Bachelor Seminar:
Current Topics in Machine Learning

Master Seminar:
Selected Topics in Machine Learning Research

Information Event

Winter Term 2024/25

Data Analytics and
Machine Learning

Team

- **Prof. Dr. Stephan Günnemann**
- Bachelor Seminar*: Dominik Fuchsgruber*, Jan Schuchardt, Filippo Guerranti, Anna Kopetzki
- Master Seminar: *Aleksei Kuvshinov*, Johanna Sommer, Yan Scholten, Marcel Kollovieh, Lukas Gosch

For Master Seminar: Machine Learning (IN2064) is a hard requirement!

Website with all information:

https://www.cs.cit.tum.de/daml/lehre/wintersemester-2024-25/seminar-current-topics-in-machine-learning/

https://www.cs.cit.tum.de/daml/lehre/wintersemester-2024-25/seminar-selected-topics-in-machine-learning-research/

Bachelor Seminar: Preliminary List of Topics I

Graph Neural Networks

- Spatial and Spectral Graph Neural Networks
- Positional Encodings: From Sequences to Graphs
- Unsupervised Learning on Graphs
- Approaches to Link Prediction
- Gaussian Processes on Graphs
- Node Regression on Graphs
- Kolmogorov-Arnold Networks & applications to graphs

Bachelor Seminar: Preliminary List of Topics II

Reliable Machine Learning

- Differentially private time series analysis
- Adversarial Attacks
- Uncertainty Estimation

Kernel Methods

- Kernel methods for time series
- Kernel methods for graphs

Master Seminar: Preliminary List of Topics I

Graph Neural Networks

- Spectral Graph Neural Networks
- Randomized Smoothing for Graphs

Robustness, Certification & Efficiency

- Certified Robustness against Poisoning Attacks
- Inference Efficiency with Pruning/Quantization
- Certified unlearning
- Data Efficiency in Robust Training

Other

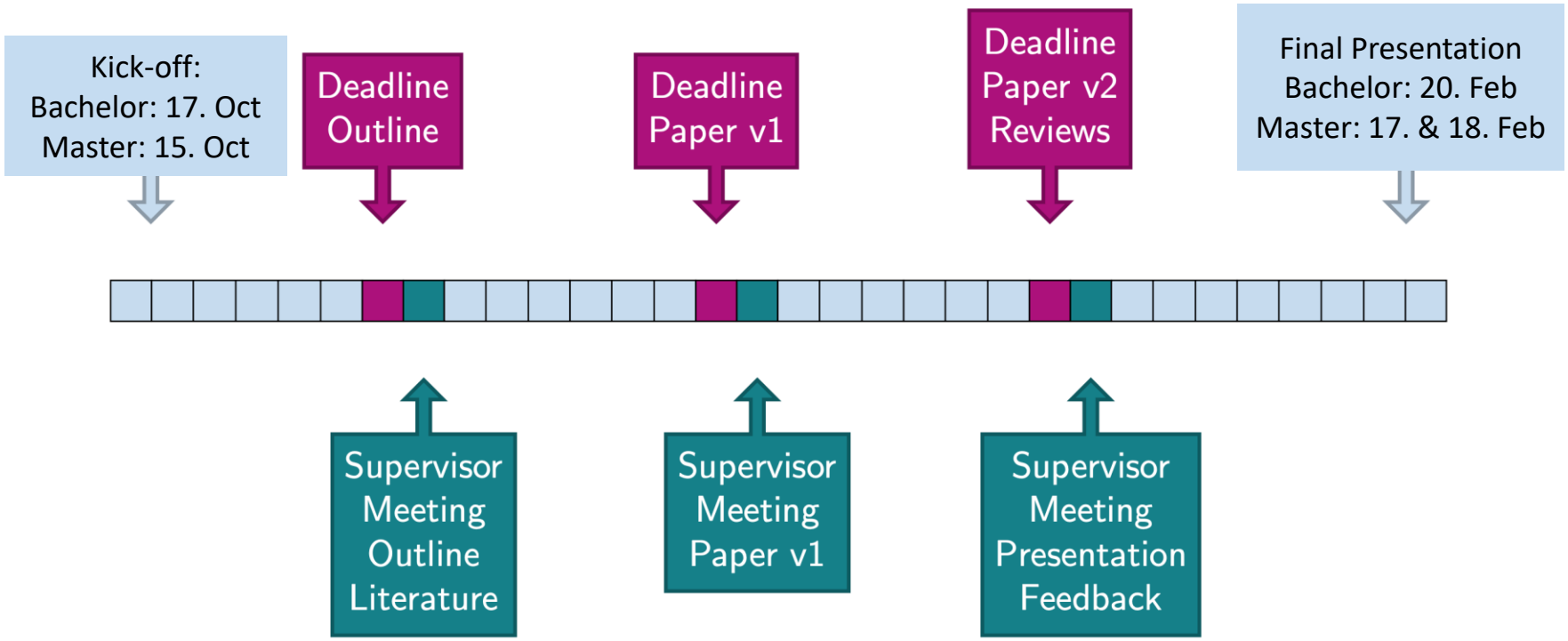
- Bayesian Flow Networks
- Discrete Generative Models
- Schrödinger Bridge Matching
- Deep implicit models
- Unlearning for LLMs

What will you do?

1. Read **seed research papers** (provided by us)
2. Research:
   a) Bachelor Seminar: Thoroughly understand and contenxtualize your topic (find relevant background references, potentially also related works)
   b) Master Seminar: Start your **snowball research** from there (references from / to these papers, relevant keywords)
3. Summarize your findings, criticism and research ideas in a **short paper** (4 pages, double column)
4. Write **reviews** for other students work
5. **Present** your work in 25-minute talks

Grades will be based on **all parts**: paper, reviews, talk & overall participation.

Schedule


Kick-off:
Bachelor: 17. Oct
Master: 15. Oct
Deadline Outline
Deadline Paper v1
Deadline Paper v2 Reviews
Final Presentation
Bachelor: 20. Feb
Master: 17. & 18. Feb
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** for Master Seminar, **strongly encouraged** for Bachelor Seminar)
  - Machine Learning for Graphs and Sequential Data
  - Deep Generative Models
  - Machine Learning Lab Course
- Motivation
- Additional selection criteria: in the application form, there will be a text field for relevant experience (projects in companies, experience as a HiWi, …)

Registration

Registration via the matching system!

https://matching.in.tum.de

+ Fill out the application form!

https://forms.gle/8YUTCuQkxw9JgxmDA

Deadline: July 20th, 2024