COST Action IC1205 on Computational Social Choice: STSM Report
Applicant: Evangelos Markakis
Home institution: Athens University of Economics and Business
Home country: Greece
Host: Jerome Lang
Host institution: Universite Paris - Dauphine
Host country: France
Dates: 03/02/2015 to 10/02/2015

During my STSM to LAMSADE at Universite Paris – Dauphine, I worked together with my host Jerome Lang on problems regarding Approval Voting elections. During the last months before my visit, we have been collaborating on these topics with my host (and together with our phd students). Partly, the purpose of this visit was to finalize a joint paper of ours, which will appear in AAMAS 2015. In particular, we have been studying a family of voting rules, the Ordered Weighted Averaging Operators for Approval Voting. This is a family that generalizes the minisum and the minimax solution. Each voting rule in the family is determined by a vector of weights w = (w_1,...,w_n), where w_i is the weight assigned to the i-th highest Hamming distance between the voters and an election outcome. The outcome of such a rule is then a committee that minimizes the weighted sum of the Hamming distances of the voters (after ordering them from largest to smallest). The questions of interest here are i) to determine which vectors can be implemented in polynomial time. E.g., we know that for w = (1,0,0,...,0) (i.e., the minimax solution), the problem is NP-hard, ii) to design efficient approximation algorithms in the cases where we have NP-hardness results, iii) to identify which rules from this family are manipulable. For example, we know that the minisum solution, i.e., w = (1/n,,1/n,...,1/n) is non-manipulable, whereas the minimax solution is manipulable.

In a nutshell, the results we have obtained and will appear in our joint paper are as follows: we first established various NP-completeness results, showing that even for vectors that may slightly differ from minisum, the problem is NP-complete. We next identified some families of vectors where we can have polynomial time exact algorithms and then moving on, we designed approximation algorithms based on Linear Programming for some of the NP-complete families. Finally, we considered the issue of manipulating such elections, showing that many OWA operators beyond minimax are manipulable as well.

Beyond finalizing our paper, during my visit in Paris, we also discussed further topics and new open problems arising from our work. In particular, we have started investigating manipulability in greater depth. So far we had focused only on resolute voting rules, where a tie-breaking rule needs to be applied in case of ties. We are now exploring the manipulation of irresolute voting rules as well. This is currently work in progress.