

# Curriculum Vitae

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André Martins Pereira

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# André Martins Pereira, PhD

## Assistant Researcher | Invited Assistant Professor

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## EDUCATION

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2013 - 2019 **Doctoral Degree in Informatics Engineering** (MAP-i) Final grade of *Very Good*

Dissertation subject: “*HEP-Frame: a Development Aid and Efficient Execution Engine where a Multi-layer Scheduler Adaptively Orders Pipelined Data Stream Applications*”, supervised by Prof. Alberto Proença and Prof. António Onofre.

Research interests focused on the development of a framework for portable and efficient coding and execution of pipelined data analysis applications on heterogeneous servers with multicore, manycore, and accelerator devices, which incorporates software engineering principles on the development workflows of non-computer scientists. Additional work on the efficient execution of neural networks (both shallow and deep) on homogeneous servers and embedded systems.

Courses attended during the doctoral programme:

- › Adaptive Business Intelligence.
- › Cryptography and Information Security.
- › Knowledge Discovery from Databases.
- › Source Code Analysis and Manipulation.

The work was partially funded by *FCT*, through the grant SFRH/BD/119398/2016, among other projects.

2011 - 2013 **Masters in Informatics Engineering** (University of Minho) Final grade of 17 out of 20.

Dissertation subject: “Efficient Processing of ATLAS Events Analysis on Homogeneous and Heterogeneous Platforms with Accelerator Devices”, supervised by Prof. Alberto Proença and Prof. António Onofre.

Specialised in Parallel and Distributed Computing and Computer Graphics:

- › Computer Systems and Performance.
- › Parallel Computing Paradigms.
- › Numerical Methods and Algorithms.
- › Computer Vision.
- › Modelling and Visualisation.
- › Illumination and Photo-realism.
- › Virtual Augmented Reality.

2008 - 2011 **Bachelor in Informatics Engineering** (University of Minho) Final grade of 13 out of 20.

- › Programming Paradigms (functional, imperative, object-oriented).
- › Math (discrete, calculus, logic, linear algebra and numerical methods).
- › Systems Engineering (economy and cost analysis, statistics, operational research).
- › Computer Architecture, Operating and Distributed Systems, and Networks.
- › Software Engineering (algorithms and complexity, software systems architecture and design).
- › Physics (modern topics, electromagnetism).
- › Databases and Knowledge Representation and Reasoning.

## ADVANCED TRAINING

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- 2024 Workshop for Team Based Learning Integration in Pedagogic Activities, at the University of Minho in Braga, Portugal, January 13<sup>th</sup>.
- 2022 NCC Portugal AI for Science Bootcamp, *online only*, from September 12<sup>th</sup> to 13<sup>th</sup>.
- 2022 Minho Advanced Computing Center User Group Workshop, at the Crowne Plaza, in Porto, Portugal, from July 7<sup>th</sup> to 8<sup>th</sup>.
- 2021 Minho Advanced Computing Center User Group Workshop, *online only*, from June 15<sup>th</sup> to 18<sup>th</sup>.
- 2017 Workshop on Advanced Computing for Earth Sciences, at the University of Porto, Portugal, from December 18<sup>th</sup> to 20<sup>th</sup>.
- 2016 TACC Summer School in Advanced Scientific Computing, in Braga, Portugal, from June 20<sup>th</sup> to 23<sup>rd</sup>.
- 2014 37<sup>th</sup> CERN School of Computing, in Braga, Portugal, from August 25<sup>th</sup> to September 6<sup>th</sup>.
- 2014 Summer School on Parallel High Performance Computing using Accelerators, in Braga, Portugal, from June 25<sup>th</sup> to 27<sup>th</sup>.
- 2014 MAP-i Spring School on Logic of Dynamical Systems, in Braga, Portugal, from March 24<sup>th</sup> to 28<sup>th</sup>.
- 2014 4<sup>th</sup> International Doctorate Network in Particle Physics, Astrophysics and Cosmology (IDPASC) Winter School, in Braga, Portugal, from January 20<sup>th</sup> to 28<sup>th</sup>.

## PROFESSIONAL EXPERIENCE

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Present September 2023	<b>Assistant Professor, UNIVERSITY OF MINHO, Portugal</b> <i>High Performance Computing (HPC) Specialist</i> for HASLAB - INESC-TEC
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High Performance Computing Scientific Computing Performance Engineering

August 2023  
January 2023

**Assistant Researcher, HASLAB AT THE UNIVERSITY OF MINHO, Portugal**

*High Performance Computing (HPC) Specialist* for INESC-TEC

Responsible for:

- › Identifying key industry and academic partners to explore collaborations between High Performance Computing and other scientific fields.
- › Collaborating in multi-disciplinary research projects related to the operation of the Minho Advanced Computing Center (MACC).
- › Configuring, managing, and utilising tools for the profiling, debugging, and visualisation of performance reports of parallel applications.

