MidTerm Project

Predicting Life Expectancy using Linear Regression

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Agenda

1. Dataset overview
2. Key findings from EDA
3. Feature scaling
4. Regression models
5. Cross validation
6. Challenges

Dataset overview

Dataset information

- Dataset name: Life Expectancy (WHO)
- Dataset link: https://www.kaggle.com/datasets/kumarajarshi/life-expectancy-who/data

Dataset size

- 22 columns
- 2938 records

Key findings from EDA

Some data had null-values so I had to fill up these data

- Apply mean imputation for `int` and `float` columns.
- Apply mode imputation for `object` columns.

Perform one-hot-encoding for country column.

Feature scaling

Correlation matrix

Find out top 5 features based on the correlation matrix.

```
Life expectancy                  1.000000
Schooling                        0.715066
Adult Mortality                  0.696359
Income composition of resources  0.692483
BMI                              0.559255
HIV/AIDS                         0.556457
```

Feature scaling

For this mid-term-project, I used 3 type feature scaling and 2 types of dataset. So totaling, it is 6 kind of feature scaling

- StandardScaler with entire data
- StandardScaler with top5-feature
- MinMaxScaler with entire data
- MinMaxScaler with top5-feature
- RobustScaler with entire data
- RobustScaler with top5-feature

And, compare result

Regression models

Train-test split

Before starting to make models, split data into train-data and test-data. This time I split data into 60%-40% and 80%-20% in order to compare results.

Perform PCA

In order to warp into 2d numbers, perform PCA.

