```
import os
import pandas as pd
import numpy as np
import sklearn
import matplotlib.pyplot as plt
import plotly.express as px
import seaborn as sns
import random
%matplotlib inline
pallete = ['Accent_r', 'Blues', 'BrBG', 'BrBG_r', 'BuPu', 'CMRmap', 'CMRmap_r', 'Dark2', 'Dark2_r', 'GnBu', 'GnBu_r', 'OrRd', 'Oranges', 'Paired', 'PuBu',
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import confusion_matrix, accuracy_score, classification_report, f1_score
from sklearn.svm import SVC
```

Mounting from Google Drive

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
from google.colab import files
uploaded = files.upload()
```

```
Choose Files diabetes.csv
• diabetes.csv(application/vnd.ms-excel) - 23873 bytes, last modified: 8/17/2021 - 100% done
Saving diabetes.csv to diabetes (1).csv
```

Reading Data

```
data = pd.read_csv('diabetes.csv')
```

```
print("shape",data.shape)
data.head(7)
```

```
shape (768, 9)
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1
5	5	116	74	0	0	25.6	0.201	30	0
6	3	78	50	32	88	31.0	0.248	26	1

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Pregnancies               768 non-null    int64  
 1   Glucose                   768 non-null    int64  
 2   BloodPressure             768 non-null    int64  
 3   SkinThickness             768 non-null    int64  
 4   Insulin                   768 non-null    int64  
 5   BMI                       768 non-null    float64
 6   DiabetesPedigreeFunction  768 non-null    float64
 7   Age                       768 non-null    int64  
 8   Outcome                   768 non-null    int64  
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
```

```
data.describe()
```

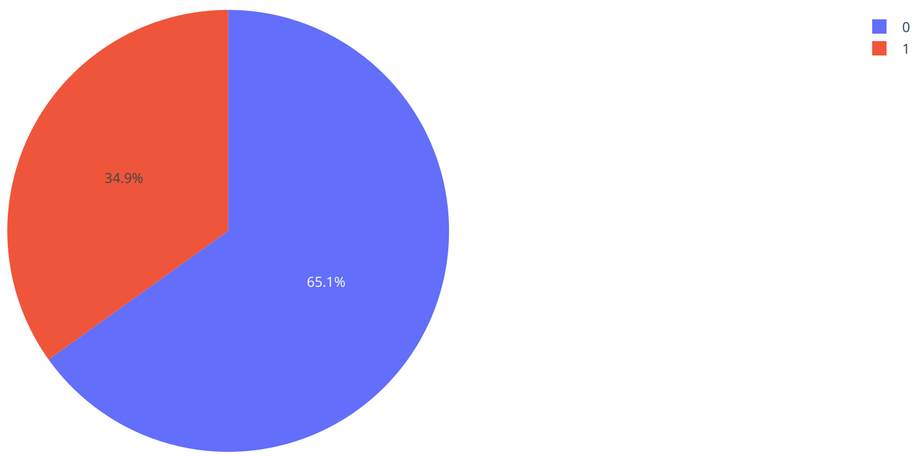
	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
count	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000
mean	3.845052	120.894531	69.105469	20.536458	79.799479	31.992578	0.471876	33.240885	0.348958
std	3.369578	31.972618	19.355807	15.952218	115.244002	7.884160	0.331329	11.760232	0.476951
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.078000	21.000000	0.000000
25%	1.000000	99.000000	62.000000	0.000000	0.000000	27.300000	0.243750	24.000000	0.000000
50%	3.000000	117.000000	72.000000	23.000000	30.500000	32.000000	0.372500	29.000000	0.000000

```
data_null=data.isnull().sum()
print(data_null)
```

```
Pregnancies                 0
Glucose                     0
BloodPressure               0
SkinThickness               0
Insulin                     0
BMI                         0
DiabetesPedigreeFunction    0
Age                         0
Outcome                     0
dtype: int64
```

EDA

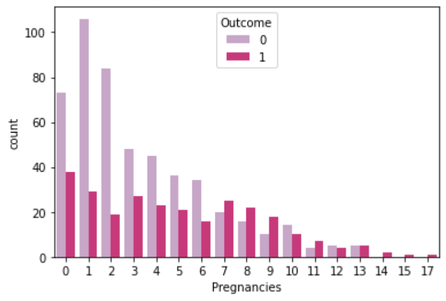
```
px.pie(data, names="Outcome")
```



Pregnencies vs Outcome

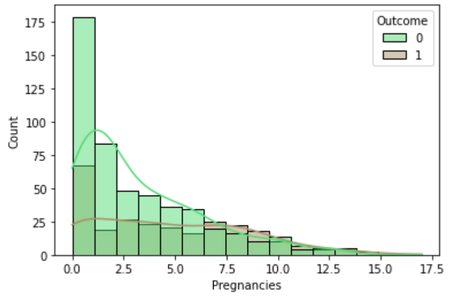
```
sns.countplot(x="Pregnancies", hue = "Outcome", data=data, palette=random.choice(pallete))
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fadc8615750>
```




