Pablo Guarda

CONTACT INFORMATION

E-mail: pablo.guarda.ml@gmail.com
Web: pabloguarda.github.io

EDUCATION

Carnegie Mellon University (CMU), Pittsburgh, PA, US

PhD in Transportation Engineering, 2023

- Thesis: Inferring demand and supply characteristics of large-scale transportation networks through multi-source system-level data
- Advisor: Sean Qian
- Research Group: Mobility Data Analytics Center (MAC)

M.S. in Machine Learning, 2022

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

University College London (UCL), London, UK

M.S. in Cognitive and Decision Sciences, 2017 (Distinction, *summa cum laude*)

- Thesis: A psychological approach to understanding decisions about time in public transport. Evidence from lab experiments in London, UK and Santiago, Chile [1] [2]
- Advisors: Nigel Harvey, Paula Parpart and Juan Carlos Muñoz
- Selected Coursework: Introduction to Cognitive Science, Principles of Cognition, Judgment and Decision-Making, Social Cognition Research Methods

Pontifical Catholic University of Chile (PUC), Santiago, Chile

M.S. in Transportation Engineering, 2015 (Maximum Distinction, *summa cum laude*) [1]

- Thesis: What is behind fare evasion in public transport? An econometric approach [1]
- Advisors: Juan de Dios Ortúzar and Patricia Galilea

B.S. in Industrial Engineering, Diploma in Transportation, 2013 (Maximum Distinction) [1]

- Selected Coursework: Transport Economics, Travel Demand Modelling, Transport Externalities, Econometrics Theory, Econometric Models in Engineering, Network Modelling, Operations Research, Stochastic Models, Simulation, Marketing

Minor in Social Psychology, 2013 [1]

PROFESSIONAL EXPERIENCE

Uber Technologies, San Francisco, CA

Scientist **May 2025 - Present**

- Leading the Science team's work on guest vertical products within Uber for Business [U4B]

Fujitsu Research, Convergence Technology Lab, Pittsburgh, PA

Principal Researcher **August 2024 - May 2025**

- 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 - Present**

- Leading a cross-functional team of data scientists and software engineers to enhance and integrate the data-driven traffic simulator developed during my PhD into Fujitsu's Social Digital Twin platform
- Collaborating with Carnegie Mellon University researchers in the development of an innovative traffic simulator that can be calibrated using satellite imagery and multi-source spatiotemporal data, including traffic counts and traffic speeds
- Implemented 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 - Aug 2022**

- Trained deep learning models with open spatio-temporal transportation data to predict cellular traffic in the 4G network
- Developed a prototype of a web-based tool to support planners on where to build new cellular towers in San Jose, CA
- Disseminated work in presentations and reports and prepared invention disclosure form for patenting the predictive tool

Inter-American Development Bank (IDB), Santiago, Chile [1]

External Consultant **February 2018 - July 2018**

- Conducted research on fare evasion and universal accessibility in public transport systems
- 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

World Resources Institute (WRI), Ross Centre for Sustainable Cities, Washington D.C., USA [1]

External Consultant **August 2016, March 2017**

- Designed and computed a set of indicators to measure different quality aspects of the data published in BRTData.org
- Coauthored a journal article and a report on bus rapid transit in China
- Collaborated in a report exploring the relationships between design elements and operational performance in BRTs.
- Recruited and onboarded a new researcher in the project Next Generation of BRT in China.

Transport Research Intern **February 2016 - July 2016**

- Conducted research and data analysis as part of a project with the Inter-American Development Bank and the Global Environment Facility to promote low-carbon technology in public bus systems in Latin America and the Caribbean.
- Continued collaborating as a researcher in the project Next Generation of BRT in China, with the BRT-CoE

Research Experience

Carnegie Mellon University (CMU), Pittsburgh, PA

Graduate Research Assistant **August 2019 – Present**

- Released three open-source Github repositories to learn travel behavior and to model traffic flow dynamics in transportation networks
- Leveraged computational graphs to compute traffic equilibrium and to learn time-varying origin-destination matrices in medium and large-scale transportation networks
- Developed a bilevel optimization algorithm to statistically infer route choice models with system-level data

- Geoprocessed data with traffic incidents, transportation infrastructure and U.S Census sociodemographics and merged it with high spatio-temporal resolution data on traffic counts and travel times

Centre of Excellence for Bus Rapid Transit (BRT-CoE), Santiago, Chile [1]

Research Assistant **November 2017 - August 2018**

- Estimated discrete choice models to capture the impact of travel time variability on route choice using data collected from the experiment conducted during my UCL MSc thesis.
- Presented research in four international conferences in the fields of Cognitive Science and Transportation Science [1].

