

RESEARCH INTEREST

- **Autonomous Drving Security:** My research interests are computer vision, AI security, adversarial attack, object tracking, and other related autonomous driving security tasks.

EDUCATION

- **Nanyang Technological University(NTU)** Singapore
Master of Engineering in Computer Science(SCSE) *Jan 2020 - Feb 2022*
 - **Thesis:** Simulation-Based perception testing for autonomous vehicles(10356/154942)
 - **Research:** Attack Autonomous Vehicle LiDAR in simulation environment
- **Nanyang Technological University(NTU)** Singapore
Bachelor of Engineering in Electrical and Electronics (EEE) *Aug 2016 - Dec 2019*
 - **FYP:** Interfacing and Testing of Localization Sensors on An Autonomous Vehicle(10356/136704)
 - **Graduate:** With Honours (Distinction)

PAPERS ACCEPTED

- **ACMMM 2022 (CCF-A):** Xingshuo Han, Guowen Xu, Yuan Zhou, **Xuehuan Yang**, Jiwei Li, Tianwei Zhang, Physical Backdoor Attacks to Lane Detection Systems in Autonomous Driving, ACM International Conference on Multimedia (MM), October 2022 (arxiv 2203.00858)
- **TIFS 2022 (CCF-A):** Jianfei Sun, Guowen Xu, Tianwei Zhang, **Xuehuan Yang**, Mamoun Alazab, Robert Deng, Verifiable, Fair and Privacy-preserving Broadcast Authorization for Flexible Data Sharing in Clouds, Accepted by IEEE Transactions on Information Forensics Security(TIFS) (9969631)

PAPERS UNDER REVIEW

- **USENIX 2023:** A Comprehensive Platform for Benchmarking Backdoor Attacks to the Perception Module in Autonomous Vehicles
- **TIFS 2022:** Identity Based Matchmaking Encryption for Cloud Computing

PAPERS UNDERGOING

- **ICCV 2023:** Dual Source Backdoor Attack for Audio Visual Speech Recognition

RESEARCH EXPERIENCE

- **School of Computer Science and Engineering@NTU** Singapore
Research Associate, Cyber Security Team *July 2022 - Dec 2022*
 - **Apollo:** Implement workflows for researchers to evaluate backdoor attack scenarios to attack lane detection in autonomoous driving platform and perform the camera backdoor attack with raining environment in the open source LGSVL simulator.
 - **Point Cloud:** Develop critical machine learning products with real-time LiDAR sensor data to improve perception performance for LiDAR system. Assess the impact of environmental conditions on LiDAR attack, assist develop methods to detect and mitigate data quality impact of adverse environmental factors through experimental design and data mining with research teams.
- **Cyber Security Research Centre@NTU** Singapore
Research Assistant, Cyber Security Team *Feb 2020 - June 2022*
 - **Gap analysis:** Perform the apollo platform for the result of LiDAR perception with the LGSVL ground truth at a low speed for safety-critical applications.
 - **Cyber security assessment:** Develop tools to interactively segment images point clouds to reduce human effort. Train object detection tracking models to pre-label multisensor data from LiDARs cameras Explore methods to help customers identify 'interesting' data in huge video datasets, which can be sent for labeling.
- **Centre for Autonomous Robotics Lab, EEE@NTU** Singapore
Research Intern, Autonomous Vehicle Localization Team *Jan 2019 - Dec 2019*

- **DSTA:** The project focuses on the Safety and Cyber Security of driverless cars, in cooperation with the Singapore Defense Science and Technology Agency (DSTA), ordered by the Singapore Ministry of Defense (Future Systems Technology Directorate FSTD). The project studies the cyber security concerns of driverless cars in hardware and software components and systems.
- **Autoware:** Collaborated Velodyne LiDAR & Delphi RADAR with existing ROS software and made essential modifications with autonomous vehicle software
- **Toyota:** Developed Object Detection and Object Avoidance algorithm for Toyota vehicle's safety scenarios using radar sensor. Successfully tested autonomous vehicle localization in CETRAN, Singapore
- **GPS Attack:** Assisted the researchers to perform a physical attack on various GPS devices to increase the GPS signal and improve the robustness of the system in this article: Detection and Isolation of Sensor Attacks for Autonomous Vehicles: Framework, Algorithms, and Validation.

● Centre for Energy Research Institute@NTU

Singapore

Research Intern, Future Mobility Team

Sep 2017 - Dec 2018

- **NTU-JTC-Navya:** Developed safe AV technologies and guarantee the safety of camera functions to verify lane detections using zed cameras on the campus of NTU.
- **NTU-Volvo-LTA:** Joined 12-meter autonomous electric bus and build up tools to support customers calibrate their sensors with the need for a traditional checkerboard based calibration. Acquired and analyzed 3D stereo camera (ZED) vision data using Nvidia CUDA to detect lane detection task and recognized obstacles using deep learning technologies.

● SingPilot

Singapore

Software Engineer, Autonomous Vehicle Perception Team

Jan 2018 - August 2018

- **Localization:** Integrated and tested autonomous vehicle localization sensors. Success tested the performance of Localization sensor in outdoor environment at different distances and reported the result of the observations.
- **Perception:** Collaborated Velodyne LiDAR & Delphi RADAR with existing software(ROS) and making necessary modifications with autonomous vehicle software (Autoware). Applied Object Detection and Object Avoidance Algos for Toyota Cams Car.
- **Vehicle:** This project supported by Temasek Laboratories @Nanyang Technological University, Singapore. The project focus on designing real-time estimation, intrusion, detection and control algorithm that could ensure safety operation of the AVs during the attack
- **Height Detection:** The project is to assist fire truck to avoid obstacles during emergency periods in Changi Airport. The project is to develop the blackbox to receive the LiDAR data and compute necessary machine learning algorithms and alarm the fire truck drivers.

AWARD

- **Math:** 3rd Place, Chinese Mathematics Olympiad (CMO) competition hosted by the Chinese National High School Mathematics League
- **Chemical:** 3rd Place, Chinese Chemical Olympiad Competition hosted by Anhui Province
- **Merit:** Merit Student in High School by Hefei City
- **Coach:** National International Inline Skating Coach Level 1 by Inline Certificate Program && National Registry of Coaches (NROC) Coaches by Sport Singapore && Ministry of Education (MOE) Inline Skating Instructor by MOE Singapore && NTU Inline Skating Club Leader and Coach
- **License:** International Driving License class 3, 4 and 5 by Singapore Safety Driving Centre for driving and testing autonomous toyota car, vehicle, bus, sweeper vehicle and heavy vehicle in Centre of Excellence for Testing & Research of Autonomous Vehicles NTU (CETRAN)