AI driven Fitness Training App

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Abstract

In a world characterized by rapid technological advancements, the fitness industry is undergoing a transformative shift with the integration of Artificial Intelligence (AI). As the pursuit of a healthier lifestyle becomes increasingly ingrained in modern culture, the cost of maintainance of such a routine is reaching the skies. The gyms are not affordable for everyone. Not everyone has the necessary amenities to provide for a trainer. Therefore AI comes to our rescue and with its integration this fitness app is being created. From tailored workout plans and real-time performance tracking to personalized nutrition recommendations, the convergence of AI and fitness is paving the way for a new era of customized, data-driven, and ultimately more effective fitness experiences. This report aims to provide an insight to an idea of an AI fitness training app in the present scenario.

Problem Statement

The problem statement is creation of a fitness app that uses Artificial Intelligence to train individuals to live a better and healthy lifestyle. Rising energy and gas prices are forcing health clubs, gyms and leisure centres to consider increasing prices for services and products. So this app aims to curb the problem by providing them personalized experience finesse at a lower cost. This app plans your exercises according to your current body type and goal. It also provides you a diet plan to be followed besides the exercises and also takes updates at regular intervals and makes changes in the procedure accordingly.

Customer Need Analysis

- **Identifying the target audience:** The target audience for this app will be the youth between the age of 17 to 40. They will be more interested in extreme exercises. The second category will be older people with age 50 and above. They will be more inclined towards freehand exercises just to keep their bodies flexible and fit. The third category will be people with disabilities or retarded health condition. They will be prone to do exercises that help reduce their ailments.

- **Goals and Objectives:** These different categories will have different goals and objectives. The first category would be more interested in bulking, shredding, harsh physical exercises and losing weight. The second category will be interested in light exercises and nice healthy diet. The third category would be interested in specific exercises that fits their cause.

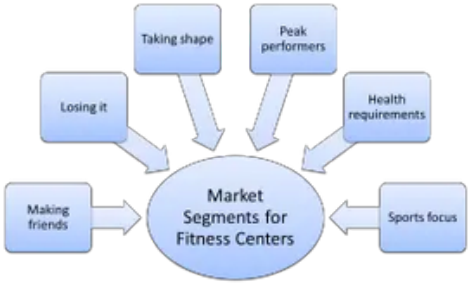
- **Pain Points and Challenges:** There are many challenges that may arise in due course of training. Some of them being lack of funds, lack of motivation, time constraints, confusion about diet, psychological barriers. The product must provide effective measures against these problems.

- **Personalization and Individualization:** This is one of the factors that requires greatest attention. Most of the customers like to train under a personal trainer that tailor to their specific needs.

- **Accessibility and Convenience:** This is another key factor. People tend to go to places that are readily accessible. So the fitness training centres must be geographically located in such a place so that it becomes readily available to the target audience. The population clustering of the target audience may help in this case. The location with the highest density must be chosen as the location of the centres. However, the app solves this problem.

- **Technology and Innovation:** A detailed exploration is suggested in this case as to whether the target audience is open to incorporating technologies and innovations to their fitness routines. Based on this the categories must be subdivided.

- **Feedback and Improvement:** Continuous gathering of feedback from the customers regarding their experiences, satisfaction levels, and areas of improvement is crucial. This will help refine the offerings over time.



Market Need Analysis

- **Market Size and Growth:** The fitness app market is one of the largest steadily growing markets in the world. The global fitness app market size was estimated at USD 6.96 billion in 2022 and expected to reach USD 8.99 billion in 2023, at a CAGR of 29.84% to reach USD 56.29 billion by 2030. For instance, MyFitnessPal offers personalized diet and activity tracking to its users, generating a revenue of USD 6.7 million in June 2020. These apps have over 2 million active users.

- **Competitive Landscape:** There exists steady competition in this aspect. The key competitors in this domain are: 1) Applico Inc. , 2)Addias, Fitbit LLC, 3)Myfitness Pal, 4)Nike Inc. MyfitnessPal owns the highest number of market shares currently.

