Idea Crunch
Idea Submission

Problem Statement:

With sporting events such as the Olympics and the Commonwealth increasingly becoming matters of national concern for many countries, there's a lot at stake that comes with upholding a nation's dignity on an international stage. Moreover, platforms such as the Olympics let the best in any sport rub shoulders with each other in the same arena. Thus providing immense scope for underdeveloped countries to make a name for themselves on the global front, encourage more individuals to take up sports and lead to an overall development in sports infrastructure in their nation.

The problem however, arises at the root; the lack of infrastructure for training athletes in the first place. Most underdeveloped nations cannot afford to spend resources on expanding their existing infrastructure. Hence, most talented athletes don't go any further in their careers due to lack of adequate resources and training facilities.

Solution:

This project aims at providing athletic training across multiple sports disciples to those who are in need of the same. Our main focus lies on individual sports where posture is key. This includes track sports like javelin, gymnastics, archery etc. This project proposes to build a software that recognizes postures and stances based on the sport and offers feedback on whether it is correct or needs improvement. The model is to be built in such a way that it dynamically improves with time as it collects data from more samples. Initially the model is trained with pre-chosen images.

The effectiveness of this software can be tested on a regular basis by certified and trained individuals in their respective fields - as to whether the model suggests correct changes in posture. Meanwhile, newer stances to be detected can also keep growing with time to cover a wider array of techniques.

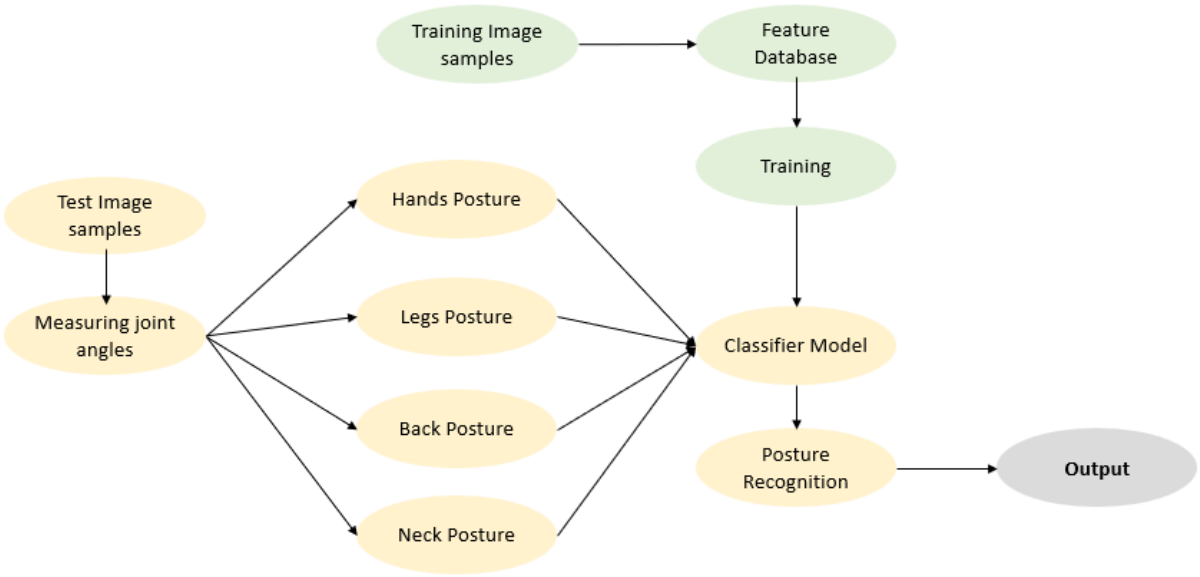
Primarily, machine learning classifiers like SVM, KNN, Naive Bayes and random forest have been used by making use of scikit-learn in python. This is in addition to deep learning models like 1D-CNN, 2D-CNN and LSTM. However, this model proposes the use of a hybrid model comprising both machine learning and deep learning models for enhanced performance. The parameters of these classifiers are set after running multiple simulations and testing their effectiveness. Moreover, we intend to make use of OpenPose, a real-time system capable of detecting key points on the human body.

The advantage of using OpenPose is that it not only detects key points of the body in the 2D space but also does the same in the 3D space. It has the capability to track multi-persons in a frame; however the single-tracking alone speeds up posture detection.

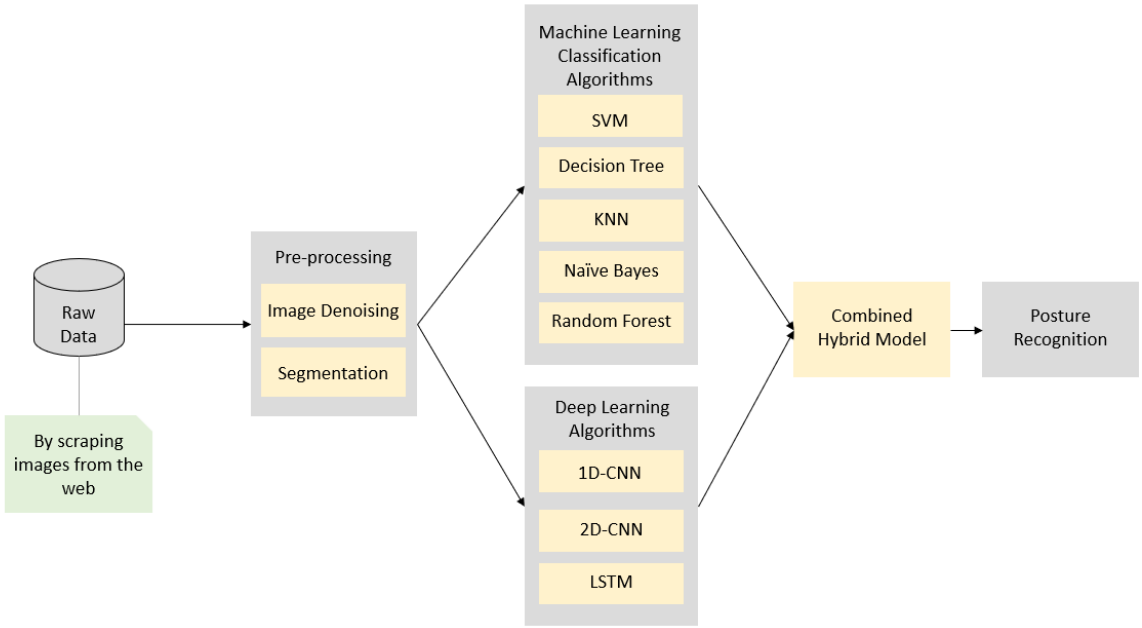
This idea is a novel one solely because of how scalable it is. While this project starts out by aiming to provide assistance in a handful of Olympic sports, it can be extended to a multitude of disciplines and events that go on to help trainers and athletes who are in need of assistance.

