Support_Vector_Machines

March 19, 2025

1 Support Vector Machines in Python

1.0.1 Task 1: Import the modules that will do all the work

```python
import pandas as pd # pandas is used to load and manipulate data and for
 ↪One-Hot Encoding
import numpy as np # numpy is used to calculate the mean and standard deviation
import matplotlib.pyplot as plt # matplotlib is for drawing graphs
import matplotlib.colors as colors
from sklearn.model_selection import train_test_split # split  data into
 ↪training and testing sets
from sklearn.preprocessing import scale # scale and center data
from sklearn.svm import SVC # this will make a support vector machine for
 ↪classificaiton
from sklearn.model_selection import GridSearchCV # this will do cross validation
from sklearn.metrics import confusion_matrix # this creates a confusion matrix
# Instead of importing plot_confusion_matrix, import ConfusionMatrixDisplay
from sklearn.metrics import ConfusionMatrixDisplay # draws a confusion matrix
from sklearn.decomposition import PCA # to perform PCA to plot the data
```

###Task 2: Import the data - UCI Heart disease Dataset!

```python
df = pd.read_csv("processed.cleveland.data", header=None)
```

```python
df.head()
```

```
      0    1    2      3      4    5    6      7    8    9    10   11   12  13
0  63.0  1.0  1.0  145.0  233.0  1.0  2.0  150.0  0.0  2.3  3.0  0.0  6.0   0
1  67.0  1.0  4.0  160.0  286.0  0.0  2.0  108.0  1.0  1.5  2.0  3.0  3.0   2
2  67.0  1.0  4.0  120.0  229.0  0.0  2.0  129.0  1.0  2.6  2.0  2.0  7.0   1
3  37.0  1.0  3.0  130.0  250.0  0.0  0.0  187.0  0.0  3.5  3.0  0.0  3.0   0
4  41.0  0.0  2.0  130.0  204.0  0.0  2.0  172.0  0.0  1.4  1.0  0.0  3.0   0
```

We see that instead of nice column names, we just have column numbers. Since nice column names would make it easier to know how to format the data, let's replace the column numbers with the following column names:

age,

sex,

cp - chest pain,

restbp - resting blood pressure (in mm Hg),

chol - serum cholesterol in mg/dl,

fbs - fasting blood sugar,

restecg - resting electrocardiographic results,

thalach - maximum heart rate achieved,

exang - exercise induced angina,

oldpeak - ST depression induced by exercise relative to rest,

slope - the slope of the peak exercise ST segment,

ca - number of major vessels (0-3) colored by fluoroscopy,

thal - this is short of thalium heart scan,

hd - diagnosis of heart disease, the predicted attribute.

```
[ ]: df.columns = ['age',
                    'sex',
                    'cp',
                    'restbp',
                    'chol',
                    'fbs',
                    'restecg',
                    'thalach',
                    'exang',
                    'oldpeak',
                    'slope',
                    'ca',
                    'thal',
                    'hd']
     df.head()
```

```
[ ]:     age  sex   cp  restbp   chol  fbs  restecg  thalach  exang  oldpeak  \
     0  63.0  1.0  1.0   145.0  233.0  1.0      2.0    150.0    0.0      2.3
     1  67.0  1.0  4.0   160.0  286.0  0.0      2.0    108.0    1.0      1.5
     2  67.0  1.0  4.0   120.0  229.0  0.0      2.0    129.0    1.0      2.6
     3  37.0  1.0  3.0   130.0  250.0  0.0      0.0    187.0    0.0      3.5
     4  41.0  0.0  2.0   130.0  204.0  0.0      2.0    172.0    0.0      1.4

        slope   ca thal  hd
     0    3.0  0.0  6.0   0
     1    2.0  3.0  3.0   2
     2    2.0  2.0  7.0   1
```

```
3     3.0  0.0  3.0    0
4     1.0  0.0  3.0    0
```

We have replaced the column numbers with nice, easy to remember names. Now that we have the data in a data frame called df, we are ready to identify and deal with Missing Data.

###Task 3: Missing Data Part 1: Identifying Missing Data

Missing Data is simply a blank space or surrogate value that indicates that we failed to collect data for one of the features. For example, if we forgot to ask someone's age, or forgot to write it down, then we would have a blank space in the dataset for that person's age.

There are two main ways to deal with missing data:

We can remove the rows that contain missing data from the dataset. This is relatively easy to do, but it wastes all of the other values that we collected. How a big of a waste this is depends on how important this missing value is for classification. For example, if we are missing a value for age, and age is not useful for classifying if people have heart disease or not, then it would be a shame to throw out all of someone's data just because we do not have their age. We can impute the values that are missing. In this context impute is just a fancy way of saying "we can make an educated guess about about what the value should be". Continuing our example where we are missing a value for age, instead of throwing out the entire row of data, we can fill the missing value with the average age or the median age, or use some other, more sophisticated approach, to guess at an appropriate value. In this section, we'll focus on identifying missing values in the dataset and dealing with them.

First, let's see what sort of data is in each column.

```
[ ]:  df.dtypes
```

```
[ ]:  age        float64
      sex        float64
      cp         float64
      restbp     float64
      chol       float64
      fbs        float64
      restecg    float64
      thalach    float64
      exang      float64
      oldpeak    float64
      slope      float64
      ca          object
      thal        object
      hd           int64
      dtype: object
```

We see that that they are almost all float64, however, two columns, ca and thal, have the object type and one column, hd has int64.

The fact that the ca and thal columns have object data types suggests there is something funny going on in them. object datatypes are used when there are mixtures of things, like a mixture

of numbers and letters. In theory, both ca and thal should just have a few values representing different categories, so let's investigate what's going on by printing out their unique values. We'll start with ca:

```
[ ]: df['ca'].unique()
```

```
[ ]: array(['0.0', '3.0', '2.0', '1.0', '?'], dtype=object)
```

We see that ca contains numbers (0.0, 3.0, 2.0 and 1.0) and questions marks (?). The numbers represent the number of blood vessels that we lit up by fluoroscopy and the question marks represent missing data.

Now let's look at the unique values in thal.

```
[ ]: df['thal'].unique()
```

```
[ ]: array(['6.0', '3.0', '7.0', '?'], dtype=object)
```

Again, thal also contains a mixture of numbers, representing the different diagnoses from the thalium heart scan, and question marks, which represent missing values.

###Task 4: Missing Data Part 2: Dealing With Missing Data

Since scikit-learn's support vector machines do not support datasets with missing values, we need to figure out what to do these question marks. We can either delete these patients from the training dataset, or impute values for the missing data. First let's see how many rows contain missing values.

```
[ ]: len(df.loc[(df['ca']=='?')|(df['thal']=='?')])
```

```
[ ]: 6
```

Since only 6 rows have missing values, let's look at them.

```
[ ]: df.loc[(df['ca'] == '?') | (df['thal'] == '?')]
```

```
[ ]:        age  sex   cp  restbp   chol  fbs  restecg  thalach  exang  oldpeak  \
      87    53.0  0.0  3.0   128.0  216.0  0.0      2.0    115.0    0.0      0.0
      166   52.0  1.0  3.0   138.0  223.0  0.0      0.0    169.0    0.0      0.0
      192   43.0  1.0  4.0   132.0  247.0  1.0      2.0    143.0    1.0      0.1
      266   52.0  1.0  4.0   128.0  204.0  1.0      0.0    156.0    1.0      1.0
      287   58.0  1.0  2.0   125.0  220.0  0.0      0.0    144.0    0.0      0.4
      302   38.0  1.0  3.0   138.0  175.0  0.0      0.0    173.0    0.0      0.0

            slope   ca thal  hd
      87      1.0  0.0    ?   0
      166     1.0    ?  3.0   0
      192     2.0    ?  7.0   1
      266     2.0  0.0    ?   2
      287     2.0    ?  7.0   0
      302     1.0    ?  3.0   0
```

Now let's count the number of rows in the full dataset.

```
[ ]: len(df)
```

```
[ ]: 303
```

So 6 of the 303 rows, or 2%, contain missing values. Since 303 - 6 = 297, and 297 is plenty of data to build a support vector machine, we will remove the rows with missing values, rather than try to impute their values. We do this by selecting all of the rows that do not contain question marks in either the ca or thal columns:

```
[ ]: df_no_missing=df.loc[(df['ca']!='?') & (df['thal']!='?')]
```

Since df_no_missing has 6 fewer rows than the original df, it should have 297 rows.

```
[ ]: len(df_no_missing)
```

```
[ ]: 297
```

```
[ ]: df_no_missing['ca'].unique()
```

```
[ ]: array(['0.0', '3.0', '2.0', '1.0'], dtype=object)
```

And we can also do the same thing for thal:

```
[ ]: df_no_missing['thal'].unique()
```

```
[ ]: array(['6.0', '3.0', '7.0'], dtype=object)
```

We have verified that df_no_missing does not contain any missing values. NOTE: ca and thal still have the object data type. That's OK. Now we are ready to format the data for making a Support Vector Machine.

