Fourth Knowledge-aware and Conversational Recommender Systems Workshop (KaRS 2022)

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Abstract
This is the preface for the Proceedings of the Fourth Workshop on Knowledge-Aware and Conversational Recommender Systems (KaRS 2022), co-located with the 16th ACM RecSys 2022 conference.

Keywords
recommender systems, workshop, proceedings

1. Introduction

In this volume, we include the contributions presented at the Fourth Workshop on Knowledge-aware and Conversational Recommender Systems (KaRS), co-located with the 16th ACM Conference on Recommender Systems (RecSys 2022) [1]. The first edition of KaRS was held in Vancouver (Canada), co-located with RecSys 2018 [2, 3], the second edition was held in Beijing (China) co-located with CIKM 2019 [4, 5], and the third joint edition with ComplexRec was held in Amsterdam (Netherlands) co-located with RecSys 2021 [6, 7].

This workshop provides a meeting forum for stimulating and disseminating research in Knowledge-aware and Conversational Recommender Systems, where researchers can network and discuss their research results in an informal way. In particular, we aimed to expand community understanding on *knowledge-aware recommenders* — from models and feature engineering issues to beyond accuracy recommendation quality with a particular focus on real-world applications — and *conversational recommenders* — from the design of a conversational agent and its interface to the user modelling problems and evaluation issues.

Overall, we accepted 12 contributions: 7 long papers, and 5 short papers. Each presentation was peer-reviewed by at least 3 program committee (PC) members. The presentations of the accepted contributions, along with the keynote addressed by Xin Luna Dong, sparked interactions among attendees and fostered ideas to continue to advance research focused around the topics of the workshop.

2. Background and Goals

Recommender systems are becoming part of our daily life in many and diverse situations. Nevertheless, they start showing their limits in the tight interaction with human users [8]. During the last years, owing in part to the new wave of deep learning approaches, a plethora of data-driven algorithms have been proposed that seek to identify latent connections among users and items [9, 10]. Despite their excellent results in terms of accuracy in recommending new items, such approaches very often miss a fundamental actor in the loop: the end-user. For this reason, current research is focusing on new challenges such as privacy [11], emotion awareness [12], and new paradigms such as federated learning [13, 14]. The exploitation of the knowledge about the domain of interest of a catalog via automated reasoning as well as critiquing approaches are very common in the normal behavior of a human user, but they are not well codified in recommendation engine behaviors. Knowledge-based approaches began to appear two decades ago [15, 16, 17, 18, 19]. Nonetheless, they became more widely used with the advent of the Linking Open Data[1] initiative when a huge number of knowledge-graphs started being released and were made freely available. These include encyclopedic datasets such as DBpedia[2] and Wikidata[3], where semantics-aware information is available on different knowledge domains and

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

applications [20]. The exploitation of such datasets together with their ontologies is at the basis of many approaches to recommendation and challenges proposed in the last years such as Knowledge Graph embeddings [21, 22, 23, 24, 25], hybrid recommendation [18, 26], link prediction [27, 28, 24, 29, 30, 31, 32], knowledge transfer [9], interpretable recommendation [33, 34, 18], and user modeling [35, 36, 37, 38]. Successful workshops and international conferences in the last few years (ISWC, ACM Recommender Systems, UMAP, AAAI, ECAI, IJCAI, SIGIR) show the growing interest and research potential of these systems.

Furthermore, this side information associated with items becomes crucial when the interaction requires content features. This is the case of Conversational Recommender Systems (CRSs) [39]. CRSs are characterized by a multi-turn dialogue between the user and the system [40] and are exploited in several domains [41]. Note that "conversational" as defined here is not restricted to CRSs that conduct dialogues in natural language. A CRS might converse in natural language, but it may allow more constrained modes of user interaction as well [42]. This kind of interaction introduces new challenges, since it blurs the difference between recommendation and retrieval. A CRS ought to be able to exploit both short- and long-term preferences, for example. Furthermore, a CRS should be able to adapt its behaviour in a timely manner when user feedback is provided. These are just some peculiarities of this kind of interaction. As we can imagine, another sensitive issue is the evaluation of CRSs [43], since also in this case we need to go beyond simple accuracy metrics. The limited availability of datasets is an additional obstacle to the evaluation of these systems [44]. While research and development into CRSs has never gone away, it has certainly been less prominent for a while. Only recently has the literature on this topic been growing again quite notably [40].

