In our research, we addressed the problem of estimating the expected cost of a given strategy for a given k-out-of-n function. The binary decision tree that describes the full strategy has an exponential size in k and n. As a result, using the standard ways over the binary decision tree causes the computation of the strategy’s expected cost in exponential time. In the research, we suggest estimating the expected cost by taking samples of the inputs like in the Monte Carlo method. We find out by numerical experiments if the strategy’s expected cost can be estimated accurately by this sampling approach.

PURPOSE OF THE PROJECT

The main purpose of the project was writing a code that estimates the expected cost of the optimal strategy that computes k-out-of-n function. In order to assess the quality of the estimation, we compare it with the real expected optimal total cost that can be computed exactly for the special case of k-out-of-n functions [1,2]. This algorithm was coded by Zahed Shahmoradi, a former MSc student at Sabancı University. We analyze the error between the estimated and real values.

ESTIMATING THE COST OF K-OUT-OF-N SYSTEMS WITH MATLAB CODE

```
for u=1:Size
    for v=1:NoOfComponent
        X=rand(1,1);
        if X <= Probability(v)
            SampVector(u,v)=1;
        else
            SampVector(u,v)=0;
        end
    end
end
```

The sample matrix is built by random distributions of 1s and 0s considering the probability vector. Total average cost is calculated from the sample matrix whose column size is amount of components and row size equals to sample size. Furthermore, matrix of sample size’s value changes according to step size. Step size equals to 100 and it checks the total average in each step with using for-loops.

At the end of MATLAB code, aim is to draw a line-graph which includes 3 different lines: average % difference, maximum % difference and minimum % difference of every step out of 5 instances.

REFERENCES