High Performance Computing Scientific Computing Performance Engineering

December 2022  
August 2022

**Post-Doc Researcher, HASLAB AT THE UNIVERSITY OF MINHO, Portugal**

*High Performance Computing (HPC) Specialist* for THE MINHO ADVANCED COMPUTING CENTER (MACC)

Responsible for:

- › Improving the scalability and performance of *HPC* scientific tools and applications of *MACC* industry partners.
- › Configuring, managing, and utilising tools for the profiling, debugging, and visualisation of performance reports of parallel applications.
- › Developing, assessing, and maintaining mechanisms for the collaboration with industry partners, focusing on coding best practices, transfer of know-how, and technological consulting.

High Performance Computing Scientific Computing Performance Engineering

Present  
October 2019

**Invited Assistant Professor, UNIVERSITY OF MINHO, Portugal**

Assistant professor for several curricular units in the field of computing systems and parallel computing. Further details in subsection 5.1.

July 2022  
April 2019

**Software Engineer, ELECTRON SOFTVIEW, Portugal**

*Lead Software Developer* for THE TOPOSEM PROJECT

Agile development of a solution for 3D reconstruction and analysis of Scanning Electron Microscope (*SEM*) images, through the integration of an existing command-line workflow into a final software product. Responsible for:

- › Requirements analysis with stakeholders and potential end-users of the software product.
- › Design of the TopoSEM core software architecture, considering both online (*SaaS*) and offline (stand-alone application) usage scenarios.
- › Integration of existing *SEM* imaging manipulation algorithms into a polished software package.
- › Design and development of proprietary file formats to hold topography data based on the 3D reconstruction of *SEM* images.
- › Design and implementation of User Interfaces based on identified workflows.
- › Design of the TopoSEM web service (*SaaS*) architecture.
- › Management and supervision of the dissertation work by a MSc student integrated in the TopoSEM project software stack.

Software Engineering Test Driven Development Qt C++ Visual Studio Docker Kubernetes SaaS Agile

September 2019  
March 2014

**Invited Teaching Assistant, UNIVERSITY OF MINHO, Portugal**

Teaching assistant for several curricular units in the field of computing systems and parallel computing. Further details in subsection 5.1.

April 2019 | **Post-Doc Researcher, UNIVERSITY OF MINHO, Portugal**  
January 2019 | *Full-stack Software Engineer* for THE REACTION DATABASE WITH TRANSITION STATE (RDB-TS) PROJECT  
Centred on extending a web platform prototype, which encompasses the transition state database, molecule rendering, and SMILE-based search modules.

- › Architecture design and implementation of database models to hold reaction transition states data.
- › Extension of the online molecule 3D rendering web service.

Software Engineering Docker Kubernetes SaaS PostgreSQL Node.js WebGL

December 2018 | **Researcher, UNIVERSITY OF MINHO, Portugal**  
February 2014 | *Parallel Computing Specialist* for LIP-MINHO ASSOCIATED LABORATORY AND ALGORITMI RESEARCH CENTRE  
Design and deployment of the *HEP-Frame* software tool, a framework to aid scientists to develop applications to analyse data from a large datasets, with a flexible pipeline of tasks. This framework, targeted at non-computer scientists, aims to provide efficient parallel code execution without requiring user expertise in parallel computing. It aids the development scientific code, while subtly imposing restrictions for users to code according to software engineering principles (in algorithm design and code structuring).

- › Design and development of workload schedulers based on novel load balancing strategies for inter- and intra-server parallel applications.
- › Design and development of custom parallel solutions for GPU and manycore hardware accelerators.
- › Design and development of a feature-rich framework, currently in use by multiple research groups.
- › Identification of design problems in existing pipelined scientific code and analysis of the relevant software engineering principles key to produce computationally efficient, maintainable, and long lasting code bases.
- › Close integration in a multi-disciplinary team of computer scientists and particle physicists.
- › Administration of Linux-based research servers: user management and software deployment.

High Performance Computing Scientific Computing Data Analysis Stream Computing

March 2016 | **Invited Teaching Assistant, INSTITUTO POLITÉCNICO DO CÁVADO E AVE, Portugal**  
October 2015 | Responsible for the restructuring of the *Arquitetura de Dispositivos Móveis* curricular unit of the *Desenvolvimento de Aplicações Móveis* professional degree. Further details in subsection 5.2.

