Importing Libraries

In [ ]:
```
import pandas as pd
import numpy as np
import seaborn as sns
from scipy.stats import skew
%matplotlib inline
```

In [ ]:
```
import matplotlib.pyplot as plt
plt.style.use("ggplot")
plt.rcParams['figure.figsize'] = (12, 8)
```

Load the Data

In [2]:
```
import pandas as pd
advert = pd.read_csv('https://raw.githubusercontent.com/dsrscientist/DSData/master/Advertising.csv')
advert.head()
```

Out[2]:

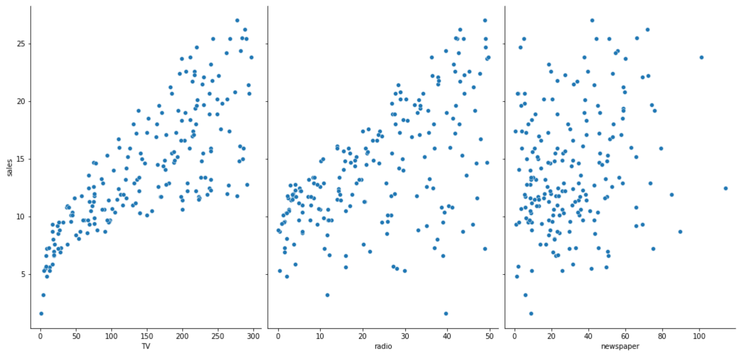
	Unnamed: 0	TV	radio	newspaper	sales
0	1	230.1	37.8	69.2	22.1
1	2	44.5	39.3	45.1	10.4
2	3	17.2	45.9	69.3	9.3
3	4	151.5	41.3	58.5	18.5
4	5	180.8	10.8	58.4	12.9

In [3]:
```
advert.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   Unnamed: 0  200 non-null    int64  
 1   TV          200 non-null    float64
 2   radio       200 non-null    float64
 3   newspaper   200 non-null    float64
 4   sales       200 non-null    float64
dtypes: float64(4), int64(1)
memory usage: 7.9 KB
```

Relationship between Features and Response

In [5]:
```
import seaborn as sns
sns.pairplot(advert, x_vars=['TV','radio','newspaper'], y_vars='sales', height=7, aspect=0.7);
```



Multiple Linear Regression - Estimating Coefficients

In [6]:
```
from sklearn.linear_model import LinearRegression

# create X and y
feature_cols = ['TV', 'radio', 'newspaper']
X = advert[feature_cols]
y = advert.sales

# instantiate and fit
lm1 = LinearRegression()
lm1.fit(X, y)

# print the coefficients
print(lm1.intercept_)
print(lm1.coef_)
```

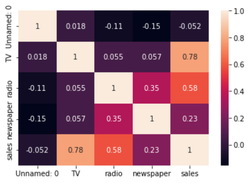
```
2.9388893694594085
[ 0.04576465  0.18853002 -0.00103749]
```

In [7]:
```
# pair the feature names with the coefficients
list(zip(feature_cols, lm1.coef_))
```

Out[7]:
```
[('TV', 0.04576464545539759),
 ('radio', 0.1885300169182046),
 ('newspaper', -0.0010374930424762452)]
```

In [8]:
```
sns.heatmap(advert.corr(), annot=True)
```

Out[8]:
```
<AxesSubplot:>
```



Feature Selection

In [9]:
```
from sklearn.metrics import r2_score

lm2 = LinearRegression().fit(X[['TV', 'radio']], y)
lm2_preds = lm2.predict(X[['TV', 'radio']])

print("R^2: ", r2_score(y, lm2_preds))
```

```
R^2:  0.8971942610828957
```

In [10]:
```
lm3 = LinearRegression().fit(X[['TV', 'radio', 'newspaper']], y)
lm3_preds = lm3.predict(X[['TV', 'radio', 'newspaper']])

print("R^2: ", r2_score(y, lm3_preds))
```

```
R^2:  0.8972106381789521
```

In [15]:
```
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_squared_error

X = advert[['TV', 'radio', 'newspaper']]
y = advert.sales

X_train, X_test, y_train, y_test = train_test_split(X, y, random_state = 1)

lm4 = LinearRegression()
lm4.fit(X_train, y_train)
lm4_preds = lm4.predict(X_test)

print("RMSE :", np.sqrt(mean_squared_error(y_test, lm4_preds)))
print("R^2: ", r2_score(y_test, lm4_preds))
```

```
RMSE : 1.4046514230328953
R^2:  0.9156213613792232
```

In [26]:
```
advert['interaction'] = advert['TV'] * advert['radio']
X = advert[['TV', 'radio', 'interaction']]
y = advert.sales

X_train, X_test, y_train, y_test = train_test_split(X, y, random_state = 1)

lm6 = LinearRegression()
lm6.fit(X_train, y_train)
lm6_preds = lm6.predict(X_test)

print("RMSE :", np.sqrt(mean_squared_error(y_test, lm6_preds)))
print("R^2: ", r2_score(y_test, lm6_preds))
```

```
RMSE : 0.7011871137164334
R^2:  0.978973681468126
```

THANK YOU

In [ ]:
```
```