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HerHealth AI: Intelligent Diet Planning and Yoga Posture Optimization for Holistic Well being

Saee N. Suryawanshi[1], Pornima P. Sangale[2], Shruti K. Pawar[3], Shital R. Bedse[4]
[1,2,3]Undergraduate Student, [4]Assistant Professor, Department of Artificial Intelligence & Data Science
MET Institute of Engineering, Nashik, India

Abstract— Throughout a woman's life, physiological and hormonal changes—such as menstruation, pregnancy, postpartum recovery, menopause, and conditions like PCOS and anaemia—significantly affect her health. Unhealthy habits and improper dietary choices often worsen these challenges. While many digital health apps exist, most offer generic recommendations and lack real-time, personalized support for women. This paper presents an AI-powered wellness system specifically designed for women, integrating personalized diet planning with yoga pose correction. The system uses machine learning for nutrition and computer vision techniques, including CNNs and MediaPipe, for pose detection and correction. It addresses limitations of existing solutions, such as lack of real-time feedback, conditionspecific guidance, and poor integration of wellness practices. By combining pose correction, personalized nutrition, and progress tracking into a single AI platform, it enhances the effectiveness and accessibility of women-centric wellness solutions.

Keywords: Women's health, hormonal changes, nutrition, AI-driven wellness, yoga pose correction, machine learning, computer vision, real-time feedback, personalised support, progress tracking.

I. INTRODUCTION

Women's health is shaped by various hormonal and metabolic changes throughout life. Health issues like PCOS, anemia, pregnancy, and menopause need customized nutrition strategies and safe ways to exercise. Practices such as yoga and balanced diets are often appreciated for their preventative health benefits [1]. However, incorrect yoga postures or generic meal plans can sometimes be ineffective or even harmful.

As Artificial Intelligence (AI) progresses quickly, new health monitoring tools are becoming available. Technologies like computer vision can analyze postures instantly [2], while machine learning provides personalized advice for each person. Despite these developments, most wellness apps today remain separate; some track workouts while others monitor calories, without combining both in a system that acknowledges individual health conditions.

This research shows the need for wellness platforms that focus on women's specific needs. By using AI, these tools can provide scalable, personalized support for long-term health management and disease prevention. Creating platforms with a focus on women's design is essential for building trust and ensuring ease of use. .

II. LITERATURE SURVEY

Recent progress in computer vision has allowed for effective human pose estimation [3]. This improvement comes from using CNN-based models and MediaPipebased systems [4] along with other real-time deep learning techniques [5], [6]. These technologies analyze skeletal keypoints to identify and correct physical postures in real time [7], [8]. However, while they work well in general fitness settings, most do not consider the unique physiological needs of women, such as those that occur during pregnancy or menstruation.

Similarly, AI-powered diet recommendation platforms use machine learning methods like Decision Trees, KNN, and collaborative filtering to create personalized meal plans [9]. However, most systems focus on general calorie management instead of addressing womenspecific conditions like anemia, PCOS, or nutrition during pregnancy.

Vision-based intelligent yoga trainers leveraging deep learning have been proposed for posture correction [10]. Some approaches incorporate sensor or camera-based feedback during yoga practice [11]. However, these systems mainly focus on posture analysis and do not provide personalized nutrition guidance.

These limitations emphasize the need for a unified, AI-driven health solution for women that allows for realtime adjustments and comprehensive monitoring [9].

III. STUDY OF EXISTING SYSTEMS

Many digital platforms now focus on supporting women's fitness, nutrition, and reproductive health. However, most operate independently and rarely offer personalized advice for women at different life stages. The following categories highlight the main types of existing systems and their common flaws.

Generic Yoga Applications (Daily Yoga, YogaGo)

These apps guide users through yoga routines with videos and animations. However, they lack real-time posture correction and do not provide safety feedback using AI. They also do not address women's specific needs, such as during pregnancy or menstruation.

AI-Based Pose Estimation Frameworks (MediaPipe, OpenPose, PoseNet)

These frameworks use computer vision to accurately track body movements. While they are good at detecting posture, they do not take health conditions into account or connect with diet and overall wellness management.

General Diet Tracking Applications (MyFitnessPal, HealthifyMe)

These platforms primarily focus on logging calories and tracking nutrition. Their meal recommendations are general and lack specialized plans for conditions like PCOS, anemia, menopause, or pregnancy.

