

CS 395 Selected Topics in CS-1

Research Project

Report Submitted for Fulfillment of the Requirements and ILO's for
Selected Topics in CS-1 course for Fall 2021

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1. Project Introduction

General information on Dataset

Numerical Dataset:

Name: heart_failure_clinical_records_dataset

URL: <https://www.kaggle.com/anderwmvd/heart-failure-clinical-data>

Number of class (features):12

Type of label	Name
features	Age : age person
features	Anaemia :decrease of blood cells or hemoglobin
features	creatinine_phosphokinase :level of cpk enzyme in the blood
features	Diabetes : if the patient has diabetes
features	ejection_fraction: precentage of blood leaving the heart at each contraction
features	high_blood_pressure : if the patient has hypertension
features	Platelets : plateles in the blood
features	serum_creatinine : level of creatine in the blood
features	serum_sodium : level of serum sodium in the blood
features	Sex : woman or man
features	Smoking
features	time
Target	death event : true or not

Number of sample	
training	293 sample
validation	60 sample
testing	60 sample
Total sample	299 sample

Image Dataset:

Name: kagglecatsanddogs_3367a

URL : [https://www.kaggle.com/ karakaggle/kaggle-cat-vs-dog-dataset](https://www.kaggle.com/karakaggle/kaggle-cat-vs-dog-dataset)

Number of class (features): 9216

Number of sample	
training	19930 sample
Validation training	19930 sample
testing	4983 sample
validation test	4 983

Model_1: support vector machine for dataset numerical

1- Features extraction

The number of features is 12 features

The number of sample and features for training data: (239, 12)

The number of sample and features for testing data: (60, 12)

The number of sample and features for validation data: (60,)

2- Preprocessing data

We make standard scaling for the features

3- Cross validation

We use the library KFold and cross_val_score to make the cross validation

Number of fold = 10 splits

The ratio of training scores: 0.679 (mean)

The standard derivation: 0.089 (std)

4- Grid search

we use the Grid Search method to choose the best parameters for the model

the best parameters for model support vector machine :

C : 1000 ()

Gamma: 0.0001 ()

Kernel : rbf ()

