Wenyao Leo Liu

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EDUCATION BACKGROUND

Oklahoma State University — Stillwater, OK

Ph.D. Civil Engineering (Pavement management and transportation safety) — Jan. 2019~Aug. 2022 (Expected)

Hunan University — Changsha, China

M.S. Civil Engineering (Pavement materials and mechanics) — Sep. 2015~Jun. 2018

Hunan University — Changsha, China

B.A. Civil Engineering (Bachelor-to-Master Consecutive Class*) — Sep. 2011~Jun. 2015

*Special class covering four directions: Structural, Bridge, Geotechnical, and Transportation Engineering

RESEARCH EXPERIENCE

1. **Multi-source Data Ananysis and Application in Transportation**
   - Statistical performance model development with govement-managed datasets
   - Pavement conditions prediction with machine learning on vehicular data
   - Transportation network assessment with spatial-temperal analysis on connected vehicle (CV) data
2. **Infrastructure Monitoring and Maintenance**
   - Decision making with Life Cycle Cost Analysis (LCCA)
   - Software, platform, and Auduino based hardware development
3. **Pavement Materials and Mechanics**
   - Exploration in low-cost, eco-friendly, and long-lasting materials
   - Mechanical analysis and simulation to improve pavement design

PEER-REVIEWED PUBLICATIONS

1. Li, J. Q.*, **W. Liu**, X. Yang, P. Lu, and K. C. P. Wang. 2022. “Statistical Safety Performance Models considering Pavement and Roadway Characteristics.” Journal of Advanced Transportation, 2022: e5871601. Hindawi. https://doi.org/10.1155/2022/5871601.
2. **Liu, W.**, J. Q. Li*, X. Yang, K. Wang, and W. Yu. 2022. “Integrating Skid Resistance and Safety Benefits into Life Cycle Cost Analysis for Pavement Surface Treatment Selection.” Journal of Transportation Engineering, Part B: Pavements, 148 (2): 04022015. American Society of Civil Engineers. https://doi.org/10/gpqm2m.
3. **Liu, W.**, J. Q. Li*, W. Yu, and G. Yang. 2021. “Change-Point Detection Approaches for Pavement Dynamic Segmentation.” Journal of Transportation Engineering, Part B: Pavements, 147 (2): 06021001. American Society of Civil Engineers. https://doi.org/10.1061/JPEODX.0000270.
4. **Liu, W.**, K. Yan, J. Q. Li*, and S. Yang. 2021. “Peridynamics-based simulation of semi-circular bending (SCB) testing.” Construction and Building Materials, 268: 121190. https://doi.org/10/gj74d8.
5. Yan, K., **W. Liu***, L. You, J. Ou, and M. Zhang. 2021. “Evaluation of waste cooling oil and European Rock Asphalt modified asphalt with laboratory tests and economic cost comparison.” Journal of Cleaner Production, 310: 127364. https://doi.org/10.1016/j.jclepro.2021.127364.
6. **Liu, W.**, K. Yan*, D. Ge, and M. Chen. 2018. “Effect of APAO on the aging properties of waste tire rubber modified asphalt binder.” Construction and Building Materials, 175: 333–341. https://doi.org/10/gj74fb.
7. Yang, G., K. Wang, J. Q. Li*, M. Romero, and **W. Liu**. 2022. “Laboratory and Field Performance Evaluation of Warm Mix Asphalt Incorporating RAP and RAS.” KSCE J Civ Eng, 26 (1): 107. https://doi.org/10/gn34vm.

