Lehren und Lernen im KI-Zeitalter

Fähigkeiten und Potenziale generativer KI in der Hochschullehre

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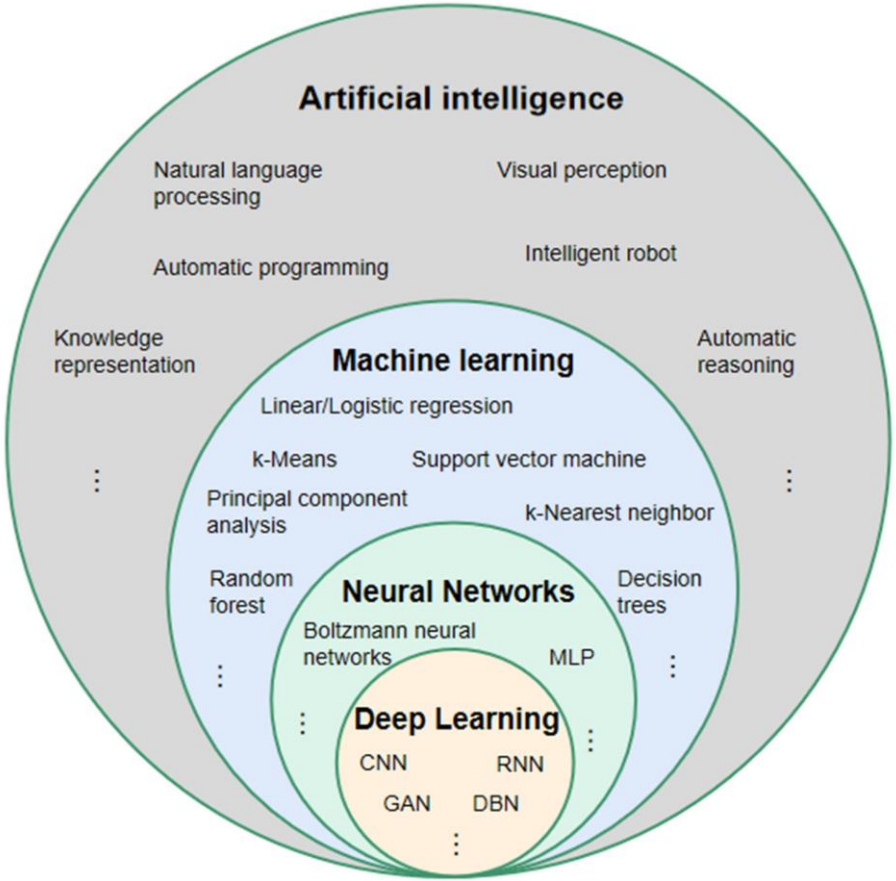
Diskussionsveranstaltung KI in der Lehre, Georg-August-Universität Göttingen, 21.9.2023

Agenda

- Was ist (generative) KI und wie funktioniert sie?
- Was kann generative KI bereits in der Lehre leisten?
- Wohin geht die Entwicklung?

Was ist KI?



Bildquelle: [1]

Was ist generative KI?

