Minor Project (Internship)

NAME = PANKAJ KUMAR SAINI

ROLL NO = 2019IMG-044

Title of the Project

Signature Forgery Detection

ABSTRACT OF THE PROJECT:

Signature is the most commonly used tool for identification of individuals extracted by previous signatures.

Main thing is that signature is very important part in bank because withdrawal of money depends on it.

For personal identification, signature verification is one of the biometric techniques which is used commonly.

In many commercial scenarios, like check payment, the signature verification process is predicated on human examination of one known sample

In banks there are no perfect systems to check the signature on cheques is fake or original. This can lead to bank frauds.

Now a days, cases about fraud signature in banks are increasing.

The Project will help to identify whether signature is real or fake.

There are two types of verification, online verification and offline verification.

We are going to implement offline verification by using different geometric measures.

Here we used python libraries like TensorFlow, Matplotlib, Pandas, Keras.

Keywords:

1. Machine learning
2. Computer vision
3. Signature Verification
4. NumPy
5. TensorFlow
6. Matplotlib
7. Pandas
8. Keras
9. Euclidean distance

INTRODUCTION TO THE PROJECT

Basically, in this Project we are going to implement How to find a signature is original or fake.
Firstly, we will train the system by using a database of signatures.
This database of signatures is previously authorized by the system.
This system will analyse all signatures and will make a reference signature will be used for other signature verification.
There are many parameters (like Euclidean Distance) in the feature space between the claimed signature and to be examined signature as a measure.
If the absolute difference between the parameters of original signature and the verification signature is greater than a pre-defined threshold then the signature is identified as forgery.

Here, we are going to use following libraries: -

➢ TensorFlow:

1. TensorFlow is one of the free and famous open-source software libraries, it used for machine learning.
2. It is used across in many tasks; it has a particular focus on training of deep neural networks.
3. It is a math library based on dataflow.

➢ Matplotlib:

1. It is a plotting library for the Python and when it extended in numerical mathematics, it is NumPy.
2. It gives an object-oriented API which is used for embedding plots into applications with the help of general-purpose GUI

➢Pandas:

1. It is mainly used for data manipulation and analysis.
2. In general, it provides data structures and operations to manipulate numerical tables and time series.

➢ Keras:

1. It is an open-source software library, it offers Python interface for artificial neural networks.
2. It also acts as an interface for the TensorFlow library.

Literature survey

Researchers have used many technologies, such as neural networks and they have done parallel processing to signature verification and they are introducing concepts, new ideas, algorithms day by day.

There are many other approaches which is evaluated of random forgeries like histograms 2D transforms.

Measurements made on tracing of the signature and thus the position of feature points located on the skeleton of the signature.

This result indicates that this dynamics isn't stable enough to be used for signature verification since the topic is trying to breed a shape instead of a temporal pattern.

Here we are going to verify only statics images of signatures.

Objective

SRVS (signature recognition and verification) is a system which is capable of addressing two individuals
(a) Identification of the signature owner, and
(b) Decision whether the signature is genuine or forger.
Here we see that signature verification are classified into two parts, according to the actual needs of the problem at hand a. Online signature verification b. Offline signature verification
When a man is writing his signature, they gave more information like hand speed and pressure management and there are many things which we can take as key point to identify real or forged image.
This project will help to solve the problem of forged signature

Methodology

This signature verification system is started with the input of the User ID.

The user is required to key in his/her ID to the system. Here, the system will decide whether the user ID is registered or not. If the user ID is not registered, the user has to drop down 5 sets of signature for training purpose.