Research Assistant **March 2015 - January 2016**

Part-time researcher in the project Next Generation of BRT in China. Teams from the BRT-CoE and the China Urban Transport Research Centre (CUSTReC) conducted the following activities:

- Study tours: My team visited Beijing in July 2015 and a team from CUSTReC visited Brazil and Chile in December 2015 to share experiences about BRT
- Technical reports: (i) Evaluation of social and environmental benefits of BRT, (ii) International benchmarking of BRT and (iii) Review of the technical standards for the design of BRT in China
- Joint research paper: Identification of the best international practices and the main factors that impact the performance of Chinese BRT systems

Centre for Sustainable Urban Development (CEDEUS), Santiago, Chile [1]

Research Assistant **April 2015 - January 2016**

- Conducted research related to (i) fare evasion in public transport
- Strategies to allocate demand-side or supply-side subsidies in public transport
- Benefits of implementing monthly passes and (iv) performance indicators in Metro systems

Collaborator of Transit UC **June 2015 - December 2015**

Developed a model to predict fare evasion at bus stops and bus routes of Transantiago using smart card and GPS data. This tool was implemented in an existing software created by the firm Transit UC and it was used by some bus private bus operators to improve their performance indicators

University of California, Davis, Department of Environmental Science and Policy, Davis, USA

Visiting Scholar [1] **January 2014 - May 2014**

- Advisor: Prof. Susan Handy, chair of the Department of Environmental Science and Policy [1]
- Courses Audited: *Transportation Survey Methods*, *Transportation Policy and Planning* and *Statistical Rethinking*

Pontifical Catholic University of Chile (PUC), Santiago, Chile

Undergraduate Research Assistant **2011 - 2013**

Collaborated in research projects on topics of high relevance to public policy in Chile

- Fare evasion in public transport, Department of Transportation Engineering, 2013
- Social mobility and equity, Department of Economics, 2012
- Socioeconomic school segregation, Department of Industrial Engineering, 2011

Teaching Experience

Carnegie Mellon University (CMU), Pittsburgh, PA

Teaching assistant **August 2019 - Present**

Taught recitations, held office hours and graded homework in the following courses:

- Advanced Computing and Problem Solving in Civil and Environmental Engineering (Spring 2023)
- Intro to Transportation Systems Analysis (Fall 2021)
- Geographic Information Systems (Fall 2020)
- Data Analytics for Engineered Systems (Fall 2019)

University of Concepción (UdeC), Department of Civil Engineering, Concepción

Lecturer **August 2018 - July 2019**

Prepared lectures, graded assignments and examinations on the following courses:

- Optimization (2' 2018, 1' 2019) [1]
- Fundamentals of Transport Engineering (2' 2018) [1]
- Transportation Planning (2' 2018)

Pontifical Catholic University of Chile (PUC), Santiago, Chile

Teaching Assistant **2009 - 2014**

Grading assignments and examinations, and preparing recitations on the following courses:

Department of Transport Engineering and Logistics [1] [2]

- Planning for Sustainable Transport, Citizens and the City (2' 2014).
- Transport Demand Models (2' 2013).
- Econometric Models in Engineering (2' 2013).
- Topics in Econometrics (1' 2013, 1' 2012).
- Transportation System Engineering (2' 2012).

Department of Mathematics [1] [2]

- Calculus 1 (1' 2013).
- Algebra (1' 2009).

