Sixth Knowledge-aware and Conversational Recommender Systems Workshop (KaRS 2024)

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Abstract
This is the preface for the Proceedings of the Sixth Knowledge-Aware and Conversational Recommender Systems Workshop (KaRS 2024), co-located with the 18th ACM RecSys 2024 conference.

Keywords
recommender systems, knowledge-aware, conversational, workshop, proceedings

1. Introduction

In this volume, we present the contributions showcased at the Sixth Knowledge-aware and Conversational Recommender Systems Workshop (KaRS 2024), co-located with the 18th ACM Conference on Recommender Systems (RecSys 2024) [1], which took place in Bari, Italy. Since its inaugural edition in Vancouver (Canada) in 2018 [2, 3], KaRS has evolved into a premier forum for discussing the integration of knowledge representation and conversational systems in recommendation. Over the years, KaRS has been co-located with major conferences in various cities such as Beijing (2019) [4, 5], Amsterdam (2021) [6, 7], Seattle (2022) [8, 9], and Singapore (2023) [10, 11].

Recommender systems are now ubiquitous across a variety of domains, from e-commerce to media content suggestions, and play a pivotal role in enhancing online user experiences. Despite their widespread adoption, these systems face challenges in engaging effectively with human users [12]. While data-driven algorithms have proven successful in uncovering patterns in user-item interactions [13, 14], they often fail to fully account for the central actor in this loop: the end-user.

A key aspect of user behavior that is frequently underrepresented in recommendation systems is the use of domain-specific knowledge. Fortunately, Knowledge-aware Recommender Systems are gaining increasing attention within the recommendation community. By leveraging structured domain knowledge represented in ontologies or Knowledge Graphs (KGs), these

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systems can model semantic relationships between users, items, and entities, offering more personalized and relevant recommendations. Although knowledge-aware approaches have existed for over two decades [15, 16, 17, 18, 19], their significance has been revitalized by the Linked Open Data initiative[1] and the growing availability of large knowledge repositories such as DBpedia[2] and Wikidata[3]. This renewed interest is evident in workshops and conferences such as ISWC, ACM RecSys, UMAP, AAAI, ECAI, IJCAI, and SIGIR. Linked data underpins many modern approaches in areas such as Knowledge Graph embeddings [20, 21, 22, 23], hybrid recommendation [18, 24], link prediction [25, 26, 27, 28, 29], knowledge transfer [13], interpretable recommendation [30, 31, 18], and user modeling [32, 33, 34, 35, 19], even in distributed and privacy-oriented architectures [36, 37].

Additionally, recent advances have brought neuro-symbolic systems to the forefront, integrating data-driven methodologies with symbolic reasoning [38]. This fusion of machine learning, which excels at leveraging data, with symbolic approaches, adept at understanding knowledge, holds great promise for improving recommendation quality, especially in data-sparse environments [39].

Parallel to these developments, Conversational Recommender Systems (CRSs) [40] have gained momentum by enhancing the quality of interactions between users and systems, particularly in multi-turn dialogues [41]. CRSs introduce challenges such as incorporating both short- and long-term preferences, dynamically adapting to user feedback, and navigating limitations in available datasets [42]. The rise of Large Language Models (LLMs) has revitalized CRSs, enabling more natural and effective user interactions. LLMs, with their advanced capabilities in natural language understanding, have significantly impacted the ability of CRSs to process complex user queries and generate meaningful recommendations [42]. Moreover, LLMs enhance CRSs' adaptability and responsiveness by continuously learning from user interactions, thus improving the overall user experience.

This year's KaRS continues to reflect the growing convergence of knowledge-aware and conversational recommender systems, with a focus on neuro-symbolic approaches and the application of LLMs to enhance personalized and interactive recommendation experiences. We are proud to present an impressive range of contributions, each peer-reviewed by a rigorous program committee, ensuring the high quality of this year's workshop and solidifying KaRS as a key platform for discussing the future of these exciting technologies.

