Pei Li

CONTACT INFORMATION

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RESEARCH INTERESTS

Traffic Safety, Autonomous and Connected Vehicles, Traffic Simulation, Machine Learning

EDUCATION

University of Central Florida, Orlando, FL, USA

Ph.D., Civil Engineering, August 2021

SAS Data Mining Certificate, May 2020

M.S., Smart Cities, May 2020

Tongji University, Shanghai, China

M.Eng., Communication and Transportation Engineering, June 2018

B.Eng., Logistic Engineering, June 2015

Coursera, Mountain View, USA

Getting Started with AWS Machine Learning, Sep 2020

RESEARCH EXPERIENCE

University of Wisconsin-Madison, Madison, WI, USA, Sep 2022 - Present
Research Scientist

University of Michigan, Ann Arbor, MI, USA August 2021 - August 2022
Postdoctoral Research Fellow

Object Detection Ground Truth Generation and Error Estimation Using CARLA

- Provided simulation support in Carla for developing the object detection model and error estimation.
- Developed a pipeline for generating the ground truth of the object detection model.
- Trained object detection model based on simulation images.
- Created the object detection error estimation pipeline

Designing a High-fidelity Traffic Simulation Framework for Testing Autonomous Vehicles

- Improved the user-friendliness of SUMO by combining it with OpenAI-Gym and published SUMO-Gym as an open-source software.
- Improved the control of ego-vehicle by introducing curvilinear coordinate system.
- Improved the fidelity of SUMO-Gym by co-simulating with CARLA.

Improving Pedestrian Safety at Intersections Using Lidar and Camera data

- Proposed novel and robust surrogate safety measures for estimating pedestrian risk at intersections.
- Improved the predictive accuracy of pedestrian crossing time prediction by applying a deep learning method.

University of Central Florida, Orlando, FL, USA August 2018 - August 2021
Graduate Research Assistant

Crash Predictions for Expedited Detection

- Processed over 2TB detector data to obtain traffic-related variables.
- Developed an ensemble tree-based model in Python for predicting secondary crash.
- Deployed the model in a real-time prototype to generate results for an interactive website.

Connecting the East Orlando Communities Project-Phase I

- Developed a deep learning model in Keras for predicting crash potential using connected vehicles emulated data.
- Implemented the model in a real-time prototype to generate results for a website.
- Developed a Bayesian negative binomial model in R for estimating crash frequency.

Using Smartphone as On-board unit Emulator Implementation Study

- Analyzed data of smartphone sensors (e.g., accelerometer, gyroscope, and GPS) from different drivers, vehicles, locations..
- Developed an LSTM model in Python to detect vehicle's maneuvers using smartphone sensors.
- Integrated the model into an Android application to protect the vulnerable road users.
- Validated the developed application under different conditions.

Pre-Deployment Study for Connecting the East Orlando Communities Project

- Evaluated safety and mobility at various segments and intersections with crash, traffic detector, and drone video data.

Tongji University, Shanghai, China August 2015 - June 2018
Graduate Research Assistant
Traffic External Costs Estimation for China

- Estimated traffic external costs for China and compare with other countries.
- Provided policy suggestions to decrease external costs by expanding railway freight.
- Evaluated the proposed suggestions by discrete choice models.

