

The Project Full Contents

- 1- Read Ds Handle Missing Encoding No...
- 2- Feature Selection-pca
- 3-Classification
- 4- GUI
- final result
- Presentation
- Report

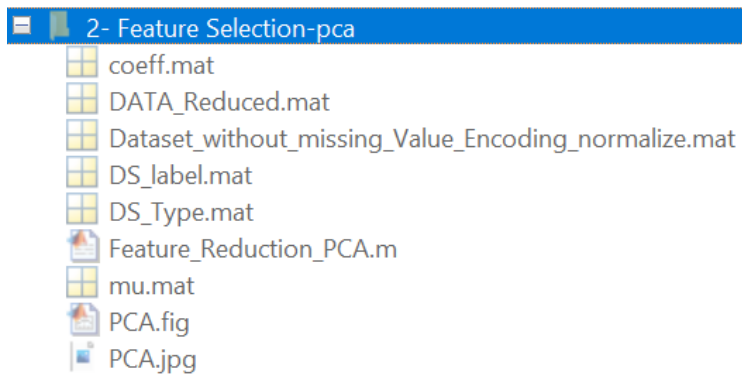
Folder contents

	Name
	1- Read Ds Handle Missing Encoding Normalization
📄	Attack.csv
📄	Dataset_without_missing_Value_Encoding_normalize.mat
📄	DS_label.mat
📄	DS_label_Info.mat
📄	DS_Type.mat
📄	DS_Type_Info.mat
📄	environmentMonitoring.csv
📄	info.m
📄	Info.xlsx
📄	patientMonitoring.csv
📄	Read_Preprocess.m

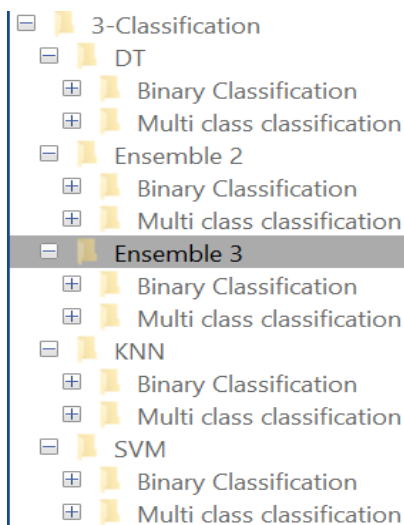
Running the code for loading and exploring the datasets

```
ans =  
8x52 table  
  
   frame_time_delta  frame_time_relative  frame_len  ip_src      ip_dst      tcp_srcport  tcp_dstport  tcp_flags  tcp_time_delta  
_____  
0                  0                    74         "10.16.120.44" "10.16.120.72" 56808        1883         2          0  
5.2e-05            5.2e-05             74         "10.16.120.72" "10.16.120.44" 1883         56808        18         5.2e-05  
9e-06              6e-05              74         "10.16.120.44" "10.16.120.72" 56810        1883         2          0  
1.2e-05            7.2e-05             74         "10.16.120.72" "10.16.120.44" 1883         56810        18         1.2e-05  
3e-06              7.5e-05             74         "10.16.120.44" "10.16.120.72" 56812        1883         2          0  
1e-05              8.5e-05             74         "10.16.120.72" "10.16.120.44" 1883         56812        18         1e-05  
4e-06              8.9e-05             74         "10.16.120.44" "10.16.120.72" 56814        1883         2          0  
9e-06              9.8e-05             74         "10.16.120.72" "10.16.120.44" 1883         56814        18         9e-06  
  
D S_label_Info =  
2x2 table  
  
   classes_in_DS  class_num  
_____  
"Attack"          80126  
"environmentMonitoring"  
"patientMonitoring" 76810
```

