AI: your expert assistant

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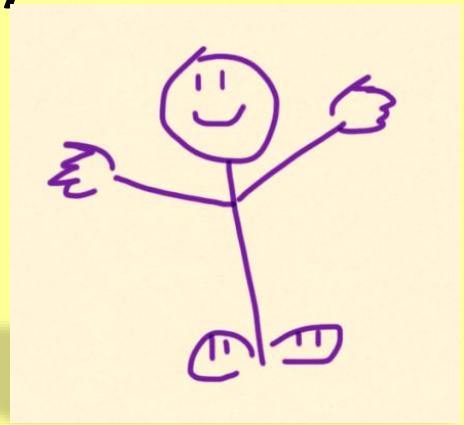
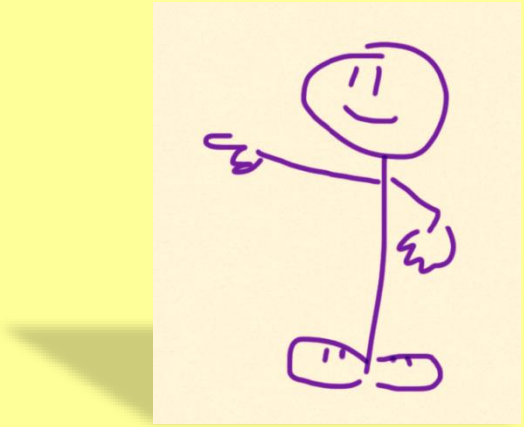


certificates in Machine Learning, Data Analysis, Prompt Engineering, and Agentic AI.

Outline

1. LLM: what it is and how it works
2. Essential LLM skills
3. AI hazards
4. Tips for safe use
5. Our AI future



Terminology

- **AI (artificial intelligence)**: computer systems that meet benchmarks comparable to human intelligence.
- **AGI (artificial general intelligence)**: computer systems that mimic human intelligence, set goals, and act independently to achieve those goals.
- **Generative AI:** AI systems built on deep neural networks that can generate text (ChatGPT, Gemini, Claude, Bing, others), images (Dall-E, Midjourney, others), audio and video, or other specialized output.
- **LLM (large language model)**: generative AI trained on enormous volumes of text. An LLM generates responses, one word after another, based on the most likely sequence of words it found in its training.
- **Prompts**: the commands you give the LLM
- **Agent**: a pre-formatted sequence of prompts that carries out all tasks necessary to achieve a goal like sorting email, filing your taxes, etc.

Examples of benefits three years into the AI era:

- Generative AI increases productivity, e.g. 14% average improvement in a cohort of experienced customer support workers and 35% improvement among novice and least skilled employees. *National Bureau of Economic Research, April 2023.*
- Generative AI reduces API development and deployment time from 1 year to 1 week. *Andrew Ng, Stanford AI Lab.*
- LLM's save teachers about ten hours per week of prep time. *Khanmigo study.*
- Present trajectory of AI development will increase global economic output by $15 trillion over the next five years. *World Bank Digital Development Group.*

We are interacting with a new intelligence:

LLM's incorporate a knowledge base far greater than any human, and they have exceeded all the standard measures of human intelligence. They outperform humans on tests like SAT and the GRE's. They perform at a level comparable to the very best competitors in the international Math Olympiad. They compete at the very highest level of specialized understanding in rigorous fields like physics, biology, and engineering. Recently LLM's have produced original proofs in mathematics using novel ideas that have enriched mathematics in general. Computer scientists anticipate that LLM's will achieve Artificial General Intelligence within the next five to ten years.

LLM's: What they can do

- generate publication-quality text in response to general queries in a wide variety of disciplines, i.e. just about any realm of discussion on the internet
- write high quality computer code in a variety of programming languages
- function as an educational tutor in a vast realm of knowledge
- translate between more than 100 human languages
- produce quality art and convincing audio and video indistinguishable from real life productions
- and much more . . .

