

Fire Detection in CCTV Surveillance

Team: AI_Engineers

Objective:

One of the most common anomalies is fire accidents. This can happen due to short circuits in buildings and car accidents also might lead to fire. In this we build a fire detection system which detects fire from a CCTV surveillance video and sends an alert to the authorities.

Dataset:

For this we have scrapped images containing Fire and also images which don't have fire in it. We made it into a complete dataset. Now it is also available in kaggle as a [Fire Detection Dataset](#). Dataset is splitted into test, train and validation sets. Here is the overview of the dataset directory

```
|- Fire_Detection_Data
    |- test
        |- Fire (87 images)
        |- no-Fire (79 images)

    |- train
        |- Fire (692 images)
        |- no-Fire (628 images)

    |- val
        |- Fire (86 images)
        |- no-Fire (78 images)
```

Model:

We have also created a custom model for our problem.

```
tf.keras.layers.MaxPooling2D(pool_size = (3,3), strides=(2,2)),
tf.keras.layers.Conv2D(384, (5,5), activation='relu'),
tf.keras.layers.MaxPooling2D(pool_size = (3,3), strides=(2,2)),
tf.keras.layers.Flatten(),
```

```
tf.keras.layers.Dropout(0.2),  
tf.keras.layers.Dense(2048, activation='relu'),  
tf.keras.layers.Dropout(0.25),  
tf.keras.layers.Dense(1024, activation='relu'),  
tf.keras.layers.Dropout(0.2),  
tf.keras.layers.Dense(2, activation='softmax')  
])  
model.compile(loss='categorical_crossentropy',optimizer=Adam(lr=0.0001),metrics=['acc'])  
model.fit(train_generator,epochs = 50,validation_data = validation_generator, shuffle = True)  
model.save('fire_model.hdf5')
```

Model is trained for 50 epochs. The accuracy was about 97%.

Proposed Method:

At first we train our model with the above dataset and our costum model proposed anova and then we divide the video into frames, then the model detects there is any fire. Finally we get the fire alert if the fire continues for more than 8 frames.

Work Done:

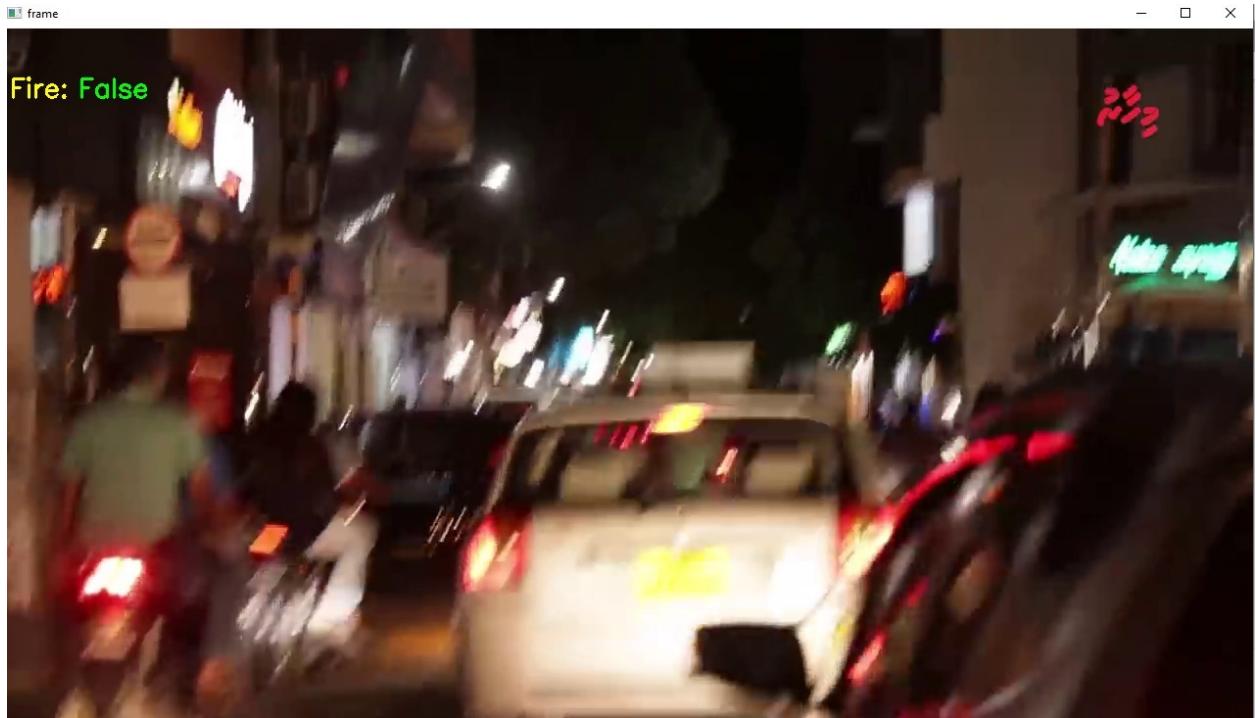
Using the trained model, we will be using a random fire accident video to check whether our model is working correctly.

