

Integration of Generative AI Tools in Computer Science Research

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ChatGPT as an Intellectual Companion



NEWS ARTICLES ON RISKS
VS. PERSONAL
EXPERIENCE



BENEFITS OF CHATGPT AS
AN INTELLECTUAL
PARTNER



IMPORTANCE OF
CONTEXT IN ASKING
QUESTIONS



REFINING REQUESTS FOR
MORE MEANINGFUL
RESPONSES

In my personal experience, ChatGPT and similar tools are 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!

About Personas

AI inference engine is an under-constrained search space

Personas are an intuitive way to provide guidance

Personas effectively narrow the set of possible responses

Persona—a description of a real or imagined person—can effectively narrow the set of possible responses and improve their relevance.

Usage of Personas in R&D

Role in software
application
development

Personas guide
requirements,
design, and testing

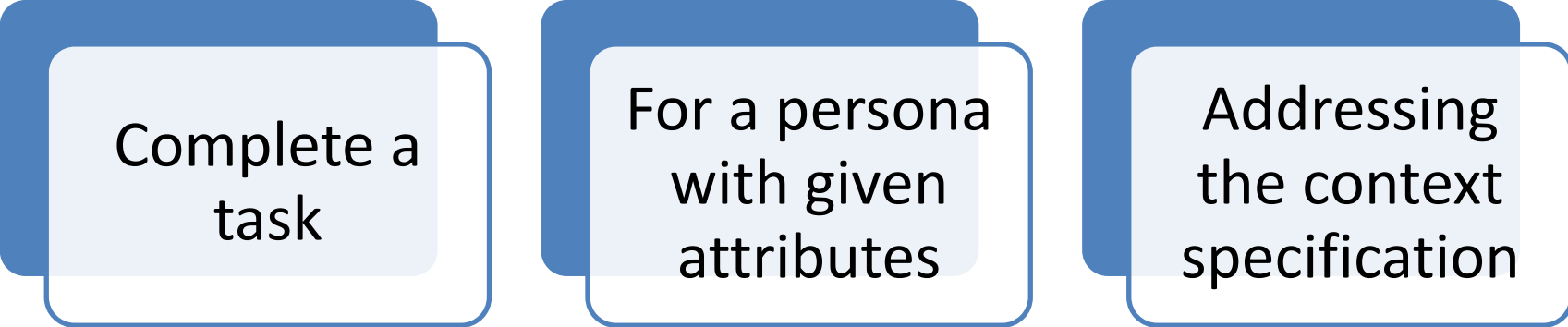
Matching product
features with user
needs

Role of Contexts

Provides task details and goals

Context ensures appropriateness and utility of responses

Scenarios: Using Personas with Contexts



Complete a
task

For a persona
with given
attributes

Addressing
the context
specification

Sample Scenarios

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.

- **Student persona:** Each student will create a persona that describes their background, experience, and interests.
- **Context:** The research topic must satisfy course requirements

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.

- **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)

Scenario: Suggest capstone course research topic

---- Copy and paste into our virtual CS373 assistant ----

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Prompt

Based on the following information about me, generate a list of 3 possible research topics for the state-of-the-field project that I could pursue that would help me succeed in the course

My 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

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

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

Give me details about why each topic would be a good choice. Give me specific details about what algorithms I would need to learn to do a good job

Virtual assistant response

Based on your coursework and interests, here are three potential research topics for your state-of-the-field project in the CSCI 373 course, along with justifications and relevant algorithms you would need to learn:

Artificial Intelligence in Computer Gaming:

Relevance: Your interest in computer gaming aligns perfectly with this topic. The field of AI in gaming is rapidly evolving and offers a plethora of research opportunities.

Coursework Connection: Your background in algorithms and software development will be crucial in understanding and developing AI systems for games.

Algorithms to Learn:

Pathfinding Algorithms (e.g., A*, Dijkstra's algorithm) for NPC movement.

Decision Trees and Machine Learning algorithms for adaptive and intelligent NPC behavior.

Reinforcement Learning for dynamic game balancing and NPC skill adjustment.

Data Analysis in Sports: A Focus on Baseball:

Relevance: Merging your interest in baseball with your computing skills could lead to fascinating insights in sports analytics, a field that's gaining immense popularity.

Coursework Connection: Your knowledge from databases, algorithms, and introductory courses in social sciences and psychology could be valuable in understanding and analyzing player statistics, team strategies, and fan psychology.

Algorithms to Learn:

Regression Analysis and Time Series Analysis for performance prediction and trend analysis.

Clustering Algorithms (e.g., K-Means) for player segmentation based on performance metrics.

Association Rule Learning for discovering interesting relations between different statistics.

Chess Engine Development and Optimization:

Relevance: As a chess enthusiast, you would find it rewarding to delve into the computational aspects of chess engines, exploring how computers simulate and strategize the game.

Coursework Connection: Your skills in algorithms and computer organization would be directly applicable in understanding and improving chess engine performance.

Algorithms to Learn:

Minimax Algorithm with Alpha-Beta Pruning for decision-making in chess.

Evaluation Functions for assessing chessboard positions.

Machine Learning techniques for strategic play based on historical game data.

Each of these topics leverages your academic background and personal interests, providing a rich ground for a comprehensive and engaging state-of-the-field project. The specific algorithms mentioned are integral to these areas and will enhance your understanding and ability to conduct in-depth research.

Goal for the Semester

Exploration and
cataloging of
personas

Using personas as
virtual
embodiments for
specific tasks

Establishing a
collection of
research advisors
for assistance

Final Note



We will embrace
generative AI tools in
this course

You must take
responsibility for the
content of your papers
& presentations

Generative AI tools can
only be used to
accelerate the finding
and learning process,
not replace it