University of Peradeniya

Machine Learning Based Human Motion Trajectory Estimation and Re-Identification

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This project presents a novel method for human re-identification using face, gait, and clothing attributes. A machine learning based model is trained to re-identify individuals across different camera views, demonstrating robustness and effectiveness on the CCVID dataset. The approach shows promise for real-world applications such as surveillance, law enforcement and healthcare.

Introduction

- Human Re-Identification can be defined as matching people across disjoint camera views.
- It is a challenging task due to many issues such as pose variations, illumination and occlusion.
- To make the identification system more robust, gait features, facial features and clothing attributes are integrated in a single re-identification architecture.

Approaches

- A new dataset created considering pose variations, illumination and occlusion.
- Yolo v7 & Mediapipe for skeleton detection
- Deeplab v3 for extract the human silhouettes.
- Three CNN models to extract gait, face and clothing features.

Methodology
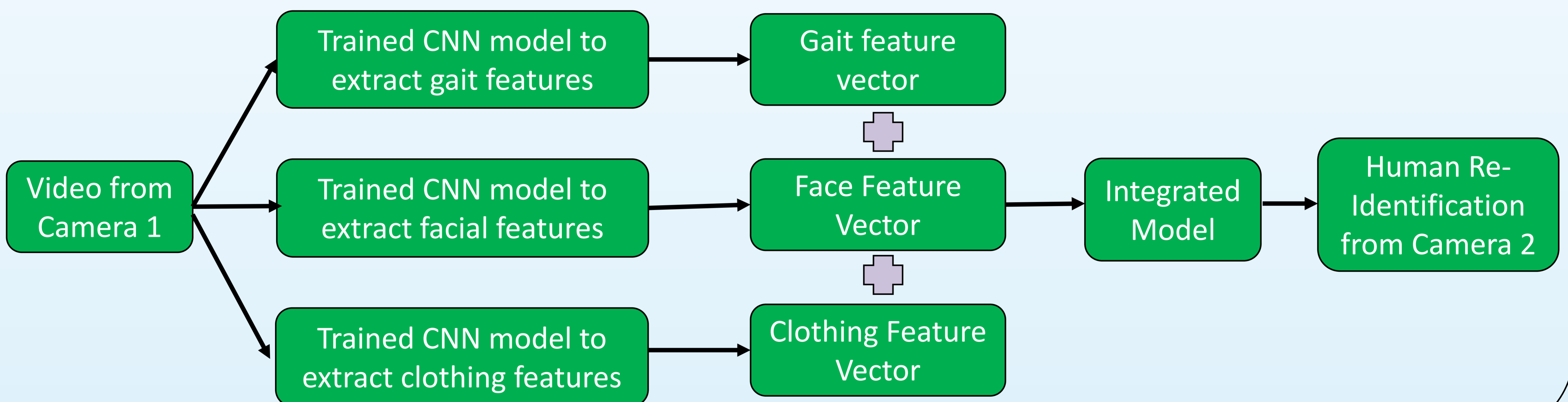
Key Features and Results

- Person trajectory detection
- Person re-identification for different walking angles (Front view, side view, back view and angle view)
- Person re-identification for both low resolution and high resolution data
- Average accuracy obtained for pose and gait based model is 78% and for face model is 75%.
- Average accuracy increased to 83% after combination.
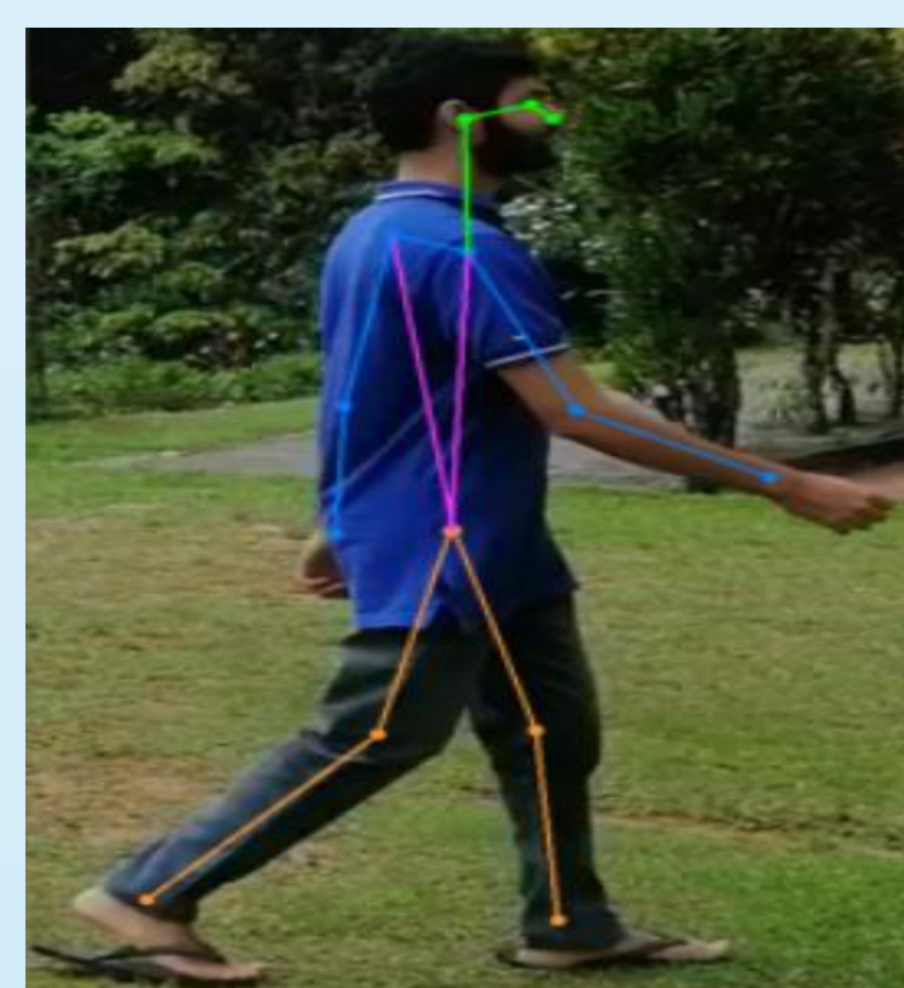
