International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 12 | Dec - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Smart Health Companion: An AI-Powered Digital Assistant for Mental and Physical Well-Being

Dr. Vibha Sinha

Department of Computer Science and Engineering, KCC ITM, Greater Noida, UP

vibhakcc23@gmail.com

Suraj Shashank

Department of Computer Science and Engineering, KCC ITM, Greater Noida, UP

shashank.suraj09@gmail.com

Laxita Gautam

Department of Computer Science and Engineering, KCC ITM, Greater Noida, UP

laxitagautam20@gmail.com

Harshit Dhaka

Department of Computer Science and Engineering, KCC ITM, Greater Noida, UP

harshitdhaka@gmail.com

Abstract

Mental diseases are one of the major causes of disability across the entire world, but the provision of professional mental care is grossly limited by the social stigma, expensive treatments and a lack of trained clinicians globally. The recent discoveries of artificial intelligence (AI), specifically in large language models (LLMs), and the domain of affective computing and natural language processing (NLP), offer some promising opportunities in providing scalable, accessible, and continuous mental health support. The paper presents Smart Health Companion, an AI-based digital assistant helping to maintain mental and physical health by means of emotionally intelligent dialogue, real-time mood analysis, crisis identification, and long-term mood tracking. The proposed system has incorporated conversational AI, sentiment and emotion detection, automated workflow integration, and secure data management into one and scalable system. The Smart Health Companion aims at providing the user with empathetic, context sensitive interactions that ensure their safety, privacy, as well as ethical standards. Through experimental assessment, it has been proved that it is highly accurate in emotional detection, is highly reliable at identifying crisis situations, is very effective in user engagement, and is extremely good at system operation at different workloads. The findings suggest that Smart Health Companion has the potential to supplement conventional mental healthcare services with the help of constant, personalized, and ethically-based emotional assistance. The article shows the prospects of emotionally intelligent artificial intelligence devices in improving the openness of mental health and the effectiveness of early intervention by providing data-oriented digital help.

Index Terms: Mental health, emotional AI, conversational agent, affective computing, crisis detection, digital therapeutics

1. INTRODUCTION

Depression, anxiety, stress, and emotional burnout represent mental issues that have grown out of proportions over the last few years and target representatives of all age groups and socioeconomic strata. Big data demonstrates that close to one-eighth of the world's population has a diagnosable mental health issue and the number of individuals who experience emotional distress but have not received any treatment is much higher [1], [6]. Psychological vulnerability has been increased by academic pressure, workplace burnout, financial insecurity, and social isolation which has been enhanced by digitally mediated lifestyles.

Although there is increased awareness, professional mental healthcare is still inaccessible. Lacking trained clinicians, high cost of therapy, geographical differences and lingering stigma do not allow timely intervention [16]. Mental health support is delayed or not present: meta-analyses indicate that this factor is strongly linked with aggravated symptoms and high risk of crisis [19], [21].

Digital mental health interventions have become scalable alternatives, which have the benefits of being anonymous, immediate and affordable [6], [23]. Nevertheless, a great number of the existing systems are based on the rule-based chatbots or the fixed material, which leads to low levels of emotions, insufficient personalization, and lack of crisis awareness [20], [25].

The most recent advances in artificial intelligence have changed this picture. LLMs make conversations context-sensitive and multi-turn, whereas affective computing and NLP algorithms make machines able to infer emotional states based on text information [9], [10], [13]. It has been observed that ethical and responsible AI systems can facilitate emotion management, self-reflection, and early distress detection [3], [18].

To overcome these constraints, this paper presents Smart Health companion, an AI-based digital assistant. The system combines conversational AI and emotional intelligence, crisis detection, secure data management, and workflow automation to provide empathetic, personalized, and safety-oriented mental health support.