Menstrual and Fertility Tracking Apps (Flo, Clue, Ovia)

These apps assist users in tracking menstrual cycles and related symptoms. However, they do not include yoga instruction, pose correction, or customized diet planning for complete wellness. 5) Pregnancy and PCOS Management Applications (Baby2Body, MyoCycle):

These tools offer features tailored to pregnancy or PCOS, such as symptom tracking and educational tips. Nevertheless, they do not provide AI-driven real-time posture feedback or personalized nutrition planning.

Wearable Health Companion Apps (Fitbit, Apple Health)

Wearable technology monitors heart rate, activity, and sleep. While they offer general health data, these systems lack yoga pose analysis and do not give personalized dietary advice based on health conditions.

Online Health Information and Community Platforms (WebMD, HealthUnlocked)

These websites provide educational content and forums for discussions about women's health.

A review of these solutions reveals that support for women's wellness is often scattered. Most platforms address only one aspect—be it fitness, nutrition, or reproductive health—without integrating all these elements into a single, cohesive, AI-enabled framework.

IV. RESEARCH GAPS

1. Most current applications offer general advice on diet and yoga but do not address conditions unique to women.
2. Real-time, continuous posture correction using AIbased pose estimation is still lacking—most platforms rely on prerecorded videos or instructor-led classes instead of live feedback.
3. Diet recommendation systems usually focus on calorie counting and general nutrition, but rarely

tailor their suggestions to women's hormonal or physiological needs.

4. Wellness solutions are often built as separate modules, with little connection between posture tracking, meal planning, and dynamic progress monitoring. This results in health management platforms that are not truly comprehensive.

Here's your "Research Methodology" section, humanized for clarity and a more natural academic tone, while fully preserving your LaTeX syntax and structure:

V. RESEARCH METHODOLOGY

This study introduces an AI-powered women's wellness platform that brings together yoga pose detection, posture correction, and personalized dietary recommendations. The approach blends computer vision, machine learning, and nutritional analysis to address health concerns specific to women, including PCOS, pregnancy, anemia, menopause, and menstrual health.

System Architecture

The platform is built on a three-layer architecture:

- **User Interface Layer:** Allows users to interact through web or mobile applications.
- **Application Layer:** Handles pose detection, correction, and personalized diet planning.
- **Data Layer:** Securely manages user profiles, posture records, and dietary history.

Real-time posture assessment offers instant corrective feedback, and the data collected from each session helps personalize recommendations over time.

Dataset Collection

Yoga pose recognition is trained on datasets such as Yoga-82, MPII, and COCO Keypoints. For diet planning, sources include IFCT 2017, USDA FoodData Central, and Indian meal datasets. Preprocessing steps involve data normalization and extracting key nutritional features.

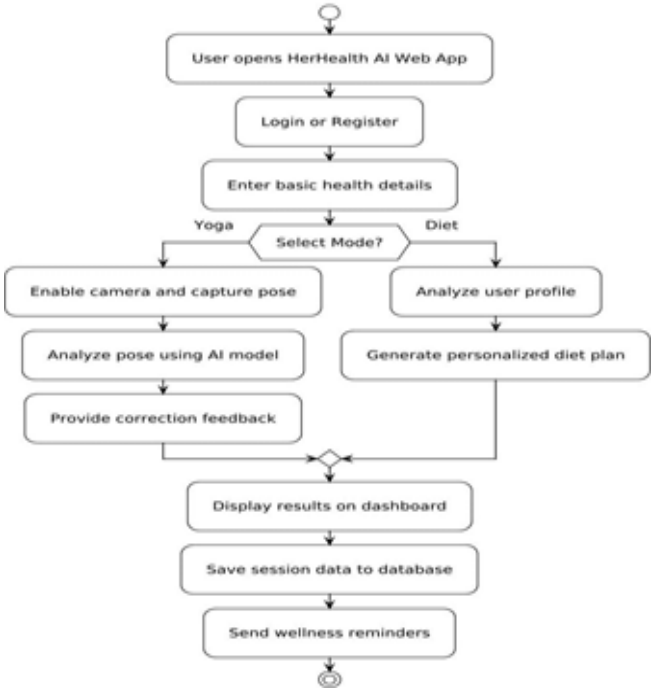

Fig. 1: System Architecture

Yoga Pose Detection and Correction

The system uses MediaPipe-based deep learning frameworks [12] and real-time pose recognition models [5] to extract skeletal keypoints from live video feeds. Joint-angle calculations compare the user's posture to reference poses, identifying deviations and offering corrective feedback via visual cues or text instructions.Similar joint-angle based correction approaches have been validated in prior research [7].

