In [75]:
```
%matplotlib inline
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_squared_error
```

In [105]:
```
df=pd.read_csv('diabetes.csv')
```

In [106]:
```
df.describe()
```

Out[106]:

	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
75%	6.000000	140.250000	80.000000	32.000000	127.250000	36.600000	0.626250	41.000000	1.000000
max	17.000000	199.000000	122.000000	99.000000	846.000000	67.100000	2.420000	81.000000	1.000000

In [107]:
```
df.head()
```

Out[107]:

	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

In [108]:
```
df.isnull().any()
```

Out[108]:
```
Pregnancies                 False
Glucose                     False
BloodPressure               False
SkinThickness               False
Insulin                     False
BMI                         False
DiabetesPedigreeFunction    False
Age                         False
Outcome                     False
dtype: bool
```

In [60]:
```
df.shape
```

Out[60]:
```
(768, 9)
```

In [61]:
```
df.columns
```

Out[61]:
```
Index(['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age', 'Outcome'],
      dtype='object')
```

In [62]:
```
df["SkinThickness"]=df["SkinThickness"].replace(0,df["SkinThickness"].mean())
df
```

Out[62]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35.000000	0	33.6	0.627	50	1
1	1	85	66	29.000000	0	26.6	0.351	31	0
2	8	183	64	20.536458	0	23.3	0.672	32	1
3	1	89	66	23.000000	94	28.1	0.167	21	0
4	0	137	40	35.000000	168	43.1	2.288	33	1
...	...	...	...	...	...	...	...	...	...
763	10	101	76	48.000000	180	32.9	0.171	63	0
764	2	122	70	27.000000	0	36.8	0.340	27	0
765	5	121	72	23.000000	112	26.2	0.245	30	0
766	1	126	60	20.536458	0	30.1	0.349	47	1
767	1	93	70	31.000000	0	30.4	0.315	23	0

768 rows × 9 columns

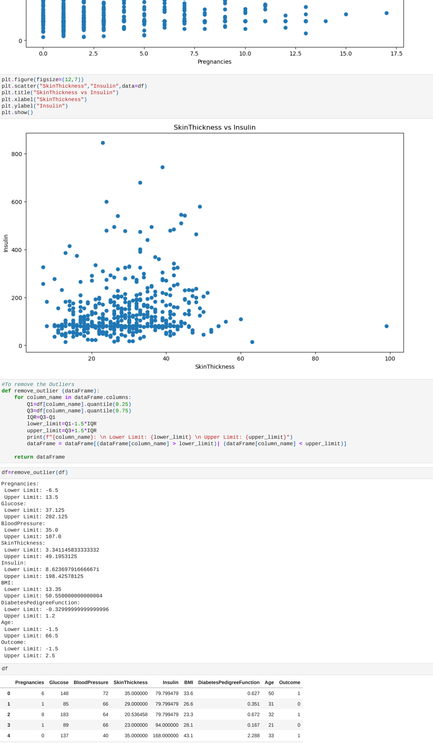
In [63]:
```
df["Insulin"]=df["Insulin"].replace(0,df["Insulin"].mean())
df
```

Out[63]:

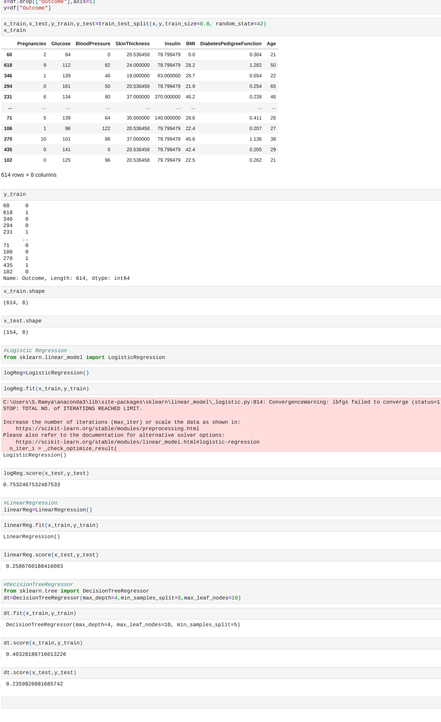
	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35.000000	79.799479	33.6	0.627	50	1
1	1	85	66	29.000000	79.799479	26.6	0.351	31	0
2	8	183	64	20.536458	79.799479	23.3	0.672	32	1
3	1	89	66	23.000000	94.000000	28.1	0.167	21	0
4	0	137	40	35.000000	168.000000	43.1	2.288	33	1
...	...	...	...	...	...	...	...	...	...
763	10	101	76	48.000000	180.000000	32.9	0.171	63	0
764	2	122	70	27.000000	79.799479	36.8	0.340	27	0
765	5	121	72	23.000000	112.000000	26.2	0.245	30	0
766	1	126	60	20.536458	79.799479	30.1	0.349	47	1
767	1	93	70	31.000000	79.799479	30.4	0.315	23	0

768 rows × 9 columns

In [64]:
```
plt.figure(figsize=(12,7))
plt.scatter("Pregnancies","Insulin",data=df)
plt.title("Pregnancies vs Insulin")
plt.xlabel("Pregnancies")
plt.ylabel("Insulin")
plt.show()
```



