As simple as possible but not simpler in Multiple Criteria Decision Analysis: the robust stochastic level dependent Choquet integral approach

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The level dependent Choquet integral has been proposed to take into account multiple criteria decision making problems in which the importance of criteria, the sign and the magnitude of their interactions may depend on the level of the alternatives' evaluations. This integral is based on a level dependent capacity, which is a family of single capacities associated to each level of evaluation for the considered criteria. Since, in general, there is not only one but many level dependent capacities compatible with the preference expressed by the Decision Maker, we propose to take into account all of them by using the Robust Ordinal Regression (ROR) and the Stochastic Multicriteria Acceptability Analysis (SMAA). On one hand, ROR defines a necessary preference relation (if an alternative a is at least as good as an alternative b for all compatible level dependent capacities), and a possible preference relation (if a is at least as good as b for at least one compatible level dependent capacity). On the other hand, considering a random sampling of compatible level dependent capacities, SMAA gives the probability that each alternative reaches a certain position in the ranking of the alternatives as well as the probability that an alternative is preferred to another. A real decision problem related to ranking of universities is provided to illustrate the proposed methodology.

References

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Joint work with Sally Giuseppe Arcidiacono and Salvatore Corrente

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