XIAXIN SHEN

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EDUCATION

- **Ph.D. in Electrical and Computer Engineering, Princeton University** *2027 (Expected)*
  First year PhD student *Princeton, NJ 08544*
- **B.S. in Computer Information Technology, Purdue University** *May 2022*
  Graduated with highest distinction (GPA: 3.96 / 4.0) *West Lafayette, IN 47906*

RESEARCH INTERESTS

My research interests lie in systems, machine learning, and privacy

PUBLICATIONS

Refereed Conference Publication

- **Xiaxin Shen**, Corbin Newhard, Miad Faezipour, and Smriti Bhatt. Smart monitoring and detection of ecg and breathing sound signals with deep learning. In *2022 IEEE International Conference on Engineering in Medicine and Biology Society (EMBC)*. IEEE, 2022
- David J. Richter, Lance Natonski, **Xiaxin Shen**, and Ricardo A. Calix. Attitude control for fixed-wing aircraft using q-learning. In *International Conference on Intelligent Human Computer Interaction (IHCI)*. Springer, 2021
- Upinder Kaur, Haozhe Zhou, **Xiaxin Shen**, Byung-Cheol Min, and Richard M. Voyles. Robomal: Malware detection for robot network systems. In *2021 IEEE International Conference on Robotic Computing (IRC)*. IEEE, 2021

AWARDS

- Gordon Y.S. Wu Fellowship in Engineering *2022*
- Best Session Paper Award in 2021 Springer IHCI (Session Name: Machine Learning for HCI) *2021*
- 3rd Place in the SAE Mobility Forward Challenge: AI Mini-Challenge Competition *2021*
- Award for Best Visualization in Purdue's 7th Annual ASA DataFest Competition *2021*
- National-wide: Top 40 and Finalist in the ITA Tech Challenge Programming Competition *2019*

RESEARCH EXPERIENCE

UAV Ground Scanning System: Human Detection with Deep Learning **Advisor: Eric T Matson**
Team Leader in the IITP Technology Entrepreneurship Program *Jan 2021 - May 2022*

- Created LIAEHU dataset comprising low-altitude infrared aerial images for human detection
- Presented an UAV ground scanning system developed with an infrared camera mounted on the UAV to detect human both in the daytime and at night
- Built a warning system for sending real-time notifications with GPS information if the result from the ground scanning system triggers the warning
- Compared and analyzed the performance of several deep learning state-of-the-art models with the LIAEHU dataset including YOLOv3, YOLOv4, YOLOv5, YOLO X, MobileNetSSDv2, and EfficientDet with TensorFlow and Pytorch

PAAg: Closed-Loop Precision Animal Agriculture **Advisors: Byung-Cheol Min & Richard M. Voyles**
Undergraduate Research Assistant *Mar 2021 - Nov 2021*

- Proposed a CPS reference architecture for closed-loop precision animal agriculture to deliver individualized care to animals
- Leveraged the uniqueness of animal agriculture in security mechanisms, communication (in-body to out-of-body), and real-time data-driven control
- Augmented low-cost hardware for high-performance in deployment, testing, and validation
- Built long range (LoRa) communication between the smart collar node and the sensor edge node (inset) with the animal body tissues as the medium for data transmission
- Implemented cloud storage and computing by utilizing ThingsBoard to build the dashboard to show sensor value plots temperature, gas, relative humidity, and pressure, based on MQTT protocol

Deleted File Persistence Tracking **Advisor: Tahir M. Khan**
Undergraduate Research Assistant *Jun 2021 - Oct 2021*

- Recorded 7 sequential images from a single system over time which include operations of deleting files and other activities
- Created DFXML files to represent specific digital forensics artifacts which contain information on all file differences between the two images including deleted, new, and modified files
- Developed a tool to parse DFXML files with Python library lxml and saved results to CSV files
- Analyzed the raw persistence data in terms of byte run, length, image offset, file offset, inode, and hashes

RoboMal: Malware Detection for Robot Network Systems **Advisors: Byung-Cheol Min & Richard M. Voyles**
Undergraduate Research Assistant *Mar 2021 - Aug 2021*

