Lei Han

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University of Central Florida, Orlando, Florida, USA

EDUCATION

- **University of Central Florida (UCF)** *August 2023 - May 2026*
  Ph.D. in Civil Engineering, Advised by Dr. Mohamed Abdel-Aty Orlando, USA
  - GPA: 4.00/4.00 (Top 5%)
  - Core courses: Algorithms for smart cities, Connected and autonomous vehicles, Advanced AI, etc.
  - Dissertation: "Connected Vehicle (CV) Data-based Traffic Safety and Mobility Analysis"

- **Tongji University** *September 2020 - May 2023*
  M.S. in Transportation Engineering, Advised by Dr. Rongjie Yu Shanghai, China
  - Grade: 4.71/5.00 (Top 5%)
  - Core courses: Traffic Safety Analysis, Applied Statistics, Optimization Methods, etc.
  - Thesis: "Expressway Crash Risk Evaluation Model Construction and Robustness Analysis"

- **Tongji University** *September 2016 - May 2020*
  B.S. in Transportation Engineering Shanghai, China
  - GPA: 4.43/5.00

RESEARCH INTERESTS

- **Transportation research**
  Traffic safety modeling; Traffic operation and prediction; Connected vehicle data application.

- **Methodology**
  Econometric statistical models; Spatiotemporal machine learning (ML)/deep learning (DL); Generative AI.

- **Working topics**
  - Multi-scale (macro/meso/micro) traffic safety modeling with CV data-based driving behaviors
  - Network mobility analysis with multi-source traffic data (e.g., CV, ATSPM, Microwave-detector data)
  - Applying generative AI for traffic safety and mobility prediction

PROJECTS

Ph.D. Research Projects

- **Network Level Proactive Traffic Operations Indicator Using AI and CV Data** *May 2025 - February 2027*
  Florida Department of Transportation Project, No. BED28 977-18. ($247,950), Project page
  - Developing CV-data-driven traffic safety and mobility indicators for urban freeway and arterial networks.
  - Implementing spatiotemporal DL models (e.g., GCN, Transformer) for real-time traffic state prediction.
  - Designing and deploying a dashboard for monitoring and forecasting network-level traffic indicators.

- **Advanced Transportation Technologies and Innovation (ATTAIN) Phase IV** *July 2022 - February 2025*
  Florida Department of Transportation Project ($500,000), Project page
  - Developing an ensemble ML framework for secondary crash prediction using Microwave-detector data.
  - Integrating the prediction module into the ATTAIN system and validating on central Florida freeways.

M.S. Research Projects

- **Smart Freeway Active Safety Traffic Operation Management** *July 2021 - January 2023*
  Science and Technology Project of Zhejiang Province, No.2021047
  - Identifying risky driving behaviors (e.g., hard braking and hard acceleration) from smartphone-based trajectory and motion data.
  - Developing a real-time crash prediction model integrating behavior features with traffic flow states.

PUBLICATIONS

Journal Publications

[J.18] Yang, S.*, Abdel-Aty, M., and **Han, L.** (2026). Crash prediction under limited connected vehicle coverage: An ensemble deep learning model integrating multi-source traffic data. *Transportation Research Part C: Emerging Technologies*, 183, 105472. [DOI]

[J.17] **Han, L.*** and Abdel-Aty, M. (2025). Intersection crash analysis considering longitudinal and lateral risky driving behavior from connected vehicle data: A spatial machine learning approach. *Accident Analysis & Prevention*, 220, 108180. [DOI]

[J.16] **Han, L.*** and Abdel-Aty, M. (2025). Segment-level safety analysis using lane-changing behavior and driving volatility features from connected vehicle trajectories. *Scientific Reports*. [DOI]

[J.15] **Han, L.***, Abdel-Aty, M., Joo, Y.-J., Zhai, S., and Wang, D. (2025). Intersection crash frequency analysis considering visual environment features using a random-parameters negative binomial–Lindley model. *Transportation Research Record*. [DOI]

[J.14] Cui, P., Abdel-Aty, M., **Han, L.***, and Yang, X. (2025). Multiscale geographical random forest: A novel spatial machine learning approach for traffic safety modeling integrating street-view semantic visual features. *Transportation Research Part C: Emerging Technologies*, 179, 105299. [DOI]

