

R S A F G

Research Studio **SDIS**

Generative AI – Grundlagen, Chancen, Fallstricke

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Research Studios Austria Forschungsgesellschaft mbH



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Grundlagen

Die Anwendung von Sprachmodellen

- Text-generierende KI: ChatGPT, Google Gemini, Claude, ...
- Bild-generierende KI: Dall-E, Midjourney, Stable-Diffusion, ...
- Video-generierende KI: Sora (OpenAI), HeyGen, Synthesia, ...
- Konversations-generierende KI: Notebook LM

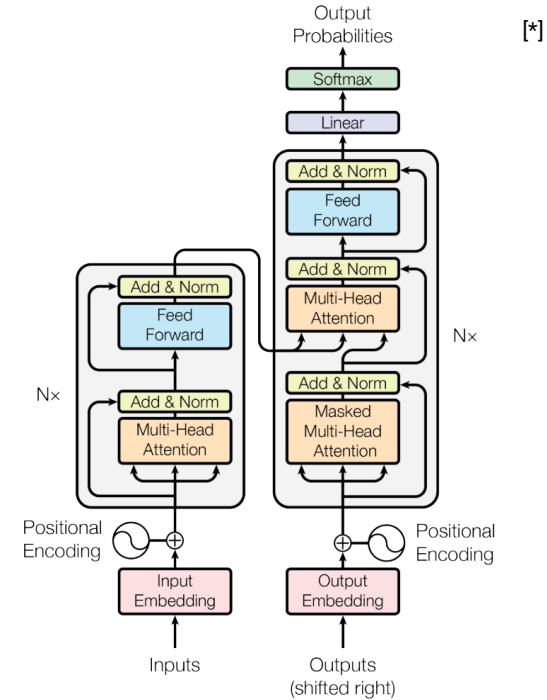
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[*] Blackbox: <https://commons.wikimedia.org/wiki/File:Blackbox3D-withGraphs.png>, CC BY-SA 4.0, Zugriff am 28.05.2024

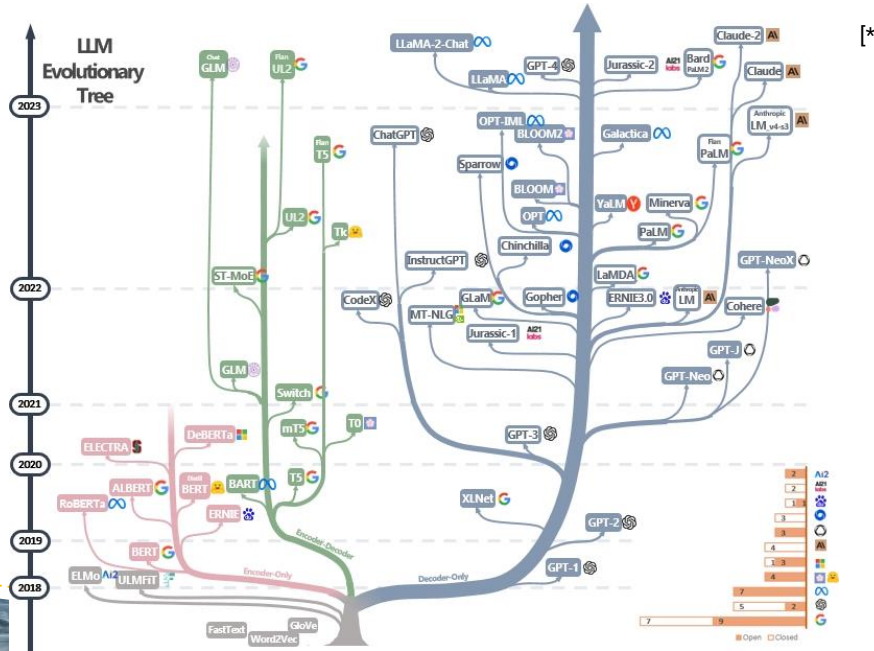
Konzepte

- Künstliche neuronale Netze
- Transformer-Modelle
- Prompt-Engineering
- Retrieval-Augmented-Generation
- Finetuning von Modellen



[*] Ashish Vaswani, Noam Shazeer, Niki Parmar, Jakob Uszkoreit, Llion Jones, Aidan N. Gomez, Łukasz Kaiser, and Illia Polosukhin. 2017. Attention is all you need. In Proceedings of the 31st International Conference on Neural Information Processing Systems (NIPS'17). Curran Associates Inc., Red Hook, NY, USA, p. 3.

