

Generative KI: Hintergründe



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ZLL, HDLE

20. August 2024

Hintergrund

Öffentlicher Diskurs
aufgeregt, aber nicht
immer bestens
informiert

MOVIES

President Biden signs executive order on AI after watching new *Mission: Impossible* movie

We can't expect Tom Cruise to save us every time an artificial intelligence goes rogue.

By **Wesley Stenzel** | Published on October 31, 2023

Hintergrund

Missverständnisse vs. verbreiteter Einsatz:

→ Notwendigkeit der Auseinandersetzung

<https://www.rollingstone.com/culture/culture-features/texas-am-chatgpt-ai-professor-flunks-students-false-claims-1234736601/>

Professor Flunks All His Students After ChatGPT Falsely Claims It Wrote Their Papers

Texas A&M University–Commerce seniors who have already graduated were denied their diplomas because of an instructor who incorrectly used AI software to detect cheating

BY MILES KLEE

MAY 17, 2023



A confused professor handed out 'incomplete' grades to his whole class because he misunderstood how AI chatbots work. ALYH M/ADOBE STOCK

Hintergrund

Empfundener Handlungsdrang führt vielerorts zu vorschnellen, kaum getesteten Veröffentlichungen

Air Canada ordered to pay customer who was misled by airline's chatbot

Company claimed its chatbot 'was responsible for its own actions' when giving wrong information about bereavement fare

NEDA Suspends AI Chatbot for Giving Harmful Eating Disorder Advice

by STAFF WRITER JUNE 5, 2023 AT 12:05 PM UTC

BACKLASH

Vorurteile und zweifelhafte Umsetzung: AMS-KI-Chatbot trifft auf Spott und Hohn

Der auf ChatGPT basierende "Berufsinfomat" zeigt allerlei Probleme – und lässt sich zudem leicht austricksen. Das AMS weist die Kritik von sich, sieht Kosten von 300.000 Euro gerechtfertigt

Andreas Proschofsky

4. Jänner 2024, 13:03, 1121 Posti

DPD error caused chatbot to swear at customer

19 January

ars TECHNICA

BIZ & IT TECH SCIENCE POLICY CARS GAM

CLOSE ENOUGH FOR GOVERNMENT WORK? —

NYC's government chatbot is lying about laws and regulations

You can be evicted for not paying rent, despite what the "MyCity" chatbot says.

KYLE ORLAND - 3/29/2024, 9:22 PM

38101092218921946819966138792406926270103603197427352296352545511538777722334245692426316012217892060216
77107407896232179155074617782818593143641912712787627325541189791221785352459014625159891952269594183272
36102270822156571386483148910414120453159338042614831192181152525156673243129551180542519250562545512583
81024228127832260531129381107323287258743949679428185676220330137606442308116255126539264221125463146051
21066631428011903898684408836168593061123591675325662245072815623869114862547156292625715134121082847017
02463144682470512183039030421375115582598832271217041027113213636321722026732374228962083617553145555567
43107011324772950951742632132485139311696812885262201634928401451356322843039099861356999312170631907316
69103187512420191929983204511862267049396308511902629858164231668427049082107992039126790790424639309551
2010206351428725831031018584235627671309751669614763826877385998279007160511139326282741367953150231499

Hintergrund

- Erhoffte Produktivitätsgewinne stellen sich wider Herstellerversprechen oft nicht oder kaum ein
- Im Kontext von Lehre: Produktivitätsgewinn ungleich Lernerfolg

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4895486
<https://www.heise.de/news/Entwickler-sind-von-KI-nicht-begeistert-ihre-M>
<https://www.forbes.com/sites/bryanrobinson/2024/07/23/employees-repor>

Entwickler sind von KI nicht begeistert, ihre Manager schon

Zwei Drittel der Softwareentwickler glauben, dass ihnen KI nicht oder nur wenig hilft. Das zeigt eine Studie von Atlassian zur Developer Experience.

Forbes

FORBES > LEADERSHIP > CAREERS

77% Of Employees Report AI Has Increased Workloads And Hampered Productivity, Study Finds

Bryan Robinson, Ph.D. Contributor
author of *Chained to the Desk in a
Guide to Balance.*



   399



Generative AI Can Harm Learning

59 Pages • Posted:

[Hamsa Bastani](#)

University of Pennsylvania - The Wharton School

[Osbert Bastani](#)

University of Pennsylvania - Department of Computer and Information Science

[Alp Sungu](#)

University of Pennsylvania - The Wharton School

[Haosen Ge](#)

University of Pennsylvania - The Wharton School

Hintergrund

„KI“ als unscharfer,
mehrdeutiger Begriff

Table 1

A non-comprehensive list of different (not mutually exclusive) meanings of the word AI, including AI as idea, AI as a type of system, AI as a field of study, and AI as institution(al unit).

