day93-94-diabetes-prediction

January 28, 2024

Day93-94 Diabetes Prediction By: Loga Aswin

Import Libraries

[95]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
```

Load Datasets

[96]:
```
df = pd.read_csv("/content/diabetes.csv")
```

[97]:
```
df.head()
```

[97]:

	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

[98]:
```
df.describe()
```

[98]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin
count	768.000000	768.000000	768.000000	768.000000	768.000000
mean	3.845052	120.894531	69.105469	20.536458	79.799479
std	3.369578	31.972618	19.355807	15.952218	115.244002
min	0.000000	0.000000	0.000000	0.000000	0.000000

```
25%       1.000000   99.000000       62.000000        0.000000    0.000000
50%       3.000000  117.000000       72.000000       23.000000   30.500000
75%       6.000000  140.250000       80.000000       32.000000  127.250000
max      17.000000  199.000000      122.000000       99.000000  846.000000

              BMI  DiabetesPedigreeFunction         Age     Outcome
count  768.000000                768.000000  768.000000  768.000000
mean    31.992578                  0.471876   33.240885    0.348958
std      7.884160                  0.331329   11.760232    0.476951
min      0.000000                  0.078000   21.000000    0.000000
25%     27.300000                  0.243750   24.000000    0.000000
50%     32.000000                  0.372500   29.000000    0.000000
75%     36.600000                  0.626250   41.000000    1.000000
max     67.100000                  2.420000   81.000000    1.000000
```

[99]:
```
df.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
```

[100]:
```
df.shape
```

[100]:
```
(768, 9)
```

[101]:
```
df.value_counts()
```

[101]:
```
Pregnancies  Glucose  BloodPressure  SkinThickness  Insulin  BMI
DiabetesPedigreeFunction  Age  Outcome
0            57       60             0              0        21.7  0.735
67   0          1
             67       76             0              0        45.3  0.194
46   0          1
5            103      108            37             0        39.2  0.305
```

```
65   0          1
             104      74            0             0        28.8  0.153
48   0          1
             105      72            29            325      36.9  0.159
28   0          1
                          ..
2            84       50            23            76       30.4  0.968
21   0          1
             85       65            0             0        39.6  0.930
27   0          1
             87       0             23            0        28.9  0.773
25   0          1
                      58            16            52       32.7  0.166
25   0          1
17           163      72            41            114      40.9  0.817
47   1          1
Length: 768, dtype: int64
```

[102]:
```
df.columns
```

[102]:
```
Index(['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age', 'Outcome'],
      dtype='object')
```

Checking Null Values

[103]:
```
df.isnull().sum()
```

[103]:
```
Pregnancies                 0
Glucose                     0
BloodPressure               0
SkinThickness               0
Insulin                     0
BMI                         0
DiabetesPedigreeFunction    0
Age                         0
Outcome                     0
dtype: int64
```

Exploratory Data Analysis

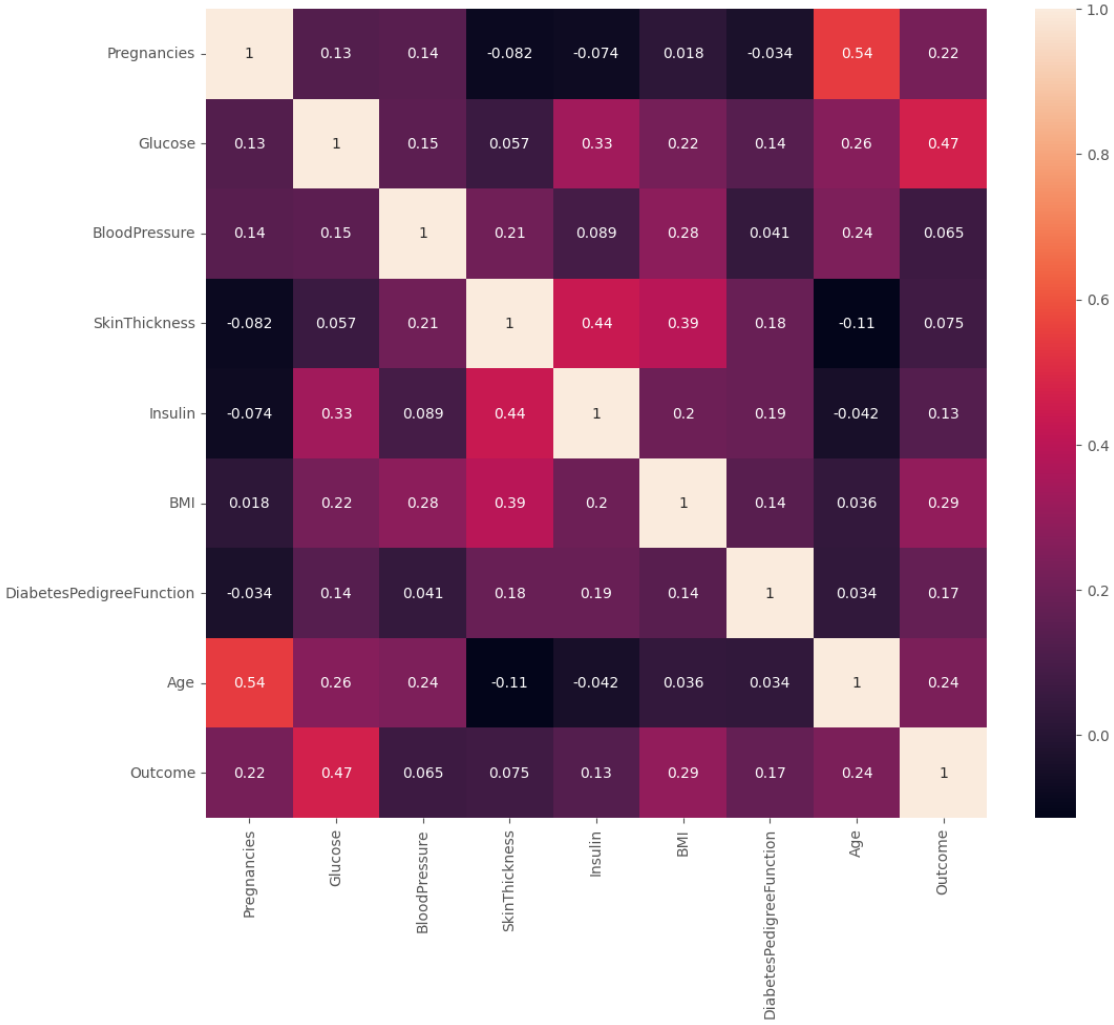
[104]:
```
df.corr()
```

[104]:
```
                          Pregnancies   Glucose  BloodPressure  SkinThickness  \
Pregnancies                  1.000000  0.129459       0.141282      -0.081672
Glucose                      0.129459  1.000000       0.152590       0.057328
BloodPressure                0.141282  0.152590       1.000000       0.207371
SkinThickness               -0.081672  0.057328       0.207371       1.000000
```

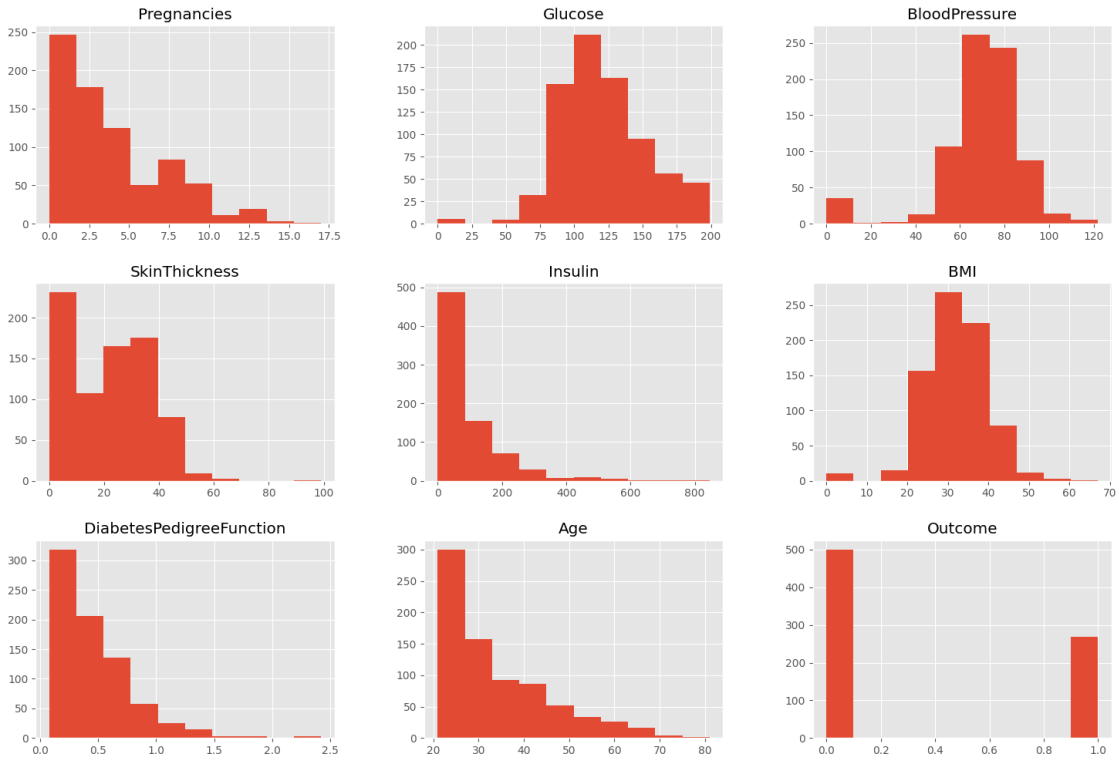
```
Insulin                    -0.073535  0.331357       0.088933       0.436783
BMI                         0.017683  0.221071       0.281805       0.392573
DiabetesPedigreeFunction   -0.033523  0.137337       0.041265       0.183928
Age                         0.544341  0.263514       0.239528      -0.113970
Outcome                     0.221898  0.466581       0.065068       0.074752

