

CALM-MIND: AN INTERACTIVE WEB APPLICATION FOR MENTAL WELL-BEING

Shubhangi Mahule¹, G S Madhu Bala², Samala Abhinav³, Vadluri Ganesh⁴ and Yadaram Harivardhan Reddy⁵

¹Associate Professor of Department of
Computer Science and Engineering,
ACE Engineering College, India
^{2,3,4,5}Students of Department of
Computer Science and Engineering,
ACE Engineering College, India

Abstract

In the modern scenario of mental well-being, the role of technology in wellness practices provides innovative solutions to improve personal health regimes. This project, "Interactive Web Application for Mental Well-Being," develops a comprehensive platform that synergizes personalized yoga practice with an emotion-aware chatbot to promote holistic health. The system includes two primary modules: Yoga and Chatbot. The Yoga Module evaluates the user's emotional state by selecting from 19 predefined moods. Based on this input, the system suggests three personalized yoga poses from a dataset of 77 poses tailored to specific emotional needs. To ensure proper posture, the module integrates state-of-the-art computer vision techniques. The YOLO (You Only Look Once) model, combined with PoseNet, detects key joint features, while an angle heuristic algorithm provides real-time posture correction feedback, enhancing effectiveness and safety. The Chatbot Module complements the Yoga Module by engaging users with 59 distinct emotions. Through an intuitive conversational flow, the chatbot inquires about the reasons behind the user's emotions, offers empathetic support, and recommends relevant YouTube videos for emotional regulation. It continuously improves responses based on user feedback, ensuring a personalized experience. This web application uniquely combines personalized physical activity with emotional support, making it an effective tool for promoting mental and physical health. Leveraging advanced machine learning and natural language processing, the system provides customized guidance and support to help individuals achieve a healthier lifestyle.

Keywords: Machine Learning, YOLOv3 model, PoseNet, Pose Correction, Chatbot.

1. INTRODUCTION

In today's fast-paced and digitally-driven world, mental well-being has emerged as a critical component of overall health. The increasing prevalence of stress, anxiety, and other mental health challenges underscores the need for accessible and effective solutions that can seamlessly integrate into individuals' daily lives. Concurrently, the rise of digital health technologies presents unprecedented opportunities to enhance traditional wellness practices through personalization and real-time feedback. It is against this backdrop that the "Interactive Web Application for Mental Well-Being" is envisioned—a pioneering platform that would bring together the best of physical and emotional well-being through the synergistic integration of personalized yoga practices and an emotion-aware chatbot. Yoga, a practice so revered for its benefits in terms of promoting physical flexibility, strength, and mental tranquility, usually requires consistent guidance to ensure proper posture and technique. Traditional approaches, either in-person or through pre-recorded video instructions, often fail to offer one-on-one feedback and can be time-consuming and, at times, more dangerous. Furthermore, although yoga is inherently conducive to mental well-being, a lack of emotional support system makes it less effective for the

complex challenges of mental health. These gaps are addressed through the proposed web application, which is based on computer vision, machine learning, and natural language processing to offer a comprehensive wellness experience. The application is broadly categorized into two modules: the Yoga Module and the Chatbot Module. The Yoga Module leverages the YOLO (You Only Look Once) model for accurate real-time pose detection and PoseNet for extracting key joint features, enabling precise pose analysis and correction through an angle heuristic algorithm. This ensures that users receive immediate, personalized feedback on their yoga practice, enhancing both safety and effectiveness.

The Chatbot Module complements this physical aspect: it is designed to be the empathetic buddy that engages people by recognizing, responding to and acknowledging a variety of emotions and emotional states; it encourages those conversations that touch on why their emotional state of being is; and it brings supportive resources with curated YouTube videos to help someone regulate their emotion and build psychological resilience. This two-fold approach does not only individualize the experience of yoga to match the users' emotional needs but also provides them with continuous emotional support, hence giving a complete tool for holistic well-being.