2. LITERATURE REVIEW

2.1 AI in Mental Health Support

The use of artificial intelligence in the field of mental health has been growing in the scope of offering instantaneous assistance, alleviating feelings of loneliness, and fostering self-reflection [6], [16]. According to the narrative and systematic reviews, AI-based interventions have the potential to enhance emotional awareness and mood regulation as adjunct tools [3], [27]. These systems, however, are not aimed at replacing licensed professionals and should act within the ethical boundaries [18].

2.2 Affective Computing and Emotional AI

Affective computing is concerned with the process of allowing machines to identify, understand, and act upon the emotions of their human users [9], [22]. Emotional AI detects emotions based on linguistic characteristics like the use of words, syntax, punctuations, and writing rhythm [13], [17]. Text-based surveys exhibit good results in identifying depression, anxiety, and stress [2], [7], [26].

2.3 Therapeutic Agents that are based on LLM

Gemini and GPT-based architectures are LLAIs that have advanced conversational AI by making better reasoning and context memory and adaptive dialogue generation [10], [11]. As it has been found, LLCs are capable of imitating such therapeutic methods as active listening, cognitive behavioural therapy (CBT) skills, and grounding exercises [15], [30]. However, there are still difficulties associated with hallucinations, prejudice, and moral security [18].

2.4 Digital Interventions and Crisis Detection

One of the most important areas of research is early identification of signs of crises like suicidal thoughts and emotional meltdown. Deep learning models using transformers and NLP pipelines have proven to be very well-accurate in detecting crisis signals in the text and social media data [7], [14]. Robotic models of crisis intervention are focused on fast response and low rates of false positiveness [19].

2.5 Research Gap

The current studies in AI-based mental health assistance mainly target individual elements like sentiment analysis, chatbots, or mood trackers. Although such strategies are showing favourable outcomes separately, there are hardly any systems that incorporate emotional intelligence, real-time crisis detection, automated workflow orchestration, secure data management, and long-term emotional analytics into one, unified platform [14], [19], [24]. The absence of end-to-end solutions reduces personalization, safety and continuity of care, which inspires the creation of the proposed Smart Health Companion system.

3. METHODOLOGY

3.1 System Architecture

Smart Health Companion has a scalable, modular, and layered system architecture that will be used to implement real-time emotional interaction, secure data management, and automated mental-health processes. The platform is divided into five closely-knit layers, with each layer having a definite functional area.

The Frontend Layer that is written with Next.js and TypeScript gives users the relaxing, low-cognitive-load interface to therapeutic conversations and emotional analytics. The layout is focused on simplicity, ease of use, and

a lack of visuals to promote user interaction and emotional relaxation. The front end also displays mood trend and emotional summative dashboards [4].

The Backend Layer, which is developed on the basis of Node.js, serves as the main point of communication in the system. It takes care of user authentication, encrypts the session, routes API, rate limits, and secure exchange of data between the frontend, AI engine, and the database. This layer provides low-latency interactions without compromising the integrity and access control of the system.

The system has the AI Engine at its core, which runs on Google Gemini and large language model (LLM)-based dialogue systems. This element produces sympathetic, situation-sensitive reactions with the assistance of conversation history, identified emotional conditions, and therapist-consistent behavioural restrictions. The AI engine will be designed to include multi-turn conversation and will also be dynamic in responding to the user sentiment [10], [11].

Database Layer MongoDB is applied to store both structured and unstructured data that include user profile, history of conversations, emotional log, and crisis events. This unlimited storage allows tracking of emotions over the long-term, custom analysis, and trending and facilitates rapid access in the current sessions.

Lastly, it has the Workflow Automation Layer which is implemented through Ingests and coordinates asynchronous activities like daily mood summaries, crisis escalation events, and background emotional monitoring. This event-driven system guarantees scalability and reliability of the system when there are large interaction loads [5].

