

Martin Meinel

PHD CANDIDATE · MACHINE LEARNING

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Profile

I am a highly motivated machine learning researcher passionate about translating machine learning research to healthcare, primarily focused on inflammatory skin diseases. I have developed SAFARI, a framework for sparse biomarker detection for rare diseases, which I was honored to present at the ML4H workshop in New Orleans. I am leveraging genetics in combination with single-cell expression data to identify causal risk factors for hereditary diseases like rheumatoid arthritis.

Education

PhD Candidate in Computational Biology

Munich, Germany

HELMHOLTZ CENTER MUNICH | TECHNICAL UNIVERSITY MUNICH | LMU MUNICH

Oct 2021 - Present

- Supervised by Dr. Michael Menden & Dr. Natalie Garzorz-Stark.

M. Sc. in Data Engineering & Analytics

Munich, Germany

TECHNICAL UNIVERSITY OF MUNICH

Oct 2018 - Nov 2020

- Relevant courses: Machine Learning, Machine Learning for Crowd Modeling & Simulation, Information Retrieval, Applied Regression, Foundations of Data Analysis, Foundations of Data Engineering.

B. Sc. in Applied Computer Science

Bayreuth, Germany

UNIVERSITY OF BAYREUTH

Oct 2014 - Oct 2017

- Major in Computer Science and minor in Engineering science

Research Experience

SAFARI - Sparse biomarkers for rare diseases

Helmholtz Center Munich

PHD STUDENT

Feb 2021 - Present

- Developed SAFARI, a model-agnostic framework designed to identify sparse and robust biomarkers for rare diseases, enabling clinical translation by operating directly on the gene space.
- SAFARI ensures high expression levels of genes, simplifying their detection in clinical applications.
- Applied SAFARI to address the critical clinical challenge of distinguishing cutaneous T Cell lymphoma from eczema. Three biomarkers were extracted from a pool of 20,000 genes within bulk RNA-seq data, empowering early diagnosis and proper treatment.
- Leveraged the three discovered biomarkers to achieve a sensitivity and specificity score of 85 % and 93 %, respectively, using a logistic regression model on an imbalanced data set.

Identification of diagnostic markers enabling precision medicine for psoriasis

Helmholtz Center Munich

PHD STUDENT

Apr 2021 - Present

- Developed a linear imputation solution for missing therapy response data of patients, enabling the analysis of complete patient datasets.
- Created an objective metric to assess therapy response, allowing for more accurate in-between patient comparisons and categorization of patients.
- Implemented statistical tests identifying best drug target per endotype.

Leveraging single-cell expression data with genetics to discover risk factors in inflammatory skin diseases

Helmholtz Center Munich

PHD STUDENT

October 2023 - Present

- Leveraging Mendelian Randomization to infer causal associations of cell-type specific gene expression levels and inflammatory skin diseases.
- Implemented pipeline to detect cis eQTLs of single-cell expression data from Peripheral Blood Mononuclear Cells.

Efficient implementation of deep convolutional Gaussian Processes

TU Munich

RESEARCHER

Jan 2020 - Nov 2020

- Implemented deep convolutional Gaussian processes to mimic convolutional neural networks (CNNs) to obtain uncertainty estimations for predictions of the MNIST dataset with the goal of faster computation (see here).
- Conducted a comprehensive evaluation of various imputation algorithms to determine their ability to efficiently approximate the kernel matrix and deliver optimal performance on test data.
- Accomplished a substantial 40% reduction in training time by using only 20% of the original training data while obtaining a high classification accuracy of 86% on the MNIST dataset (98% accuracy using the entire training set).

Publications

- Garger, D., **Meinel, M.**, Dietl, T., Hillig, C., Garzorz-Stark, N., Eyerich, K., de Angelis, M., Eyerich, S., Menden M.P. (2023). The impact of the cardiovascular component and somatic mutations on ageing. *Aging Cell*. <https://doi.org/10.1111/ace.13957>
- Fischer, F., Doll, A., Uereyener, D., Roenneberg, S., Hillig, C., Weber, L., Hackert, V., **Meinel, M.**, Farnoud, A., Seiringer, P., et al. (2023). Gene expression based molecular test as diagnostic aid for the differential diagnosis of psoriasis and eczema in formalin fixed and paraffin embedded tissue, microbiopsies and tape strips. *The Journal of Investigative Dermatology*, S0022-202X(23)00156-2. <https://doi.org/10.1016/j.jid.2023.02.015>
- Farnoud, A., Ohnmacht, A. J., **Meinel, M.**, & Menden, M. P. (2022). Can artificial intelligence accelerate preclinical drug discovery and precision medicine?. *Expert opinion on drug discovery*, 17(7), 661–665. <https://www.tandfonline.com/doi/epdf/10.1080/17460441.2022.2090540>

Working experience

Opitz Consulting GmbH

Munich, Germany

SOFTWARE ENGINEER WORKING STUDENT

Oct 2019 - Oct 2020

- Built a docker skeleton for Apache Zeppelin, enabling users to start a docker container running Apache Zeppelin on openShift with one click.
- Created a web application for Allianz IDS GmbH, allowing employees to track, assign, and rate investment orders within the department.

REHAU Industries SE & Co. KG

Bayreuth, Germany

SOFTWARE ENGINEER WORKING STUDENT

Feb 2018 - Mar 2019

- Developed ALEXA skills for the 2018 FRONTALE window exhibition, demonstrating several features of the smart window.
- Implemented a web application for Medi Bayreuth to assess players' fatigue after training sessions and their performance during regular fitness checks to visualize and track their development and prevent injuries.

REHAU Industries SE & Co. KG

Rehau, Germany

SOFTWARE ENGINEER INTERN

Nov 2017 - Jan 2018

- Developed a plugin for the open-source smart home system openHAB, enabling users to connect their automated sensor-based garden watering system with other IoT devices.

Skills

Programming	Python, Java, R, SQL, shell
Libraries / Frameworks	NumPy, Pandas, PyTorch, scikit-learn, Spring, scanpy, DESeq2, edgeR
Tools / Platforms	AWS, Docker, Git, LaTeX, slurm
Languages	German, English

Honors & Awards

2023	Poster at ML4H , Accepted Findings Paper at “Machine Learning for Health” workshop	New Orleans, US
2023	Inventor , Registered patent “Differential diagnosis of mycosis fungoides, method and system” for discovered biomarkers to distinguish Eczema from Cutaneous T Cell lymphoma using SAFARI	Munich, Germany
2023	Speaker , Selected Speaker about “Biocomputational analysis of big data” at EADV-ESDR Summer Research Workshop: Big Data and Translation in Dermatology.	Freiburg, Germany
2023	Participant , Selected as participant for summer school OxML - MLxHealth.	Oxford, UK
2021	PhD , Selected as a member of Munich School for Data Science (MuDS)	Munich, Germany

Extracurricular Activity

TUM MINGA Mentoring Program

Munich, Germany

MENTOR

Oct 2019 - Oct 2020

- Assisted incoming master students from abroad with navigating TU Munich and life in Germany by offering guidance on university procedures, exam preparations, and insights on local resources and cultural differences.

Lern-Fair

Munich, Germany

MATH TEACHER

Feb 2021 - Jul 2021

- Delivered personalized online math lessons to 9th-grade students during the COVID-19 home-schooling period, promoting understanding and growth in mathematical concepts.
- Developed and curated exercise sheets to reinforce knowledge, deepen understanding, and facilitate independent practice.