Ruoyun Ma

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EDUCATION

Tsinghua University, Beijing, China   08/2015 - 07/2019 (expected)
- B.S. in Environmental Engineering, School of Environment. GPA: 3.71/4.0 (overall), 3.79/4.0 (major)
- Core Courses (A+/A: 95-100; A-: 90-94)
  Mathematics: Calculus 1 (A+), Calculus 2 (A), Linear Algebra (A), Probability and Statistics (A)
  Major: Solid Waste Treatment and Disposal Engineering (A), Air Pollution Control Engineering (A-), Environmental Planning (A-), Organic Chemistry (A-), Physical Chemistry (A-)
  Elective: Transportation Engineering (A-), Data Structures & Algorithms (A-), Operations Research (A-)

Tsinghua University, Beijing, China   09/2016 - 07/2019 (expected)
- B.S. in Economics, School of Economics and Management. GPA: 3.59/4.0

University of Michigan, Ann Arbor, MI, USA   07/2018 - 08/2018
- Visiting Research Student, Lab for Innovative Mobility System, CEE.
- Research Topic: Ride-sourcing electric vehicle behavior modeling; Charging infrastructure optimization.

PUBLICATIONS, CONFERENCES & PATENTS

- **Ruoyun Ma**[1], Xiaoyi He[1], Yali Zheng, Boya Zhou, Sheng Lu, Ye Wu*. Real-world driving cycles and energy consumption informed by large-sized vehicle trajectory data. Journal of Cleaner Production, 2019, 223: 564-574.
- Ye Wu*, Xiaoyi He, Hyung Chul Kim, Timothy J. Wallington, Shaojun Zhang, Wei Shen, Robb De Kleine, **Ruoyun Ma**, Yali Zheng, Boya Zhou. Cradle-to-Gate Greenhouse Gas (GHG) Burdens for Aluminum and Steel Production and Cradle-to-Grave GHG Benefits of Vehicle Lightweighting in China. Submitted to Applied Energy.
- **Ruoyun Ma**, Xiaoyi He, Ye Wu*. Using an iterative Markov Chain process to develop driving cycles based on large-scale GPS data: a case study in Beijing. Poster presented at 22nd International Transport and Air Pollution Conference, 2017 Nov 15-16, Zurich, Switzerland. [Poster]
- **Ruoyun Ma**, Pei Zhao, Xiaoyi He, Ye Wu, Zhi Kou, Weixiao Huang. A software platform for electric vehicle charging pile allocation optimization based on high-resolution charging demand analysis. China. Computer Software Copyright Registration.
- Pei Zhao, **Ruoyun Ma**, Xiaoyi He, Ye Wu. An optimization method of electric vehicle charging pile allocation based on high-resolution charging demand analysis. China. Patent of Invention. Application in process.

RESEARCH EXPERIENCES

Tsinghua University, Beijing, China
Principal Researcher; Advisor: Prof. Ye Wu (Vice Chair of School of Environment)
The Development of Vehicle Driving Cycles Based on Markov Chain Process   11/2016 - 05/2017
- Preprocessed second-by-second GPS data of 459 private passenger cars in Beijing using MATLAB, including data filtration, profile segmentation, and key parameter calculations.
- Classified data into different driving states by K-means clustering; Applied Markov Chain approach to generate driving cycles with similar properties as real-world driving based on over 13 million speed-time segments; Selected candidate cycles to minimize relative errors.
- Matched trajectory records with urban road networks via ArcGIS; Labeled segments temporally as peak or off-peak hours; Developed sub-cycles for road types and travel time to differentiate driving patterns.
- Proposed for the first time an application of mass real-world data to develop driving cycles under fine-scale traffic situations as well as an improved basis for emission estimation and fuel consumption simulation; Presented as the 1st author at the poster session of the 22nd International Transport and Air Pollution Conference (TAP 2017).

The Application of Driving Cycles on Vehicle Energy Consumption Evaluation   03/2018 - 09/2018
- Further analyzed comprehensive traffic characteristics from the data covering 17,000 sampling days, including velocity, acceleration, driving modes, and internal relations; Compared driving patterns of the derived cycles with standard driving cycles.
- Adopted the operating binning method to simulate vehicle energy consumption under the given driving cycle; Conducted pair analysis for various driving situations, reference criteria and load condition.
- Read copious literature for extensive discussions of simulation results; Summarized the pros and cons of different methods for driving cycle development and completed the paper writing.

