Dr Rafael Garcia-Dias

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🔷 **Publications**

Interdisciplinary scientist in the fields of
machine learning, neuroscience, and astrophysics

Experience

Ⓚ King's College London
Research associate

August 2018 - Present

I am the main developer on neurofind.ai and the creator and developer of Neuroharmony. On these projects, I am responsible for research in brain imaging, machine learning development, software development, scientific reporting, statistical analysis, and supervision of MSc students.

I have also experience in the operation of two professional telescopes, tutoring in multiple subjects, and have been an intern in two different laboratories. More details can be found on the next page.

Education

🌐 Instituto de Astrofísica de Canarias
PhD in machine learning applied to Astrophysics

August 2015 - August 2018

In this PhD project I explored machine learning algorithms to explore a sample of 250 thousand high-resolution spectra of stars across our Galaxy. The main result of my study was to verify the limitations of stellar chemical tagging on contemporary spectroscopy surveys and to demonstrate the potential of unsupervised machine learning methods in spectral classification. My thesis was awarded a cum laude, the maximum recognition for a PhD in the institution.

🛡 Universidade Federal do Rio Grande do Sul (UFRGS)
Master's degree in Photometry and spectroscopy of stars

August 2013 - August 2015

I developed a Python script to homogeneously reanalyse a sample of 60 open star clusters in our Galaxy. To make this analysis I have gathered data from dozens of articles. The results of this work represented the largest photometric and spectroscopic study with a homogeneous analysis of this type of object to date.

🛡 Universidade Federal do Rio Grande do Sul (UFRGS)
BSc degree in Physics

March 2007 - August 2013

The Physics Institute at UFRGS holds the highest evaluation in the national education system, being one of the most prestigious physics courses in the country. During this period I have worked as an intern in a nanotechnology laboratory and an astrophysics laboratory. I started developing codes in Python to process and analyze data from these fields.

Main Skills

- Machine Learning development and lifecycle
- Data Science
- Software development
- Scientific thinking
- Experimental design
- Analytical Skills

Programming Skills

More than 10 years of experience

- Python
- Linux/bash
- Data Visualization
- Data mining
- Statistical Data Analysis

More than 5 years of experience

- Machine Learning
- Deep Neural Networks
- Distributed computing

Some experience

- Unit Testing
- Test-driven development
- Containerized applications
- Continuous Integration
- Kubernetes
- Cloud

Academic publications

- 17 peer-reviewed research articles in leading scientific journals
- h-index: 15
- More than 3,000 citations
- Multiple talks on international conferences

Languages

- Portuguese - Native
- English   - Fluent
- Spanish   - Fluent

More on Work Experiences

King's College London, Research associate, from August 2018 to present

At this position I have been responsible for research in applications of machine learning to diagnose brain disorders. I have developed part of the backend of Neurofind.ai which is a web-based application where clinicians can update images of the brain of their patients and receive a detailed report on how the brain of their patients relate to a normal brain. I have also conceptualized, designed and developed Neuroharmony, a tool to mitigate inter-scanner bias. The results obtained from Neuroharmony are published in the NeuroImage journal, the most renewed journal in the area of neuroimaging. I have supervised the research of MSc students and collaborated with the Urban Mind project.

Professional telescope observations: 16 nights of observation on the Isaac Newton Telescope and the Nordic Optical Telescopes from 2015 to 2017.

As part of my PhD, I have been observing in some professional telescopes at La Palma island in Spain. These are a few nights of 12-14 hours of intense work. It requires previous work of preparation to establish targets and procedures, substantial technical knowledge, and autonomous decision making while operating heavy machinery. One night of observation on the Isaac Newton Telescope costs about £10,000.

Intern at Magnetism laboratory at UFRGS: 16 months from 2010–2011.

Developing experiments in nanotechnology-related to giant magnetoresistance. Making nanotips by electrolysis, Using sputtering to make multilayer nanofilms, Building experimental apparatus.

Intern at Astrophysics laboratory at UFRGS: 2 years from 2011–2013

Researcher assistant on Open Stellar Clusters, measuring star formation rate in the solar neighbourhood, processing images from professional telescopes, performing automated photometry from the Magellanic Clouds. Developing a pipeline to perform photometry on sky surveys.

Private tutor: 3 years

During the last years of my undergrad I have been a private tutor in mathematics, physics, chemistry, and Spanish.

