YANG (CHRIS) SONG

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EDUCATION

The Pennsylvania State University, State College, PA   *Aug 2021 - Dec 2023 (Expected)*
Ph.D. Student in Civil Engineering (Transportation Research track, Continued)
- **Coursework:** Deterministic Models in Operations Research, Traffic Flow Theory and Simulation
- **Honors:** First place in the Center for Connected and Automated Transportation Global Symposium Student Poster Competition (2022); Leo P. Russell Graduate Fellowship in Civil Engineering (2023)

Missouri University of Science and Technology, Rolla, MO   *Jan 2019 - Aug 2021*
Ph.D. Student in Civil Engineering (Transportation Research track, Transferred)
- **Coursework:** Machine Learning Algorithms and Applications, Advanced topics in Data Mining

EXPERIENCE

Data-driven Charging Station Planning Research (@ Missouri S&T, Penn State)   *Jan 2019 - Present*
- Charging behavior analysis: Developed an ensemble learning model based on gradient boosting to model EV driver charging behavior, analyzing 4.5 years of data from 3,096 users and 468 charging stations in Kansas City. Achieved an R square value of 0.54 and a root mean square error of 0.14, outperforming benchmark models.
- Charging station location optimization: Proposed a two-stage learning-based demand-supply-coupled optimization model for charging station location, increasing charging usage rates by 14% compared to benchmark methods. Integrated EV charging demand management into infrastructure planning. Developed a greedy-based stochastic spatial search algorithm to solve the model.
- EV routing: Introduced an EV traffic assignment model for large-scale road networks with link interactions in community charging and path deviations, with a novel column-generation-based solution algorithm. Outperformed three benchmark algorithms in terms of accuracy and speed, leading to valuable insights for optimizing routing in community charging settings.

Electric Terminal Trucks Operation Analysis (@ Missouri S&T, Penn State)   *Sep 2020 - Present*
- Described the operation pattern of electric terminal trucks with operating status telematics data covering mileage driven, key-on time, and SOC value. Built an ensemble learning model to conduct endurance analysis for electric terminal trucks and determine the important factors impacting efficiency of battery level.
- Building a website to visualize the daily trajectory point, vehicle attributes and duty cycle information of electric terminal trucks.

Road Network Analysis (@ Missouri S&T)   *Jul 2020 - Jul 2021*
- Developed a tool named TMC2GMNS to convert road network from Traffic Message Channel (TMC) to General Modeling Network Specification (GMNS) format, which was more machine (and human) readable.
- Designed an algorithm to match two road networks based on bearing angle and distance of links. Visualize the two road networks with QGIS.

Roundabout Capacity Prediction (@ Missouri S&T, Penn State)   *Sep 2020 - Apr 2022*
- Analytically approximated and calibrated roundabout capacity by a merging state transition-based modeling approach. Validate the model performance with real-world vehicle trajectory data.
- Advanced the causality and theoretical understanding of roundabout capacity inference based on circulating speed, driver perception response time, and vehicle maximum deceleration.

Connected Autonomous Vehicle Development (@ Penn State)   *Sep 2021 - Present*
- Created HD map via RoadRunner for Autoware motion planning.
- Installed and configured CARMA Platform on Chrysler Pacifica modified by AutonomouStuff.

President of Institute of Transportation Engineers Student Chapter (@ Missouri S&T)   *Jul 2020 - Jul 2021*
- Organized and hosted seminars given by professionals in transportation field.
- Performed outreach with other Institute of Transportation Engineers student chapters in Missouri Valley District.

SELECTED PUBLICATIONS

Song, Y., Hu X.* (2023). **A Community-Charging-Oriented Electric Vehicle Traffic Assignment Model in a Large-Scale Road Network with Link Interaction and Path Deviations**. The 103rd TRB Annual Conference. Washington D.C. USA. (Accepted)

Song, Y., Hu X.* (2023). **A Two-Stage Demand Prediction and Optimization Modeling Framework for Charging Station Location Problem**. Transportation Research Part D: Transport and Environment.(Under Review)

Song, Y., Hu, X.* (2023). **Learning Electric Vehicle Driver Range Anxiety with An Initial State of Charge-Oriented Gradient Boosting Approach**. Journal of Intelligent Transportation Systems: Technology, Planning, and Operations.

