The general form of intuitionistic fuzzy preference-homogeneous value functions

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The Continuity Axiom of Decision Theory states that for every prospect (lottery), there exists a certain payoff equivalent to the prospect. This payoff is called the certainty equivalent (CE) of the prospect. The equivalent value is determined through experiments; however, in practice, such experiments often yield imprecise results. From this perspective, the CE can be viewed as a fuzzy quantity, which can be effectively modeled using intuitionistic fuzzy sets.

Let us recall that, if X is a prospect (or a lottery), that is a finitely supported probability distribution on $\mathbb{R}$ and $u : \mathbb{R} \to \mathbb{R}$ is a strictly increasing continuous utility function, then under the Expected Utility model the certainty equivalent of X, with respect to u, is given by the formula

$$CE_u(X) = u^{-1}(E[u(X)]).$$

Many applications of prospect theory in risk management and multi-criteria decision making implicitly assume that the function of CE_u is homogeneous. Value functions for which the function of CE_u is homogeneous are called preference-homogeneous. The fundamental question is: what happens if the CE_u is modelled with intuitionistic fuzzy sets and what does the homogeneity condition mean in this case?

In this presentation, we will show how to formulate preference homogeneity in fuzzy environment and we derive the general form of intuitionistic fuzzy preference-homogeneous value functions.

References

[1] Z. Makó and J. Salamon: Intuitionistic fuzzy certainty equivalence in prospect theory, 17th International Conference on Economics and Business, 2025.