2

(a)

What is the theoretical expected error?

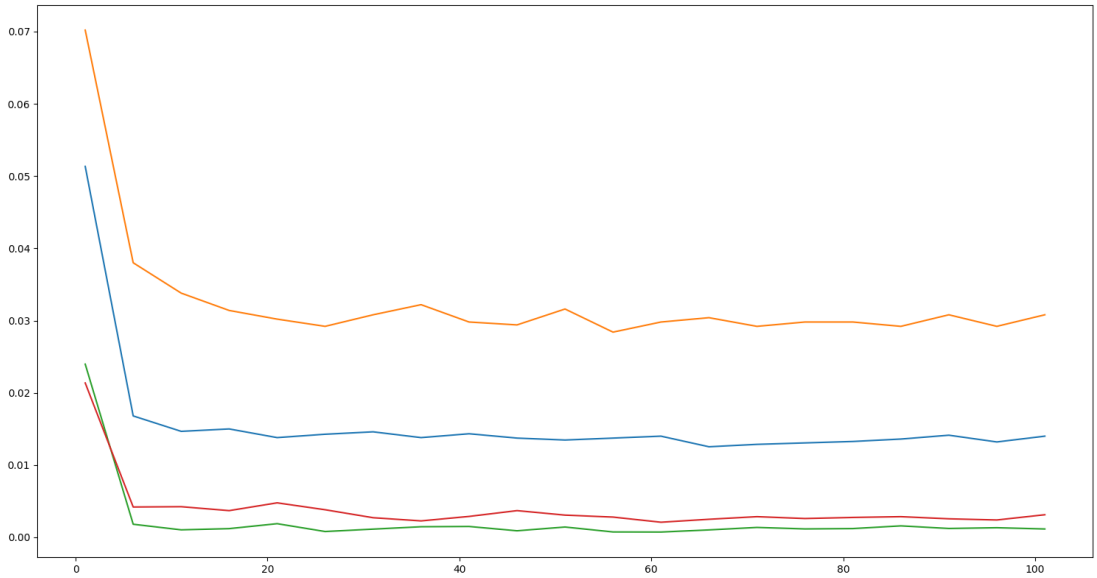
25 percent

Use python to simulate the above classifiers. What are the resulting train and test errors?

Trivial classifier I training error: 0.758 Trivial classifier I testing error: 0.78 Trivial classifier II training error: 0.75 Trivial classifier II testing error: 0.75

(b)

(i)



the minimum test error rate: 0.0284

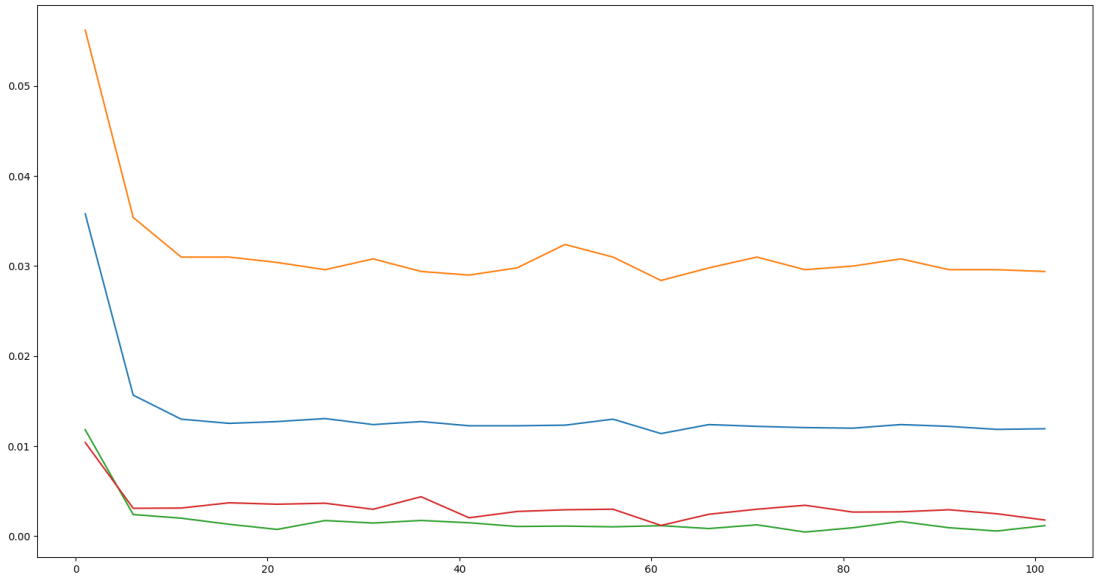
corresponding std: 0.0028

When number of trees increases, error rate goes down.

