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The Best You: Gym Based Machine Learning Application

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ABSTRACT

Use of artificial intelligence (AI) and machine learning is rapidly becoming more widespread in the 21st century. Both are quickly emerging increasingly vital aspects of today's standard exercise routines. Artificial intelligence has become inextricably linked to health and fitness. Experts in the field of technology believe that AI will solve all problems. When it comes to fitness, it has the ability to empower the app by drastically increasing engagement, which may lead to long-term income. In other words, it has the potential to make money. Apps that are equipped with AI have the potential to provide consumers a wide range of benefits. It is feasible for a person who is interested in fitness to save money because an artificial intelligence fitness trainer is more cost-effective than a human trainer. On the other hand, joining a gym may be cost prohibitive or just not doable given our hectic schedules. Aside from that, using fitness software that is powered by AI might make working out more fascinating and fun. In this section, we will discuss some of the best fitness applications that are powered by AI and machine learning models. This app creates unique training plans for each user using artificial intelligence This app was originally designed exclusively for use in gyms, but it recently changed its focus to meet the rising demand for at-home exercise. Simply put, FitnessAI pushes users to effectively build muscle every time they exercise by optimizing their weight lifting sets, repetitions, and weights for each activity. The main purpose of proposing this application system is to provide gym-goers with the right information at the right time, preventing them from taking the wrong supplements to maintain their body well.

Keywords-- AI, Deep Learning, FitnessAI, Machine Learning

I. INTRODUCTION

Physical fitness is now known to be a reliable way to improve both physical and mental health, as well as to ward off chronic illnesses and psychological pathologies [1] through [2]. Official physical activity guidelines are now being promoted by government organizations as a result of recent studies [3]. Physical inactivity still poses a serious public health threat, which is unfortunate because the original recommendation's intent was not fully realized [2]. Additionally, inexperienced athletes frequently engage in strenuous exercises without the proper supervision, which results in injuries and less-than-optimal training. Further research has revealed that setting a specific exercise goal can increase a user's motivation for training. An important step toward achieving this goal could be the adoption of programmed global positioning frameworks for the evaluation of activity quality and power.

Gym-goers people from all age groups face difficulties while taking supplements to maintain a healthy body, like coordinating them into the everyday daily practice, identifying similar products from a variety of brands, finding alternative supplements at an affordable cost, knowledge of the measure of consumption, figuring out their belongings and incidental effects, and observing the results. In this unique circumstance, a reliable supplement enhancement to the tool's adaptable versatility to the rec center participants' requirements becomes basic. Therefore, it's better to have an application that can help to gather information about the supplements. In this study[4], This application proposes a secure and easy-to-use application system based on an image processing system that will allow gym-goers to scan/search the product using their mobile phones in order to extract product information such as product description, how to use it, dosage recommendations for beginners and intermediates, and positive and negative feedback from customers using sentimental analysis.

The user will take a picture of the exercise machine using Deep Neural Networks (DNNs), and the system will scan the picture using image processing, after which the system will provide information regarding the exercise machine. The information on how to use the machine properly, how many laps a beginner should complete, how many laps an intermediate should complete, and the disadvantages of using that exercise machine incorrectly are all provided. The user is also given a link to a video that demonstrates how to use the machine and is given the option to have the system provide more information on how to use the machine. The framework likewise gives a rundown of the top exercise machines recommended by the system and provides a list of the top exercise machines recommended by fitness professionals in the area. The user can also provide feedback on the system and the fitness professionals can add the user to their network.

The system is for gym patrons who struggle to do the exercises in the proper way. Basically, the user needs

to record the video and convert it to picture frames, then compare the objects to datasets, and the system will use CNN (Conventional neural network) to determine what type of exercise is being performed and whether or not the user is performing it correctly, according to the instructions. It will then calculate how many times the user has performed his or her exercise, analyze the data, and inform the user of the number of calories that have been burned as a result of the exercise. The idea is to help the users become more efficient, and ultimately, to help them lose weight. It is a virtual trainer that is designed to help users exercise better and lose weight at the same time.

If a user gets affected by using a particular supplement product, they will provide their feedback into the system by typing in the side effects and the supplement details. Then the system will analyze the information using data mining and the Nave Bayes algorithm. From that part, the system will categorize them into three categories: 1. high, 2. medium, and low. The categories will also be shown by color. Red denotes high, yellow denotes medium, and green denotes low. If the side effects are high, the system will automatically send a generated report to the Health Department via e-mail and inform them about this product. The system will also provide each and every product's side-effects, which have side-effects, by notifying the users. This will allow the users to make their choice and avoid the use of a product that has side effects that may be harmful.