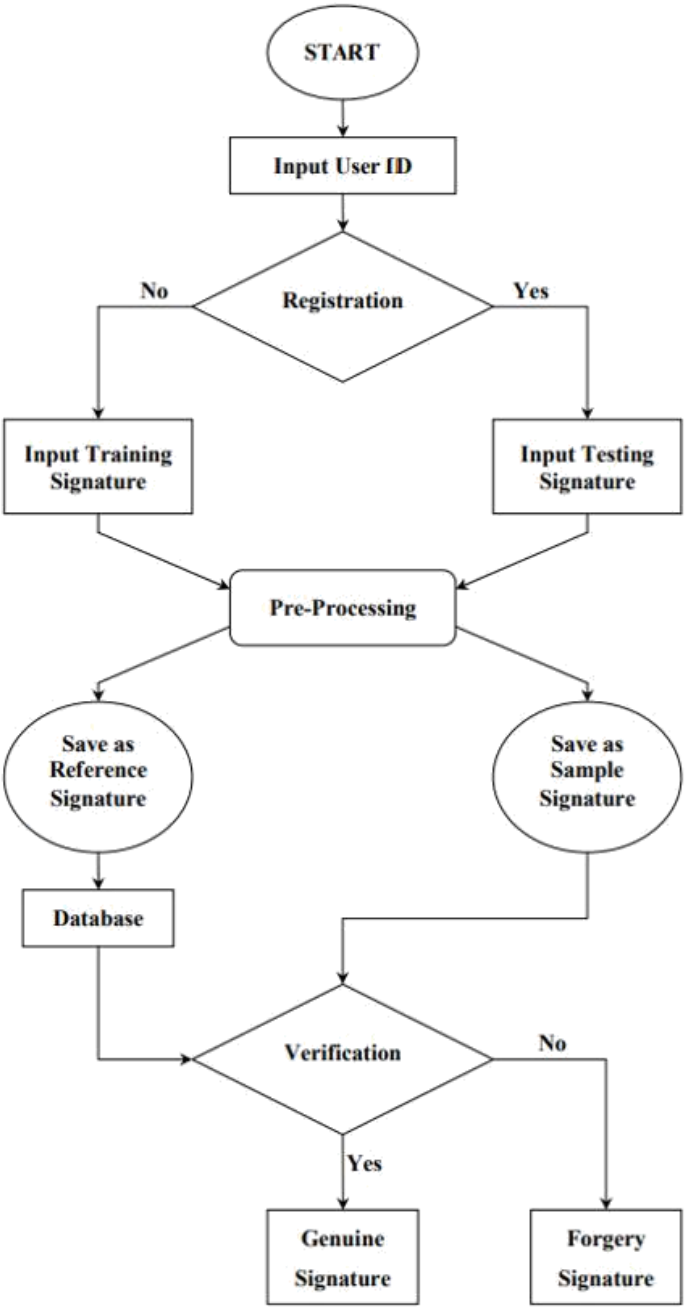
If the user ID is registered, the user will then be asked to sign for testing. Then, the input training signatures and the input testing signature will proceed to the Pre-processing stage.

After this stage, the input training signature will be saved as reference signature in the database while the input testing signature will be saved as sample signature and proceed to Verification stage.

In the Verification stage, the sample signature will be compared with the reference signature which stored in the database.

If the difference between two signatures does not exceed the Threshold value, the sample signature will be accepted as genuine signature and via versa.

Below diagram shows the Process flow:


START
Input User ID
Registration
No
Yes
Input Training Signature
Input Testing Signature
Pre-Processing
Save as Reference Signature
Save as Sample Signature
Database
Verification
No
Yes
Genuine Signature
Forgery Signature

- **Code link =** https://github.com/pnkj15/Minor_Project_IMG-2019/blob/main/Pankaj.py

- **Project link =** **https://github.com/pnkj15/Minor_Project_IMG-2019**

Some Instructions related to image

Format of path signature image in our model is XXXZZZ_YYY.png

XXX denotes id of the person who has signed on the document (ex - 001)

ZZZ denotes the id of the person to whom the sign belongs in actual (ex- 001)