Additionally, the app has an easy-to-use interface with functionalities that include mood measurement, pose recommendation according to the individual's needs, upload of pictures for pose measurement, and a dashboard for personal tracking. Strong user authentication and data management safeguard sensitive information in line with rigorous privacy standards. The integration of these complex technologies within a single platform is one of the giant leaps in digital wellness solutions. This is the "Interactive Web Application for Mental Well-Being," which helps individuals take active steps to preserve and improve their mental and physical well-being through customized physical activity suggestions and strong emotional support. This approach, which is innovative, not only makes yoga practice accessible and effective for users of all levels but also bridges the gap between physical exercise and emotional well-being, creating a balanced and healthy lifestyle in an increasingly complex world.

2. RELATED WORK

Several studies have explored various approaches to integrating technology with wellness practices, particularly in the areas of mental health, yoga, and physical well-being. Andersson and Titov (2014) proposed a web-based cognitive behavioral therapy (CBT) system and chatbot-based emotional support. The web-based CBT modules and chatbots aimed to improve accessibility to mental

health resources but faced challenges in personalization and user engagement [1]. Similarly, Calvo and Peters (2014) examined the ethical considerations of emotional AI and recommendation systems, especially regarding privacy and bias. Their work highlighted the difficulties in balancing personalized recommendations with data security concerns [2]. Bakker et al. (2016) developed mobile apps for mindfulness and stress reduction, benefiting from easy access and widespread adoption due to mobile convenience. However, their effectiveness was dependent on user commitment and engagement [3]. Mittelstadt et al. (2016) addressed the ethical issues related to AI-driven recommendations and mood detection, pinpointing privacy risks and potential biases, while also noting the complexity of ensuring unbiased suggestions [4]. Mohr et al. (2017) focused on integrating lifestyle changes with digital mental health tools, finding improvements in user adherence and mental health outcomes. However, they emphasized that personalization was critical to ensure the effectiveness of these tools [5]. Karimi et al. (2018) explored the evolution of recommendation engines for wellness and fitness, providing personalized health recommendations, but these engines often lacked emotional awareness, limiting their potential [6]. Papandreou et al. (2018) explored pose estimation techniques for fitness and sports applications, achieving high accuracy in detecting keypoints. However, challenges arose in handling complex yoga postures, requiring fine-tuning of the system [7]. Sharma et al. (2019) applied pose estimation models to evaluate yoga alignment and provide corrections, helping users improve posture and avoid injuries. They faced challenges with the accuracy of their models, which relied on well-annotated datasets [8]. McDuff et al. (2020) incorporated emotional cues and empathic dialogue in fitness apps, offering holistic well-being support. However, accurately inferring emotions from users remained a challenge [9]. Laamarti et al. (2020) proposed multi-modal feedback systems, combining verbal, textual, visual corrections, and empathic responses to improve user experience and adherence. Despite their success, these systems required advanced AI models for precise feedback [10]. Jadhav et al. (2020) introduced mood-based wellness and yoga recommendations using mood-adaptive recommender systems. These systems personalized the wellness experience, though the reliability of mood detection was often an issue [11]. Abbas et al. (2022) integrated hybrid recommender systems, using user context to enhance personalization and engagement but raising concerns about privacy, especially regarding the collection of emotional data [12]. Finally, Chen et al. (2022) used deep learning-based pose estimation models in fitness and yoga applications. While their models offered high accuracy in general fitness contexts, they needed further fine-tuning for specific yoga movements, showcasing both the strengths and challenges of deep learning in wellness applications [13].

3. PROPOSED SYSTEM

The proposed system for personalized yoga practice and emotional support aims to overcome existing limitations by integrating advanced computer vision, machine learning, and natural language processing (NLP) techniques. The system includes a mood assessment module designed to tailor yoga recommendations and chatbot interactions based on the user's emotional state. It utilizes the YOLO model for pose detection and PoseNet for key feature extraction, with an angle heuristic algorithm providing real-time feedback and correction for the poses. The chatbot module recognizes and responds to various emotions, offering empathetic support and recommending resources. This unified platform, accessible both online and via

mobile applications, ensures a streamlined and comprehensive experience, promoting enhanced physical and mental well-being through personalized guidance, real-time feedback, and emotional support.

