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YogAI: An AI based Yoga Trainer

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Abstract : The project "YogAI" addresses the need for an innovative solution to enhance yoga practice by leveraging real-time pose detection and intelligent feedback generation. In a world increasingly focused on physical and mental well-being, YogAI aims to provide a unique and accessible approach to personalized yoga training through a user-friendly Android application. The specific objectives of YogAI include guiding users through their yoga practice, ensuring correct posture and alignment, tracking progress over time, providing a real time voiced feedback based on user performance hence offering a comprehensive yoga companion experience. To achieve these goals, YogAI utilizes machine learning models for pose detection, allowing users to receive instant feedback on their poses. The app also offers guided workouts and the ability to monitor vital signs for safe and effective yoga sessions.

The approach of YogAI involves the integration of machine learning frameworks, Android app development and voiced feedback generation. The results expected include an engaging and effective yoga training tool that caters to users of all skill levels. YogAI will empower users to improve their yoga practice, manage stress, and prioritize their well-being. YogAI represents an innovative fusion of technology and wellness, offering a practical solution for individuals seeking to enhance their yoga experience. This project aims to make yoga accessible, enjoyable, and effective for everyone, promoting physical and mental health in an increasingly hectic world.

IndexTerms **- Android, Machine Learning, Pose Detection, Text to Speech, Feedback generation, Yoga and Fitness.**

I. INTRODUCTION

In today's fast-paced society, individuals often struggle to find the time and resources to engage in regular physical activity and prioritize their well-being. Yoga, with its holistic health benefits, stands as an effective solution to address these concerns. However, the accessibility and convenience of yoga practice remain significant obstacles for many.

The project's specific focus is on leveraging technological advancements to make yoga more accessible and personalized. In an era where smartphones and mobile apps have become integral parts of our daily lives, the introduction of YogAI justifies the need for a convenient and user-friendly Android application. This application aims to enhance the yoga experience for individuals seeking the physical and mental benefits of the practice, especially those who may not have access to personal trainers or dedicated yoga studios.

By employing real-time pose detection and feedback generation, YogAI fills a crucial gap in the realm of health-conscious living. This introduction highlights the relevance of the project, not only as a response to the modern lifestyle but also as a potential solution that aligns with the broader interests of individuals seeking to enhance their well-being. The justification lies in the growing demand for accessible, efficient, and personalized yoga training solutions, making YogAI a relevant and valuable endeavor both within the scientific community and among those pursuing healthier lifestyles.

The need for the YogAI project is rooted in the growing demand for convenient and effective yoga training solutions, especially for individuals leading busy lives with limited access to personal trainers. In today's fast-paced world, carving out time for physical well-being can be challenging. YogAI steps in to bridge this gap by utilizing real-time pose detection and feedback generation to offer a comprehensive and personalized yoga training experience through a user-friendly Android app. The project aims to provide an accessible and time-efficient alternative to physical trainers, empowering users to maintain correct posture, achieve their wellness goals, and prioritize their health within their busy schedules. In essence, YogAI responds to the need for a flexible and technologically-driven approach to yoga practice, aligning with the modern lifestyle of individuals seeking the benefits of yoga without the constraints of traditional training methods.

II. LITERATURE SURVEY

[1] This paper focuses on the notion of identifying different yoga postures and addressing the issue of poor posture with the aid of a precise model. It was developed to provide accurate post-estimation for the yoga poses. With OpenPose a model was created that helps in estimating the human pose. The results are obtained using the 2D and 3D points which are then determined if the accuracy of the model is increased when more features are added to the dataset.

[2] This study examines a range of posture estimating technologies and comes to a recommendation for the most effective approach for an Android app. It provides a pose estimation method for an android application. Tensorflow was used to achieve this method as it contains many libraries that provide privacy and faster analysis. The methodology was incorporated in addition to the speech-totext and text to-speech Google modules.

[3] An application powered by artificial intelligence might be helpful for identifying yoga poses and provide individualised feedback to assist people improve their poses. It is an algorithm used to calculate yoga position inaccuracy. A TensorFlow Move Net thunder model was proposed that provides an accurate pose estimation that is used to find pose problems in a person's posture.

[5] This approach was illustrated by collecting six yoga asanas as a dataset. Since the model accurately classifies yoga poses, the poses performed are further modeled using a deep learning model. This is a hybrid deep learning consisting of a CNN layer used to get key pointsand an LSTM to make predictions. The system achieved99.04% accuracy on individual images.

