Online-Journals.org

iJIM International Journal of Interactive Mobile Technologies

iJIM | eISSN: 1865-7923 | Vol. 20 No. 12 (2026) | OPEN ACCESS

https://doi.org/10.3991/ijim.v20i12.62164

PAPER

Mind Harbor: Development of an AI-Powered Prototype for Student Mental Health Support

Sherin Thomas, Jaishree Devi, Marwa Said Amur Al Khuitari, Ramesh Palanisamy(✉)

University of Technology and Applied Sciences, Ibra, Sultanate of Oman

ramesh.palanisamy@utas.edu.om

ABSTRACT

This paper presents the development of a prototype for a system called Mind Harbor; an AI-based platform aimed at supporting the mental health of university students. It builds on our earlier study, Mind Harbor: Navigating Wellness Together—with AI Integration, which identified the need for socially sensitive and accessible mental health support in Oman. In this second phase, we move from concept to implementation. The system uses a chatbot powered by a large language model (LLM) to provide empathetic and context-aware conversations with students. The prototype follows human-centered design principles to ensure it feels supportive and non-judgmental. It includes a simple web and mobile interface, basic privacy through username-and-password login, and culturally adapted responses. The system architecture has four main layers: user interface, application layer, LLM integration, and data management with MongoDB. Features such as a mood tracker, guided prompts, and a crisis support button are included to make the platform more useful and safer. While the system is still in its early stage, this paper provides details of the design, development, and integration process. It also outlines privacy safeguards, limitations, and planned improvements. The prototype serves as a foundation for future testing, expert review, and stronger security features.

KEYWORDS

AI-powered mental health support, large language models (LLMs), university student well-being, human-centered design, chatbot-based intervention

1 INTRODUCTION

The mental health of university students is a serious concern, with problems like anxiety and depression often affecting their studies, social life, and personal growth. In Oman, as in many other countries, heavy academic pressure, competition, and social expectations have made these challenges even harder.

In our earlier research, Mind Harbor: Navigating Wellness Together—with AI Integration, we showed that many students face these issues but hesitate to seek help. Common reasons include fear of shame, lack of privacy, and the absence of

Thomas, S., Devi, J., Al Khuitari, M. S. A., Palanisamy, R. (2026). Mind Harbor: Development of an AI-Powered Prototype for Student Mental Health Support. *International Journal of Interactive Mobile Technologies (iJIM)*, 20(12), pp. 100–112. https://doi.org/10.3991/ijim.v20i12.62164

Article submitted 2026-01-16. Revision uploaded 2026-02-16. Final acceptance 2026-03-07.

solutions that fit their culture. To address this, we proposed Mind Harbor, a safe, technology-based platform where students can share their feelings with an empathetic AI chatbot powered by a large language model (LLM). Chatbots, or conversational agents, are digital tools that use AI to mimic human-like interaction and provide task-oriented conversations [13].

This second phase of our work focuses on moving from concept to early-stage implementation. Our goal is to develop a working prototype of Mind Harbor that integrates LLM technology with a straightforward, user-friendly interface. The system includes basic privacy through username-and-password login and is designed to communicate in an empathetic and culturally sensitive way. In this paper, we describe the design principles, system architecture, and development process of the prototype, including chatbot integration and interface design. We also outline how the system will be tested and the improvements we plan for privacy, safety, and personalization in future versions.

1.1 Related work

Several studies, including our earlier work, Mind Harbor: Navigating Wellness Together with AI Integration [1], have explored the role of AI chatbots in supporting mental health. The studies suggest that such chatbots can make mental health support more accessible, scalable, and culturally relevant. In our initial study, we identified major barriers that prevent students from seeking help, such as feelings of shame, lack of privacy, and the lack of culturally appropriate tools. Recent studies show that machine learning can help detect depression early by analyzing behavioral and psychological patterns. While these models can improve diagnosis, challenges like interpretability and real-world integration still exist. This highlights the need for simple, transparent, and accessible AI solutions, especially in settings where stigma and limited access delay seeking help [14]. These findings guided the design and development of the Mind Harbor prototype discussed in this paper.

Research on platforms such as Woebot and Wysa has shown that conversational AI can effectively provide users with psychoeducation, mood tracking, and cognitive-behavioral therapy (CBT)-based exercises. These interventions have been shown to enhance emotional well-being and reduce symptoms of depression and anxiety [5].

The use of LLMs in mental health interventions emphasizes their capacity to generate empathetic and contextually appropriate responses. At the same time, it highlights the importance of cultural adaptation and ethical safeguards to ensure user safety and prevent potential harm [4] [9] [10] [13]. Depression affects millions of people worldwide and continues to be a serious mental health challenge with major social and economic impact. While traditional assessment methods are commonly used, they can be subjective and sometimes inconsistent. Recent studies show that machine learning can support earlier and more accurate detection, but current models still struggle with limited data and real-world application. This creates a clear need for more reliable and practical AI-based mental health solutions [15]. Recent computational studies [6] have examined how LLMs can interact intelligently with APIs through effective prompt design, highlighting their potential reliability, adaptability, and scalability when embedded in practical systems. This reinforces the feasibility of incorporating LLMs as conversational backbones within wellness and counseling platforms like Mind Harbor.

