

Using AI Personas for Capstone
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During the Spring 2023 semester, I integrated generative artificial intelligence (AI) tools into the capstone course for Computer Science students. I encouraged my students to experiment with tools such as ChatGPT and GitHub Copilot, and I shared my own experiments and results with my students. A summary of those experiences is available at this link: <https://maherou.github.io/files/papers/2023-05-31-Embracing-Generative-AI-Tools-for-Capstone-Heroux.pdf>. During the Fall 2023 semester, I plan to build on the experiences and lessons learned from last semester. One key theme I plan to explore this semester is creating and using *personas* with ChatGPT.

ChatGPT as an Intellectual Companion

Much is written in news articles about the risks and improper use of generative AI tools. However, in my personal experience, I have found ChatGPT and similar tools to be excellent intellectual partners. I can converse about many topics, learn a lot, get new insight, and take the responses with some healthy skepticism. The conversation is not unlike one I would have with a colleague while at lunch or on a walk! I find that the more context I provide prior to asking a question and the more I refine my requests in a conversation thread, the more meaningful the responses are.

Personas

One way to view a generative AI inference engine is as a highly under-constrained search space for a response to a given prompt. For simple prompts without context, the response you receive from the engine after submitting the prompt is the best guess from hundreds of other reasonable guesses. Providing additional information that guides how the engine should respond will generally improve the quality of its output. Creating a persona—a description of a real or imagined person—can effectively narrow the set of possible responses and improve their relevance.

Personas are used in many areas of research and development. When creating a product such as a software application, a development team may create and use multiple personas that represent key types of users and can guide the process of collecting requirements, making design choices, and testing if product features match a variety of user needs.

Contexts

In addition to describing the role the engine should assume as it produces a response to a prompt, *context* provide additional information about the task you are giving the engine. Context provides details about the goal—what is the purpose of the task, what are

some constraints on the output, and similar information that would make the response more appropriate and useful.

Scenarios: Using Personas with Contexts to Support Research Activities

I plan to use personas with contexts this semester to precondition generative AI behavior. ChatGPT supports the concept of *Chats*. Each chat is a separate thread of conversation between ChatGPT and the user. A chat can be brief or very long, with multiple exchanges. Much has been written about *prompt engineering* to improve the quality of a prompt response. Personas with contexts provide a specific model of prompt engineering that enables humans to create a virtual embodiment of a character with situational details that lead to better prompt responses. From my initial experiments using personas, I find that they provide an evocative and effective strategy for adapting the behavior of ChatGPT to various situations.

Given a set of personas, I can combine them with a context to create a scenario that defines the prompt and then ask the AI engine to respond to the prompt.

Here are a few sample scenarios I plan to use this semester:

- **Scenario: Select a capstone project research topic.** At the beginning of the semester, each student must determine a topic to serve as the foundation for their semester-long research project. The topic must satisfy a few criteria (significant computer science content, accessible to the student based on their background and education, and more) and should be of interest to the student.
 - **Student persona:** Each student will create a persona that describes their background, experience, and interests.
 - **Context:** The research topic must satisfy course requirementsPreconditioning a ChatGPT thread with this persona—a representation of the student for the purposes of the course—each student will converse within the ChatGPT thread to brainstorm about candidate research topics.
- **Scenario: Identify weak arguments in my paper.**
 - **Topic expert persona:** Preconditioned with reference content that conveys the domain of expertise. The student can use this persona to converse about topic details.
 - **Context:** Draft student paper, related peer-reviewed content.
- **Scenario: Improve text clarity through efficient word use.** One theme of the capstone course is efficient use of text. Word count reduction has strong correlation with improved technical prose clarity. ChatGPT can itself provide strategies for reducing word count, then uses those strategies on a given text body to reduce word count, and explain which strategies were used.
 - **Efficient-text editor persona:** Singular purpose persona that focuses on reducing word count while retaining the same meaning.
 - **Context:** Set of strategies for reducing word count (could be generated by ChatGPT too).

Many personas may be beneficial in research and development. My goal is to explore them and keep a catalog of persona descriptions that can be copied and pasted into a new chat thread with relevant context and ask the AI engine to provide a response for a specific task. In this way, I am establishing my collection of research advisors who can assist me in the research process.