YYY denotes the nth number of attempts

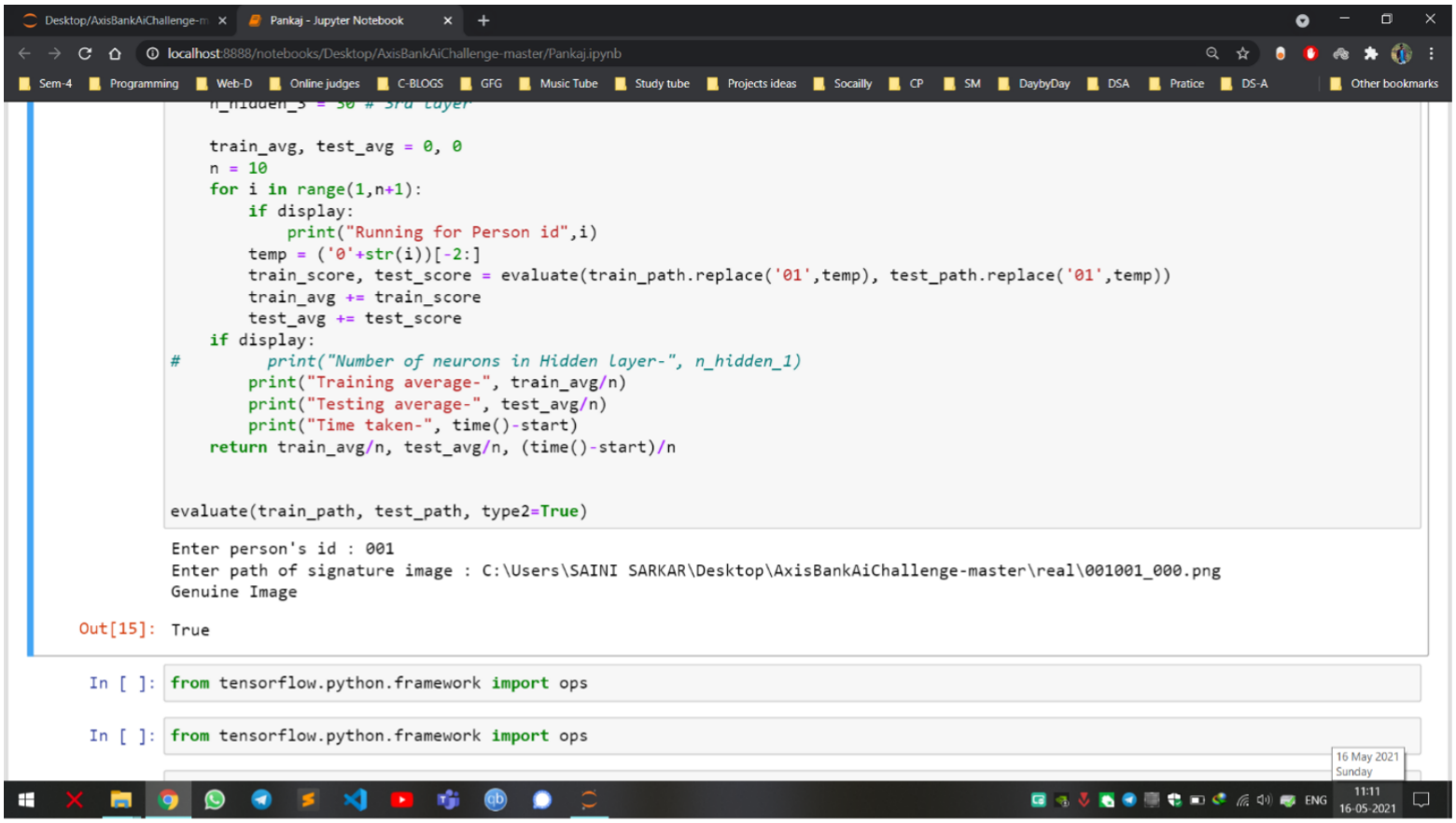
According to us if Now if XXX == ZZZ then image is genuine otherwise the signature is forged (Fake)