1.0.2 Task 5: Format Data Part 1: Split the Data into Dependent and Independent Variables

Now that we have taken care of the missing data, we are ready to start formatting the data for making a Support Vector Machine.

The first step is to split the data into two parts:

The columns of data that we will use to make classifications The column of data that we want to predict. We will use the conventional notation of X (capital X) to represent the columns of data that we will use to make classifications and y (lower case y) to represent the thing we want to predict. In this case, we want to predict hd (heart disease).

NOTE: In the code below we are using copy() to copy the data by value. By default, pandas uses copy by reference. Using copy() ensures that the original data df_no_missing is not modified when we modify X or y. In other words, if we make a mistake when we are formatting the columns for support vector machines, we can just re-copy df_no_missing, rather than have to reload the original data and remove the missing values etc.

5

```
[ ]: X=df_no_missing.drop('hd',axis=1).copy()
     X.head()
```

```
[ ]:      age  sex   cp  restbp   chol  fbs  restecg  thalach  exang  oldpeak  \
     0   63.0  1.0  1.0   145.0  233.0  1.0      2.0    150.0    0.0      2.3
     1   67.0  1.0  4.0   160.0  286.0  0.0      2.0    108.0    1.0      1.5
     2   67.0  1.0  4.0   120.0  229.0  0.0      2.0    129.0    1.0      2.6
     3   37.0  1.0  3.0   130.0  250.0  0.0      0.0    187.0    0.0      3.5
     4   41.0  0.0  2.0   130.0  204.0  0.0      2.0    172.0    0.0      1.4

         slope   ca thal
     0     3.0  0.0  6.0
     1     2.0  3.0  3.0
     2     2.0  2.0  7.0
     3     3.0  0.0  3.0
     4     1.0  0.0  3.0
```

```
[ ]: y = df_no_missing['hd'].copy()
     y.head()
```

```
[ ]: 0    0
     1    2
     2    1
     3    0
     4    0
     Name: hd, dtype: int64
```

Task 6: Format the Data Part 2: One-Hot Encoding

Now that we have split the data frame into two pieces, X, which contains the data we will use to make, or predict, classifications, and y, which contains the known classifications in our training dataset, we need to take a closer look at the variables in X. The list bellow tells us what each variable represents and the type of data (float or categorical) it should contain:

age, Float

sex - Category

0 = female 1 = male

cp, chest pain, Category

1 = typical angina, 2 = atypical angina, 3 = non-anginal pain, 4 = asymptomatic

restbp, resting blood pressure (in mm Hg), Float

chol, serum cholesterol in mg/dl, Float

fbs, fasting blood sugar, Category

0 = >= 120 mg/dl 1 = < 120 mg/dl

restecg, resting electrocardiographic results, Category

6

1 = normal 2 = having ST-T wave abnormality 3 = showing probable or definite left ventricular hypertrophy

thalach, maximum heart rate achieved, Float

exang, exercise induced angina, Category

0 = no 1 = yes

oldpeak, ST depression induced by exercise relative to rest, Float

slope, the slope of the peak exercise ST segment, Category

1 = upsloping 2 = flat 3 = downsloping

ca, number of major vessels (0-3) colored by fluoroscopy, Float

thal, thalium heart scan, Category

3 = normal (no cold spots) 6 = fixed defect (cold spots during rest and exercise) 7 = reversible defect (when cold spots only appear during exercise)

Now, just to review, let's look at the data types in X to remember how python is seeing the data right now.

```
[ ]: X.dtypes
```

```
[ ]: age        float64
     sex        float64
     cp         float64
     restbp     float64
     chol       float64
     fbs        float64
     restecg    float64
     thalach    float64
     exang      float64
     oldpeak    float64
     slope      float64
     ca          object
     thal        object
     dtype: object
```

```
[ ]: X['cp'].unique()
```

```
[ ]: array([1., 4., 3., 2.])
```

we will convert it, using One-Hot Encoding, into a series of columns that only contains 0s and 1s.

If we treated these values, 1, 2, 3 and 4, like continuous data, then we would assume that 4, which means "asymptomatic", is more similar to 3, which means "non-anginal pain", than it is to 1 or 2, which are other types of chest pain. Thus, the support vector machine would be more likely to cluster the patients with 4s and 3s together than the patients with 4s and 1s together. In contrast, if we treat these numbers like categorical data, then we treat each one a separate category that is

no more or less similar to any of the other categories. Thus, the likelihood of clustering patients with 4s with 3s is the same as clustering 4s with 1s, and that approach is more reasonable.

```
[ ]: pd.get_dummies(X, columns=['cp']).head()
```

```
[ ]:      age  sex  restbp   chol  fbs  restecg  thalach  exang  oldpeak  slope  \
     0  63.0  1.0   145.0  233.0  1.0      2.0    150.0    0.0      2.3    3.0
     1  67.0  1.0   160.0  286.0  0.0      2.0    108.0    1.0      1.5    2.0
     2  67.0  1.0   120.0  229.0  0.0      2.0    129.0    1.0      2.6    2.0
     3  37.0  1.0   130.0  250.0  0.0      0.0    187.0    0.0      3.5    3.0
     4  41.0  0.0   130.0  204.0  0.0      2.0    172.0    0.0      1.4    1.0

         ca  thal  cp_1.0  cp_2.0  cp_3.0  cp_4.0
     0  0.0   6.0    True   False   False   False
     1  3.0   3.0   False   False   False    True
     2  2.0   7.0   False   False   False    True
     3  0.0   3.0   False   False    True   False
     4  0.0   3.0   False    True   False   False
```

```
[ ]: X_encoded=pd.get_dummies(X, columns=['cp','restecg','slope','thal'])
     X_encoded.head()
```

```
[ ]:      age  sex  restbp   chol  fbs  thalach  exang  oldpeak   ca  cp_1.0  …  \
     0  63.0  1.0   145.0  233.0  1.0    150.0    0.0      2.3  0.0    True  …
     1  67.0  1.0   160.0  286.0  0.0    108.0    1.0      1.5  3.0   False  …
     2  67.0  1.0   120.0  229.0  0.0    129.0    1.0      2.6  2.0   False  …
     3  37.0  1.0   130.0  250.0  0.0    187.0    0.0      3.5  0.0   False  …
     4  41.0  0.0   130.0  204.0  0.0    172.0    0.0      1.4  0.0   False  …

         cp_4.0  restecg_0.0  restecg_1.0  restecg_2.0  slope_1.0  slope_2.0  \
     0   False        False        False         True      False      False
     1    True        False        False         True      False       True
     2    True        False        False         True      False       True
     3   False         True        False        False      False      False
     4   False        False        False         True       True      False

         slope_3.0  thal_3.0  thal_6.0  thal_7.0
     0       True     False      True     False
     1      False      True     False     False
     2      False     False     False      True
     3       True      True     False     False
     4      False      True     False     False

     [5 rows x 22 columns]
```

y doesn't just contain 0s and 1s. Instead, it has 5 different levels of heart disease. $0 =$ no heart disease and 1-4 are various degrees of heart disease. We can see this with unique():

```
[ ]: y.unique()
```

```
[ ]: array([0, 2, 1, 3, 4])
```

Since we're only making a support vector machine that does simple classification and only care if someone has heart disease or not, we need to convert all numbers > 0 to 1.

```
[ ]: y_not_zero_idx=y>0
     y[y_not_zero_idx]=1
     y.unique()
```

```
[ ]: array([0, 1])
```

1.0.3 Task 7: Format the Data Part 3: Centering and Scaling

The Radial Basis Function (RBF) that we are using with our Support Vector Machine assumes that the data are centered and scaled, so we need to do this to both the training and testing datasets.

