



# OVERVIEW AND ANALYSIS OF CROWD ANOMALIES DETECTION METHOD

<sup>1</sup>Padmavathi H G, <sup>2</sup>Shivani Kamboj

<sup>1</sup>Associate Professor, <sup>2</sup>Assistant Professor

<sup>1</sup>Computer Science and Engineering,

<sup>1</sup>Brindavan College of Engineering, Bengaluru, India

**Abstract:** Mass anomaly detection has become a very important area in recent years, especially after the recent surge in technological developments in modern times. More and more situations and locations require surveillance and anomaly detection to prevent unforeseen accidents. In order to discover abnormalities in the crowd, surveillance scene in real-time is often analyzed by crowd anomaly detection the utilizing a variety of concepts and techniques, including AI, ML, optical flow analysis, and streak flow analysis. Increase. If an anomaly is detected, the relevant authorities will be notified immediately. This review analysis some of these methods and compares their advantages and disadvantages.

**Keywords—***Surveillance, AI, ML, flow analysis, Crowd Anomaly Detection.*

## I. INTRODUCTION

There are several ways to detect crowd anomalies. This field is becoming increasingly important with the advent of modern technology, with new technologies being introduced every day. Bulk anomaly detection is highly dependent on the nature of the hardware used and the algorithm used for channel scanning. This limits progress in this area due to the limited growth of camera and sensor technology compared to tracking algorithms. Response time is an important factor in these systems. When detecting, detecting or tracking an anomaly, the system must immediately notify the relevant authorities. In modern times, civil wars have become much more frequent in many parts of the world. In these cases, the deployment of anomaly detection systems has become a popular choice worldwide to protect critical institutions and innocent people from unwanted or unexpected incidents. This white paper describes some of these methodologies. Optical and linear flow analysis, LLTR algorithm, PredNet and more. Many of these methods are most effective in specific areas such as violent incidents, evacuation planning, and homeland security. They also have different specializations. Here we describe the relevant algorithms, identify the differences between these methods, and pay particular attention to the future scope.

## LITERATURE SURVEY

Liu et al. [1] found that the lack of firing was the average Gaussian model used for object detection is: slow convergence rate. So based on the learning rate an improved attenuation strategy has been introduced. The foreground data set is processed and the prediction neural the network is trained on this dataset. Hence the difference the difference between the actual frame and the predicted frame is determined It is defined as the degree of abnormality. Over the crowd Detect motion by changing the threshold value accordingly. Under certain conditions. Direkoglu et al. [2] found that the optical flow Vectorcreates MII, a static image template. Understand the position of moving objects. CNN Training using MII, which is ultimately used to detect Anomalies in crowd behavior. Anomaly identification MII makes it easier to act as you can observe the crowd. Visual movement. Guo et al. [3] proposed a system capable of: Processing involving robots analyzing locally embedded video. Improvements to the k-means algorithm complete. Therefore, the system suggests using: MKSM Methodology for Efficient Anomaly Detection in a crowded place.

Rain. Pradeep et al. [4] proposed a system that includes Latent Dirichlet Allocation, also known as Striped LDA flow technology. The proposed methodology includes: Create blocks by splitting frames that depict the exact thing Spatial and temporal scene changes. Ranking Direction as well as movement of pedestrians in a crowd performed using optical flow a. dashed line and Latent features also contribute to crowd definition flow movement. Yang et al. [5] proposed a two-part system. Channel diagram. Wireframe of original video Used to create functional channels that include: plan. Combined based on two hybrid architectures Used to guarantee channels in deep learning. Systematic inclusion of representations of higher-level features It provides two anomalies. Architecture includes: Deep Belief Network and Class SVM based on aircraft. Earn Anomaly Points Combining with the use of the fusion system of anomalous events Detection that ultimately helps crowd anomalies detection. Kong et al. [6] proposed a system using LSTM networks. When traffic forecasting is done to evaluate the difference between actual flow and predicted flow, then improvement this is done to create the characteristics of an anomaly. Finally OCSVM Detect abnormal areas. Coolshrest, etc. al [7] proposed a system using the surveillance system, called SmartISS, includes: Identification, tracking and monitoring of people Wireless devices in real time via MAC-ID. Handheld trackers without active user collaboration the called PSU receive the probing request from the user and location. These power supplies consist of Smartphone/Jetson-TK1/PC. We use a noisy server to store the collected traces. Cloud servers help identify suspicious persons. The proposed LLTR algorithm is the most advantageous number of power supplies to find them face dynamically.

