#### **Software Engineering for Artificial Intelligence**

TECHNISCHE UNIVERSITÄT DARMSTADT

#### Introduction



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# Attendance via Zoom



- Let's try to make this a great experience for all of us:
- Please check your setup before the meeting. We start all calls 10 minutes early, where you can do so.
- () Please connect before the meeting starts.
- Please join using your full name. If you use a nickname or pseudonym, tell the advisors (needed for grading).



- We encourage you to use a microphone and a camera: It improves the overall experience in interactive parts.
- Please mute your microphone when not speaking

# Agenda

- Motivation
- This Seminar
- Seminar Structure & Grading
- Schedule
- Topics & Registration





### **Advisors & Contact**



## Any questions, suggestions, interested in research or collaborations? Talk to us or drop a mail!



#### **Motivation**



# Imagine: We build together *AcaWhooo!* a "Google Translate" for scientific text.



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## **From Data Science to Production**



- A data scientist can build our program, but...
  - They are used to fixed datasets and focus heavily on accuracy.
  - They prototype, often using Jupyter notebooks, etc.
  - They are experts in modeling and feature egineering, but stability, size, updateability and other aspects, which are important in production, do mostly not matter.
- A software engineer is focused on production grade software
  - Concerned about **many different kinds of product quality**: performance, security, safety, stability, release time, cost, customer satisfaction, maintainability, reliability, scalability, fault tolerance, ...
- Both worlds need to be brought together!







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Inductive R.

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**Overall** goals

Best effort

#### Practice tells different!

- Specifications are often vague, weak, ambiguous, ...
- Correctness proves rarely performed
- $\rightarrow$  SE developed suitable methods





### In this Seminar

- We learn about state-of-the-art software engineering for intelligent systems.
- We learn about ongoing research regarding SE for intelligent systems.
- We discuss current methods and recent ideas.
- Moreover, you can improve your scientific reading, presenting and discussion skills.





### **Resources for this Course**



- Books
  - Especially: Hulten, Geoff. <u>Building</u>
    <u>Intelligent Systems</u>: A Guide to Machine
    Learning Engineering. Apress, 2018
- Research Papers
- Blogs
- Great overview compiled by Christian Kästner (CMU):
  - <u>https://github.com/ckaestne/seaibib</u>



### **Seminar Structure**

This is an interactive format: everyone becomes the expert in one topic, teaches it to all others, and we discuss it together

- Each meeting covers 2 topics
  - Being presented first
  - Then followed by Q&A and a discussion
- 1 week before each meeting we publish a introductory reading material list (webpage)
  - Please read it for preparation





**Typical Meeting** 

### **Seminar Structure**

This is an interactive format: everyone becomes the expert in one topic, teaches it to all others, and we discuss it together

- We provide a list of materials for the start
- You extend this list with suitable resources
- You prepare a 25-30 mins presentation
- You prepare for a 15-20 mins discussion on the topic
- For your class mates, you prepare a short list of introductory reading material (~1 h reading time ~= 10 pages)

Due 7 days before your presentation slot; mail it to: sokolowski@cs.tudarmstadt.de

Presented the assigned



meeting slot



# Grading



- Introductory reading material list (20 %)
  - Did it prepare well for your presentation and the discussion?
  - Did it take roughly 1 hour to read all suggested resources?
- **Presentation** (60 %)
  - Used resources, presented slides and the talk: Was the topic well introduced, explained, and did you provide interesting insights?
- **Discussion guidance** (10 %)
  - Apart from Q&A, could you offer questions leading to discussions?
  - Did it have clear directions and involve the class mates?
- General discussion participation (10 %)
  - Did you regularly ask questions or add to the discussion?

# Schedule





# Topics



# Foundation Topics

- Choosing AI Techniques
- Software Architecture of Al-enabled Systems
- Requirements and Risks (Quality Assurance)

# Specialization Topics

- Model Quality & Metamorphic Testing
- Data Quality Assurance
- Surveys on ML Testing
- A/B Testing

- Debugging
- Data Provenance, Reproducability
- Computational Notebooks

# Registration



- Send a mail by April 26th to sokolowski@cs.tu-darmstadt.de
- Include ordered list of 3 topics
- At least one of your choices must be a "Foundation Topic"
- We assign the topics based on your mails by May 5th
- (Do not forget to register in TUCaN as well)



## Next time (May 5th): Example Meeting



- First presentation and discussion on the topic "Basics and Challenges"
  - Introduces our seminar topic
  - Gives you an example on what you shall prepare
  - After the discussion, we can clarify your questions on what we expect from you to make the grading transparent
- Do not forget to read the introductory reading material
  - It will be published on the webpage by April 28th



#### **Question & Answers**





#### **Acknowledgements & License**



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