Московский государственный технический университет им. Н.Э. Баумана
Кафедра «Системы обработки информации и управления»

Лабораторная работа №3
по дисциплине
«Методы машинного обучения»

Выполнил:
студент группыИУ5И-23М

Лю Цзычжан

Москва — 2025 г.

```python
# 安装必要的库
!pip install pandas scikit-learn matplotlib seaborn

# 导入库
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import StandardScaler, MinMaxScaler, RobustScaler
from sklearn.ensemble import IsolationForest
from sklearn.impute import SimpleImputer
from sklearn.feature_selection import SelectKBest, f_classif, RFE
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.datasets import load_diabetes

# 加载数据集
data = load_diabetes(as_frame=True)
df = data.frame
df['target'] = data.target

# 查看数据集信息
print("数据集基本信息：")
print(df.info())
df.head()
```

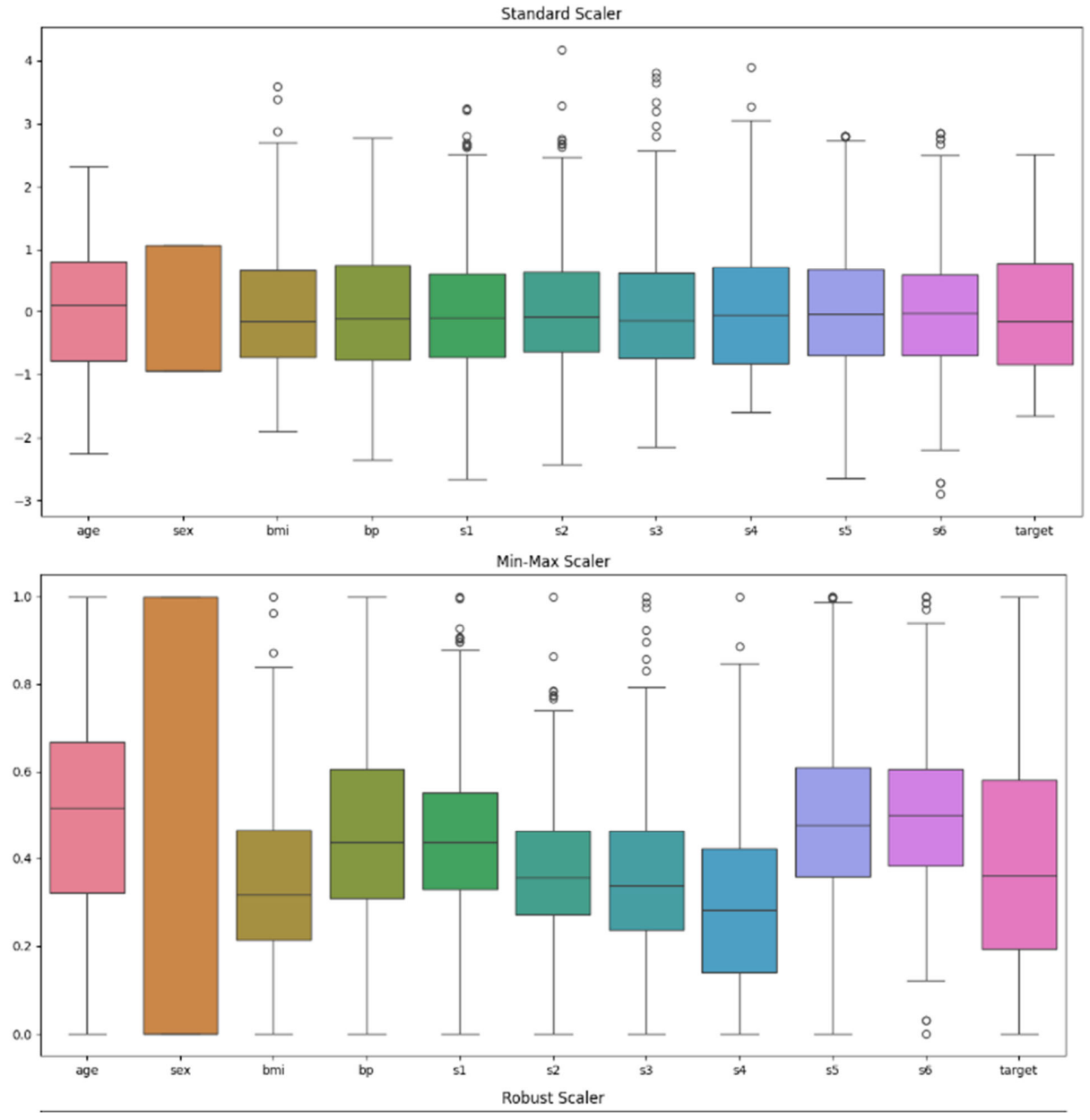
```
数据集基本信息：
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 442 entries, 0 to 441
Data columns (total 11 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   age     442 non-null    float64
 1   sex     442 non-null    float64
 2   bmi     442 non-null    float64
 3   bp      442 non-null    float64
 4   s1      442 non-null    float64
 5   s2      442 non-null    float64
 6   s3      442 non-null    float64
 7   s4      442 non-null    float64
 8   s5      442 non-null    float64
 9   s6      442 non-null    float64
 10  target  442 non-null    float64
dtypes: float64(11)
memory usage: 38.1 KB
None
```