## METHODOLOGIES AND CONCEPTS

### Gaussian Average Model:

This model corresponds to the Gaussian equation defining Discrete or continuous random probability distribution Variable [1] by implementing the last  $n$  frames. Helpful to avoid Gaussian probability density function fitting from 0 for a new image frame at time  $t$ .

Following are the step related:

- 1) Initialize the background model.
- 2) Update the background model.
- 3) Extract the foreground.

### Gaussian Average Model Based on Learning Rate Decay

The previous method shows that the updating rate has an initial value of 0.01 in the updating equation of the background model, which is a small value and in this method we alter it to 0.3 [1]. While the process is updated, the mean in addition to the variance affects the subsequent frame considerably in comparison to the present gray value, and these results in slower response speed of updating. If the value of  $\alpha$  remains less than 0.01, the foreground target is detected as the background, as the next frame retains the image of the former frame. However, in cases of large in it ial values, there arises a small difference between the mean value and current frame. The foreground remains undetected as the intensity calculated at every instance is in confidence intervals. So the old model is modified by generating: Using learning rate decay, the reduction values are: The parameter is 0.9. The advantages of the new model include: It converges quickly, is stale, and does not clog easily.

### PredNet :

PredNet is an automated neural network that can: It makes predictions inspired by the human brain. This Send prediction information to subsequent layers through what he trains [1]. The network is divided into: Four-Part Module - Input Convolution layer, prediction layer and two views that is, repetitive and incorrect layers. Unlike frednet It doesn't work for predictive tasks and has its own advantages. Because it identifies the inner behavior of a moving object interested.

### Degree of Anomaly:

Abrupt changes in movement speed or direction of an object can cause abnormal behavior [1]. Abnormal evaluation Behavioral and dynamic characteristics play. The root mean square error, abbreviated as MSE, is given by the formula: Square the difference between approximate and true Therefore, the values of these properties are commonly used to test the accuracy of prediction frames. The smaller the value the smaller the difference between actual and expected frame. The mean square error also determines the order. Anomaly Complex background noise PredNet detection, lighting changes when using coefficients In addition to moving objects, they also exist inside predictions. Photo Frame. It is

quite difficult to find a range of unusual frames. When MSE is used to directly distinguish abnormalities. Data is initially preprocessed to retrieve objects to be reduced. Errors increase under the influence of other external factors. The data is then sent as input to the PredNet to further there may be significant changes in driving characteristics. Extracted by prediction frames.

### **CNN Architecture:**

The highest accuracy in a data set is achieved through: MII experiments with CNNs with different layers, channels, filters, etc. [2]. Each convolutional layer uses a filter. And feature maps. Batch normalization is each layer and modified line block is active. This next time. Performs the maximum union operation. This results in the formation of a two-site hierarchy. This is right it's related because there are two classes and softmax. Prediction layer. Applying a classification layer recognizes the input image as normal or abnormal. Stochastic gradient descent is used for training. That best result is Experiment with these parameter values. Each Frame has CNN classifiers that detect IC anomalies Behavior.

### **MSKM Clustering Method:**

To avoid duplication of calculations the result of random selection centered on k-means, Improvisation is performed according to the clustering method [3]. The resulting method hooks up the MS kernel displaying: The starting K stands for another advantage is selection Multiple categories of effectively clustered cores. This method is an updated version of the K-Means algorithm.

### **K-means classification method:**

The K-Means algorithm is an unsupervised clustering technique. It is widely used because of its fast convergence. Simplicity of implementation [3]. This is the basic methodology Segmentation of the sample set is done according to distance between samples. The value of k is set randomly by the user. The possible options for it, if it is set are

- a. Too Low: One cannot distinguish between the samples
- b. Too high: Over-elaborated values for sample differences are obtained.