Similarly, studies [7] demonstrated the successful implementation of GPT-based conversational systems using the OpenAI API within a web-based content management system, guided by agile project management principles. This work illustrates the feasibility of deploying GPT models as interactive, user-centric chat services, an approach that parallels Mind Harbor's technical design for delivering AI-driven mental health support through web and mobile platforms.

Complementing these findings, large-scale reviews have examined how LLMs are being used in mental health care. Some researchers [7] documented their applications in early screening, suicide-risk detection, and counseling, while others [10] conducted a scoping review of 726 studies, noting the growth of generative AI for therapy and emotional support. Both highlight the need for standardized evaluation frameworks and clinical validation.

Similarly, [2] analyzed the opportunities, challenges, and ethical complexities of deploying LLMs in therapeutic contexts, emphasizing data privacy, bias mitigation, and multidisciplinary collaboration. Together, these studies reinforce Mind Harbor's approach of balancing innovation with ethical responsibility and expert oversight.

Recent work also highlights the importance of prompt engineering in optimizing AI-generated responses. [8] Provides practical strategies for crafting effective prompts that improve contextual accuracy and ethical compliance, while [3] stresses that prompt design is becoming an essential professional skill in healthcare. Together, they emphasize how carefully constructed, empathetic prompts can enhance patient communication and decision-making, an insight central to Mind Harbor's conversational framework.

Further research emphasizes that personalization, culturally sensitive language, and immediate responsiveness are essential for sustaining user trust and engagement [5].

Studies on digital mental-health tools for university students reveal that technology-driven support is particularly valuable where stigma, a shortage of professionals, or geographic barriers limit access to traditional counseling [11]. Students tend to prefer anonymous, on-demand platforms that enable open self-expression without fear of judgment, a principle reflected in Mind Harbor's design philosophy. Global mental health data shows that many people, especially youth, with depression still do not receive proper treatment due to stigma, cost, and limited access. This is particularly concerning for young people, who often face additional barriers such as hesitation to seek help and lack of awareness. These challenges highlight the need for easily expandable, technology-based solutions that enable early detection and timely support [16].

Despite these advances, researchers continue to note challenges such as ensuring privacy, maintaining clinical accuracy, and balancing automation with human oversight [12]. Mind Harbor addresses these concerns by combining GPT-based responses with culturally adapted design, secure data handling, and continuous expert review to refine the system's reliability and ethical integrity. Additional research examines students' perceptions of ChatGPT in counseling and mental health education, as well as its relation to academic stress, revealing both benefits and challenges in educational contexts [17, 18]. A recent bibliometric analysis further maps the expanding landscape of AI applications in mental health [19]. Collectively, these studies form the foundation for Mind Harbor's continued development as a culturally adaptive, ethically governed, and technologically robust AI-powered mental-health support system.

2 SYSTEM DESIGN AND ARCHITECTURE

2.1 Design principles

The design of Mind Harbor adheres to the following principles:

Human-Centered Design: Since the main goal of the system is to serve the students, it has been designed with the needs and preferences of students as a primary focus. It focuses on empathy, simplicity, and trust so that anyone using it feels comfortable, supported, and not judged.

Privacy and Security: Although this is still a prototype, access is protected by a basic username and password. Passwords are encrypted and stored securely, preventing any potential misuse. This approach helps safeguard the confidentiality of user data, ensuring that all personal information and interactions, including conversations with the AI, remain private and secure. Additionally, when users log in, they can view their history, and a few previous conversations will be displayed.

Cultural Relevance: The chatbot communicates in a way that matches Omani culture and values. Its tone and style are respectful, relatable, and sensitive to local norms. Throughout the conversation, it will ask the user, "Is this useful for you?" This approach fosters a friendly interaction with the system.

Accessibility: The platform is web-based and works smoothly on both computer and mobile, making it easy for students to use anytime and from anywhere with minimal technical effort. It features a responsive design that simplifies navigation and encourages reliable usage and engagement.

Expert Guidance: To gain a better understanding of mental health challenges and related concerns, a questionnaire was prepared and shared with mental health professionals for their feedback and suggestions.

2.2 System architecture overview

The Mind Harbor prototype consists of four main functional layers, as illustrated in Figure 1.

User Interface (UI): A simple web-based interface allows students to either type their questions or select from predefined prompts. The chatbot's responses are displayed in real time, and users can also listen to the voice responses to enhance their understanding. This feature allows users to have a natural, interactive chat experience that feels similar to talking with a human.

Application Layer: Handles basic username-and-password authentication, collects the user's input, and sends it to the ChatGPT API along with pre-configured prompt instructions designed to ensure empathy, cultural relevance, and supportive tone.

LLM Integration Layer: Connects to the ChatGPT API (powered by a Large Language Model) to generate context-aware responses. Prompt engineering is applied to guide the model's tone, ensure it is culturally sensitive, and detect distress indicators.

Data Management Layer: Uses MongoDB to store each user's prompts and corresponding chatbot responses. This allows for reviewing past interactions, supporting future personalization, and enabling analysis of conversation patterns to improve chatbot performance.

In this prototype, all stored data is linked to the user's account and kept within a secure MongoDB database.

