

# PAULO BRUNO SERAFIM

XAI Researcher | PhD Student @ GSSI

I like to solve challenging problems using my creativity, developing new solutions to relevant and nontrivial assignments. Throughout my experience on different academic projects, I became a person who not only loves resolving problems through innovation but also enjoys writing about them.

## SKILLS

**C/C++** 9 years

*Data-Oriented and Object-Oriented C/C++*

**Python** 7 years

*Numpy, Scikit, Pandas, Matplotlib*

**Julia** 2 years

*WorldDynamics.jl, Flux.jl, ModelingToolkit.jl*

**Assembly** 1 year

*Z80 processor (GBASM)*

**Reinforcement Learning** 7 years

*Deep Q-Networks and Policy Gradients*

**Explainable AI** 3 years

*OmniXAI, XRL, Natural Language Explanations*


**Large Language Models** 1 year

*GPT-3.5, GPT-4, Guidance*

## LANGUAGES

 Native Speaker

 Full Professional Proficiency

 Professional Working Proficiency


 Elementary Proficiency

## SOCIAL

 paulobruno.github.io


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## CONTACT

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## PROFESSIONAL EXPERIENCE

### Research Engineer

**Apr. 2022 - Oct. 2022**

*INRIA Sophia Antipolis*

Implemented a novel Locality-Sensitive Hashing algorithm developed in the group, performed benchmarks, and wrote reports of experiments on Machine Learning datasets. Started development of an internal package for Neural Network pruning. Lead programmer of WorldDynamics.jl, an open-source framework for world dynamics modeling and simulation written in Julia.

### Senior Data Scientist

**May 2021 - Mar. 2022**

*Instituto Atlântico*

Tech Lead of the Data Science branch of an R&D project for Dell EMC. Working with anomaly detection using unsupervised learning methods, classification using supervised learning methods, and development of Business Intelligence dashboards to assist tactical and operational decision-making. Responsible for writing and presenting technical reports to Dell EMC managers.

### Computer Vision Engineer

**Sep. 2020 - Apr. 2021**

*Instituto Atlântico*

Worked on an R&D Computer Vision project for HP Inc. applying Deep Learning to the problems of human segmentation and image matting using TensorFlow. Worked on OCR methods applied to printed text documents. Developed a synthetic document generator using OpenCV. Co-leader of the Cognitive Computing study group, focused on CV, Image Processing, and Reinforcement Learning.

### Computer Graphics Engineer

**Feb. 2019 - Aug. 2020**

*Instituto Atlântico*

Worked on R&D projects for HP Labs on 3D printing, applying computer graphics methods using only C/C++ standard libraries. Developed a new way to build voxelized tree-like support structures, which generated a patent application (2019). Worked on improvements of Genetic Algorithm heuristics applied to a Bin Packing Problem (2020).

### Software Developer

**May 2018 - Feb. 2019**

*GREat - ASTEF*

Developed solutions for fingerprint minutiae extraction and matching focused on high performance, using OpenCV in C++. Implemented a data-oriented C++ version of SourceAFIS, reducing runtime in about 90%. Created a side project using Convolutional Neural Networks for fingerprint Region of Interest (ROI) segmentation. Worked on a Transfer Learning solution to enhance fingerprint images. Helped the team with singular point detection using YOLOv4.

## EDUCATION

### PhD - Computer Science      Nov. 2022 - Present

*Gran Sasso Science Institute (GSSI)*

Advisor: Pierluigi Crescenzi

Co-Advisor: Fosca Giannotti

Research on Conversational Explainable AI (XAI) through the use of Large Language Models.

### MSc - Computer Science      Mar. 2016 - Apr. 2018

*Federal University of Ceara (UFC)*

Advisor: Dr. Joaquim Bento Cavalcante Neto

Co-Advisors: Dr. Creto Vidal and Dr. Yuri Nogueira

Thesis: *Evaluating competition in training of Deep Reinforcement Learning agents in First-Person Shooter games (in Portuguese)*

Research on multi-agent competitive applications of Deep Q-Networks using the environment ViZDoom and TensorFlow.

### BSc - Computer Science      Jan. 2013 - Dec. 2015

*Federal University of Ceara (UFC)*

*Magna Cum Laude degree*

Worked on hair animation projects using mass-spring systems and OpenGL (2013). Developed research on Neuroevolution for autonomous game agents (2014-2015).

## PERSONAL RESEARCH

### Deep RL Researcher      Apr. 2018 - Present

*CRAb - Computer Graphics, Virtual Reality and Animation*

Deep Reinforcement Learning (DRL) researcher, working with autonomous game agents using TensorFlow and PyTorch, and the environments ViZDoom, OpenAI Gym, and Unity ML-Agents. Co-advisor of one BSc, two MSc, and one PhD candidate students. Currently working on analysis of agent's performance under different views of the same scenario by using model interpretability methods.

## STUDENTS

Halisson Rodrigo	<i>PhD</i>	2020-Present
Alexandre Magno	<i>BSc/MSc</i>	2019-Present
Rômulo Férrer Filho	<i>BSc/MSc</i>	2019-Present
Hyuan Farrapo	<i>BSc</i>	2020-2022
Anderson Oliveira	<i>BSc/MSc</i>	2017-2020
Matheus Cordeiro	<i>BSc</i>	2017-2019
Eduardo Melo	<i>BSc</i>	2015-2017
Gabriel Costa	<i>BSc</i>	2015-2017

## SELECTED PUBLICATIONS

WorldDynamics.jl: A Julia Package for Developing and Simulating Integrated Assessment Models <i>Journal of Open Source Software</i> Pierluigi Crescenzi, Emanuele Natale, Aurora Rossi, Paulo B. Serafim.	Mar. 2024
Assessing the Robustness of Deep Q-Network Agents to Changes on Game Object Textures <i>XX Brazilian Symposium on Computer Games and Digital Entertainment (SBGames)</i> Paulo B. S. Serafim, Yuri L. B. Nogueira, Creto A. Vidal, Joaquim B. Cavalcante-Neto.	Oct. 2021
Deep Reinforcement Learning em Ambientes Virtuais (in Portuguese) <i>Book Chapter in Introduction to Virtual and Augmented Reality</i> Paulo B. S. Serafim, Yuri L. B. Nogueira, Joaquim B. Cavalcante-Neto, Creto A. Vidal.	Nov. 2020
Generating Supports <i>Patent WO2021107916A1</i> Jun Zeng, Paulo Bruno Serafim, Alyne Gomes Soares Cantal	Nov. 2019

## REFERENCES

### Dr. Pierluigi Crescenzi

*PhD Advisor*

Full Professor

Gran Sasso Science Institute

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### Dr. Emanuele Natale

*Employer and Research Supervisor*

CNRS Researcher

Université Côte d'Azur, INRIA, I3S

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### Dr. Joaquim Cavalcante Neto

*MSc and BSc Advisor*

Full Professor

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