Machine Learning Seminar
Preliminary Meeting (IN2107, IN4872)

Lecturer: Prof. Dr. Stephan Günnemann

Winter Term 2022

Team

- Prof. Dr. Stephan Günnemann

- Betrand Charpentier, Simon Geisler, Aleksei Kuvshinov, Tom Wollschläger, Daniel Zügner, Nicholas Gao

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

Website

`https://www.in.tum.de/daml/lehre/wintersemester-202122/seminar/`

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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**

Topics I – Graph Neural Networks

- Scalable Graph Neural Networks
- Graph Neural Networks for Heterogeneous Graphs
- Graph Neural Networks for Dynamic Graphs
- Adversarial Defenses for Graph Neural Networks
- Uncertainty in Scene Graph Prediction
- Explainable AI on Graphs
- Uncertainty on Graph Neural Networks

Topics II

- Neural Network for Physics
  - Learning to Simulate
  - Hamiltonian Neural Networks
  - Neural Differential Equations
  - Solving the Schrödinger Equation with Neural Networks
- Robustness
  - Adversarial Training for Multi-Attack Robustness
  - Adversarial Training for Wasserstein Robustness
  - Randomized Smoothing for L1 Certified Robustness
  - Randomized Smoothing for Wasserstein Certified Robustness
- Normalizer-free Networks
- Quantum Neural Networks
- Optimization beyond Adam

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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)

Tasks

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

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Schedule
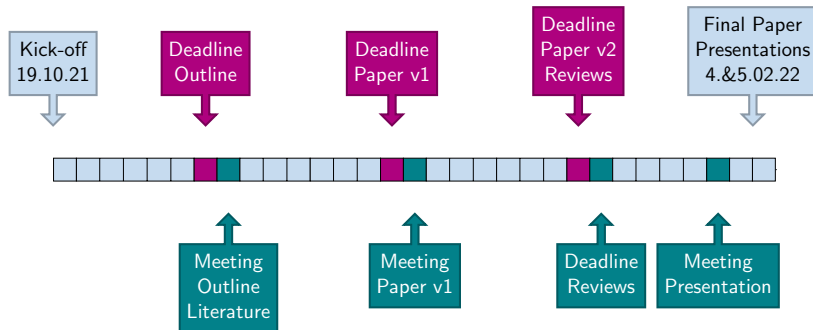
Registration

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

+ Fill out the application form!
```
https:
//docs.google.com/forms/d/e/1FAIpQLSd6zAuKWp0ASjso7b_
VYmPprqKdxtX2PEartVCzBdlMtJ6cVQ/viewform
```

- provide us with your list of experience in ML (courses, projects, etc.)
- please send us a **concise** overview (bullet list, not a complete CV)

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