Die Evolution von LLMs



[*] LLM Evolutionary Tree: <https://github.com/Morales410/LLMsPracticalGuide/blob/main/readme-ov-file>, Zugriff am 28.05.2024

Kommerzielle LLMs vs. Self-Hosting

- Kommerzielle LLMs bedeutend leistungsfähiger
 - Bezahlung mit Abo-Modellen
 - Kostenpflichtiger API-Zugriff
- Self-Hosting:
 - Open-Source-Modelle zunehmend leistungsfähiger
 - Mistral (<https://mistral.ai/news/mistral-large/>)
 - Llama (<https://llama.meta.com/>)
 - Große Rechenkapazität notwendig

Chancen

Chancen

- Verstehen großer Wissensbasen und deren Interpretation für User*innen
- Ideenbildung
- Content-Creation
- Zugang zu individuellem Graphik-Design, ohne die dafür notwendigen Fähigkeiten haben zu müssen
- Proof-Reading

Prozessautomatisierung in der Aquaponik



Automatisierung in der Aquaponik



Virtual Aquaponics Consultant



Wie kann ich helfen?



Du

Brauchen meine Fische mehr Futter?



SynAI

Nein, **laut Sensordaten ist der Nitratlevel zu hoch**. Dies kann mehrere Gründe haben:

Einbezug der Umgebungs-
variablen in der Anlage

- **Geringe Besatzdichte mit Pflanzen.** Die Nitratproduktion der Bakterien übersteigt die Aufnahmekapazität der verfügbaren Pflanzen.
- **Überfütterung der Fische.** Das nicht verbrauchte Futter erhöht die Nitratmenge in der Anlage.


Folgende Maßnahmen sollten eingeleitet werden:

- **Erhöhung der Besatzdichte mit Pflanzen.** Besonders gut eignen sich dafür Salat, Spinat, rote Rüben, Radieschen, oder Rauke.
- **Fütterung reduzieren.** Die Fütterung sollte reduziert oder vorübergehend eingestellt werden, bis sich der Nitratlevel wieder erholt hat.

Unterrichtsgestaltung



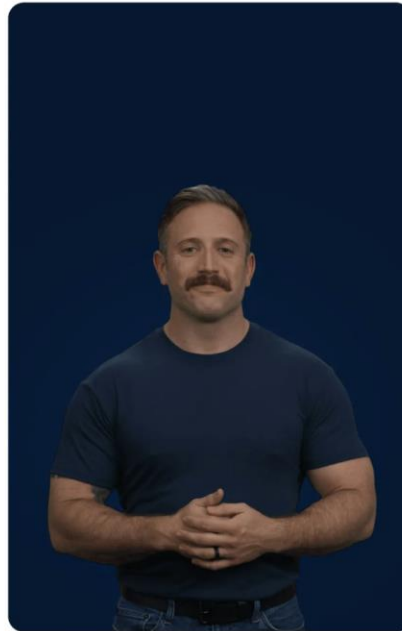
Lehrkräfte ▾ Teachino Schule ▾ KI ▾ Preise



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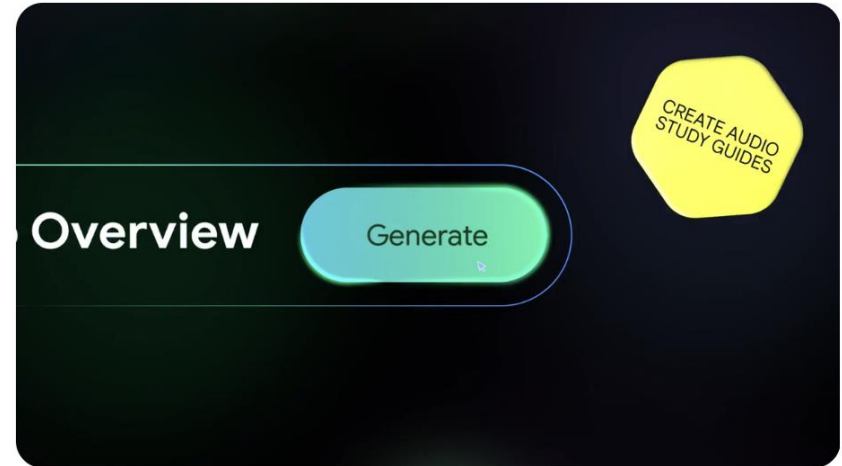
Generierung von Informationsmaterial

NotebookLM



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Explainable AI

- Explainability vs. Interpretability
- Bias in AI ist ein gängiges und schwieriges Problem. Unterschiedliche Formen, z.B. "Sampling Bias", "Algorithmic Bias", "Confirmation Bias", ...
- Technische vs. Ethische/rechtliche Probleme:
 - Technisch: Modelle mit schlechter Performance
 - Ethisch/rechtlich: Entscheidungen mit fragwürdigem Hintergrund, z.B. Ungleichberechtigung gewisser demographischer Gruppen

Fallstricke

Das Blackbox-Problem



[*] Blackbox: <https://commons.wikimedia.org/wiki/File:Blackbox3D-withGraphs.png>, CC BY-SA 4.0, Zugriff am 28.05.2024

Energieverbrauch

Power Hungry Processing: ⚡ Watts ⚡ Driving the Cost of AI Deployment?

