2018 – December 2018*
  - Applying Data Mining techniques like Support Vector Machines, K-Nearest Neighbors and Random Forest to classify whether a signature generated by Cuckoo sandbox on a given file.

ACHIEVEMENTS AND INTERESTS

- Dean's Award for excellence in research and academics, 2023.
- Ted and Syauchen Baker Award for Excellence in Student Research, Fall 2023.
- Placed 1st in CyberCorps Division in 2023 JerseyCTF competition hosted by the NJIT.
- Paper presentation in IEEE LatinCom 2023, Panama, AMC CoNEXT 2022, Rome.
- Part of FSU Cybersecurity team (Nol3ptr), currently in the top 50 in the USA.