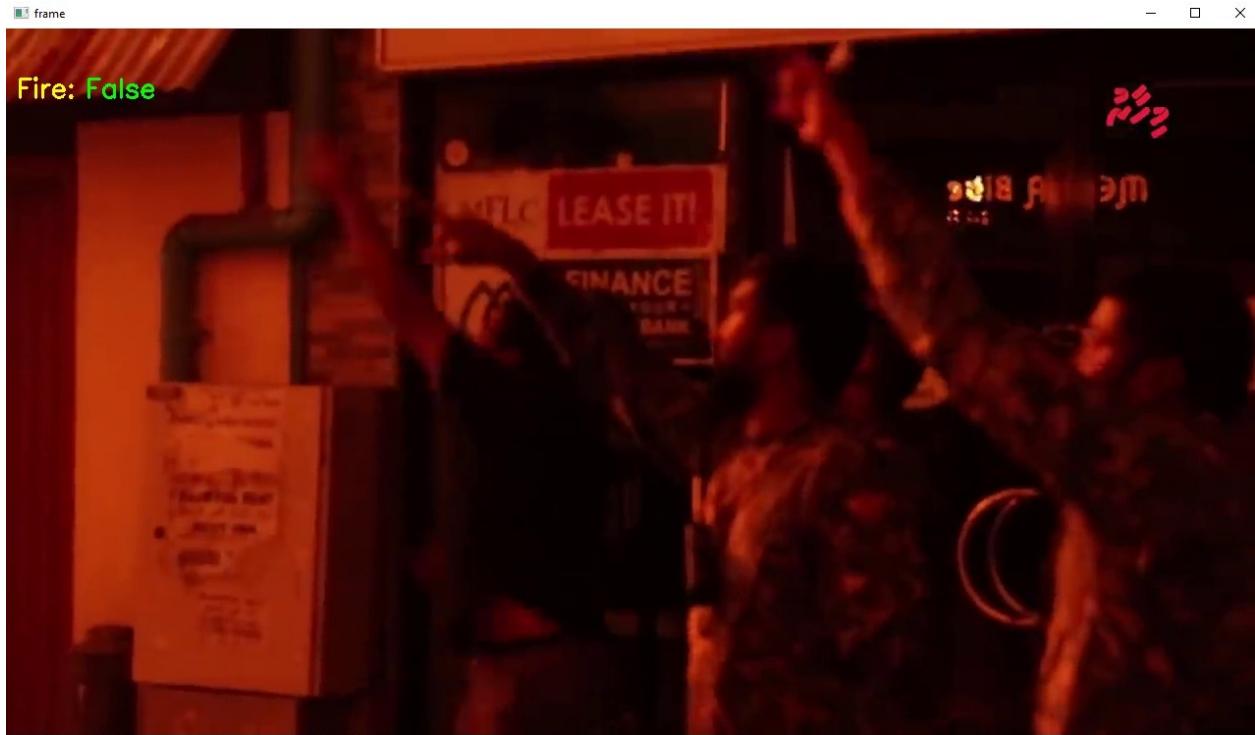
We will be looping through the frames of the video. And we will check whether there is fire or not.

