Team ID	PNT2022TMID44165
Project Name	Project-Early detection of forest fire using deep learning

Importing Keras libraries

In [1]:

```
import keras
```

Importing ImageDataGenerator from Keras

In [2]:

```
from matplotlib import pyplot as plt
from keras.preprocessing.image import ImageDataGenerator
```

In [4]:

```
pip install ibm_watson_machine_learning
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/cola
b-wheels/public/simple/
Collecting ibm_watson_machine_learning
  Downloading ibm_watson_machine_learning-1.0.257-py3-none-any.whl (1.8 MB)
     |████████████████████████████████| 1.8 MB 29.1 MB/s
Requirement already satisfied: certifi in /usr/local/lib/python3.7/dist-pac
kages (from ibm_watson_machine_learning) (2022.9.24)
Collecting ibm-cos-sdk==2.7.*
  Downloading ibm-cos-sdk-2.7.0.tar.gz (51 kB)
     |████████████████████████████████| 51 kB 866 kB/s
Requirement already satisfied: importlib-metadata in /usr/local/lib/python3
.7/dist-packages (from ibm_watson_machine_learning) (4.13.0)
Collecting lomond
  Downloading lomond-0.3.3-py2.py3-none-any.whl (35 kB)
Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/dist-pac
kages (from ibm_watson_machine_learning) (1.24.3)
Requirement already satisfied: pandas<1.5.0,>=0.24.2 in /usr/local/lib/pyth
on3.7/dist-packages (from ibm_watson_machine_learning) (1.3.5)
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-pa
ckages (from ibm_watson_machine_learning) (2.23.0)
Requirement already satisfied: tabulate in /usr/local/lib/python3.7/dist-pa
ckages (from ibm_watson_machine_learning) (0.8.10)
Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-p
ackages (from ibm_watson_machine_learning) (21.3)
Collecting ibm-cos-sdk-core==2.7.0
  Downloading ibm-cos-sdk-core-2.7.0.tar.gz (824 kB)
     |████████████████████████████████| 824 kB 65.6 MB/s
```

```
Collecting ibm-cos-sdk-s3transfer==2.7.0
  Downloading ibm-cos-sdk-s3transfer-2.7.0.tar.gz (133 kB)
     |████████████████████████████████| 133 kB 68.8 MB/s
Collecting jmespath<1.0.0,>=0.7.1
  Downloading jmespath-0.10.0-py2.py3-none-any.whl (24 kB)
Collecting docutils<0.16,>=0.10
  Downloading docutils-0.15.2-py3-none-any.whl (547 kB)
     |████████████████████████████████| 547 kB 65.2 MB/s
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /usr/local/li
b/python3.7/dist-packages (from ibm-cos-sdk-core==2.7.0->ibm-cos-sdk==2.7.*
->ibm_watson_machine_learning) (2.8.2)
Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.7/di
st-packages (from pandas<1.5.0,>=0.24.2->ibm_watson_machine_learning) (1.21
.6)
Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/dis
t-packages (from pandas<1.5.0,>=0.24.2->ibm_watson_machine_learning) (2022.
6)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-pa
ckages (from python-dateutil<3.0.0,>=2.1->ibm-cos-sdk-core==2.7.0->ibm-cos-
sdk==2.7.*->ibm_watson_machine_learning) (1.15.0)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dis
t-packages (from requests->ibm_watson_machine_learning) (2.10)
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.
7/dist-packages (from requests->ibm_watson_machine_learning) (3.0.4)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-p
ackages (from importlib-metadata->ibm_watson_machine_learning) (3.10.0)
Requirement already satisfied: typing-extensions>=3.6.4 in /usr/local/lib/p
ython3.7/dist-packages (from importlib-metadata->ibm_watson_machine_learnin
g) (4.1.1)
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in /usr/local/lib/p
ython3.7/dist-packages (from packaging->ibm_watson_machine_learning) (3.0.9
)
Building wheels for collected packages: ibm-cos-sdk, ibm-cos-sdk-core, ibm-
cos-sdk-s3transfer
  Building wheel for ibm-cos-sdk (setup.py) ... done
  Created wheel for ibm-cos-sdk: filename=ibm_cos_sdk-2.7.0-py2.py3-none-an
y.whl size=72563 sha256=5e1b00b96524160d8ef5421121f9a0b0534c97164c844c2b4a5
715fae47ae400
  Stored in directory: /root/.cache/pip/wheels/47/22/bf/e1154ff0f5de93cc477
acd0ca69abfbb8b799c5b28a66b44c2
  Building wheel for ibm-cos-sdk-core (setup.py) ... done
  Created wheel for ibm-cos-sdk-core: filename=ibm_cos_sdk_core-2.7.0-py2.p
y3-none-any.whl size=501013 sha256=7d528d6a6617defa0d8f2e942488b2c37fba6347
e8cd10b61d82c14d1bbcdf99
  Stored in directory: /root/.cache/pip/wheels/6c/a2/e4/c16d02f809a3ea998e1
7cfd02c13369281f3d232aaf5902c19
  Building wheel for ibm-cos-sdk-s3transfer (setup.py) ... done
  Created wheel for ibm-cos-sdk-s3transfer: filename=ibm_cos_sdk_s3transfer
-2.7.0-py2.py3-none-any.whl size=88622 sha256=1655c3084b8eb70b74e640f4f06c4
797f346fa3e7c09b8ab2127958c8069ea60
  Stored in directory: /root/.cache/pip/wheels/5f/b7/14/fbe02bc1ef1af890650
c7e51743d1c83890852e598d164b9da
Successfully built ibm-cos-sdk ibm-cos-sdk-core ibm-cos-sdk-s3transfer
Installing collected packages: jmespath, docutils, ibm-cos-sdk-core, ibm-co
s-sdk-s3transfer, lomond, ibm-cos-sdk, ibm-watson-machine-learning
  Attempting uninstall: docutils
    Found existing installation: docutils 0.17.1
```

```
    Uninstalling docutils-0.17.1:
      Successfully uninstalled docutils-0.17.1
Successfully installed docutils-0.15.2 ibm-cos-sdk-2.7.0 ibm-cos-sdk-core-2
.7.0 ibm-cos-sdk-s3transfer-2.7.0 ibm-watson-machine-learning-1.0.257 jmesp
ath-0.10.0 lomond-0.3.3
```

