Open in Colab

Import libraries

In [49]:
```
import pandas as pd # Data manipulation
import numpy as np # Linear algebra
import warnings # Ignore warnings
import seaborn as sns #plots
import matplotlib.pyplot as plt # plots
```

In [2]:
```
warnings.filterwarnings("ignore")
```

Load Data

In [4]:
```
df=pd.read_csv("/content/insurance.csv")
```

In [5]:
```
df.head()
```

Out[5]:

	age	sex	bmi	children	smoker	region	charges
0	19	female	27.900	0	yes	southwest	16884.92400
1	18	male	33.770	1	no	southeast	1725.55230
2	28	male	33.000	3	no	southeast	4449.46200
3	33	male	22.705	0	no	northwest	21984.47061
4	32	male	28.880	0	no	northwest	3866.85520

Unique Values

In [6]:
```
{col:list(df[col].unique()) for col in df.select_dtypes("object")}
```

Out[6]:
```
{'region': ['southwest', 'southeast', 'northwest', 'northeast'],
 'sex': ['female', 'male'],
 'smoker': ['yes', 'no']}
```

In [45]:
```
df["sex"].value_counts()
```

Out[45]:
```
male      676
female    662
Name: sex, dtype: int64
```

In [46]:
```
df["region"].value_counts()
```

Out[46]:
```
southeast    364
southwest    325
northwest    325
northeast    324
Name: region, dtype: int64
```

In [47]:
```
df["smoker"].value_counts()
```

Out[47]:
```
no     1064
yes     274
Name: smoker, dtype: int64
```

In [73]:
```
df["children"].value_counts()
```

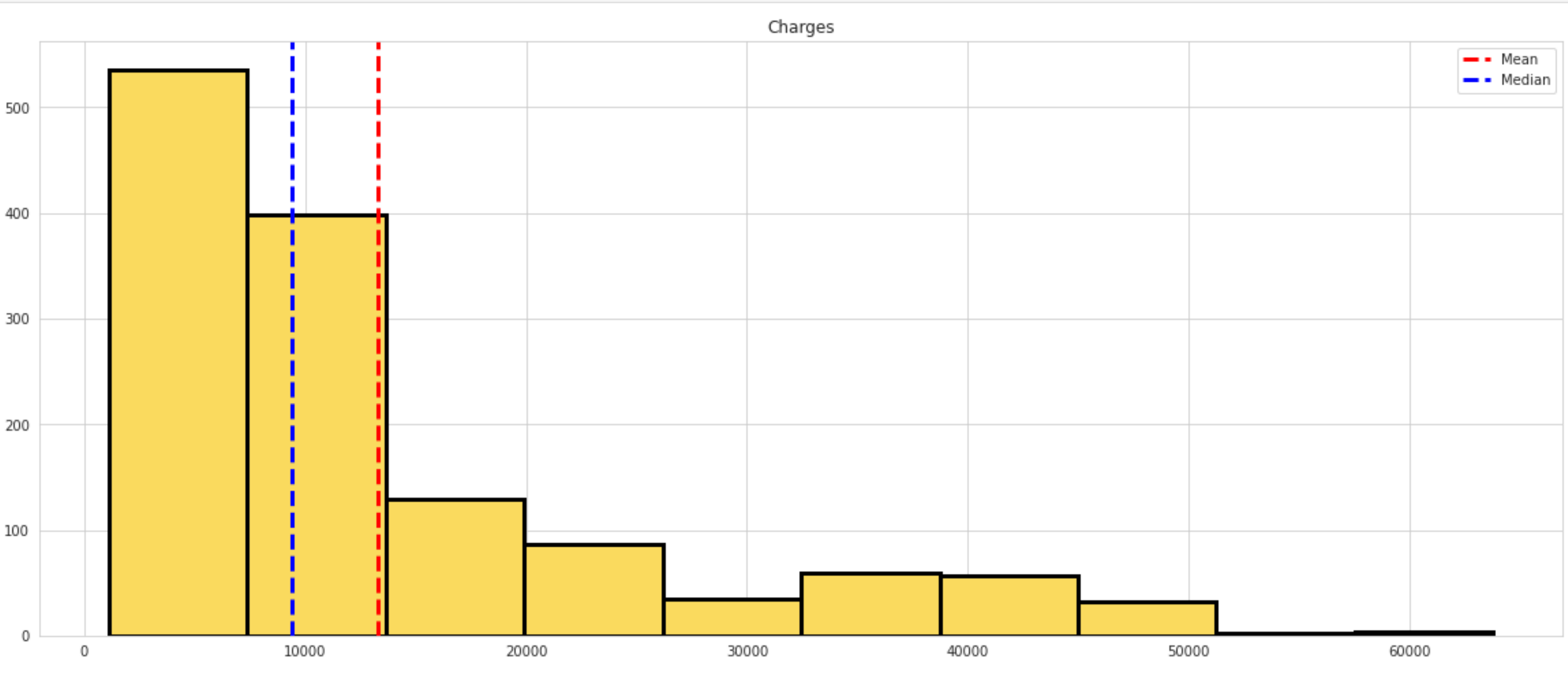
Out[73]:
```
0    574
1    324
2    240
3    157
4     25
5     18
Name: children, dtype: int64
```

