AUTHENTICATION SYSTEM BASED ON ECG

TEAM: SC_61

Team Members

Name	ID
محمد صلاح احمد يوسف	[redacted]
محمد محسن السيد عبدالرحمن محمد	[redacted]
محمد رفعت ابو الحمد حمدان	[redacted]
محمد سعيد محمد عبدالجليل	[redacted]

Data Acquisition:

TB Diagnostic ECG Database

Data has been collected from https://www.physionet.org/content/ptbdb/1.0.0/

From 52 Healthy control subjects
we selected only 4 for our system

Data preparation:

First, we got the signals and removed isoline drift.

By using high pass filter and moving average filter to get the corrected filter.

(corrected=filtered - baseline)

Then do segmentation to extract ECG segments.

Then split data with ratio 80/20

And save one segment from each person in text file to be used for testing

Used Butterworth filter of order 4 and band (2,40)

Feature Extraction:

Then extract features using one methods:

1. Pan Tompkins algorithm for ECG points detection

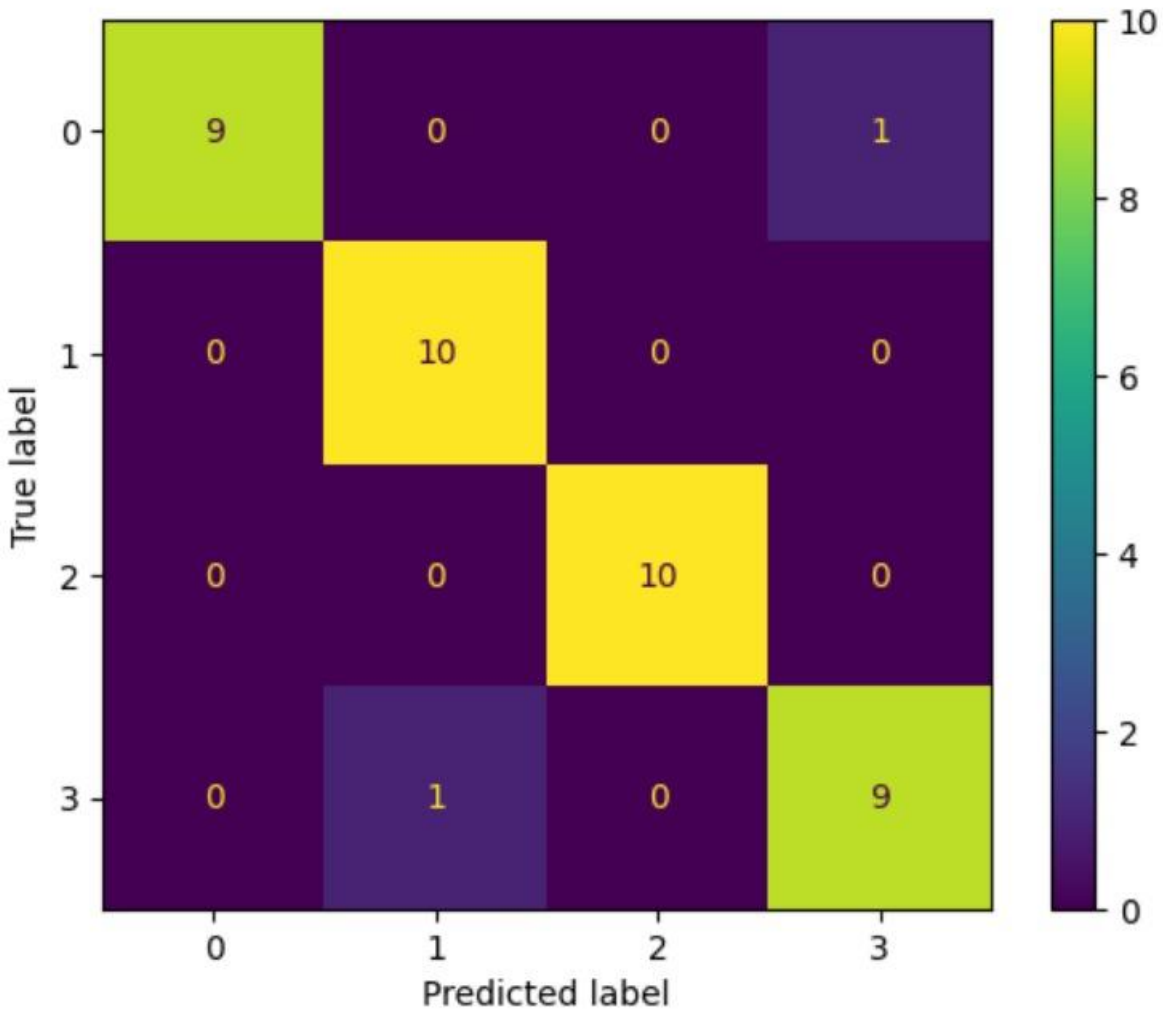
Classification:

