

CSE541 Computer Vision

Weekly Report 1

**Landing Error Scoring System for Basketball: A Computer Vision Approach**

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### **Aim:**

Understanding the Problem Statement and Literature Review

### **Introduction:**

The paper uses a video dataset of Division I female basketball athletes. This includes 50 countermovement jump videos (recorded from frontal and lateral planes) that they performed. The task is to develop a framework that takes the videos as input, attains 2D/3D coordinates of lower-limb joints using a pose estimation algorithm, computes kinetic-kinematic angles and distances, and extracts the keyframe. Furthermore, a landing error score (LESS) and real-time (RT-LESS) score is to be generated for each video. The videos are then manually annotated (with LESS errors and overall LESS and RT-LESS scores), and a model is to be trained to predict LESS and RT-LESS scores on new videos. Eventually, we need to develop a dashboard driven by videos featuring annotations for angles, distances, and LESS/RT-LESS scores and enhance its capabilities with Explainable Artificial Intelligence (XAI) to pinpoint and streamline critical errors within the LESS parameter set.

### **Work Completed:**

* We gained a comprehensive understanding of the terminology employed in the provided research paper (various pose error techniques as well as the biological terms).
* We gained a basic understanding of the pose detection algorithms like Mediapipe and Openpose. It helped us to provide valuable insights how they would capture dynamic poses for subsequent analysis.

### **Next steps and goals:**

* To compare Mediapipe and Openpose (both present in the literature) to find a suitable algorithm for pose estimation on the given dataset.

### **Conclusion:**

Our initial focus was to understand the problem statement and review relevant literature. Having gained a foundation understanding of the prominent pose detection algorithms Mediapipe and Openpose, we aim to expand our horizon by finding any other relevant algorithms (if any) and comparing them to identify the most suitable algorithm for effective pose estimation within the specified dataset.

### **References:**

1. Sharma, S., Divakaran, S., Kaya, T., Taber, C., & Raval, M. S. (2023, October). A Framework for Biomechanical Analysis of Jump Landings for Injury Risk Assessment. In 2023 IEEE 28th Pacific Rim International Symposium on Dependable Computing (PRDC) (pp. 327-331). IEEE. <https://ieeexplore.ieee.org/abstract/document/10356423/?casa_token=yM-1J2vMKG8AAAAA:QnMMyph1mKa6BfvljAqSSABrReChb5hvsEvxFUEv3z5Fiiv1daHpTdbG2oXllJYQ-WQPUijJ6wZr>
2. Hébert-Losier K, Hanzlíková I, Zheng C, Streeter L, Mayo M. The ‘DEEP’ Landing Error Scoring System. Applied Sciences. 2020; 10(3):892. <https://doi.org/10.3390/app10030892>
3. K Padua, D. A., Marshall, S. W., Boling, M. C., Thigpen, C. A., Garrett Jr, W. E., & Beutler, A. I. (2009). The Landing Error Scoring System (LESS) is a valid and reliable clinical assessment tool of jump-landing biomechanics: the JUMP-ACL study. The American journal of sports medicine, 37(10), 1996-2002.
4. DSchwartz, O., Talmy, T., Olsen, C.H. and Dudkiewicz, I., 2020. The Landing Error Scoring System Real-Time test as a predictive tool for knee injuries: A historical cohort study. Clinical Biomechanics, 73, pp.115-121.