Agustin Guerra, Ph.D.

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Professional Summary

I am an engineering professional with **+5** years of experience in the transportation industry and **+4** years of research experience in traffic engineering. My research interest includes optimization algorithms considering Connected and Automated Vehicles (CAVs) capabilities, operations research, machine learning applications, real-time implementation of CAVs, simulation, traffic flow theory, human factors, and driving simulator studies. My Ph.D. dissertation focused on developing optimization algorithms for **real-time** applications considering CAVs in urban arterials. The algorithms were developed and simulated in **Python** considering the joint optimization of vehicles' trajectories and Signal Phasing and Timing (SPaT).

Education

Ph.D. in Civil Engineering — Aug. 2019 – May 2023.
University of Florida — *Gainesville, FL.*
Dissertation: Optimization of Traffic Performance in Signalized Arterials with CAVs.

MS in Civil Engineering — Aug. 2017 – May 2019.
University of Kansas — *Lawrence, KS.*
Thesis: Modeling Discretionary Lane Change in a Connected Environment.

BS in Civil Engineering — Mar. 2008 – May 2013.
Universidad Tecnologica de Panama — *Panama, PA.*

Research Experience

Research Scientist — Jul. 2023 – Present.
INDICATIC AIP — *Panama, PA.*

- Led the establishment of a research agenda at the newly established National Institute of Advanced Scientific Research in Information and Communication Technologies (INDICATIC-AIP), aligning with the United Nations Sustainable Development Goals, with a focus on transportation.
- Secured $69,905 in funding by successfully writing and submitting a proposal to enable internship programs for thesis students from Panama at the Illinois Institute of Technology in Chicago, USA.
- Contributed to securing $70,000 in funding for research and development by writing and submitting a successful proposal to establish the first light pollution monitoring station in Panama.
- Promoted the capabilities of the newly established INDICATIC-AIP at national conferences to attract funding and collaborators.
- Mentored undergraduate students in research projects, including theses and sponsored projects, guiding them through research design, data analysis, and scientific writing.
- Supported high-school students on national scientific competitions.

Research Assistant — Aug. 2019 – May 2023.
University of Florida — *Gainesville, FL.*

- Lead two research projects sponsored by the NSF ($1,296,428) and the STRIDE-H6 ($329,692) from conceptualization to completion, each project with published articles and others under preparation.
- Performed all phases of the research process, including problem definition, literature review, research design, data collection, analysis of results, and preparation of reports.
- Developed optimization algorithms in Python to improve traffic performance on signalized arterials considering CAVs capabilities.
- Assisted in the implementation of optimization algorithm for isolated intersections into a microsimulator software.

- Facilitated the coordination of projects activities to meet deadlines.
- Formulated different optimization models to reduce intersection delays, including LP, and MILP models.
- Developed heuristic methods using search-based algorithms to reduce delays in arterials.
- Developed a Python-based data pipeline to extract trajectories from connected vehicles.
- Implemented various techniques for data preprocessing, including data normalization, outlier detection and removal, and feature selection, to ensure the quality and integrity of the data prior to analysis.
- Evaluated machine learning algorithms to estimate the occurrence of future crashes.

Master's Thesis May. 2018 – May. 2019
University of Kansas *Lawrence, KS.*

- Conducted a driving simulator study to assess human behavior during Discretionary Lane-Changing (DLC) maneuvers under connected environments.
- Implemented a predictive DLC fuzzy logic model in a driving simulator.

Summary of Research Skills

- **Expertise:** Intelligent Transportation Systems, simulation development, Machine Learning, Operation Research, IoT, CAVs, CVs, data pipelines.
- **Programming, Statistical, and Query Languages**: Python (+4 years), R (1 year), C++/SQL (1 year)
- **Optimization Modeling:** LP, MILP, heuristic search.
- **Scientific Python Libraries:** Pandas, NumPy, Matplotlib, Pandas, Gurobi, CPLEX, sci-kit learn, TensorFlow, Selenium, Seaborn, SimPy, webdrivermanager, xml, SPaCy, kepler, Streamlit.
- **Software:** PTV Vissim, Transmodeler, AutoCAD Civil 3D, HCS7, HSS.
- **Miscelaneous:** LaTeX, oral presentations, Education and Public Outreach (EPO).

Publications

Peer-Reviewed Journals

[1] P. Srisurin, **Guerra A.**, P. Jarumaneeroj. Traffic Simulation Models to Enhanced Signal Timing in an Oversaturated Network: A comparative Study of Optimizing Individual Intersections vs the Entire Network. *International Journal of Technology*, 2024. https://doi.org/10.14716/ijtech.v15i6.7123.

[2] **Guerra, A.**, L. Elefteriadou. Platooning Trajectory Optimization for Connected Automated Vehicles in Coordinated-Arterials. *Transportation Research Record*, 2023. https://doi.org/10.1177/03611981221112099.

