Gabriel Shimanuki

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Education

University of Sao Paulo
Leading university in Latin America (#92 QS World University Ranking)

M.Sc. Student in Electrical & Computer Engineering, Polytechnic School of USP *Jan 2024 – July 2025*

- Advisor: Prof. Paulo Sérgio Cugnasca / Co-Advisor: Dr. Alexandre Moreira Nascimento
- GPA: 4.0/4.0
- **Qualifying Exam:** Automatic Generation of Critical Scenarios for Evaluating Intelligent Control of Autonomous Vehicles in a Simulated Environment

B.Sc. Computer Engineering, Polytechnic School of USP, **Top 10% of the Class** *Mar 2018 – Dec 2023*

- Advisor: Prof. Paulo Sérgio Cugnasca / Co-Advisor: Dr. Alexandre Moreira Nascimento
- CGPA: 3.5/4.0
- Nomination for Top Senior Project
- **Senior Thesis:** Increasing the Reliability of Autonomous Vehicle Controls Through the Creation of More Robust Traffic Datasets

Experience

Research Assistant Intern *Sao Paulo, BR*
2 A.M. Consulting *Jan 2021 – Dec 2022*

- Designed a scalable framework for optimizing artificial neural networks (ANNs)
- Conducted over 7 million ANN training experiments and optimized performance using genetic algorithms
- Managed a distributed network of remote machines, processing 1TB+ of log data weekly

Research Projects

Autonomous Vehicle Safety - Corner Case Generation Jan 2023 - Present
University of Sao Paulo - Safety Analysis Group

- Developed AI-driven methods to generate synthetic high-risk driving scenarios, improving AV corner case generation by 23%
- Integrated CARLA Simulator with Scenic to collect high-fidelity data for simulation
- Tools: CARLA, Scenic, Python
- Award: Top Senior Project Nomination for contributions to autonomous vehicle safety

Artificial Neural Network Optimization for IoT Devices Jan 2021 - Dec 2022
2 A.M. Consulting

- Designed and implemented a framework to enhance small Artificial Neural Network (ANN) training for IoT applications
- Optimized ANN energy efficiency and implemented a hardware-in-the-loop (HIL) system using Arduino microcontrollers for collision detection in AVs
- Tools: TensorFlow, Python, Arduino

FPGA-Based Bayesian Filtering for Sensor Optimization Sept 2021 - Dec 2021
University of Sao Paulo - Safety Analysis Group

- Implemented a Bayesian filtering algorithm on FPGA to enhance low-cost sensor reliability
- Tools Used: FPGA, Arduino, VHDL, C, Python, MQTT
- Award: Best-in-class project

Autonomous Vehicle Safety - Fault Injection July 2019 - Dec 2021
University of Sao Paulo - Safety Analysis Group

- Created and developed the ARVT safety investigation framework, enabling comprehensive fault injection experiments to enhance autonomous vehicle system resilience
- Conducted over 110,000 simulation runs with 2,200 parameter variations, generating a 27.6M-line dataset for reliability analysis
- Tools: OpenDS (Java), Matlab (Control), Excel (VBA)

Publications

THESES & DISSERTATIONS

Shimanuki, G. (2024). Automatic Generation of Critical Scenarios for Evaluating Intelligent Control of Autonomous Vehicles in a Simulated Environment. Monograph for Qualifying Exam – M.Sc. in Computer Engineering, Escola Politécnica da Universidade de São Paulo (Poli-USP).

Shimanuki, G. (2023). Increasing the Reliability of Autonomous Vehicle Controls Through the Creation of more Robust Traffic Datasets. Monograph for Senior Thesis Project – B.Sc. in Computer Engineering, Escola Politécnica da Universidade de São Paulo (Poli-USP).

BOOKS

Nascimento, A., Garcia, W., Garcia, A., Queiroz, A., Garcia, E., Bandeira, F., **Shimanuki, G.**, & Satin, L. (2023). Set of Mock Exams for the ENEM (Brazilian National High School Exam), 1st edition. Editora Foco. ISBN: 978-6-55515-820-5.

