Project Report on Detecting Fire combustion in forest using IBM Watson Studio

Done by : MOHIT HARPALANI

Academy of Higher Education - Dubai Campus

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Abstract-:

Every year, fire destroys millions of hectares of forest. When forest fuels are burned, oxygen in the air is combined with woody material, resulting in a chemical reaction.pitch and other flammable substances found in the woods,surroundings. Every year, one million people die in the United States alone.Thousands of wildfires have engulfed the country, destroying over nine million acres of land.

The detection of forest fires is critical.

Early recognition of fire and monitoring of possible risk areas can drastically minimize reaction time and costs.The theory for damage as well as the expense of firefighting are both factors to consider.

Because wildfires cannot be entirely extinguished, IBM Watson Studio use artificial intelligence and machine learning to identify and battle flames more quickly and efficiently, as well as to notify firefighters and the general public.

I utilized Watson Studio to train my Convolution Neural Network (CNN), test the model, and deploy the model. As a result, technology has the potential to improve fire response significantly and management.

Introduction-:

Forest fires occur all year, with greater severity in the summer and fall seasons, and generally cause catastrophic harm to both nature and humans. Forest fires are mostly caused by human activity, such as lightning strikes, spontaneous combustion of dry leaves or saw dust, and are regarded as a major contributor to air pollution. Various techniques have been used to combat forest fires throughout the years, with the primary goal of early identification of flames.

The continuous evaluation of information and communication technology has resulted in the introduction of a new generation of solutions for early detection and prevention of forest fires, such as the deployment of a machine learning model using IBM Watson studio and the application of a convolution neural network. When compared to previous approaches such as sensors, ICT-based camera networks, and satellite technology, the usage of these technologies is far more cost efficient and dependable. It aids in the prevention of forest fires by utilizing the two technologies mentioned above.

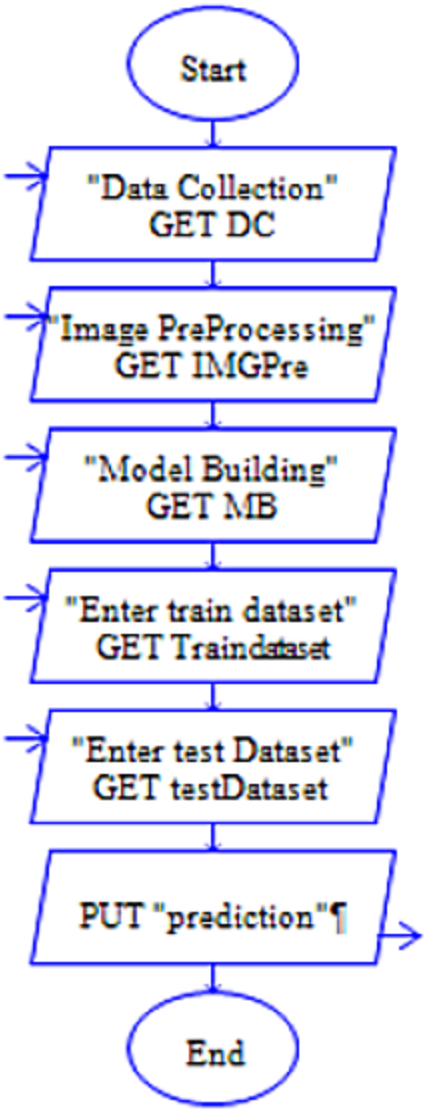
Literature Review-:

Problem Statement: Recently, there has been a lot of attention paid to forest fire disasters all around the world. Significant causes of forest fires are either human or environmental in nature. Human-induced forest fires can be caused by picnic fires, shepherd fires, smoking and tossing cigarettes, sparks in power lines, explosives, hunting fires, and so on. Forest fires are triggered by lightning strikes, which can occur because of high ambient temperatures, meteorological variables such as temperature, relative humidity, wind speed, rainfall, and so on.

Solution: The continuous evaluation of information and communication technology has resulted in the introduction of a new generation of solutions for early detection and prevention of forest fires, such as the deployment of a machine learning model using IBM Watson studio and the application of a convolution neural network.

Implementing the solutions mentioned above will aid in the early identification of forest fires worldwide, stopping them from spreading further.

