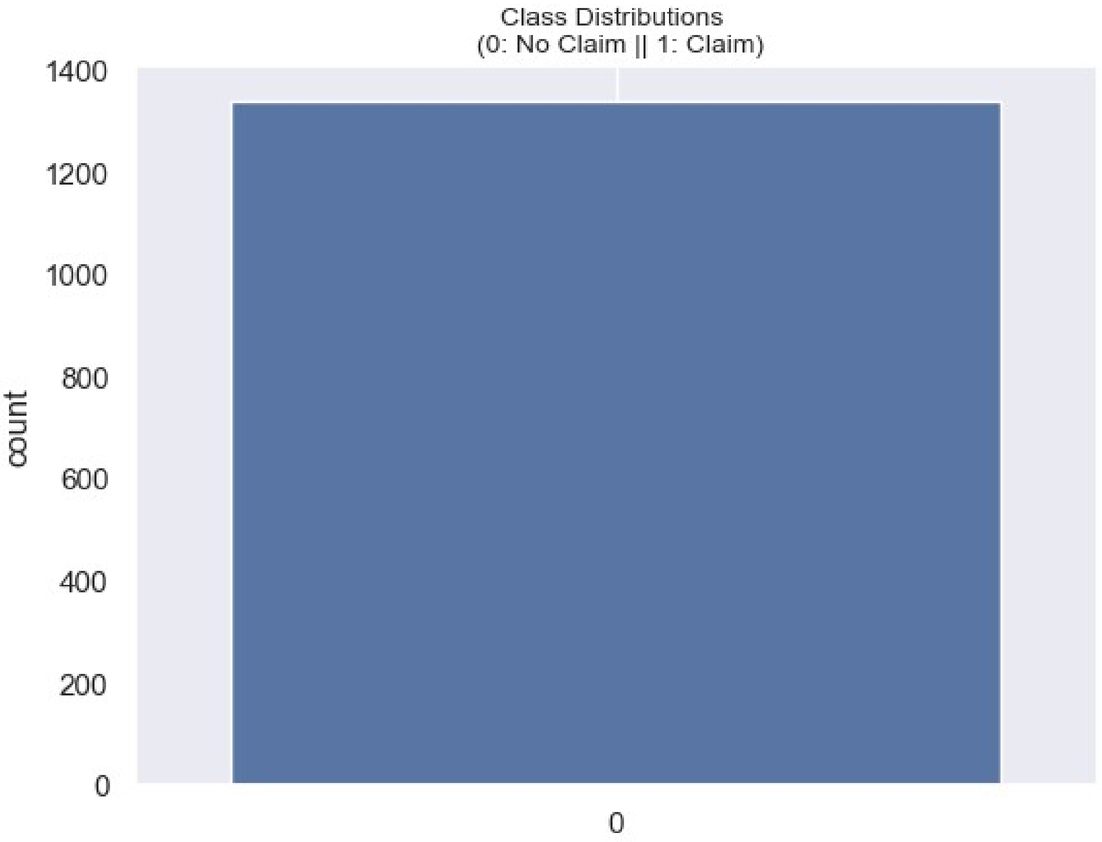
Jaswanthan KS -Insurance Claim Prediction

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns

df = pd.read_csv("E:\PYTHON\Projects\insurance3r2.csv")
df.head()

   age  sex     bmi  steps  children  smoker  region      charges  \
0   19    0  27.900   3009         0       1       3  16884.92400
1   18    1  33.770   3008         1       0       2   1725.55230
2   28    1  33.000   3009         3       0       2   4449.46200
3   33    1  22.705  10009         0       0       1  21984.47061
4   32    1  28.880   8010         0       0       1   3866.85520

   insuranceclaim
0               1
1               1
2               0
3               0
4               1