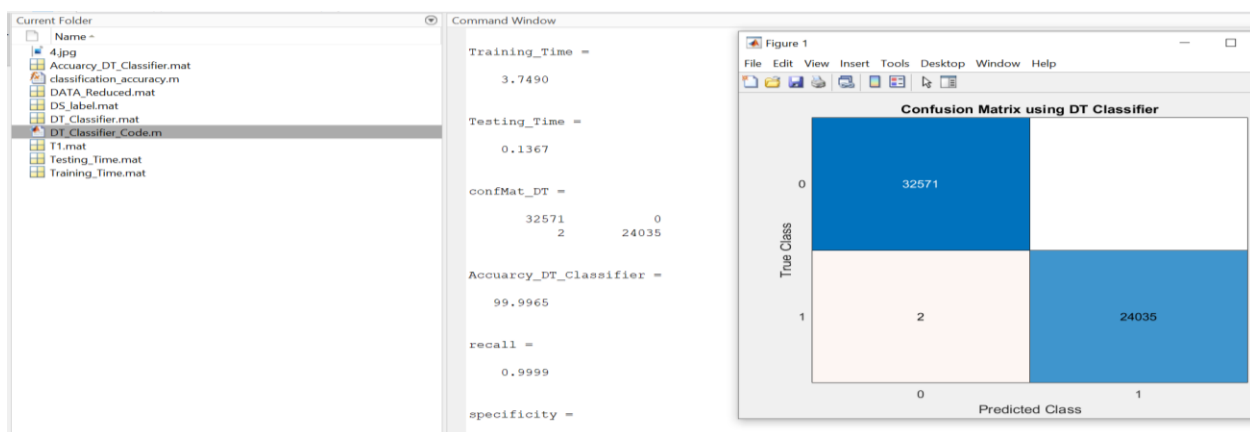
Second folder for Feature Selection



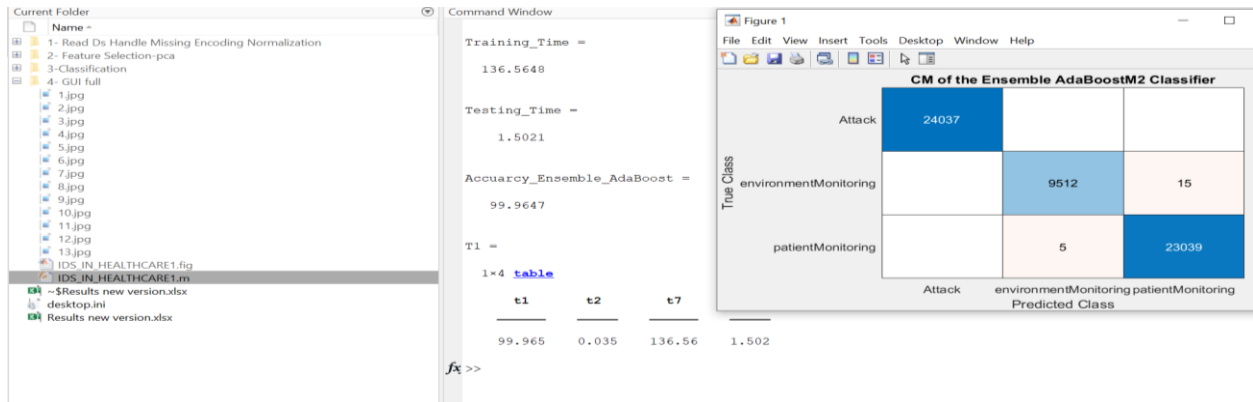
3-Classifications Algorithms



Running the Classification



Training and Evaluation the models



GUI



Full GUI

The screenshot shows a MATLAB GUI window titled "IDS of IoT in HealthCare Using ML". The main title is "Intrusion Detection System using Artificial Intelligence in IoT HealthCare". The GUI is divided into several sections:

- Project Steps:**
 - Dataset Selection:** Includes "Select Dataset" dropdown, "Load Dastaset" button, "Explore Dastaset" button, and "Spliting Dataset" button.
 - Dataset Pre-Processing:** Includes "Check Missing", "Encoding", "Normalization", and "Features Reduction-PCA" buttons.
 - First Level of Classification:** Includes "Select Model" dropdown, "Training Classifier" button, and "Classifier Evaluation" button.
 - Second Level of Classification:** Includes "Select Model" dropdown, "Training Classifier" button, and "Classifier Evaluation" button.
- Performance of 1st Level:** Includes input fields for Execution Time, Accuracy, Error Rate, Precision, Recall, F-Measure, and Specificity.
- Performance of 2nd Level:** Includes input fields for Execution Time, Accuracy, and Error Rate.
- OUTPUT WINDOW:** A large empty area for displaying results.