Then used 2 classifiers:

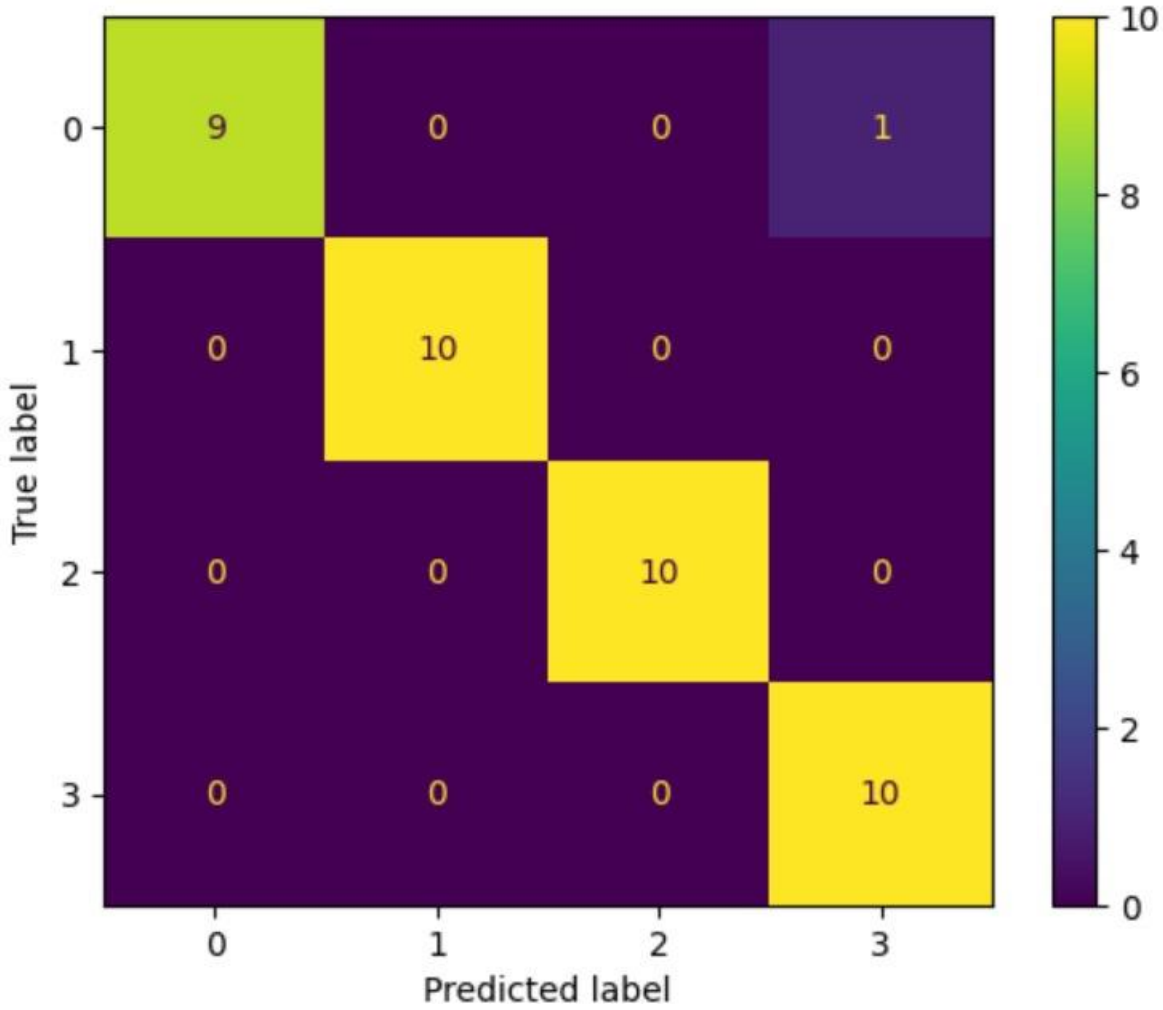
1. Support vector machines (SVM): parms=linear kernel
2. Linear Discriminant Analysis (LDA): parms= default

