```python
# Import necessary libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.datasets import load_breast_cancer
from sklearn.preprocessing import StandardScaler
from sklearn.feature_selection import SelectKBest, f_classif

# Load the breast cancer dataset
data = load_breast_cancer()
df = pd.DataFrame(data.data, columns=data.feature_names)
df['target'] = data.target

df
```

```
     mean radius  mean texture  mean perimeter  mean area  mean
smoothness  \
0          17.99         10.38          122.80     1001.0
0.11840
1          20.57         17.77          132.90     1326.0
0.08474
2          19.69         21.25          130.00     1203.0
0.10960
3          11.42         20.38           77.58      386.1
0.14250
4          20.29         14.34          135.10     1297.0
0.10030
..           ...           ...             ...        ...
...
564        21.56         22.39          142.00     1479.0
0.11100
565        20.13         28.25          131.20     1261.0
0.09780
566        16.60         28.08          108.30      858.1
0.08455
567        20.60         29.33          140.10     1265.0
0.11780
568         7.76         24.54           47.92      181.0
0.05263

     mean compactness  mean concavity  mean concave points  mean
symmetry  \
0             0.27760         0.30010              0.14710
0.2419
1             0.07864         0.08690              0.07017
0.1812
2             0.15990         0.19740              0.12790
0.2069
3             0.28390         0.24140              0.10520
```

```
0.2597
4             0.13280         0.19800              0.10430
0.1809
..                ...             ...                  ...
...
564           0.11590         0.24390              0.13890
0.1726
565           0.10340         0.14400              0.09791
0.1752
566           0.10230         0.09251              0.05302
0.1590
567           0.27700         0.35140              0.15200
0.2397
568           0.04362         0.00000              0.00000
0.1587

     mean fractal dimension  ...  worst radius  worst texture  \
0                   0.07871  ...        25.380          17.33
1                   0.05667  ...        24.990          23.41
2                   0.05999  ...        23.570          25.53
3                   0.09744  ...        14.910          26.50
4                   0.05883  ...        22.540          16.67
..                      ...  ...           ...            ...
564                 0.05623  ...        25.450          26.40
565                 0.05533  ...        23.690          38.25
566                 0.05648  ...        18.980          34.12
567                 0.07016  ...        25.740          39.42
568                 0.05884  ...         9.456          30.37

     worst perimeter  worst area  worst smoothness  worst compactness
\
0              184.60      2019.0           0.16220            0.66560

1              158.80      1956.0           0.12380            0.18660

2              152.50      1709.0           0.14440            0.42450

3               98.87       567.7           0.20980            0.86630

4              152.20      1575.0           0.13740            0.20500

..                ...         ...               ...                ...

564            166.10      2027.0           0.14100            0.21130

565            155.00      1731.0           0.11660            0.19220

566            126.70      1124.0           0.11390            0.30940

567            184.60      1821.0           0.16500            0.86810
```

```
568            59.16       268.6           0.08996             0.06444


     worst concavity  worst concave points  worst symmetry  \
0             0.7119                0.2654          0.4601
1             0.2416                0.1860          0.2750
2             0.4504                0.2430          0.3613
3             0.6869                0.2575          0.6638
