CentraleSupélec

VOTING RULES IN PYTHON

Let us consider an election with n voters ($0 \leq n \leq 200$) and m candidates ($0 \leq m \leq 20$). We assume that :
- The preferences of each voter are given as a linear order (total order) on the set of candidates
- All the preferences (of the n voters) **are contained in an Excel file or a csv file.**

This work aims at computing in python language the voting rules introduced in Chapter 2. You can use the examples of this chapter to test your functionalities, especially the following example where we have $m = 4$ candidates $\{a, b, c, d\}$ and $n = 27$ voters :

$$
\begin{array}{rl}
5 \text{ voters :} & a \succ b \succ c \succ d \\
4 \text{ voters :} & a \succ c \succ b \succ d \\
2 \text{ voters :} & d \succ b \succ a \succ c \\
6 \text{ voters :} & d \succ b \succ c \succ a \\
8 \text{ voters :} & c \succ b \succ a \succ d \\
2 \text{ voters :} & d \succ c \succ b \succ a
\end{array}
$$

For the questions 2, 3, 4 and 5, you will have to manage yourself any possible ties among the winners.

1. Compute a function `Plurality` returning the result of a plurality voting.

2. Compute a function `PluralityRunoff` returning the result of a plurality Runoff voting (plurality with two rounds).

3. Compute a function `CondorcetVoting` returning the result of the application of the Condorcet principle (the existence of the Condorcet winner).

4. Compute a function `BordaVoting` returning the result of the application of the Borda principle.

5. Is it possible to elaborate an election example with $n \geq 60$ and $m \geq 8$ where the winner is the same for the four voting rules Plurality, Plurality with Runoff, Condorcet Principle and Borda rules ?

   In your example, no more than 50% of voters has the same "best candidate" and no more than 40% of voters has the same "worst candidate". You should implement, separately, a python function allowing to test if these two conditions are satisfied.

6. Is it possible to elaborate an election example with $n \geq 60$ and $m \geq 8$ where the unique winner is not the same for the four voting rules Plurality, Plurality with Runoff, Condorcet Principle and Borda rules (we should have 4 different winners) ?

   In your example, no more than 50% of voters has the same "best candidate" and no more than 40% of voters has the same "worst candidate". In order to test if these two conditions are satisfied, you can use the function implemented above, in question 5.

N.B : Each group will present, during the session of Monday November 10th, their obtained results of the questions 5 and 6. You can present these results trough some slides containing the example you have constructed, as well as the different winners.