January 2014 | **Junior Researcher, UNIVERSITY OF MINHO, Portugal**  
January 2013 | *Parallel Computing Engineer* for LIP-MINHO  
Performance analysis and improvement of a particle collision data analysis application.

- › Profiling, analysis, and characterisation of the software bottlenecks.
- › Development of custom solutions for the performance improvement of code sections in homogeneous (shared memory) and heterogeneous (distributed memory) servers.

High Performance Computing Scientific Computing CUDA Accelerator Devices OpenMP

August 2012 | **Research Intern, UNIVERSITY OF TEXAS AT AUSTIN, USA**  
July 2012 | *Parallel Computing Engineer* for INSTITUTE OF COMPUTATIONAL ENGINEERING AND SCIENCES  
Responsible for the optimisation and parallelisation of a molecular docking scientific code on heterogeneous servers with GPUs. Further details in subsection 4.3.

High Performance Computing Scientific Computing CUDA Accelerator Devices MPI

## SCIENTIFIC CONTRIBUTIONS

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### 4.1 Scientific Performance

The list of publications can be found below. A brief summary of their venue classifications, based on the ScimagoJR/Core ranking systems, is also included. Note that I was the main author in all publications. The citation count was obtained by cross referencing

Google Scholar and Scopus data. These publications, along with other metrics, can also be found in [Google Scholar](#).

## Publications

- 2024 Micaella Coelho, Kary Ocaña<sup>1</sup>, André Pereira, Alexandre Porto<sup>1</sup>, Douglas O., Cardoso, Arthur Lorenzon, Rui Oliveira, Philippe O. A. Navaux, Carla Osthoff  
*Machine Learning Regression-based Prediction for Improving Performance and Energy Consumption in HPC platforms*  
In Proceedings of the Latin America High Performance Computing Conference (CARLA), 2024.
- 2024 Carlos Silva, Ricardo Vilaça, André Pereira, Ricardo Bessa  
*A review on the decarbonization of high-performance computing centers*  
Renewable and Sustainable Energy Reviews, Volume 189, Part B.  
[Access the paper.](#)
- 2024 Leander Reascos, Fábio Carneiro, André Pereira, Nuno Filipe Castro, Ricardo Mendes Ribeiro  
*Berry: A code for the differentiation of Bloch wavefunctions from DFT calculations*  
Computer Physics Communications.  
[Access the paper.](#)
- 2023 André Pereira, António Onofre, and Alberto Proença  
*HEP-Frame: an Efficient Tool for Big Data Applications at the LHC*  
European Physics Journal Plus, Volume 138, Springer.  
[Access the paper.](#)
- 2021 André Pereira and Alberto Proença  
*HEP-Frame: Improving the Efficiency of Pipelined Data Transformation & Filtering for Scientific Analyses*  
Computer Physics Communications, Volume 263, Elsevier.  
[Access the paper.](#)
- 2021 André Pereira and Alberto Proença  
*PRNG-Broker: A High-Performance Broker to Supply Parallel Streams of Pseudo-Random Numbers for Large Scale Simulations*  
In Transactions on Computational Science and Computational Intelligence, pp. 167-183, Springer.
- 2018 André Pereira and Alberto Proença  
*Efficient Use of Parallel PRNGs on Heterogeneous Servers*  
In Proceedings of the International Conference on Mathematical Applications, pp. 7–12, Institute of Knowledge and Development.  
[Access the paper.](#)

- 2016 André Pereira, António Onofre, and Alberto Proença  
*Tuning Pipelined Scientific Data Analyses for Efficient Multicore Execution*  
 In Proceedings of the International Conference on High Performance Computing & Simulation, pp. 751-758, IEEE. *Invited for a submission of an extended version of the publication.*  
[Access the paper.](#)
- 2015 André Pereira, António Onofre, and Alberto Proença  
*HEP-Frame: A Software Engineered Framework to Aid the Development and Efficient Execution of Scientific Code*  
 In Proceedings of the International Conference on Computational Science and Computational Intelligence, IEEE.  
[Access the paper.](#)
- 2014 André Pereira, António Onofre, and Alberto Proença  
*Removing Inefficiencies from Scientific Code: The Study of the Higgs Boson Couplings to Top Quarks*  
 In Proceedings of the International Conference on Computational Science and its Applications, LNCS vol.8582, Part IV, pp. 576–591, Springer.  
[Access the paper.](#)

## Participation in International Scientific Events

ISC High Performance 2024 (ISC 24)

*May 12<sup>th</sup> to the 16<sup>th</sup> 2024, Hamburg, Germany*

Supercomputing Conference (SC23)

