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Deep Learning in Physics

Intro Lecture

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Wavenumber k

CNN



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Lam et al. (2022)



MPNN



Scieur et al. (2022)

Kochkov et al. (2021)

► MLP - ►

Brandstetter et al. (2022)

About this Seminar



- Recent research topics in **deep learning for physics**
 - Architectures
 - Learning algorithms
 - Applications
- Familiarize yourself with the **underlying physics & ML applicability**
- Students conduct independent analyses of the topic and related work
- Develop writing & presentation skills
- Submission: Presentation slides, Report

Presentation



Slides:

- Any style you like, submit as PDF
- Follow guidelines (text-balance, visualizations, highlighting etc.)
- Feedback on semi-final slides provided by your advisor

Presenting:

- Present in **English**
- Target **25 min** for presentation, **10 min** for questions
- Test your setup beforehand (laptop/projector)!
- Tips for a good presentation: <u>DocTUM: How to give a great scientific talk</u>

Report



- Maximum 4 pages
- ACM SIGGRAPH TOG format (acmtog) available online
- Guideline
 - Start with a summary of the paper (required for semi-final version!)
 - Own thoughts and reasoning should be the main focus
 - Example: comparison to literature, pros & cons, future work...
- Feedback provided by advisor, final version due after talk

Your Timeline





Additional Resources



All information is available on <u>the website</u>!

Background Reading:

- Book: Hastie et al., <u>The Elements of Statistical Learning</u>
- Book/Online: Goodfellow et al., <u>Deep Learning</u>
- Online: Nielsen, <u>Neural Networks and Deep Learning</u>
- Online: Thuerey et al., <u>Physics-based Deep Learning</u>

Additional Information



- TUMonline registration is handled by us, you do not need to sign up
- Advisor:
 - Assigned to you in advance (see website)
 - Contact your advisor **1 week before** your presentation at the latest
- Attendance:
 - Missing one session is allowed, let us know in advance and write a short summary of the papers (ca. 1 page)
 - Missing another session means failing the seminar (special rules for severe issues as appropriate)

Grading Criteria



Presentation

- Good explanations
- Knowledgeable
- Clarity
- Stage performance

Slides

- Design, text density
- Citations
- Highlighting
- Visualizations

Report

- Base summary
- Literature review
- Own judgement

Other

- Own experiments
- Participation in discussions

Any questions?