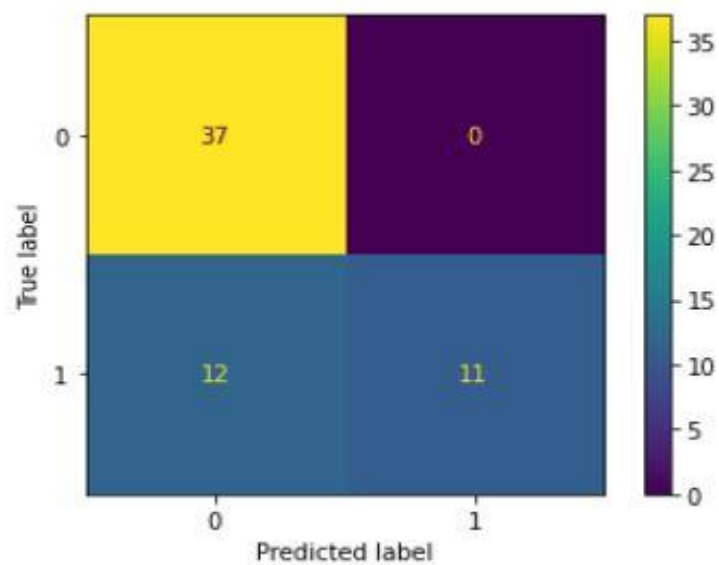
The best score in grid is 0.83677

5- The classification report

precision	recall	f1-score	support	
0	0.76	1.00	0.86	37

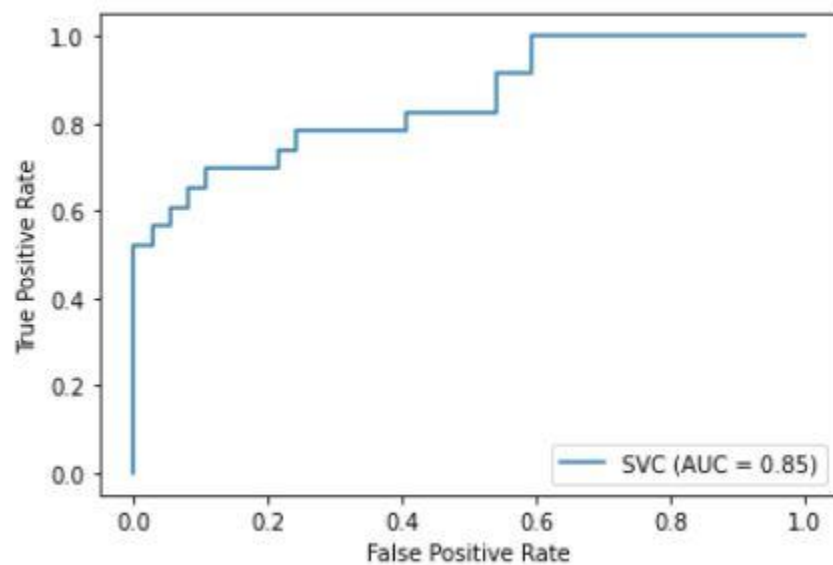
1	1.00	0.48	0.65	23
accuracy			0.80	60
macro avg	0.88	0.74	0.75	60
weighted avg	0.85	0.80	0.78	60

6- confusion matrix



7- ROC

curve



Model_2: artificial neural network for dataset numerical

1- Features extraction

The number of features is 12 features

The number of sample and features for training data: (239, 12)

The number of sample and features for testing data: (60, 12)

The number of sample and features for validation data: (60,)

2- Preprocessing data

We make standard scaling for the features

3- Cross validation

We use the library KFold and cross_val_score to make the cross validation

Number of fold = 10 splits

4- Grid search

we use the Grid Search method to choose the best parameters for the model

The best parameters for model support vector machine :

Batch size :10

Dropout rate: 0

Epochs:10

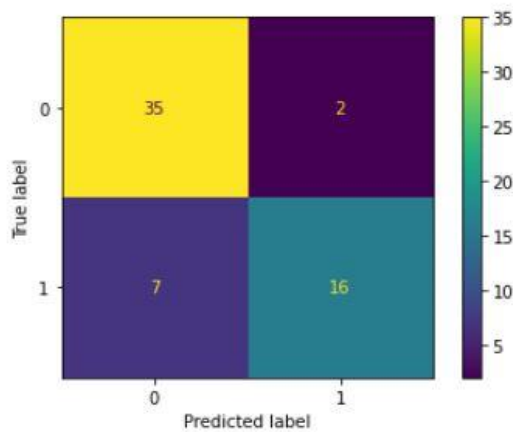
Learning rate: 0.001

5- The classification report

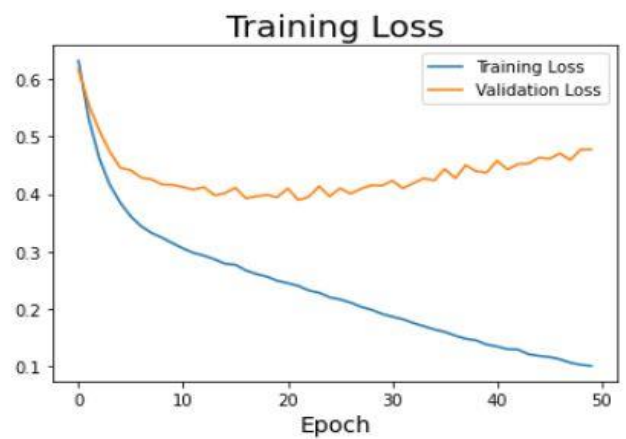
precision	recall	f1-score	support	
0	0.83	0.95	0.89	37
1	0.89	0.70	0.78	23

