AI-Driven Health Assistant: Skin Disease Detection with Mental Health Support

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Abstract - The rapid advancement of artificial intelligence (AI) in healthcare has opened new avenues for improving accessibility and efficiency in medical services. This paper presents the development of a Smart Healthcare Chatbot that integrates automated skin disease diagnosis with mental health support, offering a dual-function platform for comprehensive health assistance. The system leverages computer vision techniques for analysing skin images, providing users with preliminary diagnostic suggestions based on trained machine learning models. Concurrently, it incorporates natural language processing (NLP) to deliver empathetic mental health support, including mood assessment, stress management resources, and Cognitive Behavioral Therapy (CBT)-based conversational tools. The chatbot is designed for real-time interaction, aiming to reduce barriers to care, especially in low-resource or remote environments. By combining physical and psychological health services within a single interface, the system demonstrates the potential of AI-driven solutions to enhance early diagnosis, promote mental well-being, and alleviate pressure on traditional healthcare infrastructure. Preliminary results suggest that such an integrated model can significantly improve user engagement, satisfaction, and self-reported health outcomes.

I. INTRODUCTION

In today's fast-evolving digital landscape, healthcare is undergoing a transformative shift driven by artificial intelligence (AI). With rising demands on medical systems and a growing need for accessible, affordable care, intelligent virtual assistants are emerging as powerful tools in modern healthcare delivery. This paper presents a Smart Healthcare Chatbot that brings together two essential aspects of personal health often treated separately: skin disease diagnosis and mental health support.

Skin conditions are among the most widespread health concerns globally, yet timely diagnosis remains a challenge, particularly in remote or under-resourced areas. The proposed chatbot leverages advanced computer vision algorithms to analyze images of skin lesions or abnormalities uploaded by users, offering preliminary diagnostic suggestions that can prompt early medical intervention.

Equally critical, yet frequently overlooked, is the state of an individual's mental health. Conditions such as stress, anxiety, and depression are on the rise, but barriers like social stigma, lack of awareness, and limited access to professional help continue to hinder timely support. By incorporating natural language processing (NLP) and conversational AI, the chatbot engages users in empathetic dialogue, tracks emotional states, and provides evidence-based mental health strategies, such as CBT-based tools and mindfulness practices. This dual approach empowers users to take proactive control of their well-being while reducing the burden on healthcare providers

II. LITERATURE SURVEY

The rapid advancement of artificial intelligence (AI) has significantly impacted healthcare, particularly in the domains of dermatological diagnosis and mental health support. However, integrating these capabilities into a single, cohesive chatbot platform remains a relatively novel and underexplored area.

1. AI in Skin Disease Diagnosis : AI-driven skin disease diagnosis has shown considerable promise. Esteva et al. [1] developed a convolutional neural network (CNN) capable of classifying skin cancer with accuracy comparable to dermatologists. Building on this, Han et al. [2] applied deep learning techniques to classify multiple dermatological conditions. Despite these advancements, challenges persist. Notably, dataset bias—especially concerning underrepresented skin tones—and variability in image quality can limit diagnostic accuracy [3]. As a result, such AI tools are generally regarded as

decision-support systems rather than replacements for clinical evaluation.

2. Chatbots for Mental Health Support : Conversational AI has gained traction as a tool for mental health support. Fitzpatrick et al. [4] introduced *Woebot*, a chatbot employing cognitive behavioral therapy (CBT) techniques, which demonstrated measurable reductions in depression and anxiety symptoms. A systematic review by Abd-Alrazaq et al. [5] affirmed the potential of mental health chatbots while highlighting limitations such as low user engagement and the need for clinical validation. The chatbot's ability to deliver empathetic, personalized interactions is crucial to its therapeutic effectiveness.

3. Toward Integrated Multi-Modal Healthcare Solutions : While AI applications in physical and mental health have independently advanced, integrated solutions are still rare. Razzaki et al. [6] proposed an AI-based platform providing both diagnostic and emotional support for cancer patients, underscoring the potential of holistic care approaches. However, real-time systems that combine image-based skin disease diagnosis with natural language processing (NLP)-driven mental health support—such as the proposed chatbot—represent a novel and emerging research area.