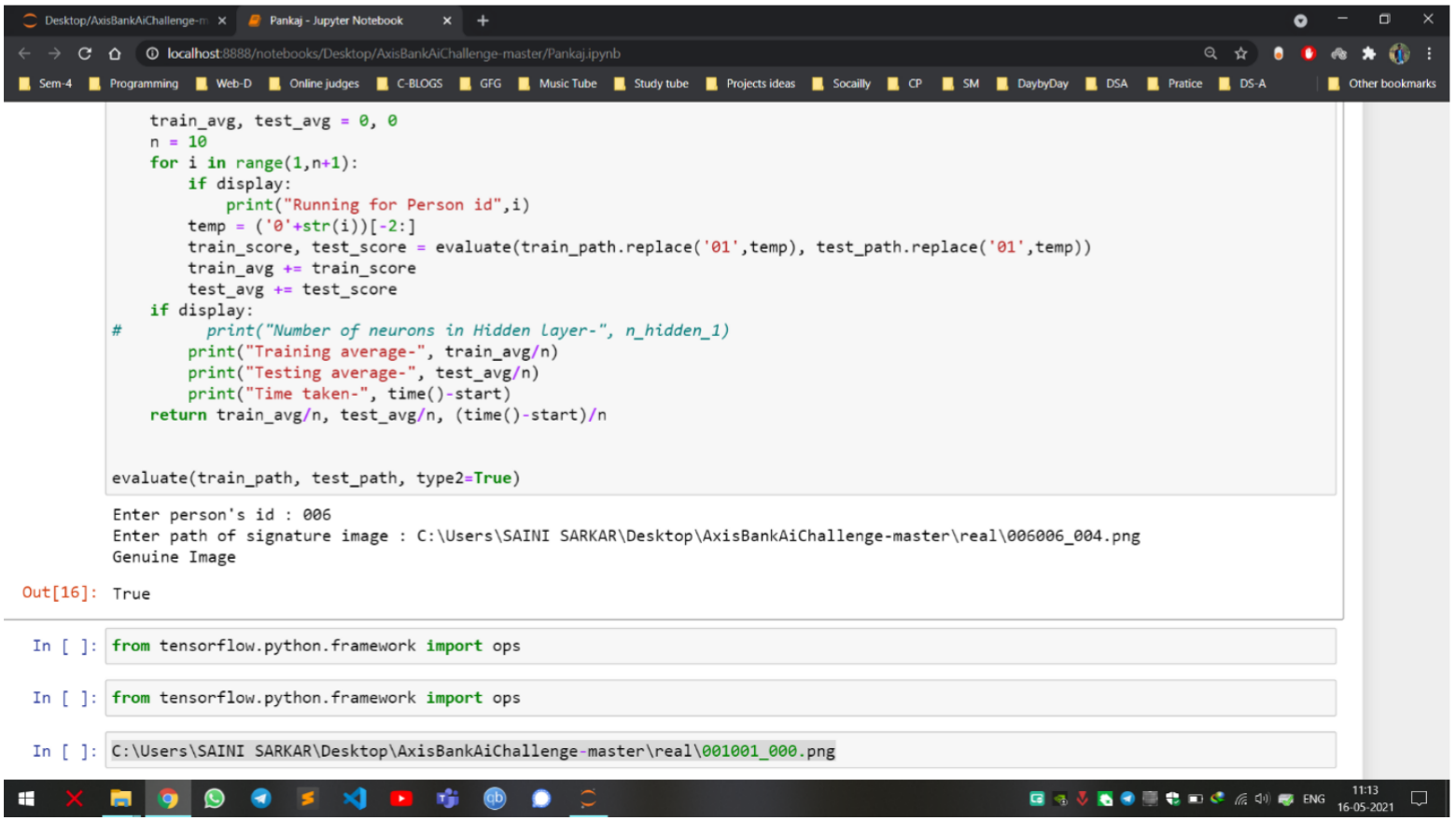
Below Screenshot when Signature is Real

Note:

Here Image is 001001_000.png

Here XXX = ZZZ it means it was real signature and our model is also showing that it is real.


Desktop/AxisBankAiChallenge-m
Pankaj - Jupyter Notebook
localhost:8888/notebooks/Desktop/AxisBankAiChallenge-master/Pankaj.ipynb
Sem-4 Programming Web-D Online judges C-BLOGS GFG Music Tube Study tube Projects ideas Socailly CP SM DaybyDay DSA Pratice DS-A Other bookmarks
n_hidden_3 = 50 # 3rd Layer
train_avg, test_avg = 0, 0
n = 10
for i in range(1,n+1):
if display:
print("Running for Person id",i)
temp = ('0'+str(i))[-2:]
train_score, test_score = evaluate(train_path.replace('01',temp), test_path.replace('01',temp))
train_avg += train_score
test_avg += test_score
if display:
# print("Number of neurons in Hidden Layer-", n_hidden_1)
print("Training average-", train_avg/n)
print("Testing average-", test_avg/n)
print("Time taken-", time()-start)
return train_avg/n, test_avg/n, (time()-start)/n
evaluate(train_path, test_path, type2=True)
Enter person's id : 001
Enter path of signature image : C:\Users\SAINI SARKAR\Desktop\AxisBankAiChallenge-master\real\001001_000.png
Genuine Image
Out[15]: True
In [ ]: from tensorflow.python.framework import ops
In [ ]: from tensorflow.python.framework import ops
16 May 2021
Sunday
ENG
11:11
16-05-2021