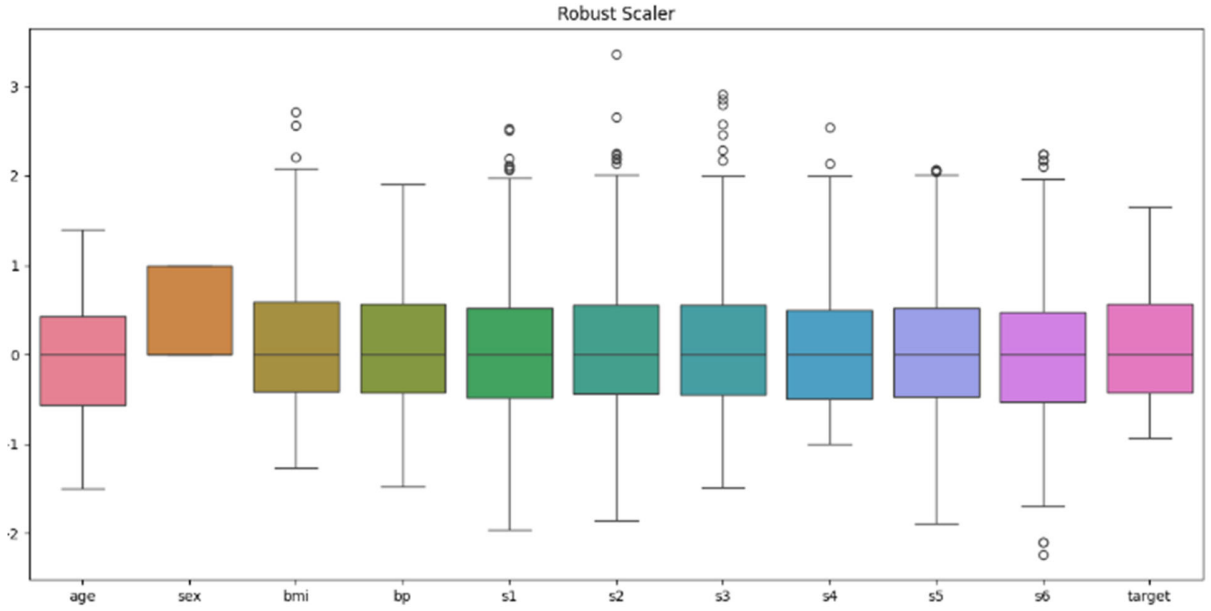
	age	sex	bmi	bp	s1	s2	s3	s4	s5	s6	target
0	0.038076	0.050680	0.061696	0.021872	-0.044223	-0.034821	-0.043401	-0.002592	0.019907	-0.017646	151.0
1	-0.001882	-0.044642	-0.051474	-0.026328	-0.008449	-0.019163	0.074412	-0.039493	-0.068332	-0.092204	75.0
2	0.085299	0.050680	0.044451	-0.005670	-0.045599	-0.034194	-0.032356	-0.002592	0.002861	-0.025930	141.0
3	-0.089063	-0.044642	-0.011595	-0.036656	0.012191	0.024991	-0.036038	0.034309	0.022688	-0.009362	206.0
4	0.005383	-0.044642	-0.036385	0.021872	0.003935	0.015596	0.008142	-0.002592	-0.031988	-0.046641	135.0