I think it shows convergence because when number of trees increases, the test error decreases and remains low

(ii)

max_features = 3



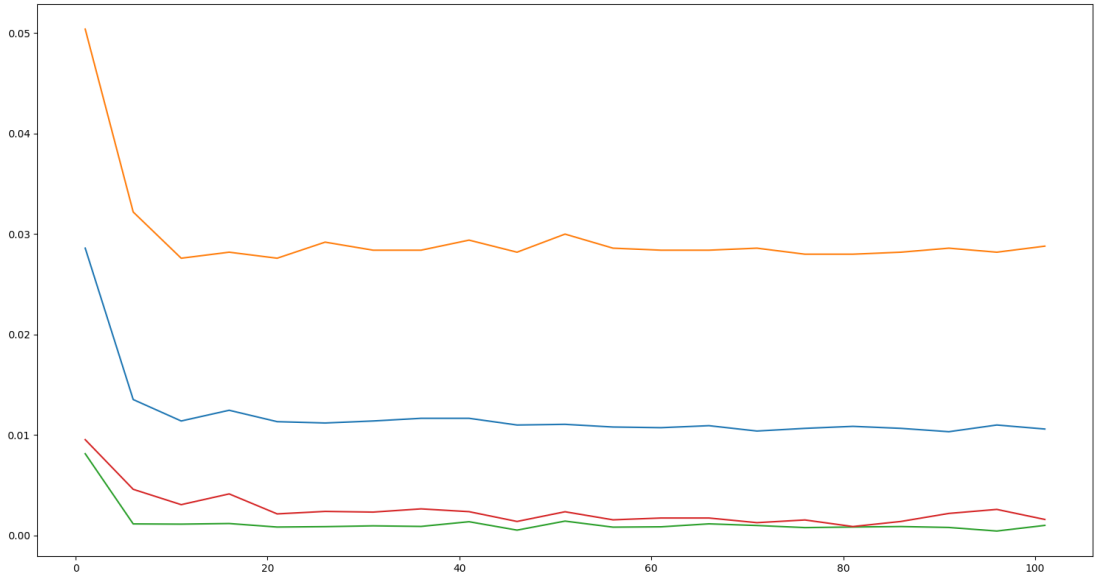
the minimum test error rate: 0.0284

corresponding std: 0.00119

When number of trees increases, error rate goes down.

I think it shows convergence because when number of trees increases, the test error decreases and remains low