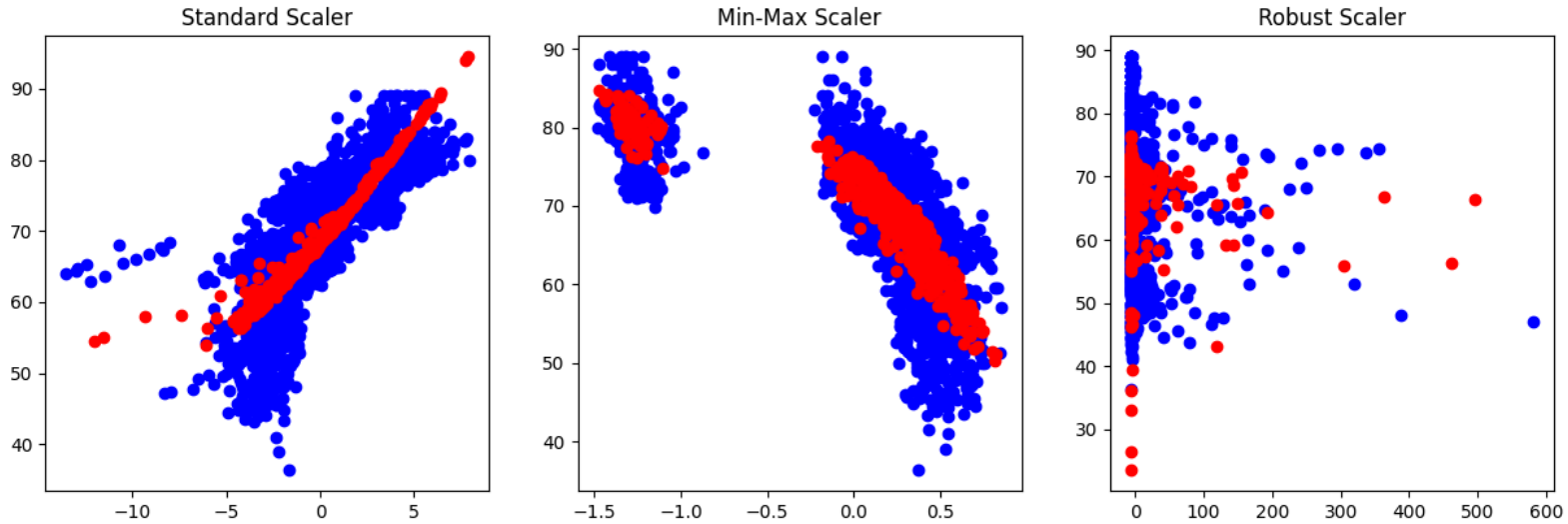
Make models

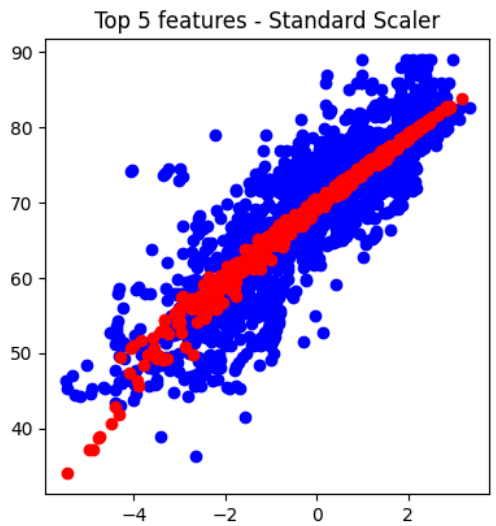
Make models using with data which was performed PCA.

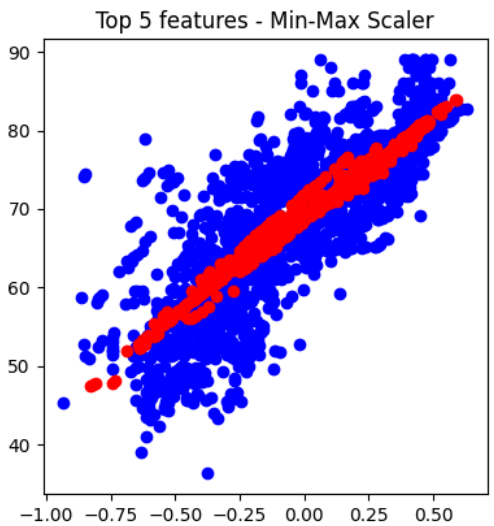
Prediction

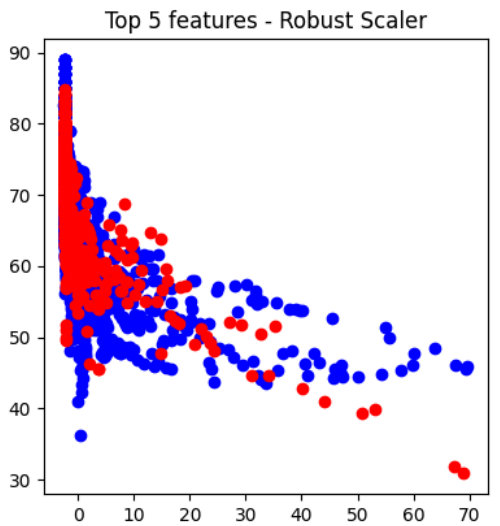
These scatter plot shows train data and prediction data.

x-axis:features, y-axis:target, blue-plot:train-data, red-plot:test-data









Evaluation with MAE, MSE, RMSE, and R2

Train-data:60%, Test-data:40%

Model	MAE	MSE	RMSE	R2
Standard Scaler	4.558195	32.513194	5.702034	0.641470
Min-Max Scaler	9.579367	139.613058	11.815797	-0.539541
Robust Scaler	8.596135	125.391163	11.197820	-0.382714
Top5 features - Standard Scaler	9.791548	154.255161	12.419950	-0.701003
Top5 features - Min-Max Scaler	9.992961	156.235747	12.499430	-0.722843
Top5 features - Robust Scaler	9.977972	160.161032	12.655474	-0.766128

Train-data:80%, Test-data:20%

Model	MAE	MSE	RMSE	R2
Standard Scaler	4.545390	32.062129	5.662343	0.636536
Min-Max Scaler	9.991245	157.483100	12.549227	-0.785267
Robust Scaler	8.077685	114.153075	10.684244	-0.294067
Top5 features - Standard Scaler	9.796859	156.941338	12.527623	-0.779125
Top5 features - Min-Max Scaler	9.770935	150.164734	12.254172	-0.702304
Top5 features - Robust Scaler	9.849289	158.176033	12.576805	-0.793122

Cross validation

Perform KFold cross-validation(splits: 5)

```
                            Model  Score(MSE)
                 Standard Scaler   32.398139
                  Min-Max Scaler   36.830030
                    Robust Scaler   55.933006
Top5 features - Standard Scaler   20.863351
 Top5 features - Min-Max Scaler   28.347514
  Top5 features - Robust Scaler   21.614507
```

Challenges

There was a lot of way to do feature scaling, split-data, and extract data. But I couldn't which way is most proper. So this time, I tried to perform everyway as far as I could and compare results. After all, I could figure out which one is most-fit-way.