**WATCHDOG.AI - Case Study**

**Problem Statement and Objectives**

Manual CCTV monitoring is error-prone and slow, leading to delayed response to violent incidents. The objective is to automate violence detection in surveillance footage using deep learning, allowing real-time alerts and reducing human dependency for improved security in public and private spaces.

**Data Preprocessing**

* Video streams are captured in real time and split into 5-second clips.
* Each clip is processed to extract 16 evenly spaced frames, resized to 224x224 pixels.
* Frames are normalized (ImageNet statistics) to standardize input for the neural network.
* Data augmentation and optimization techniques like early stopping and learning rate reduction are applied during training to prevent overfitting.

**Model Selection and Development**

* The violence detection model is based on a Temporal Relation Network (TRN) with a ResNet50 backbone, doing analysis of temporal dynamics in video sequences.
* The model is converted to TensorFlow Lite for efficient inference on live video feeds.
* The system uses multithreading to process video clips and analyse them for violent activity in parallel with ongoing recording.

**Visualizations and Insights**

* The GUI displays a live video feed with overlays that turn red and display an alert message when violence is detected above the set confidence threshold.
* An “Alerts” tab lists all detected violent incidents, including timestamp, confidence score, and video preview.
* Exportable reports and video previews facilitate investigation and review.

**Recommendations**

* Deploy the system in environments requiring real-time security (e.g., public venues, workplaces, schools).
* Integrate with messaging services (e.g., WhatsApp) for immediate notification of security personnel.
* Regularly update and retrain the model with new data to maintain high accuracy in diverse environments.