The two methods for k selection are:

1. Elbow method
2. Silhouette method

### **Algorithm for Optical flow:**

Identification of non-stationary objects is performed. Optics for the same purpose with segmentation Flow [4] is used. Farneback with obstructed optical flow Algorithm and Results Algorithm Optical Flow the Farneback Algorithm. Create image pyramid it arises from the optimal flow algorithm. Reliable features Extraction methods are used to create flow models. Effectively. The classic texture function measures grayscale. Image Level Matrix, also known as GLCM. GLCM measurement The pixel shape of a grayscale image. Texture stats are normalized accordingly. The most appropriate models used here are contrast and uniformity. The direction of the optical flow due to the motion of the object A handle is defined.

### **Deep Belief Networks (DBN):**

Deep Belief Networks, also known as DBNs, have multiple layers and an example of a generative model. DBN acquisition Output of SDAE layer as input [5]. Being completed to allow PSVM to filter out anomalous data normal data. This reduces the dimensionality of the data in order to increase it. The speed of our architecture. Boltzmann Machinery Limited, Also known as RBM, it trains DBN layer by layer. Education RBMs are layered one RBM on top of another RBM and then the weights of the resulting DBN are initialized. When you go up from the lowest level.

### **PSVM :**

PSVM is done after using DBN. [5] Main The purpose of PSVM is to score anomalies. You can filter out abnormal data from normal data. PSVM it is computationally simpler compared to other schemes such as spherical, oval, etc.

**Anomalous Event Detection:**

This process is performed at the final stage of SHAED. PSVM model [5]. This is the default merging scheme. Placed to combine anomaly scores from both eggplants. Weights are obtained in a heuristic way. Maximum optimality of the training data. According to Observation, the final result depends little weight selection.

**LSTM Networks:**

It is very similar to a recurrent neural network Courtesy of, and adapted from, Hochreiter and Schmidhuber. It has been popularized by many intellectuals. [6]. It has a wide range of applications and is mainly known for its ability to learn long-term addition. There are 3 doors that is, the entrance, oblivion, and exit gates that it guards Controller.

**Abnormal Behavior Detection using OC-SVM:**

Hysteresis anomaly scores are expressed as coefficients. Actual consumption minus estimated consumption [6]. Historic an anomaly estimate is given by a multi-step LSTM. If the the distribution of normal samples is considered. Anomalous samples do not go inside normal distribution. This method is used to find anomalies. Steps involved in this with unsupervised learning process:

- Step 1: Compute a region wise pairwise similarity matrix for every resource from  
Where the data has been extracted.
- Step 2: Reduce the similarity between two data present in different regions and  
Calculate the degree of anomaly.
- Step 3: Region wise, the anomaly score at that instant has to be evaluated.
- Step 4: Taking the surrounding areas into consideration, evaluate the regional  
Anomaly score.
- Step 5: Select regions that fall in the maximum range of anomaly scores which forms  
The output.
- Step 6: Region of exception is identified through different factors.

**LLTR Algorithm:**

This method is used for crowd monitoring [7]. Power supply a portable tracker is used that transmits data to the cloud. Synchronized time level. The process is done through: Cloud to identify uploaded data that deviate from normal A digital record of one and the time of its occurrence is recorded. Subtracting this value from the current value Cloud if below specified limit Send location information. Send it otherwise. Send the MAC address of this location to the other S1 servers. It is then sent to XMPP. If the last found position is 0 XMPP then takes over the request and immediately sends each BP Receive requests you are asked to send answer. These responses are coupled together Moved to S1. Upcoming PSUs appearing in the latest PSUs Where it is found is tracked by XMPP. Similarly, this Find K-Nearest Neighbors. After requesting both power supplies it stays idle. If there is no answer he Return null from S1. But if you answer identifies the current location of the PSU. Data has been received. If your current location is actually your last location after finding the location, XMPP queries S1 for the absence Information. The S1 then connects to the cloud to Find missing information. Combining the two answers Clouds as well as XMPP are suitable Official.

**CONCLUSION**

So we have different methodologies and approaches used to detect anomalies in crowd behavior. Some of these methods have gap, some have potential or opportunity for improvement/expansion of the application. We hope more suitable and competitive models can be developed in future proposals to Address Existing Problems as Specified in the above method.

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