

# Gabriel Shimanuki

📍 São Paulo, SP, Brazil

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👤 Gabriel Shimanuki

🔗 <https://gabrielshimanuki.github.io/>

## Education

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### University of São Paulo

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

M.Sc. Student in Electrical & Computer Engineering, Polytechnic School of USP      Feb 2024 – Mar 2026

- 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

### University of São Paulo

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

## Research Interests

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- **Trustworthy AI for Cyber-Physical Systems (CPS) & Autonomous Systems**
- **Safety, Validation & Verification (V&V)** of AI-controlled systems
- **Efficient AI for Edge/Embedded Devices (TinyML)** and Hardware-in-the-Loop (HIL)
- **Probabilistic Methods** for state estimation and reliability analysis

## Research Experience

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University of São Paulo - Safety Analysis Group

São Paulo, BR, Jan 2023 – Present

### Graduate Researcher (AV Safety & Corner Case Generation)

- Led AI-driven methods to generate critical driving scenarios, resulting in two first-author journal submissions (CORTEX-AVD framework).
- Developed novel techniques to identify and generate synthetic corner cases, improving high-risk scenario detection by 23% over baseline methods.
- Integrated and managed complex simulation environments (CARLA, Scenic, OpenDS) to create high-fidelity datasets for AV validation.
- **Tools:** CARLA, Scenic, Python

Beyond the Hype (BTH)

São Paulo, BR, Sept 2025 – Present

### Consultant

- Conducted applied R&D for FIESP (Brazil's most influential industrial association) to build novel automation tools for economic analysis.
- Engineered agent-based models utilizing LLM APIs to automate the analysis of industrial sector performance reports.

2 A.M. Consulting

São Paulo, BR, Jan 2021 – Dec 2022

### Research Assistant Intern (ANN Optimization for IoT)

- Designed and implemented a scalable framework to enhance small Artificial Neural Network (ANN) training for IoT applications.
- Conducted over 7 million ANN training experiments and optimized performance using genetic algorithms.
- Optimized ANN energy efficiency and implemented a hardware-in-the-loop (HIL) system using Arduino microcontrollers for collision detection in AVs.
- Managed a distributed network of remote machines, processing 1TB+ of log data weekly.
- **Tools:** TensorFlow, Python, Arduino, C

University of São Paulo - Safety Analysis Group

São Paulo, BR, July 2020 – Dec 2021

#### **Undergraduate Researcher (AV Safety & Fault Injection)**

- Extended the ARVT safety investigation framework by developing new fault injection modules (Java/Matlab) to enhance AV resilience analysis.
- Executed over 110,000 simulations with 2,200 parameter variations, generating a 27.6M-line dataset to analyze system resilience.
- **Tools:** OpenDS (Java), Matlab (Control), Excel (VBA)

University of São Paulo - Safety Analysis Group

São Paulo, BR, Sept 2021 – Dec 2021

#### **Undergraduate Researcher (FPGA-Based Bayesian Filtering)**

- Implemented a Bayesian filtering algorithm on FPGA (VHDL) to enhance the reliability of low-cost ultrasonic sensors for distance measurement.
- **Tools:** FPGA, Arduino, VHDL, C, Python, MQTT

## Publications

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### Peer-Reviewed Publications

Nascimento, A., **Shimanuki, G.**, & Dias, L. (2024). 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](https://doi.org/10.3390/app14114880).

**Shimanuki, G.**, Nascimento, A., & Queiroz, A. (2024). 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.** (2023). An Enhanced Artificial Neural Network Approach to Predict Student Dropout From Imbalanced Datasets. Presented in the [ISLA 2023 Proceedings](#).

### Preprints & Theses

Nascimento, A.; **Shimanuki, G.**; Vismari, L.; Camargo Jr., J.; Almeida Jr., J.; Cugnasca, P.; Queiroz, A.; Bailenson J. (2025). Injecting Hallucinations in Autonomous Vehicles: A Component-Agnostic Safety Evaluation Framework. [10.48550/arXiv.2510.07749](https://doi.org/10.48550/arXiv.2510.07749). - *Under Review*.

**Shimanuki, G.**; Nascimento, A.; Vismari, L.; Camargo Jr., J.; Almeida Jr., J.; Cugnasca, P. (2025). CORTEX-AVD: A Framework for CORner Case Testing and EXploration in Autonomous Vehicle Development. [10.48550/arXiv.2504.03989](https://doi.org/10.48550/arXiv.2504.03989). - *Under Review*.

**Shimanuki, G.**; Nascimento, A.; Vismari, L.; Camargo Jr., J.; Almeida Jr., J.; Cugnasca, P. (2025). Navigating the Edge with the State-of-the-Art Insights into Corner Case Identification and Generation for Enhanced Autonomous Vehicle Safety. [10.48550/arXiv.2503.00077](https://doi.org/10.48550/arXiv.2503.00077). - *Under Review*.

**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).

### Other Publications & Presentations

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.

**Shimanuki, G.** (2022). 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). 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). 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).

## Awards & Honors

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<b>AI4Industry 2025 Summer School</b> , École des Mines de Saint-Étienne, France	2025
<i>Awarded fully-funded participation in a competitive program on AI for Industry 4.0.</i>	
<b>Master's Data Science (C<sup>2</sup>D) Fellowship</b>	2024 – 2025
<i>Competitive graduate research fellowship sponsored by Itaú-Unibanco (Latin America's largest bank).</i>	
<b>Nomination for Top Senior Project</b> , University of São Paulo, Dept. of Computer Engineering	2023
<i>Nominated by faculty for thesis on AV reliability.</i>	
<b>Pre-Master's (C<sup>2</sup>D) Fellowship</b>	2023
<i>Undergraduate research fellowship sponsored by Itaú-Unibanco.</i>	
<b>2 A.M. Consulting Research Grant</b>	2022
<i>Private grant to fund research on ANN optimization.</i>	
<b>Best Project, Digital Systems Laboratory II</b> , University of São Paulo, Dept. of Computer Engineering	2021
<i>Awarded 1st place for the FPGA-based Bayesian filtering project.</i>	
<b>PIBIC Research Grant</b>	2021
<i>National research grant from CNPq (Brazilian National Council for Scientific Development).</i>	
<b>FDTE Research Grant</b>	2020
<i>Grant from the Foundation for Engineering Research and Development.</i>	

## Lectures & Talks

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Invited Talk, FIESP	Oct 2025
<i>"Generative AI for Automating Economic Analysis"</i>	
Guest Lecture, University of São Paulo	Sept 2025
<i>Course: Fault Tolerant Systems (PCS3578)</i>	
<i>"The Challenge of Corner Cases - Safety Improvement Strategies for Autonomous Vehicles"</i>	
Invited Talk, Itaú-Unibanco	Feb 2025
<i>"Automatic Generation of Critical Scenarios for Evaluating Intelligent Control..."</i>	
Invited Talk, Itaú-Unibanco	Dec 2023
<i>"Optimizing Confidence in Autonomous Vehicle Controls..."</i>	

## Academic Service

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Reviewer, IEEE Open Journal of Intelligent Transportation Systems (OJ-ITS)

## Offers of Admission

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New York University (NYU), Tandon School of Engineering  
M.Sc. in Electrical Engineering

2025

## Technical Skills

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- **Programming:** Python, C, Java, VHDL, MATLAB, VBA
- **AI & Data Science:** TensorFlow, Scikit-learn, Pandas
- **AV Simulation:** CARLA, Scenic, OpenDS
- **Hardware & IoT:** FPGA, Arduino, MQTT