Масштабирование признаков

3s

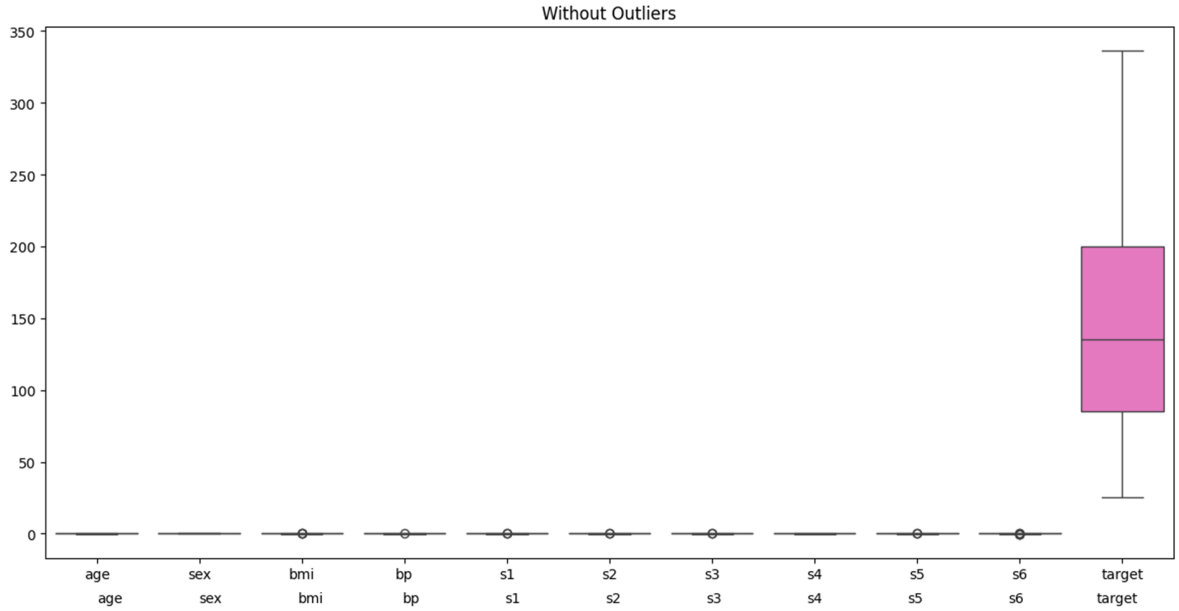
```
# 标准化缩放
scaler_standard = StandardScaler()
df_standard = df.copy()
df_standard[df.columns] = scaler_standard.fit_transform(df)

# 最小-最大缩放
scaler_minmax = MinMaxScaler()
df_minmax = df.copy()
df_minmax[df.columns] = scaler_minmax.fit_transform(df)

# Robust 缩放
scaler_robust = RobustScaler()
df_robust = df.copy()
df_robust[df.columns] = scaler_robust.fit_transform(df)

# 绘制缩放后的数据分布图
fig, axes = plt.subplots(3, 1, figsize=(12, 18))
sns.boxplot(data=df_standard, ax=axes[0])
axes[0].set_title('Standard Scaler')
sns.boxplot(data=df_minmax, ax=axes[1])
axes[1].set_title('Min-Max Scaler')
sns.boxplot(data=df_robust, ax=axes[2])
axes[2].set_title('Robust Scaler')
plt.tight_layout()
plt.show()
```

