National College of Ireland

Configuration Manual

MSc Research Practicum part 2
MSc in Cybersecurity

Rishan Backer
Student ID: 22235949

School of Computing
National College of Ireland

Supervisor: Mark Monaghan

National College of Ireland

MSc Project Submission Sheet

School of Computing

Student Name:	Rishan Backer
Student ID:	22235949
Programme:	MSc in Cybersecuirty **Year:** 2023/24
Module:	MSc Research Practicum part 2
Lecturer:	Mark Monaghan
Submission Due Date:	12/Aug/2024 2:00 P.M
Project Title:	Combination of Face recognition and Handprint Biometrics with Fingerprint Image Encryption Using Multiple QR Decomposition

Word Count: 999 Page Count: 3

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.
ALL internet material must be referenced in the bibliography section. Students are required to use the Referencing Standard specified in the report template. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action.

Signature: Rishan Backer

Date: 11/Aug/2024

PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST

Attach a completed copy of this sheet to each project (including multiple copies)	□
Attach a Moodle submission receipt of the online project submission, to each project (including multiple copies).	□
You must ensure that you retain a HARD COPY of the project, both for your own reference and in case a project is lost or mislaid. It is not sufficient to keep a copy on computer.	□

Assignments that are submitted to the Programme Coordinator Office must be placed into the assignment box located outside the office.

Office Use Only	
Signature:	
Date:	
Penalty Applied (if applicable):	

Configuration Manual

Rishan Backer
Student ID: 22235949

1 Anaconda Navigator

The Anaconda navigator is a software which is a Graphical User Interface desktop software included in anaconda distribution, this enables the user to launch the anaconda packages and environments and channel. This software enables us to use the Jupyter notebook, [1]

1.1 Jupytor Notebook

The Jupyter notebook is an web based application which is used for creating and sharing the original computational documents, this enables the users to create streamlined document oriented experience in a simple way. The Jupyter notebook enable us to use the python coding. This contain different set of programming languages such as Python, R, Julia and scala. The Jupyter notebook support over 40 programming languages.

This can liverage big data tools, for example apache spark, from python, R and Scala. This enables to explore the same data with pands, scikit-learn, ggplot2 and Tensorflow. [2]

2 Scikit-image

The Scikit-image is a image processing software used to process the images and fine tune the images. This is an open-source software library for python. This provides high quality image processing. This program is written by an active community of volunteers. This helps to enable the CLAHE image tuning functionality. [3]

2.1 CLAHE

The CLAHE is the image contrast enhancement and histogram equalization method, the CLAHE stands for Contrast Limited Adaptive Histogram Equalization method. Thus helps to adjust the contrast of the image and equalize the image histogram, which helps to protect from overdone of contrasting, CLAHE works with specific tile area and removes the false boundaries, here the cliplimit is set by 3.0 and a tilegrid of 8,8 for the biometric traits, for fingerprint, face and palmprint biometric image, over doing of cliplimit can increase the contrast and the tilegrid is set by 8 in order to distribute evenly and thus provide less noise in the image.

3 Matplotlib

This software library is used in the python in order to visualize the fine tuned images, here the visualization is done for CLAHE image and equalized histogram images. Here the

plotting of histogram is also done by converting the histogram to flat. The complete range of histogram is applied here as 0 to 255. [4]

4 Dlib

Dlib is a python library software which is used for image processing, this is mainly used to detect the face images, this is a powerful tool for face recognition. This provides very high capability for face detection. Here the Dlib is used to extract the face region of interest. [5]

5 Tensorflow

Tensorflow software is an end to end platform for machine learning, tensor flow has the ability to solve many real world problem with machine learning. The tensor flow has keras basics, this is useful for both beginers and advanced users. Here the tensor flow keras are used to extract the features. The tensorflow is used here for python. The version used here is Tensorflow v2.16.1 [6]