Honors and Awards

TCS Presidential Fellowship **2021 - 2022**

The Tata Consultancy Services (TCS) Presidential Fellowship Program provides financial support to recruit and retain outstanding graduate students, whose work here will ensure that Carnegie Mellon maintains its position as an international leader in graduate education and research. [1]

Becas Chile - Conicyt Master Fellowship **2016 - 2017**

Fellowship that covers full tuition fees and living expenses to study a Masters program abroad. [1]

Michael Beesley Award **2015**

Award for the best workshop paper presented by an early career professional, 14th International Conference on Competition and Ownership in Land Passenger Transport (Thredbo 14) [1] [2] [3]

Best Research Paper in the Area of Equity and Social Mobility **2012**

Research award given in a student conference organized by the School of Engineering at PUC [1]

Fellowship for Engineering Students to Study Abroad **2012**

Grant given by the PUC School of Engineering for an internship abroad [1]

John Paul II Foundation Undergraduate Fellowship **2009 - 2013**

Fellowship given annually to about 20 undergraduate students from PUC who represent the values of the institution, including social conscience, service to the community, academic excellence. [2]

Journal Articles

Guarda, P., Qian, S., 2025. Traffic estimation in unobserved network locations using data-driven macroscopic models. *Transportmetrica A: Transport Science*.

Guarda, P., Qian, S., 2024. Statistical inference of travelers' route choice preferences with system-level data. *Transportation Research Part B: Methodological*. [link]

Guarda, P., Battifarano, M., Qian, S., 2024. Estimating network flow and travel behavior using day-to-day system-level data: a computational graph approach. *Transportation Research Part C: Emerging Technologies*. [link]

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. [link]

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. [link]

Guarda, P., Velásquez J. M., Tun H. T., 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. [link]

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. [link]

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. [link]

Technical Reports

Velásquez J. M., Tun H. T., Hidalgo, D., Ramos, C., **Guarda, P.**, Chen, X., Zhong, G., 2017. Bus Rapid Transit in China: A Comparison of Design Features with International Systems. Ross Center for Sustainable Cities, World Resources Institute, Washington D.C., USA. [link]

Conference Papers

Kawamura, R., **Guarda, P.**, Narwade, P., Patel, Y., Niinuma, K., 2025. RN-SAM: Road network-aided SAM optimization for road segmentation in satellite imagery. *2025 IEEE International Conference on Image Processing*, Anchorage, AK, USA

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*, Edmonton, Canada, pp. 733-740

Patents and Patent Applications

Kawamura, R., **Guarda, P.**, Narwade, P., Patel, Y., Niinuma, K., 2025. Road area segmentation using satellite imagery and OpenStreetMap data, U.S. Patent 19/312,636, filed on August 28, 2025, with Fujitsu Research. Patent pending.

Liu, Z., Chen, X., Liu, Y., Hsu, C., Shahi, N. **Guarda, P.**. 2025, Cellular traffic prediction using open transportation data. U.S. Patent Application Publication No. US20250193692A1, filed Dec 12, 2023, published Jun 12, 2025. Patent pending. Assigned to AT&T Intellectual Property I, L.P. [1]

Guarda, P., Liu, J., Niinuma, K., Qian, S., 2024. Traffic simulator adjustment, U.S. Patent 18/791,147, filed on July 31, 2024, with Fujitsu Research. Patent pending.

Conference Presentations

Liu, J., **Guarda, P.**, Niinuma, K., Qian, S. Enhanced Mesoscopic Network Model Calibration with both Global High-Resolution Satellite Imagery and Local Traffic Sensor Data. Transportation Research Board 105th Annual Meeting, January 5-9, 2025, Washington D.C, United States of America

Liu, J., **Guarda, P.**, Niinuma, K., Qian, S. Enhancing multi-class mesoscopic network modeling with high-resolution satellite imagery. 2024 IEEE 27th International Conference on Intelligent Transportation Systems (ITSC), September 24- 27, 2024, Edmonton, Canada

Guarda, P., Qian, S. Statistical inference of travelers' route choice preferences with network level data. Transportation Research Board 101st Annual Meeting, January 9-13, 2022, Washington D.C, United States of America

Guarda, P., Battifarano M., Qian, S. Estimating stochastic user equilibrium using day-to-day system-level data: A computational graph approach. 16th International Conference on Travel Be-

havior Research, December 11-15, 2022, Santiago, Chile [1]

Guarda, P., Qian, S. Statistical inference of travelers' route choice preferences with system level data. Society for Industrial and Applied Mathematics (SIAM) Conference on Mathematics of Planet Earth, July 13-15, 2022, Pittsburgh, PA

