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Workout Assistant and Fitness Guide using Machine Learning

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Abstract: *In today's world, virtual assistants have become an integral part of our daily lives. In fact, according to a survey, nearly 27% of people use AI virtual assistants to carry out their daily activities.AI is an emerging technology that we want to explore through our project of AI based workout assistants. In our project, we will introduce Fit Exercise. This app will detect your exercise pose, count the exercise repetitions, and provide you with personalized, detailed advice on how you can improve your form. The app uses a Media Pipe to identify your exercise pose. Then, it will analyze the geometry of your pose from your data set and the real time video and count the repetitions for your exercise.*

Keywords: AI, Virtual assistant, CNN, workout assistant, Pose estimation. Blaze pose, OpenCV

I. INTRODUCTION

People are naturally vulnerable to a lot of health issues, of which muscle disorders are one of the most important areas that need to be treated as soon as possible. Millions of people suffer from muscle disorders every year due to accidents or ageing. You can improve your body by practicing yoga. There are many advantages to exercising, but doing so wrong can lead to a risky lifestyle. Therefore, proper instruction is necessary for people who are doing activities alone. With proper direction, you can get several advantages from activities while improving your health.

Yoga postures help to create awareness, harmony and strength in the mind and body. On the other hand, incorrect yoga postures can lead to catastrophic complications such as stroke and nerve damage. Therefore, proper yoga postures must be followed.

II. RELATED WORK

Pose recognition methods

Pose recognition methods focus on detecting human figures in images and video, with the goal that one could decide, for instance, where somebody's elbow appears in a ppicture. This method does not perceive exactly who is in an image. The algorithm simply estimates where key body joints are. Although, other systems integrate this technology to associate the pose detection with user identifiable information. Salvatore Source et al. introduced a method to distinguish whether a hand is open or closed base on neural network . They utilize hand division with the RGB frames from Kinect camera and afterward utilize three distinct methodologies as inputs for the Neural classifier. As indicated by their examinations and dialog, their methodology that incorporate hand mask with edge do not get great outcomes and need more autonomous calculations for edge extraction. Youness Choubik and Abdelhak Mahmoudi proposed to apply machine learning algorithms to classify poses in real time through a characterized terminology, utilizing the skeleton information given by the Kinect sensor [8]. Basically, they extracted features from skeleton data to train machine learning algorithms with different classifiers such as Support Vector Machines, Artificial neural networks, k-nearest neighbours and Bayes classifier. Their application obtained good results, however the poses used for testing were very simple for a convincing study. There was only one difference between the positions of the arms.

Yoga frameworks

The YogaST is a self-training framework that aims at instructing the user/practitioner to accomplish yoga poses accurately and anticipating damage caused by inappropriate stances . They utilized two Kinect 1 devices with opposite review headings to acquire the body map. To complete the pose recognition, applied image processing to get a contour

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map and convolved with line masks. With that information, the framework extracts the axis body user to compare and analyse the correct posture. The primary trouble is when there is a cover of the body parts since division cannot happen accurately. Eyes-Free Yoga is an exergame that uses depth cameras for visually impaired and low vision practice . This framework utilizes Kinect 1 and the users can interact with a yoga trainer receiving audio instructions for six standing yoga poses. The method is to calculate the different body angles using the Law of Cosines, which was very popular among developers who used this version of Kinect in the beginning for the recognition of gestures. Additionally, through of a normal of 11 rules for each pose, the need for changes in the human body is resolved. It is along these lines, how the input of guidelines for the adjustment of the body is chosen. Microsoft Kinect device gives an astounding application advancement interface that empowers human activity investigation like learning Yoga. Despite the fact, that there are numerous methodologies and solutions for this research, our interactive system plans to bring a faster and stronger method of recognizing poses.

III. CHALLENGES

1. Alignment: Maintaining proper alignment without a teacher's guidance can be difficult and may lead to incorrect postures.
2. Balance: Balancing poses may be challenging without someone to provide support or guidance.
3. Safety: In some advanced poses, the risk of injury is higher without assistance.
4. Motivation: Staying motivated and disciplined in your practice can be harder when you're alone.
5. Progress: Progress may be slower without feedback from an instructor or assistance in deepening your practice.
6. Variety: It can be harder to incorporate new poses and techniques without assistance or exposure to different styles of yoga.

