Decision Analysis Case Study

Assume that you were just hired as a new analyst in a company and based on your skills in decision analysis tools, you were assigned to evaluate the previous decision taken by the company during the last 8 years.

One of the most important decisions to the CEO was always the marketing department capacity. At January of each year, he has to take a decision whether to let this department as it is or he should hire new marketing employees or sign an agreement with an external marketing agency. He knows that this decision has risks because the marketeers value level is not known beforehand (not known at start of the year . We have to wait till mid year to know real values). The marketeers value level is known to have 6 standard levels in industry (levels from 1 to 6) and the company agrees on some probabilities for each level at Jan each year before taking the decision.

You were given all this historical data in addition to the revenue generated by the marketing activities each year. You can find this in two csvs:

* “marketeer\_level\_prob” for the 6 probabilities at each year from 2013 till 2020 and
* “marketeer\_revenues” for the revenues that can be generated at each year at each combination of (decision, value\_level): so the first 18 values are for 2013 and are sorted by rows which means the first 6 values of them represent the revenues if decision 1 (*let this department as it is*) was applied under the different value levels.
* “Marketer\_capacity\_decision” shows the decision number that was finally taken at each year *( Decisions are numbered based on the order of showing them above)*

You were required to:

1. The CEO needs the following:
   1. Apply the concept of opportunity loss at each year to then compare which action it recommends versus the action that was taken.
   2. Recommend an action at each year based on the concept of monetary value then show the difference between the payoff of your recommendation versus the payoff of the selected action
2. He knows that the previous two managers before him, one of them was a very optimistic decision maker and the other was very pessimistic. He wants to simulate what action they would have chosen if they were in charge of that ? . In addition to know how much the final payoff’s values will be changed at each year?
3. He also needs after this to see a distribution of actions and how many times they were chosen by your different 4 techniques above ? Just to clarify if many techniques go for a specific action or not ?
4. From your side, you want to run sensitivity analysis scenarios for the current year’s probabilities (2021) and show different recommendations to the CEO based on this analysis. The probabilities of last year will be the same for 2021 but the revenues are given in “2021\_revenues.csv” file

In your code *(Implementation in Julia will extra credits)*, you should have:

1. “Utils.py” file which includes all helper functions like:
   1. A function for reading input files
   2. A function per each algorithm you will implement
2. “Experiment\_i.py” file for each requirement above (so total are 4 files) which will call functions from utils.py file and plot some figures and generate some conclusions based on the figures.

In your report, you should have proper section for each requirement and well displayed results