Guarda, P., Qian, S. Learning and inference of travelers' route choice preferences from network level data. The 2021 Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting, October 24-27, 2021, Anaheim, CA

Guarda, P., González, F., Muñoz, J.C. A cumulative prospect theory approach to understand the impact of variability in waiting and in-vehicle times on route choice. Interdisciplinary Choice Workshop (ICW), August 7-10, 2018, Santiago, Chile [1]

Guarda, P., Muñoz, J.C. Cross-national and gender differences in preferences for waiting and traveling in public bus systems: evidence from lab experiments in Santiago, Chile and London, UK. Interdisciplinary Choice Workshop (ICW), August 7-10, 2018, Santiago, Chile [1]

Guarda, P., González, F., Muñoz, J.C. Reference points and loss aversion as drivers of risk-aversion in decisions about time. 51st Annual Meeting of the Society for Mathematical Psychology, July 21-24, 2018, Madison, WI, United States [1]

Guarda, P., González, F., Muñoz, J.C. A prospect theory model of route choice with context-dependent reference points. 15th International Conference on Travel Behavior Research, July 15-20, 2018, Santa Barbara, CA, United States [1]

Thun H. T., **Guarda, P.**, Ramos C., Hidalgo, D. Understanding bus rapid transit (BRT) performance: Examining the relationship between speed and BRT design indicators. Thredbo 15 conference on competition and ownership issues in land passenger transport, August 13-17, 2017, Stockholm, Sweden

Guarda, P., Velasquez J.M., Thun H. T., Chen, X., Zhong, G. Comparing Chinese and non-Chinese Bus Rapid Transit: Evidence from evaluation of global BRT based on BRT design indicators. Transportation Research Board 96th Annual Meeting, January 8-12, 2017, Washington D.C, United States of America [1]

Guarda, P., Bueno, C., Galilea P., Muñoz, J.C., Ortúzar, J. de D. ¿Tarifas más bajas o frecuencias más altas, qué es lo que la gente quiere? Un modelo microeconómico. XVII Congreso Chileno de Ingeniería de Transporte, October 13-15, 2015, Concepción, Chile

Guarda, P., Galilea, P., Paget-Seekins, L., Ortúzar, J. de D. ¿Qué está detrás de la evasión en el sistema de buses de transporte público? Una aproximación econométrica. XVII Congreso Chileno de Ingeniería de Transporte, October 13-15, 2015, Concepción, Chile

Guarda, P., Bueno, C., Galilea P., Muñoz, J.C., Ortúzar, J. de D. Lower bus fares or higher frequencies, what do people want? A microeconomic analysis. 4th Symposium European Association for Research in Transportation (HEART), September 9-11, 2015, Copenhagen, Denmark [1]

Guarda, P., Galilea, P., Handy, S., Muñoz, J.C., Ortúzar, J. de D. Decreasing fare evasion without fines? A microeconomic analysis. Thredbo 14 conference on competition and ownership issues in land passenger transport, September 1-3, 2015, Santiago, Chile [1]

Guarda, P., Ortúzar, J. de D., Handy, S., Galilea P., Muñoz, J.C. Optimal mixed strategies for dealing with fare evasion in public transport. 13th Conference on Advanced Systems in Public Transport, July 19-23, 2015, Rotterdam, The Netherlands

Guarda, P., Galilea, P., Paget-Seekins, L., Ortúzar, J. de D. What is behind fare evasion? The case of Transantiago. Transportation Research Board 94th Annual Meeting, January 11-15, 2015,

Washington D.C, United States of America

Guarda, P., Galilea, P., Paget-Seekins, L., Ortúzar, J. de D. Understanding fare evasion in Santiago's public transport system. XVII Pan-American Congress of Transit, Transport and Logistics Engineering, June 11-13, 2014, Santander, Spain

Guarda, P., Galilea, P., Paget-Seekins, L., Ortúzar, J. de D. Understanding fare evasion in Santiago's public transport system. University of California Transportation Center Student Conference, April 17-18, 2014, Pomona, United States of America

Poster sessions

Guarda, P., Parpart, P., Harvey, N., Muñoz, J.C. Decisions about time in public transport. 40th Annual Meeting of the Cognitive Science Society, July 25-28, 2018, Madison, WI, United States [1]

