

Configuration Manual

MSc Internship
Cyber Security

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National College of Ireland

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National College of Ireland
MSc Project Submission Sheet
School of Computing



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Programme:.....MSc Cybersecurity..... **Year:**2021.....

Module: ...Research Project

Lecturer: ...Dr. Imran Khan.....

Submission Due Date:16/12/2021.....

Project Title: ...Face Spoof Detection Using Ensemble Classifier.....

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Configuration Manual

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INTRODUCTION

In this write-up, you will find the step-by-step guide to completely reproduce the face spoofing detection using ensemble classifier. The steps followed to demonstrate the research are listed below.

HARDWARE CONFIGURATION OF COMPUTER USED

Device specifications

Device name	DESKTOP-FNI7B07
Processor	Intel(R) Core(TM) i7-7600U CPU @ 2.80GHz 2.90 GHz
Installed RAM	16.0 GB (15.9 GB usable)
Device ID	F8B8C7B5-688F-4C7C-8D45-2C490950D970
Product ID	00330-50959-02002-AAOEM
System type	64-bit operating system, x64-based processor
Pen and touch	Pen and touch support with 10 touch points

Copy

Rename this PC

Windows specifications

Edition	Windows 10 Pro
Version	20H2
Installed on	3/25/2021
OS build	19042.1165
Experience	Windows Feature Experience Pack 120.2212.3530.0

Copy

Fig 1: Configuration

The system properties of the computer system used in this research is as shown above in Fig 1. The windows

- Windows 10 Operating System
- 8GB of RAM,
- Intel(R) Core Processor with i5-7200U CPU and frequency speed at 2.50GHz 2.70 GHz.

The specification is the minimum required for running the simulation.

ENVIRONMENT SET-UP

Environment setup refers to the configuration of the computer system to a mode where the system can execute some specific commands.