Flow Chart-:


Start
"Data Collection"
GET DC
"Image PreProcessing"
GET IMGPre
"Model Building"
GET MB
"Enter train dataset"
GET Traindataset
"Enter test Dataset"
GET testDataset
PUT "prediction"¶
End

System Requirements-:

System Requirement

Software-:

Jupyter Notebook

Anaconda Navigator

Anaconda Prompt

IBM Cloud Account for Machine Learning

Activities Zoho writer for Document

Hardware Processor :

Intel Core i7 10510u

Secondary Storage Device =512 G

Experimental Results-:

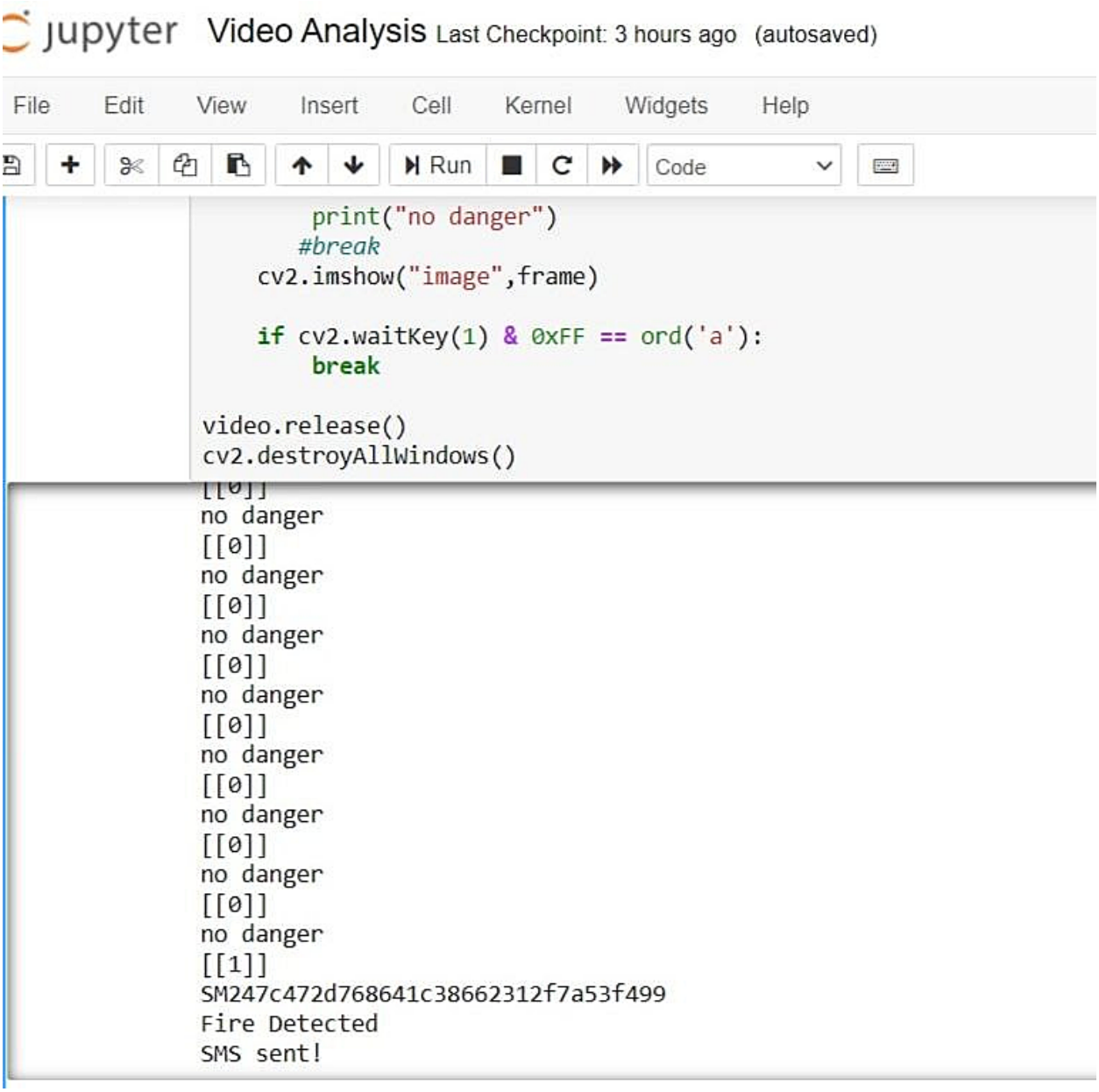
Experimental Results Output on Training the model on Local System

```
In [19]: model.fit_generator(x_train,steps_per_epoch=5,epochs=10,validation_data=x_test,validation_steps=5)

WARNING:tensorflow:From C:\Users\ACER\AppData\Local\Temp/ipykernel_14928/127651181.py:1: Model.fit_generator (from tensorflow.python.keras.engine.training) is deprecated and will be removed in a future version.
Instructions for updating:
Please use Model.fit, which supports generators.
Epoch 1/10
5/5 [==============================] - ETA: 0s - loss: 1.2319 - accuracy: 0.5143WARNING:tensorflow:Your input ran out of data; interrupting training. Make sure that your dataset or generator can generate at least `steps_per_epoch * epochs` batches (in this case, 5 batches). You may need to use the repeat() function when building your dataset.
5/5 [==============================] - 18s 4s/step - loss: 1.2319 - accuracy: 0.5143 - val_loss: 0.3287 - val_accuracy: 0.8595
Epoch 2/10
5/5 [==============================] - 10s 2s/step - loss: 0.8572 - accuracy: 0.7625
Epoch 3/10
5/5 [==============================] - 7s 1s/step - loss: 0.6393 - accuracy: 0.7071
Epoch 4/10
5/5 [==============================] - 6s 1s/step - loss: 0.4317 - accuracy: 0.7929
Epoch 5/10
5/5 [==============================] - 8s 2s/step - loss: 0.3036 - accuracy: 0.8500
Epoch 6/10
5/5 [==============================] - 10s 2s/step - loss: 0.3049 - accuracy: 0.8687
Epoch 7/10
5/5 [==============================] - 7s 1s/step - loss: 0.2526 - accuracy: 0.8750
Epoch 8/10
5/5 [==============================] - 10s 2s/step - loss: 0.2305 - accuracy: 0.9214
Epoch 9/10
5/5 [==============================] - 8s 2s/step - loss: 0.2255 - accuracy: 0.8875
Epoch 10/10
5/5 [==============================] - 9s 2s/step - loss: 0.2218 - accuracy: 0.8938

Out[19]: <tensorflow.python.keras.callbacks.History at 0x1e1e1dab9d0>
```

