

# PABLO GUARDA

Pittsburgh, PA

📞 724-384-9116 ✉ [pablo.guarda.r@gmail.com](mailto:pablo.guarda.r@gmail.com) 🌐 [pabloguarda.github.io](https://pabloguarda.github.io) 🔗 [linkedin.com/in/pabloguarda](https://linkedin.com/in/pabloguarda) 📄 📧 📧 📧

## Education

### Carnegie Mellon University (CMU)

Pittsburgh, PA

*PhD in Civil and Environmental 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

**Deep Learning Frameworks:** TensorFlow, PyTorch, Torchvision, RasterVision

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

## Professional Experience

### Fujitsu Research, Convergence Technology Lab

Pittsburgh, PA

*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 - August 2022

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

### 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

### World Resources Institute (WRI), Ross Centre for Sustainable Cities

Washington, DC

*External Consultant*

August 2016, August 2017

- 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

*Transport Research Intern*

February 2016 - July 2016

- Leveraged classic statistical methods and publicly available datasets to benchmark bus rapid transit systems in China
- Coauthored 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

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### Carnegie Mellon University (CMU)

Pittsburgh, PA

Graduate Research Assistant

August 2019 – July 2023

- 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

Research Assistant

November 2017 – August 2018

- 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

Research Assistant

April 2015 – January 2016

- 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 conference in Transportation science

## Teaching Experience

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### Carnegie Mellon University (CMU)

Pittsburgh, PA

Teaching Assistant

August 2019 – May 2023

- Taught recitations, held office hours and graded homework on 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 Concepcion (UdeC), Department of Civil Engineering

Concepcion, Chile

Lecturer

August 2018 - July 2019

- Prepared lectures and assignments and graded examinations in the following courses: Optimization Methods (2' 2018, 1' 2019), Transportation Planning (2' 2018, 1' 2019), Fundamentals of Transportation Engineering (2' 2018)

### Pontifical Catholic University of Chile (PUC)

Santiago, Chile

Teaching Assistant

March 2009 – December 2014

- Taught recitations and graded exams on the following courses: Planning for Sustainable Transport, Citizens and the City (2' 2014), Transport Demand Models (2' 2013), Econometric Models in Engineering (2' 2013), Calculus 1 (1' 2013), Topics in Econometrics (1' 2013, 1' 2012), Transportation System Engineering (2' 2012), Algebra (1' 2009)

## Publications and preprints

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**Guarda, P.**, Qian, S., 2024. Traffic estimation in unobserved network locations using data-driven macroscopic models. Submitted for review at *Transportation 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: Emerging Technologies* 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.

**Guarda, P.**, Harvey, N., & Muñoz, J.C., 2023. Uncovering the influence of time perception on decision-making about time. Submitted for review at *Journal of Mathematical Psychology*. Preprint available at <https://doi.org/10.31234/osf.io/t49kf>

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.

**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.