Text

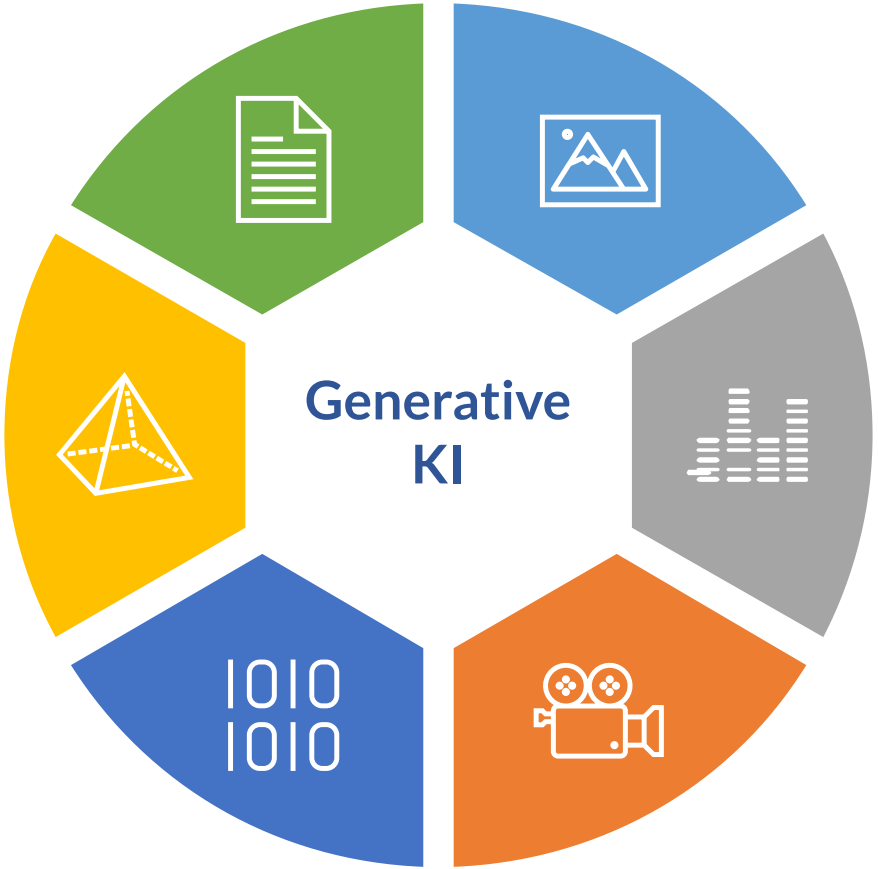
ChatGPT, Bard, BingChat

3D

Spline AI, Masterpiece Studio, Meshcapade

Code

GitHub Co-Pilot, Cogram, Mutable AI



Image

Midjourney, Stable Diffusion DALL E

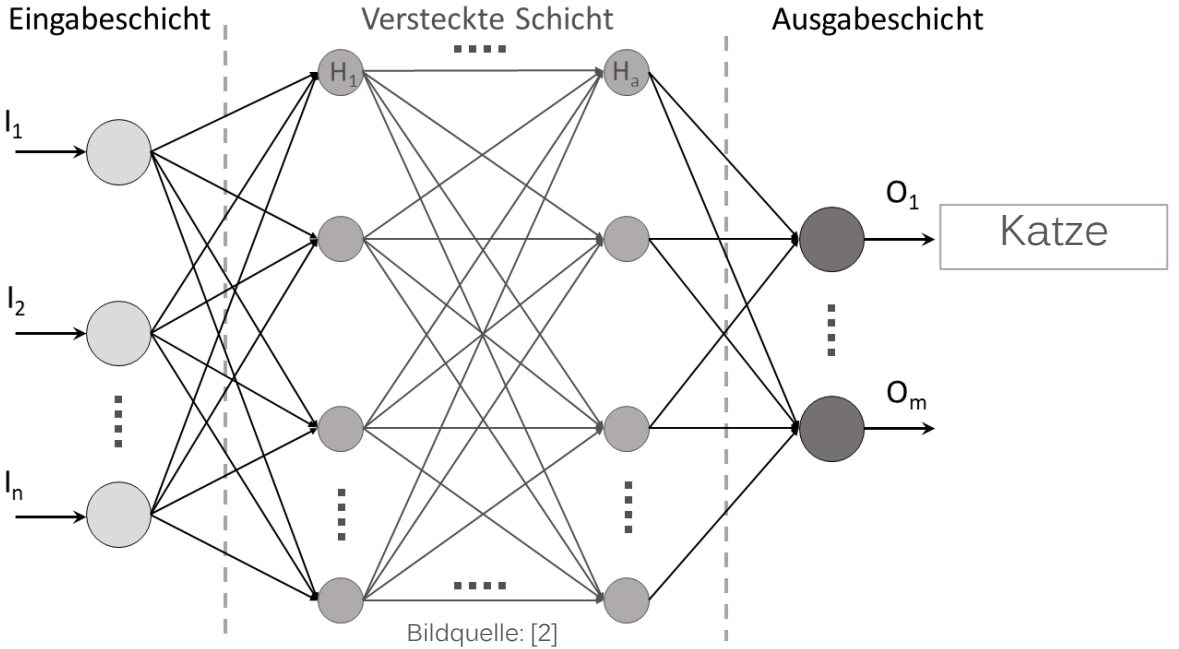
Speech

Listnr, Wellsaid, Podcast.ai

Video

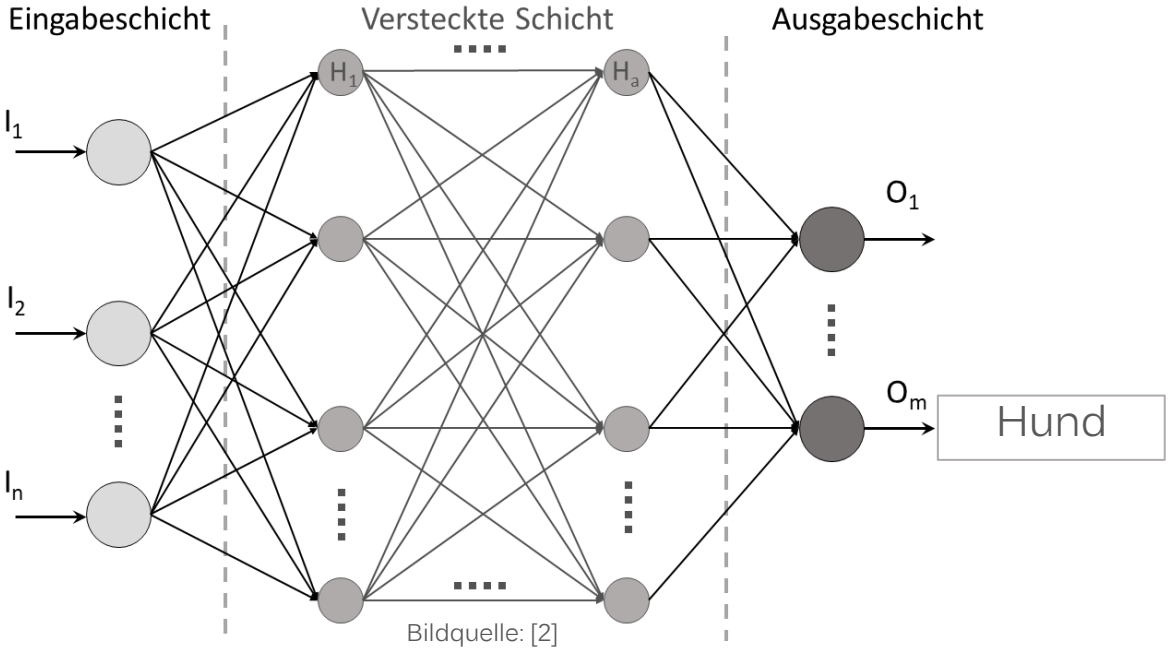
Synthesia, Runway, Pictory

Wie funktionieren Künstliche Neuronale Netze?



Bildquelle: [2]

Wie funktionieren Künstliche Neuronale Netze?