4. Ethical and Practical Considerations : Ethical and practical concerns remain central to AI deployment in healthcare. Issues such as data privacy, algorithmic bias, and the risk of misdiagnosis must be addressed. The World Health Organization (WHO) [7] emphasizes the need for transparency, safety, and human oversight in AI healthcare systems. In dermatology, Adamson and Smith [3] highlight disparities in AI performance across skin tones, reinforcing the necessity for diverse and inclusive training datasets.

III. PROPOSED SYSTEM

The proposed system is a cutting-edge smart healthcare chatbot that seamlessly integrates early skin disease diagnosis with compassionate mental health support. Accessible via a user-friendly mobile or web interface, it allows users to effortlessly upload images of skin conditions, which are analysed by a powerful deep learning model trained on extensive medical datasets to deliver accurate and easy-to-understand assessments.

What makes this system innovative is its dual functionality on a single platform, addressing both physical and psychological health needs, anytime, anywhere. Simultaneously, the chatbot engages users in meaningful, empathetic conversations powered by advanced NLP, offering mood tracking and personalized therapeutic exercises grounded in CBT. The system is also designed to recognize signs of emotional distress or crisis, promptly directing users to vital emergency resources. By combining these services, the chatbot offers a holistic, AI-driven healthcare experience, empowering individuals—especially those in remote or underserved communities—with timely, accessible, and confidential healthcare guidance.

IV. METHODOLOGY

The proposed system is a smart healthcare chatbot that leverages artificial intelligence to provide skin disease detection and mental health support through a unified, conversational interface. It integrates computer vision for image-based diagnosis and natural language processing (NLP) for emotional state analysis, offering users a multi-dimensional self-assessment and support platform.

1. System Architecture
The chatbot consists of two main AI-driven modules:
a. Skin Diagnosis Module: Detects and classifies common skin conditions from user-submitted images using deep learning.
b. Mental Health Support Module: Analyses user text input to identify emotional states and provide appropriate mental health assistance.

These modules are integrated within a mobile/web chatbot interface for seamless interaction.

2. Data Collection and Preprocessing
A. Skin Disease Detection
Datasets: Public dermatology datasets including ISIC 2018 and HAM10000.
Preprocessing:
- Image resizing to 224×224 pixels
- Normalization
- Data augmentation (e.g., rotation, flipping) to improve generalization

B. Mental Health Support

Datasets: EmpatheticDialogues and DAIC-WoZ for emotion recognition.

Preprocessing:

- Text cleaning, tokenization
- Emotion labeling (e.g., stress, anxiety, sadness, calm)

3. AI Model Development

A. Skin Diagnosis

Model: MobileNetV2 with transfer learning

Training: Fine-tuned on labelled skin condition images using categorical cross-entropy loss

Output: Skin condition class, confidence score, and risk level (e.g., informational, see a dermatologist)

B. Mental Health Analysis

Model: DistilBERT fine-tuned for multi-class emotion classification

Output: Detected emotional state + context-aware chatbot response

Features: Suggests basic coping mechanisms like breathing exercises, self-care tips, or links to mental health resources

4. Chatbot Interface and Workflow

Developed using platforms like Rasa or Dialogflow

Supports:

- Image upload for skin analysis
- Text-based mental health check-ins

Real-time AI-generated responses and feedback

Designed for ease of use, with minimal input required from the user

5. Evaluation Metrics

A. Skin Diagnosis Module

Metrics: Accuracy, Precision, Recall, F1-Score, AUC-ROC

Evaluation on test set with class-balanced validation

B. Mental Health Module

Metrics: Emotion classification accuracy

Usability assessed through user satisfaction surveys and feedback

6. Privacy and Ethical Considerations

User data is anonymized and processed locally or securely via encrypted channels.

No personally identifiable information (PII) is stored.

