Sebastian Schmon, DPhil (Oxford)

Machine Learning Research & Engineering

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I am a machine learning researcher, engineer and former professor driven by a passion for leveraging AI to tackle real-world challenges. I am proud to say that the teams under my guidance have always punched above their weight. With publications in top-tier conferences and journals, I take a collaborative approach to developing innovative algorithms and solutions that not only advance the field but also have a tangible impact on people's lives.

⚙ Professional Experience

2023 — today

Senior Staff Machine Learning Engineer   Altos Labs, Cambridge, United Kingdom
- *Altos Labs is a research company based in California, US and Cambridge, UK and brings together some of the most accomplished researcher worldwide (including Nobel laureates) in order to research and develop strategies that can halt or even reverse age and diseases.*
- *I develop and implement large scale AI/ML models (*biological foundation models *and* generative models*) for biological phenotypes.*
- *My novel models help disentangle the very noisy human transcriptome (RNA transcribed from DNA) and uncover the mechanisms driving ageing and diseases.*
- *I develop* perturbation response *models that can predict the impact of chemical compounds and genetic perturbations (e.g. CRISPR screens)* in-silico*, i.e. before the experiments have been carried out in-vitro.*

2023

Senior Research Scientist   Shift Lab (defunct), London, United Kingdom
- *Founded by two ex-Deepmind co-founders,* **bridge between academic AI research and real-world production software***.*
- *I have been working with* **state-of-the-art generative models***, e.g. OpenAI's language models, and as* **diffusion models** *for image generation.*
- *Statistics and ML approaches to* **learn representations** *from* **large language model** *embeddings and combine them with expert opinions on the "tone of voice" of brands' communications.*
- *Use those representations to build a model maximising the value of brands' communication in terms of* **user engagement based on actionable attributes***. Managed to get this* **prototype ready 3 weeks** *after my joining.*

2020 — 2022

Research Scientist   Improbable Worlds Ltd., London, United Kingdom
- *Leverage new technologies for large scale networked simulations to build* **generative models of complex systems** *and* **digital twins** *modelling e.g. Covid-19 policies, cyberattacks.*
- *Ensure those synthetic environments are a reflection of real world phenomena.*
- *Using* **simulation-based inference** *and to estimate the uncertainty associated with imperfect simulations.*
- *Building fast surrogate models that could reduce the model complexity without losing much of the predictive accuracy.*
- *Tools I used: agent-based models, probabilistic models, (deep) surrogate models such as neural ODEs, normalising flows, (deep) Bayesian inference, diffusion models and generalised Bayesian inference.*

2021 — 2022	**Assistant Professor in Statistics** Department of Mathematics University of Durham, Durham, United Kingdom • *Supervision / pastoral care of PhD, MSc and BSc projects, some of which have lead to papers that were accepted at* **CVPR** *and* **ICLR** *workshops.* • *Updated the universities "unsupervised learning" module to now include* deep neural network based *approaches.* • *Organized to set up a* **new doctoral training center.** • *Served as* **industry outreach** *officer.*
2018 — 2020	**Head of Data Science** Foresight Works, technology start-up, Oxford, United Kingdom • *AI to avoid large (and otherwise common) cost overruns and improve executive decision making.* • *Second employee. Helped the company set up and brainstorm their core products, including appropriate metrics and statistical forecasting techniques to ensure adequate project progress as well as data driven estimates of potential cost overruns.* • *To kickstart and validate the value proposition we consulted with clients (large international companies, >£5bn in revenue) on data science and analytics challenges.* • *Compiled and delivered whole project, presented to the COO, providing recommendations on financial decisions for a new £1.2bn megaproject).*
2018	**Intern** Oxford Asset Management, Oxford, United Kingdom Quantitative Analyst
2017	**Summer Associate** Goldman Sachs, London, United Kingdom Strategist, Risk Division

🏛 Teaching Experience

2015 — 2019	**Departmental Teaching Fellowship** University of Oxford, United Kingdom Department of Statistics • *Teaching advanced courses in statistics and probability (3rd and 4th year), including* applied probability, advanced simulation, graphical models *and* Markov chain Monte Carlo.
2016 – 2017	**College Lecturer** Hertford College, University of Oxford, United Kingdom • *Lecturer for probability and statistics.*
2012 — 2015	**Teaching Assistant/Class Tutor** Free University of Berlin, Germany Department of Business & Economics, Chair of Statistics • *Tutorials for undergraduate students at introductory or intermediate level as well as the development of exercises for homework and exams.*

