João P. Faria

Contact

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Research Interests

Exoplanet detection and characterization in radial-velocity data; modelling and correcting the effects of stellar activity in radial velocities and photometry; spectroscopic analysis; properties of exoplanet populations; constraints on planet formation and evolution; optimal scheduling of observations; probabilistic data analysis, statistical methods, Gaussian processes, and machine learning.

Academic background

Jan 2018 — Ph.D. in Astronomy — **University of Porto**
Advisors: Nuno C. Santos and Pedro Figueira
FCT grant SFRH/BD/93848/2013
Dissertation: "Exoplanet detection in metal-poor stars"

Jul 2013 — M.Sc. in Astronomy — **University of Porto**
Advisors: Mário J. P. F. G. Monteiro and Margarida S. Cunha
Dissertation: "Asteroseimology of 16 Cyg A and B"

Jul 2011 — B.Sc. in Physics — **University of Lisbon**

Research Experience

2018 - present — Post-doctoral Researcher
Institute of Astrophysics and Space Sciences, Porto, Portugal

Publications

Full list in ADS or at joaofaria.space/publications
40 refereed papers. **496** citations
5 first-author papers. **50** citations, **3** self-citations

Faria, **J. P.** and 15 other authors (2019), Decoding the radial velocity variations of HD41248 with ESPRESSO, *in press*.
Faria, **J. P.** and 3 other authors (2018), kima: Exoplanet detection in radial velocities, *JOSS* 3.26, 487.
Faria, **J. P.** and 16 other authors (2016), The HARPS search for southern extra-solar planets. XL. Searching for Neptunes around metal-poor stars, *A&A* 589, A25.
Faria, **J. P.** and 6 other authors (2016), Uncovering the planets and stellar activity of CoRoT-7 using only radial velocities, *A&A* 588, A31.

Other selected publications

Nelson, Benjamin E., 4 authors, **J. P. Faria**, and 3 other authors (2020), Quantifying the Bayesian Evidence for a Planet in Radial Velocity Data, *AJ* 159.2, 73.
Pereira, Filipe, Tiago L. Campante, Margarida S. Cunha, **J. P. Faria**, and 5 other authors (2019), Gaussian process modelling of granulation and oscillations in red giant stars, *MNRAS* 489.4, 5764–5774.

