

# 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

- "passed with high distinction" (1.2) - No corrections for thesis
- Learning theory, ML, DL, Quantum Computing, Protein Prediction, ...
- 📖 Attending theoretical foundations of AI and protein prediction reading groups

B.Sc. Informatics | Mathematics track

Bundeswehr University Munich

 Oct 2017 - Sept 2019

- Only student who completed the 3 year curriculum in 2 years
- 📖 Built concept and started development of the app CoachPTBS

## EXTRACURRICULAR TRAINING

Machine Learning Summer School: MLSS

 Aug 2021

- Strong student award and nominated for best paper (selective admission)

Eastern European ML Summer School: EEML

 Jul 2021

- 1 of 4 chosen students to present research (selective admission)

London Geometry and ML Summer School: LOGML

 Jul 2021

- GNNs for molecules project with Dr. Wengong Jin (selective admission)

PRAIRIE/MIAI AI Summer School: PAISS

 Jul 2021

- Organized two meetups about Graph ML (selective admission)

## CORE RESEARCH PROJECTS

MIT Internship: Geometric DL for Binding Prediction

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

 since Oct 2021

 Remote

- SE(3)-invariant prediction of the bound ligand's 3D coordinates: [Paper](#) 📖
- Follow-up project on learning physically plausible atom position evolution

Master's Thesis on Graph Representation Learning

Pietro Liò, Cambridge University + Stephan Günnemann, TUM

 Mar 2021 - Sept 2021

 Remote

- Use SSL to pre-train GNNs with 3D information of molecules leading to a 22% average improvement in prediction error: [video explanation](#) 📺

Protein Language Models for Protein Prediction

Burkhard Rost, Technical University of Munich

 Sept 2020 - Feb 2021

 Remote

- Developed **attention mechanism and architecture** for predicting proteins' subcellular location beating SOTA by 8 percentage points: [video](#) 📺

## PUBLICATIONS

- Stärk, Hannes et al. (2022) "EquiBind: Geometric Deep Learning for Drug Binding Structure Prediction". *Under review*.
- Stärk, Hannes et al. (2021) "3D Infomax improves GNNs for Molecular Property Prediction". *Under review*. Also accepted at NeurIPS 2021 ML4PH, AI4S, SSL workshops and ELLIS ML4Molecules workshop.
- Kefato, Z.; Stärk, Hannes et al. (2021) "Jointly Learnable Data Augmentations for Self-Supervised GNNs". In: *Under review*. Accepted at NeurIPS 2021 SSL
- Stärk, Hannes et al. (2021) "Light Attention Predicts Protein Location from the Language of Life". In: *OUP Bioinformatics Advances*. Posters + contributed talk at ICLR'21 AI4PH and ICLR'21 MLPCP. Poster + "long talk" at MLCBSB 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



Self-Supervised learning, Transformers for proteins, Differentiable rendering, Reinforcement learning, WaveNet for denoising audio, Enzyme prediction + projects done as coursework and exercises created for courses

TensorFlow, Keras



Variational Autoencoder for aerial images

**Other:** Spectral Methods for Graphs, Computer Vision, Git, Unix systems, Shell, Docker, Cloud-foundry, 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

🏆 Strong student award at MLSS

## WORK EXPERIENCE

### Mathematics Instructor

#### BIB Augsburg gGmbH

📅 Feb 2020 - Nov 2021 📍 Augsburg, DE 🛒 Part-time

👤 4h workweek: teaching linear algebra, analysis, and statistics

- Online lectures and weekly individual lessons

### Student Assistant

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

📅 Sept 2018 - July 2019 📍 Munich, DE 🛒 Part-time

👤 10h workweek: causal inference + structure learning in Bayesian networks

- 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

👤 38h workweek: 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

- Taught two recitations per week for 40 students, helped in online forum

### Deep Learning

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

📅 Nov 2020 - April 2021 📍 Remote 🛒 Part-time

- Held weekly office hours, created exercises and learning material like jupyter notebooks, answered questions in an online forum

## VOLUNTARY WORK

### Co-organizer of ML on Graphs workshop @ WSDM 2022

#### 2022 Machine Learning on Graphs Workshop

📅 Dec 2021 - Feb 2022 📍 Remote

- Publicity Chair, advertising, and running the workshop's [Twitter account](#)

### Reviewer for ML4H 2021 Symposium

#### 2021 Machine Learning for Health Symposium

📅 Sept 2021 - Oct 2021 📍 Remote

- Review four papers on graph representation learning and time series analysis

### ICLR 2021 and ICML 2021 Volunteer

#### ICML and ICLR

📅 Jul 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

**Mila - Quebec AI Institute** 📅 Jan 2022

Molecular Modelling. Host: Dr. Prudencio Tossou

**Twitter Research** 📅 Jan 2022

Host: Prof. Michael Bronstein and Fabrizio Frasca

**Hong Kong ML meetup** 📅 Dec 2021

Invited talk about GNNs for molecules

**Technical University of Munich** 📅 Nov 2021

Two **guest lectures** about protein prediction for biology and CS students. Host: Prof. Burkhard Rost

**University of Cambridge** 📅 Oct 2021

AI Research seminar. Host: Prof. Mateja Jamnik

**Valence Discovery** 📅 Oct 2021

Invited talk. Host: Daniel Cohen

### ICLR'21, ICML'21, and NeurIPS'21 Workshops

4 contributed talks for strong papers

**ISMB/ECCB 2021** 📅 July 2021

Chosen for "Long Talk" on representation learning

**RLB Workshop** 📅 July 2021

Protein localization. Host: Christian Dallago

## PROJECTS

### GraphML Reading Group

#### LoGaG Reading Group

📅 since Aug 2021 📍 virtual

- I am organizing the [Learning on Graphs and Geometry reading group](#) where paper authors present their work in an open discussion on Zoom
- >50 weekly attendees and sponsored by [Valence](#)

### 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: graph representations of robots in reinforcement learning: [Report](#) 📄, [Code](#) 🔗

### Seminar: Topics in machine learning

#### DAML at Technical University of Munich

📅 April 2020 - Sept 2020 📍 Munich, DE

- I wrote a survey on Transformers and reviewed the papers of three other students: [My survey](#) 📄

### Bachelor's Thesis

#### Bundeswehr University Munich

📅 May 2019 - Sept 2019 📍 Munich, DE

- Implemented a variational autoencoder and developed methods for interpolating in the latent space and interpreting + visualizing it: [Bachelor's thesis](#)