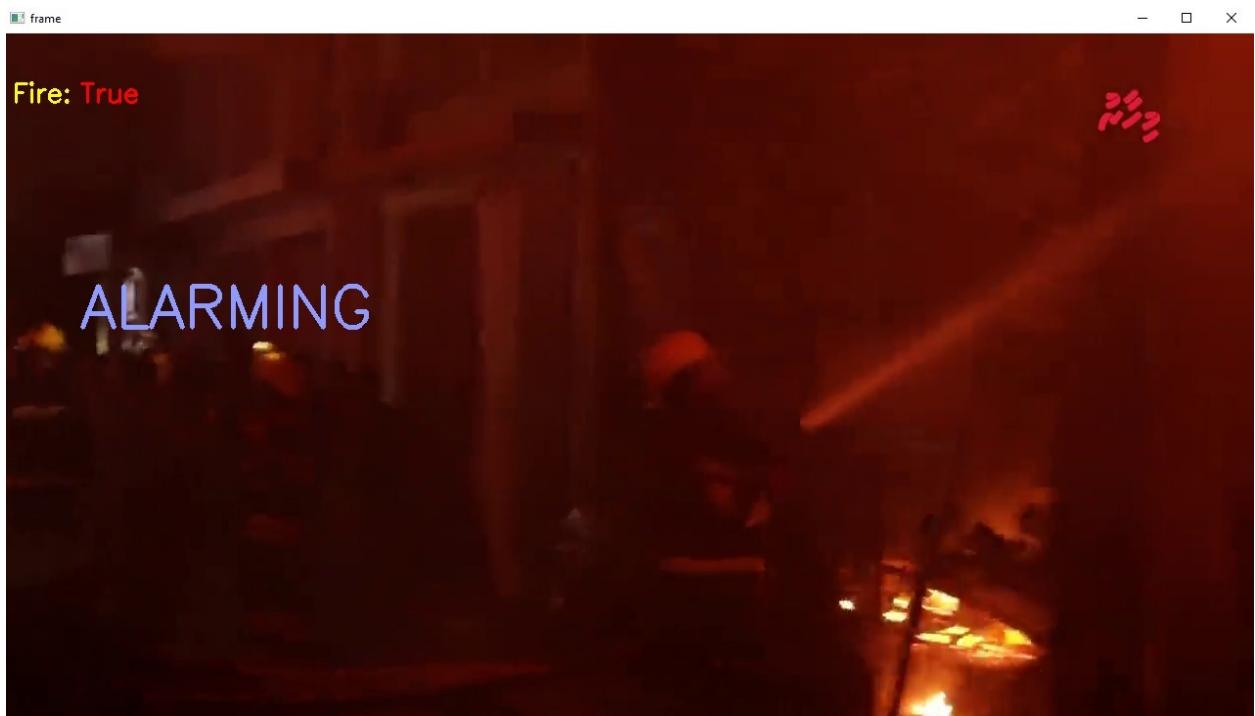
And also, we will be alarming everyone if it is continuous fire. So checking whether it continues to fire we will be saving the label data for some particular frames and if it has the highest number of True for fire then we will be alarmed.

Results:

We have tested our model with a few fire accident videos. It works perfectly for it. Here we have attached the snap of the output video.







Conclusion:

This model gives good accuracy and fits properly so we can use it in real time prediction. Where every footage of the CCTV in an area is sent to a central server and in that server it detects. The fire alert and notify the authorities with the final picture of

the fire accident and the location of the accident. So that the fire engine and the rescue team is sent to the spot.