



Preference learning from different perspectives

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Multiple Criteria Decision Aiding vs. Machine Preference Learning

- Meeting point of MCDA and MPL: learning by examples in order to rank
- MCDA main preoccupations:
 - a) how to integrate preferences in aggregation of vector evaluations?
 - b) how to enrich dominance relation so that non-dominated alternatives become more comparable by preference relation?
 - c) how to exploit preference relation so as to arrive at the ranking?
- MCDA is a constructive learning process with subjective judgements – contrary to machine discovery of a preference system supposed to pre-exist in DMs mind

Multiple Criteria Decision Aiding vs. Machine Preference Learning

- In **MCD**A, preference model built via (Robust) Ordinal Regression aims to reconstruct as faithfully as possible the DM's preference information
 - machine learns a preference model from decision examples (pc, rank-rel-req, intens-pref) to recommend DM's choices
 - DM learns from consequences of applying the compatible preference model on the set of alternatives to be ranked
- In **MPL**, learning is usually achieved by minimizing an empirical estimate of an assumed loss function on rankings
 - machine learns the preference model to predict DM's choices
 - DM can interfere with the learning process in active learning

interaction

Multiple Criteria Decision Aiding vs. Machine Preference Learning

- Empirical comparison wrt the output of MCDA-ROR and MPL is not meaningful, as there is no common context of their use and no objective truth to be attained
- The concept of learning is implemented differently in MCDA-ROR & MPL
- The progress in learning of the DM is not measurable
- Size of data:
 - MCDA-ROR – several dozens of alternatives – scaling is not an issue – faithful representation of DM's preferences is important
 - MPL – massive data – scaling is a fundamental issue – only top of the ranking is relevant

Multiple Criteria Decision Aiding vs. Machine Preference Learning

- Attributes:
 - MCDA-ROR – consistent family of criteria with real-number(-coded) **monotonic preference scales** – hierarchical structure – geographical (spatial) vector data considered within **MCDA-GIS**
 - MPL – **non-monotonic preference scales** permitted – relationships between value sets of attributes & DM's preferences are **discovered** – **complex structures of attributes** (texts, images) permitted
- Amount of available human preferences:
 - MCDA-ROR – **small training set** (preference information)
 - MPL – training set **big enough for statistical learning**

Multiple Criteria Decision Aiding vs. Machine Preference Learning

- Dealing with inconsistencies:
 - MCDA-ROR – treats inconsistencies explicitly during construction of the preference model
 - MPL – process noise in the training data in a statistical way
- Interpretability and regularization of the preference model:
 - MCDA-ROR – interpretability, faithfulness and explicative character of the model are crucial for interaction with the DM
 - MPL – statistical predictability and capacity of handling complex interdependencies over interpretability of the model – faithfulness less important for a fear of overfitting