NOTE: We split the data into training and testing datasets and then scale them separately to avoid Data Leakage. Data Leakage occurs when information about the training dataset currupts or influences the testing dataset.

```
[ ]: X_train, X_test, y_train, y_test=train_test_split(X, y, random_state=42)
     X_train_scaled=scale(X_train)
     X_test_scaled=scale(X_test)
```

###Task 8: Build A Preliminary Support Vector Machine

```
[ ]: clf_svm=SVC(random_state=42)
     clf_svm.fit(X_train_scaled, y_train)
```

```
[ ]: SVC(random_state=42)
```

we've built a Support Vector Machine for classification. Let's see how it performs on the Testing Dataset and draw a Confusion Matrix.

```
[ ]: cm = ConfusionMatrixDisplay.from_estimator(
         clf_svm,
         X_test_scaled,
         y_test,
         display_labels=["Does not have HD", "Has HD"]
     )
```
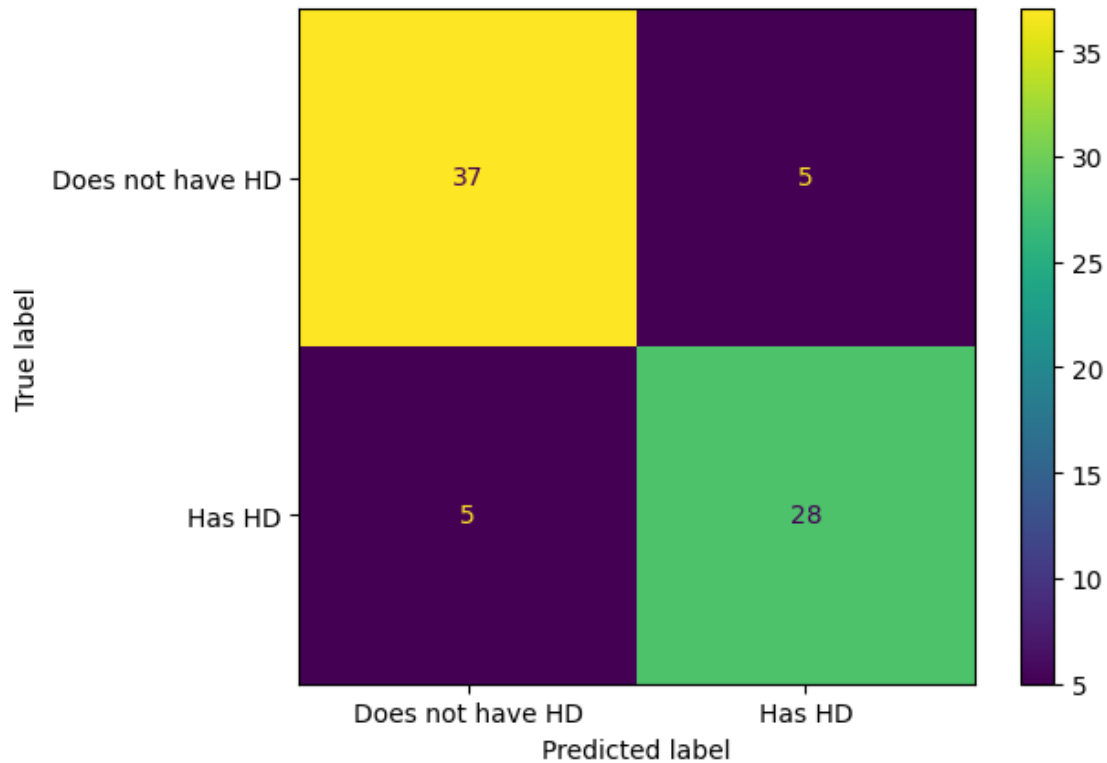
In the confusion matrix, we see that of the $37 + 5 = 42$ people that did not have Heart Disease, 37 (88%) were correctly classified. And of the $5 + 28 = 33$ people that have Heart Disease, 28 (85%) were correctly classified. So the support vector machine did pretty well without any optimization. That said, it is possible that we can improve predictions using Cross Validation to optimize the parameters.

1.0.4 Task 9: Optimize Parameters with Cross Validation

Optimizing a Support Vector Machine is all about finding the best value for gamma, and, potentially, the regularization parameter, C. So let's see if we can find better parameters using cross validation in hopes that we can improve the accuracy with the Testing Dataset.

Since we have to parameters two optimize, we will use GridSearchCV(). We do this by specifying potential values for gamma and C, and GridSearchCV() tests all possible combinations of the parameters for us.

```
param_grid=[
    {'C': [1,10,100,1000],
     'gamma': [0.001, 0.0001],
     'kernel': ['rbf']},
]
optimal_params = GridSearchCV(
    SVC(),
```

```
        param_grid,
        cv=5,
        verbose=0
    )
optimal_params.fit(X_train_scaled, y_train)
optimal_params.best_params_
```

[ ]: {'C': 10, 'gamma': 0.001, 'kernel': 'rbf'}

we see that the ideal value for C is 10 and the ideal value for gamma is 0.001.

1.0.5 Task 10: Building, Evaluating, Drawing, and Interpreting the Final Support Vector Machine
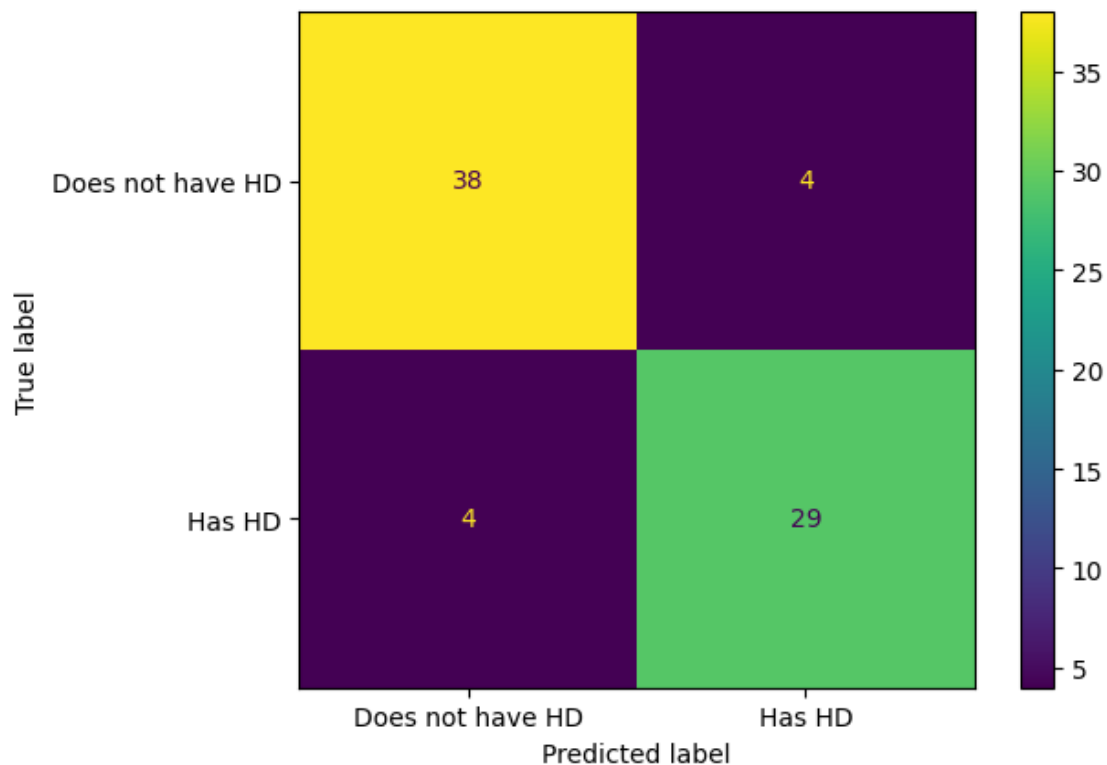
```
[ ]: clf_svm=SVC(random_state=42, C=10, gamma=0.001)
     clf_svm.fit(X_train_scaled, y_train)
```

[ ]: SVC(C=10, gamma=0.001, random_state=42)

```
[ ]: cm = ConfusionMatrixDisplay.from_estimator(
         clf_svm,
         X_test_scaled,
         y_test,
         display_labels=["Does not have HD", "Has HD"]
     )
```

We see that the optimized Support Vector Machine is better at classifying patients than the preliminary support vector machine.