PYTHON FOR WINDOWS

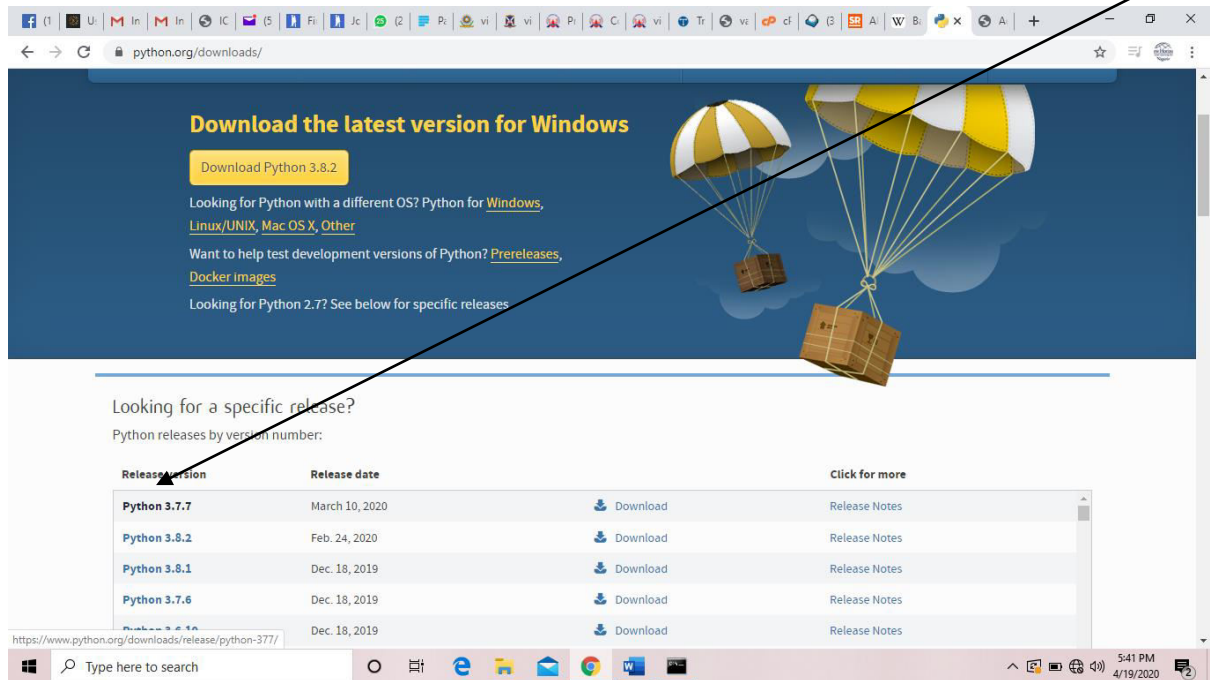


Fig 2. Download of Python

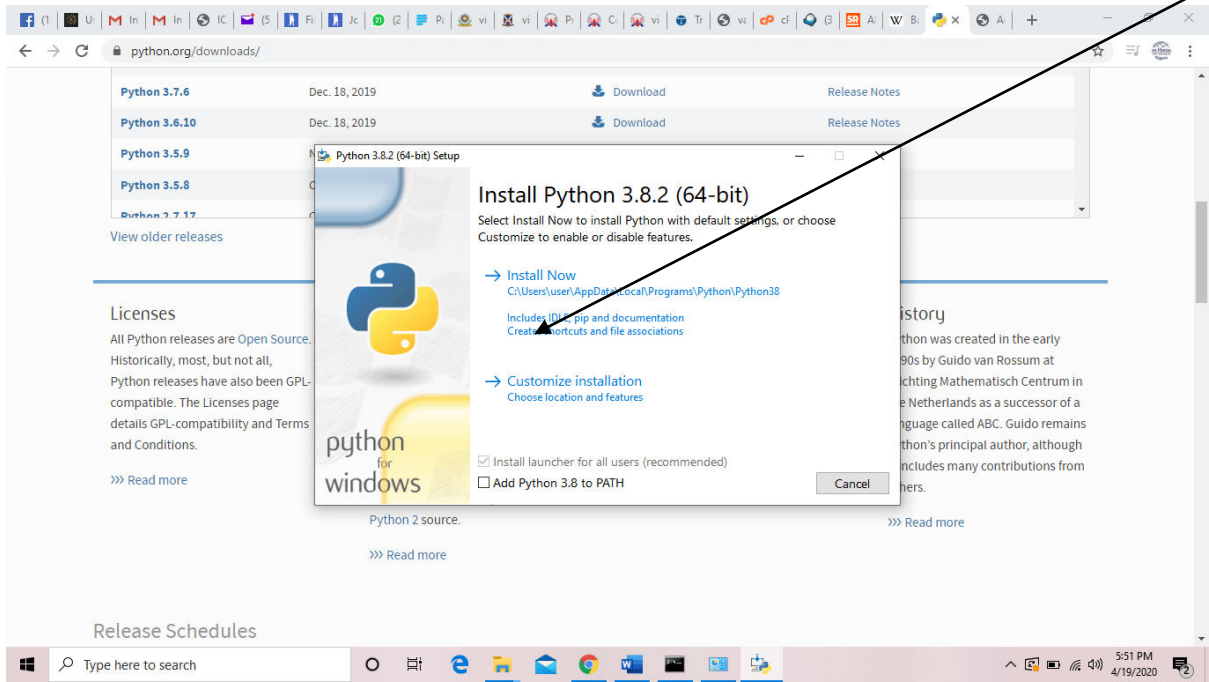


Fig 2.1 Installing Python software

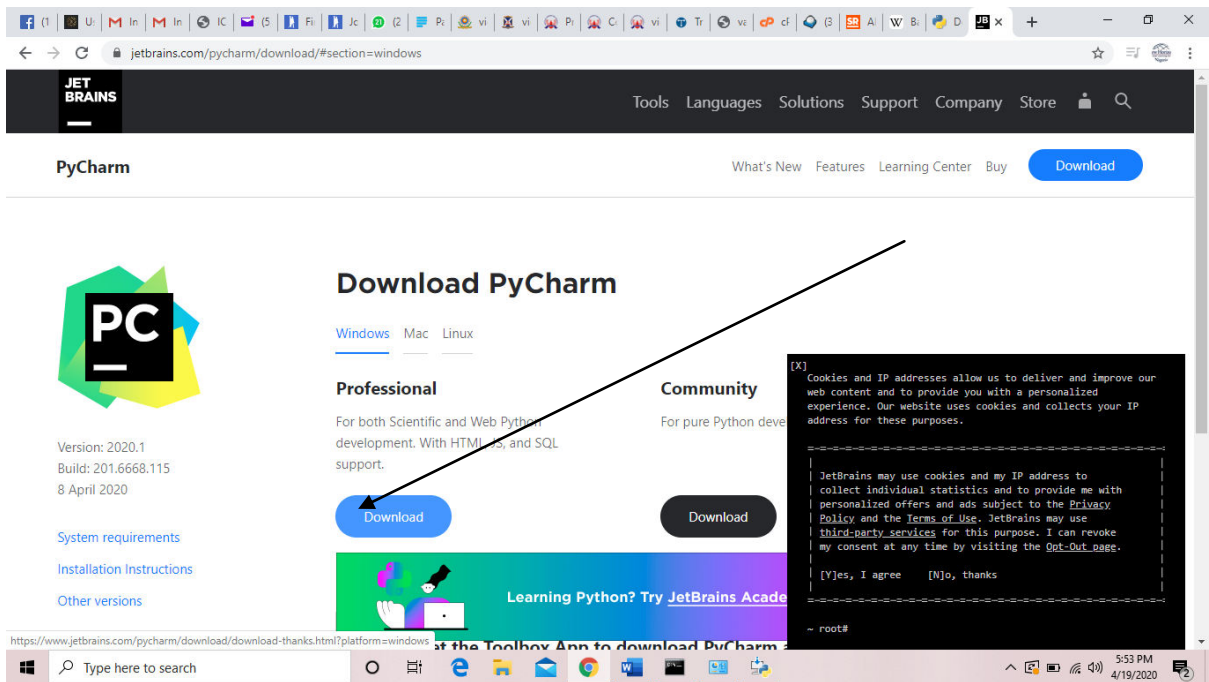


Fig 2.2 Pycharm IDE download

```

C:\Users\User\AppData\Local\Programs\Python>cd python38

C:\Users\User\AppData\Local\Programs\Python\Python38>pip install numpy
Requirement already satisfied: numpy in c:\users\user\appdata\local\programs\python\python36\lib\site-packages (1.18.2)
You are using pip version 18.1, however version 20.0.2 is available.
You should consider upgrading via the 'python -m pip install --upgrade pip' command.

C:\Users\User\AppData\Local\Programs\Python\Python38>pip install matplotlib
Collecting matplotlib
