

University of Hertfordshire  
School of Computer Science  
BSc Computer Science (Networks)

Module: Data Security and Biometrics

Assignment 2

Fingerprint Recognition Report



Anthony Constant.co.uk

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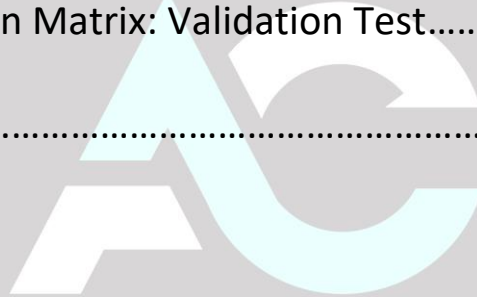
Your Name: Anthony Constant

Level 6

Academic Year 2020 – 21

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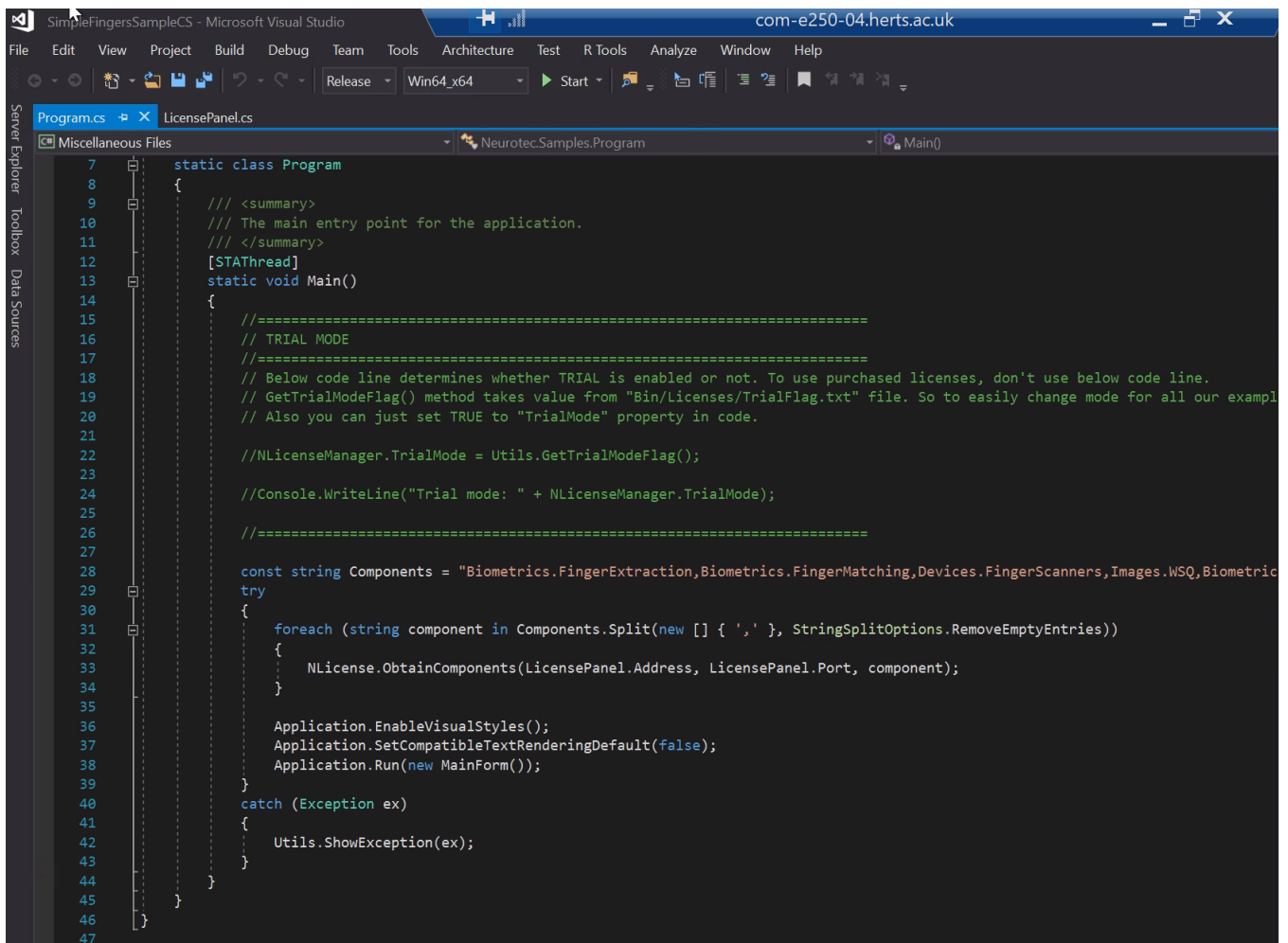
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## 1.0 Introduction

The overall aim of this report was to use commercial biometric software to enrol students into the system and carry out recognition/validation. Also, verified tests are to be planned, to test the robustness of the fingerprint biometric. Furthermore, a formal performance evaluation will be conducted and a reflection on the tool, process and results are reflected upon.