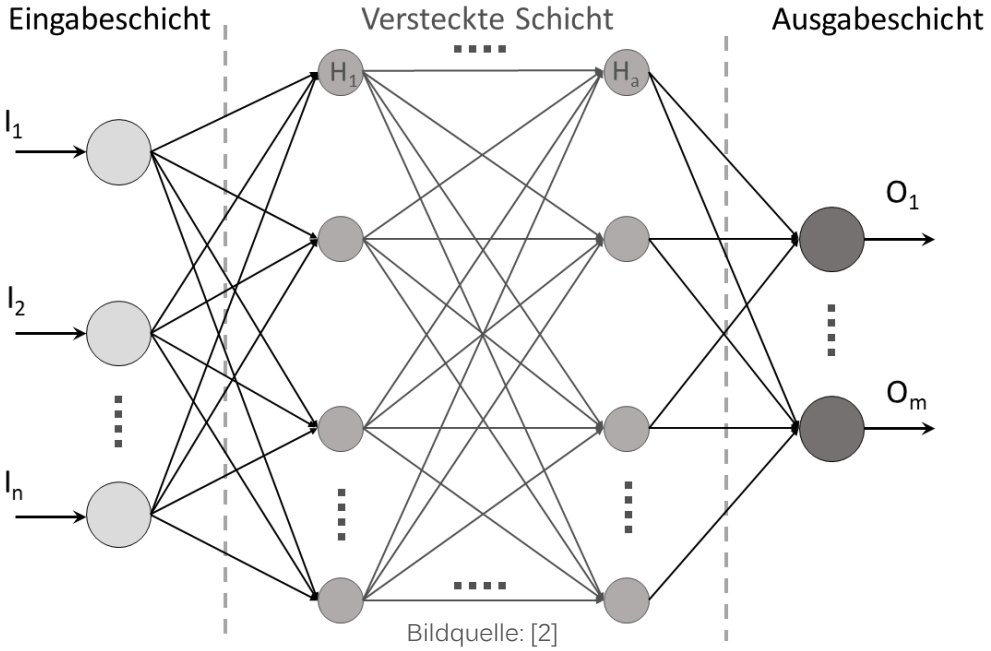


Bildquelle: [2]

Wie funktionieren Künstliche Neuronale Netze?

Katze

Hund

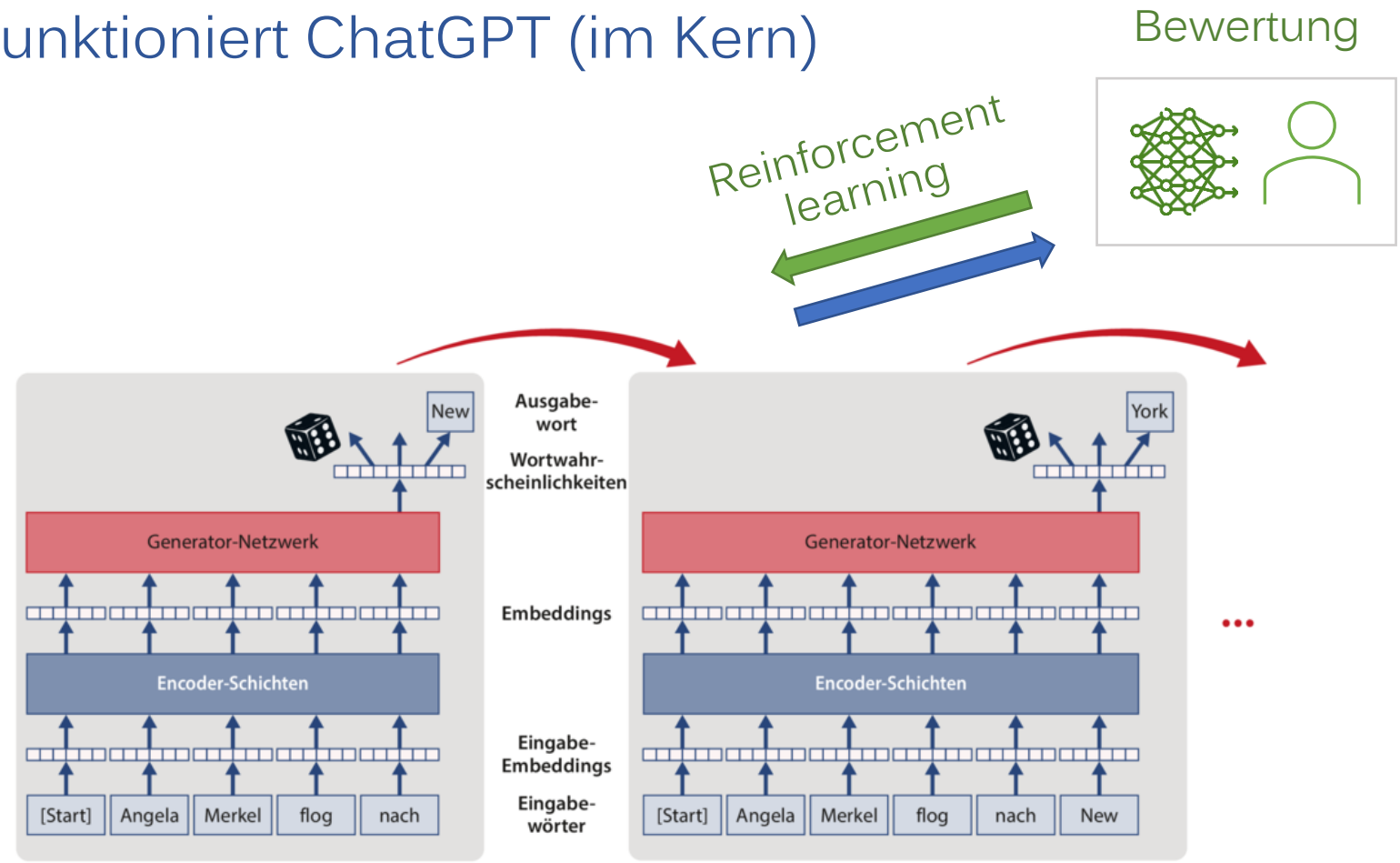


Bildquelle: [2]

