Predictive learning HW1

Personal Information

Name: 王重鈞
ID: 41047025S

Program Information

Language: Python3.11.4
Pakcage: Numpy, Panda, Scikit-learn, Matplotlib

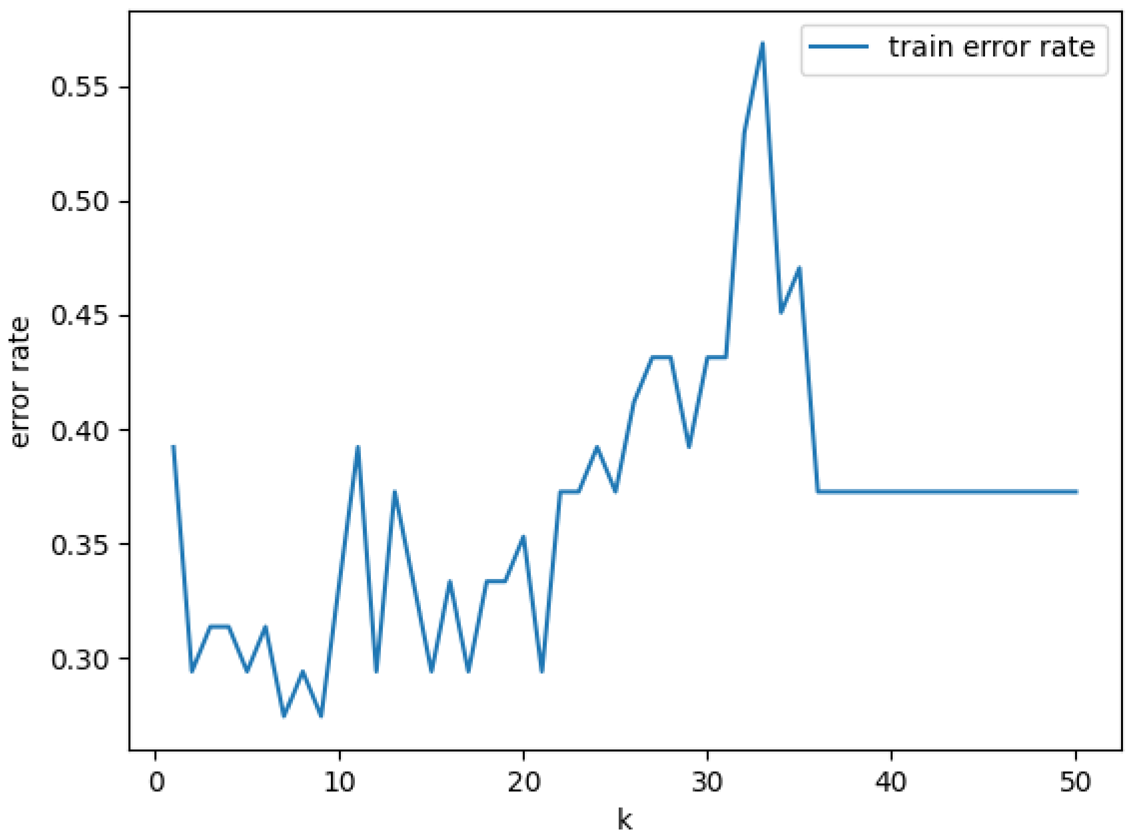
P1

train error rate in different k in K Nearest Neighbors algorithm

Model: KNeighborsClassifier

Model Assumption: The primary assumption that a KNN model makes is that data points/instances which exist in close proximity to each other are highly similar.