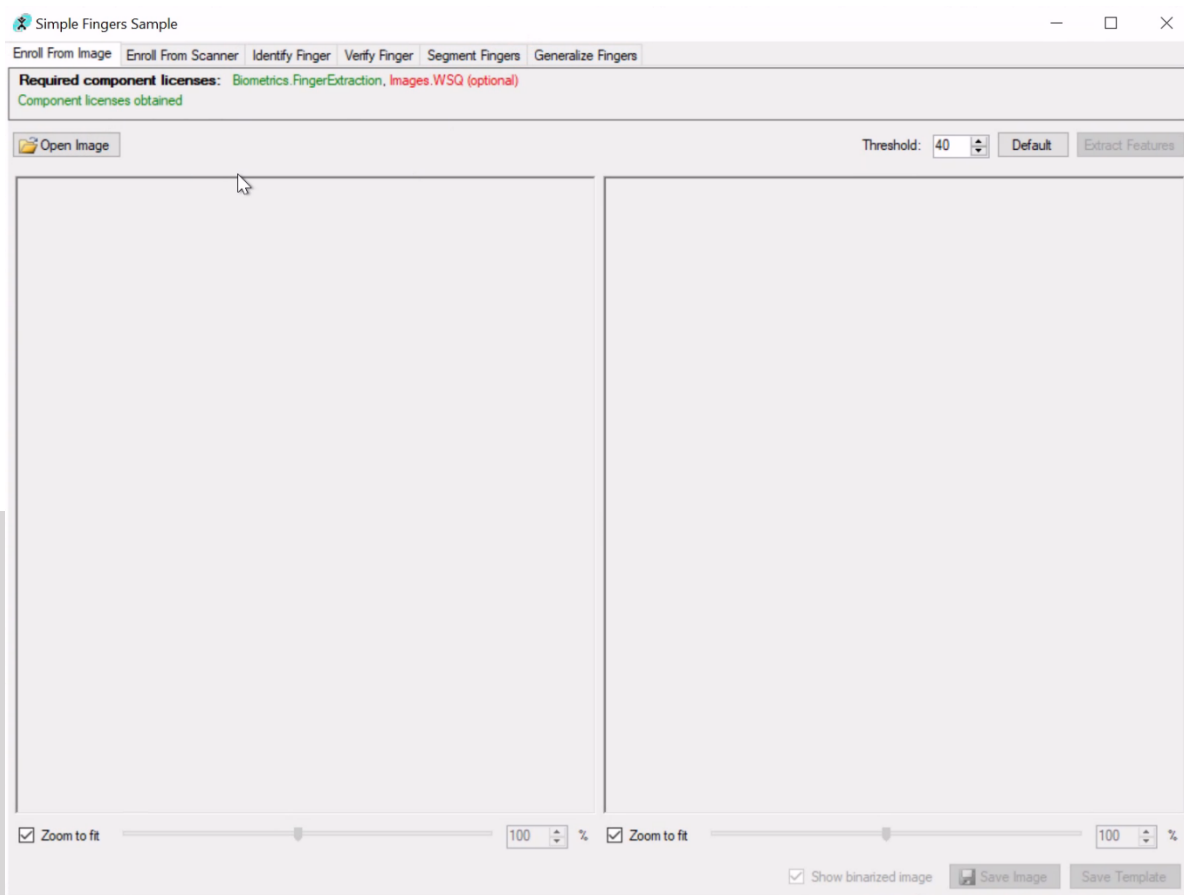
## 2.0 Stage 1 Neurotec\_Biometric\_SDK

As part of the stage 1 it was required to access the application called 'Neurotec\_Biometric\_SDK'. It could be said that once accessing the file, it was necessary to run the code within Visual Studio, as shown in the image below.



```
7 static class Program
8 {
9     /// <summary>
10     /// The main entry point for the application.
11     /// </summary>
12     [STAThread]
13     static void Main()
14     {
15         //=====
16         // TRIAL MODE
17         //=====
18         // Below code line determines whether TRIAL is enabled or not. To use purchased licenses, don't use below code line.
19         // GetTrialModeFlag() method takes value from "Bin/Licenses/TrialFlag.txt" file. So to easily change mode for all our exampl
20         // Also you can just set TRUE to "TrialMode" property in code.
21
22         //NLicenseManager.TrialMode = Utils.GetTrialModeFlag();
23
24         //Console.WriteLine("Trial mode: " + NLicenseManager.TrialMode);
25
26         //=====
27
28         const string Components = "Biometrics.FingerExtraction,Biometrics.FingerMatching,Devices.FingerScanners,Images.WSQ,Biometric
29         try
30         {
31             foreach (string component in Components.Split(new [] { ',' }, StringSplitOptions.RemoveEmptyEntries))
32             {
33                 NLicense.ObtainComponents(LicensePanel.Address, LicensePanel.Port, component);
34             }
35
36             Application.EnableVisualStyles();
37             Application.SetCompatibleTextRenderingDefault(false);
38             Application.Run(new MainForm());
39         }
40         catch (Exception ex)
41         {
42             Utils.ShowException(ex);
43         }
44     }
45 }
46
47 }
```

