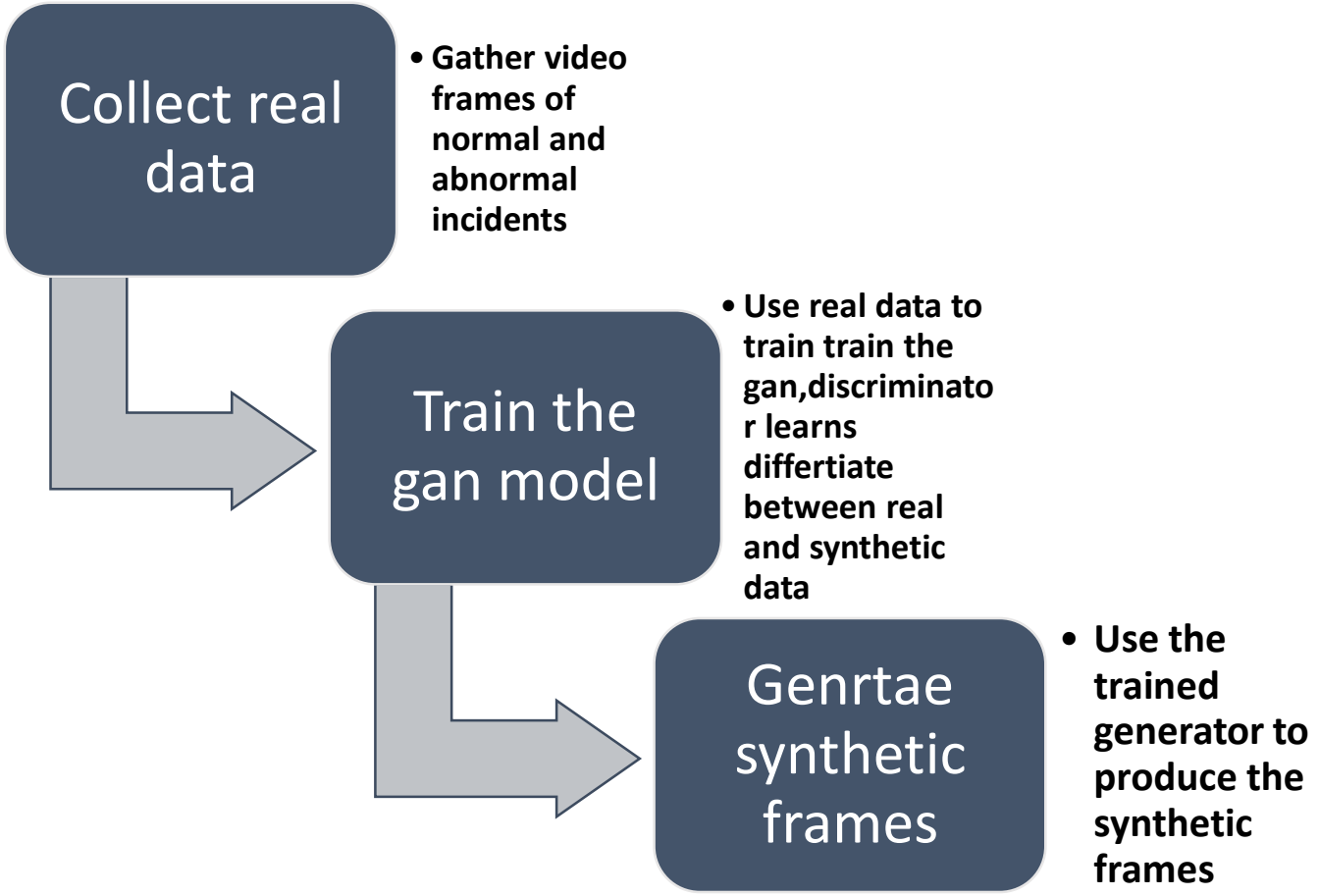
Contd.

