Yeshwantrao Chavan College of Engineering

Project Preliminary Investigation Report

Session 2023-24

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Information Technology

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Title of the Project:

Real-time yoga posture detection and correction using yolo v8.

Area of Project Work :

Computer vision, Deep learning

Problem Statement :

Develop a real-time system using YOLO V8 to detect and correct yoga postures, providing practitioners with immediate feedback for improved practice and reduced risk of injury.

Prior Art (Patent Search) :

Patent Application No.	Title of Patent	Existing Solutions (Abstract of Patent)
US20220310226A1	Method and system for measuring and analyzing body movement, positioning and posture	One aspect of the invention provides a computer-based method for providing corrective feedback about exercise form, the method comprising; recording a user performing a specific exercise: evaluating, by the computer, with machine learning, computer vision, or deep learning models that have been previously trained in order to evaluate the form of a user by training on labelled and or unlabeled datasets that consist of: both correct and incorrect exercise form for the different types of exercises being evaluated; identifying the user throughout the video

CN116597224A	defect detection method based on improved YOLO V8 network model	The invention discloses a potato defect detection method based on an improved YOLO V8 network structure, which improves a YOLO V8 model, increases a depth deformable rolling and A2Attention mechanism, and improves the recognition capability of the YOLO V8 model on defects with small targets and large shape differences; in order to improve the accuracy and robustness of the model, a Wise IoU loss function is added; to reduce the number of parameters of the model
WO2011157754A2	Method and device for secured entry of personal data	The invention relates to a method for secured entry of personal data. This method comprises for each item of personal data a first step of presentation of a virtual keyboard (100) comprising keys (101, 104) and a first cursor (102), followed by a step of selection of a key corresponding to the item of personal data characterized in that the virtual keyboard also comprises at least one dummy cursor (501) and in that the position (502) on the virtual keyboard of the at least one dummy cursor (501) depends on the position of the first cursor (502).. The invention also relates to a device for secured entry of personal data implementing the method.
US11270455B2	Method and apparatus for pose processing	Provided is a method for pose estimation in a device, the method comprising capturing an image; estimating poses of

		an object included in the captured image; obtaining skeleton information of the object based on the estimating of the poses of the object; and processing the skeleton information of the object for at least one of detecting blocking of the object, detecting the poses of the object and adjusting content based on detected virtual object distinct from human body poses.

Literature Review :

Title of Paper	Details of Publication with Date and Year	Literature Identified for Project
AI Fitness Coach at Home using Image Recognition	September 29th,2020	The AI Fitness Coach, consists of a pose recognition unit, a fitness movement analysis unit, and a feed back unit.
Virtual Fitness Trainer using Artificial Intelligence	March-2023	This application aims to address the limitations of traditional fitness training methods by utilizing advanced technologies to offer real-time feedback and guidance.
Computer Vision Based Workout Application	April 2023	an application, that counts the repetitions of a certain exercise while detecting the user's exercise pose and providing individualised, in-depth information regarding enhancing the user's body posture

Yoga Pose Detection and Correction using Posenet and KNN	2021	Analyzing human poses to detect and correct yoga poses can benefit humans living a healthier life in their homely environment.
Real-Time Posture Correction in Gym Exercises: A Computer Vision-Based Approach for Performance Analysis, Error Classification and Feedback	September 04–08, 2023	real-time feedback on posture during fitness exercises, aiding in self-correction without professional guidance. By analyzing expert demonstrations or video content with the YOLOv7-pose model and human topology-oriented tracking, the system offers immediate feedback to rectify posture
AI Human Pose Estimation: Yoga Pose Detection and Correction	May – 2022	methodology is used in Android applications along with Google's Text-to-Speech and Speech to-Text modules to enable users to practice yoga very effectively.

Current Limitations

Realtime and instant feedback with accurate key point detection

Proposed Solution

The prevalence of incorrect yoga postures can vary based on factors such as the level of experience of practitioners, the quality of instruction, and individual body differences. However, it's not uncommon for beginners or those without proper guidance to perform yoga postures incorrectly. Some studies suggest that up to 20-30% of people may perform yoga postures incorrectly, leading to potential discomfort, strain, or injury. Regular practice under the supervision of a qualified instructor can help reduce the likelihood of incorrect postures and improve the overall benefits of yoga practice.

Objectives and Scope of Work

Objectives:

1.Stay Safe: Ensure they maintain proper alignment to prevent injuries during their practice.

2.Improve Technique: Offer instant guidance to refine their yoga poses for better performance and effectiveness.

3.Enhance Awareness: Increase mindfulness by encouraging practitioners to pay closer attention to their body alignment and movements during yoga sessions.

Scope of Work:

1.Data Collection and Annotation: Collect a dataset of yoga poses with 100 images for each pose and annotate them with keypoints using the CVAT website.

2.Model Training: Train the YOLO v8 model using the annotated dataset to detect and recognize keypoints of various yoga poses.

3.System Development: Develop a system that integrates the trained model to provide real-time feedback on yoga postures. This includes developing a user interface for practitioners to interact with the system.

4.Testing and Validation: Test the system to ensure it accurately detects and corrects yoga postures. Validate the system's performance with a diverse set of yoga practitioners.

Feasibility Assessment:

I. Expected Outcomes of the Project

1) Real time pose detection and correction.
2) detection from -image, video, web cam.
3) Identification of key points.

II. Innovation Potential

1)Accessible Guidance: The system offers accessible guidance to practitioners of all levels, particularly benefiting those without access to expert instructors.

2)Real-time Feedback: By providing real-time feedback, the system enables immediate corrections, enhancing the effectiveness of yoga practice sessions.

3)Injury Prevention: The system helps prevent injuries by guiding practitioners to achieve correct postures, reducing the risk of strain or accidents.

4)Personalized Corrections: Utilizing keypoints and YOLO v8, the system can offer personalized guidance tailored to individual practitioners' needs.

III. Task Involved

1) Dataset Formation: Collect and curate a dataset of yoga poses with 100 images for each pose. This involves capturing images of individuals performing various yoga poses from different angles and perspectives.
2) Annotation on CVAT Website: Use the Computer Vision Annotation Tool (CVAT) website to annotate the dataset. This involves marking keypoints on the human body for each pose in the images. These keypoints serve as the basis for detecting and correcting yoga postures.
3) Model Training: Train the YOLO v8 model using the annotated dataset. This involves feeding the annotated images into the model to teach it how to detect and recognize the keypoints of various yoga poses.
4) User Interface Development: Develop a user interface for the system that allows users to interact with it easily. This may include displaying detected poses, providing feedback on corrections, and tracking progress over time.

IV. Expertise Required

1. Inhouse Expertise
   -Computer Vision Specialist
   -Software Developer
   -web developer

2. External Expertise
   -Data Annotation Service
   -Testing and Validation sevice

V. Facilities Required

1. Inhouse Facilities
   -Software Development Tools
   -Data Storage
   -Testing Environment:

2. External Facilities
   -Cloud Computing Services
   -Testing Facilities.

Milestones and Time Plan

	Task	JAN 2024	FEB 2024	MAR 2024	APR 2024	MAY 2024	JUNE 2024
Design	Conceptual Design						
	Detailed design						
	Design Modifications						
	Final Design						
Develop	Procurement (If any)						
	Prototyping						
	Modifications						
Deliver	Testing and Validation						
	Final Modifications						
	IPR / patent draft						
	Thesis and Poster						

Name and Signature of Project Guide

Signature of HOD