5.1 DenseNet 201

The DenseNet201 is a dense convolution network architecture used with tensorflow keras application in python, in order to extract the features from the biometric traits, we are using the DenseNet201, the setup for image predictions are done by adjusting the ROI size to 224 pixel density and loaded the dataset from ImageNet for fine tuning image, the colour channel is RGB. [7]

6 Scikit learn

The scikit learn is a powerful python software used for different machine learning purpose, such as classification, clustering, prediction, regression, clustering, similarity calculation and much more. Here we are using this library for similarity calculation and classification method using cosine similarity function and softmax function. [8]

6.1 Cosine similarity

The cosine similarity is used to calculate the similarity of each biometric trait set here. Here first we normalize the feature vectors and then calculate the similarity for each set. The cosine similarity is calculated based on Scikit learn algorithm. [9]

6.2 Softmax function

The softmax function here used to classify the image based on the biometric to calculate the cosine similarity score, which can be used based on the alogorithm numpy and scikit learn. [10]

7 Score level fusion method

The score level fusion method here used to combine the biometric traits, a threshold value is set in order to achieve the fused similarity score while authorizing a perron's biometric. If it is right the authorization will detect the person or else fail. Here the threshold value is set by 9.

8 Numpy

Numpy mainly used in python to work with array, numpy used here to perform mathematical operation with the machine learning.
Numpy is python softwares used here to extract the region of interest from the biometric traits and also to do the QR decomposition. The pixel value for region of interest is set by 255 here. The multiple times decomposition of matrix is also done with a number decomposition of 3 times. [11]. The version of numpy used here is numpy 2.0 released oin 2024-06-07.

9 Open CV

OpenCv is a python library software used for image recognition and identification, here the opencv is used in amny region such as importing the biometric image and also for identification. [12]

References

[1] "Anaconda Navigator — Anaconda documentation," Anaconda.com, 2024. https://docs.anaconda.com/navigator/# (accessed Aug. 11, 2024).

[2] Project Jupyter, "Project Jupyter," Jupyter.org, 2019. https://jupyter.org

[3] "scikit-image: Image processing in Python — scikit-image," scikit-image.org. https://scikit-image.org

[4] Matplotlib, "Matplotlib: Python plotting — Matplotlib 3.1.1 documentation," Matplotlib.org, 2012. https://matplotlib.org

[5] S. Singh, "A Step-by-Step Guide to Face Detection with the dlib Library," Medium, Oct. 02, 2023. https://medium.com/@sukanyasingh303/a-step-by-step-guide-to-face-detection-with-the-dlib-library-2e8f6429e632#:~:text=Dlib%20is%20used%20for%20face (accessed Aug. 11, 2024).

[6] TensorFlow, "API Documentation | TensorFlow Core v2.4.1," TensorFlow. https://www.tensorflow.org/api_docs

[7] "tf.keras.applications.DenseNet201 | TensorFlow v2.16.1," TensorFlow, 2024. https://www.tensorflow.org/api_docs/python/tf/keras/applications/DenseNet201

[8] "SKLearn | Scikit-Learn In Python | SciKit Learn Tutorial," Analytics Vidhya, Jan. 05, 2015. https://www.analyticsvidhya.com/blog/2015/01/scikit-learn-python-machine-learning-tool/#:~:text=What%20is%20scikit%2Dlearn%20or

[9] DataStax, "How to Implement Cosine Similarity in Python," Medium, Nov. 30, 2023. https://datastax.medium.com/how-to-implement-cosine-similarity-in-python-505e8ec1d823

[10] “How to implement the Softmax function in Python?,” Stack Overflow. https://stackoverflow.com/questions/34968722/how-to-implement-the-softmax-function-in-python

[11] “Introduction to NumPy,” www.w3schools.com. https://www.w3schools.com/python/numpy/numpy_intro.asp#:~:text=What%20is%20NumPy%3F

[12] “OpenCV Tutorial | OpenCV using Python - javatpoint,” www.javatpoint.com, 2021. https://www.javatpoint.com/opencv#:~:text=OpenCV%20stands%20for%20Open%2DSource (accessed Aug. 11, 2024).