df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1338 entries, 0 to 1337
Data columns (total 9 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   age             1338 non-null   int64
 1   sex             1338 non-null   int64
 2   bmi             1338 non-null   float64
 3   steps           1338 non-null   int64
 4   children        1338 non-null   int64
 5   smoker          1338 non-null   int64
 6   region          1338 non-null   int64
 7   charges         1338 non-null   float64
 8   insuranceclaim  1338 non-null   int64
dtypes: float64(2), int64(7)
memory usage: 94.2 KB

df.describe()

               age          sex          bmi         steps
children  \
count  1338.000000  1338.000000  1338.000000   1338.000000
1338.000000
mean     39.207025     0.505232    30.663397   5328.623318
```

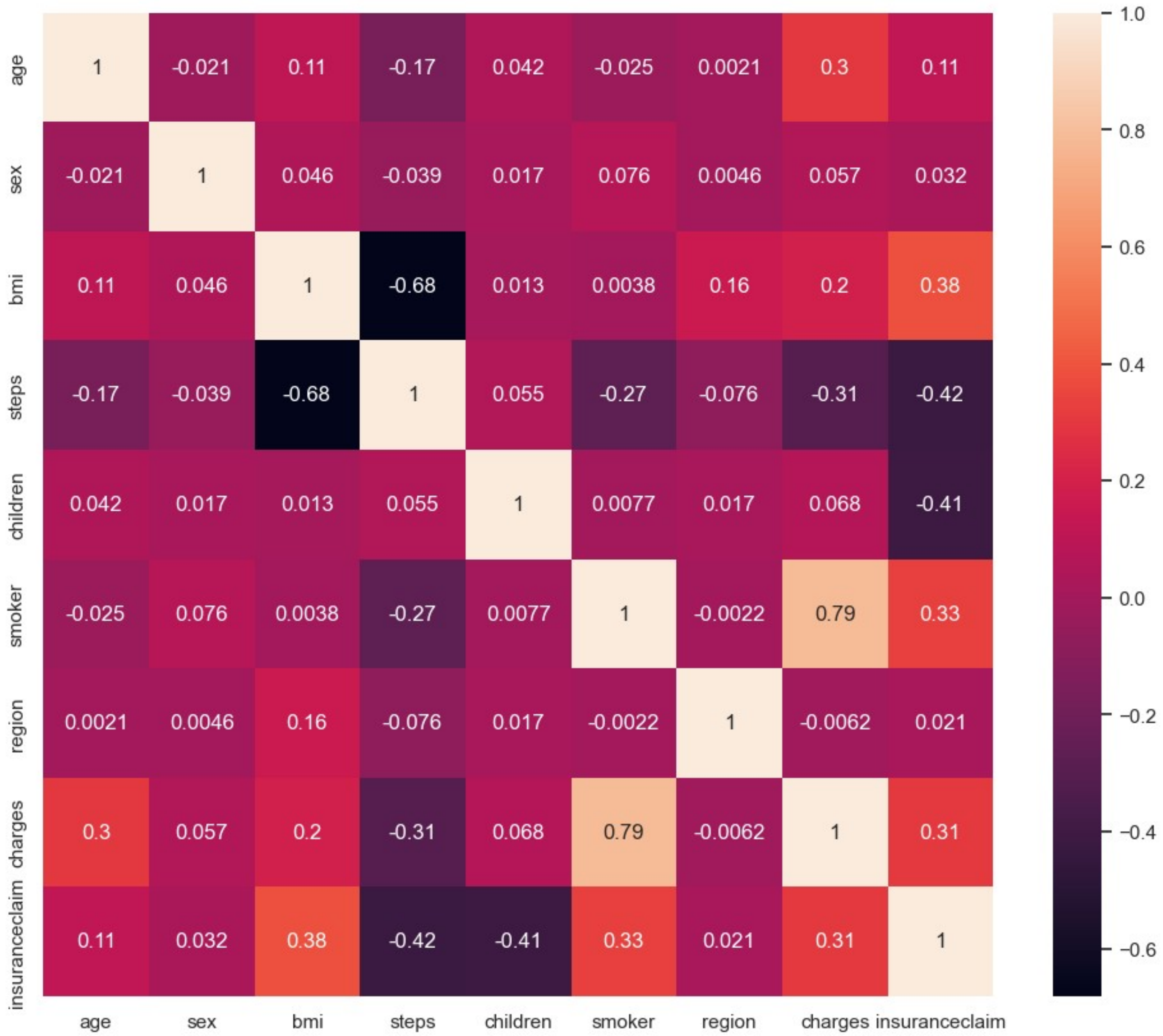
```
1.094918
std       14.049960     0.500160      6.098187   2453.643236
1.205493
min       18.000000     0.000000     15.960000   3000.000000
0.000000
25%       27.000000     0.000000     26.296250   3008.000000
0.000000
50%       39.000000     1.000000     30.400000   4007.000000
1.000000
75%       51.000000     1.000000     34.693750   8004.000000
2.000000
max       64.000000     1.000000     53.130000  10010.000000
5.000000