The image reveals SimpleFingersSampleCS

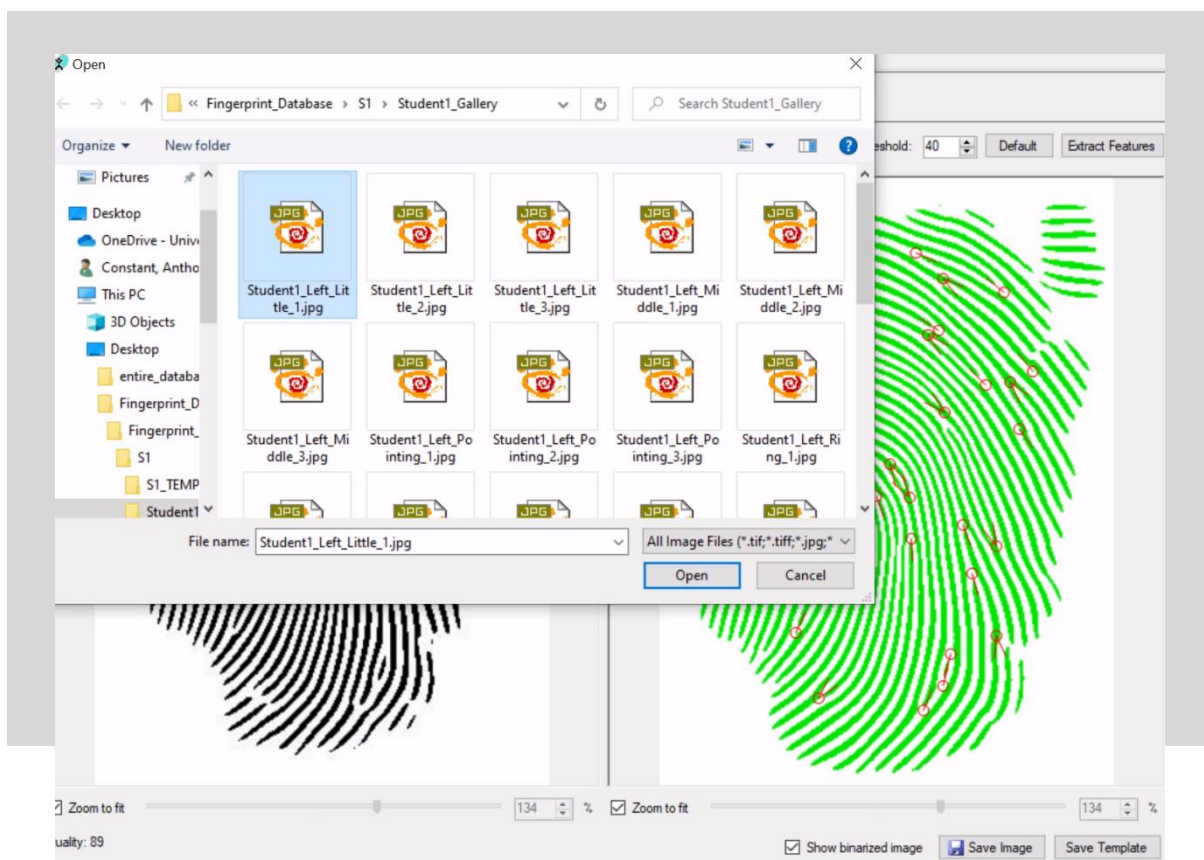


The image reveals SimpleFingersSampleCS after clicking start.

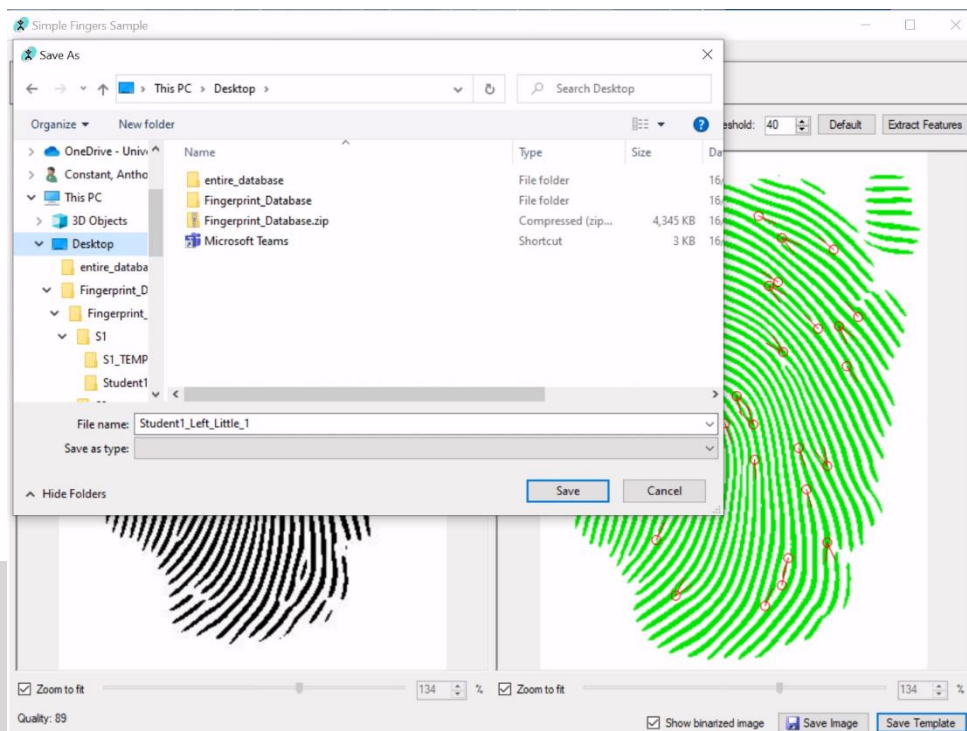
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### 3.0 Stage 2 Enrolled Students fingerprints and templates Database

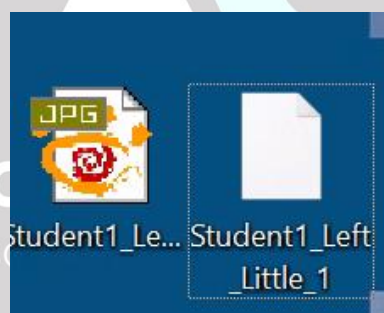
As part of stage 2 it was essential to use the Software Development Kit (SDK) for enrolment using previously captured images. It could be said that will be using the pre-captured fingerprint images of anonymous student subjects, using each of their finger. From these pre-captured images, the SDK will be used to generate templates using a specific naming convention, which will be stored in a separate directory than the pre-captured images. In addition, the templates combined will be considered as the entire database, and the images will be considered as test data, for the purpose of this report. Furthermore, stage 2 will reveal how to enrol from an image into a template using the SDK, as shown in the images below.



The image reveals SimpleFingersSampleCS importing an individual image from Student 1 gallery. As a result, after clicking open the image file was imported and next was to save the image as template as shown in the image below.



After clicking save template it was essential to follow the specific naming convention mentioned previously, 'Student1\_Left\_Little\_1.jpg' INTO Student1\_Left\_Little\_1. As a result, there will be two individual files as shown in the image below.



After repeating the same process for student1 Gallery, it could be said that there was a total of three samples for each of the ten fingers and therefore, had a total of 30 fingerprints for each Student Gallery. After repeating the same process for student 2 and 3, this completed the generation of templates required from fingerprints of three people and stored within a Database(DB). This also completes the enrolment of three students and template generation for each student. Lastly, the database templates and test data are revealed as shown in the table below. It also consists of two individual tables for each of the students. For example, one-to-one table templates, is when every finger enrolled, has a corresponding template. Whereas, Many-one templates involves three samples for every finger were used to generate the template, as shown in the tables below.

