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, traffic flow theory, microsimulation, 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 Assistant — Aug. 2019 – Present
University of Florida

- 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
- Facilitated the coordination of projects activities to meet deadlines
- Formulated different optimization models to reduce intersection delays, including LP, IP, 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

- 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

- Optimization modeling (LP, MIP, heuristic search), Python (Matplotlib, CPLEX, Gurobi, Numpy, Pandas, SciPy, scikit-learn, TensorFlow), signal control/traffic flow theory, human-factors, driving simulator, data pipelines, data scrapping, project management, research methodology & design, participant recruitment, data collection, data management, data analysis, R, SPSS, LaTeX, oral presentations, Education and Public Outreach (EPO)

Publications

Peer-Reviewed Journals

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

[2] **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.**, 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, 2023. https://dx.doi.org/10.2139/ssrn.4411134

[2] **Guerra, A.**, L. Elefteriadou. Analysis of Trajectory Control Strategies for Connected Automated Vehicles in a Comercial Microsimulator, 2023

[3] **Guerra, A.**, M. Asgharzadeh, A. Kondyli. Modeling Driving Behavior during Discretionary Lane Change in a Connected Environment, 2023

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

Presentations

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

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

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

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

[5] **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

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

[7] **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

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

[9] **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

Technical Reports

[1] Manjunatha P., L. Elefteriadou, M. Hunter, H. Zhou, S. Noei, **A. Guerra**, L. Carvalho, R. Favero, A. Guin, A. Saroj. Evaluation of Advanced Vehicle and Communication Technologies through Traffic Microsimulation (Project I5) *Phase II, Task 1*, 2022 (ongoing project)

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, 2018 — 2018 – 2019

Fellowships & Awards

- **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

Professional Societies

IEEE: Institute of Electrical and Electronics Engineers — 2022 – Present
TRB AME40: TRB Standing Committee on Transportation in Developing Countries — 2022 – Present
IEEE-ITSS: IEEE Intelligent Transportation Systems Society — 2022 – Present
ITE: Institute of Transportation Engineers — 2019 – Present
ASCE: 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
Alexandra Kondyli, PhD: Associate Professor, University of Kansas akondyli@ku.edu
Juliana Canas: Senior Advisor, First Climate juliana.canas-vanegas@firstclimate.com