PAULO BRUNO DE SOUSA SERAFIM

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EDUCATION

Ph.D. student in Computer Science November 2022 - Present
Gran Sasso Science Institute (GSSI), L'Aquila, Italy

Master's degree in Computer Science March 2016 - April 2018
Federal University of Ceara (UFC), Fortaleza, Brazil

Bachelor's degree in Computer Science January 2013 - February 2016
Federal University of Ceara (UFC), Fortaleza, Brazil

Bachelor's degree in Chemical Engineering (incomplete) January 2010 - December 2012
Federal University of Ceara (UFC), Fortaleza, Brazil

MASTER'S THESIS

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

Comparison of autonomous agents' performance in relation to different training opponents. Multiple agents were trained from image data in a competitive scenario of a First-Person Shooter environment using Deep Q-Networks (DQN). Agents that trained against DQN opponents performed better.

Advisor: Prof. Joaquim Bento Cavalcante-Neto (UFC)
Co-advisors: Prof. Creto Vidal (UFC) and Prof. Yuri Nogueira (UFC)
Outside reader: Prof. Soraia Musse - Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS)

RESEARCH EXPERIENCE

Inria - Sophia Antipolis Méditerranée April 2022 - Present
Research Engineer

Optimisation of Neural Networks with implementation using Julia programming language. Lead programmer of WorldDynamics.jl, an open-source framework for world dynamics modelling and simulation.

CRAb Research Group - Department of Computer Science (UFC)

External Collaborator March 2018 - Present
Working on analysis of agent's performance under different views of the same scenario by using model interpretability methods. Started researching on character-oriented player modelling behaviour.

Master's student March 2016 - February 2018
Master's work in Deep Reinforcement Learning.

Volunteer Researcher August 2014 - February 2016
Undergraduate research in Neuroevolution, constructing autonomous agents immersed in a resource gathering environment and in a simplified version of a MOBA game.

Undergraduate scholarship August 2013 - July 2014
Undergraduate research on hair animation using mass-spring systems and Neuroevolution for autonomous game agents.

WORK EXPERIENCE

Instituto Atlântico May 2021 - March 2022
Data Scientist

Technical Leader in a team of three Data Scientists on an R&D project for Dell EMC. Worked with anomaly detection using unsupervised learning methods, classification using supervised learning, and development of dashboards to assist tactical and operational decision making.

Instituto Atlântico September 2020 - April 2021
Computer Vision Engineer

Developer on an R&D Computer Vision project for HP Inc using Deep Learning for human segmentation in photos. Worked on OCR methods applied to printed text documents and developed a synthetic document generator.

Instituto Atlântico February 2019 - August 2020
Computer Graphics Engineer

Developer on an R&D project for HP Labs in the field of 3D printing. Applied Computer Graphics techniques to build voxelised tree-like support structures.

GREat - ASTEF May 2018 - February 2019
Software Developer

Developed solutions for fingerprint minutiae extraction and matching focused on high-performance. Started a side research project using Convolutional Neural Networks for fingerprint ROI segmentation.

TEACHING EXPERIENCE

Teaching Internship February 2017 - July 2017

Graduate Teaching Assistant of the Introduction to Computer Science course under the supervision of Prof. Yuri Nogueira, Assistant Professor at the Department of Computer Science (UFC).

Teaching Initiation Program September 2014 - December 2014
Scholarship (R$ 1,600.00) funded by the Vice Provost for Undergraduate Studies (Prograd-UFC).

Undergraduate Teaching Assistant of the Elementary Calculus course under the supervision of Prof. Frederico Girão, Associate Professor at the Department of Mathematics (UFC).

Short-duration courses

An Introduction to Reinforcement Learning (18 hours) February 2020 - April 2020
Internal course at Instituto Atlântico organised by the Group of Cognitive Computing

Introduction to 2D Game Development (4 hours) August 2015
Organised by the Program of Tutoring Education of the Computer Science Department (UFC)

Elementary Excel (3 hours) June 2015
Organised by the Program of Tutoring Education of the Economics Department (UFC)

Introduction to C Programming Language (20 hours) June 2012
Organised by the Junior Enterprise of Chemical Engineering (UFC)

SUPERVISORY EXPERIENCE

Graduate students 2021 - Present

Co-supervisor of a Ph.D. candidate, providing support in the field of Deep Reinforcement Learning.
Direct supervisor of two Master's students in their works and thesis.