8. Li, J. Q.*, K. Wang, S. A. Cross, **W. Liu**, and K. Suitor. 2021. "ODOT Involvement with the NCAT Test Track and Task Groups." International Conference on Transportation and Development 2021 (pp. 215-224). https://doi.org/10.1061/9780784483541.020.
9. Yan, K.*, H. Lan, Z. Duan, **W. Liu**, L. You, S. Wu, and M. Miljković. 2021. "Mechanical performance of asphalt rejuvenated with various vegetable oils." Construction and Building Materials, 293: 123485. https://doi.org/10.1016/j.conbuildmat.2021.123485.
10. Liu, J., K. Yan*, **W. Liu**, and X. Zhao. 2020. "Partially replacing Styrene-Butadiene-Styrene (SBS) with other asphalt binder modifier: Feasibility study." Construction and Building Materials, 249: 118752. https://doi.org/10.1016/j.conbuildmat.2020.118752.
11. Zhu, W., J. Pan, W. Ma*, S. Deng, W. Zhou, **W. Liu**, S. Long, C. Yang, and L. You. 2021. "Dynamic response of the heterogeneous deep-sea sediment with nonlinear gradient modulus to mining machine loading." Marine Georesources & Geotechnology, 40 (3): 255–266. Taylor & Francis. https://doi.org/10/gj8fnc.
12. Yan, K.*, W. He, M. Chen, and **W. Liu**. 2016. "Laboratory investigation of waste tire rubber and amorphous poly alpha olefin modified asphalt." Construction and Building Materials, 129: 256–265. https://doi.org/10.1016/j.conbuildmat.2016.10.090.
13. Zhang X., K Yan, and **W. Liu***. 2022. "Partially Replacing Cement with Rice Husk Ash (RHA) in Cement Stabilized Macadam (CSM) containing Reclaimed Asphalt Pavement (RAP) for Qualified Subbase." Road Materials and Pavement Design. (Under Review).
14. **Liu, W**, K Yan*, and Hongyan Ji. 2022. "Bonding Performance Evaluation on WTR-APAO Composite Modified Asphalt as Waterproof Adhesive Layer for Concrete Bridge". Construction and Building Materials. (Under Review).
15. **Liu, W.**, J. Q. Li, and K. Wang. 2022. "Pavement characteristics prediction by machine learning on vehicular sensor data." (In Preparation).

PATENTS

1. **Wenyao Liu** (2018). Bike Saddle Capable of Being Turned Over for Replacement. China Invention Patent.
2. **Wenyao Liu** (2016). A Moving-object Article Management System. China Unity Model Patent.

TECHNICAL REPORTS

1. Joshua Q. Li, Kelvin C. P. Wang, **Wenyao Liu**, and Wenying Yu. 2021. "Utilizing Pavement Friction and Texture Data for the Reduction of Traffic Crashes and Delays." Final Report FHWA-OK-21-01 (SP&R 2309). Oklahoma Department of Transportation (ODOT), Oklahoma City, OK.
2. Joshua Q. Li, Kelvin C. P. Wang, Wenying Yu, **Wenyao Liu** 2020. "Continuous Friction Measurement Equipment (CFME) for Highway Safety Management in Oklahoma." Final Report FHWA-OK-20-02 (SP&R 2306). Oklahoma Department of Transportation (ODOT), Oklahoma City, OK.

PARTICIPATED PROJECTS

1. Utilizing Pavement Friction and Texture Data for The Reduction of Traffic Crashes and Delays (2018-2021)
   PI: Joshua Q. Li
   Sponsor: *Oklahoma Department of Transportation*
   - Analyzed friction demands, influencing factors and appropriate models (3 papers published).
   - Developed spreadsheet software for integrating safety cost in life cycle cost analysis (LCCA).
   - Drafted final report and passed the ADA requirements at first submission.

2. Long Term Performance Monitoring of High Friction Surfacing Treatments (HFST) Sites (2016-2020)
   PI: Kelvin C.P. Wang
   Sponsor: *Federal Highway Administration, U.S. Department of Transportation*
   - Collected field performance data on 36 HFST sites over 12 states in U.S.
   - Evaluated the variation of HSFT sites over 3 years of observation
3. Ground Tire Rubber (GTR) Dry Process Experiment Pavement Surface Evaluation (2019-2020)
   PI: Kelvin C.P. Wang
   Sponsor: *Oklahoma Department of Transportation*
   - Collected field data on Ground Tire Rubber (GTR) treated pavement in Oklahoma
   - Analyzed friction data and field profile
4. Continuous Friction Measurement Equipment (CFME) For Highway Safety Management in Oklahoma (2017-2019)
   PI: Joshua Qiang Li
   Sponsor: *Oklahoma Department of Transportation*
   - Applied changepoint methods in dynamic segmentation based on CFME measurements
5. Laboratory Performance of Compound Modified Asphalts Using Waste Tire Rubber (WTR) and Amorphous Poly Alpha Olefin (APAO) (2016-2018)
   PI: Kezhen Yan
   Sponsor: *The Hunan Provincial Department of Education of China*
   - Evaluated the performance of compound modified asphalt with WTR and APAO
6. Anisotropic Mechanical Behavior of the Pavement Structure and Intelligent Retrieval of its Parameters (2014-2016)
   PI: Kezhen Yan
   Sponsor: *The National Natural Science Foundation of China*
   - Conducted experimental tests for providing parameters for mechanical simulation