            smoker       region      charges  insuranceclaim
count  1338.000000  1338.000000  1338.000000     1338.000000
mean      0.204783     1.515695 13270.422265        0.585202
std       0.403694     1.104885 12110.011237        0.492871
min       0.000000     0.000000  1121.873900        0.000000
25%       0.000000     1.000000  4740.287150        0.000000
50%       0.000000     2.000000  9382.033000        1.000000
75%       0.000000     2.000000 16639.912515        1.000000
max       1.000000     3.000000 63770.428010        1.000000
```

```
df = df.dropna()
```

```
plt.title("Class Distributions \n (0: No Claim || 1: Claim)" ,
fontsize = 10)
sns.set(style="darkgrid")
sns.countplot(df['insuranceclaim'])
plt.grid()
```



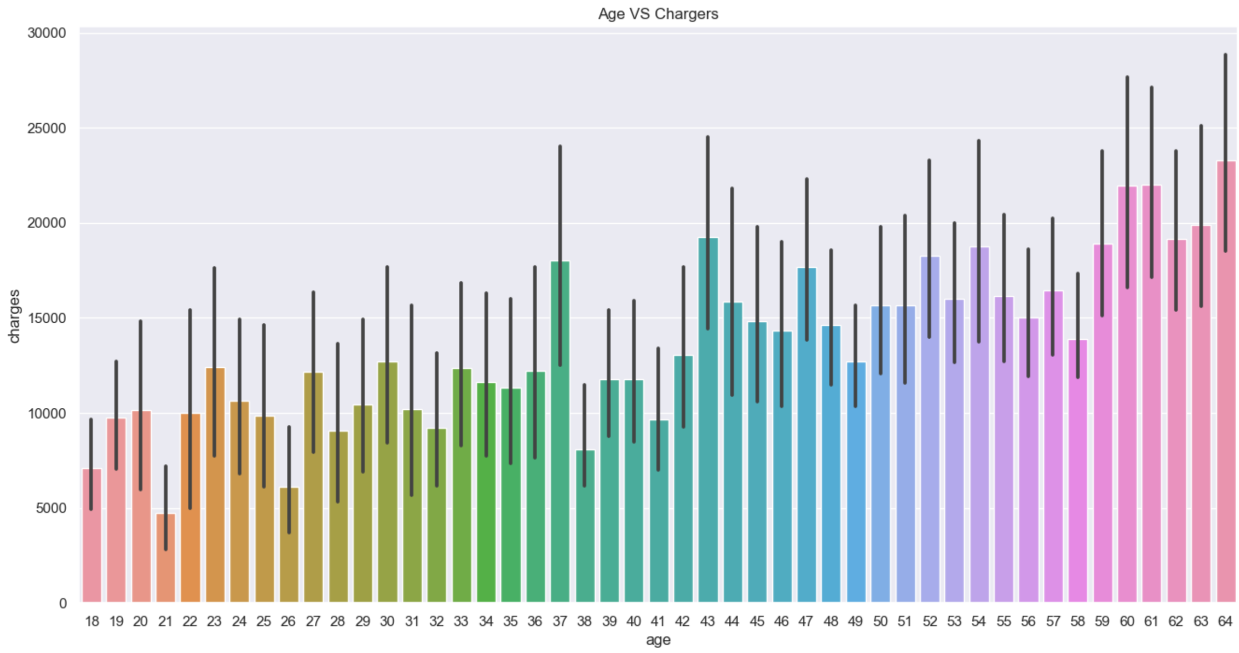
```
correlation = df.corr()
plt.figure(figsize=(12,10))
sns.heatmap(correlation , annot=True)
plt.show()
```