Fully GDPR-compliant, with clear disclaimers that the tool does not replace professional medical advice or diagnose

V. RESULTS

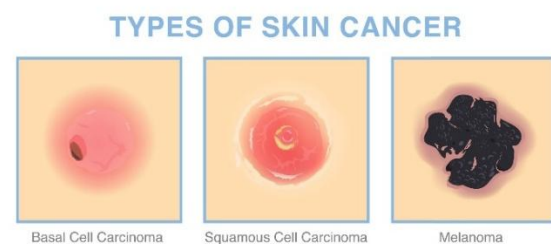Figure 1: Image upload for skin analysis
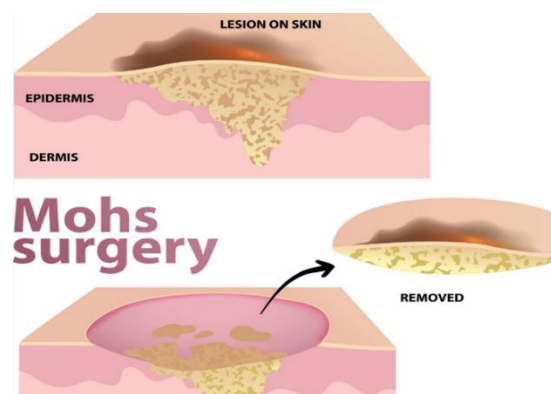

Figure 2: Predict Diagnosis

Figure 3: Medication Suggestions

After diagnosing a skin condition, the chatbot helps users understand their illness by providing detailed information, possible treatments, and medication suggestions. It also offers mental health support to reduce stress or anxiety caused by the diagnosis, using empathetic conversation and CBT-based

techniques to promote emotional well-being alongside physical care.

VI. CONCLUSION AND FUTURE WORKS

This paper presented a Smart Healthcare Chatbot that integrates AI-driven skin disease diagnosis and mental health support into a unified, accessible platform. Using computer vision (MobileNetV2) and natural language processing (DistilBERT), the system provides real-time, confidential assistance for both physical and emotional health concerns, which can particularly benefit users in underserved areas. After diagnosing a skin condition, the chatbot helps users understand their illness by providing detailed information and suggesting possible treatments. It also offers mental health support to reduce any stress or anxiety caused by the diagnosis, using empathetic conversation and CBT-based techniques to promote emotional well-being alongside physical care.

Preliminary results show promising accuracy in classification tasks and strong user engagement, indicating the chatbot's potential to enhance early intervention and self-monitoring. Future work will focus on improving dataset diversity to reduce AI bias, adding multilingual capabilities, conducting clinical validations to verify efficacy, and personalizing responses through more advanced AI techniques. Overall, this dual-function chatbot demonstrates how AI can deliver scalable, holistic healthcare support, reducing barriers to care and alleviating pressure on traditional health systems..

REFERENCES

[1] Esteva, A., Kuprel, B., Novoa, R. A., Ko, J., Swetter, S. M., Blau, H. M., & Thrun, S. (2017). Dermatologist-level classification of skin cancer with deep neural networks. Nature, 542(7639), 115-118. https://doi.org/10.1038/nature21056

[2] Han, S. S., Park, G. H., Lim, W., Kim, M. S., Na, J. I., Park, I., & Chang, S. E. (2018). Classification of the clinical images for benign and malignant cutaneous tumors using a deep learning algorithm. Journal of Investigative Dermatology, 138(7), 1529-1538.

[3] Adamson, A. S., & Smith, A. (2018). Machine learning and health care disparities in dermatology. JAMA Dermatology, 154(11), 1247-1248.

[4] Fitzpatrick, K. K., Darcy, A., & Vierhile, M. (2017). Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent (Woebot): A randomized controlled trial. JMIR Mental Health, 4(2), e19.

[5] Abd-Alrazaq, A., Rababeh, A., Alajlani, M., Bewick, B. M., & Househ, M. (2020). Effectiveness and safety of using chatbots to improve mental health: Systematic review and meta-analysis. Journal of Medical Internet Research, 22(7), e16021.

[6] Razzaki, S., Baker, A., Perov, Y., Middleton, K., Baxter, J., Mullarkey, D., ... & King, D. (2018). A comparative study of artificial intelligence and human doctors for the purpose of triage and diagnosis.
NPJ Digital Medicine, 1, 13. https://doi.org/10.1038/s41746-018-0029-1

[7] World Health Organization. (2021).
Ethics and governance of artificial intelligence for health: WHO guidance. https://www.who.int/publications/i/item/978924 0029200