1,000 inferences). Text-based tasks are, all things considered, more energy-efficient than image-based tasks, with image classification requiring less energy (median of 0.0068 kWh for 1,000 inferences) than image generation (1.35 kWh) and, conversely, text generation (0.042 kWh) requiring more than text classification (0.0023 kWh). For comparison, charging the average smartphone requires 0.022 kWh of energy [51], which means that the most efficient text generation model uses as much energy as 9% of a full smartphone charge for 1,000 inferences, whereas the least efficient image generation model uses as much energy as 522 smartphone charges (11.49 kWh), or around half a charge per image generation⁴, although there is also a large variation between image generation models, depending on the size of image that they generate.

[1]

Amazon buys nuclear-powered data center from Talen

Thu, Mar 7, 2024, 2:01PM | Nuclear News



Susquehanna nuclear plant in Salem Township, Penn., along with the data center in foreground. (Photo: Talen Energy)

* <https://www.ans.org/news/article-5842/amazon-buys-nuclearpowered-data-center-from-talen/>, Zugriff am 15.10.2024

Behinderung von Lerneffekten

The Widening Gap: The Benefits and Harms of Generative AI for Novice Programmers

[2]

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ABSTRACT

Novice programmers often struggle through programming problem solving due to a lack of metacognitive awareness and strategies. Previous research has shown that novices can encounter multiple metacognitive difficulties while programming, such as forming incorrect conceptual models of the problem or having a false sense of progress after testing their solution. Novices are typically unaware of how these difficulties are hindering their progress. Meanwhile, many novices are now programming with generative AI (GenAI), which can provide complete solutions to most introductory programming problems, code suggestions, hints for next steps when stuck, and explain cryptic error messages. Its impact on novice metacognition has only started to be explored. Here we replicate a previous study that examined novice programming problem solving behavior and extend it by incorporating GenAI tools. Through 21

Based on our observations from both groups, we propose ways to scaffold the novice GenAI experience and make suggestions for future work.

CCS CONCEPTS

- **Social and professional topics** → **Computing education**; **CS1**;
- **Human-centered computing** → **Human computer interaction (HCI)**; **Empirical studies in HCI**; **User studies**; **Natural language interfaces**;
- **Computing methodologies** → **Artificial intelligence**.

KEYWORDS

ChatGPT, Copilot, CS1, generative AI, large language models, metacognition

COMPUTER SCIENCE

[3]

Generative AI enhances individual creativity but reduces the collective diversity of novel content

Anil R. Doshi^{1*} and Oliver P. Hauser^{2,3*}

Creativity is core to being human. Generative artificial intelligence (AI)—including powerful large language models (LLMs)—holds promise for humans to be more creative by offering new ideas, or less creative by anchoring on generative AI ideas. We study the causal impact of generative AI ideas on the production of short stories in an online experiment where some writers obtained story ideas from an LLM. We find that access to generative AI ideas causes stories to be evaluated as more creative, better written, and more enjoyable, especially among less creative writers. However, generative AI-enabled stories are more similar to each other than stories by humans alone. These results point to an increase in individual creativity at the risk of losing collective novelty. This dynamic resembles a social dilemma: With generative AI, writers are individually better off, but collectively a narrower scope of novel content is produced. Our results have implications for researchers, policy-makers, and practitioners interested in bolstering creativity.

Fallstricke

- Over-promising und Hype
- Bei unklarem Verwendungszweck gibt es keine positiven Effekte
- Überflutung mit digitalem Content
- Abflachen der Kreativität, Eintönigkeit in der Content-Erstellung
- Fehlende Notwendigkeit, einen geschliffenen Sprachstil zu erwerben
- Unreflektiertes Übernehmen von Inhalten, kein Hinterfragen des Wahrheitsgehalts (Halluzinationen)

Vielen Dank für Ihre
Aufmerksamkeit!

...Research that matters!



Bibliographie

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