CentraleSupélec

MASTER BDMA
DECISION MODELING
PRACTICAL WORKS

VOTING RULES IN PYTHON

Let us consider an election with n voters ($0 \leq n \leq 100$) and m candidates ($0 \leq m \leq 6$). 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 :

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

1. Compute a function `MajorityRule` returning the result of a simple majority rule voting, between two candidates.
2. Compute a function `Plurality` returning the result of a plurality voting.
3. Compute a function `PluralityRunoff` returning the result of a plurality Runoff voting (plurality with two rounds).
4. Compute a function `CondorcetVoting` returning the result of the application of the Condorcet principle (the existence of the Condorcet winner).
5. Compute a function `BordaVoting` returning the result of the application of the Borda principle.
6. Elaborate an election example with $n \geq 40$ and $m \geq 6$ where the winner is the same for the four voting rules Plurality, Plurality with Runoff, Condorcet Principle and Borda rules. In your example, at least 10% of voters should have different preferences and no more than 70% of voters has the same "best candidate".
7. Elaborate an election example with $n \geq 40$ and $m \geq 6$ where the winner is not the same for the four voting rules Plurality, Plurality with Runoff, Condorcet Principle and Borda rules. In your example, at least 10% of voters should have different preferences and no more than 70% of voters has the same "best candidate".