~Madhya Pradesh Police

>> The state of Madhya Pradesh is flanked by five other states.

>>The country has a total area of 3,088,000 square kilometres and a population of 75 million people.

>> With a total area of 94,689.38 square kilometres, it is the world's largest forest.

>> 20 National Highways (3714 km) and a 5500 km railway network.

Madhya Pradesh requires the implementation of an Integrated Surveillance System throughout the state.

>> OBJECTIVE

Surveillance cameras are increasingly being used in public areas. The monitoring capabilities of law enforcement agencies has not kept pace.

➔The proposed CCTV Surveillance system's main objectives are:

Develop an intelligent system for automatically detecting video anomalies to reduce labour and time waste.

Achieving a safe city environment.

Preventing crime.

Identifying crime hot spots.

Safety countermeasures.

Public order management.

VIP security and access control.

End-to-end incident management.

Real-time coordination and collaboration with sister departments.

Design Attributes

>> Monitoring Device Status, Detection of Impediments, and Notification of Availability.

>> Cooperation with Other Police Department Initiatives.

>> Monitoring and Response Centre for Integrated Video Surveillance in Safe Cities.

>> User-specific dashboard that can be customised.

>> Briefing Room Data analysis.

>> Incident Management from Beginning to the end.

>> Command Control Solution

>>Traffic Management

>> Event Correlation

>> Security & Access Control

>> Alert Notification

>>In Ujjain, PCR VANs and Drone Cameras are being integrated with mobile surveillance (UAV).

>>Standard Operating Procedures (SOPs) that have been thoroughly thought out and written.

LIMITATIONS OF PREVIOUS APPROACHES:

$ Identify a single anomalous event, such as a traffic anomalous event: it cannot generalize to other anomalous events, thus you'll have to use a different classifier if you wish to detect other occurrences.

$ Methods based on spare coding:

EXPLANATION: This method takes the inertial component into account and uses it to create a dictionary and reconstruct future frames. If there is any deviation from the construction mistake, it is assumed that an anomaly detection is taking place.

$ If there is a sudden extreme shift in the environment, do not manage it adequately. This will result in a huge construction error and maybe a high false alarm rate for deviations from typical behavior.