Sousa, Sérgio G., 7 authors, **J. P. Faria**, and 10 other authors (2019), The metallicity-period-mass diagram of low-mass exoplanets, *MNRAS* 485.3, 3981–3990.
Oshagh, M., 5 authors, **J. P. Faria**, and 13 other authors (2018), Activity induced variation in spin-orbit angles as derived from Rossiter-McLaughlin measurements, *A&A* 619, A150.
Martins, J. H. C., 4 authors, **J. P. Faria**, and 2 other authors (2018), Recovering the colour-dependent albedo of exoplanets with high-resolution spectroscopy: from ESPRESSO to the ELT, *MNRAS* 478.4, 5240–5262.
Serrano, L. M., 3 authors, **J. P. Faria**, and 3 other authors (2018), Distinguishing the albedo of exoplanets from stellar activity, *A&A* 611, A8.
Ulmer-Moll, S., 3 authors, and **J. P. Faria** (2019), Beyond the exoplanet mass-radius relation, *A&A* 630, A135.
Lillo-Box, J., 9 authors, **J. P. Faria**, and 2 other authors (2018), The TROY project. II. Multi-technique constraints on exotrojans in nine planetary systems, *A&A* 618, A42.
Santerne, A., 21 authors, **J. P. Faria**, and 23 other authors (2018), An Earth-sized exoplanet with a Mercury-like composition, *Nature Astronomy* 2, 393–400.
Barros, Susana and **J. P. Faria** (2018). Tutorial: Detecting Planetary Transits and Radial-Velocity Signals. *Asteroseismology and Exoplanets: Listening to the Stars and Searching for New Worlds*. Ed. by Tiago L. Campante, Nuno C. Santos, and Mário J. P. F. G. Monteiro. Vol. 49, p. 267.
Santos, Nuno C. and **J. P. Faria** (2018). Exoplanetary Science: An Overview. *Asteroseismology and Exoplanets: Listening to the Stars and Searching for New Worlds*. Ed. by Tiago L. Campante, Nuno C. Santos, and Mário J. P. F. G. Monteiro. Vol. 49, p. 165.
Santos, N. C., 6 authors, **J. P. Faria**, and 4 other authors (2017a), Observational evidence for two distinct giant planet populations, *A&A* 603, A30.
Lillo-Box, J., 6 authors, and **J. P. Faria** (2018), The TROY project: Searching for co-orbital bodies to known planets. I. Project goals and first results from archival radial velocity, *A&A* 609, A96.
Oshagh, M., 5 authors, **J. P. Faria**, and 11 other authors (2017), Understanding stellar activity-induced radial velocity jitter using simultaneous K2 photometry and HARPS RV measurements, *A&A* 606, A107.
Barros, S. C. C., 25 authors, **J. P. Faria**, and 21 other authors (2017), Precise masses for the transiting planetary system HD 106315 with HARPS, *A&A* 608, A25.
Santos, N. C., 7 authors, **J. P. Faria**, and 2 other authors (2017b), Constraining planet structure and composition from stellar chemistry: trends in different stellar populations, *A&A* 608, A94.
Adibekyan, V., 4 authors, **J. P. Faria**, and 5 other authors (2016a), ζ^2 Reticuli, its debris disk, and its lonely stellar companion ζ^1 Ret. Different T_c trends for different spectra, *A&A* 591, A34.
Santos, N. C., A. Santerne, **J. P. Faria**, and 19 other authors (2016), An extreme planetary system around HD 219828. One long-period super Jupiter to a hot-Neptune host star, *A&A* 592, A13.
Figueira, P., 8 authors, **J. P. Faria**, and 7 other authors (2016), Is the activity level of HD 80606 influenced by its eccentric planet?, *A&A* 592, A143.
Adibekyan, V., 6 authors, **J. P. Faria**, and 4 other authors (2016b), Abundance trend with condensation temperature for stars with different Galactic birth places, *A&A* 592, A87.
Figueira, P., **J. P. Faria**, and 3 other authors (2016), A Pragmatic Bayesian Perspective on Correlation Analysis. The exoplanetary gravity - stellar activity case, *Origins of Life and Evolution of the Biosphere* 46.4, 385–393.
Adibekyan, V., 3 authors, **J. P. Faria**, and 7 other authors (2015), Identifying the best iron-peak and α-capture elements for chemical tagging: The impact of the number of lines on measured scatter, *A&A* 583, A94.
Martins, J. H. C., N. C. Santos, P. Figueira, **J. P. Faria**, and 10 other authors (2015), Evidence for a spectroscopic direct detection of reflected light from <ASTROBJ>51 Pegasi b</ASTROBJ>, *A&A* 576, A134.
Mortier, A., **J. P. Faria**, and 3 other authors (2015), BGLS: A Bayesian formalism for the generalised Lomb-Scargle periodogram, *A&A* 573, A101.
Figueira, P., **J. P. Faria**, and 5 other authors (2014), Exoplanet hosts reveal lithium depletion. Results from a homogeneous statistical analysis, *A&A* 570, A21.
Verma, Kuldeep, **J. P. Faria**, and 8 other authors (2014), Asteroseismic Estimate of Helium Abundance of a Solar Analog Binary System, *ApJ* 790.2, 138.
Santos, N. C., A. Mortier, **J. P. Faria**, and 21 other authors (2014), The HARPS search for southern extra-solar planets. XXXV. The interesting case of HD 41248: stellar activity, no planets?, *A&A* 566, A35.
Faria, **J. P.** and M. J. P. F. G. Monteiro (2012), On the possibility of using seismic probes to study the core composition in pulsating white dwarfs, *Astronomische Nachrichten* 333.10, 954.

Teaching Experience

December, 2019	Exoplanets: Detection, Characterization, Population *Doctoral Program in Astronomy, University of Porto* Course for first-year PhD students; 15h of lectures
July 17-27, 2016	Detecting Planetary Transits and Radial-Velocity Signals *IVth Azores International Advanced School in Space Sciences* 4.5hrs tutorial in the Summer school "Asteroseismology and Exoplanets: Listening to the Stars and Searching for New Worlds" covering data analysis methods for the detection of exoplanets in transit lightcurves and radial-velocity datasets. DOI: 10.1007/978-3-319-59315-9
February, 2016	Bayesian Statistics *Advanced Course, Institute of Astrophysics and Space Sciences* Created and lectured a course about Bayesian statistics, composed of a seminar talk (2h) and two hands-on computational classes (6h). Lecture notes are also available. Online repository.
November, 2015	Python for Astronomers *Advanced Course, Center for Astrophysics University of Porto* Teaching assistant for introductory programming classes. Online repository.
Aug 31 - Sep 4, 2015	Escola de Verão de Física (Physics Summer School) *Summer School, Faculty of Sciences, University of Porto* Supervised and lectured a project about "The energy of stars" for a class of 5 high-school students.
March 26-28, 2014	Stellar evolution models with the MESA code *Advanced Course, Center for Astrophysics University of Porto* Developed and coordinated a series of three hands-on tutorial classes demonstrating the use of the `MESA` stellar evolution code (Paxton et al. 2011; 2013).

