Abstract for the SmartForest2025 conference by Flaminia Catalli

ProMCDA: A Probabilistic Approach to Multicriteria Decision Analysis for Forest Management

ProMCDA (Probabilistic Multicriteria Decision Analysis) is an open-source Python package [1] designed to enhance decision-making under uncertainty. We will provide an overview of the methodology behind MCDA, where data normalization and aggregation, polarity setting and weight assignement [2] play a crucial role in deriving final scores for decision alternatives. Unlike traditional MCDA methods, ProMCDA accounts for the interplay of different functions and incorporates uncertainty in indicator and weight values.

A case study on forest management will illustrate how ProMCDA can support decision-makers in selecting optimal management strategies for forest stands with varying environmental conditions. By comparing distinct stands, we will explore how different settings impact decision outcomes, and demonstrate ProMCDA's ability to integrate uncertainty into the analysis.

Finally, we will discuss ongoing developments, including a refactoring effort to modularize ProMCDA as a Python library and future plans to extend its capabilities to process geospatial data, making it even more applicable to spatial decision problems.

[1]
Catalli et al., (2025). ProMCDA: A Python package for Probabilistic Multi-Criteria Decision Analysis. Journal of Open Source Software, 10(105), 6190, https://doi.org/10.21105/joss.06190.

[2]
Spada et al., (2024), Effect of Weights and Criteria Uncertainty on Scoring In Multi Criteria Decision Analysis Ranking Problem: Application To Electricity Supply Resilience. Advances in Reliability, Safety and Security.