- **Target Audience:** Based on current scenario, the app addresses mainly three categories as mentioned in the above section of customer need analysis. The problems that existed due to physical training centres is solved by using this AI driven fitness training application.

- **Unique Selling Proposition (USP):** The unique selling proposition for the app is that it is highly personalized. The users need to create an account where they need to post their daily updates and the AI will monitor it accordingly. The exercises assigned may be performed in accordance with the user's discretion but an option of posture accuracy will also be present where the user can see how correct their posture is. The app will guide the user throughout their exercise if the user requires its guidance.

- **Technology Readiness:** The AI uses unsupervised learning algorithms to classify the exercises as per the user input. The model will be fed with a large dataset consisting of various crucial aspects such as age, gender, current problems, diseases(if any), current weight, current height etc. as input and suggests a range of exercises as output. It will be using AI frameworks such as mediapipe for posture detection.

- **Integration with Wearables and Devices:** This app will be integrated with wearables in due time. Integrating it with the wearable will enable real-time monitoring of the user and help provide enhanced results.

- **Pricing Model:** The pricing model will be as follows. The free version will have some basic features and advertisements displayed in regular intervals. The subscription version will come with the advanced features such as a virtual trainer, posture accuracy detector etc. There will be three plans available that will be monthly, semi-annually and annually.

Business Need Analysis

In this assessment we find out what fitness market needs. It defines the gaps that are preventing the fitness market from reaching its desired goals . It also contains the strategy to make this business perfect or up to the mark. Let us analyze these problems.

- **Choosing the right location for fitness business:** The choice of location is very important as the people tend to rely on items that are readily accessible. The app solves the problem as their fitness trainer will be right in their pockets.

- **Finding clients/members:** Target audience is very important for a business to grow. Finding the suitable audience to target is the first agenda of a business. To solve this effective marketing of the app is required especially reaching out to the target audience.

- **Securing finances:** Capital is something that is a necessity to open a fitness centre or gym. A huge capital is required to open a gym as it includes the rent of the building(price if the owner buys the place), gym equipments, salaries of the employees etc. But this problem gets solved as the capital required in this case is very minimal.

- **Building a team of experts:** A fitness centre requires a team of experts to drive the business. This includes hiring of professionals in this fields which in turn includes a chunk of the capital. The app solves this problems as it is AI driven. No separate professionals need to be hired.

- **Dealing with competition in fitness industry:** The fitness industry is highly competitive, and it can be difficult to stand out from the pack. This demands a unique selling proposition that makes this app stand out from the rest. The unique selling proposition is described in the previous section.

- **Getting members results:** Getting regular feedbacks from customers becomes a troublesome process for fitness centres. This problem is also solved by the app. It will take feedback from its users on a weekly basis. Those feedbacks needs to be analyzed and strategies need to be developed to fit the customer's needs.

Target Specifiacation

1. **Personalized Workouts:**
   - AI generates customized workout plans based on user goals (weight loss, muscle gain, endurance, etc.), fitness level, available equipment, and time constraints.
   - Offers a variety of exercise options, including strength training, cardio, flexibility, and more.
   - Progressively adjusts workout intensity as users advance, preventing plateaus and overexertion.
2. **Nutrition Planning:**
   - AI develops personalized meal plans and nutritional recommendations based on user preferences, dietary restrictions, and fitness goals.
   - Provides a database of recipes with nutritional information, making healthy eating more convenient.
3. **Real-time Form Feedback:**
   - Utilizes device cameras to provide real-time feedback on exercise form and technique.
   - Helps users maintain proper form, preventing injuries and maximizing the effectiveness of workouts.
4. **Activity Tracking:**
   - Syncs with wearable devices (smartwatches, fitness trackers) to capture users' daily activities, such as steps taken, heart rate, sleep patterns, and more.
   - Offers insights into users' overall physical activity and progress.
   - Tracks postures using the posture accuracy feature.
5. **AI Progress Analysis:**
   - Analyzes users' performance data to track progress and provide visual representations of achievements.
   - Suggests adjustments to workout routines and nutrition plans based on progress.
6. **Virtual Personal Trainer:**
   - AI-driven virtual trainer offers real-time guidance and motivation during workouts.
   - Responds to user queries, provides exercise modifications, and offers motivational cues.
7. **Goal Setting and Tracking:**
   - Allows users to set short-term and long-term fitness goals.
   - Tracks users' progress toward goals and adjusts recommendations accordingly.
8. **Social Interaction:**
   - Offers social features for users to connect, share progress, and participate in challenges.
   - Supports friendly competition and community support.
9. **Educational Content:**
   - Provides articles, videos, and resources related to fitness, health, and wellness.
   - Enhances users' understanding of exercise techniques, nutrition principles, and overall well-being.
10. **Data Privacy and Security:**
    - Prioritizes user data protection and privacy, complying with industry standards and regulations.
    - Allows users to control data sharing preferences.