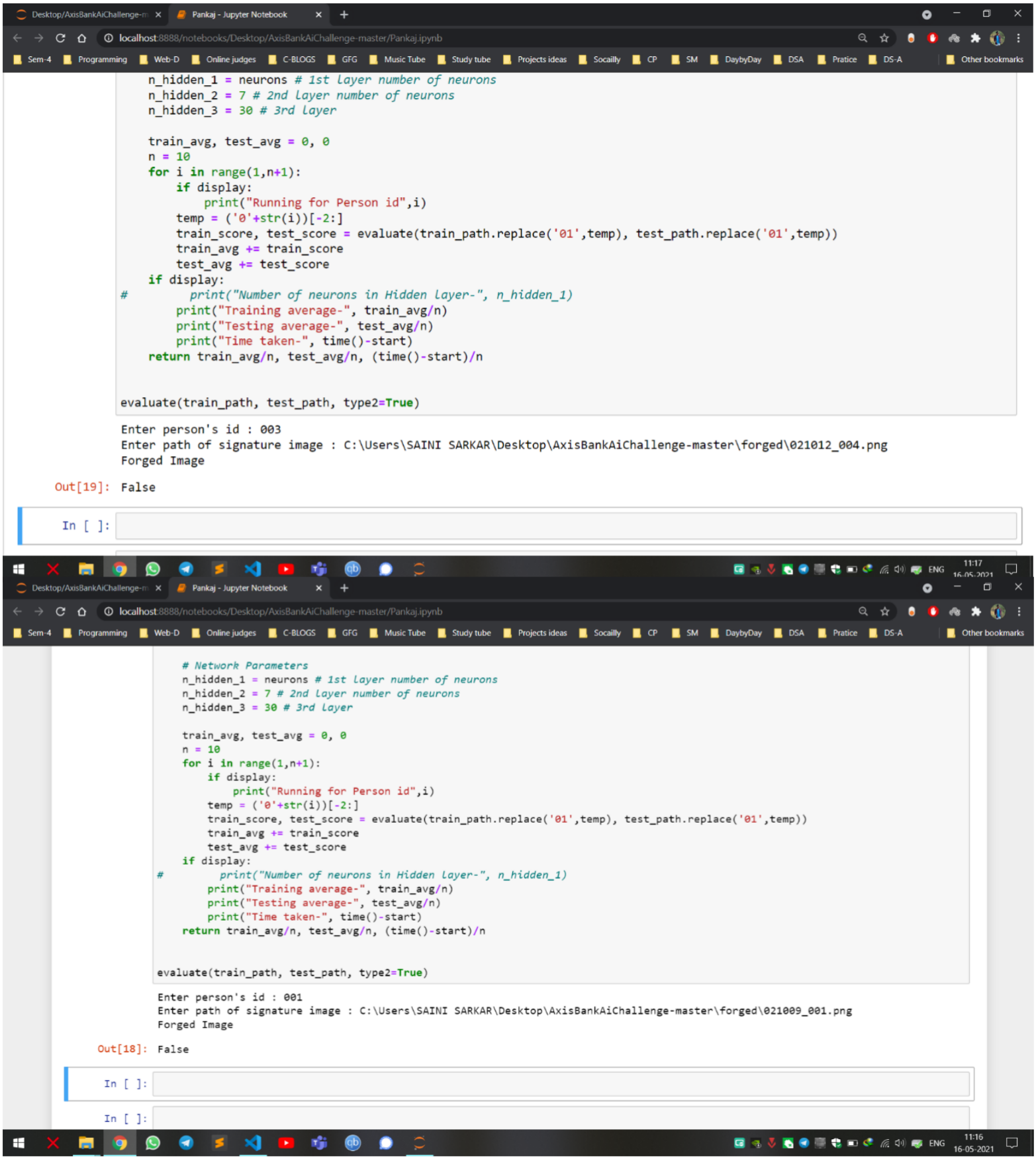

Desktop/AxisBankAiChallenge-m
Pankaj - Jupyter Notebook
localhost:8888/notebooks/Desktop/AxisBankAiChallenge-master/Pankaj.ipynb
Sem-4 Programming Web-D Online judges C-BLOGS GFG Music Tube Study tube Projects ideas Socailly CP SM DaybyDay DSA Pratice DS-A Other bookmarks
train_avg, test_avg = 0, 0
n = 10
for i in range(1,n+1):
if display:
print("Running for Person id",i)
temp = ('0'+str(i))[-2:]
train_score, test_score = evaluate(train_path.replace('01',temp), test_path.replace('01',temp))
train_avg += train_score
test_avg += test_score
if display:
# print("Number of neurons in Hidden Layer-", n_hidden_1)
print("Training average-", train_avg/n)
print("Testing average-", test_avg/n)
print("Time taken-", time()-start)
return train_avg/n, test_avg/n, (time()-start)/n
evaluate(train_path, test_path, type2=True)
Enter person's id : 006
Enter path of signature image : C:\Users\SAINI SARKAR\Desktop\AxisBankAiChallenge-master\real\006006_004.png
Genuine Image
Out[16]: True
In [ ]: from tensorflow.python.framework import ops
In [ ]: from tensorflow.python.framework import ops
In [ ]: C:\Users\SAINI SARKAR\Desktop\AxisBankAiChallenge-master\real\001001_000.png
ENG
11:13
16-05-2021

Below Screenshot when Signature is Fake

Note: Here Image is 021012_004.png

Here XXX is not equal to ZZZ

it means it was fake signature and our model is also showing that it was fake.


