```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, r2_score

# Load the dataset
data= pd.read_csv('sales_pred.csv', encoding='ISO-8859-1')  # Load the dataset
print(data)
```

```
        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
..     ...    ...        ...    ...
195   38.2    3.7       13.8    7.6
196   94.2    4.9        8.1   14.0
197  177.0    9.3        6.4   14.8
198  283.6   42.0       66.2   25.5
199  232.1    8.6        8.7   18.4

[200 rows x 4 columns]
```

```
# Data Preprocessing
print(data.head())
```

```
[200 rows x 4 columns]
      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
```

print(data.isnull().sum())

```
TV           0
Radio        0
Newspaper    0
Sales        0
dtype: int64
```

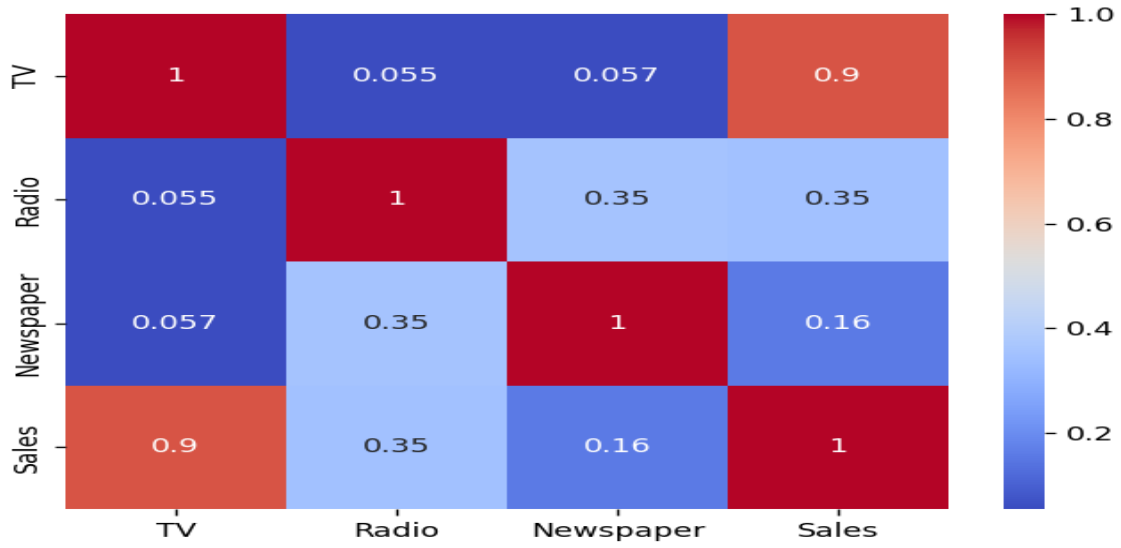
print(data.describe())

	TV	Radio	Newspaper	Sales
count	200.000000	200.000000	200.000000	200.000000
mean	147.042500	23.264000	30.554000	15.130500
std	85.854236	14.846809	21.778621	5.283892
min	0.700000	0.000000	0.300000	1.600000
25%	74.375000	9.975000	12.750000	11.000000
50%	149.750000	22.900000	25.750000	16.000000
75%	218.825000	36.525000	45.100000	19.050000
max	296.400000	49.600000	114.000000	27.000000

Check correlation

sns.heatmap(data.corr(), annot=True, cmap='coolwarm')

plt.show()



Split into features and target variable

X = data[['TV', 'Radio', 'Newspaper']] # Features

y = data['Sales'] # Target variable

print(X)

print(y)

```
        TV  Radio  Newspaper
0    230.1   37.8       69.2
1     44.5   39.3       45.1
2     17.2   45.9       69.3
3    151.5   41.3       58.5
4    180.8   10.8       58.4
..     ...    ...        ...
195   38.2    3.7       13.8
196   94.2    4.9        8.1
197  177.0    9.3        6.4
198  283.6   42.0       66.2
199  232.1    8.6        8.7

[200 rows x 3 columns]
0      22.1
1      10.4
2      12.0
3      16.5
4      17.9
       ...
195     7.6
196    14.0
197    14.8
198    25.5
199    18.4
Name: Sales, Length: 200, dtype: float64
```

Split into training and testing sets

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

print(X_train,X_test,y_train,y_test)9o

```
Name: Sales, Length: 160, dtype: float64 95     16.9
15     22.4
30     21.4
158     7.3
128    24.7
115    12.6
69     22.3
170     8.4
174    16.5
45     16.1
66     11.0
182     8.7
165    16.9
78      5.3
186    10.3
177    16.7
56      5.5
152    16.6
82     11.3
68     18.9
124    19.7
16     12.5
148    10.9
93     22.2
65     11.3
60      8.1
84     21.7
67     13.4
125    10.6
132     5.7
9      15.6
18     11.3
55     23.7
75      8.7
150    16.1
104    20.7
135    11.6
137    20.8
164    11.9
76      6.9
Name: Sales, dtype: float64
```

```
# Initialize and train the model
model = LinearRegression()
print(model)
print(model.fit(X_train, y_train))
```

```
LinearRegression()
LinearRegression()
```

```
# Make predictions
y_pred = model.predict(X_test)
print(y_pred)
# Compare predicted vs actual
comparison_df = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
print(comparison_df.head())
```

