What pose estimation methods are most effective for analysing cricket shots?

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1) Background

Human pose estimation(HPE) is the process of mapping key points onto an image to represent the joints of a person.

The key points from HPE can be used in order to help athletes in training and providing feedback on their technique. Other papers often focus on classification of cricket shots and these can be improved using pose estimation.

Other studies use pose Estimation in cricket or Similar fields but Do not consider which Method is best for their purposes.

2) research question:

- **What** pose estimation methods are most effective for analysing cricket shots?

Sub Questions
- **What** existing frameworks or studies have explored pose estimation in similar domains
- **What** are the trade-offs between different pose estimations
- **How** well do different pose estimation techniques handle real-world challenges

3.1) Methodology

Pose estimation frameworks:
-**Mediapipe** - used in cricket classification literature (google)
-**Openpose** - one of the most popular for sports
-**HRNet** - one of the best performing in surveys for general use
Pose estimation datasets:
Existing datasets like Crowdpose, OCHuman and COCO do not contain (much) cricket data. We propose a hand annotated set for cricket pose estimation.

3.2) Methodology

Real world challenges:
The impact of occlusion will be tested since the padded clothing and contorted poses of cricket players cause this to be relevant.
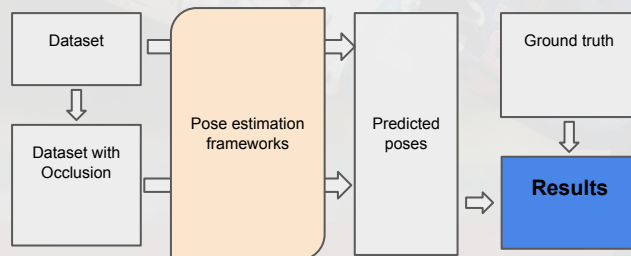
The dataset consists of 191 images that have been hand annotated. Using the ground truth one random joint in every image is occluded in order to create the occluded dataset.[2]

The results are evaluated based on the Object keypoint similarity (OKS). Which is a measure of similarity between 2 keypoint skeletons.[3] The time needed to perform HPE for all of the 191 images is also measured

4) Results:

Results of HPE on regular dataset

Framework	Runtime (s)	Average OKS
MediaPipe	31.4	0.50
HRNet	420.9	**0.65**
OpenPose	**15.8**	0.64

Results of HPE on occluded dataset

Framework	Runtime (s)	Average OKS
MediaPipe	29.1	0.25
HRNet	393.6	**0.55**
OpenPose	**16.0**	0.51

5) Conclusion

HRNet
performs best in both regular and occluded also losing the least amount of precision from occlusion in the dataset.
Openpose
Is fastest from the tested models while still having a decent amount of precision for both the regular and occluded sets.
Mediapipe
Loses a lot of performance but part of that is because for certain images it did not return any result at all. Perhaps because the occlusion made it too difficult.

6) Future work

- Create larger dataset for Cricket pose estimation as well as testing more HPE frameworks and challenges faced by them.
- Apply proposed methods in further applications and research like cricket shot classification.
- The uncommon poses that cricket players take and protective equipment seems to cause issues for HPE

References and other data

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[2]Han, A., Song, C., Wang, S., Wang, H., Chen, E., & Wang, G. (2025). Occluded human pose estimation based on limb joint augmentation. Neural Computing and Applications, 37(3), 1241–1253.
[3]https://doi.org/10.1007/s00521-024-10676-3
Gu, K., Chen, R., & Yao, A. (2023). On the Calibration of Human Pose Estimation (No. arXiv:2311.17105). arXiv. https://doi.org/10.48550/arXiv.2311.17105
Code and dataset available at:
https://github.com/DanielPlevier/Cricket_pose_estimation