Paulo Santos

Paulo Alexandre Canelas dos Santos
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Research Interests

I am a Ph.D. Student at LASIGE at the Faculdade de Ciências da Universidade de Lisboa and at the Institute for Software Research at Carnegie Mellon University. I am working under the supervision of Alcides Fonseca and Sara Silva at FCUL, and Chris Timperley at CMU. I have a special interest in programming languages, program repair, and robotic systems (namely in the combination of all of them). Outside of geek world, I'm an easy-going person who spends his time discovering new places and meeting new people.

Education

2020 – 2025 **PhD in Software Engineering**, *Institute for Software Research*, Carnegie Mellon University.

(expected) **PhD in Informatics**, *LASIGE*, Faculdade de Ciências da Universidade de Lisboa.
Dissertation: Type-Driven Repair of Robotic Systems.
Ph.D. Advisors: Alcides Fonseca, Christopher S. Timperley, Sara Silva.

2018 – 2020 **MSc. Software Engineering**, *Faculty of Sciences*, University of Lisbon, 17/20.
Dissertation: Towards the Conceptualization of Refinement Typed Genetic Programming.

2015 – 2018 **BSc. Informatics Engineering**, *Faculty of Sciences*, University of Lisbon, 16/20.

Publications

2022 **An Experience Report on Challenges in Learning the Robot Operating System**.
Paulo Canelas, Miguel Tavares, Ricardo Cordeiro, Alcides Fonseca and Christopher S. Timperley. 2022. Paper. In the *Robotics Software Engineering* (*RoSE*) workshop at the International Conference on Software Engineering (ICSE 2022).

2022 **Grammatical Evolution Mapping for Semantically-Constrained Genetic Programming**.
Alcides Fonseca, **Paulo Canelas**, Guilherme Espada and Sara Silva. 2022. Paper. In Genetic Programming Theory and Practice XVIII.

2021 **User-driven Design and Evaluation of Liquid Types in Java**.
Catarina Gamboa, **Paulo Alexandre Santos**, Christopher S. Timperley, and Alcides Fonseca. 2021. Extended Abstract. In the *Human Aspects of Types and Reasoning Assistants* (*HATRA*) workshop at the ACM SIGPLAN conference on Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH 2021).

2021 **Augmenting Search-based Techniques with Static Synthesis-based Input Generation**.
Paulo Santos, José Campos, Chris S. Timperley and Alcides Fonseca. 2021. Short Paper. In the *Search-Based Software Testing* (*SBST*) workshop at the International Conference on Software Engineering (ICSE 2021).

2020 **Extending Java with Refinements**.
Catarina Gamboa, **Paulo Santos**, and Alcides Fonseca. 2020. Student Paper. In *Program Semantics, Specification and Verification: Theory and Applications* (*PSSV-2020*).

2020 **The Usability Argument for Refinement Typed Genetic Programming**.
Alcides Fonseca, **Paulo Santos**, and Sara Silva. 2020. Full paper. In *Parallel Problem Solving from Nature – PPSN XVI* (PPSN 2020).

2020 **Refined typed genetic programming as a user interface for genetic programming**.
Paulo Santos, Sara Silva, and Alcides Fonseca. 2020. Poster. In *Proceedings of the 2020 Genetic and Evolutionary Computation Conference Companion* (*GECCO '20*).

Teaching Experience

Sept. 2021 – Feb. 2021 **Invited Teaching Assistant**, *Departament of Informatics*, Faculty of Sciences.
Programming course: responsible for preparing the laboratory exercises and lecturing a laboratory class to students attending the BSc. in Biomedical and Biophysics Engineering, and Physics Engineering (1st Year). Students evaluation score of the classes: 4.7/5.0.

Feb. 2021 – June 2021 **Invited Teaching Assistant**, *Departament of Informatics*, Faculty of Sciences.
Object Oriented Development course: responsible for lecturing a practice class to students in Informatics Engineering (2nd Year).

Awards and Achievements

September 2020 **EDP University Challenge - Portugal**, Top15.
Every year the national energy provider, Energias de Portugal (EDP), organizes a competition for the university students. In this edition, I achieved the top 15 out of 1152 teams (4138 students) with the project ecoServer: a system to optimize the energy impact of servers in data centers.

February 2020 **LASIGE Workshop'20**, Best Poster - 1st.
In the annual gathering of the LASIGE research group, MSc. and PhD. students compete on a challenge to develop and expose a poster on their current work. In the 2020 edition, the poster I presented about my MSc. Thesis obtained the first place.

Research Experience

Accepted 2020 **Visiting Student**, Institute for Software Research, Carnegie Mellon University.
Accepted in the CMU|Portugal program. Visiting canceled due to coronavirus.

May 2019 – Currently **Student Researcher**, *LASIGE*, Faculty of Sciences, University of Lisbon.

Scientific Outreach

February 2022 – September 2022 **LASIGE PhD Student Commission Member**, *LASIGE, Department of Informatics, University of Lisbon.*
Responsible for the co-creation and management of a funded Commission that promotes the inclusion and culture between the Ph.D. Students.

October 2021 – September 2022 **PhD Student Representative**, *Department of Informatics, University of Lisbon.*

May 2022 **International Conference in Software Engineering (ICSE) Student Volunteer**.

June 2022 **PhD. Exchange Student Program with University of Coimbra Organizer**.

July 2021 **Computer Aided Verification (CAV) Student Volunteer**.

January 2021 **Principles of Programming Language (POPL) Student Volunteer**.

November'20 – February'22 **LASIGE Event Organizer**.
Main responsible for the organization of the LASIGE annual gatherings. Organized the LASIGE Workshop 2020 remote edition, the LASIGE Welcome Day 2021 that counted with the participation of more than 100 members. Helped guiding the new students in the organization for the LASIGE Workshop 2022 edition.

November 2019 **COST ACTION CA15140 - ImAppNIO**.
During the MSc. Thesis period I attended a Doctoral School at University of Coimbra, the Improving Applicability of Nature-Inspired Optimisation by Joining Theory and Practice Training School, to more deeply improve my knowledge in evolutionary computation essential for my thesis.

Research Projects

2019 **ÆON - A Programming Language for Refinement Typed Program Synthesis**.
Æon is a programming language with polymorphism and refinement types used as the basis for Refinement Typed Genetic Programming (RTGP) which allows the complete synthesis of programs. In this project, I was responsible for developing the language syntactic sugar frontend, the evolutionary approach, and the development and optimization on the non-deterministic synthesizer from the refinement types.

2020 **Genetic Probabilistic Programming Framework**.

This work proposes the combination of Genetic Programming (GP), as a search method for finding a probability model layout, with Deep Probabilistic Programming (DPP), for learning the parameters of the layout. In this work, I was responsible for developing the probabilistic programming language, the non-deterministic synthesis of the program expressions, and the genetic programming approach.