

XIAXIN SHEN

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🌐 <https://allisonshen.github.io/>

EDUCATION

- **B.S. Computer Information Technology, Purdue University**
GPA: 3.98 / 4.0

May 2022
West Lafayette, IN 47906

RESEARCH INTERESTS

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

PUBLICATIONS

In Preparation (Draft Available)

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

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

Refereed Journal Publication

- 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

Under Review

- 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

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

- 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 detected 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: Richard M. Voyles & Byung-Cheol Min

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: Richard M. Voyles & Byung-Cheol Min

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

REFERENCES

Eric T. Matson

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