Abstract

While the onset of the pandemic scenario had moved the world on a precarious perch, technology has by far proved itself to be highly effective to ensure the betterment of humankind by providing cutting-edge solutions in every possible field. Now, more than ever before, it is vital to look after both physical and psychological health. Although many of the doctor's consultations have moved to virtual platforms, there do exist many more possibilities which can enhancing better ways for some forms of virtual treatments such as physiotherapy rehabilitation. One of the emerging technological areas of deep learning have been observed to assist significantly while on a lookout for solutions to such problems relating to image classification, human pose estimation etc.

Despite the ongoing work of many big technology giants on human pose estimation, there is a just a single well-known research published back in 2020 to utilise deep learning for action quality assessment of physiotherapy rehabilitation exercises. This dissertation has made an attempt to gain particular knowledge for advancing that research in a way to establish a possible pipeline for action quality assessment on camera-captured videos. This research is split majorly into 2 phases, namely, pose estimation (for test data preparation) and model training (for preparing the model to take test data as input).

For the same, a review of the previous work done in the field of physiotherapy, human pose estimation, deep learning is made and a framework for preparing test data by 2D pose extraction to 3D pose estimation of smartphone captured video datasets has been established by using HRNET with COCO dataset and VideoPose3D inference using Detectron library. The mapping of the obtained coordinates to 3D joints is then examined wherein it is observed that the final test data preparation can only be accomplished with licensed access to Human3.6M to utilise the actual inferences of VideoPose3D with Human3.6M. On the other hand, the recent work on action quality assessment with 2D markers has been preestablished with their existing UIPRMD dataset of squats for understanding and then enhancements to the work have been made from scratch to ensure that it takes into account the 3D joint positions for action quality assessment. The obtained results have shown that the model can take 3D joint positions as an input while providing near-to-similar results as for the one with 2D markers.

Note: The reader of the research document is requested to view the document in Acrobat Reader to have an insight to the animated gif files which are added in the last chapters.