

AI IN GYMS

Rutik Yerunkar

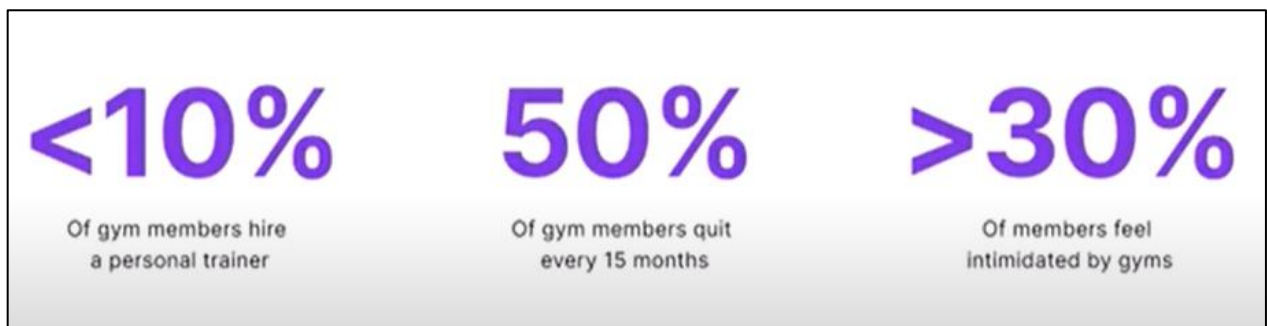
Date: 04-09-2022

Abstract

This report discusses the benefits and methods of implementing AI in Gym culture and ways to enhance the Gym ecosystem for the members where they can get A-Z information about their fitness part of the life at one place and make easier for them so that they continue their fitness journey in an interesting manner and never get bored of following same workout and diet routine and eventually quitting soon. Also, how gym management can boost their sales by making fitness fun for their members is also mentioned in the report.

1.0 Problem Statement

Every year millions of people set the resolution to work on their physical health by joining gym but according to studies less than 8% of people stick to their resolutions each year and their can be tons of reasons for that so. In the beginning the people are fully motivated to achieve their fitness goals but later due to lack of time they cannot be regular to the gym or due to lack of proper guidance since many members do not consider hiring a coach or they feel intimidated at the gyms due to lack of knowledge of using machines they don't get to see the desired results and they give up too often.



So, by implementing Artificial Intelligence in Gym Culture will make the fitness journey of the gym members more interesting, knowledgeable and enjoyable.

2.0 Assessment

2.1 Customer Need Assessment

Gym members would prefer such a gym ecosystem where they can be able to view and log every small to big details related to their fitness part of their life. Right from starting with the gym membership details to their workout plans, exercise tutorials to know about the correct movement of each exercise, a virtual guide who can observe their workout posture and correct them by instructing them, to view their customized meal plan and a place to log their daily calorie intake, to track their health parameters like heart rate, to track their recovery by logging daily sleep schedule, to track their daily activity levels so that their workout plans intensity are designed accordingly. Members would also love to get updates of the fun activities that may be happening in the gym on weekly basis like Zumba Classes, Yoga Classes etc.

2.2 Market Need Assessment

In India even in lavish gyms the gym management do not care about their client's progress as they find it very tedious to look after every member but if they develop an ecosystem where they can easily track the members progress, analyse the members health data, and accordingly design the roadmap. It can be beneficial for both, gym management as well as for the members. It will be beneficial for the gym management in such a way that their reputation will increase as the success rate of their members achieving their desired goals will increase and they will get free mouth publicity in their area and also they will get a huge client database which they can use it in future for designing the workout program for their future clients and predicting the success rate of the client if he/she follows the program accordingly. Gym management can build voice customer assistant that can give a short summary of the gym to the new members which will help the gym management to bring new members at their door. As competition is increasing in gym markets following such strategies have to be implemented by the gyms to attract more customers so that they can outperform in such a cutting-edge competition market.

3.0 Target Specifications

So, our target would be to develop an ecosystem where gym members can:

- The members can have their specialized diet plan available in the app where they can follow it and track their macros.
- The workout plan will be customized according to the members fitness goals and, they can have an alternative to do a quick workout session anywhere outside the gym when they don't have time to visit the gym.
- Record their health markers and recovery status every morning.
- The personal trainer can daily update the client's workout session based on his recovery level.
- The clients with no personal trainers can design their own workout plan from wide database of available exercises and track their gym progress.
- The app will also use computer vision to analyse the posture of members while exercising and in real time correct their mistake through voice assistants.

