MINGDONG LYU

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EDUCATION

University of Southern California
Ph.D. of Industrial System Engineering; GPA:3.76 — Aug. 2018 ~ May. 2023
Master of Computer Science; GPA: 3.9 — Aug. 2021~ Dec. 2022
Harbin Institute of Technology
Master of Electrical Engineering; GPA: 3.64 (Top 5%) — Sep. 2016 ~ Jul. 2018
Bachelor of Electrical Engineering; GPA:3.71 (Top 2%) — Sep. 2012 ~ Jul. 2016

WORK EXPERIENCE

National Renewable Energy Laboratory (NREL) - Postdoctoral Researcher — Oct 2022 ~ Present

➢ **PPO Reinforcement Learning for Vehicle Routing**
- Implemented PPO reinforcement learning algorithms to derive optimal routing policies, focusing on the minimization of costs through the strategic balance of time, distance, and energy parameters.

➢ **Freight Delivery Vehicle Routing Problem under Travel Time Uncertainty**
- Addressed the freight vehicle routing problem within the San Francisco region by integrating local-cheapest-insertion algorithms with Monte-Carlo simulations on NREL's Eagle HPC, considering capacity constraints, window time, and travel time uncertainty.

➢ **Hierarchical Optimization Method (HOME) for eVTOL Network Design**
- Initiated a comprehensive study on eVTOL network design through the formulation of a path-based optimization problem, advancing to the development of a Hierarchical Optimization Method (HOME) that integrates integer linear programming with parallel computing for enhanced computational efficiency and precision. This methodological innovation was rigorously evaluated against traditional Genetic Algorithms, with findings published in peer-reviewed forums.

➢ **Dynamic Multimodal Route Planner for Large-Scale Mobility Analysis**
- Collaboratively developed a dynamic multimodal routing algorithm using A* search to integrate various travel modes, dynamically adjust travel times, and employ parallel AWS for performance improvement. Integrated this algorithm into the Mobility, Energy, and Productivity (MEP) framework for enhanced precision in accessibility computations through detailed path-centric analyses, showcasing advanced technical skills in algorithm development and system integration.

➢ **Multi-model Route Energy Prediction under Uncertainty with Routee Powertrain**
- Designed and deployed a suite of algorithms, including Random Forest, XGBoost regression, and Multi-layer Perceptron Neural Network, to accurately forecast energy costs under uncertainty for individual road links, offering a diverse model selection for Routee Powertrain users.

➢ **Self-attention Graph Convolution Network Model for International Air Passenger Flow**
- Developed a Self-Attention Graph Convolutional Network (SAGCN) model using the Eagle HPC platform to predict international air passenger flows, utilizing node embedding and self-attention mechanisms.

University of Southern California (USC) - Research Assistant — Aug 2018 ~ May 2023

➢ **Integrated Modeling and Healthcare Resource Optimization in Pandemics**
- Developed a time-varying compartmental model for epidemic intervention assessment under uncertainties, and a dynamic optimization strategy for vaccine distribution, incorporating a novel first-order Euler simplification to address non-linear differential equations in vaccine allocation against availability and regional transmission dynamics.

SKILLS

Computer Science: Analysis of Algorithms; Machine Learning; Deep Learning and Its Applications; Foundations of Artificial Intelligence; Database Structure
Operation Research: Foundations of Optimization; Foundations of Stochastic Process; Large Scale Optimization for Machine Learning; Advance Design of Experiments; Linear Programming; Mixed-Integer Programming
Statistics: Mathematical Statistics; Numerical Analysis and Computation; Theory of Probability; Real Analysis
Software/Tools: Pytorch; TensorFlow; AWS; Keras; Tableau; GitHub; Google OR Tool
Programming Language: Python (pandas, numpy, scikit-learn, etc); R (dplyr, ggplot2, Shiny); SQL; MATLAB; PySpark

PUBLICATIONS

1. Mingyi He, **Mingdong Lyu** et al., "A Hierarchical Optimization MEthod (HOME) for eVTOL Network Design", Computer-Aided Civil and Infrastructure Engineering, 2023 (Under review)
2. Mingyi He, **Mingdong Lyu** et al., "GravAttn: A spatially transferable gravity model for trip distribution based on Graph Attention Network and self-attention", Transportation Research Board, 2023.
3. **Mingdong Lyu**, R. Hall et al., Dynamic Vaccine Allocation for Control of Human Transmissible Disease, Health Care Management Science, 2023 (Under review)
4. A. Moore, **Mingdong Lyu**, R. Hall, "Tracking Covid-19 Cases and Deaths in the United States Distribution of Events by Day of Pandemic", Statistical Methods in Medical Research, 2021

AWARDS

- Health Systems Science and Innovation Student Innovators Fellowship 2022
- USC Viterbi Ph.D. Fellowship in Industrial & Systems Engineering 2018~2019
- Outstanding Graduate of Harbin Institute of Technology 2018
- First Prize Academic Scholarship of Harbin Institute of Technology 2016~2017
- First Prize Scholarship Sponsored by Infineon Technology 2016~2017
- First Prize Scholarship for Graduate Student of Harbin Institute of Technology 2015~2016
- Outstanding Graduate Thesis of Harbin Institute of Technology 2016
- Meritorious Winner of Mathematical Contest in Modeling 2015