

Leon Kloker

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EDUCATION

Stanford University Sept. 2022 – June 2024

M.Sc. in Computational and Mathematical Engineering. GPA 3.9/4.0

Stanford, CA

Relevant coursework: Machine learning, deep multi-task and meta learning, parallel computing with CUDA, software engineering, stochastic simulation, convex optimization, numerical linear algebra

University of Stuttgart

Oct. 2017 – Aug. 2021

B.Sc. in Simulation Technology. GPA 1.3 (inverted 4.0 scale, top of the class)

Stuttgart, Germany

Relevant coursework: Analysis, linear algebra, system concepts and programming, data structures & algorithms, deep learning, numerical simulation, computational & theoretical physics, general relativity

INTERNSHIPS

Scientific ML research intern @ Ansys June 2023 – Sept. 2023

- Developed transformer models in order to time integrate solution snapshots of the 2D incompressible Navier-Stokes equation in the turbulent regime as a benchmark
- Explored the intersection of Fourier Neural Operators and Transformers for Neural Operator Learning

ML research intern @ Sandia National Laboratories

Dec. 2022 – Mar. 2023

- Investigated the performance of different model architectures, such as convolutional networks or graph networks, and different circuit encodings for predicting the fidelity of a quantum computation circuit
- Results are about to be published in Bulletin of the American Physical Society

RESEARCH PROJECTS

Machine Learning for allergy prognosis, Tang Lab @ Stanford Engineering Jan. 2024 – now

- Developing ML models such as regressions, SVMs and CNNs to predict the percentage of CD63-positive basophils in an anti-IgE or allergen stimulated blood sample of allergic patients
- Designed features from the marginal distributions of the sample's Impedance Flow Cytometry data
- Results (Pearson > 0.98) are about to be published in the Journal of Allergy and Clinical Immunology

LLM-powered intelligent search, project @ CS224G Apps with LLMs

Dec. 2023 – Apr. 2024

- Developed a chatbot tailored towards solar M&A analysts allowing them to talk and Q&A a data-room
- Oversaw our software team working on a python flask backend, web deployment, front-end development to coding a retrieval-augmented-generation LLM search engine with LlamaIndex

RNA reactivity prediction, project @ CS330 Deep Multi-Task and Meta Learning Sept. 2023 – Dec. 2023

- Built a model consisting of multiple prediction heads on top of a BERT-style foundation model to simultaneously predict reactivity and binding information of each nucleotide in an RNA sequence
- Compared performance of LSTM, GRU, 1D-CNN and transformer as fine-tuned prediction heads

CUDA parallel computing, Course project @ CME 213 Parallel Computing

Apr. 2023 – June 2023

- Implemented a feedforward neural network from scratch in C++ and verified the code on MNIST task
- Wrote optimized, custom CUDA kernels for forward and backward pass for several functions such as general matrix-matrix multiplication or softmax and checked their performance using GPU profilers
- Parallelized the training by using MPI for batch data distribution

Computer Vision for precision oncology, Ruijiang Li lab @ Stanford Medicine

Dec. 2022 – June 2023

- Built computer vision algorithms for automated cell segmentation & classification in cancer biopsies
- Discovered spatial biomarkers that can predict progression free survival after immunotherapy
- Final model (AUC 0.81) will be presented by co-author in American Society of Clinical Oncology meeting

Modeling endogenous liquidity crises, project with Prof. Papanicolaou

Apr. 2023 – June 2023

- Used multivariate Hawkes processes to stochastically model the emergence of flash crashes
- Analytically investigated the emerging stability bounds and ran simulations of the model as verification

Monocular depth estimation with cGANs, project @ CS230 Deep

Sept. 2022 – Dec. 2022

- Programmed a conditional generative adversarial network as well as our own google earth data pipeline to train a model that predicts the relative elevation map of a given satellite image
- Used a U-Net as generator and a patch-based CNN as discriminator to improve upon previous results

Navier-Stokes solver C++, Course project @ Numerical Simulation

Oct. 2021 – Mar. 2022

- Built a solver for the incompressible, non-isothermal Navier-Stokes equations in 2 dimensions with a range of possible boundary conditions from scratch in C++
- Parallelized several iterative methods solving the pressure Poisson equation using MPI

Modeling convective groundwater flow, Final thesis @ University of Stuttgart June 2021 – Sept. 2022

- Created a mathematical model for convective groundwater flow due to evaporation in arid regions
- Derived the ground-state flow analytically and stability criteria via a linear stability analysis
- Conducted direct numerical simulations of the system using my own MATLAB code
- Methods and results were published in the journal *Physics of Fluids*

Monte-Carlo simulation of CO₂-alcohol mix, project @ Thermodynamics lab Feb. 2020 – Dec. 2020

- Implemented a novel molecular force field and Monte-Carlo moves in RASPA
- Conducted NPT-Gibbs ensemble simulations of CO₂-alcohol mixtures to verify the force field code

PUBLICATIONS

Kloker, L. et al. (2022). *Solution approaches for evaporation-driven density instabilities in a slab of saturated porous media*. *Physics of Fluids* (Vol. 34, Issue 9)

Eweje F. et al. (2024). *Use of artificial intelligence-based digital pathology to predict outcomes for immune checkpoint inhibitor therapy in advanced gastro-esophageal cancer*. *ASCO annual meeting 2024*.

Kim S. et al. (2024, under review). Label-free, machine learning assisted impedance measurement of basophil activation for food allergy assessment. *Journal of Allergy and Clinical Immunology*.

Hothem D. et al. (2024, under review). Cross-model quantum circuit fidelity prediction. *Bulletin of the American Physical Society*.

AWARDS AND FELLOWSHIPS

Scholarship of the German Academic Exchange Service (DAAD)	2022 – 2024
Simulation Technology valedictorian award	2021
Ferry Porsche Abitur Prize, German Physical Society Abitur Prize	2017

ADDITIONAL WORK

One Semester of M.Sc. Simulation Technology at University of Stuttgart	2021 – 2022
TA: Engineering Mechanics 1-4, ML, Intro to AI, Linear Algebra for Computing, Parallel Computing	2018 – 2024
Tennis and fitness coach at tennis club Grötzingen and Bernhausen	2018 – 2022

SKILLS & INTERESTS

Technical: Python, C++, CUDA, MATLAB, Java, Git, Bash Script, Latex

Language: Fluent in German and English, intermediate in French

Tennis & golf, long-distance running, working out, playing saxophone