External Search

The sources that I have went through in order to develop this AI driven fitness app project are mentioned below. These sources also list how the companies are using different techniques in this field.

- www.segmentationstudyguide.com
- https://www.glofox.com/blog/how-market-segmentation-can-help-grow-your-fitness-business/
- www.bplans.com
- www.360iresearch.com
- www.grandviewresearch.com
- https://wemarketresearch.com/reports/fitness-apps-market/8/
- www.futuremarketinsights.com
- www.openpr.com

Benchmarking

The fitness industry has undergone significant changes with the integration of AI (Artificial Intelligence) technologies. Here's a comparison of the industry with and without AI:

1. Personalization and Customization:

Without AI: In the past, fitness routines and diet plans were often generic and not tailored to individual needs. Trainers relied on generalized advice that might not be suitable for everyone.

With AI: AI has enabled the creation of personalized fitness and nutrition plans based on individual goals, body types, fitness levels, and preferences. Machine learning algorithms analyze data and adjust plans over time, optimizing results for each person.

2. Data Tracking and Analysis:

Without AI: Tracking progress manually was time-consuming and often inaccurate. Individuals would keep records of workouts, diet, and measurements, making it challenging to gain insights.

With AI: AI-powered fitness apps and wearables automatically collect data on activities, heart rate, sleep patterns, and more. This data is analyzed to provide actionable insights, helping individuals understand their progress and make informed decisions.

3. Virtual Trainers and Coaches:

Without AI: Access to personal trainers was limited by location and cost. Many people had to rely on self-guided routines or group classes.

With AI: AI-driven virtual trainers and coaches offer guidance through apps and platforms. They can demonstrate exercises, correct form, and adapt routines in real time, providing a more interactive and accessible training experience.

4. Workouts and Routine Generation:

Without AI: Creating diverse and effective workout routines required expert knowledge. People often fell into repetitive patterns that hindered progress.

With AI: AI algorithms can generate dynamic workout plans that vary exercises, intensity, and duration. This prevents plateaus, keeps users engaged, and optimizes results.

5. Nutritional Guidance:

Without AI: Nutritional advice was typically based on generic guidelines, and individuals had to manually track their food intake.

With AI: AI-powered apps can analyze dietary preferences, restrictions, and goals to suggest personalized meal plans and recipes. Some apps even use image recognition to estimate nutritional content from photos of meals.

6. Preventive Measures:

Without AI: Identifying potential health issues and injury risks was primarily reactive.

With AI: AI algorithms can analyze movement patterns and biomechanics to detect potential injury risks. This allows for proactive adjustments to training routines to minimize the likelihood of injuries.

7. Community and Motivation:

Without AI: Staying motivated often relied on personal discipline. Community support was typically limited to local gyms and workout groups.

With AI: AI-powered fitness platforms can connect users globally, fostering a sense of community. Virtual challenges, social features, and personalized encouragement help individuals stay motivated.

Applicable Patents

- **Body Posture Detection and Motion Tracking using AI for Medical Exercises and Recommendation System**

This is a paper written by Anuj Patil, Darshan Rao, Kaustubh Utturwar, Tejas Shelkeand and Ekta Sarda. A software-based motion tracker can keep track of all the exercises you've done and provide you feedback on your posture while you're working out. Through computing data and analysis, the exercise's beneficial efficiency will be increased. The MediaPipe framework could be utilized for this application; in this machine learning model, points are plotted at several joints of the human body posture, and movement is tracked, stored, and analyzed. This detailed analysis of the body tracking could be used in the implementation of an application that could keep a track of the medical exercise of a registered individual.

