1. Project Name

Anomaly Pose Detection for Subways And Streets

2. Overview

The "Anomaly Pose Detection for Subways and Streets" project aims to develop an advanced computer vision system that can detect abnormal human poses in subway stations and on streets. This system will enhance urban safety by identifying potential threats or unusual activities, enabling prompt responses from security personnel.

3. Background

Urban areas, especially subways and streets, are often susceptible to safety and security challenges, including theft, vandalism, and personal attacks. Traditional surveillance systems primarily rely on human monitoring, which is labor-intensive and prone to errors. The advancement in machine learning and computer vision technologies offers an opportunity to automate and enhance the monitoring process. Anomaly pose detection can identify irregular human poses or activities that may indicate distress or suspicious behavior, thereby improving response times and overall urban safety.

4. Key Objectives / Business Objectives

a. Research Questions

- How can computer vision be utilized to effectively identify and classify abnormal human poses in real-time?
- What are the most common indicators of anomalous behavior in subway stations and streets?
- How can the detection system be integrated with existing surveillance infrastructure for seamless operation?

b. Key Steps

- Conduct a comprehensive literature review on current anomaly detection and pose estimation techniques.
- Collect and annotate a dataset of human poses in subway and street environments.
- Develop and train a machine learning model to detect anomalous poses.
- Evaluate the model's performance and refine it for accuracy.
- Integrate the model with a real-time surveillance system and test in a pilot environment.
- Develop a user interface for security personnel to receive alerts and monitor detected anomalies.

5. Methods and Workflow

a. Datasets

- **Source:**

- **UCSD Anomaly Detection Dataset:** Pedestrian traffic data provided by the University of California.
- **Avenue Dataset:** Anomaly detection dataset provided by Hong Kong Polytechnic University.
- **CUHK Avenue Dataset:** Street data provided by the Chinese University.
- **Content:** Images and videos capturing various human poses and activities, both normal and abnormal.
- **Annotation:** Detailed labeling of poses, categorizing them as normal or anomalous.

b. Data Cleaning/Preprocessing

- **Data Cleaning:** Remove noise, irrelevant frames, and low-quality images.
- **Preprocessing:** Normalize images, apply augmentation techniques (e.g., rotation, scaling), and segment relevant regions (e.g., human figures).
- **Annotation Tools:** Use tools like LabelImg for manual annotation and validation.

c. Modelling

- **Model Selection:** Evaluate different models such as OpenPose, AlphaPose, and DeepPose for pose estimation.Create some models with CNN,transfer learning.
- **Training:** Train models using the annotated dataset, leveraging transfer learning where applicable.
- **Evaluation:** Use metrics like precision, recall, F1-score, and ROC-AUC to assess model performance.
- **Optimization:** Fine-tune hyperparameters and employ techniques like cross-validation to enhance model accuracy.

d. Deliverables

- **Dataset:** A comprehensive, annotated dataset of human poses in subway and street environments.
- **Anomaly Detection Model:** A trained and validated machine learning model capable of detecting anomalous poses in real-time.
- **Integration:** A fully integrated system with existing surveillance infrastructure, including a user-friendly interface for security personnel.
- **Documentation:** Detailed project documentation, including methodology, code, and user manuals.