accuracy			0.85	60
macro avg	0.86	0.82	0.83	60
weighted avg	0.85	0.85	0.85	60

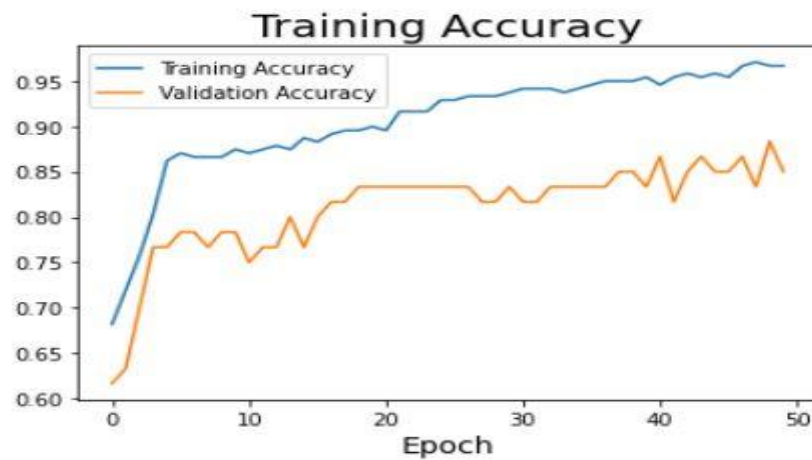
6- confusion matrix



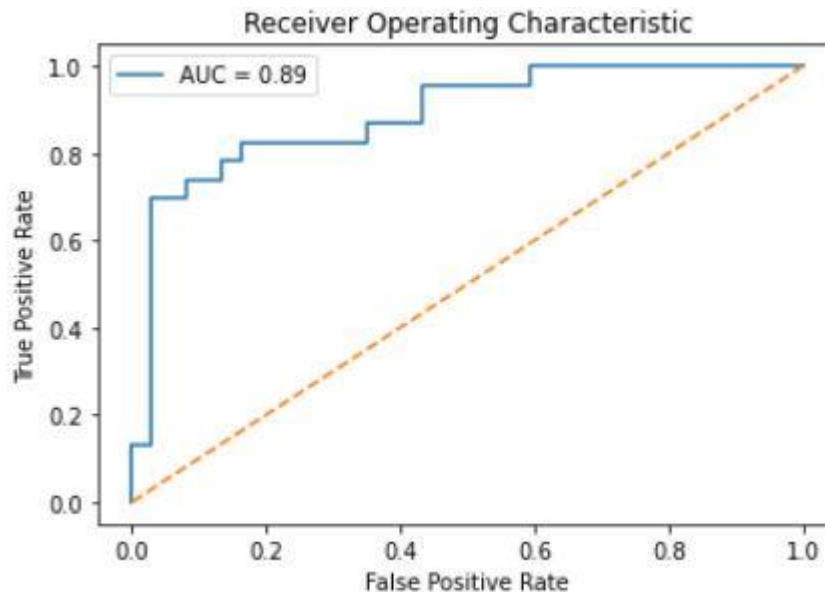
7- loss curve



8- training curve



9-(ROC –AUC) curve.



Model_3 Artificial neural network for dataset image

1- Features extraction

the number of features extraction :9216
the number of sample for training: 19930
the number of sample for testing 4983
the number of sample for validation training: 19930
the number of sample for validation test: 4983

2- Preprocessing data

- 1- we read image form the dataset
- 2- convert image from RGB to grayscale
- 3- convert image from grayscale to Histograms features
- 4- flatten the image that is make histograms

3- Cross validation

We use the library KFold and cross_val_score to make the cross validation

Number of fold = 2 splits

4- Grid search

we use the Grid Search method to choose the best parameters for the model

The best parameters for model support vector machine :

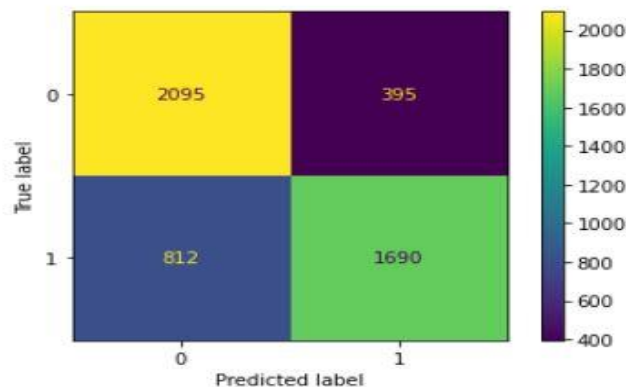
Batch size : 20 Dropout rate: 0

Epochs: 20 Learning rate: 0.001

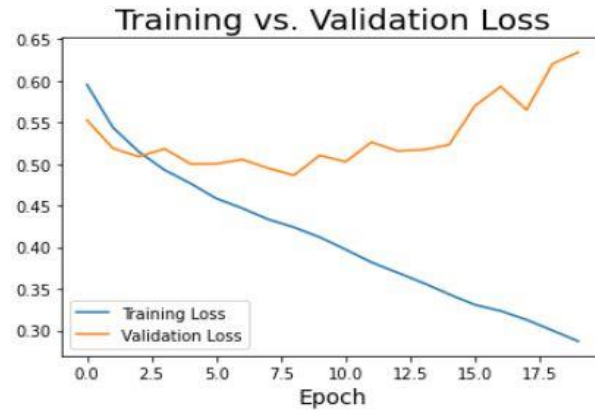
5- The classification report

precision	recall	f1-score	support	
0	0.73	0.80	0.77	2477
1	0.78	0.71	0.75	2506
accuracy			0.76	4983
macro avg	0.76	0.76	0.76	4983
weighted avg	0.76	0.76	0.76	4983