**Note: Each finger is scanned more than once x3**

### Student1 Enrolment one-one

User	Hand	Finger	Samples	Sample Image Filename, Store in dir: Gallery	Template Filename, Store in dir: Templates
Student 1	Left	Little	1,2,3	Student1_Left_Little_1.jpg Student1_Left_Little_2.jpg Student1_Left_Little_3.jpg	Student1_Left_Little_1 Student1_Left_Little_2 Student1_Left_Little_3
		Ring	1,2,3	Student1_Left_Ring_1.jpg Student1_Left_Ring_2.jpg Student1_Left_Ring_3.jpg	Student1_Left_Ring_1 Student1_Left_Ring_2 Student1_Left_Ring_3
		Middle	1,2,3	Student1_Left_Middle_1.jpg Student1_Left_Middle_2.jpg Student1_Left_Middle_3.jpg	Student1_Left_Middle_1 Student1_Left_Middle_2 Student1_Left_Middle_3
		Pointing or Index	1,2,3	Student1_Left_Pointing_1.jpg Student1_Left_Pointing_2.jpg Student1_Left_Pointing_3.jpg	Student1_Left_Pointing_1 Student1_Left_Pointing_2 Student1_Left_Pointing_3
		Thumb	1,2,3	Student1_Left_Thumb_1.jpg Student1_Left_Thumb_2.jpg Student1_Left_Thumb_3.jpg	Student1_Left_Thumb_1 Student1_Left_Thumb_2 Student1_Left_Thumb_3
	Right	Little	1,2,3	Student1_Right_Little_1.jpg Student1_Right_Little_2.jpg Student1_Right_Little_3.jpg	Student1_Right_Little_1 Student1_Right_Little_2 Student1_Right_Little_3
		Ring	1,2,3	Student1_Right_Ring_1.jpg Student1_Right_Ring_2.jpg Student1_Right_Ring_3.jpg	Student1_Right_Ring_1 Student1_Right_Ring_2 Student1_Right_Ring_3
		Middle	1,2,3	Student1_Right_Middle_1.jpg Student1_Right_Middle_2.jpg Student1_Right_Middle_3.jpg	Student1_Right_Middle_1 Student1_Right_Middle_2 Student1_Right_Middle_3
		Pointing or Index	1,2,3	Student1_Right_Pointing_1.jpg Student1_Right_Pointing_2.jpg Student1_Right_Pointing_3.jpg	Student1_Right_Pointing_1 Student1_Right_Pointing_2 Student1_Right_Pointing_3
		Thumb	1,2,3	Student1_Right_Thumb_1.jpg Student1_Right_Thumb_2.jpg Student1_Right_Thumb_3.jpg	Student1_Right_Thumb_1 Student1_Right_Thumb_2 Student1_Right_Thumb_3



### Student1 Enrolment Many-one

User	Hand	Finger	Samples	Sample Image Filename, Store in dir: Gallery	Template Filename, Store in dir: Templates
Student 1	Left	Little	1,2,3	Student1_Left_Little_1.jpg Student1_Left_Little_2.jpg Student1_Left_Little_3.jpg	Student1_Left_Little
		Ring	1,2,3	Student1_Left_Ring_1.jpg Student1_Left_Ring_2.jpg Student1_Left_Ring_3.jpg	Student1_Left_Ring
		Middle	1,2,3	Student1_Left_Middle_1.jpg Student1_Left_Middle_2.jpg Student1_Left_Middle_3.jpg	Student1_Left_Middle
		Pointing or Index	1,2,3	Student1_Left_Pointing_1.jpg Student1_Left_Pointing_2.jpg Student1_Left_Pointing_3.jpg	Student1_Left_Pointing
		Thumb	1,2,3	Student1_Left_Thumb_1.jpg Student1_Left_Thumb_2.jpg Student1_Left_Thumb_3.jpg	Student1_Left_Thumb
	Right	Little	1,2,3	Student1_Right_Little_1.jpg Student1_Right_Little_2.jpg Student1_Right_Little_3.jpg	Student1_Right_Little
		Ring	1,2,3	Student1_Right_Ring_1.jpg Student1_Right_Ring_2.jpg Student1_Right_Ring_3.jpg	Student1_Right_Ring
		Middle	1,2,3	Student1_Right_Middle_1.jpg Student1_Right_Middle_2.jpg Student1_Right_Middle_3.jpg	Student1_Right_Middle
		Pointing or Index	1,2,3	Student1_Right_Pointing_1.jpg Student1_Right_Pointing_2.jpg Student1_Right_Pointing_3.jpg	Student1_Right_Pointing
		Thumb	1,2,3	Student1_Right_Thumb_1.jpg Student1_Right_Thumb_2.jpg Student1_Right_Thumb_3.jpg	Student1_Right_Thumb



## Student2 Enrolment one-one

User	Hand	Finger	Samples	Sample Image Filename, Store in dir: Gallery	Template Filename, Store in dir: Templates
Student 2	Left	Pinkie	1,2,3	Student2_Left_Pinkie_1.jpg Student2_Left_Pinkie_2.jpg Student2_Left_Pinkie_3.jpg	Student2_Left_Pinkie_1 Student2_Left_Pinkie_2 Student2_Left_Pinkie_3
		Ring	1,2,3	Student2_Left_Ring_1.jpg Student2_Left_Ring_2.jpg Student2_Left_Ring_3.jpg	Student2_Left_Ring_1 Student2_Left_Ring_2 Student2_Left_Ring_3
		Middle	1,2,3	Student2_Left_Middle_1.jpg Student2_Left_Middle_2.jpg Student2_Left_Middle_3.jpg	Student2_Left_Middle_1 Student2_Left_Middle_2 Student2_Left_Middle_3
		Pointing or Index	1,2,3	Student2_Left_Index_1.jpg Student2_Left_Index_2.jpg Student2_Left_Index_3.jpg	Student2_Left_Index_1 Student2_Left_Index_2 Student2_Left_Index_3
		Thumb	1,2,3	Student2_Left_Thumb_1.jpg Student2_Left_Thumb_2.jpg Student2_Left_Thumb_3.jpg	Student2_Left_Thumb_1 Student2_Left_Thumb_2 Student2_Left_Thumb_3
	Right	Pinkie	1,2,3	Student2_Right_Pinkie_1.jpg Student2_Right_Pinkie_2.jpg Student2_Right_Pinkie_3.jpg	Student2_Right_Pinkie_1 Student2_Right_Pinkie_2 Student2_Right_Pinkie_3
		Ring	1,2,3	Student2_Right_Ring_1.jpg Student2_Right_Ring_2.jpg Student2_Right_Ring_3.jpg	Student2_Right_Ring_1 Student2_Right_Ring_2 Student2_Right_Ring_3
		Middle	1,2,3	Student2_Right_Middle_1.jpg Student2_Right_Middle_2.jpg Student2_Right_Middle_3.jpg	Student2_Right_Middle_1 Student2_Right_Middle_2 Student2_Right_Middle_3
		Pointing or Index	1,2,3	Student2_Right_Index_1.jpg Student2_Right_Index_2.jpg Student2_Right_Index_3.jpg	Student2_Right_Index_1 Student2_Right_Index_2 Student2_Right_Index_3
		Thumb	1,2,3	Student2_Right_Thumb_1.jpg Student2_Right_Thumb_2.jpg Student2_Right_Thumb_3.jpg	Student2_Right_Thumb_1 Student2_Right_Thumb_2 Student2_Right_Thumb_3