Data Visualization

In [50]:
```
sns.set_style(style="whitegrid")
```

In [121…
```
def histogram(feature,title):


  fig,ax=plt.subplots(1,1,figsize=(20,8))

  ax.set_title(title)
  ax.hist(df[feature],ec="k",color="#FADA5E",lw=3)


  ax.axvline(df[feature].mean(),
           color="red",
           linestyle="--",
           lw=3,label="Mean")


  ax.axvline(df[feature].median(),
           color="blue",
           linestyle="--",
           lw=3,label="Median")

  ax.legend()

  plt.show()
```

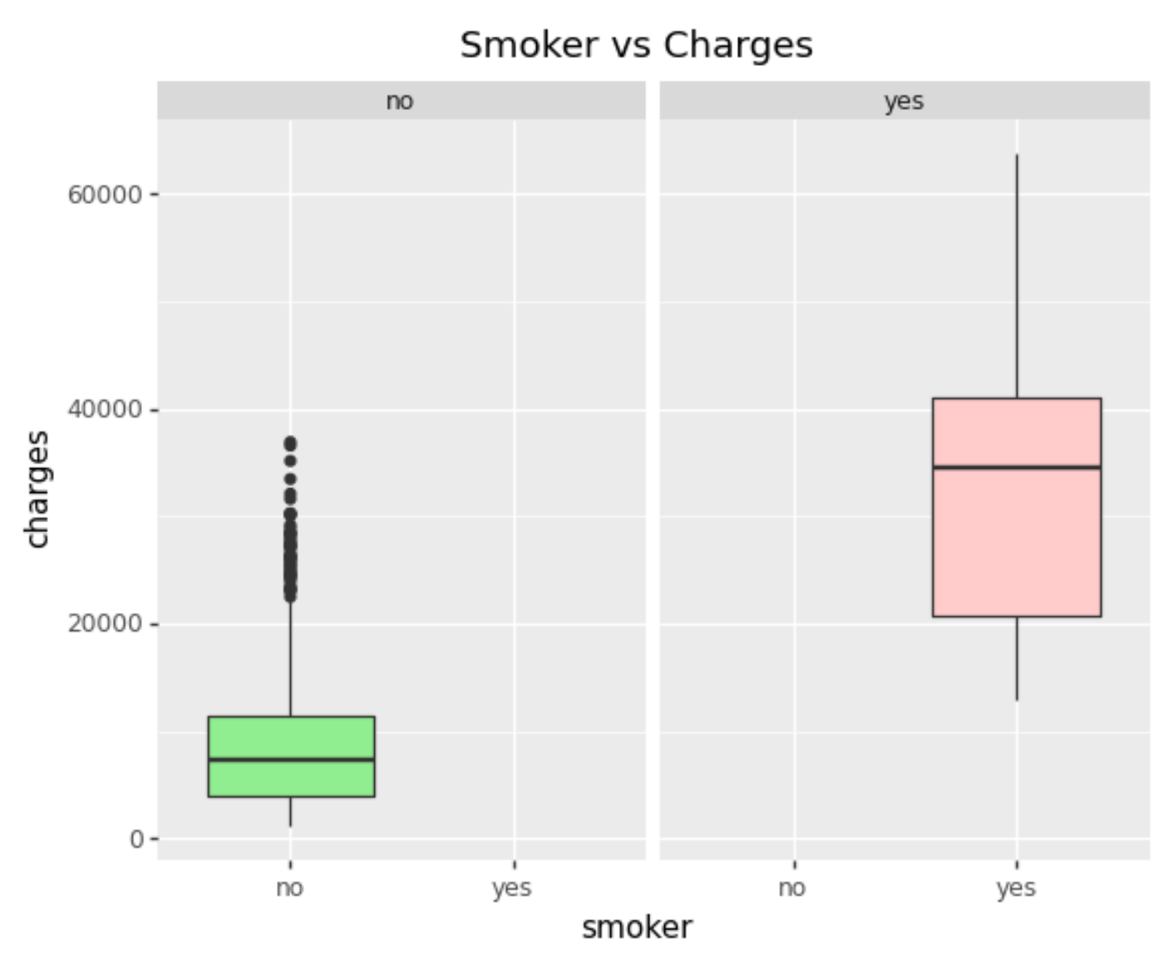
In [122…
```
histogram("charges","Charges")
```



