



Preface to the special issue on conversational recommender systems: theory, models, evaluations, and trends

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1 Introduction

In recent years, the landscape of human-computer interaction has been significantly reshaped by the rapid proliferation of digital assistants (DAs) such as Amazon Alexa, Apple's Siri, and Google Assistant. These technologies have transformed how users engage with digital environments, enabling interactions through natural language. However, despite the advancements in executing tasks like playing music, making phone calls, or sending messages, the field of recommendation systems within these conversational agents remains in its infancy (Iovine et al. 2020).

This gap has reignited interest among researchers, positioning conversational recommender systems (CRSs) at the forefront of both academic and industry focus (Jannach et al. 2021). This interest has been further amplified by the rapid growth in attention toward large language models (LLMs) and their applications for recommendation tasks (Yang and Chen 2024; Di Palma et al. 2024).

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CRSs represent a shift from traditional recommendation models by enabling users to refine their preferences through an incremental dialog. Unlike one-shot recommendations, where users receive suggestions based on limited input, CRSs allow users to progressively articulate their needs, adjusting their requests as the conversation unfolds. This ongoing dialog presents both opportunities and challenges that need further exploration.

One of the key areas requiring attention is the theoretical foundation of CRSs. There has been limited exploration of the underlying strategies and algorithms that can drive more sophisticated conversational recommendations. Beyond the complexity of building an effective CRS, researchers are now investigating how these systems can integrate advanced recommendation techniques, domain knowledge, and decision-making processes to more effectively serve users (Di Noia et al. 2022).

A pivotal aspect of CRSs is the need for rich domain knowledge. Whether this knowledge is represented in structured formats, like databases or taxonomies, or in more complex forms like knowledge graphs, it is essential for understanding the items being recommended. The ability to harness such knowledge can significantly enhance a CRS's ability to generate relevant, diverse, and high-quality recommendations that align with the user's evolving preferences throughout the conversation.

Evaluation is another critical and complex aspect of CRSs that sets them apart from traditional recommender systems. While traditional evaluation metrics such as accuracy are still relevant, CRSs introduce new dimensions of performance assessment. For instance, the user effort required to reach a satisfactory recommendation, the diversity and novelty of the suggested items, and the quality of explanations provided by the system are all essential factors to consider. Additionally, many evaluations of CRSs demand user studies, where real interactions can shed light on the system's effectiveness and user satisfaction in a dynamic, conversational environment.

This special issue brings together cutting-edge research on the various aspects of CRSs, from foundational theory and model development to the practical challenges of evaluation and emerging trends in the field. We aim to present a comprehensive view of the progress in this area and inspire future research and development efforts to push the boundaries of conversational recommendation systems. As this field continues to evolve, we anticipate that CRSs will play a central role in revolutionizing how people discover, explore, and engage with digital content.

2 Accepted articles

The accepted contributions range from systematic literature reviews to work that focus on specific aspects of the conversational recommendation pipeline, as well as case studies in particular domains.

Farshidi et al. in the paper titled *Understanding user intent modeling for conversational recommender systems: a systematic literature review* present a systematic literature review on user intent modeling in conversational recommender systems. They identified 59 distinct models and 74 commonly used features, providing insights into trends, model combinations, evaluation measures, and datasets. The authors developed a decision model to guide researchers in selecting appropriate intent models for

their systems, offering practical support for improving personalized responses in AI-driven recommendations. Two case studies were conducted to validate the decision model's effectiveness in helping researchers choose suitable user intent models for conversational recommender systems.

On the topic of user intent Ma et al., in their work titled *Investigating meta-intents: user interaction preferences in conversational recommender systems*, introduce the concept of meta-intents (MI), which represent high-level user preferences related to interaction styles and decision-making support in conversational recommender systems (CRS). Through an exploratory study (212 participants) and a confirmatory study (394 participants), the authors develop a stable MI questionnaire with 22 items, corresponding to seven interaction preference factors. They find that MI can link general psychological characteristics to CRS design. Additionally, a CRS framework with a chatbot in the smartphone domain is used to study real interactions. Online and interview studies (99 and 19 participants, respectively) reveal that factors like dialog initiation and efficiency orientation significantly affect interaction behavior. Based on these findings, the authors offer design suggestions for personalizing CRS interactions using meta-intents.