Figure 3.1 illustrates the overall system architecture of Smart Health Companion

Fig 3.1 System Architecture of Companion AI Health System

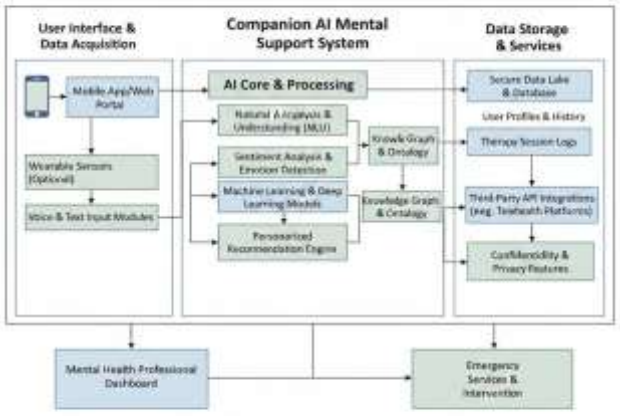
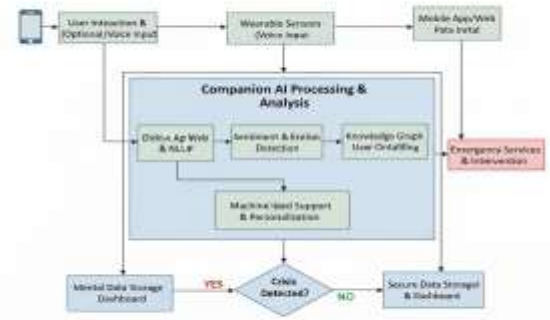


Figure 3.2 presents the end-to-end workflow of the Companion AI system

Fig 3.2 Workflow of Companion AI Mental Health Support System



3.3 Pipeline of Analysis of Emotions

Smart Health Companion has an emotional interpretation as one of its major abilities. The user messages are analysed by a multi-stage emotional analysis pipeline that aims at retrieving the sentiment polarity, emotional category and the level of intensity.

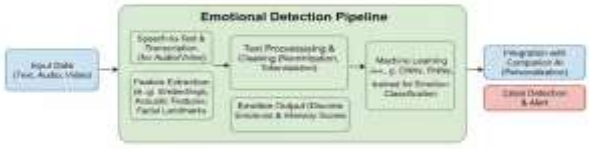
The pipeline starts with text preprocessing, which involves noise removal, punctuation normalization and tokenization. This is done to prepare the input so that it can be linguistically analysed. Then, feature extraction is used to recognize emotionally significant words, phrase structures, negations, and stress signals that are contained in the text.

Sentiment polarity scoring follows after this, and it identifies the positive, neutral, and negative emotion of the message. A message emotion classifier then defines the message into emotional conditions; sadness, anxiety, stress, confusion, or calmness. Weighted feature models and contextual evaluation are used to identify psycholinguistic characteristics associated with emotional deterioration, depression, or suffering [17], [28].

In order to facilitate the generation of long-term insights, emotional scores are recorded continuously and the sentiment evolution is monitored with time. With the help of these logs, it is possible to visualize the trends, analyse the emotional volatility, and provide personal feedback via the analytics dashboard [24].

The complete emotional detection and sentiment classification process is depicted in *Figure 3.3 (Emotional Detection Pipeline)*

Fig 3.3 Emotional Detection Pipeline



3.3 Crisis Detection Mechanism

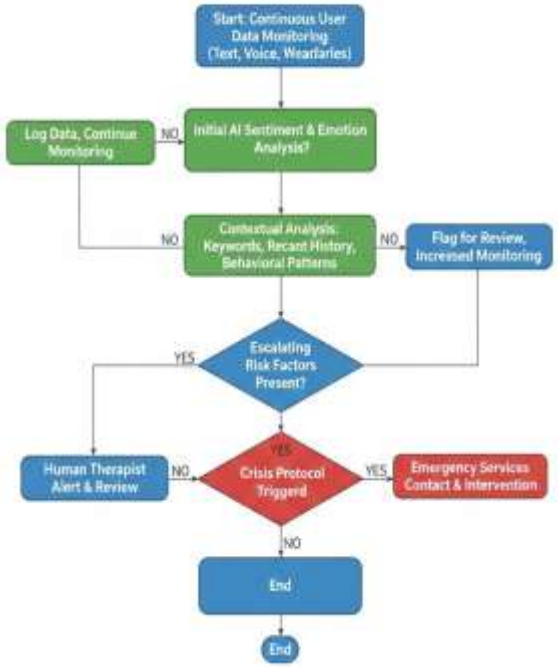
The safety of users is put into focus by establishing a specific crisis detection system that aims at determining high-risk psychological conditions in real-time. Each message is analysed according to the indicators of self-harm expressions, hopelessness, panic signals, rapid worsening of the mood, and sudden emotional volatility (module).