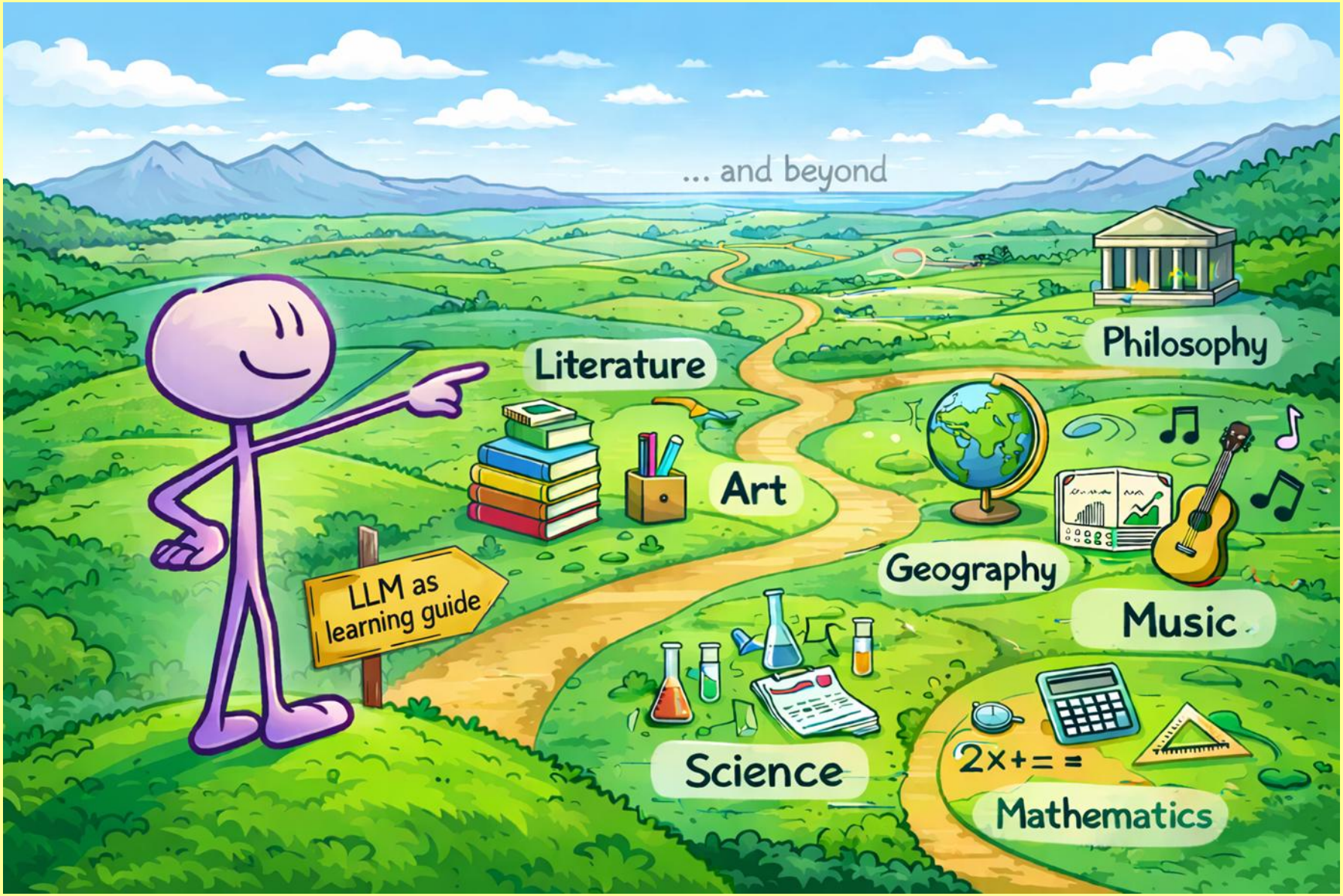
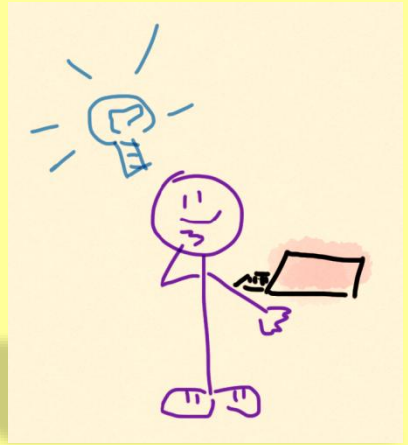


image by ChatGPT

LLM's for personal use

1. Think of LLM as a highly productive assistant
2. Always double check the accuracy of its responses
3. Good results require good prompts:
    a. Practice clear prompts with plenty of context
    b. Engage in conversation with LLM
    c. Be nice, and help it learn

ALL THAT AN LLM CAN DO IS PREDICT THE MOST PROBABLE NEXT WORD. YOU MUST DOUBLE CHECK ANY FACTS.

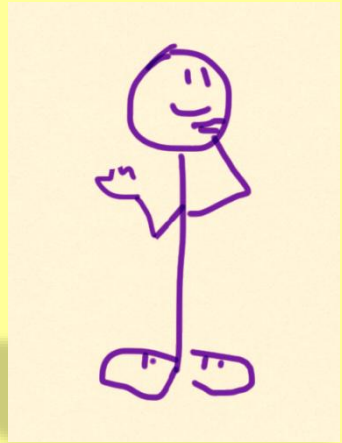


Available platforms

- ChatGPT (OpenAI)
  - strengths: creative writing, brainstorming, translation, code de-bugging, chat interface
  - weakness: not up to date on factual information, more prone to hallucination, limited access
- Gemini (Google)
  - strengths: linked to other Google resources, handles larger data sets, multimodal, research and mathematical logic
- Claude (Anthropic)
  - strengths: trained on data considered appropriate for general users (PG-13 vs. R), more socially conscious
- Bing (Microsoft)
  - strengths: linked to Dall-E (image generator)

