Title: Real-time Fall Detection System using Movenet Algorithm and ML Model

Introduction:
The Real-time Fall Detection System is designed to monitor a live webcam feed and accurately detect falls using the Movenet algorithm for pose estimation. The system aims to promptly notify a kin or healthcare assistant when a fall is detected, enabling immediate assistance. This tech stack proposal outlines the various components and technologies involved in building and deploying the fall detection system.

Tech Stack:

- Programming Language: Python

Python is a versatile language commonly used in machine learning and computer vision projects. Its rich ecosystem of libraries and frameworks makes it well-suited for implementing the fall detection system.

- Webcam Interface: OpenCV

OpenCV is a popular computer vision library that provides functions for accessing and processing video streams from webcams. It enables the system to capture a live feed from the webcam.

- Pose Estimation Algorithm: Movenet

Movenet is an advanced real-time pose estimation model developed by Google. Leveraging deep learning techniques, Movenet accurately estimates human poses from video frames, making it an ideal choice for detecting falls. A convolutional neural network model that runs on RGB images and predicts human joint locations of people in the image frame. The multi pose model is able to detect multiple people in the image frame at the same time while still achieving real-time speed. The model was designed to be run in the browser using TensorFlow.js or on devices using TensorFlow Lite, targeting movement/fitness activities. The released variant “Lightning” can run at >30FPS on most modern laptops and detects up to 6 people simultaneously while achieving good performance. Tuned to be robust on detecting fitness/fast movement with motion blur poses. Most suitable for detecting the pose of multiple people who are 3ft ~ 6ft away from a device’s webcam that captures the video stream. Detect up to 6 people and their poses in the image frame. The model predicts 17 human key points of the full body even when they are occluded. For key points that are outside of the image frame, the model will emit low confidence scores. A confidence threshold can be used to filter out unconfident predictions. The model is robust to the input video streams that are captured through common devices’ webcams. The model is trained on images with various lighting, noise, motion conditions and with diverse augmentations.

- Machine Learning Framework: TensorFlow or PyTorch

TensorFlow is a powerful deep learning frameworks widely used for developing and training machine learning models.

- Fall Detection Model:

The fall detection model is responsible for classifying fall and non-fall poses. It can be built using Machine Learning techniques. Training the fall detection model may require a powerful machine or cloud-based GPU instances, as deep learning models benefit from GPU acceleration.

- Model Deployment:

We can build a custom deployment pipeline using web frameworks FastAPI. These frameworks allow you to expose an API endpoint that accepts video frames and returns fall detection results.

- Alerting System:

SMS/Text Message: Integrate an alerting system to notify a kin or healthcare assistant when a fall is detected. Use an SMS gateway service like Twilio to send text notifications.

- Cloud Services:

AWS. Consider leveraging cloud platforms for scalability, reliability, and additional services. Platforms like AWS offer object storage, and deployment options that can enhance the performance and availability of the fall detection system.

- Version Control:

Git
Utilize a version control system like Git to manage the project's codebase, track changes, and facilitate collaboration with other team members or contributors.