*November 10<sup>th</sup> to the 20<sup>th</sup> 2023, Denver Colorado, USA*

Yearly meeting of Rede Nacional de Computação Avançada

*November 07<sup>th</sup> to the 08<sup>th</sup> 2023, Vila Real, Portugal*

5<sup>th</sup> FOAM Iberia Meeting

*November 2<sup>nd</sup> to the 3<sup>rd</sup> 2023, Guimarães, Portugal*

EUMaster4HPC plenary meeting

*October 03<sup>rd</sup> to the 05<sup>th</sup> 2023, Erlangen, Germany*

Castiel2 AI Training Task Force meeting

*June 30<sup>th</sup> 2023, online only*

NCC Portugal AI for Science Bootcamp

*September 12<sup>th</sup> to 13<sup>th</sup>, 2022, Porto, online only*

Minho Advanced Computing Center User Group Workshop (MUG 2022)

*July 7<sup>th</sup> to 8<sup>th</sup>, 2022, Porto, Portugal*

Minho Advanced Computing Center User Group Workshop (MUG 2021)

*June 15<sup>th</sup> to 18<sup>th</sup>, 2021, Portugal (online event)*

The 2020 World Congress in Computer Science, Computer Engineering, & Applied Computing (CSCE)

*July 27<sup>th</sup> to 30<sup>th</sup>, 2020, Las Vegas, NV, USA (virtual participation)*



The 2017 Workshop on Advanced Computing for Earth Sciences (ACES)

*December 18<sup>th</sup> to 20<sup>th</sup>, 2017, Porto, Portugal*

The 2016 International Conference on High Performance Computing & Simulation (HPCS)

*July 18<sup>th</sup> to 22<sup>nd</sup>, 2014, Innsbruck, Austria*

TACC Summer School in Advanced Scientific Computing

*June 20<sup>th</sup> to 23<sup>rd</sup>, 2016, Braga, Portugal*

The 2015 International Conference on Computational Science and Computational Intelligence (CSCI)

*December 7<sup>th</sup> to 9<sup>th</sup>, 2015, Las Vegas, NV, USA*

The Inverted CERN School of Computing (iCSC)

*February 23<sup>rd</sup> to 24<sup>th</sup>, 2015, CERN, Switzerland*

The 37<sup>th</sup> CERN School of Computing (CSC)

*August 24<sup>th</sup> to September 6<sup>th</sup>, 2014, Braga, Portugal*

The 14<sup>th</sup> International Conference on Computational Science and Its Applications (ICCSA)

*June 30<sup>th</sup> to July 3<sup>rd</sup>, 2014, Guimarães, Portugal*

Summer School on Parallel High Performance Computing using Accelerators

*June 25<sup>th</sup> to 27<sup>th</sup>, 2014, Braga, Portugal*

The 4<sup>th</sup> International Doctorate Network in Particle Physics, Astrophysics and Cosmology (IDPASC)

*January 20<sup>th</sup> to 28<sup>th</sup> 2014, Braga, Portugal*

## Tools Developed for the Scientific Community

**HEP-Frame** is a framework to aid the development and efficient execution of pipelined data analysis applications in homogeneous and heterogeneous servers. This tool resulted from the work developed during my *PhD*, and is currently actively used in particle physics research. The scientific details of *HEP-Frame*'s core components are described in publication #1. The tool is publicly available at <https://bitbucket.org/ampereira/hep-frame/wiki/Home>.

**PRNG-Broker** is a middle layer between the application code, e.g., a Monte Carlo simulation, and specialised pseudo-random number generation (*PRNG*) libraries. It efficiently manages parallel *PRN* requests to external *PRNG* libraries, adequately using the computational resources available in multicore, manycore, and *GPU* devices. This efficient management of *PRN* generation focus on improving the performance of parallel compute-bound applications, but also provides a significant benefit for both sequential and memory-bound codes. The tool is publicly available at <https://github.com/prng-broker/prng-broker/wiki/PRNG-Broker>.

