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Faculty of Computers and Artificial Intelligence

Computer Science Department

2021/2022

**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

Team No. 24

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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

**Number of class (features): 9216**

|  |  |
| --- | --- |
| **Number of sample** |  |
| **training** | **19930 sample** |
| **Validation training** | **19930 sample** |
| **testing** | **4983 sample** |
| **validation test** | **4983** |

**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**

**![Chart, treemap chart

Description automatically generated]()**

**7- ROC curve**

**![Chart

Description automatically generated]()**

**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**

**![Chart, line chart

Description automatically generated]()![Chart

Description automatically generated]()**

**8- training curve**

**![Chart, line chart

Description automatically generated]()**

**9-(ROC –AUC) curve.**

**![Chart, line chart

Description automatically generated]()**

**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**

**![Chart, treemap chart

Description automatically generated]()**

**![Chart, line chart

Description automatically generated]()7- loss curve**

**![Chart, line chart

Description automatically generated]()8- learning curve**

**9 –ROC curve**

**![Chart, line chart

Description automatically generated]()**

**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**

**![Chart, treemap chart

Description automatically generated]()**

**6- Roc curve![Chart

Description automatically generated]()**