2.1. Objectives

The *Fourth Knowledge-aware and Conversational Recommender Systems* (KaRS) Workshop focuses on all aspects related to the exploitation of external and explicit knowledge sources to feed and build a recommendation engine, and on the adoption of interactions based on the conversational paradigm. The aim is to go beyond the traditional accuracy goal [8] and to start a new generation of algorithms and approaches with the help of the methodological diversity embodied in fields such as Machine Learning (ML), Human–Computer Interaction (HCI), Information Retrieval (IR), and Information Systems (IS). Hence, the focus lies on research improving the user experience and following goals such as user engagement and satisfaction or customer value as has also been advocated by Zanker et al. [45]. The aim of this fourth edition of KaRS [4, 2] is to bring together researchers and practitioners around the topics of designing and evaluating novel approaches for recommender systems in order to (i) share research and techniques, including new design technologies, (ii) identify next key challenges in the area, (iii) identify emerging topics in the field. The workshop aims to establish an interdisciplinary community with a focus on the exploitation of (semi-)structured knowledge and conversational approaches for recommender systems and promoting collaboration opportunities.

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.), 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 engines, Deep learning methods to model semantic features
- **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 General Data Protection Regulation)
- **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 consists of:

- an invited keynote by Xin Luna Dong (Meta) on "Next-Generation Intelligent Assistants for AR/VR Devices";
- the presentation of the selected research papers.

4. Website & Proceedings

All workshop material including schedule and news will be found on the 2022 workshop website at https://kars-workshop.github.io/2022/.

5. Program Committee

We thank the members of the Program Committee of KaRS 2022 for their thorough reviews and their detailed feedback they gave to the authors. The PC consisted of the following international experts: **Aris Anagnostopoulos** (Sapienza University of Rome), **Vito Walter Anelli** (Politecnico di Bari), **Marco Angelini** (Sapienza University of Rome), **Pierpaolo Basile** (Dipartimento di Informatica - University of Bari), **Roberto Basili** (Dept. of Enterprise Engineering - Univ. of Roma Tor Vergata), **Alejandro Bellogin** (Universidad Autonoma de Madrid), **Ludovico Boratto** (University of Cagliari), **Eric Charton** (Banque Nationale du Canada), **Giandomenico Cornacchia** (Politecnico di Bari), **Fabio Crestani** (Università della Svizzera Italiana) (USI), **Danilo Croce** (Dept. of Enterprise Engineering - Univ. of Roma Tor Vergata), **Marco de Gemmis** (University of Bari Aldo Moro, Dept. of Computer Science), **Tommaso Di Noia** (Politecnico di Bari), **Davide Di Ruscio** (Università degli Studi dell'Aquila), **Fabrizio Falchi** (ISTI-CNR), **Antonio Ferrara** (Politecnico di Bari), **Maurizio Ferrari Dacrema** (Politecnico di Milano), **Andrea Iovine** (Università degli Studi di Bari Aldo Moro), **Dietmar Jannach** (University of Klagenfurt), **Daniele Malitesta** (Polytechnic University of Bari), **Rubén Francisco Manrique** (Universidad de los Andes), **Olga Marino** (Universidad de los Andes), **David Massimo** (Free University of Bolzano), **Franco Maria Nardini** (ISTI-CNR), **Fedelucio Narducci** (Politecnico di Bari), **Raffaele Perego** (ISTI-CNR), **Marco Polignano** (Università degli Studi di Bari Aldo Moro), **Claudio Pomo** (Politecnico di Bari), **Yongli Ren** (RMIT University), **Gaetano Rossiello** (IBM Research AI), **Pablo Sánchez** (Universidad Autónoma de Madrid), **Giovanni Semeraro** (University of Bari), **Damiano Spina** (RMIT University), **Alain Starke** (Wageningen University & Research)

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