

PABLO GUARDA

United States

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Education

Carnegie Mellon University (CMU)

Pittsburgh, PA

PhD in Transportation Engineering

August 2023

- Thesis: Inferring demand and supply characteristics of transportation networks through multi-source system-level data
- Award: Tata Consultancy Services (TCS) Presidential Fellowship 2021-2022

Master of Science in Machine Learning

December 2022

- Selected Coursework: Machine Learning with Large Datasets, Graduate Artificial Intelligence, Convex Optimization, Intermediate Deep Learning, Deep Reinforcement Learning, Probabilistic Graphical Models

University College London (UCL)

London, United Kingdom

Master of Science in Cognitive and Decision Sciences

July 2017

- Thesis: A psychological approach to understanding decisions about time in public transport.
- Award: Becas Chile - Conicyt Master Fellowship 2016 - 2017

Pontifical Catholic University of Chile (PUC)

Santiago, Chile

Master of Science in Transportation Engineering

July 2015

- Thesis: What is behind fare evasion in public transport? An econometric approach

Bachelor of Science in Industrial Engineering

December 2013

- Award: John Paul II Foundation Undergraduate Fellowship 2009 - 2013

Skills

Programming Languages: Python, R, C#, Bash, Java, Visual Basic

Developer Tools: VS Code, PyCharm, RStudio, Docker, Git, Github, Gitlab, Linux terminal, Eclipse, Spyder, Conda

Data Science: Pandas, Numpy, Scikit-learn, NetworkX, GeoPandas, Tidyverse, SQL, Tableau, QGIS, ArcGIS, Stata, SPSS

Cloud and Parallel Computing: AWS, IBM Cloud, Spark

Simulation and Optimization: SciPy, CVXPY, Matlab, Octave, Arena, Gurobi, AMPL, Maple

Deep Learning Frameworks: TensorFlow, PyTorch, Torchvision, RasterVision

Languages: Advanced level in reading, writing and conversational English and Spanish (native)

Professional Experience

Fujitsu Research, Convergence Technologies Lab

Pittsburgh, PA

Principal Researcher

August 2024 - Present

- Presenting demos to multiple stakeholders of a new traffic simulation technology that performs end-to-end optimization for toll allocation and pricing, and estimates the local and network-wide impacts of traffic incidents and road closures
- Developing a computer vision pipeline to perform more accurate road segmentation on high-resolution satellite imagery using Segment Anything (SAM) foundational model and point prompts sampled from OpenStreetMap street centerlines

Senior Researcher

August 2023 - July 2024

- Built and led a team of data scientists to successfully integrate the data-driven traffic simulator developed during my PhD into Fujitsu's Social Digital Twin platform, enabling fast, automated and scalable city-wide traffic simulation
- Presented a conference paper and filed a patent with Carnegie Mellon University researchers on an innovative traffic simulator that can be trained with satellite imagery and multi-source spatiotemporal data
- Developed and deployed a machine learning pipeline that leverages state-of-the-art computer vision algorithms and geospatial packages to estimate road traffic at a city scale using satellite imagery and OpenStreetMap data

AT&T Labs, Network Analytics and Automation

Remote

Research Intern, PhD

June 2022 - August 2022

- Implemented a machine learning pipeline to predict cellular traffic using open-source and AT&T proprietary datasets
- Filed a patent of a machine learning system that ranks the best locations to build new cellular towers
- Prototyped a web-based tool to support AT&T network planning operations in San Jose, CA

Inter-American Development Bank (IDB)

Santiago, Chile

External Consultant

February 2018 - July 2018

- Processed datasets with millions of smartcard transactions and fare evasion records collected from a bus system in Chile
- Trained random forest, support vector machines and logistic regression models to identify bus stops with high evasion

- Computed data quality KPIs with scraped data from BRTData.org to improve the website's data collection strategy
- Estimated multiple linear and ordinal logistic regression models to capture the relationship between performance and design elements of bus rapid transit systems worldwide using data from BRTData.org

- Leveraged classic statistical methods and publicly available datasets to benchmark bus rapid transit systems in China
- Published a journal article and a grey paper that convey the research findings to practitioners and policymakers
- Created a Tableau dashboard to benchmark bus rapid transit systems worldwide based on the article's methodology

