

Web Application-Based Machine Learning Approach to Enhance the Exercise Performance Through Posture Correction

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ABSTRACT

Poor posture is a growing concern that can lead to numerous health problems. The main research component proposed here aims to develop a web-based platform that uses machine learning models to improve posture while exercising through video analysis with accurate recommendations. The research area employs neural networks created to process the video in real-time, providing personalized feedback and recommendations to correct postural imbalances. Other tools are also used to create machine learning models that correct posture. The application can be accessed from home or work, making it a powerful tool for short-term and long-term posture correction goals and increase the availability, scalability. By deploying machine learning models for posture correction, the experimental setup proposed in this research paper aims to promote healthy habits and mitigate posture-related problems, reducing the risk of exercise-related injuries by giving real-time feedback and recommendations. This approach can assist in correcting poor posture and improving overall well-being. Overall, the experimental setup provides a convenient and effective way to improve posture and reduce health risks associated with poor posture. The key findings of this research focuses on the results obtained by combining the Machine Learning (ML) models in the proposed experimental setup.

Keywords: Poor posture, Video analysis, Machine Learning, Postural Imbalances, Neural networks

I. INTRODUCTION

This Poor posture is an increasing concern in today's fast-paced society because it can result in a number of health problems. Poor posture is frequently caused by prolonged desk work, the use of smartphones and computers, and improper exercise methods. One's emotional and physical health are both negatively impacted by poor posture. Lack of confidence, low self- esteem, and decreased productivity might result from it. Consequently, there is a rising need for a solution that will assist people in improving their posture and forming better habits.

Machine learning [4] model deployment for posture correction can play a vital role in addressing this concern. Machine learning models [6] can analyse video input and provide real-time [8] feedback on an individual's posture [10]. These models can identify areas of the body that require correction and provide personalized recommendations on how to improve posture. By using machine learning models for posture correction, people

can spot postural abnormalities and fix them before they become a problem. Furthermore, people can improve their postural patterns over time thanks to the models' personalized input.

One of the significant benefits of using machine learning models for posture correction is that individuals can readily access the web-based posture correction technological structure from their homes or places of employment. The technological structure can be applied to both immediate and long-term posture correction objectives. The ML model is an effective tool for assisting people in forming better posture [10] habits since it can assess video data and offer feedback in real-time. Real-time [8] feedback can be used to correct posture during exercise, and personalized recommendations can be implemented in daily activities such as sitting and standing.

Using machine learning models [6] to improve posture can also result in significant financial savings. Early postural abnormality detection lowers healthcare expenditures by preventing the emergence of long-term health problems. Furthermore, by forming improved postural habits with the use of machine learning models, people can avoid costly therapies like chiropractic or physiotherapy.

Powerful tools like machine learning [4] and video analysis can help people correct their posture and prevent related health problems. For posture correction, machine learning models offer personalized recommendations, real-time feedback, and significant cost savings. Machine learning models have huge potential for improving posture [10] correction and lowering associated health risks as technology develops.

II. LITERATURE SURVEY

Poor posture is becoming an increasingly common issue in today's lifestyle, resulting in a range of health problems such as back and neck pain, headaches, and poor circulation. Many people are unaware of their incorrect posture, even during exercise, which can lead to long-term issues. To address this growing concern, machine learning [4] model deployment for posture correction can play a vital role.

Machine learning models can analyse video input and provide real-time [8] feedback on an individual's posture. These models can identify areas of the body that require correction and provide personalized recommendations on how to improve posture [10]. One of the benefits of applying machine learning models for posture correction is the ability to spot postural abnormalities and fix them before they become a problem. People can also improve their postural patterns over time thanks to the models' personalized input.

The web-based posture correction [3] technological structure is accessible to people from their homes or places of employment. The ML model is an effective tool for assisting people in forming better posture habits since it can assess video data and offer feedback in real-time. Furthermore, the technological structure can be applied to both immediate and long-term posture correction objectives.

During exercise, good posture can improve general physical health and stop additional injury. Therefore, those who consistently exercise can greatly benefit from machine learning [4] models. People can avoid long-term health issues, such as chronic pain, by taking care of posture disorders as soon as they arise.

In conclusion, machine learning models for posture correction are an innovative and effective solution for addressing poor posture in today's lifestyle. By using these models, individuals can correct their posture during exercise and develop healthier habits, leading to improved overall physical health.

