

First steps towards discovery of non-monotonic utility functions from web usage data

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Web usage data capture the interaction of visitors with a website. This data can be used to infer preferences of individual visitor in terms of stated order of alternatives (products) - from the most preferred alternative to the least preferred one if a) importance of each of the pageviews in the visitor's clickstream is known and b) pages represent products that can be described by a consistent set of criteria. One of the best method for evaluating data of this kind are the UTA methods, whose output is a preference model in the form of utility functions. UTA methods are, however, not applicable if non-monotonic preferences are present. This is unfortunately often the case with web usage data. E.g. consider website offering package holidays. The visitor prefers a certain length of his/her holiday and hence his partial utility function what concerns the length of a holiday is non-monotonic. This paper presents an algorithm that comes out of the UTA methods, but allows non-monotonic preferences. UTA methods use linear programming techniques for finding additive utility functions that best explain stated preferences given the fact that these are monotonous. The method UTA-NM (Non Monotonic) is inspired by the UTA Star algorithm but allows non-monotonic partial utility functions if they decrease total model error. The shape of the functions is determined automatically while linearization techniques ensure balance between the error and simplicity of the model. The resulting program is still linear and convex. The evaluation of the method on a synthetic task achieves the same Pearson Coefficient between the model and stated preferences as Zopounidis Non-Monotonic UTA. Unlike this method, UTA-NM does not require the provision of information on the shape of the utility function neither it is restricted to one change of shape per criterion.