  Downloading https://files.pythonhosted.org/packages/59/77/7a13ef25b605311d8603074959c129cd60ef0eb26979aba7a7ed5b9e792/matplotlib-3.2.1-cp36-cp36m-win_amd64.whl (9.2M)
100% |#####| 9.2MB 241kB/s
Collecting kiwisolver>=1.0.1 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/2a/1e/f53031838c75cef71086ab7fc0dea1853d811ba3ec72465d78287723f09/kiwisolver-1.2.0-cp36-none-win_amd64.whl (57kB)
100% |#####| 61kB 1.1MB/s
Requirement already satisfied: numpy>=1.11 in c:\users\user\appdata\local\programs\python\python36\lib\site-packages (from matplotlib) (1.18.2)
Collecting cyclar=>0.10 (from matplotlib)
  Using cached https://files.pythonhosted.org/packages/f7/d2/e07d3ebb2bd7af69644ce7e754c59dd546ffe1bbe732c8ab689c834e61/cyclar-0.10.0-py2.py3-none-any.whl
Collecting pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/8a/bb/488841f56197b13700afd5658fc279a2025a39e22449b7cf29864669b15d/pyparsing-2.4.7-py2.py3-none-any.whl (67kB)
100% |#####| 71kB 1.2MB/s
Requirement already satisfied: python-dateutil>=2.1 in c:\users\user\appdata\local\programs\python\python36\lib\site-packages (from matplotlib) (2.8.1)
Requirement already satisfied: six in c:\users\user\appdata\local\programs\python\python36\lib\site-packages (from cyclar=>0.10->matplotlib) (1.14.0)
Installing collected packages: kiwisolver, cyclar, pyparsing, matplotlib
Successfully installed cyclar-0.10.0 kiwisolver-1.2.0 matplotlib-3.2.1 pyparsing-2.4.7
You are using pip version 18.1, however version 20.0.2 is available.
You should consider upgrading via the 'python -m pip install --upgrade pip' command.

C:\Users\User\AppData\Local\Programs\Python\Python38>