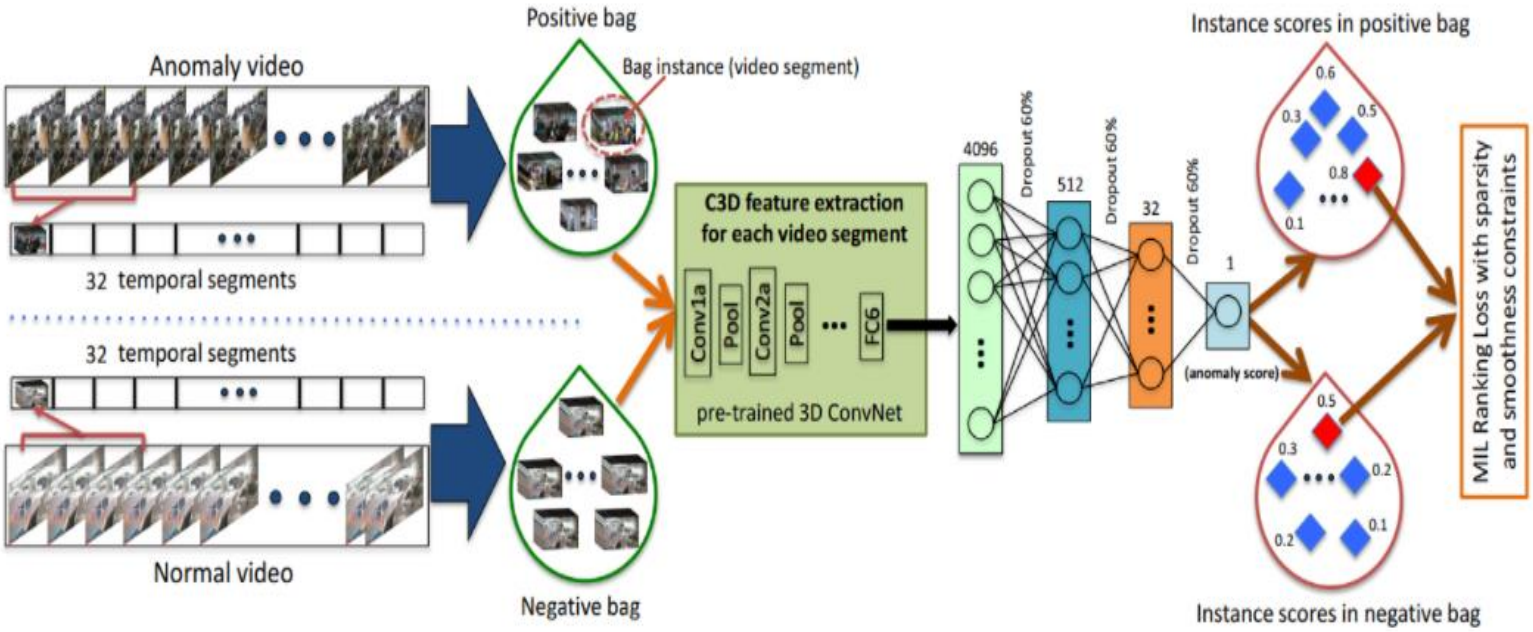
GOAL:-

(OUR APPROACH: Multiple Instance Learning Approach)

>> In a long surveillance film, determine the time window of the abnormality.

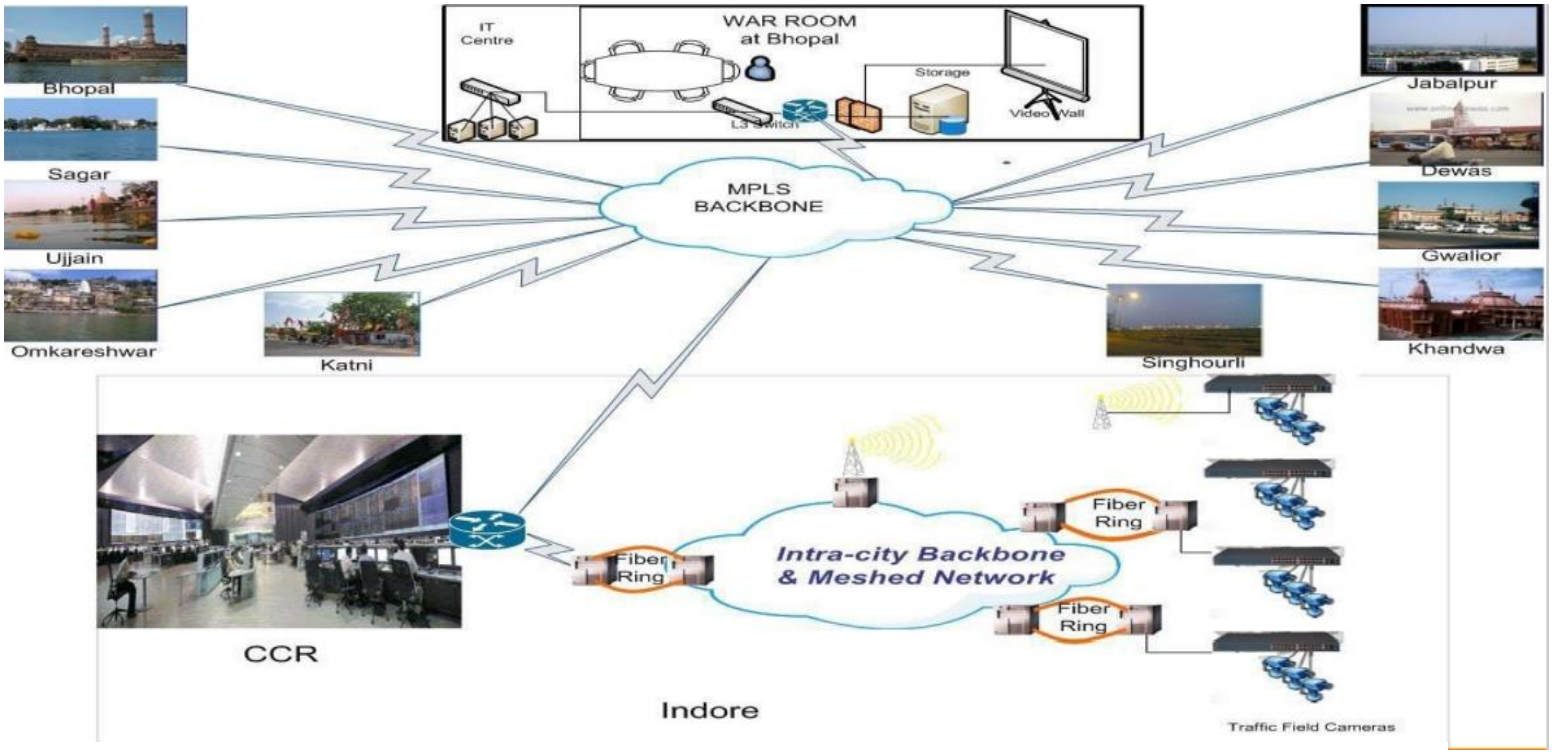
>> Learn anomalies by exploiting both normal and anomalous video because anomalies have a lot of patterns and you can't exactly list all of them, therefore we use normal and anomalous films to try to learn the differences between them.