                           Insulin       BMI  DiabetesPedigreeFunction  \
Pregnancies              -0.073535  0.017683                 -0.033523
Glucose                   0.331357  0.221071                  0.137337
BloodPressure             0.088933  0.281805                  0.041265
SkinThickness             0.436783  0.392573                  0.183928
Insulin                   1.000000  0.197859                  0.185071
BMI                       0.197859  1.000000                  0.140647
DiabetesPedigreeFunction  0.185071  0.140647                  1.000000
Age                      -0.042163  0.036242                  0.033561
Outcome                   0.130548  0.292695                  0.173844

                               Age   Outcome
Pregnancies               0.544341  0.221898
Glucose                   0.263514  0.466581
BloodPressure             0.239528  0.065068
SkinThickness            -0.113970  0.074752
Insulin                  -0.042163  0.130548
BMI                       0.036242  0.292695
DiabetesPedigreeFunction  0.033561  0.173844
Age                       1.000000  0.238356
Outcome                   0.238356  1.000000
```

[105]:
```
plt.figure(figsize = (12,10))

sns.heatmap(df.corr(), annot =True)
```

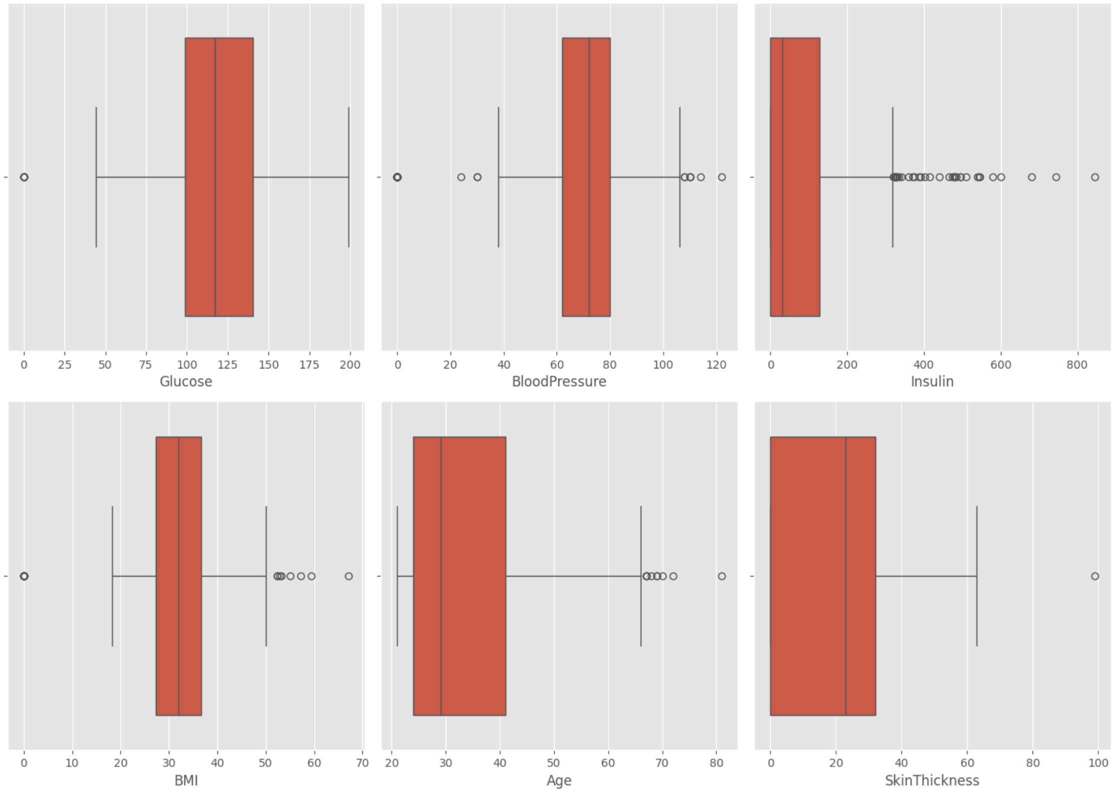
[105]:
```
<Axes: >
```



[106]:
```
df.hist(figsize=(18,12))
plt.show()
```



[107]:
```
features = ['Glucose', 'BloodPressure', 'Insulin', 'BMI', 'Age',␣
 ↪'SkinThickness']
plt.figure(figsize=(14, 10))

for i, feature in enumerate(features, start=1):
    plt.subplot(2, 3, i)
    sns.boxplot(x=feature, data=df)

plt.tight_layout()
plt.show()
```



[108]:
```
mean_col = ['Glucose','BloodPressure','Insulin','Age','Outcome','BMI']

sns.pairplot(df[mean_col],palette='dark')
```

```
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1513: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=vector, **plot_kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1513: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=vector, **plot_kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1513: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=vector, **plot_kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1513: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=vector, **plot_kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1513: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=vector, **plot_kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1513: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=vector, **plot_kwargs)
```