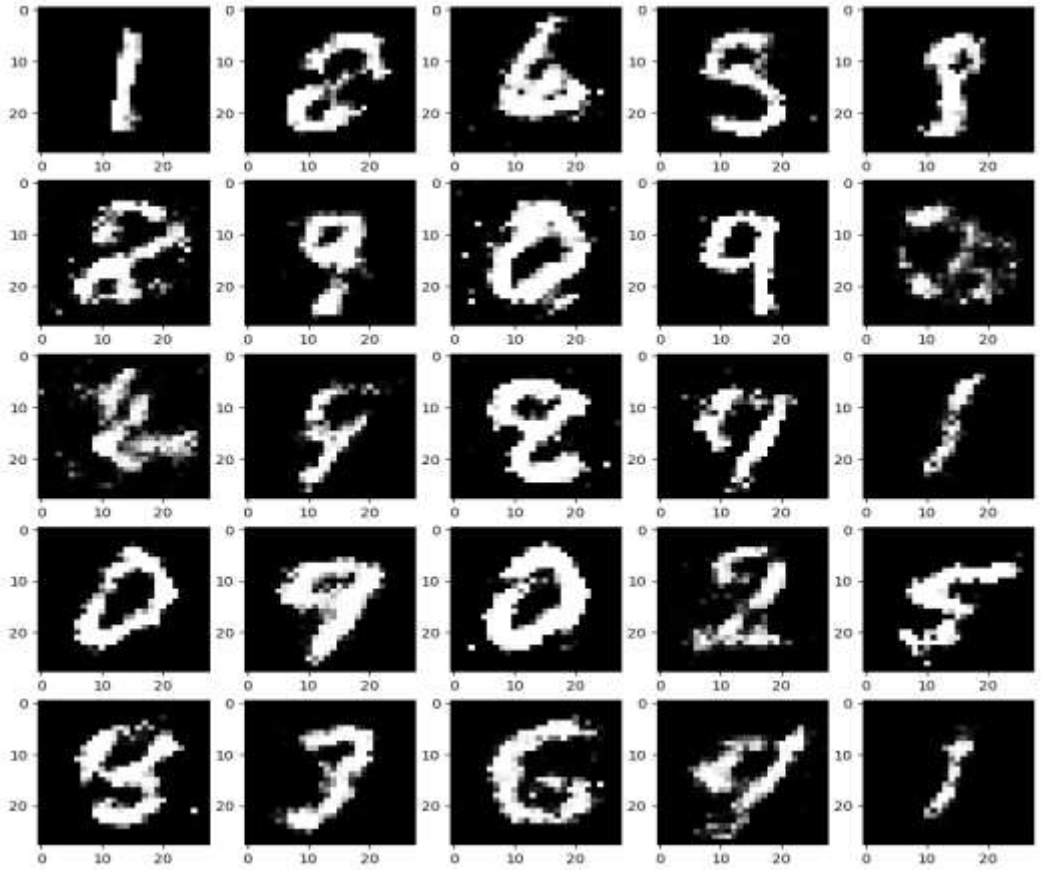

Collect real data
• Gather video frames of normal and abnormal incidents
Train the gan model
• Use real data to train train the gan,discriminator learns differtiate between real and synthetic data
Genrtae synthetic frames
• Use the trained generator to produce the synthetic frames

Contd.

