Curriculum Vitæ

Bruno Alves

Nationalities Portuguese, Italian
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Education

2012–2018 **Integrated Master's Degree (MSc) in Engineering Physics, University of Lisbon, *Instituto Superior Técnico* (IST)**

Average score: 17/20
– IST is the best engineering school in Portugal, 11th in Europe and top-50 in the world (2018 US News ranking);
– Engineering Physics at IST has currently the highest high-school entrance grade across all universities and disciplines in Portugal.

Master's project grade: 19/20
– use CERN (CMS) data to understand the way b-quarks group after their production. This is a fundamental ingredient for the discovery of New Physics.
Supervisors: Prof. Dr. Nuno Leonardo, Prof. Dr. João Varela.
Contacts: nuno.leonardo@cern.ch, joao.varela@cern.ch
Location: LIP, Lisbon, Portugal.

2015 **Erasmus programme at the University of Amsterdam (UvA)**
Average score: 8/10
– Selected for one of the 2 available positions at UvA;
– The average score includes a top-1% score in Particle Physics.

Current research

2019 - 2021 **CERN Trainee**
1st project: geometry studies of the future calorimeter of the CMS detector.
2nd project: not yet entirely specified, but will involve GPU computing and possibly some machine learning.
Supervisors: Dr. Pedro Silva, Dr. André David
Contacts: pedro.silva@cern.ch, andre.david@cern.ch
Location: Geneva, Switzerland.

2018 **Machine Learning and Data Science paid internship.**
1st project: analyse Big Data output of supercomputer simulations to shed light on high redshift dark matter halos.
– a Python package was written from scratch and released ('dmprofile')
Supervisor: Assoc. Prof. Dr. Alan Duffy

2nd project: build a generative adversarial model based on deep learning to identify unknown objects in future James Webb Space Telescope data. This is a new and unexplored technique that may deeply impact astronomical research.
– a paper is currently being preparation.
Supervisor: Prof. Dr. Karl Glazebrook

Contacts: aduffy@swin.edu.au, kglazebrook@swin.edu.au
Location: Swinburne University of Technology, Melbourne, Australia.

Skills

Languages

Portuguese and Italian (native), English (C2), German (B2, certified), Mandarin (HSK1).

Computer

Programming languages

Proficient: Python, C/C++, Shell/Bash, Latex

Occasionally used: Mathematica, Fortran, SQL (online certification).

Others

Numpy, Matplotlib, Seaborn, Scipy, Scikit-learn, Pandas, Uproot, Jupyter;
Tensorflow, Keras;
CMS-SW, ROOT, HTCondor
Git, GitHub, GitLab, SVN.
Job submission to computer grids.
Linux/Unix, Windows.

Communication

Excellent communication skills developed thanks to weekly meetings, including international CERN meetings, talks given in different countries, poster presentations and presentations for schools.

Others

Tutor experience as a Red Cross volunteer:
– helping problematic children to better understand and enjoy Mathematics
– helping foreign children that do not speak Portuguese

Additional research

2018 **Machine learning paid internship**

Study and implementation of advanced data processing and Deep Learning techniques to extract novel insights from hundreds of thousands of images.
– Preliminary results were exciting: I demonstrated that up to now inaccessible parameters regarding galaxy mergers can be directly retrieved from a single image of a merging system.
Supervisors: Dr. Maxwell X. Cai, Dr. Jeroen Bédorf
Contacts: cai@strw.leidenuniv.nl, jeroen@bedorf.net
Location: Leiden University, Leiden, Netherlands.

2016 **CERN Summer Student Programme**

1st project: using C/C++ in combination with CERN software to analyse B Physics data (the non-trivial "ρ factor" was studied).
Supervisors: Dr. Ilse Kratschmer, Dr. Carlos Lourenço.

2nd project: build data input and processing pipeline for detecting the $B_C(2S)$ meson mass peak.
– After setting most of the required software, I concluded that more data was needed to claim the observation of the mass peak.
– My work contributed to the recent discovery of the $B_C(2S)$ peak, which used additional data.
Supervisor: Dr. Francesco Fiori.

Location: CERN, Geneva, Switzerland.

Grants & Awards

2018 **Machine Learning and Data Science grant**
– Funded by Dr. Karl Glazebrook's competitive ARC Laureate Fellowship;
Location: Melbourne, Australia

Machine Learning grant
– Awarded by the Astronomy group of Leiden University
– Very competitive (around 60 candidates per project)
Location: Leiden, Netherlands

2017 **Master's project grant**
– Awarded by LIP-Lisbon;
6 months grant.
FCT grant reference: CERN/FIS-PAR/0006/2017
Location: Lisbon, Portugal

Technical internship grant (assemble anion detector)
– Awarded by IAESTE (Organization for Technical Experience);
6 weeks grant.
Location: Vienna, Austria

2016 **Winner: LIP Técnico Particle Challenge.**
– Answering several written questions over the period of one week;
– Presentation for a panel of experts on Particle Physics.
Prize: 6 months grant.
FCT grant reference: IF/01454/2013/CP1172/CT0003
Location: Lisbon, Portugal

2015 **Erasmus grant**
Location: Amsterdam, Netherlands

Bruno Alves

Geneva, 30th August 2019