ECG Personal Information Lock

SC\_07

Under supervision:

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Data Preparation

Test subjects selected for our system are:

* Test subject 173
* Test subject 182
* Test subject 234
* Test subject 238

They were selected because they are healthy patients admitted into the hospital only for health control based on the data in the controls file on the database’s website, which can be confirmed through the patient’s header file.

A graph with lines on it

Description automatically generated

*Visualization of patient 173’s ECG recordings*

The data can be found on the website through this [link](https://www.physionet.org/content/ptbdb/1.0.0/).

The data was read from the files and split into train and test data by 70% and 30% respectively.

Two test data subjects were created for two scenarios, an identified subject and an unidentified subject.

For the identified subject, it should be recognized as test subject 182, we combined the signals of the four subjects, but most of the signals were from that test subject.

For the unidentified subject, it should not allow the subject to view any files, the signals were evenly collected from all four test subjects.

Preprocessing

1. Bandpass filter

Low cutoff frequency = 1

High cut-off frequency = 40

Sampling rate = test subject’s sampling rate

Order = 2

1. First order difference
2. Squaring
3. Moving-Window Integration

A graph of a graph of a graph

Description automatically generated with medium confidence

*Visualization of the signal from the first test subject during the preprocessing steps*

Feature Extraction

Fiducial features were used.

By detecting the peaks of each wave P, QRS, and T. In addition to their onsets and offsets.

The features can be calculated as such through the following:

A diagram of a graph

Description automatically generated

Classifiers

SVM Classifier:

Hyperparameters tested:

* C (Error): 0.001, 0.01, 0.1, 1, 10.
* max\_iter (Maximum number of iterations): range from 1 to 1000.

Hyperparameters used:

* C = 0.001
* max\_iter = 10

Logistic Regression Classifier:

Hyperparameters tested:

* C (Error): 0.001, 0.01, 0.1, 1, 10.
* max\_iter (Maximum number of iterations): range from 10 to 100.
* solver (Type of classifier used): 'newton-cg', 'lbfgs', 'liblinear'

Hyperparameters used:

* C = 1
* max\_iter = 12
* solver = liblinear

Results

|  |  |  |
| --- | --- | --- |
| Model | Accuracy | Hyperparameters |
| SVM | 99.36% | * C = 0.001 * max\_iter = 10 |
| Logistic Regression | 99.36% | * C = 1 * max\_iter = 12 * solver = liblinear |

Interface

A screenshot of a computer

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Scenario 1:

The test subject is identified, using the logistic regression classifier:

A screenshot of a computer

Description automatically generated

The test subject is identified, using the support vector machine classifier:

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Description automatically generated

Scenario 2

The test subject is unidentified, using the logistic regression classifier:

A screenshot of a computer

Description automatically generated

The test subject is unidentified, using the support vector machine classifier:

A screenshot of a computer

Description automatically generated