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Use of Tensor Flow to Forecast Human Motion Detection in Video Surveillance Systems

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Abstract

Image processing and machine learning are two areas where Deep learning techniques have recently been investigated. Human and non-human movement detection in video surveillance systems employ the same deep learning prediction model. People and other moving things in videos may be identified using a deep learning technique. To find people in dynamic settings where things are constantly in motion, a series of image processing algorithms must be used. For this purpose, we utilize a multi-layered convolutional neural network classifier, such the one available in the Google Tensor Flow data science platform, to examine the information gathered from the top areas. High-resolution, low-resolution, and shaky-camera footage are all part of the dataset our technique analyzes. Experimental investigation investigating the link between moving objects and video surveillance revealed a prediction performance of 85% correct from a dataset of 65 movies.

Introduction

These days, monitoring and safety are two of the most common uses for video surveillance systems. Transportation management, security infrastructure, financial services, etc. all benefit from government usage. A article in the April 2019 issue of the Times of India predicts that by the year 2029, most locations in India would have surveillance systems enabled for full monitoring and assistance. Both businesses and households have begun making use of various forms of video surveillance technology. garages, stores, malls, cybercrime, theft, and surveillance. To monitor all areas with less need for human labor, Laszewski et al. [1] installed CCTV systems in all relevant locations. Objects in movies may be identified using image processing methods.

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The field of deep learning image processing is expanding, and many different convolutional algorithms are being put to use. In this work, we used a deep learning technique to distinguish people from other moving objects in surveillance videos [4]. In particular, these techniques are used in frontier regions for the detection of things at great distances. Human detection results are presented at the end of each deep learning layer [2] in the human object identification or moving object monitoring system developed by Kehtarnavaz et al.

Histogram gradients and support vector machine features are used in an ad boost classifier technique for motion object detection [8]. Human detection makes use of recurrent neural networks that are trained to recognize certain regions of the human body. Here, we use human detection and classification methods on video stream data to create a useful tool. Using edge detection methods, the item is detected, and the calculation procedure is computationally rapid for evaluating dynamic regions. Learning systems are utilized in the categorization phase to distinguish between able-bodied people, people with impairments, and those who aren't holding anything. In recent years, machine learning has emerged as a popular method for conducting computational learning experiments and making decisions. Modeling, prediction, and decision making issues are addressed by means of statistical learning and neural networks [10]. Information may be gleaned from data streams like video, audio, and text using the many tools and methodologies made available by machine learning. In order to foretell the future and glean useful information from a massive data collection, a model has been observed and developed. In the work of Luis et al., the behavior model is utilized to learn the characteristics, capabilities, and behaviors of objects, while a-priori techniques are used for foresight and categorization. Using exhaustive computing methodologies, machine learning provides an intriguing paradigm for infeasible and unresolved issues [4].

Learning Techniques 2.1 Statistical Learning

Machine learning techniques are applied based on statistical approach, prediction, clustering, classification and decision making. A-priori model is used for trained the data set and creating model. Supervised and Unsupervised learning are used for data streaming problems. Supervised learning is observation based approach and outputs are calculated by polynomial and linear approach. Tree, Forests, Space and Neighbor, Bayesian methods are used for supervised learning calculations. Unsupervised learning is discovering data relations and models without specifying outputs. Clustering and Dimensionality reduction techniques are applied

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for unsupervised learning calculations [5].

Reinforcement Learning

Reinforcement learning methods are combination of statistical learning and Q-Learning approaches. This is trial and error model with adjusting feedback based measurement procedures. The classical use of the learning is making effective decision and maximizing utilization factor [6]. Online learning is recent model with combining the entire above learning feature for Big Data and Data Analytics. This model has updating buffering and streaming data as input and predicts the future for next level [9].

Deep Learning

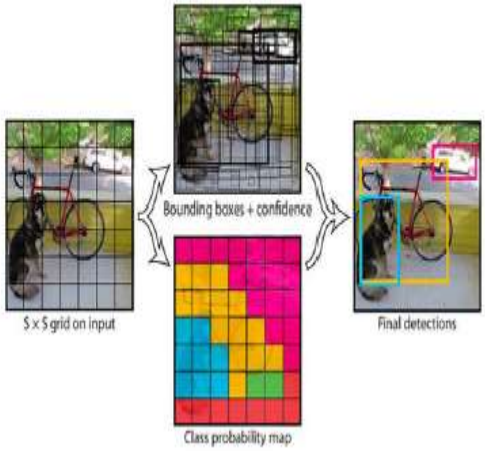
Neural Network is combination of all learning techniques which is used for predicting and classifying future. Artificial Neural Network are a model which collects connected neurons as input and apply regression for resulted output neurons [12]. Convolution techniques are used for image processing techniques. A neuron has perception with the input function f(x) and output function g(x) where x refers neuron. The linear sigmoid function is applied for calculating error and adjusting input parameters. The quality factor can be calculated

