DESIRE TO LEARN HANDOUT

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Exploring Generative AI: Exercises and Resources for Life Scientists

Biological Literature Synthesis

Use an AI summarization tool to condense a long research article into a short summary. Compare the AI-generated summary to your own version. What key points did the AI miss? How can you guide it to improve its focus?

Scientific Figure Interpretation

Try extracting information from a research graph by describing it to an LLM. Use tools like ChatGPT to ask questions about trends or implications of a graph. Reflect on how LLMs interpret visual data compared to human analysis.

Build Your First LLM Prompt Experiment

Use a free LLM tool (e.g., ChatGPT) to design prompts for generating insights about a biological process, such as protein folding or drug metabolism. Start with a simple question and refine your prompts to get deeper answers. Observe how prompt engineering changes the quality of responses.

Collaborate with an LLM to develop a Hypothesis

Input a research problem you are working on and ask an LLM for potential hypotheses. Compare these generated ideas with your current thinking. This exercise helps explore the AI's ability to support ideation and creativity.

Collaborate with LLM to develop persona patterns

Create a custom GPT with a specific persona using the Persona Pattern.

Format of the Persona Pattern

To use this pattern, your prompt should make the following fundamental contextual statements:

- Act as Persona X

- Perform task Y

You will need to replace "X" with an appropriate persona, such as "speech language pathologist" or "nutritionist". You will then need to specify a task for the persona to perform.

Examples:

> Act as a speech language pathologist. Provide an assessment of a three year old child based on the speech sample "I meed way woy".

Essential Reading for upskilling

Publications to read:

- Defining our future with generative AI: Suri, S. Defining our future with generative AI. *Nat Comput Sci* **4**, 641–643 (2024). PMID: 39317755   DOI: 10.1038/s43588-024-00694-5

- Attention is all you need.
  - Landmark paper on Machine learning: 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, 6000–6010.

- Conroy G. How ChatGPT and other AI tools could disrupt scientific publishing. Nature. 2023 Oct;622(7982):234-236. PMID: 37817033 DOI: 10.1038/d41586-023-03144-w

- GSM-Symbolic: Understanding the Limitations of Mathematical Reasoning in Large Language Models arXiv:2410.05229 [cs.LG]: https://arxiv.org/abs/2410.05229 Iman Mirzadeh, Keivan Alizadeh, Hooman Shahrokhi, Oncel Tuzel, Samy Bengio, Mehrdad Farajtabar - Apple

Blogposts to read:

- https://joakimedin.substack.com/p/has-apple-proven-that-large-language?r=3modbm&triedRedirect=true

Further Learning

Online Tools & Courses

Coursera's "Generative AI for everyone" or "Generative AI with large language models" are great starting points for hands-on learning.

Experiment with OpenAI API

If you're comfortable coding, consider experimenting with an API like OpenAI's to build simple applications that generate scientific content.

Challenge Yourself

Write a short reflection (200-300 words) on how you could use LLMs to support one of your ongoing research projects. This will help solidify the potential role of AI in your scientific workflow.