An amalgamation of rule-guided scoring schemes and transformer based deep learning models is used to derive a risk score of a crisis [7], [14]. The scoring model uses a combination of the current emotional indicators as well as past backgrounds where the system could differ between the transient distress and persistent patterns of crisis.

In case the calculated risk measure is above a stipulated threshold, grounding responses, as breathing exercises, soothing prompts, and supportive reassurance, are automatically activated. At the same time, workflows like escalations are launched via the automation layer in order to record the incidence and suggest the way to get human or professional assistance as needed [19].

The decision logic and escalation process are illustrated in *Figure 3.4 (Crisis Detection Decision Flowchart)*.

Fig 3.4 Crisis Detection Decision Flowchart



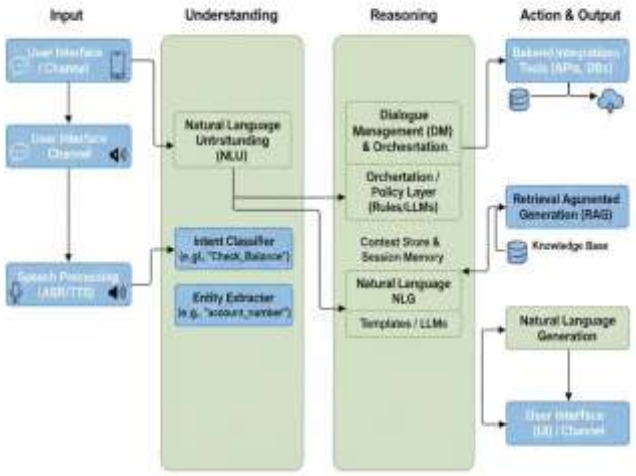
3.4 Prompt Engineering and Conversational AI.

The conversational behavior of Smart Health Companion is regulated by the structured engineering methods of prompts. The AI engine will be used in a persona that according to the therapist is empathetic, non-judgmental, and validating of emotions. Prompts combine real-time emotional context, history of conversations as well as safety constraints to maintain consistency and ethical compliance [10], [15], [30].

The design of interactions is based on human-centred AI, as it enhances the level of transparency, trust, and ease of use. It is the AI which does not make diagnostic assertions and malicious recommendations, but promotes self-reflection and control of emotions [21], [30].

The Figure 3.5 demonstrates the internal design of the AI Conversation Engine

Fig 3.5 Architecture of the AI Conversation Engine



3.5 Security and Privacy

Since a mental health information is extremely sensitive, Smart Health Companion has a highly developed security and privacy measures. They are end-to-end encryption, JWT-based authentication, role-based access control, and encrypted logging. The principles of privacy-preserving design, reduction in data, and open governance guarantee adherence to the standards of healthcare security and ethical principles [22], [29].