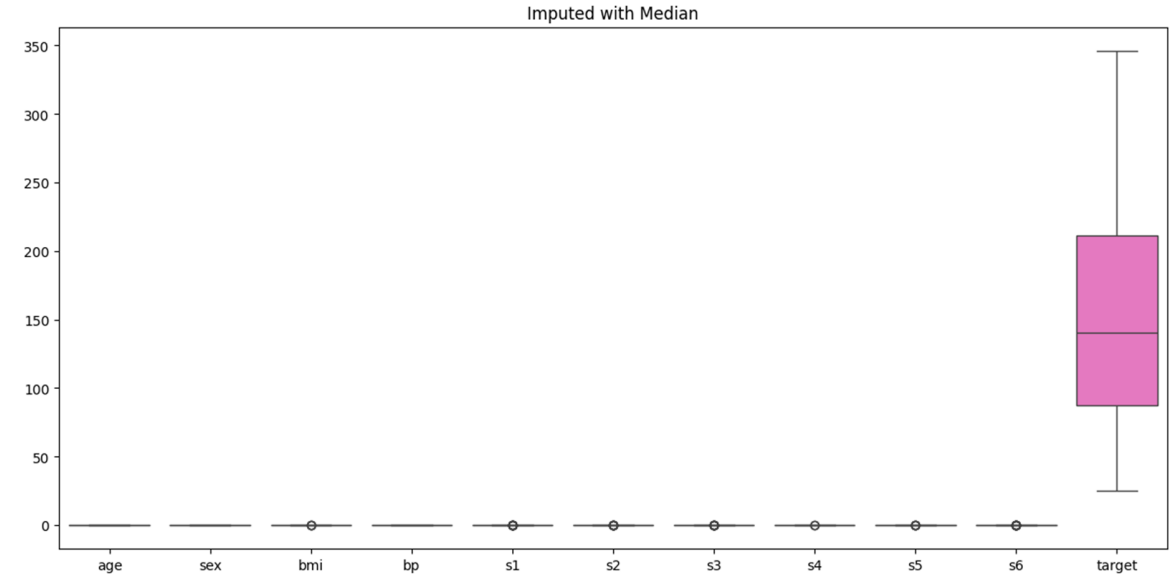

Standard Scaler
4
3
2
1
0
−1
−2
−3
age
sex
bmi
bp
s1
s2
s3
s4
s5
s6
target
Min-Max Scaler
1.0
0.8
0.6
0.4
0.2
0.0
age
sex
bmi
bp
s1
s2
s3
s4
s5
s6
target
Robust Scaler



✓ 3s

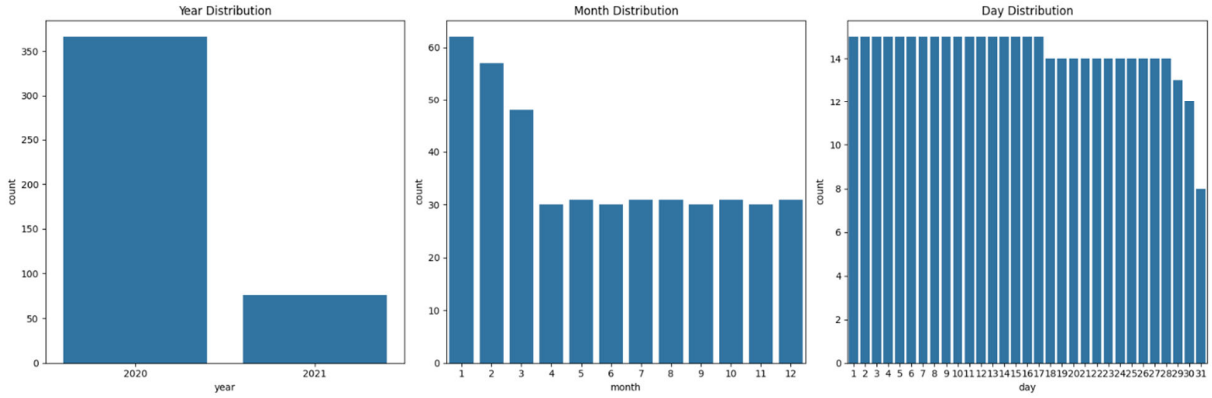
[10]
```python
# 使用 Isolation Forest 检测和删除异常值
iso = IsolationForest(contamination=0.1)
yhat = iso.fit_predict(df)
mask = yhat != -1
df_no_outliers = df[mask]

# 使用中位数替换异常值
imputer = SimpleImputer(strategy='median')
df_imputed = df.copy()
df_imputed[df.columns] = imputer.fit_transform(df)

# 绘制处理异常值后的数据分布图
fig, axes = plt.subplots(2, 1, figsize=(12, 12))
sns.boxplot(data=df_no_outliers, ax=axes[0])
axes[0].set_title('Without Outliers')
sns.boxplot(data=df_imputed, ax=axes[1])
axes[1].set_title('Imputed with Median')
plt.tight_layout()
plt.show()
```


