EARS 2019: The 2nd International Workshop on ExplainAble Recommendation and Search

Yongfeng Zhang
Department of Computer Science
Rutgers University
yongfeng.zhang@rutgers.edu

Yi Zhang
School of Engineering
University of California Santa Cruz
yiz@soe.ucsc.edu

Min Zhang
Department of Computer Science
Tsinghua University
z-m@tsinghua.edu.cn

Chirag Shah
School of Communication and Information
Rutgers University
chirags@rutgers.edu

ABSTRACT

Explainable recommendation and search attempt to develop models or methods that not only generate high-quality recommendation or search results, but also interpretability of the models or explanations of the results for users or system designers, which can help to improve the system transparency, persuasiveness, trustworthiness, and effectiveness, etc. This is even more important in personalized search and recommendation scenarios, where users would like to know why a particular product, web page, news report, or friend suggestion exists in his or her own search and recommendation lists. The workshop focuses on the research and application of explainable recommendation, search, and a broader scope of IR tasks. It will gather researchers as well as practitioners in the field for discussions, idea communications, and research promotions. It will also generate insightful debates about the recent regulations regarding AI interpretability, to a broader community including but not limited to IR, machine learning, AI, Data Science, and beyond.

1 MOTIVATION AND APPROPRIATENESS

Explainable recommendation and search attempt to develop models or methods that not only generate high-quality recommendation or search results, but also intuitive explanations of the results, which can help users to better understand the results, or help system designers to better understand how the system or model works. It can eventually help to improve the system transparency, persuasiveness, trustworthiness, and effectiveness. Explainability is even more important in personalized search or recommendation scenarios, where users would like to know why a particular web page, product, news report, or friend suggestion exists in his or her own search or recommendation lists.

The motivation of the workshop is to promote the research and application of Explainable Recommendation and Search, under the background of Explainable AI in a broader sense. Early recommendation and search systems adopted intuitive yet easily explainable models to generate recommendation and search lists, such as user-based and item-based collaborative filtering for recommendation, which provide recommendations based on similar users or items, or TF-IDF based retrieval models for search, which provide document ranking lists according to word similarity between different documents.

However, state-of-the-art recommendation and search models extensively rely on complex machine learning and latent representation models such as matrix factorization or even deep neural networks, and they work with various types of information sources such as ratings, text, images, audio or video signals. The complexity nature of state-of-the-art models make search and recommendation systems as blank-boxes for both end users and system designers, and the lack of explainability weakens the transparency, persuasiveness, and trustworthiness of the system, making explainable recommendation and search important research issues to the research community.

In a broader sense, researchers in the broader artificial intelligence community have also realized the importance of Explainable AI, which aims to address a wide range of AI explainability problems in deep learning, computer vision, automatic driving systems, and natural language processing tasks. Very recently, a series of AI regulations have entered into force, such as the EU General Data Protection Regulation (GDPR) and The California Consumer Privacy Act of 2018, which emphasize the "principle of transparency" of intelligent algorithms, and imply the "right to explanation" of algorithmic decisions in AI systems. As an important branch of AI research, this further highlights the importance and urgency for our research community to discuss and address the explainability issues of various recommendation and search systems.

The first edition of the workshop was successfully hosted with SIGIR 2018 in Ann Arbor, Michigan. In the second edition, we hope the workshop will not only present state-of-the-art research on Explainable IR, but also generate insightful debates about the recent regulations regarding AI interpretability, to a broader community including but not limited to IR, machine learning, AI, Data Science, and beyond.

2 THEME AND PURPOSE

The purpose of the workshop is to gather researchers and practitioners of the IR community to communicate the latest ideas and research achievements on explainable recommendation and

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search, discuss about the advantages and disadvantages of existing approaches, and share the ideas of future directions of recommendation and search in the explanation perspective. Based on this workshop, we would not only like to present the latest research achievements, but also connect researchers in the community that are interested in the explainable recommendation and search topic to promote this direction in the following years.

