# Summative2Q1

January 6, 2023

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In [1]: ## Load dataset

        from sklearn import datasets
        import matplotlib.pyplot as plt
        import numpy as np
        import pandas as pd
        breast_cancer_data = datasets.load_breast_cancer()
        df = breast_cancer_data.data

        labels = breast_cancer_data.target
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In [2]: # Reshaping labels to append to dataframe

        labels = np.reshape(labels,(569,1))
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In [3]: breast_cancer_df = np.concatenate([df, labels], axis=1)
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In [4]: # converting to dataframe

        breast_cancer_df = pd.DataFrame(breast_cancer_df)
```

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In [5]: features = breast_cancer_data.feature_names
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In [6]: # Adding label column name

        features_labels = np.append(features, "label")

        #Adding the labels to the dataframe columns
        breast_cancer_df.columns = features_labels
```

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In [7]: #Separate features and target variables
        X = breast_cancer_df.loc[:, features].values
        y = breast_cancer_df.loc[:, 'label'].values

        #Normalising data using StandardScaler
        from sklearn.preprocessing import StandardScaler
        #x = breast_cancer_df.loc[:, features].values
        #x = StandardScaler().fit_transform(x)
```

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In [8]: #3 Splitting the X and Y into the
        # Training set and Testing set
        from sklearn.model_selection import train_test_split
        X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2,
        random_state = 0)
```

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In [9]: #4 performing preprocessing part
        from sklearn.preprocessing import StandardScaler
        sc = StandardScaler()
        X_train = sc.fit_transform(X_train)
        X_test = sc.transform(X_test)
```

```
In [10]: #5 Applying PCA function on training
         # and testing set of X component
         from sklearn.decomposition import PCA
         pca = PCA(n_components = 2)
         X_train = pca.fit_transform(X_train)
         X_test = pca.transform(X_test)
         explained_variance = pca.explained_variance_ratio_
```

```
In [11]: #6 Fitting Logistic Regression To the training set
         from sklearn.linear_model import LogisticRegression
         classifier = LogisticRegression(random_state = 0)
         classifier.fit(X_train, y_train)

         #7 Predicting the test set result using
         # predict function under LogisticRegression
         y_pred = classifier.predict(X_test)

         #8 making confusion matrix between
         # test set of Y and predicted value.
         from sklearn.metrics import confusion_matrix
         cm = confusion_matrix(y_test, y_pred)

         #9 Predicting the training set
         # result through scatter plot
         from matplotlib.colors import ListedColormap
         X_set, y_set = X_train, y_train
         X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 1,
                                        stop = X_set[:, 0].max() + 1, step = 0.01),
                              np.arange(start = X_set[:, 1].min() - 1,
                                        stop = X_set[:, 1].max() + 1, step = 0.01))

         plt.contourf(X1, X2, classifier.predict(np.array([X1.ravel(),
                                                       X2.ravel()]).T).reshape(X1.shape), a
                      cmap = ListedColormap(('yellow', 'white', 'aquamarine')))

         plt.xlim(X1.min(), X1.max())
         plt.ylim(X2.min(), X2.max())

         for i, j in enumerate(np.unique(y_set)):
             plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1],
                         c = ListedColormap(('red', 'green', 'blue'))(i), label = j)

         plt.title('Logistic Regression (Training set)')
         plt.xlabel('PC1') # for Xlabel
         plt.ylabel('PC2') # for Ylabel
         plt.legend() # to show legend
         # show scatter plot
         plt.show()


         #10 Visualising the Test set results through scatter plot
         from matplotlib.colors import ListedColormap
         X_set, y_set = X_test, y_test
         X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 1,stop = X_set[:, 0].max()
                              np.arange(start = X_set[:, 1].min() - 1,
                                        stop = X_set[:, 1].max() + 1, step = 0.01))

         plt.contourf(X1, X2, classifier.predict(np.array([X1.ravel(),
                                                           X2.ravel()]).T).reshape(X1.shape), a
                      cmap = ListedColormap(('yellow', 'white', 'aquamarine')))
         plt.xlim(X1.min(), X1.max())
         plt.ylim(X2.min(), X2.max())

         for i, j in enumerate(np.unique(y_set)):
             plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1],
                         color = ListedColormap(('red', 'green', 'blue'))(i), label = j)

         # title for scatter plot
         plt.title('Logistic Regression (Test set)')
         plt.xlabel('PC1') # for Xlabel
         plt.ylabel('PC2') # for Ylabel
         plt.legend()