IV. TECHNOLOGY REQUIRED

Machine learning, a subfield of artificial intelligence, has become a transformative force in the 21st century. It empowers computers to learn and improve from data without explicit programming, revolutionizing various aspects of our lives. This essay delves into the core principles of machine learning, explores its diverse applications, and examines the potential challenges and ethical considerations surrounding its development and deployment. The applications of machine learning are vast and ever-expanding. It shapes our daily experiences in numerous ways, from recommender systems suggesting products on online platforms to fraud detection algorithms protecting financial transactions. Machine learning powers self-driving cars navigating complex traffic scenarios and medical diagnosis tools assisting healthcare professionals in identifying diseases. It also plays a crucial role in scientific research, accelerating drug discovery and materials science advancements.

1. DBSqlite

Database Requirements require a large amount of data, some of which may need to be retrieved several times, and the best way to store this data is in the form of a database. The database will store the data from the input of the Database Requirements and the retrieved data for the use of the Database Requirements.

SQLite is an easy-to-use, self-contained and high-performance SQL database engine. SQLite differs from the typical client-server database system in that it works on a file-based basis, storing data directly in a single file, making it suitable for a wide range of applications that require a portable and high-performance database solution..

2. Python

Python is a high-level, general-purpose programming language known for its readability, versatility, and extensive library ecosystem. Python, a high-level, general-purpose programming language, has emerged as a dominant force in the digital age. Its unique blend of readability, versatility, and extensive library ecosystem has propelled it to the forefront of various domains, from web development and data science to automation and scientific computing. This essay explores the key features of Python, its diverse applications, and the factors contributing to its widespread adoption.

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3. DB Browser

DB Browser for SQLite (DB4S) emerges as a user-friendly bridge, connecting individuals with the power of databases. This free and open-source software empowers users of all skill levels to create, edit, and manage SQLite databases, a widely used lightweight database engine. This essay explores the functionalities of DB4S, its significance in database interaction, and its impact on various user groups

DB4S distinguishes itself through its intuitive interface. Unlike traditional database management systems that rely on complex command-line tools, DB4S presents a familiar spreadsheet-like environment. This visual approach allows users to effortlessly browse tables, edit data, and perform basic operations without requiring extensive knowledge of SQL syntax. However, for more advanced users, DB4S also offers the ability to write and execute SQL queries directly, catering to their specific needs and fostering deeper exploration of the database.

4. LR Algorithm

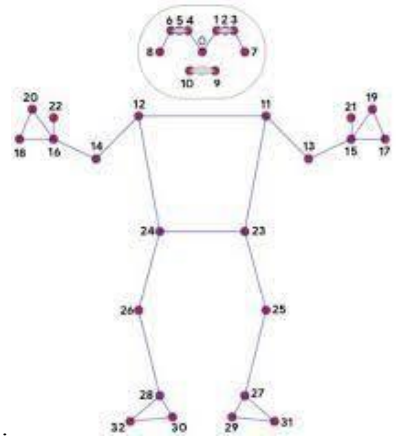
Logistic regression, a fundamental tool in the statistician's arsenal, empowers us to model the relationship between a binary dependent variable and one or more independent variables. Unlike linear regression, which predicts continuous outcomes, logistic regression tackles the realm of categorical dependent variables, typically with only two possible values, often denoted as "success" and "failure" or "presence" and "absence." This type of statistical model (also known as logit model) is often used for classification and predictive analytics. Logistic regression estimates the probability of an event occurring, such as voted or didn't vote, based on a given dataset of independent variables.

Within machine learning, logistic regression belongs to the family of supervised machine learning models. It is also considered a discriminative model, which means that it attempts to distinguish between classes (or categories). Unlike a generative algorithm, such as naïve bayes, it cannot, as the name implies, generate information, such as an image, of the class that it is trying to predict (e.g. a picture of a cat).

In designing specific error-handling routines for an LR parser, we can fill in each blank entry in the action field with a pointer to an error routine that will take the appropriate action selected by the compiler designer. LR parsing is a widely used method of syntax analysis for a variety of reasons. First and foremost, an LR parser is a deterministic parser that is highly efficient: it scans the input string in one pass and is able to detect errors at an early stage.