Other research outcomes

- ESPRESSO Science Team *collaborator* (analysis of RV data, selection of targets)
- PI of **3** ESO observing proposals (ESPRESSO @ VLT)
- co-I of **20** accepted ESO/OPTICON observing proposals
- PI of cooperation project FCT-DAAD (Porto-Göttingen); awarded 2000€
- co-I of **2** accepted ISSI International Team proposals
- member of the PLATO Work Package 115100, dealing with *Astrophysical Noise Sources*
- observing experience from **4** missions to the La Silla and Paranal observatories
- referee for A&A, MNRAS, and AJ

Outreach

- *Press coverage* on the first ESPRESSO results (Faria+ 2019): PR, several news stories [1, 2], radio interview.
- *CoAstro*, a project to involve primary school teachers in research projects, 2018 (more info, in Portuguese).
- *Ignite IAstro (multiple sessions)*, short outreach presentations in small towns (more info, in Portuguese).
- *Mentes que Brilham (TV show)*, interview about the work published in Martins+ (2015), May 13, 2015.
- *Universidade Júnior (University of Porto)*, monitor of scientific activities for middle-school students, July 2013.
- *Planetarium sessions (presenter)*, as collaborator of the Outreach Unit of CAUP, Summer 2013.
- *Noites no Observatório*, monthly outreach events at the Lisbon Astronomical Observatory, 2010-2011.

Supervision

- Ph.D. project: João D. Camacho (IA, U. Porto)
  "Statistical Data Analysis Methods for the detection of Other Earths"
- M.Sc.-level fellowship: João Gomes da Silva (IA)
  new activity indicators; development of ACTIN
- M.Sc. thesis project: João D. Camacho (IA, U. Porto)
  "Gaussian processes [... for ...] exoplanet search"
- Undergraduate project: Ishan Mishra (IIT, India)
  "Spectral Activity Indices calculation tool"

Software development

- ESPRESSO: Tools to download and analyse ESPRESSO data (public release in 2020)
- kima: Exoplanet detection in RVs with DNest4 and GPs, described in Faria et al. (2018)
- BGLS: Bayesian version of the Generalized Lomb-Scargle periodogram, described in Mortier et al. (2015)
- OPEN: A platform for exoplanet detection in RVs
- pfigueira/BayesianCorrelation (contribution)

Technical skills

- Programming: Python, C++/C, Fortran, R, Shell
- Markup: HTML (+CSS+JS), LaTeX, Markdown

Languages

- Portuguese (Native)
- English (Proficient)
- Spanish, French (Beginner)

Talks / Posters

Invited

Statistical Methods for Estimating Radial Velocities in the Presence of Stellar Activity. *EPRV IV* — Grindelwald, Switzerland. Mar 17-21, 2019

Dealing with stellar activity in radial velocities. *EXO.AR 1 – 1st Argentinian Workshop on Exoplanets* — Buenos Aires, Argentina. Oct 30 - Nov 2, 2017

Gaussian processes for the analysis of RV data. *EPRV III* — State College, USA, Aug 14-17, 2017

Contributed (abridged list)

T Searching for low-mass planets around metal-poor stars. *EPRV IV*, Grindelwald. 21 Mar, 2019

T Realistic simulation of stellar radial velocities. *Observing the Sun as a Star*, Göttingen. 13 Sep, 2018

T The power of Gaussian processes as models for stellar activity. *CHEOPS Fifth Science Workshop.* Leibnitz, Austria. 24 Jul, 2017

T Searching for planets around metal-poor stars. *IA Seminar.* Porto. 24 May, 2017

T Trans-dimensional Bayesian inference. *ESO MCMC coffee.* Santiago, Chile. 30 Mar, 2017

T Detecting planets around active stars with radial velocity observations. *ESO seminar.* Santiago, Chile. 30 Mar, 2017

T Searching for low-mass planets around metal-poor stars. *INAF/OAT.* Torino, Italy. 20 Oct, 2016

P The search for low-mass planets around metal-poor stars. *4th Annual GMT Community Science Meeting.* 26-28 Sep, 2016, Pacific Grove, CA, USA

P CoRoT-7 as seen with HARPS radial velocities. *Exoplanets I.* 3-8 Jul 2016, Davos, Switzerland

P A radial velocity search for low mass planets around metal-poor stars: first statistical results. *EPRV II.* 5-8 Jul, 2015, Yale University, USA

T The interesting case of HD41248: stellar activity, no planets?. *TOE II - The Star-Planet Connection*, Porto. 16 Sep, 2014