Therefore, this study is about implementing a Supporting application to Enhance the Gym-Tracking. It can be implemented using multiple machine learning algorithms and classification techniques to provide the highest accuracy and best solutions for users to improve their performance skills.

II. BACKROUND

In past years, several systems have been proposed for Fitness Workout. Different machines for Fitness Workout have been used. Below are some articles we have reviewed on the Fitness workout application.

Imaging has now become vital in numerous domains of medical and laboratory research, as well as clinical treatment. Using MRI and CT images, radiologists identify and measure malignancies, whereas neuroscientists detect regional metabolic brain activity using PET and functional MRI. Biologists examine cells and build 3D confocal microscope data sets; virologists reconstruct viruses in 3D from micrographs; radiologists identify and measure cancers from MRI and CT scans; and neuroscientists detect regional metabolic brain activity from PET and functional MRI scans. For the analys of these varied image types, computerized quantification and visualization methods are necessary. Until recently, 3D visualization and quantitative analysis of pictures required expensive UNIX computers and specialized software. The majority of today's visualization and analysis may be performed on a low-cost desktop computer equipped with the required graphics hardware and software. This article presents [1] a general-purpose image processing and representation and analysis might be performed on a minimally expensed personal computer furnished with the necessary illustrative equipment and programming. This article presents [1] a universally useful picture handling and representation application that is extendable, platform-independent, and constructed explicitly to suit the requirements of an Internet-associated clinical analyses local area. MIPAV (Medical Image Processing, Analysis, and Visualization) is a program that enables the Internet-based clinical and quantitative investigation of clinical pictures. Utilizing MIPAV's standard UI and investigation instruments, specialists and clinicians at remote locales can undoubtedly share research information and analyses, helping their capacity to study, analyze, screen, and treat medical issues.

On the basis of this[2], This study utilizes the actual qualities of fitness coaches as picture target identification pointers. This review involves infrared catch as the premise of picture catch location innovation, utilizes FCM bunching as the fluffy picture foundation division calculation, utilizes k-implies grouping analyses to concentrate on the dark histogram, and proposes a composite order highlight following strategy for coach picture following as per the hypothesis that the human body will disperse more intensity during the fitness cycle. When joined with test research, the study demonstrates how the research strategy moves along the detection rate of the human target by making use of the benefits of the composite classification feature. As a result, it is a highly efficient and real-time algorithm for detecting humans in infrared images.

A machine learning approach is suggested in this paper[3] to evaluate user activity on a platform for at-home workouts. Keep is an at-home workout program that offers a variety of exercise options, including yoga, cycling, running, and fitness diet advice. They compared the four supervised learning support vector machine, k-nearest neighbor, random forest, and Logistic regression utilizing the joined preparation set information of 7734 Keep clients. The receiver operating curve analysis showed that random forest had a higher overall discrimination verification power than the other three models. 850 test samples were classified using the random forest model, and an accuracy rate of 88 percent was attained. This method can forecast users' continued use of the home workout application after installation. On Keep, they took into account 18 variables that were predicted to have an impact on the assurance of ceaseless cooperation. Keep certification was the main factor influencing the study's findings.

The goal of this study[4] is to create a deep learning pipeline to identify signals of adverse events (DS AEs) connected to dietary supplements on Twitter. Materials and procedures From 2012 to 2018, 247 807 tweets mentioning both DS and AE were collected by us. They created a specific explanation rule for DS AEs and

commented on 2000 tweets with biomedical elements and relations. With a CRF classifier, we streamlined and looked at the presentation of the BioClinical-BERT, PubMedBERT, ELECTRA, Roberta, and DeBERTa models for the idea extraction task.

By considering these factors we recommend a Mobile-application as a solution and hope it will be of help to Fitness Workout who are not satisfied with their Fitness performance levels and who do not have the facilities to obtain the best and free solutions to workout or the time, can access our mobile application and get the help they need.

III. METHODOLOGY

Fig.1 shows a block diagram of the Integrated Gym system: A Supporting application for Enhancing the fitness workout. The application's essential objective is to provide support for gym as an aiding instrument. The mobile application will aid in the fitness workout and assist users who are struggling to get a product analyzer, gym assistant, or Activity analyser for the correct healthy fitness, and Product Unfavorable.