Loading the data

Intrusion Detection System using Artificial Intelligence in IoT HealthCare

Project Steps

Dataset Selection
ICUDatasetPro...
Load Dastaset
Select Dataset
Explore Dastaset

Dataset Pre-Processing
Check Missing
Encoding
Normalization
Features Reduct

Splitting Dataset

First Level of Classification
Select Model
Training Classifier
Classifier Evaluation

Second Level of Classification
Select Model
Training Classifier
Classifier Evaluation

Performance of 1st Level
Execution Time
Precision
Accuracy
Recall
Specificity

OUTPUT WINDOW

Succ...
Successfully Loading
OK

The dataset consists of 50 features (columns) and two labels (Class and Label) columns with 188694 samples (rows).

Selection Dataset for Explore

Intrusion Detection System using Artificial Intelligence in IoT HealthCare

Project Steps

Dataset Selection
ICUDatasetPro...
Load Dastaset
Select Dataset
Explore Dastaset
Num. of samples of Label (Normal vs. Attack)
Num. of samples of Class

Dataset Pre-Processing
Check Missing
Encoding
Normalization
Features Reduction-PCA

Splitting Dataset

First Level of Classification
Select Model
Training Classifier
Classifier Evaluation

Second Level of Classification
Select Model
Training Classifier
Classifier Evaluation

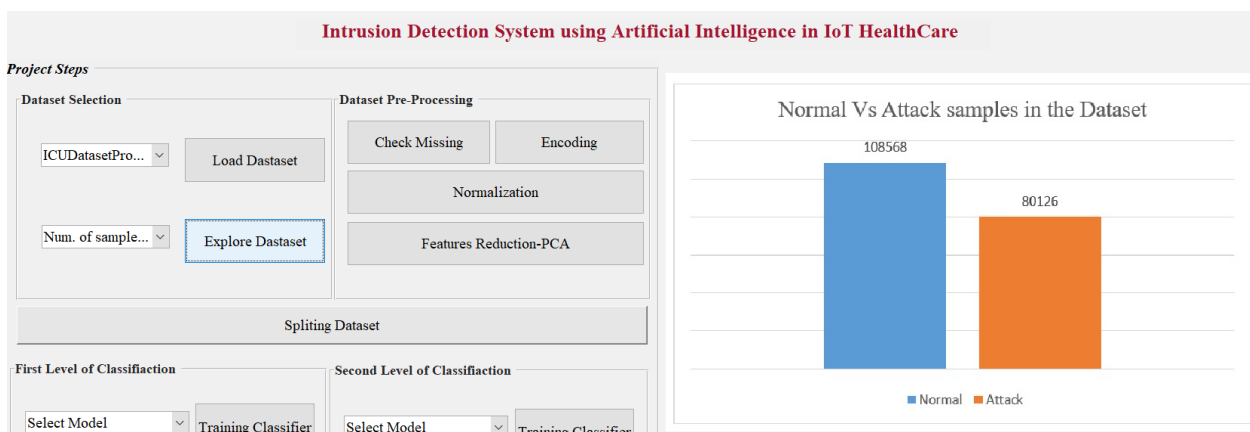
Performance of 1st Level
Execution Time
Precision
Accuracy
Recall
Specificity
Error Rate
F-Measure