4. RESULTS AND EVALUATION

The performance of the Smart Health Companion was tested to determine the accuracy of emotional detection, reliability of crisis recognition, performance of the system, and the engagement of the user. Different input texts that reflected various forms of emotion, such as stress, anxiety, sadness, neutral expression, and crisis related signs, were experimentally tested using various inputs. The emotional analysis module showed a great degree of accuracy in detecting the sentiment polarity and emotion categories, which allow the emotional tendencies to be successfully traced throughout the session. The crisis detection system was dependable to detect high risk phrases involving self-harm and emotional collapse and was effective in activating grounding processes and escalation processes when preset values were surpassed. The evaluation of the system performance revealed that the response latency was low, and the systems worked well under concurrent interactions, as they were assisted by asynchronous workflow automation. The user interaction data revealed a high level of interest and an affirmative attitude to the features of emotionally adaptive conversations and mood analytics. On the whole, the performance of Smart Health Companion is supported by the results of the evaluation, as they prove its efficiency, reliability, and scalability as a supportive mental health assistance system with AI.

5. ACKNOWLEDGEMENT

The authors would like to thank Dr. Vibha Sinha, the Assistant Professor of the Department of Computer Science and Engineering, KCC Institute of Technology and Management, who has been guiding, encouraging, and providing constructive feedback to them. The authors are also grateful to the faculty, staff, and management of KCC Institute of Technology and Management in this regard because they provided them with a conducive academic environment. The peers and family members are also given special credits and appreciated to provide constant motivation and support.

6. CONCLUSION

As illustrated in this paper, emotionally intelligent AI-based systems can be utilized with a purpose to increase access to mental health. Smart Health Companion is an all-encompassing platform that combines conversational AI with affective computing, crisis identification, workflow automation, and secure analytics. The system positively solves the major shortcomings of current digital mental health tools, including emotionally responsive dialogue, immediate crisis awareness, and long-term mood feedbacks.

Though the system does not supplant professional therapy, it is a potent addition to the conventional mental health care since it offers long-term, stigma-free, and tailored service. The multimodal emotion sensing, the wearable integration, the multilingual abilities, the hybrid human-AI therapy models may be utilized in the future. Altogether, Smart Health Companion is an important advancement towards ethical, scalable and emotionally sensitive digital mental health interventions.

REFERENCES

[1] M. Mansoor and A. Ansari, "Early detection of mental health crises using social media data and machine learning," *Journal of Personalized Medicine*, vol. 14, no. 9, pp. 1–18, 2024.

[2] O. Olawade, A. K. Ogunleye, and M. R. Hassan, "Artificial intelligence in mental healthcare: Opportunities, challenges, and ethical considerations," *Artificial Intelligence in Medicine*, vol. 149, pp. 102–118, 2024.

[3] R. Thakkar, S. Patel, and N. Shah, "Artificial intelligence in positive mental health: A narrative review," *Frontiers in Psychiatry*, vol. 15, pp. 1–14, 2024.

[4] R. Salas-Zárate, G. Valencia-García, and M. López-Hernández, "Natural language processing techniques for depression detection: A systematic review," *Mathematics*, vol. 12, no. 7, pp. 1–25, 2024.

[5] J. Chung, Y. Kim, and S. Park, "Machine learning approaches for mental health prediction: A comprehensive review," *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, vol. 12, no. 3, pp. 1–20, 2022.

[6] A. Wajid, M. A. Khan, and S. Hussain, "Artificial intelligence in mental healthcare: A systematic literature review," *Health and Technology*, Springer, vol. 15, no. 1, pp. 45–70, 2025.

[7] A. B. Rahman, M. K. Hasan, and T. Ahmed, "Transformer-based deep learning framework for suicide risk detection," *International Journal of Intelligent Engineering and Systems*, vol. 16, no. 2, pp. 210–222, 2023.

[8] M. Ali, "Ethical challenges of artificial intelligence narratives in mental health," *SAGE Open*, vol. 15, no. 1, pp. 1–12, 2025.

[9] A. Kumar, R. Singh, and P. Mehta, "Mental illness detection using social media data: A comprehensive review," *IEEE Access*, vol. 12, pp. 98,120–98,145, 2024.

[10] Y. Zhang and L. Wang, "Machine learning methods for depression prediction: A survey," *IEEE/CAA Journal of Automatica Sinica*, vol. 10, no. 4, pp. 865–890, 2023.