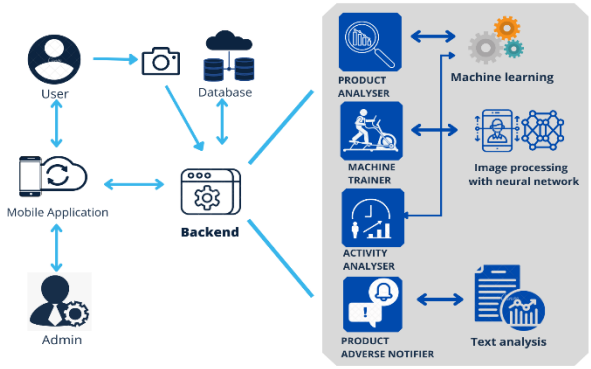

Figure 1: System Architecture

The proposed framework will be completed under four primary parts.

1) Product analysing using machine learning which would be able to provide the details of the supplement to maintain a healthy body.
2) Machine trainer using image processing with a neural network which will assist as a virtual trainer.
3) Activity analyser using machine learning that could provide the amount of the activity and correct it as possible.
4) Product adverse notifier using text analysis, which can aid other users to find supplement side effects.
5) Give the solution to fitness workouts using a mobile app.

Different types of CNN algorithms and models will be used to examine the data. After the ML (Machine Learning) model has been prepared, the binary classifier results will be sorted. Python was picked as the programming language, alongside the libraries, Deep Learning, ML framework, K-means clustering Model to Implementation, and Image processing for finding the product and Video processing.

1) Product analysing using machine learning which would be able to provide the supplements details healthy body

This paper represents the implementation of users' reliable supplement management tool adaptable to gym-goers and Evaluates the complexity of the supplements search. Moreover, identifying similar products from a variety of brands, finding alternative supplements under affordable cost, knowledge on the measure of consumption, grasping their belongings and secondary effects and observing results

Secure and user-friendly application system based on an image processing system that will allow gym-goers to scan/search the product using their mobile phones to extract product information such as product description, how to use it, dosage recommendations for beginners and intermediates, and positive and negative customer feedback using sentimental analysis. The program will guide users to offer alternative items based on comparable product features and price comparisons, suggesting alternatives ranging in price from low to high. This application system's primary objective is to supply gym-goers with the proper information at the right time, to keep them from taking the incorrect supplements to keep their bodies healthy.

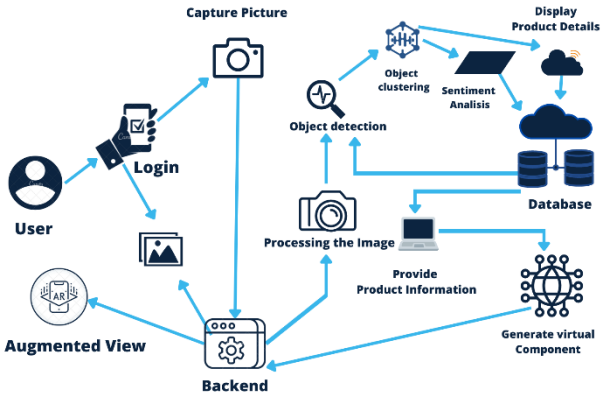

Figure 2: Product Analyser System Architecture

a. Initialization and Product Analyser

Above Fig. 2 is the individual system diagram where this component is represented as a small box, and the middlebox in the research component is typical for everyone; hence it involves machine learning. This involves input product photos once scanned and Gray-scaling the photos. Then the system will use the medium filter for image processing to separate the object. Then, using the K-means clustering system will identify the product type and analyse the details of the product like product information, alternative products, price comparisons, and feedback from users. It will provide the product's positive and negative adverse using the sentimental analysis system.

b. K-means Clustering Analysis

Used k-Mean clustering to the selection of the cluster center trend's turning point following k-means clustering analysis of the gray histogram is the fundamental component of the algorithm. The selection of the measure function is a significant factor influencing the result.

Given a dataset, the K-Means Clustering algorithm will determine Which information focuses have a place in every one of the k-clusters? It utilizes your information to sort out some way to cluster it. The calculation fabricates gatherings of information focuses known as groups through a progression of emphasis that limits a specific expense capability. Data of interest in a similar group will be like each other when the inside cluster number of squares is utilized as the expense capability, though data of interest in various groups will be less like each other.

