

Lukas Franken

✉ lukas.franken@ed.ac.uk • 📄 lukasfrankenq.github.io • 🌐 LukasFrankenQ

Education

PhD, Engineering/Computer Science

- Geospatial machine learning: variance estimation, causal inference, dense features.
- Surrogate modelling, model predictive control and forecasting to evaluate the role of seasonal thermal storages in the energy transformation.
- Deep Learning: remote sensing, object detection, transfer-learning.

University of Edinburgh

December 2024 (*exp.*)

MSc, Physics

(*Distinction*)

- Thesis: Stability in quantum natural gradient descent (1.0/1.0, Prof David Gross)
- Courses in statistical, computational and solid state physics.

University of Cologne

March 2021

BSc, Geophysics

- Thesis: Perturbation of solar wind by water vapor around dwarf planet Ceres (1.3/1.0, Prof Joachim Saur) *September 2017*
- Courses in foundational mathematics, physics and programming.

University of Cologne

Experience

The Alan Turing Institute, London

Enrichment Scheme Placement

- An opportunity for UK based machine learning PhD students to work in a shared environment to foster collaboration and exchange ideas and experience.

October 2022 - March 2023

PyPSA Earth Initiative

Project Lead

- Code and team lead in a project to infer the electric grid from satellite imagery using object detection and transfer-learning
- Developing tools to obtain coordinate-based energy demand estimations

Since Summer 2021

Berlin Institute of Technology, Berlin

Researcher

- Provided support in statistics and programming for a project investigating urban planning to reduce of CO₂ emissions.

April 2021 - June 2021

Fraunhofer Institute IAIS, Sankt Augustin

Researcher

- Research in machine learning (published at *ICLR* and *ESANN*).
- Public and science facing publications on quantum computing.
- Extensive coding in a group of programmers, numerous talks, project organisation.

August 2019 - June 2021

Publications

Heating up decision boundaries: isocapacitory saturation, adversarial scenarios and generalization bounds.

Bogdan Georgiev, Lukas Franken, Mayukh Mukherjee. International Conference on Learning Representations (ICLR) 2021.

On the impact of stable ranks in deep nets. *Bogdan Georgiev, Lukas Franken, Mayukh Mukherjee, Georgios Arvanitidis.* Preprint on arXiv. 2020.

Predicting dam locations in West Bengal using Gaussian processes and lightweight data fusion. *Lukas Franken, John Fisher, Stephen James Lee.* Work in progress. 2022.

The effect of demand predictability in district heating schemes supported by long term thermal storages. *Lukas Franken, Daniel Friedrich.* Work in progress, available on request. 2022.

How to choose the regularization parameter in the quantum natural gradient method. *Lukas Franken, David Wierichs, David Gross.* Work in progress (available on request). 2021.

Gradient-free quantum optimization on NISQ devices. *Lukas Franken, Bogdan Georgiev, Sascha Muecke, Moritz Wolter, Nico Piatkowski, Christian Bauckhage.* 2022 IEEE Congress on Evolutionary Computation.

Explorations in quantum neural networks with intermediate measurements. *Lukas Franken, Bogdan Georgiev.* ESANN 2020.

Using explainable machine learning to understand how urban form shapes sustainable mobility. *Felix Wagner, Nikola Milojevic-Dupont, Lukas Franken, Aicha Zekar, Ben Thies, Nicolas Koch, Felix Creutzig.* Transportation Research Part D: Transport and Environment. 2022.

PyPSA-Earth. A new global open energy system optimization model demonstrated in Africa. Maximilian Parzen, Hazem Abdel-Khalek, Ekaterina Fedorova, Matin Mahmood, Martha Maria Frysztacki, Johannes Hampp, Lukas Franken, Leon Schumm, Fabian Neumann, Davide Poli, Aristides Kiprakis, Davide Fioriti. available on arXiv, submitted to *Applied Energy* . 2022.

Scholarships and Awards

- **Full PhD Scholarship.** Funded by the EPSRC (~100 000 £).
- **Enrichment Scheme Placement Award.** Six months research visit at the Alan Turing Institute (3 000 £).

Programming Skills

- **Languages:** Python, Julia, MATLAB.
- **Libraries:** sklearn, numpy, torch, scipy, pandas, geopandas, gdal, jax, detectron2, pypsa, sqlite.
- **Tools:** git, vim, cuda, oop design, unix, testing, Lint.

Open Source Contributions

- **atlite:** Python package to retrieve and transform weather data into renewable generation profiles; **Maintainer.**
- **georetriever:** Python package to retrieve geological data relevant for ground heat storages; work in progress; **Creator.**
- **pydemand:** Python package to retrieve energy demand time series; work in progress; **Creator;**

Miscellaneous

- **Activities:** Physics Bonn-Cologne Graduate School Student Representative: Event and tutoring organisation.
- **Tutoring:** quantum information theory, partial differential equations.
- **Reviewer** at AISTATS 2022.
- **Cooking Enthusiast.** Favorites: italian cuisine, various curries, Kaiserschmarrn.