```

Fig 2.3 Pandas, Scikit-learn, numpy Python library installation via command prompt.

```

C:\Users\User\AppData\Local\Programs\Python\Python38>pip install tensorflow==2.0.0
Collecting markdown>=2.6.8 (from tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/ab/c4/ba46d4485e6eb1770a12edace5a16506de13349f592b9036257f3c3d3/Markdown-3.2.1-py2.py3-none-any.whl
Collecting google-auth<2,>=1.6.3 (from tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Downloading https://files.pythonhosted.org/packages/4f/97/5e7083a5be4cbd1d928061c9d9cb3c07e0e55d5a15c563be41cb47b544807/google_auth-1.14.0-py2.py3-none-any.whl (88kB)
100% |#####| 92kB 423kB/s
Collecting werkzeug>=0.11.15 (from tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Downloading https://files.pythonhosted.org/packages/cc/94/5f7079a0e00bd6863ef8f1da638721e9da21e5bacee597595b318f71d62e/Werkzeug-1.0.1-py2.py3-none-any.whl (298kB)
100% |#####| 307kB 2.0MB/s
Collecting requests<3,>=2.21.0 (from tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/1a/70/1935c770cb3be6e3a8b78ced23d7e0f3b187f5cbfab4749523ed65d7c9b1/requests-2.23.0-py2.py3-none-any.whl
Collecting google-auth-oauthlib<0.5,>=0.4.1 (from tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/7b/b8/88def36e74bee9fce11c9519571f4e485e890093ab74422844ffaef60b/google_auth_oauthlib-0.4.1-py2.py3-none-any.whl
Collecting rsa<4.1,>=3.1.4 (from google-auth<2,>=1.6.3->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/02/e5/38518af393f7c214357079ce67a317307936896e961e35450b70fad2a9cf/rsa-4.0-py2.py3-none-any.whl
Collecting cachetools<5.0,>=2.0.0 (from google-auth<2,>=1.6.3->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Downloading https://files.pythonhosted.org/packages/b3/59/524ffb454d05001e2be74c14745b485681c6ed5f2e625f71d135704c0909/cachetools-4.1.0-py3-none-any.whl
Collecting pyasn1-modules>=0.2.1 (from google-auth<2,>=1.6.3->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/95/de/214830a981892a3e286c3794f41ae67a4495df1108c3da8a9f62159b9a9d/pyasn1_modules-0.2.8-py2.py3-none-any.whl
Collecting certifi>=2017.4.17 (from requests<3,>=2.21.0->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Downloading https://files.pythonhosted.org/packages/57/2b/26e37a4b034800c960a00c4e1b3d9ca5d7014e983e6e729e33ea2f36426c/certifi-2020.4.5.1-py2.py3-none-any.whl (157kB)
100% |#####| 163kB 1.9MB/s
Collecting idna<3,>=2.5 (from requests<3,>=2.21.0->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/89/e3/afebe61c546d18fb1709a61bee788254b40e736cff7271c7de5de2dc4128/idna-2.9-py2.py3-none-any.whl
Collecting urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 (from requests<3,>=2.21.0->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Downloading https://files.pythonhosted.org/packages/e1/e5/df302e8017440f111c11c41a6b432838672f5a70aa29227bf58149dc72f/urllib3-1.25.9-py2.py3-none-any.whl (126kB)
100% |#####| 133kB 1.3MB/s
Collecting chardet<4,>=3.0.2 (from requests<3,>=2.21.0->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/bc/a9/01ffebfb562e4274b6487b4bb1ddc7ca55ec7510b22ba4c51f14098443b8/chardet-3.0.4-py2.py3-none-any.whl
Collecting requests-oauthlib>=0.7.0 (from google-auth-oauthlib<0.5,>=0.4.1->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/a3/12/b92740d845ab62ea4edf04d2f4164d82532b5a0b03836dd4e71cf6f3d379/requests_oauthlib-1.3.0-py2.py3-none-any.whl
Collecting pyasn1>=0.1.3 (from rsa<4.1,>=3.1.4->google-auth<2,>=1.6.3->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/62/1e/a94a8d635fa3ce4cfc7f506003548d0a2447ae76fd5ca53032970fe3053f/pyasn1-0.4.8-py2.py3-none-any.whl
Collecting oauthlib>=3.0.0 (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorflow<2.1.0,>=2.0.0->tensorflow==2.0.0)
  Using cached https://files.pythonhosted.org/packages/05/57/ce2e7a8fa7c0afb54a0581b14a65b56e2b5759dbc98e80627142b8a3704/oauthlib-3.1.0-py2.py3-none-any.whl
tensorflow 2.0.2 has requirement setuptools>=41.0.0, but you'll have setuptools 48.0.2 which is incompatible.
Installing collected packages: astor, wrapt, termcolor, protobuf, google-pasta, grpcio, opt-einsum, wheel, tensorflow-estimator, absl-py, markdown, pyasn1, rsa, cachetools, pyasn1-modules, google-auth, werkzeug, certifi, idna, urllib3, chardet, requests, oauthlib, requests-oauthlib, google-auth-oauthlib, tensorflow, gast, tensorflow
Running setup.py install for wrapt ... done
Running setup.py install for termcolor ... done
Running setup.py install for absl-py ... done

