Haitam Laarabi, Ph.D.

/* <u>Computer Scientist</u> by Training, <u>Transportation Energy Scientist</u> by Specialization */

Portfolio: BEAM CORE (BEAM.LBL.GOV, GitHub/LBNL-UCB-STI) • Carsharing (GitHub/CARSHARING)
Contacts: +1 (510) 705-3806 | hmlaarabi@gmail.com • **Links**: • **Speaks**: English, Italian, French, Arabic, Moroccan Dialect

WORK EXPERIENCE

Lawrence Berkeley National Laboratory
Energy Technologies Area, Berkeley, CA, USA

At Berkeley Lab, I co-led the development of BEAM CORE, an open-source, regional-scale agent-based transportation modeling platform. I was responsible for developing, operating, and integrating BEAM CORE with energy systems to support transportation and energy studies. BEAM CORE includes a variety of models, such as a coevolutionary algorithm to resolve congestion and the choice of transportation modes, as well as models for land use, demographics, vehicle ownership, activity patterns, firm synthesis, commodity flows, powertrain adoption, routing, and dynamic traffic assignment. BEAM CORE is one of the few comprehensive models of its kind, recognized for its modularity and accessibility, and is primarily built using Scala, Akka, Java, and Python with open data.

NOVEMBER 2023 TO PRESENT
Career Transportation Research Software Developer (Transitioning to Research Scientist)

PI and and Technical Lead on two cutting-edge projects; Task Coordinator on a multi laboratory project ($15 million budget):

(1) I serve as Principal Investigator at Berkeley Lab for a Health Effects Institute-funded project that integrates BEAM CORE with health risk assessment to evaluate the health impacts of traffic-related air pollution. Currently, I have developed a decision tree probabilistic regression model to characterize vehicle fleets and emissions processes, and automated the integration of multiple models for efficient scenario analysis. I also oversee the calibration, validation, and design of transportation scenarios for the San Francisco Bay Area.

(2) I serve as Co-PI on a Google-funded project developing a model to assess energy consumption and potential savings from the widespread deployment of robotaxis using BEAM CORE. The work considers on-board computing requirements, including hardware architecture, AI model characteristics, and data transfer needs. I also support other tasks by conducting a literature review on data center energy use and exploring how GenAI can improve energy efficiency in manufacturing processes, such as cement production, as well as HVAC systems.

(3) I am coordinating a task on a US Department of Energy (DOE) funded project that involves working closely with four major Metropolitan Planning Organizations (MPOs)—notably PSRC, MTC, SCAG, and the Boston Region—to understand their transportation modeling workflows and help upgrade their demographic and freight models using BEAM CORE. My role includes supervising the calibration of models from national data to MPO-specific data and collaborating with sub-task leads to adjust model interfaces for activating MPO-specific scenario levers.

(4) I'm leading a sub-task under DOE funded project in close collaboration with Seattle DOT and SFCTA to study EV curb incentives and the impact of double parking on congestion and freight operations in downtown Seattle, as well as conducting sensitivity analyses of on-demand delivery services (such as UberEats) in San Francisco. My role includes developing on-demand delivery simulations in BEAM and integrating them with an e-commerce model, developing double parking capabilities for network traffic modeling, creating speed and VMT calibration processes, and supervising scenario analysis.

NOVEMBER 2018 – OCTOBER 2023
Career-track Energy Policy Project Scientist

Task lead on several DOE-funded projects and Senior Researcher on a GM Cruise LLC-funded project (budget over $20 million):

(1) Co-led the design, development, and deployment of BEAM CORE, specifically architecting and implementing innovative algorithms for ride-hailing, autonomous vehicle coordination, car-sharing, micromobility, and freight vehicle assignments (VSP).

(2) Co-led BEAM CORE co-simulation with a power grid model by developing a charging behavior model, which includes a multinomial logit charging choice model, a site power manager, and a charging siting model. I also supervised the development of a behind-the-meter storage model to manage the EV ride-hail fleet.

(3) I developed a multi-ridehail competing fleet simulation capability in BEAM CORE for a Cruise LLC-funded project and supervised a sensitivity analysis study on shared autonomous electric vehicle fleets in the San Francisco area.

Italian National Research Council
Ubiquitous Internet Lab, Pisa, Italy

JUNE 2015 – OCTOBER 2018
Postdoctoral Researcher

As part of a European Union project, I architected and developed a generic car-sharing traffic simulation framework using the MATSim model and integrated it with an activity-based demand model. I applied this framework to study the operational model of an innovative concept for mechanically attached shared cars, enabling more efficient repositioning similar to a road train. This project was successfully commercialized as Kiwee Mobility.

Novedia Group
Novedia Morocco, Casablanca, Morocco

FEBRUARY 2011 – FEBRUARY 2012
Software Engineer

Developed a social media platform for entrepreneurs using Java/JEE and Liferay for a French telecommunications company, and worked with a team on the enhancement of an intranet platform for the incident management system at PSA Peugeot Citroën.