III. METHODOLOGY

A. Experimental Design

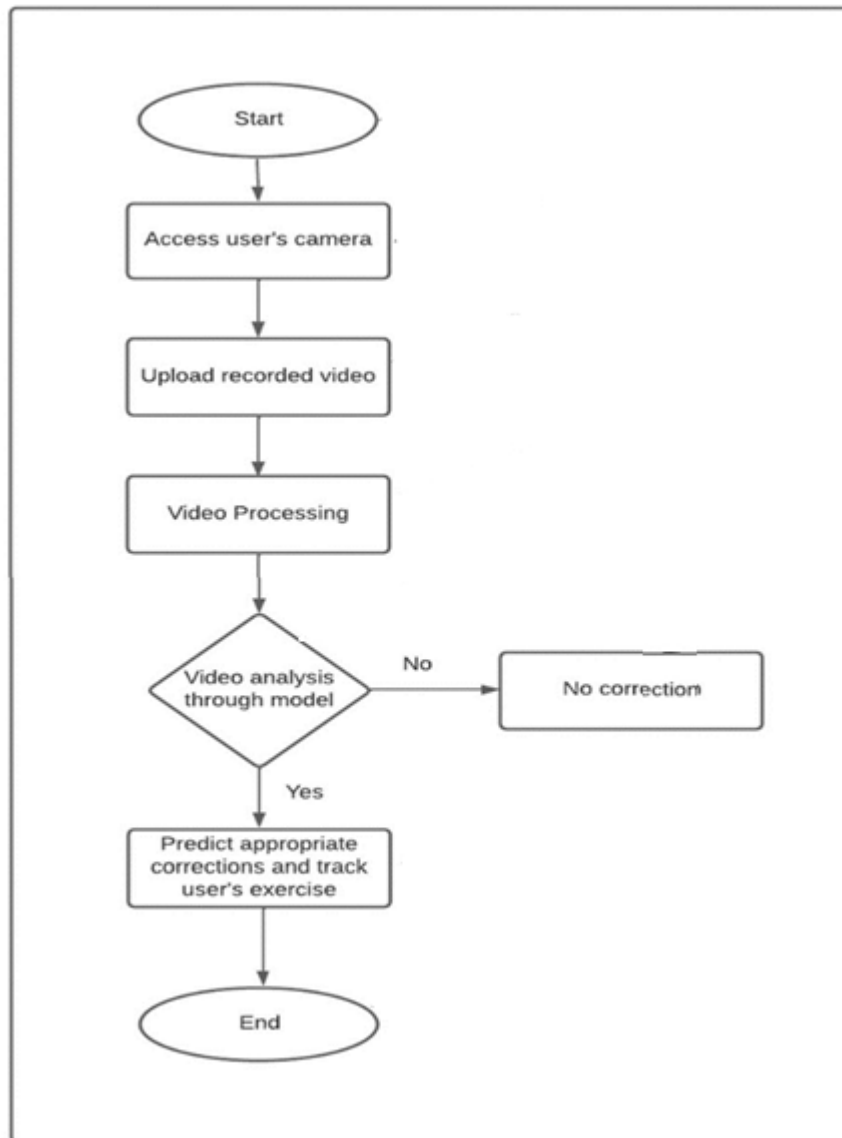


Fig 1. General flow of the algorithm and the web application.

In reference to Fig. 1, The experimental design constitutes methods which are critical to the web application and includes the necessary components for the functioning of the web application.

B. Components and Libraries Used

The various machine learning technologies which can be used are described below.

a). Numerical Python

NumPy, often known as mathematical Python, is a well-liked Python module for scientific computing. It offers strong capabilities for Python data processing and numerical computations. Large datasets can be processed

mathematically using NumPy's effective n- dimensional array object. Linear algebra, Fourier analysis [1], and random number creation are further features of NumPy.

During exercise, poor posture is a prevalent problem that can result in pain and injuries. NumPy can be used to diagnose and treat bad posture while working out. It can be used, for instance, to determine the angle of the joints during exercise and compare it to the proper angle. In order to rectify bad posture, NumPy can also be used to determine the centre of mass and the weight distribution during exercise.

b). Keras API

A high-level API for building neural networks is provided by the popular deep learning programme Keras. Keras provides a user-friendly interface for building complex neural networks on top of TensorFlow. Few of the layers provided by Keras that may be used to build various kinds of neural networks include convolutional, recurrent, and dense layers.