2. Background and Goals

Recommender systems have become an integral part of everyday life, powering applications in diverse fields such as e-commerce, entertainment, and content curation. However, despite their widespread use, many systems still face challenges when it comes to engaging users effectively [12]. While deep learning techniques have significantly improved the ability to uncover latent relationships between users and items [43], they often fail to fully capture the user's perspective and feature relevance in the recommendation process [44].

[1] http://linkeddata.org
[2] https://dbpedia.org
[3] https://wikidata.org

A key approach to overcoming these limitations lies in knowledge-based methods [15, 16, 17, 18]. These techniques utilize knowledge graphs and ontologies to model the relationships between users, items, and other entities in a domain. Large knowledge graphs, such as DBpedia[4] and Wikidata[5], have played a crucial role in revitalizing interest in these methods. Recent advances focus on knowledge graph embeddings [20, 21, 22, 27, 23], hybrid recommendation systems [18, 45, 46], link prediction [25, 26, 27, 47, 48, 28, 29], and interpretable recommendation [30, 31, 18].

Moreover, a new wave of research is emerging through neuro-symbolic systems, which integrate data-driven machine learning techniques with symbolic reasoning [38]. These approaches hold promise for improving recommendations, particularly in scenarios where training data is sparse, by effectively leveraging both data and knowledge [39].

Conversational Recommender Systems (CRSs) represent another important advancement in this space. CRSs engage users through multi-turn dialogues, allowing the system to gather more detailed preferences and adjust recommendations dynamically [40, 41]. The conversational nature of these systems introduces unique challenges, such as balancing short- and long-term preferences, adapting quickly to user feedback, and developing evaluation metrics that go beyond accuracy [42]. Despite limited dataset availability often due to privacy requirements [42, 49], recent research into CRSs has been rapidly growing [41, 50]. The advent of Large Language Models (LLMs) is set to further transform this field. LLMs bring sophisticated natural language understanding capabilities that can greatly enhance the conversational experience, allowing systems to process complex user queries and provide more intuitive and relevant recommendations.

In light of these advances, the *Sixth Knowledge-aware and Conversational Recommender Systems (KaRS)* Workshop aims to serve as a platform for sharing recent research and exploring future directions in knowledge-aware and conversational recommender systems. This edition will place particular emphasis on the integration of LLMs, neuro-symbolic methodologies, and knowledge-based approaches, highlighting their potential to address the challenges and opportunities in this rapidly evolving domain.

2.1. Objectives

The *Sixth Knowledge-aware and Conversational Recommender Systems (KaRS)* Workshop [10, 8, 6, 4, 2] is not just another academic event centered on the latest advancements in recommendation algorithms. Instead, its primary goal is to inspire a new wave of research focused on enhancing user experience, engagement, and satisfaction [51], rather than solely emphasizing algorithmic accuracy [12].

By integrating diverse expertise from fields such as Machine Learning, Human-Computer Interaction, Information Retrieval, and Information Systems, this workshop seeks to drive forward innovative research directions.

KaRS provides a vibrant platform for researchers, practitioners, and industry professionals to not only share their latest findings but also to identify emerging trends, outline future challenges, and explore opportunities for research and development. By encouraging active participation

[4] https://dbpedia.org
[5] https://wikidata.org

and idea-sharing, KaRS fosters the growth of an interdisciplinary community dedicated to knowledge-aware and conversational recommender systems, while also embracing cutting-edge topics such as Large Language Models (LLMs) and neuro-symbolic approaches, which further expand the scope of this year's edition.