Of the $38 + 4 = 42$ people that did not have heart disease, 38 (90%) were correctly classified. This is an improvement over the preliminary support vector machine, which only correctly classified 37 (88%) of the patients without heart disease. Of the $4 + 29 = 33$ people with heart disease, 29 (87%) were correctly classified. This is also an improvement over the preliminary support vector machine, which only correctly classified 28 (85%) of the patients with heart disease. Yay for optimizing the parameters!

The last thing we are going to do is draw the optimized support vector machine decision boundary and discuss how to interpret it.

The first thing we need to do is count the number of columns in X:

```
[ ]: len(df.columns)
```

```
[ ]: 14
```

So we see that there are 14 features, or columns, in X. This is a problem because it would require a 14-dimensional graph, one dimension per feature used to make predictions, to plot the data in its raw form. If we wanted to, we could just pick two features at random to use as x and y-axes on our graph, but instead , we will use PCA (Principal Component Analysis) to combine the 14 features into 2 orthogonal meta-features that we can use as axes for a graph. If you don't already know about PCA, don't sweat it. For now, just know that it is a way to shrink a 14-dimensional graph into a 2-dimensional graph.

However, before we shrink the graph, let's first determine how accurate the shrunken graph will be. If it's relatively accurate, than it makes sense to draw the 2-Dimensional graph. If not, the shrunken graph will not be very useful. We can determine the accuracy of the graph by drawing something called a scree plot.

```
[ ]: pca = PCA() # By default, PCA() centers the data, but does not scale it.
     X_train_pca = pca.fit_transform(X_train_scaled)

     per_var = np.round(pca.explained_variance_ratio_* 100, decimals=1)
     labels = ['PC' + str(x) for x in range(1, len(per_var)+1)]

     plt.bar(x=range(1,len(per_var)+1), height=per_var, tick_label=labels)
     plt.ylabel('Percentage of Explained Variance')
     plt.xlabel('Principal Component')
     plt.title('Scree Plot')
     plt.show()
```
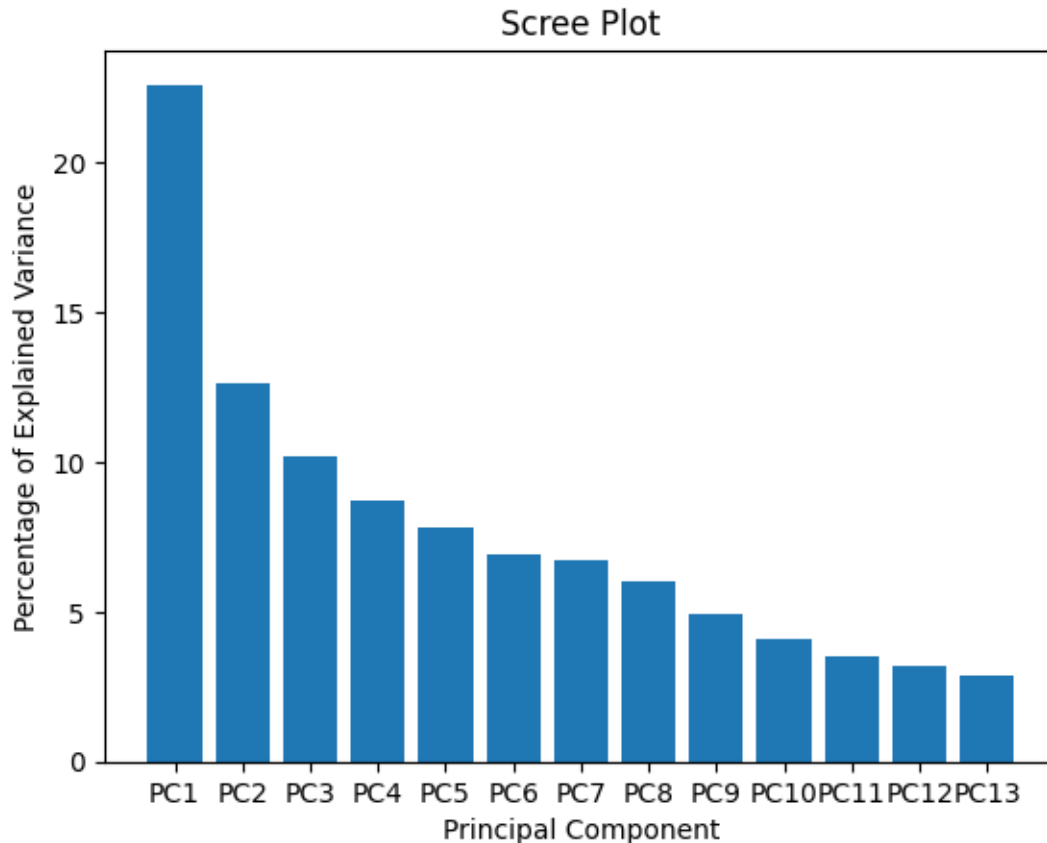
Scree Plot