Katze

Hund

Wie funktioniert ChatGPT (im Kern)



Bildquelle: [3]

Generative KI für Text

Für Lernende und Lehrende

GPT-3.5 GPT-4

Our fastest model, great for most everyday tasks.

Available to Free and Plus users

ChatGPT PLUS

Compare storytelling techniques
in novels and in films

Explain why popcorn pops
to a kid who loves watching it in the microwave

Design a database schema
for an online merch store

Come up with concepts
for a retro-style arcade game

Send a message

ChatGPT may produce inaccurate information about people, places, or facts. ChatGPT August 3 Version

GPT-3.5 GPT-4

No plugins enabled

ChatGPT PLUS

Suggest fun activities
to do indoors with my high-energy dog

Make a content strategy
for a newsletter featuring free local weekend events

Create a personal webpage for me
after asking me three questions

Brainstorm incentives
for a customer loyalty program in a small bookstore

Send a message

ChatGPT may produce inaccurate information about people, places, or facts. ChatGPT August 3 Version

Inspirationsgeber und Recherchepartner – Elicit

Quelle: [4]

Relevante Funktionalität

- Semantische Suche
- Zusammenfassung eines oder mehrerer Texte
- Informationsextraktion

Schreibpartner – Text Generierung

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

JLU

Jobs & Karriere | Wir über uns | Wissenschaft | Verwaltung, IT & Technik | Ausbildung & Duales Studium | Stellenangebote

Website durchsuchen

W3-Professur für Angewandte Informatik mit dem Schwerpunkt Künstliche Intelligenz

Im **Fachbereich Mathematik und Informatik, Physik, Geographie** ist zum nächstmöglichen Zeitpunkt die

W3-Professur für Angewandte Informatik
mit dem Schwerpunkt Künstliche Intelligenz

unter Beachtung des § 67 Abs. 7 Hessisches Hochschulgesetz (HessHG) zu besetzen; es gelten die Einstellungsvoraussetzungen nach § 68 HessHG.

Aufgaben:

Die Justus-Liebig-Universität Gießen (JLU) hat sich zum Ziel gesetzt, den Bereich der Angewandten Informatik zu stärken und ein Zentrum für Angewandte Informatik und Data Science zu etablieren. Die Professur soll die Lehr- und Forschungsaktivitäten in der Angewandten Informatik an der JLU im Bereich der Künstlichen Intelligenz stärken und gemeinsam mit weiteren zu berufenden Professuren das Zentrum aufbauen und etablieren.

Ihr Forschungsgebiet soll verschiedene Methoden der Künstlichen Intelligenz von den Grundlagen bis hin zur Anwendung umfassen. Ihre Forschungsaktivitäten knüpfen dabei an mindestens einen der fachbereichsübergreifenden Schwerpunkt- und Potentialbereiche der Universität und/oder an einen der Akzentbereiche des Fachbereichs an.

Ihre Lehraufgaben im Umfang von 8 Semesterwochenstunden umfassen die Pflicht- und Wahlpflichtmodule, die das Institut für Informatik anbietet. Dies beinhaltet die Studiengänge Angewandte Informatik, Data Science und Data Analytics sowie Nebenfächer in anderen Studiengängen der JLU. Sie zeigen ein hohes Engagement in der akademischen Lehre und der konzeptionellen Weiterentwicklung von Lehrangeboten in den genannten Bereichen, inklusive des Einsatzes von E-Learning und digitalen Medien. Sie sind bereit, bei Bedarf Ihre Lehre auf Englisch durchzuführen und sich aktiv an der akademischen Selbstverwaltung zu beteiligen.

Neben einer aktiven Beteiligung an den Aktivitäten rund um hessian.AI ist die Integration von Gender- und Antidiskriminierungsaspekten in Forschung und Lehre erwünscht.

Voraussetzungen:

Einstellungsvoraussetzungen sind neben den allgemeinen dienstrechtlichen Voraussetzungen ein abgeschlossenes Hochschulstudium, eine herausragende Promotion sowie zusätzliche wissenschaftliche Leistungen (nachgewiesen z. B. durch eine Habilitation oder in Form einschlägiger Publikationen mit peer-review) im Bereich der Angewandten Informatik mit Bezug zur Künstlichen Intelligenz.

Das Forschungsgebiet soll eine breite Verankerung in einem aktuellen Gebiet der Künstlichen Intelligenz aufweisen und an mindestens einen der Potential- und Akzentbereiche des Fachbereiches Mathematik und Informatik, Physik, Geographie anknüpfen. Eine weitere Anbindung an Forschungsaktivitäten anderer Fachbereiche ist wünschenswert. Vorausgesetzt werden zudem hervorragende, international sichtbare wissenschaftliche Leistungen und internationale Kooperationen.

