- un titre

Aggregating Classifications: Theory and Computation

- un court développement du contexte, de la problématique et des retombées attendues

A classification is an assignment of objects into any collection of predefined categories. Classification aggregation (CA) refers to settings where an ordered list of classifications is aggregated into a single classification. The model admits various interpretations. For instance, imagine a research department going through a restructuring that will entail assigning researchers into a set of predefined research groups based on their research topics. A panel of directors at the department might come up with their individual classifications of the whole faculty and an aggregation process should take place in order to reach a final classification. In a similar vein, assigning tasks to employees, characterizing celestial bodies into categories, identifying demographics in a population, allocating objects to individuals are CA problems.

Although there is some work done in setting the stage in terms of the formal models of CA problems (see Dokow and Holzman, 2010 and Maniquet and Mongin, 2016), the literature is rather scant when it comes to understanding the limits and possibilities of these models. For instance, manipulability, a very central concept in social choice theory, is not studied in the context of CA. Interestingly, this setting is related to, but different than, one of the classical settings studied in multiple criteria decision aiding, which aim at sorting objects into preferentially-ordered categories on the basis of evaluations of these objects on multiple points of view (Bouyssou and Marchant, 2007). Furthermore, there are plausible directions of inquiry in relation to classification algorithms in machine learning that also remain unexplored. Finally, some authors pointed to the possible usefulness of aggregation frameworks related to CA in solving certain problems within argumentation theory (see Awad et al. 2017, and Ganzer-Ripoli et al. 2019), without further exploration.

The current doctoral student proposal aims at exploring classification aggregation problems in relation to social choice theory, multiple criteria decision aiding, argumentation theory, and other branches of computer science. This would entail studying properties of CA rules, which are either already analyzed extensively or relatable to those that are already analyzed extensively in these fields. This research might be pursued both theoretically and experimentally.

- une équipe encadrante, leur contact,

Remzi Sanver
Olivier Cailloux
Ali Ozkes (external, membre associé de Lamsade)

- le profil de candidat recherché.

Students with a master degree who have received formal education in quantitative subjects such as Mathematics, Computer Science, and Economics with an interest in career in applied theoretical research would be suitable.

References

Awad, Edmond, et al. "Experimental assessment of aggregation principles in argumentation-enabled collective intelligence." *ACM Transactions on Internet Technology (TOIT)* 17.3 (2017): 1-21.

Bouyssou, Denis, and Thierry Marchant. "An axiomatic approach to noncompensatory sorting methods in MCDM, I: The case of two categories." European Journal of Operational Research 178.1 (2007): 217-245.

Ganzer-Ripoll, Jordi, et al. "Combining social choice theory and argumentation: Enabling collective decision making." *Group Decision and Negotiation* 28.1 (2019): 127-173.

Dokow, Elad, and Ron Holzman. "Aggregation of non-binary evaluations." Advances in Applied Mathematics 45.4 (2010): 487-504.

Maniquet, François, and Philippe Mongin. "A theorem on aggregating classifications." Mathematical Social Sciences 79 (2016): 6-10.