In [81]:
```
from plotnine import ggplot, aes, geom_point,geom_boxplot
```

Detection outlires

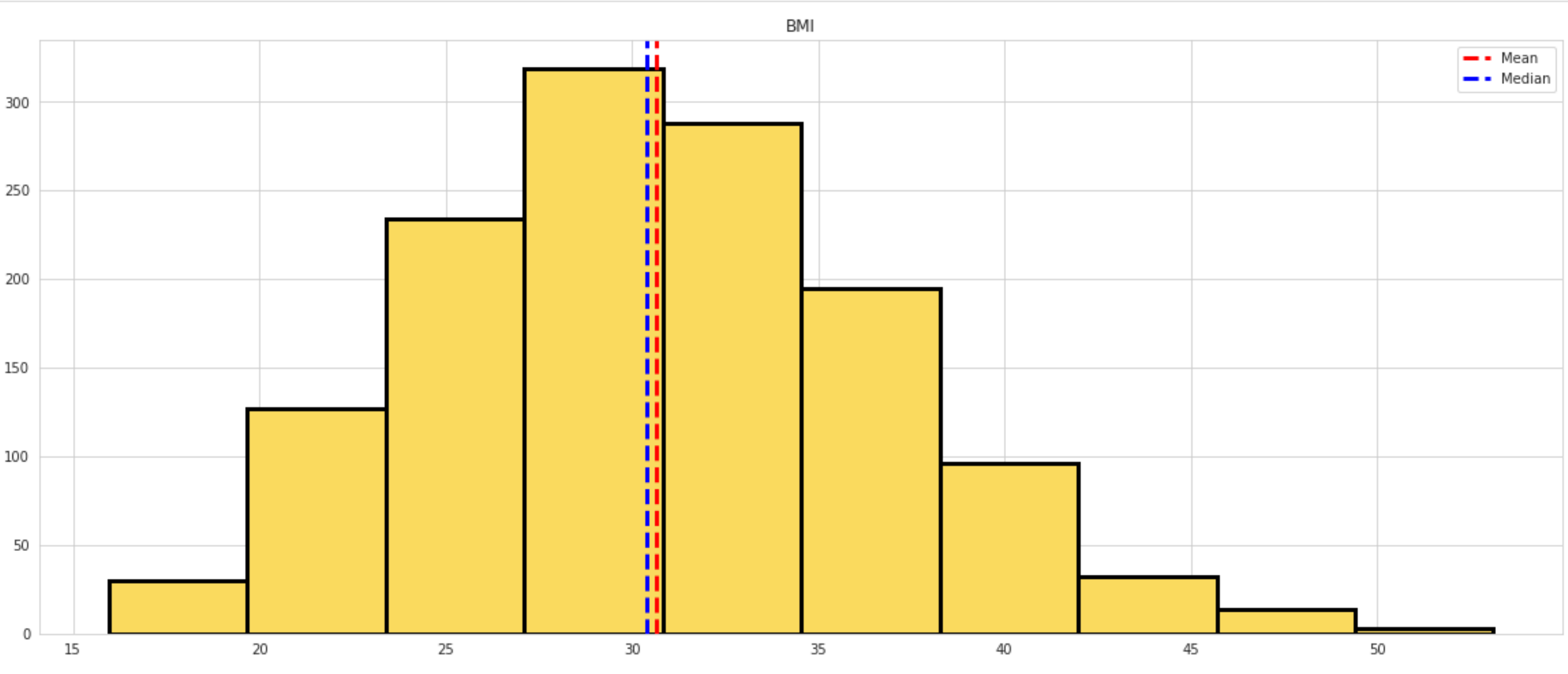
In [82]:
```
(


    ggplot(df)
    + aes(x="smoker",y="charges",fill="smoker")
    + geom_boxplot() + labs(title="Smoker vs Charges")
    + facet_wrap("smoker")
    + theme(legend_position="none")
    +  scale_fill_manual(values=["#90ee90","#ffcccb"])




)
```



Out[82]:
```
<ggplot: (8773668648113)>
```

We observe a strong presence of outliers, for the category of non-smokers.

