Hanlin (Julia) Chen

Website: https://web.ics.purdue.edu/~chen1368/
501 Northwestern Avenue, Room SB 028
West Lafayette, IN 47906, USA

Email: chen1368@purdue.edu
Alt: hlchenjulia@gmail.com
Phone: +1 (765) 637-5486

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Education and Employment

August/2021–August/2023 **Postdoctoral Research Assistant**, *Civil Engineering*, Purdue University, West Lafayette, IN, USA.
Mentor: Dr. Yiheng Feng

August/2016–August/2021 **Doctor of Philosophy**, *Computer Information and Technology*, Purdue University, West Lafayette, IN, USA.
Advisor: Dr. John A. Springer
Thesis: Adaptive safety and cyber security for connected and automated vehicle system

May/2016–August/2016 **Unemployed**.

August/2013–May/2016 **Master of Science**, *Mechanical Engineering Technology*, Purdue University, West Lafayette, IN, USA.
Advisor: Dr. Henry H. Zhang

June/2013–August/2013 **Unemployed**.

September/2009–June/2013 **Bachlor of Engineering**, *Electrical Engineering and Automation*, Huazhong University of Science and Technology, Wuhan, Hubei, China.

June/2009–September/2009 **Unemployed**.

September/2006–June/2009 **Highschool Deploma**, *Wuhan Foreign Languages School*, Wuhan, Hubei, China.

Publications

(Authors underline are students under my supervision and collaboration)

PAPERS UNDER REVIEW

1. Yuankai He, **Hanlin Chen**, and Weisong Shi. Blue ice - an integrative customizable simulated environment for autonomous driving. In *The Transportation Research Board (TRB) 102nd Annual Meeting(**TRB**)*, 2024(under review)
2. **Hanlin Chen**, Vamsi K. Bandaru, Yilin Wang, Mario A. Romero, Andrew Tarko, and Yiheng Feng. A cooperative perception system for aiding cavs navigation and improving safety. In *The Transportation Research Board (TRB) 102nd Annual Meeting(**TRB**)*, 2024(under review)
3. **Hanlin Chen**, Simin Chen, Wenyu Li, Wei Yang, and Yiheng Feng. Impact analysis of inference time attack of perception sensors on autonomous vehicles. In *The Transportation Research Board (TRB) 102nd Annual Meeting(**TRB**)*, 2024(under review)
4. **Hanlin Chen**, Xiaolin Xu, Jeffrey Sun, Qilin Chen, and Yiheng Feng. I know you changed your lane without seeing you: a lane change time estimation based on following vehicle's trajectory only. In *The Transportation Research Board (TRB) 102nd Annual Meeting(**TRB**)*, 2024(under review)

5. Ahmed Abdo, **Hanlin Chen**, Xuanpeng Zhao, Guoyuan Wu, and Yiheng Feng. Cybersecurity on connected and automated transportation systems: A survey. *JOURNAL OF IEEE TRANSACTIONS ON INTELLIGENT VEHICLES*, 2023(2nd round review)

PEER-REVIEWED JOURNAL PUBLICATIONS

6. Shuocheng Guo, **Hanlin Chen**, Mizanur Rahman, and Xinwu Qian. Dca: Delayed charging attack on the electric shared mobility system. *IEEE Transactions on Intelligent Transportation Systems*, 2023
7. Ziyang Tang, Xiang Liu, **Hanlin Chen**, Joseph Hupy, and Baijian Yang. Deep learning based wildfire event object detection from 4k aerial images acquired by uas. *AI*, 1(1):117–140, 2020