The main themes and topics of the workshop include but are not limited to:

- **New Models for Explainable Information Retrieval**
  - Explainable shallow models
  - Explainable neural models
  - Explainable sequential modeling
  - Explainable optimization theories
  - Causal inference for explainable analysis
- **Different Information Sources for Explanation**
  - Text-based modeling and explanation
  - Image-based modeling and explanation
  - Using knowledge-base for explanation
  - Audio-based modeling and explanation
  - Video-based modeling and explanation
  - Integrating heterogenous information for explanation
- **User Behavior Analysis and HCI for Explanation**
  - Explanation and user satisfaction
  - Mouse movement analysis
  - Eye tracking and attention modeling
- **New Types of Explanations**
  - Textual sentence explanations
  - Visual explanations
  - Statistic-based explanations
  - Aggregated explanations
  - Context-aware explanations
- **Evaluation of Explainable Information Retrieval**
  - Offline evaluation measures and protocols
  - Online evaluation measures and protocols
  - User study for explanation evaluation
- **New Applications**
  - Explainable product recommendation and search
  - Explainable social recommendation and search
  - Explainable news recommendation and search
  - Explainable POI recommendation and search
  - Explainable multimedia recommendation and search

3 KEYNOTE SPEECH

Title: Building a broad knowledge graph for products.

Abstract: Knowledge graphs have been used to support a wide range of applications and enhance search results for multiple major search engines, such as Google and Bing. At Amazon we are building a Product Graph, an authoritative knowledge graph for all products in the world. The thousands of product verticals we need to model, the vast number of data sources we need to extract knowledge from, the huge volume of new products we need to handle every day, and the various applications in Search, Discovery, Personalization, Voice, that we wish to support, all present big challenges in constructing such a graph.

In this talk we describe our efforts in building a broad product graph, a graph that starts shallow with core entities and relationships, and allows easily adding verticals and relationships in a pay-as-you-go fashion. We describe our efforts on knowledge extraction, linkage, and cleaning to significantly improve the coverage and quality of product knowledge. We also present our progress towards our moon-shot goals including harvesting knowledge from the web, hands-off-the-wheel knowledge integration and cleaning, human-in-the-loop knowledge learning, and graph mining and graph-enhanced search.

Bio: Dr. Xin Luna Dong is a Principal Scientist at Amazon, leading the efforts of constructing Amazon Product Knowledge Graph. She was one of the major contributors to the Google Knowledge Vault project, and has led the Knowledge-based Trust project, which is called the "Google Truth Machine" by Washington's Post. She has co-authored book "Big Data Integration", was awarded ACM Distinguished Member, VLDB Early Career Research Contribution Award for "advancing the state of the art of knowledge fusion", and Best Demo award in Sigmod 2005. She serves in VLDB endowment and PVLDB advisory committee, and is a PC co-chair for VLDB 2021, ICDE Industry 2019, VLDB Tutorial 2019, Sigmod 2018 and WAIM 2015.

4 ACCEPTED CONTRIBUTIONS

- Charles-Emmanuel Dias, Vincent Guigue and Patrick Gallinari. Personalized Attention for Textual Profiling and Recommendation.
- X. Chen, X. Chen and Y. Zhang. Generating Natural Language Explanations for Personalized Recommendation.
- Kyoung-Rok Jang, Sung-Hyon Myaeng, Hee-Cheol Seo and Joo-Hee Park. Selection and Interpretation of Embedding Subspace for Query Classification.
- Xianchao Wu. Learning-to-Explain: Recommendation Reason Determination Through Q20 Gaming.
- Massimo Melucci. Can Structural Equation Models Interpret Search Systems?
- Y. Nakamura, Y. Asano and M. Yoshikawa. DiaQueTT: A Diachronic and Queryable Topic-Tracking Model.
- Rishabh Jain and Pranava Madhyastha. Model Explanations under Calibration.
- Diana C. H. Bocanegra and J. Ziegler. Assessing the Helpfulness of Review Content for Explaining Recommendations.
- Abraham Gale and Amelie Marian. Metrics for Explainable Ranking Functions.
- A. K. Jaiswal, H. Liu and I. Frommholz. Effects of Foraging in Personalized Content-based Image Recommendation.
- Farhan Khawar and Nevin L. Zhang. Learning Hierarchical Item Categories from Implicit Feedback Data for Efficient Recommendations and Browsing.
- Masoud Davari, Ran Yu and Stefan Dietze. Understanding The Influence of Task Difficulty on User Fixation Behavior.
- Zhizhuang Li, Zhengzhou Zhu and Teng Yang. Exercises Recommendation Method Based on Machine Learning.
- Zhizhuang Li, Zhengzhou Zhu and Teng Yang. An Exercise Recommendation Method for K-12 Students Based on the Syllabus.