```
df=df.drop('region',axis=1)
df.head()

   age  sex     bmi  steps  children  smoker      charges
insuranceclaim
0   19    0  27.900   3009         0       1  16884.92400
1
1   18    1  33.770   3008         1       0   1725.55230
1
2   28    1  33.000   3009         3       0   4449.46200
0
3   33    1  22.705  10009         0       0  21984.47061
0
4   32    1  28.880   8010         0       0   3866.85520
1
```

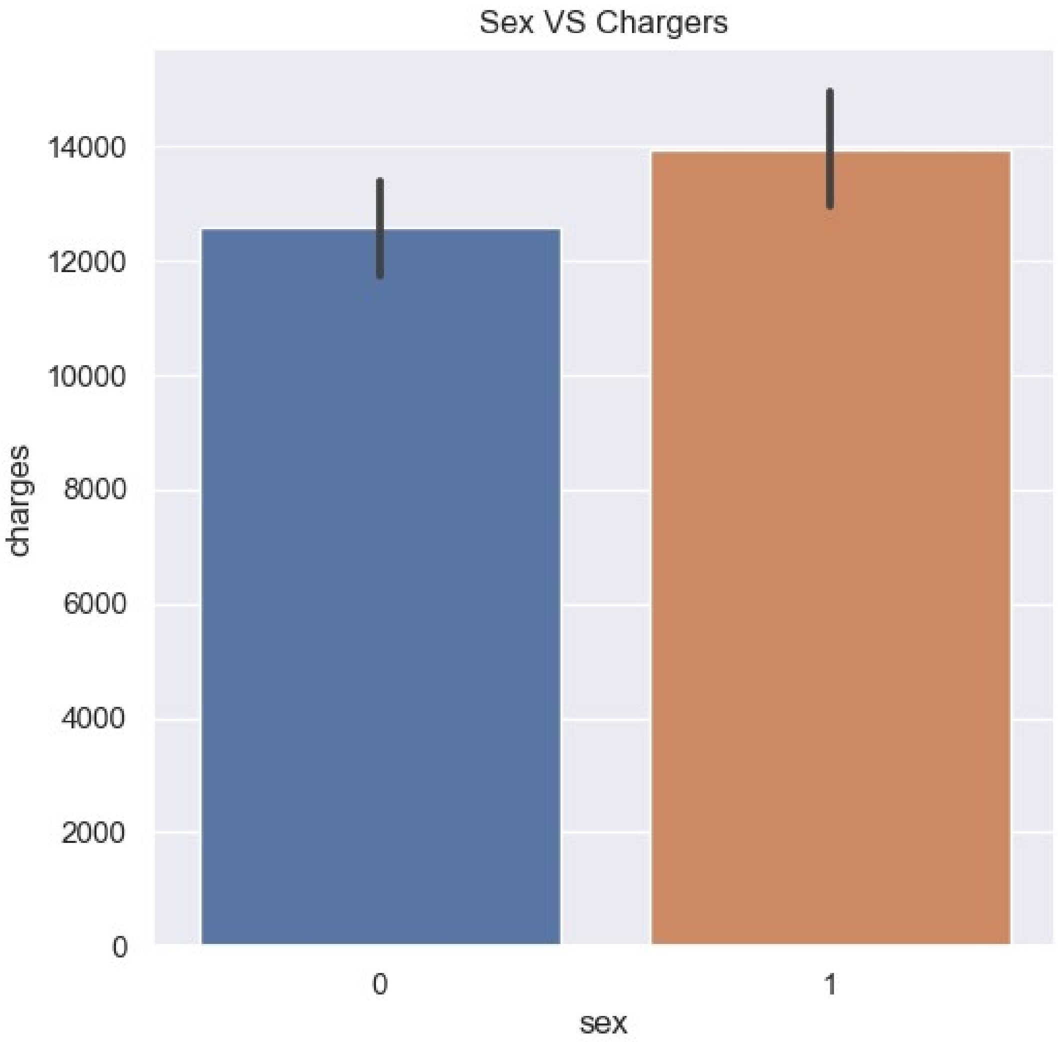
```
plt.figure(figsize = (16, 8))
sns.barplot(x = 'age', y = 'charges', data = df)
plt.title("Age VS Chargers")
```

