Generative AI as a Research Tool: Potentials and Pitfalls

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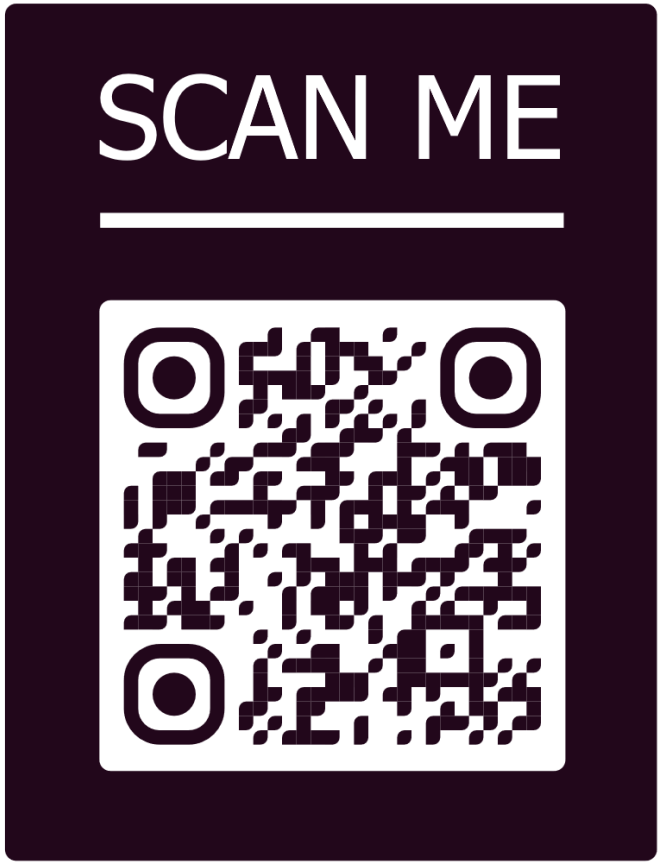
Intro



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What Is Generative AI?

Definition “Artifical Intelligence”

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“The study and construction of agents that do the right thing”

(Russell & Norvig, 2021, S. 22)

Types/Stages of "AI"

(Otte, 2023)

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	Stage	Capabilities	Examples
Fully computational AI	Deductive, logical AI	Understanding and applying rules	Programmable calculcator
	Inductive, learning AI	Identifying and applying rules	Classification & detection models
	Cognitive AI	Understanding, identifying, extending, and applying rules	Generative models
Only physically producible AI	Perceiving & self-perceiving AI	Cognitive AI with a mechanical body & sensors	In development
Only biologically producible AI	Feeling, wanting & Self-consciously wanting AI	Cogitive AI with a biological body (i.e., cells)	???

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Research is a Creative* Process – (How) Can Generative AI Help?

*Creativity = ability to create something novel and valuable

Kann a Deep Neural Network Be Truely “Creative”?

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- Generative ≠ creative

Following John R. Searle (1980) artificial neural networks are **“weak AIs”** that **cannot create something novel and valuable** as they **do not understand** the **meaning** of their inputs and outputs.

Searle, J. R. (1980). Minds, brains, and programs. *Behavioral and Brain Sciences*, *3*(3), 417–424. https://doi.org/10.1017/S0140525X00005756

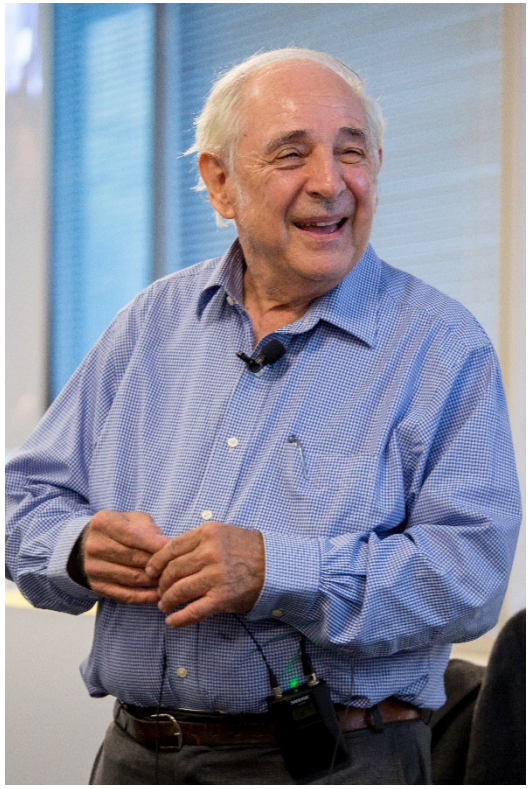

Image source:
Wikimedia Commons

“The Chinese Room”
(Searle‘s Response to the Turing Test)