V. DATASET COLLECTION

Currently, it is quite challenging to come across a precise and efficient yoga-pose dataset online. The YOGI dataset includes a combination of standing and sitting poses, utilizing the entire body to showcase each yoga pose. These poses feature various hand and leg positions, posing a challenge for posture detection algorithms to function effectively. To address this issue, the YOGI dataset comprises 10 yoga poses that were captured using the burst feature of the camera. The images were captured with high precision and accuracy, resulting in a total of 5459 images in the compiled Colour Image dataset, with each of the 8 yoga poses having approximately 400 to 900 images



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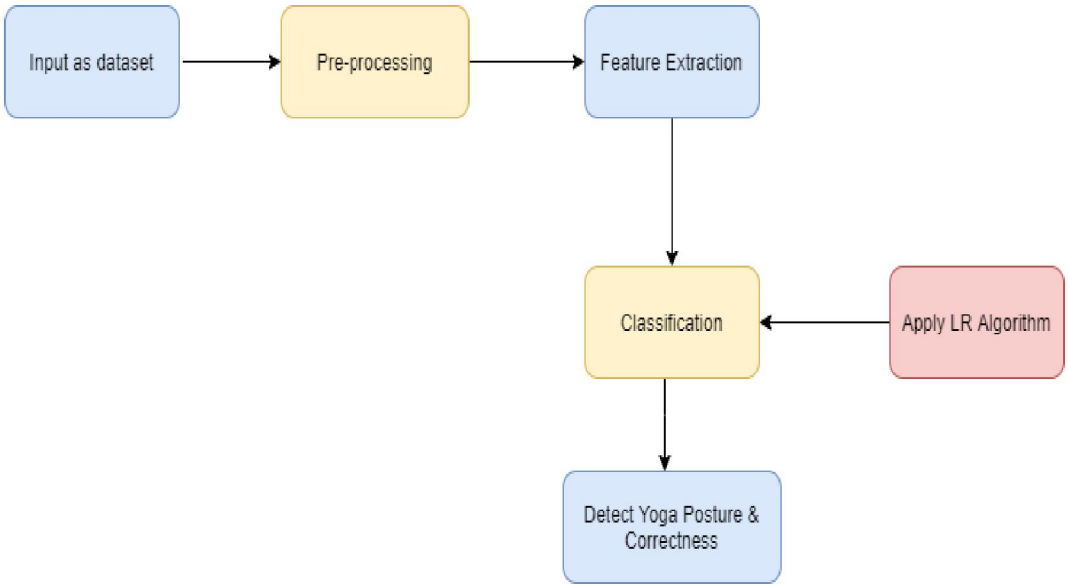
Collecting data manually of a huge volume requires a lot of effort, attention, and precision. Listed below is the procedure.

- A closed room was used to avoid any use of direct sunlight to get images without any reflection or glare
- The camera was mounted and adjusted on a tripod with an appropriate frame centering the person performing the yoga poses, and the distance was maintained around 4 to 5m between the camera and the person.
- The background was kept plain white to enhance and distinguish the yoga poses done by the person.
- Images of every pose were clicked from multiple directions and angle with the motion to capture every form of the pose, this helped to create a mixed Realtime dataset.
- Images of each pose were clicked in continuous mode ,25 images in a single go.

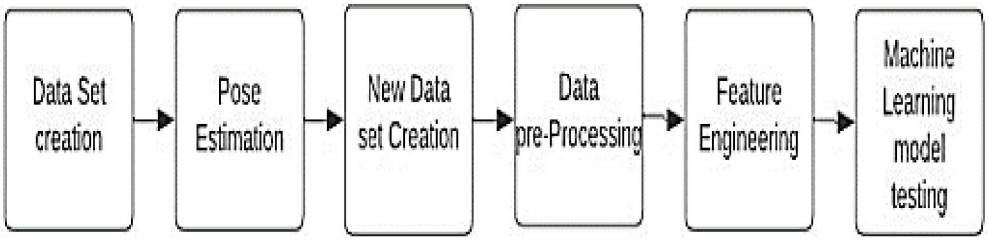
VI. ARCHITECTURE



VII. WORK FLOW CONCLUSION

WORKFLOW PREPROCESSING: For preprocessing of data normalization is applied to the dataset. Machine learning models require normalized data to perform efficiently and provide good results.

DETECTION: Pre-processing and feature engineering is done on the testing data which was done on training data. The reason for this is that machine learning models understand the training data. Finally, the output is obtained for the test data and then fed to the trained model to evaluate its performance based on its predictions



VIII. CONCLUSION

In conclusion, nowadays our life is becoming busier and we hardly find time in our schedules to be healthy and fit and exercise daily. This has caused many diseases and health issues. The implementation of Artificial Intelligence in the field of fitness can solve many problems. The health-related applications and devices are making our lives easier and

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easing our fitness journey. Individuals can use this application in their workouts, hence making them more efficient are less error-prone. In this process, we learned how to use the OpenCV library and package and how the application of machine learning can be beneficial to humans

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