CONFERENCE PROCEEDINGS AND PRESENTATIONS

1. **Wenyao Liu**, Joshua Qiang Li, Hamed Gholizadeh (2021). "Utilization of UAV for Estimating Cut and Fill in Roadway Construction and Design." The 2021 Oklahoma Transportation Symposium. July 27th, 2021. Oklahoma City, OK. (Poster Presentation)
2. **Wenyao Liu**, Joshua Qiang Li, Xue Yang, Guangwei Yang, Kelvin Wang (2021). "Pavement Condition Assessment Utilizing Smartphone and Vehicle Sensor Data." International Airfield & Highway Pavements Conference, American Society of Civil Engineers (ASCE). (Full Paper Under Preparation)
3. Joshua Q. Li, Kelvin Wang, Stephen A. Cross, **Wenyao Liu**, and Kevin Suitor (2020). "ODOT Involvement with the NCAT Test Track and Task Groups." International Airfield & Highway Pavements Conference, American Society of Civil Engineers (ASCE), Austin TX. (Full Paper Accepted)
4. **Wenyao Liu**, Joshua Qiang Li, Guangwei Yang, Xue Yang, Kelvin C. P. Wang (2020). "Utilizing Pavement Friction Data for the Reduction of Traffic Crashes and Delays." The 2020 Oklahoma Transportation Research Day (OTRD). Oklahoma City, OK. (Poster presentation)
5. **Wenyao Liu**, Guangwei Yang, Kelvin Wang, Joshua Q. Li, Xue Yang, Guolong Wang (2020). "Long Term Performance Monitoring of High Friction Surfacing Treatments (HFST) Sites." The 2020 Oklahoma Transportation Research Day (OTRD). Oklahoma City, OK. (Poster presentation)

6. **Wenyao Liu**, Guangwei Yang, Kelvin Wang, Joshua Qiang Li, Guolong Wang (2020). "Long Term Pavement Performance Monitoring of Six LTPP SPS-10 Sections in Oklahoma." The 2020 Oklahoma Transportation Research Day (OTRD). Oklahoma City, OK. (Poster presentation)
7. **Wenyao Liu**, Qiang Joshua Li, Wenying Yu, Guangwei Yang (2019). "Evaluation of Change Point Detection Approaches for Pavement Dynamic Segmentation." The 15th Annual Inter-University Symposium on Infrastructure Management (AISIM), Rutgers University, Piscataway, NJ. (Presentation only)
8. Xue Yang, Joshua Qiang Li, **Wenyao Liu**, Guangwei Yang, Kelvin Wang (2020). "Accident Prediction Modeling for At-Grade Highway-Rail Crossings." International Airfield & Highway Pavements Conference, American Society of Civil Engineers (ASCE), Austin TX. (Poster Presentation)
9. Xue (Helen) Yang, Joshua Q. Li, **Wenyao Liu** (2020). "Considering Grade Separation of Rail-Highway Crossings in Oklahoma." The 2020 Oklahoma Transportation Research Day (OTRD). Oklahoma City, OK.. (Poster presentation)
10. Guolong Wang, Guangwei Yang, Kelvin C. P. Wang, Joshua Q. Li, and **Wenyao Liu** (2020). "Ground Tire Rubber (GTR) Dry Process: Experiment Pavement Surface Evaluation." The 2020 Oklahoma Transportation Research Day (OTRD). Oklahoma City, OK. (Poster presentation)

Representative Honors

1. Best Poster Award, Second Place — Oklahoma City, OK. Oct. 2020
   Wenyao Liu, Joshua Li, Guangwei Yang, Xue Yang, and Kelvin C. P. Wang. "Utilizing Pavement Friction Data for the Reduction of Traffic Crashes and Delays." 2020 Oklahoma Transportation Research Day.
2. Outstanding Graduate of Hunan University — Changsha, China. Jun. 2018
3. National Scholarship for Graduate Student — Changsha, China. Sep. 2016

Professional Services

1. Reviewer for
   - Automation in Construction
   - Journal of Infrastructure Systems
   - Advances in Data Science and Adaptive Analysis
   - TRB Annual Meeting
2. Teaching assistant on
   - CIVE-3633-20472 Transportation Engineering Spring 2022
   - CIVE-3633-60636 Transportation Engineering Fall 2019

References

Qiang Joshua Li, Ph.D., P.E
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Email: qiang.li@okstate.edu

Kelvin C.P. Wang, Ph.D., P.E
Regents Professor, Oklahoma State University, Stillwater
Email: kelvin.wang@okstate.edu

*Additional references available upon request