

# Mahalakshmi Sabanayagam

[Email](#) | [Google Scholar](#) | [Website](#) | [Github](#) | [LinkedIn](#)

## RESEARCH INTEREST

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I am interested in the theory of machine/deep learning, primarily in understanding its connection to kernels and the interplay between adversarial robustness and optimization. I am also interested in graph based learning problems.

## EDUCATION

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<b>Ph.D.</b> in Computer Science Technical University of Munich, Germany	August 2021 – Present
<b>Advisor:</b> <i>Prof. Debarghya Ghoshdastidar</i> <b>Master of Science</b> , Informatics Technical University of Munich, Germany	October 2018 – June 2021 <i>CGPA: 1.3 (best of 1.0)</i>
<b>Bachelor of Technology</b> , Computer Science & Engineering National Institute of Technology, Trichy, India	July 2011 – May 2015 <i>CGPA: 9.37 (best of 10)</i>

## ACADEMIC / INDUSTRY EXPERIENCE

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<b>Research Visitor</b> , New York University, USA Worked with <i>Prof. Julia Kempe</i> , on theoretical analysis of adversarial robustness of neural networks, and together with <i>Prof. Andrew Gordon Wilson</i> on robustness to distributional shifts under Bayesian inference.	March 2023 – June 2023
<b>Computer Scientist 1</b> , Adobe Systems, India Developed a robust OS agnostic (Mac/Windows) framework for Dreamweaver, with HiDPI adaptation. Upgraded Chromium Embedded Framework (CEF) with custom optimization for messaging queue and memory.  Recognized as a top contributor and was awarded two early promotions - <i>Member of Technical Staff 2</i> in January 2017 and <i>Computer Scientist 1</i> in January 2018.	July 2015 – September 2018
<b>Research Intern</b> , Samsung R&D Institute, India Implemented a module for secure log-out in Android Browser of Samsung. Worked on improving the efficiency of Optical Character Recognition using Tesseract and OpenCV.	May 2014 – July 2014

## PUBLICATIONS

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9. **Kernels, Data & Physics.** Francesco Cagnetta, Deborah Oliveira, *Mahalakshmi Sabanayagam*, Nikolaos Tsilivis, Julia Kempe. At Journal of Statistical Mechanics: Theory and Experiment (*JSTAT Lecture Notes 2024*) [[paper](#)]
8. **Robust Feature Inference: A Test-time Defense Strategy using Spectral Projections.** Anurag Singh\*, *Mahalakshmi Sabanayagam*\*, Krikamol Muandet, Debarghya Ghoshdastidar. At Transactions on Machine Learning Research (*TMLR 2024*) [[paper](#)][[code](#)]
7. **Unveiling the Hessian's Connection to the Decision Boundary.** *Mahalakshmi Sabanayagam*, Freya Behrens, Urte Adomaityte, Anna Dawid. At Mathematics of Modern Machine Learning Workshop, NeurIPS (*M3L NeurIPS 2023*) [[paper](#)] [[code](#)]
6. **Analyzing Graph Neural Network Architectures through the Neural Tangent Kernel.** *Mahalakshmi Sabanayagam*, Pascal Esser, Debarghya Ghoshdastidar. At Transactions on Machine Learning Research (*TMLR 2023*) [[paper](#)] [[code](#)]
5. **Improved Representation Learning Through Tensorized Autoencoders.** Pascal Esser\*, Satyaki Mukherjee\*, *Mahalakshmi Sabanayagam*\*, Debarghya Ghoshdastidar. At International Conference on Artificial Intelligence and Statistics (*AISTATS 2023*) [[paper](#)][[code](#)]

