

## Homework #5

**Deadline: Wednesday, 24 May 2017, 19:00**

### Question 1 (10 marks)

Recall that we discussed three simple approaches for extending a single-winner voting rule  $F$  to a multiwinner voting rule to choose a committee of size  $k$ : *rank-and-cut*, *score-and-cut*, and *choose-and-repeat*. Another option would be what we might call *eliminate-and-repeat*: repeat eliminating one of the alternatives with the lowest score under  $F$  until only  $k$  candidates are left. (This is well-defined if  $F$  is associated with some notion of score.) If we do this with the plurality rule, we obtain a multiwinner rule that is similar to STV. Demonstrate that this new rule and STV differ by means of an example where they return distinct outcomes. Then give a short high-level explanation of what the crucial difference between the two rules is.

### Question 2 (10 marks)

Answer the following questions with one paragraph of text each. Some of them are more or less open questions and a precise answer is not always possible, certainly not given the space constraints imposed here. What we want to see is that you have thought about these questions and have understood what they are about.

- (a) Suppose you want to use the Borda rule to select one winner from a set of  $m$  alternatives. Because  $m$  is large, you allow each voter to just rank a (not necessarily proper) subset of the alternatives. How would you adapt the Borda rule to this setting? Why?
- (b) For most of the classical theorems of voting theory we have discussed in class, there are contributions to the literature formalising those results using some form of logical framework or proving them using some kind of automated reasoning technique. An exception appears to be one of the simplest results we have seen, May's Theorem.  
Can you explain why that might be so?
- (c) Consider the Chamberlin-Courant multiwinner voting rule for the special case of electing a committee of size 1. Which single-winner voting rule does this correspond to?
- (d) Recall how we had defined Slater's voting rule as first computing a collective ranking of the alternatives (this part is a SWF) and then returning the top-element of that ranking. How would you translate the Slater SWF into a judgment aggregation rule?
- (e) How would you adapt the concept of an *impartial culture* to judgment aggregation?