# HANNES STÄRK

**MIT Research Intern - M.Sc. Informatics from TUM, Munich, DE**

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## EDUCATION

### M.Sc. Informatics | Machine Learning major

**Technical University of Munich**

Oct 2019 - Sept 2021 | Munich, DE | Full-time

- 2nd Year: Advanced topics in machine learning and probabilistic inference
- 1st Year: Introduction to machine learning and learning theory

Attending theoretical foundations of AI and protein prediction reading groups

### B.Sc. Informatics | Mathematics track

**Bundeswehr University Munich**

Sept 2017 – Sept 2019 | Munich, DE | Full-time

Built concept and started development of the app CoachPTBS

### EXTRACURRICULAR TRAINING

**Machine Learning Summer School: MLSS**

Aug 2021 | Taipei, TW | Selective Admission

- Strong student award + fee waiver and nominated for best paper

**Eastern European Machine Learning Summer School: EEML**

Jul 2021 | Budapest, HU | Selective Admission

**London Geometry and Machine Learning Summer School: LOGML**

Jul 2021 | London, UK | Selective Admission

**PRAIRIE/MIAI AI Summer School: PAISS**

Jul 2021 | Remote | Selective Admission

## MAIN RESEARCH PROJECTS

### MIT Internship: Geometric DL for Binding Prediction

**Tommi Jaakkola, MIT + Regina Barzilay, MIT + Octavian Ganea, MIT**

since Oct 2021 | Boston, USA | Full-time

- 3D GNN simultaneously reasons about atom positions of a protein and a small molecule to predict whether it fits into the protein's binding pocket

### Master's Thesis on Graph Representation Learning

**Pietro Liò, Cambridge University + Stephan Günnemann, TUM**

Mar 2021 – Sept 2021 | Cambridge, UK | Full-time remote

- **Self-supervised learning for small molecular graphs: Thesis**
- Use SSL to pre-train a GNN by learning joint embeddings between the GNN's representations and the 3D information of a molecule: video explanation

### Protein Language Models for Protein Prediction

**Burkhard Rost, Technical University of Munich**

Sept 2020 – Feb 2021 | Munich, DE | Full-time course

- **Developed attention mechanism and architecture for predicting proteins' subcellular location beating SOTA by 8 percentage points: video**

## PUBLICATIONS

- Stärk, Hannes et al. (2021) "3D Infomax improves GNNs for Molecular Property Prediction". In: *Preprint. Under review.*
- Kefato, Z.; Stärk, Hannes et al. (2021) "Jointly Learnable Data Augmentations for Self-Supervised GNNs". In: *Preprint. Under review.*
- Stärk, Hannes et al. (2021) "Light Attention Predicts Protein Location from the Language of Life". In: *To appear in OUP Bioinformatics Advances. Posters + contributed talk at ICLR'21 AI4PH and ICLR'21 MLPCP. Poster + long talk at MLCSB 2021. Poster + talk at WCB ICML'2021.*

## SUMMARY

*I am passionate about **MACHINE LEARNING** and especially **GRAPH REPRESENTATION LEARNING**. I have hands-on experience from academia + industry and am now fully devoted to research. My main expertise revolves around symmetry aware **GNNs** for **MOLECULES** and **SELF-SUPERVISED LEARNING** on graphs. Previously, I worked on transformers for **PROTEIN PREDICTION**. I am a researcher with a mathematical background, eager to learn about important problems and find impactful solutions.*

## SKILLS

**Python** ●●●●○

Main language in projects and personal use

**Java + Scala** ●●●○○

Two years of backend development and main language during studies

**Other Languages:** HTML, CSS, JavaScript (proficient) R, C++, SQL, ARM assembly, Swift, MATLAB (used occasionally)

**PyTorch** ●●●●○

Protein localization prediction, Neural Radiance Fields, Graph representations in reinforcement learning, WaveNet for denoising audio, Enzyme prediction + projects done as coursework, exercises created for courses

**TensorFlow, Keras** ●○○○○

Variational Autoencoder for remote sensing images

**Other:** Spectral Methods for Graphs, Audio processing, Robotics, Computer Vision and Graphics, Git, Unix systems, Shell, Docker, Cloudfoundry, Jenkins, Unittesting, Jupyter, LaTeX, **clean code**, AWS, Google Cloud Platform