5 ORGANIZERS

Biography of the organizers and their main research experience related to the proposed workshop topic are as follows.

Yongfeng Zhang is an Assistant Professor in the Department of Computer Science at Rutgers University (The State University of New Jersey). His research interest is in Recommendation and Search Systems, Economic Data Science, and Conversational Systems. In the previous he was a postdoc advised by Prof. W. Bruce Croft in the Center for Intelligent Information Retrieval (CIIR) at UMass Amherst, and did his PhD and BE in Computer Science at Tsinghua University, with a BS in Economics at Peking Univeristy. He is a Siebel Scholar of the class 2015, and a Baidu Scholar of the class 2014. Together with coauthors, he has been consistently working on explainable recommendation and search models [1–14]. His recent work on explainability of search and recommendation models include visually explainable recommendation, knowledge graph embedding for explainable recommendation, natural language generation for explainable recommendation, as well as explainable product search in e-commerce.

Yi Zhang is a professor in the School of Engineering, University of California Santa Cruz. Her research interests include large scale information retrieval, recommendation systems, internet advertising, data mining, natural language processing, and applied machine learning. She has published chapters, journal articles, and papers at top conferences in these areas, such ACM SIGIR, WWW, CIKM, IEEE ICDM, ICML, COLINGS, HLT. She received NSF Faculty Early Career Award in 2010, an Air Force Research Young Investigator Award in 2008, the Best Paper Award at ACM SIGIR in 2002, and several other awards. Her Information Retrieval and Knowledge Management Lab is doing research sponsored by several government agencies and companies (Microsoft, Yahoo, Google, NEC, Bosch, Nokia etc.). She has served as a consultant or technical advisor for companies. She regularly serves on the program committees of the very best conferences in her research areas. She has served as area chair or senior PC member at ACM SIGIR, EMNLP, and ACM Recommender Systems. She has served as conference co-chair in charge of Information Retrieval area at the ACM Conference on Information and Knowledge Management, and tutorial chair for ACM SIGIR. She is serving as an associate editor for ACM Transaction on Information Systems. Dr. Zhang received her Ph.D. from School of Computer Science at Carnegie Mellon University, specializing in Language and Information Technologies.

Min Zhang is an associate professor in the Department of Computer Science and Technology (DCST), Tsinghua University. She received her Bachelor and PhD degrees from DCST at Tsinghua University in 1999 and 2003, respectively. During the past years, she has visited DFKI Germany, City University of HongKong, Kyoto University, and MSRA as visiting researcher. Dr. Zhang specializes in information retrieval, Web user behavior analysis and machine learning. She has published more than 100 papers on important international journals and conferences, such as JASIST, JIR, SIGIR, WWW, WSDM, CIKM, etc. She has participated in TREC (Text REtrieval Conference) benchmarks as the team leader since 2002. Her team has continuously achieved multiple top performances during 10 years. She also contributed in INTENT tasks in NTCIR evaluation as task co-organizer from 2011 to 2013. Dr. Zhang served as PC chair at WSDM 2017, as well as area chairs or senior PC members at CIKM and AIRS, and PC members at SIGIR, WWW, WSDM, KDD, ACL, etc. Currently she is also the executive director of Tsinghua University-Microsoft Research Asia Joint Research Lab on Media and Search, and the vice director of Tsinghua-Sohu Joint Research Lab of Search Technology.

Chirag Shah is an Associate Professor of Information Science and an affiliate member of Computer Science at Rutgers University. Until recently he was a Visiting Research Scientist at Spotify. His research interests include studies of interactive information retrieval/seeking, trying to understand the task a person is doing and providing proactive recommendations. He also studies social media and data generated by wearable devices as kinds of signals that can help us understand and impact human behaviors. He applies them to various problems related to search, personalization, and recommendation. Recently he has also been exploring ways to reduce bias and bring fairness in search and in general in Machine Learning. His work falls under and uniquely connects Computer Science, Data Science, and Information Science. He received his PhD in Information Science from University of North Carolina (UNC) at Chapel Hill. He holds an MTech, Computer Science & Engineering from Indian Institute of Technology (IIT) Madras, India and an MS, Computer Science from University of Massachusetts (UMass) Amherst. He has published and talked extensively on topics related to social and collaborative information seeking, interactive information retrieval, and social media. He serves as a consultant to the United Nations Data Analytics on various Data Science projects involving social and political issues, peacekeeping, climate change, and energy.

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