```
sns.histplot(x="Pregnancies", hue="Outcome", data=data, kde=True, palette=random.choice(pallete))
```

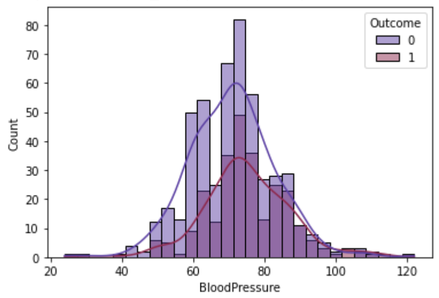
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fadc74f76d0>
```



Blood Pressure vs Outcome

```
sns.histplot(x="BloodPressure", hue="Outcome", data=data, kde=True, palette=random.choice(pallete))
```

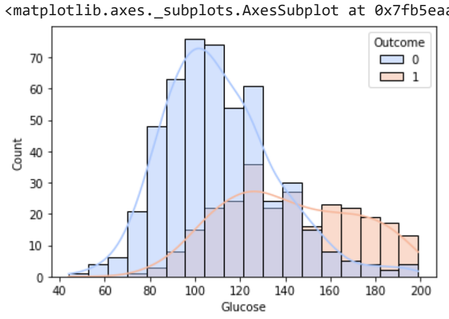
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5eccdc150>
```



Glucose vs Outcome

```
sns.histplot(x="Glucose", hue="Outcome", data=data, kde=True, palette=random.choice(pallete))
```

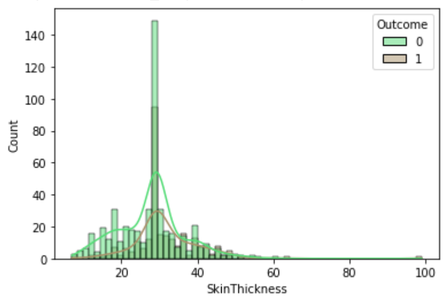
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5eaae2a90>
```



Skin Thickness vs Outcome

```
sns.histplot(x="SkinThickness", hue="Outcome", data=data, kde=True, palette=random.choice(pallete))
```

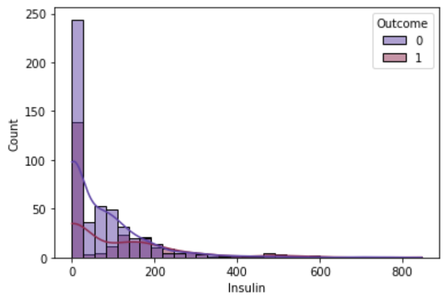
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5eaa76390>
```



Insulin vs Outcome

```
sns.histplot(x="Insulin", hue="Outcome", data=data, kde=True, palette=random.choice(pallete))
```

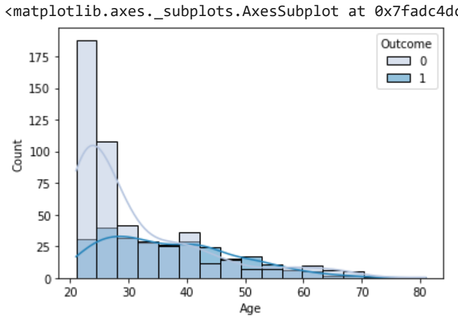
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fadc9fa5fd0>
```



Age vs Outcome

```
sns.histplot(x="Age", hue="Outcome", data=data, kde=True, palette=random.choice(pallete))
```

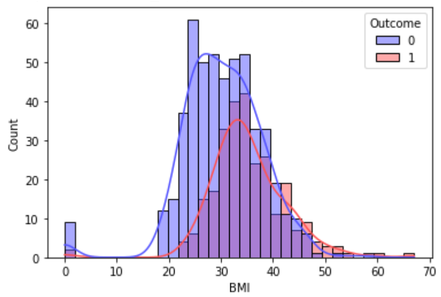
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fadc4dc0c10>
```



BMI vs Outcome

```
sns.histplot(x="BMI", hue="Outcome", data=data, kde=True, palette=random.choice(pallete))
```

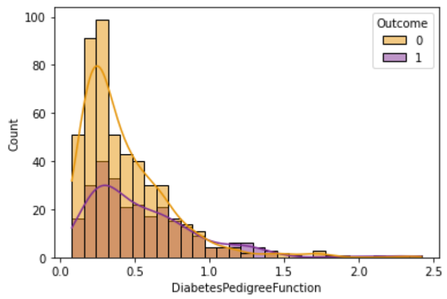
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fadc4dc47d0>
```



