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Introduction to the Special Issue

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Conversational Search and Recommendation: Introduction to the Special Issue

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1 INTRODUCTION

While conversational search and recommendation has roots in early **Information Retrieval (IR)** research, the recent advances in automatic voice recognition and conversational agents have created increasing interest in this area. This topic was recognized as an emerging research area in the Third Strategic Workshop on Information Retrieval in Lorne (SWIRL 2018) [Culpepper et al. 2018].[1] Conversational search and recommendation systems consist of multiple components, from user modeling to conversational understanding to query modeling to result presentation.

In recent years, the IR and related communities have witnessed a number of major contributions to the field of conversational search and recommendation. They include but are not limited to conversational search conceptualization (e.g., Azzopardi et al. [2018], Deldjoo et al. [2021], and Radlinski and Craswell [2017]), effective conversational query re-writing (e.g., Yu et al. [2020]), generating and selecting clarifying questions (e.g., Zamani et al. [2020a, c]), conversational preference elicitation (e.g., Radlinski et al. [2019] and Zhang et al. [2018]), and understanding user interactions with spoken conversational systems (e.g., Trippas et al. [2018, 2020]). The growing body of work in this area has been supplemented by an increasing number of recent seminars (e.g., Anand et al. [2020]), workshops (e.g., Arguello et al. [2018], Burtsev et al. [2017], Chuklin et al. [2018], and

[1] https://sites.google.com/view/swirl3/.

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Spina et al. [2019]), tutorials (e.g., Fu et al. [2020] and Gao et al. [2018]), shared tasks (e.g., Dalton et al. [2019, 2020], Ram et al. [2018]), and datasets (e.g., Aliannejadi et al. [2019], Choi et al. [2018], Radlinski et al. [2019], Reddy et al. [2019], Thomas et al. [2017], Trippas and Thomas [2019], and Zamani et al. [2020b]). Despite this great success, there are still numerous open problems in this domain that require in-depth investigation. Papers presented in this special issue target some of these important problems and suggest insightful future directions for the field.

2 OVERVIEW OF PAPERS

We received 27 submissions in response to the "call for papers" that was first announced in March 2020. This special issue presents the papers that were accepted for publication. It covers a wide range of topics related to conversational systems, including one paper on the theory of conversational interactions, three papers on conversational recommender systems, three papers on chatbots and dialogue systems, five papers on conversational search systems, two papers on evaluating conversational information seeking, one paper that presents a contrasting perspective of a semantic conversational system used with IoT devices, and one paper on diversifying responses in conversation models.

Thomas et al. [2021] in the first article of the issue provide a theoretical analysis of human-to-human conversations and connect the dots to recent advances in conversational search systems. In more detail, they examine well-established social communication theories within the context of conversations with humans in addition to agents and robots. Their work suggests initial guidelines and makes recommendations for future work on social communication, moves and structures, affect, style and alignment, simulations, data creation, and evaluation methodologies in the context of conversational IR systems.

In the second article of this issue, Li et al. [2021a] propose *Conversational Thompson Sampling*, a model for conversational recommendation systems that focuses on cold-start users. The work advances the state of the art in conversational recommender systems. In the next article, Contreras et al. [2021] study conversational group recommender systems with a web-based interface and perform extensive user studies to demonstrate the effectiveness of the proposed approach. A unique property of their approach is the exploitation of the interactions between users in a group during the recommendation sessions. Related to this research topic, Wilkinson et al. [2021] bridge the gap between conversational recommendation and trust and explainability. They focus on "why" and "why not" justifications for recommendations through conversational interactions in the domain of movie recommendation. This work contains interesting findings for conversational recommendation design. For example, the online experiments suggest that the studied "why" justifications (but not the "why not" justifications) have a significant impact on users' perception of the recommendation engine.

