Sentiment Analysis Over Visual Data

INTRODUCTION: -

Sentiment Analysis is the most common classification tool that analyses an incoming message and tells whether the underlying sentiment is positive, negative, or neutral. Before we start discussing popular techniques used in sentiment analysis, it is very important to understand what sentiment is. Sentiment analysis is a series of methods, techniques, and tools about detecting and extracting subjective information, such as opinion and attitudes, from language.

OBJECTIVE: -

Our project tries to explore video analytics to understand the customer sentiments, understand the patterns / behaviors/ actions in certain branches for proactive surveillance and provide better services to customers.

Problems that needs to be solved:

Constantly scanning multiple video footage for:

1. Sentiments of customers
2. Tampering with the cameras / sensitive or high priority area within premises.
3. Count of People
4. Any activity that needs attention
5. Time taken for activity on premises
6. Identification of known facilitators
7. Feedback mechanism for false positives / incorrect classification for enhancement in model

Solutions approaches for the above problems:

1. **Sentiment analysis**: - Real-time sentiment analysis on video streams involves classifying a customer's emotional expressions over time based on visual and/or audio information in the data stream. Sentiment can be analyzed using various modalities such as speech, mouth motion, and facial expression. This project might propose a deep learning approach based on multiple modalities in which extracted features of an audio-visual data stream are fused in real time for sentiment classification. The proposed system may comprise small deep neural network models that analyze visual features and audio features concurrently.

2. **Camera tampering detection: -** Camera Tampering means any external interference with the camera, causing damage to it or making unauthorized alterations. It may indicate that criminal activity is occurring or is about to occur.

   Example or problems of camera tempering:-

   1. Turning the camera to point in a different direction so that the activities cannot be recorded.
   2. Covering the lens of the camera by opaque objects(Also known as Camera Occlusion).
   3. Screen shaking, fogging, screen flickering, defocus, etc.

   How this works:-

   Tamper detection allows your camera to alert you when its ability to record has been impacted. Especially helpful for locations where the camera may be physically attacked or blocked.

   Tamper detection can also be set to send alerts based on the duration of the disruption, so a stray leaf caught on the camera for a few seconds won't trigger anything but spray painting the camera will trigger an alert.

We will be using Computer Vision to solve our problem. Differences between the older frames and recent frames will be monitored and based on it, the decision of tampering or not will be taken.

Implementation using opencv and numpy:

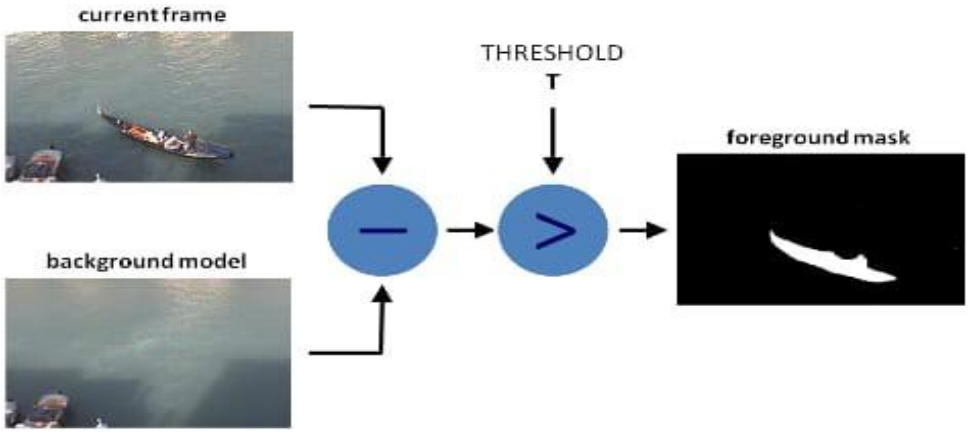
Step 1:Importing necessary libraries(NumPy and OpenCV).

Step 2: Camera is opened and video capturing starts. Here 0 specifies the use of the built-in webcam while 1 specifies the use of an external webcam. One by one the frames of the camera are read.

Background Subtraction is a technique used for generating a foreground mask. It is a two-step process: **Background Initialisation and Updation**.

1. *Background Initialisation*: In the Background Initialisation process, an initial model is computed.
2. *Background Updation:* In Background Updation, the model is updated to keep new changes in the frame.

Step 3: We are now ready to loop over frames and begin the detection process



At last we are going with erosion and dilation.Erosion is a process of eroding the boundaries of the foreground object. As the kernel slides over the image, depending on the values of pixels (0 or 1), the value is eroded while Dilation is a process of increasing the size of the foreground image thus increasing the white region.When a hand or any object is brought nearer to the camera, the distance decreases and after a particular set threshold value, a message is displayed **"TAMPERING DETECTED"**.

3. **Count of people: -** People counters are electronic devices that count the number of individuals passing through a defined space. The technology used varies from simple solutions using light beams, to more complex dedicated sensors that employ stereo cameras or time of flight sensors. KiwiVision™ People Counter within Security Center Omnicast provides occupancy levels as well as information on the number of people entering and leaving your facilities.

4. **Suspicious activities: -** Creating a model based on Machine Learning algorithms having datasets of normal activities, such as walking, talking, reading, and sitting. Feed the datasets of suspicious activities like fighting, boxing, pointing a gun, or any other violent movement deemed suspicious, into the ML model.

5. **Time complexity: -** After the project is completed, we can calculate the time complexity of the project. We are giving assurance that our software will take less time.

6. **Known facilitators identification: -** Using Basic understanding of Image Classification, Python and Deep Learning, we can recognize known facilitators easily. Here we use face embeddings in which every face is converted into a vector. The technique of converting the face into a vector is called deep metric learning.

7. **False-positive classification: -** Trajectory-based method segments scenes into different objects while the objects are tracked throughout the video sequence. The tracked object forms a trajectory which defines the behavior of the object. String kernels clustering , single-class SVM, spatio-temporal path search, zone-based analysis, semantic tracking and

deep learning-based approach have been used in evaluating abnormality in trajectory-based methods.

TEAM: -

Team Leader: Sandip Ash

Team Member: Sudip Kabiraj

Team Member: Avijit Dey

Team Member: Barsha Ghosh