```

Fig 2.4 Keras, Sequential, Dense libraries installation

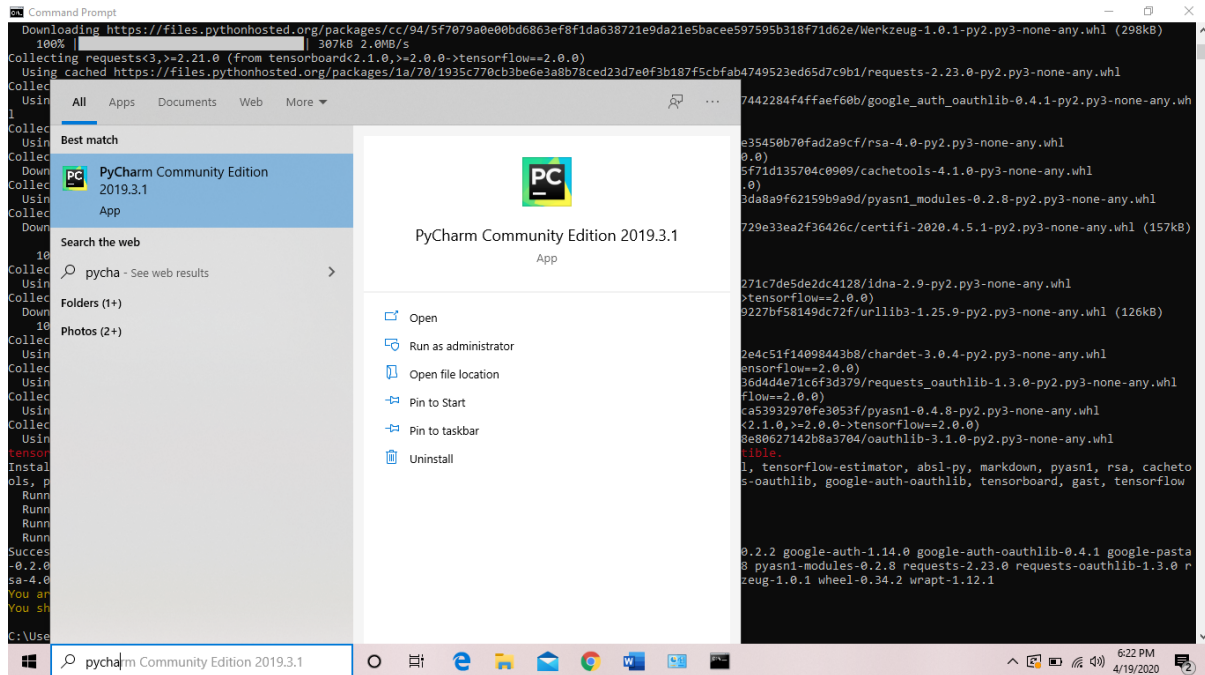
IMPLEMENTATION

DATA SOURCE

The dataset used was obtained from kaggle.

The screenshot shows a Kaggle notebook interface. On the left is a navigation sidebar with options like Home, Competitions, Datasets, Code, Discussions, Courses, and More. The main content area features a search bar, a user profile for 'ANASTASIA S' (2 years ago, 5,166 views), and a 'Face Anti-Spoofing' notebook. The notebook is written in Python and is titled 'Real and Fake Face Detection'. Below the title, there are tabs for 'Notebook', 'Data', 'Logs', and 'Comments (1)'. The 'Data' tab is active, displaying a directory named 'real_and_fake_face' which contains two sub-directories: 'training_fake' (960 files) and 'training_real' (1081 files). On the right side, an 'Input (225.79 MB)' section shows a tree view of the data sources, including the 'real_and_fake_face' directory and its sub-directories.

2. Start IDE



2.4 figure showing code construct of Random Forest implementation and Neural Network

```
1 import pandas as pd
2 import numpy as np
3
4 df = pd.read_csv("anti_spoofing.csv")
```

2.4.1 Read in dataset

```
print("Shape: ", df.shape)
print(list(df.columns))
print(df.head())
```

2.4.2 Print shape of dataset

```
df_cat = pd.DataFrame()
for i in list(df.columns):
    df_cat['{}_cat'.format(i)] = df[i].astype('category').copy()
    df_cat['{}_cat'.format(i)] = df_cat['{}_cat'.format(i)].cat.coo

print(df_cat.head())
```

2.4.3 Convert to machine readable format

```
print(df_cat.head())

X = np.array(df_cat.drop('class_cat', axis=1))
y = np.array(df_cat['class_cat'])
```

2.4.4 Convert data to array category

```

from sklearn.model_selection import KFold
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import f1_score
from sklearn.metrics import accuracy_score
from sklearn.metrics import recall_score

```

2.4.5 import metrics and random forest classifier from sklearn

```

kf = KFold(n_splits=5, random_state=42)
results = []
results2= []
for train_index, test_index in kf.split(X):
    X_train, X_test = X[train_index], X[test_index]
    y_train, y_test = y[train_index], y[test_index]
    model = RandomForestClassifier(n_estimators=100, random_state=24)

```

2.4.6 Split data to training and testing

```

Y_train = keras.utils.to_categorical(Y_train, num_classes)
Y_test = keras.utils.to_categorical(Y_test, num_classes)

```

```

from keras.models import Sequential
from keras.layers import Dense, Conv2D, Flatten
from keras.layers import MaxPooling2D, Dropout
model = Sequential()#add model layers
model.add(Conv2D(32, kernel_size=(5, 5),
                activation='relu',
                input_shape=input_shape))
model.add(MaxPooling2D(pool_size=(2, 2)))
# add second convolutional layer with 20 filters
model.add(Conv2D(64, (5, 5), activation='relu'))

# add 2D pooling layer
model.add(MaxPooling2D(pool_size=(2, 2)))

# flatten data
model.add(Flatten())

```

2.4.7 neural network model activation

```

print("f1-score: ", np.mean(results))
print("Accuracy:", np.mean(results2))
print("Recall:", np.mean(results3))

```

2.4.7 Show evaluation and result

References

- [1] www.kaggle.com