PROJECT DEVELOPMENT PHASE

SPRINT-II

Date	10 November 2022
Team ID	PNT2022TMID37914
Project Name	Natural Disaster Intensity Analysis and Classification using Artificial Intelligence

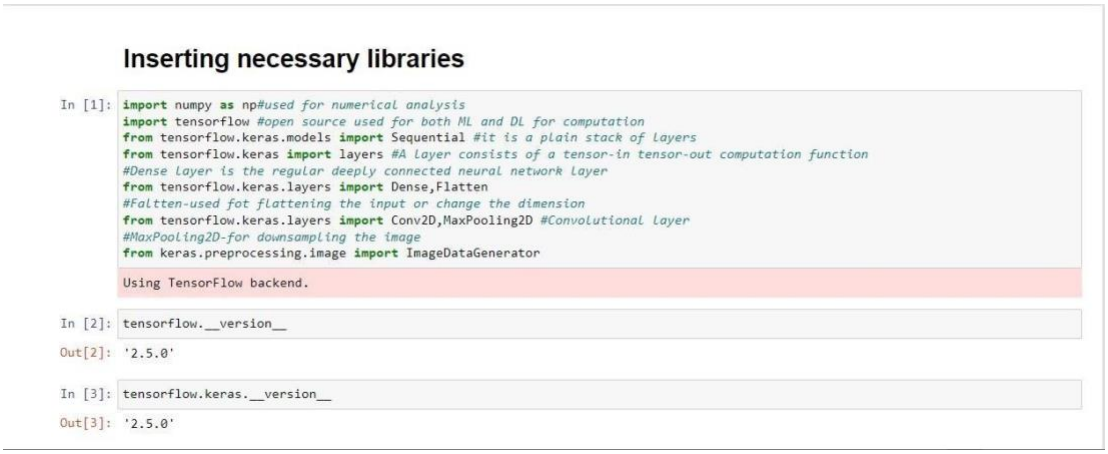
INSERTING NECESSARY LIBRARIES:

Numpy: It is an open source numerical python library.

Scikit-learn: It is a machine learning library for python.

OpenCV: OpenCV is a library of programming functions mainly aimed at real-time computer vision.

Flask: Web framework used for building web application.



Inserting necessary libraries

```
In [1]: import numpy as np#used for numerical analysis
        import tensorflow #open source used for both ML and DL for computation
        from tensorflow.keras.models import Sequential #it is a plain stack of layers
        from tensorflow.keras import layers #A layer consists of a tensor-in tensor-out computation function
        #Dense layer is the regular deeply connected neural network layer
        from tensorflow.keras.layers import Dense,Flatten
        #Faltten-used fot flattening the input or change the dimension
        from tensorflow.keras.layers import Conv2D,MaxPooling2D #Convolutional layer
        #MaxPooling2D-for downsampling the image
        from keras.preprocessing.image import ImageDataGenerator

        Using TensorFlow backend.

In [2]: tensorflow.__version__
Out[2]: '2.5.0'

In [3]: tensorflow.keras.__version__
Out[3]: '2.5.0'
```

LOADING DATA AND PERFORMING DATA AUGUMENTATION:

Loading the data into the Jupyter notebook by using RR dataset path.

Loading our data and performing Data Augumentation

```
In [5]: #performing data agumentation to train data
        x_train = train_datagen.flow_from_directory(r'C:\Users\ELCOT\Downloads\projest\ibm\dataset\train_set',target_size=(64, 64),batch_
                                                    color_mode='rgb',class_mode='categorical')
        #performing data agumentation to test data
        x_test = test_datagen.flow_from_directory(r'C:\Users\ELCOT\Downloads\projest\ibm\dataset\test_set',target_size=(64, 64),batch_si
                                                  color_mode='rgb',class_mode='categorical')

        Found 742 images belonging to 4 classes.
        Found 198 images belonging to 4 classes.

In [6]: print(x_train.class_indices)#checking the number of classes

        {'Cyclone': 0, 'Earthquake': 1, 'Flood': 2, 'Wildfire': 3}

In [7]: print(x_test.class_indices)#checking the number of classes

        {'Cyclone': 0, 'Earthquake': 1, 'Flood': 2, 'Wildfire': 3}

In [8]: from collections import Counter as c
        c(x_train .labels)

Out[8]: Counter({0: 220, 1: 156, 2: 198, 3: 168})
```

CREATING THE MODEL:

Creating the Model a Classifier Sequential. Classifier is a machine learning algorithm that determines the class of the input element based on the set of the feature. In this model using convolution2D function. Convolution2D parameter is an number of filters that convolution layer will be learn from. Then we will be using MaxPooling2D function. Then, using a Flatten() function that flatten the multidimensional input denser into the denser.