The scree plot shows that the first principal component, PC1, accounts for a relatively large amount of variation in the raw data, and this means that it will be a good candidate for the x-axis in the 2-dimensional graph. Since PC2 accounts for the next largest amount of variance, we will use that for the y-axis.

```
pc1 = X_train_pca[:, 0]
pc2 = X_train_pca[:, 1]

## NOTE:
## pc1 contains the x-axis coordinates of the data after PCA
## pc2 contains the y-axis coordinates of the data after PCA

## Now we fitthe SVM to the x and y-axis coordinates
## of the data after PCA dimension reduction...
clf_svm.fit(np.column_stack((pc1, pc2)), y_train)

## Now create a matrix of points that we can use to show
## the decision regions.
## The matrix will be a little bit larger than the
## transformed PCA points so that we can plot all of
```

```python
## the PCA points on it without them being on the edge
x_min = pc1.min() - 1
x_max = pc1.max() + 1

y_min = pc2.min() - 1
y_max = pc2.max() + 1

xx, yy = np.meshgrid(np.arange(start=x_min, stop=x_max, step=0.1),
                     np.arange(start=y_min, stop=y_max, step=0.1))

## now we will classify every point in that
## matrix with the SVM. Points on one side of the
## classification boundary will get 0, and points on the other
## side will get 1.
Z = clf_svm.predict(np.column_stack((xx.ravel(), yy.ravel())))
## Right now, Z is just a long array of lots of 0s and 1s, which
## reflect how each point in the mesh was classified.
## We use reshape() so that each classification (0 or 1) corresponds
## to a specific point in the matrix.
Z = Z.reshape(xx.shape)

fig, ax = plt.subplots(figsize=(10,10))
## now we will use contourf() to draw a filled contour plot
## using the matrix values and classifications.
## The contours will be filled according to the
## predicted classifications (0s and 1s) in Z
ax.contourf(xx, yy, Z, alpha=0.1)

## now create custom colors for the actual data points
cmap = colors.ListedColormap(['#e41a1c', '#4daf4a'])
## now darw the actual data points - these will
## be colored by their known (not predcited) classifications
## NOTE: setting alpha=0.7 lets us see if we are covering up a point
scatter = ax.scatter(pc1, pc2, c=y_train,
                cmap=cmap,
                s=100,
                edgecolors='k', ## 'k' = black
                alpha=0.7)

## now create a legend
legend = ax.legend(scatter.legend_elements()[0],
                   scatter.legend_elements()[1],
                    loc="upper right")
legend.get_texts()[0].set_text("No HD")
legend.get_texts()[1].set_text("Yes HD")

## now add axis labels and titles
```
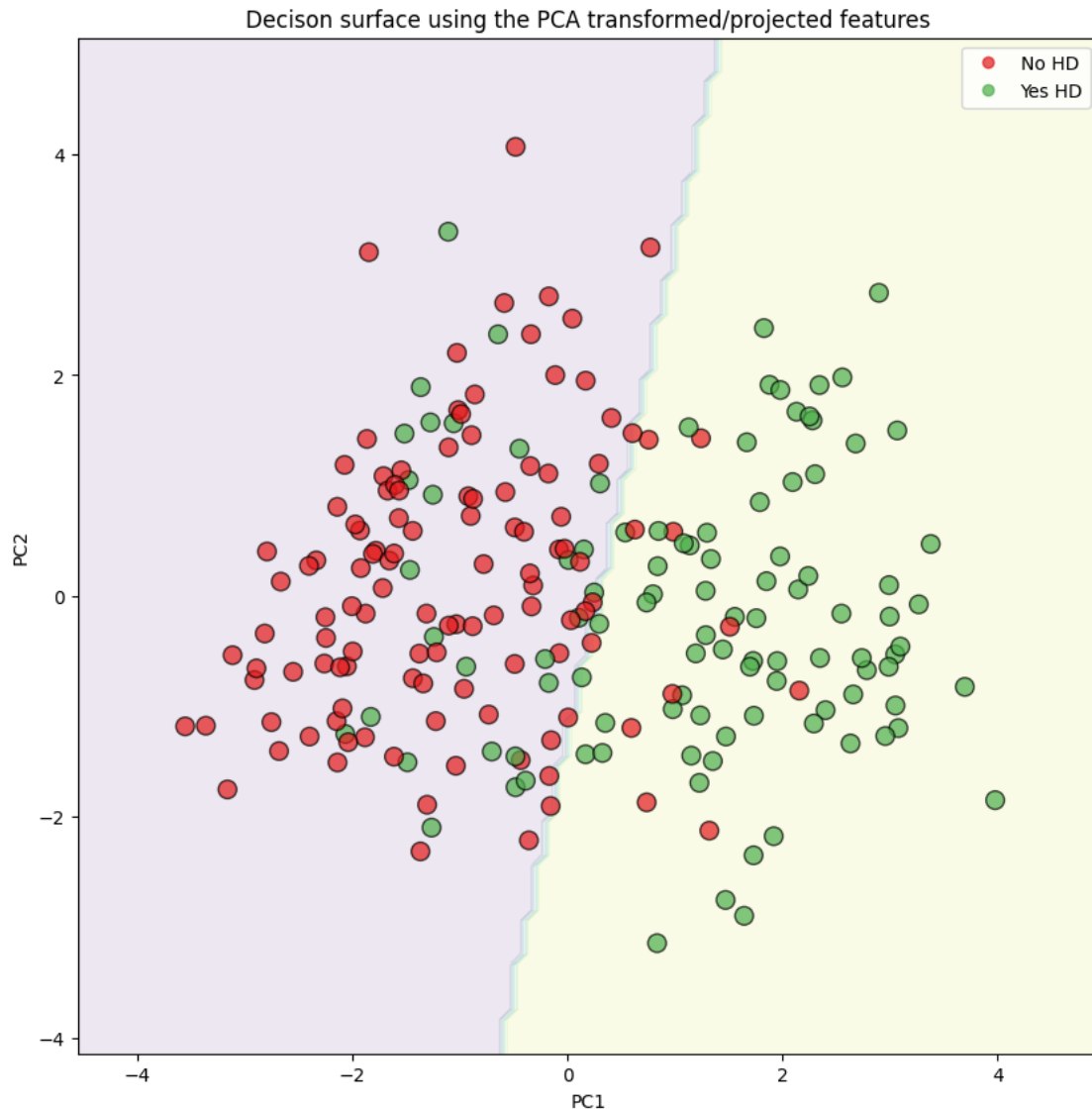
```
ax.set_ylabel('PC2')
ax.set_xlabel('PC1')
ax.set_title('Decison surface using the PCA transformed/projected features')
# plt.savefig('svm.png')
plt.show()
```


Decison surface using the PCA transformed/projected features

The pink side of the graph on the left is the area were all datapoints will be predicted to not have heart disease. The yellow side of the graph on the right is the area where all datapoints will be predicted to have heart disease. The the dots are datapoints in the training dataset and are color coded by their known classifications: red is for those that did not have heart disease and green is for those that did have heart disease.

```
[1]: !sudo apt-get update
     !sudo apt-get install texlive-xetex pandoc
```

