Machine Learning Seminar

Preliminary Meeting (IN2107, IN4872)

Lecturer: Prof. Dr. Stephan Günnemann

Winter Term 2223

Team

- Prof. Dr. Stephan Günnemann
- Nicholas Gao, Lukas Gosch, Filippo Guerranti, Anna Kopetzki, Aleksei Kuvshinov, Tom Wollschläger

This is a seminar for **Master** students!
Main prerequisite: Machine Learning (IN2064)

Website

`https://www.cs.cit.tum.de/daml/lehre/wintersemester-2022-23/seminar/`

Topics I: Seminar WS2223

- Properties of neural networks
  - Attack Strategies & Robust Training
  - Black-box Adversarial Attack Methods
  - Robustness verification
  - Distance to Classifier's Decision Boundary: Exact Computation
  - Smoothness of (Pruned) Neural Networks
- Modern Architectures & Training
  - Contrastive Learning
  - Zero shot models: Transfer learning without retraining
  - Generative models for 3D point clouds
  - Deep Metric Learning
  - Quantum Neural Networks

Topics II: Seminar WS2223

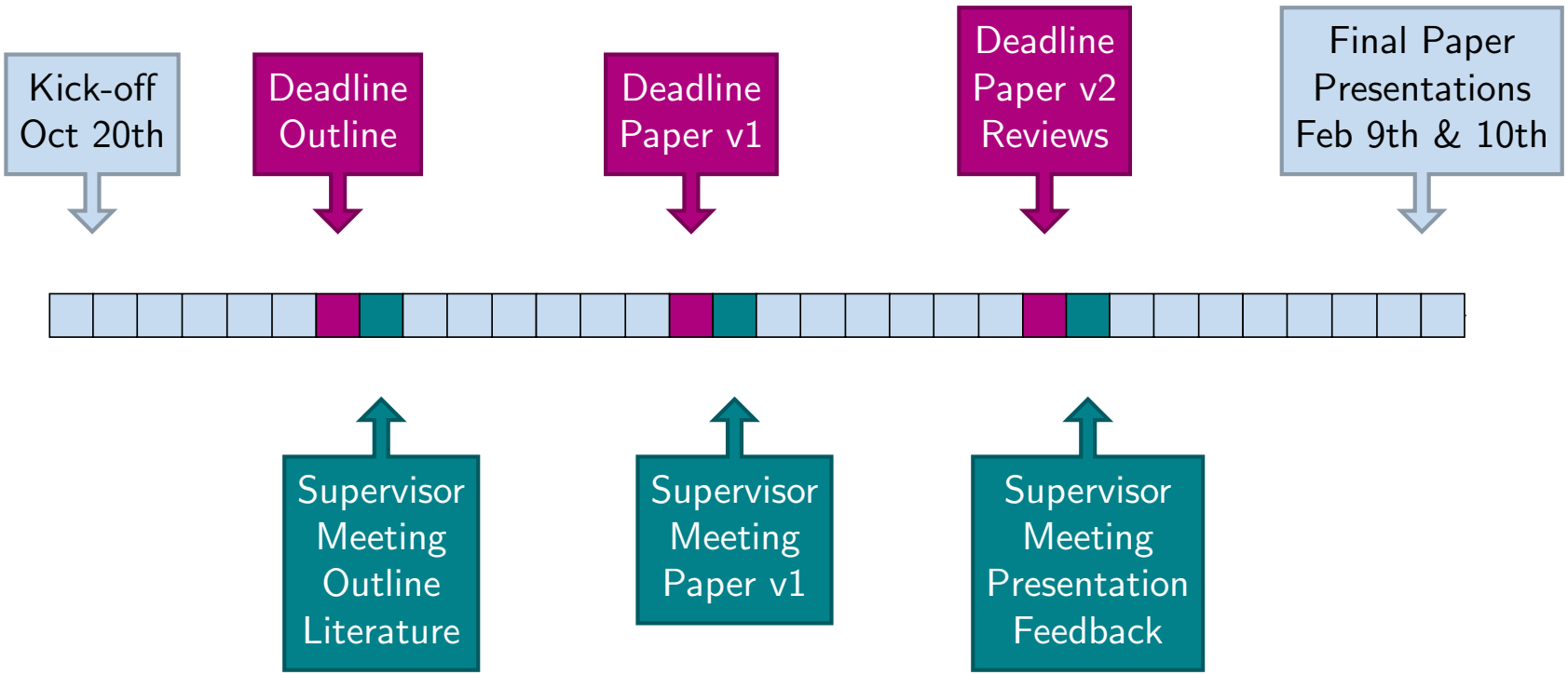
- ML & Graphs
  - Adversarial Robustness of Graph Neural Networks
  - Graph Topology Learning
  - Relational Reasoning on Graphs
  - Graph Discovery for Time-Series Data and Interacting Systems
  - Equivariant Graph Neural Networks
  - Expressivity and Higher-Order Graph Neural Networks
  - Solving Combinatorial Optimization Problems using (Graph) Neural Networks
  - Graph Neural PDEs

What will you do?

1. Read **seed research papers** (provided by us)
2. Start your **snowball research** from there (references to, from these papers, relevant keywords)
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

Schedule


Kick-off
Oct 20th
Deadline
Outline
Deadline
Paper v1
Deadline
Paper v2
Reviews
Final Paper
Presentations
Feb 9th & 10th
Supervisor
Meeting
Outline
Literature
Supervisor
Meeting
Paper v1
Supervisor
Meeting
Presentation
Feedback

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. Improve your **presentation 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 (formerly Mining Massive Datasets)
  - Machine Learning Lab
- Motivation
- Additional selection criteria
  - relevant experience (projects in companies, experience as a HiWi)
    $\Rightarrow$ you can send an overview of your experience to us (see end of slides)

Registration

Registration via the matching system!

`https://matching.in.tum.de/`

Selected Topics in Machine Learning Research (IN2107, IN4872)

+ Fill out the application form!

`https://docs.google.com/forms/d/e/1FAIpQLSfimIgRaV_d27ejTzBKvWOMTbPzm0Fhx3WE2MuqnvpD5G6SxA/viewform`

Deadline July 27th, 2022

Application

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