Applicable Regulations

1. Information Technology Act, 2000: The IT Act covers various aspects of electronic commerce and digital transactions. It's essential to ensure that your app's operations, data handling, and user interactions comply with the provisions of this act.

2. Personal Data Protection Bill (PDPB): India is in the process of finalizing its comprehensive data protection legislation, known as the Personal Data Protection Bill. Once passed, this law will regulate the collection, processing, and storage of personal data, including health-related data. The bill outlines rules for obtaining user consent, data transfer, and more.

3. Consumer Protection Act, 2019: This act focuses on protecting consumers' interests, including in the digital realm. The act includes provisions against unfair trade practices, misleading advertisements, and more.

4. Medical Devices Rules: If your AI-driven fitness app provides medical advice or tracks health parameters in a manner that's similar to medical devices, you might need to adhere to the Medical Devices Rules and regulations laid out by the Central Drugs Standard Control Organization (CDSCO).

5. Advertising Standards: The Advertising Standards Council of India (ASCI) sets guidelines for truthful and ethical advertising. Ensure that any health-related claims or representations in your app's content or advertisements comply with ASCI's guidelines.

6. Cybersecurity and Data Protection: Given the sensitive nature of health data, it's crucial to implement robust cybersecurity measures to protect user information and privacy.

7. Copyright and Intellectual Property: Ensure that you have the necessary rights to use any content, images, or videos within your app, and respect intellectual property laws.

8. User Agreement and Privacy Policy: Clearly outline how user data is collected, used, and protected in your app's terms of service and privacy policy.

9. Accessibility: Consider accessibility standards to ensure that your app is usable by individuals with disabilities.

Applicable Constraints

AI-driven fitness apps can offer innovative solutions for users looking to improve their health and wellness. However, they also need to operate within certain constraints to ensure user safety, privacy, and regulatory compliance. Here are some important constraints to consider when developing an AI-driven fitness app:

1. Accuracy and Reliability: The AI algorithms and health-related advice provided by the app must be accurate and reliable. Inaccurate recommendations can lead to user harm and damage the app's reputation.

2. Privacy and Data Security: The app should adhere to strict data privacy and security standards to protect users' personal and health-related data from breaches or unauthorized access.

3. Data Protection Regulations: If the app collects, processes, or stores user data, it must comply with relevant data protection regulations, such as GDPR, PDPB in India, or other applicable laws in different jurisdictions.

4. Informed Consent: Users should be informed about the data the app collects, how it will be used, and any potential health risks associated with using the app's features. Obtain explicit and informed consent from users.

5. Medical Accuracy and Liability: If the app provides medical advice or health-related recommendations, it should clearly state that it is not a substitute for professional medical advice. Avoid making false claims about curing medical conditions.

6. User Safety: The app should prioritize user safety and avoid recommending activities or exercises that could be harmful to certain individuals, especially those with pre-existing health conditions.

7. Accessibility: Ensure that the app is accessible to users with disabilities, adhering to relevant accessibility guidelines.

8. Transparency and Explainability: Users should be able to understand how the app's AI algorithms make decisions and provide recommendations. Transparent explanations build trust and help users make informed decisions.

9. Ethical Considerations: AI algorithms should be designed and trained ethically, avoiding biases, discrimination, and any potential harm to vulnerable groups.

10. Endorsements and Advertising: If the app includes endorsements or advertisements, ensure they are transparent, truthful, and comply with relevant advertising standards.

11. User Experience: The app's user interface and interactions should be intuitive and user-friendly, ensuring a positive experience for users.

12. Regulatory Compliance: Adhere to all applicable regulations, such as healthcare laws, privacy laws, and consumer protection laws in the jurisdictions where the app is available.

13. Technical Constraints: The app should function smoothly on various devices and operating systems, providing a consistent experience for all users.