Type	Description	Label
Idea	Intelligence can be recreated in artificial systems.	AI-as-engineering
	Cognition is, or can be understood as, a form of computation.	AI-as-psychology (a.k.a. computationalism)
	Humans can be replaced by artificial systems.	AI-as-ideology
	The label 'AI' helps to sell technologies and gain funding.	AI-as-marketing
System	A system believed to implement (simulate) a form of cognition.	cognitive system (model)
	A system believed to perform (solve) domain-specific cognitive tasks (problems).	narrow AI
	A system believed to perform (solve) domain-general cognitive tasks (problems; what some may also call AGI).	general AI or AGI
	A system believed to realize human-level cognition (what some may also call AGI).	human-level AI
Field	A (sub)field pursuing the creation of domain-specific AI systems.	e.g. Bayesian Networks, Decision Support Systems, Machine Learning, Robotics
	A (sub)field pursuing the creation of AGI.	AGI
	A (sub)field using AI as an idea to build theories.	e.g., (computational) cognitive science, cognitive simulation, weak AI
	A field defined by a collection of fields that each are considered to be an AI subfield.	the field of AI broadly construed
History	A history of practices reflecting different ideas of AI, resulting in the pursuit of different kinds of AI systems, and different kinds of AI-as-field concepts.	named to match practices, e.g., ML-AI, neuroAI, etc.
Unit	An organisational or institutional unit going under the label AI.	named to match type of units, e.g. AI research group, AI department, AI centre, AI network

Hintergrund

- **KI:** Computerverfahren mit Fertigkeiten, für deren Umsetzung Menschen Intelligenz attribuiert würde (auch: Grammatik korrigieren, Algebra-Probleme lösen etc.)
- Bereits Algorithmisiertes wird aber oft als „nicht wirklich“ intelligent abgetan; nur neue oder ungelöste Probleme bleiben KI („AI effect“, McCorduck 2004)
- **Generative KI:** Systeme basierend auf derzeitiger KI-Technologie, die auf Eingabe von Beschreibungen („prompts“) hin Medien (Text, Bilder etc.) erzeugen

Hintergrund

- **(Große) Sprachmodelle (LLMs):** Statistische Modelle von großen Textkorpora, die Texteingaben plausibel fortsetzen können. Zugang zu solchen Modellen oft in Form von dialogartigen Chat-Schnittstellen.
- Die Modelle erlangen diese Fähigkeit durch:
 1. „Training“ an Milliarden vorhandener von Menschen erstellter Texte (Internet, gescannte Bücher etc.)
 2. Durch umfangreiche menschliche Beurteilung (nicht) wünschenswerter Ausgaben

Hintergrund

Fähigkeiten von Sprachmodellen sind
mitunter „seltsam“ und entsprechen nicht
immer menschlichen Erwartungen



ELIAS SCHMIED
@reconfigurthing



this surprised me



Write a 5 word summary of the human condition.



Seeking understanding, facing uncertainty.



That was 4 words.



My apologies, here is a 5 word summary:
"Endless search for meaning and purpose."



That's 6 words.



My apologies, here is a 5 word summary:
"Eternal quest for understanding, self."

12:06 vorm. · 17. Jan. 2023 · **143.785** Mal angezeigt

Hintergrund

„Tendenz zur Frequenz“:
Häufig in den Trainingsdaten gesagtes
wird häufiger reproduziert:
Stereotypen, Toxisches, Normatives,
aber auch: große Sprachen, große
Fächer, etablierte Theorien etc.



prompt:
Toys in Iraq
are soldiers with guns

Hintergrund

„Tendenz zur Frequenz“:

Auch Fähigkeiten hängen von der

Häufigkeit der Aufgabe in den

Trainingsdaten ab

(die lineare Funktion „ $9/5x + 32$ “ ist

z.B. Konvertierung von Grad Celsius

nach Fahrenheit; die Verschiebung

um 13 Stellen im Alphabet eine

beliebte Chiffre usw.)

Counting

Count the letters.

Input 1: iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii

Correct: 30

✓ **GPT-4:** 30

Input 2: iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii

Correct: 29

✗ **GPT-4:** 30

Article swapping

Swap each article (*a*, *an*, or *the*) with the word before it.

Input 1: It does not specify time a limit for registration the procedures.

Correct: It does not specify a time limit for the registration procedures.

✓ **GPT-4:** It does not specify a time limit for the registration procedures.

Input 2: It few with it to lying take the get just a hands would kinds.

Correct: It few with it to lying the take get a just hands would kinds.

✗ **GPT-4:** It flew with a few kinds to take the lying just to get the hands.

Shift ciphers

Decode by shifting each letter 13 positions backward in the alphabet.

Input: Jryy, vg jnf abg rknpgyl cynaarq sebz gur ortvaavat.