## Student2 Enrolment Many-one

User	Hand	Finger	Samples	Sample Image Filename, Store in dir: Gallery	Template Filename, Store in dir: Templates
Student 2	Left	Pinkie	1,2,3	Student2_Left_Pinkie_1.jpg Student2_Left_Pinkie_2.jpg Student2_Left_Pinkie_3.jpg	Student2_Left_Pinkie
		Ring	1,2,3	Student2_Left_Ring_1.jpg Student2_Left_Ring_2.jpg Student2_Left_Ring_3.jpg	Student2_Left_Ring
		Middle	1,2,3	Student2_Left_Middle_1.jpg Student2_Left_Middle_2.jpg Student2_Left_Middle_3.jpg	Student2_Left_Middle
		Pointing or Index	1,2,3	Student2_Left_Index_1.jpg Student2_Left_Index_2.jpg Student2_Left_Index_3.jpg	Student2_Left_Index
		Thumb	1,2,3	Student2_Left_Thumb_1.jpg Student2_Left_Thumb_2.jpg Student2_Left_Thumb_3.jpg	Student2_Left_Thumb
	Right	Pinkie	1,2,3	Student2_Right_Pinkie_1.jpg Student2_Right_Pinkie_2.jpg Student2_Right_Pinkie_3.jpg	Student2_Right_Pinkie
		Ring	1,2,3	Student2_Right_Ring_1.jpg Student2_Right_Ring_2.jpg Student2_Right_Ring_3.jpg	Student2_Right_Ring
		Middle	1,2,3	Student2_Right_Middle_1.jpg Student2_Right_Middle_2.jpg Student2_Right_Middle_3.jpg	Student2_Right_Middle
		Pointing or Index	1,2,3	Student2_Right_Index_1.jpg Student2_Right_Index_2.jpg Student2_Right_Index_3.jpg	Student2_Right_Index
		Thumb	1,2,3	Student2_Right_Thumb_1.jpg Student2_Right_Thumb_2.jpg Student2_Right_Thumb_3.jpg	Student2_Right_Thumb

### Student3 (Sooda) Enrolment one-one

User	Hand	Finger	Samples	Sample Image Filename, Store in dir: Gallery	Template Filename, Store in dir: Templates
Sooda	Left	Little	3	Sooda_Left_Little_1.jpg	Sooda_Left_Little_1
		Ring	1,2,3	Sooda_Left_Ring_1.jpg Sooda_Left_Ring_2.jpg Sooda_Left_Ring_3.jpg	Sooda_Left_Ring_1 Sooda_Left_Ring_2 Sooda_Left_Ring_3
		Middle	1,2,3	Sooda_Left_Middle_1.jpg Sooda_Left_Middle_2.jpg Sooda_Left_Middle_3.jpg	Sooda_Left_Middle_1 Sooda_Left_Middle_2 Sooda_Left_Middle_3
		Pointing or Index	1,2,3	Sooda_Left_Pointing_1.jpg Sooda_Left_Pointing_2.jpg Sooda_Left_Pointing_3.jpg	Sooda_Left_Pointing_1 Sooda_Left_Pointing_2 Sooda_Left_Pointing_3
		Thumb	1,2,3	Sooda_Left_Thumb_1.jpg Sooda_Left_Thumb_2.jpg Sooda_Left_Thumb_3.jpg	Sooda_Left_Thumb_1 Sooda_Left_Thumb_2 Sooda_Left_Thumb_3
	Right	Little	1,2,3	Sooda_Right_Little_1.jpg Sooda_Right_Little_2.jpg Sooda_Right_Little_3.jpg	Sooda_Right_Little_1 Sooda_Right_Little_2 Sooda_Right_Little_3
		Ring	1,2,3	Sooda_Right_Ring_1.jpg Sooda_Right_Ring_2.jpg Sooda_Right_Ring_3.jpg	Sooda_Right_Ring_1 Sooda_Right_Ring_2 Sooda_Right_Ring_3
		Middle	1,2,3	Sooda_Right_Middle_1.jpg Sooda_Right_Middle_2.jpg Sooda_Right_Middle_3.jpg	Sooda_Right_Middle_1 Sooda_Right_Middle_2 Sooda_Right_Middle_3
		Pointing or Index	1,2,3	Sooda_Right_Pointing_1.jpg Sooda_Right_Pointing_2.jpg Sooda_Right_Pointing_3.jpg	Sooda_Right_Pointing_1 Sooda_Right_Pointing_2 Sooda_Right_Pointing_3
		Thumb	1,2,3	Sooda_Right_Thumb_1.jpg Sooda_Right_Thumb_2.jpg Sooda_Right_Thumb_3.jpg	Sooda_Right_Thumb_1 Sooda_Right_Thumb_2 Sooda_Right_Thumb_3

