Chandrika Mukherjee

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Professional Summary

I am a first-year Computer Science Ph.D. student at Purdue University, with expertise in software development across web, mobile, and immersive applications and conducting user studies to evaluate the security and usability of proposed systems or protocols. Previously, I worked as an SWE intern at Meta and an SWE at HSBC. I am looking for a research internship opportunity for summer 2024.

Education

Ph.D. in Computer Science December 2027 (Expected)
Purdue University
GPA: 3.95/4.00
Advisor: Professor Z. Berkay Celik
Research: Security and privacy issues in AR/VR/MR systems.

M.S. in Computer Science 2021 - 2023
Purdue University
GPA: 3.83/4.00
Graduate Coursework: Security Analytics, Data Mining, Information Security, Independent Study on XR, Programming Languages, Algorithm Analysis, Data Communication and Computer Networks, Multimedia Networking and Operating Systems, Database Systems.

B.Tech in Computer Science and Engineering 2015 - 2019
NIT Durgapur
GPA: 9.16/10.00
Undergraduate Coursework: Data Structures and Algorithms, Operating Systems, Database Systems, Computer Networks, Computer Vision, Software Engineering, Object Oriented Programming, Theory of Computation, Compiler Design, Artificial Intelligence.

Skills

Programming Languages: C++, Python, React, C#, Java, C, Javascript, HTML/CSS, PHP, GraphQL, SQL, Shell
Tools and Frameworks: Unity3D, A-Frame, MRTK, Git/GitHub, Mercurial
Software Development: Web App, Mobile App, Immersive Standalone and WebXR Apps for AR/VR headsets.

Research Projects

Group Pairing of Mixed Reality Headsets: [Paper Under Construction]

- Designing a secure pairing protocol for multiple mixed reality headsets (e.g. - Hololens2) in the presence of active and passive adversaries in the surroundings. The protocol utilizes hand, eye and head tracking along with data from IMU sensors to verify authentic users.
- Implemented immersive mixed-reality applications to accumulate data from sensors during pairing. Designed and implemented pairing algorithm employing comparison between signals generated from sensors. Conducted user studies to evaluate the efficacy of the proposed system.

UI Dark Patterns in WebXR: [Paper Under Construction]

- Identified some vulnerable properties in WebXR and proposed novel proof of concept attacks utilizing combination of those properties.
- Working on designing a large scale user study of the proposed attacks along with several already established UI exploitation attacks in WebXR domain.

Near Future Work and Interests:

- Propose rule based and machine learning based approach to develop defense mechanism against UI exploitation in WebXR. Conduct user study to evaluate the system.
- Investigate security and privacy vulnerabilities within XR platforms, specifically delving into potential risks associated with LLM.

Previous Research Work:

- **Mobile Computing and Network Research Group, NIT Durgapur**
  July 2017 - May 2019

  Project Description: Visualize Summarization of Crowdsourced GIS Objects and Corresponding Statistics Offline during a Post Disaster Situation.

  Implemented a dashboard that displays periodic summarized views derived from the offline synchronization of files originating from various devices [GitHub Repo].

  [Publication:] Partha Sarathi Paul, Chandrika Mukherjee, Bishakh Chandra Ghosh, Sudipta Pandit, Sujoy Saha, Subrata Nandi On Designing a Fast-Deployable 'Localized' GIS Platform for using 'Offline' during Post-Disaster Situation, 20th International Conference on Distributed Computing and Networking (ICDCN).

- **Complex Network Research Group, IIT Kharagpur**
  May 2018 - June 2018

  Project Description: Peer-to-Peer Live Video Streaming based on Scalable Video Coding.

  Implemented a system which could encode .mp4 files to .svc , transfer those files using BitTorrent like communication between server and client and decode back to .mp4 files. [GitHub Repo]

Relevant Course Research Work:

- **HoloLens2 Sensor Streaming Application and Head Movement Detection**
  Developed a sensor streaming application using MRTK in Unity for HoloLens2. Collected data from different users and compared data from different IMU sensors across various users. Used Affinity Propagation, SVM to train a ML model to identify users. [GitHub Repo] [Project Report]

Software Engineering Experiences

META May 2022 - August 2022
Software Engineering Intern

- Worked in Messaging Health Signals infra team under Messenger Org. Over the internship period, worked on three milestones, collaborated with cross-functional team members to deliver my project.
- The main idea was to develop a user interface tool capable of notifying team owners if any portion of their code accessed data from a database containing sensitive information, prior to the production release.
- Developed a new user interface designed to visually represent the data flow within various privacy assets across Meta. This tool enables team owners to easily visualize the trajectory of data, such as from APIs to stored procedures and ultimately to sensitive tables.
- Primary tech stack - React, GraphQL, PHP, Python.

HSBC July 2019 - August 2021
Software Engineer

- Worked as a full-stack Java developer in Global Credit Module team under Wealth and Personal Banking department.
- Worked on developing features such as - automatic email notification during credit limit approval or rejection, sms notification to inform customers about their credit margin status, calculation changes related to assigning rates to customer portfolio, system basket(rules) assignment to the securities received from external clients in the daily batch process, Jasper reports.
- Participated in code management activities using Git during production releases.
- Supported the production batch for four client regions (HK, SG, US, and CA).
- Primary tech stack - Java, DB2, Spring Batch.

Teaching

Graduate Teaching Assistant

- EPICS and VIP Fall 2022, Spring 2023, Fall 2023
- ENGR 133 - First Year Engineering
  Introduction to Excel, Python, MATLAB Summer 2023