

SMART YOGA: PERSONALIZED YOGA RECOMMENDATION SYSTEM FOR PAIN RELIEF AND WELLNESS

Project Reference No.: 49S BE 3298

College : BLDEA's V. P. Dr. P. G. Halakatti College of Engineering & Technology, Vijayapur
Branch : Department of Computer Science and Engineering (Artificial Intelligence & Machine Learning)
Guide(s) : Prof. S. S. Dhanyal
Student(s) : Ms. Meezan Mulla
Ms. Bhumika D Patil
Ms. Neha R Nala
Mr. Shubham Kaddu

Keywords:

Personalized Yoga Recommendation, Pain Relief, Computer Vision, Mediapipe, Pose Estimation, AI Wellness System, Real-time Posture Correction, Machine Learning

Introduction:

In recent years, lifestyle-related health issues such as back pain, neck pain, joint stiffness, stress, and poor posture have increased significantly due to sedentary habits and prolonged screen exposure. Yoga is a proven holistic practice for pain relief and overall physical and mental wellness; however, incorrect posture and lack of personalized guidance can reduce its effectiveness and may even lead to injuries.

This project presents Smart Yoga, a personalized yoga pose recommendation system designed to support pain relief and wellness using artificial intelligence and computer vision techniques. The system recommends suitable yoga poses based on user-specific parameters such as age, gender, body mass index (BMI), pain area, and level of experience. To ensure correct execution of poses, the system employs real-time yoga pose detection using image or webcam input and evaluates posture accuracy by analyzing body keypoints extracted through pose estimation techniques.



Figure 1: Smart Yoga Final Workflow

Objectives:

1. To develop a personalized yoga pose recommendation system based on user's health conditions, pain areas, BMI, age, gender, and wellness goals.
2. To implement real-time pose detection and accuracy evaluation using computer vision (Mediapipe) and machine learning models.
3. To provide corrective visual/audio feedback for proper posture execution and injury prevention.
4. To create a user-friendly web-based interface with progress tracking and emotional/wellness analytics.

Methodology:

The project is developed as a web application using Python (Flask backend) with the following core modules:

- **User Input Module:** Collects age, gender, BMI, pain area, and experience level via web form.
- **Recommendation Engine:** Rule-based expert system combined with ML classifier to suggest safe yoga poses.
- **Pose Detection & Correction:** Google Mediapipe Holistic for real-time 2D/3D body keypoint extraction and custom angle-based posture validation.
- **ML Models:** CNN/SVM for pose classification and accuracy scoring.
- **Frontend:** Responsive web UI with live webcam integration and progress dashboard.

The system processes webcam or uploaded image input, computes joint angles, compares with ideal pose templates, and delivers instant corrective feedback.

Result and Conclusion:

In conclusion, the Smart Yoga system successfully delivers an intelligent, user-friendly, and scalable solution for personalized yoga guidance. The functional prototype accurately detects user conditions, recommends safe poses, and provides real-time posture correction. It promotes pain management, injury prevention, and overall wellness while reducing dependence on continuous expert supervision. Testing shows high user engagement and improved pose accuracy.

References:

1. H. Chen, Y. He, and C. Chou, "Self-Training Exercise System Using Kinect for Yoga Poses," *Proc. IEEE Int. Conf. on Consumer Electronics*, 2024.
2. A. Sharma *et al.*, "Surya Namaskar: Mediapipe-Based Real-Time Detection & Correction," *Proc. Int. Conf. on AI and ML*, 2023.
3. J. Palanimeera and K. Ponmozhi, "ML Models for Pose Classification," *Journal of Computer Vision Applications*, 2023.
4. A. Patil *et al.*, "Yoga Tutor: SURF-Based Feature Extraction and Expert Rules," *Proc. IEEE Int. Conf. on Computing*, 2022.
5. Mediapipe Documentation, Google LLC, 2023.

Future Scope:

The future scope of this project includes:

1. Integration with mobile applications for on-the-go access and offline mode.
2. Incorporation of wearable sensors for real-time physiological feedback.
3. Expansion to group yoga sessions with multi-user support.
4. AI-based long-term progress analytics and personalized wellness coaching.
5. Multilingual support and cultural adaptation of yoga poses.