>> During training, we divide surveillance movies into a set number of segments, which is the first step in our suggested approach. In a bag, these segments create instances. We train the anomaly detection model using both positive (anomalous) and negative (normal) bags, using the suggested deep MIL ranking loss.



This is proposed anomaly detection approach's flow diagram. Given a positive video with an anomaly someplace and a negative video with no abnormality. Each of them is divided into many temporal video pieces. Each video is then represented as a bag, with each temporal segment representing one of the bag's instances. We train a fully connected neural network using a unique ranking loss function that computes the ranking loss between the highest scored instance (shown in red) in the positive bag and the negative bag after extracting c3d features.

➔*Architecture of the Madhya Pradesh CCTV Solution*



➔The CCTV System's Components

a) CCTV cameras installed on a tower for fixed area surveillance

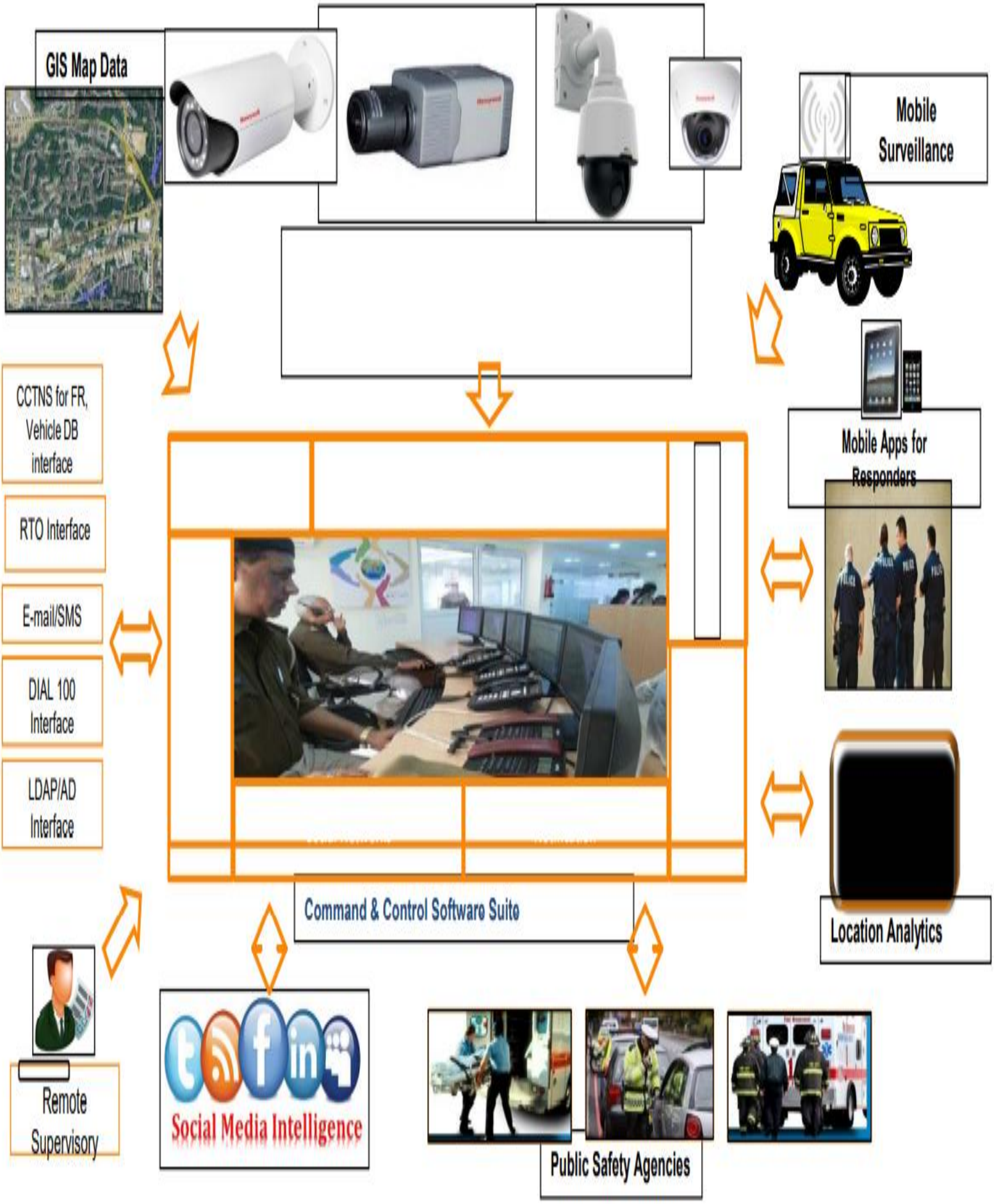
b) PCR vans will be equipped with a surveillance system or software.