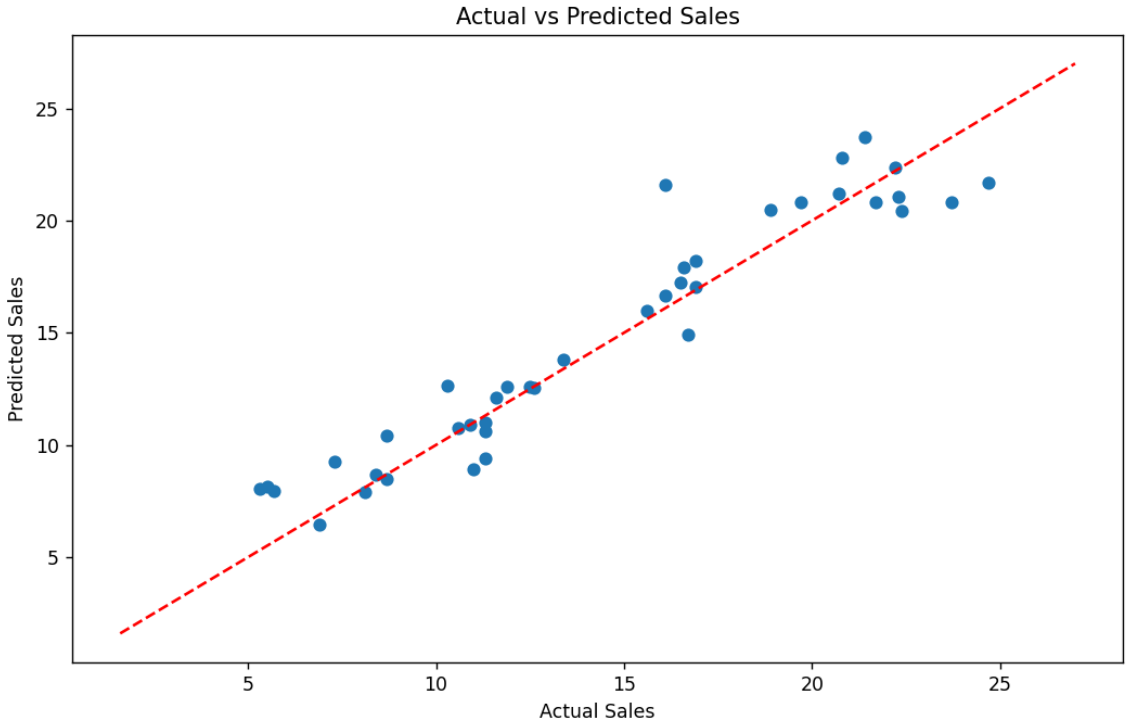
```
[17.0347724  20.40974033 23.72398873  9.27278518 21.68271879 12.56940161
 21.08119452  8.69035045 17.23701254 16.66657475  8.92396497  8.4817344
 18.2075123   8.06750728 12.64550975 14.93162809  8.12814594 17.89876565
 11.00880637 20.47832788 20.80631846 12.59883297 10.9051829  22.38854775
  9.41796094  7.92506736 20.83908497 13.81520938 10.77080925  7.92682509
 15.95947357 10.63490851 20.80292008 10.43434164 21.5784752  21.18364487
 12.12821771 22.80953262 12.60992766  6.46441252]
     Actual  Predicted
95     16.9  17.034772
15     22.4  20.409740
30     21.4  23.723989
158     7.3   9.272785
128    24.7  21.682719
```

```
# Evaluate the model
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)
print(f'Mean Squared Error: {mse}')
print(f'R-squared: {r2}')
```

```
     Actual  Predicted
95     16.9  17.034772
15     22.4  20.409740
30     21.4  23.723989
158     7.3   9.272785
128    24.7  21.682719
Mean Squared Error: 2.9077569102710896
R-squared: 0.9059011844150826
```

```
# Plot actual vs predicted sales
plt.figure(figsize=(10, 6))
plt.scatter(y_test, y_pred)
plt.plot([y.min(), y.max()], [y.min(), y.max()], color='red', linestyle='--')  # Line of perfect prediction
plt.xlabel('Actual Sales')
plt.ylabel('Predicted Sales')
plt.title('Actual vs Predicted Sales')
plt.show()

# Print model coefficients
print('Coefficients:', model.coef_)
print('Intercept:', model.intercept_)
```




```
Mean Squared Error: 2.9077569102710896
R-squared: 0.9059011844150826
Coefficients: [0.05450927 0.10094536 0.00433665]
Intercept: 4.714126402214127
```