```
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
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/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
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/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
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/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
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Ignoring `palette` because no `hue` variable has been assigned.
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Ignoring `palette` because no `hue` variable has been assigned.
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  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
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  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
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  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
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  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
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  func(x=x, y=y, **kwargs)
```

```
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
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/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
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  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
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  func(x=x, y=y, **kwargs)
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Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
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  func(x=x, y=y, **kwargs)
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  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1615: UserWarning:
Ignoring `palette` because no `hue` variable has been assigned.
  func(x=x, y=y, **kwargs)
```
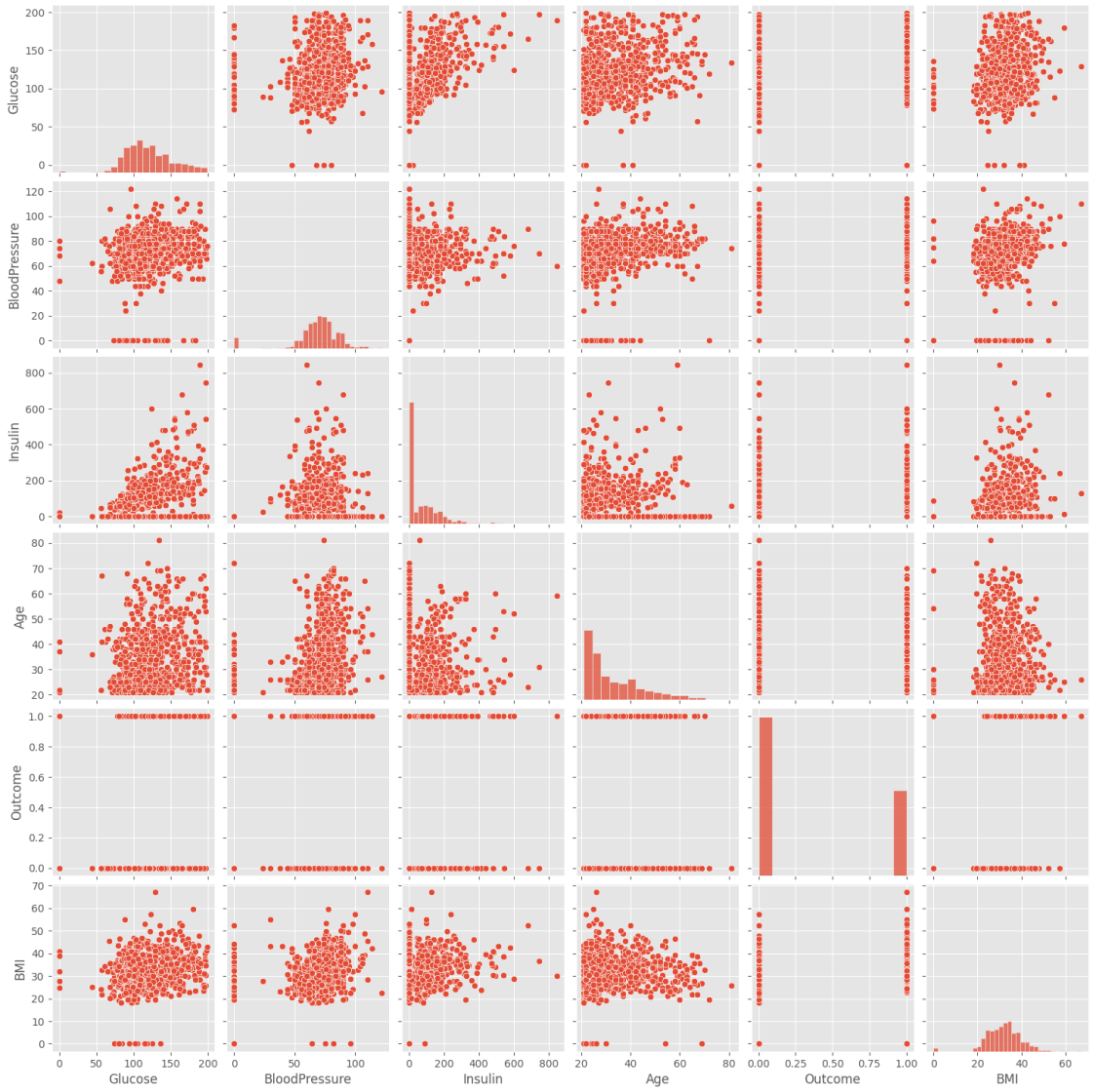
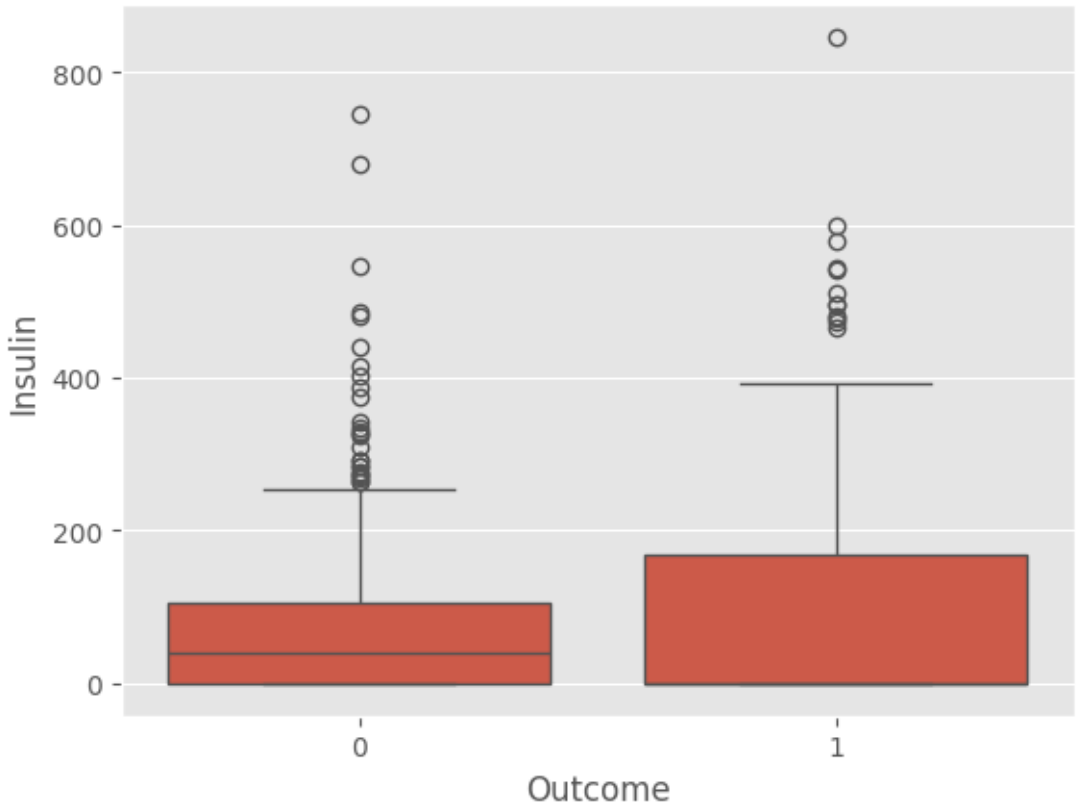