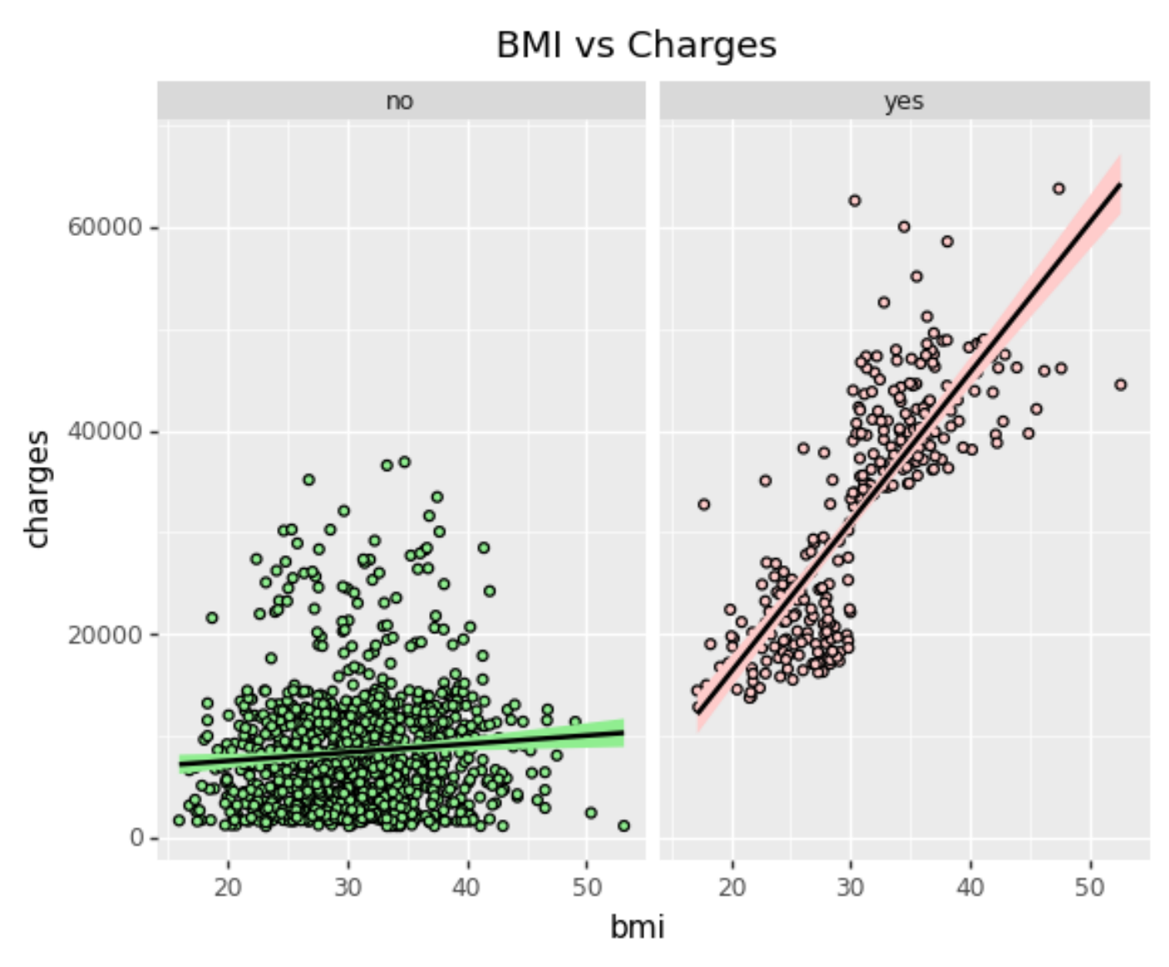
In [123…
```
histogram("bmi","BMI")
```



Most of the BMI data is within a normal distribution. But even so, it is possible to appreciate outlier values in the upper range.