Chen, C., **Song, Y.**, Wang, Y. D., Hu, X., Liu, J* (2023). A Machine Learning-Based Approach to Assess Impacts of Autonomous Vehicles on Pavement Roughness. Philosophical Transactions of the Royal Society A.

Qi, H.*, **Song, Y.**, Huang, Z., Hu, X. (2023). Deadlock Detection, Cooperative Avoidance and Recovery Protocol for Mixed Autonomous Vehicles in Unstructured Environment. IET Intelligent Transport Systems.

Song, Y., Hu, X.*, Lu, J., Zhou, X. (2022). Analytical Approximation and Calibration of Roundabout Capacity: A Merging State Transition-based Modeling Approach. Transportation Research Part B: Methodological.

Song, Y., Wang, D., Hu, X., Liu, J.* (2022) An Efficient and Explainable Ensemble Learning Model for Asphalt Pavement Condition Prediction Based on LTPP Dataset. IEEE Transactions on Intelligent Transportation Systems.

Tang, Q., Cheng, Y., Hu, X.*, Chen, C., **Song, Y.**, Qin, R. , (2021). Evaluation Methodology of Leader-Follower Autonomous Vehicle System for Work Zone Maintenance. Transportation Research Record: Journal of the Transportation Research

Cheng, Y., Chen, C., Hu, X.*, Chen, K., Tang, Q.,**Song, Y.**, (2021). Enhancing Mixed Traffic Flow Safety via Connected and Autonomous Vehicle Trajectory Planning with a Reinforcement Learning Approach. Journal of Advanced Transportation

Chen, C., **Song, Y.**, Hu, X.*, Guardiola, I. (2020). **Analysis of Electric Vehicle Charging Behavior Patterns with Function Principal Component Analysis Approach**. Journal of Advanced Transportation.

Tang, Q., Cheng, Y., Hu X.*, Chen, C., **Song, Y.** (2020). Field Testing and Evaluation of Leader-Follower Autonomous Truck Mounted Attenuator Vehicle System for Work Zone Maintenance. Presented on the 99th TRB Annual Conference. Washington D.C. USA, 12-16 January.

Du, Y., Liu C.*, **Song, Y.**, Li, Y., Shen, Y. (2019) Rapid Estimation of Road Friction for Anti-Skid Autonomous Driving. IEEE Transactions on Intelligent Transportation Systems.

Song, Y.*, Lu J. (2018). RNN-based Traffic Flow Prediction for Dynamic Reversible Lane Control Decision, Presented on the 13th International Conference on Intelligent Systems and Knowledge Engineering (ISKE2018), Belfast. UK, 21-24, August

Song, Y.,Chen Z.*, Liu C., Sun L. (2018). Highway Pricing in Road Network Considering Maintenance Cost. Presented on the 97th TRB Annual Conference. Washington D.C. USA, 7-11 January.

Song, Y.,Chen Z.*, Liu C., Sun L. (2017). Ordinal Cluster Division of Road Section Considering Maintenance Factor Weight. Presented on the 17th COTA conference International Conference of Transportation Professionals. Shanghai. China, 7-9 July.

PROJECTS

Electrifying Terminal Trucks in Unincentivized Markets	*USDOE, 2020-2023*
Electric Vehicle Charging Station Innovation: Streetlight Charging in City Right-of-Way	*USDOE, 2019-2023*

SKILLS

Languages	English and native proficiency in Mandarin (Chinese)
Programming	Python (NumPy/Pandas/Scikit-learn), C++, Matlab, SQL, JS, R, LaTeX
Tools	GIS, Linux, Algorithms, ML, DL, Optimization