Research Experience

Carnegie Mellon University (CMU)

Pittsburgh, PA

- Released three open-source repositories to model travel behavior and traffic flow dynamics in transportation networks
- Leveraged computational graphs and neural networks to compute traffic equilibrium, estimate city-wide traffic flow and travel time, and learn time-varying origin-destination matrices in large-scale transportation networks
- Developed new large-scale optimization algorithms and a hypothesis test framework to estimate travelers' route choice preferences using traffic counts and diverse geospatial data sources at the network-level
- Implemented Python modules to automatically process multiple geospatial and spatio-temporal data sources, including traffic incidents, transportation infrastructure, U.S Census features, traffic counts and travel time measurements

Centre of Excellence for Bus Rapid Transit (BRT-CoE)

Santiago, Chile

- Implemented a lab experiment in Python Qt that simulated with animations the route choice in public transport
- Estimated discrete choice models to capture the impact of travel time variability and time perception on route choices
- Presented research findings in four international conferences in the fields of Cognitive Science and Transportation Science

Centre for Sustainable Urban Development (CEDEUS)

Santiago, Chile

- Integrated econometric and mathematical programming methods to optimize the allocation of bus ticket inspectors
- Published a journal article and received the best paper award at an international transportation conference

Publications

Liu, J., **Guarda, P.**, Niinuma, K., Qian, S., 2024. Enhancing multi-class mesoscopic network modeling with high-resolution satellite imagery. *2024 IEEE 27th International Conference on Intelligent Transportation Systems (ITSC)*, Edmonton, Canada.

Guarda, P., Qian, S., 2024. Traffic estimation in unobserved network locations using data-driven macroscopic models. Under review at *Transpormetrica A: Transport Science*. Preprint available at <https://doi.org/10.48550/arXiv.2401.17095>

Guarda, P., Battifarano, M., Qian, S., 2023. Estimating network flow and travel behavior using day-to-day system-level data: a computational graph approach. *Transportation Research Part C: Emerging Technologies* 158.

Guarda, P., Qian, S., 2023. Statistical inference of travelers' route choice preferences with system-level data. *Transportation Research Part B: Methodological* 179.

Geng, K., Wang, Y., Cherchi, E., **Guarda, P.**, 2023. Commuter departure time choice behavior under congestion charge: Analysis based on cumulative prospect theory. *Transportation Research Part A: Policy and Practice* 20, 55-71.

Astroza, S., **Guarda, P.**, Carrasco, J., 2022. Modeling the relationship between food purchasing, transport, and health outcomes: Evidence from Concepcion, Chile. *Journal of Choice Modelling* 42, 100341.

Guarda, P., Velásquez J., Tun H. , Chen, X., Zhong, G., 2017. Comparing Chinese and non-Chinese Bus Rapid Transit: Evidence from evaluation of global BRT based on BRT design indicators. *Transportation Research Record* 2647, 118-126.

Velásquez J. , Tun H., Hidalgo, D., Ramos, C., **Guarda, P.**, Chen, X., Zhong, G., 2017. Bus Rapid Transit in China: A Comparison of Design Features with International Systems. World Resources Institute, Washington D.C., USA. Available at <http://www.wri.org/publication/bus-rapid-transit-in-china>

Guarda, P., Galilea, P., Handy, S., Muñoz, J.C., Ortúzar, J. de D., 2016. Decreasing fare evasion without fines? A microeconomic analysis. *Research in Transportation Economics* 59, 151-158.

Guarda, P., Galilea, P., Paget-Seekins, L., Ortúzar, J. de D., 2016. What is behind fare evasion in urban bus systems? An econometric approach. *Transportation Research Part A: Policy and Practice* 20, 55-71.

Patents

Guarda, P., Liu, J., Niinuma, K., Qian, S., 2024, Traffic simulator adjustment using satellite imagery and multi-source spatiotemporal data, U.S. Patent 18/791,147, filed on July 31, 2024, with Fujitsu Research. Patent pending.

Liu, Z., Chen, X., Liu, Y., Hsu, C., Shahi, N. **Guarda, P.**, 2022, Cellular traffic prediction using open transportation data, U.S. Patent 18/536,791, filed on December 12, 2023, with AT&T labs. Patent pending.