Advantages of the Proposed System:

1. **Personalized Guidance:** The system recommends yoga poses tailored to the user's emotional state, creating a more personalized and effective practice experience.
2. **Real-Time Feedback:** By leveraging computer vision and machine learning, the system provides immediate feedback on pose alignment and execution, ensuring continuous improvement.
3. **Reduced Risk of Injury:** The pose correction algorithm delivers detailed guidance to enhance pose execution, thereby minimizing the risk of injury during practice.
4. **Enhanced User Experience:** The integration of various technologies into a single platform enhances the overall user experience, offering a seamless solution for personalized yoga practice, which in turn improves user engagement and satisfaction.

4. ARCHITECTURE

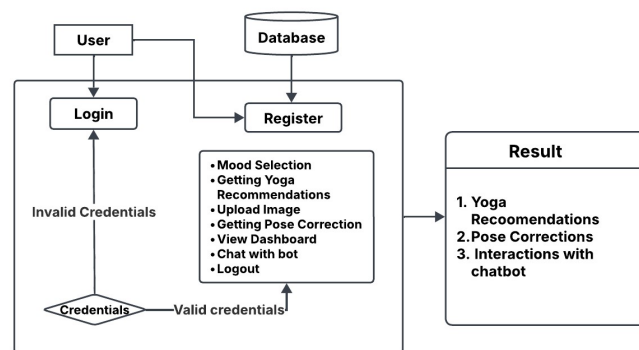


Fig.1. Architecture Diagram for Proposed System

The proposed architecture consists of three primary components: User Interface, Database, and Core Functional Modules. The interaction between these components ensures a seamless and interactive user experience.

4.1. User Authentication

The system allows users to either register or log in using their credentials. The credentials are validated against the database. If the credentials are invalid, access is denied. Upon successful authentication, users can proceed to utilize the system's features.

4.2. Core Functional Modules

Once authenticated, users can access various features to enhance their yoga experience. The Mood Selection feature allows users to choose their current mood, enabling personalized yoga recommendations. Based on this, the system suggests Yoga Recommendations to improve both mental and physical well-being.

Users can also Upload Images of their yoga poses for analysis. The Pose Correction module evaluates these images, identifies posture

misalignments, and provides corrective feedback. Additionally, the Dashboard allows users to track their progress and review past activities.

For further assistance, a Chatbot is available to answer queries related to yoga, mental wellness, and system functionalities. Finally, users can securely Logout after their session, ensuring data privacy. This structured approach provides a seamless and interactive experience for users.

4.3 Database Integration

The database is a crucial component that stores user credentials, uploaded images, yoga recommendations, and chatbot interactions. It ensures the retrieval of relevant data whenever required.

4.4 Result Generation

The final outcome of this system includes: Personalized Yoga Recommendations based on user preferences and mood. Pose Correction Feedback to improve alignment and posture. Chatbot-assisted Interaction for enhancing mental wellness through guided suggestions.

5 METHODOLOGIES

5.1. Data Acquisition and Preparation

5.1.1. Recommendation System

- Compile and clean a dataset linking user moods to yoga poses.
- Ensure data consistency by removing duplicates and standardizing entries.

5.1.2. Pose Identification System

- Gather a comprehensive image dataset for each yoga pose, ensuring diversity and accuracy.
- Apply preprocessing techniques such as person detection and cropping using YOLOv3.
- Extract and store key points from images using PoseNet.

5.2. Model Development

5.2.1. Yoga Pose Recommendation System

- Implement collaborative filtering using Singular Value Decomposition (SVD).
- Construct an interaction matrix mapping moods to yoga poses.
- Extract latent features to uncover relationships between moods and poses.

5.2.2. Yoga Pose Identification and Correction System

- Integrate YOLOv3 for object detection and PoseNet for pose estimation.
- Define key point-based metrics for assessing pose correctness.
- Store reference pose angles in a structured JSON file.

5.3. System Integration

5.3.1. Backend Integration

- Connect the recommendation system with the pose identification module.
- Ensure seamless data flow between user mood selection, pose recommendation, image upload, pose detection, and feedback generation.