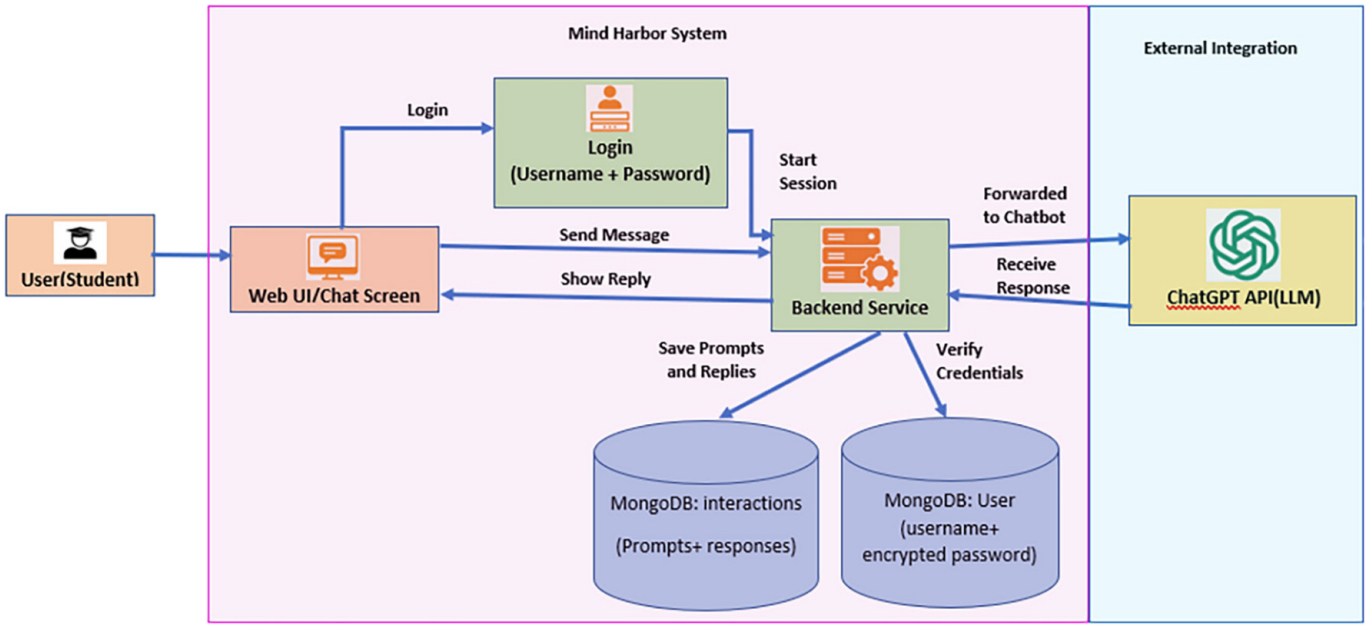

Fig. 1. Proposed architecture of Mind Harbor: showing internal components (Login, Chat Interface, Backend, Databases) and external integration with the ChatGPT API (LLM)

2.3 UI design

The Mind Harbor UI is designed to foster warmth, empathy, and trust, particularly during the student's first interaction. Since the initial moments are critical for engagement, the chatbot begins with a culturally appropriate, friendly greeting before moving into structured conversation.

Login and welcome screen. As shown in Figure 2, students initially access the system through the home page, which provides a simple and user-friendly interface. From the home page, they proceed to the login section, where they enter their username and password, secured with encryption. Once authenticated, they are welcomed with a personalized message, creating a supportive and approachable atmosphere.

