



Dr. Dominik Schröder

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Positions

Qube Research & Technologies

Zurich

QUANTITATIVE RESEARCH ANALYST

since 08/2024

- Large scale data analysis and statistical modeling
- Data processing and feature engineering using *Polars* and *high performance Rust plugins*
- Time series prediction using *gradient boosting*, *transformers*, *tabular foundation models*
- Sentiment analysis (NLP, LLMs) on large text corpora
- Implementing and maintaining ML pipelines

ETH Zurich

Zurich

POSTDOC

2020 – 2024

- Work on random matrix theory, free probability, and statistical learning theory
- Focus: Asymptotic analysis of large neural networks and random feature models
- Mentors: Prof. Vincent Tassion, Prof. Wendelin Werner & Prof. Alain-Sol Sznitman

Bosch Center for Artificial Intelligence

Renningen

INDUSTRY SABBATICAL (DURING THE PhD)

2018

- Work on clustering of image and audio data
- Focus: Analysis of facets of the lifted multicut polytope on paths
- Goal: Combination of initial segmentation by neural networks with additional expert knowledge

Education

IST Austria

Vienna

MATHEMATICS

2015 – 2019

- **PhD in Mathematics.**
Doctoral thesis “From Dyson to Pearcey: Universal Statistics in Random Matrix Theory” supervised by Prof. Dr. László Erdős.

University of Cambridge

Cambridge

MATHEMATICS

2014 – 2015

- **MASc in Mathematics.** *with distinction*
Essay “Interlacing Families and the Kadison-Singer Problem” supervised by Prof. Timothy Gowers.

LMU Munich

Munich

MATHEMATICS & PHYSICS

2011 – 2014

- **BSc in Mathematics.** *Final grade 1.08*
Bachelor thesis “The Integrated Density of States of Random Schrödinger Operators” supervised by Prof. Dr. Peter Müller.
- **MSc in Theoretical and Mathematical Physics** *with distinction (final grade 1.0)*
Master thesis “Phase Transition in the Density of States of Quantum Spin Glasses” supervised by Prof. Dr. László Erdős.

Prizes & Fellowships

2010 – 2015	Studienstiftung des deutschen Volkes, Scholarship	
2015	Horne Prizes for Physical Sciences	Clare College, Cambridge
2015 – 2017	IST Austria Excellence Scholarship	IST Austria
2019 – 2022	ITS Junior Fellow supported by Dr. Rössler and the Walter Haefner Foundation	ETH Zurich

Acquired funding

2022 – 2026	SNF (Schweizerischer Nationalfonds) Ambizione. Value CHF544,720 Project: <i>Random matrix universality in data science and theoretical physics</i>
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Research

ORCID ID orcid.org/0000-0002-2904-1856

Google Scholar scholar.google.com/citations?user=u3ilHrcAAAAJ

b-index: 21

Full Publication List dominik.page/publications.pdf

Machine learning theory

3 PUBLICATIONS:

- Analysis of one-hidden-layer Neural Networks via the Resolvent Method, *NeurIPS 2021*
- Deterministic Equivalent and Error Universality of Deep Random Features Learning, *ICML 2023*
- Asymptotics of Learning with Deep Structured (Random) Features, *ICML 2024*

Random matrix theory

22 PUBLICATIONS. KEY PUBLICATIONS:

- Random Matrices with Slow Correlation Decay, *Forum of Mathematics, Sigma*
- Edge Universality for non-Hermitian Random Matrices, *Probab. Theory Related Fields*
- Central Limit Theorem for Linear Eigenvalue Statistics of non-Hermitian Random Matrices, *Comm. Pure Appl. Math.*
- Normal Fluctuation in Quantum Ergodicity for Wigner Matrices, *Ann. Probab.*

Free probability

2 PUBLICATION

- Thermalisation for Wigner matrices, *J. Funct. Anal.*
- Matrix Concentration Inequalities and Free Probability II. Two-sided Bounds and Applications, *in revision at Comm. AMS*

Numerical analysis

1 PUBLICATION

- On the condition number of the shifted real Ginibre ensemble, *SIAM J. Matrix Anal. Appl.*

Statistical physics

1 PUBLICATION

- Phase transition in the density of states of quantum spin glasses, *Math. Phys. Anal. Geom.*

Programming Skills

Python	Advanced, including deep learning frameworks (PyTorch, TensorFlow)
Rust	Intermediate, mainly high performance Python plugins
Cuda	Intermediate, mainly linear algebra kernels
Typescript	Advanced, including React, Node.js, D3.js
SQL	Intermediate

Machine Learning / Programming

Cortical Silent Period (cSP) evaluation algorithm

[wirhabenzeit/csp](#)

DEEP LEARNING

Regression on EEG data using resnet for a clinical study (ongoing work). Written in Python (PyTorch), inference and visualization in JavaScript (onnxruntime)

ActivityMap

[wirhabenzeit/stravamap](#)

WEB APPLICATION

Map and statistical analysis of personal outdoor activities. Written in Typescript (React.js, D3.js)

pybibget

[wirhabenzeit/pybibget](#)

COMMAND LINE UTILITY

Download and manage bibtex entries from arXiv, Google Scholar, and other sources. Written in Python

Teaching experience

Lecture

ETH Zurich

PROBABILITY THEORY

2022

Lecture series

ETH Zurich

MEDLEY IN ADVANCED PROBABILITY

2020

Supervision of students

Master thesis

ETH Zurich

VANESSA PICCOLO: "ASYMPTOTIC SPECTRAL DENSITY OF NON-LINEAR RANDOM MATRIX MODELS"

2020 – 2021

Won the "Premio Pro Ticino Zurigo" prize

Master thesis

ETH Zurich

YANNICK EGG: "COMMUNITY DETECTION IN THE STOCHASTIC BLOCK MODEL"

2023-2024

Bachelor thesis

ETH Zurich

NICOLAS HOTTON: "THE BBP PHASE TRANSITION IN PRINCIPAL COMPONENT ANALYSIS"

2023

Bachelor thesis

ETH Zurich

SVEN KELLER: "EXISTENCE OF INFINITE FAMILIES OF RAMANUJAN GRAPHS VIA THE PROBABILISTIC METHOD"

2024

Semester papers

ETH Zurich

TOPICS: DYSON BROWNIAN MOTION, RANDOM MATRIX THEORY, PRINCIPAL COMPONENT ANALYSIS

2021–2023

Miscellaneous

Jul – Aug 2010 Volunteer teacher for mathematics & english, Godavari State School

Nepal