Get:1 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Hit:2 http://archive.ubuntu.com/ubuntu jammy InRelease
Get:3 https://cloud.r-project.org/bin/linux/ubuntu jammy-cran40/ InRelease
[3,632 B]
Get:4 https://developer.download.nvidia.com/compute/cuda/repos/ubuntu2204/x86_64
InRelease [1,581 B]
Get:5 https://r2u.stat.illinois.edu/ubuntu jammy InRelease [6,555 B]
Get:6 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Hit:7 https://ppa.launchpadcontent.net/deadsnakes/ppa/ubuntu jammy InRelease
Hit:8 https://ppa.launchpadcontent.net/graphics-drivers/ppa/ubuntu jammy
InRelease
Get:9 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]
Hit:10 https://ppa.launchpadcontent.net/ubuntugis/ppa/ubuntu jammy InRelease
Get:11 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages
[2,692 kB]
Get:12 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages
[1,236 kB]
Get:13 https://cloud.r-project.org/bin/linux/ubuntu jammy-cran40/ Packages [69.9
kB]
Get:14
https://developer.download.nvidia.com/compute/cuda/repos/ubuntu2204/x86_64
Packages [1,378 kB]
Get:15 https://r2u.stat.illinois.edu/ubuntu jammy/main all Packages [8,754 kB]
Get:16 https://r2u.stat.illinois.edu/ubuntu jammy/main amd64 Packages [2,675 kB]
Get:17 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [3,000
kB]
Get:18 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages
[1,535 kB]
Fetched 21.7 MB in 10s (2,260 kB/s)
Reading package lists… Done
W: Skipping acquire of configured file 'main/source/Sources' as repository
'https://r2u.stat.illinois.edu/ubuntu jammy InRelease' does not seem to provide
it (sources.list entry misspelt?)
Reading package lists… Done
Building dependency tree… Done
Reading state information… Done
The following additional packages will be installed:
  dvisvgm fonts-droid-fallback fonts-lato fonts-lmodern fonts-noto-mono
  fonts-texgyre fonts-urw-base35 libapache-pom-java
  libcmark-gfm-extensions0.29.0.gfm.3 libcmark-gfm0.29.0.gfm.3
  libcommons-logging-java libcommons-parent-java libfontbox-java libfontenc1
  libgs9 libgs9-common libidn12 libijs-0.35 libjbig2dec0 libkpathsea6
  libpdfbox-java libptexenc1 libruby3.0 libsynctex2 libteckit0 libtexlua53
  libtexluajit2 libwoff1 libzzip-0-13 lmodern pandoc-data poppler-data

```
    preview-latex-style rake ruby ruby-net-telnet ruby-rubygems ruby-webrick
    ruby-xmlrpc ruby3.0 rubygems-integration t1utils teckit tex-common tex-gyre
    texlive-base texlive-binaries texlive-fonts-recommended texlive-latex-base
    texlive-latex-extra texlive-latex-recommended texlive-pictures
    texlive-plain-generic tipa xfonts-encodings xfonts-utils
Suggested packages:
    fonts-noto fonts-freefont-otf | fonts-freefont-ttf libavalon-framework-java
    libcommons-logging-java-doc libexcalibur-logkit-java liblog4j1.2-java
    texlive-luatex pandoc-citeproc context wkhtmltopdf librsvg2-bin groff ghc
    nodejs php python libjs-mathjax libjs-katex citation-style-language-styles
    poppler-utils ghostscript fonts-japanese-mincho | fonts-ipafont-mincho
    fonts-japanese-gothic | fonts-ipafont-gothic fonts-arphic-ukai
    fonts-arphic-uming fonts-nanum ri ruby-dev bundler debhelper gv
    | postscript-viewer perl-tk xpdf | pdf-viewer xzdec
    texlive-fonts-recommended-doc texlive-latex-base-doc python3-pygments
    icc-profiles libfile-which-perl libspreadsheet-parseexcel-perl
    texlive-latex-extra-doc texlive-latex-recommended-doc texlive-pstricks
    dot2tex prerex texlive-pictures-doc vprerex default-jre-headless tipa-doc
The following NEW packages will be installed:
    dvisvgm fonts-droid-fallback fonts-lato fonts-lmodern fonts-noto-mono
    fonts-texgyre fonts-urw-base35 libapache-pom-java
    libcmark-gfm-extensions0.29.0.gfm.3 libcmark-gfm0.29.0.gfm.3
    libcommons-logging-java libcommons-parent-java libfontbox-java libfontenc1
    libgs9 libgs9-common libidn12 libijs-0.35 libjbig2dec0 libkpathsea6
    libpdfbox-java libptexenc1 libruby3.0 libsynctex2 libteckit0 libtexlua53
    libtexluajit2 libwoff1 libzzip-0-13 lmodern pandoc pandoc-data poppler-data
    preview-latex-style rake ruby ruby-net-telnet ruby-rubygems ruby-webrick
    ruby-xmlrpc ruby3.0 rubygems-integration t1utils teckit tex-common tex-gyre
    texlive-base texlive-binaries texlive-fonts-recommended texlive-latex-base
    texlive-latex-extra texlive-latex-recommended texlive-pictures
    texlive-plain-generic texlive-xetex tipa xfonts-encodings xfonts-utils
0 upgraded, 58 newly installed, 0 to remove and 35 not upgraded.
Need to get 202 MB of archives.
After this operation, 728 MB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-droid-fallback all
1:6.0.1r16-1.1build1 [1,805 kB]
Get:2 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-lato all 2.0-2.1
[2,696 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy/main amd64 poppler-data all
0.4.11-1 [2,171 kB]
Get:4 http://archive.ubuntu.com/ubuntu jammy/universe amd64 tex-common all 6.17
[33.7 kB]
Get:5 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-urw-base35 all
20200910-1 [6,367 kB]
Get:6 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libgs9-common
all 9.55.0~dfsg1-0ubuntu5.10 [752 kB]
Get:7 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libidn12 amd64
1.38-4ubuntu1 [60.0 kB]
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0.19-3build2 [64.7 kB]
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9.55.0~dfsg1-0ubuntu5.10 [5,031 kB]
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amd64 2021.20210626.59705-1ubuntu0.2 [60.4 kB]
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Get:14 http://archive.ubuntu.com/ubuntu jammy/universe amd64 fonts-lmodern all
2.004.5-6.1 [4,532 kB]
Get:15 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-noto-mono all
20201225-1build1 [397 kB]
Get:16 http://archive.ubuntu.com/ubuntu jammy/universe amd64 fonts-texgyre all
20180621-3.1 [10.2 MB]
Get:17 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libapache-pom-java
all 18-1 [4,720 B]
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gfm0.29.0.gfm.3 amd64 0.29.0.gfm.3-3 [115 kB]
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extensions0.29.0.gfm.3 amd64 0.29.0.gfm.3-3 [25.1 kB]
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java all 43-1 [10.8 kB]
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java all 1.2-2 [60.3 kB]
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all 1.18 [5,336 B]
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3.0.2-7ubuntu2.8 [50.1 kB]
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all 1.7.0-3ubuntu0.1 [52.1 kB]
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0.3.2-1ubuntu0.1 [24.9 kB]

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amd64 3.0.2-7ubuntu2.8 [5,113 kB]
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amd64 2021.20210626.59705-1ubuntu0.2 [55.6 kB]
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amd64 2021.20210626.59705-1ubuntu0.2 [120 kB]
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amd64 2021.20210626.59705-1ubuntu0.2 [267 kB]
Get:37 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libzzip-0-13 amd64
0.13.72+dfsg.1-1.1 [27.0 kB]
Get:38 http://archive.ubuntu.com/ubuntu jammy/main amd64 xfonts-encodings all
1:1.0.5-0ubuntu2 [578 kB]
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1:7.7+6build2 [94.6 kB]
Get:40 http://archive.ubuntu.com/ubuntu jammy/universe amd64 lmodern all
2.004.5-6.1 [9,471 kB]
Get:41 http://archive.ubuntu.com/ubuntu jammy/universe amd64 pandoc-data all
2.9.2.1-3ubuntu2 [81.8 kB]
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2.9.2.1-3ubuntu2 [20.3 MB]
Get:43 http://archive.ubuntu.com/ubuntu jammy/universe amd64 preview-latex-style
all 12.2-1ubuntu1 [185 kB]
Get:44 http://archive.ubuntu.com/ubuntu jammy/main amd64 t1utils amd64
1.41-4build2 [61.3 kB]
Get:45 http://archive.ubuntu.com/ubuntu jammy/universe amd64 teckit amd64
2.5.11+ds1-1 [699 kB]
Get:46 http://archive.ubuntu.com/ubuntu jammy/universe amd64 tex-gyre all
20180621-3.1 [6,209 kB]
Get:47 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 texlive-
binaries amd64 2021.20210626.59705-1ubuntu0.2 [9,860 kB]
Get:48 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-base all
2021.20220204-1 [21.0 MB]
Get:49 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-fonts-
recommended all 2021.20220204-1 [4,972 kB]
Get:50 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-latex-base
all 2021.20220204-1 [1,128 kB]
Get:51 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libfontbox-java all
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1:1.8.16-2 [5,199 kB]
Get:53 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-latex-
recommended all 2021.20220204-1 [14.4 MB]
Get:54 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-pictures
all 2021.20220204-1 [8,720 kB]
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all 2021.20220204-1 [13.9 MB]
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generic all 2021.20220204-1 [27.5 MB]
Get:57 http://archive.ubuntu.com/ubuntu jammy/universe amd64 tipa all 2:1.3-21
[2,967 kB]
Get:58 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-xetex all
2021.20220204-1 [12.4 MB]
Fetched 202 MB in 9s (21.6 MB/s)
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based
frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line 78,
<> line 58.)
debconf: falling back to frontend: Readline
debconf: unable to initialize frontend: Readline
debconf: (This frontend requires a controlling tty.)
debconf: falling back to frontend: Teletype
dpkg-preconfigure: unable to re-open stdin:
Selecting previously unselected package fonts-droid-fallback.
(Reading database … 125044 files and directories currently installed.)
Preparing to unpack …/00-fonts-droid-fallback_1%3a6.0.1r16-1.1build1_all.deb
…
Unpacking fonts-droid-fallback (1:6.0.1r16-1.1build1) …
Selecting previously unselected package fonts-lato.
Preparing to unpack …/01-fonts-lato_2.0-2.1_all.deb …
Unpacking fonts-lato (2.0-2.1) …
Selecting previously unselected package poppler-data.
Preparing to unpack …/02-poppler-data_0.4.11-1_all.deb …
Unpacking poppler-data (0.4.11-1) …
Selecting previously unselected package tex-common.
Preparing to unpack …/03-tex-common_6.17_all.deb …
Unpacking tex-common (6.17) …
Selecting previously unselected package fonts-urw-base35.
Preparing to unpack …/04-fonts-urw-base35_20200910-1_all.deb …
Unpacking fonts-urw-base35 (20200910-1) …
Selecting previously unselected package libgs9-common.
Preparing to unpack …/05-libgs9-common_9.55.0~dfsg1-0ubuntu5.10_all.deb …
Unpacking libgs9-common (9.55.0~dfsg1-0ubuntu5.10) …
Selecting previously unselected package libidn12:amd64.