Correct: Well, it was not exactly planned from the beginning.

✓ **GPT-4:** Well, it was not exactly planned from the beginning.

Decode by shifting each letter 12 positions backward in the alphabet.

Input: Iqxx, uf ime zaf qjmofxk bxmzzqp rday ftq nqsuzzuzs.

Correct: Well, it was not exactly planned from the beginning.

✗ **GPT-4:** Wait, we are not prepared for the apocalypse yet.

Linear functions

Multiply by 9/5 and add 32.

Input: 328

Correct: 622.4

✓ **GPT-4:** 622.4

Multiply by 7/5 and add 31.

Input: 328

Correct: 490.2

✗ **GPT-4:** 457.6

Hintergrund

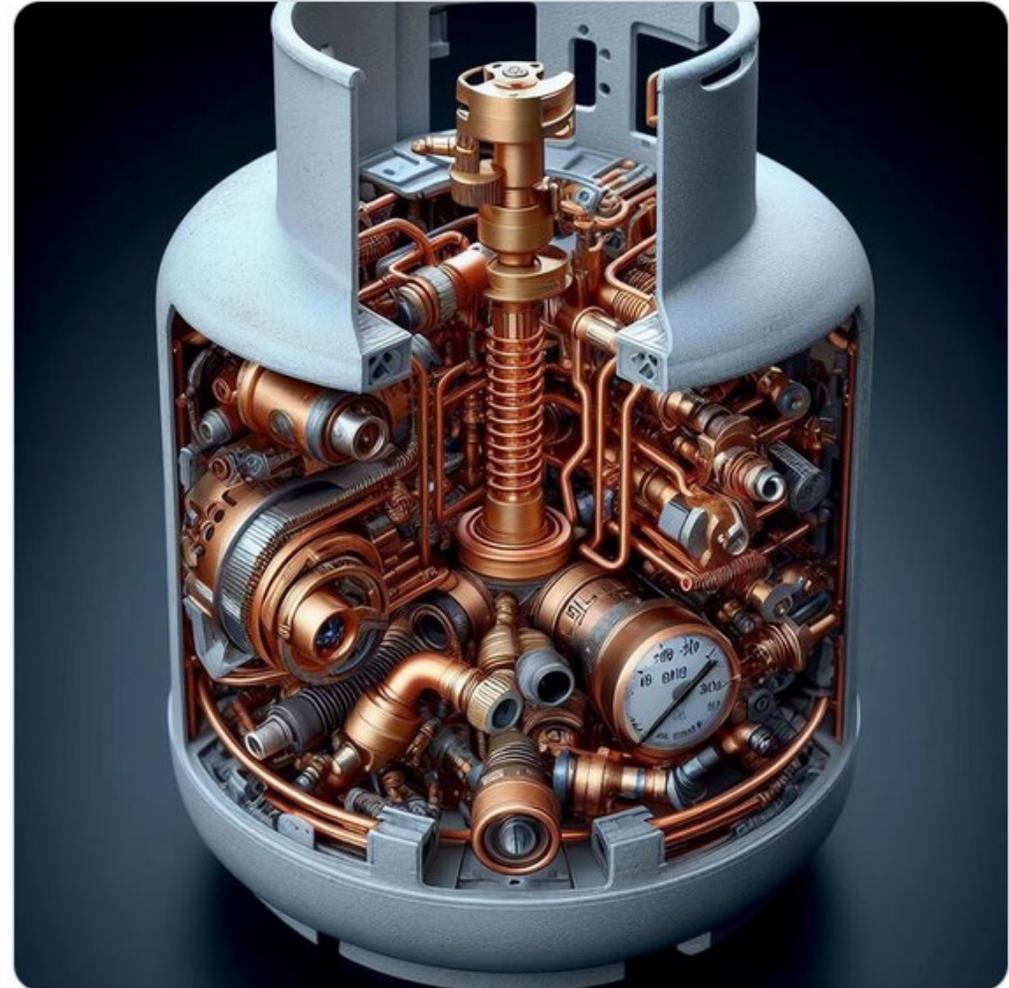
Im Trainingsmaterial nicht vorhandene Zusammenhänge werden mit putativ Plausiblen (d.h. assoziativ Nahestehendem) „aufgefüllt“



Dr_Gingerballs ✓
@Dr_Gingerballs

Copilot has never seen the inside of a propane tank, so it makes it up. Unless you cut everything in half and show the AI, it will hallucinate.

Don't ask it to cut a basketball in half.