$$Q(x) <- \text{sigmoid}(f(x),\text{sigmoid}(f(x-1))$$

Training perception is required in each stages, Feed Forward are used by arrays of storage calculations, Convolution for hidden layers, Recurrent for behaviors and Auto encoders for dimensionality reductions. The Boltzmann machine is input each layer results and new feature can be activated for expanding dimensions and new features results.

Video Data Set

A Video data set collected from various source like CCTV surveillance gate entrance, shopping malls, banking sectors, railway station and traffic signals from Nagapattinam areas, Tamil Nadu, India on March and April‟2019. The dataset consist of 65 videos and we bundled into 5 video clips into single neuron. We applied image processing steps for image enhancement, restoration and support vector calculations. The following figure 1 shows that the moving object clips and motions.



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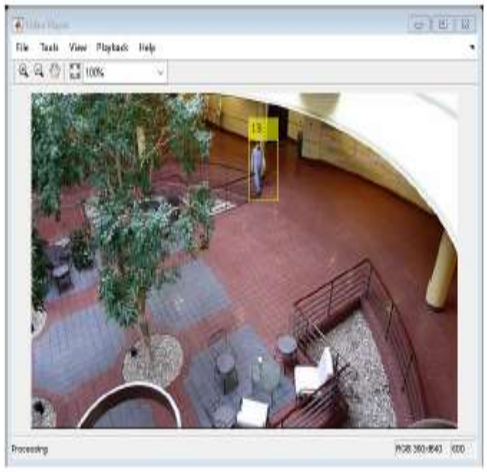

Figure 1. Moving Object Detection

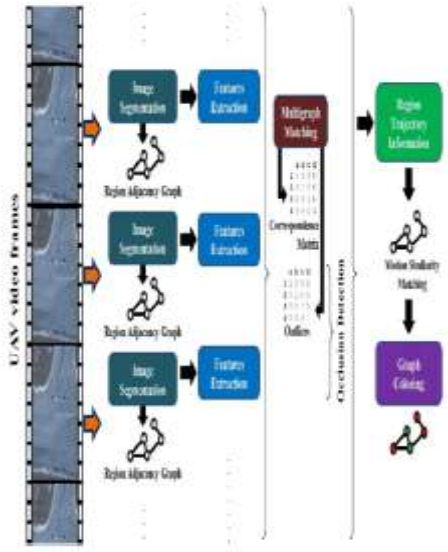

Figure 2. Processing Matrix and Deep learning classification

The video data are associated with environment so we need following challenges for identifying human. I. The video clip is long range so the human appears with various resolutions, ii. Remove fixed and unmoving objects, iii. Remove shaking, blurring and out of focus data, IV. Calculate ad boost classifier value for noise and error factor.

Human Detection

Detecting and locating the human from moving objects is required at various image frames. We selected frame size as (1900 * 1020) and apply human detector algorithms applied for selected image. First the given image frame are sampled by using down factor value 2 and 4 so that we calculated efficiency. In next step the color images are converted in gray scale image by applying binary classifier techniques. 2D convolution operation is used to obtain moving object prediction. The final step applied for Human detection algorithm with Ad boost classifier.

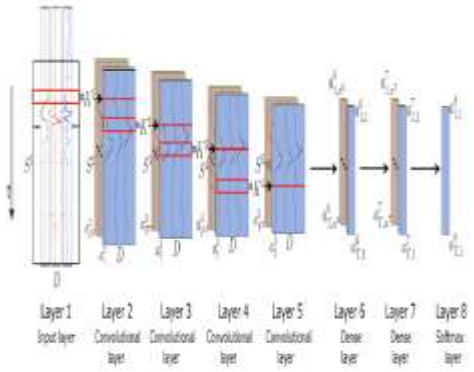

Figure 3. CNN Classifier process after finding sub images are passed to Convolutional Neural Network classifier. In this classifier has detection stage, misdetection stage, removal stage and labeled stage. The background areas are removed and bundled. The bundled videos are trained and tested and the output are classified as Human without hold anything, Human holds with objects and Human with disabilities. The total 65 videos are trained and tested bundles. Each bundles had 5 video clips, total 13

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bundles are divided into 8 training data set and 5 are testing data set.