```
[108]: <seaborn.axisgrid.PairGrid at 0x7deae4c86650>
```



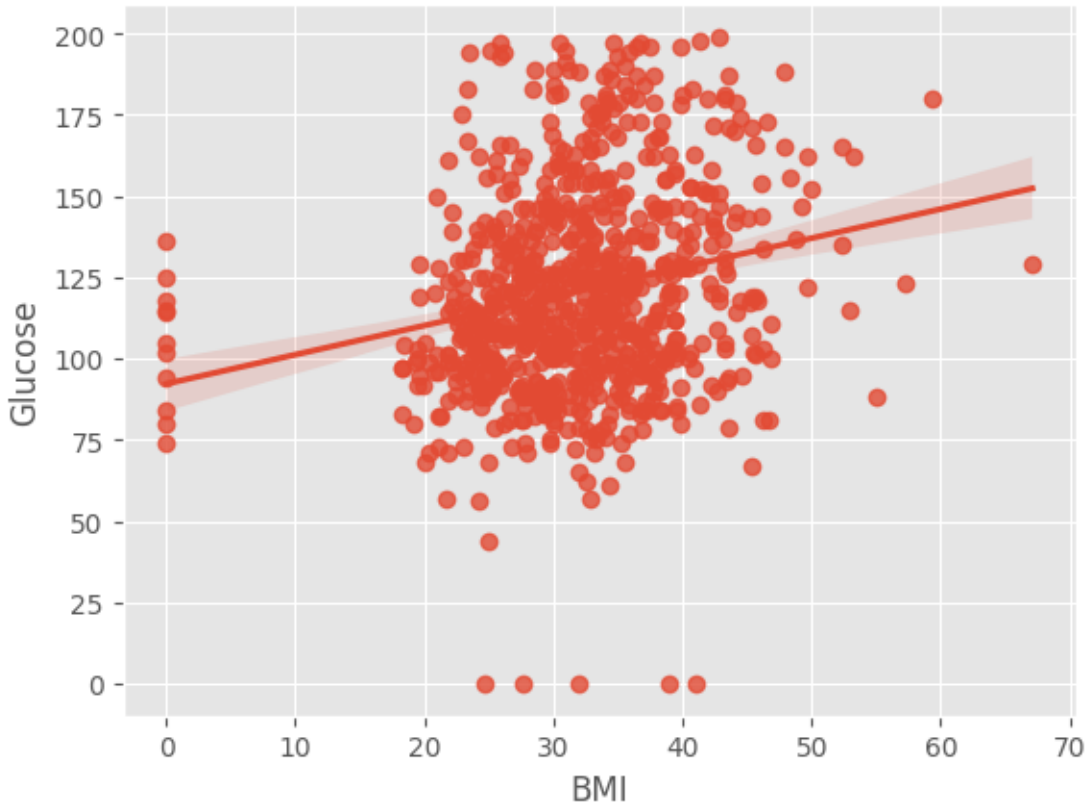
[109]:
```
sns.boxplot(x='Outcome',y='Insulin',data=df)
```

[109]: <Axes: xlabel='Outcome', ylabel='Insulin'>



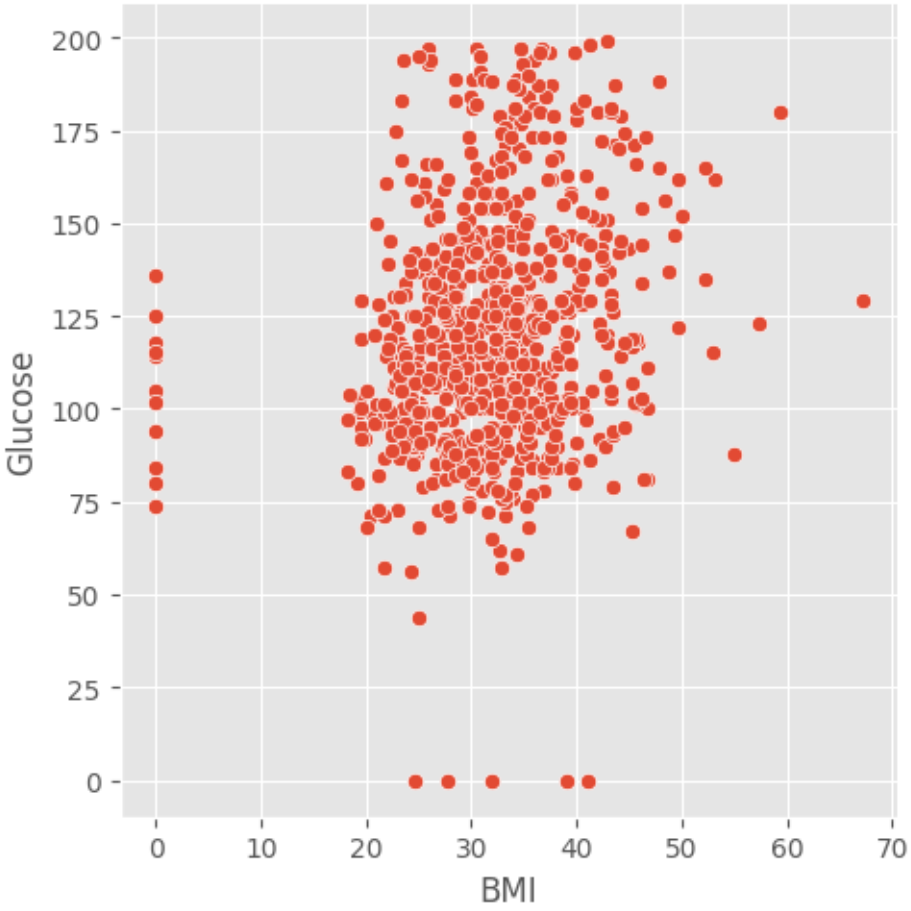
[110]:
```
sns.regplot(x='BMI', y= 'Glucose', data=df)
```

[110]: <Axes: xlabel='BMI', ylabel='Glucose'>



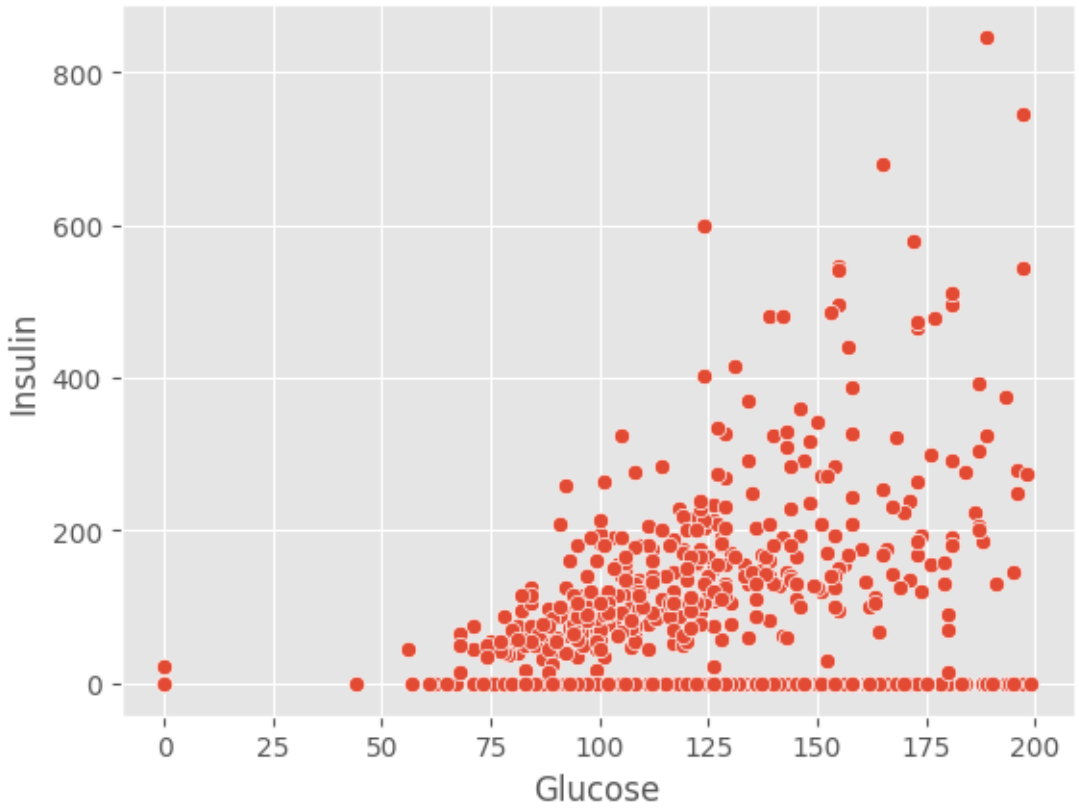
[111]:
```
sns.relplot(x='BMI', y= 'Glucose', data=df)
```

[111]: <seaborn.axisgrid.FacetGrid at 0x7deadfba97b0>



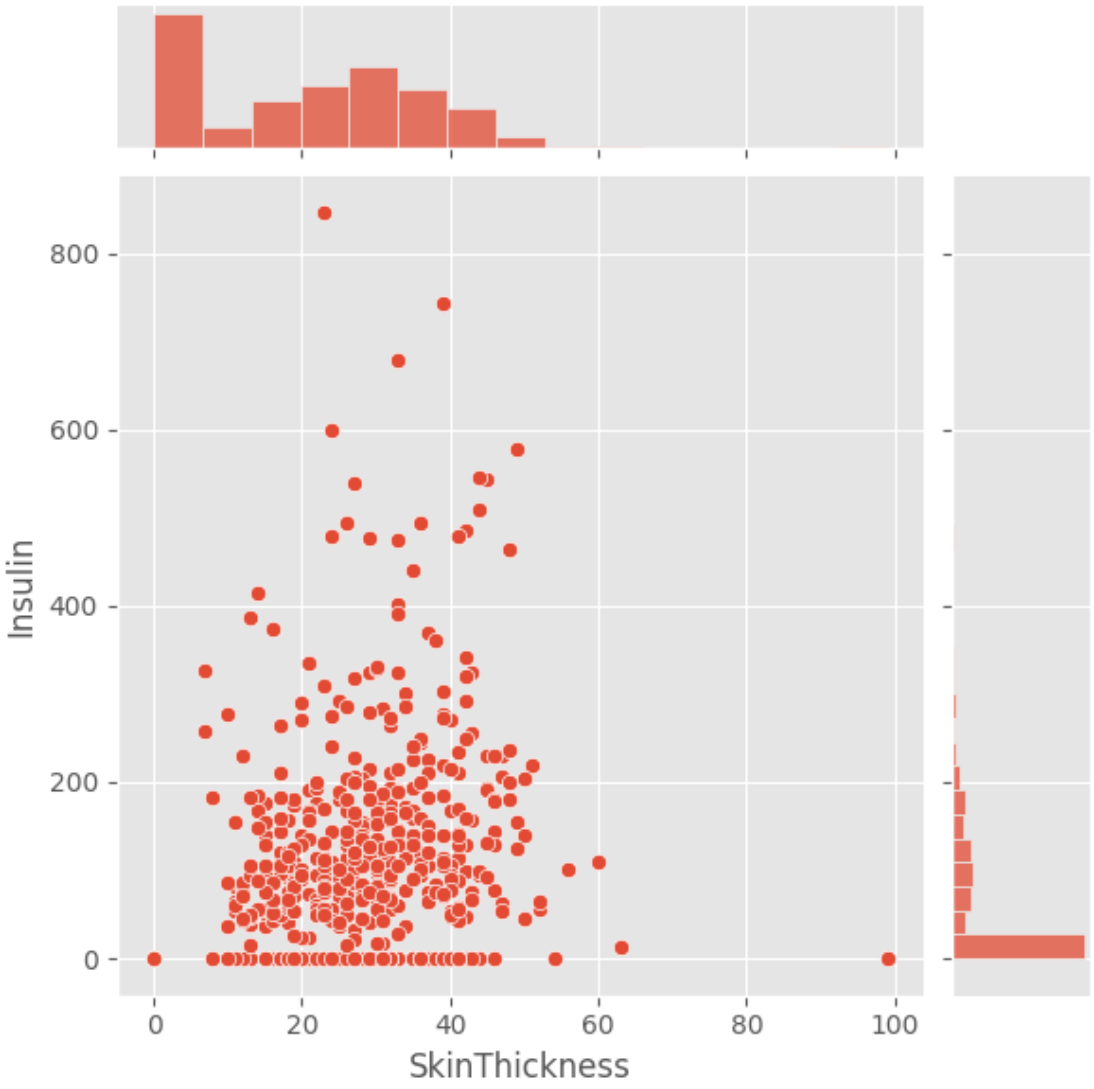
[112]:
```
sns.scatterplot(x='Glucose', y= 'Insulin', data=df)
```

[112]:
```
<Axes: xlabel='Glucose', ylabel='Insulin'>
```



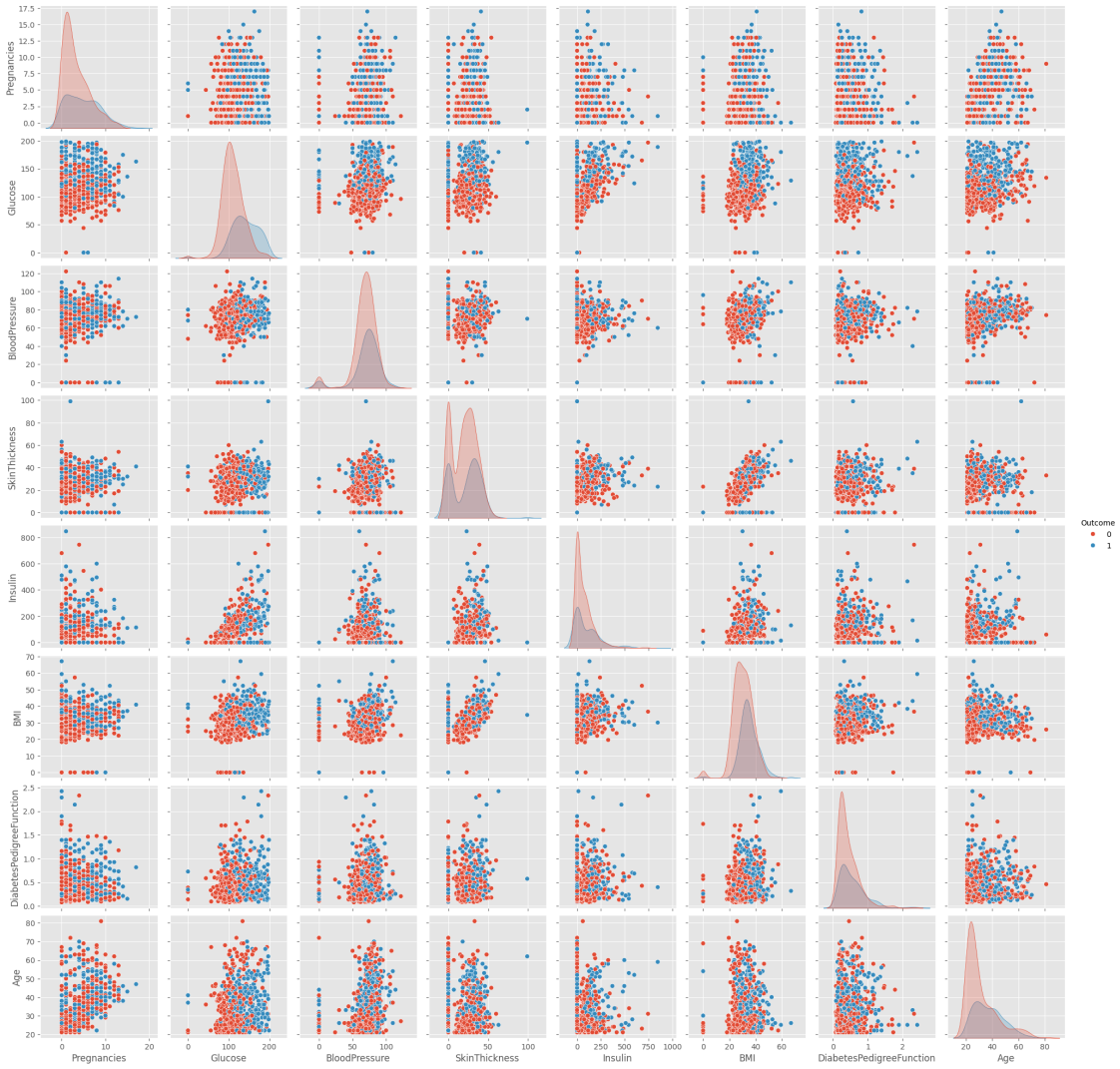
[113]:
```
sns.jointplot(x='SkinThickness', y= 'Insulin', data=df)