Classification Results:

	Classifier	
Feature extraction method	SVM	LDA
Fiducial features /Pan Tompkins	97.5 %	100.0 %
Fiducial features /11_points	95 %	97.5 %



SVM for 11 points



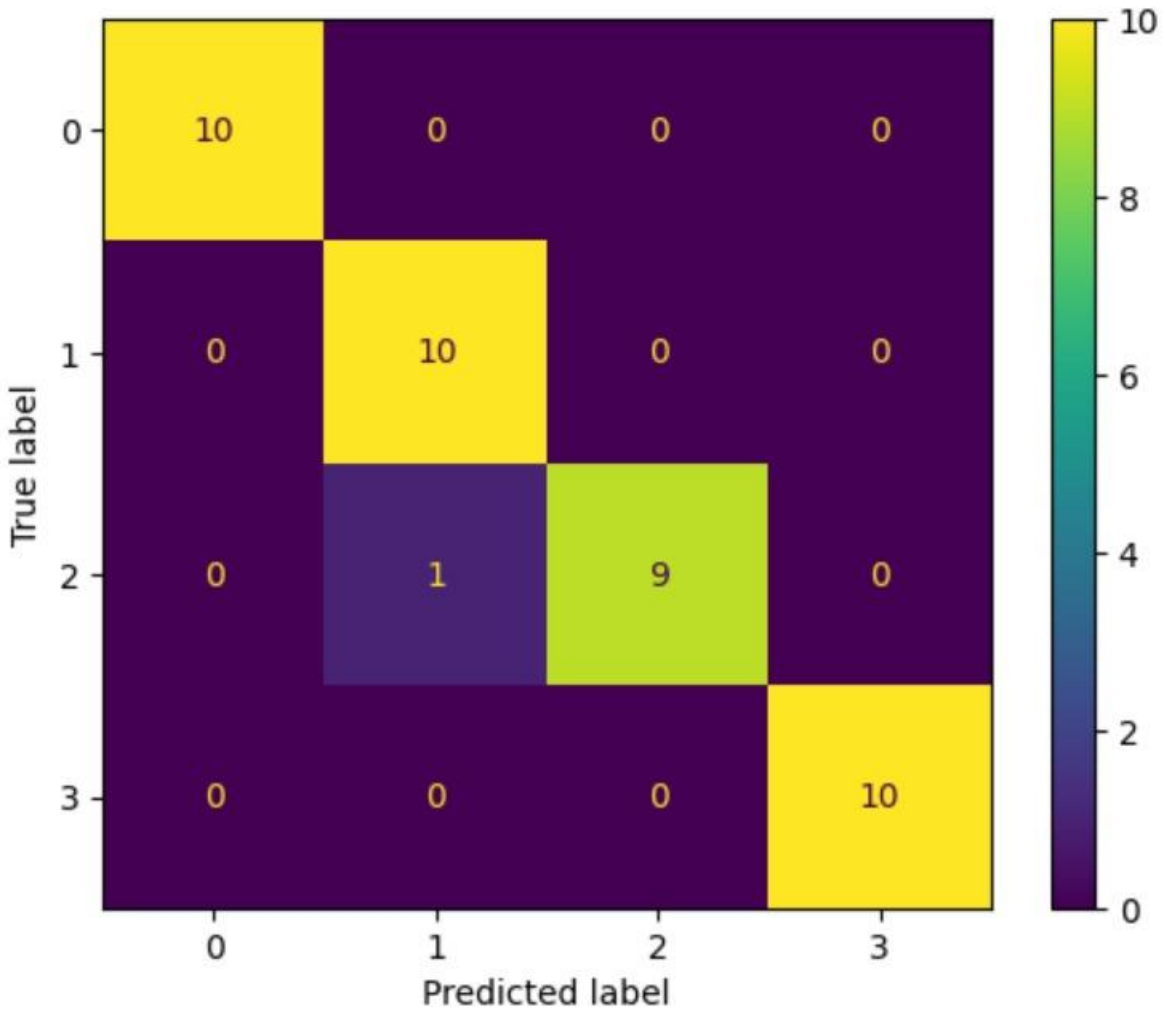
LDA for 11 points

	precision	recall	f1-score	support
sub_1	1.00	1.00	1.00	10
sub_2	0.91	1.00	0.95	10
sub_3	1.00	0.90	0.95	10
sub_4	1.00	1.00	1.00	10
accuracy			0.97	40
macro avg	0.98	0.97	0.97	40
weighted avg	0.98	0.97	0.97	40