```
Text(0.5, 1.0, 'Age VS Chargers')
```

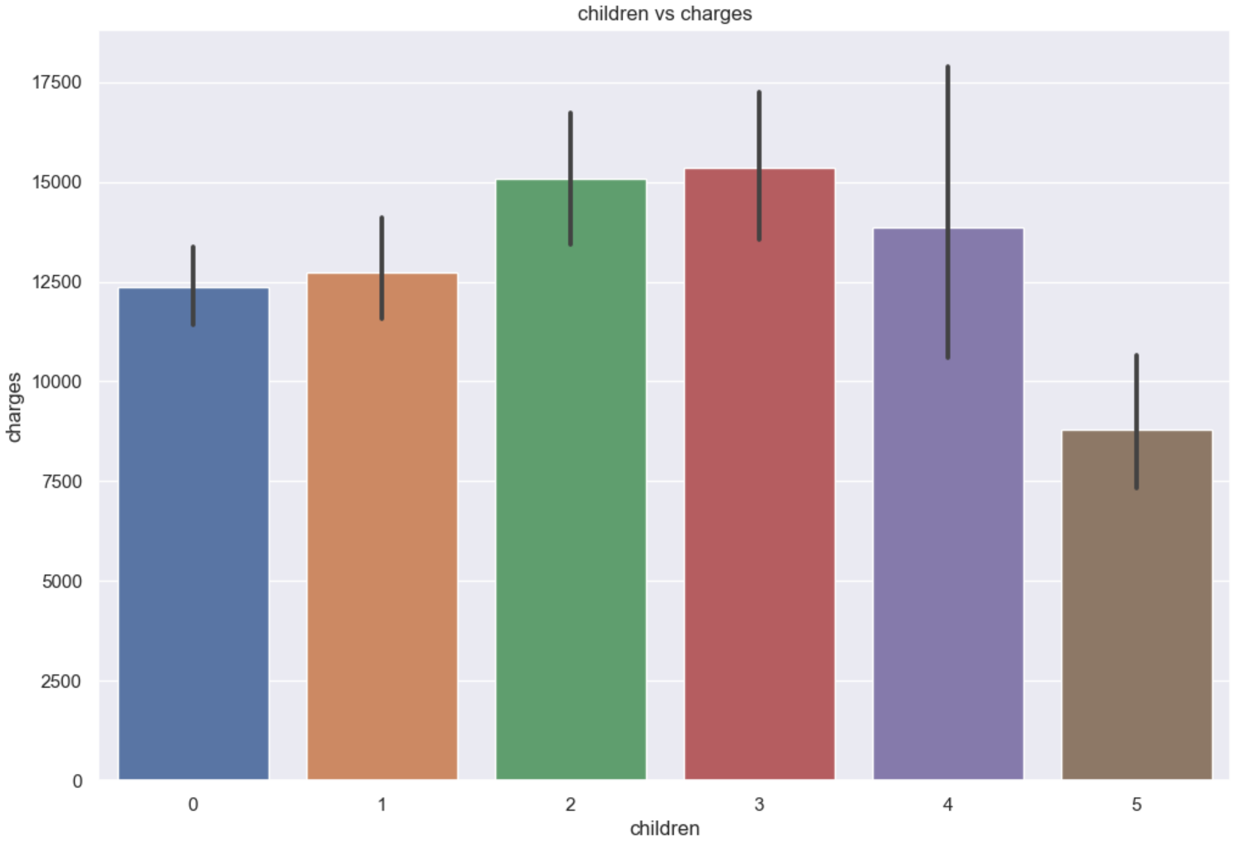