In [130…
```
from plotnine.facets import facet_grid

from plotnine.geoms import geom_smooth

def sactter_plots(feature,title):

  return((ggplot(df)
    + aes(x=feature,y="charges",fill="smoker",alpha=0.1)
    + geom_point() + labs(title=title,x=feature)
    + facet_wrap("smoker")
    + theme(legend_position="none")
    +  scale_fill_manual(values=["#90ee90","#ffcccb"])
    + geom_smooth(method="lm")))
```

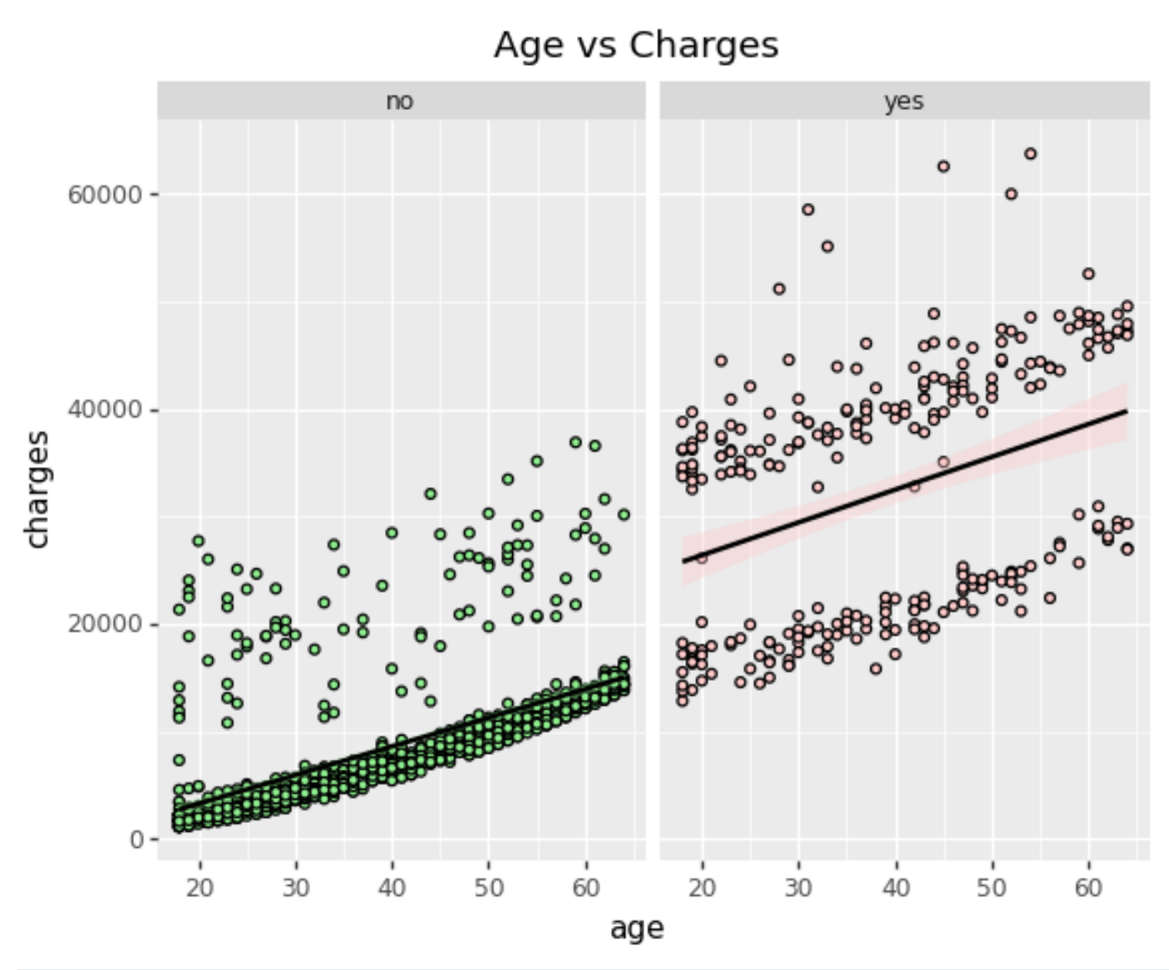
In [131…
```
sactter_plots("bmi","BMI vs Charges")
```



Out[131…
```
<ggplot: (8773669076133)>
```

- For non-smokers, the data trend remains constant.
- While for smokers the trend line is linear.

In [127…
```
sactter_plots("age","Age vs Charges")
```



Out[127…
```
<ggplot: (8773669396241)>
```

- For non-smokers, the trend of the data remains linear with respect to age.
- For smokers, the relationship between age seems non-existent.