c) Integration with the department's current surveillance initiatives in the cities under consideration.

d) Designing Citizen-based CCTV Control Rooms

e) At the state level, a Safe City Monitoring and Response Centre was established.

➔How Does a CCTV Svstem Work



➔Plan for Training and Capacity Building

~ Preparation of Detailed Standard Operating Procedures (SOP) for Police & other Personnel

~ Preparation of Training Material for operation, upkeep and safety related subjects for

a) Technical Staff

b) Executive Staff

c) Supervisory Staff

~ Training Programs organized at every district head quarter in 11 cities.

~ Hands on experiences provided on Video Management System (VMS) and Analytics

>> OUR ANOMALY DETECTION DATASET

@ 1900 real world surveillance videos of 128 hours.

@ 15 times more videos than existing dataset

@ 13 real-world anomalies.

	# of videos	Average # of frames	Dataset length	Example anomalies
UCSD Ped1 [27]	70	201	5 min	Bikers, small carts, walking across walkways
UCSD Ped2 [27]	28	163	5 min	Bikers, small carts, walking across walkways
Subway Entrance [3]	1	121,749	1.5 hours	Wrong direction, No payment
Subwa Exit [3]	1	64,901	1.5 hours	Wrong direction, No payment
Avenue [28]	37	839	30 min	Run, throw, new object
UMN [2]	5	1290	5 min	Run
BOSS [1]	12	4052	27 min	Harass, disease, panic
Abnormal Crowd [31]	31	1408	24 min	Panic, fight, congestion, obstacle, neutral
Ours	**1900**	**7247**	**128 hours**	**Abuse, arrest, arson, assault, accident, burglary, fighting, robbery**

FIG: A comparison of datasets with anomalies. Our database includes a greater quantity of longer surveillance recordings with more realistic abnormalities.

>> The total number of videos in our dataset for each abnormality.

The number of videos in the training set is indicated by the numbers in brackets.

# of videos	Anomaly
50 (48)	Abuse
50 (45)	Arrest
50 (41)	Arson
50 (47)	Assault
100 (87)	Burglary
50 (29)	Explosion
50 (45)	Fighting
150 (127)	Road Accidents
150 (145)	Robbery
50 (27)	Shooting
50 (29)	Shoplifting
100 (95)	Stealing
50 (45)	Vandalism
950 (800)	**Normal events**

>> ANOMALY DETECTION RESULTS

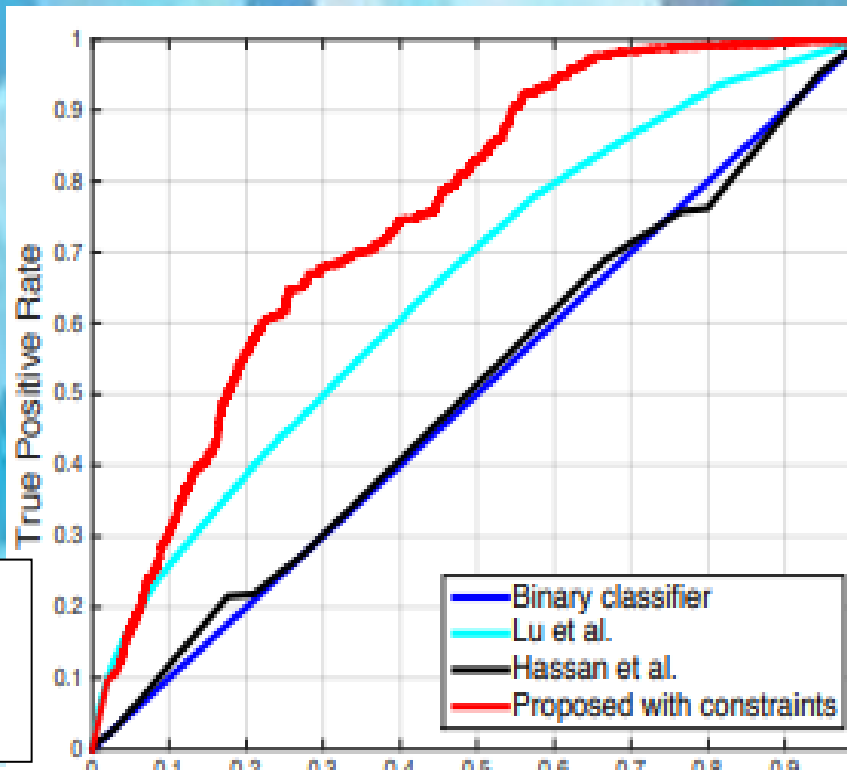
Examples of different anomalies in our dataset