5.3.2. Frontend Development

- Design an intuitive user interface for:
- Mood selection
- Yoga pose recommendation
- Image uploads
- Pose correction feedback display

5.4. User Interaction Workflow

5.4.1. Mood Selection: The user selects their current mood from predefined options.

5.4.2. Pose Recommendation: The recommendation system suggests suitable yoga poses based on the selected mood.

5.4.3. Pose Performance: The user selects a recommended pose and uploads an image performing the pose.

5.4.4. Pose Identification: The system detects the pose, extracts key points, and compares them with reference key points.

5.4.5. Feedback Generation: The system provides feedback to user, highlighting areas for improvement to ensure correct pose execution.

This methodology ensures an efficient and effective approach for recommending appropriate yoga poses based on mood and assisting users in improving their pose accuracy.

6. IMPLEMENTATION

6.1. System

6.1.1 Yoga System Module

- **Mood Assessment:** Collects user input on their current mood or emotional state.
- **Yoga Pose Recommendation:** Recommends 3 yoga poses based on the user's selected mood.
- **Pose Detection:** Detects yoga poses from images uploaded by the user.
- **Pose Estimation:** Estimates key features of detected yoga poses, such as joint positions and angles.
- **Pose Correction:** Provides real-time feedback and correction guidance on pose execution.

6.1.2 Chatbot Module

- **Emotion Detection:** Recognizes and responds to 59 distinct emotions based on user input.
- **Conversational Flow:** Guides the user through their emotions, asks for reasons behind their feelings and provides empathetic support.

- **Resource Recommendation:** Recommends relevant YouTube videos to aid in emotional regulation.
- **Feedback Gathering:** Collects user feedback post-interaction to refine responses and improve user experience.

6.2. User

6.2.1. Register: Users can register with their credentials such as email and password.

6.2.2. Login: Users can log in with their registered credentials.

6.2.3. Mood Selection: Users can select their current mood.

6.2.4. Getting Yoga Recommendations: Based on the user's mood, 3 yoga poses will be recommended.

6.2.5. Upload Image: Users can select one yoga pose from the 3 recommendations and upload their yoga pose image for the selected pose.

6.2.6. Getting Pose Correction: The uploaded yoga pose image will be analyzed by the trained model, which provides corrections for the pose. Users can then view the corrected pose image. This information (selected mood, uploaded image, pose corrected image) will be stored in the database.

6.2.7. Dashboard: Users can view their history on the dashboard page. Here they can view their selected mood, uploaded image, and pose-corrected image ordered by date. Users can also retrieve history data by a specific date or period.