Desktop/AxisBankAiChallenge-m
Pankaj - Jupyter Notebook
localhost:8888/notebooks/Desktop/AxisBankAiChallenge-master/Pankaj.ipynb
Sem-4 Programming Web-D Online judges C-BLOGS GFG Music Tube Study tube Projects ideas Socailly CP SM DaybyDay DSA Pratice DS-A Other bookmarks
n_hidden_1 = neurons # 1st Layer number of neurons
n_hidden_2 = 7 # 2nd Layer number of neurons
n_hidden_3 = 30 # 3rd Layer
train_avg, test_avg = 0, 0
n = 10
for i in range(1,n+1):
if display:
print("Running for Person id",i)
temp = ('0'+str(i))[-2:]
train_score, test_score = evaluate(train_path.replace('01',temp), test_path.replace('01',temp))
train_avg += train_score
test_avg += test_score
if display:
# print("Number of neurons in Hidden Layer-", n_hidden_1)
print("Training average-", train_avg/n)
print("Testing average-", test_avg/n)
print("Time taken-", time()-start)
return train_avg/n, test_avg/n, (time()-start)/n
evaluate(train_path, test_path, type2=True)
Enter person's id : 003
Enter path of signature image : C:\Users\SAINI SARKAR\Desktop\AxisBankAiChallenge-master\forged\021012_004.png
Forged Image
Out[19]: False
In [ ]:
ENG 11:17 16-05-2021
Desktop/AxisBankAiChallenge-m
Pankaj - Jupyter Notebook
localhost:8888/notebooks/Desktop/AxisBankAiChallenge-master/Pankaj.ipynb
Sem-4 Programming Web-D Online judges C-BLOGS GFG Music Tube Study tube Projects ideas Socailly CP SM DaybyDay DSA Pratice DS-A Other bookmarks
# Network Parameters
n_hidden_1 = neurons # 1st Layer number of neurons
n_hidden_2 = 7 # 2nd Layer number of neurons
n_hidden_3 = 30 # 3rd Layer
train_avg, test_avg = 0, 0
n = 10
for i in range(1,n+1):
if display:
print("Running for Person id",i)
temp = ('0'+str(i))[-2:]
train_score, test_score = evaluate(train_path.replace('01',temp), test_path.replace('01',temp))
train_avg += train_score
test_avg += test_score
if display:
# print("Number of neurons in Hidden Layer-", n_hidden_1)
print("Training average-", train_avg/n)
print("Testing average-", test_avg/n)
print("Time taken-", time()-start)
return train_avg/n, test_avg/n, (time()-start)/n
evaluate(train_path, test_path, type2=True)
Enter person's id : 001
Enter path of signature image : C:\Users\SAINI SARKAR\Desktop\AxisBankAiChallenge-master\forged\021009_001.png
Forged Image
Out[18]: False
In [ ]:
In [ ]:
ENG 11:16 16-05-2021

RESULT AND DISCUSSION

This project will help to identify original and fake signatures

In the training phase, the training depends on the size, amount, and type of data. The size of our test set is relatively smaller than that of general machine learning datasets.

As a signature is generated by human action, mistakes occur frequently, even though the signature is drawn by the same person.

In the test phase, a mistake may result in a single verification failure. However, in the training phase, a mistake could lead to a decrease in verification accuracy.

CONCLUSION

This project is successfully implemented and working with good accuracy and great results.
In future work, I plan to verify signatures drawn by a hand gripping a smartphone, i.e., a user draws a signature in the air by a hand gripping a smartphone, and not on a screen by a finger. Anyway, the features and characteristics of the hand-drawn signature may be different from those of a finger-drawn signature. The differences can bring up issues.
I expect that the huge numbers of signature drawn by hand could have positive effects of verification accuracy and it would be user convenience.

Pankaj Kumar Saini

2019IMG-044