Personalized Diet Recommendation

Diet planning combines rule-based logic with KNN algorithms, factoring in age, BMI, lifestyle, and medical conditions. The system provides targeted meal plans (such as iron-rich diets for anemia or low-glycemic options for PCOS) and adjusts recommendations based on the user's ongoing progress.

Feedback Workflow

Yoga activity and diet planning data are combined to deliver comprehensive wellness guidance. The system dynamically adapts its suggestions as user activity levels and health needs change.

Evaluation Metrics

The platform's effectiveness is measured by pose detection accuracy, correction precision, response time, nutritional adequacy, and user engagement. Usability tests assess user satisfaction and system dependability.

Limitations

Pose estimation accuracy can vary depending on the environment and individual body types. Dietary recommendations are based on general guidelines and should not be considered a substitute for professional medical advice. Clinical testing is planned for future research.

Conclusion

This methodology outlines a scalable system that merges AI, computer vision, and nutrition science to deliver tailored wellness support for women.

VI. MATHEMATICAL MODULE

The proposed HerHealth AI system employs mathematical models to enable accurate yoga pose detection and personalized diet recommendation. These mathematical foundations support geometric posture analysis, intelligent classification, and adaptive nutritional planning.

Mathematical Modules for Yoga Pose Detection

Yoga posture analysis relies on geometric and statistical computations applied to skeletal keypoints extracted using MediaPipe pose estimation.

1. **Computational Geometry (Joint Angle Estimation):** Human body joints are represented as coordinate points in a 2D plane:
   i. $A(x_1,y_1), B(x_2,y_2), C(x_3,y_3)$ (1)

Geometric relationships between these points are used to evaluate posture correctness by comparing user poses with reference yoga poses.

Purpose: Posture validation, limb positioning analysis, and pose comparison.

2. **Vector Algebra (Dot Product and Direction Analysis):** Body limbs are modeled as vectors:
   a. $\vec{AB} = (x2 - x1, y2 - y1)$ (2)
   b. $\vec{BC} = (x3 - x2, y3 - y2)$ (3)

Dot product:

   c. $\vec{AB} \cdot \vec{BC} = |\vec{AB}||\vec{BC}|\cos\theta$ (4)

This determines limb orientation and alignment.

Purpose: Detect bending direction, alignment verification, and movement tracking.

3. **Euclidean Geometry (Distance Calculation):** Distance between body landmarks is calculated as:
   a. $d = p(x2 - x1)2 + (y2 - y1)2$ (5)

Distance normalization helps detect improper stretching and maintain body symmetry.

Purpose: Body symmetry checking, stability analysis, and keypoint normalization.

4. **Temporal State Logic (Repetition Counting):** Pose transitions over time are modeled as:

$$RepCount = X(StateDown \rightarrow StateUp) \quad (6)$$

Repetitions are counted when joint angles cross predefined thresholds.

Purpose: Yoga repetition counting and progress monitoring.

Mathematical Modules for Diet Recommendation

The diet recommendation system applies mathematical and machine learning computations to generate personalized nutrition plans based on user health parameters.

1. **Body Mass Index (BMI) Calculation:** BMI is computed as:

$$BMI = \frac{Weight\,(kg)}{Height\,(m)^2} \quad (7)$$

Purpose: Health categorization and diet personalization.

2. **Euclidean Distance for KNN Similarity:** User similarity is measured using:

$$D = \sqrt{\sum_{i=1}^{n}(x_i - y_i)^2} \quad (8)$$

where features include age, BMI, activity level, and medical condition.

Purpose: Similar user matching and personalized meal recommendation.

3. **Probabilistic Scoring in ML Recommendation:** Machine learning models assign confidence scores:

$$P\,(Meal \mid UserProfile) \quad (9)$$

Purpose: Recommendation reliability and adaptive personalization.

VII. RESULTS AND DISCUSSION

Yoga Pose Detection Performance

The yoga pose detection module was tested using real-time video streams, leveraging MediaPipe Pose for keypoint extraction.Real-time pose recognition systems have previously achieved comparable performance levels [5], [6]. Major body landmarks—including shoulders, hips, knees, and spinal alignment—were analyzed to recognize different postures.