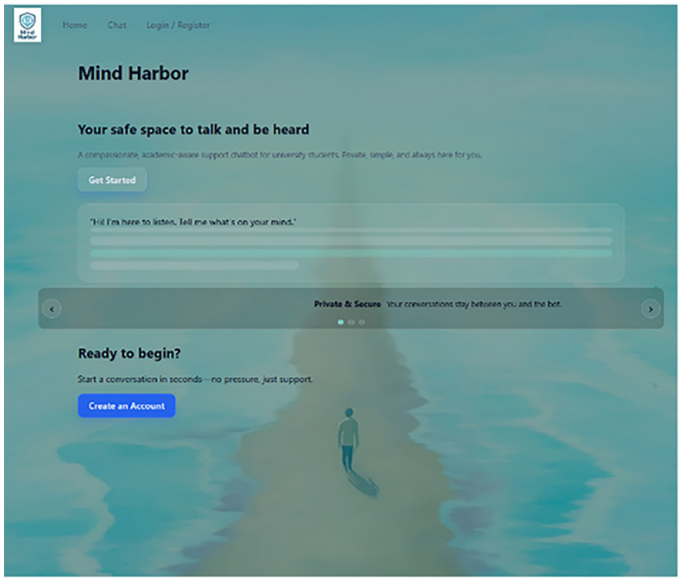

Fig. 2. *(Continued)*

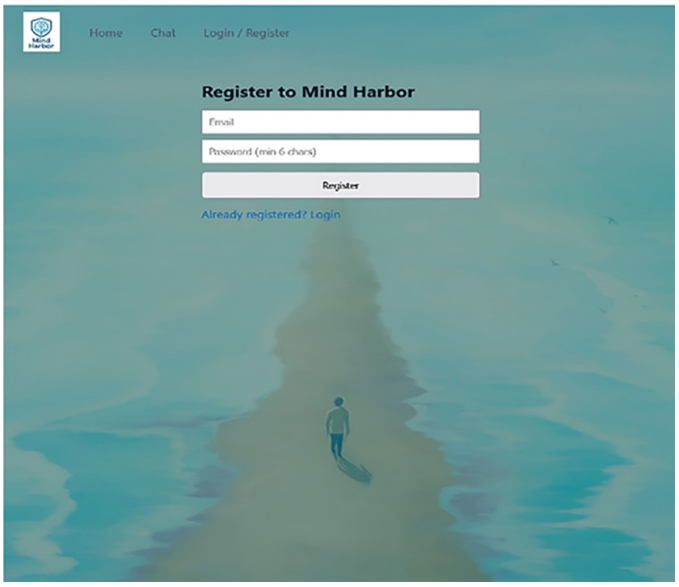

Fig. 2. Home page and student login interface

Additional features

Mood Tracker: The system allows students to log their emotions by selecting appropriate emojis that represent their current mood, as illustrated in Figure 3. Following this, they can either type their own questions or choose from predefined prompts to continue the interaction. This feature encourages emotional self-awareness among students and also enables the system to tailor its responses, thereby providing more personalized and empathetic support.

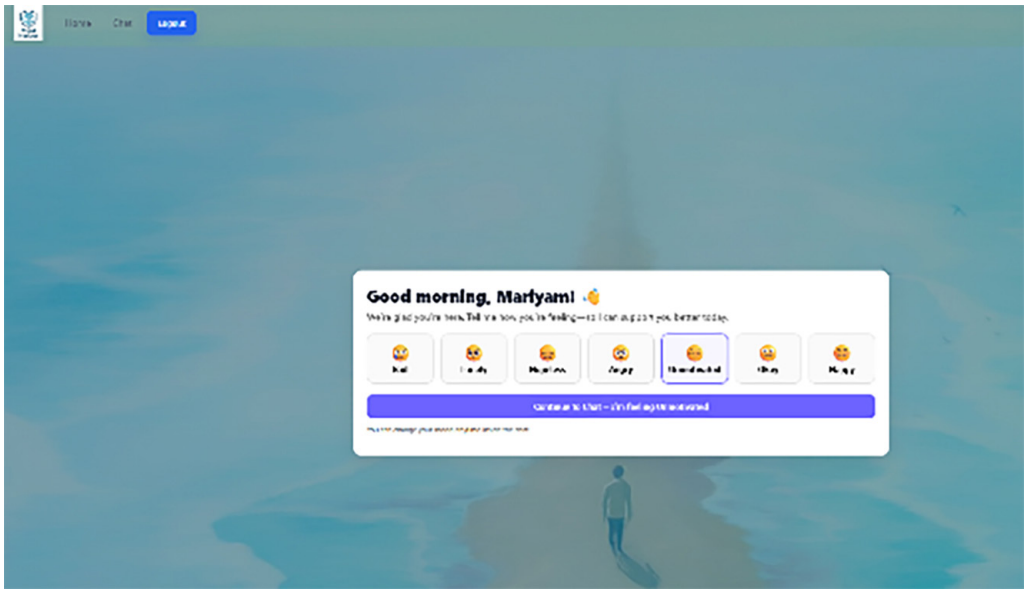

Fig. 3. Mood tracker interface

Guided Prompts: Suggested prompts like exam stress, academic pressure, or feeling lonely help students who find it hard to talk about their feelings. By choosing one of these topics, they can easily start a conversation with the system. This feature makes it easier for students to share their thoughts and feelings in a safe and understanding space (see Figure 4).