```
plt.figure(figsize = (6,6))
sns.barplot(x = 'sex', y = 'charges', data = df)
plt.title("Sex VS Chargers")
```

```
Text(0.5, 1.0, 'Sex VS Chargers')
```

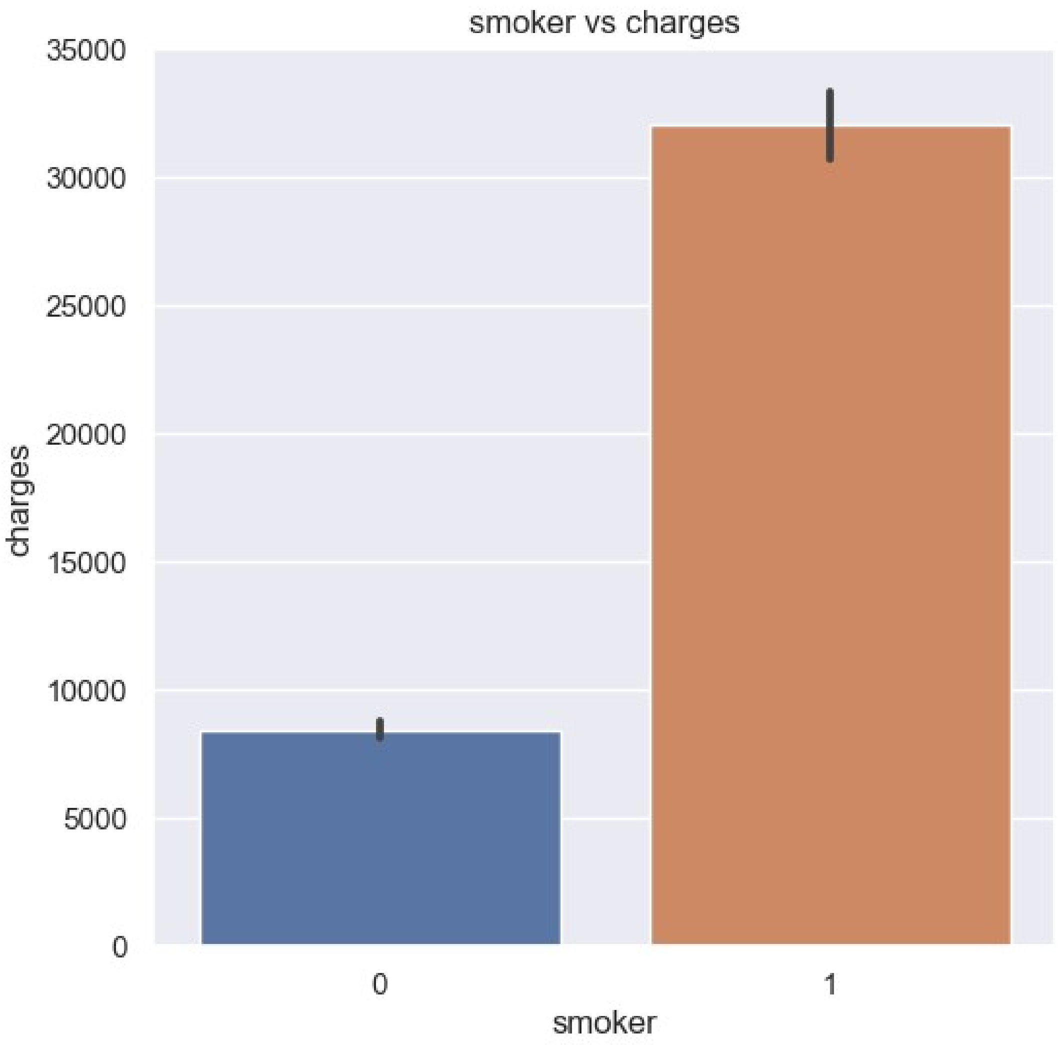