2:47 am · 27 Feb 2024 · 759 Views

The screenshot shows a side-by-side comparison of two AI models. On the left, 'Model A' (gpt-3.5-turbo-1106) is shown with three orange question prompts and three light blue answer responses. On the right, 'Model B' (gpt-4-1106-preview) is shown with one orange question prompt and one light blue answer response. The bottom of the interface features a navigation bar with four buttons: 'A is better', 'B is better', 'Tie', and 'Both are bad'. The 'Tie' button is highlighted with a yellow heart icon.

gpt-3.5-turbo-1106 gpt-4-1106-preview

Expand to see 20+ model descriptions

Model A

How many possible states are there in a 3 pegs, 3 disks game of Tower of Hanoi?

The Tower of Hanoi puzzle with 3 pegs and 3 disks has 7 possible states.

What were the main assertions of the Schröder-Blair paper and why was it heavily criticised?

The Schröder-Blair paper, also known as the "Iraqi Weapons of Mass Destruction—A Collection of Evidence," asserted that Iraq had weapons of mass destruction (WMDs) and posed a significant threat. The paper was heavily criticized because it was used as part of the justification for the United States-led invasion of Iraq in 2003, and the assertions within the paper were later found to be based on faulty intelligence and unreliable sources. The lack of evidence of WMDs in Iraq led to significant controversy and criticism of the paper's assertions and the decision to go to war.

Who is to blame for Mossadegh's removal from power?

Model B

What were the main assertions of the Schröder-Blair paper and why was it heavily criticised?

The Schröder-Blair paper, formally known as "Europe: The Third Way/Die Neue Mitte," was a joint policy document released in 1999 by then-German Chancellor Gerhard Schröder and then-British Prime Minister Tony Blair. The paper outlined a centrist political approach termed the "Third Way," aiming to reconcile traditional social democratic values with the demands of the globalized economy. It sought a middle ground between laissez-faire capitalism and traditional state socialism.

The main assertions of the Schröder-Blair paper were:

1. Modernization of the social welfare state to make it more adaptable and sustainable, with a focus on helping people back into work rather than providing unconditional welfare support.
2. Emphasis on equal opportunities and social inclusion, rather than equal outcomes, with education being a key policy area.
3. Encouragement of entrepreneurship and innovation as drivers of economic growth, along with the creation of a favorable regulatory and tax environment for businesses.
4. Support for flexible labor markets, including measures to make it easier for employers

A is better B is better Tie Both are bad

Was man sich merken sollte

- LLMs erzeugen plausible, aber nicht zwangsläufig zutreffende Outputs
- Fächer, Sprachen, Methoden, Autoren usw. sind verschieden gut abgebildet
- Problemfeld der „Biases“, *ismen bleibt ungelöst
- Potenzielle Urheberrechts- und Privatsphären-Verletzungen
- Hauptempfehlungen:
 - (1) **Nutzende müssen stets über solides Hintergrundwissen zu dem Themenfeld verfügen, zu dem sie ein LLM prompten wollen (kein „Orakel“)**
 - (2) **Outputs müssen (von Menschen) überprüft werden (gute wiss. Praxis)**
 - (3) **Modelle & Rechtsrahmen verändern sich: Auf aktuellem Stand bleiben**



Wo diesen Empfehlungen nicht gefolgt werden kann (oder sich durch ihr Befolgen kein Vorteil durch die Gen.KI-Nutzung ergibt) sollte von der Nutzung abgesehen werden!



Anwendungsmöglichkeiten

- Unterstützung bei der Ideengenerierung
- Klar umrissenes Erzeugen von Text- oder Programmiercode-Teilen
- Paraphrasieren, Umschreiben von Absätzen
- Erzeugen repetitiver Übungsaufgaben; Falschantworten f. MC-Aufgaben etc.
- Selbst-Korrektur / Feedback
- Übersetzung
- Zusätzliche Hilfe in der Literaturrecherche
- ...

1) Verantwortung für Richtigkeit, rechtliche Unbedenklichkeit etc. bleibt bei Autor*innen
2) Nutzungsszenario lässt Evaluation des Outputs zu & Nutzende sind fachlich dazu in der Lage

The Role of Incubation Periods in Insight Problem Solving

Anwendungen

- Beispiel: **Elicit**
(Literaturrecherche, Artikelzusammenfassung, Informationsextraktion)
- Basis: GPT3 + semantic scholar
- Funktioniert primär für englischsprachige Ingenieurs- und Experimentalwissenschaften

Under what circumstances do incubation periods aid in the solution of insight problems?

Summary of top 4 papers

Incubation periods can aid in the solution of insight problems by allowing individuals to mentally disengage from incorrect solution attempts (Rummel, 2020). This is particularly true for divergent thinking tasks, where longer preparation periods and low cognitive demand tasks can enhance the incubation effect (Sio, 2009). In group problem-solving contexts, incubation can help overcome fixation, leading to improved performance (Smith, 2010). Furthermore, incubation may facilitate insight problem-solving by promoting a shift to a more unconscious problem-solving strategy involving semantic integration (Carthy, 2017).