[3] **Guerra, A.**, V. Gadhiya, P. Srisurin. Crash Prediction on Road Segments Using Machine Learning Methods. *ASEAN Engineering Journal*, 2022. https://doi.org/10.11113/aej.v12.17601.

Conference Proceedings

[1] L. Carvalho, **Guerra, A.**, X. Wang, P. Manjunatha, L. Elefteriadou. Simulation Platform for Testing and Evaluation of CAV Trajectory Optimization and Signal Control Algorithm Integrated with Commercial Traffic Simulator. *Proceedings of the 2022 Winter Simulation Conference*. https://doi.org/10.1109/WSC57314.2022.10015399.

Under Preparation

[1] **Guerra A.**, R.Favero, L. Elefteriadou. Assessing Traffic Impact of Autonomous Shuttles on Urban Signalized Arterials, 2024. http://dx.doi.org/10.13140/RG.2.2.17890.13764.

[2] **Guerra, A.**, E. Amini, L. Elefteriadou. A Computationally-Efficient Algorithm to Enable Joint Optimization of Connected Automated Vehicles' Trajectories and Signal Phasing and Timing in Coordinated Arterials, 2024. https://dx.doi.org/10.2139/ssrn.4411134.

[3] **Guerra A.**, L. Elefteriadou. Review and Analysis of Longitudinal Trajectory Control Strategies for Connected Automated Vehicles at Signalized Intersections, 2024.

[4] A. Hurtado-Beltran, **Guerra A.**, C. Chavez-Negrete, J.E. Arreygue-Rocha. GIS-Based Methodology for Allocating New Truck Stops from a Safety Perspective, 2024.

Research Projects

† indicates projects where Agustin Guerra served as Principal Investigator (PI) 2024
INDICATIC AIP

- First light pollution monitory station accross the Panama Canal, (USD $70,000.00). Award number FID-074-2024. PI: Jose Robles, Ph.D., INDICATIC AIP.

Mobility Projects

† indicates projects where Agustin Guerra served as Principal Investigator (PI) 2023
INDICATIC AIP

- † INDICATIC-IPRO-UTP summer program, (USD $69,905.00). Award number DDCCT-002-2024.

Presentations

[1] **Guerra, A.**, R. Favero, L. Elefteriadou. Quantifying The Traffic Impact of Autonomous Shuttles on Signalized Arterials: A Microsimulation Study. *The Transportation Research Board (TRB) 103rd Annual Meeting, Washington, D.C.*, January 2024

[2] **Guerra, A.**, L. Elefteriadou. Optimizing Signalized Coordinated Arterial Performance in a Fully Automated Environment. A Heuristic Approach. *The Transportation Research Board (TRB) 102nd Annual Meeting, Washington, D.C.*, January 2023.

[3] **Guerra, A.**, L. Salas-Nino. Actuated Micromobility Users Presence Awareness System in Urban Arterials. *The Transportation Research Board (TRB) 102nd Annual Meeting, Washington, D.C.*, January 2023.

[4] Carvalho L., **A. Guerra**, X. Wang, P. Manjunatha, L. Elefteriadou. ***Invited Paper***. Simulation Platform for Testing and Evaluation of CAV Trajectory Optimization and Signal Control Algorithm Integrated with Commercial Traffic Simulator. *Winter Simulation Conference, Singapore,* December 2022.

[5] **Guerra, A.**, V. Zorbas, L. Elefteriadou. In a Hurry? Try Going Slower. *Florida Automated Vehicle (FAV) Summit, Jacksonville, FL*, November 2022.

[6] Elefteriadou, L., E. Amini, L. Carvalho, **A. Guerra**. ***Invited Speaker***. Leveraging CAVs to Improve Traffic Operational Quality. *T3e Webinar: Impacts on Roads from Automated Driving System (ADAS) - ITS Professional Capacity Building Program*, May 2022.

[7] **Guerra, A.**, L. Elefteriadou. A Trajectory-based Method for Platoon Formation of Connected and Automated Vehicles. *7th Annual UTC Conference for the Southeastern Region, Boca Raton, FL*, March 2022.

[8] **Guerra, A.**, L. Elefteriadou. Platooning Trajectory Optimization for Connected Automated Vehicles in Coordinated-Arterials. *The Transportation Research Board (TRB) 101st Annual Meeting*, 2022.

[9] **Guerra, A.**, L. Elefteriadou. Platooning Trajectory and Signal Phasing Optimization for Connected Automated Vehicles in Coordinated-Arterials. *The Transportation Research Board (TRB) 101st Annual Meeting, Washington, D.C.*, January 2022.

[10] **Guerra, A.**, L. Elefteriadou. Computation Efficient Alternative for Connected Automated Vehicles Platoon Formation. *Florida Automated Vehicle (FAV) Summit, Orlando FL*, December 2021.

[11] **Guerra, A.**, M. Asgharzadeh, A. Kondyli. Discretionary Lane Changing Decisions for Connected-Vehicles Based on Fuzzy Logic. *The Transportation Research Board (TRB) 99th Annual Meeting, Washington, D.C.*, January 2020.