```

[113]: <seaborn.axisgrid.JointGrid at 0x7deadfa2cbe0>



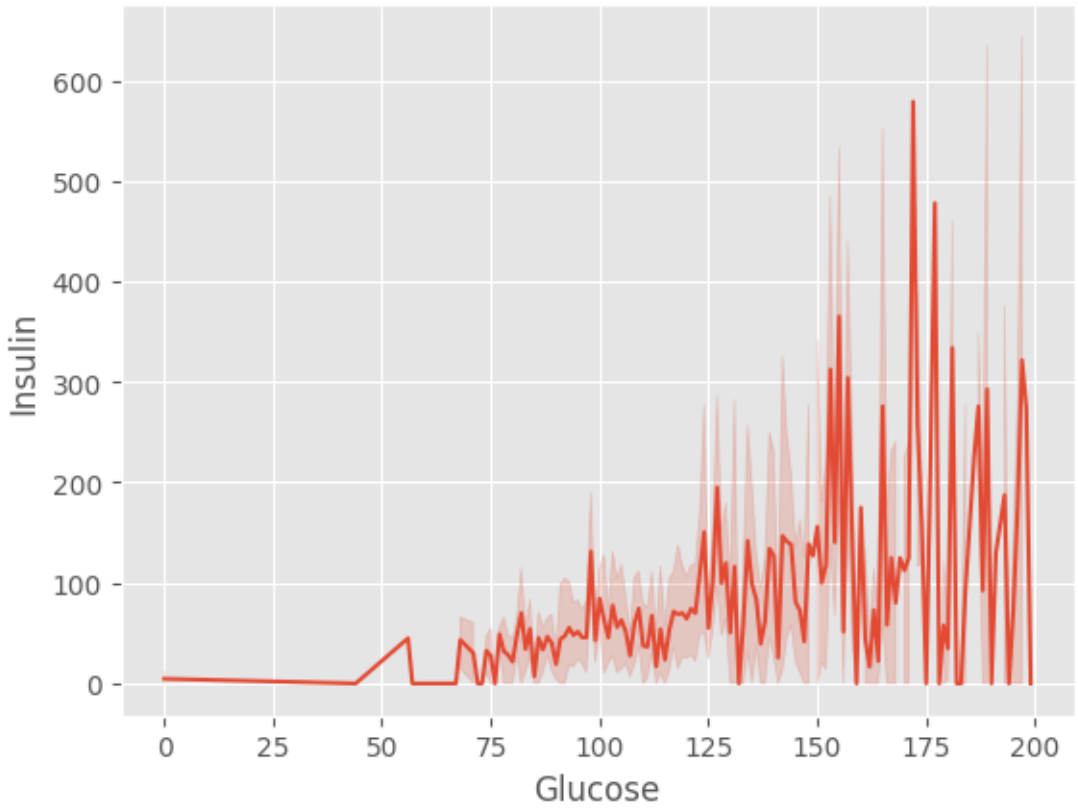
[114]:
```
sns.pairplot(df,hue='Outcome')
```

[114]: <seaborn.axisgrid.PairGrid at 0x7deadf9c3d60>



[115]:
```
sns.lineplot(x='Glucose', y= 'Insulin', data=df)
```

[115]: <Axes: xlabel='Glucose', ylabel='Insulin'>



[116]:
```
sns.swarmplot(x='Glucose', y= 'Insulin', data=df)
```

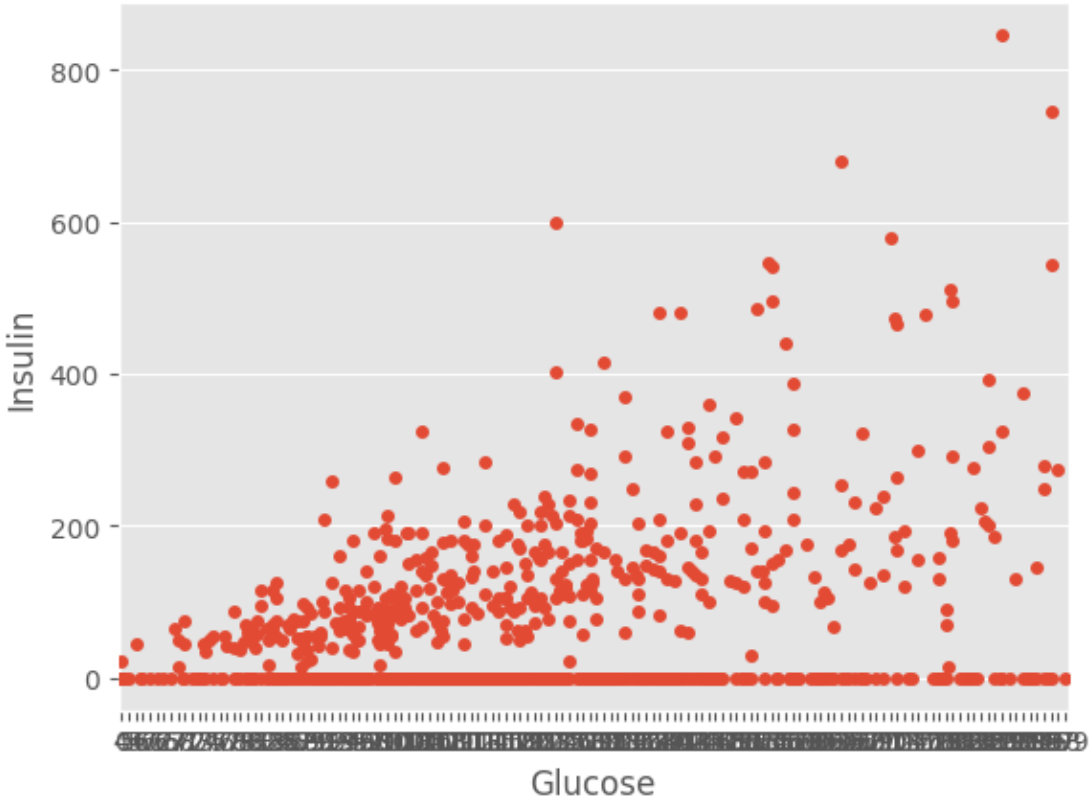
```
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 60.0% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 50.0% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 33.3% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 25.0% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 66.7% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
```