Di Bratto et al. move the attention to the evaluation of argumentative CRSs through linguistic-based dialog simulations in their paper titled *Linguistics-based dialog simulations to evaluate argumentative conversational recommender systems*. The authors introduce an argumentation-based conversational recommender model that leverages cognitive pragmatics to enhance the relevance of recommendations by presenting supporting arguments. These systems aim to help users make informed decisions through deliberative dialog, where the system and user share beliefs and work toward a common goal. The authors develop a dialog simulator to evaluate this model and generate synthetic dialogs based on a computational implementation of the linguistic theory. Human evaluations indicate that these dialogs are both natural and effective in selecting appropriate supporting arguments, validating the model's theoretical approach.

In the paper *Design of a conversational recommender system in education*, Valtolina et al. focus their attention on the specific domain of education. This paper presents a new approach to creating digital courses using learning objects (LOs) as foundational elements, facilitated by an intelligent chatbot. Developed with RASA technology, the chatbot helps teachers by gathering information about their profile and course needs, then recommends relevant LOs and suggests how to combine them based on prerequisites and outcomes. The recommendations are powered by BERT, a machine learning model using Transformers to assess semantic similarity between input data and LO metadata. The paper includes preliminary results from teacher trials, demonstrating the chatbot's effectiveness in assisting course creation.

Finally, in the paper titled *Toward joint utilization of absolute and relative bandit feedback for conversational recommendation* Xia et al. present a hybrid conversational recommender system that combines absolute and relative feedback to enhance user preference elicitation in recommendation tasks. Traditional recommender systems often rely on one type of feedback, either absolute (prone to bias) or relative (lacking absolute user attitudes). To overcome this, the proposed system seamlessly integrates both types of feedback, including neutral responses, for more accurate preference capture. The authors introduce two bandit algorithms, RelativeConUCB and ArcUCB,

to effectively model and utilize this mixed feedback. Experiments on synthetic and real-world datasets demonstrate the superiority of their approach over existing methods.

3 Conclusion and future directions

The field of conversational recommender systems has made significant advancements in personalizing recommendations through dialogs that capture user preferences more effectively.

Key contributions of this Special Issue include:

- **Hybrid Feedback Models:** Systems that integrate both absolute and relative user feedback to improve preference elicitation accuracy
- **User Intent Modeling:** Systematic models for better understanding user intentions, aiding personalized responses
- **Meta-Intents:** A novel concept that links high-level user preferences and decision-making styles to enhance interaction in CRS
- **Argumentative CRS:** Integration of argumentation-based dialog to support recommendations with logical reasoning, improving trust and decision-making
- **Chatbot-Based Learning Assistance:** Intelligent chatbots using machine learning (e.g., BERT) to assist in content recommendation and creation in specific domains like e-learning

As future challenges we can identify:

- **Dynamic and Adaptive Systems:** Developing systems that can adapt in real time to users' changing preferences and context across multiple sessions
- **Integration of Multimodal Interaction:** Incorporating more diverse forms of interaction, such as voice, gestures, images, or emotional responses, to provide a more holistic interaction
- **LLM-based methodologies for recommendation:** Large language models (LLMs) are revolutionizing natural language interactions with intelligent systems (Zhang et al. 2024), including recommender systems. Recently, there has been rapid growth in research exploring the application of LLMs for various tasks in CRS. This emerging area holds significant promise and warrants deeper investigation to fully unlock its potential.
- **Cross-Domain CRS:** Creating systems that can handle recommendations across various domains and switch context fluidly
- **Explainability and Trust:** Improving transparency in recommendation processes, especially for argument-based CRS, to build user trust
- **Scalability and Real-World Applications:** Ensuring CRS can scale effectively in practical settings, especially in areas like education, healthcare, and e-commerce
- **New Forms of Evaluation:** Traditional accuracy-focused evaluation methods may not fully capture the quality of CRS interactions. Future evaluations should focus on user experience, dialog quality, and engagement over time. Additionally, considering metrics like user satisfaction, decision confidence, and long-term preference alignment will provide a more comprehensive view of CRS performance.

These areas represent the next steps toward creating highly personalized, adaptive, and context-aware CRS that can interact with users in a meaningful, efficient, and transparent manner.

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