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VigilEye

CSGY 6513 Big Data Project Presentation

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Introduction

Objective

- Design and implement a scalable anomaly detection system for real-time processing of surveillance camera feeds.
- Utilize big data technologies, such as Apache Spark and Kafka, to train the system on the extensive UCF-Crime dataset.
- Provide actionable insights to law enforcement agencies for proactive intervention and improved public safety in urban areas.

Challenges

- Video data is generated in a continuous manner and the size of data is usually extremely large.
- The main challenge is to design an efficient data processing pipeline which can capture live video stream and feed the model with real time data so that it can give almost real time updates.

Why Big Data?

Dataset

- UCF Crime Dataset: 140 hours of data across 14 different anomalies
- Added a new class: Protests - 100+ videos
- Total 100+ GB of data
- Convert to around 50000+ images

Technologies

- The code utilizes Apache Spark to parallelize and efficiently count every 10th frame from video files across 15 different categories, showcasing Spark's capability to handle data-intensive tasks.

  Total number of frames counted for each category are collected and displayed, summarizing large-scale data processing operations.

- Apache Kafka is used for creating a pipeline of live stream videos, and converting them to image frames

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About the Data

15 Classes

Abuse, Arrest, Arson, Assault, Burglary, Explosion, Fighting, Normals, Protest, Road Accidents, Robbery, Shooting, Shoplifting, Stealing, Vandalism

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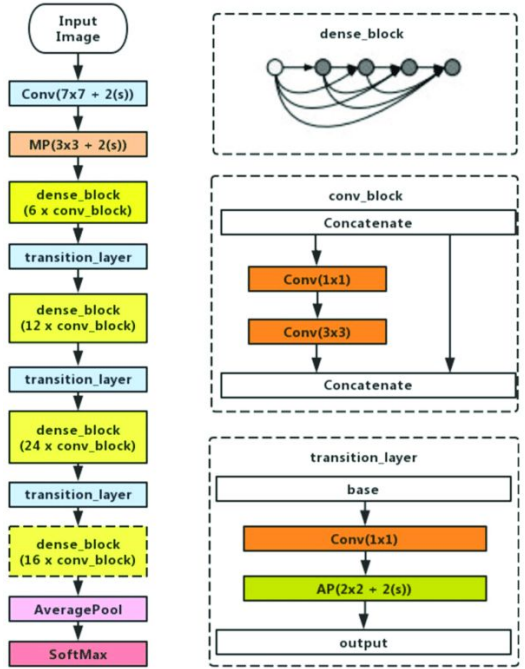
Preprocessing and Feature Extraction

- Preprocessing techniques were applied to make the data suitable for the analysis.. Continuously every 10th frame extracted from cctv videos is being sent to the model for inference.
- For training, video to frames on large dataset, image rescaling etc was performed before model training
- Features were extracted from the images to represent relevant information using Apache Spark.