Preparing to unpack …/06-libidn12_1.38-4ubuntu1_amd64.deb …
Unpacking libidn12:amd64 (1.38-4ubuntu1) …
Selecting previously unselected package libijs-0.35:amd64.
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Preparing to unpack …/08-libjbig2dec0_0.19-3build2_amd64.deb …
Unpacking libjbig2dec0:amd64 (0.19-3build2) …
Selecting previously unselected package libgs9:amd64.
Preparing to unpack …/09-libgs9_9.55.0~dfsg1-0ubuntu5.10_amd64.deb …
Unpacking libgs9:amd64 (9.55.0~dfsg1-0ubuntu5.10) …
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Selecting previously unselected package libkpathsea6:amd64.
Preparing to unpack …/10-libkpathsea6_2021.20210626.59705-1ubuntu0.2_amd64.deb
…
Unpacking libkpathsea6:amd64 (2021.20210626.59705-1ubuntu0.2) …
Selecting previously unselected package libwoff1:amd64.
Preparing to unpack …/11-libwoff1_1.0.2-1build4_amd64.deb …
Unpacking libwoff1:amd64 (1.0.2-1build4) …
Selecting previously unselected package dvisvgm.
Preparing to unpack …/12-dvisvgm_2.13.1-1_amd64.deb …
Unpacking dvisvgm (2.13.1-1) …
Selecting previously unselected package fonts-lmodern.
Preparing to unpack …/13-fonts-lmodern_2.004.5-6.1_all.deb …
Unpacking fonts-lmodern (2.004.5-6.1) …
Selecting previously unselected package fonts-noto-mono.
Preparing to unpack …/14-fonts-noto-mono_20201225-1build1_all.deb …
Unpacking fonts-noto-mono (20201225-1build1) …
Selecting previously unselected package fonts-texgyre.
Preparing to unpack …/15-fonts-texgyre_20180621-3.1_all.deb …
Unpacking fonts-texgyre (20180621-3.1) …
Selecting previously unselected package libapache-pom-java.
Preparing to unpack …/16-libapache-pom-java_18-1_all.deb …
Unpacking libapache-pom-java (18-1) …
Selecting previously unselected package libcmark-gfm0.29.0.gfm.3:amd64.
Preparing to unpack …/17-libcmark-gfm0.29.0.gfm.3_0.29.0.gfm.3-3_amd64.deb …
Unpacking libcmark-gfm0.29.0.gfm.3:amd64 (0.29.0.gfm.3-3) …
Selecting previously unselected package libcmark-gfm-
extensions0.29.0.gfm.3:amd64.
Preparing to unpack …/18-libcmark-gfm-
extensions0.29.0.gfm.3_0.29.0.gfm.3-3_amd64.deb …
Unpacking libcmark-gfm-extensions0.29.0.gfm.3:amd64 (0.29.0.gfm.3-3) …
Selecting previously unselected package libcommons-parent-java.
Preparing to unpack …/19-libcommons-parent-java_43-1_all.deb …
Unpacking libcommons-parent-java (43-1) …
Selecting previously unselected package libcommons-logging-java.
Preparing to unpack …/20-libcommons-logging-java_1.2-2_all.deb …
Unpacking libcommons-logging-java (1.2-2) …
Selecting previously unselected package libfontenc1:amd64.
Preparing to unpack …/21-libfontenc1_1%3a1.1.4-1build3_amd64.deb …
Unpacking libfontenc1:amd64 (1:1.1.4-1build3) …
Selecting previously unselected package libptexenc1:amd64.
Preparing to unpack …/22-libptexenc1_2021.20210626.59705-1ubuntu0.2_amd64.deb
…
Unpacking libptexenc1:amd64 (2021.20210626.59705-1ubuntu0.2) …
Selecting previously unselected package rubygems-integration.
Preparing to unpack …/23-rubygems-integration_1.18_all.deb …
Unpacking rubygems-integration (1.18) …
Selecting previously unselected package ruby3.0.
Preparing to unpack …/24-ruby3.0_3.0.2-7ubuntu2.8_amd64.deb …
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Unpacking ruby3.0 (3.0.2-7ubuntu2.8) …
Selecting previously unselected package ruby-rubygems.
Preparing to unpack …/25-ruby-rubygems_3.3.5-2_all.deb …
Unpacking ruby-rubygems (3.3.5-2) …
Selecting previously unselected package ruby.
Preparing to unpack …/26-ruby_1%3a3.0~exp1_amd64.deb …
Unpacking ruby (1:3.0~exp1) …
Selecting previously unselected package rake.
Preparing to unpack …/27-rake_13.0.6-2_all.deb …
Unpacking rake (13.0.6-2) …
Selecting previously unselected package ruby-net-telnet.
Preparing to unpack …/28-ruby-net-telnet_0.1.1-2_all.deb …
Unpacking ruby-net-telnet (0.1.1-2) …
Selecting previously unselected package ruby-webrick.
Preparing to unpack …/29-ruby-webrick_1.7.0-3ubuntu0.1_all.deb …
Unpacking ruby-webrick (1.7.0-3ubuntu0.1) …
Selecting previously unselected package ruby-xmlrpc.
Preparing to unpack …/30-ruby-xmlrpc_0.3.2-1ubuntu0.1_all.deb …
Unpacking ruby-xmlrpc (0.3.2-1ubuntu0.1) …
Selecting previously unselected package libruby3.0:amd64.
Preparing to unpack …/31-libruby3.0_3.0.2-7ubuntu2.8_amd64.deb …
Unpacking libruby3.0:amd64 (3.0.2-7ubuntu2.8) …
Selecting previously unselected package libsynctex2:amd64.
Preparing to unpack …/32-libsynctex2_2021.20210626.59705-1ubuntu0.2_amd64.deb
…
Unpacking libsynctex2:amd64 (2021.20210626.59705-1ubuntu0.2) …
Selecting previously unselected package libteckit0:amd64.
Preparing to unpack …/33-libteckit0_2.5.11+ds1-1_amd64.deb …
Unpacking libteckit0:amd64 (2.5.11+ds1-1) …
Selecting previously unselected package libtexlua53:amd64.
Preparing to unpack …/34-libtexlua53_2021.20210626.59705-1ubuntu0.2_amd64.deb
…
Unpacking libtexlua53:amd64 (2021.20210626.59705-1ubuntu0.2) …
Selecting previously unselected package libtexluajit2:amd64.
Preparing to unpack
…/35-libtexluajit2_2021.20210626.59705-1ubuntu0.2_amd64.deb …
Unpacking libtexluajit2:amd64 (2021.20210626.59705-1ubuntu0.2) …
Selecting previously unselected package libzzip-0-13:amd64.
Preparing to unpack …/36-libzzip-0-13_0.13.72+dfsg.1-1.1_amd64.deb …
Unpacking libzzip-0-13:amd64 (0.13.72+dfsg.1-1.1) …
Selecting previously unselected package xfonts-encodings.
Preparing to unpack …/37-xfonts-encodings_1%3a1.0.5-0ubuntu2_all.deb …
Unpacking xfonts-encodings (1:1.0.5-0ubuntu2) …
Selecting previously unselected package xfonts-utils.
Preparing to unpack …/38-xfonts-utils_1%3a7.7+6build2_amd64.deb …
Unpacking xfonts-utils (1:7.7+6build2) …
Selecting previously unselected package lmodern.
Preparing to unpack …/39-lmodern_2.004.5-6.1_all.deb …
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Unpacking lmodern (2.004.5-6.1) …
Selecting previously unselected package pandoc-data.
Preparing to unpack …/40-pandoc-data_2.9.2.1-3ubuntu2_all.deb …
Unpacking pandoc-data (2.9.2.1-3ubuntu2) …
Selecting previously unselected package pandoc.
Preparing to unpack …/41-pandoc_2.9.2.1-3ubuntu2_amd64.deb …
Unpacking pandoc (2.9.2.1-3ubuntu2) …
Selecting previously unselected package preview-latex-style.
Preparing to unpack …/42-preview-latex-style_12.2-1ubuntu1_all.deb …
Unpacking preview-latex-style (12.2-1ubuntu1) …
Selecting previously unselected package t1utils.
Preparing to unpack …/43-t1utils_1.41-4build2_amd64.deb …
Unpacking t1utils (1.41-4build2) …
Selecting previously unselected package teckit.
Preparing to unpack …/44-teckit_2.5.11+ds1-1_amd64.deb …
Unpacking teckit (2.5.11+ds1-1) …
Selecting previously unselected package tex-gyre.
Preparing to unpack …/45-tex-gyre_20180621-3.1_all.deb …
Unpacking tex-gyre (20180621-3.1) …
Selecting previously unselected package texlive-binaries.
Preparing to unpack …/46-texlive-
binaries_2021.20210626.59705-1ubuntu0.2_amd64.deb …
Unpacking texlive-binaries (2021.20210626.59705-1ubuntu0.2) …
Selecting previously unselected package texlive-base.
Preparing to unpack …/47-texlive-base_2021.20220204-1_all.deb …
Unpacking texlive-base (2021.20220204-1) …
Selecting previously unselected package texlive-fonts-recommended.
Preparing to unpack …/48-texlive-fonts-recommended_2021.20220204-1_all.deb …
Unpacking texlive-fonts-recommended (2021.20220204-1) …
Selecting previously unselected package texlive-latex-base.
Preparing to unpack …/49-texlive-latex-base_2021.20220204-1_all.deb …
Unpacking texlive-latex-base (2021.20220204-1) …
Selecting previously unselected package libfontbox-java.
Preparing to unpack …/50-libfontbox-java_1%3a1.8.16-2_all.deb …
Unpacking libfontbox-java (1:1.8.16-2) …
Selecting previously unselected package libpdfbox-java.
Preparing to unpack …/51-libpdfbox-java_1%3a1.8.16-2_all.deb …
Unpacking libpdfbox-java (1:1.8.16-2) …
Selecting previously unselected package texlive-latex-recommended.
Preparing to unpack …/52-texlive-latex-recommended_2021.20220204-1_all.deb …
Unpacking texlive-latex-recommended (2021.20220204-1) …
Selecting previously unselected package texlive-pictures.
Preparing to unpack …/53-texlive-pictures_2021.20220204-1_all.deb …
Unpacking texlive-pictures (2021.20220204-1) …
Selecting previously unselected package texlive-latex-extra.
Preparing to unpack …/54-texlive-latex-extra_2021.20220204-1_all.deb …
Unpacking texlive-latex-extra (2021.20220204-1) …
Selecting previously unselected package texlive-plain-generic.
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Preparing to unpack …/55-texlive-plain-generic_2021.20220204-1_all.deb …
Unpacking texlive-plain-generic (2021.20220204-1) …
Selecting previously unselected package tipa.
Preparing to unpack …/56-tipa_2%3a1.3-21_all.deb …
Unpacking tipa (2:1.3-21) …
Selecting previously unselected package texlive-xetex.
Preparing to unpack …/57-texlive-xetex_2021.20220204-1_all.deb …
Unpacking texlive-xetex (2021.20220204-1) …
Setting up fonts-lato (2.0-2.1) …
Setting up fonts-noto-mono (20201225-1build1) …
Setting up libwoff1:amd64 (1.0.2-1build4) …
Setting up libtexlua53:amd64 (2021.20210626.59705-1ubuntu0.2) …
Setting up libijs-0.35:amd64 (0.35-15build2) …
Setting up libtexluajit2:amd64 (2021.20210626.59705-1ubuntu0.2) …
Setting up libfontbox-java (1:1.8.16-2) …
Setting up rubygems-integration (1.18) …
Setting up libzzip-0-13:amd64 (0.13.72+dfsg.1-1.1) …
Setting up fonts-urw-base35 (20200910-1) …
Setting up poppler-data (0.4.11-1) …
Setting up tex-common (6.17) …
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based
frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line
78.)
debconf: falling back to frontend: Readline
update-language: texlive-base not installed and configured, doing nothing!
Setting up libfontenc1:amd64 (1:1.1.4-1build3) …
Setting up libjbig2dec0:amd64 (0.19-3build2) …
Setting up libteckit0:amd64 (2.5.11+ds1-1) …
Setting up libapache-pom-java (18-1) …
Setting up ruby-net-telnet (0.1.1-2) …
Setting up xfonts-encodings (1:1.0.5-0ubuntu2) …
Setting up t1utils (1.41-4build2) …
Setting up libidn12:amd64 (1.38-4ubuntu1) …
Setting up fonts-texgyre (20180621-3.1) …
Setting up libkpathsea6:amd64 (2021.20210626.59705-1ubuntu0.2) …
Setting up ruby-webrick (1.7.0-3ubuntu0.1) …
Setting up libcmark-gfm0.29.0.gfm.3:amd64 (0.29.0.gfm.3-3) …
Setting up fonts-lmodern (2.004.5-6.1) …
Setting up libcmark-gfm-extensions0.29.0.gfm.3:amd64 (0.29.0.gfm.3-3) …
Setting up fonts-droid-fallback (1:6.0.1r16-1.1build1) …
Setting up pandoc-data (2.9.2.1-3ubuntu2) …
Setting up ruby-xmlrpc (0.3.2-1ubuntu0.1) …
Setting up libsynctex2:amd64 (2021.20210626.59705-1ubuntu0.2) …
Setting up libgs9-common (9.55.0~dfsg1-0ubuntu5.10) …
Setting up teckit (2.5.11+ds1-1) …
Setting up libpdfbox-java (1:1.8.16-2) …
Setting up libgs9:amd64 (9.55.0~dfsg1-0ubuntu5.10) …
```