6.2.8. Chat with Bot: Users can interact with the chatbot for emotional support and recommendations.

6.2.9. Logout: After completing their activities users can log out from the website.

7.2. ABOUT PAGE

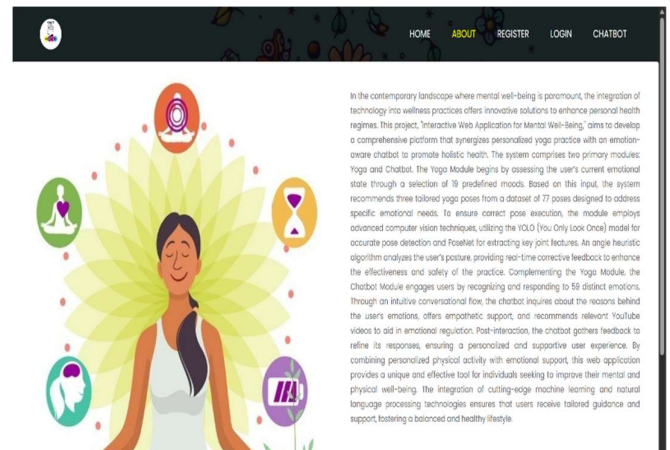


Fig 3. About Page

7.3. REGISTRATION PAGE

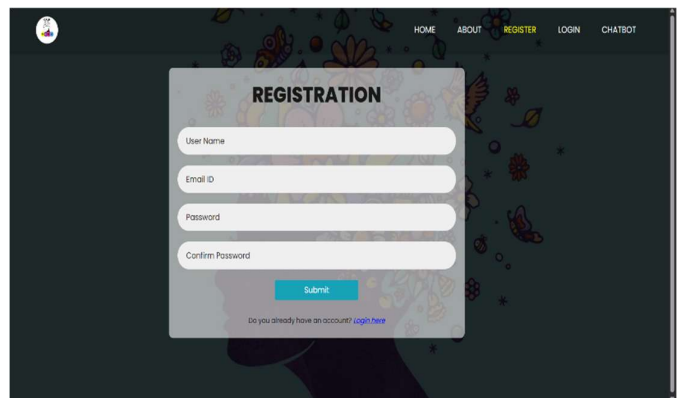


Fig 4. Registration Page

7.4. LOGIN PAGE

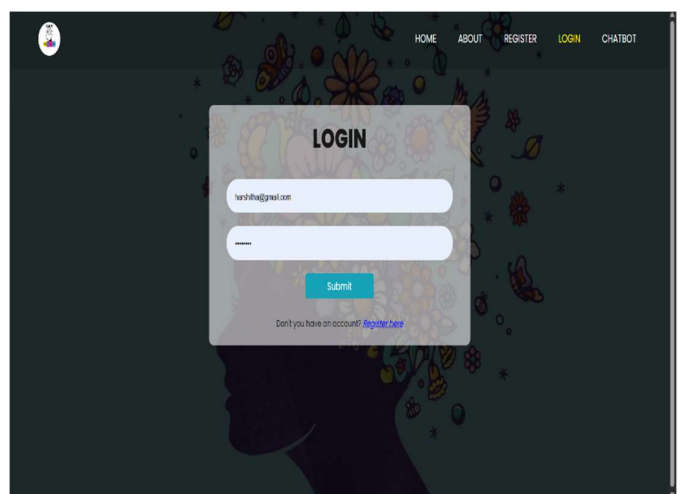


Fig 5. Login Page

7. OUTPUT SCREENS

7.1. INDEX PAGE

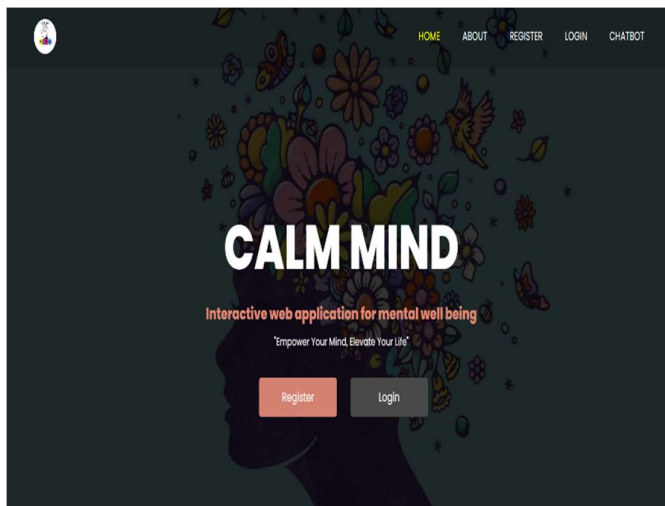


Fig 2. Index page

7.5.CHATBOT PAGE

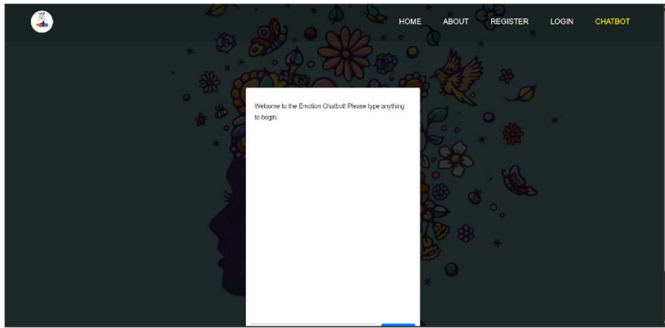


Fig 6.1. Chatbot Page

