Fran Bartolić

PhD candidate in astrophysics working on probabilistic modelling of time-series data. Interested in applying my skills to solving exciting new problems in an industry setting.

website: fbartolic.github.io
email: fb90 *at* ast-andrews.ac.uk
github: fbartolic
linkedin: fbartolic
location: Oxford, UK

Personal information

Nationality: Croatian

Languages: English (Fluent), Croatian (Native)

Experience

02/2020–06/2020 **Research analyst**, *Center for Computational Astrophysics (CCA), Flatiron Institute (Simons Foundation)*, New York, USA.

- Developed a probabilistic model for inferring time-variable two dimensional surface maps of exoplanets given one-dimensional time series data using latent nonnegative matrix factorization (NMF) and variational inference.
- Wrote code in Python using PyMC3 and Numpyro.
- Worked in a team with two other scientists.
- Upcoming paper contains more details.

Skills

Programming: Python, C/C++.

Tools: PyMC3, Pyro, JAX, theano, Stan, scikit-learn, PyTorch, Jupyter, Pandas, matplotlib, Git, continuous integration, Vim, Linux, HTML & CSS.

Statistics & ML: Probabilistic modelling, general linear models, MCMC, variational inference, Bayesian decision making, Gaussian processes, frequentist statistics, neural networks.

Other: I have given talks at international conferences and meetings and worked on projects in a team. As part of my PhD I have tutored undergraduates in astronomy and have given talks to members of the public, having to describe complex statistical methods to non-experts.

Education

2017–2022 (expected) **Ph.D. Astrophysics**, *University of St Andrews*, St Andrews, Scotland.

- Conducted research into Bayesian approaches to modeling astrophysical time-series data for the purpose of detecting stars, exoplanets and black holes in a regime where priors and expert knowledge cannot be neglected.
- Wrote open-source Python package caustic for fitting gravitational microlensing events using Hamiltonian Monte Carlo and Nested Sampling.
- Given talks at international conferences and workshops.
- Took courses related in machine learning and data science.

2015–2017 **M.Sc. Physics with Astrophysics**, *University of Rijeka*, Rijeka, Croatia.

- Cumulative GPA: 4.7/5.
- Took courses in theoretical physics.
- Worked on a theoretical research project in astrophysics for 7 months at Lund University in Sweden.

2012–2015 **B.Sc. Physics**, *University of Split*, Split, Croatia.
- Cumulative GPA: 4.5/5.
- Took courses in theoretical physics and computer science.
- Exchange semester at Lund University in Sweden.

Publications

2021 **F. Bartolić** & M. Dominik (in prep). Statistical challenges in modelling gravitational microlensing events.

2021 **F. Bartolić**, R. Luger, D. Foreman-Mackey (in prep). Occultation mapping of Io's surface in the near-infrared II: Inferring dynamic maps

2021 **F. Bartolić**, R. Luger, D. Foreman-Mackey (in prep). Occultation mapping of Io's surface in the near-infrared I: Inferring static maps

2021 R. Luger, E. Agol, **F. Bartolić**, D. Foreman-Mackey (in prep). Analytic Light Curves in Reflected Light: Phase Curves, Occultations, and Non-Lambertian Scattering for Spherical Planets and Moons.

2020 N. Golovich, W. Dawson, **F. Bartolić**, et al. A Reanalysis of Public OGLE-III and IV Gravitational Microlensing Events, arXiv:2009.07927

2018 V. Bozza, E. Bachelet, **F. Bartolić**, T. M. Heintz, A. R. Hoag, and M. Hun-dertmark. *VBBINARYLENSING: a public package for microlensing light-curve computation.*, 2018, MNRAS, 479, 5157. doi:10.1093/mnras/sty1791

Awards, Competitions and Honors

2019 *Arthur Maitland Prize* for the best talk, University of St Andrews.

2015 *Dean's Award for undergraduate academic excellence*, University of Split.

Hobbies & Interests

Cooking, reading, complexity science, localism, Effective Altruism.