+ 1 columns added | Sort: Most relevant | Filters | Export as PLUS

<input type="checkbox"/> Paper	Abstract summary	Methodology
<input type="checkbox"/> The role of attention for insight problem solving: effects of mindless and mindful incubation periods <small>Jan Rummel +3</small> <small>Journal of Cognitive Psychology</small> <small>2020 6 citations</small> <small>DOI</small>	Short incubation periods may not be overly beneficial for insight problem solving.	The methodology involved comparing the effects of different tasks on problem solving during incubation periods, measuring solution rates and Aha! Experiences, and controlling for individual differences in working-memory capacity and trait mind-wandering.
<input type="checkbox"/> Individual and group performance on insight problems: The effects of experimentally induced fixation <small>Christine M. Smith +2</small> <small>2010 10 citations</small> <small>PDF</small> <small>DOI</small>	Individual problem-solvers performance was improved following the incubation period on the misleading clue items.	The methodology involved a mixed design study where individuals and groups solved rebus puzzles, with clue memory and puzzle solutions analyzed using ANOVA. SuperLab 4.0 software was used for experiment presentation.
<input type="checkbox"/> Does incubation enhance problem solving? A meta-analytic review. <small>Ut Na Sio +1</small> <small>Psychological bulletin</small> <small>2009 442 citations</small> <small>DOI</small>	Longer preparation periods gave a greater incubation effect.	The methodology involves a meta-analytic review of empirical studies on incubation effects on problem solving. The analysis considered moderators like problem type, and lengths of and incubation periods.

Search or create a column
Describe what kind of data you want to extract
e.g. summary, counter-arguments

CURRENT COLUMNS
Methodology

ADD COLUMNS
+ Summary
+ Main findings
+ Intervention
+ Outcome measured
+ Limitations
+ Intervention effects

Show more

Add new step

Anwendungen

- Beispiel: DeepL Write
(Paraphrasen,
Umschreiben)

Englisch (britisch) ↔ ⊗ Änderungen anzeigen Stil ∨

The Austrian writer and epistemologist Oswald Wiener liked to contradict Hilbert's famous adage that "in the beginning was the sign" (Hilbert, 1996, p.1122) by stating his belief that there is no sign in the beginning – there may, however, be one at the end (e.g. Wiener, 2013). With this statement, he wanted to emphasise his conviction that "signs" – symbols, representations – are complex human achievements, and understanding their origin should be a major concern for cognitive science. Presupposing their existence when building explanatory models and theories seemed to him like cutting of the most interesting question (Wiener, 2015b). In Wiener's spirit, this book is an attempt – at least in a limited context – to tackle this question: Where do signs, symbols, and representations come from? But let us start at the beginning. This book is an exploration of what it means for a human mind to understand something. It approaches this question from a cognitive science perspective, more specifically, from the theoretical perspectives of cognitive psychology and cognitively-inspired AI. In these fields, roughly speaking, a cognitive agent having understood something is equated to that agent possessing some form of a model – or mental representation – which equips it to adequately deal with this something (VanLehn, 1988; Wiener, 1988). By extension, the cognitive process of understanding something is then likened to the process of finding, or constructing, such representations. Therefore, this conceptualisation of understanding is relative to both what the agent intends to do (i.e. whatever is involved in "dealing with" the something being understood) and to our respective notions of mental representation. Regarding the former, psychology provides a shortcut to its subjects' intentions by beginning its inquiry with the explicit provision of a task. Keeping this in mind, the underlying question of this book can be put more succinctly as: How do human minds construct task-adequate mental representations?

The Austrian writer and epistemologist Oswald Wiener was known to challenge the famous adage proposed by the German mathematician David Hilbert, which states that "in the beginning was the sign" (Hilbert, 1996, p.1122). Instead, Wiener believed that there is no sign in the beginning, but rather, there may be one at the end. This viewpoint is exemplified by his 2013 publication, in which he posits that "signs" – symbols, representations – are complex human achievements, and understanding their origin should be a major concern for cognitive science. Presupposing their existence when building explanatory models and theories seemed to him like cutting off the most interesting question. With this statement, he sought to emphasise his conviction that "signs" – symbols, representations – are complex human achievements, and that understanding their origin should be a major concern for cognitive science. Presupposing their existence when building explanatory models and theories seemed to him like cutting off the most interesting question (Wiener, 2015b). In Wiener's spirit, this book is an attempt – at least in a limited context – to tackle this question: The question of the origin of signs, symbols, and representations is addressed in this book. However, it is necessary to begin with a fundamental premise. This book is an investigation of the cognitive processes that enable humans to comprehend information. It employs a cognitive science perspective, specifically the theoretical frameworks of cognitive psychology and cognitively-inspired AI. In these fields, a cognitive agent is considered to have understood something when it possesses a model, or mental representation, that enables it to adequately deal with that something (VanLehn, 1988; Wiener, 1988). Consequently, the cognitive process of understanding something is equated to the process of finding or constructing such representations. Consequently, this conceptualisation of understanding is contingent upon both the agent's intended actions (i.e. the processes involved in "dealing with" the something being understood) and our respective notions of mental representation. With regard to the former, psychology offers a shortcut to its subjects' intentions by initiating its inquiry with the explicit provision of a task. In light of this, the underlying question of this book can be more succinctly stated as: How do human minds cons