2.2. Topics

Topics of interests include, but are not limited to:

- **Models and Feature Engineering**: Data models based on structured knowledge sources (e.g., Linked Open Data, Wikidata, BabelNet, etc.), Neuro-Symbolic approaches to recommendation, Semantics-aware approaches exploiting the analysis of textual sources (e.g., Wikipedia, Social Web, etc.), Knowledge-aware user modeling, Methodological aspects (evaluation protocols, metrics, and datasets), Logic-based modeling of a recommendation process, Knowledge Representation and Automated Reasoning for recommendation, Deep learning methods to model semantic features, Large Language Models for Conversational Recommenders
- **Beyond-Accuracy Recommendation Quality**: Using knowledge bases and knowledge graphs to increase recommendation quality (e.g., in terms of novelty, diversity, serendipity, or explainability), Explainable Recommender Systems, Knowledge-aware explanations (compliant with the GDPR)
- **Online Studies**: Knowledge sources for cross-lingual recommendations, Applications of knowledge-aware recommenders (e.g., music or news recommendation, off-mainstream application areas), User studies (e.g., on the user's perception of knowledge-based recommendations), field studies
- **Design of a Conversational Agent**: Design and implementation methodologies, Dialogue management (end-to-end, dialogue-state-tracker models), UX design, Dialogue protocol design
- **User Modeling and Interfaces**: Critiquing and user's feedback exploitation, Short- and Long-term user profiling and modeling, Preference elicitation, Natural language, multimodal, and voice-based interfaces, Next-question problem
- **Methodological and Theoretical aspects**: Evaluation and metrics, Datasets, Theoretical aspects of conversational recommender systems

3. Program

The program of the half-day workshop consisted of:

- a session with the presentation of three papers on Content-based and Knowledge-aware Recommender Systems;
- a session with the presentation of two papers on Large Language Models for recommendation;

- a keynote by Nicola Ferro (Full Professor in Computer Science at the Department of Information Engineering at the University of Padua, Italy) on the Dagstuhl CAFE Framework for the evaluation of Conversational Agents: Ferro discussed the evaluation of conversational agents used in Information Retrieval (IR) and Recommender Systems (RS), emphasizing challenges like personalization, veracity, bias, and trustworthiness; he presented insights from the Dagstuhl Perspectives Workshop on the topic, proposing evaluation methods to address these issues, especially with the rise of Large Language Models;
- a session with the presentation of three papers on Conversational Recommender Systems.

4. Website & Proceedings

All workshop material including schedule and news will be found on the 2024 workshop website at https://kars-workshop.github.io/2024/.

5. Program Committee

We thank the members of the Program Committee of KaRS 2024 for their thorough reviews and the detailed feedback they gave to the authors. The PC comprised people from different countries and spanning various levels of seniority: **Nourah AlRossais** (King Saud University), **Vito Walter Anelli** (Polytechnic University of Bari), **Marco Angelini** (Sapienza University of Rome), **Pierpaolo Basile** (University of Bari), **Giovanni Maria Biancofiore** (Polytechnic University of Bari), **Ludovico Boratto** (University of Cagliari), **Salvatore Bufi** (Polytechnic University of Bari), **Tommaso Carraro** (University of Padova), **Giandomenico Cornacchia** (Polytechnic University of Bari), **Alessandro De Bellis** (Polytechnic University of Bari), **Marco de Gemmis** (University of Bari), **Dario Di Palma** (Polytechnic University of Bari), **Davide Di Ruscio** (Università degli Studi dell'Aquila), **Francesco Maria Donini** (Università della Tuscia), **Antonio Ferrara** (Polytechnic University of Bari), **Dietmar Jannach** (University of Klagenfurt), **Daniele Malitesta** (Polytechnic University of Bari), **Alberto Carlo Maria Mancino** (Polytechnic University of Bari), **Mirko Marras** (University of Cagliari), **Giacomo Medda** (University of Cagliari), **Cataldo Musto** (University of Bari), **Franco Maria Nardini** (ISTI-CNR), **Fedelucio Narducci** (Polytechnic University of Bari), **Vincenzo Paparella** (Polytechnic University of Bari), **Aleksandr Petrov** (University of Glasgow), **Claudio Pomo** (Polytechnic University of Bari), **Azzurra Ragone** (University of Bari), **Paolo Sorino** (Polytechnic University of Bari), **Marko Tkalcic** (Free University of Bozen), **Markus Zanker** (Free University of Bozen and University of Klagenfurt).

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