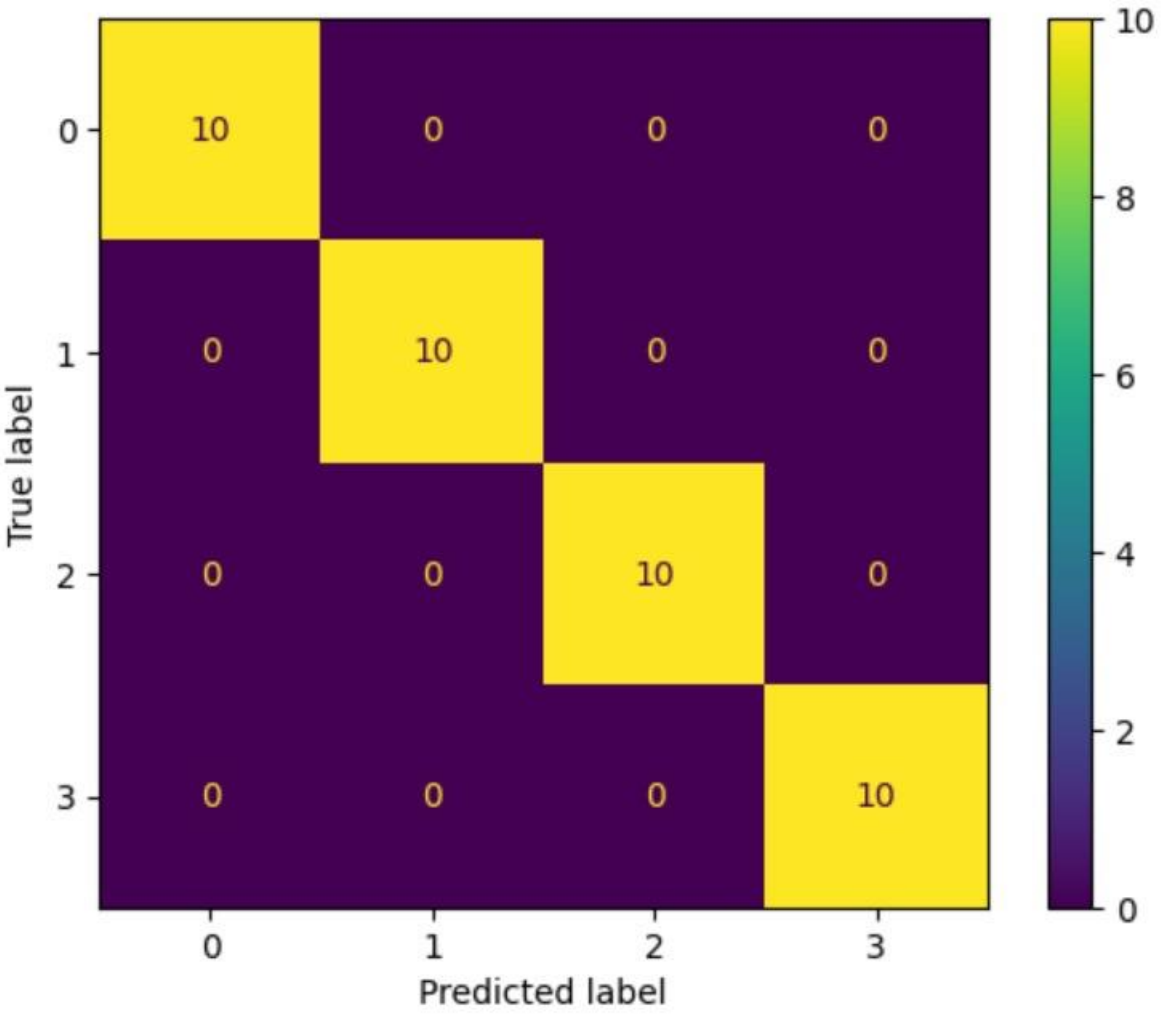
SVM for Pan

	precision	recall	f1-score	support
sub_1	1.00	1.00	1.00	10
sub_2	1.00	1.00	1.00	10
sub_3	1.00	1.00	1.00	10
sub_4	1.00	1.00	1.00	10
accuracy			1.00	40
macro avg	1.00	1.00	1.00	40
weighted avg	1.00	1.00	1.00	40

LDA for Pan



SVM for Pan



LDA for Pan

Screen Shots:

