Ayushi Mishra

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Research Interest

Internet of Things (IoT), Sensing, Wireless communication, Cybersecurity and Digital Forensics, Deep Learning and its applications in cyber-physical systems

Education

2021–present **Integrated PhD, Computer Science & Engineering**, *Indian Institute of Technology*, Kanpur, **GPA: 8.3/10**.
Courses: Sensing, Communication, and Networking for Smart Wireless Devices, Introduction to the Internet of Things and its Industrial Applications, Deep Learning for Computer Vision, Malware Analysis and Intrusion Detection, Modern Cryptology

2015–2019 : **Bachelor of Technology - Computer Science & Engineering**, *Madan Mohan Malaviya University of Technology*, Gorakhpur, India, **(Gold Medal), GPA:9.22/10**.
Courses: Computer Networks, Digital Signal Processing, Mobile Computing, Principles of Operating System, Data Structures and Algorithms, Introduction to Machine Learning

2013–2014 : **Intermediate**, *SSDEC*, Kanpur, India, **93.2%**.

2011–2012 : **High School**, *SSDEC*, Kanpur, India, **GPA: 10/10**.

Research Experience

July 2023 – Present: **Research Internship, University of Maryland, College Park**

Voice Anonymization, The motivation of the project is to secure the voice, ensuring intelligibility, understandability, and naturalness.
Various Deep Learning techniques obtain the anonymity of voice.

August 2021 – Present: **Researcher, IoT Innovation Lab**, CSE, IIT Kanpur

Digital Forensics for Medical Devices, Investigating the security attacks on Medical Devices. The current research is on how we can gather evidence if a hospital network is hacked and the DICOM files are injected with the malicious payload.
Presented a poster on **CSE Research Day** at IIT Kanpur hosted by professor **Purushottam Kar**

Memory and Network Forensics, Capture artifacts from the volatile memory of the assaulted medical device. Also, consider cyber assaults on IoT communication protocols: WiFi, Bluetooth, and MQTT. The investigation process involves analyzing the volatile RAM, authentication process, and network traffic to predict the pattern of the attack.

Deep Learning, The research in these fields also leverages different Machine learning and Deep Learning algorithms to automate the forensics techniques. Machine Learning algorithms are applied to extract the features from the memory dump and network artifacts to classify the types of malware.

2020–2021: Research Scholar, Industrial and Management Engineering, IIT Kanpur

Involved in some Statistical courses, Data Mining, Probability and Statistics, Research Methodology, and Social Media analytics.

Publications

2023 **Ayushi, Mishra**, Subhajyoti Saha, Saroj Mishra, and Priyanka Bagade. A federated learning approach for smart healthcare systems. ***CSI Transactions on ICT***, pages 1–6. Springer, 2023.

2023 **Ayushi Mishra**, Shyam Sundar Ramaswami, and Priyanka Bagade. **MalDicom:** a memory forensic framework for detecting malicious payload in dicom files (**Under Review**). 2023.

2023 **Ayushi Mishra** and Priyanka Bagade. **MediHunt**: A network forensics framework for medical iot devices (**Under Review**). 2023.

2023 **Ayushi Mishra** and Priyanka Bagade. Investigating iot systems security attacks using network forensics. *2023* ***15th International Conference on COMmunication Systems & NETworkS*** *(COMSNETS)*, pages 72–77, 2023.

2023 Nanda Rani, **Ayushi Mishra**, Rahul Kumar, Sarbajit Ghosh, Sandeep K. Shukla, and Priyanka Bagade. A generalized unknown malware classification. In Fengjun Li, Kaitai Liang, Zhiqiang Lin, and Sokratis K. Katsikas, editors, ***Security and Privacy in Communication Networks***, pages 793–806, Cham, 2023. Springer Nature Switzerland.

2022 **Ayushi Mishra** and Priyanka Bagade. Digital forensics for medical internet of things. *2022* ***IEEE Globecom Workshops****(GC Wkshps)*, pages 1074–1079, 2022.

Projects

2023 **Modern Cryptology**, Breaking Cryptosystem - Implemented differential cryptanalysis to find the key for a 6-Round DES encryption using a chosen plaintext attack, implemented different substitution cipher techniques to break the ciphertext, and leveraged structural cryptanalysis to decipher EAEAE substitution method with 5 layers.
supervised by **Prof. Manindra Agrawal**, IIT Kanpur

2022 **Computer Vision - Intelligent Vision System based Malware classification using Deep Learning Models**, Three research problems were solved: the limited data by few-shot learning, the imbalanced data problem by calculating the class weights and generalization for unseen malware using Meta-Learning.
supervised by **Prof. Priyanka Bagade**, IIT Kanpur

2022 **Intrusion Drift Detection and Adaptation**, During testing, the new intrusions are often coming from different distributions and cause the problem of concept drift. To solve this problem, the contrastive learning approach is used to first detect the drifts and then propose a new framework to adapt the drifts detected.
supervised by **Prof. Sandeep Kumar Shukla**, IIT Kanpur

