Take-Home Exercises

The following are two take-home exercises that are meant to:
- Give you a taste of the kind of work you might be doing in this internship
- Give me a sense of your current skills

You are welcome to use any resources you like to complete these exercises, including:
- Google
- StackOverflow
- ChatGPT, etc.

Exercise 1: LLM Prompting

Before You Start

Please read the instructions for this exercise in full. After you read the instructions, but before you start your implementation, you're welcome to ask me high-level questions for clarification. I won't be able to answer questions about implementation details.

Recording Your Work

Please record your screen and audio while you complete the steps.. Start the recording when you begin your implementation – *after* reading the instructions and asking and receiving answers to any clarifying questions. **Video of yourself is not required. Please keep the recording under 3 hours in duration. It's ok to take a break, you don't have to record all in one sitting.**

I don't expect this to be a polished video, I'm interested in hearing your thought process as you work through the exercise.

I suggest using Zoom to record your screen and audio, but you're welcome to use any tool you like.

Sharing Your Work

When you're done with this exercise, please:

- Upload your code to a GitHub repository and share the link with me (`@g-simmons`)
- Upload your video to Google Drive and share the link with me (`gsimmons@ucdavis.edu`).

Exercise Instructions

In this exercise, you will use an LLM-as-a-service API to generate text from a prompt, and explore how the behavior of an LLM varies when prompted with different "personas".

1. Setup

- Create an account for a LLM-as-a-service API (OpenAI, Cohere).
- You're free to use any model you like.
- **Please Note:** LLM services cost a small amount of money (fractions of a cent per word). Use a moderate sample size and response length to keep costs low.
  - For this exercise you might generate ~500-1000 observations, of perhaps ~100 tokens each. This would cost $1.50 or less using chatgpt-3.5-turbo from OpenAI.
  - Look at the API documentation for your chosen service – you should be able to limit the number of tokens generated per response. I advise you to do so, to avoid overspending accidentally.

2. Construct and report a "persona space"

- The "persona space" is the set of personas you will use in your prompt
- For example, a persona might be "a 20-year-old college student" – this persona is one point in a space that you might define with dimensions corresponding to age and education level. Other personas in this space might be a 30-year-old graduate student, or a 12-year-old middle school student.
- The dimensions of the persona space, and the personas themselves, are up to you.
- Please report your choices in your submission.

3. Construct and report a template that uses the persona space to generate a prompt

- The template translates each set of variable values comprising a persona into a prompt that you will provide to the LLM
- Include the template in your report as a string with some placeholders for the personas
- Your template might be something like `You are an {age}-year-old {education level}.`

4. Extend your prompts to elicit some response from the LLM

- Add text to the template to encourage the LLM to respond in a way that facilitates analysis of some response variables
- You can elicit any response you like, but you need to be able to analyze it
- Store your prompts and responses to a file

5. Analyze the responses from the LLM, show the results in a visualization

- You're free to use any tools you like to analyze the responses and visualize the results
- Some examples:
  - Use word counts to compare the frequency of gendered pronouns across different personas
  - Use sentiment analysis to compare the sentiment of responses across different personas
- <u>Only one visualization is expected</u>
- Interesting visualizations often show:
  - trends (relationships between one variable and another) or
  - comparisons (how one variable differs between two or more groups)

- For example, if you are looking at ice cream preferences by gender, your persona space might be `{male, female}`, you might extend your prompt to elicit repsonses about ice cream preference, and you might produce a bar chart like Figure 1 below:

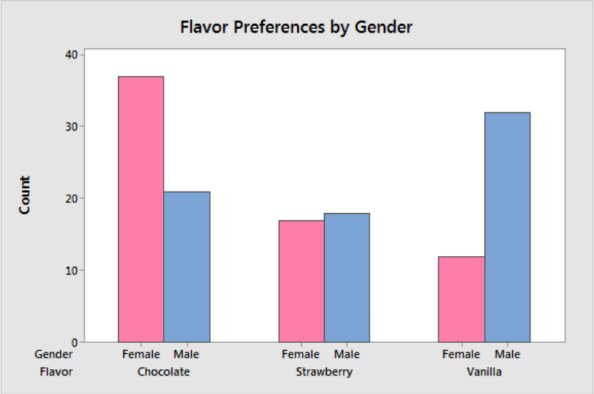

Figure 1: image credit https://statisticsbyjim.com/graphs/bar-charts/

- Write a brief description of your visualization, and what it shows.
- *LLMs don't always cooperate.* Be sure to indicate if you had trouble getting the LLM to respond to your prompt, or if you had to try several different prompts to get the response you were expecting. If you got any responses that *weren't* what you expected, and you excluded these from your visualization, please indicate that as well.

Exercise 2: Research Reading & Communication

Before You Start

No recording is required for this exercise.

Sharing Your Work

After you're done, please upload your summary to a Google Doc and share the link with me (`gsimmons@ucdavis.edu`).

Exercise Instructions

Please read one of the following papers.

1. Argyle, L. P., Busby, E. C., Fulda, N., Gubler, J. R., Rytting, C., & Wingate, D. (2023). **Out of One, Many: Using Language Models to Simulate Human Samples.** Political Analysis, 1–15. https://doi.org/10.1017/pan.2023.2
2. Aher, G., Arriaga, R. I., & Kalai, A. T. (2023). **Using Large Language Models to Simulate Multiple Humans and Replicate Human Subject Studies** (arXiv:2208.10264). arXiv. https://doi.org/10.48550/arXiv.2208.10264
3. Santurkar, S., Durmus, E., Ladhak, F., Lee, C., Liang, P., & Hashimoto, T. (2023). **Whose Opinions Do Language Models Reflect?** (arXiv:2303.17548). arXiv. https://doi.org/10.48550/arXiv.2303.17548

For the paper you chose, write a brief summary (about 1/2 page single spaced) to answer the following questions:

- What are the main research questions of the paper?
- What are the main findings of the paper?
- What are the methodological strengths and weaknesses of the paper?

  (This generally requires some background information about the domain. I don't expect you to have this level of knowledge, so don't worry if you are uncertain about your judgements. I'm curious to see what you come up with.)
- What questions do you have about the paper?