In [11]:

```
pip install watson-machine-learnig-client --upgrade
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/cola
b-wheels/public/simple/
ERROR: Could not find a version that satisfies the requirement watson-machi
ne-learnig-client (from versions: none)
ERROR: No matching distribution found for watson-machine-learnig-client
```

In [12]:

```
import ibm_watson_machine_learning
from ibm_watson_machine_learning import APIClient
wml_credentilas = {
                   "url":"https://us-south.ml.cloud.ibm.com",
                   "apikey":"hxe6koyIaU12_be6Qw-sQ8omzOrg9czDp9Ep11YppBs6"
}
client = APIClient(wml_credentilas)
```

```
Python 3.7 and 3.8 frameworks are deprecated and will be removed in a futur
e release. Use Python 3.9 framework instead.
```

In [13]:

```
def guid_from_space_name(client, space_name):
    space = client.spaces.get_details()
    return(next(item for item in space['resources'] if
item['entity']["name"] == space_name)['metadata']['id'])
```

In [14]:

```
space_uid = guid_from_space_name(client, 'Forestrecognition')
print("Space UID = " + space_uid)
```

```
Space UID = 2bae4b0b-57cd-4fd3-89ef-5fc4a44867a5
```

In [15]:

```
client.set.default_space(space_uid)
```

Out[15]:

```
'SUCCESS'
```

In [21]:

```
client.repository.download('1baa1aab-07c5-4a4a-a297-
9b4c3444d699','forest.tar.gz')
```

```
Successfully saved model content to file: 'forest.tar.gz'
```

