

Computational Aspects of Machine Learning

Seminar in Winter 2014
Preliminary meeting

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About the Seminar

What is Machine Learning?

- Intersection of **applied mathematics**, **informatics**, and **computational science**.
- Concerns methods and systems, that **learn** from data.
 - Generate knowledge from experience.

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What are we up to in the seminar?

- Amount of data grows rapidly.
- Models become more complex.
- HPC systems get more sophisticated with every generation.
- The demands of customers are rising.
- → We study recent concepts and algorithms that cope with these challenges.

Topics

1. Parallelisation paradigms and parallel performance models
2. Large scale Bayesian inference
3. Approximate k-nearest neighbors search
4. Random projection matrices, feature hashing
5. Speeding-up deep learning
6. Advanced MCMC algorithms
7. Online learning
8. Real-time data mining with guaranteed throughput
9. Data Mining with sparse grids
10. Fault detection in data streams
11. Map-reduce for machine learning algorithms
12. **Your own idea?**

Seminar classification & Prerequisites

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- Hauptseminar: For advanced bachelor students or master students.
- Fields of Study: Informatics, Information Systems, Games Engineering, Master CSE.
- 2 SWS, 4 ECTS.

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Prerequisites

- **mathematics**: linear algebra, probability theory, calculus, and convex optimisation.
- **machine learning**: basic concepts.
- **Soft skills**: presentation techniques, scientific paper studying and writing.

Organisational Information

Course of the seminar

- **Weekly sessions** of 90 Minutes: 45 Minutes presentation followed by a discussion.
- **Extended abstract:** 1 page article style with motivation, key concepts and results.
- **Paper:** min. 5 pages in IEEE format (excl. sources).
- **Language:** English
- 10 participants
- Blind peer-review process: 2 reviews per student.
- Session chairs.
- Attendance and active participation at all seminar sessions is mandatory.

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Dates, Time and Location

- Wednesdays, 10 a.m..
- First session: October 22th.
- Last session: December 17th (two talks).
- Room: MI 02.07.023.

Organisational Information

Deadlines

- 1 week before the talk: submission of an extended abstract
- The days of the talk: submission of a preliminary paper for review
- 1 week after the talk: receiving comments from reviewers
- 2 week after the talk: submission of the final paper

Application

- Seminar matching system: Available from July 4th until July 8th.
- Our application system: Available from now until July 8th (link on course website).
- 3 topic preferences.
- Motivation letter.

After that...

- Until end of july: matching of seminar participants to topics.
- Use the semester break to prepare your abstract, paper and presentation.

[http://www5.in.tum.de/wiki/index.php/Hauptseminar_
Computational_Aspects_of_Machine_Learning_-_Winter_14](http://www5.in.tum.de/wiki/index.php/Hauptseminar_Computational_Aspects_of_Machine_Learning_-_Winter_14)