OUTPUT WINDOW

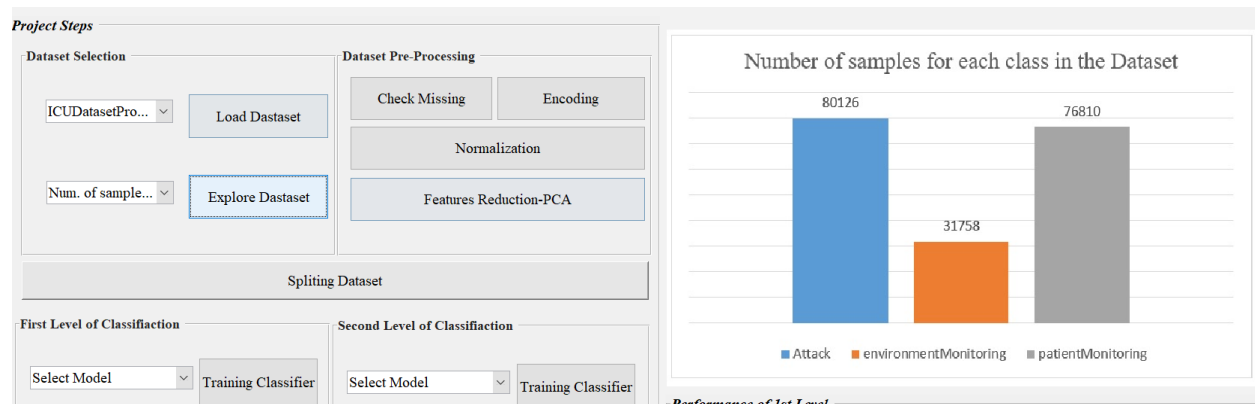
The dataset consists of 50 features (columns) and two labels (Class and Label) columns with 188694 samples (rows).

Performance of 2nd Level
Execution Time
Accuracy

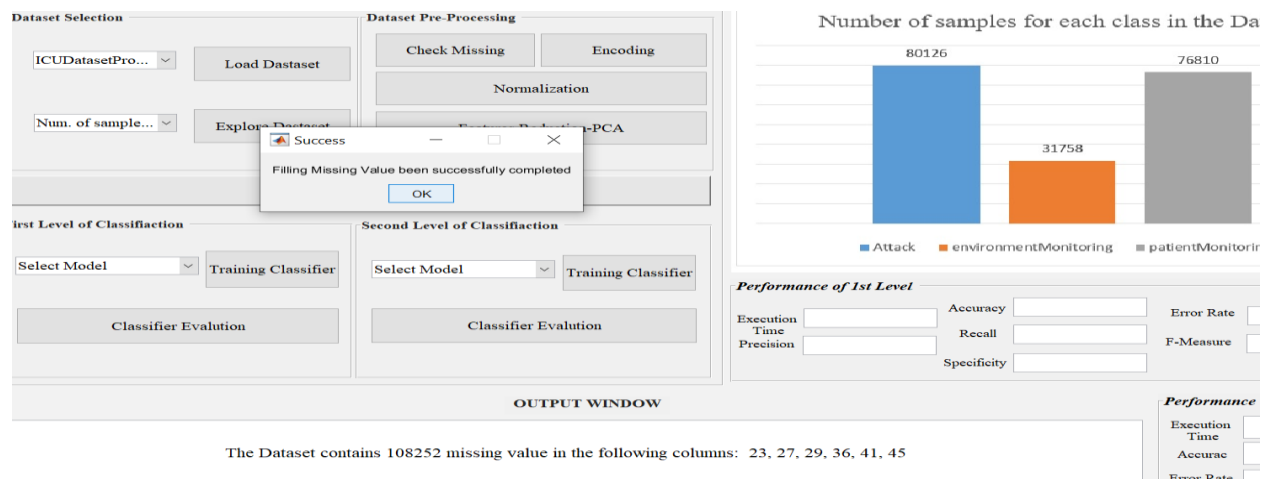
Exploring the data no of sample of label