PEER-REVIEWED CONFERENCE PAPERS

8. Simin Chen, **Hanlin Chen**, Mirazul Haque, Cong Liu, and Wei Yang. The dark side of dynamic routing neural networks: Towards efficiency backdoor injection. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, pages 24585–24594, June 2023
9. **Hanlin Chen**, Renyuan Luo, and Yiheng Feng. Improving autonomous vehicle mapping and navigation in work zones using crowdsourcing vehicle trajectories. In *The Transportation Research Board (TRB) 102nd Annual Meeting(**TRB**)*, 2023
10. **Hanlin Chen**, Brian Liu, Xumiao Zhang, Feng Qian, Z. Morley Mao, and Yiheng Feng. A cooperative perception environment for traffic operations and control. In *The Transportation Research Board (TRB) 102nd Annual Meeting(**TRB**)*, 2023
11. **Hanlin Chen** and John A. Springer. A risk analysis framework for vehicular networks. In *The Third IEEE International Conference on Connected and Autonomous Driving (**MetroCAD**)*, 2020
12. **Hanlin Chen** and Baijian Yang. A performance evaluation of can encryption. In *The First IEEE International Conference on Trust, Privacy and Security in Intelligent Systems, and Applications(**IEEE-TIP2019**)*, 2019
13. Wangling Yu and **Hanlin Chen**. Controller design for mechatronic rotary inverted pendulum. In *2018 ASEE Mid-Atlantic Section Spring Conference*, 2018
14. Niveah Abraham, Adfolarian A. Bolaji, **Hanlin Chen**, Melissa Dark, Albert Holt, and John A. Springer. Internet of things mobility forensics. In *The 2017 Annual Cerias Information Security Symposium(**CERIAS**)*, 2017

Projects

Collaboraitve projects

May 2023 - Present **Lane change estimation with following vehicle data only**, *Postdoctoral Research Assistant at CART Lab, Purdue University*, with ISS Lab at Purdue AAE.

Collaborators: Xiaolin Xu and Professor Dengfeng Sun

Develop a lane change estimation model based on following vehicle trajectory only

Performed lane change estimation accuracy with HighD dataset, for old following vehicle the accuracy is above 90%.

September 2022 - Present **Inference time attack and its impact on smart transportation system**, *Postdoctoral Research Assistant at CART Lab, Purdue University*, with ISS Lab at University of Texas Dallas.

Collaborators: Simin Chen and Professor Wei Yang

Formulated the inference time attack problem into the context of autonomous vehicle control

Implement the inference time attack in a co-simulation platform for end-to-end impact analysis

Have one research paper published in CVPR 2023, one paper submitted to TRBAM2024. More research work in progress.

December 2022 - Present

A Digital Twin Simulation Toolkit for C-V2X-Enabled Collaborative Autonomous Driving, *Postdoctoral Research Assistan at CART Lab, Purdue University*, with CAR Lab at University of Delaware.

Collaborators: William He and Professor Weisong Shi

Help developing a digital twin simulation for collaborative autonomous driving automation

Wrote the background vehicle control module using SUMO simulator, which provides more accurate vehicle maneuvers

Integrating the digital twin system with C-V2X communication system to better assess the impact of communication delay

Have one paper submitted to TRBAM2024. More research work in progress.

July 2022 - Present

Cybersecurity on Electric Shared Mobility System, *Postdoctoral Research Assistant at CART Lab at Purdue University*, ,with Mobility-X Lab at University of Alabama.

Collaborators: Shuocheng Guo and Professor Xinwu Qian

Use proper charging station and EV model to formulate the threat into a more realistic attack

Adjusted the threat model for network level attack

Shuocheng presented the work in TRBAM2023 lecturn. One research paper published in IEEE TITS

Projects inside Purdue University

August 2022 - September 2023

Development of A Cooperative Perception System, *Postdoctoral Research Assistant at CART Lab, Purdue University*, West Lafayette, Indiana.

Develop a augmented reality system for testing on collision avoidance algorithms

Develop decision level merging for cooperative perception system

Build virtual test proving ground for project testing

August 2021 - Present

NSF-CPS: Medium: Transforming Connected and Automated Transportation with Smart Networking, Cooperative Sensing, and Edge Computing, *Postdoctoral Research Assistant at CART Lab, Purdue University*, West Lafayette, Indiana.

