Paulo Alexandre Canelas dos Santos

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Summary

My research focuses on empirically studying bugs and developing program analysis techniques to detect errors in software systems. I have worked on code generation using evolutionary computation, and I am closely researching the application of AI, programming languages, and software engineering techniques to robot software. Overall, I am interested in **Program Analysis**, **Code Generation & Repair**, and **Mixed-method Studies**.

Education

Carnegie Mellon University - School of Computer Science — Pittsburgh, Pennsylvania
Dual Degree Ph.D. in Software Engineering, with University of Lisbon — 2020 – present
- **Thesis**: Specification-Driven Detection of Misconfigurations in ROS-based Systems.
- Advisors: Alcides Fonseca, Sara Silva and Christopher S. Timperley.

Faculdade de Ciências, University of Lisbon — Lisbon, Portugal
M.Sc. in Software Engineering — 2018 – 2020

Faculdade de Ciências, University of Lisbon — Lisbon, Portugal
B.Sc. in Computer Science — 2015 – 2018

Work Experience

PhD Software Engineer Intern, Uber Technologies Inc — Sunnyvale, CA
June 2024 – Aug 2024
Mentored by Stefan Heule and Yuxin Wang in the Programming Systems Group.
Developed a static analysis tool in Golang to detect configuration errors at scale.

Selected Publications

LGTM! Characteristics of Auto-Merged LLM-based Agentic Pull Requests — 2026
Ruben Branco*, **Paulo Canelas***, Catarina Gamboa*, Alcides Fonseca.
In Submission.

ROSpec: A Domain-Specific Language for ROS-based Robot Software — 2025
Paulo Canelas, Bradley Schmerl, Alcides Fonseca, Christopher S. Timperley.
Proceedings of the ACM on Programming Languages (OOPSLA).

Are Large Language Models Memorizing Bug Benchmarks? — 2024
Daniel Ramos, Claudia Mamede*, Kush Jain*, **Paulo Canelas***, Catarina Gamboa*, Claire Le Goues.
International Workshop on Large Language Models for Code (LLM4Code).

Understanding Misconfigurations in ROS: An Empirical Study — 2024
Paulo Canelas, Bradley Schmerl, Alcides Fonseca, Christopher S. Timperley.
International Symposium on Software Testing and Analysis (ISSTA).

Usability-Oriented Design of Liquid Types for Java — 2023
Catarina Gamboa, **Paulo Canelas**, Christopher S. Timperley, Alcides Fonseca.
International Conference on Software Engineering (ICSE).

Awards and Achievements

🏆 **Best Paper Award at International Workshop on Large Language Models for Code (LLM4Code)**.

LASIGE Best PhD Researcher - Honorable Mention: Recognized for outstanding research contributions.

LASIGE Workshop'20 - Best Poster Award: M.Sc. and PhD students poster competition best poster.

EDP University Challenge, Top 15/1152: Top 15/1152 teams (4138 students) with the project ecoServer, a system to optimize the energy impact of servers in data centers, organized by Energias de Portugal (EDP).

Research Projects

A Study on Auto-Merging Requirements for Agent-based PRs in GitHub: I conducted a quantitative study on AI-generated pull requests (PR) from tools, such as Copilot and Codex, to understand what conditions allow maintainers to automatically land AI-generated PRs.

Architectural Evolution and Drift Analysis in Open Source Robotics: I am developing an automated cross-language evolution and drift analysis tool that (1) statically extracts architectural elements from ROS systems in C++ and Python, (2) infers documentation changes using LLMs, and (3) analyzes architectural evolution and detects documentation drift.

ROSpec: A Domain-Specific Language for Robot Software: I developed ROSpec, a language to verify component configurations and integration. I evaluated ROSpec by specifying a warehouse robot, and implementing specifications for components from 182 misconfiguration questions from prior work.

Taxonomy of Misconfigurations in ROS-based Robotic Systems: I conducted a qualitative study to understand ROS misconfigurations developers make by manually analyzing thousands of Q&A posts. Moreover, I performed a literature review to understand which techniques address them.

Teaching Experience

Teaching Assistant — Carnegie Mellon University, 2023-2024
- **(17-643) Quality Management**, and **(17-623) Quality Assurance**.

Teaching Assistant — University of Lisbon, 2021-2022
- **Programming**, and **Object-Oriented Design**.

Scientific Outreach

Invited Reviewer at International Conference on Robotics and Automation (ICRA).

Invited Reviewer at Transactions on Software Engineering (TSE).

Artifact Evaluation Committee at International Conference on SE (ICSE).

LASIGE Summer of Research Organizer. Co-creator of a funded Research Experience in Undergraduate program to promote research at the undergraduate level at University of Lisbon.

LASIGE Ph.D. Commission Member. Responsible for the co-creation and management of a funded commission that promotes the inclusion and culture between Ph.D. Students.

Ph.D. Student Representative at Faculdade de Ciências, University of Lisbon.

Students Mentored

Márcio Caetano. Summer of Research/Research Experience for Undergraduates in University of Lisbon. Márcio worked on code generation of specifications for Java from documentation using Large Language Models.

Eduardo Pareja Lema. Research Experience for Undergraduates in Software Engineering (REUSE) at CMU. Eduardo worked on Collaborative Oracle Inference for Robotic Systems.