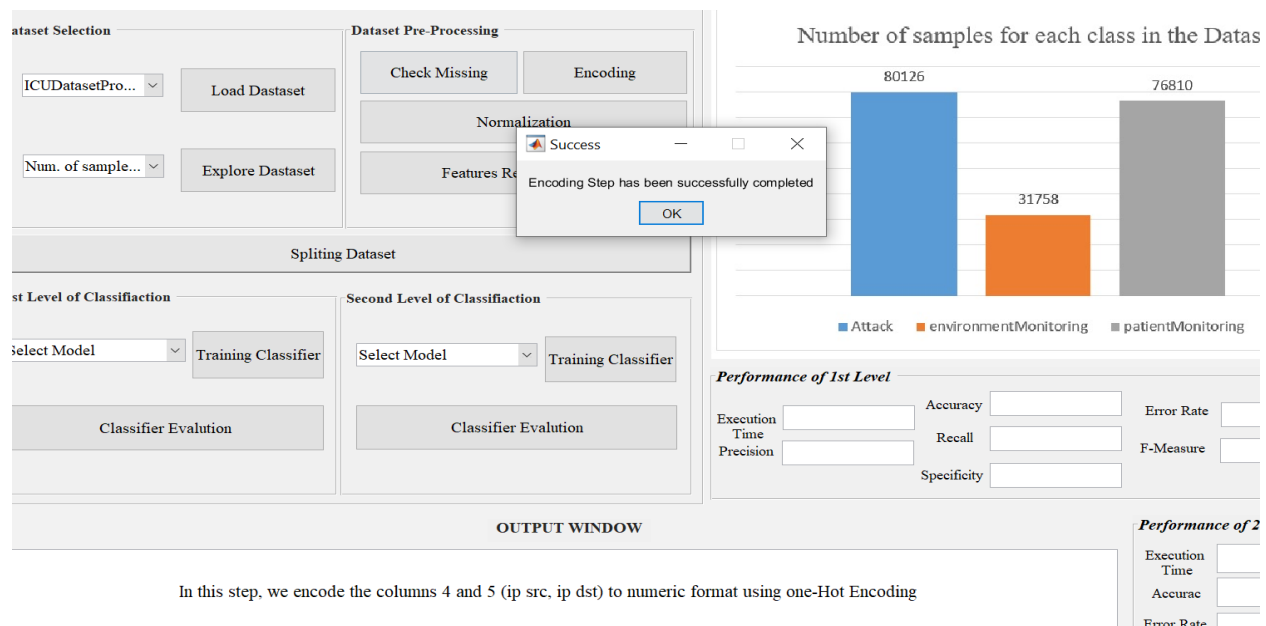
No of each sample Class



Check Missing values



Apply Encoding



Apply Normalization

The screenshot shows the 'Dataset Pre-Processing' section of the 'Intrusion Detection System using Artificial Intelligence in IoT HealthCare' application. The 'Normalization' button is highlighted, and a success dialog box is displayed: 'Success: Min-Max Normalization has been successfully completed'. The interface includes sections for 'Dataset Selection', 'Dataset Pre-Processing', 'Splitting Dataset', 'First Level of Classification', 'Second Level of Classification', and 'Performance of 1st Level'.

Normalization using Min-Max For All columns In Dataset

Apply PCA

The screenshot shows the 'Dataset Pre-Processing' section of the 'Intrusion Detection System using Artificial Intelligence in IoT HealthCare' application. The 'PCA' button is highlighted, and a success dialog box is displayed: 'Success: Feature Reduction using PCA has been successfully completed'. The interface includes sections for 'Dataset Selection', 'Dataset Pre-Processing', 'Splitting Dataset', 'First Level of Classification', 'Second Level of Classification', and 'Performance of 1st Level'. A scatter plot of 'Principal Component values' is visible, showing a clear separation between the two classes.

We choose First 19 columns to reconstruct 99.99% of the dataset, and drop 20-50 columns.

Splitting the data

The screenshot shows the 'Dataset Pre-Processing' section of the 'Intrusion Detection System using Artificial Intelligence in IoT HealthCare' application. The 'Splitting Dataset' button is highlighted, and a success dialog box is displayed: 'Success: Splitting dataset has been successfully completed'. The interface includes sections for 'Dataset Selection', 'Dataset Pre-Processing', 'Splitting Dataset', 'First Level of Classification', 'Second Level of Classification', and 'Performance of 1st Level'. A scatter plot of 'Principal Component values' is visible, showing a clear separation between the two classes.

The size of training and testing datasets are (132086 , 19) and (56608 , 19) respectively.

