

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 synthesis, and evolutionary algorithms (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, Sara Silva, Christopher S. Timperley.
- 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

- 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

- Feb. 2021 – **Invited Teaching Assistant**, *Department of Informatics*, Faculty of Sciences.
- June 2021 Teaching and Scientific Divulcation which is a course in the PhD program requiring the students to teach theoretical-practical classes. I was responsible for the **Object Oriented Development** course (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 **LASIGE Workshop'20**, Best Poster - 1st.

2020 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 **Visiting Student**, Institute for Software Research, Carnegie Mellon University.

2020 Accepted in the CMU|Portugal program. Visiting canceled due to coronavirus.

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

Currently

Other Experience

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

Volunteered to help the 10th Workshop on Synthesis (SYNT).

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

Responsible for helping in the different tracks at the POPL conference.

November'20 **LASIGE Workshop'21 Organizer.**

– Currently Responsible for organizing the sixth edition of the LASIGE annual gathering.

November **COST ACTION CA15140 - ImAppNIO.**

2019 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.