Publications

Journals

1. **Li, P.**, Abdel-Aty, M., Zhang, S., 2022. Improving Spatiotemporal Transferability of Real-Time Crash Likelihood Prediction Models Using Transfer-Learning Approaches. *Transportation Research Record*.
2. **Li, P.**, Abdel-Aty, M., 2022. Real-Time Crash Likelihood Prediction Using Temporal Attention–Based Deep Learning and Trajectory Fusion. *Journal of transportation engineering, Part A: Systems*, 148.
3. **Li, P.**, Abdel-Aty, M., 2022. A Hybrid Machine Learning Model for Predicting Real-time Secondary Crash Likelihood. *Accident Analysis and Prevention*, 165.
4. **Li, P.**, Abdel-Aty, M., 2021. Driving Behaviors Detection Using Semi-supervised LSTM and Smartphone Sensors. *Transportation Research Record*.
5. **Li, P.**, Abdel-Aty, M. and Yuan, J., 2020. Using Bus Driving Events as Surrogate Safety Measures for Pedestrian and Bicycle Based on GPS Trajectory Data. *Accident Analysis and Prevention*, 150.
6. **Li, P.**, Abdel-Aty, M., Cai, Q. and Islam, Z., 2020. A Deep Learning Approach to Detect Real-Time Vehicle Maneuvers Based on Smartphone Sensors. *IEEE Transactions on Intelligent Transportation Systems*.
7. Zhang, S., Abdel-Aty, M., Cai, Q., **Li, P.** and Ugan, J., 2020. Prediction of pedestrian-vehicle conflicts at signalized intersections based on long short-term memory neural network. *Accident Analysis and Prevention*, 148.
8. **Li, P.**, Abdel-Aty, M., Cai, Q. and Yuan, C., 2020. The Application of Novel Connected Vehicles Emulated Data on Real-Time Crash Potential Prediction for Arterials. *Accident Analysis and Prevention*, 144.
9. Zhang, S., Abdel-Aty, M., Yuan, J. and **Li, P.**, 2020. Prediction of pedestrian crossing intentions at intersections based on long short-term memory recurrent neural network, *Transportation Research Record*, 2674(4).
10. **Li, P.**, Abdel-Aty, M. and Yuan, J., 2020. Real-time crash risk prediction on arterials based on LSTM-CNN. *Accident Analysis and Prevention*, 135.

Conferences

1. Kusari, A., **Li, P.**, Yang, H., Punshi, N., Rasulis, M., Bogard, S. and LeBlanc, D.J., 2022, June. Enhancing SUMO simulator for simulation based testing and validation of autonomous vehicles. In 2022 IEEE Intelligent Vehicles Symposium (IV) (pp. 829-835). IEEE.
2. **Li, P.**, Abdel-Aty, M. Improving Spatio-temporal Transferability of Real-Time Crash Likelihood Prediction Models Using Transfer Learning Approaches, *Presentation at the 101th Annual Meeting of the Transportation Research Board*, Washington D.C., USA, Jan 2022.
3. **Li, P.**, Abdel-Aty, M. Real-time Secondary Crash Likelihood Prediction Using A Hybrid Machine Learning Model, *Presentation at the 101th Annual Meeting of the Transportation Research Board*, Washington D.C., USA, Jan 2022.
4. **Li, P.**, Abdel-Aty, M. Trajectory Fusion-based Real-Time Crash Likelihood Prediction Using LSTM-CNN with Attention Mechanism, *Presentation at the 100th Annual Meeting of the Transportation Research Board*, Washington D.C., USA, Jan 2021.
5. **Li, P.**, Abdel-Aty, M. and Islam, Z, Driving Behavior Detection Using Semi-supervised LSTM and Smartphone Sensors, *Presentation at the 100th Annual Meeting of the Transportation Research Board*, Washington D.C., USA, Jan 2021.
6. **Li, P.**, Abdel-Aty, M. Using Bus Driving Events as Surrogate Safety Measures for Pedestrian and Bicycle Based on GPS Trajectory Data, *Presentation at the 100th Annual Meeting of the Transportation Research Board*, Washington D.C., USA, Jan 2021.
7. **Li, P.**, Abdel-Aty. M, Cai, Q, and Islam, Z, Real-time Vehicle Maneuvers Detection Based on Smartphone Sensors and Deep Learning, *Presentation at the 99th Annual Meeting of the Transportation Research Board*, Washington D.C., USA, Jan 2020.
8. Zhang. R, **Li, P.**, Calculation of External costs of Road and Railway Freight Transportation and Internalization, *Presentation at the 95th Annual Meeting of the Transportation Research Board*, Washington D.C., USA, Jan 2016.

Honors and Awards

- Transportation Forecasting Competition, TRB AED50 Committee, 1st Prize 2022
- UCF College of Graduate Studies Presentation Fellowship, University of Central Florida 2020
- Stage III Winner in the USDOT's Solving for Safety Visualization Challenge, U.S. DOT 2019
- UCF College of Graduate Studies Presentation Fellowship, University of Central Florida 2019
- ORC Doctoral Fellowship, University of Central Florida 2018
- Best Undergraduate Thesis, Tongji University 2015

Academic Service

- Reviewer, Accident Analysis and Prevention
- Reviewer, Traffic Injury Prevention
- Reviewer, Journal of Advanced Transportation
- Reviewer, Transportation Research Board
- Reviewer, Journal of Transportation Engineering, Part A: Systems