Implement a co-simulation platform for microscopic level traffic simulation and vehicle level simulation

Created an adaptive traffic signal control system utilizing cooperative perception with raw data level data sharing

One TRB paper accepted as project outcome, more research work in progress

March 2019 - December 2019

Object and Fire Detection using Deep Learning and UAV for Disaster Rescuing, *Graduate Research Assistant at DAO2 Lab, Purdue University*, West Lafayette, Indiana.

Developed object and fire-recognition model based on deep learning from UAV data

One research paper published as project outcome

July 2019

SAE CyberAuto Challenge, *Participant*, SAE International, Warren, Michigan.

Conducted investigation on a modern automobile, figured out potential threats and risks within the in-vehicular and inter-vehicular system using reverse engineering and penetration testing.

June 2018 - August 2018

Development of a Apollo based autonomous driving platform with V2X communication, *Visting student at MCity Lab, University of Michigan*, Ann Arbor, Michigan.

Mentor: Professor Huei Peng

Successfully Integrated Apollo open-AI system on a Kia Soul EV

Added V2X communication function in Apollo system that worked on the target vehicle

Obtained a vehicle dynamic model for the testing vehicle Kia Soul EV based on the vehicle dynamics testing data

January 2017 - December 2018 **Forecast Project: Increase graduate student success using big data**, *Graduate Research Assistant at Office of Information Management and Analysis, Purdue University*, West Lafayette, Indiana.

- Perform data analysis for big data on graduate student
- Developed numerical models that predict students' academic performance based on the selected factors
- UI testing for Purdue's new database user interface

August 2017 - June 2017 **InSURE: Risk Analysis on Vehicular Network**, *Graduate student at The Center for Education and Research in Information Assurance and Security(CERIAS), Purdue University*, West Lafayette, Indiana.

- Proposed a risk-analysis taxonomy based on current experimental results that fits the existing Autonomous Vehicle environment with vehicular communication.

August 2016 - December 2016 **InSURE: Internet of Things Mobility Forensics**, Graduate Student at CERIAS, Purdue University,West Lafayette, Indiana.

- Defined the gap between the traditional computer cyberforensics and cyberforensics for IoT devices
- Find out some limitation for IoT mobility forensics and performed several forensic analysis on a smart doorbell to prove our theoretical analysis result.

August 2013 - June 2014 **EcoCar2, Purdue University**, *Graduate Student*, West Lafayette, Indiana.

- Develop and rebuild the infotainment system for the vehicle of Purdue EcoCar2 project while making it collaborating with the existing in-vehicular network

Teaching and service

Mentor

Fall 2022 PMP program Metor, Purdue Disability Resource Center

Teaching Assistant

Summer 2019 Design for Security Foundations of Secure Design

Spring 2014 MET 302, CAD In The Enterprise

Fall 2014 MET 143, Materials And Processes

Grader

Spring 2021 ECE301 Signals and Systems

Professional Experience

Associate Editor Multimedia Tools and Applications,Springer

Program Committee International Conference on Algorithms and Architectures for Parallel Processing(ICA3PP),2023

Reviewer IEEE International Automated Vehicle Validation Conference(IAVVC),2023

Reviewer IEEE Transactions on Intelligent Transportation Systems

Reviewer IEEE Transactions on Intelligent Vehicles

Reviewer Accident Analysis Prevention

Reviewer IEEE Transaction on Internet of Things

Reviewer Mechanical Systems and Signal Processing

Student Reviewer IEEE Transaction on Computer

Student Reviewer BMVC

Participant 2018 SAE CyberAuto Challenge

Invited Talks

Spring 2023 An Introduction to Connected and Automated Vehicle with demonstration. Guest Lecture at CE 597 - Smart Construction. Purdue University,West Lafayette, IN, 2023

Fall 2022 An introduction to Cooperative Driving Automation from a vehicle perspective. Guest Lecture at CE 565 - Traffic Operations and Control. Purdue University,West Lafayette, IN, 2022

Fall 2022 An Introduction to Connected and Automated Vehicle with demonstration. Guest seminar session at Purdue ITE seminar. Purdue University,West Lafayette, IN, 2022