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Setting up preview-latex-style (12.2-1ubuntu1) …
Setting up libcommons-parent-java (43-1) …
Setting up dvisvgm (2.13.1-1) …
Setting up libcommons-logging-java (1.2-2) …
Setting up xfonts-utils (1:7.7+6build2) …
Setting up libptexenc1:amd64 (2021.20210626.59705-1ubuntu0.2) …
Setting up pandoc (2.9.2.1-3ubuntu2) …
Setting up texlive-binaries (2021.20210626.59705-1ubuntu0.2) …
update-alternatives: using /usr/bin/xdvi-xaw to provide /usr/bin/xdvi.bin
(xdvi.bin) in auto mode
update-alternatives: using /usr/bin/bibtex.original to provide /usr/bin/bibtex
(bibtex) in auto mode
Setting up lmodern (2.004.5-6.1) …
Setting up texlive-base (2021.20220204-1) …
/usr/bin/ucfr
/usr/bin/ucfr
/usr/bin/ucfr
/usr/bin/ucfr
mktexlsr: Updating /var/lib/texmf/ls-R-TEXLIVEDIST…
mktexlsr: Updating /var/lib/texmf/ls-R-TEXMFMAIN…
mktexlsr: Updating /var/lib/texmf/ls-R…
mktexlsr: Done.
tl-paper: setting paper size for dvips to a4:
/var/lib/texmf/dvips/config/config-paper.ps
tl-paper: setting paper size for dvipdfmx to a4:
/var/lib/texmf/dvipdfmx/dvipdfmx-paper.cfg
tl-paper: setting paper size for xdvi to a4: /var/lib/texmf/xdvi/XDvi-paper
tl-paper: setting paper size for pdftex to a4: /var/lib/texmf/tex/generic/tex-
ini-files/pdftexconfig.tex
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based
frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line
78.)
debconf: falling back to frontend: Readline
Setting up tex-gyre (20180621-3.1) …
Setting up texlive-plain-generic (2021.20220204-1) …
Setting up texlive-latex-base (2021.20220204-1) …
Setting up texlive-latex-recommended (2021.20220204-1) …
Setting up texlive-pictures (2021.20220204-1) …
Setting up texlive-fonts-recommended (2021.20220204-1) …
Setting up tipa (2:1.3-21) …
Setting up texlive-latex-extra (2021.20220204-1) …
Setting up texlive-xetex (2021.20220204-1) …
Setting up rake (13.0.6-2) …
Setting up libruby3.0:amd64 (3.0.2-7ubuntu2.8) …
Setting up ruby3.0 (3.0.2-7ubuntu2.8) …
Setting up ruby (1:3.0~exp1) …
Setting up ruby-rubygems (3.3.5-2) …
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Processing triggers for man-db (2.10.2-1) …
Processing triggers for mailcap (3.70+nmu1ubuntu1) …
Processing triggers for fontconfig (2.13.1-4.2ubuntu5) …
Processing triggers for libc-bin (2.35-0ubuntu3.8) …
/sbin/ldconfig.real: /usr/local/lib/libtbb.so.12 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbbind_2_5.so.3 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbbind.so.3 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libur_adapter_opencl.so.0 is not a symbolic
link

/sbin/ldconfig.real: /usr/local/lib/libtbbbind_2_0.so.3 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbmalloc.so.2 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libumf.so.0 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libur_loader.so.0 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtcm.so.1 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libhwloc.so.15 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtcm_debug.so.1 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbmalloc_proxy.so.2 is not a symbolic
link

/sbin/ldconfig.real: /usr/local/lib/libur_adapter_level_zero.so.0 is not a
symbolic link

Processing triggers for tex-common (6.17) …
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based
frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line
78.)
debconf: falling back to frontend: Readline
Running updmap-sys. This may take some time… done.
Running mktexlsr /var/lib/texmf … done.
Building format(s) --all.
        This may take some time… done.
```

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[ ]: !jupyter nbconvert --to pdf "/content/drive/MyDrive/Colab_Notebooks/Projects/
     ↪Logistic_Regression_and_Naive_Bayes_Titanic_Survival_Prediction.ipynb"
```