🎓 Education

2015 — 2020	**PhD Computational Statistics and Machine Learning** Magdalen College, University of Oxford, United Kingdom • *Computational statistics: Markov chain Monte Carlo, Sequential Monte Carlo, Bayesian Statistics.* • *Machine Learning: Variational autoencoders, representation learning.* Supervisors: Arnaud Doucet (`http://www.stats.ox.ac.uk/~doucet`), George Deligiannidis (`http://www.stats.ox.ac.uk/~deligian`)
2014 — 2015	**Mathematics** Imperial College London, United Kingdom (Erasmus Programme, non-degree)
2013 — 2015	**MSc Statistics** Humboldt University of Berlin, Germany Specialisation in Statistical Modelling and Inference, Econometrics, Monte-Carlo Methods and Stochastic Simulation, Survey Methodology *With Distinction*

2012 — 2015	**BSc Mathematics** Free University of Berlin, Germany Specialisation in Probability Theory, Numerical Methods and Functional Analysis Minor in Statistics
2009 — 2013	**BSc Economics** Free University of Berlin, Germany Specialisation in Quantitative Methods (Econometrics, Time Series and Statistics) and Economic Theory

</> Programming

A selection of tools and frameworks I have used recently.

- **Programming and Scripting**: Python, R
- **Machine Learning/Deep Learning Frameworks**: PyTorch, PyTorch Lightning, JAX, scvi-tools
- **Bioinformatics and Data Analysis**: Scanpy, Anndata
- **Data Processing and Visualization**: NumPy, Pandas, Matplotlib, Seaborn, Plotly, Dash, Streamlit
- **Database Management and Storage**: TileDB, MySQL
- **Configuration and Workflow Management**: GitHub, Flyte, Hydra
- **Cloud Computing Platforms**: AWS, Google Cloud
- **Experiment Tracking and Model Management**: Weights & Biases, MLflow

☑ Selected Publications

A selection of recent publications that I am particularly proud of. (Ask me why! ☺)

Robust Neural Posterior Estimation and Statistical Model Criticism
with Daniel Ward, Patrick Cannon, Mark Beaumont and Matteo Fasiolo
NeuRIPS 2022

Learning Multimodal VAEs through Mutual Supervision
with Tom Joy, Yuge Shi, Philip H.S. Torr, Tom Rainforth, and N. Siddharth
ICLR 2022 (Spotlight)

Amortised Likelihood-free Inference for Expensive Time-series Simulators with Signatured Ratio Estimation
with Joel Dyer and Patrick Cannon
AISTATS 2022

Optimal scaling of random walk Metropolis algorithms using Bayesian large-sample asymptotics
with Philippe Gagnon
Statistics and Computing, 2022

Capturing Label Characteristics in VAEs
with Tom Joy, Philipp Torr, Siddharth Narayanaswamy and Tom Rainforth
ICLR 2021

Large Sample Asymptotics of the Pseudo-Marginal Method
with Arnaud Doucet, George Deligiannidis and Mike Pitt
Biometrika 2021

☑ Workshop Paper

Denoising diffusion probabilistic models on SO(3) for rotational alignment
with Adam Leach, Matteo T. Degiacomi and Chris G. Willcocks
Workshop on Geometrical and Topological Representation Learning, ICLR 2022

AnoDDPM: Anomaly Detection with Denoising Diffusion Probabilistic Models using Simplex Noise
with Julian Wyatt, Adam Leach and Chris G. Willcocks
NTIRE, CVPR 2022

Calibrating Agent-based Models to Microdata with Graph Neural Networks
with Joel Dyer and Patrick Cannon
AI4ABM Workshop, ICML 2022 (Best Paper Award)

✒ Unpublished

Neural ODEs for Multi-state Survival Analysis
with Stefan Groha and Alexander Gusev
`arxiv.org/abs/2006.04893`

Investigating the Impact of Model Misspecification in Neural Simulation-based Inference
with Patrick Cannon and Daniel Ward
`https://arxiv.org/abs/2209.01845`

🏆 Awards

- EPSRC DPhil scholarship, Oxford (out of 1 per year)
- Departmental teaching scholarship, Oxford, Department of Statistics
- Humboldt University Erasmus grant for an exchange year at Imperial College
- Magdalen College Oxford travel/research grant
- ISBA travel grant
- Best paper award, AI4ABM workshop, ICML 2022
- Best reviewer award, Neurips 2022
- Best reviewer award, UAI 2022
- Best reviewer award, UAI 2021