```
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 71.4% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 42.9% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 55.6% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 81.8% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 57.1% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 61.5% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 37.5% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 64.7% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 44.4% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 76.9% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 53.8% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 85.7% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
```

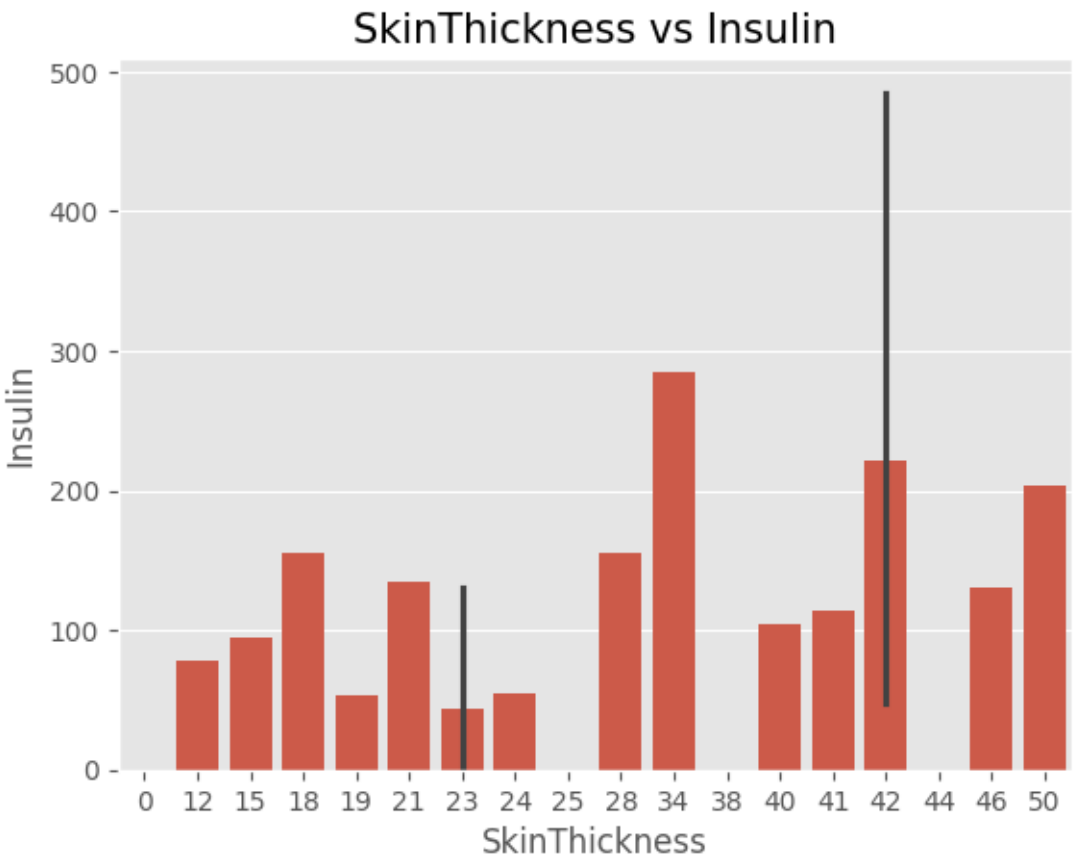
```
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 63.6% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 64.3% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 69.2% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 70.0% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 45.5% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 54.5% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 58.3% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 22.2% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 40.0% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 80.0% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 16.7% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 62.5% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
```