```
plt.figure(figsize = (12, 8))
sns.barplot(x = 'children', y = 'charges', data = df)
plt.title('children vs charges')

Text(0.5, 1.0, 'children vs charges')
```



```
plt.figure(figsize = (6, 6))
sns.barplot(x = 'smoker', y = 'charges', data = df)
plt.title('smoker vs charges')
```

```
Text(0.5, 1.0, 'smoker vs charges')
```



PREDICTING BASED ON THE INSURANCE CLAIM

```
X=df.iloc[:,:-1]
X.head()
```

```
   age  sex     bmi  steps  children  smoker      charges
0   19    0  27.900   3009         0       1  16884.92400
1   18    1  33.770   3008         1       0   1725.55230
2   28    1  33.000   3009         3       0   4449.46200
3   33    1  22.705  10009         0       0  21984.47061
4   32    1  28.880   8010         0       0   3866.85520
```

```
y=df.iloc[:,-1]
y.head()
```

```
0    1
1    1
2    0
```

```
3    0
4    1
Name: insuranceclaim, dtype: int64
```

```
from sklearn.model_selection import train_test_split
X_train , X_test , y_train , y_test = train_test_split(X,y ,
random_state=42 , test_size=0.3)
```

```
X_train
```

```
      age  sex     bmi  steps  children  smoker      charges
332    61    0  31.160   3009         0       0  13429.03540
355    46    1  27.600   8009         0       0  24603.04837
138    54    0  31.900   4007         3       0  27322.73386
381    55    1  30.685   3004         0       1  42303.69215
292    25    1  45.540   3004         2       1  42112.23560
...   ...  ...     ...    ...       ...     ...          ...
1095   18    0  31.350   3010         4       0   4561.18850
1130   39    0  23.870  10000         5       0   8582.30230
1294   58    1  25.175   5010         0       0  11931.12525
860    37    0  47.600   4009         2       1  46113.51100
1126   55    1  29.900   5004         0       0  10214.63600

[936 rows x 7 columns]
```

```
X_test
```

```
      age  sex     bmi  steps  children  smoker      charges
764    45    0  25.175   8007         2       0   9095.06825
887    36    0  30.020   4006         0       0   5272.17580
890    64    0  26.885   5005         0       1  29330.98315
1293   46    1  25.745   8001         3       0   9301.89355
259    19    1  31.920   3010         0       1  33750.29180
...   ...  ...     ...    ...       ...     ...          ...
701    50    0  44.745   4009         0       0   9541.69555
672    36    1  29.700   8008         0       0   4399.73100
1163   18    0  28.215   8000         0       0   2200.83085
1103   58    1  36.080   4000         0       0  11363.28320
1295   20    1  22.000  10004         1       0   1964.78000

[402 rows x 7 columns]
```

```
y_train
```

```
332     1
355     1
138     0
381     1
292     1
       ..
1095    0
```

```
1130    0
1294    0
860     1
1126    1
Name: insuranceclaim, Length: 936, dtype: int64
```

```
y_test
```

```
764     1
887     1
890     1
1293    1
259     1
       ..
701     1
672     1
1163    1
1103    1
1295    0
Name: insuranceclaim, Length: 402, dtype: int64
```

Standardising the X_train and X_test values