Real image

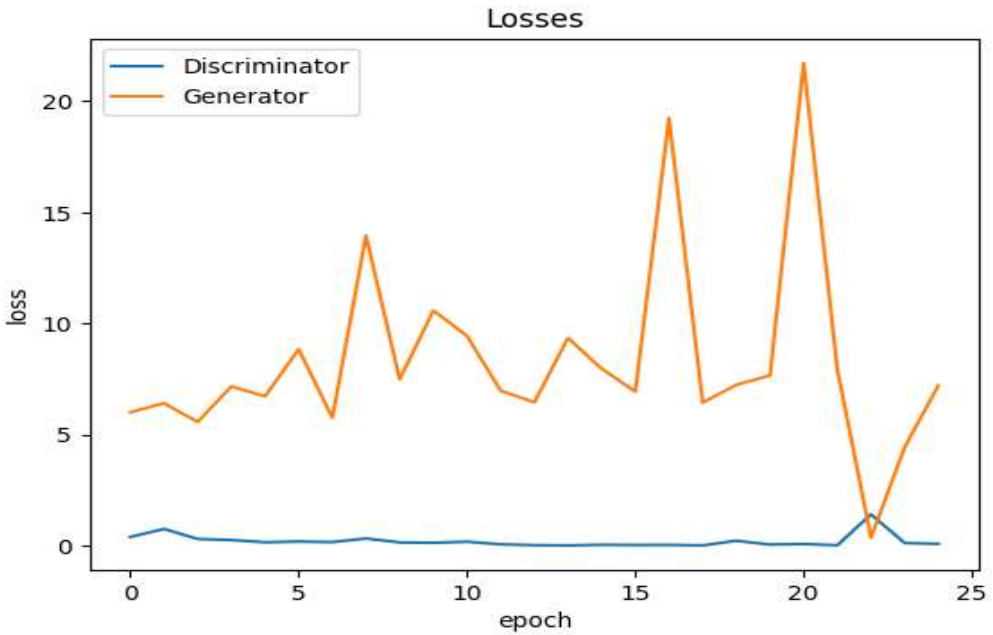
Gan generated image

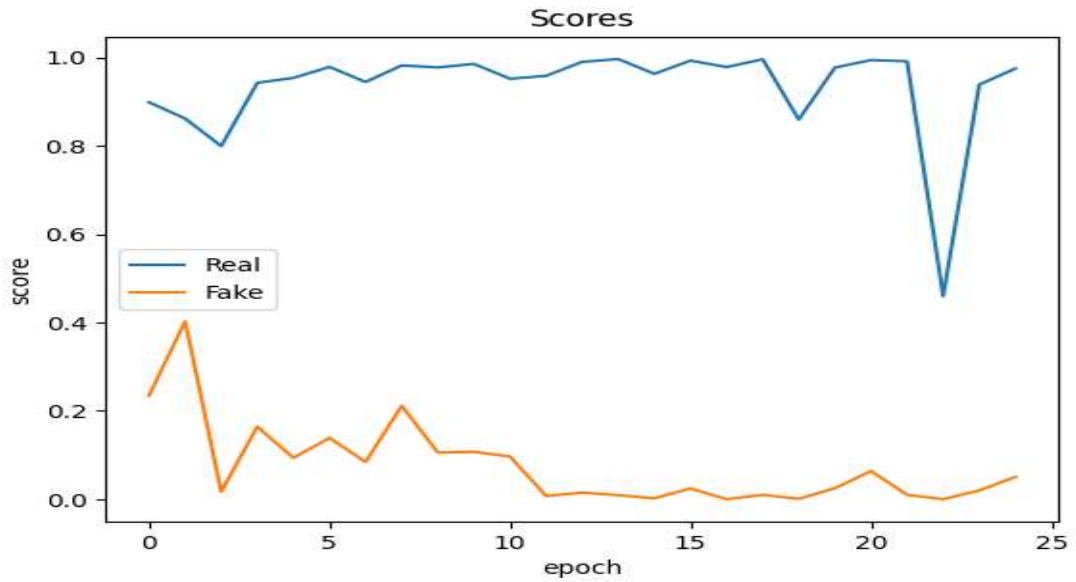
Contd.



Contd.

EPOCHS	REAL SCORE	FAKE SCORE	loss_Discriminator
25	0.9751	0.0505	0.0832





Model Training and Evaluation:

Training Setup:

Training Data:

- Combination of real and synthetic frames.
- Augmented to enhance variability and robustness.

Validation Data:

- Separate set for model evaluation during training.

Contd.

Model Training Process:

Compilation:

- **Loss Function:** Sparse Categorical Crossentropy.
- **Optimizer:** Adam with initial learning rate of 1e-3.

Callbacks:

- **Early Stopping:** Monitors validation loss, stops training if no improvement.
- **ReduceLROnPlateau:** Reduces learning rate on plateau of validation loss.

Training Execution:

- **Epochs:** 50 epochs
- **Training Dataset:** Train the model with the training dataset.
- **Validation:** Evaluate performance using validation dataset during training..

Evaluation Metrics:

- **Accuracy:** Percentage of correctly classified instances.
- **Loss:** Measure of error in predictions.

Contd.

Performance Monitoring:

- **TensorBoard:** Real-time visualization of training and validation metrics.
- **Validation Loss & Accuracy:** Monitored to ensure model is learning effectively

Diagram:

- Training and Evaluation Process:

- Flowchart illustrating the sequence from data loading, model training, validation, and performance monitoring.

Limitations and Problems Faced:

Large Dataset:

- Approximately 500-600 GBs of video data.
- High storage and processing requirements.

Limited Resources:

- Using Google Colab Pro with limited compute resources.
- Relies on L4 GPUs for training and Google Drive for storage.

Internet Dependency:

- Need for a stable and high-speed internet connection for data transfer and processing.

Contd.