Unsupervised learning is a category of learning algorithms that includes K-Means Clustering. This kind of learning model does not explicitly assign each data point a label, class, or category.

Every data point of interest in your dataset is a vector of characteristics, or elements, without even a name that could relegate it to a specific group or class. The calculation will then, at that point, naturally figure out how to gather and cluster data of interest with comparable qualities.

c. Grey Scale Image

An analog image is represented digitally by a sampled and quantized version. The result is that it uses a limited number of samples to represent an analog image. A principal unit or cell called a "pixel" makes up a picture. A two-layered cluster or two-layered series of pixels makes up a computerized picture of exercise center machines. In this way, an assortment of pixels that are reliably organized into a significant request addresses a picture. Computerized pictures are divided into double, grayscale, and shaded pictures.

Each pixel in a grayscale computerized picture is a solitary example of a resource, and it requires next to no ability to arrange. Pictures of this classification, which are otherwise called "highly contrasting," are altogether made out of shades of dark, changing from the dark as an afterthought with the lower solidarity to the dark as an afterthought with the most grounded side. Grayscale depictions are portrayals that do exclude variety or other chromatic components..

2) Machine trainer using image processing with a neural network which will assist as a virtual trainer

The system is a hybrid system that uses agile and prototype methodologies to manage the project and the Gantt chart and WBS to keep track of the development process and project sub-components. The suggested method will use image processing in a neural network and a trained deep learning model for a virtual assistant is the process.

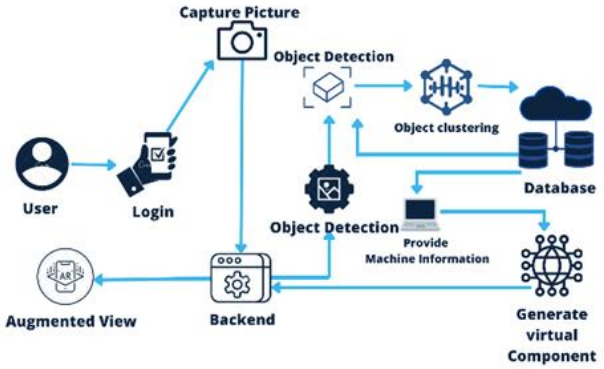

Figure 3: Machine Trainer

The algorithms will utilize pixel patterns that are quite close to what the machine has previously observed. A comprehensive procedure is required to develop an image classifier.

Image Classification requires a working reference dataset. A code line may be used to import a group of photos from the Keras API (Application Programming Interface). Python might be a terrific answer for you if you want to utilize it as a programming language. Once your dataset has been installed, you may choose to spend a few minutes exploring it to see which classes have already been established.

a. Object Recognition using Neural Network

Object recognition identifies a specific object inside a digital picture or video. In the disciplines of item confinement, impediment discovery, scene cognizance, surface grouping, clinical analysis, observing and reconnaissance, biometrics, and route, this article acknowledgment has numerous applications. Object acknowledgment challenges are frequently separated into two classifications: (a) example based acknowledgment and (b) class-based acknowledgment. Example acknowledgment is the most common way of recognizing 2D or 3D unbending articles with differing sees and swarmed, impediment inclined foundations. These issues are additionally evolved and are utilized in different business applications, for example, conventional class acknowledgment and applications in light of photosynthesis. In this instance, class recognition issues entail the identification of a certain class, such as chest press machines, cable machines, leg extension machines, and other gym equipment.

b. Feature Extraction

Depending on the picture resolution, a computer interprets an image input as an array of pixels. Depending on the image resolution, height * width * dimension will be shown. Then, these characteristics are utilized in the subsequent step, which entails selecting and developing a machine-learning algorithm to classify novel feature vectors given a large database of feature vectors with established classifications. For this, we selected the optimal K-mean clustering approach. However, the trained model may always be modified based on performance indicators. Finally, we may utilize the

trained model to create predictions based on previously unknown data.