[6] In this paper the TL MobileNet DA model was selected as the best model showing overall value 98.43% accuracy, 98.30% sensitivity, 99.88% specificity, and a Matthews correlation coefficient of 0.9831. This study presented a yoga posture coaching system Real-time recognition of the movement of the user's yoga posture, You can choose yoga posture tips and guide them to avoid bad postures.

III. RESEARCH METHODOLOGY

SYSTEM ARCHITECTURE

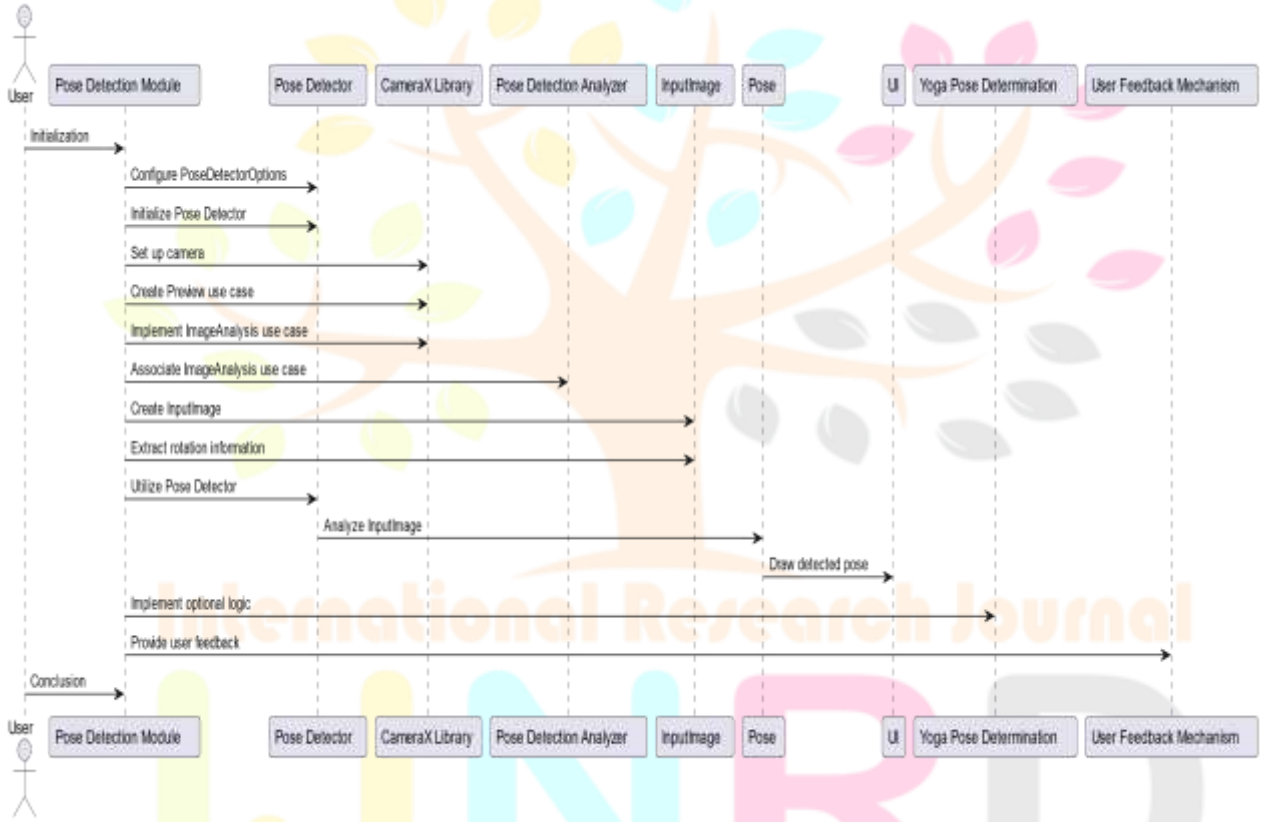


Fig.1 System Sequence Diagram

The proposed system automatically extracts the user's posture from the front camera and monitors 33 major body points from the camera image of the user performing asanas to determine the pre-defined acceptable comparison with a collection of similar yoga postures.
The procedure he consists of four stages. They are:

- Pose extraction through Camera
- Key-point extraction
- Application of Yoga Pose Recognition Algorithm
- Error estimation and feedback.