## 4.2 Involvement in Research Projects and Grants

### Phenomenological Studies at the LHC - 70K €

Co-funded by FCT and the CERN Fund following a competitive open call for projects

Project reference: CERN/FP/123619/2011

Project duration: 2012 - 2014

*Junior Researcher* from 2013 to 2014

### Plano Estratégico da Escola de Engenharia - Agenda 2020: Projetos multidisciplinares

Doctoral grants awarded by the School of Engineering of the University of Minho (EEUM)

*Doctoral Grant holder* from 2014 to 2015

### **Laboratório de Instrumentação e Física Experimental de Partículas - annual funding of 5.9M €**

Grant awarded by LIP through FCT/COMPETE 2020 funding with reference POCI-01-0145-FEDER-007334

Grant reference: UID/FIS/50007/2013

Project duration: 2015 - 2018

*Researcher* from 2015 to 2016

### **FCT Doctoral Grant**

Funded by FCT in a competitive open call with a 31% approval rate

Grant reference: SFRH/BD/119398/2016

*Doctoral Grant holder* from 2016 to 2019

### **RDB-TS: A Reaction DataBase with Transition State information from quantum chemical calculations - 233K €**

A joint project with researchers from Centro Algoritmi (UMinho) and REQUIMTE (UPorto) funded by FCT following a competitive open call for projects

Project duration: 2018 - 2022

Project reference: NORTE-01-0145-FEDER-031689

*Post-doctoral Researcher* in 2019 and *co-PI* involved in the conception and definition of computing requirements of the project proposal

### **EUROCC: National Competence Centres in the framework of EuroHPC - 2M €**

Funded by the EuroHPC Joint Undertaking

Project duration: 2020 - 2022

Project reference: 951732-H2020-JTI EuroHPC-2019-2

*Post-doctoral Researcher* in 2022

### **SustainableHPC: Sustainable High Performance Computing - 7.3M €**

Funded by the Fundo de Apoio à Inovação and the Fundo de Eficiência Energética

Project duration: 2021 - 2023

*Assistant Researcher* from 2022, collaborating in the design and specification of a carbon-aware resource management system for the upcoming Deucalion supercomputer

### **EUROCC2: National Competence Centres in the framework of EuroHPC - 43M € total budget**

Funded by the EuroHPC Joint Undertaking

Project duration: 2023 - 2026

Project reference: DIGITAL-EUROHPC-JU-2022-NCC-01

*Researcher* from January 2023, collaborating as INESC TEC's representative

### **ATTRACT DIH: Digital Innovation Hub for Artificial Intelligence and High-Performance Computing**

Funded by the Digital Europe Programme

*Researcher* from January 2023, collaborating as University of Minho's representative

### **EUMaster4HPC**

Funded by the Horizon 2020 Framework Programme

Project reference: H2020-JTI-EuroHPC-2020-03

University of Minho's representative from August 2023

## **EPICURE - Application Support in High Performance Computing - 10M € total budget for the EuroHPC institutions**

Funded by the Digital Europe Programme

Project reference: DIGITAL-EUROHPC-JU-2022-APPSUPPORT-01

Entities currently involved: MACC, CINECA, LUMI, IT4I, BSC, LuxProvide, Cyfronet, DeiC, Julich, Genci, IZUM, KTH, STP, and U. Antwerp

Collaborated in the overall project proposal, responsible for the WP 5 and collaborating on WPs 1, 2, 3, and 4.

## **exaSIMPLe - 160K €**

Funded by the Inno4scale Programme

Project duration: 2023 - 2024

Collaborated in the project proposal and currently co-PI. The project was awarded 1M node-hours at the Deucalion supercomputer in a separate national call.

### 4.3 Internship in International Institutes

August 2012	Research Intern, UNIVERSITY OF TEXAS AT AUSTIN, USA
July 2012	<i>Parallel Computing Engineer</i> for INSTITUTE OF COMPUTATIONAL ENGINEERING AND SCIENCES Responsible for the parallelisation of <i>F2Dock</i> , a software package for protein-protein docking, on distributed memory environment servers with <i>GPU</i> devices. Integrated in a research group under the supervision of professor Chandrajit Bajaj. Work focused on: <ul style="list-style-type: none"><li>› Profiling, analysis, and characterisation of the software bottlenecks.</li><li>› Design and implementation of parallelisation strategies to speedup the execution time of specific code sections for multi-<i>GPU</i> servers.</li></ul>

### 4.4 Tutoring and Master Thesis Co-Supervisions

Introduction and training of computer science MSc students on programming accelerator devices - General Purpose *GPUs* and Intel manycore Knights Corner and Knights Landing architectures - applied to scientific fields related to *HPC*, such as particle physics and artificial intelligence. Responsible for tutoring several particle physics BSc and MSc students in the challenges of parallel computing and in using the *HEP-Frame* tool for the development of data analysis code.

Co-supervised *Projetos Integrados*, an academic project for 4<sup>th</sup> year students in *Mestrado em Engenharia Informática* and *Mestrado Integrado em Engenharia Informática*, which had a duration of 1 to 2 semesters. The students were integrated into existing parallel computing projects, often multi-disciplinary and used real case studies. This work often continued into their MSc dissertations.