Out[21]:

```
'/content/forest.tar.gz'
```

In [16]:

```
client.software_specifications.list()
```

```
------------------------------  ------------------------------------  ----
NAME                            ASSET_ID                              TYPE
default_py3.6                   0062b8c9-8b7d-44a0-a9b9-46c416adcbd9  base
kernel-spark3.2-scala2.12       020d69ce-7ac1-5e68-ac1a-31189867356a  base
pytorch-onnx_1.3-py3.7-edt      069ea134-3346-5748-b513-49120e15d288  base
scikit-learn_0.20-py3.6         09c5a1d0-9c1e-4473-a344-eb7b665ff687  base
spark-mllib_3.0-scala_2.12      09f4cff0-90a7-5899-b9ed-1ef348aebdee  base
pytorch-onnx_rt22.1-py3.9       0b848dd4-e681-5599-be41-b5f6fccc6471  base
ai-function_0.1-py3.6           0cdb0f1e-5376-4f4d-92dd-da3b69aa9bda  base
shiny-r3.6                      0e6e79df-875e-4f24-8ae9-62dcc2148306  base
```

```
tensorflow_2.4-py3.7-horovod   1092590a-307d-563d-9b62-4eb7d64b3f22  base
pytorch_1.1-py3.6              10ac12d6-6b30-4ccd-8392-3e922c096a92  base
tensorflow_1.15-py3.6-ddl      111e41b3-de2d-5422-a4d6-bf776828c4b7  base
autoai-kb_rt22.2-py3.10        125b6d9a-5b1f-5e8d-972a-b251688ccf40  base
runtime-22.1-py3.9             12b83a17-24d8-5082-900f-0ab31fbfd3cb  base
scikit-learn_0.22-py3.6        154010fa-5b3b-4ac1-82af-4d5ee5abbc85  base
default_r3.6                   1b70aec3-ab34-4b87-8aa0-a4a3c8296a36  base
pytorch-onnx_1.3-py3.6         1bc6029a-cc97-56da-b8e0-39c3880dbbe7  base
kernel-spark3.3-r3.6           1c9e5454-f216-59dd-a20e-474a5cdf5988  base
pytorch-onnx_rt22.1-py3.9-edt  1d362186-7ad5-5b59-8b6c-9d0880bde37f  base
tensorflow_2.1-py3.6           1eb25b84-d6ed-5dde-b6a5-3fbdf1665666  base
spark-mllib_3.2                20047f72-0a98-58c7-9ff5-a77b012eb8f5  base
tensorflow_2.4-py3.8-horovod   217c16f6-178f-56bf-824a-b19f20564c49  base
runtime-22.1-py3.9-cuda        26215f05-08c3-5a41-a1b0-da66306ce658  base
do_py3.8                       295addb5-9ef9-547e-9bf4-92ae3563e720  base
autoai-ts_3.8-py3.8            2aa0c932-798f-5ae9-abd6-15e0c2402fb5  base
tensorflow_1.15-py3.6          2b73a275-7cbf-420b-a912-eae7f436e0bc  base
kernel-spark3.3-py3.9          2b7961e2-e3b1-5a8c-a491-482c8368839a  base
pytorch_1.2-py3.6              2c8ef57d-2687-4b7d-acce-01f94976dac1  base
spark-mllib_2.3                2e51f700-bca0-4b0d-88dc-5c6791338875  base
pytorch-onnx_1.1-py3.6-edt     32983cea-3f32-4400-8965-dde874a8d67e  base
spark-mllib_3.0-py37           36507ebe-8770-55ba-ab2a-eafe787600e9  base
spark-mllib_2.4                390d21f8-e58b-4fac-9c55-d7ceda621326  base
autoai-ts_rt22.2-py3.10        396b2e83-0953-5b86-9a55-7ce1628a406f  base
xgboost_0.82-py3.6             39e31acd-5f30-41dc-ae44-60233c80306e  base
pytorch-onnx_1.2-py3.6-edt     40589d0e-7019-4e28-8daa-fb03b6f4fe12  base
pytorch-onnx_rt22.2-py3.10     40e73f55-783a-5535-b3fa-0c8b94291431  base
default_r36py38                41c247d3-45f8-5a71-b065-8580229facf0  base
autoai-ts_rt22.1-py3.9         4269d26e-07ba-5d40-8f66-2d495b0c71f7  base
autoai-obm_3.0                 42b92e18-d9ab-567f-988a-4240ba1ed5f7  base
pmml-3.0_4.3                   493bcb95-16f1-5bc5-bee8-81b8af80e9c7  base
spark-mllib_2.4-r_3.6          49403dff-92e9-4c87-a3d7-a42d0021c095  base
xgboost_0.90-py3.6             4ff8d6c2-1343-4c18-85e1-689c965304d3  base
pytorch-onnx_1.1-py3.6         50f95b2a-bc16-43bb-bc94-b0bed208c60b  base
autoai-ts_3.9-py3.8            52c57136-80fa-572e-8728-a5e7cbb42cde  base
spark-mllib_2.4-scala_2.11     55a70f99-7320-4be5-9fb9-9edb5a443af5  base
spark-mllib_3.0                5c1b0ca2-4977-5c2e-9439-ffd44ea8ffe9  base
autoai-obm_2.0                 5c2e37fa-80b8-5e77-840f-d912469614ee  base
spss-modeler_18.1              5c3cad7e-507f-4b2a-a9a3-ab53a21dee8b  base
cuda-py3.8                     5d3232bf-c86b-5df4-a2cd-7bb870a1cd4e  base
autoai-kb_3.1-py3.7            632d4b22-10aa-5180-88f0-f52dfb6444d7  base
pytorch-onnx_1.7-py3.8         634d3cdc-b562-5bf9-a2d4-ea90a478456b  base
----------------------------  ------------------------------------  ----
Note: Only first 50 records were displayed. To display more use 'limit' par
ameter.
```