- Developed the RoboMal dataset using the controller files of the publicly available autonomous car with Gazebo-based simulation for both robotic systems and simpler embedded actuator-based Cyber Physical Systems (CPS)
- Created a total of 450 binary executable and linkable format (ELF) files with 232 malware files and 218 good software files by modifying gains and scalars and manipulating the proportional–derivative (PD) control structure

- Built a bidirectional Long Short-Term Memory (LSTM) based model with embedding for identifying the maliciousness of the code with an accuracy of 85% and precision of 87% which outperforms than other methods like CNN, GRU, and ANN

Flow Simulation for Airfoil Images with Autoencoder and CNN **Advisor: Tae-Hoon Kim**
Undergraduate Research Assistant Aug 2020 - Dec 2020

- Proposed a deep learning-based solution for flow simulation for airfoil images
- Cleaned data with Python for geometry images, data of pressure, velocity, coordinates of X and Y and constructed CSV files with those data
- Built multiple autoencoder models with geometry images and extracted features with different settings of neurons
- Implemented multiple CNN structures and trained models for getting a competitive prediction accuracy for Airfoil pressure and velocity with Python, TensorFlow, Google Colab, and Purdue's Scholar and Gilbreth computing resources

Attitude Control for Fixed-Wing Aircraft using Q-Learning **Advisor: Ricardo A. Calix**
Undergraduate Research Assistant *Jan 2020 - Nov 2020*

- Proposed a promising automated stabilization model for airplane flight based on Reinforcement Learning (RL)
- Applied algorithms Q-Learning to high dimensional, non-linear and complex tasks with a simulated aircraft Cessna 172 in JSBSim and X-Plane
- Defined a Q-table with the size (states(168), actions(4)) by creating an encoding system by converting discrete action values to continuous values
- Implemented sparse reward function and delta reward function which are trained separately and provides rewards respectively for certain states and all states

PROJECT EXPERIENCE

Twitter Scraper *Jan 2021 - May 2021*

- Built a web scraping tool to obtain Twitter information by accessing and recording data from the Twitter website with Python library selenium
- Scraped information including user, handle, post dates, tweet texts as well as counts of reply, retweet and like
- Cleaned the data and saved the data to CSV files
- Analyzed and visualized the data with Python libraires: pandas and matplotlib

Visualising the Digital Twin Using Augmented Reality Based on Web *Jan 2020 - May 2020*

- Presented an application where an Augmented Reality system access the Twin Model data and display real-time information to the user
- Utilized WebAR technology for showing network status, device information and GPS location with the browser of the mobile phone when scanning images through the phone's camera
- Applied three.js, jsartookit, and ar.js to the application and utilized jQuery for the ease use of JavasSript

SKILLS

- **Python:** Implemented data scraping, XML files parsing, data cleaning, data analytics and model building with TensorFlow and PyTorch
- **C/C++:** Implemented data structure and algorithms by finishing about 150 problems at online judge system
- **Java:** Maintained a Java-based system using the technique of Mybatis, Maven, Spring MVC for knowledge mapping. Implemented parallel programming for operating system. Developed Android App: RLEAM Reader
- **Latex:** Edited paper with IEEE/ ACM/ Springer formats
- **Git:** Version control especially for group projects
- **Hadoop & Spark:** Set up a distributed, multi-node Apache Hadoop cluster backed by the Hadoop Distributed File System (HDFS), running on Ubuntu Linux. Ran MapReduce jobs with Hadoop. Deployed Spark and ran NLP tasks with Spark
- **Tableau:** Visualized and analyzed data for illicit drugs in US in Purdue's 7th Annual ASA DataFest Competition

REFERENCES

Eric T. Matson **ematson@purdue.edu**
Professor, Department of Computer and Information Technology, Purdue University *(765) 494-8259*
Richard M. Voyles **rvoyles@purdue.edu**
Daniel C. Lewis Professor, School of Engineering Technology, Purdue University *(765) 494-3733*
Byung-Cheol Min **minb@purdue.edu**
Associate Professor, Department of Computer and Information Technology, Purdue University *(765) 494-6490*
Tahir M. Khan **tmkhan@purdue.edu**
Clinical Assistant Professor, Department of Computer and Information Technology, Purdue University *(765) 496-1660*