Nascimento, A., Garcia, W., Garcia, A., Queiroz, A., Garcia, E., Bandeira, F., **Shimanuki, G.**, & Satin, L. (under editorial review). Set of Mock Exams for the ENEM (Brazilian National High School Exam), 2nd edition.

PEER-REVIEWED JOURNAL PUBLICATIONS

Shimanuki, G.; Nascimento, A.; Vismari, L.; Camargo Jr., J.; Almeida Jr., J.; Cugnasca, P. (2025, February). Navigating the Edge with the State-of-the-Art Insights into Corner Case Identification and Generation for Enhanced Autonomous Vehicle Safety. arXiv:2503.00077. - *Under Review*

Nascimento, A., **Shimanuki, G.**, & Dias, L. (2024, July). Making More With Less: Improving Software Testing Outcomes Using a Cross-project and Cross-Language ML Classifier Based on Cost-Sensitive Training. 10.3390/app14114880.

PEER-REVIEWED CONFERENCE PUBLICATIONS

Shimanuki, G., Nascimento, A., & Queiroz, A. (2024a, August). Enhancing Academic Performance Prediction: A Comprehensive Comparison of Machine Learning Techniques and Metrics. Presented in the ISLA 2024 Proceedings.

Nascimento, A., Queiroz, A., & **Shimanuki, G.** (2023a, August). An Enhanced Artificial Neural Network Approach to Predict Student Dropout From Imbalanced Datasets. Presented in the ISLA 2023 Proceedings.

Shimanuki, G. (2022, October). Analysis of the Influence of the Safety Zone on the Effectiveness of the Lateral Control Algorithm for Lane Change in Autonomous Vehicles. 30th University of São Paulo's International Symposium of Undergraduate Research (originally presented in Portuguese).

Shimanuki, G. (2021, November). Analysis of the Influence of the Safety Zone on the Effectiveness of the Lane Crossing Control Algorithm for Autonomous Vehicles. 29th University of São Paulo's International Symposium of Undergraduate Research (originally presented in Portuguese).

Shimanuki, G. (2020, October). Influence of the Safety Zone on Accident Risk with Autonomous Vehicles. 28th University of São Paulo's International Symposium of Undergraduate Research (originally presented in Portuguese).

WORKING PAPERS

Access all working papers here.

Shimanuki, G., Nascimento, A., Vismari, L., & Cugnasca, P. (2023a). Genetic Algorithm-Driven Corner Case Generation: Advancing Simulation for Safer Autonomous Vehicle Systems.

Shimanuki, G., Nascimento, A., Vismari, L., & Cugnasca, P. (2021a). Bayesian Filtering on FPGA: Enhancing Low-Cost Ultrasonic Sensor Reliability for Distance Measurement.

Nascimento, A., Shimanuki, G., Dias, L., & Cunha, A. (2024b). Making Even More with Much Less: Improving Software Testing Outcomes Using a Cross-Project and Cross-Language ML Classifier Based on Cost-Sensitive Training on Class-Weighted Dataset.

Awards & Honors

Nomination for Top Senior Projects in Computer Engineering Department *Dec 2023*

Best Project - Digital Systems Laboratory II *Dec 2021*

Grants

Master's Data Science Center (C^2D) Fellowship *Jan 2024*
(Itaú-Unbanco, #86 in the Global Forbes List)

Pre-Master's (C^2D) Fellowship (Itaú-Unbanco) *Jan 2023*

2 A.M. Consulting Research Grant *Jan 2022*

Scientific Scholarship Program - National Council for Scientific and Technological Development (CNPq) *Aug 2021*

Foundation for Engineering Research and Development (FDTE) Research Grant *June 2020*

Technologies

Languages: Python, C, VHDL

Technologies: TensorFlow, CARLA Simulator, OpenDS

Extracurricular Activities

Business Group of Polytechnic School of USP (GNP) *June 2019 - June 2021*
This student initiative fosters the study and development of business management topics, such as strategy, corporate finance, and marketing. The group's primary goal is to prepare members for careers in finance, consulting, or entrepreneurship, while offering valuable networking opportunities with leading Brazilian companies and mentorship from industry professionals.

- Led workshops on strategy and finance for engineering students
- Organized events with leading firms across various sectors, including Bain & Company, Santander, Azul, Burger King, Stone, and Magazine Luiza