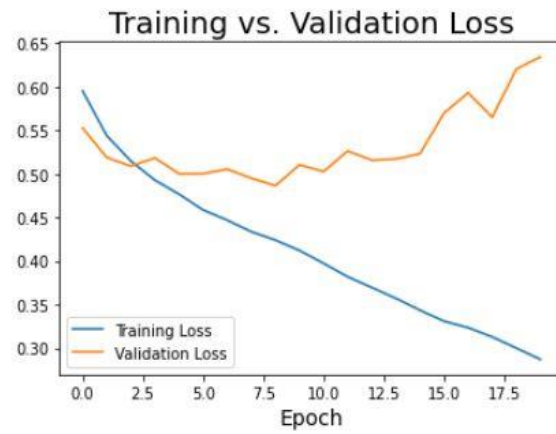
6- confusion matrix



7- loss curve

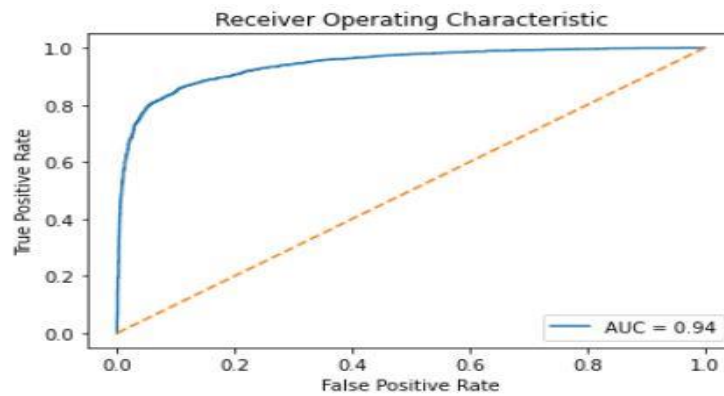


8- learning



curve

9 –ROC curve



Model_4 Artificial neural network for dataset image

1- Features extraction

the number of features extraction :9216
the number of sample for training: 19930
the number of sample for testing 4983
the number of sample for validation training: 19930
the number of sample for validation test: 4983

2- Preprocessing data

- 1- we read image form the dataset
- 2- convert image from RGB to grayscale
- 3- convert image from grayscale to Histograms features
- 4- flatten the image that is make histograms
- 3- Standard scalar and PCA

We used standard scalar to scale features between small value

Then used the PCA to downsize the number of features for image

3- Cross validation

We use the library KFold and cross_val_score to make the cross validation

Number of fold = 4 splits

Accuracy: 0.706 (0.010)

4- Grid search

we use the Grid Search method to choose the best parameters for the model

The best parameters for model support vector machine :

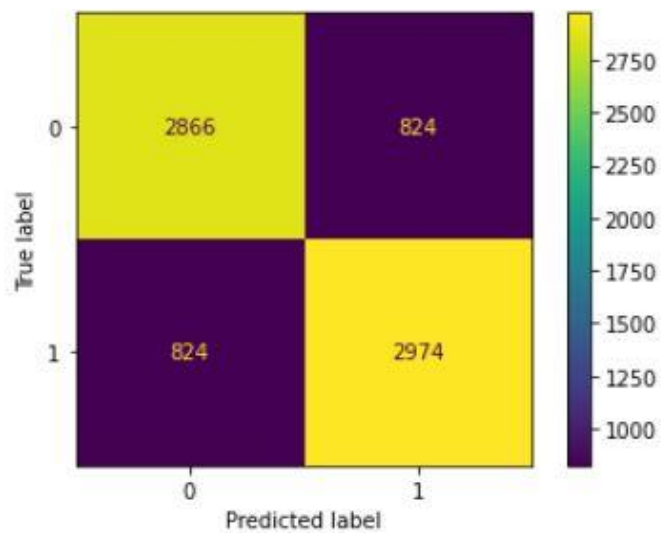
C': 1, 'gamma': 0.001, 'kernel': 'rbf'

Best score 0.71

5- The classification report

	Precision	recall	f1-score	support
0	0.78	0.78	0.78	3690
1	0.78	0.78	0.78	3798
Accuracy			0.78	7488
Macro avg	0.78	0.78	0.78	7488
Weighted avg	0.78	0.78	0.78	7488

6- Confusion matrix



6- Roc curve