Talks

Seminar at the Psychosis Studies Meeting, IoPPN

2021 - *King's College London, London, England, United Kingdom*
Title: Quality control and Harmonization of MRI

Talk at the PPGFSC physics seminars

2021 - *UFSC, Florianópolis, Brasil*
Title: Aprendizado de máquina, potenciais e limitações (Machine learning: potential and limitations)

Talk at the Big Data London 2019

2019 - *London, England, United Kingdom*
Title: Why do some machine learning models fail?

Talk at Codemotion Milan 2019

2019 - *Codemotion, Milan, Italy*
Title: Why do some machine learning models fail?

Plenary talk at SDSS-IV Collaboration Meeting Santiago

2007 - *Pontificia Universidad Católica de Chile, Santiago, Chile*
Title: Machine learning in APOGEE: Unsupervised spectral classification with K-Means.

Workshop on collaborative text tools

2007 - *Instituto de Astrofísica de Canarias, Spain, Tenerife*
Title: LATEX collaborative tools (overleaf and sharelatex) and publications management (Mendeley)

Workshop in version control using Git, GitHub, Atom and GitKraken

2017 - *Instituto de Astrofísica de Canarias, Spain, Tenerife*

Talk at ALMA and the Brazilian Community Workshop

2014 - Observatório Nacional, Rio de Janeiro, Brasil.

More on Educational Experiences

Apr. 8th, 2019 - Early Psychosis: Latest Developments in Prevention, Prediction and Treatment

A masterclass with renewed professors and professionals of the market sector. The masterclass was organized and held at King's College London.

Nov. 28th-December 1st, 2017 - ESAC Data Analysis & Statistics Workshop

Covered fundamental topics in statistics and data analysis, including practical applications and advanced topics.

Nov. 13th-17th, 2017 - XXIX Canary Islands Winter School of Astrophysics on Applications of Radiative Transfer to Stellar and Planetary Atmospheres

The advanced school was dedicated to the fundamental physical processes in both stellar and planetary atmospheres, as well as the bases of the numerical treatment of radiative transfer, to form researchers with the background required to face the present and future challenges.

Oct. 2nd-3rd, 2017 - Early Data Release and Scientific Exploitation of the J-PLUS Survey

The goal of the event was to present the survey to the Spanish community, describe the potential and quality of the data and discuss scientific cases and applications.

Jul. 22th-29th, 2017 - SDSS-IV Collaboration Meeting Santiago

The Sloan community meeting. The talks at the conference covered topics in galactic, extragalactic, cosmology and technical aspects of the infrastructure of the Sloan Digital Sky Survey.

Sep. 12th-16th, 2016 - 11th Heidelberg Summer School on Astrostatistics & Data Mining

The school looked at the principles of inference and methods of astronomical data analysis and data mining, also covering a range of numerical and statistical techniques and their application to different types of astronomical data.

Mar. 15th-17th, 2016 - Conference on Big Data from Space - BiDS'16

The objective of this conference is to bring together researchers, engineers and users working in the area of Big Data from Space.

Aug. 18th-21st, 2014 - ALMA and the Brazilian community workshop

The goal of the workshop was to explore how the current science activity within the Brazilian community can benefit from the new ALMA observatory and radio observations in general.

Sep. 2nd-12th, 2014 - JPL-Caltech Virtual Summer School in Big Data Analytics

Computational skills and methodology needed for the analysis and interpretation of ever more massive and complex data sets are essential for the scientific and technological workforce in the 21st century. This virtual summer school addressed this need.

Oct. 18th-19th, 2014 - VIII Workshop in Neuroscience

The workshop covered the themes of memory, consciousness, neurotoxicity, neuro degeneracy and graduate programs in neuroscience.

Oct. 28th-29th, 2014 - III Symposium of the UFRGS Psychiatry League

Controversial issue on neuroscience. In the symposium, the following themes were discussed: neuroimaging, drug regulation, suiciding and medicalization.

Oct. 16th-20th, 2013 - 5th INPE advanced course: An overview of cosmology in the era of large telescopes: Theory, observation and simulations.

The lectures were focused on the following topics: 1) Cosmic Microwave Background, with emphasis on the new results from Planck 2) the large scale structure as unveiled by the recently completed Sloan Digital Sky Survey and 3) cosmological simulations, which became an essential part of the research in this field.

Jul. 1st 2012 - Workshop Technological Innovations for Hardware Integration

This event was aimed at disseminating and discussing new ideas, actions and activities on semiconductors in Brazil. It included technical lectures from both industry and universities and also laboratory demonstrations of integrated circuit projects under development at the CEITEC, the first microelectronics factory in Latin America.