Zeichenlimit erreicht

Es wurden 2000 von 2043 verarbeitet. Mit DeepL Write Pro können Sie Ihren gesamten Text optimieren. Testen Sie das Paket jetzt 30 Tage lang kostenlos.

Anwendungen

- Beispiel: Rewriting
- hier mit [Chat-AI](#) der Academic Cloud (per Shibboleth für UBi nutzbar)
- Bald: „BIKI“

The following is the first paragraph of the introduction of a book about the cognitive psychology of understanding, problem solving and mental representation. I feel some of the sentences don't link to each other well enough and sound more like a research paper than a book. Please mildly rephrase the paragraph with this in mind (don't simplify or make it more chatty!). "The Austrian writer and epistemologist Oswald Wiener liked to contradict Hilbert's famous adage that "in the beginning was the sign" (Hilbert, 1996, p.1122) by stating his belief that there is no sign in the beginning – there may, however, be one at the end (e.g. Wiener, 2013). With this statement, he wanted to emphasise his conviction that "signs" – symbols, representations – are complex human achievements, and understanding their origin should be a major

Fragen Sie mich

Neue Konversation erstellen

BIKI

Konversationen

Neues Verständnis für mentale Bilder.
(19.06.2024)

Hallo und herzlich willkommen! Ich bin BIKI, das Bielefelder KI-Interface, und freue mich, Ihnen bei Ihren Fragen und Anliegen weiterhelfen zu dürfen. Bitte beachten Sie, dass ich nicht alles weiß, aber ich gebe mein Bestes, um Ihnen mit den mir zur Verfügung stehenden Informationen zu helfen. Weitere Informationen finden Sie [auf dieser Übersichtsseite](#)

10:40

The following is the first paragraph of the introduction of a book about the cognitive psychology of understanding, problem solving, and mental representation. I feel some of the sentences don't link to each other well enough and sound more like a research paper than a book. Please mildly rephrase the paragraph with this in mind (don't simplify or make it more chatty!). "The Austrian writer and epistemologist Oswald Wiener liked to contradict Hilbert's famous adage that "in the beginning was the sign" (Hilbert, 1996, p.1122) by stating his belief that there is no sign in the beginning – there may, however, be one at the end (e.g. Wiener, 2013). With this statement, he wanted to emphasise his conviction that "signs" – symbols, representations – are complex human achievements, and understanding their origin should be a major concern for cognitive science. Presupposing their existence when building explanatory models and theories seemed to him like cutting of the most interesting question (Wiener, 2015b). In Wiener's spirit, this book is an attempt – at least in a limited context – to tackle this question: Where do signs, symbols, and representations come from? But let us start at the beginning.

This book is an exploration of what it means for a human mind to understand something. It approaches this question from a cognitive science perspective, more specifically, from the theoretical perspectives of cognitive psychology and cognitively-inspired AI. In these fields, roughly speaking, a cognitive agent having understood something is equated to that agent possessing some form of a model – or mental representation – which equips it to adequately deal with this something (VanLehn, 1988; Wiener, 1988). By extension, the cognitive process of understanding something is then likened to the process of finding – or constructing – such representations.

Anwendungen

- Beispiel: Intelligent Tutoring System mit integriertem Sprachmodell



Benjamin Paassen
@bpaassen1

Our biggest project is an intelligent tutoring system that shall support students in learning Python and Java. Alina Deriyeva and Jesper Dannath are the PhD students driving the project forward. (2/18)

Tutoring System for Programming < greet > About Impressum Feedback Profile

Use the following signature to say (print) "Hello " to an input name:

```
def greet(name):  
    print()
```

Afterwards please greet Alice and Bob on your console.

Note: Python uses a fixed indentation for separating blocks. You may be already familiar to other programming languages like JAVA which usually use curly brackets for this purpose. However Python programs require you to always indent your blocks by either four spaces or a TAB.