In [65]:
```
plt.figure(figsize=(12,7))
plt.scatter("SkinThickness","Insulin",data=df)
plt.title("SkinThickness vs Insulin")
plt.xlabel("SkinThickness")
plt.ylabel("Insulin")
plt.show()
```



In [66]:
```
#To remove the Outliers
def remove_outlier(dataFrame):
    for column_name in dataFrame.columns:
        Q1=df[column_name].quantile(0.25)
        Q3=df[column_name].quantile(0.75)
        IQR=Q3-Q1
        lower_limit=Q1-1.5*IQR
        upper_limit=Q3+1.5*IQR
        print(f"{column_name}: \n Lower Limit: {lower_limit} \n Upper Limit: {upper_limit}")
        dataFrame = dataFrame[(dataFrame[column_name] > lower_limit) &(dataFrame[column_name] < upper_limit)]

    return dataFrame
```

In [67]:
```
dfremove_outlier(df)
```

```
Pregnancies:
 Lower Limit: -6.5
 Upper Limit: 13.5
Glucose:
 Lower Limit: 37.125
 Upper Limit: 202.125
BloodPressure:
 Lower Limit: 35.0
 Upper Limit: 107.0
SkinThickness:
 Lower Limit: 3.341145833333332
 Upper Limit: 49.1953125
Insulin:
 Lower Limit: 8.623699791666671
 Upper Limit: 198.42578125
BMI:
 Lower Limit: 13.35
 Upper Limit: 50.55000000000004
DiabetesPedigreeFunction:
 Lower Limit: -0.3299999999999996
 Upper Limit: 1.2
Age:
 Lower Limit: -1.5
 Upper Limit: 66.5
Outcome:
 Lower Limit: -1.5
 Upper Limit: 2.5
```

In [68]:
```
df
```

Out[68]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35.000000	79.799479	33.6	0.627	50	1
1	1	85	66	29.000000	79.799479	26.6	0.351	31	0
2	8	183	64	20.536458	79.799479	23.3	0.672	32	1
3	1	89	66	23.000000	94.000000	28.1	0.167	21	0
4	0	137	40	35.000000	168.000000	43.1	2.288	33	1
...	...	...	...	...	...	...	...	...	...
763	10	101	76	48.000000	180.000000	32.9	0.171	63	0
764	2	122	70	27.000000	79.799479	36.8	0.340	27	0
765	5	121	72	23.000000	112.000000	26.2	0.245	30	0
766	1	126	60	20.536458	79.799479	30.1	0.349	47	1
767	1	93	70	31.000000	79.799479	30.4	0.315	23	0

768 rows × 9 columns

In [69]:
```
#Splitting the datas
from sklearn.model_selection import train_test_split
x=df.drop("Outcome",axis=1)
y=df["Outcome"]
```

In [70]:
```
x_train,x_test,y_train,y_test=train_test_split(x,y,train_size=0.8, random_state=42)
x_train
```

Out[70]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
60	2	84	0	20.536458	79.799479	0.0	0.304	21
618	9	112	82	24.000000	79.799479	28.2	1.282	50
346	1	139	46	19.000000	83.000000	28.7	0.654	22
294	0	161	50	20.536458	79.799479	21.9	0.254	65
231	6	134	80	37.000000	370.000000	46.2	0.238	46
...	...	...	...	...	...	...	...	...
71	5	139	64	35.000000	140.000000	28.6	0.411	26
106	1	96	122	20.536458	79.799479	22.4	0.207	27
270	10	101	86	37.000000	79.799479	45.6	1.136	38
435	0	141	0	20.536458	79.799479	42.4	0.205	29
102	0	125	96	20.536458	79.799479	22.5	0.262	21

614 rows × 8 columns

In [91]:
```
y_train
```

Out[91]:
```
60     0
618    1
346    0
294    0
231    1
      ..
71     0
106    0
270    1
435    1
102    0
Name: Outcome, Length: 614, dtype: int64
```

In [92]:
```
x_train.shape
```

Out[92]:
```
(614, 8)
```

In [93]:
```
x_test.shape
```

Out[93]:
```
(154, 8)
```

In [94]:
```
#Logistic Regression
from sklearn.linear_model import LogisticRegression
```

In [95]:
```
logReg=LogisticRegression()
```

In [96]:
```
logReg.fit(x_train,y_train)
```

```
C:\Users\S.Ramya\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:814: 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(
LogisticRegression()
```

In [97]:
```
logReg.score(x_test,y_test)
```

Out[97]:
```
0.7532467532467533
```

In [98]:
```
#LinearRegression
linearReg=LinearRegression()
```

In [99]:
```
linearReg.fit(x_train,y_train)
```

Out[99]:
```
LinearRegression()
```

In [100]:
```
linearReg.score(x_test,y_test)
```

Out[100]:
```
0.2586760188416063
```

In [101]:
```
#DecisionTreeRegressor
from sklearn.tree import DecisionTreeRegressor
dt=DecisionTreeRegressor(max_depth=4,min_samples_split=5,max_leaf_nodes=10)
```

In [102]:
```
dt.fit(x_train,y_train)
```

Out[102]:
```
DecisionTreeRegressor(max_depth=4, max_leaf_nodes=10, min_samples_split=5)
```

In [103]:
```
dt.score(x_train,y_train)
```

Out[103]:
```
0.4032818671601226
```

In [104]:
```
dt.score(x_test,y_test)
```

Out[104]:
```
0.2350826081685742
```

In [ ]:
```

```