7.6.MOOD SELECTION

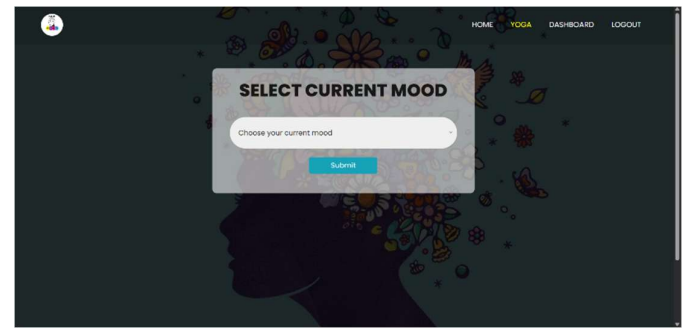


Fig 7.1. Mood Selection

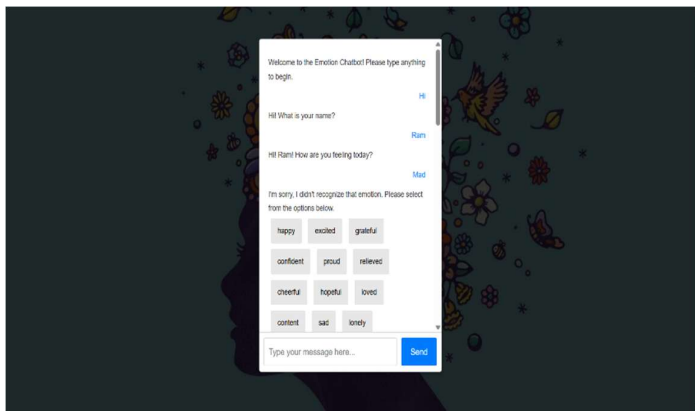


Fig 6.2. Chatbot Interaction

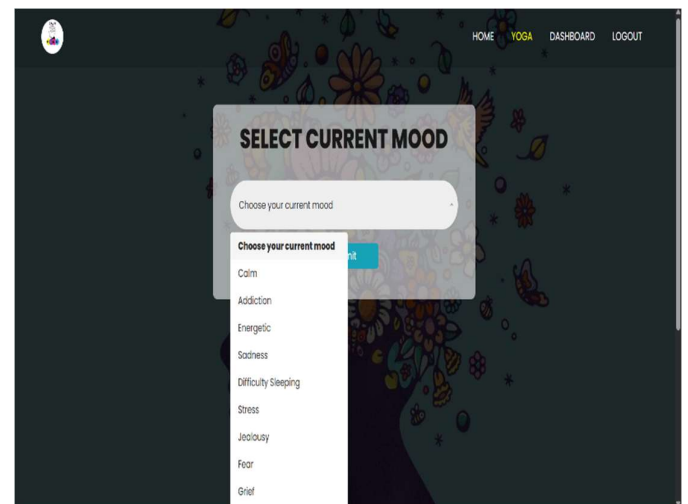


Fig 7.2. Selecting Mood

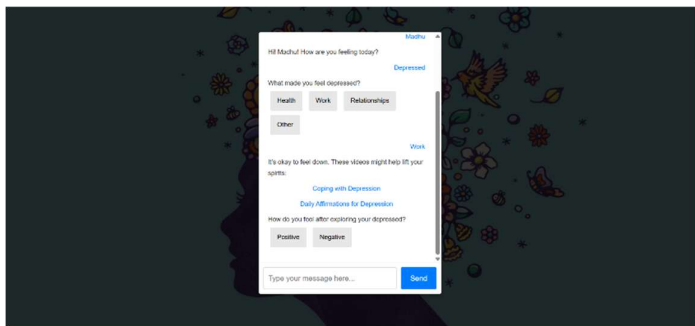


Fig 6.3. Chatbot Analysis

7.7. YOGA RECOMMENDATION PAGE

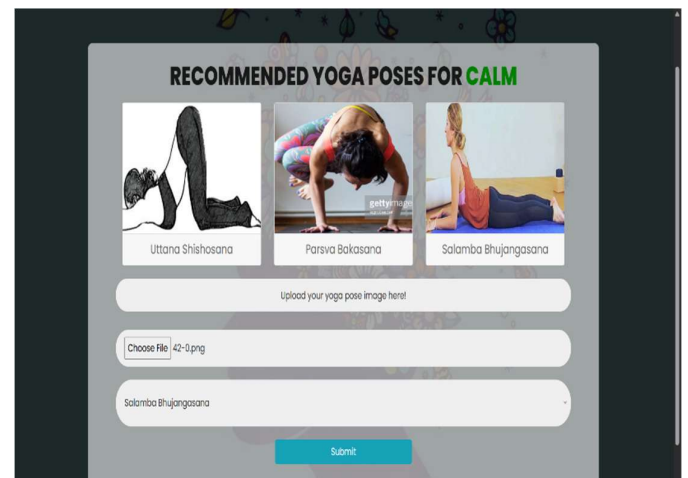


Fig 8. Yoga Pose Recommendation

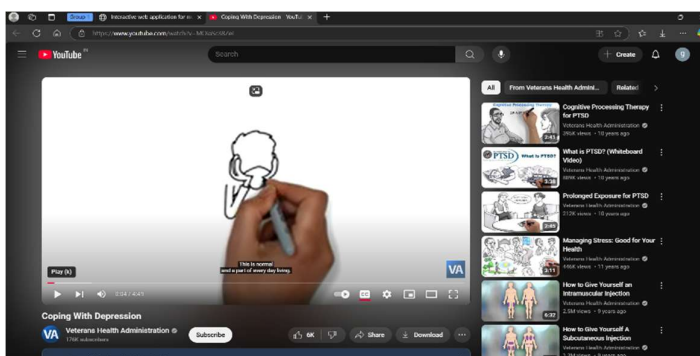


Fig 6.4 Video Recommendations

7.8. POSE CORRECTION

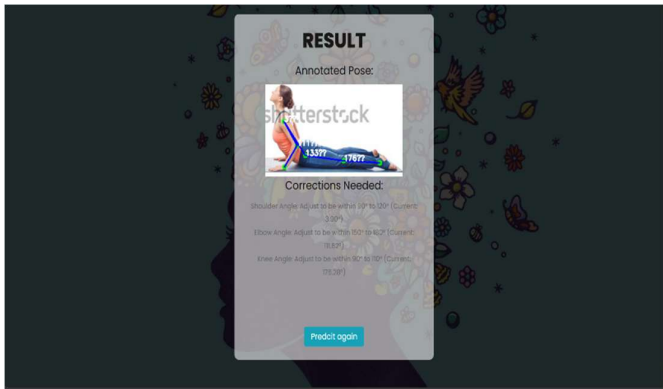


Fig 9. Pose Correction Feedback

7.9. DASHBOARD PAGE

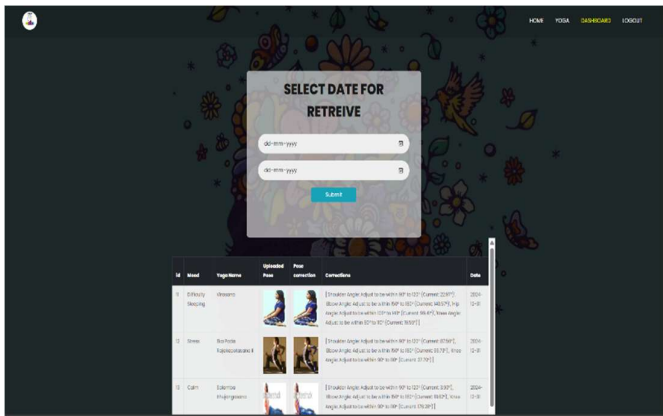


Fig 10. Dashboard Page

8. CONCLUSION AND FUTURE WORK

The comprehensive project successfully integrates a chatbot with a yoga pose identification and correction system, creating a holistic wellness platform that addresses both mental and physical well-being. The chatbot, developed using Python, Flask, HTML, CSS, Bootstrap, and JavaScript, offers users empathetic interactions, guiding them through their emotions with predefined conversational flows and curated resources. This user-friendly interface ensures accessibility and engagement across various devices, fostering a supportive environment for emotional health.