- 2018/2019 “Neural Net Computing in Embedded Systems”, work developed with BOSCH on delivering real-time performance of inference process of deep neural networks, by Manuel Moreno and Nuno Magalhães.
- 2015/2016 “Porting Heterogeneous Schedulers into *HEP-Frame*”, focused on the study and integration of *CPU-GPU* load balancing schedulers on the *HEP-Frame* tool, by Nelson Torres and Tiago Santos.
- 2014/2015 “Performance Evaluation of an ATLAS Experiment Data Analysis Application”, work that integrated *HPC* with a real particle physics case study, by John Maia and José Silva.

Advisor and co-advisor of several master dissertations in conjunction with different research groups (various multi-disciplinary themes from computer science to physics and chemistry) and BOSCH (focused on real-time issues of *AI* and computer vision computation).

- 2024 “Development and Implementation of Scheduling Algorithms in High Performance Computing Systems”, to be defended by Diogo Pires at the University of Minho. Co-advisory role.
- 2024 “Energy-aware Scheduling of Irregular Tasks”, to be defended by Nuno Reis at the University of Minho. Advisory role.
- 2024 “Performance and Carbon Footprint Modelling of Irregular Tasks”, to be defended by Nuno Carvalho at the University of Minho. Advisory role.
- 2024 “Improving the Performance of the Berry Software”, to be defended by Carolina Gomes at the University of Minho. Advisory role.
- 2024 “A Software Engineering Methodology for Test-Driven Verification and Performance Analysis of Compilation Toolchains”, defended by Luís Silva at the University of Minho, in partnership with Synopsys. Advisory role.
- 2023 “Improving the Efficiency of Digital Image Correlation Computation for *SEM* Images”, successful defence by José Ferreira at the University of Minho, in partnership with Electron Softview. Advisory role.
- 2022 “Integration of Local and Remote Hardware Accelerators into Parallel and Distributed Applications Using *HPX*”, successful defence by Pedro Barbosa at the University of Minho. Co-advisory role.
- 2021 “Upgrading the *HEP-Frame* Scheduling Dependency Graph to Support Conditional Task Graphs”, work on hold by José Resende at the University of Minho. Co-advisory role.
- 2021 “Optimisation of Deep Learning Algorithms for an Autonomous *RC* Vehicle”, work in cooperation with BOSCH, successful defence by André Filipe Pereira at the University of Minho. Co-advisory role.
- 2021 “Improving the Efficiency of the Energy-Split Tool to Compute the Energy of Very Large Molecular Systems”, successful defence by Sara Pereira at the University of Minho. Co-advisory role.
- 2019 “Adapting *HEP-Frame* for a Streaming Approach to a Linear Algebra OLAP Engine”, thesis write-up on hold by Daniel Rodrigues at the University of Minho. Co-advisory role.
- 2018 “Deploy: a Neural Network Computer Vision Tool for the NVidia Tegra TX2 Embedded System”, work in cooperation with BOSCH, successful defence by João Fernandes at the University of Minho. Co-advisory role.
- 2017 “Towards Efficient Deep Learning Algorithms”, thesis write-up on hold by Nelson Torres at the University of Minho. Co-advisory role.
- 2016 “Integrating Heterogeneous Computing Features Into *HEP-Frame*”, successful defence by John Maia at the University of Minho. Advisory role.

## 4.5 Scientific Dissemination and Public Speaking

- May 2024 Presented an overview of the EPICURE project, followed by a Q&A session, at the EuroHPC Joint Undertaking booth at ISC High Performance 2024.
- October 2022 Responsible for planning, organising, producing content, and lecturing theoretical and lab sessions of a three-day workshop on High Performance Computing. This workshop resulted from an invitation by the Portuguese Navy and was held at the Instituto Hidrográfico in Lisbon.
- May 2022 Presenter of a 20-min session on the engineering challenges tackled at the Electron Softview Spin-Off in “Tomorrow Needs Engineering - da Academia ao Mercado”, organised by InvestBraga at the Altice Forum in Braga, Portugal. This session was integrated in the 5<sup>a</sup> *Semana da Economia* and focused on the application of academia research to industry needs.
- March 2022 Lecturer of a 3-hour workshop entitled “Programming Microcontrollers: A Computer Scientist’s Perspective”, invited by the Núcleo de Estudantes de Física da Universidade do Minho, targeted at physics students.
- February 2015 Invited lecturer at the Inverted CERN School of Computing (*iCSC*) at CERN. Responsible for the planning, creation of the material, and lecturing a 4-hour session on the development of efficient parallel code, whose target audience academic background was in either experimental or theoretical physics. These scientists, while extremely specialised in their fields of study, were mostly self-taught programmers with little to no expertise in Computer Science.