- The app's algorithms will search for its database for training programs that match the user's preferences. Over time, the algorithms will adjust the workouts depending on the user's previous performances to ensure they achieve their goals.

4.0 External Search

The sources I have used for reference to analyse how AI can be efficiently used in gyms to enhance users experience and boost gym membership sales are as follows:

1. <https://www.financialexpress.com/healthcare/healthtech/will-fitness-ai-and-automated-trainers-take-the-wellness-industry-by-storm/2634425/>
2. <https://medium.com/swlh/how-ai-can-solve-problems-for-gym-studio-owners-in-2020-9b7221c446d6>
3. <https://www.clubindustry.com/trends/artificial-intelligence-takes-off-high-touch-world-fitness>
4. <https://hackernoon.com/how-ai-is-improving-the-fitness-industry-l72n347o>

5.0 Benchmarking

The comparison table between Features in Gym Culture with or without artificial intelligence.

Sr. No.	Features	Without Artificial Intelligence	With Artificial Intelligence
1.	Personal Training	Costly	Cheap
2.	Workout Timings	Stringent	Flexible
3.	Level of Motivation	Limited	Aggrandized
4.	Supervision	Fitful	Constant
5.	Performance Tracking	Indiscriminately	Systematically
6.	Tracking of Health Parameters (E.g., Heart Rate)	Seldom	Frequent
7.	Chances of Human Error	Maximum	Minimum

6.0 Applicable Patents

Following patent inventions relate to the application of AI in making Smart Gyms by detecting the human motions and providing real time feedback. Also guiding in workout design for effective results and sharing the progress on various social media platforms.

1. <https://patents.google.com/patent/US11351419B2/en>
2. <https://patents.google.com/patent/WO2022030619A1/en>
3. <https://patents.google.com/patent/TWI722188B/en>
4. <https://patents.google.com/patent/US20110281249A1/en>
5. <https://patents.google.com/patent/US9532734B2/en>

7.0 Applicable Constraints

The most probable constraint in implementing AI is the initial cost which will require to develop such ecosystem and then carrying out maintenance in regular intervals.

8.0 Business Opportunity

Various business opportunity that will open for the gyms after building an AI ecosystem will be:

1. They can charge their members for assigning a virtual personal assistant who can guide the members to improve their workout experience.
2. They can charge their members to get access to large database of healthy recipes which their members can try to overcome the boredom of eating same meal every day.
3. Gyms can get large data of members which will help them to enhance the gym members experience even more and also help the gym management to understand the need of their clients and work on it to grow their business exponentially.

9.0 Concept Generation

Artificial intelligence in gyms can only empower the benefit of practice in a health club of any kind. Basically, our app can work as an adaptive recommendation engine and assist gym coaches. It can tell them how well the program is working for their clients. An app can adapt and adjust based on a client's performance. Coaches could also use apps and connected fitness equipment to learn how an individual uses each machine, provide motivation, and customize workouts. This novelty factor alone could maintain gym memberships and private trainer client at a high level.

The self-adjusting diet algorithms are usually based on a model that maps and forecasts the progress of a user and makes intelligent adjustments (weekly or monthly) based on the gathered data. AI can analyse the user's digestive system or metabolism to create an ideal meal plan for their needs. This might be especially useful for bodybuilding activities. Moreover, a solution like this could potentially save millions of lives by preventing diabetes, heart disease, and other conditions caused by malnutrition.

10.0 Concept Development

The concept is to develop an application for the gyms which they will provide it to their members with specific member login id and password. The application will work as an CRM for the gyms. The features of the application experienced by the users will be:

- Members can track their gym memberships or get information about other services through voice assistant AI application bot.
- The application will regularly save client health parameters like heart rate and recovery parameter like quality of sleep.
- If the member has taken personal trainer in the gym, then their trainer will have the access to all the health parameters of the client, past health history and desired fitness goal according to which the trainer can design the workout plan through n number of exercises present in the dataset and also design daily macro that to be consumed by the client through n number of recipes available on the dataset. The application will take the food preferences of the client and accordingly suggest some healthy and tasty recipes to the client.
- The members who have not taken personal training they can design their workout plan from wide database of available exercises with tutorials based on their fitness goals, daily activity, and recovery level. The feature of designing own workout will help client to do a quick workout session when they don't have time to visit the gym.
- Every client can log his/her daily workout viz number of sets and reps with weights used in each exercise and log daily calorie intake. Combining data logs about nutrition, workout performance, age, weight, and gender will also give the model a basis to predict a member's success at achieving their goals by searching its database for results with similar attributes.
- The app's algorithms will search for its database for training programs that match the user's preferences. Over time, the algorithms will adjust the workouts depending on the user's previous performances to ensure they achieve their goals.
- The app will also use computer vision to analyse the posture of members while exercising and in real time correct their mistake through voice assistants.
- The members can also book a slot for extracurricular activities happening in the gym like Zumba, Yoga etc through application and gym managers will be able to view the reservations for slots in classes over the last years. This allows managers to predict in the future which classes and time slots will be popular.

