Preface to the joint proceedings of the ComplexRec and ImpactRS workshops at ACM RecSys 2020

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Abstract

Recommender systems are widely used in modern online applications, from e-commerce sites over media streaming services to social networks. In academic research, we however often abstract from the specifics of these applications and rely on simplified assumptions such as the availability of past rating data. Furthermore, we mostly focus on predicting to what extent a user will like a certain item, but do not explicitly consider the long-term effects of recommendations on the users' decision-making processes or the expected impact on orgnizations.

The 14th ACM Conference on Recommender Systems hosted two workshops which aim to look beyond our often too simplifying assumptions, the Fourth Workshop on Recommendation in Complex Environments and the Second Workshop on the Impact of Recommender Systems. These proceedings describe the specific goals of the workshops and contain the papers that were presented during the online events.

Keywords

Recommender Systems, Workshop, Proceedings

1. Workshop on Recommendation in Complex Environments

1.1. Background and Goals

During the past decade, recommender systems have rapidly become an indispensable element of websites, apps, and other platforms that are looking to provide personalized interaction to their users. As recommendation technologies are applied to an ever-growing array of non-standard problems and scenarios, researchers and practitioners are also increasingly faced with challenges of dealing with greater variety and complexity in the inputs to those recommender systems. For example, there has been more reliance on fine-grained user signals as inputs rather than simple ratings or likes. Many applications also require more complex domain-specific constraints on inputs to the recommender systems.

Workshop on Recommendation in Complex Environments (ComplexRec '20) and Workshop on the Impact of Recommender Systems (ImpactRS '20), September 25, 2020, Online

The outputs of recommender systems are also moving towards more complex composite items, such as package or sequence recommendations. This increasing complexity requires smarter recommender algorithms that can deal with this diversity in inputs and outputs. For the past three years [1, 2, 3], the ComplexRec workshop series has offered an interactive venue for discussing approaches to recommendation in complex scenarios that have no simple one-size-fits-all solution.

For the fourth edition of ComplexRec we narrowed the focus of the workshop and contributions to the workshop about topics related to one of these two main themes on complex recommendation: complex inputs and complex outputs.

1.2. Complex inputs

An important source of complexity comes from the various types of inputs to the system beyond users and items, such as features, queries and constraints. There are active user inputs (interaction), implicit user inputs (task, context, preferences), item inputs (features or attributes) and domain inputs (eligibility, availability). In group-based recommendation, the user input can be a combination of inputs for multiple individual users as well as group aspects such as the composition of the group and how well they know each other. An additional challenge is providing users with ways to have control over the inputs. For instance by selecting and weighting or ranking user and item features, providing interactive queries to steer the recommendation, or deal with longer narrative statements that require natural language understanding.

1.3. Complex outputs

Another type of complexity that we wish to focus on in ComplexRec 2020 is the complexity of the outputs of a recommender system to move away from a straightforward ranked list of items as output. An example of such complex output is package recommendation: suggesting a set or combination of items that go well together and are complementary on dimensions that matter to the user. In many domains the sequence in which items are recommended is also important. Moreover, different users may want different information about items, so the output complexity goes beyond ranking and also manifests itself in how the interface should allow the user to view the type of information that is most relevant to them. Another example of complexity in recommender systems output are environments where the system's goal is to create new, composite items that must satisfy certain constraints (such as menu recommendation, or recommendations for product designs).

1.4. Program

The half-day workshop consisted of two slots, with an introduction reviewing the complex scenarios presented in previous ComplexRec workshops, before Christine Bauer gave her opening keynote. Authors of accepted submissions were invited to give 10-minute presentations followed by 10 minutes of questions and discussions. Evaluation criteria for acceptance included novelty, diversity, significance for theory/practice, quality of presentation, and the potential for sparking interesting discussion at the workshop. All submitted papers were reviewed by at least three members of the Program Committee. The workshop closed with a 30-minute discussion on future directions for research on complex recommendation scenarios.

The workshop will also feature a keynote presentation given by Christine Bauer, researcher at the Institute of Computational Perception at Johannes Kepler University Linz, Austria. In her talk "Ratings in, rankings out. Keep it simple, they said. But we need more than that", Christine will

reflect on the complexity of recommender systems by reaching out to related fields such as context-aware computing and pervasive advertising for inspiration.

1.5. Accepted Papers

In total, five papers were accepted for presentation and cover a broad set of complex recommendation scenarios. Moskalenko et al.[4] propose WikiRecNet: a system for providing personalized recommendations of Wikipedia articles to editors by exploiting the text content and link structure of the articles and built on top of Graph Convolutional Networks and Doc2Vec. Their approach is shown to outperform BM25, CB and kNN baselines. Parra et al.[5] propose a transfer-learning model, CuratorNet, based on CNN (ResNet) and trained using BPR for personalized ranking of items from an art store. Their evaluation shows that their model tends to perform better than two baselines. Mavridis et al.[6] describe various challenges and viable solutions for some of the ML-powered rankers powering Booking.com, with focus on modelling, experimentation and serving. They also show the increase in business value as a result of these considerations. Wadhwa et al.[7] attempts to predict a user's inclination towards specific price bands using historical user-item, and to use these predictions for creating recommendations to user through re-ranking. Their approach shows improvements in offline evaluation metrics. Ahlers [8] discussses the implications of "smart-city" infrastructure for future developments of recommender systems, such as offering inhabitants to adapt their behaviour, for example in the choice of mobility with personalised options. However, he emphasizes that such complex recommendation scenario is an as-yet underspecified problem.