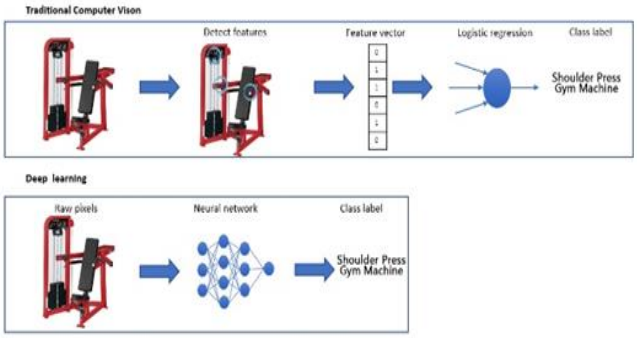

Figure 4: Feature Extraction

3) Activity analyser using machine learning that could provide the amount of the activity and correct it as possible

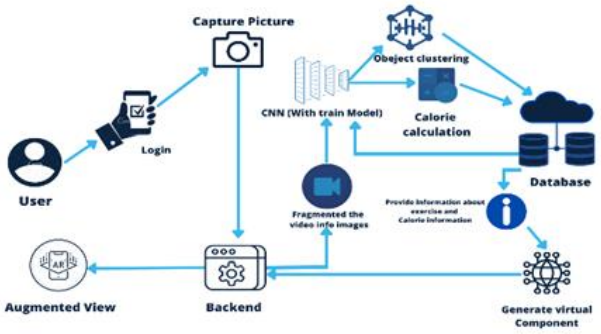

Figure 5: Activity analyser

For users, spotting and following moving targets in fitness videos can be very helpful. For instance, the fitness instructor can analyze the fitness strategy by using the pertinent information extricated from the wellness video to direct a fitness system. The direction of the wellness work force is then planned to the location model through the ID, following, and order of the wellness staff. Competitors can work on their preparation through the three-layered remaking of this information and the sensible preparation, demonstrating, and investigation of specialized activities. The competitor can all the while assess the pertinent wellness video caught by the camera to separate the objective of the district of interest, playing out a more exact investigation and streamlining the preparation impact. Furthermore, decide the calories consumed.

a. Deep Convolution Neural Network Design

Convolutional and pooling layers are typically combined for computation in the CNN network structure. After the convolutional layer extracts the features, the pooling layer performs the dimensionality reduction operation by selecting the standout features from the amplified feature attributes before passing the data to the fully-connected layer for classification [11]. A maximum accuracy index of 77.46 percent for the time domain model is possible, which is about 5% less accurate than the accuracy index for the frequency domain model. Examine the effect of attention techniques on the distribution of the input in more detail. The local perceptual field plays a crucial role in the convolutional operation, which uses a convolutional kernel to extract features from the original image. The pooling layer primarily reduces the dimensionality of the data while keeping the most important details. While weight sharing enables CNN to better reduce the number of parameters, the number of tuning parameters, and the amount of computation, the local perception field enables CNN to extract features incrementally through convolution kernels, and a simple pixel image is computed to gain relevant information about that now. Each layer's CNN structure, as depicted in Figure 6, gathers and enriches feature information.

The convolutional layer is the distinguishing feature of the CNN and is used to extract features, which is a Main Component of the CNN.

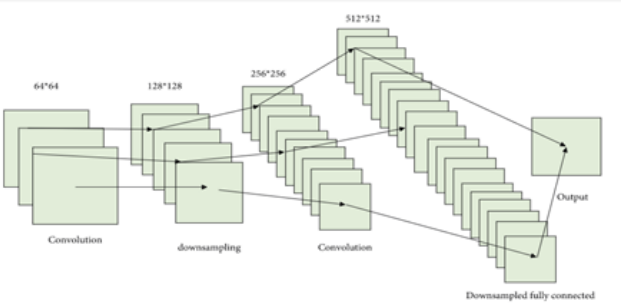

Figure 6: CNN

The production of numerous element maps is achieved by first deciding the size of the convolution part, then, at that point, speaking the unique information with the weight framework of the convolution piece, moving to the next grid scope of the first information while keeping up with a similar size, and lastly, proceeding to dab. The convolution operation has the ability to reduce noise in addition to enhancing certain aspects of the original image. Due to the small difference between the matrix value and the surrounding pixels' average values, the convolution kernel calculates the matrix value in the image and lowers the noise point. The value and value differ significantly, which reflects the prominent locations and enhances the features. 44.35 percent is Ll's lowest percentage.

b. Video Processing and Image Processing

In the section, we segmented the video into images with its start and end timestamps. In this part, the video file will break into segments using the start and end timestamps in the above section. Once this process is done, we have a word transcript and related video segments separately. In the next section, the system will use created segments by objects to analyze and generate formant frequencies for the prediction.