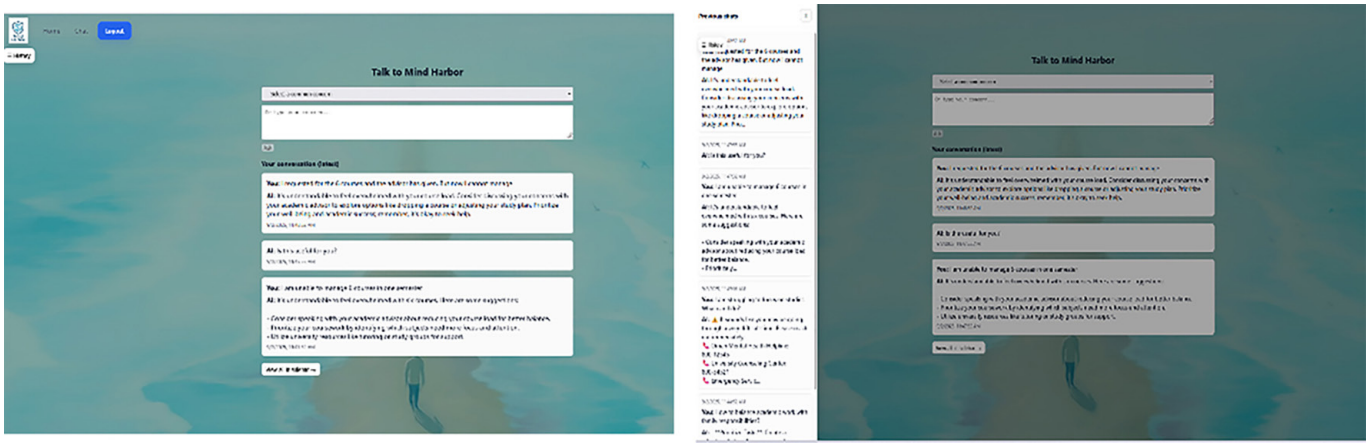

Fig. 4. Suggested prompts interface for student support

Feedback Mechanism: After a few exchanges, the chatbot discreetly asks, "*Was this helpful for you?*" to collect student feedback for improvement. This design balances flexibility and structure, offering students the choice between free-flowing conversation and guided interaction while maintaining a compassionate and culturally sensitive tone.

2.4 Application layer design and backend management

The interface is seamlessly integrated with the chatbot through a secured API and a set of pre-configured prompts that guide the flow of conversation. This integration allows smooth communication between the UI and the chatbot engine, ensuring that responses are generated quickly and contextually based on user inputs.

The backend of the system is built using Node.js and Express, which handle user authentication, session management, and message routing efficiently. All user interactions and chatbot responses are stored in a MongoDB database, providing a reliable and scalable way to manage data. This storage mechanism allows students to review their past conversations whenever needed, helping them reflect on previous discussions or advice shared by the chatbot.

In addition, the system includes a safety feature: when the chatbot detects signs of distress or a critical situation, the interface automatically displays emergency contact numbers and guidance for seeking immediate help. This ensures that the application not only provides emotional support but also prioritizes the student's well-being and safety at every stage of interaction.

3 PROTOTYPE DEVELOPMENT

3.1 Technology stack

The prototype of Mind Harbor is built using modern web technologies to ensure a responsive, accessible, and maintainable application. The selected stack includes:

- **Frontend:** HTML5, CSS3, JavaScript, React strap, and Bootstrap with React.js for dynamic rendering and a smooth, interactive user experience.

- **Backend:** Node.js with the Express framework for handling API requests, managing authentication, and integrating with external services.
- **LLM Integration:** OpenAI GPT-based API with culturally adapted prompt templates to ensure empathetic, context-aware responses.
- **Database:** MongoDB, storing two key collections:
- **Users:** Securely storing usernames and hashed passwords for login authentication.
- **Conversations:** Storing prompts and chatbot responses for each user.