### Student3 (Sooda) Enrolment Many-one

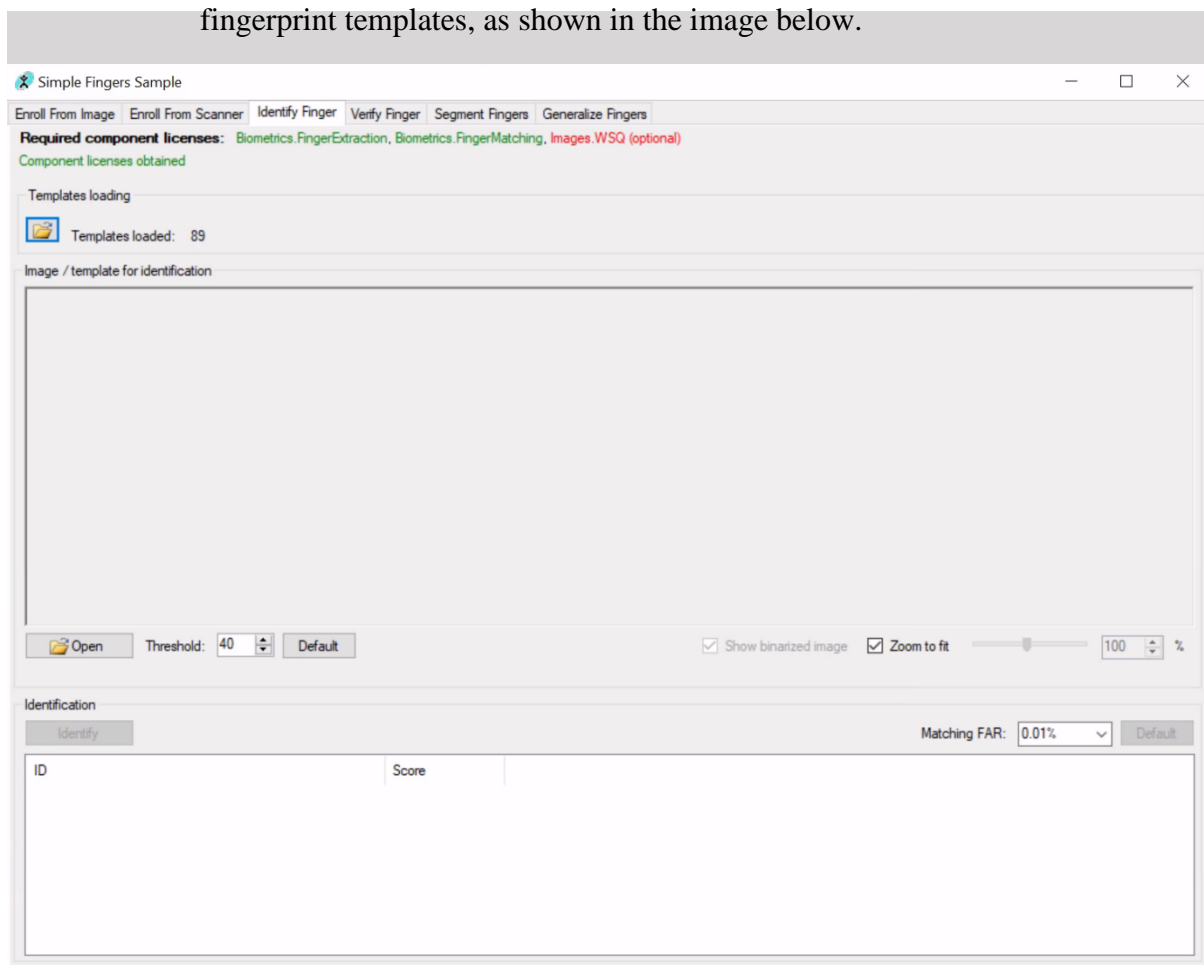
User	Hand	Finger	Samples	Sample Image Filename, Store in dir: Gallery	Template Filename, Store in dir: Templates
Sooda	Left	Little	3	Sooda_Left_Little_1.jpg	Sooda_Left_Little_1
		Ring	1,2,3	Sooda_Left_Ring_1.jpg Sooda_Left_Ring_2.jpg Sooda_Left_Ring_3.jpg	Sooda_Left_Ring
		Middle	1,2,3	Sooda_Left_Middle_1.jpg Sooda_Left_Middle_2.jpg Sooda_Left_Middle_3.jpg	Sooda_Left_Middle
		Pointing or Index	1,2,3	Sooda_Left_Pointing_1.jpg Sooda_Left_Pointing_2.jpg Sooda_Left_Pointing_3.jpg	Sooda_Left_Pointing
		Thumb	1,2,3	Sooda_Left_Thumb_1.jpg Sooda_Left_Thumb_2.jpg Sooda_Left_Thumb_3.jpg	Sooda_Left_Thumb
	Right	Little	1,2,3	Sooda_Right_Little_1.jpg Sooda_Right_Little_2.jpg Sooda_Right_Little_3.jpg	Sooda_Right_Little
		Ring	1,2,3	Sooda_Right_Ring_1.jpg Sooda_Right_Ring_2.jpg Sooda_Right_Ring_3.jpg	Sooda_Right_Ring
		Middle	1,2,3	Sooda_Right_Middle_1.jpg Sooda_Right_Middle_2.jpg Sooda_Right_Middle_3.jpg	Sooda_Right_Middle
		Pointing or Index	1,2,3	Sooda_Right_Pointing_1.jpg Sooda_Right_Pointing_2.jpg Sooda_Right_Pointing_3.jpg	Sooda_Right_Pointing
		Thumb	1,2,3	Sooda_Right_Thumb_1.jpg Sooda_Right_Thumb_2.jpg Sooda_Right_Thumb_3.jpg	Sooda_Right_Thumb