Predictions

In [17]:

```
software_spec_uid =
client.software_specifications.get_uid_by_name("tensorflow_rt22.1-py3.9")
software_spec_uid
```

Out[17]:

```
'acd9c798-6974-5d2f-a657-ce06e986df4d'
```

In [24]:

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, ca
ll drive.mount("/content/drive", force_remount=True).
```

In [ ]:

```
#import load model from keras.model
from keras.models import load_model
#import image from keras
import h5py as h5
from tensorflow.keras.preprocessing import image
import numpy as np
#import cv2
import cv2
#load the saved model
model=load_model('/content/forest.tar.gz')
img=image.load_img('/content/drive/MyDrive/IBM PROJECT/dataset/DATA
SET/archive/Dataset/Dataset/test_set/forest/0.72918000_1559733279_forests1_
gettyimages_.jpg')
x=image.img_to_array(img)
res=cv2.resize(x,dsize=(64,64),interpolation=cv2.INTER_CUBIC)
#expand the image shape
x=np.expand_dims(res,axis=0)
```

In [ ]:

```
pred=model.predict(x)
pred = int(pred[0][0])
pred
int(pred)
```

In [ ]:

```
if pred==1:
  print('Forest fire')
elif pred==0:
  print('No Fire')
```

Open cv for video processing

In [ ]:

```
pip install twilio
```

In [ ]:

```
pip install playsound
```

In [ ]:

```
from logging import WARNING
#import opencv library
import cv2
#import numpy
import numpy as np
#import image function from keras
from keras.preprocessing import image
#import load_model from keras
from keras.models import load_model
#import client from twilio API
from twilio.rest import Client
```

```
#import playsound package
from playsound import playsound
```

Creating An Account in Twilio Service

In [ ]:

```
from twilio.rest import Client
from playsound import playsound
if pred==1:
  print('Forest fire')
  account_sid='AC34c4bee5e03df7bc7dba1eef29761275'
  auth_token='1fc522239435d0c251c1fd870d715295'
  client=Client(account_sid,auth_token)
  message=client.messages \
  .create(
      body='forest fire is detected,stay alert',
      #use twilio free number
      from_='+19803934024',
      #to number
      to='+919962082226')
  print(message.sid)
  print("Fire detected")
  print("SMS Sent!")
```