Undergraduate students 2015 - 2022

Direct supervisor of three undergraduate students in their Bachelor's thesis.
Tutor of four undergraduate students during their one-year internships in the CRAb research group.

Company employees 2018 - 2022

Co-leader of a study group, leading proof-of-concept research in Reinforcement Learning.
Direct supervisor of three interns during their first months in the company.
Started and led a research subgroup with five people in Deep Learning applied to fingerprint image problems.

BOARDS

Federal University of Ceara (UFC) April 2021

Co-advisor of an undergraduate student in the field of Deep Reinforcement Learning.

Federal University of Ceara (UFC) June 2019

Outside reader of an undergraduate thesis in the field of Computer Vision.

AWARDS AND HONOURS

Magna Cum Laude 2015
Federal University of Ceara

An academic distinction awarded by the Federal University of Ceara for students that conclude the Bachelor's degree with elevated academic performance.

Best Paper Nominations

XIX Brazilian Symposium on Computer Games and Digital Entertainment (SBGames) 2020
XVI Brazilian Symposium on Computer Games and Digital Entertainment (SBGames) 2017

FELLOWSHIPS AND GRANTS

Ph.D. Scholarship Novembre 2022 - October 2026
€ 64,639.64

Funded by the Gran Sasso Science Institute (GSSI).

Master's Fellowship March 2016 - February 2018
R$ 36,000.00

Funded by the Brazilian National Council for Scientific and Technological Development (CNPq).

Program Young Talents for Science August 2013 - July 2014
R$ 4,800.00

Funded by the Brazilian Coordination for the Improvement of Higher Education Personnel (CAPES).

PATENTS

Generating supports 2019
WO2021107916A1

Generation of tree-like supporting structures for 3D printing. Developed when I was working at Instituto Atlântico in a partnership with HP Inc., under the supervision of HP Labs Senior Researcher Jun Zeng.

STUDENT SOCIETIES

Politeq Jr. (currently called Ciclo Jr.)
Junior Enterprise affiliated to the Departments of Chemical and Environmental Engineering at UFC

President — June 2012 - January 2013
Director of Finance and Administration — February 2012 - June 2012
Trainee — August 2011 - February 2012

FEJECE
Federation of Junior Enterprises of Ceara

Board member representing Politeq Jr. — February 2012 - January 2013

ACADEMIC SERVICE

Reviewer — 2021

Invited reviewer for the 23rd Symposium on Virtual and Augmented Reality (SVR 2021).

O CT quer você! — June 2012

An event idealised by the Centre of Technology (UFC) comprising all engineering courses to help secondary school students. I was a member of the Chemical Engineering organisation committee.

LECTURES

Technological Advances in 3D Printing — August 2020
In Portuguese

Guest lecturer invited by the University for the International Integration of Afro-Brazilian Lusophony.

Deep Reinforcement Learning: Today's AIs that beat humans — August 2020

Lecturer at CorongaMeet 2.0 Ceara.

Autonomous Bots in StarCraft II — November 2019
In Portuguese

Lecturer at the national Developer's Conference 2019 (TDC).

How do Robots See? — October 2019
An introduction to semantic segmentation in images

Lecturer at HP Spark Day 2019, organised by HP Inc.

Introduction to Artificial Intelligence Applied to Digital Games — October 2018
In Portuguese

Guest lecturer invited by the University Centre UniFanor.

Artificial Intelligence Applied to Digital Games — November 2017
In Portuguese

Guest lecturer invited by the University Centre Unichristus.

Introduction to Digital Games Development — June 2017
In Portuguese

Guest lecturer invited by the State School of Professional Education Julia Giffoni.

SELECTED PUBLICATIONS

XX Brazilian Symposium on Computer Games and Digital Entertainment October 2021

Assessing the Robustness of Deep Q-Network Agents to Changes on Game Object Textures
Paulo B. S. Serafim, Yuri L. B. Nogueira, Creto A. Vidal, Joaquim B. Cavalcante-Neto.

Book Chapter - Introduction to Virtual and Augmented Reality (in Portuguese) November 2020

Deep Reinforcement Learning em Ambientes Virtuais (Deep Reinforcement Learning in Virtual Environments)
Paulo B. S. Serafim, Yuri L. B. Nogueira, Joaquim B. Cavalcante-Neto, Creto A. Vidal.

2019 International Joint Conference on Neural Networks July 2019

A Method based on Convolutional Neural Networks for Fingerprint Segmentation
Paulo B. S. Serafim, Aldísio G. Medeiros, Paulo A. L. Rego, José G. R. Maia, Fernando A. M. Trinta, Marcio E. F. Maia, José A. F. Macêdo, Aloísio V. Lira Neto.