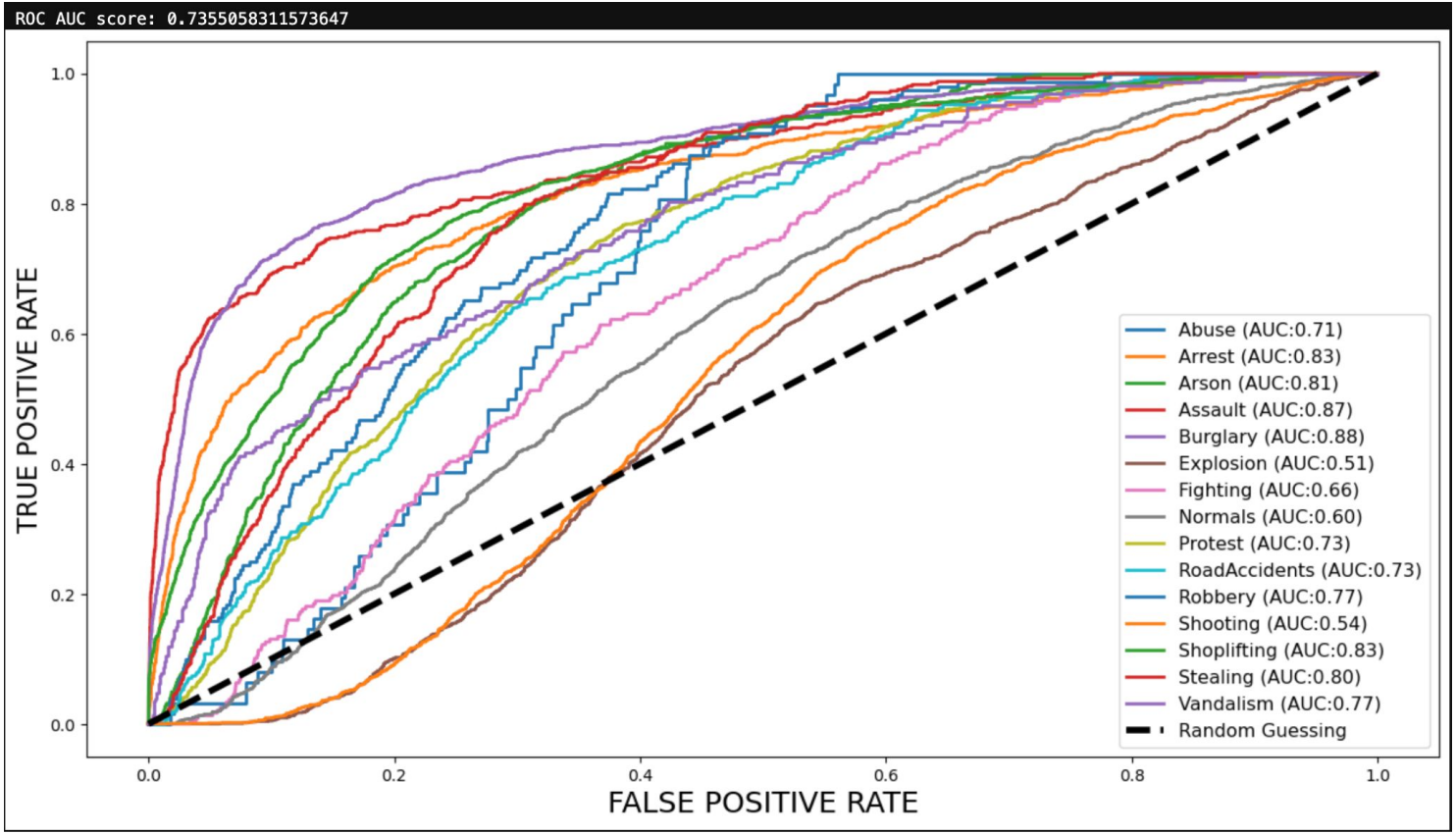
Model Integration

- A DenseNet121 architecture was used to do multiclass prediction for the 15 different labels.
- The model was adjusted to suit the specific requirements of the task of predicting violent activities from the image data.



Prediction and Evaluation

- The model predicts labels for the image data, identifying violent activities or other specified events
- Plotted the AUROC curve to evaluate model performance


ROC AUC score: 0.7355058311573647
TRUE POSITIVE RATE
FALSE POSITIVE RATE
0.0
0.2
0.4
0.6
0.8
1.0
Abuse (AUC:0.71)
Arrest (AUC:0.83)
Arson (AUC:0.81)
Assault (AUC:0.87)
Burglary (AUC:0.88)
Explosion (AUC:0.51)
Fighting (AUC:0.66)
Normals (AUC:0.60)
Protest (AUC:0.73)
RoadAccidents (AUC:0.73)
Robbery (AUC:0.77)
Shooting (AUC:0.54)
Shoplifting (AUC:0.83)
Stealing (AUC:0.80)
Vandalism (AUC:0.77)
Random Guessing

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Real-time Streaming Setup

- Apache Kafka was implemented to facilitate real time streaming data coming from “Bryant Park Live Stream” video on YouTube.
- Producers were configured to process video streams into individual frames.
- Consumers were set up to receive the image data and apply the trained model for real-time prediction.

Monitoring

- The pipeline continuously monitors the video stream and predict labels and checks for violent activities in real-time.
- The live webcam footages are collected from many producer

Future Work

- Improving the accuracy of the model by testing it on generalized and real world data.
- Creating a front-end system and an alert system to create a comprehensive user experience so that nearby officer are alerted and provided the clip of crime detected so that prompt action is taken.
- Predict which areas have high criminal activities and predict from real world crime alerts, what time the patrolling should be performed.

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