ex_1{207447970}

Daniel Nisnevich

Name: Daniel Nisnevich

Scenario 1 Results

Number of times best prophet selected: 74

Average test error of selected prophet: 0.76

Average approximation error: 0.2

Average estimation error: 0.052000000000000002

We do know the bias in this scenario as the true risk is not estimated but already known.

Scenario 2 Results:

Number of times best prophet selected: 70

Average test error of selected prophet: 0.79

Average approximation error: 0.2

Average estimation error: 0.060000000000000026

Even though we 10x the amount of games we se no significant changes, the fake prophet won 4 more games than before slight changes in test error and average estimation error.

Scenario 3 Results:

Number of times best prophet selected: 24

Average test error of selected prophet: 0.28

Average approximation error: 0.5195802006372554

Average estimation error: 0.7210388097122995

We have a lot more prophets, we see a drastic decrease in times of choosing the true prophet.

Also, average approximating error has significantly increased together with average estimation error.

About changing the distribution to [0,0.5] the estimation error and approximation error would both decrease because prophets would tend to be more correct and the difference would be smaller.

Scenario 4 Results:

Number of times best prophet selected: 100

Average test error of selected prophet: 0.29

Average approximation error: 0.0004753641061820968

Average estimation error: 0.7108549816250715

Number of times almost best prophet selected: 0

As we prolonged the amount of test meaning the amount of games, the true prophet was selected 100% of the time and we managed to avoid the almost true prophet at all.

The true prophet won with avg test error of 0.29/

On the train set there can be an overfitting in many case and that’s why we need the validation set and test set to find the best of the prophets and later to evaluate it's est. erorr.

Scenario 5 Results:

M = 1000	M = 50	M = 10	M = 1	K/M
0.83/0.16	0.85/0.163043253407	0.87/0.163588769378	0.79/0.162361358442	K = 2
0.89/0.10	0.88/0.107975083995	0.9/0.108694052684	0.8/0.104517231106	K = 5
0.93/0.12	0.85/0.121064773152	0.83/0.136402178556	0.9/0.12315354363	K = 10
0.89/0.13	0.83/0.142313155524	0.9/0.124345052017	0.86/0.138505421823	K = 50

We can see that increase in K(Number of prophets)leads to a decrease in the ERM, in a same manner a increase in the number of games shows the same pattern.

Meaning, more prophets and more games tends to achieve the best overall performance, of course that in many situations we have to choose what do we prefer more games or more prophets and according to the changes I saw in the table I can suggest that adding more games might lead to better results.

Scenario 6 Results:

Average approximation error for class 1: 0.46097848046243195

Average approximation error for class 2: 0.5489781789435793

Average estimation error for class 1: 0.57

Average estimation error for class 2: 0.53

Class 1,the bias is high , only 5 prophets and a small amount of possible values, it might complex the ability to handle the tasks .if the prophets weren't random but as in usual cases we can expect high bias and underfitting.

Class2, 500 prophets with a bit higher possible values, we can be able to handle the task better in this situation compared to the previous as we have more prophets and less bias however, this can lead to overfitting on the test data and we can achieve poor performance on validation set according to the severity of the overfitting.