AI Fitness Trainer

*Progress Report #3*

# TL; DR

**On track (*Github:***[*AI-FitnessTrainer*](https://github.com/aminuabdusalam/AI-FitnessTrainer)*)***.** Completed pose estimation module for detection of all 33 pose landmarks by **9/11.**

# Project Goals (Recap)

The goal of the project can be summarized as developing an **AI fitness trainer** embedded with **storage and recommender systems** and an **AI virtual mouse**.

The AI fitness trainer will help the user lose weight, gain muscle, and accomplish other fitness goals. In addition, it'd attempt to understand the client goals, develop a fitness routine, recommend a healthy eating plan, and ensure all exercises are performed correctly.

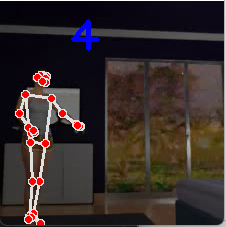
# Highlights

* Migrated pose estimation program into a module for easy use in personal trainer project: [AI-FitnessTrainer/PoseEstimationModule.py at main · aminuabdusalam/AI-FitnessTrainer (github.com)](https://github.com/aminuabdusalam/AI-FitnessTrainer/blob/main/PoseEstimationModule.py)
  + Revamped Basic Pose Estimation Program(<https://github.com/aminuabdusalam/AI-FitnessTrainer/blob/main/PoseEstimationBasic.py>). Check out [AI-FitnessTrainer/progress\_report\_#2.docx](https://github.com/aminuabdusalam/AI-FitnessTrainer/blob/main/ProgressReports/progress_report_%232.docx) for more details on the functionalities of the Basic Pose Estimation Program.
  + Created **PoseDetector** Class with the attributes
* **static\_image\_mode** set to False by default: it will try to detect the most prominent person in the very first images, and upon a successful detection further localizes the pose landmarks. If set to True, person detection runs every input image, ideal for processing a batch of static, possibly unrelated, images.
* **smooth\_landmarks** set to True by default: the solution filters pose landmarks across different input images to reduce jitter.
* **min\_detection\_confidence** for the detection to be considered successful set to 0.5. **min\_tracking\_confidence** for the pose landmarks to be considered tracked

successfully, or otherwise person detection will be invoked automatically on the

next input image is set to 0.5.

* **mp\_draw** (drawing utilities) and **mp\_pose** (pre-trained pose model) from media pipe solutions.
  + Added **find\_pose** method that detects posture in an image **to the PoseDetector class**
    - Converts the video from BGR colorspace (because that’s how cv2 captures the image) to RGB colorspace to ease processing of the image for the pose model. NB: cv2 and Mediapipe are for capturing/processing the videos and leveraging pre-trained BlazePose Model.
    - After image is sent to model for detection of the landmarks, the Mediapipe drawing utilities were used in drawing lines connecting the detected landmarks.
  + Added **find\_landmarks** method that returns the landmarks in an image **to the PoseDetector class**.
  + A snippet of my program finding the right elbow [**shown with a blue dot** on the red circle] in an image (landmark 14).



# Lowlights

None

# Next Steps

* Set up PoseDetection program to capture video from webcam input ([Pose - mediapipe (google.github.io)](https://google.github.io/mediapipe/solutions/pose#static_image_mode)) and **complete by 09/19**. NB: program currently detects pose in saved images/video.
* Kickstart build of personal trainer and **complete by 10/25.**
  + Program should be able to find/calculate angle between a series of landmark and leverage that in conjunction with the acceptable angles of different parts of the body during exercises such as **Arm Raise**, **Curl, Pushup, and Squat**, but could be extended to Bicycle Crunch, Bird Dog, Fly, Leg Raise, Overhead Press, and Superman in future.

# Timeline

This section lists the milestones of the project spread across two semesters (Fall 2022 and Spring 2023).

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| --- | --- | --- | --- |
| **Milestones** | | **ETA** | **Status** |
| **Requirements Gathering** (Project Idea, Project Proposal) | | 08/22 | Completed |
| **Design Exploration** (Setup and Installation of necessary technologies, Addition of Project to remote repo, Skill Preparation, Framework Project) | | 08/29 | Completed |
| **Implementation** | Complete Pose Estimation Build | 09/19 | Completed |
| Complete AI Personal Trainer Build | 10/25 | **In Progress** |
| Partly Complete Storage System Build | 10/31 | Not Started |
| **Quality Testing** | | 11/7 | Not Started |
| **Midpoint Presentation Draft** | | 11/14 | Not Started |
| **Midpoint Demo & Report** | | 11/21 | Not Started |
|  | **WINTER BREAK** | | |
| **Project Review** (Current status and Re-evaluation of Next Steps as Needed) | | 01/16 | Not Started |
| **Implementation** | Complete Storage System Build | 01/30 | Not Started |
| Complete Recommender System Build | 02/20 | Not Started |
| Complete Hand Tracking Build (Stretch Goals) | 03/13 | Not Started |
| Complete AI Virtual Mouse Build (Stretch Goals) | 03/27 | Not Started |
| **Quality Testing** | | 04/3 | Not Started |
| **Final Presentation Draft** | | 04/10 | Not Started |
| Final Demo & Report | | 04/17 | Not Started |