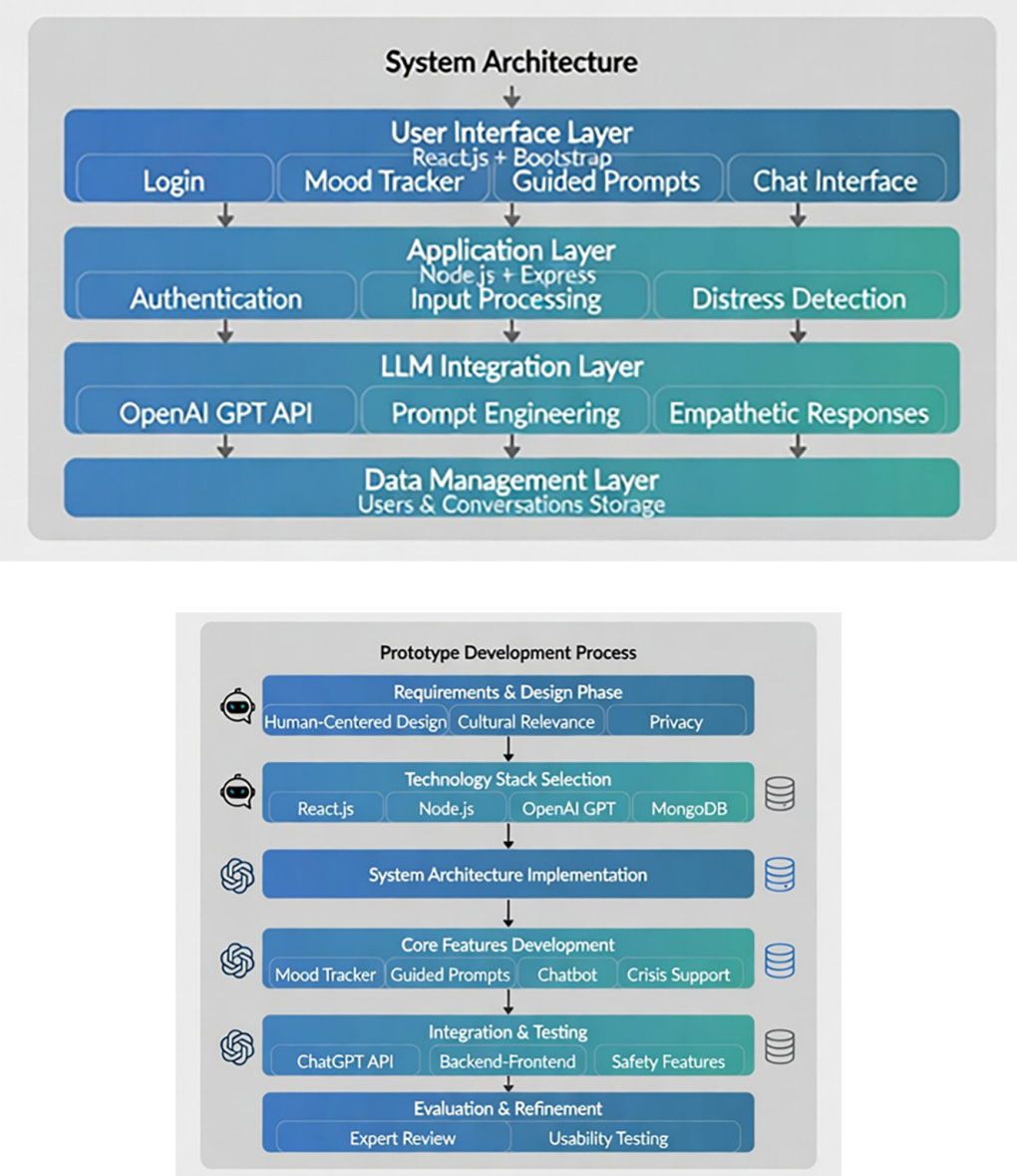

Fig. 5. Layered architecture and prototype development process of Mind Harbor

3.2 Chatbot integration

In the Mind Harbor prototype, all the chatbot conversations are powered by the ChatGPT API. The development mainly focuses on connecting this API with the web

application and setting it up to make sure the chatbot interacts with students in a safe, caring, and culturally appropriate way.

Key integration steps include:

System Prompt Configuration: The ChatGPT API is provided with a predefined set of instructions guiding it to maintain a warm, supportive tone, avoid judgmental language, and respect Omani cultural norms.

Interaction Flow Design: The frontend captures user input and sends it to the backend. The backend then forwards it to the ChatGPT API, receives the reply, and displays the response back on the user's screen.

It occasionally asks, "Was this helpful for you?" to build a friendly rapport with the user.

Distress Keyword Handling: The application layer monitors the conversation for specific distress-related terms. If the system detects signs of distress, it gently shows a supportive message along with contact details and helpline numbers, encouraging the user to reach out for help.

Conversation Storage: All conversations between the user and the chatbot are securely stored in MongoDB to help improve the system's quality and performance over time. The interface also shows the ongoing chat on the screen, and users can easily view their past conversations within the application whenever they need.

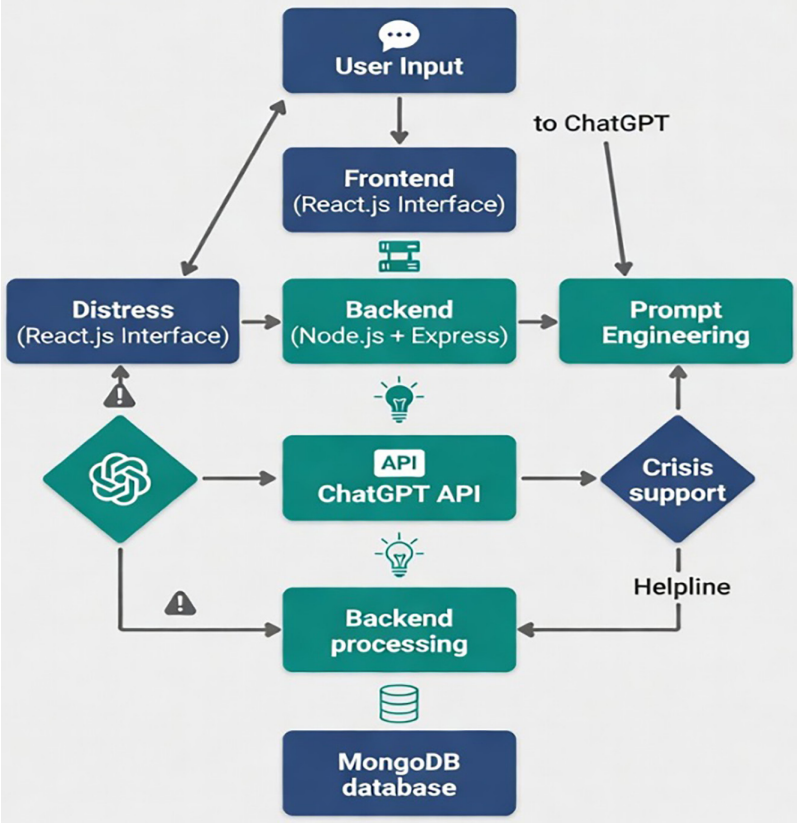

Fig. 6. ChatGPT API integration process in Mind Harbor

3.3 Preliminary expert feedback

As part of the next development phase, responses generated by the chatbot will be evaluated by a mental health professional. Earlier, an initial set of user prompts

and questions was shared with a mental health expert to better understand the types of mental health issues students might face. The goal was to ensure that the questionnaire, designed as conversation prompts for users, accurately reflected real situations and concerns. The expert's feedback helped us refine and improve the design of our system.