14. Feedback and Improvement: Implement mechanisms for users to provide feedback and report any issues. Use this feedback to continuously improve the app's performance and user experience.

15. Continuous Monitoring and Maintenance: Regularly monitor the app's performance, data security, and accuracy. Update the app to address any issues or new regulations that may arise.

***Business Model* (Monetization Idea)**

The most fundamental objective of an app is to generate revenue. A proper monetization idea is fundamental to justify the aforementioned objective. The expenses and the income factors are listed below:

Sources of Expense:

- **Development Costs:** Expenses for app development, updates, and maintenance.
- **AI Infrastructure:** Costs related to AI model training and computational resources.
- **Content Creation:** Expenses for creating workout routines, meal plans, and educational materials.
- **Marketing and Advertising:** Budget for promotional activities, influencer partnerships, and advertising campaigns.
- **Personnel:** Salaries for development, design, AI specialists, and marketing professionals.

Sources of Income:

- **Advertisements:** The free version of the app will have pop-ups in between which will generate some revenue from the company whose advertisements wil by displayed.
- **Subscriptions:** The app has three subscription plans. The first plan is on monthly basis where the person will get access to the nutrition planning on top of workout planning. The second plan is on semi-annually basis where the person would get access to the virtual personal trainer on top of the previous mentioned attributes. The third plan is on annually basis where the person would get access to the posture analysis feature on top of the above mentioned features.
- **Hiring of Professional Trainers:** Professional trainers who would collaborate with the app will be getting customers who would hire them provided the app will take a certain percentage of the amount charged which will contribute to the overall revenue of the app.
- **Partnerships and collaborations:** Collaborations with different companies and persuading them to invest in the app. There will also be points awarded for completion of the daily tasks and based on the points collected, vouchers and discounts will be provided.
- **Sponsored Challenges and Competitions:** Collaborate with fitness brands or events to organize sponsored fitness challenges or competitions within the app. Charge a fee for users to participate and offer prizes sponsored by the partner.