```
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 20.0% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398:
UserWarning: 28.6% of the points cannot be placed; you may want to decrease the
size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
```

[116]: `<Axes: xlabel='Glucose', ylabel='Insulin'>`



[117]:
```
sns.barplot(x="SkinThickness", y="Insulin", data=df[150:180])
plt.title("SkinThickness vs Insulin",fontsize=15)
plt.xlabel("SkinThickness")
plt.ylabel("Insulin")
plt.show()
plt.style.use("ggplot")
```



[118]:
```
plt.figure(figsize=(5,5))
sns.barplot(x="Glucose", y="Insulin", data=df[120:130])
plt.title("Glucose vs Insulin",fontsize=15)
plt.xlabel("Glucose")
plt.ylabel("Insulin")
plt.show()
```

Training and Testing Data

[119]:
```
x = df.drop(columns = 'Outcome')

y = df['Outcome']

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)
```

MODELS

1. Logistic Regression

[120]:
```
from sklearn.linear_model import LogisticRegression
model = LogisticRegression()
model.fit(X_train, y_train)

y_pred = model.predict(X_test)
```

```
print(classification_report(y_test, y_pred))
print(confusion_matrix(y_test, y_pred))

from sklearn.metrics import accuracy_score
LRAcc = accuracy_score(y_pred,y_test)
print('Logistic Regression accuracy is: {:.2f}%'.format(LRAcc*100))
```

```
              precision    recall  f1-score   support

           0       0.84      0.92      0.88       107
           1       0.76      0.62      0.68        47

    accuracy                           0.82       154
   macro avg       0.80      0.77      0.78       154
weighted avg       0.82      0.82      0.82       154

[[98  9]
 [18 29]]
Logistic Regression accuracy is: 82.47%
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/linear_model/_logistic.py:458:
ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-
regression
  n_iter_i = _check_optimize_result(
```

2. KNeighborsClassifier

[121]:
```
from sklearn.neighbors import KNeighborsClassifier
model = KNeighborsClassifier(n_neighbors=7)
model.fit(X_train, y_train)

y_pred = model.predict(X_test)

print(classification_report(y_test, y_pred))
print(confusion_matrix(y_test, y_pred))

from sklearn.metrics import accuracy_score
KNAcc = accuracy_score(y_pred,y_test)
print('KNeighborsClassifier accuracy is: {:.2f}%'.format(KNAcc*100))
```

```
              precision    recall  f1-score   support

           0       0.82      0.84      0.83       107
```

```
           1       0.61      0.57      0.59        47

    accuracy                           0.76       154
   macro avg       0.72      0.71      0.71       154
weighted avg       0.76      0.76      0.76       154

[[90 17]
 [20 27]]
KNeighborsClassifier accuracy is: 75.97%
```

3. SVC

[122]:
```
from sklearn.svm import SVC
model = SVC()
model.fit(X_train, y_train)

y_pred = model.predict(X_test)

print(classification_report(y_test, y_pred))
print(confusion_matrix(y_test, y_pred))

from sklearn.metrics import accuracy_score
SVCAcc = accuracy_score(y_pred,y_test)
print('SVC accuracy is: {:.2f}%'.format(SVCAcc*100))
```

```
              precision    recall  f1-score   support

           0       0.81      0.92      0.86       107
           1       0.73      0.51      0.60        47

    accuracy                           0.79       154
   macro avg       0.77      0.71      0.73       154
weighted avg       0.78      0.79      0.78       154