In this way by implementing the above concepts we can be able to build an AI powered Gym ecosystem.

11.0 Final Product Prototype

The workflow of our designing process will be in following way. Firstly, we will create a ML model which will be capable of doing all the predictions task which would be needed in the application for various task then using pickle we will export the model to Flask REST API and write logic for it which then be exported in json format to the application which is built in Java Language.

So, we will develop an ML model in python which will be converted in Flask API. We are creating API because the output of API is in json format which can be understood by any programming language and then through Java android application we will hit the API whose response will be in json format and that json will be parsed and displayed on the android application.



12.0 Product Details

12.1 How does it works

It works as an AI based CRM Android Application and fitness tracker.

12.2 Data Sources

We can use Gym workout datasets available on Kaggle for workout prediction or design and past client's data to detect success rate of clients.

12.3 Algorithms, frameworks, software etc. needed

The APIs that are in the list are Google Fitness API, Lumo API, Starve, Health Graph, MisFit, Breezometer air quality API, Jawbone UP, Unofficial fitocracy API, Runscope API, etc. The list of tools includes BMI calculator, Withings, FoodSpex. These APIs and tools work in the background, hidden from the users behind the hardware. There are specific hardware requirements for the wearables that will connect to your app to fetch the required data, such as Ambient light sensors, Bioimpedance sensors, Skin response sensors, Barometric altimeter, Accelerometer, Gyroscopes, Compasses, etc.

Programming languages and frameworks required to enhance your app's functionalities include C, Java, JavaScript, and HTML5. To deliver dedicated cloud hosting, a cloud computing platform is mandatory, such as IBM SoftLayer. Two powerful frameworks that are preferred in the development of these apps are Android SDK and Spring Framework. For performance monitoring, you can use Relic. For tracking any issue, you can consider JIRA and Confluence for the purpose of project management.

12.4 Team required to develop

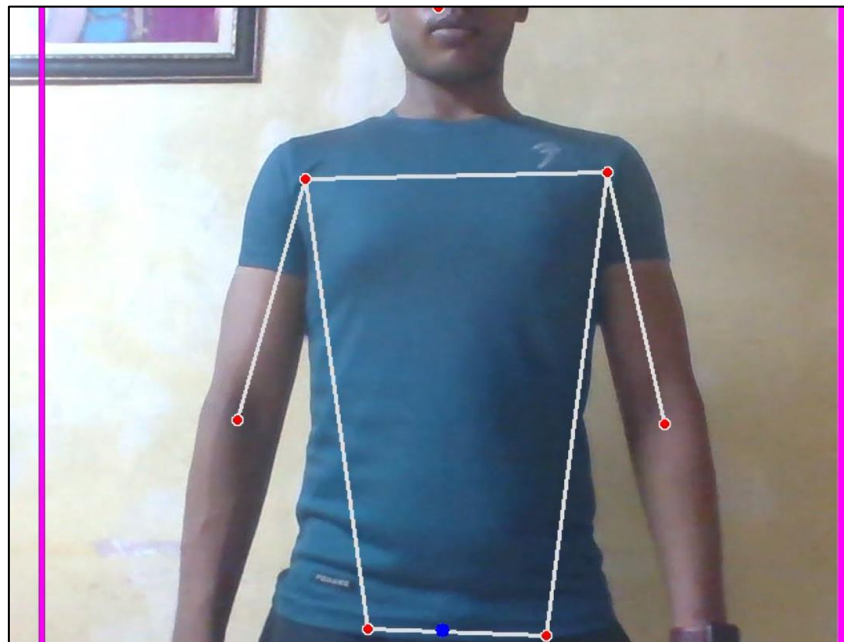
A team must consist of members who are familiar with developing ML models and members of android developers.