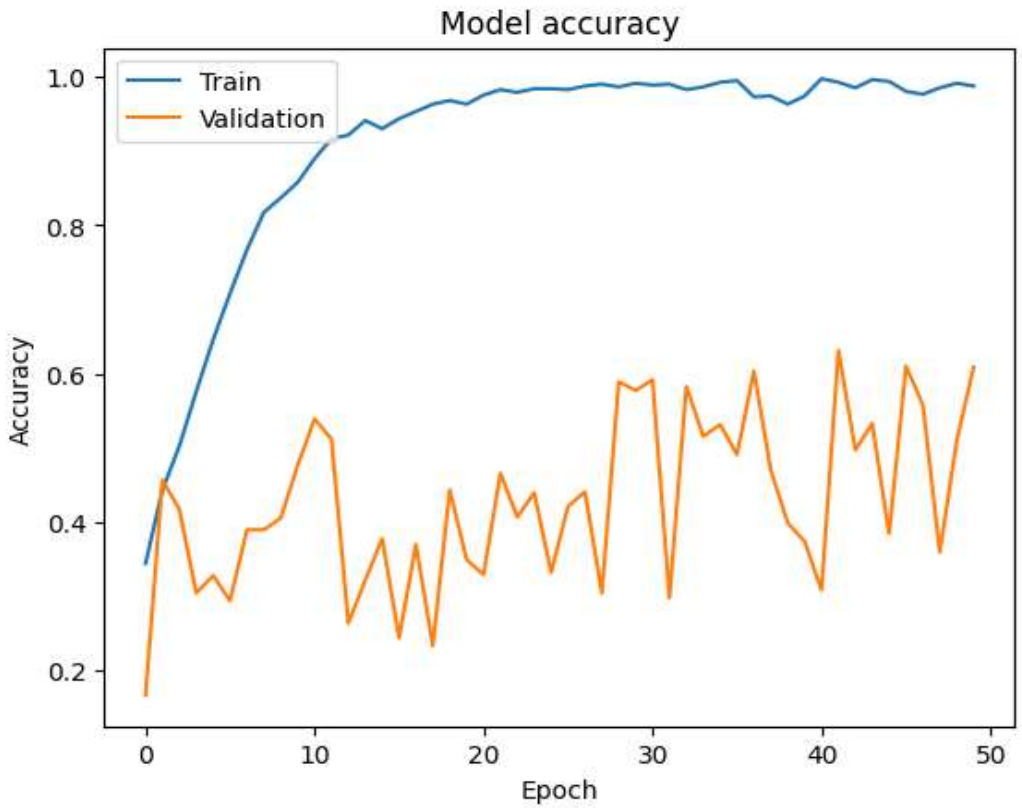
Data Quality:

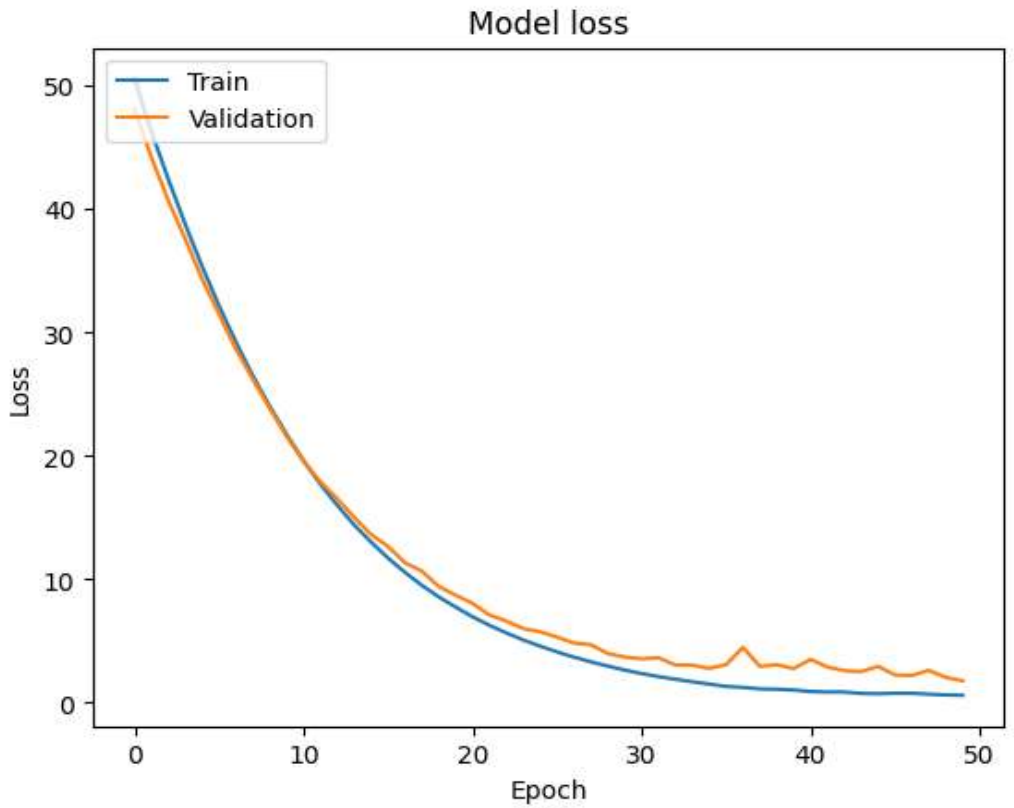
- Presence of noise in the dataset requiring continuous monitoring of the training process.
- Fluctuating learning rate impacting training stability.