[[98  9]
 [23 24]]
SVC accuracy is: 79.22%
```

4. RandomForestClassifier

[123]:
```
from sklearn.ensemble import RandomForestClassifier
model = RandomForestClassifier()
model.fit(X_train, y_train)

y_pred = model.predict(X_test)

print(classification_report(y_test, y_pred))
print(confusion_matrix(y_test, y_pred))
```

```
from sklearn.metrics import accuracy_score
RFAcc = accuracy_score(y_pred,y_test)
print('RFC accuracy is: {:.2f}%'.format(RFAcc*100))
```

```
              precision    recall  f1-score   support

           0       0.85      0.88      0.87       107
           1       0.70      0.66      0.68        47

    accuracy                           0.81       154
   macro avg       0.78      0.77      0.77       154
weighted avg       0.81      0.81      0.81       154

[[94 13]
 [16 31]]
RFC accuracy is: 81.17%
```

5. Gradient Boosting Classifier

[124]:
```
from sklearn.ensemble import GradientBoostingClassifier
model = GradientBoostingClassifier()
model.fit(X_train, y_train)

y_pred = model.predict(X_test)

print(classification_report(y_test, y_pred))
print(confusion_matrix(y_test, y_pred))

from sklearn.metrics import accuracy_score
GBCAcc = accuracy_score(y_pred,y_test)
print('GBC accuracy is: {:.2f}%'.format(GBCAcc*100))
```

```
              precision    recall  f1-score   support

           0       0.87      0.87      0.87       107
           1       0.70      0.70      0.70        47

    accuracy                           0.82       154
   macro avg       0.79      0.79      0.79       154
weighted avg       0.82      0.82      0.82       154

[[93 14]
 [14 33]]
GBC accuracy is: 81.82%
```

6. Naive Bayes

[125]:
```
from sklearn.naive_bayes import GaussianNB
model = GaussianNB()
model.fit(X_train, y_train)

y_pred = model.predict(X_test)

print(classification_report(y_test, y_pred))
print(confusion_matrix(y_test, y_pred))

from sklearn.metrics import accuracy_score
GNBAcc = accuracy_score(y_pred,y_test)
print('GNB accuracy is: {:.2f}%'.format(GNBAcc*100))
```

```
              precision    recall  f1-score   support

           0       0.84      0.87      0.85       107
           1       0.67      0.62      0.64        47

    accuracy                           0.79       154
   macro avg       0.76      0.74      0.75       154
weighted avg       0.79      0.79      0.79       154

[[93 14]
 [18 29]]
GNB accuracy is: 79.22%
```

Compare Models

[126]:
```
compare = pd.DataFrame({'Model': ['Logistic Regression', 'K Neighbors', 'SVM',␣
↪'Random Forest', 'GradientBoostingClassifier', 'GaussianNB'],
                        'Accuracy': [LRAcc*100, KNAcc*100, SVCAcc*100,␣
↪RFAcc*100, GBCAcc*100, GNBAcc*100]})
compare.sort_values(by='Accuracy', ascending=False)
```

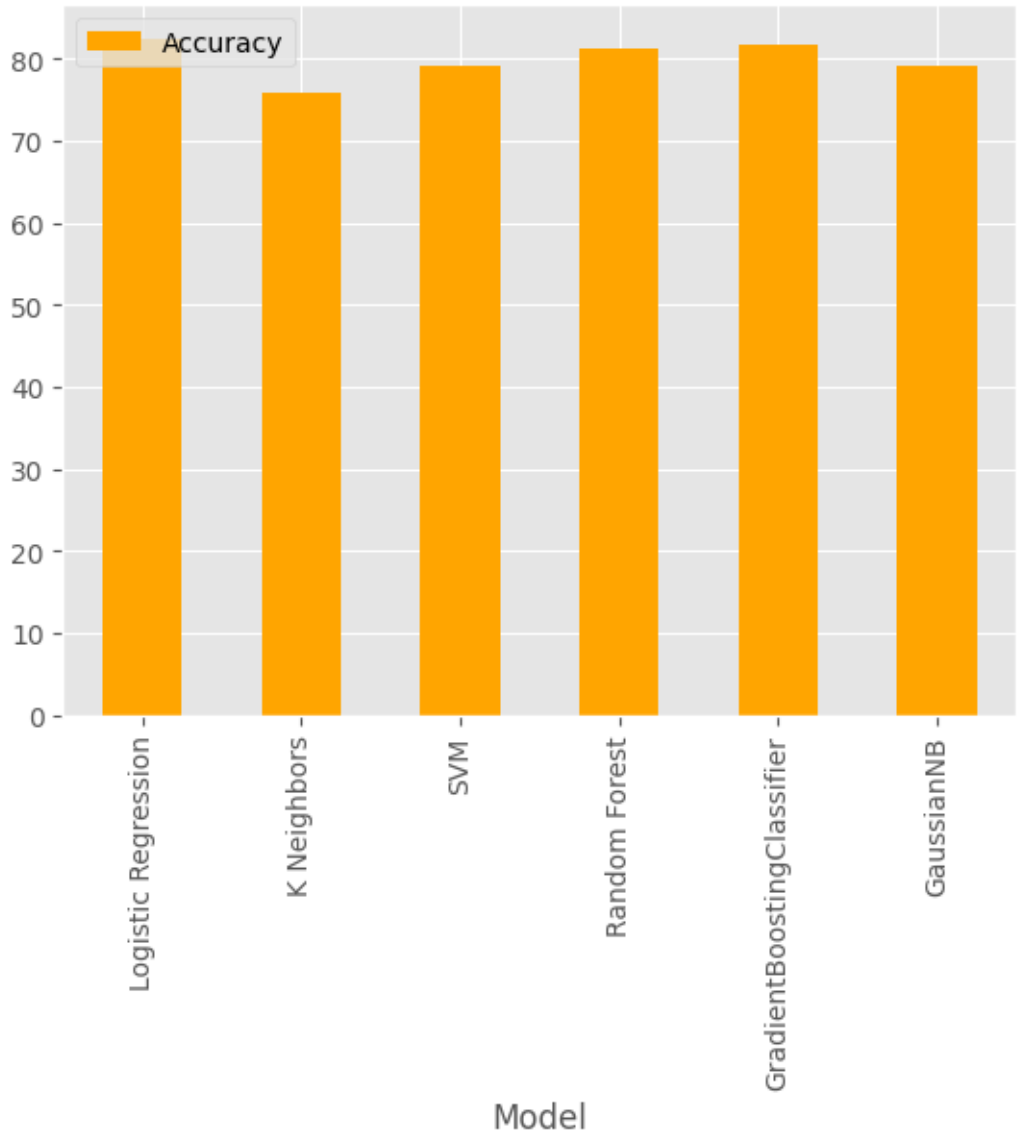
[126]:

	Model	Accuracy
0	Logistic Regression	82.467532
4	GradientBoostingClassifier	81.818182
3	Random Forest	81.168831
2	SVM	79.220779
5	GaussianNB	79.220779
1	K Neighbors	75.974026

Plotting Model Comparison

[127]:
```
compare.plot(x='Model', y='Accuracy', kind='bar', color='orange')
```

[127]:
```
<Axes: xlabel='Model'>
```



From the comparison plot, among the 6 ML models, Logistic Regression had achieved the highest accuracy of 82.50%.