**Languages:**

**German** ●●●●●

Native Speaker

**English** ●●●●●

Professional Proficiency | 96% in TOEFL test

**French** ●○○○○

Secondary language at school and from friends

## LEISURE

**Sports:** Gymnastics, Calisthenics, Acrobatics

Watching online lectures, Writing about maths, Chess, Paper discussion groups

## AWARDS

Highest prize money award at WCB ICML'21

## WORK EXPERIENCE

### Mathematics Lecturer

**BIB Augsburg gGmbH**

since Feb 2020 | Augsburg, DE | Part-time

**Teaching linear algebra, analysis, and statistics**

- Organizing online teaching and weekly individual lessons
- Student mediation and counseling. Collecting feedback, Weekly reports

### Student Assistant

**Institute of Mathematics and OR, Bundeswehr University Munich**

Sept 2018 – July 2019 | Munich, DE | Part-time

**Worked on causal inference for train traffic data with structure learning in Bayesian networks and validated approaches with simulation data**

- Implemented and evaluated methods for regression on time-series data

PyTorch, Python, Anylogic simulations, Recurrent neural networks, SARIMA, ARIMAX, LSTMs, Bayesian network structure learning, causal inference

### Dual Study Program

**Allianz Deutschland AG**

Sept 2017 – Sept 2019 | Munich, DE | Part-time

**Web-development and digital infrastructure maintenance in an agile development team, technical training in computer science**

- Designed and Developed an app for organizing large software releases
- Provided web-applications for customer interaction and deployment pipelines

Java (Spring Boot), HTML, CSS, TypeScript (Angular), Git, Jenkins, software engineering best practices, clean and fast programming

## TEACHING

### Operations Research

**Technical University of Munich, Decision Sciences**

April 2021 – Sept 2021 | Remote | Part-time

### Deep Learning

**Technical University of Munich, CV & AI Niessnerlab**

Nov 2020 – April 2021 | Remote | Part-time

## VOLUNTARY WORK

### Reviewer for ML4H 2021 Symposium

**2021 Machine Learning for Health Symposium**

Sept 2021 - Oct 2021 | Remote | Part-time

- Review papers on graph representation learning and NLP

### ICML 2021 Volunteer

**International Conference on Machine Learning**

Jul 2021 | Remote | One-time event

- Helped presenters during poster and live sessions and in workshops

### ICLR 2021 Volunteer

**International Conference on Learning Representations**

April 2021 – May 2021 | Remote | One-time event

- Helped presenters during poster and live sessions and in workshops

### Gymnastics and Acrobatics Trainer

**VfL Buchloe**

Sept 2015 – Present | Buchloe, DE

- Started acrobatics show group Akrobatik Astral
- Training gymnastics and acrobatics groups for competitions and shows
- Choreograph acrobatics shows and participate in them

## TALKS

### 3D Pre-training improves GNNs

**Cambridge CL AI Research Talk** | Oct 2021

### Self-Supervised learning on Proteins

**ICML 2021 WCB** | July 2021

### Attention predicts Protein Location

**ISMB/ECCB 2021** | July 2021

### Language Models for Protein Prediction

**Representation Learning in Biology** | July 2021

### Contributed talk ICLR'21 MLPCP

**ICLR 2021 MLPCP** | May 2021

## PROJECTS

### GraphML Reading Group

**LoGaG Reading Group**

since July 2021 | virtual

- I am organizing the Learning on Graphs and Geometry reading group where paper authors present their work with with >50 weekly attendees

### Guided Research Computer Vision

**Matthias Nießner's CV & AI chair at TUM**

Mar 2020 – Sept 2020 | Munich, DE

- "Neural Radiance Fields for Novel View and Human Pose Synthesis" (unpublished) with video explanation and code

### Predict Protein webserver

**Rostlab at Technical University of Munich**

April 2021 | Munich, DE

- Provide the state-of-the-art subcellular localization predictions for the predict protein webserver

### GNNs for Reinforcement Learning

**Technical University of Munich**

Nov 2020 – Mar 2021 | Munich, DE

- **Project in a course: using graph representations of robots in reinforcement learning**

"Graph representations in Reinforcement Learning"

### Seminar: Topics in machine learning

**DAML at Technical University of Munich**

April 2020 – Sept 2020 | Munich, DE

- Seminar where each student wrote a survey on selected machine learning topics and had to review the papers of three other students

A detailed "Survey on Transformers" (unpublished)

### Bachelor's Thesis

**Bundeswehr University Munich**

May 2019 – Sept 2019 | Munich, DE

- Implemented a convolutional variational autoencoder and investigated methods for interpolating in the latent space and understanding it with t-SNE and linear probing
- "Understanding Variational Autoencoders' Latent Representations of Remote Sensing Images"