```
from sklearn.preprocessing import StandardScaler
ss = StandardScaler()
X_trainss= ss.fit_transform(X_train)
X_trainss
X_train=pd.DataFrame(X_trainss,columns=X_test.columns)
X_train
```

```
          age       sex       bmi     steps  children    smoker  
charges
0    1.544465 -1.025978  0.103182 -0.954752 -0.915011 -0.512989  
0.004121
1    0.481874  0.974679 -0.490845  1.069532 -0.915011 -0.512989  
0.927409
2    1.048589 -1.025978  0.226660 -0.550705  1.560279 -0.512989  
1.152132
3    1.119429  0.974679  0.023923 -0.956776 -0.915011  1.949359  
2.389981
4   -1.005753  0.974679  2.502650 -0.956776  0.735182  1.949359  
2.374161
..        ...       ...       ...       ...       ...       ...  
...
931 -1.501628 -1.025978  0.134886 -0.954347  2.385375 -0.512989 -
0.728612
932 -0.014001 -1.025978 -1.113238  1.875602  3.210472 -0.512989 -
0.396355
933  1.331947  0.974679 -0.895484 -0.144633 -0.915011 -0.512989 -
0.119648
```

```
934 -0.155680 -1.025978  2.846384 -0.549895  0.735182  1.949359
2.704779
935  1.119429  0.974679 -0.107063 -0.147063 -0.915011 -0.512989 -
0.261479

[936 rows x 7 columns]

X_testss= ss.fit_transform(X_test)
X_testss
X_test=pd.DataFrame(X_testss,columns=X_test.columns)
X_test

          age       sex       bmi     steps  children    smoker
charges
0    0.415902 -0.975426 -0.913284  1.148860  0.789344 -0.494552 -
0.323910
1   -0.232690 -0.975426 -0.146665 -0.511576 -0.894032 -0.494552 -
0.639621
2    1.785150 -0.975426 -0.642712 -0.096985 -0.894032  2.022031
1.347257
3    0.487967  1.025193 -0.823093  1.146370  1.631032 -0.494552 -
0.306830
4   -1.457807  1.025193  0.153970 -0.924921 -0.894032  2.022031
1.712222
..        ...       ...       ...       ...       ...       ...
...
397  0.776230 -0.975426  2.183256 -0.510330 -0.894032 -0.494552 -
0.287026
398 -0.232690  1.025193 -0.197298  1.149275 -0.894032 -0.494552 -
0.711671
399 -1.529873 -0.975426 -0.432268  1.145955 -0.894032 -0.494552 -
0.893265
400  1.352756  1.025193  0.812202 -0.514066 -0.894032 -0.494552 -
0.136591
401 -1.385741  1.025193 -1.415661  1.977626 -0.052344 -0.494552 -
0.912759

[402 rows x 7 columns]
```

RANDOM FOREST MODEL

```
from sklearn.metrics import accuracy_score, classification_report,
confusion_matrix
from sklearn.ensemble import RandomForestClassifier

model = RandomForestClassifier()
model.fit(X_train , y_train)
y_pred = model.predict(X_test)
print(confusion_matrix(y_test , y_pred))
```

```
[[157   4]
 [ 16 225]]
```

```
accuracy = accuracy_score(y_test, y_pred)
print(f"Accuracy Score: {accuracy:.2f}")
```

```
Accuracy Score: 0.95
```

```
from sklearn.metrics import classification_report
print(classification_report(y_test , y_pred))
```

```
              precision    recall  f1-score   support

           0       0.91      0.98      0.94       161
           1       0.98      0.93      0.96       241

    accuracy                           0.95       402
   macro avg       0.95      0.95      0.95       402
weighted avg       0.95      0.95      0.95       402
```

```
from sklearn.model_selection import cross_val_score
acc=cross_val_score(estimator=model,X=X_train,y=y_train,cv=10)
acc.mean()
acc.std()
```

```
0.016909130611689045
```