## 4.0 Stage 3 Fingerprint Verification, Identification and Performance Evaluation

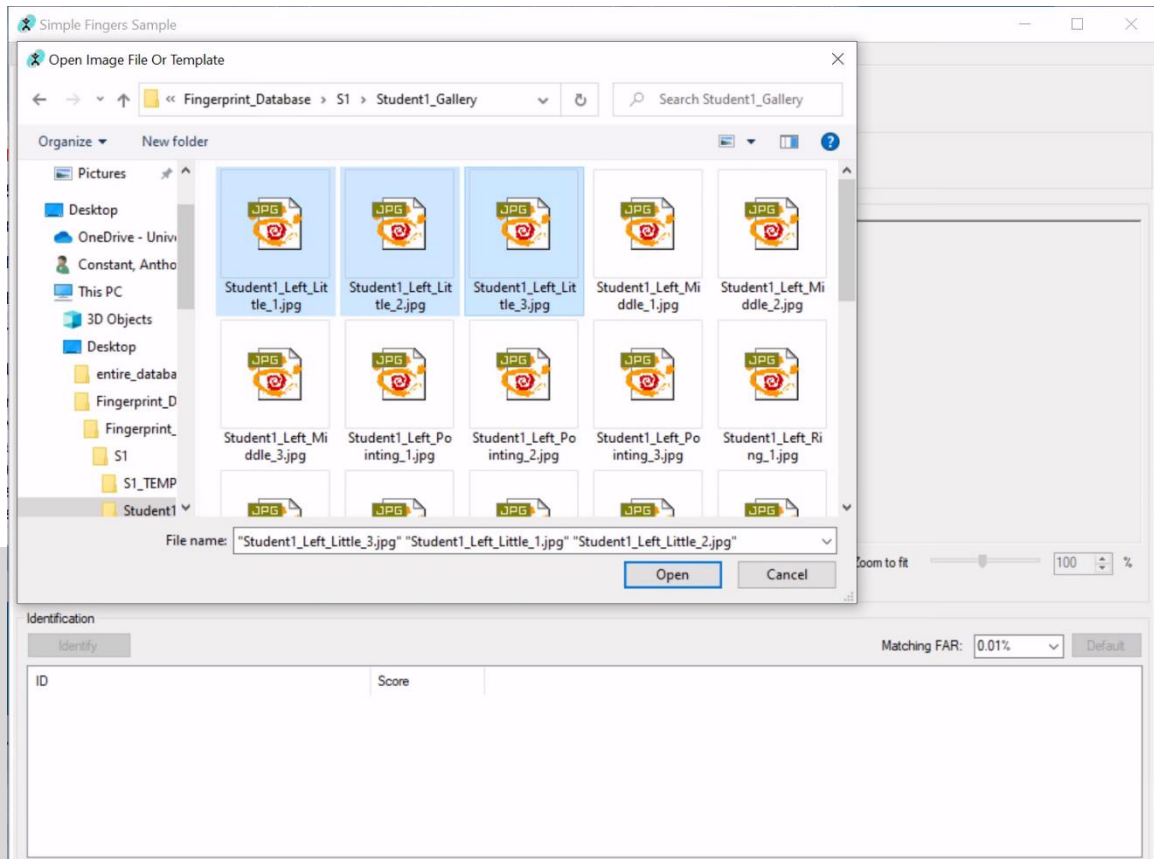
As part of stage 3 it was essential to conduct the next step verification, and identification. Identification could be described as asking users to provide some form of ID to prove who they are whereas, Verification is a process which involves ensuring whether the identity data is associated with a specific individual. For example, matching a student fingerprint against the fingerprint database.

### 4.1 Identification

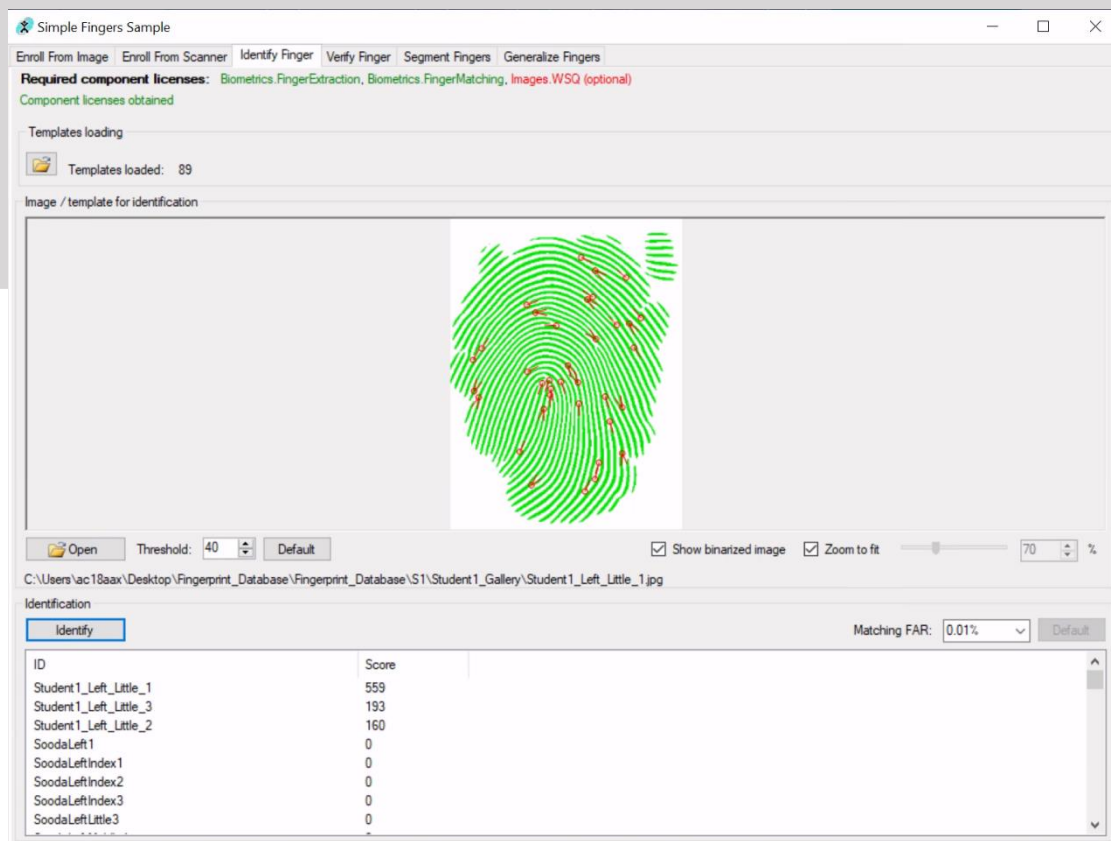
To perform identification, it is required to choose an image from the gallery and test it against the database. Additionally, the entire database could be considered all the Student files combined, which provides a total of 89 fingerprint templates, as shown in the image below.



The image reveals 89 templates has been imported from the entire database (all individual database combined i.e. S1,S2 and S3). After importing the templates, it was then required to import the fingerprint test images as shown in the image below.



The image reveals importing Student1's left little fingerprint more than once x3. After importing the individual images next, was required to perform the Identification by clicking identify as shown in the image below.



After comparing the results, it could be said that, there was a match as shown in the image above. As you can see it provided three different results however, only the highest score will be added to the graph in the next step for many-one tables however, for one-to-one table, it will required ONE template against ONE image. The score determines if there is a closest match and if the score is higher, the match is more likely identical however, if the score is lower, it means there is less likeliness of a match being identical to the test image against the database. Next, is to conduct a Validation test on each of the test images against the database and will require a Confusion Matrix table as the next step describes.

## 4.2 Confusion Matrix: Validation Test

As discussed previously, the templates will be treated as the Database and Gallery as the test data set. After performing Identification on each test image against the Database, it had produced the final results to include in the Matrices.

