

## **Analogy in decision-making and social interaction and emergent rationality**

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**Abstract:** Colman's reformulation of rational theory is challenged in two ways. Analogy-making is suggested as a possible candidate for an underlying and unifying cognitive mechanism of decision-making, one which can explain some of the paradoxes of rationality. A broader framework is proposed in which rationality is considered as an emerging property of analogy-based behavior.

Rationality has long been shown to fail as a descriptive theory of human decision-making, both at the individual and social levels. In addition, Colman presents strong arguments that rationality also fails as a normative theory for "good" decision-making – "rational" thinking does not produce optimal behavior in social interaction and even acts against the interests of the individual in some cases. Fortunately, human beings often act against the postulates of rationality and achieve better results than prescribed by the theory. Therefore, Colman concludes that "rationality" has to be redefined by extending it with additional criteria for optimization, such as the requirement for maximizing the "collective" payoff, or with additional beliefs about the expected strategies of the coplayers. He does not clarify how and when these additional criteria are triggered or where the common beliefs come from.

We are so much attached to the notion of rationality that we are always ready to repair it, but not to abandon it. The theory of rationality is, in fact, a formalization of a naive theory of human thinking. This naive theory makes it possible to predict human behavior in most everyday situations in the same way as naive physics makes it possible to predict natural phenomena in everyday life. However, no one takes naive physics that seriously to claim that it provides "the explanation" of the world. Moreover, even refined and formalized versions of this naive theory, like Newtonian mechanics, are shown not to be valid, and more complicated and counterintuitive theories at the microlevel, like

quantum mechanics, have been invented. On the contrary, rationality theory is taken seriously, especially in economics, as an explanation of human behavior.

Instead of extending rationality theory with additional socially-oriented rules, it may be more useful to make an attempt to build a multilevel theory that will reveal the implicit and explicit cognitive processes involved in decision-making. These underlying cognitive mechanisms produce decisions, which are sometimes “individually rational,” sometimes “collectively rational,” and sometimes “not rational at all.” Because these mechanisms have been evolved and developed to assure human survival, they will, most of the time, produce results that are “rational” or “optimal” from some point of view – this is what makes rationality a good naive theory. However, this does not mean that people explicitly follow the rules of maximization prescribed by the theory.

Colman proposes an eclectic collection of ad-hoc strategies (team reasoning, Stackelberg reasoning, epistemic, and nonmonotonic reasoning), which are all different forms of explicit deductive reasoning. Deduction can certainly play a role in decision-making, but it is not enough to explain it. Recent studies revealed that analogy-making is a more basic mechanism of human thinking, which is present from early infancy and is used ubiquitously in everyday life (Gentner et al. 2001). Analogy-making is a process of perceiving one situation (target) in terms of another (base) thereby preserving the system of relations among elements and transferring knowledge from the base to the target. Arguments have been presented that deduction is in fact based on, and a special form of, analogy (Halford 1993; Kokinov 1992). Markman and Moreau (2001) have reviewed the evidence that analogy plays an important role in perceiving and framing the decision situation, as well as in comparison of the alternatives. Moreover, analogy may be used both explicitly and implicitly (Kokinov & Petrov 2001; Markman & Moreau 2001). Thus, analogy may play a unifying role in describing the mechanisms of decision-making.

Analogy-making may explain the paradoxes of using the focal points described by Colman. They are easily perceivable and analogous to focal points in other games. Therefore it is natural to expect people to use them again and again if previous experience of using a focal point has been successful. Similar arguments may be applied to social dilemmas and trust games. If another player has used a certain strategy in a previous case, I may expect he or she to behave the same way in an analogous situation, and thus have a prediction for his or her behavior.

Analogies may be applied at various levels: Analogies to previous cases of decision-making in the same game or analogies to games with similar structure; analogies to cases of social interaction with the same individual or to cases of social interactions with individuals who are considered analogous (e.g., are in similar relations to me, like family or team members). Thus, even a novice in a particular game can still use his or her previous experience with other games.

Analogy can explain the “deviations” from the prescribed “rational” behavior and the individual differences among players. If a player has an extensive positive experience of cooperative behavior (i.e., many successful cases of benefiting from acting together), and if the current game is found to be analogous to one of these cases, then he or she might be expected to act cooperatively (even if this is not the optimal strategy). On the contrary, if the game reminds the player of a previous case of betrayal or fraud, then defection strategy should be expected.

In summary, analogy may play a crucial role in a future theory of decision-making. Instead of explaining rationality with rules for utility maximization, which people follow or break, we may explain human behavior by assuming that decisions are made by analogy with previous cases (avoid strategies that were unsuccessful in analogous situations and reuse strategies that were successful). Thus, utility maximization is an emergent property that will emerge in most cases, but not always. In this view, rationality is an emergent phenomenon, and rational rules are only a rough and approximate explanation of human behavior.

## References

- Gentner, D., Holyoak, K. & Kokinov, B., eds. (2001) *The analogical mind*. MIT Press.
- Halford, G. S. (1993) *Children's understanding: The development of Mental Models*. Erlbaum.
- Kokinov, B. (1992) Inference evaluation in deductive, inductive and analogical reasoning. *Proceedings of the Fourteenth Annual Conference of the Cognitive Science Society*,. 903-08. Erlbaum.
- Kokinov, B. & Petrov, A. (2001) Integration of memory and reasoning in analogy-making: The AMBR model. In: *The analogical mind*, ed. D. Gentner, K. Holyoak & B. Kokinov. MIT Press.
- Markman, A. & Moreau, C. (2001) Analogy and analogical comparison in choice. In: *The analogical mind*, ed. D. Gentner, K. Holyoak & B. Kokinov. MIT Press.