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\*Equal Contribution

4. **Analysis of Graph Convolution Networks using Neural Tangent Kernels.** *Mahalakshmi Sabanayagam, Pascal Esser, Debarghya Ghoshdastidar.* At MLG workshop, European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (*ECML PKDD 2022*) [[paper](#)] [[code](#)]
3. **Graphon based Clustering and Testing of Networks: Algorithms and Theory.** *Mahalakshmi Sabanayagam, Leena Chennuru Vankadara, Debarghya Ghoshdastidar.* At International Conference on Learning Representations 2022 (*ICLR 2022*) [[paper](#)] [[code](#)]
2. **Rough Set-based Feature Selection for Credit Risk Prediction using Weight Adjusted Boosting Ensemble Method.** Sivasankar Elango, Selvi Chandran, *Mahalakshmi Sabanayagam.* At Journal of Soft Computing 2019 [[paper](#)]
1. **Cross Domain Sentiment Analysis Using Different Machine Learning Techniques.** *Mahalakshmi Sabanayagam, Sivasankar Elango.* At Fifth International Conference on Fuzzy and Neuro Computing (*FANCCO 2015*) and as poster in Grace Hopper Celebration India (*GHCI 2016*) [[paper](#)]

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## PREPRINTS / UNDER REVIEW

3. **Cluster Specific Representation Learning.** *Mahalakshmi Sabanayagam, Omar Al-Dabooni, Pascal Esser*
2. **Provable robustness of (graph) neural networks against data poisoning and backdoor attacks.** Lukas Gosch\*, *Mahalakshmi Sabanayagam\**, Debarghya Ghoshdastidar, Stephan Günnemann. [[paper](#)]
1. **Machine learning-based image detection for lensless microscopy in life science.** *Mahalakshmi Sabanayagam, Jan Brunckhorst, Andreas Pirchner, Nikhitha Radhakrishna Naik* [[link](#)]

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## RESEARCH ACTIVITIES

- *Summer School:* Statistical Physics & Machine Learning, Cargese, France August 1-12, 2023
- *Workshop:* Physics for Neural Networks, Center for Theoretical Science, Princeton April 17-19, 2023
- *Summer School:* Statistical Physics & Machine Learning, Les Houches, France July 4-29, 2022
- *Reviewer:* AISTATS 2023, NeurIPS 2024

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## TEACHING / STUDENT JOBS

- *Teaching Assistant* for Seminar on Theoretical Advances in Deep Learning (WS 2022/23), Statistical Foundations of Learning (SS 2022), Analysis of new phenomena in machine/deep learning (SS 2022, SS 2023), Gems of Informatics 3: Modelling and analysis of graphs (WS 2021/22, WS 2022/23), Efficient Algorithms & Data Structures (WS 2020/21)
- *Research Assistant* in Certifiable AI at Fraunhofer-Institute, Munich (Sept 2020 – Feb 2021): Worked on novel ways to quantify risk in object detectors
- *Working Student* in Innovation Department at Osram GmbH, Munich (Sept 2019 – Dec 2019): Developed faster RCNN and YOLO based models for detection, identification and tracking of multiple traffic objects

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## AWARDS & HONORS

- *Funding:* TUM-GS Internationalization Support of 3,000 Euro
- Largest sustainability impact award by **Siemens AI@sustainability Hackathon, 2020** for the AI solution towards finding new strategies that reduce the spread of COVID-19
- 2<sup>nd</sup> place in Female Tech Leaders Hackathon on **Introduction to Big Data: COVID-19 and its Global Effects, 2020** for analysing COVID-19 related tweets and the impact on equities
- Finalist in **Mobility Innovation Competition @ Campus, 2019** by Zentrum Digitalisierung Bayern
- **O.P. Jindal Engineering and Management Scholarship, 2012** one among 100 students all over India
- **Bachelor's Study scholarship** from NLC for the period 2011 – 2015
- Bronze medal (national level) and 1<sup>st</sup> in the city in **National Cyber Olympiad, 2007**

## TECHNICAL SKILLS

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**Languages:** C++ (Proficient), Python (Proficient), Java (Good)

**Technologies:** Tensorflow, Pytorch, JAX, NetworkX, Chromium Embedded Framework, OpenCV, AWS, Git