- Distinguished 15.7% and 24.8% higher fuel consumption differences under Beijing real-world off-peak and peak cycles compared to NEDC-simulated results, which enlarge to 28.3% and 36.6% compared with vehicle type approval results. Emphasized the significance of employing local real-world driving cycles, addressing traffic congestion and constricting related regulations; Submitted the paper to Journal of Cleaner Production as the co-first author.

Optimizing the Allocation of Urban Electric Vehicle Charging Piles   11/2017 - 08/2018
- Extracted potential charging events from GPS trajectory records of 340 private electric vehicles over 750 months in total by MATLAB; Associated geographic POI data to the 1km × 1km city grid map and distinguished surface features by ArcGIS.
- Analyzed charging demand by kernel density estimation, depicting the relationships among parking time, regional types, and charging duration; Simulated charging events of city grids according to population density and fitted demand function.
- Developed a heuristic to optimize charging pile allocation in city grids, maximizing the utilization ratio of charging piles as well as the convenience for drivers, and subject to the constrains of a given amount of charging piles and specified hypothetical scenarios of electric vehicle penetration.
- Provided a new perspective for private vehicle charging infrastructure optimization, based on high-resolution demand analysis; Cooperatively developed a visualized case website for Shanghai [Chinese Version]; Filed for the patent of invention and the software registration in China.

University of Michigan, Ann Arbor, MI, USA   07/2018 - 08/2018
Principal Researcher; Advisor: Prof. Yafeng Yin (Transportation Research Part C, Editor in Chief)
Developing an Agent-based Model of Ride-sourcing Electric Vehicles for Charging Station Optimization
- Developed a data-driven simulation model to mimic spatial and temporal travel behaviors of ride-sourcing electric vehicles (RSEVs); Adopted AnyLogic, an agent-based simulation software, to build a framework and implement a set of behavior rules for taking orders and charging.
- Processed over 32 million ride-sourcing conventional vehicle trajectory records from DiDi through MATLAB, including data cleaning, coordinate correction and pattern analysis; Applied those data for simulation experiments in the model; Calculated total missed trips and utilization ratio of charging stations as measures of performance.
- Conducted sensitivity analysis to distinguish prominent parameters of the system; Developing heuristics based on metamodel approach to optimize charging station deployment plans.
- Built an agent-based model for RSEV driving behavior from a microcosmic perspective; Simultaneously visualized the model on the regional map and the variation of objectives [Video (preliminary version)].

AWARDS & HONOR
- Fellowship, THU Spark Program (for talent in scientific research, Top 1% university-wide)   2017
- Tsinghua-Veolia Scholarship (Top 5%)   2018
- Tsinghua-Evergrande Scholarship (Top 5%)   2017
- Tsinghua-Suzhou Industrial Park Scholarship (Top 5%)   2016
- Innovation Award, 13th National Environmental-friendly Sci & Tech Competition (Top 5%)   2018
- Third Prize, 36th Tsinghua University Challenge Cup Sci & Tech Competition (Top 15%)   2018
- Award for Comprehensive Excellence; Award for Excellence in Academic Performances; Award for Excellence in Research and Innovation; Award for Excellence in Social Work.   2016; 2017; 2018

LEADERSHIP & ACTIVITIES
Student Union, School of Environment, THU | **Vice Chair**   09/2016 - 06/2017
- Developed ground-breaking cooperative relationships between Student Union and several enterprises (e.g., Want Want Corp), and obtained plenty of sponsorship (over ¥30,000) for student activities.
- Creatively planned and organized a series of lectures on student career development, and invited alumni to share their personal experiences and the market insights, all of which were well received by participants.

COMPUTER SKILLS
- Proficient: C/C++, MATLAB, ArcGIS, AnyLogic, SPSS, Microsoft Office
- Familiar: AutoCAD, Java, Python, LaTeX, R

STANDARD TEST SCORES

TOEFL	106	Reading 29, Listening 28, Speaking 22 (Best 23), Writing 27
GRE	325 + 4.0	Verbal 155, Quantitative 170, Analytical Writing 4.0