Sohir Maskey

PhD Student · Mathematical Foundations of Deep Learning

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Education

Ludwig-Maximilians University of Munich *Munich*

PhD on Mathematical Foundations of Deep Learning *04/2021 - present*

- Working on the theoretical foundations and applications of geometric deep learning
- Research on generalization abilities and expressivity of graph neural networks
- Research on graph neural ODE and its applications in graph representational learning
- Research on expressivity of graph neural networks
- Supported by NSF–Simons Research Collaboration on the Mathematical and Scientific Foundations of Deep Learning.
- Advisor: Prof Dr. Gitta Kutyniok

Technical University of Berlin *Berlin*

MS Mathematics *10/2018 - 04/2021*

- Master thesis on transferability of graph neural networks, Advisor: Prof Dr. Gitta Kutyniok
- Final grade: 1.0 (Top of the class)

University of Heidelberg *Heidelberg*

BS Mathematics *10/2014 - 09/2017*

- Minors in Economics
- Bachelor thesis on modular forms
- Final grade: 1.5 (Top 10%)

Professional Experience

2021	**Assistant Teacher for Linear Algebra**, Ludwig-Maximilian University of Munich
2020	**Working Student for ML applications**, mayato GmbH: Implementation of NLP models for Twitter sentiment analysis
2019	**Assistant Teacher for Analysis**, Technical University of Berlin
2017-2018	**Intern at SAP (Cloud Business Group)**, SAP
2016 - 2017	**Assistant Teacher for Analysis and Geometry**, University of Heidelberg

Publications

Published and To Appear

S. Maskey, R. Paolino, A. Bacho, G. Kutyniok. A Fractional Graph Laplacian Approach to Oversmoothing, 2023. NeurIPS 2023.

S. Maskey, R. Levie, G. Kutyniok. Transferability of Graph Neural Networks: an Extended Graphon Approach, 2023. In Applied and Computational Harmonic Analysis 63, 48-83.

S. Maskey, R. Levie, Y. Lee, G. Kutyniok. Generalization Analysis of Message Passing Neural Networks on Large Random Graphs, 2022. NeurIPS 2022.

S. Maskey, Ali Parviz, Maximilian Thiessen, Hannes Stärk, Ylli Sadikaj, Haggai Maron. Generalized Laplacian Positional Encoding for Graph Representation Learning, 2022. NeurIPS 2022 Workshop on Symmetry and Geometry in Neural Representations.

S. Maskey, G. Kutyniok, R. Levie. Generalization in Graph Neural Networks on Random Graph Models, 2022. Accepted at 56th IEEE Asilomar Conference on Signals, Systems, and Computers.

Preprints

S. Maskey, R. Levie, Y. Lee, G. Kutyniok. Convergence and Transferability of Message Passing Graph Neural Networks.

Talks

Summer 2021. *Transferability of Graph Neural Networks*. International Conference on Computational Harmonic Analysis, Online.

Summer 2021. *Transferability of Graph Neural Networks*. Theorinet Annual Retreat, Online.

Summer 2022. *Stability and Generalization Capabilities of Message Passing Graph Neural Networks*. Computational and mathematical methods in data science at GAMM 2022, Aachen, Germany.

Summer 2022. *Generalization Analysis of Message Passing Neural Networks on Large Random Graphs.* ICCHA 2022, Ingolstadt, Germany

Student Supervison

2022 **Sean Disaro**, Bachelor Thesis on "Overcoming Limitations in Expressivity of Graph Neural Networks", Ludwig-Maximilian University of Munich.

Outreach & Professional Development

Research Visit at Chair of Prof. Dr. Soledad Villarat John-Hopkins University, 2023.

Participated at Workshop on Interpretability, safety and security in AI at Isaac Newton Institute for Mathematical Sciences, University of Cambridge, 2022.

Participated at Workshop on Deep learning and partial differential equations at Isaac Newton Institute for Mathematical Sciences, University of Cambridge, 2022.

Participated at LOGML Summer School 2022: Geometry and Machine Learning, Online, 2022.

Peer Reviewing

Asilomar Conference on Signals, Systems, and Computers, 2022.

IEEE Journal on Transactions on Signal Processing

ICML 2023

NeurIPS 2023

ICLR 2023