Authentication system GUI

er your Name[s sub_1

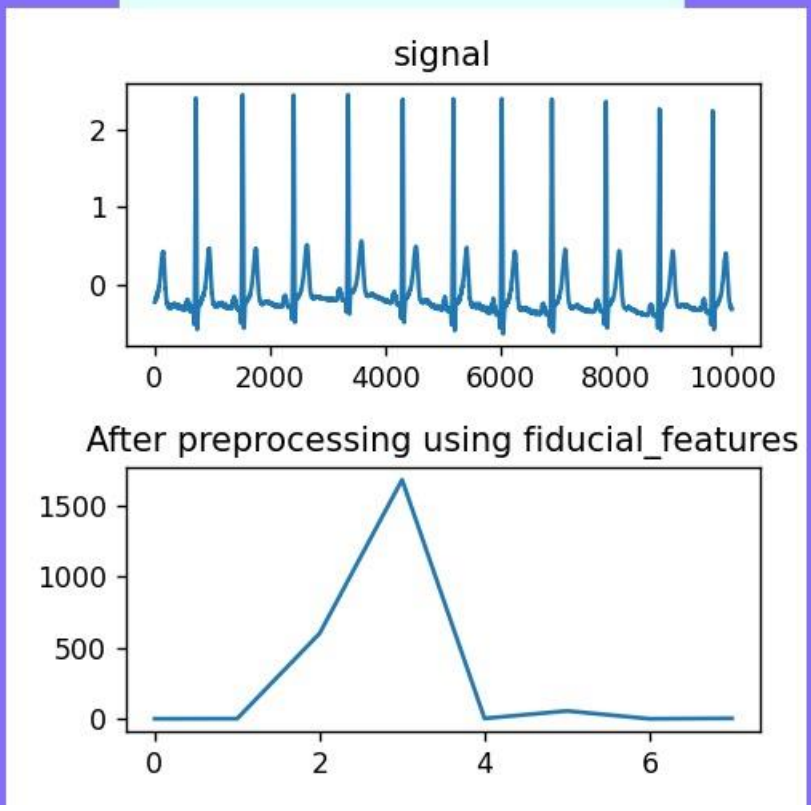
Open file sub_1

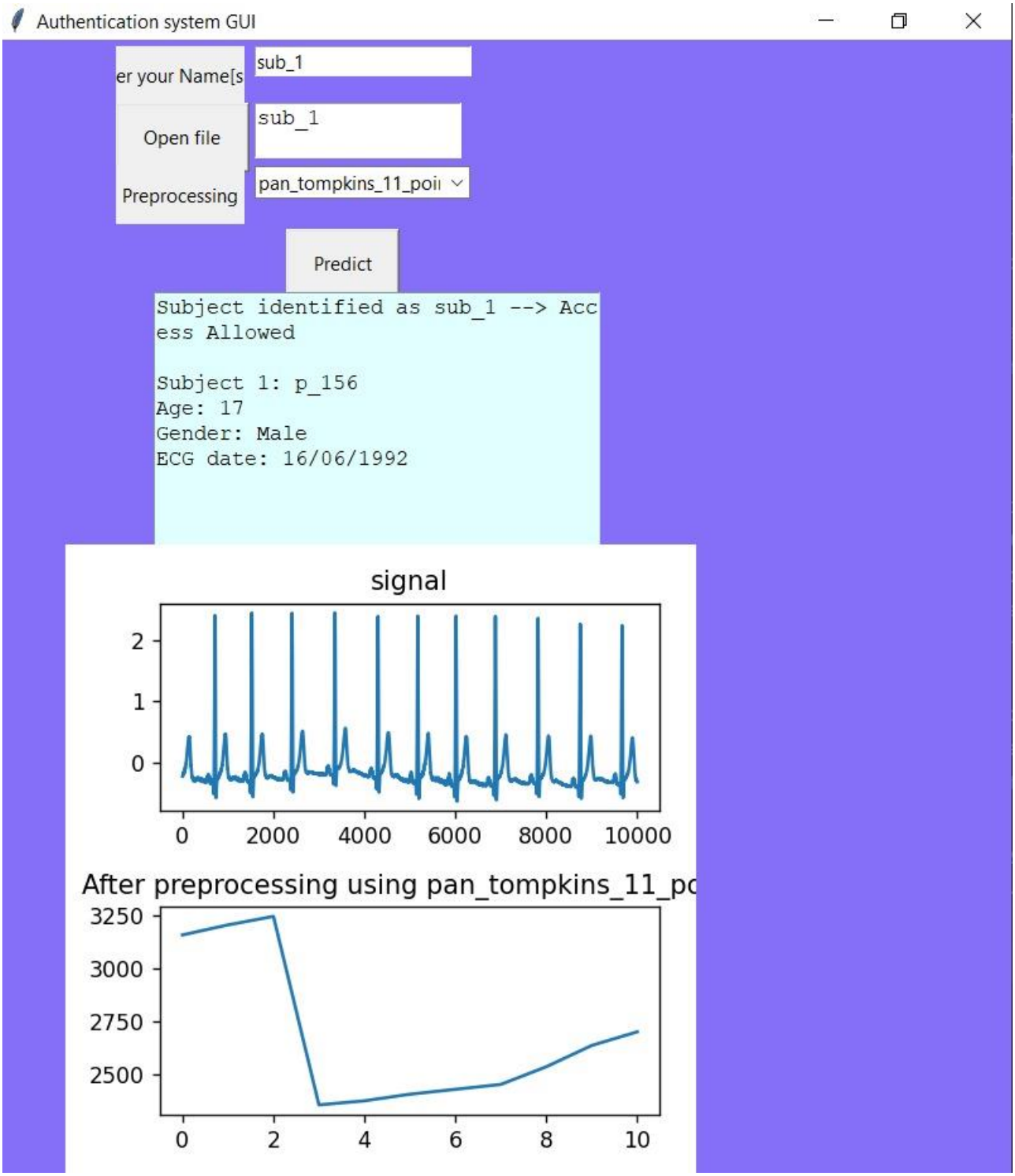
Preprocessing optimized_Fiducial

Predict

```
Subject identified as sub_1 --> Acc
ess Allowed

Subject 1: p_156
Age: 17
Gender: Male
ECG date: 16/06/1992
```




Authentication system GUI
er your Name[s
sub_1
Open file
sub_1
Preprocessing
pan_tompkins_11_poi
Predict
Subject identified as sub_1 --> Acc
ess Allowed
Subject 1: p_156
Age: 17
Gender: Male
ECG date: 16/06/1992
signal
2
1
0
0
2000
4000
6000
8000
10000
After preprocessing using pan_tompkins_11_pc
3250
3000
2750
2500
0
2
4
6
8
10