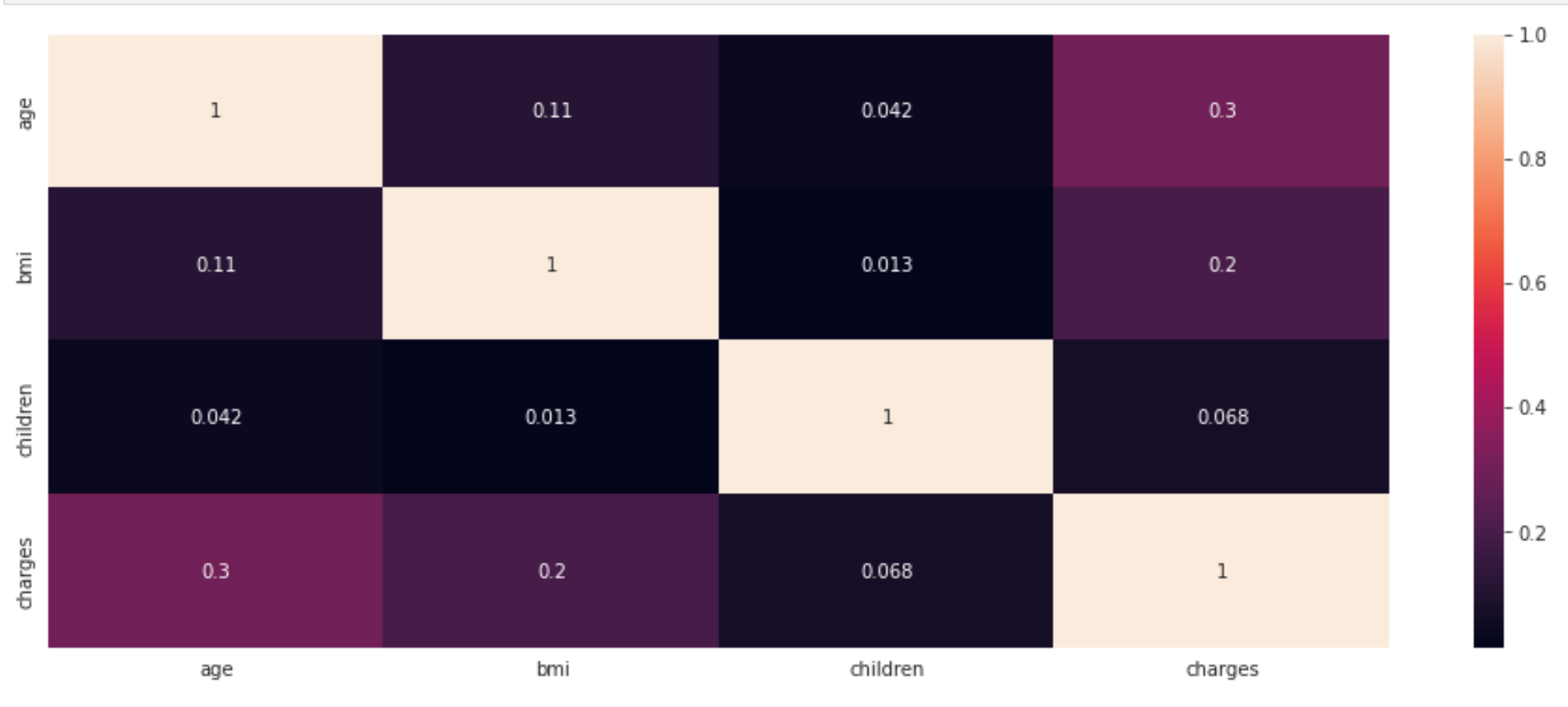
In [149…
```
corr_pearson=df.corr(method="pearson")
corr_spearman=df.corr(method="spearman")

def correlation_matrix(corr_matrix):

  plt.figure(figsize=(16, 6))
  sns.heatmap(corr_matrix,annot=True)

  plt.show()
```

Correlation Matrix

It is used to establish possible relationships between variables

Pearson

In [150…
```
correlation_matrix(corr_pearson)
```



	age	bmi	children	charges
age	1	0.11	0.042	0.3
bmi	0.11	1	0.013	0.2
children	0.042	0.013	1	0.068
charges	0.3	0.2	0.068	1

Spearman

In [152…
```
correlation_matrix(corr_spearman)
```

	age	bmi	children	charges
age	1	0.11	0.057	0.53
bmi	0.11	1	0.016	0.12
children	0.057	0.016	1	0.13
charges	0.53	0.12	0.13	1

Negative r values indicate a negative correlation, in which the values of one variable tend to increase while the values of the other variable decrease. The values 1 and -1 represent positive and negative "perfect" equivalence, respectively. Although the correlations are not so insignificant. They can serve as complementary variables; to generate more accurate predictions.