Videos have a great many worldly degrees and can't be handled with fixed-sized engineering as effectively as pictures, which can be edited and resized to the proper size. In this work, we treat every video as an

assortment of fixed-length, brief clips as pictures. The way that each clasp contains various sequential edges in time permits us to expand the organization's network in the time aspect and learn spatiotemporal highlights. Various choices exist for the particulars of the drawn-out availability, and we list three significant classes of network designs underneath (Early Fusion, Late Fusion, and Slow Fusion). Then, at that point, to address the computational effectiveness, we depict a multiresolution design.

4) Product adverse notifier using text analysis, which can aid other users to find supplement side effects

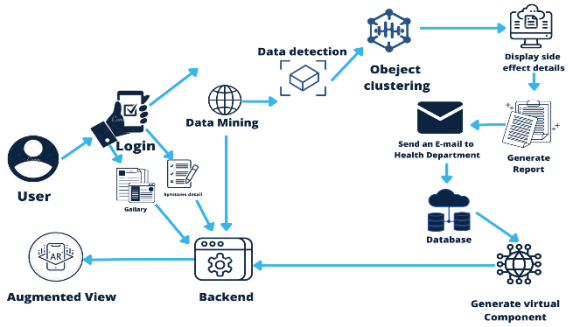

Figure 7: Product adverse notifier

With the help of the product adverse, if a user gets affected by using a particular supplement product, they will provide their feedback into the system by typing in the side effects and the supplement details. Then the system will analyse the information using data mining and the Nave Bayes algorithm. From that part, the system will categorize them into three categories: 1. high, 2. medium, and low. The categories will also be shown by color. Red denotes high, yellow denotes medium, and green denotes low. If the side effects are high, the system will automatically send a generated report to the Health Department via e-mail and inform them about this product. The system will also provide each and every product's side-effectiveness, which has side effects, by notifying the users. Finally, a report will be able to generate.

a. Navie Bayes Classification

The Nave Bayes categorization system uses probability and statistical approaches. This approach employs the Bayes theorem and presupposes that all independent variables are class variable values. This approach just requires the quantity of training data necessary to approximate the Process classification parameters. NBC frequently outperforms expectations in the most difficult real-world circumstances. The Bayes theorem is a mathematical procedure for determining conditional probability in equation 1.

To classify a case d, the Naïve Bayes Classifier computes the back-likelihood P(c|d) in view of the Bayes Theorem and the autonomy suspicion. Given a bunch of classes C, the qualities < a1, a2, L, a > and the qualities < v1, v2 ,L, vn > that depict an info example, the Naïve Bayes Classifier doles out the most plausible classification as indicated by the equation.

b. Data Mining

Data mining is the process of examining and synthesizing data from several perspectives to obtain meaningful information. Technically, data mining is the process of discovering patterns and correlations in a big relational database. Data sources might be databases, data warehouses, the Internet, other information repositories, or data that flows dynamically into the system. Despite the fact that large-scale information technology, transaction, and analytical systems can be built independently, data mining provides a link between the two. The mining of data can lead to the discovery of new connections and patterns. Statistics, machine learning, artificial intelligence, and neural networks are some of the fields that make use of it.

IV. RESULTS

Moreover, Search or scan the product with an image processing system to extract information about the product, suggest alternative products, and Details on how an exercise machine works, including how many laps a novice should run and the drawbacks of the wrong operation. The user takes a picture of the workout equipment with the help of eep Neural Networks, and then the system utilizes image processing to analyze the picture and provide details about the equipment. and order them from best to worst based on both the costs and the comments left by previous customers. The algorithm for infrared images can be seen to take advantage of the advantages of the composite classification feature when combined with experimental research to increase the target detection rate of the human body.

V. CONCLUSION

The primary focus of this study is on the image detection of fitness systems. The human body will, however, lose more heat during the fitness process than it does in the normal state. As a result, infrared sensing is used in this study to gather image data. This study makes use of a two-dimensional histogram-based image K-means clustering segmentation method. In this method, the spatial information between the neighborhoods and the infrared image's gray information are combined to create a two-dimensional histogram, which makes it simpler to distinguish between the object and the background. In this study, the histogram is split into several regions for multi-cluster analysis before the distribution of clustering centers for various categories is examined.

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