



Using GPT as a Political Science Researcher

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GPT



- ▶ **Generative Pretrained Transformer**
 - ▶ G: Predicts data that look like input data
 - ▶ P: Was trained/fitted on large data, can be used for general tasks; fine-tuning optional
 - ▶ T: A particular kind of deep-learning statistical model
- ▶ chatGPT = GPT “finetuned” on examples of question - response pairs



What does GPT do?

Suppose we give an LLM the prompt “The first person to walk on the Moon was”, and suppose it responds with “Neil Armstrong”. What are we really asking here? In an important sense, we are not really asking who was the first person to walk on the Moon. What we are really asking the model is the following question: Given the statistical distribution of words in the vast public corpus of (English) text, what words are most likely to follow the sequence “The first person to walk on the Moon was”? A good reply to this question is “Neil Armstrong”.



It is dangerous to anthropomorphize GPT

- ▶ It is easy to ascribe human-ness or human characteristics to GPT
- ▶ “GPT says...”, “GPT thinks...”, “GPT believes...”
- ▶ “My phone thinks we’re in the car park” (Shanahan) is common and fine
- ▶ We need to be mindful of how GPT works in order to use it intelligently & avoid mistakes



Silly GPT Mistakes

Is 29.5 days longer than 40?

Yes, 29.5 days is longer than 40 days. A day is a unit of time that is equal to the time it takes for the Earth to complete one rotation on its axis. The length of a day is usually measured in hours, minutes, and seconds, and a day is typically divided into 24 hours. In the Gregorian calendar, which is the most widely used calendar system, a month is typically defined as the time it takes for one full moon to occur and pass, which is about 29.5 days. This means that a month is longer than 40 days, because 29.5 is greater than 40.



Are there less than 40 days in a month?

No, there are more than 40 days in a month. A month is a unit of time that is commonly used to measure the duration of time between two dates. The length of a month varies depending on the calendar system that is being used. In the Gregorian calendar, which is the most widely used calendar system, a month is typically defined as the time it takes for one full moon to occur and pass. This means that a month is about 29.5 days long. Since 29.5 is less than 40, there are more than 40 days in a month.





Hallucinations

les [Playground](#)

Playground

A reference for an academic paper on how to introduce GPT to political science master students:

1. Heng, Matthew. "Introducing GPT-3 to Political Science Master Students." *International Journal of Technology and Human Interaction*, vol. 17, no. 5, 2021, pp. 1–9.
2. Brown, David J., et al. "GPT-3 as a tool for political science research: a case study." *International Journal of Human-Computer Interaction*, vol. 36, no. 5, 2020, pp. 521–537.
3. Schumann, Steffen. "GPT-3 in political science: a critical examination." *Political Science Research and Methods*, vol. 8, no. 3, 2020, pp. 593–607.
4. Del Prete, David, et al. "GPT-3: a case study of the potential use of natural language processing in political science." *AI & Society*, vol. 35, no. 3, 2020, pp. 369–379.
5. Kwon, Min-Seok, et al. "GPT-3 in political science: a review of applications, opportunities, and challenges." *Political Analysis*, vol.



Interacting with GPT & Mistakes

- ▶ I've had interactions that went as follows:
 - ▶ Me: "Can you give me R code that does [task]?"
 - ▶ GPT: "Sure, here is [code]"
 - ▶ Me: "Mmh, when I run [code], I get this [error]. Can you correct this?"
 - ▶ GPT: "Sure, here is [corrected code]"
- ▶ The corrected code works. Why didn't GPT give it to me in the first place?



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- ▶ *Because GPT predicts the next words, given some input words*



Implications for working with GPT

- ▶ No 100% guarantee that things will work
- ▶ No guarantee that things that seem to work now/for some questions will not stop working later/for similar questions
 - ▶ This is true for all things in life (except Math)
- ▶ Need to skilfully navigate & test the model
- ▶ Don't use it for Math (as of June 2023)



Use GPT iteratively

- ▶ Ask GPT
- ▶ Give feedback on answer
- ▶ Simplify
- ▶ Try out stuff



Impact of GPT on coding work

- ▶ Still need to be able to read code
- ▶ Asking the right questions is key
- ▶ Danger of being “dumbed down”
- ▶ Cf. introduction of calculators



Practical issues

- ▶ chatGPT-3.5 in the browser is free: chat.openai.com
- ▶ chatGPT-4 costs 25 USD
- ▶ API: chatGPT-3.5 costs 0.0015 US cents / 1000 tokens (750 words)
 - ▶ Announced today:
 - ▶ Price reduction by 25%
 - ▶ More expensive model with 16k tokens context length (instead of 4k)
 - ▶ Function calling
- ▶ <https://platform.openai.com/>



Calling the openAI API via R

- ▶ `max_tokens` controls length of output
 - ▶ tokens cost money; tailor to your needs
- ▶ `temperature` b/w 0 and 1 controls “randomness” or creativity of GPT
 - ▶ `temperature = 0` is deterministic and useful for summarization tasks
- ▶ Prompts should not end with a whitespace
- ▶ Be mindful of string formatting, escape characters etc.
- ▶ openAI has good documentation:
<https://platform.openai.com/docs/models>



Prompt engineering; zero-/few-shot learning

- ▶ The science/art of writing a good prompt is called prompt engineering
- ▶ Canonical structure:
 - ▶ [Optional instruction/explanation]
 - ▶ [Optional Input/Output examples]
 - ▶ “Input text”
 - ▶ “[Answer/Response/Label/...]:”
- ▶ Zero-shot learning: No examples, perhaps not even instructions
- ▶ Few-shot learning: around 1-5 examples
- ▶ Because we are using a “machine learning” model to predict something, this is an instant of “learning” (although model itself is not updated)



Things to watch for

- ▶ GPT plugins: Lets chatGPT scrape web search results, interact with websites, code in Python (!)
- ▶ Lots of open-source models being fitted and released (some of which approach GPT-3.5 capabilities)
- ▶ langchain: Python package to neatly work with complex and structured calls to LLM APIs