Model classification first Level

Dataset Selection

ICUDataSetPro... Load Dastaset

Num. of sample... Explore Dastaset

Dataset Pre-Processing

Check Missing Encoding

Normalization

Features Reduction-PCA

Splitting Dataset

First Level of Classification

Select Model
Select Model
DT
Ensemble AdaBoost
Ensemble Bag Tree
KNN
SVM

Training Classifier

Second Level of Classification

Select Model Training Classifier

Classifier Evaluation

Train First Level classifications

Dataset Selection

ICUDataSetPro... Load Dastaset

Num. of sample... Explore Dastaset

Dataset Pre-Processing

Check Missing Encoding

Normalization

Features Reduction-PCA

First Level of Classification

Ensemble AdaBoost Training Classifier

Classifier Evaluation

Second Level of Classification

Select Model Training Classifier

Classifier Evaluation

Success

Training The Ensemble AdaBoost Model Of The First Classification Level has been Done Successfully

OK

Evaluation first level classification

Intrusion Detection System using Artificial Intelligence in IoT HealthCare

Project Steps

Dataset Selection

ICUDataSetPro... Load Dastaset

Num. of sample... Explore Dastaset

Dataset Pre-Processing

Check Missing Encoding

Normalization

Features Reduction-PCA

Splitting Dataset

First Level of Classification

Ensemble AdaBoost Training Classifier