## 4.6 Academic and Scientific Evaluation Roles

Participation in an academic jury as external evaluator:

**July 2024** interviewed candidates over 23 years old to enroll in the School of Engineering at the University of Minho through a special status.

**October 2021** “Optimizing Real-time Physics Simulation using *GPGPU* Techniques”, co-supervised by Professor Jorge Barbosa and Nelson Rodrigues and successfully defended by Ricardo Pereira, for the degree in *Mestrado Integrado em Engenharia Informática e Computação* at the *Faculdade de Engenharia da Universidade do Porto*.

Participation in juries and interviews of candidates for scientific grants and full-time research positions since January 2023.

Reviewer of scientific papers for the following venues:

**October 2023** Journal of Parallel Computing.

**January 2024** The 35<sup>th</sup> Symposium on Implementation and Application of Functional Languages.

**August 2024** INFORMS Journal on Computing.

Technical reviewer of scientific projects:

**Since March 2024** Technical reviewer of benchmark, development, regular, and extreme scale projects to access Deucalion supercomputer through national calls.

**Since June 2024** Review coordinator and technical reviewer of benchmark, development, regular, and extreme scale projects to access Deucalion supercomputer through EuroHPC JU calls.

## PEDAGOGIC ACTIVITIES

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### 5.1 Lecturing Activities

September 2023 October 2019	<p><b>Invited Assistant Professor, UNIVERSITY OF MINHO, Portugal</b></p> <ul style="list-style-type: none"> <li>› <i>Sistemas da Computação</i>, for <i>Licenciatura em Engenharia Informática</i>, <i>Mestrado Integrado em Engenharia Informática</i>, <i>Mestrado Integrado em Engenharia Física</i>, and <i>Licenciatura em Ciências da Computação</i>. Academic years: 19/20, 20/21, 21/22, and 22/23.</li> <li>› <i>Arquitetura de Computadores</i>, for <i>Licenciatura em Engenharia Informática</i> and <i>Mestrado Integrado em Engenharia Informática</i>. A.y.: 20/21 and 22/23.</li> <li>› <i>Arquiteturas Avançadas</i>, for <i>Mestrado em Engenharia Informática</i> and <i>Mestrado Integrado em Engenharia Informática</i>. A.y.: 20/21.</li> <li>› <i>Programação Paralela</i>, for <i>Mestrado Integrado em Engenharia Física</i> and <i>Licenciatura em Engenharia Física</i>. A.y.: 21/22.</li> <li>› <i>Computação Paralela</i>, for <i>Mestrado Integrado em Engenharia Informática</i> and <i>Mestrado em Engenharia Informática</i>. A.y.: 21/22.</li> </ul>
September 2019 March 2014	<p><b>Invited Teaching Assistant, UNIVERSITY OF MINHO, Portugal</b></p> <ul style="list-style-type: none"> <li>› <i>Sistemas da Computação</i>, for <i>Licenciatura em Engenharia Informática</i>, <i>Mestrado Integrado em Engenharia Informática</i>, and <i>Mestrado Integrado em Engenharia Física</i>. Academic years: 14/15, 15/16, 16/17, 17/18, and 18/19.</li> <li>› <i>Arquitetura Avançada de Computadores</i>, for <i>Mestrado em Engenharia Informática</i>. A.y.: 14/15.</li> <li>› <i>Arquitetura de Computadores</i>, for <i>Licenciatura em Engenharia Informática</i> and <i>Mestrado Integrado em Engenharia Informática</i>. A.y.: 18/19 and 19/20.</li> <li>› <i>Arquiteturas Avançadas</i>, for <i>Mestrado em Engenharia Informática</i> and <i>Mestrado Integrado em Engenharia Informática</i>. A.y.: 16/17.</li> <li>› <i>Paradigmas de Computação Paralela</i>, for <i>Mestrado em Engenharia Informática</i>. A.y.: 16/17.</li> </ul>
March 2016 October 2015	<p><b>Invited Teaching Assistant, INSTITUTO POLITÉCNICO DO CÁVADO E AVE, Portugal</b></p> <ul style="list-style-type: none"> <li>› <i>Arquitetura de Dispositivos Móveis</i>, for <i>Desenvolvimento de Aplicações Móveis</i> TeSP professional degree.</li> </ul>

## 5.2 Participation in Pedagogic Projects

Most of the material I produced for the curricular units listed below can be consulted at <https://ampereira90.github.io/teaching/>.

