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BAYESIAN PREFERENCE LEARNING: FROM GENOMICS TO RECOMMENDATION SYSTEMS

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Ranking items is crucial for collecting information about preferences in many areas, and the interest often lies both in producing estimates of the consensus ranking of all items, and in learning individualized preferences of the users. This latter task is particularly relevant for recommender systems, where posterior distributions of individual rankings allow for prediction (with uncertainty) of each user's missing individual preferences, thus suggesting personalized recommendations.

To these purposes, we propose to use the Mallows rank model, a quite intuitive distance-based approach to analyze rank data, able of flexibly handling very different applicative problems. We develop new computationally tractable methods for Bayesian inference in Mallows models, allowing a fully probabilistic analysis, and easily handling missing data via augmentation procedures. Our method performs inference also based on partial rankings, such as top-k items or pairwise comparisons. We propose a mixture model for clustering heterogeneous users in homogeneous subgroups, with cluster-specific consensus rankings. Interestingly, this Bayesian framework also allows for genomic data integration, since ranks are insensitive to heterogeneity in the measurement scales. The use of ranks in combining genomic studies is relevant, since the biological interest often lies in over/under-expressed genes for a given pathology.

joint work with: Øystein Sørensen, Marta Crispino, Arnoldo Frigessi, Elja Arjas; for genomics: Magne Thoresen, Manuela Zucknick