4             0.4000                0.1625          0.2364
..               ...                   ...             ...
564           0.4107                0.2216          0.2060
565           0.3215                0.1628          0.2572
566           0.3403                0.1418          0.2218
567           0.9387                0.2650          0.4087
568           0.0000                0.0000          0.2871

     worst fractal dimension
0                    0.11890
1                    0.08902
2                    0.08758
3                    0.17300
4                    0.07678
..                       ...
564                  0.07115
565                  0.06637
566                  0.07820
567                  0.12400
568                  0.07039

[569 rows x 30 columns]
```

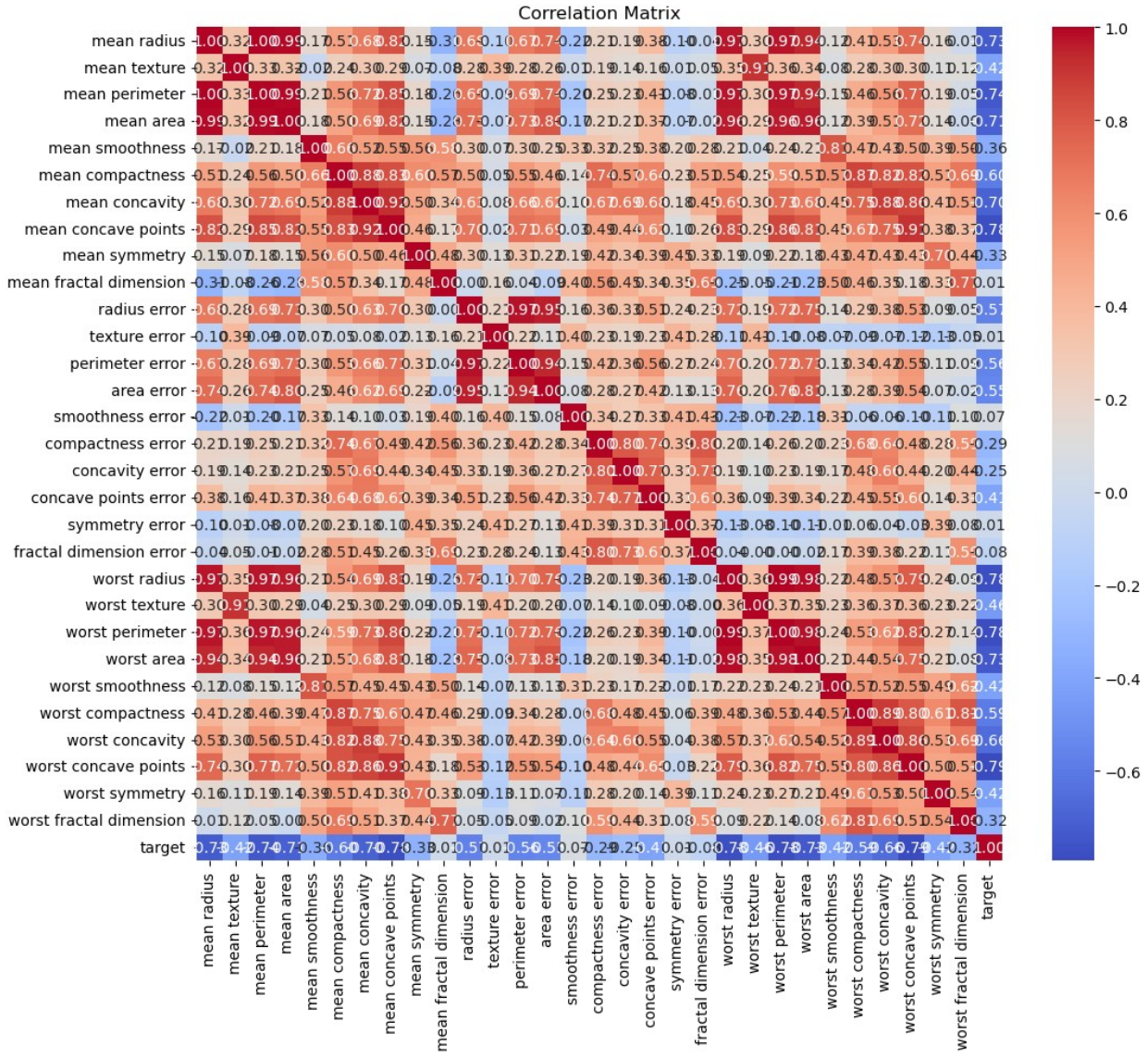
```
# Display the first few rows of the dataset

df.head()
```

```
   mean radius  mean texture  mean perimeter  mean area  mean
smoothness  \
0        17.99         10.38          122.80     1001.0
0.11840
1        20.57         17.77          132.90     1326.0
0.08474
2        19.69         21.25          130.00     1203.0
0.10960
3        11.42         20.38           77.58      386.1
0.14250
4        20.29         14.34          135.10     1297.0
0.10030

   mean compactness  mean concavity  mean concave points  mean
```

```
symmetry  \
0           0.27760          0.3001              0.14710
0.2419
1           0.07864          0.0869              0.07017
0.1812
2           0.15990          0.1974              0.12790
0.2069
3           0.28390          0.2414              0.10520
0.2597
4           0.13280          0.1980              0.10430
0.1809

   mean fractal dimension  ...  worst texture  worst perimeter  worst
area  \
0                 0.07871  ...          17.33           184.60
2019.0
1                 0.05667  ...          23.41           158.80
1956.0
2                 0.05999  ...          25.53           152.50
1709.0
3                 0.09744  ...          26.50            98.87
567.7
4                 0.05883  ...          16.67           152.20
1575.0

   worst smoothness  worst compactness  worst concavity  worst concave
points  \
0            0.1622             0.6656           0.7119
0.2654
1            0.1238             0.1866           0.2416
0.1860
2            0.1444             0.4245           0.4504
0.2430
3            0.2098             0.8663           0.6869
0.2575
4            0.1374             0.2050           0.4000
0.1625

   worst symmetry  worst fractal dimension  target
0          0.4601                  0.11890       0
1          0.2750                  0.08902       0
2          0.3613                  0.08758       0
3          0.6638                  0.17300       0
4          0.2364                  0.07678       0

[5 rows x 31 columns]
```

```
# Task 3: Remove constant columns
df = df.loc[:, (df != df.iloc[0]).any()]
```

```
# Task 4: Encode categorical features (if any)
# In this dataset, encoding is not necessary as all features are
numerical

# Task 5: Feature scaling
numerical_features = df.drop('target', axis=1).columns
scaler = StandardScaler()
df[numerical_features] = scaler.fit_transform(df[numerical_features])

# Task 6: Correlation analysis
correlation_matrix = df.corr()
plt.figure(figsize=(12, 10))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm',
fmt=".2f")
plt.title("Correlation Matrix")
plt.show()
```




```python
# Task 7: Feature selection
X = df.drop('target', axis=1)
y = df['target']
k_best_selector = SelectKBest(score_func=f_classif, k=5)
X_new = k_best_selector.fit_transform(X, y)

# Display the selected features
selected_features = X.columns[k_best_selector.get_support()]
print("\nSelected Features:")
print(selected_features)
```

```
Selected Features:
Index(['mean perimeter', 'mean concave points', 'worst radius',
```

```
       'worst perimeter', 'worst concave points'],
      dtype='object')
```