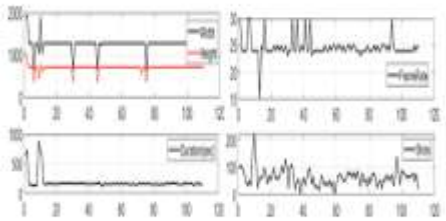

Figure 4. Tensor flow result of CNN values

Image based Classification

CNN models are trained from huge number of video clips and calculated by previously trained data. The fully connected layer formed from trained data set and transfer learning methods are used. The transfer learning is used by pre-trained data from Alex Net and pre-trained Google Net. The GPU is utilization also important for calculating accuracy factor. The three different CNN approaches, self-defined CNN for training and convolution operations, max-pooling layers for fully connected layer calculations and Alex Net and Google Net for pre-trained model. This approach consists of convolution, max pooling, inception, perception and hidden layer processing.

Video based Classification

The video based classification is applied for each bundle, Image based classification is first step based on image result we can create behavior and fully connected layer. Number of images are classified various cases for example (20, 20, 10) indicated human classification factor.

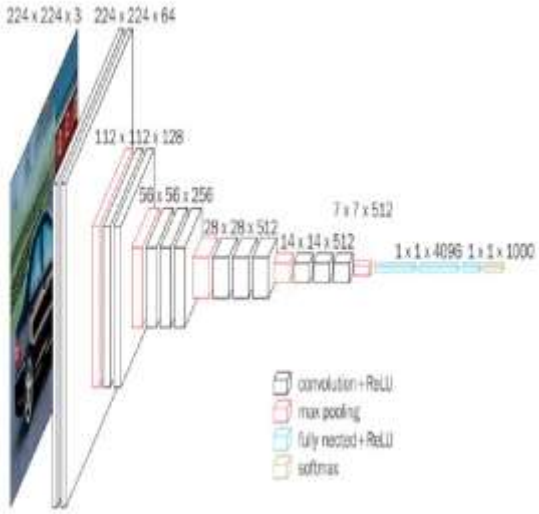

Figure 5. Convolutional and fully connected pooling results

Performance Evaluation

The bundled groups are classified by various factors and each layer we calculated accuracy factor. The table 1 shows the bundle group and number of image clips in each bundle.

Table 1: Bundles and Image with sigmoid values

Bundles	Images	Sigmoid(x)
1	23,400	270
2	27,890	280
3	13,457	190
4	12,688	176
5	25,789	278
6	10,678	115
7	11,874	120
8	34,657	312
9	28,098	309
10	34,878	318
11	15,081	198
12	17,898	187
13	21,048	201

The following table 2 shows for each bundle values for test and trained result in each layer stage

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Bundles	Images	I	II	III	Classifier	Test	Quality	Accuracy
1	23.400	34	32	30	31	378	78%	91%
2	27.890	21	34	32	30	457	68%	84%
3	13.457	34	45	36	40	565	72%	88%
4	12.688	25	27	25	23	476	89%	95%
5	25.789	21	23	25	21	345	78%	91%
6	10.678	56	45	47	45	469	87%	90%
7	11.874	78	78	76	76	786	89%	91%
8	34.657	56	48	67	68	791	69%	79%
9	28.098	34	45	36	37	567	89%	95%
10	34.878	45	67	76	67	456	76%	87%
11	15.081	35	27	29	31	356	89%	90%
12	17.898	45	56	65	55	567	87%	94%
13	21.048	87	87	88	86	807	88%	97%

Table 2: Bundles with image clip classifier result and accuracy rate

Figure 6. Tensor flow results

Conclusion

This study provided a thorough explanation of the deep learning-based strategy for locating humans and other mobile objects in a variety of settings. We used statistical learning, RL, and other machine learning models for human prediction, as well as for generating a variety of predictions and decisions. When looking for people, 65 videos are combined into one big one. Indicated for all human movements and acts by the video-based categorization. Using Google Net and Google Tensor Flow, we look at many different convolutional neural network strategies for generating predictions and taking actions. The computed rates of quality and accuracy for each package. We find that 88% is the typical rate of correctness for each given bundle. In the future, the same method will be used to both border regions and cyber crime ecosystems.

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Data analysis in Python using the Pandas library.

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