3.4 Data privacy and ethical considerations

The current Mind Harbor prototype allows users to log in with a username and password, ensuring that only registered users can access the platform. All passwords are already encrypted and securely stored in MongoDB to protect user privacy and maintain data security.

Current privacy measures

Authentication: Students log in using their username and password before starting a chat session, ensuring that only authorized users can access the system.

Encryption: Authentication details, including passwords, are securely hashed before being stored in MongoDB to protect user credentials and ensure privacy.

Session Control: The chat interface becomes available only after successful login, providing a secure and personalized experience for each user.

Data Storage: The complete chat history is securely stored in MongoDB and linked to each user's account. This allows students to view and continue their past conversations seamlessly whenever they return to the platform.

Ethical Safeguards

- The chatbot is configured with culturally sensitive prompts to maintain empathy and respect for Omani social norms.
- If distress-related words are detected in the user's message, the system responds with supportive language and displays crisis hotline information.

4 PLANNED FUTURE ENHANCEMENTS

Following the successful development of the Mind Harbor prototype, several enhancements are planned to improve its functionality, usability, and long-term impact.

Usability Testing: The next stage will involve conducting a pilot study with a small group of university students to evaluate how intuitive and user-friendly the platform is. Feedback will focus on the chatbot's tone, cultural sensitivity, and the perceived empathy of its responses. Insights from this stage will help refine both the conversational flow and UI to better suit students' emotional needs.

Privacy and Security Enhancements: Although basic authentication has been implemented, further work will strengthen data protection. Future upgrades will be implemented in alignment with ethical data-handling standards in digital mental-health solutions.

Feature Expansion: Several new features are planned to increase personalization. These include multilingual support (Arabic and English) to ensure inclusivity, an advanced mood-tracking dashboard, and AI-driven well-being recommendations tailored to each user's emotional patterns.

Expert Review Dashboard: To integrate professional oversight, a dedicated interface will be designed for mental-health professionals. This dashboard will allow

experts to review anonymized conversation patterns, monitor chatbot quality, and suggest improvements to ensure ethical and responsible use.

5 LIMITATIONS

While Mind Harbor demonstrates promising potential, certain limitations remain at this prototype stage:

Prototype-Stage Security: Currently, the system uses a simple username-and-password mechanism for authentication. Stronger encryption and anonymization are future goals.

Dependency on External API: The chatbot relies on the ChatGPT API, which requires stable internet connectivity and depends on external service availability. Any downtime or API changes may temporarily affect the chatbot's responsiveness.

Lack of Clinical Validation: The chatbot's responses are designed to be empathetic and supportive but have not yet been evaluated by mental-health experts. Collaboration with licensed psychologists and mental-health experts will be essential before deployment to ensure responsible usage and safety.

6 CONCLUSION

This paper presented the prototype development of Mind Harbor, an AI-assisted mental-health support system designed for university students in Oman. Building on earlier conceptual research, the project has progressed into an implementation stage that integrates an LLM with a culturally sensitive, user-friendly web interface. The system includes basic authentication, secure data storage, and chat interaction features that simulate supportive, empathetic conversations.

Although still in its early stages, Mind Harbor establishes a strong foundation for future growth. The prototype demonstrates how AI can complement human mental-health initiatives by offering accessible, stigma-free, and culturally aligned support. Future development will focus on enhancing privacy safeguards, conducting usability and clinical testing, and developing expert oversight tools to ensure safety, reliability, and real-world effectiveness.

Ultimately, Mind Harbor aims to evolve into a trusted digital companion, one that promotes mental wellness, encourages help-seeking behavior, and contributes to the broader vision of student well-being within Oman's higher-education ecosystem.

7 REFERENCES

[1] S. Thomas *et al.*, "Mind harbor: Navigating wellness together – with AI integration," *Advanced Engineering Science*, vol. 56, no. 9, 2024.

[2] G. Dosovitsky *et al.*, "Artificial intelligence chatbot for depression: Descriptive study of usage," *JMIR Formative Research*, vol. 4, no. 11, p. e17065, 2020. https://doi.org/10.2196/17065

[3] R. Fulmer, A. Joerin, B. Gentile, L. Lakerink, and M. Rauws, "Using psychological artificial intelligence (Tess) to relieve symptoms of depression and anxiety: Randomized controlled trial," *JMIR Mental Health*, vol. 5, no. 4, p. e64, 2018. https://doi.org/10.2196/mental.9782