         # show scatter plot
         plt.show()
```

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*c* argument looks like a single numeric RGB or RGBA sequence, which should be avoided as value
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```
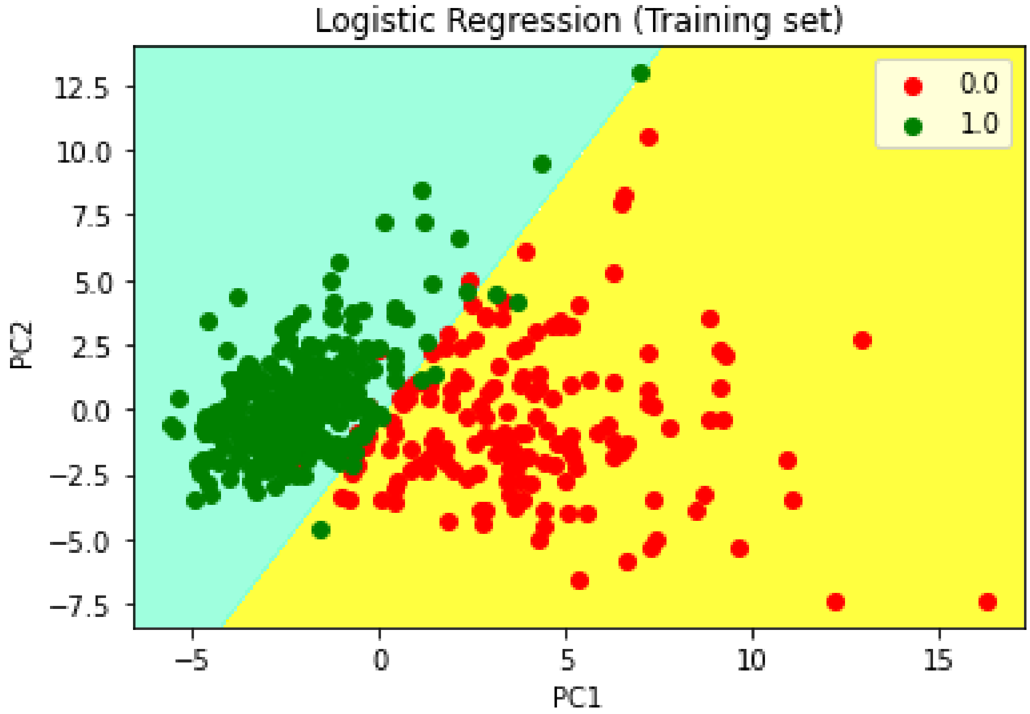
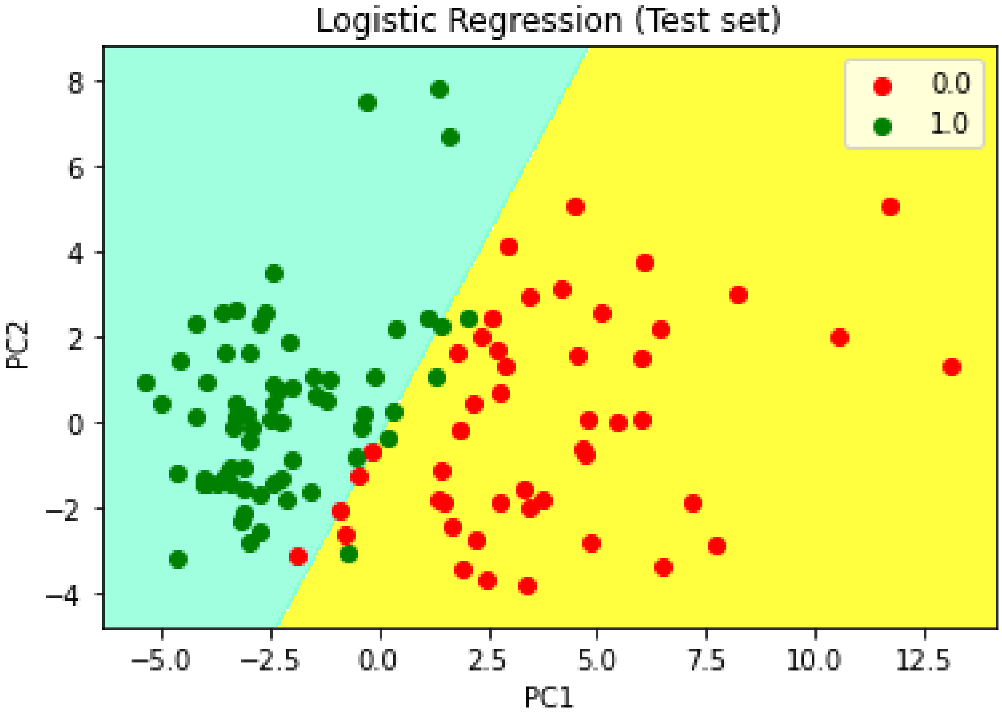


Logistic Regression (Training set)
12.5
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
PC2
−5
0
5
10
15
PC1
0.0
1.0


Logistic Regression (Test set)
8
6
4
2
0
−2
−4
PC2
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
12.5
PC1
0.0
1.0