

Magnus Petersen

PhD Student: Generative Modeling for Statistical Physics

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Professional Experience

- **PhD Student (full-time) - FIAS**
Development of deep learning methods for molecular dynamics using generative models and statistical physics.
2023–Present
- **Data Scientist (full-time) - EY**
ML model development for money laundering detection using time series data.
2021–2023
- **Research Internship - FIAS**
Applied manifold learning for molecular dynamics analysis.
2020–2020

Research

- **TELD: Trajectory-Level Langevin Dynamics** [🔗](#)
Novel Langevin dynamics method for sampling molecular trajectories and rare events.
NeurIPS MLAPS
- **DynamicsDiffusion: MD Trajectory Generation** [🔗](#)
Diffusion-based framework for generating molecular dynamics trajectories and rare event sampling.
NeurIPS AI for Science
- **BrainACTIV: Brain-Guided Image Manipulation** [🔗](#)
Method for manipulating images to control activity in specific brain regions via diffusion models.
In Review
- **Multiple Neighborhood Neural Cellular Automata** [🔗](#)
Enhanced NCA framework with multiple neighborhoods for improved texture synthesis.
arXiv preprint
- **Evolutionary Prompt Search (EvoGen)** [🔗](#)
Evolutionary algorithm for optimizing text-to-image prompts using aesthetic scoring.
NeurIPS MLACD

Education

- **M.S. & B.S. Biophysics**
J. W. Goethe University Frankfurt
German Grade: **1.4** US Conversion: **4.0**
Thesis: "Visualizing and Comparing Standardized Neural Network Encodings Using Manifold Learning"
B.Sc.: 2015-2019, M.Sc.: 2019-2021
- **St Leonards Boarding School**
St Andrews, Scotland
2011–2014

Expertise

- **Methods**
Diffusion Models, Flow-Matching Models, Statistical Physics, Stochastic Processes, Monte Carlo Methods, Molecular Dynamics, Evolutionary Algorithms
- **Technologies**
Python (PyTorch, JAX), MLOps (AWS, Weights & Biases), SQL, R, Git

Scholarship & Voluntary Work

- **Main Campus Doctus Scholar**
Recipient of a PhD scholarship from the Polytechnische Gesellschaft e.V.
- **Physics for Refugees**
Organization of weekly science tutoring and experimentation sessions for refugee children.
- **Machine Learning Teaching**
Instructor for 'Modern Statistical Data Analysis' and 'Deep Learning II' courses.
- **'Young Scholars' Youth Outreach**
Educational outreach at primary schools promoting CS education.
- **Hobbies**
Development of methods and tools for artistic applications of deep learning and self-organizing systems [🐦](#) (*NCA, Diffusion Models*). Interests include reading (Egan, Vonnegut, etc.), gym training, bouldering and learning Japanese.