ADDITIONAL PUBLICATIONS

XXI Brazilian Symposium on Computer Games and Digital Entertainment October 2022

DRLeague: a Novel 3D Environment for Training Reinforcement Learning Agents
Hyuan P. Farrapo, Rômulo F. Férrer Filho, José G. R. Maia, Paulo B. S. Serafim.

XX Brazilian Symposium on Computer Games and Digital Entertainment October 2021

Gym Hero: A Research Environment for Reinforcement Learning Agents in Rhythm Games
Rômulo F. Férrer Filho, Yuri L. B. Nogueira, Creto A. Vidal, Joaquim B. Cavalcante-Neto, Paulo B. S. Serafim.

28th International Conference on Systems, Signals and Image Processing June 2021

Robust Fingerprint Singular Point Detection using a Single-Stage CNN for Object Detection
Lucas S. Fernandes, João P. B. Andrade, Leonardo F. Costa, Paulo B. S. Serafim, Paulo A. L. Rego, José G. R. Maia.

XIX Brazilian Symposium on Computer Games and Digital Entertainment November 2020

Investigating Deep Q-Network Agent Sensibility to Texture Changes on FPS Games
Paulo B. S. Serafim, Yuri L. B. Nogueira, Creto A. Vidal, Joaquim B. Cavalcante-Neto, Rômulo F. Férrer Filho.

XXII Symposium on Virtual and Augmented Reality November 2020

Autonomous Foraging with SARSA-based Deep Reinforcement Learning
Anderson O. Mesquita, Yuri L. B. Nogueira, Creto A. Vidal, Joaquim B. Cavalcante-Neto, Paulo B. S. Serafim.

XIX Brazilian Symposium on Computer Games and Digital Entertainment November 2020

Simplifying Attribute Balancing in Electronic Role-Playing Games (in Portuguese)
Alexandre M. M. Santos, Paulo B. S. Serafim, Artur O. R. Franco, Rafael A. F. Carmo, José G. R. Maia.

2020 International Joint Conference on Neural Networks July 2020

A Novel Approach for Automatic Enhancement of Fingerprint Images via Deep Transfer Learning
Aldísio G. Medeiros, João P. B. Andrade, Paulo B. S. Serafim, Alexandre M. M. Santos, José G. R. Maia, Fernando A. M. Trinta, José A. F. Macêdo, Pedro P. R. Filho, Paulo A. L. Rego.

XVIII Brazilian Symposium on Computer Games and Digital Entertainment October 2019

A Minimal Training Strategy to Play Flappy Bird Indefinitely with NEAT
Matheus G. Cordeiro, Paulo B. S. Serafim, Yuri L. B. Nogueira, Creto A. Vidal, Joaquim B. Cavalcante-Neto.

XVII Brazilian Symposium on Computer Games and Digital Entertainment October 2018

Evaluating Competition in Training of Deep Reinforcement Learning Agents in First-Person Shooter Games
Paulo B. S. Serafim, Yuri L. B. Nogueira, Creto A. Vidal, Joaquim B. Cavalcante-Neto.

XVI Brazilian Symposium on Computer Games and Digital Entertainment November 2017

On the Development of an Autonomous Agent for a 3D First-Person Shooter Game Using Deep Reinforcement Learning
Paulo B. S. Serafim, Yuri L. B. Nogueira, Creto A. Vidal, Joaquim B. Cavalcante-Neto.

19th Symposium on Virtual and Augmented Reality November 2017

Towards Playing a 3D First-Person Shooter Game Using a Classification Deep Neural Network Architecture
Paulo B. S. Serafim, Yuri L. B. Nogueira, Creto A. Vidal, Joaquim B. Cavalcante-Neto.

LANGUAGES

Portuguese	Native
English	Full professional working proficiency
French	Professional working proficiency
Italian	Elementary proficiency

REFERENCES

Dr. Emanuele Natale, CNRS Researcher
Research Supervisor

Affiliation: CNRS, Université Côte d'Azur, Inria, I3S
E-mail: emanuele.natale@inria.fr

Dr. Joaquim Bento Cavalcante-Neto, Full Professor at UFC
Master's and Bachelor's Advisor

Affiliation: Department of Computer Science, Federal University of Ceara (UFC)
E-mail: joaquimb@dc.ufc.br