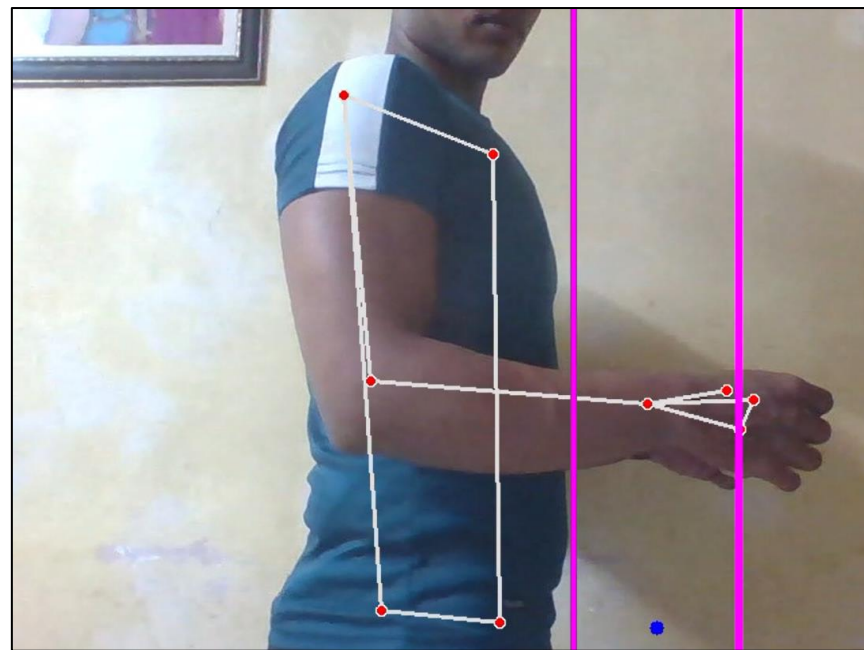
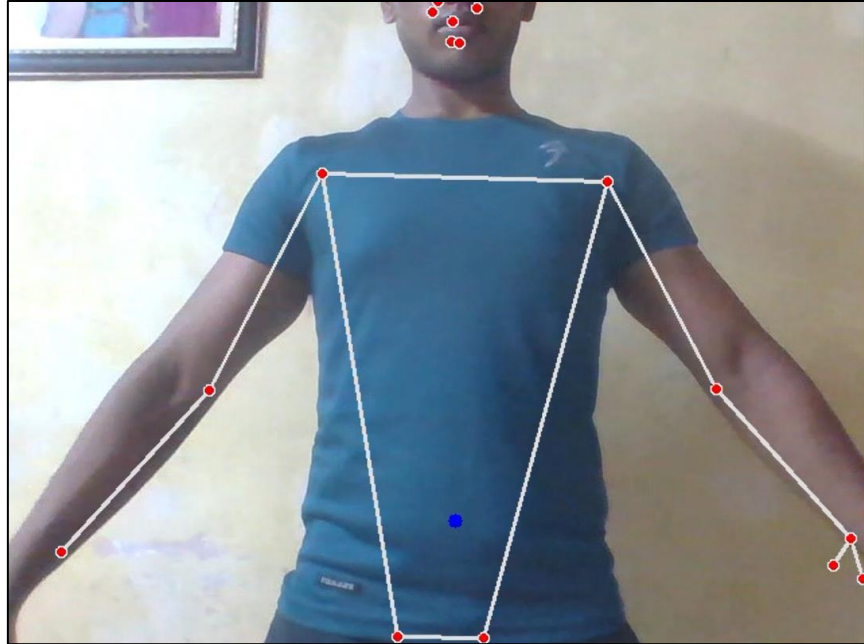
13.0 Code Implementation/Validation on Small Scale

Implementing computer vision to analyse the posture of members.

```
jupyter Human Body Detection Last Checkpoint: 8 minutes ago (unsaved changes)
File Edit View Insert Cell Kernel Help Trusted Python 3
In [2]: import cv2
        from cvzone.PoseModule import PoseDetector

In [*]: detector = PoseDetector()
        cap = cv2.VideoCapture(0)
        while True:
            success,img = cap.read()
            img = detector.findPose(img)
            lmList,bbox = detector.findPosition(img,bboxWithHands=True)
            cv2.imshow("Result",img)
            cv2.waitKey(1)
```





13.1 GitHub Link

<https://github.com/RutikYerunkar/Computer-Vision.git>

14.0 Conclusion

It is time for the gyms to revolutionize their traditional working method and start gaining the benefits of implementing AI in Gyms and boosting their sales and enhancing Gym members experience.