Fall 2022 Cooperative perception for traffic operation and control with vehicle application. Guest seminar session at Purdue Polytechnic Institute. Purdue University,West Lafayette, IN, 2022

Spring 2022 Mapping in temporary changed drive-able area with crowd-source trajectory data. Guest seminar session at Purdue Polytechnic Institute. Purdue University,West Lafayette, IN, 2022

Fall 2019 CAN Performance Evaluation of CAN Encryption. The First IEEE International Conference on Trust, Privacy and Security in Intelligent Systems, and Applications(IEEE-TPS), Los Angeles, CA, 2019

Fall 2019 CAN Performance Evaluation of CAN Encryption. Guest lecture at CSI 4480 - Information Security Practice. Oakland University, Rochester, MI, 2019.

Fall 2018 Implementation of an open-source platform for CAV system: a comprehensive report. Guest lecture at CSI 4480 - Information Security Practice. Oakland University, Rochester, MI, 2018.

Demos

2023 **Development of A Cooperative Perception System**.
Impact evaluation of decision level mering for cooperative perception, information shared from infrastructure
Baseline link here:Link to be added
CAV driving only, no TScan:Link to be added
CAV driving only, with TScan:https://youtu.be/8WBlpk_8e8g

2023 **Inference time attack on autonomous vehicle in end2end simulation**.
Inference time attack on perception module for autonomous vehicle, impact evaluation in end to end system
Baseline link here:https://youtu.be/-UJOcZR_IHw
Attack link here:https://youtu.be/TlCj_hna_XM

2023 **High fidelity driving simulator with background vehicle**.
A driving simulator using CARLA for perception data generation, SUMO for background vehicle control, and ROS for ego vehicle control
link here:https://youtu.be/JzlB_81JHHA

2023 **Augmented Reality with CART CAV and Visualization**.
An augmented reality system for safer CAV testing with CART CAV and visualization
link here:https://youtu.be/IAp-tFonHZI

2022 **Trajectory following with pure pursuit implementation on CAV platform**.
Trajectory following with real-time perception result, both implemented on CART Lab's CAV and demo in Purdue's parking lot
link here:https://www.youtube.com/shorts/44eg8jUbyqI

2022 **Real-time perception implementation on CAV platform.**
Visualization for real-time perception on CART Lab's CAV with both 2d and 3d data. Result can be used for decision level merging
link here:https://youtu.be/0ont9S0ySz0

2021 **CARMA co-simulation platform with online raw data level merging.**
A demo video for raw data level merging on cooperative perception between infrastructure and CAVs
link here:https://youtu.be/NJ2Ue3Fg6og

Media Coverage

2023 **The USDoT Research and Tchnology story about our Cooperative Driving Automation research.**
LinkedIn: https://www.linkedin.com/posts/usdot-research-technology_fhwas-cooperative-driving-automation-cda-activity-7041815509478035456-snuk?utm_source=share&utm_medium=member_desktop
Twitter: https://twitter.com/ITS_USDOT/status/1636049834032365569
Facebook: https://www.facebook.com/photo/fbid=600391862112904&set=a.234011082084319

2022 **CE's Feng leads testing of new autonomous car.**
Purdue College of Engineering News:https://engineering.purdue.edu/Engr/AboutUs/News/Spotlights/2022/2022-0722-ce-feng

2022 **CIT researchers develop new "deep learning" methods to fight wildfires with drones.**
Purdue Polytechnic News Room:https://polytechnic.purdue.edu/newsroom/cit-researchers-develop-new-deep-learning-methods-fight-wildfires-drones

2014 **Purdue wins 'EcoCAR 2' accolades in creating hybrid-electric vehicle.**
Purdue News Room: https://www.purdue.edu/newsroom/releases/2014/Q2/purdue-wins-ecocar-2-accolades-in-creating-hybrid-electric-vehicle.html
AVTC: https://avtcseries.org/about-avtc/past-competitions/ecocar-2/