Chair for Human-Centered Technologies for Learning
Technical University of Munich

Empathy in the Machine: How Avatar Personalities Shape Human Learning Experience

Mid-term Project Progress Overview

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1. Current Project Status

At the time of submission, the project has a functional prototype of an avatar-supported, LLM-based educational system. Two avatar personalities (supportive and neutral) have been fully implemented and integrated with structured psychology learning scenarios. The system supports interactive tutoring, quiz-based feedback, and adaptive behavior in the supportive condition.

Multiple system prototypes were developed to support iterative testing, including Streamlit- and Gradio-based versions with and without avatar visualization. Preparations for a controlled user study are underway, including questionnaire drafting and study design. The project is currently transitioning from system development to evaluation and data collection.

2. Overview of Completed and Ongoing Tasks

Task	Description / Outcome	Responsible Member(s)	Status	TODO / Next Steps
Initial project ideation & weekly discussion	Participated in the initial and weely group meeting, contributed ideas on project direction, research focus, and potential methodological approaches.	All	Completed	Further refinement of research questions

Shared workspace & group coordination	Organized internal group workflow, established shared online workspace (Word, PPT), and coordinated group communication.	Araks Karapetyan	Completed	Maintain coordination and documentation
Project concept, learning structure & literature review	Defined project goals, designed learning structure, reviewed relevant literature, and planned semester workload.	All	Completed	Formalize background and related work
Pitch 1 presentation PPT	Prepared slides for the first project pitch presentation.	Araks Karapetyan; Yiyang Xie; Yusong Yang	Completed	Incorporate feedback
Pitch 1 presentation	Delivered the first project pitch presentation.	Brishila Firza	Completed	Incorporate feedback
Learning scenarios 1–5 (content, prompts & quizzes)	Designed detailed learning content, system prompts, and quiz questions for five psychology topics.	Araks Karapetyan(S1); Brishila Firza(S2); Yiyang Xie(S3–5)	Completed	Refinement after user testing
Prompt design, avatar & chatbot integration	Implemented prompt logic, LLM-based chatbot, and avatar behavior using Python in a web-based UI.	Yiyang Xie	Completed	Improve robustness and UX
LLM deployment & technical setup	Configured OpenAI API access, token control, and development environment.	Yiyang Xie	Completed	Optimize performance and cost
Debugging & internal mentoring	Conducted debugging, system testing, mentor consultations, and recorded an instructional video for group members.	Yiyang Xie	Ongoing	Continue iteration
Mid-term report preparation	Compiled and edited the mid-term report content. Structured, wrote, and formatted the mid-term report using LaTeX.	All	Completed	Reuse structure for final report

Authoritative avatar (optional)	Optional design of an authoritative teaching persona for comparison.	Araks Karapetyan	Planned	Implement prompt logic
User study questionnaire	Created an initial questionnaire including demographics, Likert-scale items, and pre/post knowledge questions.	All	Ongoing	Finalize study protocol
User study analysis	Post-study survey to analyse people interaction with the avatar.	All	Ongoing	
Final report preparation	Compiled and edited the final report content.	All	Ongoing	

Upcoming Work Summary

The next phase of the project will focus on improving system functionality, enriching domain knowledge, and completing the empirical evaluation. Specifically, planned tasks include integrating speech support for the avatar, optimizing response speed and verbosity, and clarifying the avatar's assumed prior knowledge to better guide user interactions. In parallel, the psychological knowledge base of the avatar will be expanded to ensure accurate and pedagogically meaningful responses. The collected user study data will be analyzed to compare the effectiveness of different avatar personalities on learning outcomes and user experience. Finally, the group will prepare a video presentation demonstrating the system, experimental design, and preliminary findings.

3. Development Artifacts and Tools

Implemented Code Files

- `chatbotScript.py`: Core chatbot logic and reusable LLM interaction functions
- `SafePredifine.py`: Utility functions, safety logic, and predefined configurations
- `appSimuChatGPT.py`: Streamlit prototype (version 1) without avatar
- `app0avatar.py`: Streamlit testing version without avatar
- `app2avatar.py`: Streamlit version 2 with integrated 3D avatar
- `appGradio.py`: Gradio-based chatbot prototype without avatar

Libraries and Frameworks Used: OpenAI API, tiktoken, Streamlit, Gradio

4. Missing Components and Planned Work

Currently incomplete: Speech support for the avatar, implementation of the authoritative avatar personality, and finalized user study protocol.

Planned next steps: Finalize the user study design, conduct data collection during the break, analyze results, extend the system with an authoritative avatar, and prepare the final presentation and report.

5. Conclusion

The project has reached a stable and functional mid-term state. Core system components, learning scenarios, and two avatar personalities have been successfully implemented, and the project is well positioned to proceed with evaluation and data collection.