Diversity-oriented Multimodal and Interactive Information Retrieval

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Abstract

Information retrieval methods, especially considering multimedia data, have evolved towards the integration of multiple sources of evidence in the analysis of the relevance of the items considering a given user search task. In this context, for attenuating the semantic gap between low-level features extracted from the content of the digital objects and high-level semantic concepts (objects, categories, etc.) and making the systems adaptive to different user needs, interactive models have brought the user closer to the retrieval loop allowing user-system interaction mainly through implicit or explicit relevance feedback. Analogously, diversity promotion has emerged as an alternative for tackling ambiguous or underspecified queries. Additionally, several works have addressed the issue of minimizing the required user effort on providing relevance assessments while keeping an acceptable overall effectiveness.

This thesis discusses, proposes, and experimentally analyzes multimodal and interactive diversity-oriented information retrieval methods. This work, comprehensively covers the interactive information retrieval literature and also discusses about recent advances, the great research challenges, and promising research opportunities. We have proposed and evaluated two relevance-diversity trade-off enhancement work-flows, which integrate multiple information from images, such as: visual features, textual metadata, geographic information, and user credibility descriptors. In turn, as an integration of interactive retrieval and diversity promotion techniques, for maximizing the coverage of multiple query interpretations/aspects and speeding up the information transfer between the user and the system, we have proposed and evaluated a multimodal online learning-to-rank method trained with relevance feedback over diversified results.

Our experimental analysis shows that the joint usage of multiple information sources positively impacted the relevance-diversity balancing algorithms. Our results also suggest that the integration of multimodal-relevance-based filtering and reranking is effective on improving result relevance and also boosts diversity promotion methods. Beyond it, with a thorough experimental analysis we have investigated several research questions related to the possibility of improving result diversity and keeping or even improving relevance in interactive search sessions. Moreover, we analyze how much the diversification effort affects overall search session results and how different diversification approaches behave for the different data modalities. By analyzing the overall and per feedback iteration effectiveness, we show that introducing diversity may harm initial results whereas it significantly enhances the overall session effectiveness not only considering the relevance and diversity, but also how early the user is exposed to the same amount of relevant items and diversity.

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