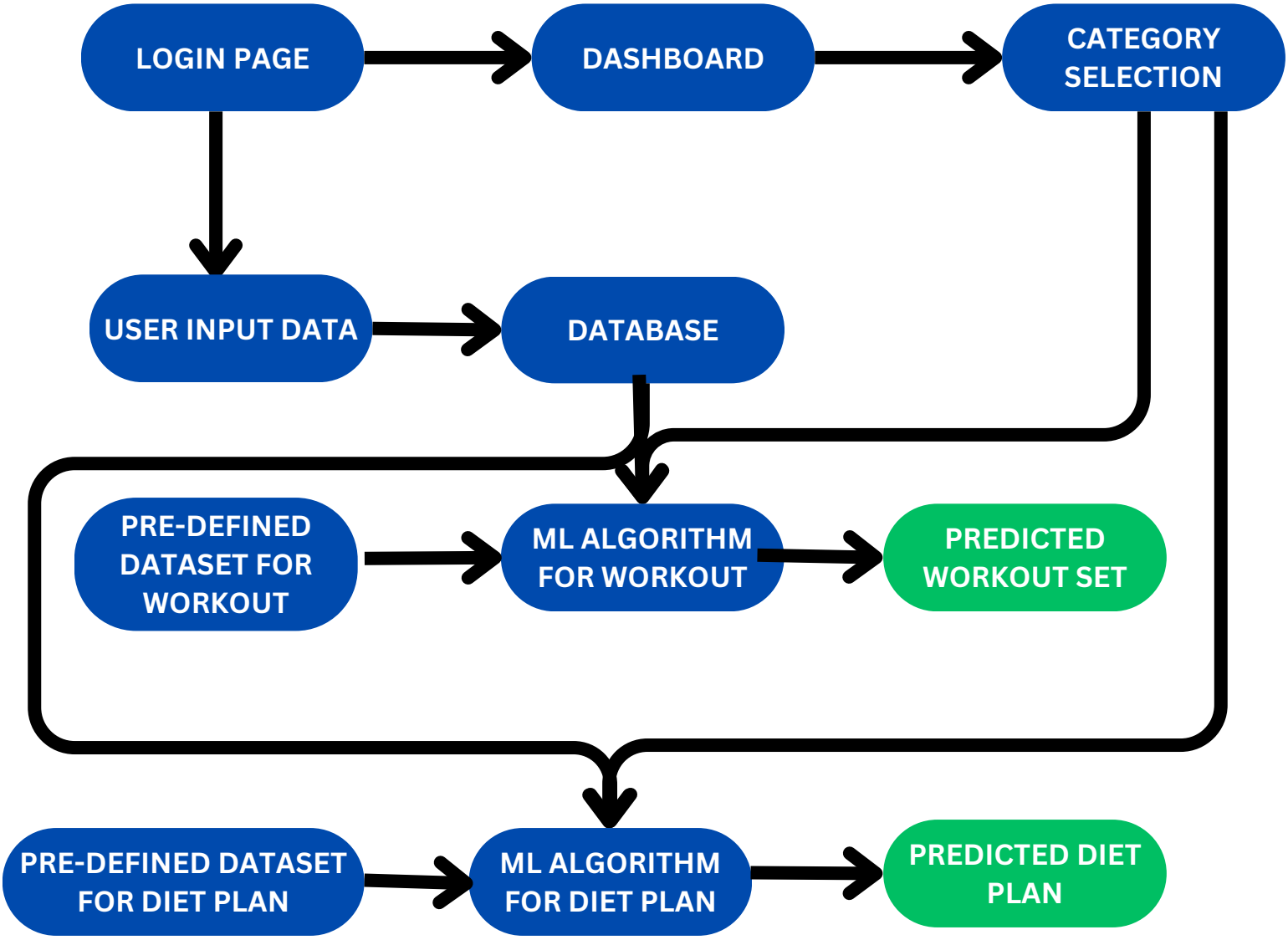
Concept Generation

The concept is creation of an AI driven fitness app that is capable of providing enhanced results based on the real-time analysis of the user's daily workout and diet routine. It will also provide the growth percentage by analyzing the performance of the user and also provide suitable feedbacks for improvement. It will have the feature of posture accuracy meter where the user can verify their posture in real time while doing exercises. A virtual trainer will be assigned if the user asks for it. The main objective of the app is to spread awareness regariding maintainance of a healthy lifestyle and thereby reduce the cost of doing so.