Dataset Variability:

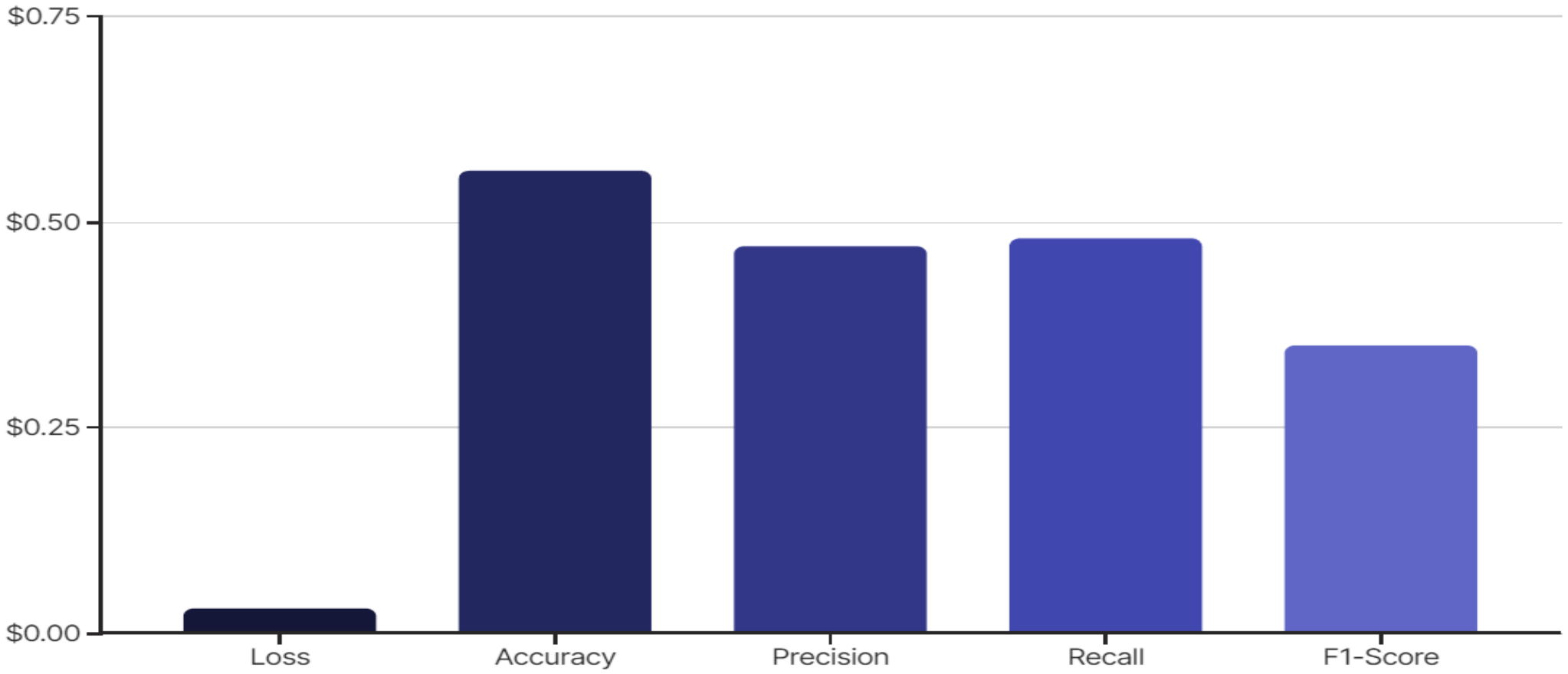
- While organized, the dataset lacks sufficient representation of sparse crowd conditions.
- Need for additional diverse data to improve model robustness in different scenarios.

