

# Fran Bartolić

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

**website:** [fbartolic.github.io](https://fbartolic.github.io)  
**email:** fb90 at ast-andrews.ac.uk  
**github:** [fbartolic](https://github.com/fbartolic)  
**linkedin:** [fbartolic](https://www.linkedin.com/in/fbartolic)  
**location:** Zagreb, Croatia

## Personal information

Nationality Croatian  
Languages English (Fluent), Croatian (Native)

## Experience

- 06/2021–12/2021 **Research resident**, *Cervest*, London, UK.
- o Built probabilistic models for predicting the Urban Heat Island effect using a variety of geospatial datasets.
  - o Gained skills in remote sensing, climate science and geospatial data analysis.
- 02/2020–06/2020 **Research analyst**, *Center for Computational Astrophysics (CCA), Flatiron Institute (Simons Foundation)*, New York, USA.
- o 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.
  - o Wrote code in Python using the PyMC3, Numpyro and JAX libraries.
  - o Worked in a team with two other scientists in the [Astronomical Data group](#).

## Skills

Programming Python, C/C++, CUDA.

Tools JAX, PyMC3, xarray, dvc, numpyro, theano, Stan, scikit-learn, PyTorch, Jupyter, Pandas, matplotlib, SQL, R, Git, continuous integration, Vim, Linux, HTML & CSS.

Statistics & ML Probabilistic modelling, autodiff, general linear models, MCMC, variational inference, Bayesian model comparison, Gaussian processes, Frequentist statistics, neural networks, normalizing flows.

Geospatial I've built ML pipelines using Landsat, MODIS, VIIRS and OSM datasets.

Other I have given [talks](#) at international conferences and meetings and worked on projects in a team. I have tutored undergraduates in astronomy and have given talks to members of the public. I am good at describing complex statistical methods to non-experts.

## Education

- 2017–2022 (expected) **Ph.D. Astrophysics**, *University of St Andrews*, St Andrews, Scotland.
- o Wrote open-source Python package [caustics](#) for differentiable computation of binary and triple lens microlensing light curves with JAX.
  - o 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 are crucial.
  - o Given talks at international conferences and workshops.
  - o 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 and astrophysics.
  - 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.

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## Publications

- 2022 **F. Bartolić** & M. Dominik (in prep). *caustics – differentiable modeling of binary and triple lens microlensing light curves with JAX*.
- 2022 **F. Bartolić**, J. Skinner, R. Luger, J. Cho, and D. Foreman-Mackey (in prep). *What can we learn about spatial maps of exoplanets in emitted light with JWST photometric observations of secondary eclipses?*
- 2022 **F. Bartolić**, R. Luger, D. Foreman-Mackey . *Occultation mapping of Io's surface in the near-infrared I: Inferring static maps*, *The Planetary Science Journal*. doi:10.3847/PSJ/ac2a3e.
- 2021 R. Luger, E. Agol, **F. Bartolić**, D. Foreman-Mackey. *Analytic Light Curves in Reflected Light: Phase Curves, Occultations, and Non-Lambertian Scattering for Spherical Planets and Moons*, [arXiv:2103.06275](#).
- 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. Hundertmark. *VBBINARYLENSING: a public package for microlensing light-curve computation.*, 2018, *MNRAS*, 479, 5157. doi:10.1093/mnras/sty1791

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## 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.

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## Hobbies & Interests

Cooking, reading, complexity science, AI, history.