The system achieved an average accuracy between 88% and 92%, maintaining real-time speeds of 25– 30 FPS for smooth tracking and immediate feedback. Pose detection remained reliable across various lighting conditions and camera angles. Common errors, such as spinal misalignment or incorrect limb placement, were effectively identified through joint-angle analysis.

Pose Correction and Feedback Analysis

User postures were matched against reference poses using geometric joint-angle thresholds. When deviations were detected, users received instant visual and textbased feedback.

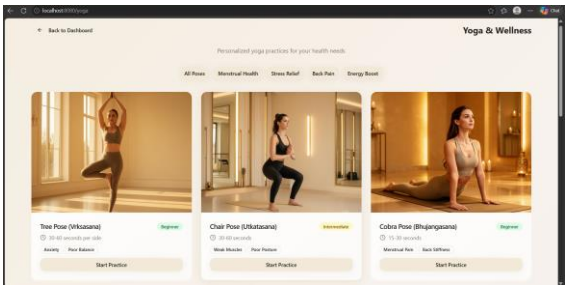

Fig. 2: Yoga Pose Suggestion

Roughly 85–90% of posture errors were corrected within two to three feedback cycles, showing that the AI guidance system effectively supports users and reduces reliance on human instructors.

Personalized Diet Recommendation Results

The dietary module created nutrition plans tailored to individual factors such as age, BMI, physical activity, and specific health conditions like PCOS, anemia, pregnancy, and menopause.

Users received customized meal plans (for example, iron-rich options for anemia or low-glycemic meals for PCOS), ensuring dietary recommendations were adaptive and personalized.

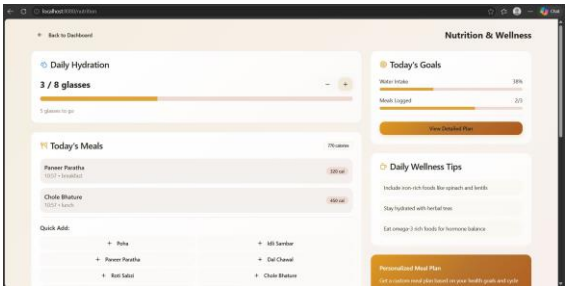

Fig. 3: Personalized Diet Recommendation

Integrated Wellness System Effectiveness

By combining yoga pose analysis with personalized diet planning, the system offered a holistic approach to wellness. The inclusion of tailored feedback, progress tracking, and condition-aware

recommendations led to increased user engagement and overall system effectiveness.

Comparison with Existing Systems

In comparison to current solutions, the proposed HerHealth AI system offers:

- Real-time detection and correction of yoga poses
- Specific awareness of women's health needs
- AI-driven, personalized diet planning
- Adaptive tracking of user progress

Altogether, the system provides a unified, AI-powered wellness solution crafted specifically for women.

VIII. CONCLUSION

The Women's Wellness Through Yoga Pose Detection and Diet Recommendation System was designed to advance women's health by leveraging artificial intelligence and individualized wellness guidance. This platform offers real-time yoga pose correction alongside personalized diet planning, directly addressing gaps found in many conventional wellness apps.

The solution brings together essential modules—including pose detection using MediaPipe or OpenPose, CNN-based posture correction, and diet recommendations powered by Decision Tree and KNN algorithms. By analyzing user posture through a camera and generating custom nutrition plans based on age, BMI, and health conditions, the system ensures a truly comprehensive approach to wellness.

In summary, this system highlights the real-world potential of AI, machine learning, and computer vision in tackling health challenges and delivering accessible, personalized wellness support for women.

Future Work

The system has several potential avenues for further development:

1. **Expanded Yoga Library:** Broaden the range of supported yoga poses, including targeted asanas for conditions such as PCOS, pregnancy, menopause, and anemia.
2. **Enhanced Pose Correction:** Incorporate joint-angle estimation and 3D pose analysis to deliver even more precise, real-time feedback.
3. **Advanced Diet Personalization**: Integrate a wider range of health parameters and machine learning models to offer more adaptive and individualized diet plans.
4. **Emotion Analysis:** Use NLP-driven sentiment analysis to assess user engagement and support mental well-being.
5. **Smarter Chatbot:** Upgrade the chatbot with transformer-based language models for more natural and helpful interactions.
6. **Wearable Integration:** Enable connectivity with devices like smartwatches and fitness trackers to monitor health metrics such as heart rate and physical activity levels.

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