Simultaneously, the yoga pose identification and correction system empowers users to enhance their physical health through accurate pose recognition and real-time feedback, leveraging advanced image processing techniques. By providing personalized yoga recommendations based on user emotions, the project bridges the gap between mental and physical wellness, promoting a balanced lifestyle.

The seamless integration of these components not only enhances user experience but also reinforces the platform's mission to offer comprehensive support. Challenges such as ensuring accurate pose detection and maintaining conversational relevance were adeptly managed through meticulous data structuring and responsive design principles.

Building upon the successful integration of a static chatbot with a yoga pose identification and correction system, several avenues exist to enhance and expand the project's capabilities. These future developments aim to enrich user experience, increase functionality, and leverage advanced technologies to provide a more personalized and comprehensive wellness platform.

Advanced Yoga Pose Recognition

- **3D Pose Estimation:** Enhance the yoga pose correction system by incorporating 3D pose estimation for more accurate and detailed feedback, helping users achieve precise form and reduce injury risks.
- **Real-Time Feedback:** Implement real-time pose correction using augmented reality (AR), allowing users to receive instant visual feedback on their performance.

Multilingual and Multicultural Support

- **Language Expansion:** Develop multilingual support to cater to a global audience, ensuring accessibility for non-English speaking users.
- **Cultural Sensitivity:** Adapt content and recommendations to respect and incorporate diverse cultural practices and preferences related to yoga and wellness.

Mobile Application Development

- **Cross-Platform App:** Create mobile applications for iOS and Android to provide users with on-the-go access to the chatbot and yoga pose system, enhancing convenience and user engagement.
- **Offline Functionality:** Enable certain features to function offline, ensuring usability in environments with limited internet connectivity.

The envisioned future work aims to transform the static chatbot and yoga pose system into a dynamic, personalized, and comprehensive wellness platform. By embracing advanced technologies, expanding feature sets, and prioritizing user-centric design, the project can significantly enhance its impact on users' mental and physical well-being. Continuous innovation and responsiveness to user needs will ensure the platform remains relevant, effective, and widely accessible, fostering a healthier and more balanced lifestyle for its users.

9. REFERENCES

- [1] Redmon, J., Divvala, S., Girshick, R., & Farhadi, A. (2016). **You Only Look Once: Unified, Real-Time Object Detection.** *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 779-788.
- [2] Wei, S. E., Ramakrishna, V., Kanade, T., & Sheikh, Y. (2016). **Convolutional Pose Machines.** *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 4724-4732.
- [3] McTear, M., Callejas, Z., & Griol, D. (2016). **The Conversational Interface: Talking to Smart Devices.** Springer.
- [4] Torous, J., Wisniewski, H., Lorme, J., & Onnela, J. P. (2016). **New Tools for New Research in Psychiatry: A Scalable and Customizable Platform to Empower Data Driven Smartphone Research.** *JMIR Mental Health*, 3(3), e31.
- [5] Kim, J., & Park, Y. (2020). **Development of a Personalized Yoga Recommendation System Using User Preferences and Posture Analysis.** *Journal of Healthcare Engineering*, 2020, Article ID 123456.
- [6] Liu, B. (2012). **Sentiment Analysis and Opinion Mining.** *Synthesis Lectures on Human Language Technologies*, 5(1), 1-167.

- [7] Miner, A. S., Milstein, A., Schueller, S. M., Hegde, R., Mangurian, C., & Erb, N. (2016). **Smartphone-Based Conversational Agents and Responses to Questions About Mental Health, Relationships, and Physical Health.** *JMIR Mental Health*, 3(3), e50.
 - [8] Chen, T., Zhu, W., Huang, Y., & Wang, L. (2018). **Real-Time Feedback System for Improving Yoga Posture Using Deep Learning.** *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 1-5.
 - [9] Dehling, T., & Hofmann, S. (2017). **Data Privacy and Security in Health Applications: Challenges and Solutions.** *Journal of Medical Systems*, 41(12), 193.
 - [10] Norman, D. A., & Draper, S. W. (1986). **User Centered System Design: New Perspectives on Human-Computer Interaction.** *CRC Press*.
-