[4] H. Gaffney *et al.*, "Conversational agents in mental health care: A systematic review," *Digital Health*, vol. 9, 2023.
[5] B. Inkster, S. Sarda, and V. Subramanian, "An empathy-driven, conversational artificial intelligence agent (Wysa) for digital mental well-being: Real-world data evaluation," *JMIR mHealth and uHealth*, vol. 6, no. 11, p. e12106, 2018. https://doi.org/10.2196/12106
[6] B. Silva and Y. G. Tesfagiorgis, "Large language models as an interface to interact with API tools in natural language," Linnaeus University, 2023.
[7] D. Tosic, "Artificial intelligence-driven web development and agile project management using OpenAI API and GPT technology," Bachelor's Thesis, Mid Sweden University, 2023.
[8] S. Ekin, "Prompt engineering for ChatGPT: A quick guide to techniques, tips, and best practices," *TechRxiv*, 2023. https://doi.org/10.36227/techrxiv.22683919.v1
[9] Z. Guo *et al.*, "Large language models for mental health applications: Systematic review," *JMIR Mental Health*, vol. 11, p. e57400, 2024. https://doi.org/10.2196/57400
[10] Y. Hua *et al.*, "A scoping review of large language models for generative tasks in mental health care," *npj Digital Medicine*, vol. 8, no. 1, p. 230, 2025. https://doi.org/10.1038/s41746-025-01611-4
[11] D. Rickwood, F. P. Deane, C. J. Wilson, and J. Ciarrochi, "Young people's help-seeking for mental health problems," *Australian e-Journal for the Advancement of Mental Health*, vol. 4, no. 3, pp. 218–251, 2007. https://doi.org/10.5172/jamh.4.3.218
[12] A. Tandon *et al.*, "Human factors, usability, and human-centered design in sensor-based digital health technologies: A scoping review," *npj Digital Medicine*, vol. 6, no. 1, p. 115, 2023. https://doi.org/10.2196/preprints.57628
[13] A. N. Vaidyam *et al.*, "Chatbots and conversational agents in mental health: A review of the psychiatric landscape," *The Canadian Journal of Psychiatry*, vol. 4, no. 7, pp. 456–464, 2019. https://doi.org/10.1177/0706743719828977
[14] S. E. Hosseini, S. Pervez, P. L. Manalo, M. J. Iqbal, and M. Shahbaz, "Depression prediction using enhanced machine learning pipeline," *International Journal of Online and Biomedical Engineering (iJOE)*, vol. 22, no. 1, pp. 147–163, 2026. https://doi.org/10.3991/ijoe.v22i01.57957
[15] A. Ayodele, A. Adetunla, and E. Akinlabi, "Depression severity prediction using stacked heterogenous learning on integrated biomedical and lifestyle data," *International Journal of Online and Biomedical Engineering (iJOE)*, vol. 21, no. 14, pp. 156–167, 2025. https://doi.org/10.3991/ijoe.v21i14.56383
[16] M. A. Angotti, "Rethinking youth mental health: Challenges, interventions, and cultural perspectives," *Journal for Future Society and Education (JFSE)*, vol. 2, no. 2, pp. 29–40, 2025. https://doi.org/10.3991/jfse.v2i2.54267
[17] A. O. Ajlouni, A. S. Almahaireh, and F. A.-A. Whaba, "Students' perception of using ChatGPT in counseling and mental health education: The benefits and challenges," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 18, no. 20, pp. 199–218, 2023. https://doi.org/10.3991/ijet.v18i20.42075
[18] A. Ajlouni, A. AlOmary, F. A.-A. Wahba, H. Al-Kubaisi, and A. Ibrahim, "The intensity of using ChatGPT in relation to academic stress: A cross-sectional study," *International Journal of Interactive Mobile Technologies (iJIM)*, vol. 19, no. 17, pp. 81–100, 2025. https://doi.org/10.3991/ijim.v19i17.56495
[19] I. Shubina and A. J. Dzido, "Artificial intelligence and mental health: Bibliometric analysis," *International Journal of Interactive Mobile Technologies (iJIM)*, vol. 19, no. 19, pp. 4–18, 2025. https://doi.org/10.3991/ijim.v19i19.58041

8 AUTHORS

Sherin Thomas holds a Master's degree in Computer Science and is currently working as a Lecturer at the College of Computing and Information Sciences, University of Technology and Applied Sciences, Ibra, Sultanate of Oman. She is a researcher and educator specializing in AI-based systems. She has actively participated in various academic projects related to Artificial Intelligence applications and has currently published two research papers in different journals. Her research interests focus on developing intelligent and practical AI-driven solutions for real-world challenges (E-mail: sherin.thomas@utas.edu.om).

Jaishree Devi is currently working as a Lecturer at the College of Computing and Information Sciences, University of Technology and Applied Sciences, Ibra, Sultanate of Oman. She holds a Master's degree in Computer Application and specializes in Artificial Intelligence and Data Science. She is a researcher with a focus on AI-driven and data-centric solutions. She has published one research paper in a reputed journal and is actively engaged in academic and research activities within her field of expertise (E-mail: jaishree.devi@utas.edu.om).

Marwa Said Amur Al Khuitari is currently working at the College of Computing and Information Sciences, University of Technology and Applied Sciences, Ibra, Sultanate of Oman. She holds a Master's degree and is currently pursuing her PhD in the field of Cyber and Information Security. She is a researcher specializing in cybersecurity and information security systems. She has published one research paper in a reputed journal and is actively involved in academic and research activities related to secure computing and cyber defense (E-mail: marwa.alkhuitari@utas.edu.om).

Dr. Ramesh Palanisamy is a Professor at College of Computing and Information Sciences, UTAS, Oman, with over 16 years of experience in networking and cybersecurity. He received his Ph.D. in Computer Communication and completed postdoctoral research at SIT, Singapore. His research interests include cybersecurity, AI, IoT, and smart grid security. He has published over 65 papers in international journals and conferences (E-mail: ramesh.palanisamy@utas.edu.om).