Education

2014 **Ph.D., Systems Monitoring and Environmental Risk Management**

École des Mines de Paris & University of Genoa

Thesis Title: *Multicriteria route optimization for dangerous goods transport using fuzzy risk assessment and agent-based traffic simulation* [🎓]

Area of Studies: *Sciences and Engineering of Hazardous Activities & Industrial and Information Engineering*

2011 **M.Sc., Software Engineering and Systems Integration**

Faculty of Science and Technology of Mohammedia

2008 **B.Sc., Computer and Mathematical Science**

Faculty of Sciences of Aïn Chock, Morocco

Science & Modeling Skills

Math & Computer Science: Graph Theory & Path Planning • MPC & Optimization • Fuzzy & Bayesian Inference • Multi-Agent Systems • Multinomial Logit Model • Evolutionary and Metaheuristics Algorithmic • Actor Model • Machine Learning (Regression, Clustering, Decision Trees, Dimensionality Reduction) • Dynamic Programming

Transportation & Energy Modeling: Charging Siting & Behavior • Vehicle Ownership • Destination and Mode Choice • Activity-Based Model • Autonomous Vehicles & On-board Computing Consumption • Last-Mile Delivery • Shared Mobility • Co-Simulation (HELICS Framework) • Simulation (MATSim and SUMO Frameworks)

Interdisciplinary Knowledge: Energy Storage Management, Land Use & Demographic Evolution, Commodity & E-commerce, Risk from HazMat Transport, Traffic-related Emissions & Air Pollution

Engineering Skills

~15 years: Java/Scala, QGIS, Git, Maven, OpenStreetMap
~7 years: Python, R, AWS/GCE, GeoTools, Gradle
~5 years: MySQL, MongoDB, C++ (QT, Boost, MFC)
~1-2 years: R5 Router, Graph-Tool, OR-Tools, JSprit, Google APIs

US DOE CODE Software Releases [links]

[</>] Needell, Z., Waddell, P., Caicedo, J., **Laarabi, H.**, Wang, Y., Poliziani, C., Lazarus, J., Openkov, D., Gardner, M., Rezaei, N. and Auld, J. (2024). *Platform for Integrated Land use And Transportation Experiments and Simulation (PILATES) v1.0*

[</>] Lazarus, J., Sheppard, C., Jiang, X., Waraich, R., **Laarabi, H.**, Needell, Z., Hiry, J., Fitzgerald, R., Illin, N., Openkov, D. and Sharma, R. (2024). *Behavior, Energy, Autonomy, Mobility Modeling Framework (BEAM) v1.0*

US DOE Reports [links]

2024: [DOE Energy Storage & AI] • [BEAM CORE] • [BEAM]
2020-2023: [Grid/XFC Y3] • [Grid/XFC Y2] • [Grid/XFC Y1]

Selected Papers [links]

[] Aka, J., Panossian, N., & **Laarabi, H.** (2025). *Economic Storage Size Optimization for Electric Vehicle Extreme-Fast Charging Stations.* **(Accepted for the 2025 IEEE Power & Energy Society General Meeting)**

[🌐] **Laarabi, H.** et al. (2025). *BREATHE: Bridging Realms for Equitable Assessment of Traffic-related Health Effects.* Health Effects Institute Annual Conference 2025

[🎓] Poliziani, C., Needell, A. Z., **Laarabi, H.**, et al. (2024). *Simulating Impacts from Transit Service Enhancements in the San Francisco Bay Area*

[🎓] Xu, X., Yang, H.C., Jeong, K., Bui, W., Ravulaparthy, S., **Laarabi, H.**, et al. (2024). *Teaching freight mode choice models new tricks using interpretable machine learning methods*

[🎓] **Laarabi, H.**, Xu, X., Jin, L., Brauer, M., Spurlock, A., Kirchstetter, T., Marshall, J., Arku, R., et al (2024). *A High-Resolution, Large-Scale Agent-Based Transport Model for Health Outcomes Evaluation from Policy Changes*

[🎓] Poliziani, C., Hsueh, G., Czerwinski, D., Wenzel, T., Needell, Z., **Laarabi, H.**, et al. (2023). *Micro Transit Simulation of On-Demand Shuttles Based on Transit Data for First-and Last-Mile Connection*

[🎓] Panossian, N.V., **Laarabi, H.**, et al. (2023). *Architecture for co-simulation of transportation and distribution systems with electric vehicle charging at scale in the san francisco bay area*

[🎓] **Laarabi, H.**, Boldrini, C., Bruno, R., Porter, H., Davidson, P. (2019). *User-Based Relocation of Stackable Car Sharing*

[🎓] Boulmakoul, A., **Laarabi, M. H.**, Sacile, R. et al. (2017). *An original approach to ranking fuzzy numbers by inclusion index and Bitset Encoding*

[🎓] **Laarabi, M. H.**, Bruno, R. (2017). *A Generic Software Framework for Carsharing Modelling Based on a Large-Scale Multi-agent Traffic Simulation Platform* **(Nominated for Award)**

[🎓] **Laarabi, H.**, Boldrini, C., Bruno, R., et al. (2017). *Integration of Demand and Operational Models for an Agent-based Model of a Stackable Electric Vehicle*

[🎓] **Laarabi, M. H.**, Boldrini, C., Bruno, R., Porter, H. and Davidson, P. (2017). *On the performance of a one-way car sharing system in suburban areas: A real-world use case*

[🎓] Boulmakoul, A., **Laarabi, M. H.**, Sacile, R. et al. (2017). *An original approach to ranking fuzzy numbers by inclusion index and Bitset Encoding*

[🎓] **Laarabi, M. H.**, Boulmakoul, A., Mabrouk, A., Sacile, R. and Garbolino, E. (2016). *Real-timefastest path algorithm using bidirectional point-to-point search on a Fuzzy Time-Dependent transportation network*

[🎓] **Laarabi, M. H.**, Boulmakoul, A., Sacile, R. and Garbolino, E. (2014). *A scalable communication middleware for real-time data collection of dangerous goods vehicle activities*