Classifier Evaluation

Second Level of Classification

Select Model Training Classifier

Classifier Evaluation

Confusion Matrix using Ensemble AdaBoost Classifier

True Class

0 32561 9

1 4 24034

Predicted Class

0 1

Performance of 1st Level

Execution Time 2.492

Precision 0.99983

Accuracy 99.977

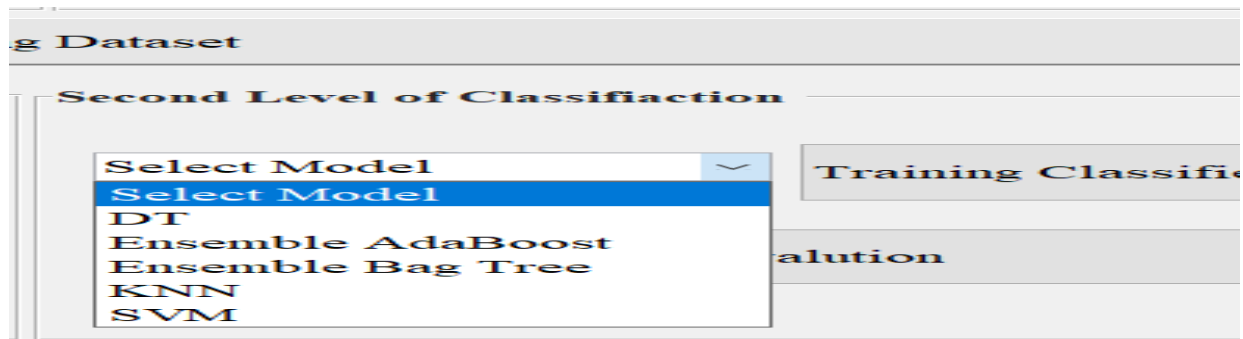
Recall 0.99972

Specificity 0.99963

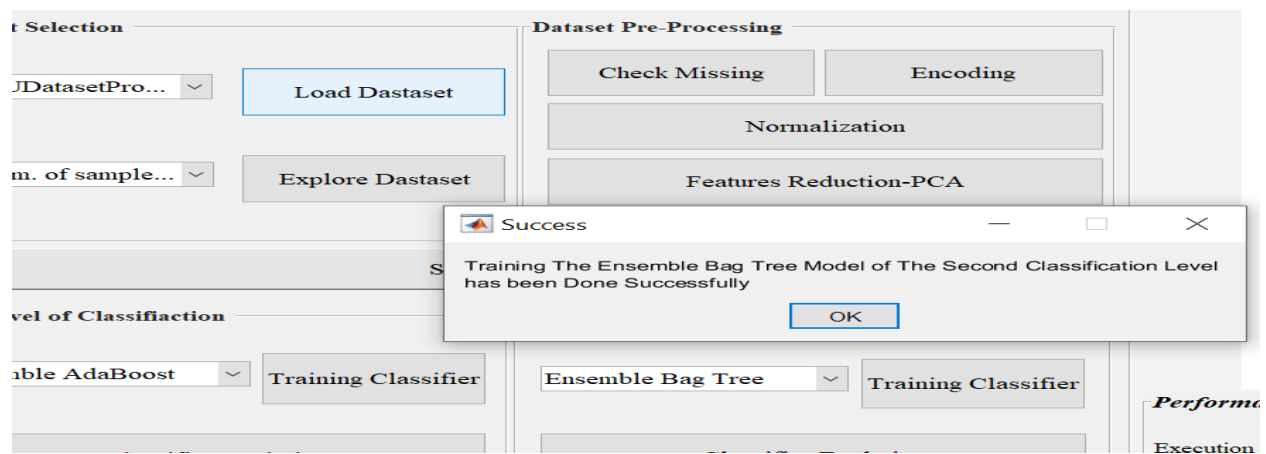
Error Rate 0.02296

F-Measure 0.99973

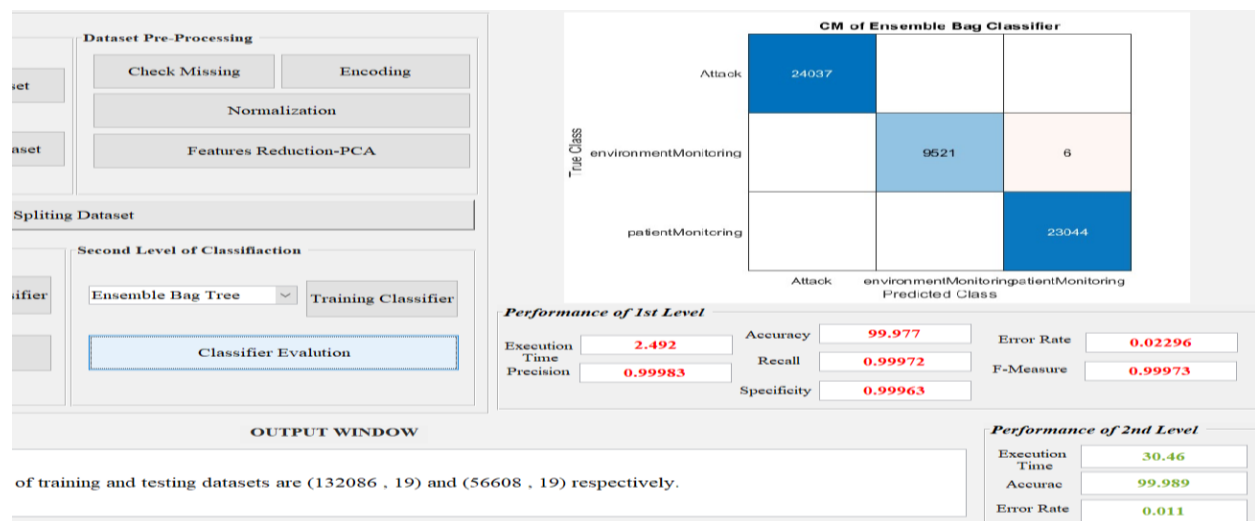
Second Level of classification



Train second level



Evaluation



Intrusion Detection System using Artificial Intelligence in IoT HealthCare

Dataset Pre-Processing

Check Missing

Encoding

Normalization

Features Reduction-PCA

ing Dataset

Second Level of Classifiaction

Ensemble AdaBoost

Training Classifier

Classifier Evaluation

CM of the Ensemble AdaBoostM2 Classifier

Attack	24037		
environmentMonitoring		9522	6
patientMonitoring		3	23040
	Attack	environmentMonitoring	patientMonitoring

Predicted Class

Performance of 1st Level

Execution Time	2.492	Accuracy	99.977	Error Rate	0.02296
Precision	0.99983	Recall	0.99972	F-Measure	0.99973
		Specificity	0.99963		

OUTPUT WINDOW

aining and testing datasets are (132086 , 19) and (56608 , 19) respectively.

Performance of 2nd Level

Execution Time	39.142
Accurac	99.984
Error Rate	0.016