Method	AUC
Binary classifier	50.0
Hasan *et al.* [18]	50.6
Lu *et al.* [28]	65.51
Proposed w/o constraints	74.44
Proposed w constraints	**75.41**

TABLE: AUC comparison of various approaches on our dataset.

Method	[18]	[28]	Proposed
False alarm rate	27.2	3.1	1.9

TABLE: False alarm rate comparison on normal testing videos.



ROC comparison of binary classifier (blue), Lu et al. (cyan), Hasan et al. (black), proposed method without constraints (magenta), and proposed method with constraints (black) (red).

➔Analysis of proposed method

The proposed approach is based on the idea that given a large number of positive and negative videos with video-level labels, the network can learn to anticipate the location of the anomaly in the movie automatically.

During training iterations, the network should learn to produce high scores for aberrant video segments in order to achieve this goal. Figure 8 depicts the progression of a training anomalous example's anomaly score over iterations.

The network predicts high scores for both anomalous and typical video parts after 1,000 iterations. The network begins to produce poor ratings for normal segments after 3,000 iterations while maintaining high scores for anomalous segments.

As the number of iterations grows and the network views more videos, it learns to precisely locate itself.

➔The percentage of false alarms.

The percentage of false alarms. A large portion of a surveillance film is common in a real-world environment. On regular videos, a reliable anomaly detection method should have a low false alarm rate.

As a result, we exclusively use normal videos to evaluate the performance of our approach and other ways. The false alarm rates of several techniques at the 50% threshold are listed in the table on the upper slide.

Our method generates far less false alarms than other systems, implying a more reliable anomaly detection system in practice.

This demonstrates that training our deep MIL rating model with both anomalous and normal videos helps it learn more general normal patterns.

➔The Most Important Benefit - CCTV Surveillance System

* Desirability of associating competent consultants duly assisted by domain experts from the stage of DPR & RFP preparation and Vendor Selection.

*Need for a strong ownership/ sponsor to support and sustain the project.

* Active Support of fields functionaries to adopt the System at the pre- implementation, Implementation and post implementation stages.

*Very thorough location selection survey for installation of towers and CCR with the full involvement of Stakeholders to accomplish the objectives of Surveillance.

*High level of coordination and collaboration with local bodies/ authorities to get timely clearances and approval for civil/electrical and other related work.

*Availability of a core team of technical experts and executive police officers with the Chief executive/ Central Nodal Authority to pursue issues at different levels and in different departments for timely resolution of issues and to expedite sanctions/approvals.

* The engagement of reputed consultants, duly assisted by domain experts to perform the task of project Monitoring consultancy effect.

>> CONCLUSION

-We offer a method for detecting real-world anomalies in surveillance films using deep learning.

- Because of the complexity of these realistic anomalies, relying just on normal data for anomaly identification may not be ideal. We look for both typical and unusual videos to exploit.

- We learn a general model of anomaly detection using the deep MIL framework with poorly labelled data to avoid labor-intensive temporal annotations of anomalous parts in training movies.

- A new large-scale anomaly dataset, which includes a range of real-world anomalies, is introduced to validate the proposed approach.

- Our proposed anomaly detection strategy outperforms baseline methods in this dataset, according to the results.

- We also show that our dataset is useful for detecting unusual behavior.

Physical Safety Information System

THANK YOU!

TEAM MEMBERS NAME:-

1) Siddharth Sharma(team leader)
2) Yash Gaur
3) Ayush
4) Tushar Bansal
5) Ajay Bansal
6) Shreya Kumari