Emerging methods for early detection of forest fires

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ABSTRACT :

Forest fire is an alarm in condition which occurs in boreal, tropical as well as temperal forests due to natural causes such as volcanic eruption, high atmospheric temperature and dryness (low humidity) and man made causes such as cigarettes discarded with flame,campus left unattended, burning of debris equipment use and malfunctions, leftovers of ignited flammable products which not only causes harmful effects on the ecosystem but also for human beings who are living in the forest(tribes) as well as the surrounding areas. So it is necessary to prevent fires that are occurring in the forest. Which saves not only the natural resources but also has a good impact in uplifting the quality of environment.

INTRODUCTION:

The main objective of a project is to detect the fires occurring in the forest. For this we have created a convolution neural network that predicts the fire.This project is an attempt to use convolutional neural networks (CNN) to detect the presence or the start of a forest fire in an image. The model could be process in open cv and applied in real-time to low-framerate surveillance video (with fires not moving that much fast, this assumption is somewhat sound) and give alert in case of fire.

EXISTING SOLUTIONS:

- Aerial monitoring of forest fire using drone Cameras operated in remote locations
- Use of various sensors such as smoke, flame, gas etc…to sense and detect fire
- Human surveillance for forest
- Thermal imaging of forest
- Use of satellite images to detect fire

PROPOSED SOLUTION:

Using deep learning (convolutional neural network) to predict the forest fire.

The process is briefly described below:

COLLECTION OF DATASET:

The model is trained on a provided dataset which contains images of : 'fire' and 'no fire', totallyaround 1900 images. These images are mostly of forest or forest-like environments like sea shore, river banks, ponds, beach, etc….

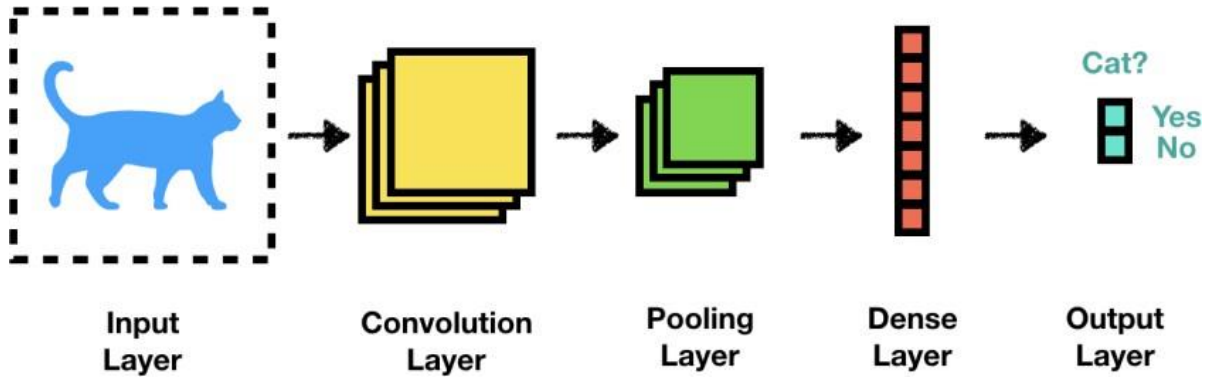
DATA PROCESSING:

First importing the required libraries and then splitting the collected data into training as well as testing.1520 images are used for training and 380 images are used for testing. Then we perform data augmentation where we increase our availabe datasets by rotating, flipping,shearing, scaling, cropping,etc..This helps in reducing the chances of overfitting when training our model.Now we have more data to perform better.

BUILDING THE MODEL:

Importing the required libraries and since we are building our model to get 1 input and give back 1 output we are initiating the model as sequential. Adding the convolution layer,max pooling layer as well as flatten layer. Then passing it to a fully connected layer which is nothing but a Artificial neural network layers(i.e the input layer, hidden layer, output layer). The activation function for hidden layer is specified as relu(rectified linear activation function) and the activation function for output layer is given as sigmoid. Then the model is compiled with optimizer as adam , loss function as binary-cross-entropy(since our model is a binary

classification model and setting the metrics to accuracy. Training the model, setting epoch value as 10.



Accuracy vs loss(during training):

Epoch	Accuracy	Loss	Val-loss	Val-accuracy
1	0.8612	0.5750	0.9289	0.2057
2	0.9151	0.2386	0.9151	0.1584
3	0.9461	0.1595	0.9316	0.1794
4	0.9526	0.1530	0.9026	0.2408
5	0.9480	0.1525	0.9237	0.1976
6	0.9342	0.1873	0.9289	0.1569
7	0.9507	0.1657	0.9421	0.1541
8	0.9533	0.1549	0.9316	0.1917
9	0.9513	0.1451	0.9368	0.1848
10	0.9520	0.1589	0.1496	0.9447

After this saving our model in .H5 format.

TESTING THE MODEL:

Then testing our model by providing the data that is allocated for testing. We can use our saved model file for video analysis of forest fire and use it in real time surveillance camera for real time prediction.

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