max_features = 4



the minimum test error rate: 0.0275

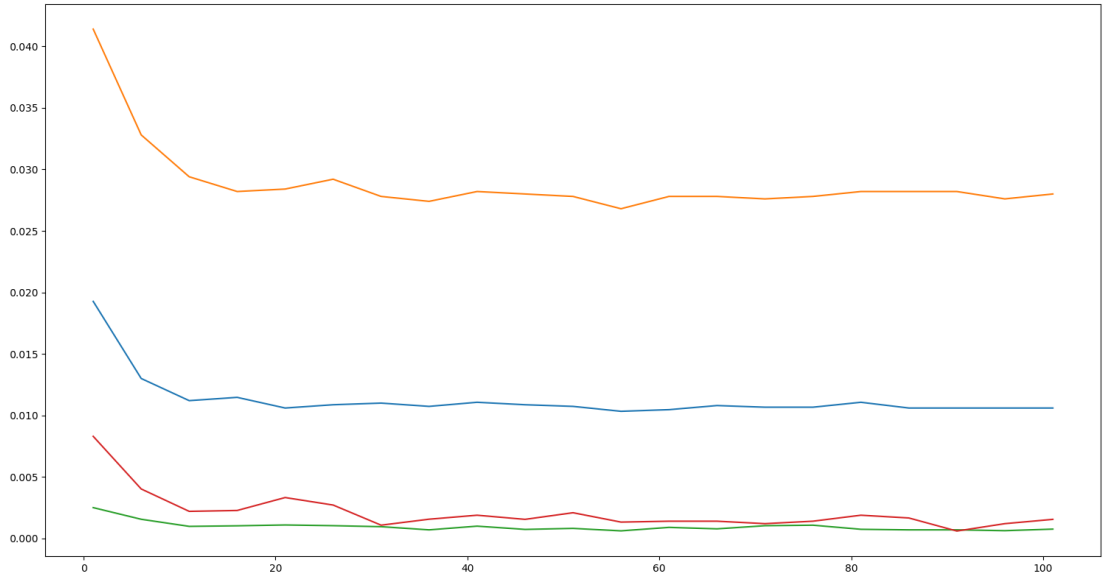
corresponding std: 0.00307

When number of trees increases, error rate goes down.

I think it shows convergence because when number of trees increases, the test error decreases and remains low

(iii)

max_features = 7



the minimum test error rate: 0.0268

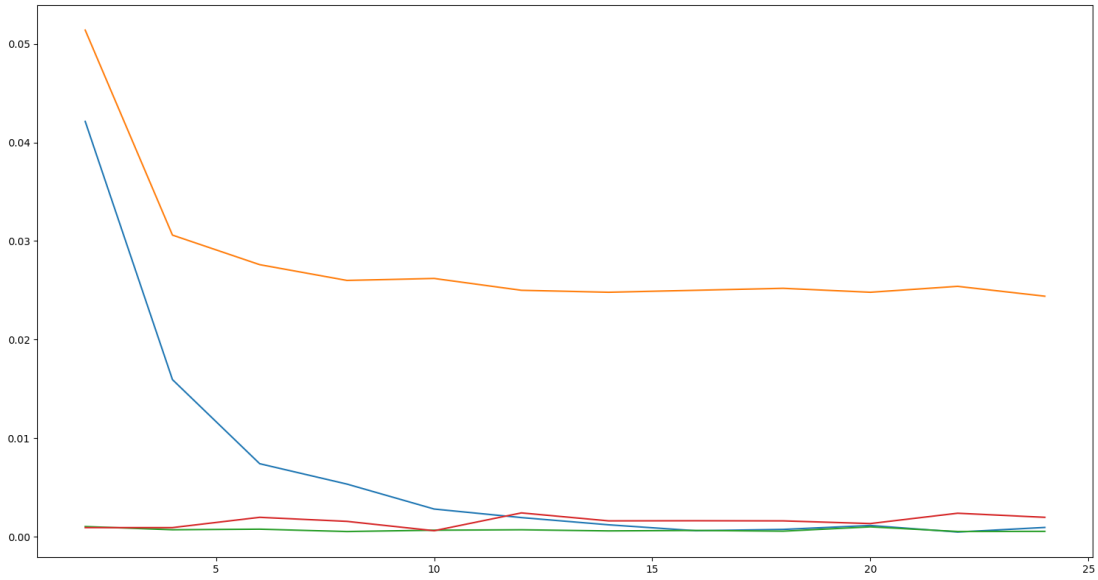
corresponding std: 0.00132

The test error goes down and standard deviation is relativly smaller, however, it is hard to say RF model with max_features = 7 performs better than before because the difference on test error rate is within the standard deviation range

(iv)

max_features = 7

n_estimators = 56



the minimum test error rate: 0.02439

corresponding std: 0.001959

The training error goes down as max depth increases.

The testing error does not vary too much.

(iv)

The best setting:

max_features = 7

n_estimators = 56

the minimum test error rate: 0.02439

corresponding std: 0.001959

Trivial classifiers:

Trivial classifier I training error: 0.758 Trivial classifier I testing error: 0.78 Trivial classifier II training error: 0.75 Trivial classifier II testing error: 0.75

It has learned from data as testing error ot the best setting is greatly smaller than trivial classifiers.