```
Python 3.8.3 (default, Jul  2 2020, 17:30:36) [MSC v.1916 64 bit (AMD64)]
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IPython 7.16.1 -- An enhanced Interactive Python.

In [1]:
   ...:
   ...: import pandas as pd
   ...: import matplotlib.pyplot as plt

In [2]: data = pd.read_csv("advertising.csv")
   ...: data.head()
Out[2]:
      TV  Radio  Newspaper  Sales
0  230.1   37.8       69.2   22.1
1   44.5   39.3       45.1   10.4
2   17.2   45.9       69.3   12.0
3  151.5   41.3       58.5   16.5
4  180.8   10.8       58.4   17.9

In [3]:
   ...: fig , axs = plt.subplots(1,3,sharey = True)
   ...: data.plot(kind='scatter',x='TV',y='Sales',ax=axs[0], figsize = (14,7))
   ...: data.plot(kind='scatter',x='Radio',y='Sales',ax=axs[1])
   ...: data.plot(kind='scatter',x='Newspaper',y='Sales',ax=axs[2])
Out[3]: <matplotlib.axes._subplots.AxesSubplot at 0x1c43e6f7a90>

In [4]: feature_cols = ['TV']
   ...: X = data[feature_cols]
   ...: y = data.Sales

In [5]: from sklearn.linear_model import LinearRegression
   ...: lr = LinearRegression()
   ...: lr.fit(X, y)
Out[5]: LinearRegression()

In [6]: print(lr.intercept_)
   ...: print(lr.coef_)
6.9748214882298925
[0.05546477]

In [7]: result = 6.9748214882298925+0.05546477*50
   ...: print(result)
9.748059988229892

In [8]:
   ...: X_new = pd.DataFrame({'TV':[data.TV.min(),data.TV.max()]})
   ...: X_new.head()
Out[8]:
      TV
0    0.7
1  296.4

In [9]: preds = lr.predict(X_new)
   ...: preds
Out[9]: array([ 7.01364683, 23.41457946])

In [10]:
    ...:
```

```
    ...: data.plot(kind = 'scatter',x='TV',y='Sales')
    ...:
    ...: plt.plot(X_new,preds,c='red',linewidth = 1)
Out[10]: [<matplotlib.lines.Line2D at 0x1c44110d250>]

In [11]:
    ...: import statsmodels.formula.api as smf
    ...: lm = smf.ols(formula = 'Sales ~ TV',data =data).fit()
    ...: lm.conf_int()
Out[11]:
                  0         1
Intercept  6.338740  7.610903
TV         0.051727  0.059203

In [12]: lm.pvalues
Out[12]:
Intercept    5.027719e-54
TV           7.927912e-74
dtype: float64

In [13]: lm.rsquared
Out[13]: 0.8121757029987415

In [14]: feature_cols = ['TV','Radio','Newspaper']
    ...: X = data[feature_cols]
    ...: y = data.Sales

In [15]: lr = LinearRegression()
    ...: lr.fit(X,y)
Out[15]: LinearRegression()

In [16]: print(lr.intercept_)
    ...: print(lr.coef_)
4.625124078808652
[0.05444578 0.10700123 0.00033566]

In [17]: lm = smf.ols(formula='Sales ~ TV+Radio+Newspaper', data=data).fit()
    ...: lm.conf_int()
    ...: lm.summary()
Out[17]:
<class 'statsmodels.iolib.summary.Summary'>
"""
                            OLS Regression Results
==============================================================================
Dep. Variable:                  Sales   R-squared:                       0.903
Model:                            OLS   Adj. R-squared:                  0.901
Method:                 Least Squares   F-statistic:                     605.4
Date:                Sat, 22 Aug 2020   Prob (F-statistic):           8.13e-99
Time:                        19:02:53   Log-Likelihood:                -383.34
No. Observations:                 200   AIC:                             774.7
Df Residuals:                     196   BIC:                             787.9
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
Intercept      4.6251      0.308     15.041      0.000       4.019       5.232
TV             0.0544      0.001     39.592      0.000       0.052       0.057
Radio          0.1070      0.008     12.604      0.000       0.090       0.124
```

```
Newspaper      0.0003      0.006      0.058      0.954      -0.011       0.012
==============================================================================
Omnibus:                       16.081   Durbin-Watson:                   2.251
Prob(Omnibus):                  0.000   Jarque-Bera (JB):               27.655
Skew:                          -0.431   Prob(JB):                     9.88e-07
Kurtosis:                       4.605   Cond. No.                         454.
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
"""

In [18]: lm = smf.ols(formula='Sales ~ TV+Radio', data=data).fit()
    ...: lm.conf_int()
    ...: lm.summary()
Out[18]:
<class 'statsmodels.iolib.summary.Summary'>
"""
                            OLS Regression Results
==============================================================================
Dep. Variable:                  Sales   R-squared:                       0.903
Model:                            OLS   Adj. R-squared:                  0.902
Method:                 Least Squares   F-statistic:                     912.7
Date:                Sat, 22 Aug 2020   Prob (F-statistic):          2.39e-100
Time:                        19:03:10   Log-Likelihood:                -383.34
No. Observations:                 200   AIC:                             772.7
Df Residuals:                     197   BIC:                             782.6
Df Model:                           2
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
Intercept      4.6309      0.290     15.952      0.000       4.058       5.203
TV             0.0544      0.001     39.726      0.000       0.052       0.057
Radio          0.1072      0.008     13.522      0.000       0.092       0.123
==============================================================================
Omnibus:                       16.227   Durbin-Watson:                   2.252
Prob(Omnibus):                  0.000   Jarque-Bera (JB):               27.973
Skew:                          -0.434   Prob(JB):                     8.43e-07
Kurtosis:                       4.613   Cond. No.                         425.
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
"""

In [19]:
```