

# 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

- "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  Munich, DE  Full-time

- 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)

## 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

- SE(3)-invariant prediction of the bound ligand's 3D coordinates

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 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  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". 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 MLCBS 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

- 📅 since Feb 2020      📍 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](#)