### **Desenvolvimento de Aplicações Móveis, INSTITUTO POLITÉCNICO DO CÁVADO E AVE,**

Responsible for the restructuring of the *Arquitetura de Dispositivos Móveis* (ADM, in 2015/2016) curricular unit of the *Desenvolvimento de Aplicações Móveis* professional degree, at Instituto Politécnico do Cávado e Ave. The previous and first edition of the ADM was not adequately organised according to the overall goals of the course it was integrated in. I was invited to lecture and re-structure this curricular unit given my background in teaching computer architecture and computing systems. I was in charge of:

- › Defining the learning goals, expected learning outcomes, and evaluation methodology.
- › Planning the concepts to be approached in each session with the students.
- › Creating content for theoretical classes (slides and other support material).
- › Creating content for the lab classes.

#### **Workshop on High Performance Computing, MINHO ADVANCED COMPUTING CENTER,**

Responsible for planning, organising, and producing content for theoretical and lab sessions of a three-day workshop on High Performance Computing at the Instituto Hidrográfico in Lisbon. The majority of the sessions were under my responsibility in terms of lecturing and guiding the trainees through the practical exercises.

- › Defining the learning goals, expected learning outcomes, and the organisation of the workshop sessions.
- › Planning and creating theoretical and hands-on exercises addressing the fundamentals and advanced concepts of parallel programming with *OpenMP* on shared memory environments.
- › Planning the whole session and creating hands-on exercises addressing the fundamentals and advanced concepts of parallel programming with *MPI* on distributed memory environments.
- › Planning and creating content for a theoretical-only session of scientific computing.

#### **Inverted CERN School of Computing, CERN, SWITZERLAND,**

Responsible for the planning, creation of the material, and lecturing a 4-hour session on the development of efficient parallel code, whose target audience academic background was in either experimental or theoretical physics.

- › Defining the learning goals, expected outcomes, and the organisation of the session.
- › Planning and creating content and slides on high performance scientific computing.

#### **Programming Microcontrollers: A Computer Scientist's Perspective, UNIVERSITY OF MINHO,**

Responsible for the planning, creation of the material, and lecturing a 3-hour workshop on the architecture and programming of microcontrollers, targeted at physics students.

- › Defining the learning goals, expected outcomes, and the organisation of the session.
- › Planning and creating theoretical and hands-on exercises addressing the fundamentals concepts of programming microcontrollers using assembly language.

#### **Programação Paralela, UNIVERSITY OF MINHO,**

Helped in the definition and organisation of the curricular unit goals and expected learning outcomes in its first year (21/22). Co-responsible for organising and defining the concepts and guides for the lab sessions. This curricular unit was taught in the *Mestrado em Engenharia Informática* Msc course, named *Computação Paralela* but with the same syllabus, and the *Licenciatura em Engenharia Física* Bsc course.

#### **Arquiteturas Avançadas, UNIVERSITY OF MINHO,**

Responsible for planning, organising, and producing content for lab sessions of the *Arquiteturas Avançadas* curricular units, integral for the *Mestrado Integrado em Engenharia Informática* and *Mestrado em Engenharia Informática* degrees, along with Professor Alberto Proença. The material ranged from theory-focused presentations of parallel computing paradigms and tools to the guides to be followed by the students during the lab sessions.

#### **Computação Paralela and Programação Paralela, UNIVERSITY OF MINHO,**

Responsible for planning, organising, and producing content for lab sessions of the new *Computação Paralela* and *Programação Paralela* curricular units, of *Mestrado em Engenharia Informática* and *Licenciatura em Engenharia Física* respectively, which I lectured since their first semester of 2021/2022. This work is shared with Professor João Sobral.

#### **Sistemas de Computação, UNIVERSITY OF MINHO,**

Responsible for reviewing and extending the existing content for the lab sessions of the *Sistemas de Computação* curricular unit, for the *Mestrado Integrado em Engenharia Informática*.



**Arquitetura de Computadores, UNIVERSITY OF MINHO,**

Responsible for producing content for the lab sessions of *Arquitetura de Computadores*, for the *Mestrado Integrado em Engenharia Informática*, along with Professor António Pina. These sessions specifically focused on the programming and architectural details of GPU devices.

### 5.3 Pedagogic Dissemination

June 2016 Teaching assistant at the 2016 Summer School in Advanced Scientific Computing, organised by the Texas Advanced Computing Center (*TACC*) at the University of Minho. This 3-day school focused on creating the theoretical and practical foundations for the development of efficient parallel code targeted at the non-computing scientific community. The goal was to give the tools and expertise to scientists from the most diverse fields to efficiently use the university's advanced computing resources, such as the *SeARCH* computing cluster.