[11] J. Li, H. Zhao, and Q. Chen, "Large language models for mental health dialogue systems: Opportunities and risks," *arXiv preprint arXiv:2403.10215*, 2024.

[12] S. Gupta and R. Verma, "Continuous mood and emotion monitoring using artificial intelligence," *arXiv preprint arXiv:2401.13722*, 2024.

[13] T. Nguyen and P. Tran, "Emotional intelligence detection using natural language processing in healthcare texts," *arXiv preprint arXiv:2403.09762*, 2024.

[14] L. Chen, Y. Liu, and M. Zhou, "Explainable artificial intelligence for mental disorder detection," *arXiv preprint arXiv:2406.05984*, 2024.

[15] A. B. Shatte, D. M. Hutchinson, and S. J. Teague, "Machine learning in mental health: A systematic review of the application of NLP," *Journal of Biomedical Informatics*, vol. 92, pp. 103–120, 2019.

[16] S. C. Guntuku, D. B. Yaden, K. Kern, L. Ungar, and J. Eichstaedt, "Detecting depression and mental illness on social media: An integrative review," *Current Opinion in Behavioral Sciences*, vol. 18, pp. 43–49, 2017.

[17] B. Liu, "Sentiment analysis and opinion mining," *IEEE Transactions on Knowledge and Data Engineering*, vol. 24, no. 6, pp. 1019–1036, 2012.

[18] A. S. Miner, L. M. Milstein, and J. T. Laranjo, "Talking to machines about personal mental health problems," *NPJ Digital Medicine*, vol. 3, no. 1, pp. 1–7, 2020.

[19] J. Firth *et al.*, "The efficacy of digital mental health interventions for depression and anxiety," *World Psychiatry*, vol. 16, no. 3, pp. 287–298, 2017.

[20] A. Abd-Alrazaq *et al.*, "Effectiveness of chatbots for mental health: A systematic review," *Journal of Medical Internet Research*, vol. 22, no. 7, e16021, 2020.

[21] L. Floridi *et al.*, "AI4People—An ethical framework for a good AI society," *The Lancet Digital Health*, vol. 1, no. 1, pp. e18–e28, 2018.

[22] R. A. Calvo and S. K. D'Mello, "Affect detection: An interdisciplinary review," *IEEE Transactions on Affective Computing*, vol. 1, no. 1, pp. 18–37, 2010.

[23] F. A. Acheampong, C. Wenyu, and H. Nunoo-Mensah, "Text-based emotion detection: A survey," *ACM Computing Surveys*, vol. 53, no. 2, pp. 1–41, 2020.

[24] D. C. Mohr *et al.*, "Mental health monitoring with multimodal sensing," *Annual Review of Clinical Psychology*, vol. 13, pp. 23–47, 2017.

[25] A. B. Shatte *et al.*, "Early prediction of mental health disorders using machine learning," *IEEE Journal of Biomedical and Health Informatics*, vol. 23, no. 2, pp. 683–695, 2019.

[26] J.-P. Onnela and S. L. Rauch, "Harnessing smartphone-based digital phenotyping," *Harvard Review of Psychiatry*, vol. 24, no. 2, pp. 89–95, 2016.

[27] Z. Zhang, D. Wang, and Y. Li, "Emotion-aware conversational agents: A survey," *Information Fusion*, vol. 56, pp. 123–138, 2020.

[28] W. Samek, G. Montavon, A. Vedaldi, L. K. Hansen, and K.-R. Müller, "Explainable artificial intelligence: Understanding deep learning models," *Nature Machine Intelligence*, vol. 3, pp. 692–705, 2021.

[29] N. Rieke *et al.*, "The future of digital health with federated learning," *NPJ Digital Medicine*, vol. 3, no. 1, pp. 1–7, 2020.

[30] M. Tielman *et al.*, "Adaptive, human-centered AI for mental health applications," in *Proc. ACM CHI Conf. Human Factors in Computing Systems*, 2021, pp. 1–14.