Authentication system GUI

er your Name[s

sub_5

Open file

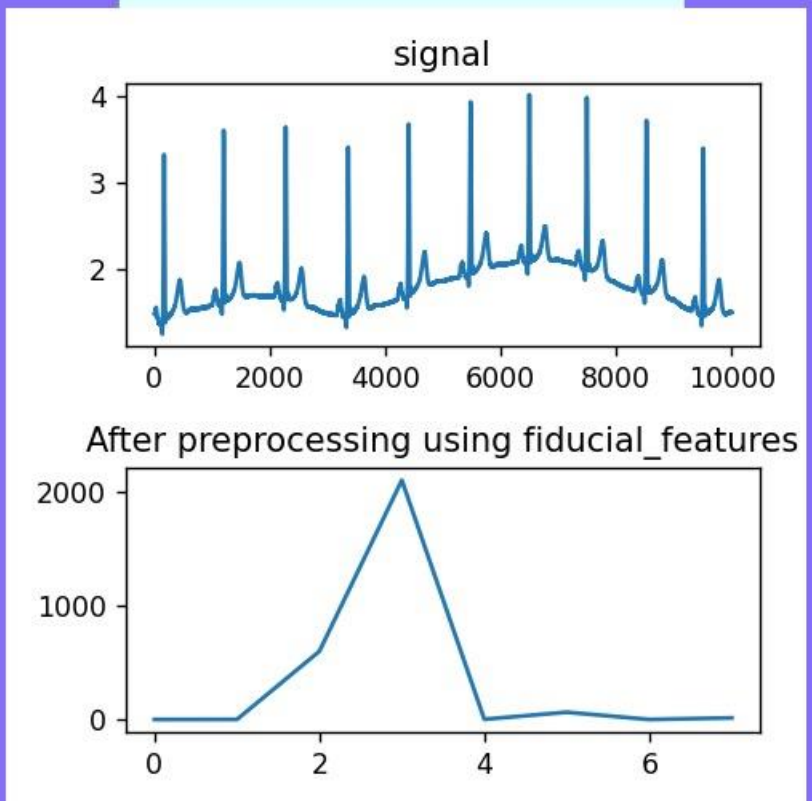
sub_5

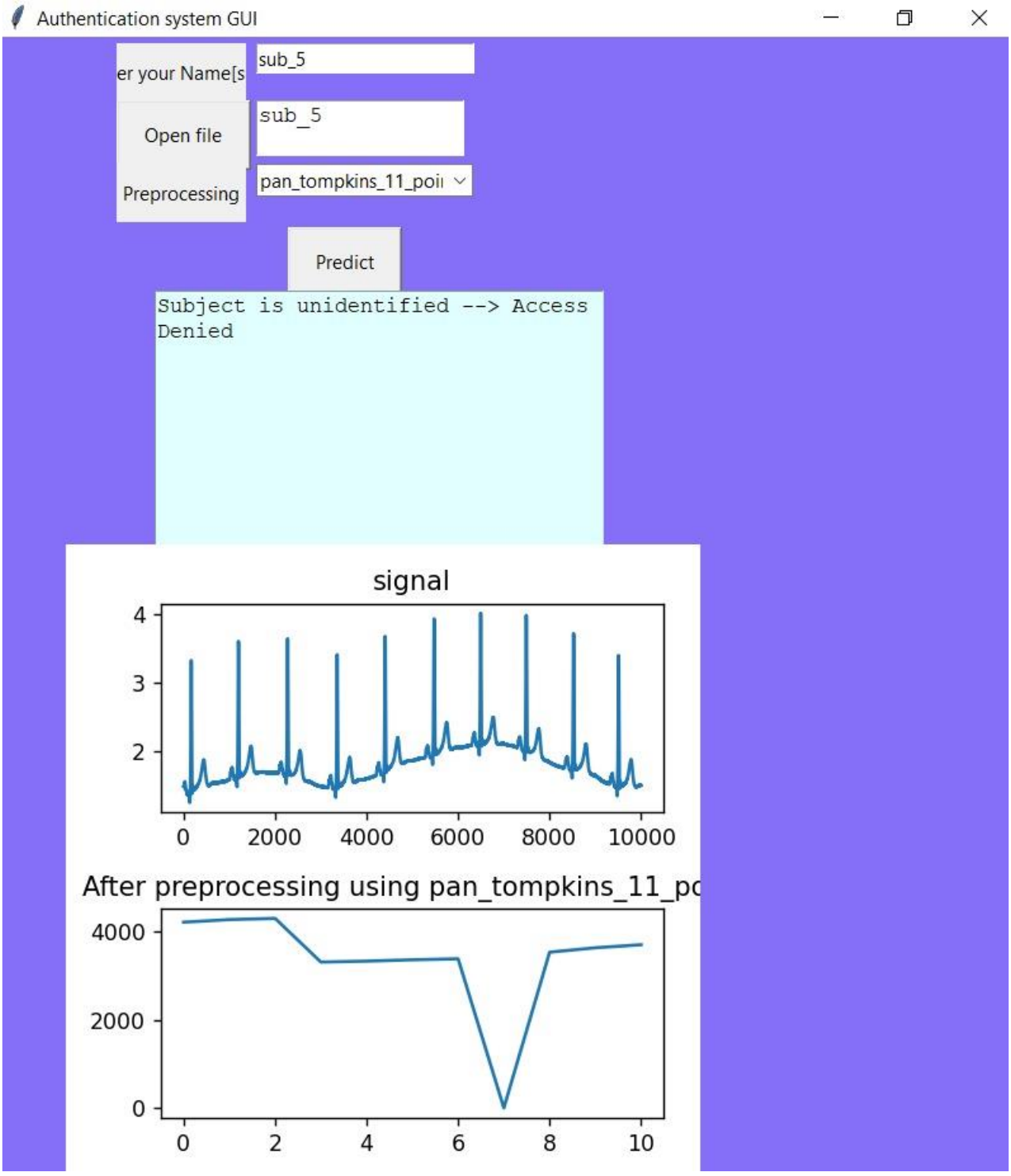
Preprocessing

optimized_Fiducial

Predict

```
Subject is unidentified --> Access
Denied
```




Authentication system GUI
er your Name[s
sub_5
Open file
sub_5
Preprocessing
pan_tompkins_11_poi
Predict
Subject is unidentified --> Access Denied
signal
4
3
2
0
2000
4000
6000
8000
10000
After preprocessing using pan_tompkins_11_pc
4000
2000
0
0
2
4
6
8
10

Architecture of the ECG identification