

## PROJECT DEVELOPMENT PHASE

### SPRINT-III

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Team ID	PNT2022TMID37822
Project Name	Natural Disaster Intensity Analysis and Classification using Artificial Intelligence
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### 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
#Flatten-used for 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 augmentation to train data
x_train = train_datagen.flow_from_directory(r'C:\Users\ELCOT\Downloads\project\ibm\dataset\train_set',target_size=(64, 64),batch_size=32,color_mode='rgb',class_mode='categorical')

#performing data augmentation to test data
x_test = test_datagen.flow_from_directory(r'C:\Users\ELCOT\Downloads\project\ibm\dataset\test_set',target_size=(64, 64),batch_size=32,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 pooling
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
```

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 (MaxPooling2D)	(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

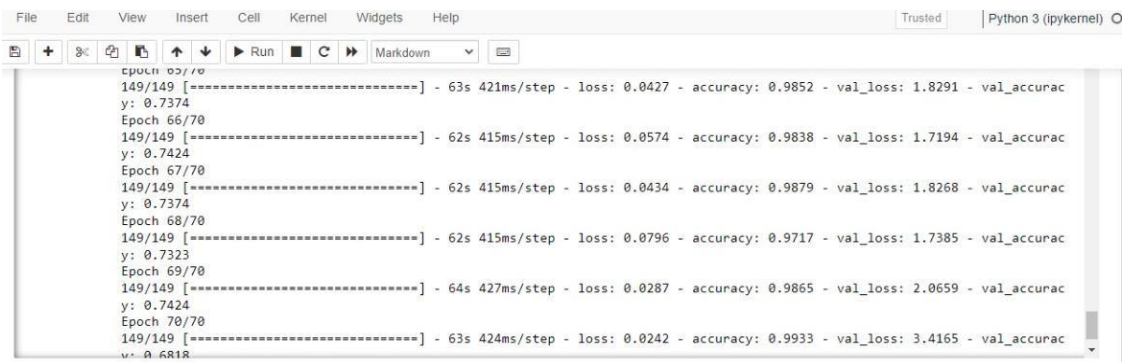
## **COMPILING THE MODEL:**

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.



```
File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)
149/149 [=====] - 63s 421ms/step - loss: 0.0427 - accuracy: 0.9852 - val_loss: 1.8291 - val_accuac
y: 0.7374
Epoch 66/70
149/149 [=====] - 62s 415ms/step - loss: 0.0574 - accuracy: 0.9838 - val_loss: 1.7194 - val_accuac
y: 0.7424
Epoch 67/70
149/149 [=====] - 62s 415ms/step - loss: 0.0434 - accuracy: 0.9879 - val_loss: 1.8268 - val_accuac
y: 0.7374
Epoch 68/70
149/149 [=====] - 62s 415ms/step - loss: 0.0796 - accuracy: 0.9717 - val_loss: 1.7385 - val_accuac
y: 0.7323
Epoch 69/70
149/149 [=====] - 64s 427ms/step - loss: 0.0287 - accuracy: 0.9865 - val_loss: 2.0659 - val_accuac
y: 0.7424
Epoch 70/70
149/149 [=====] - 63s 424ms/step - loss: 0.0242 - accuracy: 0.9933 - val_loss: 3.4165 - val_accuac
y: 0.6818
```

## **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\project\ibm\dataset\test_set\Cyclone\870.jpg', grayscale=False, target_size=(64,64))
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_classes()` 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'
```