Guarda, P. Free mass mobility for everyone? The potential of zero fare public transport. Transforming Transportation 2015, Smart Cities for Shared Prosperity, January 15-16, 2015, World Bank, Washington D.C., United States of America [1]

Invited Talks

Guarda, P., Evasión en los Sistemas de Transporte de las Ciudades de América Latina: Casos Transantiago y Transmilenio. Webinar Series Inter-American Development Bank (IDB). February 26, 2017 [1]

Velásquez, J.M., **Guarda, P.**, Opportunities to improve bus rapid transit in China – A comparison of several BRT systems around the world. Webinar Series Bus Rapid Transit Centre of Excellence (BRT-CoE). July 20, 2016 [1] [2] [3]

Guarda, P., Understanding fare evasion in urban bus systems: Evidence from Santiago, Chile. Webinar Series Bus Rapid Transit Centre of Excellence (BRT-CoE). January 22, 2016 [1] [2] [3]

Guarda, P., Paget-Seekins, L., Muñoz, J.C. What is behind on time performance indicators at the MBTA?. World Resources Institute (WRI). July 22, 2015, Beijing, China

Guarda, P., Galilea, P., Paget-Seekins, L., Ortúzar, J. de D. Understanding fare evasion in Santiago's public transport system?. Department of Civil and Environmental Engineering, University of California, Berkeley. April 7, 2014, Berkeley, United States of America

Professional Service and Development

Journal Reviewer

Transportation Research Part A (8), Transportation Research Part B (3), Transportation Research Part C (3), Research in Transportation Economics (3), Transport Reviews (3), Transportation Science (2), Journal of Choice Modelling (2), IEEE Transactions on Intelligent Transportation Systems (1) IEEE Intelligent Transportation Systems Conference (1), Network and Spatial Economics (1), Journal of Transportation Engineering, Part A: Systems (1), Journal of Crime and Delinquency (1)

Professional Memberships

Transportation Research Board (TRB), International Association for Travel Behaviour Research (IATBR), Society for Industrial and Applied Mathematics (SIAM), Institute for Operations Research and the Management Sciences (INFORMS), Cognitive Science Society (COGSCI)

Trepcamp, Washington DC, United States [1]

Mentor **June 2016**

Mentored a group of 5 Mexican undergraduate students based at George Town University that were creating an innovative solution in urban logistic at Trempcamp[1].

Community Engagement

CMU Counseling and Psychological Services (CaPS), Pittsburgh, Pennsylvania

Member of Student Advisory Board **August 2022 - April 2023**

- Provided insights and concerns regarding matters of diversity and inclusion
- Identified areas of need and provide advice on specific services in CAPS
- Assisted in disseminating CaPS information to peers and campus community
- Participated and provide feedback on staff interviews

John Paul II Foundation, Santiago, Chile

Volunteer in Nursing Home "El Buen Samaritano" **March 2010 - December 2013**

Volunteered in community service project aimed at accompanying the elderly at a nursing home once a week and taking care of their mental and physical health.

Volunteer in Children's Theater Workshop **August 2009 - December 2009**

Volunteered in community service project helping children with low self-esteem and from low-income families. Volunteers taught children acting exercises and helped them to prepare an adaptation of a theater production performed by both children and volunteers.

School of Engineering, Pontifical Catholic University of Chile (PUC), Santiago, Chile

Student Union Coordinator **1' 2010 - 1' 2011**

Organized student activities such as policy discussion forums, recreational activities and community service that were part of the agenda of the Engineering Student's Union at PUC (CAI)

Student Delegate **March 2009 - March 2010**

One of the three students elected in my class (about 500 students) to be an intermediary between the students and the School of Engineering at PUC

Skills

- **Programming Languages**: Python, R, C#, Bash, Java, Visual Basic
- **Developer Tools**: Cursor, VS Code, PyCharm, RStudio, Docker, Git, Github, Gitlab, Linux terminal, Eclipse, Spyder, Conda
- **Data Science**: SQL, Pandas, Numpy, Scikit-learn, NetworkX, GeoPandas, Tidyverse, SQL, Tableau, QGIS, ArcGIS, Stata, SPSS
- **Cloud & Parallel Computing**: AWS, IBM Cloud, Spark
- **Simulation & 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)

October 9, 2025