

Pedro Campos Vieira

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Education

Faculty of Sciences of University of Porto

Porto, Portugal

Master in Data Science

September 2022 - July 2024

Thesis *in viva* approved with the maximum grade possible.

Final Mark: Average 19/20; ECTS grade A; 4.0/4.0 GPA (top 1%);

Faculty of Sciences of University of Porto

Porto, Portugal

Bachelor in Computer Science

September 2019 - July 2022

Final Mark: Average 18/20; ECTS grade A; 3.90/4.0 GPA (top 1%)301607626400193483

Université Paris-Saclay à Centrale Supélec

Study Abroad

Orsay, Paris, France

Summer School for Introduction to Artificial Intelligence

June 2022 - July 2022

Research Experience

Department of Computer Science of the Faculty of Sciences of University of Porto

Porto, Portugal

Research Assistant as Master's Candidate

September 2023 - July 2024

- Conducted independent research under the mentorship of Prof. Pedro Manuel Pinto Ribeiro and Prof. Miguel Eduardo Pinto da Silva, with a focus on advancing Graph Neural Networks (GNNs) for motif discovery.
- Explored the foundational principles, limitations, and current methodologies of GNNs, critically analyzing state-of-the-art techniques and identifying significant gaps in the literature.
- Designed and executed both theoretical and empirical experiments addressing these gaps, culminating in an alternative to motif estimation using GNNs.
- Led the drafting of a manuscript detailing these findings for publication.

INESC TEC - Artificial Intelligence and Decision Support Research Center

Porto, Portugal

Research Assistant

February 2022 - January 2023

- Collaboration between Carnegie Mellon (CMU), INESC TEC/ID, NOVA.ID.FCT and FCIências.ID to deanonymize Dark Web Traffic of Mix Networks for Cybercrime Investigation (project: DANon)
- Applied machine learning methods, including reinforcement learning and genetic algorithms, to extract origin relay information from encrypted TCP connections.
- Developed and implemented heuristic-based algorithms for temporal sequence similarity measurement to enhance relay matching accuracy.
- Researched the applicability of the described methods to demultiplex encrypted TCP requests from a single logical connection.
- Authored a comprehensive technical report documenting methodologies, findings, and implications for secure communications analysis (not publicly available).

INESC TEC - HumanISE Research Center

Porto, Portugal

Research Assistant

February 2021 - September 2021

- Collaborated with a research team (MoST project) to design advanced spatio-temporal data structures, integrating rigorous time and space complexity analysis to establish defined performance boundaries, beating the state-of-the-art.
- Explored structural applications to challenging spatio-temporal problems, notably the “Teapot in a Stadium” problem, deriving critical insights that contributed to error correction and refinement of the models.
- Led the drafting of a manuscript detailing these findings for publication.

Publications

C. Vieira, P*., Montrezol, J.P.*, T. Vieira, J., Gama, J. (2024). S+t-SNE - Bringing Dimensionality Reduction to Data Streams. In: Miliou, I., Piatkowski, N., Papapetrou, P. (eds) Advances in Intelligent Data Analysis XXII.

C. Vieira, P., Silva, M.E.P., Ribeiro, P., Studying and Improving Graph Neural Network-based Motif Estimation. Submitted to conference, in peer-review.

Carneiro, E.*, **C. Vieira, P.***, Carvalho, A. V., Amaro, M., “The Dynamic-Loose octree : a spatial index structure towards time-efficiency”. Journal peer-reviewed to be published in mid-to-late Winter 2025.

Talks

From Networks to Insights: Analyzing Graphs With and Without Machine Learning

Invited PhD Interview Presentation, The International Max Planck Research School for Intelligent Systems, 2025

Brief description: *A 15-minute presentation on graphs, highlighting approaches on how to analyze them.*

S+t-SNE Bringing dimensionality reduction to data streams

Oral Presentation, Intelligent Data Analysis (IDA) 2024, Stockholm, Sweden, April 24-26, 2024

Brief description: Presented a first adaptation of t-SNE to online scenarios. [10.1007/978-3-031-58553-1_8](https://doi.org/10.1007/978-3-031-58553-1_8)

Other Academic Activities

- **28th International Conference on Discovery Science 2025** - Program Committee (Reviewer)
- **European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD) 2025** - Reviewer
- **International Conference on Learning Representations (ICLR) 2025** - Reviewer
- **27th International Conference on Discovery Science 2024** - Program Committee (Reviewer)

Academic Service

Monitoring Committee of the Bachelors Program in Computer Science

Member

December 2021 - December 2022

Monitoring Committee of the Master Program in Data Science

Member

December 2022 - December 2024

Selected Extra Projects

Construction and Analysis of Complex Networks of MOBA Matches

- Worked in retrieving massive data regarding MOBA matches using public APIs and in the construction of complex networks from such data.
- Examined the created networks regarding properties such as bond and site percolation and information diffusion.
- Applied machine learning algorithms in order to predict the rank of a match.

Maze Solver

- Explored computer vision techniques to digitally reconstruct mazes given by live video.
- Examined different methodologies to make the reconstruction resilient to different types of illumination and different ways of representing the maze e.g. on a piece of paper and on backlit screens.
- Implemented simple algorithmic tricks to solve the digital reconstruction.

Modulation and Forecast of Aerosol Time Series

- Studied time series regarding aerosol quantities in different points of the world and modulated their behavior with multiple parametric and non-parametric models.
- Compared different methods for forecasting, together with a study of best practices for forecasting.

Random Polygon Generator

- Designed algorithms based on adversarial and local search and optimisation to efficiently generate convex polygons given a set of points and predetermined connections.
- Investigated shortest route discovering (TSP-like) methodologies through the aforementioned method.

Skills & Interests

Technical - Programming Languages: Python, Java , R (*expert level*); Bash, C++, C, Haskell, MySQL (*advanced level*); CUDA, Rust, Erlang (*beginner level*).

Technical - Tools and Frameworks: Pytorch, Pytorch Geometric, TensorFlow/Keras, Numpy, Pandas, Scikit-Learn, Networkx, Networkit, Graph-Tool, Ray (*expert level*); OpenCV, Weka, Gephi, AMPL, BLAST, biopython, PySpark (*intermediary level*); SLURM, OpenSearch, RAPIDS, HoloViz (*beginner level*).

Language: Portuguese (*Native*), English (*Native Level*), Spanish (*Reading Proficiency*).

Additional Interests: Building computers and experimenting with hardware; Studying mythology (mainly greek)

References

João Manuel Portela da Gama
Full Professor
University of Porto
jgama@fep.up.pt

Pedro Manuel Pinto Ribeiro
Associate Professor
University of Porto
pribeiro@fc.up.pt

Miguel Eduardo Pinto da Silva
Invited Professor; Data Scientist
University of Porto, EXADS
mepsilva@fc.up.pt