

Fire Detector using Deep Neural Network

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Abstract - In the epoch of Artificial Intelligence, the recent advance in technology has enabled the Image based system to detect fire during surveillance using Deep neural Network. A cost effective DNN architecture for fire detection offers a better solution. The concept was done by a result which was influenced from Squeeze Net Architecture. When compared to Alex Net which is computationally expensive, Squeeze Net is considered based upon the computation and also it could be appropriate for any intended problems. In addition, closed circuit television (CCTV) surveillance systems are currently installed in various public places monitoring indoors and outdoors applications which may gain an early fire detection capability with the use of fire detection. This fire detection is implemented by using software processing on the outputs of CCTV cameras in real time. Then, camera is kept under surveillance that periodically records the motion of activities that happens daily. If any fire accident occurs, it immediately captures and compares with the trained data set. If the compared image is true it sends a fire alert message to the fire station.
Index terms: Deep neural network (DNN), fire detection, video analysis of CCTV.

Key Words: Fire detection, DNN, Squeeze Net, Fire image.

1. INTRODUCTION

A deep neural network (DNN) which is an artificial neural network (ANN) with multiple layers between the input and output layers. The deep neural network finds the correct numerical maneuvering to turn the input into the output, whether it be a linear relationship or a non-linear relationship. The network navigates through the layers calculating the probability of each output. The goal of this paper is that it aims eventually; the network will be trained to decompose an image into features, identify trends that exist across all samples and classify these new images by their similarities of these output images without requiring human input. DNNs can model complex non-linear relationships. DNN architectures produce compositional models for the object is expressed as a layered composition of primitives. Deep architectures include many such similar

variants of a few basic approaches. Each architecture has found success in specific domains. The "deep" in "deep learning" refers to the number of layers through which the data is transformed. More precisely, deep learning systems have a substantial credit assignment path(CAP) depth. The

CAP is the chain of distinct changes from input to output. CAPs describe potentially causal connections between input and output. DNNs are typically feed forward networks where the data flows from the input layer towards the output layer without looping backward. At first, the DNN creates a map of virtual neurons and assigns random numerical values, or "weights", to connections between them. The weights and inputs are multiplied. It is then made to return an output between 0 and 1. If the network didn't accurately recognize a particular pattern, an algorithm would adjust the weights. This way the algorithm is used to make certain parameters more influential until it determines the correct mathematical manipulation to fully process the data.

2. SQUEEZE NET

Squeeze Net to create smaller neural network with fewer parameter that can more easily fit into computer memory and can more easily be transmitted. The network was made smaller by replacing 3*3 filters as also reduced down sampling of the layers when happening at the higher level providing large activation maps. Squeeze Net can compress upto 5MB of parameter whereas the AlexNet can compress 540MB.

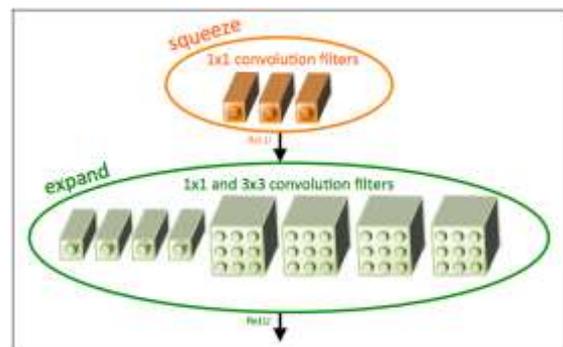


Fig 1:Squeeze Net

3. PROPOSED MODEL

The project analyses the fire images from a camera which is under surveillance periodically using the Deep Neural Network (DNN).A closed-circuit television (CCTV) surveillance systems are currently installed in various public places monitoring indoors and outdoors applications which may gain an early fire detection capability with the use of fire detection. This fire detection is done by using software processing the outputs of CCTV cameras in real time. Then, camera is kept under

surveillance that regularly records the motion of activities that happens daily. If any fire accident occurs, it immediately captures and compares with the trained data set. If the compared image is true it sends a fire alert message to the fire station. The advantage of this method is that it could produce the images continuously and also sends an alert message to the fire station.

4. SYSTEM ARCHITECTURE

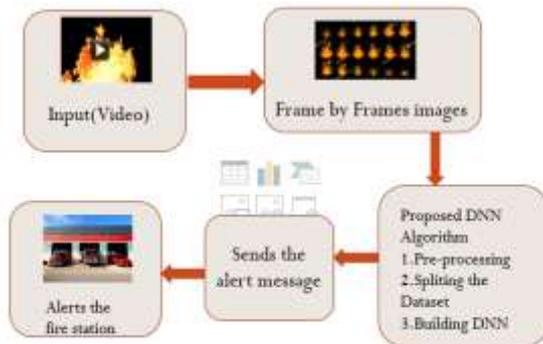


Fig.2: System Architecture

In system architecture, the input data is the surveillance video then the images in the video is splitted into frame by frame. Then the DNN's Squeeze Net algorithm performs the pre-processing technique, then splits the dataset which is trained already and at last build the DNN. Then after detecting the fire it sends an alert message and it alerts the fire station.

5. METHODOLOGY

5.1 DATASET CREATION:

To Collect images of fire and non-fire images and train both the fire and non-fire images separately. Now there created a trained dataset with well determined fire images which compares with the video sequence.

FRAME BY FRAME DETECTION

The captured images are splitted into frame by frame and the frame is again splitted into pixels with the help of the SqueezeNet algorithm from the surveillance

WORK OF DNN

As the Deep neural network can perform complex calculations , we use DNN's Squeeze Net to get accurate images of fire from the surveillance video .The Squeeze Net can compress the images upto 5mb from the original size of the image .So this reduces the consumption of less memory and the rate of accuracy is higher when compared to other algorithms.

6. CONCLUSION

Thus, this model proposes if any fire accident occurs, it immediately captures and compares with the trained data set. If the compared image is true it sends a fire alert message to the fire station. The alert message is sent immediately to the fire station and the accidents could be reduced. The future of our project is to develop an application which helps common people in an emergency situation. This app first will have a simple page which directs us to the camera and helps in video capturing. Then when the fire is detected it will ask us to choose the options like the fire station, police station and hospital. Once chosen it will automatically call the emergency number which is already fed.

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