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Potentials and Pitfalls of Generative AI as a Research Tool

Four Essential Rules for Integrating AI into Work and Life (Mollick 2024)

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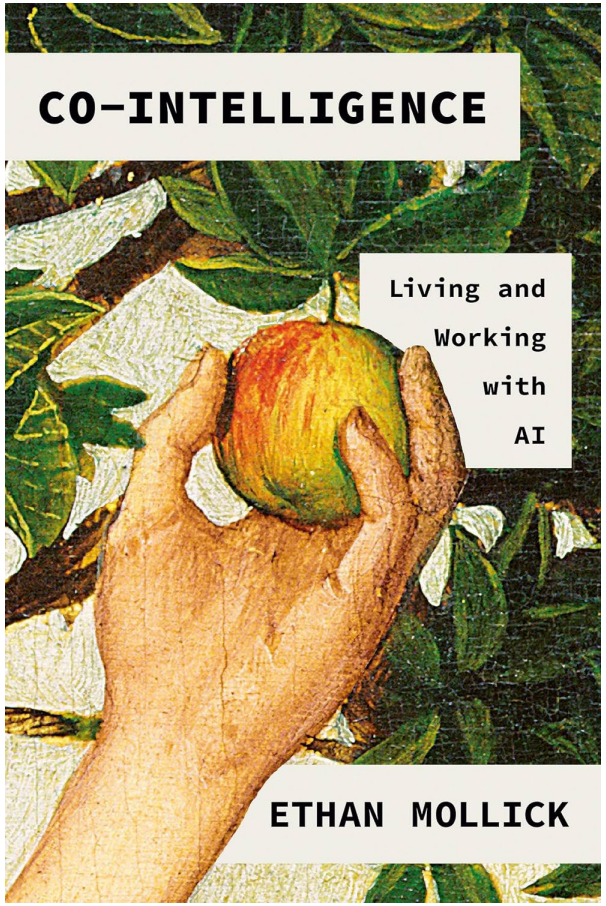
1. Always invite AI to the table.
2. **Be the human in the loop.**
3. Treat AI like a human. **(But tell it what kind of human to be.)**
4. **Assume this is the worst AI you will ever use.**



Task I: Finding research questions

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https://www.researchkick.com

LLM-based assistant (GPT 4)

Helps you formulate a concrete research question within a broader field

No free version

PM rating:
I am unconvinced!

Task II: Finding and summarizing relevant literature

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https://consensus.app
https://elicit.com
https://typest.io

- Three very similar applications
- Designed for answering yes/no questions based on scientific papers
- Summarize results of individual papers as well as the overarching state of research
- Varying extent to which they can be used for free

Task III: Finding sources you might have missed based on your reference list

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https://researchrabbitapp.com

- Not actually a generative AI application
- Helps you identify items that are lacking from your paper‘s references list, based on citations
- Displays citation network that lets you assess the centrality of a paper in the field
- Will not help you discover papers that have not been cited in the network

Task IV: Reading papers

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https://www.scholarcy.com
https://www.humata.ai

- AI assistants that help you read papers pre-defined by you
- Summarize papers & answer your specific questions to the papers
- Highlight exact passages within the papers that information has been taken from
- No (only very limited) free versions

PM rating:
Can be useful
Recommendation:
Humata

Task V: Writing code and analyzing data

(e.g. https://chat.openai.com)

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- By design, the strength of LLMs rests in understanding language and reproducing formal rules → This makes them ideal tools to help you…
  - …write programming code
  - …select data analysis strategies tailored to your RQ & data structure
  - …find meaningful labels for clusters within your data
- But keep in mind:
  - Everything stands & falls with your prompts!
  - Coding errors are always possible
  - Try to really comprehend how suggested code works / why an analysis routine is the right fit for your data
  - Stay critical!

Final Words

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- Just a short primer on what is possible already
- When trying stuff out, keep in mind:
  - Language models are good at dealing with language (also, see, editGPT, Grammarly, etc.) but not good at understanding complex differentiations and offering creative solutions
  - All applications are provided by commercial start-ups which want to make you believe you cannot do without their tools
  - Try to always understand how a tool is working, what limitations it comes along with, and judge all results critically against these
- PM´s rule of thumb: The more human decisions are involved, the more useful AI applications can be in a research context

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Thanks a lot for your interest!

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