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Concepts, Models and Evaluation

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Abstract. Recent work have shown the potential of collaboration for
solving complex or exploratory search tasks allowing to achieve synergic
effects with respect to individual search, which is the prevalent informa-
tion retrieval (IR) setting this last decade. This interactive multi-user
context gives rise to several challenges in IR. One main challenge relies
on the adaptation of IR techniques or models [8] in order to build algo-
rithmic supports of collaboration distributing documents among users.
The second challenge is related to the design of Collaborative Infor-
mation Retrieval (CIR) models and their effectiveness evaluation since
individual IR frameworks and measures do not totally fit with the collab-
oration paradigms. In this tutorial, we address the second challenge and
present first a general overview of collaborative search introducing the
main underlying notions. Then, we focus on related work dealing with
collaborative ranking models and their effectiveness evaluation. Our pri-
mary objective is to introduce these notions by highlighting how and why
they should be different from individual IR in order to give participants
the main clues for investigating new research directions in this domain
with a deep understanding of current CIR work.

Keywords: Collaborative Information Retrieval, Collaboration, Search
Process, Ranking Model, Evaluation

1 Introduction and Tutorial Objectives

Traditional conceptualizations of an IR task generally rely on an individual user's
perspective. Accordingly, a great amount of research in the IR domain mostly
dealt with both the design of enhanced document ranking models and a deep
user's behavior understanding with the aim of improving an individual search
effectiveness. However, in practice, collaboration among a community of users
is increasingly acknowledged as an effective mean for gathering the complemen-
tary skills and/or knowledge of individual users in order to solve complex shared
search tasks, such as fact-finding tasks (e.g., travel planning) or exploratory

search tasks [13, 18]. Collaboration allows the group achieving a result that is more effective than the simple aggregation of the individual results [14]. This class of complex search settings frequently occurs within a wide-range of domain-applications, such as the medical domain, the legal domain or the librarian domain to cite but a few. CIR results in collaborative information behavior processes, such as information sharing, evaluation, synthesis and sense-making. Two fundamental research challenges are faced by the design of CIR systems [8]: 1) allowing effective communication and coordination among the collaborators and 2) achieving high synergic effectiveness of the search results.

This tutorial focuses on the second challenge and pay a great deal of attention to how collaboration could be integrated in IR models and effectiveness evaluation processes. Our goal is to provide concepts and motivation to researchers so that participants could investigate this emerging IR domain as well as giving them some clues on how to experiment their models. More specifically, the tutorial aims to:

1. Give an overview of the concepts underlying collaborative information behavior and retrieval;
2. Present state-of-the art retrieval techniques and models that tackle the search effectiveness challenge;
3. Synthesize the metrics used for the evaluation of the effectiveness of CIR systems.

2 Outline

Part 1: Collaborative Information Retrieval Fundamental Notions
In this part, our primary objective is specifically to propose a broad review of collaborative search by presenting a detailed notion of collaboration in a search context including its definition [6, 20], dimensions [2, 5], paradigms [4, 9], and underlying behavioral search process [3, 7].

1. **Notion of collaboration in information seeking and retrieval**
2. **Dimensions of Collaboration**
3. **Collaboration Paradigms**
4. **Behavior Processes**

Part 2: Models and Techniques for Collaborative Document Seeking and Retrieval
CIR models provide an algorithmic mediation that enables to leverage from collaborators' actions in order to enhance the effectiveness of the search process [19]. In this context, previous work have been proposed, characterized by two common axes based on the relevance judgment integration and the division of labor paradigm. While the integration of relevance judgments is issued from interactive and contextual search, division of labor is an intrinsic feature of collaboration and represents the most common paradigm integrated in CIR models

since it avoids redundant actions between collaborators. Among the multiple possible types of division of labor, only the algorithmic and the role-based ones are appropriate for the CIR domain [9]. One of the main approaches relies on the search strategy differences between collaborators using roles [12, 15, 16, 17, 19], where the algorithmic-based division of labor considers that users have similar objectives (in this case, users could be seen as peers) [4, 11]. These approaches are contrasted to the ones surrounded by a division of labor guided by collaborators' roles in which users are characterized by asymmetric roles with distinct search strategies or intrinsic peculiarities.

1. **Algorithmic-Driven Division of Labor-based Document Ranking models**
2. **Role-Based Document Ranking Models**

Part 3: Effectiveness Evaluation of Collaborative Document Seeking and Retrieval
Due to the complexity of the collaborative search setting, its evaluation is challenging and constitutes an opened perspective in CIS and CIR [13]. Indeed, the high-level on heterogeneous interactions engaged for the coordination and the collective sense-making necessary to solve a shared information need raise new issues not yet tackled in interactive and contextual search. Concerning the IR aspects, the goal of this evaluation is no longer limited to the assessment of the document relevance with respect to a query, but rather the collective relevance in response to the information need expressed by all users. While the evaluation of individual IR depends only on the query and, in the case of personalized IR, the user, evaluating collaborative ranking models and techniques should consider the aspects connected to the collaboration. We present in this section, for both CIS and CIR, the evaluation framework listing the existing protocols and the evaluation metrics.

1. **Taxonomy of evaluation methodologies**
2. **Evaluation metrics**

Part 4: Perspectives. Collaborative search rises several perspectives. Some of them are outlined in this tutorial. More particularly, we focus on the use of roles in collaborative search [17], the leveraging of social media [10] as well as the standardization of evaluation framework [1].

1. **User-driven CIR models**
2. **Community-based and Social-Media-Based Collaborative Information Information Retrieval Systems**
3. **Standardization and CIR evaluation campaigns**

Part 5: Questions and Discussion with the Instructors
We end with an open discussion with participants.

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