By creating a neural network that can recognize the ideal posture and give the user feedback, the Keras framework can be used to fix bad posture while exercising. A neural network can be trained, for instance, to distinguish the proper stance for a particular exercise and to alert the user if it is inappropriate. A neural network that tracks a user's posture while they exercise and provides them with quick feedback can likewise be created using Keras.

c). Tensorflow

A well-liked deep learning package called TensorFlow offers various tools for creating and training neural networks. Users of TensorFlow may create sophisticated neural networks thanks to its potent computational graph. Convolutional, recurrent, and dense layers are just few of the layers which TensorFlow provides that can be used to construct different kinds of neural networks.

TensorFlow may be utilized to improve poor posture when exercising by creating a neural network that can distinguish the correct posture and provides feedback to the user. For example, a neural network can be taught to recognize the appropriate stance for a certain exercise and to warn the user if it is not correct. TensorFlow may be used to build a neural network that monitors a user's posture while they workout and gives them immediate feedback.

d). Sklearn

A well known Python library for machine learning is sklearn or scikit-learn. It offers resources for model choice, data pre-processing, and analysis [1] of data. For classification, regression, clustering, and dimensionality reduction, Sklearn includes various algorithms.

Sklearn may be used to improve poor posture while exercising by developing a machine learning model that can identify the ideal posture and gives the feedback to user. For instance, a machine learning model can be trained to identify the proper stance for certain exercises and alert the user if their stance is off. The data can also be pre-processed using Sklearn, and the ideal model for correcting posture can then be chosen.

C. Experimental Setup

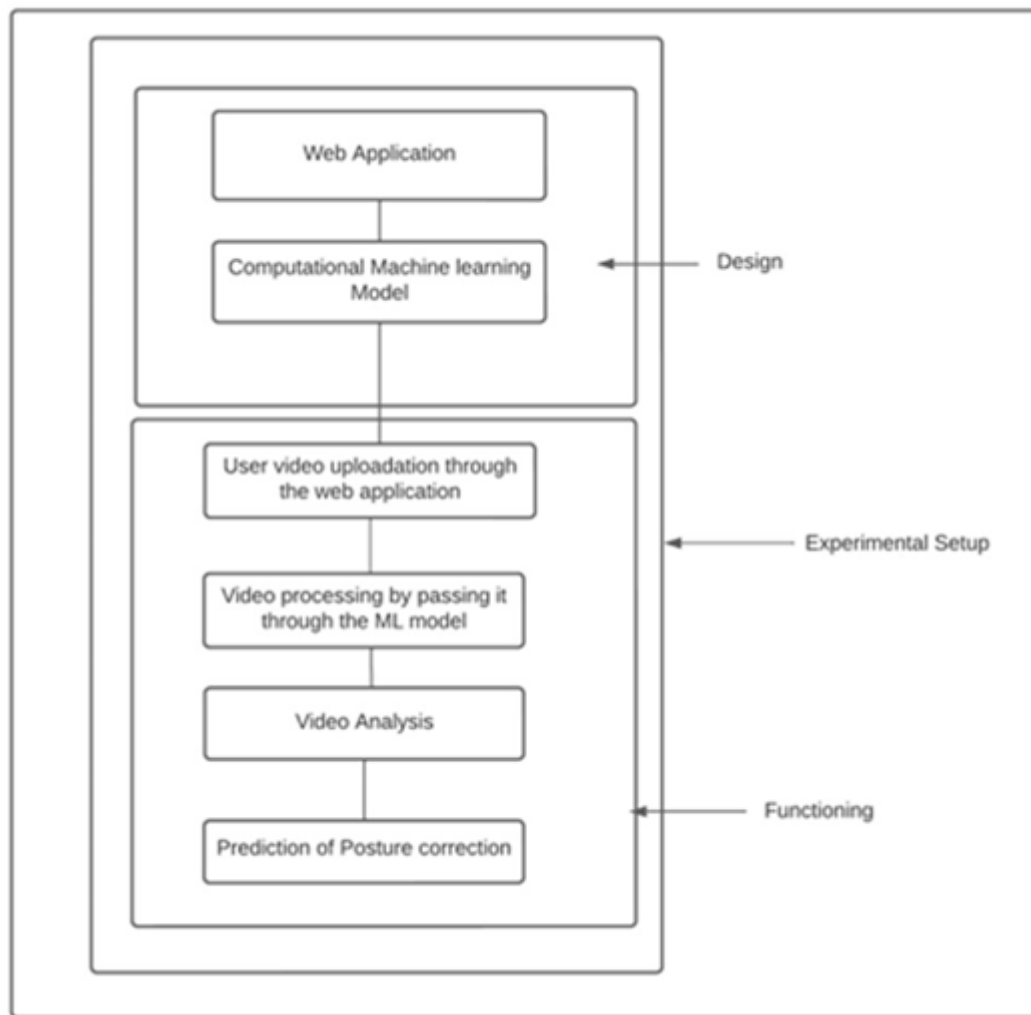


Fig 2. Experimental setup.

