Impartial Peer Evaluation

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Peer evaluation is a central institution of many communities of experts. Evaluating the relative merits of specialized pieces of work requires knowledge that can only be found among those experts, thus it cannot be entrusted to an impartial outside observer. But peer evaluation is plagued by conflicts of interest, a difficulty only partially alleviated by the confidentiality of reports: even protected by the veil of anonymity, evaluator Smith may and will take into account how her message about Jones' work affects Smith's standing within the peer group. Although it is clearly impossible to eliminate entirely the inherent *partiality* of peer evaluation[1], we can nevertheless design group decision rules for specific, limited choice problems, that systematically avoid any conflict of interest.

In a general group decision problem, we call a decision rule *impartial* if an agent's message never has any influence on the aspects of the collective decision that matter to this agent; thus I have no way to use my message strategically, because I am indifferent between all outcomes in my option set.

A family of impartial rules for allocating a divisible commodity is the subject of [1]: a group of four or more partners must divide a bonus (or a malus) among themselves, and each partner has a well formed subjective opinion about the relative contributions of the *other* partners to the bonus, which the rule asks him to report. The key assumption is that he cares only about his own share, not about the distribution among others of the money he does not get. Impartiality means that his report has *no impact* on his final share.

The paper explores impartial rules in two simple problems involving no money, one akin to voting and one to assignment. In the first problem, a group of agents must choose one of them to receive a prize, or undertake a task (not necessarily a desirable one). Each agent cares about receiving the prize or not, but is indifferent about who among the others gets the prize. In the second problem, the agents must be assigned to a given set of indivisible objects (private goods or bads), and each one cares only about which object she gets. A prime example of the second problem is the collective determination of a strict ranking of the agents, based on these agents' messages only, when we assume that each participant only cares about her own rank. Think of a ranking of undergraduate programs by polls of their alumni.

We look for "reasonable" impartial decision rules in these two problems, where "reasonableness" conveys other, more familiar, desirable properties of a rule.

In the first problem, we must assign a purely private commodity called a prize. We look for impartial voting rules: everyone votes for someone other than herself, and whether or not she get the prize is completely independent of her own message (but this message does influence who gets it if not her).

The set of agents is N; agent i's message space is $N \diagdown i$: everyone nominates one of the other agents to be the winner. We interpret $m_i = j$ as supporting the choice of agent j for the winner, which requires the rule to be *monotonic* in the sense that additional votes for a given agent cannot reverse the decision to make her the winner.

With the notation $\mathcal{D} = \sqcap_{i \in N} (N \diagdown i)$, with generic element $x = (x_i)$, a **voting rule** is a mapping $\varphi : \mathcal{D} \to N$, and we want such a rule to satisfy

- **Impartiality**: for all i, x_i, x_i', x_{-i}, $\varphi(x_i, x_{-i}) = i \Leftrightarrow \varphi(x_i', x_{-i}) = i$;
- **Unanimity**: for all i, x, $\{x_j = i \text{ for all } j \in N \diagdown i\} \Rightarrow \varphi(x) = i$;

[1] For a formal statement we can invoke the Gibbard-Satterthwaite impossibility result.

- **Monotonicity**: for all $i, j, i \neq j$, all x, $\varphi(x) = i \Rightarrow \varphi(i, x_{-j}) = i$;
- **No Dummy**: for all i, $\varphi(x_i, x_{-i}) \neq \varphi(x'_i, x_{-i})$ for some x_i, x'_i, x_{-i}.

We show that these four requirements are incompatible for $n \leq 4$, but they are compatible for $n \geq 5$ or more agents. The proof is constructive.

In the second problem we must determine a strict ordering of the agents (with respect to some given criteria), when everyone cares only about his own rank (i.e., how many are above but not who). There too it seems possible to design a reasonable mechanism where agent i's report is a strict ranking of agents other than i, and i's actual ranking is independent of his own report.

References

[1] de Clippel, G., Moulin, H. and N. Tideman, 2008, Impartial division of a dollar, *Journal of Economic Theory*, 139, 176-191.

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