Without Outliers
350
300
250
200
150
100
50
0
age
sex
bmi
bp
s1
s2
s3
s4
s5
s6
target


Imputed with Median
350
300
250
200
150
100
50
0
age
sex
bmi
bp
s1
s2
s3
s4
s5
s6
target

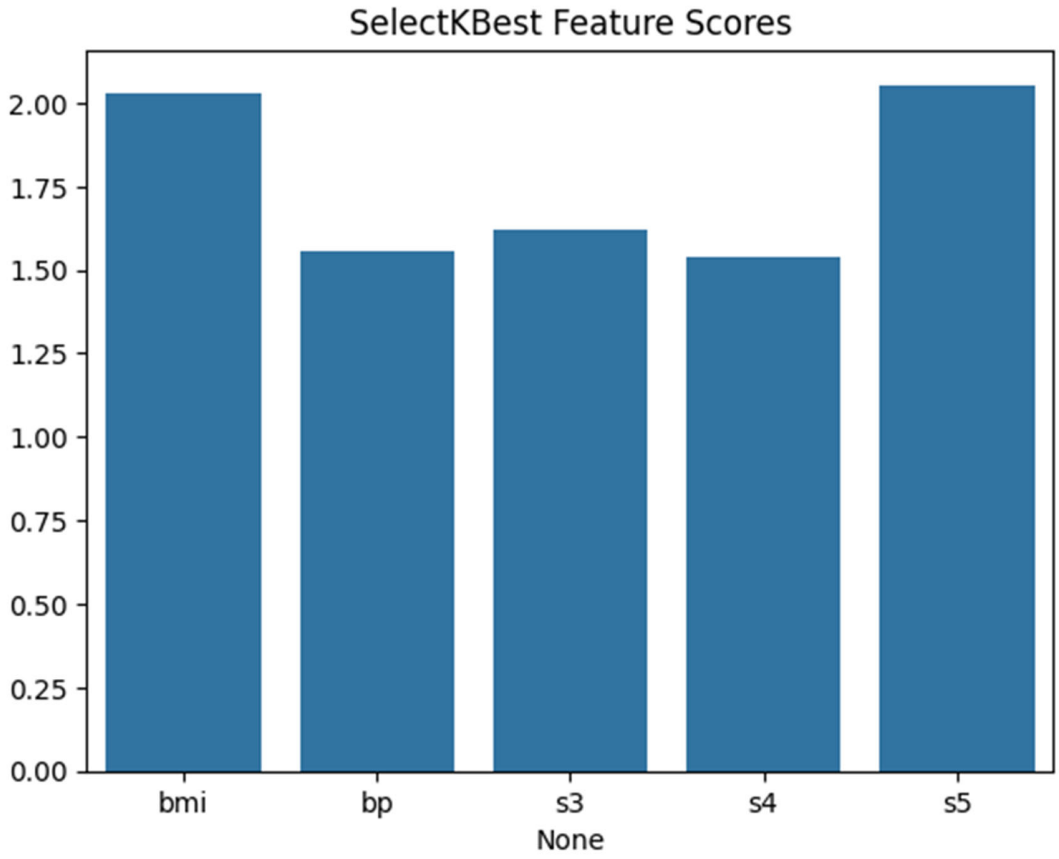
2s

```
# 添加一个日期特征
df_dates = df.copy()
df_dates['date'] = pd.date_range(start='1/1/2020', periods=len(df_dates), freq='D')

# 提取年、月、日
df_dates['year'] = df_dates['date'].dt.year
df_dates['month'] = df_dates['date'].dt.month
df_dates['day'] = df_dates['date'].dt.day

# 绘制日期特征的分布图
fig, axes = plt.subplots(1, 3, figsize=(18, 6))
sns.countplot(x='year', data=df_dates, ax=axes[0])
axes[0].set_title('Year Distribution')
sns.countplot(x='month', data=df_dates, ax=axes[1])
axes[1].set_title('Month Distribution')
sns.countplot(x='day', data=df_dates, ax=axes[2])
axes[2].set_title('Day Distribution')
plt.tight_layout()
plt.show()

print("Date feature processed:\n", df_dates.head())
```