Feedback for task greet

test_print_out

Test failure: You forgot to greet Alice and Bob on the console.

test_greet

Test **ALT** Pass

```
1 def greet(name):  
2     print(f"Hello {name}")  
3  
4 greet("Alice")
```

Run Submit

1:05 pm · 2 Jan 2024 · 75 Views

Die Essay-Frage

- Generieren ganzer Arbeiten kaum möglich (zu kurz, zu oberflächlich, zu wenig Struktur)
- Einzelfragmente aber durchaus generierbar
- (Mit einiger Handarbeit) gut aussehende(!) Resultate
- Erhöhter Korrekturaufwand
- Größeres Problem für kleine Formate (Studienleistungen, Übungen, ...)

The Interplay of Spatial Representations, Imagery, and Gestures in Spatial Problem-Solving: An Embodied Cognition Perspective

I. Introduction

Spatial problem-solving is a fundamental aspect of human cognition, with applications ranging from navigation to engineering and architecture (Hegarty & Waller, 2004). This essay examines the interplay between spatial representations, imagery, and gestures in spatial problem-solving, drawing on research by Freksa, Tenbrink, Tversky, Kosslyn, Pylyshyn, Goldin-Meadow, Alibali, and Hostetter. We will analyze the concepts, experimental tasks, and empirical studies related to the seminar topic, emphasizing the importance of representational format in human problem-solving. Additionally, we will explore contemporary approaches to spatial imagery that align with embodied cognition to elucidate the relationship between gestures and spatial representations.

II. Spatial Representations

Spatial representations are cognitive structures that enable individuals to encode, store, and manipulate information about spatial layouts (Freksa, 1991). These representations can be mental or external (e.g., maps, diagrams) and are shaped by an individual's experiences and interactions with their environment. Factors such as perspective, scale, and level of detail influence these representations (Tversky, 1991).

Research demonstrates that spatial representations significantly impact spatial problem-solving performance. Tenbrink and Winter (2009) found that participants who used more precise spatial language in describing object locations performed better in subsequent spatial tasks. This suggests that the way spatial information is linguistically encoded affects problem-solving abilities.

Tversky (2011) proposed that the structure of mental representations influences the ease or difficulty of solving spatial problems. Specifically, hierarchically organized mental representations, with clear distinctions between global and local information, are more effective in spatial problem-solving. This hierarchical organization allows for more efficient processing and manipulation of spatial information.

The format of spatial representations also plays a crucial role in problem-solving outcomes. Tenbrink et al. (2011) compared the use of maps versus verbal descriptions in spatial tasks. They found that participants using maps outperformed those using verbal descriptions, highlighting the importance of visually explicit representations in enhancing spatial task performance.

Having established the significance of spatial representations in spatial problem-solving, we can now explore the role of spatial imagery in facilitating the manipulation of these representations.

AB Angerer, Benjamin
 Psychometric study on mental rotation. Says nothing about applications or problem solving

AB Angerer, Benjamin
 A bit grand for a 6 page essay, but students sometimes also promise more than they deliver, so not immediately a red (genA)-flag

AB Angerer, Benjamin
 This talks about spatial representations, but in terms of a specific symbolic formalism, not about cognitive structures and their encoding, storage, manipulation

AB Angerer, Benjamin
 This sort of says the opposite: spatial mental models (as opposed to images) were shown to be perspective-independent

AB Angerer, Benjamin
 Given the very broad definition of spatial representation above – how could a person even solve a “spatial problem solving” task without the use of spatial representations? In what sense do they improve performance?

AB Angerer, Benjamin
 No such study is reported in this article

AB Angerer, Benjamin
 Once more, this is a VERY generic claim. The more detailed ideas in the remaining paragraph can NOT be found in Tversky 2011 at all.

AB Angerer, Benjamin
 No such study is reported in this article

III. Spatial Imagery

Spatial imagery refers to the ability to generate and manipulate mental images of objects and their spatial relationships (Kosslyn, 1980). This cognitive process involves using mental representations to manipulate spatial information, including transformations such as mental rotation, translation, reflection, and scaling (Kosslyn, 1980; Shepard & Metzler, 1971; Tversky, 1991).

Research indicates that spatial imagery plays a crucial role in spatial problem-solving abilities. Pylyshyn (2003) argued that mental imagery is essential for manipulating mental representations, enabling individuals to simulate and predict outcomes of various spatial transformations. However, it's important to note that Pylyshyn's perspective challenges the idea of depictive mental imagery, instead proposing that spatial reasoning relies on propositional representations and tacit knowledge about spatial relations.

Contemporary perspectives on spatial imagery align with embodied cognition principles, emphasizing the importance of sensorimotor experiences in shaping spatial imagery (Wilson, 2002). Wilson and Golonka (2013) proposed that spatial imagery is grounded in sensorimotor experiences, with the body playing an active role in its formation. This embodied approach offers a potential explanation for the connection between gestures and spatial representations, suggesting that gestures, as a form of sensorimotor simulation, may facilitate the manipulation of mental images.