2021 **Cyber-Attack Detection in IoT System**, Used various ML and Deep Learning approaches like Logistic Regression, Decision Trees, Random Forest, XGBoost, etc., to detect seven different attacks: denial of service (DoS), probing, spying, wrong setup, scan, malicious operation, and malicious control.
supervised by **Prof. Priyanka Bagade**, IIT Kanpur

2021 **Human Activity Recognition using Deep Learning**, Propsed different machine learning and deep learning models that predicts human activities such as walking, walking upstairs, walking downstairs, sitting, standing, and laying. The overall accuracy achieved was 91.3 % .
supervised by **Prof. Amitangshu Pal**, IIT Kanpur

2021 **Detecting Covid-19 with Chest X-Ray using Pytorch**, The Project was made to categorize three classes: Normal, Viral Pneumonia, and Covid-19. The aim of the project is not to diagnose covid-19 but for the learning purpose.

2020 **Prediction of Flight Ticket Price**, Data Mining Project based on various Machine Learning Algorithms.
supervised by **Prof. Faiz Hamid**, IIT kanpur

Work Experience

2019–2020 : **Hummingwave Technologies, Bangalore, India**, Software Developer (Full-time), During my tenure as a software developer, I worked on two projects:.
Etutor: Online Teaching Platform for Students made on React JS framework
Smartkarrot: Customer Success Relationship Project based on innovation and modification. The project was made on Angular JS framework

May 2018 – July 2018: **Student Intern**, *Indian Institute of Technology, Kanpur*, worked on a project "Visual profiling Using D3.js" , under Professor **Preeti Malakar** in Computer Science And Engineering Department.

Teaching and Research Assistantship, IIT Kanpur

Fall, 2023 : **Fundamentals of Computing**.

Spring, 2022 : **Deep Learning for Computer Vision**.

Fall, 2022 : **Internet of Things and it's Industrial Applications**.

Summer, 2022 : **eMasters in Cybersecurity**, TA for emasters degree provided by IIT Kanpur for courses Computer Networks and, Embedded and Cyber-Physical Systems, and IoT Security, Advised by: Professor **Amitangshu Pal and Priyanka Bagade**.

Fall, 2021 : **Technical Communications**.

Spring, 2021 : **Computer Networks**.

Fellowships & Awards

2023 **COMSNETS 2023** Travel Grant Awardee

2021 Shortlisted for participating in **Maitreyee**: An IBM Research-India's annual women outreach event in September 2021

2021 Ministry of human resource development **(MHRD)** Fellowship

2020 Participated in **ACM India Grad Cohort** for women in computing, organized by IIT Gandhinagar in July 2020

Academic Achievements & Recognitions

2019 Awarded **Vice-Chancellor Gold Medal** by **N.R. Narayana Murthy** and Chief Minister **Yogi Adityanath** for holding 1^{st} Rank in Computer Science Department

2019 Awarded **Sponsored Gold Medal** (Shri Munni Lal Jain Memorial Gold Medal) in the Computer Science and Engineering Department

2018 Awarded **Malaviyan Excellent Student Award (MESA)** for outstanding academic performance

2018 **Certificate of Merit** for 1^{st} position in B.Tech 1^{st} Year in Computer Science Department

Position of Responsibility

2022 **Student Member**, *Association for Computing Machinery (ACM)*, ACM membership.

2016–2019 **Executive Member, Computer Engineering Society**, *MMMUT Gorakhpur, India*, Conducted technical events for undergraduate students.

2018–2019 **Secretary, Robotics Club**, *MMMUT Gorakhpur, India*, Event Organizer of technical fest of Robotics Club, Robomania.

2017–2018 **Managerial Head, Robotics Club**, *MMMUT Gorakhpur, India*, Served as the management head for the technical fest of Robotics Club, Robomania.

2017 **Faculty of Web Development, Robotics Club**, *MMMUT Gorakhpur, India*, Served as a faculty of Web Development in college under Robotics Club.

Skills Summary

Programming Languages: Python, C, C++, JavaScript

Web Technologies: HTML, CSS, PHP, JAVASCRIPT, D3.js

Frameworks: Scikit, TensorFlow, Keras, Pytorch, Angular, React

Application and Tools: Wireshark, Nmap, Volatility, LaTex, git, MS Office, Bash Scripting

Soft Skills: Leadership, Event Management, Public Speaking

Extracurricular Activities

2022 Run a podcast named "The HealthHak Talks" on Spotify: The podcast is about the importance of cybersecurity in Healthcare.

2022 Member of Animal Welfare Club, IIT Kanpur

2017 1^{st} position in the volley ball competition of the college

2017 Participated in Digital Rangoli organized by Centre for Technical Education

2016 Runner-up for Inter-Branch Volleyball competition

2015 Awarded 2^{nd} position in Techprastuti organized by IEEE at technical fest

2015 Awarded 3^{rd} position in Arunoday, an event organized by Editorial Board

2015 Participated in Robokriti, a robotics competition for both wired and wireless robots

2015 Participated in I-Expo, an event organized by Innovation cell for bringing new ideas to society