

Selected Topics in Machine Learning Research

Preliminary Meeting (IN2107, IN4872)

Lecturer: Prof. Dr. Stephan Günnemann

Summer Term 2022

- Prof. Dr. Stephan Günnemann
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This is a seminar for **Master** students!
Main prerequisite: Machine Learning (IN2064)

Website

<https://www.in.tum.de/daml/lehre/sommersemester-2022/seminar-selected-topics/>

Topics I – Robustness

- Robust Fine Tuning
- Robustness Against Synthetic and Natural Perturbations
- Attack Strategies
- Certified Robustness of L-infinity Distance Nets
- Computing Bounds on Network's Local Lipschitz Constant
- Certifiably Robust Training using Lipschitz constants
- A Data-Centric View On Robustness

Topics II

- Vision & NLP
 - Connecting Text and Images
 - Zero-shot Models & Pre-training
- Deep Learning Techniques
 - Equivariant Deep Learning
 - Knowledge Distillation
 - Quantization in Deep Learning
- Physics & Simulation
 - Learning in Function Space with Neural Operators
 - Hamiltonian Neural Networks
- Uncertainty Estimation
 - Uncertainty in Reinforcement Learning

What will you do?

1. Read **seed research papers** (provided by us)
2. Start your **snowball research** from there (follow references)
3. Summarize your findings, criticism, and research ideas in a **short paper** (4 pages, double column)
4. Write **reviews** of other students' work
5. **Present** your work in 25-minute talks

Grade will be based on **all** parts: Paper, reviews, talk and overall participation

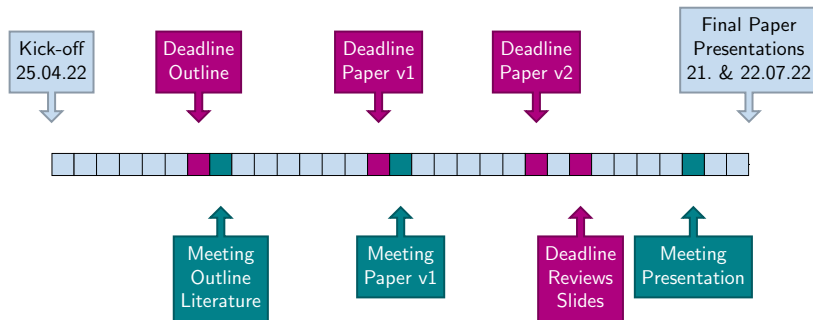
Why attend this seminar?

1. Learn about and explore **state-of-the-art** research in ML
2. **Analyze and criticize** recent publications
3. Improve your **scientific writing**
4. Participate in a **review process** akin to international conferences
5. Develop your **presentations skills**

Requirements

- Strong knowledge of machine learning and mathematics
- Passed relevant courses (the more, the better)
 - Machine Learning (hard requirement)
 - Machine Learning for Graphs and Sequential Data
 - Machine Learning Lab
 - Introduction to DL, DL for Computer Vision, etc.
- Motivation
- Additional selection criteria
 - relevant experience (projects in companies, experience as a HiWi)
⇒ you can send an overview of your experience to us (see end of slides)

Schedule



Registration via the matching system
Selected Topics in Machine Learning Research
(IN2107, IN4872)

+ Fill out the application form!

<https://forms.gle/6ZSDGDxHNcrFw7gm9>

Deadline 15.02.2022

- Which lab / seminar are you applying for?
- List of ML-related lectures you have attended
- A **concise** overview of your resume (bullet list, not a complete CV)
- A brief motivational statement
- Any additional relevant experience (research, HiWi positions etc.)