Even though chatbots and dialogue systems are not mainly targeting information seeking tasks, such as search and recommendation, they are somewhat related to the broad area of conversational search and recommendation. Wei et al. [2021] design and develop an end-to-end neural chatbot architecture that is optimized to provide responses that not only are semantically relevant and coherent, but also take emotional information into account. This joint optimization leads to improvements in terms of both semantic- and emotional-level evaluation. On the other hand, Xu et al. [2021] focus on retrieval-based approaches to dialogue systems and propose a representation-interaction-matching framework. The intuition behind this work is to model the relation of neighboring elements and phrasal patterns in addition to long-range dependencies in dialogues. The article presents strong performances on three public multi-turn dialogue response selection

benchmarks. Related to this work, Li et al. [2021b] study personalized wording in dialogue history to improve retrieval-based dialogue systems.

Four of the accepted articles are related to conversational search systems. Musto et al. [2021] build a personal digital assistant, called MyrrorBot, that enables users to have personalized access to online services, such as music, videos, games, and news. A nice characteristic of MyrrorBot is that it enables users to query their own user profiles to learn about the features encoded in their profile, which improves the transparency of the personalization process. The qualitative and quantitative evaluations of the model through a set of user studies demonstrate the effectiveness of the developed agent. Ren et al. [2021] study the concept of conversation with search engines, whose goal is to provide a natural language interface to the users that supports multi-turn interactions. They focus on addressing complex information needs that require multi-turn user-system interactions. They create and release the SaaC dataset (Search as a Conversation) and propose a pipeline for conversations with search engines. Lin et al. [2021] focus on conversational passage retrieval and propose two conversational query reformulation methods. The first method focuses on term importance estimation, while the other method rewrites the query using a sequence-to-sequence model. The outputs of these two methods are fused and led to 30% NDCG@3 improvement compared to the top-performing submission at the TREC CAsT Track in 2019. Vakulenko et al. [2021] perform a large-scale analysis of mixed-initiative interactions in 15 publicly available datasets and uncover the limitations of existing benchmarks. Kiesel et al. [2021] conduct a through study of meta-information in conversational search. Exchange of meta-information in conversational search is necessary to complete the seeker's state of knowledge. The authors refine the existing definitions of meta-information for conversational search and conduct quantitative and qualitative analysis on MISC [Thomas et al. 2017] and SCS datasets [Trippas and Thomas 2019] for analyzing conversational interactions that contain meta-information.

Evaluating conversational search, and interactive IR in general, is challenging. Lipani et al. [2021] explore offline evaluation of conversational search systems. The work is based on the idea of subtopics, which has been extensively used in evaluating search novelty and diversity. The proposed evaluation framework is based on a user model similar to the well-known geometric browsing model. Liu et al. [2021] evaluate the existing evaluation metrics used in the conversational search literature in terms of reliability, fidelity, and intuitiveness. This study shows that existing metrics correlate weakly with user satisfaction, and also suggests that existing session-based evaluation metrics can be used for measuring the quality of multi-turn conversational search with moderate concordance with user satisfaction.

Corno et al. [2021] study conversational interactions for the Internet of Things by exploring IF-THEN rules that can be deployed in different contexts. This article presents a semantic conversational system, called HeyTAP, that takes into account the current user's intention, the connected entities owned by the user, and the user's long-term preferences.

In the last article included in this special issue, Yan et al. [2021] focus on improving the diversity of responses in conversation models. They achieve this goal by learning end-to-end dynamic representations for each input query conditioned on different response candidates. Evaluation on a wide range of human-to-human conversational data, including those collected from community question answering websites, forums, and micro-blog social networks, demonstrates the effectiveness of the proposed approach in terms of both appropriateness and diversity.

3 CONCLUSIONS

The articles included in this special issue cover a broad range of topics related to conversational search and recommendation, from theoretical analysis to algorithmic modeling to evaluation.

Despite the growing body of work in conversational search and recommendation, it is important to note that most of the topics in this area are still under-researched. We are still yet to observe many breakthrough ideas in this domain in the coming years.

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