Leadership/Involvement

Founding Member and Chair of the IEEE-ITSS Student Chapter: Led the efforts to establish an IEEE Student Chapter branch of the ITSS at the University of Florida. 2021 – 2022

ITE University Chapter Vice President: Coordinated student seminars and ITE activities. 2021 – 2022

Student Representative at the UFTI Internal Steering Committee: Promoted engagement activities between industry professionals and students. 2020 – 2022

Media Manager at KU Fulbright Student Association: Led dissemination of activities promoted by the Fulbright Student Board, and fostering DEI. 2018 – 2019

Fellowships & Awards

- **National Research System, member Category I** : Awarded by The National Research System (SNI) and the The National Secretariat of Science, Technology and Innovation (SENACYT), Panama. 2024
- **Second Place, best mentor of Young Scientist**: Awarded by the National Secretariat of Science, Technology and Innovation (SENACYT), Panama for the mentoring of SIPRADV. 2024
- **Anne Brewer Academic Scholarships** : Awarded by the Intelligent Transportation Society (ITS) Florida Chapter. 2022
- **Second Place, IEEE-ITSS Logo Design Competition**: Awarded by the IEEE Intelligent Transportation Systems Society (ITSS). 2022
- **Fulbright Fellowship**: Awarded by the U.S Bureau of Educational and Cultural Affairs to complete a Master's Degree at the University of Kansas. 2017
- **Global Best Project in Roads and Highways**: Awarded by the ENR for the Coastal Beltway project in Panama. 2015
- **Petroterminal of Panama Scholarship**: Awarded by the Petroterminal of Panama (PTP) to complete a Bachelors's Degree at the Universidad Tecnologica de Panama. 2009

Teaching Experience

Teaching Assistant Sep. 2020 – Dec. 2020.
University of Florida

- Developed and taught three graduate lectures for the traffic flow theory course.
- Explained and assisted students with traffic flow theory assignments.
- Created reference material (example problems) to help students understand key concepts, including the motion of single vehicles, car-following models, shock-wave analysis, flow regimes, and capacity.
- Educated students on deficiencies of existing signal control strategies, such as detection, communication delay, and computation time.
- Introduced CAVs concepts, discrete optimization methods, Python-programming language as a tool for developing optimization frameworks for CAVs.
- Developed reference material for PhD students about Python, version control (git, and github), and discrete optimization.

Peer Review Activities

Transportation Research Board Annual Meeting (16)

IEEE Access (4)

Simulation Modelling Practice and Theory (3)

IEEE Transaction on Vehicular Technology (2)

Journal of Intelligent and Connected Vehicles (1)

Transportation Research Record (1)

IEEE Transactions on Intelligent Transportation Systems (1)

Student Mentorship

- Alejandro Gonzalez (expected summer 2025). Analyzing Time Series of Stock Assets Using Long-Short Term Memory (LSTM) and News Sentiment Analysis. Computer Science, undergraduate student, Universidad Tecnologica de Panama.
- Christopher Diaz (expected fall 2026). Overcoming Traffic Data Scarcity by Leveraging Google Maps' API and Deep Learning in Developing Countries. Computer Science, undergraduate student, Universidad Tecnologica de Panama.

Professional Societies

TRB AME40: Friend of TRB Standing Committee on Transportation in Developing Countries	2022 – Present
IEEE-ITSS: Member of the IEEE Intelligent Transportation Systems Society	2022 – 2023
IEEE: Member of the Institute of Electrical and Electronics Engineers	2022 – 2023
ITE: Member of the Institute of Transportation Engineers	2019 – 2023
ASCE: Member of the American Society of Civil Engineers	2021 – 2022

Industry Experience

Highway & Traffic Consultant May 2019 – Aug. 2019.
WSP *Panama.*

- Provided safety assessment for roadways, interchanges, and intersections.
- Developed geometric design proposals for transportation infrastructure projects.
- Conducted earthwork estimation for highway projects.

Highway Engineer Nov. 2012 – Aug. 2017.
Louis Berger *Panama.*

- Developed geometric designs for proposal and as-built drawings for highway projects with a project portfolio comprising several projects in the Latin American region (Panama, Colombia, Honduras, and Peru) totaling $3 billion in construction amount.
- Coordinated with different departments (geotechnical, hydraulic, and pavement) to meet deadlines.
- Created digital model terrain for highway projects.
- Verified slope stability analysis using the Slide-Rockscience software.
- Supervised and provided mentorship to a team of four drafters, contributing to their professional development and ensuring project deliverables met quality standards.

References

Lily Elefteriadou, PhD: Barbara Goldsby Professor, University of Florida elefter@ce.ufl.edu
Siva Srinivasan, PhD: Associate Professor, University of Florida siva@ce.ufl.edu
Alexandra Kondyli, PhD: Associate Professor, University of Kansas akondyli@ku.edu
Juliana Canas: Senior Advisor, First Climate juliana.canas-vanegas@firstclimate.com