Schreibpartner — Korrigieren und Verbessern

ME

Proofread this, significantly improving structure, clarity, and flow. Retain all LaTeX markup and do not add content. Explain all changes you performed.: The most formulas on Wikipedia notated by the article's authors in TeX-format in the markdown describing Wikipages, the Wikitext\footnote{the English Wikipedia has 38,670 pages with the TeX-math tag and 4,097 pages with the alternative HTML math Tag as of 09.08.23 }. When a Wikipedia page is loaded in the users' browser, for each formula, usually three formats are delivered in the HTML-DOM: SVG, MathML and TeX. Blind and visually impaired users use screen readers. The commonly used screen readers, JAWS, NVDA, VoiceOver and Orca are generating speech output from the MathML in the HTML-DOM retrieved from the users' Browser \cite{math_wg_mathml_2021}.

Here's the revised version of your text:

Wikipedia articles frequently contain formulas notated in TeX format within the markdown, known as Wikitext\footnote{As of 09.08.23, the English Wikipedia has 38,670 pages with the TeX-math tag and 4,097 pages with the alternative HTML math tag}. When a user loads a Wikipedia page in their browser, each formula is typically rendered in three formats within the HTML-DOM: SVG, MathML, and TeX. For blind and visually impaired users, screen readers such as JAWS, NVDA, VoiceOver, and Orca generate speech output from the MathML present in the HTML-DOM of the user's browser\cite{math_wg_mathml_2021}.

Explanation of Changes:

1. **Introduction**: I started with the main idea, which is the presence of formulas in Wikipedia articles. This sets the context for the reader.
2. **Clarity**: I rephrased "The most formulas on Wikipedia notated by the article's authors in TeX-format in the markdown describing Wikipages" to "Wikipedia articles frequently contain formulas notated in TeX format within the markdown, known as Wikitext". This makes the sentence clearer and more direct.
3. **Flow**: I separated the information about the number of pages with TeX and HTML math tags into a footnote for better flow and readability.
4. **Consistency**: I changed "users' browser" to "user's browser" for consistency, as the rest of the paragraph refers to a singular user.
5. **Simplification**: I simplified the sentence about screen readers to make it more straightforward and easier to understand.
6. **Grammar and Punctuation**: I made minor grammatical adjustments for clarity and added necessary punctuation for better readability.

Schreibpartner — Übersetzen

ME

please tanslate tzo english: Der Hochschulverband Informationswissenschaft ist die wissenschaftliche Vereinigung der auf den Gebieten informationswissenschaftlicher Forschung, Lehre und Praxis Tätigen. Die zentrale Aufgabe des Hochschulverbands Informationswissenschaft ist die Stärkung der informationswissenschaftlichen Forschung und Lehre an den informationswissenschaftlichen Ausbildungs- und Forschungsstätten in den deutschsprachigen Ländern.

The Association of Information Science in Higher Education is the scientific association of those engaged in information science research, teaching, and practice. The central objective of the Association of Information Science in Higher Education is to enhance information science research and teaching at educational and research institutions specializing in information science in German-speaking countries.

Schreibpartner — Restrukturieren

The comment rightly points out a structural issue in the flow of the content. It seems that the information about the pre-study and the subsequent study (the "Prolific Study") is intermingled, causing confusion for the reader.

To clarify and ensure a smooth flow of ideas, consider restructuring the content in the following way:

1. **Pre-Study Details**:
   Begin with an introductory sentence to the pre-test and follow with details of the pre-test.

```css
"To understand players' initial experiences, we first conducted a qualitati
```

2. **Transition to the Prolific Study**:
   This can help in providing context and separating the two studies.

```css
"Building upon the feedback and refinements from the pre-test, we moved on
```

3. **Prolific Study Details**:
   Lay out all the specifics of this study.

```css
"This subsequent study involved crowdsourced workers to determine if the pl

We relied on the IAA metric Krippendorff's $\alpha$ for data quality evalua

Furthermore, we assessed the backgrounds of players through a demographic s
```

This restructuring starts with the preliminary assessment (pre-test), moves to the refinements, and then transitions seamlessly to the larger Prolific Study. The flow of ideas is clearer, and each study is distinctly demarcated, reducing potential confusion for readers.

Schreibpartner — Kürzen

ME

summarize this to two or three senteces about future work: \textbf{Improved Data Integration. }Enhancing the integration of medical data from diverse sources, such as electronic health records, research studies, and patient narratives, can provide a more comprehensive foundation for character generation. AI algorithms can be developed to effectively process and extract relevant information from these sources.

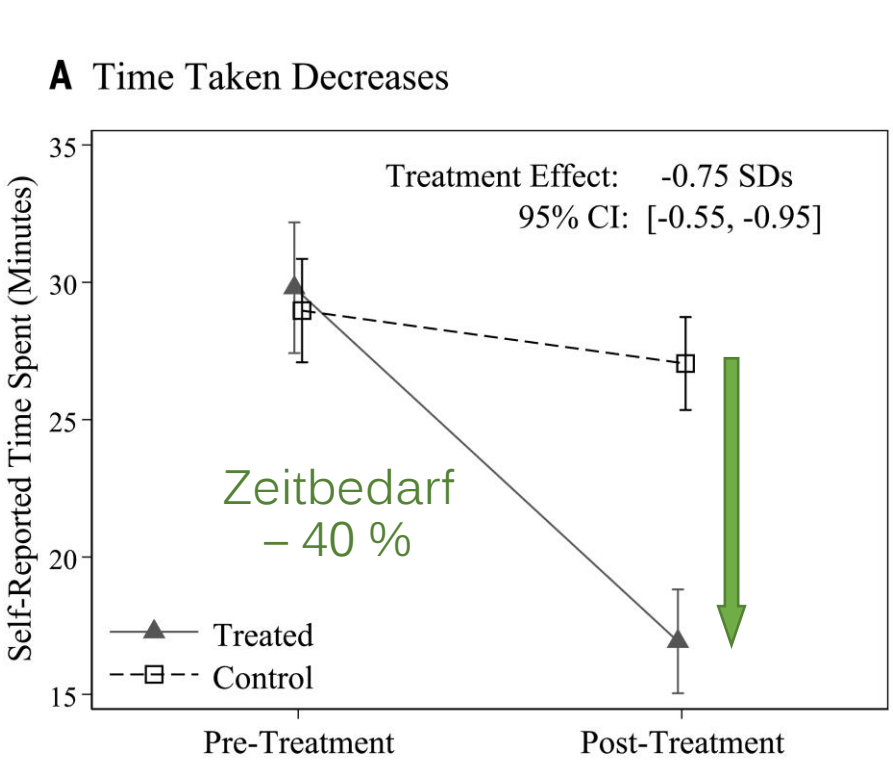
\textbf{Fine-grained Representation. }Advancements in AI can facilitate the creation of more nuanced and detailed representations of characters in medical stories. This includes capturing not only physical attributes but also psychological traits, emotional states, and personal histories. Incorporating these aspects can enhance the authenticity and relatability of the characters.