Fig 2. Describes the experimental set up with wide range of options for individualised and successful training programmes are now possible thanks to the integration of machine learning and web applications. In this experimental setup, we suggest a web application that makes use of a machine learning model to examine exercise videos [3] and offer sensible suggestions for improving the form and technique of the exercises carried out. After being trained and optimised, the machine learning model is linked into a web application that enables users to record and upload their own workout videos. The application then analyses the video using a machine learning model [9] to provide users tailored advice on how to improve their skill. This can involve advice on how to improve range of motion, correct posture, or change the exercise's tempo and intensity.

This experimental setup's capacity to give consumers real-time feedback is one of its main advantages. The application analyses the video while it is being captured and can immediately offer suggestions [7] and adjustments, enabling users to modify their form and technique as needed. This can result in workouts that are more effective and efficient, as well as a lower chance of strain or injury. This setup's potential for scalability is another benefit. Since the machine learning model can learn and develop over time, it will eventually produce more precise and individualised recommendations.

IV. RESULTS AND DISCUSSION

A. Results

A web application [7] that makes use of machine learning technologies can make it easier to get feedback on or suggestions for bad posture.

The user must first open the web application [7] and upload a video of oneself working out. The submitted video is subsequently examined using NumPy-powered posture analysis[1][5] software.

After that, neural networks created using Keras and TensorFlow are used to process the video in real-time [8] and give the viewer instant feedback on their posture. The usage of Sklearn also makes it easy to create machine learning models that correct posture. These gadgets can assist in correcting poor posture and lowering the risk of exercise-related injuries by giving real-time feedback and recommendations.

The user is given forecasts, recommendations [9], or feedback based on the findings of the posture analysis [1][5]. The user can utilise this knowledge to direct their future training regimens and enhance their overall posture. Individuals can get personalised feedback on their posture and workout methods with the aid of machine learning technology, allowing them to achieve their fitness goals in a secure and efficient manner.

Overall, people trying to enhance their exercise routines and avoid injuries may find it useful to use machine learning [4] technologies to analyse their posture. Individuals can improve their posture and workout methods to get the best outcomes by receiving personalised advice and real-time feedback.

B. Discussion

Poor posture is a prevalent issue in today's society, with many individuals experiencing related health problems such as back pain and headaches. The experimental setup of a web-based platform that uses machine learning models for posture correction [3] provides a promising solution to this growing concern. The model can analyse video input and provide real-time feedback, personalized recommendations [9], and techniques for correcting postural imbalances. One of the significant advantages of using machine learning models for posture correction is the ability to provide personalized feedback. The model can identify specific areas of the body that require correction, offering targeted recommendations [9] that can lead to improved posture habits. Additionally, the platform can be accessed from home or work, making it a convenient tool for short- term and long-term posture correction goals.

Possibilities for large cost savings exist when employing machine learning models for posture correction. Early diagnosis of postural disorders [2] can reduce healthcare costs by preventing long-term health issues. Furthermore, people can avoid expensive treatments like chiropractic or physiotherapy by adopting better postural habits.

There are several restrictions to take into account, even though the development of a web-based platform that corrects posture using machine learning models is a promising approach. For instance, the calibre of the video input could affect how accurate the model is.

Additionally, people without internet access or others who are uncomfortable using technology might not be able to use the platform.

V. CONCLUSION

Poor posture is a growing concern that can lead to numerous health problems. The experimental setup of a web-based platform that uses machine learning models for posture correction provides a promising solution to this issue. The model can provide personalized feedback, real-time recommendations, and techniques for correcting postural imbalances. Additionally, the platform can be accessed from home or work, making it a convenient tool for improving posture habits.

Using machine learning models for posture correction also has the potential for significant cost savings by preventing the emergence of long-term health problems and avoiding costly therapies. While there are some limitations to consider, the experimental setup of a web-based platform that uses machine learning models for posture correction has huge potential for improving posture correction and lowering associated health risks as technology continues to develop.

VI. REFERENCES

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