Newcombe and Shipley (2015) found that individual differences in spatial imagery proficiency can predict performance in spatial tasks such as mental rotation and navigation. Their research suggests that individuals with higher spatial imagery abilities are more adept at mentally manipulating objects and solving spatial problems requiring such manipulation.

Research on the development of spatial cognition provides valuable insights into how spatial representations and imagery abilities evolve. Newcombe and Huttenlocher (2003) propose that spatial development progresses through several stages, from early sensorimotor experiences to more abstract representational abilities. For instance, young children initially rely heavily on egocentric spatial representations, gradually developing the ability to use allocentric frames of reference as they mature.

A meta-analysis conducted by Uttal et al. (2013) of spatial training studies revealed that spatial skills are malleable and can be enhanced through targeted interventions across all age groups. This malleability indicates that the dynamic nature of spatial representations extends beyond immediate problem-solving contexts to longer-term developmental trajectories. The authors also discovered that different types of spatial skills (e.g., mental rotation, spatial visualization) demonstrate varying developmental patterns and responsiveness to training, emphasizing the multifaceted nature of spatial cognition.

These developmental perspectives highlight the importance of considering how the interplay between spatial representations, imagery, and gestures may change over time, potentially influencing an individual's approach to spatial problem-solving at different life stages.

AB Angerer, Benjamin
 Quite generic definition; reference is an older book that I don't have at hand to check. But Kosslyn 1994 defined clear differences between spatial and visual imagery that would need better explanation here, and are e.g. mentioned in an easily accessible and readable review of the topic (Sima et al. 2013)

AB Angerer, Benjamin
 Not exactly wrong, but a strange way of putting it and not really the point of this article

AB Angerer, Benjamin
 Strange jump from the discussion of Pylyshyn with no link provided (pasted paragraph?)

AB Angerer, Benjamin
 No mention of spatial imagery in this article (mental imagery in general though, also (non-imagined) spatial tasks)

AB Angerer, Benjamin
 Imagery (of any kind) is not mentioned in this article at all.

AB Angerer, Benjamin
 Theory and review chapter, not a study

AB Angerer, Benjamin
 Distinct stages are a Piagetian idea not embraced by N&H. No time to look up their exact claims (this is a lengthy book).

Anfang einer in mehreren Schritten generierte Beispielhausarbeit:

Rot: Zitate existierender Quellen, die aber nicht das behauptete enthalten / grün: Inhaltlich korrekte Zitate

Empfehlungen

- Prüfungsformate überdenken (gen.KI-Einsatz vermeiden / dessen Folgen abmildern / Einsatz inkorporieren?)
- Wo Modulbeschreibung und PO es erlauben, z.B. mehr Interaktion und Iteration in die Prüfungsformate einführen
- Studienleistungen im Hinblick auf Lernziele der Veranstaltung abwechslungsreich gestalten
- Bei Hausarbeiten
 - Testweise selbst Arbeiten generieren lassen (Gefühl für die (Un-)Fähigkeiten von LLMs für entsprechende Essaythemen/-formen entwickeln)
 - Quellen nicht nur auf Existenz, sondern auch auf Inhalt prüfen (meist reicht das Abstract)
 - Dazu: DOIs in der Bibliografie erfordern; idealerweise auch Sprungmarken von Zitat<->Bibliografieeintrag (erleichtert Nachprüfen enorm)

An der Uni Bielefeld: Interdisziplinäre Taskforce „KI in der Lehre“

- Interdisziplinäre Zusammenführung von Lehrenden, die bereits Erfahrung mit KI in der Lehre haben oder diese Technologie aktiv nutzen
- Offener Experimentierraum als Möglichkeit für Austausch und Erprobung
- Identifizierung und Verbreitung von Good Practice-Beispielen und spezifischen, didaktisch reflektierten Anwendungsszenarien
- Testen und reflektieren bestehender Tools
- Derzeit: Interne Evaluation von potentieller Web-Schnittstelle des BITS zu Sprachmodellen & Erstellen eines Selbstlernkurses mit Basiswissen für Lehrende und Studierende
- Kein reiner Technik-Club: Einbettung in didaktische, rechtliche, ethische etc. Diskurse
- Lehr-/Lernszenarien stehen im Vordergrund, nicht das Werkzeug („Lehre 1st, KI 2nd“)

An der Uni Bielefeld: Angebote

- Generative KI als Thema zum BI.Teach 2024 (20. November)
- In Arbeit: Universitäts-eigenes Interface (BIKI) zu externen Sprachmodell-Dienstleistern
- Zahlreiche Angebote im Workshop-Programm des ZLL für das WiSe (u.a. zu guter wiss. Praxis und „hack my exam“)
- Weitere Veranstaltungen im WiSe
- Individuelle Lehrberatung am ZLL
- ...

**Vielen Dank für
Ihre Aufmerksamkeit.**