Creating the Model

```
In [9]: # Initializing the CNN
        classifier = Sequential()

        # First convolution layer and poolingo
        classifier.add(Conv2D(32, (3, 3), input_shape=(64, 64, 3), activation='relu'))
        classifier.add(MaxPooling2D(pool_size=(2, 2)))
        classifier.add(Conv2D(32, (3, 3), input_shape=(64, 64, 3), activation='relu'))
        # Second convolution layer and pooling
        classifier.add(Conv2D(32, (3, 3), activation='relu'))
        # input_shape is going to be the pooled feature maps from the previous convolution layer
        classifier.add(MaxPooling2D(pool_size=(2, 2)))
        classifier.add(Conv2D(32, (3, 3), input_shape=(64, 64, 3), activation='relu'))

        # Flattening the layers
        classifier.add(Flatten())

        # Adding a fully connected layer
        classifier.add(Dense(units=128, activation='relu'))
        classifier.add(Dense(units=4, activation='softmax')) # softmax for more than 2
```

Using classifier.summary() function summary of our model

```
In [10]: classifier.summary()#summary of our model

Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d (Conv2D)              (None, 62, 62, 32)        896
_________________________________________________________________
max_pooling2d (MaxPooling2D) (None, 31, 31, 32)        0
_________________________________________________________________
conv2d_1 (Conv2D)            (None, 29, 29, 32)        9248
_________________________________________________________________
conv2d_2 (Conv2D)            (None, 27, 27, 32)        9248
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 13, 13, 32)        0
_________________________________________________________________
conv2d_3 (Conv2D)            (None, 11, 11, 32)        9248
_________________________________________________________________
flatten (Flatten)            (None, 3872)              0
_________________________________________________________________
dense (Dense)                (None, 128)               495744
_________________________________________________________________
dense_1 (Dense)              (None, 4)                 516
=================================================================
Total params: 524,900
Trainable params: 524,900
Non-trainable params: 0
```

COMPILING THE MODEL:

The model is compiled using the following code.

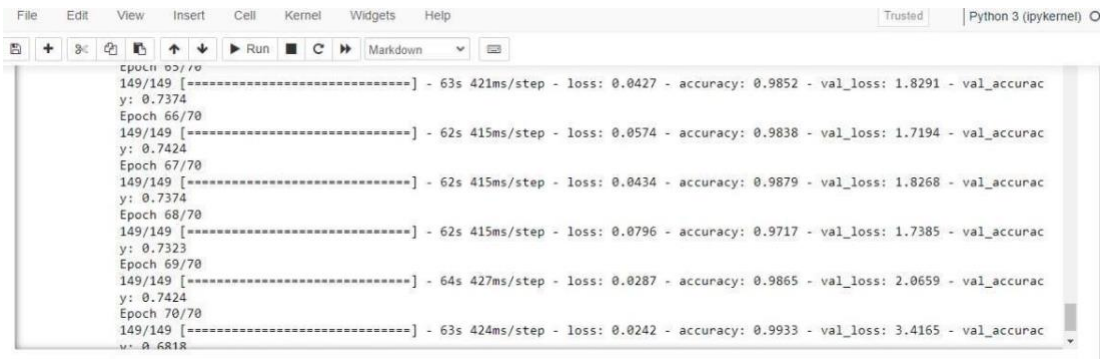
```
In [11]: # Compiling the CNN
         # categorical_crossentropy for more than 2
         classifier.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
```

FITTING THE MODEL:

Fitting the Model with 70 epoch.

SAVING THE MODEL:

Saving the Model as disaster.h5. disaster.h5 file is used to find the image



classification files. Model.json represents that Jason stands for JavaScript object

rotation, Jason is a lite weight data format used for data inserting between multiple different language.

Saving the Model

```
In [13]: # Save the model
         classifier.save('disaster.h5')

In [14]: model_json = classifier.to_json()
         with open("model-bw.json", "w") as json_file:
             json_file.write(model_json)
```

PREDICTING RESULTS:

Loading model from the tensorflow keras models and loading the image then converting image into array. Then predicting our model.

```
In [15]: from tensorflow.keras.models import load_model
         from keras.preprocessing import image
         model = load_model("disaster.h5") #loading the model for testing

In [ ]:

In [16]: img = image.load_img(r'C:\Users\ELCOT\Downloads\projest\ibm\dataset\test_set\Cyclone\870.jpg',grayscale=False, target_size= (64,6
         x = image.img_to_array(img)#image to array\n",
         x = np.expand_dims(x,axis = 0)#changing the shape\n",
         pred = model.predict_classes(x)#predicting the classes\n",
         pred

         C:\Users\ELCOT\anaconda3\lib\site-packages\tensorflow\python\keras\engine\sequential.py:455: UserWarning: `model.predict_classe
         s()` is deprecated and will be removed after 2021-01-01. Please use instead:* `np.argmax(model.predict(x), axis=-1)`,   if your
         model does multi-class classification   (e.g. if it uses a `softmax` last-layer activation).* `(model.predict(x) > 0.5).astype
         ("int32")`,   if your model does binary classification   (e.g. if it uses a `sigmoid` last-layer activation).
           warnings.warn('`model.predict_classes()` is deprecated and '

Out[16]: array([0], dtype=int64)

In [17]: index=['Cyclone','Earthquake','Flood','Wildfire']
         result=str(index[pred[0]])
         result

Out[17]: 'Cyclone'
```