

Francesca Basini

PHD IN APPLIED MATHEMATICS · GRADUATE STATISTICIAN

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Summary

Passionate about science and coding enthusiast. I appreciate working in interdisciplinary teams and communicating at different levels of expertise. I tackled research questions with applications ranging from biology to social studies, using my expertise in dynamical systems, network modelling and clustering, MCMC algorithms and Bayesian estimation, and neural networks.

Education

PhD in Applied Mathematics | UNIVERSITY OF WARWICK

Coventry, UK

- Project: *“Trajectory Inference methods for multimodal SDEs with applications in developmental biology.”*
- Researcher in mathematical and statistical methods with applications in systems biology.

2020 - Ongoing

Areas of expertise:

- mathematical modelling and dynamical systems,
 - data analysis and dimensionality reduction techniques (PCA, UMAP etc),
 - Bayesian inference and algorithms (MCMC, Approximate Bayesian Computation, Sequential and Population Monte Carlo),
 - neural Stochastic Differential Equations and neural network training with novel loss functions (MMD, Wasserstein, Scoring Rules)
- Supervisors: Dr. Ritabrata Dutta and Professor Marie-Therese Wolfram.
 - Treasurer of SIAM Student chapter, SSLC representative.

MSc in Applied Mathematics | UNIVERSITY OF WARWICK

Coventry, UK

- Project: *“New model approaches to developmental biology in mouse embryos.”*
- Supervisors: Professor David Rand.
- Grade: Distinction.

2019 - 2020

Master Thesis Abroad | UNIVERSITY COLLEGE DUBLIN

Dublin, IR

- Carried out research at **Insights Centre for Data Analytics** under the supervision of Professor Nial Friel.
- Winner of Science Foundation of Ireland Scholarship for PhD students - declined.

Feb 2019 - June 2019

MSc in Statistics and Data Science | UNIVERSITY OF BOLOGNA

Bologna, IT

- Thesis abroad at **University College Dublin**, IR, titled: *“A stochastic blockmodel for football network data”*.
- Supervisors: Professor Cinzia Viroli and Professor Nial Friel.
- Grade: 110/110 cum laude.

2017 - 2019

Collegio Superiore - School of Excellence | UNIVERSITY OF BOLOGNA | LICENCE OF COMPLETION

Bologna, IT

- Collegio Superiore is the school of Excellence of the University of Bologna. I obtained a full-ride scholarship from the Collegio which offers advanced and interdisciplinary education.
- Selection of modules undertaken: Medicine of Longevity, History and legislation of the EU, Quantum Mechanics, Mathematics & Democracy, Cryptocurrencies, Greek translation and study of Pythagorean proofs.

2017 - 2019

BSc in Statistics (joint degree) | UNIVERSITY OF BOLOGNA & UNIVERSITY OF GLASGOW

Bologna, IT, Glasgow, UK

- Erasmus+ Double degree at University of Glasgow
- Thesis: *“Protein fluorescence modelling and regression”*
- I built probabilistic bayesian models to describe simple fluorescence and FRET activities with multi-type populations of proteins and implemented MCMC methods and algorithms for parameter estimation.
- Grade: 110/110 cum laude (Bologna) - Honours of the First Class (Glasgow)

2014 - 2017

Work Experience

Graduate Teaching Assistant | UNIVERSITY OF WARWICK

Coventry, UK

- Supervisor for 1st Year Maths Core modules.
- Teaching Assistant: Probability I & II, Statistical Laboratory in R, Mathematical Statistics, Statistical Inference, Scientific Computing.
- Workshops organiser in High-Performance Computing.

Sep 2020 - Ongoing

Academic Tutor | UNIVERSITY OF BOLOGNA

Bologna, IT

- Tutor for the orientation plan “Scientific Degrees” (statistics area).
- Delivered lectures and practicals to high-school students.

Apr - May 2018

Biostatistician Intern | IRST, CANCER INSTITUTE

Meldola, IT

- Developed a novel study on the efficacy of new treatment in basket phase III clinical trials.
- Proposed a Bayesian Hierarchical model based on PC priors and the use of R-INLA as computational tool.

Jul - Sep 2019

Collaboration during Italian national elections and local elections, tasks:

- Data collection, prediction of vote flows, abstention analysis and political scenarios.
- Infographics and reports (local newspapers).

Publications

- Francesca Basini, Vasiliki Tsouli, Ioannis Ntzoufras, Nial Friel, Assessing competitive balance in the English Premier League for over forty seasons using a stochastic block model, *Journal of the Royal Statistical Society Series A: Statistics in Society*, 2023

Conferences and Talks

- Scheduled

- CRISM Workshop on “Fusing Simulation with Data Science” | University of Warwick, 18-19 July 2023.
Jointly organized with Met Office and ECMWF.
Poster: Trajectory Inference with neural diffusion Bridges for applications in cell dynamics.
- **OxML - Oxford Machine Learning School** | University of Oxford, 8-16 July 2023 | (in-person)
ML for Finance & NLP. ML for Health
Organised by AI for Global Goals.

- Past

- **SPAAM Seminar** | University of Warwick, 9 March 2023 | (hybrid)
Talk: “Likelihood-Free Inference methods for trajectory inference with applications in developmental biology”
- Participant at **Mir@W on Optimal Transport and Machine Learning** | University of Warwick, 23 Jan 2023.
- **INI program workshop on Mathematical and statistical foundation of future data driven engineering** | University of Cambridge, 16 - 20 January 2022.
- **AS&RU Partnership Day 2022** | University of Warwick, 14 Dec 2022 |
poster: “Improving the LNA” (Best poster - joint winner)
- **ICMS workshop - Connections between interacting particle dynamics and data science** | Sabhal Mor Ostaig, Isle of Skye UK, 22-27 May 2022 - poster: “Improving the LNA” (see below)
- Speaker at **Women in Mathematical Sciences** event | University of Warwick, 12 May 2022.
- **SPAAM Seminar** | University of Warwick, 3 February 2021 | (hybrid)
Talk: “Improving the Linear Noise Approximation method with applications in developmental biology”
- **CompSysBio21** | Aussois FR, 14-19 November 2021 | (in-person)
Poster: “Landscape modelling approaches in developmental biology”
- Working group on **Model-Based Clustering** | Vienna AU, 15-19 July 2019 | (in-person)
Poster: “A stochastic block model for football network data”

Honors & Awards

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| 2019 | Best Performer Award , MSc in Statistics and Data Science | IT |
| 2019 | Scholarship for Research Abroad , Collegio Superiore Alumni Association | IT |
| 2019 | Scholarship for Thesis Abroad , University of Bologna | IT |
| | Scholarship for Excellent Students , undergraduate degree. A.Y.:2015, 2016, 2017 | IT |

Technical Skills

Programming	Python, R (+Shiny), C, Matlab, Mathematica SAS Certified Base Programmer for SAS 9
IDE	Jupyter Notebook , Visual Studio Code, Anaconda, PyCharm
Text editors	TeX (including beamer), Markdown, Microsoft Office tools
Operating Systems	Ubuntu Linux, Windows
other	Version Control with git and GitHub , High Performance Computing

Spoken languages Italian (native), English (IELTS C1), Spanish (DELE B2), French (A2)

Transferable Skills

- **Postgraduate Certificate in Transferable Skills in Science (University of Warwick)**
Modules: Teamworking, Science Communication, Decision-Making and Leadership.

Extracurricular Activity

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| Volunteering | Blood donor and social media manager. |
| Hobbies | Travelling, powerlifting;
avid reader, TV-show binge watcher. |