

Scalable Evaluation of Rule-Based Recommender Systems: Algorithms and Benchmarks

Len Feremans^{1,2} and Bart Goethals¹

¹ Adrem Data Lab, University of Antwerp, Belgium
`bart.goethals@uantwerpen.be`

² Data Science Institute, University of Hasselt, Belgium
`len.feremans@uhasselt.be`

Recommender systems help users identify the most relevant items from a large collection of items. Rule-based recommenders offer efficient, interpretable, accurate and trustworthy recommendations that address key challenges in the design of recommenders. Using association rules that have a single or multiple conditions, we build transparent white-box models, especially for long-tail items. In addition, recent studies challenge the trade-off between interpretability and precision [3]. However, aspects beyond accuracy and efficiency—such as popularity bias, coverage, diversity, and comprehensibility—have been largely overlooked in previous evaluations. Additionally, well-known higher-order rule-based recommender methods lack scalability. Finally, many methods have been proposed that vary in rule form, scoring measures, aggregation, and inference strategies.

We introduce RuleRec, a scalable toolkit offering six seminal rule-based recommenders [1, 2]. We extend Apriori, MSApriori and adaptive-support rule mining, thereby presenting novel algorithms based on the generalization of pairwise rule mining using an inverted index. We find that the proposed algorithms are an order of magnitude more efficient. Finally, we empirically evaluate six rule-based recommender algorithms on six benchmark datasets, comparing their accuracy, efficiency, diversity, popularity bias, and comprehensibility. To our knowledge, this is the first work to provide an efficient open-source implementation and comparative evaluation over multiple rule-based recommenders. This work supports applications prioritizing recall, and demanding trustworthiness. We also highlight future research directions to enhance rule-based recommenders.

References

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