Methodology:

Flowchart



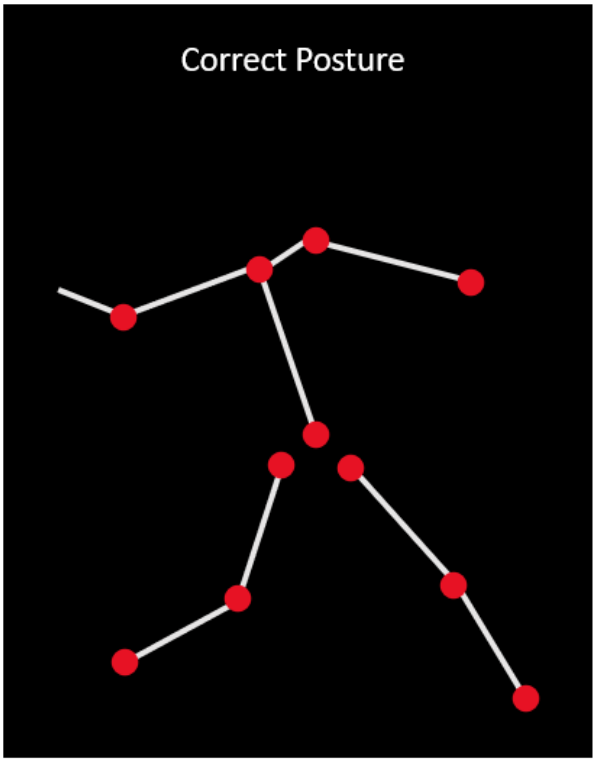
Basic Architecture Diagram

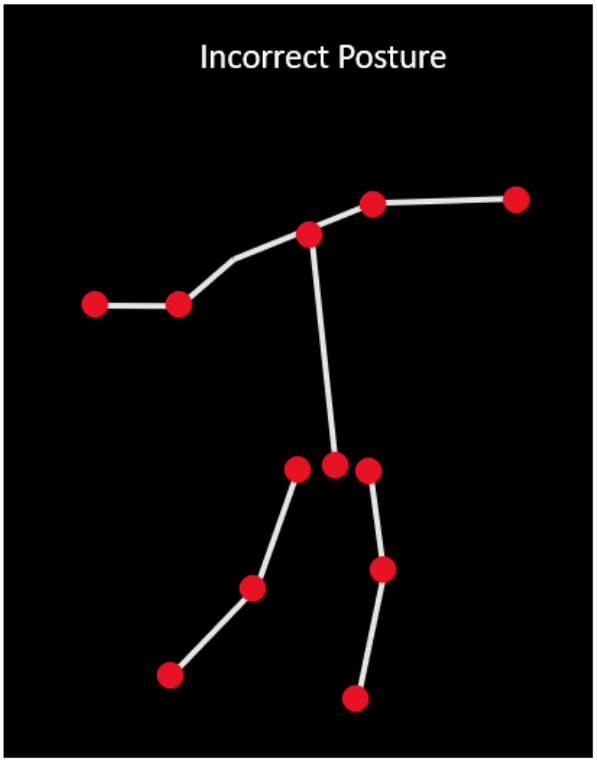


Examples of key points detection in javelin throw (all 135 key points have not been indicated):

Correct Posture:

Incorrect Posture:


Correct Posture


Incorrect Posture

Societal Impact:

We believe that by building software that can ably assist trainees, with an adequately sized dataset of images that lets the model get trained to a good accuracy, athletes across the planet can make use of it to upskill themselves. Though we start off on a small scale, covering only a number of sports for detection, we still believe that with time, a software such as this has the scope to be used in high-end training centers in developed nations for posture correction as well. Though posture correction only counts as the stepping stone towards training, it is a crucial one in athletics as far as form is concerned; which is why we emphasize the use of this software in nations with below par facilities to train budding athletes from a young age where they can gauge these techniques with relative ease. This goes on to inspire an entire generation of young sportspersons to continue with their passion on a global scale.

Scope for Future Innovation:

The expansion of use for this software is practically limitless for the number of sports there are out there. So naturally, with time, as we have a larger reserve of reference images across postures, stances and sports, the more domains we can cover, and the more communities can be benefited from the same.

On the business front, we foresee that larger training institutes could make use of this posture detection software to make their overall training process simpler by automating these initial nuances of training, hence lifting off some weight off the shoulders of trainers. Hence, this software could be outsourced to multiple such institutes.