3.1 Pose extraction through Camera

The initial step is to extract the pose from the front camera. Smartphone front camera is used to capture real-time video of the practitioner practicing a yoga pose. This feed from the front is then used for key-point extraction.

3.2 Key-point Extraction

A front camera collects real-time images while performing poses. From now on, we use media pipes to extract 32 body points from the stream as shown in the image. The extracted points are saved in a Pose Landmark Result object and compared to set point values in the training data based on the positions and angles between them.

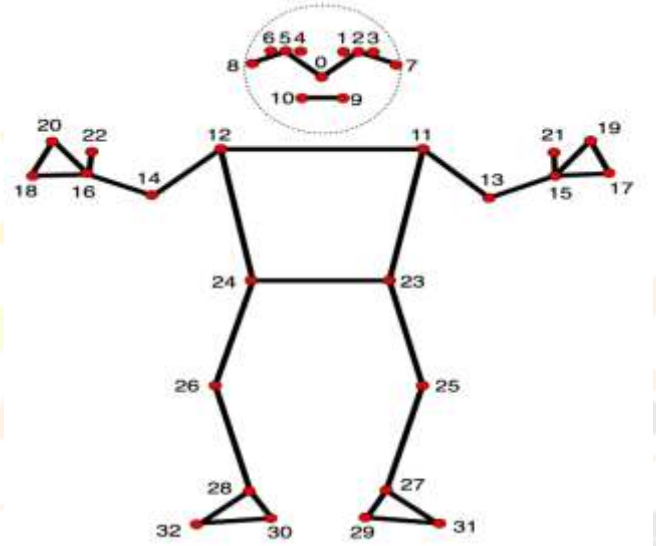
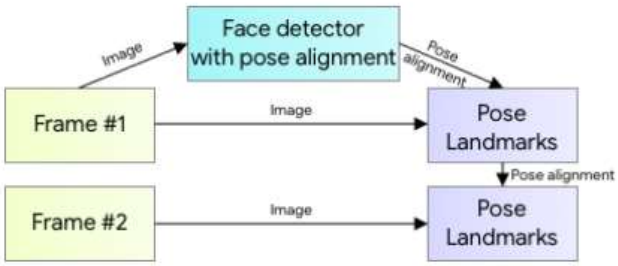


Fig2.Key Points Identified by Model

3.4 Application of Yoga Pose Recognition Algorithm

Obtaining Landmarks:
PoseLandmarkerResult provides a set of landmarks representing key points on the human body, such as joints and extremities.



Angle Calculation:
Once the landmarks are obtained, your application calculates angles between specific sets of landmarks to infer the user's body posture

$$angle = atan2(y2 - y1, x2 - x1)$$

(x1,y1): represents the coordinates of the starting point of the vector.
(x2,y2): represents the coordinates of the ending point of the vector.
atan2: atan2 is the arctangent function that returns the angle whose tangent is the quotient of its arguments. It provides the angle in radians.
To convert angle from radians to degrees:

$$angle_{degrees} = angle_{radians} \times \frac{\pi}{180}$$

Pose Classification:
This classification process typically involves defining criteria or thresholds for each pose and comparing the calculated angles against these criteria.

Feedback and Instructions:
Depending on the classified pose and the user's performance, your application provides feedback and instructions to guide the user in achieving the desired posture using **Android TTS Library** This feedback may include spoken instructions, visual cues, or textual prompts displayed on the user interface.

3.5 Error Estimation and feedback

The model then compares key points derived from: User image to a predefined set of reference keys The point of building the ideal body for this asana. Or Position of each key point. If an adjacent key point is tested and an error occurs or if a mismatch is detected, a text message and A voice message is displayed to guide the user Make necessary adjustments to the current pose Fix the error.