I am sharing my thoughts with the faculty at the beginning of the semester in case the personas and contexts approach appears attractive for your own teaching activities. I intend to report my experiences at the end of the Fall 2023 semester.

Final note: While I will continue to embrace generative AI tools in my course as I did last semester, I will also continue to emphasize that students must take responsibility for the content of their papers. Generative AI tools can only be used to accelerate the finding and learning process, not replace it.

Appendix

Below I have attached a sample persona-context scenario prompt and the ChatGPT 4.0 response. The response provides a collection of ideas that the made-up student, Mike Herman, can consider and further explore as candidate research topics. Previously, this kind of specific information would require a couple of weeks for the typical student to assemble and would not be as well informed or as broad a set.

Scenario: Suggest capstone course research topics

---- Copy and paste into ChatGPT 4.0 text window (<https://chat.openai.com/?model=gpt-4>) ----

Persona

Name: Mike Herman

Coursework: Intro to computer science, software development, algorithms, computer organization, databases, computer ethics, agile software development, differential and integral calculus, intro psychology, intro social science

Interests: Computer gaming, chess, baseball, new ideas in technology

Things I don't find interesting: Cooking, sophisticated movies, loud music

Context

A good research topic must positively answer the following questions:

1. Does it have a significant computer science component? (Does it require your computer science background to do the research?)
2. Are there sufficient high-quality resources at your disposal?
3. Is it an active field in the computer science community?
4. Can I develop a demonstration or prototype capability in this topic area?
5. Is there intellectual substance to this topic?

Task: Generate a list of possible research topics I could pursue for my semester-long capstone course in computer science

ChatGPT 4.0 Response

Certainly, Mike! Based on your coursework, interests, and the provided context, here's a list of research topics that might align with your requirements for your semester-long capstone course:

1. AI in Computer Gaming:

- Significant computer science component: AI and Machine Learning algorithms.
- Resources: Game engines, AI frameworks.
- Active field: Continual development in AI and gaming.
- Prototype: Develop an AI-driven non-player character in a game.
- Intellectual substance: Exploration of cognitive behaviors, decision-making, and learning techniques.

2. Algorithmic Trading Strategies in Baseball Player Performance Prediction:

- Significant computer science component: Data analysis, algorithms.
- Resources: Publicly available baseball statistics, machine learning libraries.
- Active field: Sports analytics.
- Prototype: Implement a predictive model for player performance.
- Intellectual substance: Statistical modeling, algorithm development.

3. Quantum Computing in Chess Algorithms:

- Significant computer science component: Quantum computing, algorithms.
- Resources: Quantum development kits, chess databases.
- Active field: Quantum computing.
- Prototype: Implement a quantum chess-playing algorithm.
- Intellectual substance: Quantum mechanics, algorithmic complexity.

4. Blockchain Technology for Secure Data Management in Databases:

- Significant computer science component: Cryptography, databases.
- Resources: Blockchain platforms, database systems.
- Active field: Data security.
- Prototype: Develop a blockchain-secured database.
- Intellectual substance: Security measures, decentralization.

5. Ethics and Bias in AI Algorithms:

- Significant computer science component: AI, Ethics.
- Resources: AI frameworks, literature on ethics.
- Active field: AI ethics, bias detection.
- Prototype: Develop a bias-detection system.
- Intellectual substance: Ethical considerations, algorithm fairness.

6. VR/AR Applications in Agile Software Development Environments:

- Significant computer science component: Virtual Reality/Augmented Reality, Software Development.
- Resources: VR/AR development tools, agile methodologies.
- Active field: Agile development, human-computer interaction.
- Prototype: Create a VR/AR tool for agile project management.
- Intellectual substance: Human interaction, software engineering principles.

7. Personalized Education through Machine Learning:

- Significant computer science component: AI, personalized learning.
- Resources: Educational datasets, machine learning frameworks.
- Active field: EdTech, AI in education.
- Prototype: Develop a personalized learning algorithm.
- Intellectual substance: Learning theory, algorithm design.

These topics should provide a rich ground for exploration, aligning with your background and interests in computer science, and satisfying the requirements outlined for your capstone course.