### Confusion Matrix LEGEND

Key	Name
LL	Left Little
LR	Left Ring
LM	Left Middle
LP / LI	Left Pointing/Left Index
LPK	Left Pinkie
LT	Left Thumb
RL	Right Little
RR	Right Ring
RM	Right Middle
RP / RI	Right Pointing / Right Index
RPK	Right Pinkie
RT	Right Thumb

Note: The Confusion matrix will show the high scores along the diagonal elements of the table.



Student 1 Fingerprint Validation Results

Student1\_Many-one

Use Sample Images here (Test )	Use Templates (Database)									
	LL	LR	LM	LP	LT	RL	RR	RM	RP	RT
	LL	559								
	LR		640							
	LM			795						
	LP				785					
	LT					746				
	RL						778			
	RR							695		
	RM								587	
	RP									582
	RT									627

Student1\_one-one (Table can be found within Excel document)

Use Sample Images here (Test )	Use Templates (Database)																													
	LL1	LL2	LL3	LR1	LR2	LR3	LM1	LM2	LM3	LP1	LP2	LP3	LT1	LT2	LT3	RL1	RL2	RL3	RR1	RR2	RR3	RM1	RM2	RM3	RP1	RP2	RP3	RT1	RT2	RT3
	LL1	559																												
	LL2		543																											
	LL3			584																										
	LR1				640																									
	LR2					627																								
	LR3						690																							
	LM1							795																						
	LM2								850																					
	LM3									844																				
	LP1										785																			
	LP2											758																		
	LP3												796																	
	LT1													746																
	LT2														319															
	LT3															775														
	RL1																778													
	RL2																	629												
	RL3																		593											
	RR1																			695										
	RR2																				703									
	RR3																					645								
	RM1																						587							
	RM2																							597						
	RM3																								588					
	RP1																									582				
	RP2																										593			
	RP3																											602		
	RT1																												627	
RT2																													640	
RT3																													706	

## Student 2 Fingerprint Validation Results

### Student2\_Many-one

Use Sample Images here (Test )	Use Templates (Database)									
	LPK	LR	LM	LP	LT	RPK	RR	RM	RP	RT
	LPK	250								
	LR	563								
	LM	557								
	LP			X						
	LT				579					
	RPK					540				
	RR					572				
	RM							545		
	RP								X	
	RT									534

### Student2\_one-one (Table can be found within Excel document)

Use Sample Images here (Test )	Use Templates (Database)																													
	LPK1	LPK2	LPK3	LR1	LR2	LR3	LM1	LM2	LM3	LI1	LI2	LI3	LT1	LT2	LT3	RPK1	RPK2	RPK3	RR1	RR2	RR3	RM1	RM2	RM3	RI1	RI2	RI3	RT1	RT2	RT3
	LPK1	0																												
	LPK2		585																											
	LPK3			609																										
	LR1				563																									
	LR2					541																								
	LR3						557																							
	LM1							557																						
	LM2								564																					
	LM3									0																				
	LI1										562																			
	LI2											487																		
	LI3												549																	
	LT1													579																
	LT2														618															
	LT3															560														
	RPK1																540													
	RPK2																	543												
	RPK3																		514											
	RR1																			572										
	RR2																				548									
	RR3																					571								
	RM1																						545							
	RM2																							564						
	RM3																								579					
	RI1																									539				
	RI2																										547			
	RI3																											548		
	RT1																												534	
	RT2																													556
RT3																														

## Student 3 Fingerprint Validation Results

### Student3\_Many-one

Use Sample Images here (Test )	Use Templates (Database)									
	LL	LR	LM	LI	LT	RL	RR	RM	RI	RT
	LL	815								
	LR		875							
	LM			753						
	LP				696					
	LT					740				
	RL						685			
	RR							716		
	RM								605	
	RP									579
	RT									637

### Student3\_one-one (Table can be found within Excel document)

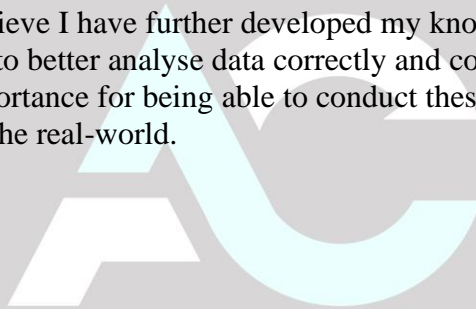
Use Sample Images here (Test )	Use Templates (Database)																RL1	RL2	RL3	RR1	RR2	RR3	RM1	RM2	RM3	RI1	RI2	RI3	RT1	RT2	RT3													
	LL1	LL2	LL3	LR1	LR2	LR3	LM1	LM2	LM3	LI1	LI2	LI3	LT1	LT2	LT3																													
	LL1	815																																										
	LL2	X																																										
	LL3		X																																									
	LR1			805																																								
	LR2				622																																							
	LR3					789																																						
	LM1						753																																					
	LM2							582																																				
	LM3								696																																			
	LI1									696																																		
	LI2										601																																	
	LI3											794																																
	LT1												740																															
	LT2													746																														
	LT3														654																													
	RL1															685																												
	RL2																															561												
	RL3																																721											
	RR1																																	716										
	RR2																																		568									
	RR3																																			743								
	RM1																																				605							
	RM2																																					612						
	RM3																																						648					
	RI1																																							579				
	RI2																																								514			
	RI3																																									681		
	RT1																																										637	
	RT2																																											524
	RT3																																											

## 5.0 Conclusion

Overall, the tasks that were carried out whilst undertaking this report has provided good insight into using commercial biometric software, to enrol students into the system and perform Identification and Validation.

What I have learned from this whole experience is how to conduct fingerprint scanning using pre-captured images and testing the data. I have also learned how to convert from images into templates using the SDK. I have learned how to import templates into the Database and test images such that, I'm now able to run the Identification and Validation tests. After running these tests, it was essential to note down the results and input them into the Matrix Confusion table, which provided good insight how to work with the data. I have also learned that the highest score retrieved from the test image compared against the template, means there is an identical match whereas, the lower score means there is a less likeliness of an identical match.

In conclusion, I believe I have further developed my knowledge regarding Biometrics, and I am now able to better analyse data correctly and convert the data. Therefore, I understand the importance for being able to conduct these tests, as they have a massive impact in the real-world.



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