Skeleton Detection for high & low resolution data
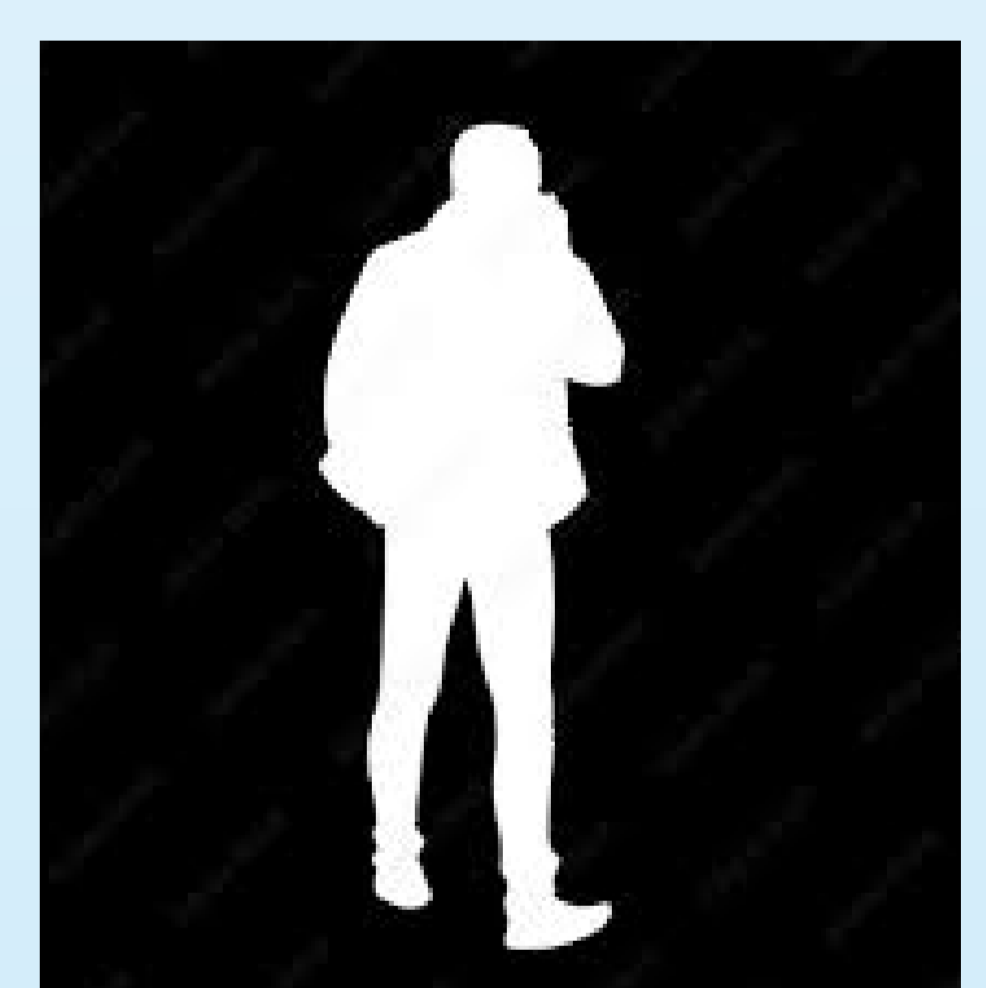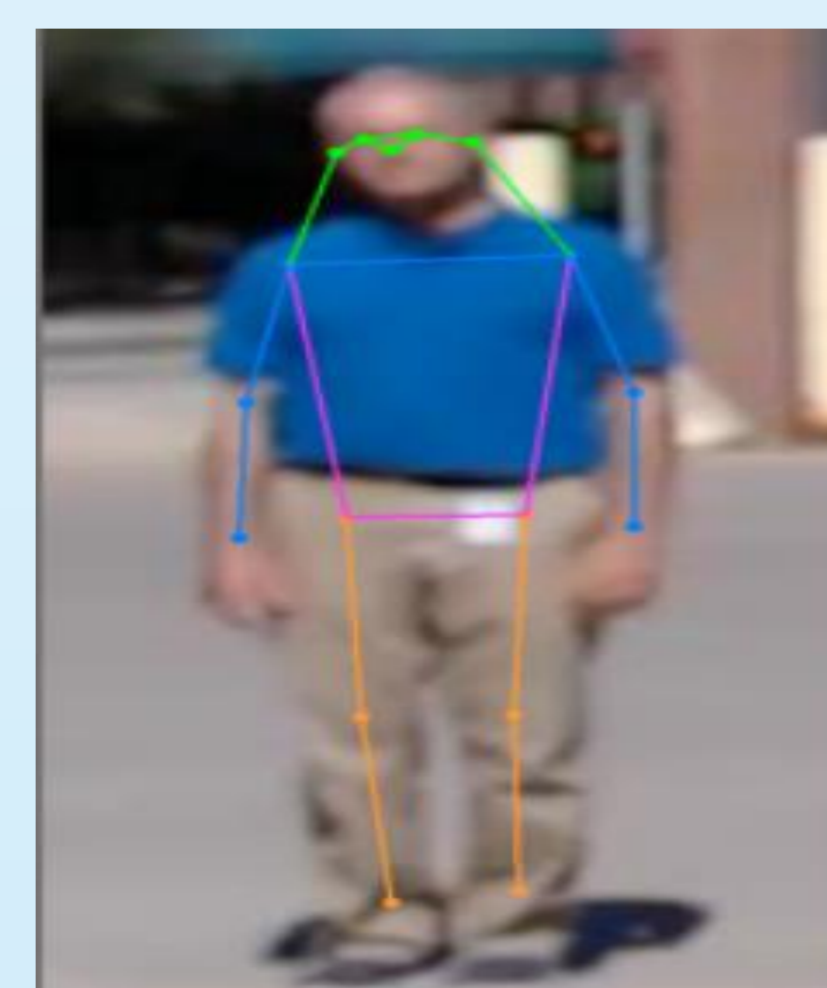
Person Silhouette

Conclusion

- Facial features, gait patterns and clothing attributes have been extracted using individual models.
- Moreover, gait patterns have been extracted using both silhouettes and skeleton landmarks.
- The re-identification performance of each individual models was evaluated using the CCVID dataset.
- In order to further improve the re-identification accuracy, all three individual models were integrated using a newly implemented Siamese model.
- Performance of the overall model have been evaluated for different illumination conditions, occlusion, resolution conditions and pose variations.

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