**Efficient Fire Detection for Uncertain Surveillance Environment**

**Alternative title**:

 Detect fire in uncertain IoT environment using Convolutional neural network

**Aim**:

 To mainstay of this project is to efficiently apply CNN for fire detection in videos captured in uncertain surveillance scenarios

**Synopsis:**

 Tactile Internet can combine multiple technologies by enabling intelligence via mobile edge computing and data transmission over a 5G network. Recently, several convolutional neural networks (CNN) based methods via edge intelligence are utilized for fire detection in certain environment with reasonable accuracy and running time. However, these methods fail to detect fire in uncertain IoT environment having smoke, fog, and snow. Furthermore, achieving good accuracy with reduced running time and model size is challenging for resource constrained devices.

**Existing System:**

 To detect fire, researchers have presented both traditional and learned representation based fire detection methods. In literature, the traditional methods use either color or motion characteristics for fire detection. For instance, used color features for fire detection by exploring different color models including HSI, YUV, YCbCr, RGB, and YUC. The major issue with these methods is their high rate of false alarms. Several attempts have been made to solve this issue by combing the color information with motion and analyses of fire’s shape and other characteristics

**Proposed System**

 We propose an efficient CNN based system for fire detection in videos captured in uncertain surveillance scenarios. Our approach uses light-weight deep neural networks with no dense fully connected layers, making it computationally inexpensive. Experiments are conducted on benchmark fire datasets and the results reveal the better performance of our approach compared to state-of-the-art. Considering the accuracy, false alarms, size, and running time of our system, we believe that it is a suitable candidate for fire detection in uncertain IoT environment for mobile and embedded vision applications during surveillance.

**Module Description:**

* CNN based Fire Detection
* Details of the Proposed Architecture for Fire Detection
* Motivations of using Mobile Net for Fire Detection

**CNN based Fire Detection:**

 In case of fire detection, a CNN architecture is usually changed such that the final fully connected layer has two classes i.e., fire and non-fire. The input fire data is provided to the intended CNN for training during which the weights of a large number of neurons are adjusted and learnt for classification into fire and non-fire.

**Details of the Proposed Architecture for Fire Detection**

 MobileNet (v2) version better than other models such as Alex Net, Google Net and Squeeze Net. Thus, we use a model with similar architecture to MobileNet and modify it according to fire detection problem in uncertain surveillance environment. To this end, we kept the number of neurons to two instead of 1000 in the final layer of our architecture, enabling classification into fire and non-fire.

**Motivations of using MobileNet for Fire Detection:**

 Compared to other CNN models, we use MobileNet due to its higher feasibility for memory and bandwidth-restricted hardware architectures

**Algorithm Used:**

 **CNN-Convolution Neural Network**

**Software Requirements:**

* Operating System : Windows 7 , 8, 10 (64 bit)
* Software : Python 3.7
* Tools : Anaconda (Jupyter Note Book IDE)

**Hardware Requirements:**

* Hard Disk : 500GB and Above
* RAM : 4GB and Above
* Processor : I3 and Above
* Webcam 1

**Architecture Diagram:**

Classification

Convolutional neural network

Webcam

Fire Detection

Video Stream

