University of Antwerp
I Adrem I Adrem Data Lab

Current Trends in Data Science and Artificial Intelligence

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Course Topics

- **Large language models**
  - Architecture of different large language models
    - GPT2, BERT, T5, GPT3
  - Chain-of-thought (reasoning)
  - Reinforcement learning with human feedback
- **Issues with LLMs**
  - Hallucination, privacy, bias and stereotypes
- **Using LLMs**
  - Fine-tuning
  - Retrieval-augmented generation

13-2-2025	Introduction: course organization ; deep learning; NLP
20-2-2025	Presentation: Attention is all you need
27-2-2025	Presentation: BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding
	Presentation: Exploring the Limits of Transfer Learning with a Unified Text-to-Text Transformer
6-3-2025	Presentation: Language Models are Few-Shot Learners (GPT-3)
	Presentation: Chain-of-Thought Prompting Elicits Reasoning in Large Language Models
13-3-2025	Presentation: Training language models to follow instructions with human feedback
	Presentation: Sparks of Artificial General Intelligence: Early experiments with GPT-4
20-3-2025	Paper 1
	Paper 2
27-3-2025	Paper 3
	Paper 4
3-4-2025	Paper 5
	Paper 6
10-4-2025	paasvakantie
17-4-2025	paasvakantie
24-4-2025	preparation time / invited speaker
30-4-2025	preparation time / invited speaker
8-5-2025	preparation time / invited speaker
15-5-2025	Demo & poster session: application (RAG, fine-tuning, verify paper results)
22-5-2025	Demo & poster session: application (RAG, fine-tuning, verify paper results)

Course Schedule

- 3 assignments
  - 2 presentations
  - 1 poster
- Groups of 3 students
  - Based on your paper preference
  - Groups assigned *by me*
  - Groups change between assignments
- Invited speakers

Course evaluation

- **Presentations & demo/poster:**
  - Graded by lecturer
    - Individual score
  - Feedback by fellow students
    - Key take-away
    - Positive points – points for improvement
  - Peer evaluation within group
- **Permanent evaluation**
  - Small test at the end of the lecture

Block 1 papers

- Attention is all you need
- BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding
- Exploring the Limits of Transfer Learning with a Unified Text-to-Text Transformer
- Language Models are Few-Shot Learners (GPT-3)
- Chain-of-Thought Prompting Elicits Reasoning in Large Language Models
- Training language models to follow instructions with human feedback
- Sparks of Artificial General Intelligence: Early experiments with GPT-4

Block 2 papers

- Measuring Fairness with Biased Rulers: A Comparative Study on Bias Metrics for Pre-trained Language Models
- Distilling Step-by-Step! Outperforming Larger Language Models with Less Training Data and Smaller Model Sizes
- On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?
- An empirical study of LLaMA3 quantization: from LLMs to MLLMs
- Can LLMS keep a secret? Testing privacy implications of language models via contextual integrity theory
- Red Teaming Language Models to Reduce Harms: Methods, Scaling Behaviors, and Lessons Learned
- Red Teaming Language Models with Language Models
- Bias and Fairness in Large Language Models: A Survey

Block 3

- **Propose your own idea**
  - Present a third paper
  - Try out some ideas that were presented
  - Build a RAG system
  - Finetune a model
  - Build a simple application based on LLMs
  - …