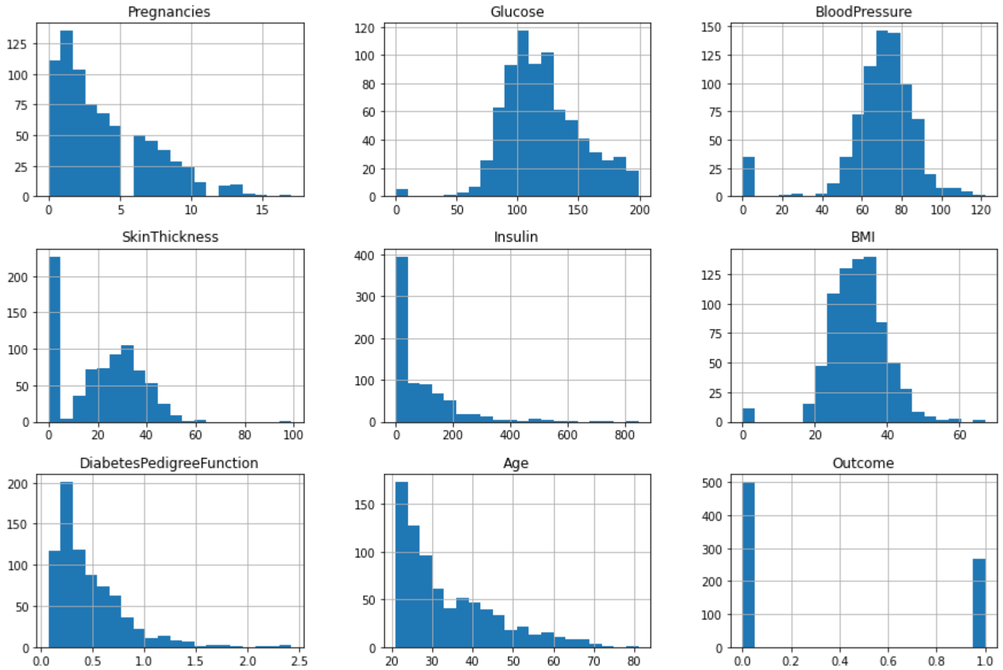
DiabetesPedigreeFunction vs Outcome

```
sns.histplot(x="DiabetesPedigreeFunction", hue="Outcome", data=data, kde=True, palette=random.choice(pallete))
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fadc4df72d0>
```




```
data.hist(bins=20, figsize=(15,10))
plt.show()
```



Data Preprocessing

```
for col in data.columns:
    print("The minimum value for the {} column is {}".format(col, data[col].min()))
```

```
The minimum value for the Pregnancies column is 0
The minimum value for the Glucose column is 0
The minimum value for the BloodPressure column is 0
The minimum value for the SkinThickness column is 0
The minimum value for the Insulin column is 0
The minimum value for the BMI column is 0.0
The minimum value for the DiabetesPedigreeFunction column is 0.078
The minimum value for the Age column is 21
The minimum value for the Outcome column is 0
```

```
data[['Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI']] = data[['Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI']].replace(0, np
```

```
data['Insulin'] = data['Insulin'].fillna(data['Insulin'].median())
for col in ['Glucose', 'BloodPressure', 'SkinThickness', 'BMI']:
    data[col] = data[col].fillna(data[col].mean())
```

Splitting Data

```
train, test = train_test_split(data, test_size=0.3, random_state=50)
x_train = train.drop(columns='Outcome')
y_train = train['Outcome']

x_val = test.drop(columns='Outcome')
y_val = test['Outcome']

scaler = StandardScaler().fit(x_train)
x_train = scaler.transform(x_train)
x_val = scaler.transform(x_val)
```

Logistic Regression

```
l = LogisticRegression(solver='liblinear', max_iter=100, C=0.25).fit(x_train, np.ravel(y_train))
y_pred_log= l.predict(x_val)
print('Classification report:\n\n{}'.format(classification_report(y_val, y_pred_log)))
print('The accuracy of the Logistic Regression is', accuracy_score(y_val, y_pred_log))
```

```
Classification report:

              precision    recall  f1-score   support
```

```
              0       0.76      0.89      0.82       148
              1       0.72      0.51      0.60        83

       accuracy                           0.75       231
      macro avg       0.74      0.70      0.71       231
   weighted avg       0.75      0.75      0.74       231

   The accuracy of the Logistic Regression is 0.7532467532467533
```

K Neighbors Classifier

```
knn = KNeighborsClassifier(n_neighbors = 9).fit(x_train, y_train)
y_pred_knn = knn.predict(x_val)
print('Classification Report:\n\n{}'.format(classification_report(y_val, y_pred_knn)))
print('The accuracy of the KNN is', accuracy_score(y_val, y_pred_knn))
```

```
   Classification Report:

                 precision    recall  f1-score   support

              0       0.79      0.84      0.81       148
              1       0.68      0.59      0.63        83

       accuracy                           0.75       231
      macro avg       0.73      0.72      0.72       231
   weighted avg       0.75      0.75      0.75       231

   The accuracy of the KNN is 0.7532467532467533
```

SVM

```
svm = SVC(kernel='rbf', degree=4, C=0.7, probability=True).fit(x_train, np.ravel(y_train))
y_pred_svm = svm.predict(x_val)
print('Classification Report:\n\n{}'.format(classification_report(y_val, y_pred_svm)))
print('The accuracy of the SVM is', accuracy_score(y_val, y_pred_svm))
```

```
   Classification Report:

                 precision    recall  f1-score   support

              0       0.74      0.90      0.81       148
              1       0.71      0.43      0.54        83

       accuracy                           0.73       231
      macro avg       0.72      0.67      0.67       231
   weighted avg       0.73      0.73      0.71       231

   The accuracy of the SVM is 0.7316017316017316
```