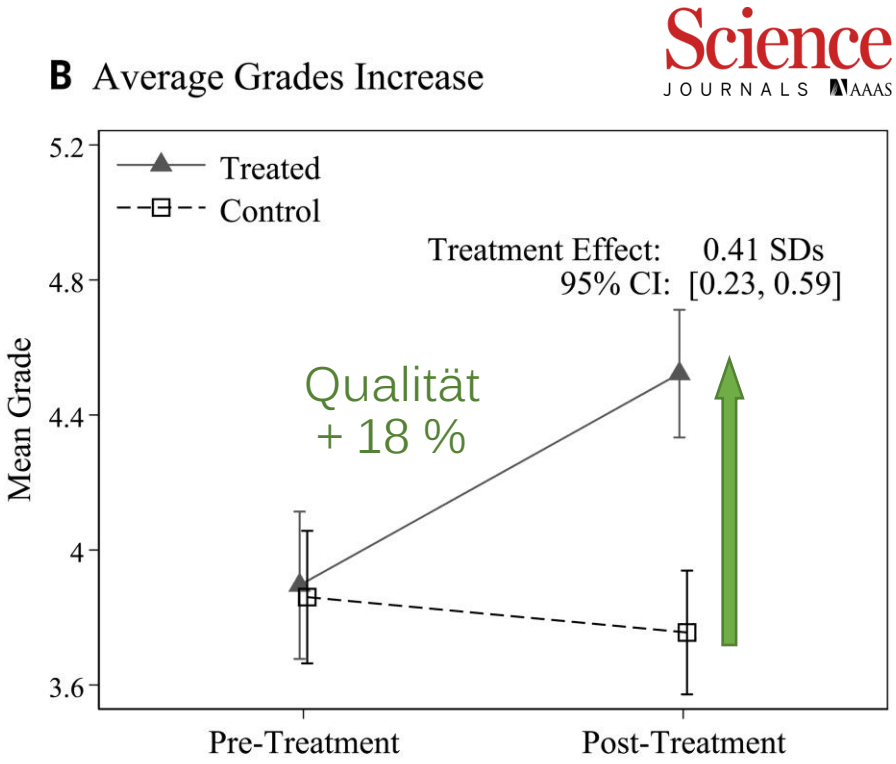
\textbf{Personalization and Adaptation. }AI models can personalize character generation based on individual patient data, resulting in tailored and patient-specific narratives. This

\textbf{Adapting the Pipeline to other Data Stories. }For other data-driven stories, our pipeline can also be used to generate expert characters (referenced as "scientist in <domain>") for example to deliver the most relevant information and messages to the audience.

Future work could focus on improved data integration by enhancing the integration of diverse medical data sources, enabling comprehensive character generation. Advancements in AI could lead to more detailed character representations encompassing psychological traits, personal histories, and emotional states. Personalization and adaptation through AI models could result in patient-specific narratives, while evaluating the effectiveness of character designs in achieving educational and empathetic goals through user studies is crucial. Collaborations with companies like BioDigital and adapting the pipeline to different data-driven stories offer promising avenues for application and advancement.

Produktivitätssteigerung bei Schreibaufgaben



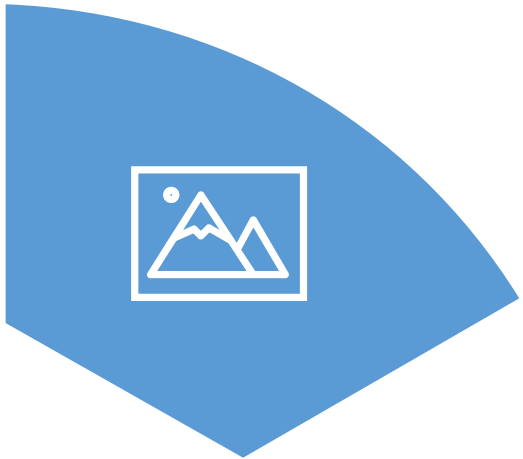


Quelle: [5]

Wie gut sind die Inhalte?