Train Data: obesity_election_2004.csv
Test Data: obesity_election_2000.csv



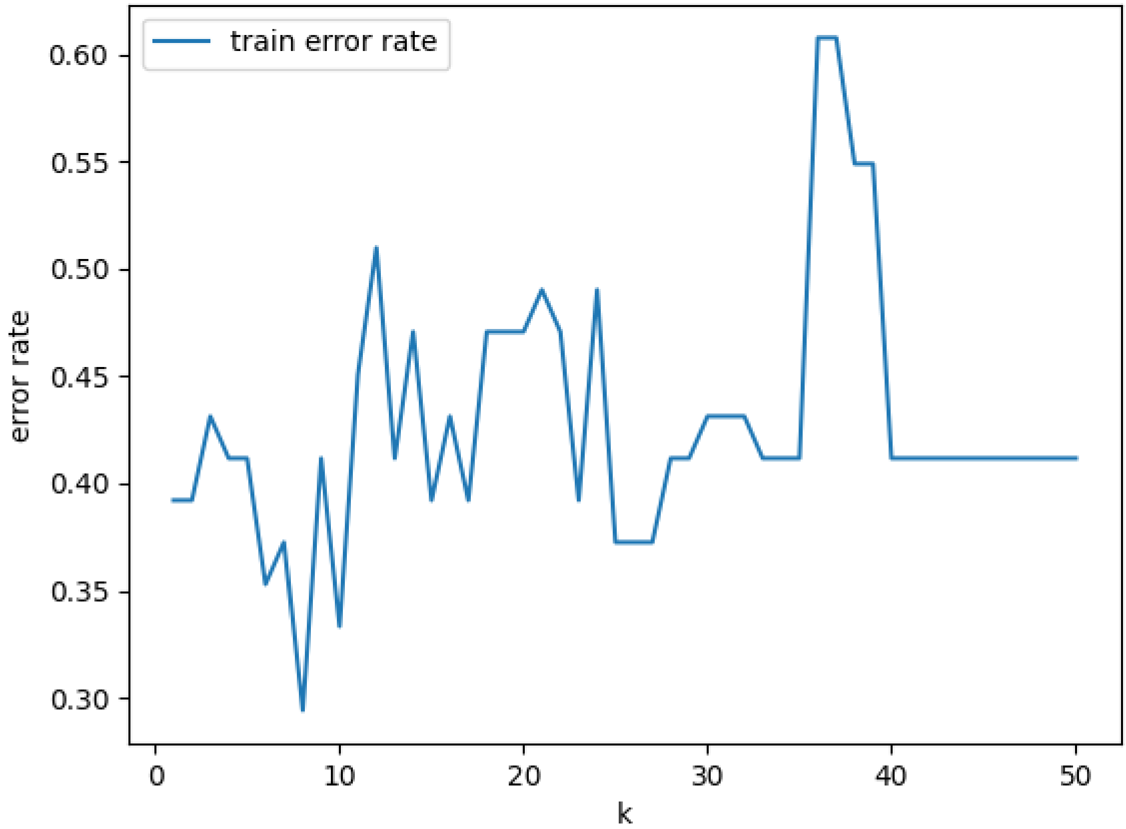
Least error rate when k = 7
Resample error rate with k = 7: 0.2156862745098039
Test error rate with k = 7: 0.5294117647058824

P2

Model: NeighborsClassifier
Train Data: obesity_election_2000.csv
Test Data: obesity_election_2004.csv

Model Assumption: The primary assumption that a KNN model makes is that data points/instances which exist in close proximity to each other are highly similar.

train error rate in different k in K Nearest Neighbors algorithm



Least error rate when k = 8 Resample error rate with k = 8: 0.2549019607843137 Test error rate with k = 8: 0.39215686274509803

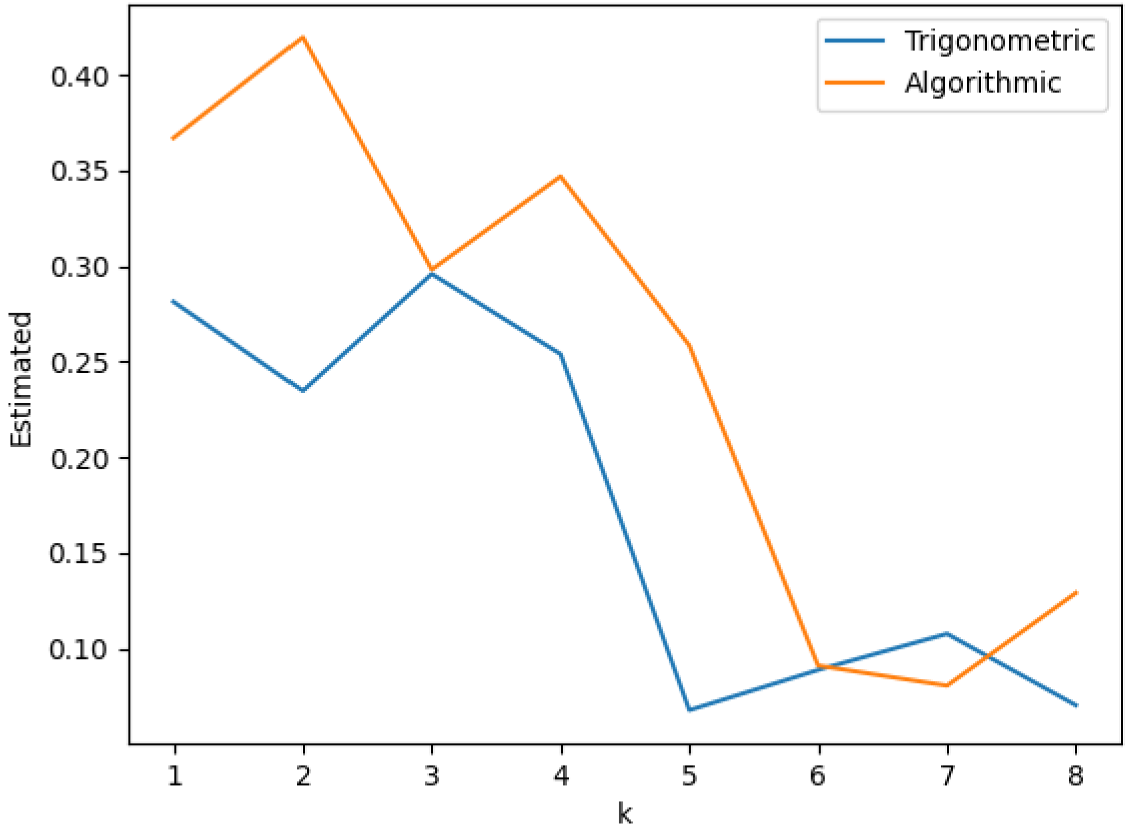
Data generate for P3 P4:

```
def generate_data(size=10):
    xs = np.random.uniform(0, 1, size=size)
    ys = xs**2 + 0.1 * xs + np.random.normal(0, 0.5, size=size)
    return xs, ys
```