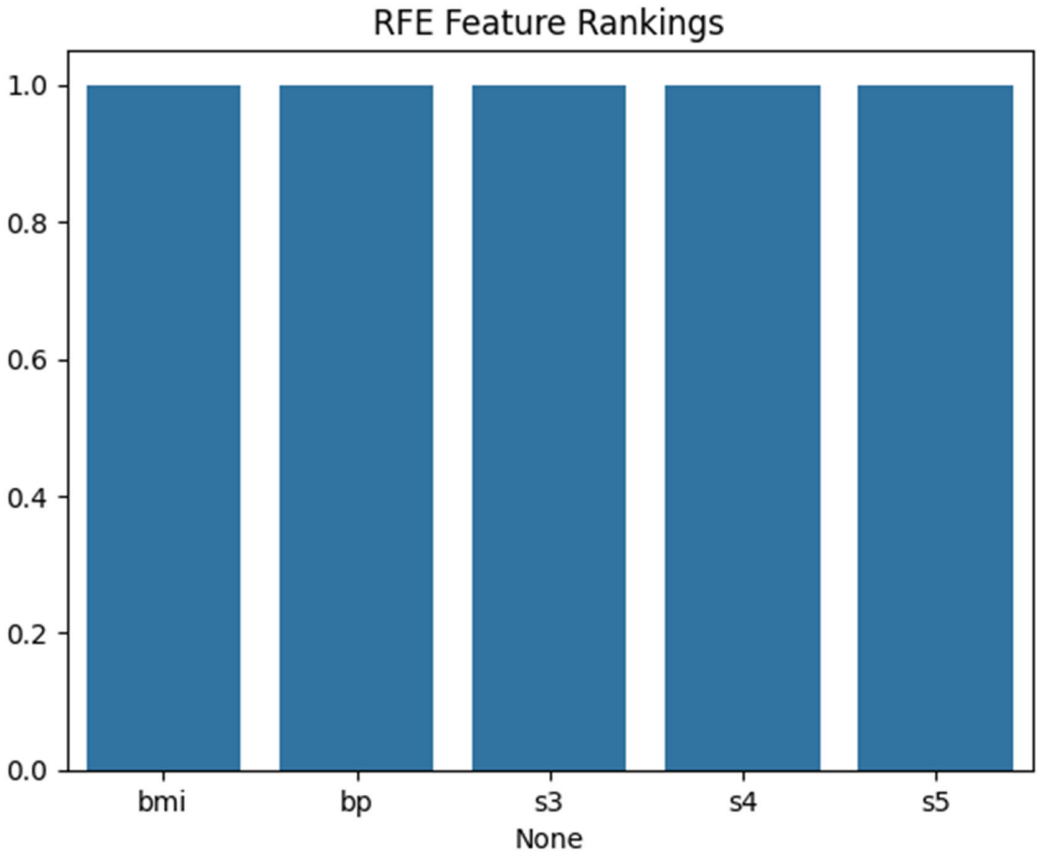


```
Date feature processed:
        age       sex       bmi        bp        s1        s2        s3  \
0  0.038076  0.050680  0.061696  0.021872 -0.044223 -0.034821 -0.043401
1 -0.001882 -0.044642 -0.051474 -0.026328 -0.008449 -0.019163  0.074412
2  0.085299  0.050680  0.044451 -0.005670 -0.045599 -0.034194 -0.032356
3 -0.089063 -0.044642 -0.011595 -0.036656  0.012191  0.024991 -0.036038
4  0.005383 -0.044642 -0.036385  0.021872  0.003935  0.015596  0.008142

        s4        s5        s6  target       date  year  month  day
0 -0.002592  0.019907 -0.017646   151.0 2020-01-01  2020      1    1
1 -0.039493 -0.068332 -0.092204    75.0 2020-01-02  2020      1    2
2 -0.002592  0.002861 -0.025930   141.0 2020-01-03  2020      1    3
3  0.034309  0.022688 -0.009362   206.0 2020-01-04  2020      1    4
4 -0.002592 -0.031988 -0.046641   135.0 2020-01-05  2020      1    5
```

