Independence in judgment aggregation

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Judgment aggregation is a rapidly developing research area in economics which attracts the interest of several fields, such as law, political science and philosophy [3]. It studies how the individual opinions of an agent, which are opinions on logically interconnected propositions, can be mapped into a collective judgment on the same propositions. Dietrich and List showed that judgment aggregation is a generalization of the aggregation issues discussed in Arrow's impossibility theorem [1]. Whereas social choice theory studies the aggregation of individual preferences in order to select a collectively preferred alternative, judgment aggregation explores how to combine individual judgments on specific propositions.

Unfortunately, likewise social choice theory, the field of judgment aggregation is plagued by impossibility results (see, for example, [4, 6]), which generally state that there exists no aggregation rule that generates complete, consistent and deductively closed collective sets of judgments, while satisfying a set of seemingly rational conditions. The conditions imposed on the aggregation rule aim to ensure the rationality and the systematic approach of the aggregation procedure. The first impossibility result [4] contained that all consistent and complete judgment sets are being considered for the joint outcome (Universal Domain), and that all agents opinions are equally contributing to the joint outcome (Anonymity). In addition, a (Systematicity) rule is imposed, which ensures that the collective judgment on each proposition depends only on the individual judgments on that proposition, and that the aggregation rule remains the same across all propositions.

The hope for possibility results is seen in re-examining and relaxing these conditions and, with systematicity being considered the most controversial, it has been weekend to an Independence condition. The independence of irrelevant alternatives condition is systematicity without the neutrality condition, requiring that all propositions are equally treated. Just like Arrow's independence condition plays a central role in his famous impossibility theorem, the similar requirement leads to impossibility results in judgment aggregation.

However, these formal frameworks ignore an important distinction between aggregating judgments and preferences, which becomes apparent in our study of the benchmark examples of these areas. In this paper we start by arguing that the distinction between the premises and conclusions play an important role in the benchmark examples of judgment aggregation. By considering the notion of independence in judgment aggregation frameworks, we observe that the distinction between premises and conclusion is not taken into account. In these frameworks, the conclusion(s), individually or jointly obtained, are logically dependent on the corresponding premises. However, the premises are independent from each other.

Based on our analysis, we introduce new independence assumptions that capture the distinction between premises and conclusions. Recently, Mongin and Dietrich and Mongin [5, 2] further relaxed Independence. We use Mongin's framework, because his notion of independence of irrelevant propositional alternatives enables us to formulate our new independence assumptions and to define our operators based on a partition between premise and conclusion propositions. In particular, we define:

1. A strong notion of premise independence, where the aggregated premise propositions depend on the individual judgments of this proposition, as well as on the aggregated conclusion propositions.
2. A weak notion of premise independence, where the aggregated premise propositions depend on the individual judgments of this proposition, as well as on the individual and aggregated conclusion propositions.
3. A strong notion of conclusion independence, where the aggregated conclusion propositions depend on the individual judgments of this proposition, as well as on the aggregated premise propositions.
4. A weak notion of conclusion independence, where the aggregated conclusion propositions depend on the individual judgments of this proposition, as well as on the individual and aggregated premise propositions.

Since in most cases there will be several premise propositions and only one conclusion proposition, as in the standard example of the doctrinal paradox in the literature, the first two assumptions will be more often used than the latter ones. Of the first two, the strong notion already enables several interesting operators, which we illustrate using the revised conclusion procedure and the conclusion dictator. In both cases the aggregation may in some cases depend on the aggregated conclusion. For example, the conclusion dictator ensures that the joint decision is always determined by herself, but he allows the other individuals to influence the reasons why her decision is justified.

References

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