1.6. Website & Proceedings

The workshop material (list of accepted papers, keynote, and the workshop schedule) will be found on the ComplexRec 2020 workshop website at https://complexrec2020.aau.dk/. We also plan on making a summary of the workshop available through submission to the SIGIR Forum in order to increase cross-disciplinary awareness of recommender systems research.

1.7. Program Committee

The ComplexRec 2020 organizers would like to thank the members of the program committee for their time and effort to provide timely and constructive reviews of the submitted papers.

- Panagiotis Adamopoulos, Emory University
- Robin Burke, University of Colorado, Boulder
- Iván Cantador, Universidad Autónoma de Madrid
- Pablo Castells, Universidad Autónoma de Madrid
- Paolo Cremonesi, Politecnico di Milano
- Peter Dolog, Aalborg University
- Fabio Gasparetti, Artificial Intelligence Laboratory – ROMA TRE University
- Marco de Gemmis, University of Bari Aldo Moro, Dept. of Computer Science
- Cristina Gena, Department of Computer Science, University of Torino

- Dietmar Jannach, University of Klagenfurt
- Ernesto William De Luca, Georg-Eckert-Institute – Leibniz-Institute for international Textbook Research
- Cataldo Musto, Dipartimento di Informatica – University of Bari
- Fedelucio Narducci, Politecnico di Bari
- Tommaso Di Noia, Politecnico di Bari
- Shaghayegh Sahebi, University at Albany – SUNY
- Nafiseh Shabib, Norwegian University of Science and Technology

2. Workshop on the Impact of Recommender Systems

2.1. Background and Goals

Research in the area of recommender systems is largely focused on helping individual users finding items they are interested in. This is usually done by learning to rank the recommendable items based on their assumed relevance for each user. The implicit underlying goal of a such system is to affect users in different positive ways, e.g., by making their search and decision processes easier or by helping them discover new things.

Recommender systems can, however, also have other more directly-measurable impacts, e.g., such that go beyond the individual user or the short term influence. A recommender system on a news platform, for example, can lead to a shift in the reading patterns of the entire user base. Similarly, on e-commerce platforms, it has been shown that a recommender can induce significant changes in the purchase behavior of consumers, leading, for example, to generally higher sales diversity across the site. On the other hand, recommender systems usually serve certain business goals and can have an impact not only on the customers, e.g., by stimulating higher engagement on a media streaming platform or a social network, but also direct and indirect affect sales, revenue or conversion and churn rates.

The research literature that considers such more direct measurements of impact of recommender systems on the various stakeholders is comparably scarce and scattered. With the workshop, we pursue different goals.

- First, the workshop serves as a platform where researchers can present their latest works in which they analyzed different forms of impact of recommenders. We consider both papers where impact on individual users was measured (e.g., more healthy eating habits that were stimulated by a food recommender or a more efficient choice process), papers that highlight effects on a community or a society as a whole, and papers that demonstrate effects in terms of business value.
- Second, the goal of industry panel is discuss in which ways recommender systems may have long-term and indirect effects on businesses.
- Third, the workshop shall serve as an instrument to raise awareness in the community regarding the importance of impact-oriented research. This aspect in our view is particularly important as more and more research works indicate that optimizing for the most accurate prediction not

necessarily leads to the best recommendations in terms of the users' quality perception or the desired effects of a recommender.

2.2. Program

We received 8 submissions to the workshop. Each research paper was reviewed by three members of the program committee (PC) and each position paper was reviewed by two PC members. After the reviewing process, we accepted four of the research papers.

The program of the half-day workshop consists of:

- an invited keynote by Professor Barry Smyth from University College Dublin,
- the presentation of the selected research papers,
- a panel discussion on long-term and indirect effects of recommender systems with participants from industry.

2.3. Program Committee

We thank the members of the Programme Committee for their thorough reviews and their detailed feedback they gave to the authors. The PC consisted of the following international experts.

- Gediminas Adomavicius, University of Minnesota
- Christine Bauer, Johannes Kepler University Linz
- Joeran Beel, Trinity College Dublin
- Pablo Castells, Universidad Autónoma de Madrid
- Li Chen, Hong Kong Baptist University
- Paolo Cremonesi, Politecnico di Milano
- Michael Ekstrand, Boise State University
- Alexander Felfernig Graz University of Technology
- Maurizio Ferrari Dacrema, Politecnico di Milano
- Werner Geyer, IBM T.J. Watson Research
- Michael, Jugovac TU Dortmund
- Surya Kallumadi, The Home Depot
- Iman Kamehkhosh, TU Dortmund
- Amit Livne, Ben-Gurion University
- Massimo Quadrana, Pandora
- Adi Shalev, Intuit

- Bracha Shapira, Ben-Gurion University
- Harald Steck, Netflix
- Tao Ye, Amazon
- Markus Zanker, Free University of Bozen-Bolzano
- Yong Zheng, Illinois Institute of Technology
- Alex Zhicharevich, Intuit

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