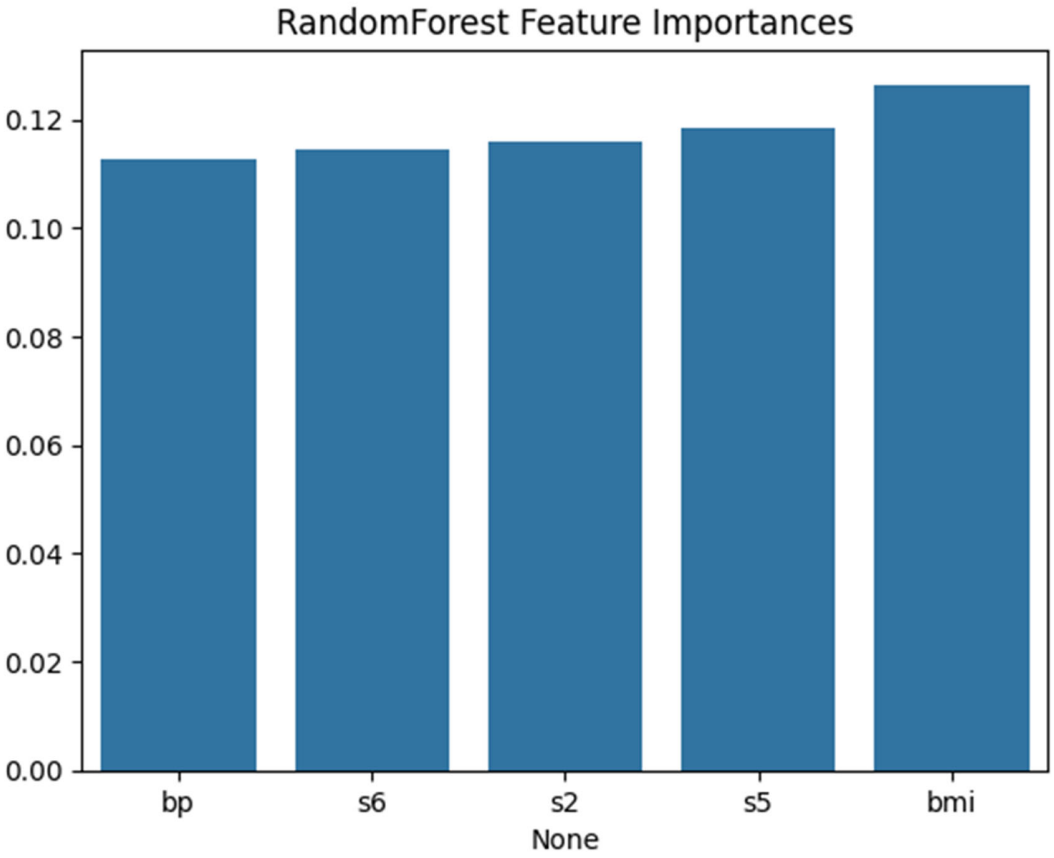
```
X = df.drop(columns='target')
y = df['target']

# 使用 SelectKBest
select_k_best = SelectKBest(score_func=f_classif, k=5)
X_selected_kbest = select_k_best.fit_transform(X, y)
selected_features_kbest = X.columns[select_k_best.get_support()]

print("SelectKBest features:", selected_features_kbest)

# 绘制选择的特征
sns.barplot(x=selected_features_kbest, y=select_k_best.scores_[select_k_best.get_support()])
plt.title('SelectKBest Feature Scores')
plt.show()
```




```
# 使用 RFE
model = LogisticRegression(max_iter=10000)
rfe = RFE(model, n_features_to_select=5)
fit = rfe.fit(X, y)
selected_features_rfe = X.columns[fit.support_]

print("RFE features:", selected_features_rfe)

# 绘制选择的特征
sns.barplot(x=selected_features_rfe, y=fit.ranking_[fit.support_])
plt.title('RFE Feature Rankings')
plt.show()
```




```
# 使用随机森林
model = RandomForestClassifier()
model.fit(X, y)

# 特征重要性
importances = model.feature_importances_
indices = np.argsort(importances)[-5:]
selected_features_rf = X.columns[indices]

print("RandomForest features:", selected_features_rf)

# 绘制特征重要性
sns.barplot(x=selected_features_rf, y=importances[indices])
plt.title('RandomForest Feature Importances')
plt.show()
```


RandomForest Feature Importances
0.12
0.10
0.08
0.06
0.04
0.02
0.00
bp
s6
s2
s5
bmi
None