XIAXIN SHEN

shen452@purdue.edu | 219-238-8619 | https://allisonshen.github.io/

EDUCATION

- **B.S. Computer Information Technology, Purdue University** *May 2022*
  GPA: 3.98 / 4.0 *West Lafayette, IN 47906*

RESEARCH INTERESTS

My research interests include robotics, machine learning, deep learning, computer vision, malware detection, reinforcement learning and security.

PUBLICATIONS

Refereed Conference Publication

- 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

Under Review

- 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*. Springer, 2022
- Upinder Kaur, Arunashish Datta, Haozhe Zhou, **Xiaxin Shen**, Shreyas Sen, Byung-Cheol Min, and Richard M. Voyles. Rpaag: A reference architecture and testbed for closed-loop precision animal agriculture. In *International National Conference on Cyber-Physical Systems (ICCPS)*. ACM/IEEE, 2022

In Preparation (Draft Avaliable)

- **Xiaxin Shen**, Haeun Ko, Yeji Gong, Taeuk Gwak, Jihyeon Noh, Minji Lee, and Eric T. Matson. Uav ground scanning system: Human detection from infrared imagery with deep learning

AWARDS

- World-wide: 3rd place in the SAE Mobility Forward Challenge: AI Mini-Challenge Competition *2021*
- University-wide: Award for Best Visualization in Purdue's 7th Annual ASA DataFest Competition *2021*
- Undergraduate Research Grant: X-plane Automatic Flying with Reinforcement Learning *2020*
- National-wide: Top 40 and Finalist in the ITA Tech Challenge Programming Competition *2019*
- National-wide: Chinese Scholarship Council (CSC) Scholarship *2018*

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 - present*

- Set up the IoT devices, including the Raspberry pi, the GPS sensor and the infrared camera sensor
- Presented a novel human detection methodology based on deep convolutional neural network with UAV imagery
- Built and prepossessed the dataset including daytime and night infrared imaging taken from a low-altitude downward angle with Python and TensorFlow Object Detection API
- Implemented transfer learning with weights of YOLO v5 and SSD mobile net on the dataset
- Working on deploying and pushing warning messages with GPS information when human are detected when searching or rescuing events are operated

PAAg: Closed-Loop Precision Animal Agriculture **Advisor: Richard M. Voyles**

Undergraduate Research Assistant *Mar 2021 - Oct 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

RoboMal: Malware Detection for Robot Network Systems **Advisor: 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

- 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*

- Collaborated with 2 students to analyze and evaluate how a simulated Cessna 172 can learn to stabilize itself while in flight
- Developed and tested a reinforcement learning based methodology for airplane stabilization using Python
- Performed the analysis on X-plane 11 which is a realistic flight simulator

PROJECT EXPERIENCE

RLEAM Reader: Read, Learn, and Memorize *Oct 2021 - Dec 2021*

- Developing RLEAM Reader, which can help users read ebook/documents with a convenient way to lookup dictionary explanations of words and review as well as memorize complex vocabularies with flashcards and forgetting curve
- Implementing the function of querying the meaning of words very conveniently by simple tapping in the read view
- Implementing the function of personalizing favorites lists from the text the user read
- Realizing the association of favorites lists with dates, and helping users review and memorize with flashcards based on the forgetting curve

Deleted File Persistence Tracking

Advised by Tahir M. Khan *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

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

E-Commerce Website

Team Leader *Aug 2019 - Dec 2019*

- Collaborated with 6 students to design and implemented front-end and back-end of the e-commerce website using HTML, JavaScript, CSS, PHP, MySQL
- Utilized distributed application architecture and deployed the database at the Oracle server
- Identified user requirements, drew ER, EER diagram, and created relational schema to build the database

Pathway IVY Tech-Purdue Project

Student Worker *Oct 2018 - May 2019*

- Maintained and improved the Java-based system using the technique of Mybatis, Maven, Spring MVC, Bootstrap, JQuery in order to build a seamless pathway for transfer students
- Implemented a comprehensive framework to evaluate and analyze two programs based on course curriculum, CAE Knowledge Units (KUs), major topics, and NCWF KSAs (Knowledge, Skills, and Abilities)
- Fixed bugs for SQL and data presentation problems in front-end

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
- **Dynamic website development:** Implemented an e-commerce site with HTML, CSS, JavaScript, JQuery, PHP, MySQL
- **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
- **AR:** Visualized the digital twin using augmented reality based on Web for showing network information and GPS location with mobile phones when scanning images

REFERENCES

Eric T Matson **ematson@purdue.edu**
Professor *Purdue University*
Department of Computer and Information Technology
Knoy 377C, Knoy Hall of Technology, West Lafayette, IN 47907, USA
Phone: +1 (765) 494-3733

Richard Voyles **rvoyles@purdue.edu**
Daniel C. Lewis Professor *Purdue University*
Department of Engineering Technology
Knoy 193, 401 N. Grant Street, West Lafayette, IN 47907, USA
Phone: +1 (765) 494-3733

Tahir M. Khan **tmkhan@purdue.edu**
Clinical Assistant Professor *Purdue University*
Department of Computer and Information Technology
KNOY 263, Knoy Hall of Technology, West Lafayette, IN 47907, USA
Phone: +1 (765) 496-1660