Simulated exams	GPT-4 estimated percentile	GPT-4 (no vision) estimated percentile	GPT-3.5 estimated percentile
Uniform Bar Exam (MBE+MEE+MPT)[1]	298 / 400 ~90th	298 / 400 ~90th	213 / 400 ~10th
LSAT	163 ~88th	161 ~83rd	149 ~40th
SAT Evidence-Based Reading & Writing	710 / 800 ~93rd	710 / 800 ~93rd	670 / 800 ~87th
SAT Math	700 / 800 ~89th	690 / 800 ~89th	590 / 800 ~70th
Graduate Record Examination (GRE) Quantitative	163 / 170 ~80th	157 / 170 ~62nd	147 / 170 ~25th
Graduate Record Examination (GRE) Verbal	169 / 170 ~99th	165 / 170 ~96th	154 / 170 ~63rd
Graduate Record Examination (GRE) Writing	4 / 6 ~54th	4 / 6 ~54th	4 / 6 ~54th
USABO Semifinal Exam 2020	87 / 150 99th–100th	87 / 150 99th–100th	43 / 150 31st–33rd
USNCO Local Section Exam 2022	36 / 60	38 / 60	24 / 60
Medical Knowledge Self-Assessment Program	75%	75%	53%
Codeforces Rating	392 below 5th	392 below 5th	260 below 5th
AP Art History	5 86th–100th	5 86th–100th	5 86th–100th
AP Biology	5 85th–100th	5 85th–100th	4 62nd–85th
AP Calculus BC	4 43rd–59th	4 43rd–59th	1 0th–7th
AP Chemistry	4 71st–88th	4 71st–88th	2 22nd–46th

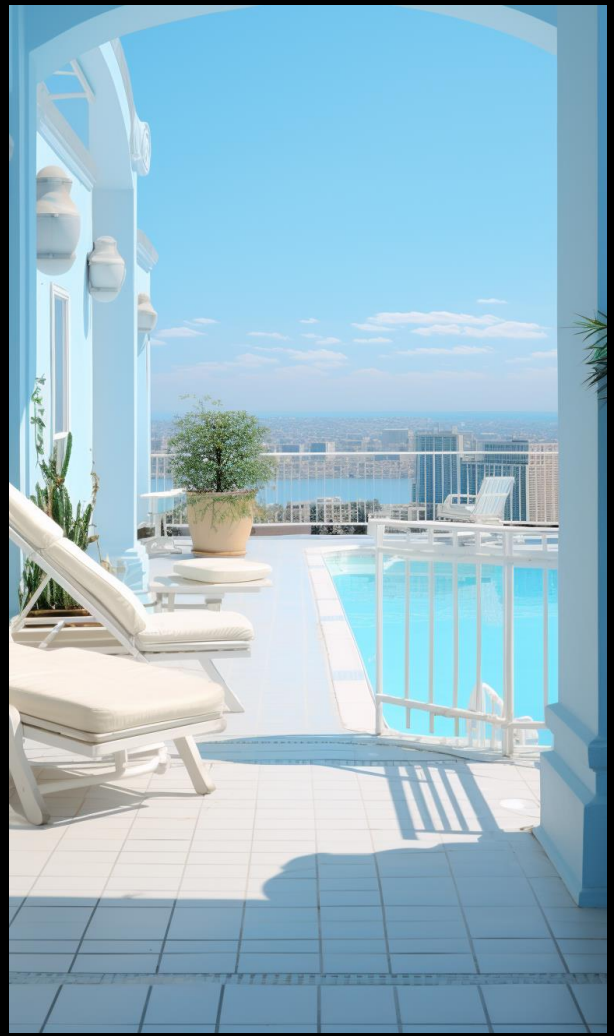
Quelle: [6]



Generative KI für Bilder




IWC
SCHAFFHAUSEN
AUTOMATIC



Human

Cost	$150
Time	5 Hours

Generative AI

Cost	$0.08
Time	< 1 Minute

Quelle: [7]

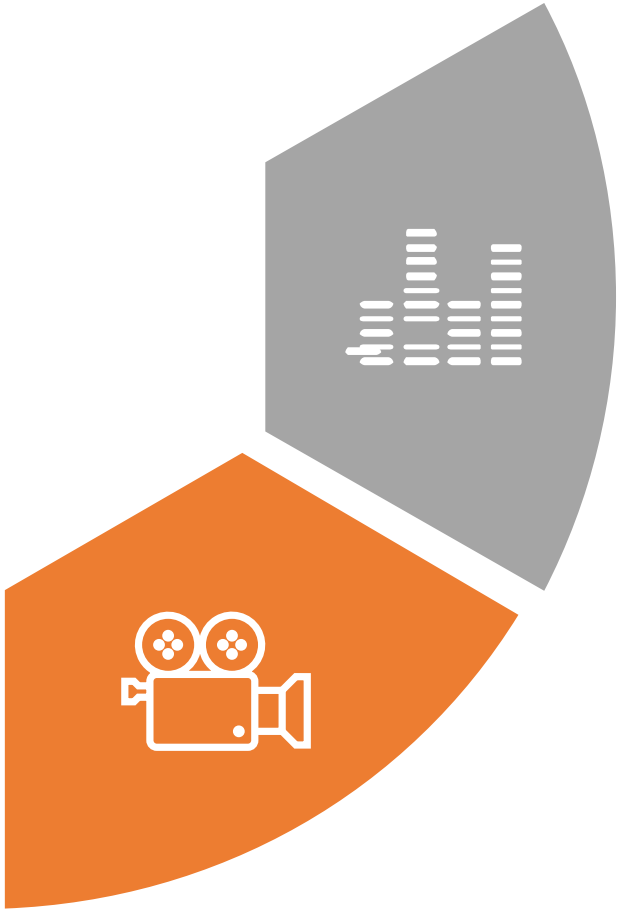
An artist who won an award at a world-renowned photography competition says the winning image was actually generated by AI