VIDEO ANALYSIS OUTPUT



Experimental Analysis-:

Examination of experimental data While constructing the

machine learning model, I was exposed to a few data science libraries such as tensor flow, keras, and opencv for project objectives. I was also exposed to numpy and pandas libraries, as well as the concepts of Artificial Neural Network, Recurrent Neural Network, and Convolutional Neural Network.
We were also given lab sessions to help us grasp ideas by completing lab work on Jupyter notebooks. The major use of this model is to forecast whether the supplied image contains a forest fire. It has been thoroughly trained to anticipate the right data.

Advantages and Disadvantages of Convolutional Neural Network(CNN) -:

CNN has the following benefits:

1. It detects important characteristics without the need for human involvement.

2.Low dependence on pretreatment

3. It is simple to understand and put into practice.

4. It has the highest level of accuracy of any image prediction system.

5. It creates a dense network that is effective in prediction and identification.

CNN's drawbacks include:

1. A Convolutional Neural Network is significantly slower due to operations such as maxpool.

2. For a ConvNet to process and train the neural network, a large dataset is necessary.

3. If the CNN has several layers, the training procedure will take a lengthy time if the computer has a powerful Graphical Pro.

4. A large amount of training data is required.

5. Does not encode the object's location and orientation

Future Scope-:

Artificial Intelligence and Machine Learning may be used to detect forest fires by focusing on daytime photos and

identifying smoke and flames quickly, decreasing false positives and the time it takes for fire crews to arrive on the site. Second, a system may be developed to identify whether any trees or plants are overgrown or too close to electricity lines. As a result, they can respond quickly and prevent forest fires.