

Problem Statement:

Your task is to create a small test dataset for infant/toddler action recognition using cutting-edge pose detection algorithms and assess its performance with a pre-trained skeleton-based action recognition model like ST-GCN. No model training is required.

Requirements:

- **Data Collection:** Download 12 brief video clips from online sources, each representing an action performed by infants or toddlers. Choose three action classes from a set including sitting, sleeping, rolling over, and standing, ensuring four clips per action. All clips should isolate a single action and have clear segmentation.
- **Pose Detection:** Utilize state-of-the-art pose detection algorithms such as OpenPose to extract accurate 2D or 3D poses from each video clip. Ensure proper formatting of the pose data, capturing essential body keypoints and movements of the subjects.
- **Pose Data Visualization:** Develop a visualization tool to overlay the extracted pose data onto the video frames. This tool serves to validate the accuracy and limitations of the pretrained pose detection algorithms and aids in understanding infant/toddler movements, highlighting challenges faced by current state-of-the-art pose detection models.
- **Action Recognition Model:** Choose a skeleton-based action recognition model, like ST-GCN (or any other skeleton based method), and format the pose data to be fed into the model. No model training is required; utilize a pre-trained version of the selected model and test the model to evaluate and predict the label.
- **Testing:** Input the prepared pose data into the selected action recognition model and generate predictions. Report the confidence scores and predicted classes for each video clip. Also, specify the dataset on which the model has been pre-trained.
- **Challenges:** Discuss the obstacles encountered in accurately detecting and recognizing infant/toddler actions solely based on pose data without model training. Investigate potential limitations of pose detection algorithms, such as occlusion and variability in infant/toddler behavior. Suggest strategies to mitigate these challenges and enhance the performance of the action recognition model.

Evaluation Criteria:

- **Data Quality:** Ensure the downloaded video clips are well-segmented and provide clear footage of the actions to be recognized.
- **Pose Data Visualization Quality:** Implement a visualization tool that effectively presents the extracted pose data overlaid on the video frames, accurately depicting the detected poses.
- **Model Compatibility:** Prepare the pose data in a format suitable for the selected action recognition model.
- **Recognition Performance:** Report the confidence scores and predicted classes obtained from the action recognition model for each video clip, specifying the model's pre-trained dataset.

- **Challenges Discussion:** Offer a thorough discussion of the challenges faced in accurately detecting and recognizing infant/toddler actions based on pose data without model training. Propose strategies to address these challenges and improve model performance.
- **Documentation:** Provide clear documentation in .txt format via Overleaf, detailing the dataset preparation steps, pose detection algorithms used, visualization tool implementation, challenges encountered, and proposed solutions.