Grace Dean

17 apr 2023

Foto: Boris Eldagsen with DALL-E 2. Courtesy Photo Edition Berlin

Quelle: [8]



Generative KI für Sprache und Video

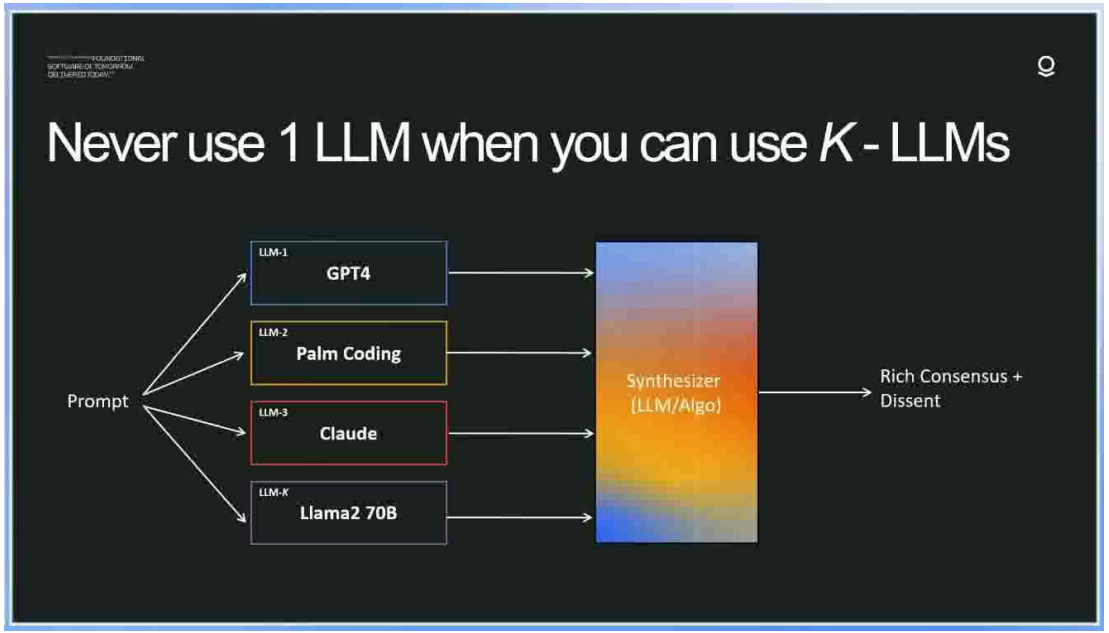
Quelle: [9]

Ausblick – Fachlich

- Neu Lernziele & -methoden
  - Mit und von der KI lernen (Reflektion, Ethik, kritisches Denken)
  - Cognitive Offloading, Fokussierung auf menschliche Stärken
  - Virtuelle Labore

- Personalisierte Lernpfade
  - Erkennung individueller Lernbedürfnisse
  - Anpassung von Lernmaterialien in Echtzeit

Ausblick – Technisch



Bildquelle: [10]

Auto gpt

Bildquelle: [11]

Folien & Videos
des Vortrags:

www.gipplab.org/ki-lehre-23

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Quellen

[1] Li, S. et al. 2021. A Comprehensive Review on Radiomics and Deep Learning for Nasopharyngeal Carcinoma Imaging. Diagnostics. 11, 9 (Aug. 2021), 1523. DOI: https://doi.org/10.3390/diagnostics11091523.

[2] Hamburg Open Online University. 2022. Neuronale Netze kurz erklärt. Online. https://www.hoou.de/projects/neuronale-netze-kurz-erklart/pages/neuronales-netz

[3] Hecker, G. P., Dirk, "Sprachversteher: GPT-3 & Co. texten überzeugend, aber nicht faktentreu", *c't*, vol. 2022, no. 9, Heise, pp. 64–66, Apr. 8, 2022, Available: https://www.heise.de/select/ct/2022/9/2204711320572887119.

[4] Sreenivasan, R. *Elicit The AI Research Assistant AI Tools Demo*. May 2023, Available: https://www.youtube.com/watch?v=BgQvncUInlE.

[5] Noy, S. and Zhang, W. 2023. Experimental evidence on the productivity effects of generative artificial intelligence. Science. 381, 6654 (Jul. 2023), 187–192. DOI: https://doi.org/10.1126/science.adh2586.

[6] Lindrea, B., "ChatGPT v4 aces the bar, SATs and can identify exploits in ETH contracts", Cointelegraph, Mar. 2023. [Online]. Available: https://cointelegraph.com/news/chatgpt-v4-aces-the-bar-sats-and-can-identify-exploits-in-eth-contracts.

[7] "Big Ideas 2023: Innovation is Taking Off", *ARK Invest*. [Online]. Available: https://ark-invest.com/big-ideas-2023/.

[8] Desan, G., "An artist who won an award at a world-renowned photography competition says the winning image was actually generated by AI", *Business Insider*, Available: https://www.businessinsider.nl/an-artist-who-won-an-award-at-a-world-renowned-photography-competition-says-the-winning-image-was-actually-generated-by-ai/.

[9] Finger, Job [@mrjonfinger], "Testing out @HeyGen_Official translation on French and German.", *Twitter*. Sep. 2023, Available: https://twitter.com/mrjonfinger/status/1701075571630047525.

[10] Palantir. AIP Product Update | Palantir CTO Shyam Sankar at AIPCon. Sep. 2023, Available: https://www.youtube.com/watch?v=oW9svx4vT5g.

[11] Auto-GPT, "Home", *The Official Auto-GPT Website*. [Online]. Available: https://news.agpt.co/.