[J.13] Wang, C., Abdel-Aty, M., and **Han, L.*** (2025). Grouped random-parameters Poisson–Lindley model with spatial effects addressing crashes at intersections: Insights from visual environment features and spatiotemporal instability. *Analytic Methods in Accident Research*, 100387. [DOI]

[J.12] Wang, C., Abdel-Aty, M., and **Han, L.*** (2025). Tunnel crash severity and congestion duration joint evaluation based on cross-stitch networks. *Accident Analysis & Prevention*, 213, 107942. [DOI]

[J.11] Wang, Z., Wang, C.*, Abdel-Aty, M., **Han, L.**, Huang, H., and Tang, J. (2025). Impact of speed on injury severity in single-vehicle run-off-road crashes: Insights from a partially temporally constrained modeling approach. *Accident Analysis & Prevention*, 210, 107848. [DOI]

[J.10] **Han, L.***, Yu, R., Wang, C., and Abdel-Aty, M. (2024). Transformer-based modeling of abnormal driving events for freeway crash risk evaluation. *Transportation Research Part C: Emerging Technologies*, 165, 104727. [DOI]

[J.9] **Han, L.***, Abdel-Aty, M., Yu, R., and Wang, C. (2024). LSTM + Transformer real-time crash risk evaluation using traffic flow and risky driving behavior data. *IEEE Transactions on Intelligent Transportation Systems*. [DOI]

[J.8] Wang, C., Abdel-Aty, M., **Han, L.***, and Easa, S. M. (2024). Analyzing speed-difference impacts on freeway joint injury severities of leading–following vehicles using statistical and data-driven models. *Accident Analysis & Prevention*, 206, 107695. [DOI]

[J.7] Yu, R., **Han, L.**, Abdel-Aty, M., Wang, L., and Zou, Z.* (2024). Improving model robustness of traffic crash risk evaluation via adversarial mix-up under the traffic flow fundamental diagram. *Accident Analysis & Prevention*, 194, 107360. [DOI]

[J.6] Wang, C.*, Abdel-Aty, M., and **Han, L.** (2024). Effects of speed difference on injury severity of freeway rear-end crashes: Insights from correlated joint random-parameters bivariate probit models and temporal instability. *Analytic Methods in Accident Research*, 42, 100320. [DOI]

[J.5] Wang, C., Abdel-Aty, M., Cui, P.*, and **Han, L.** (2024). Effects of helmet usage on moped riders injury severity in moped–vehicle crashes: Insights from partially temporally constrained random-parameters bivariate probit models. *Accident Analysis & Prevention*, 208, 107800. [DOI]

[J.4] Gao, Z., Xu, J., Yu, R.*, and **Han, L.** (2024). Utilizing an angle-based outlier detection method with a sliding-window mechanism to identify real-time crash risk. *Journal of Transportation Safety & Security*, 16(2), 157–174. [DOI]

[J.3] Zheng, Y., **Han, L.**, Yu, J., and Yu, R*. (2023). Driving risk assessment under the connected vehicle environment: A CNN–LSTM modeling approach. *Digital Transportation and Safety*, 2(3), 211–219. [DOI]

[J.2] Yang, D., Dai, J., Zhang, Y., **Han, L.**, and Yu, R*. (2023). Effects of spacing of highway roadside millimeter-wave radar detectors on the accuracy of a crash risk evaluation model (In Chinese). *Journal of Traffic Information and Safety*, 41(2), 28–35. [DOI]

[J.1] Yu, R., **Han, L.**, and Zhang, H*. (2021). Trajectory data-based freeway high-risk events prediction and its influencing factors analyses. *Accident Analysis & Prevention*, 154, 106085. [DOI]

Preprints and Conference Papers (preprints without links are available upon request)

[PP.5] **Han, L.***, Abdel-Aty, M., Kim, Y., Joo, Y., and Islam, Z. MMCAformer: Macro-Micro Cross-Attention Transformer for Traffic Speed Prediction with Microscopic Connected Vehicle Driving Behavior. *Accepted by 2026 TRB Annual Meeting, Under Review by IEEE Transactions on Intelligent Transportation Systems*

