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MCDA novelties

- AI and ML are used for large data and real-time data sets management
- AI and ML are used for selecting the most appropriate criterion
- AI and ML are used for automatically archive weighting criteria
- AI and ML are used to predict the likely outcome and its solution
- Use of expert's neutral or abstention and uncertainty assessments
- MCDA results are tended towards the benchmarkign and as interval results
- New MCDA sensitivity analysis tools consider changes in multiple parameters

Introduction

Multi-criteria decision analysis (MCDA) has been around for several decades and has been one of the fastest-growing subfields of research. However, in recent years, artificial intelligence (AI) and machine learning (ML) have shown that they can assist to decision-makers. MCDA powered by AI/ML assists at every stage, from identifying problems and solutions, to data entry, weighting and delivering results to decision-makers.

However, decision-makers need to understand the extent to which AI/ML should be allowed to operate. If the human-in-the-loop (HITL) factor is not considered in a hybrid system, it can become a "black box" system, meaning that the decision-maker cannot understand or explain the decision made by the hybrid system.

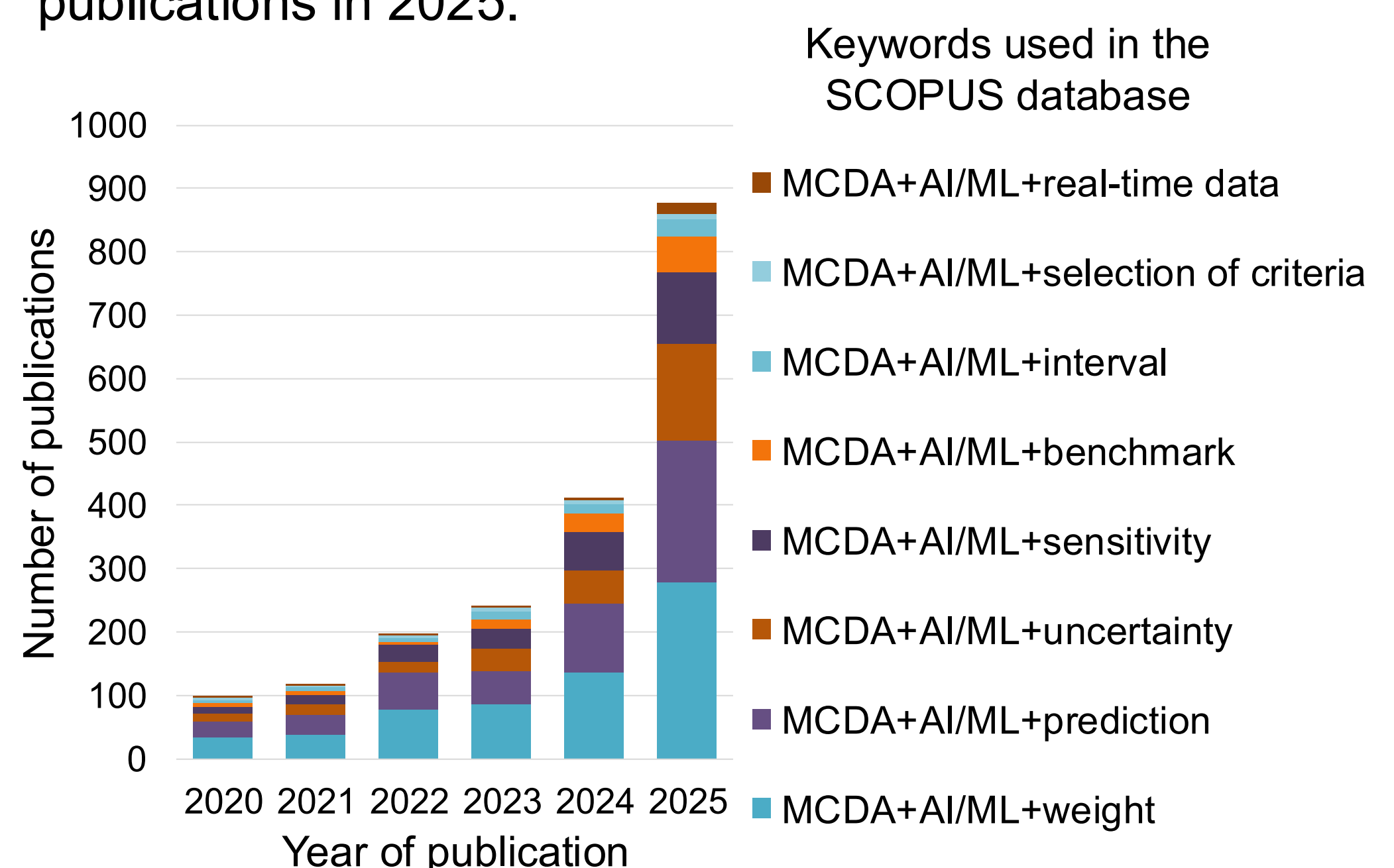
Explainable AI (XAI) makes it possible to transform the "black box" created by MCDA and AI/ML hybrid systems into an approach that is understandable and logical to decision-makers.

Insights

Benefits for MCDA and AI/ML hybrid system	Drawbacks for MCDA and AI/ML hybrid system
Effectively handles complexity and large datasets	Lack of explainability and transparency
Reducing subjectivity and bias	Issues of data quality and robustness
Dynamic adaptability and scalability	Requires high-level human involvement as decision-makers due to ethical reasons

Trends in scientific publications

The number of publications in the Scopus database based on the keywords "multi-criteria decision analysis" or "multi-criteria decision analysis" or "MCDA" or "multi -criteria decision making" or "multi criteria decision making" or "MCDM" and "artificial intelligence" or "AI" or "machine learning" or "ML" showed a trend of a significant increase in the number of publications. While there were 12 publications in 2005, there were 125 publications in 2020 and 322 publications in 2025.



Conclusion

The MCDA and AI/ML hybrid system ensures that decision-makers' choices are not based on intuition, but rather on the use of large datasets and complex models, enabling them to obtain dynamic, real-time assessments.

However, it must be understood that while this approach improves decision-making efficiency and provides a more comprehensive assessment, the human element must not be overlooked.