Result


Model accuracy
Train
Validation
Accuracy
Epoch
1.0
0.8
0.6
0.4
0.2
0
10
20
30
40
50


Model loss
Train
Validation
Loss
Epoch
50
40
30
20
10
0
0
10
20
30
40
50

Contd.



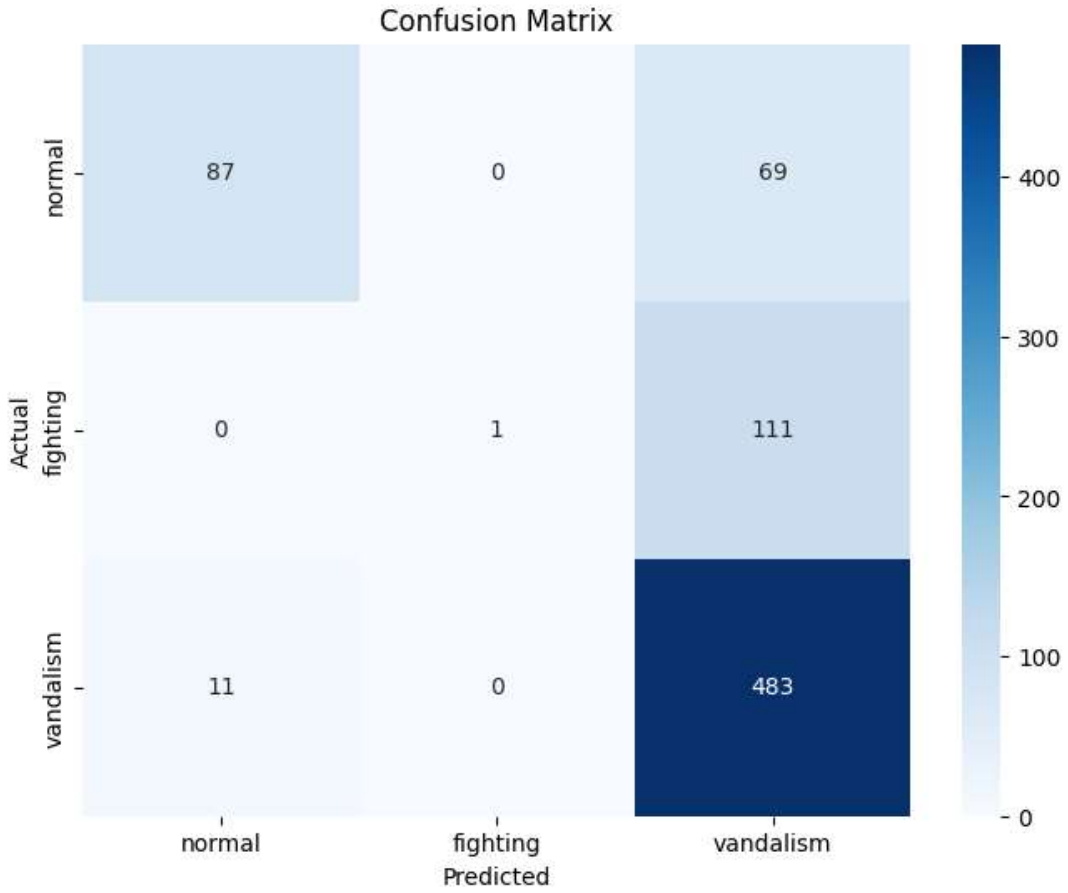
Contd.

loss	Accuracy	Anamoly class detected
0.02%	58%	Fighting ,vandalism

Contd.

Class	Precision	Recall	F1-Score	Support
Normal	0.25	0.97	0.40	156
Fighting	0.69	0.39	0.50	112
Vandalism	0.47	0.80	0.55	194
Macro average	0.47	0.48	0.35	462
Weighted Average	0.46	0.31	0.25	462

Confusion matrix:



Real – Time testing

Real – Time testing

FUTURE GOALS & SCOPE

- **Integration with Autonomous Drones**
- **Objective:** Enhance surveillance capabilities by integrating the anomaly detection model with autonomous drones.
- **Application:** Cross-border security to prevent smuggling and unauthorized border crossings.
- **Hardware:**
    - **Processing Unit:** NVIDIA Jetson Nano kit mounted on the drone.
    - **Input Devices:** Intel RealSense camera with infrared and LiDAR sensors for night vision and dense area coverage.

Contd.

- **Benefits:**
  - Improved real-time monitoring and response.
  - Enhanced detection accuracy in diverse environments and conditions.
  - Contribution to national security by preventing illegal activities.