[PP.4] **Han, L.***, Abdel-Aty, M., and Joo, Y. Arterial Network Traffic State Prediction with Connected Vehicle Data: An Abnormality Aware Spatiotemporal Network. *Under Review by Transportation Research Part C: Emerging Technologies*

[PP.3] **Han, L.***, Abdel-Aty, M., Islam, Z., and Wang, C. Real-time Secondary Crash Likelihood Prediction Excluding Post Primary Crash Features. *Accepted by 2025 TRB Annual Meeting, Under Review by IEEE Transactions on Intelligent Transportation Systems.*

[PP.2] Wang, C.*, Abdel-Aty, M., **Han, L.**, and Yang, S. Real-Time Freeway Crash Occurrence and Type Prediction Using Connected Vehicle Data via a Spatiotemporal BiLSTM-Transformer. *Accepted by 2026 TRB Annual Meeting, Under Review by IEEE Open Journal of Intelligent Transportation Systems.*

[PP.1] Lu, J., Li, Z., **Han, L.**, and Guo, Q.* Measuring Nonlinear Relationships and Spatial Heterogeneity of Influencing Factors on Traffic Crash Density Using GeoXAI. *Accepted by 2026 TRB Annual Meeting, Under Review by Accident Analysis & Prevention.* [arXiv]

HONORS AND AWARDS

• **FTTE Future Stars Award** *November 2025*
  4th International Conference on Frontiers of Traffic and Transportation Engineering (FTTE 2025)
• **Department Fellowship** *2023-2024*
  Department of Civil, Environmental and Construction Engineering, UCF
• **China National Scholarship** *November 2021*
  (1 of 9 winners out of 326 students)
• **Second Prize: 18th China Postgraduate Mathematical Contest in Modeling (CPMCM)** *November 2020*
• **China National Encouragement Scholarship** *November 2019*
  (1 of 10 winners out of 420 students)
• **First Prize: 14th National Competition of Transport Science and Technology for Students** *November 2019*
  (1 of 2 winners out of 20 teams)
• **Tongji University 2nd-Class Outstanding Student Scholarship** *November 2019*

ACADEMIC SERVICES

• **Journal Reviewer**
  ◦ Accident Analysis & Prevention *(JCR Q1, reviewed 10 papers by 2025)*
  ◦ Transportation Research Part A: Policy and Practice *(JCR Q1)*
  ◦ Transportation Research Part C: Emerging Technologies *(JCR Q1)*
  ◦ Transportation Research Part E: Logistics and Transportation Review *(JCR Q1)*
  ◦ Expert Systems with Applications *(JCR Q1)*
  ◦ Journal of Traffic and Transportation Engineering (English Edition) *(JCR Q1)*
  ◦ Journal of Transport Geography *(JCR Q1)*
  ◦ Transport Policy *(JCR Q1)*
  ◦ Safety Science *(JCR Q1)*
  ◦ Journal of Transportation Engineering Part A: Systems *(JCR Q2)*
  ◦ Traffic Injury Prevention *(JCR Q2)*
• **Conference Reviewer**
  ◦ Transportation Research Board Annual Meeting *(2024-2026)*
  ◦ World Transport Convention *(2023-2024)*

SKILLS

◦ **Programming:** Python, R, BUGS (for Bayesian inference modeling), LaTeX
◦ **Software & Tools:** VS Code, Cursor, RStudio, WinBUGS, ArcGIS Pro, Zotero, Overleaf, Microsoft Office
◦ **Languages:** Chinese (Native), English (Fluent)

REFERENCES

1. **Dr. Mohamed Abdel-Aty (M.Aty@ucf.edu),** Profile
   Pegasus Professor, Trustee Endowed Chair, and former Chair of the CECE Department at UCF
   Director of Smart & Safe Transportation Lab (SST Lab)
   Editor Emeritus of Accident Analysis & Prevention
   Relationship: [e.g., Ph.D. Advisor]

2. **Dr. Rongjie Yu (yurongjie@tongji.edu.cn),** Profile
   Professor at the College of Transportation, Tongji University
   National Young Scholar (Ministry of Education of China)
   Worlds Top 2% Scientists (Stanford-Elsevier)
   Relationship: [e.g., M.S. Advisor]