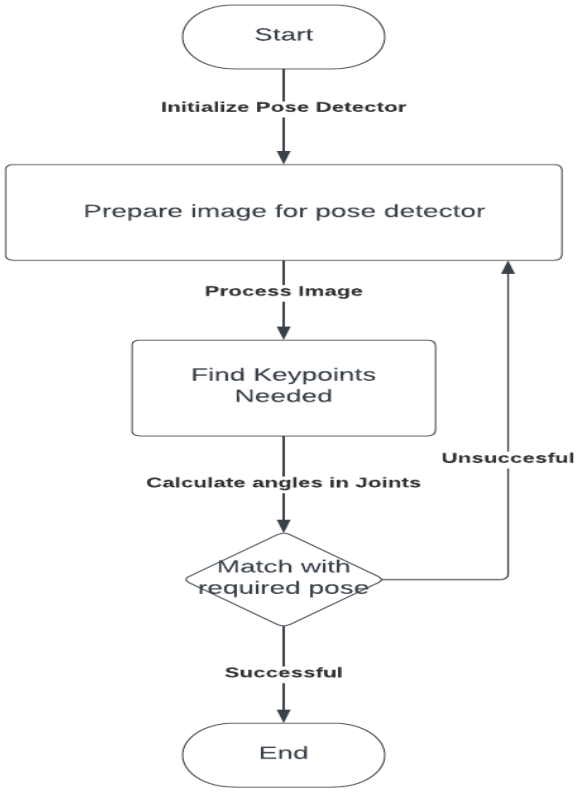


Fig 3. Flow chart of YogAI

IV. RESULTS AND DISCUSSION

4.1 Results of Descriptive Statics of Study Variables

DATA
Contains 1400 samples evenly distributed across 14 geographical subregions. Each region contains 100 images.
All samples are picked from the same source as training samples and are characterized as smartphone back-facing camera photos taken in real-world environments (see specification in "Factors and Subgroups - Instrumentation").

Model Performance Measures PDJ, Average percentage of detected joints (Also known as PCK@0.2 - Percent of Correct Keypoints)

Evaluation across gender yields an average performance of 94.8% with a range of [94.2%, 95.3%] for the heavy model, an average performance of 92.3% with a range of [91.2%, 93.4%] for the full model, and an average of 83.7% with a range of [86.0%, 89.1%] for the lite model. The maximum discrepancy is 1.1% for the heavy model, 2.2% for the full model and 3.1% for the lite mode

Gender	% of dataset	Lite model	
		PDJ	Standard deviation
Male	43.5	89.1	12.4
Female	56.5	86.0	13.6
Average		87.6	
Range		3.1	

V. CONCLUSION

The YogAI project introduces a groundbreaking mobile app that combines real-time pose detection and AI-driven feedback for personalized yoga training. This innovation addresses the need for accessible yoga guidance and offers versatile applications in fitness, wellness, and healthcare. YogAI's contribution to yoga practice is noteworthy, making it more engaging and interactive. Future studies could refine accuracy and assess long-term impact. Overall, YogAI represents a significant step forward in modernizing yoga practice.

VI . REFERENCES

a.) ***IEEE Paper References:***

- **"Yoga Pose Estimation and Feedback Generation Using Deep Learning"** by Vivek Anand Thoutam, Anugrah Srivastava, Tapas Badal, Vipul Kumar Mishra, G. R. Sinha, Aditi Sakalle, Harshit Bhardwaj, and Manish Raj. This paper was published in the journal "Computational Intelligence and Neuroscience" in 2022.
- **"THE AI YOGA TRAINER USING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING"** by Shivani Balakrishnan, Shriya S, Srajana, Vaishnavi N, and Dr. Kavitha C. This paper was published in the "International Journal of Creative Research Thoughts (IJCRT)" in January 2023.
- **"Yoga pose detection and feedback generation: A review"** by Dr. Piyush Choudhary, Aman Kumar, Alefiya Raja, Ananya Sharma, Khushi Jain. This paper was published in the "International Journal of Multidisciplinary Research and Analysis (IJMRA)" in March-April 2023.

b.) ***Books Referred:***

- Yoga Postures step by step: RINL , GOI Undertaking.
- Page no : 1-35

- Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow: Aurèlian Gèron
- Chapters: 4, 12, 19

- Computer Vision: Algorithms and Applications: Matthew Rever
- Page no: 63-84

c.) ***Web References:***

- https://papers.ssrn.com/sol3/papers.cfm?abstract_id=384265
- https://ijisrt.com/assets/upload/files/IJISRT20SEP704.pdf
- https://www.hindawi.com/journals/cin/2022/4311350/
- https://ta7489.medium.com/yoga-pose-classification-and-self-instruction-system-f15828da4810.
- https://www.infoq.com/articles/human-pose-estimation-ai-powered-fitness-apps/.