P3

Model: LinearRegression

Train/Test Data: The data consists of n = 10 samples, (x, y), where x is uniformly distributed in [0,1] and y = x^2 +0.1x+noise and the noise has Gaussian distribution N(0, 0.25). Note that the noise has variance 0.25 or standard deviation 0.5.



Trigonometric Best k: 5

Trigonometric Best Estimated : 0.06783024545392217

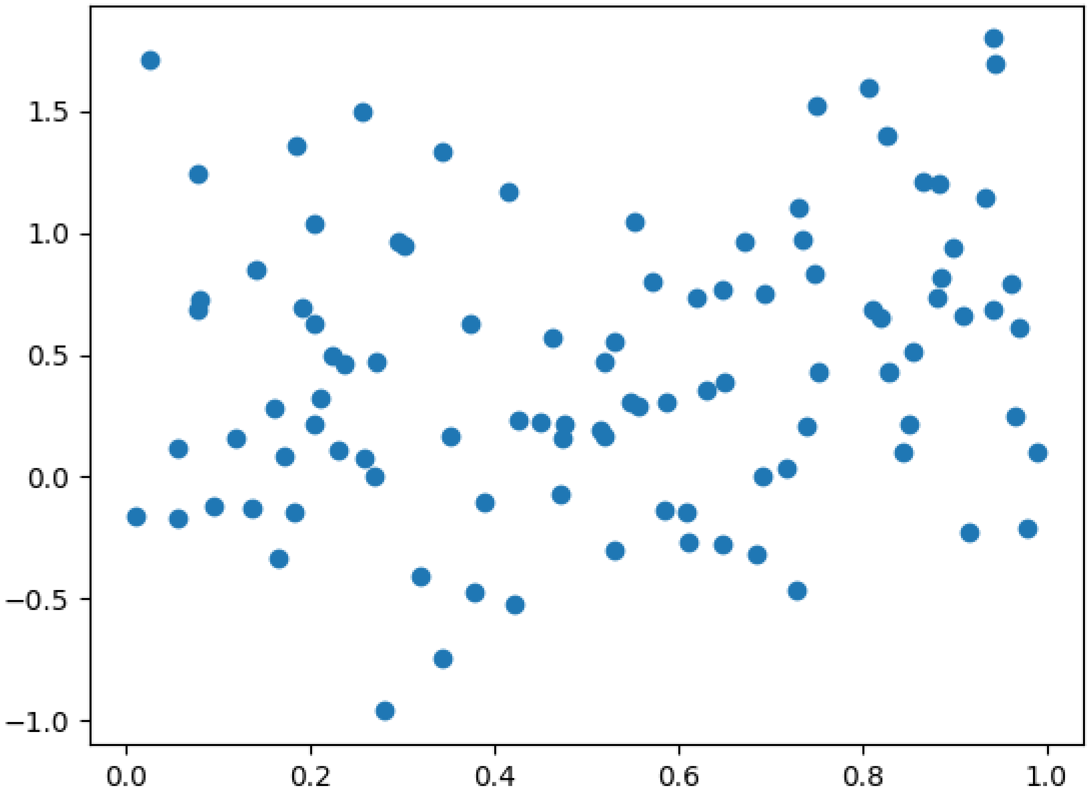
Algorithmic Bestk: 7

Algorithmic Best Estimated :: 0.08067735912605192

Question

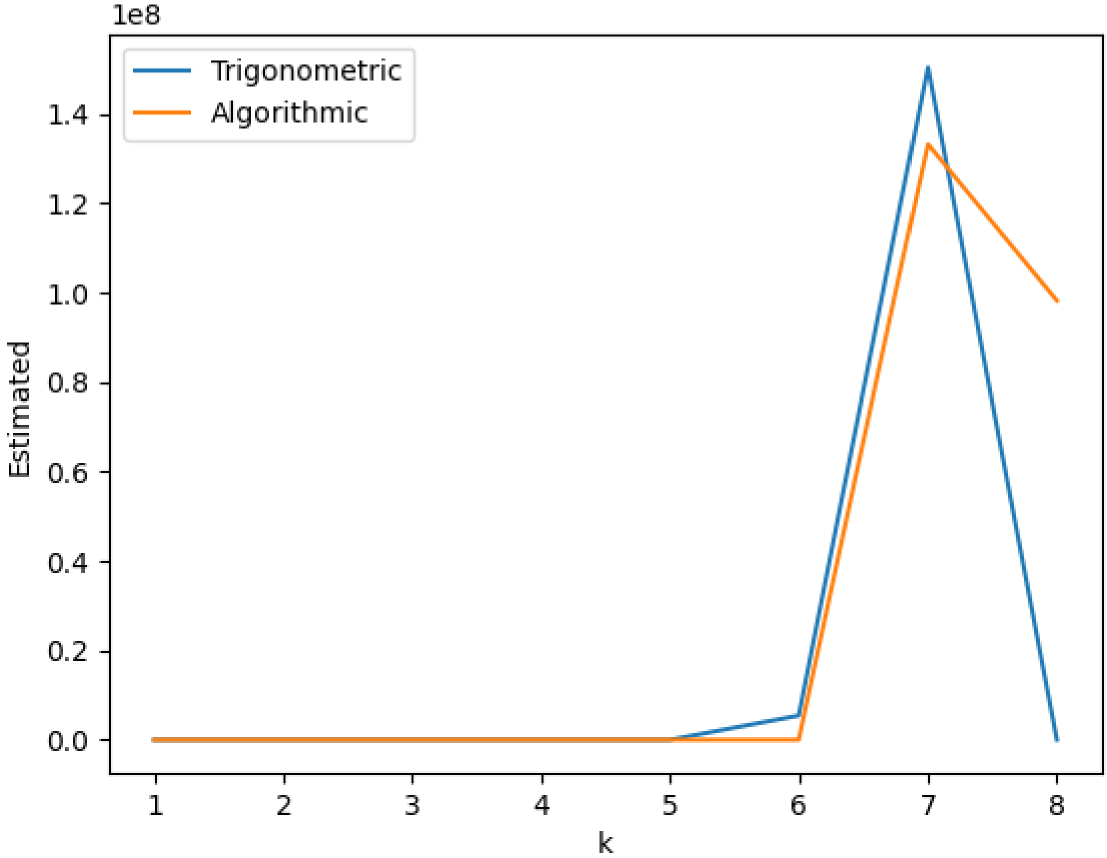
> Is it possible to choose the best predictive model, Trigonometric vs. Algorithmic polynomial, using only the result of model selection for each method?

I think the answer is NO. Because the data is only 10 samples. The model would be easy to overfitting. Besides, the noise is huge such as the figure, we hardly to find the func `yx^2 +0.1x`. So, I think we couldn't say Trigonometric or Algorithmic model is better.



P4

Model: LinearRegression
Train/Test Data: The data consists of n = 10 samples, (x, y), where x is uniformly distributed in [0,1] and y = x^2 +0.1x+noise and the noise has Gaussian distribution N(0, 0.25). Note that the noise has variance 0.25 or standard deviation 0.5.



Trigonometric Best k: 1

Trigonometric Best Estimated : 0.3247638822147406

Algorithmic Bestk: 1

Algorithmic Best Estimated :: 0.28062363861405615