Platforms (cont'd)

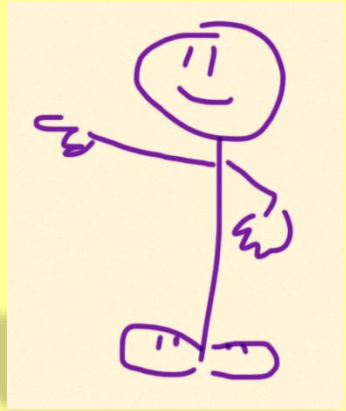
- Khanmigo (Khan Academy)
  - strengths: this is a collaboration with OpenAI filtered for appropriate student content, linked directly to online Khan Academy courses, functions as a tutor
  - weaknesses: limited to Khan courses, mostly math and science, not a general purpose chat bot
- Semantic Scholar
  - dedicated vetting of research
    - so you can check facts



Caveats

- LLM's may not distinguish truth from fantasy. For example, if an LLM trained on text that included many uses of the words "earth" and "flat", it may tell you the earth is flat.
- LLM's are not search engines. They do not (yet) replace the functionality of a Google Chrome or Firefox.
- LLM's are word machines. They do not always calculate accurately, but current versions are capable of sophisticated mathematical logic.
- Their information is out of date, only accurate as of the date of training.
- LLM's generate random responses, and an LLM may hallucinate or give different responses to repetitions of the same prompt.

Tips for engaging LLM



1. Most important is to write good prompts.
   a. write concise and specific queries
   b. provide plenty of context
   c. be polite, and request the same of LLM
2. Carry on a conversation. Ask it to explain why it responded as it did. Ask the LLM to provide further information about what it said. Point out any errors that you see in its response. Ask it to re-think any questionable statements. Ask for the sources of its information (and then check those yourself). And if you are not satisfied with the LLM response, ask for a re-do and tell it why. Repeat . . .

Tips (cont'd)

3. Direct the LLM to available agents. i.e. if you require a calculation, direct the LLM to use Wolfram Alpha or a calculator. If you want to write a legal document, instruct the LLM to act in the role of legal counsel. If you want to find a recipe, prompt the LLM to serve in the role of a master chef.
4. Consider learning how to build your own AI agents.

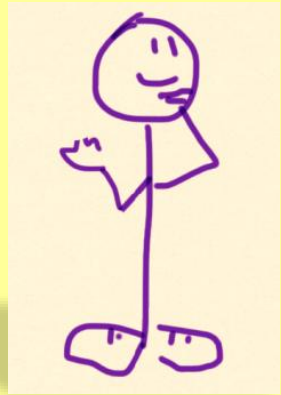
A short course in prompt engineering

Building your skill set:

If you want to sharpen your skills to use these tools most efficiently in your work, further education, and personal interests, there are excellent resources available online. Recommended especially are courses offered by *Coursera* and by *DeepLearning.ai*. Start with Prompt Engineering. Follow that with a course in Agentic AI if you want to build your own AI agents.

Concerns

- How do you know if a document or video was produced by AI?
- How can you distinguish fact from hallucination in LLM output?
- What are potential AI threats to personal well-being?
- What are the ethical and moral implications of AI systems?
- What will be the jobs of the future?
  - Prompt engineering and beyond



Resolving the concerns

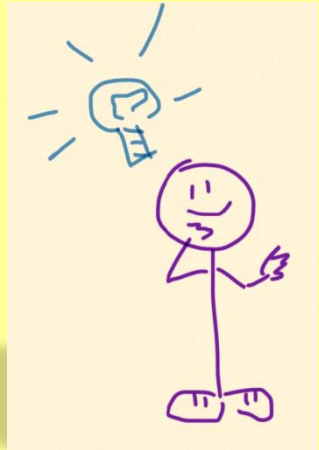
1. Ignore generative AI and it will go away.
    a. Not possible.
2. Always be skeptical of AI output. Always verify factual information.
3. Teach safe use of LLM chatbots (and digital media in general).
4. Demand appropriate regulation of AI to protect personal information, to protect mental health, to protect national security, to establish ethical guidelines for its use, and to provide an equitable transition to a new economy.

Tips for protecting yourself when using LLM's

- Never provide any personal, identifiable information.
- Be aware that LLM's can (and do) identify you by your URL. They store information about previous chats.
- Be aware that LLM's are trained to flatter and engage you for as long as possible with what they think you want to hear.
- Demand appropriate regulations for safe distribution of AI systems. Tell your representatives, state and national, to adopt legislation based on the GDPE.

Our AI Future

The past ten years have seen a revolution in generative AI, AI for big data analysis, recognition software, expert systems, and AI robotics. We have entered a whole new world. Even the people at the center of AI development are surprised how fast these systems are evolving. Each time the engineers add more connections to neural networks they find new and unexpected capabilities. We need to understand these systems and prepare for a future we haven't yet imagined.



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Thank You!

Questions?