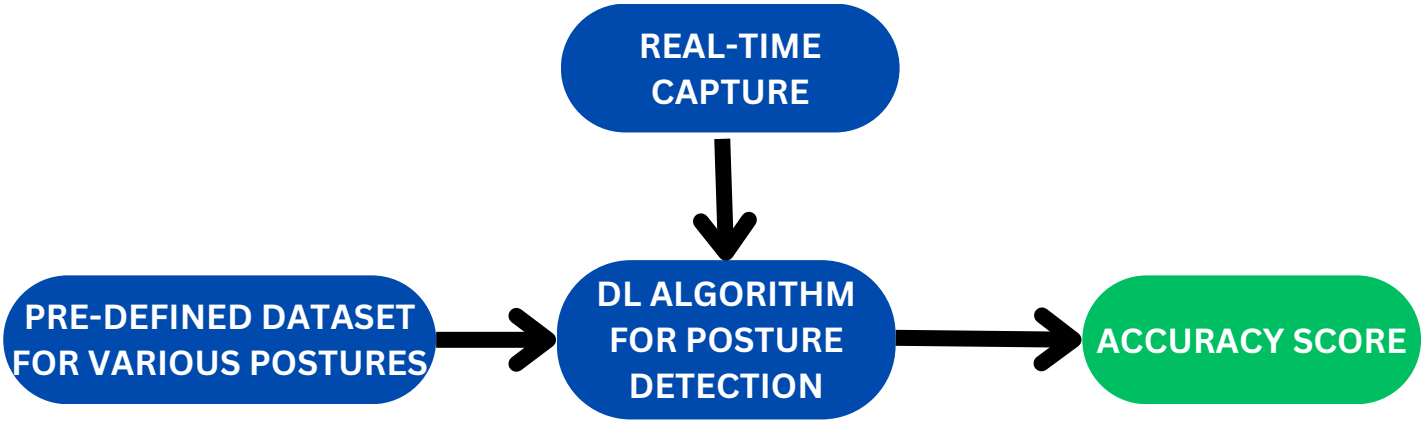
Concept Development

The app will have a login page where the user needs to fill in his/her details. Once the registration is complete, they will be directed to the dashboard where they will have options to select the category, workout plans, nutrition and the rest of the premium features will also be on display but will be locked. Once the data will be provided, the app will analyze the user profile where the details will be given and based on that, the set of exercises will be given.

Final Product Prototype



Posture accuracy dataflow diagram



Product Details

The app contains a login page. The user needs to sign up using a valid email-id and password. They will then login into the app using the registered email-id and password. After that the user will have to fill in certain details. The details consists of **Name, Date of Birth, Gender, Height, Weight, Any medical history(if available**). Once these details are entered, the user will be redirected to the dashboard.

In the dashboard, there are options where he can select the category, diet plan, and the premium features such as **Posture Accuracy Meter, Virtual Fitness Trainer and Real-time Monitoring**. Once the category is selected and clicked on the generate button, the app will use the data given by the user from the database, combine it with the user's choice and predict a workout set for him/her. Similar procedure is followed for the nutrition training.

The app will provide the user his daily objectives and will ask for the user to update their progress on a daily basis. Based on the user feedback the AI model will retriain itself to give more effective results.

Let us now discuss about the premium features. The **Posture Accuracy Meter** is an AI tool that will tell the user whether or not his posture for the given exercise is correct. On opening the tool, the user will be asked to select the name of the exercise from the drop down list available. Then the model will capture the frames of the user performing the exercise and show the accuracy score on the upper right hand corner of the screen.

The next feature is the **Virtual Fitness Trainer.** This feature is essentially a chatbot that will be given which will be trained on almost every possible questions that may arise **(NOTE: It will not be a general chatbot like chatgpt. It will be strictly objective oriented as in this case only for health related questions only).** It will answer any question pertaining to health related issues. If the user it is not satisfied by the reply, there will also be a provision available to hire professional trainers. The fee of the trainer will be charged separately and a certain percentage of the fee will be charged by the app which will contribute to the overall revenue of the app.

The next feature is **Real-time Monitoring**. In this feature, the user will have to perform the exercises while camera is turned on. In this way the app will take note of the exercises performed from the daily task and auto-update it. It will then generate the progress report on a weekly basis.

The app will pop-up advertisements in between for the non-premium users. The app will also award coins. Vouchers or discounts will be provided based on the amount of coins collected for the companies in collaboration. The coins will get accumulated by taking part in contests organized by the app. Entry for the contests may be free or paid(a very nominal amount). The coins will be awarded based on the performance of the competitor.

Algorithms and database

The algorithms that needs to be considered are:

- Softmax Regression
- Support Vector Machines(SVM)
- K-means Clustering
- Naive Bayes
- Deep Neural Networks
- Convolutional Neural Networks

Frameworks:

- Mediapipe
- FaceNet
- DeepFace

Database:

- Firebase
- AstraDB
- Cassandra
- Pinecone

Team Required

- Deep Learning Engineer
- Business Analyst
- Database Engineer
- Cloud Engineer
- Backend Engineer
- UI/UX Designer
- Software Engineer
- Data Engineer/ Data Scientist

Conclusion

The rapid advancements in technology have paved the way for innovative solutions in the fitness industry, with AI-driven fitness apps emerging as a promising avenue for personalized health and wellness. This report delved into the realm of AI-driven fitness apps, exploring their capabilities, benefits, challenges, and potential impact on users' fitness journeys.

The integration of artificial intelligence in fitness apps offers an unprecedented level of customization and guidance. Through data analysis and machine learning algorithms, these apps can adapt to users' unique profiles, goals, and progress, creating tailored workout routines and nutritional plans. This personalization enhances user engagement, motivation, and ultimately, the likelihood of achieving desired fitness outcomes.