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Diversity, Fairness, and Data-Driven Personalization in (News) Recommender System

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Diversity, Fairness, and Data-Driven Personalization in (News) Recommender System

Edited by

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Abstract

As people increasingly rely on online media and recommender systems to consume information, engage in debates and form their political opinions, the design goals of online media and news recommenders have wide implications for the political and social processes that take place online and offline. Current recommender systems have been observed to promote personalization and more effective forms of informing, but also to narrow the user's exposure to diverse content. Concerns about echo-chambers and filter bubbles highlight the importance of design metrics that can successfully strike a balance between accurate recommendations that respond to individual information needs and preferences, while at the same time addressing concerns about missing out important information, context and the broader cultural and political diversity in the news, as well as fairness. A broader, more sophisticated vision of the future of personalized recommenders needs to be formed—a vision that can only be developed as the result of a collaborative effort by different areas of academic research (media studies, computer science, law and legal philosophy, communication science, political philosophy, and democratic theory). The proposed workshop will set first steps to develop such a much needed vision on the role of recommender systems on the democratic role of the media and define the guidelines as well as a manifesto for future research and long-term goals for the emerging topic of fairness, diversity, and personalization in recommender systems.

Seminar November 24–29, 2019 – <http://www.dagstuhl.de/19482>

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Diversity, Fairness, and Data-Driven Personalization in (News) Recommender System, *Dagstuhl Reports*, Vol. 9, Issue 11, pp. 117–124

Editors: Abraham Bernstein, Claes De Vreese, Natali Helberger, Wolfgang Schulz, and Katharina A. Zweig



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1 Executive Summary

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The Dagstuhl Perspectives Workshop 19482 on Diversity, Fairness, and Data-Driven Personalization in (News) Recommender Systems,¹ took place from November 24 to November 29 at Schloss Dagstuhl in Germany. The goal of the workshop was to bring together researchers from the various disciplines relevant to news recommender systems (computer, communications, legal, and political science) to (1) develop a joint understanding of the issues arising for society with regards to the diversity and fairness of recommender systems, (2) identify the gaps in science, practice and regulation with regards to these topics, and (3) to compile a set of recommendations—in the form of a manifesto—that outlines needed steps from all actors involved to address the societal issues at hand.

Workshop Schedule

The workshop was organized in the following phases:

Welcome and introductions This first phase introduced the workshop goal to the participants and then offered each of them five minutes to introduce their research activities, expertise, their interest in the topic, and research directions they see as relevant to the workshop’s topic.

Impulse presentations Given the diversity of the backgrounds of the participants, eight brief stage setting presentations were given. The goal of these was to establish a common ground in terms of relevant questions and common vocabulary.²

Topical breakout group discussions Based on the introducing presentations and impulse presentations, the next phase of the workshop was organized around topical breakout groups. Topics discussed included relating fairness to diversity, user desiderata and characteristics, wider societal implications, governance, data requirements, and clustering of research gaps.

Writing sessions The next phase was focused on jointly drafting the manifesto that incorporated recommendations developed from discussions so far and compiling them into a coherent document.

The remainder of this text provides the abstracts of the impulse presentations. The insights resulting from our discussions can be found in the manifesto document, which will be published in due course.

¹ See workshop home page at <https://www.dagstuhl.de/19482>

² Brief abstracts of these talks can be found in this document.

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3 Overview of Talks

3.1 Bringing Diversity to News Recommender Algorithms

Abraham Bernstein (Universität Zürich, CH)

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Joint work of Abraham Bernstein, Bibek Paudel, Suzanne Tolmeijer

Main reference Bibek Paudel, Fabian Christoffel, Chris Newell, Abraham Bernstein: “Updatable, Accurate, Diverse, and Scalable Recommendations for Interactive Applications”, *TiiS*, Vol. 7(1), pp. 1:1–1:34, 2017.

URL <https://doi.org/10.1145/2955101>

Recommender systems have become a backbone of consumption. They combine information about items and previous behavior of users to personalize the user’s experience when reading the news, buying goods, or choosing what to watch in the evening. This talk succinctly introduces how recommender systems work to establish the technical underpinnings for all workshop attendees and suggests various approaches for how diversity can be added to them as an additional target measure.

3.2 News Recommender Systems (NRS) – A communication science perspective

Claes De Vreese (University of Amsterdam, NL)

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Main reference Nicholas Diakopoulos: “Towards a Design Orientation on Algorithms and Automation in News Production”, *Digital Journalism*, Vol. 7(8), pp. 1180–1184, Routledge, 2019.

URL <https://doi.org/10.1080/21670811.2019.1682938>

Main reference Judith Möller, Damian Trilling, Natali Helberger, Bram van Es: “Do not blame it on the algorithm: an empirical assessment of multiple recommender systems and their impact on content diversity”, *Information, Communication & Society*, Vol. 21(7), pp. 959–977, Routledge, 2018.

URL <https://doi.org/10.1080/1369118X.2018.1444076>

Main reference Neil Thurman, Seth C. Lewis, Jessica Kurnert: “Algorithms, Automation, and News”, *Digital Journalism*, Vol. 7(8), pp. 980–992, Routledge, 2019.

URL <https://doi.org/10.1080/21670811.2019.1685395>

In this Introduction talk, NRS are contextualized as part of a larger development towards the role of data and automated decision making both in the production, dissemination, and consumption of news, in a changing media ecosystem. It is highlighted that communication science research often focuses on the user and effects on the user, but that in the space of NRS there is still a relative paucity of empirical research in this area. Recent publications have called for more attention to the design and features of NRS and the implications for user agency and effects on users’ knowledge, attitudes and behavior. The diversity notion has been central in communication science for decades, and there is a clear need to expand diversity research in NRS beyond topical diversity to also include medium, device, outlet and content (e.g., tone, frame, actors) diversity. The talk concludes with a number of emerging topics in communication science research on NRS, such as the role of conversational agenda, NRS and platforms like YouTube, the role of NRS in journalistic production routines, and the potentially unintended consequences on diversity in NRS.

3.3 Algorithmic Accountability and Fairness – A computer scientist’s perspective

Marc Hauer (TU Kaiserslautern, DE)

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The talk gave a short outline about three notions of algorithmic accountability, the Algorithm Accountability Lab of TU Kaiserslautern is currently working on, namely how to assign responsibilities in the development of ADM-systems, the various and incompatible measures of fairness, and a regulation approach that has been included into the final report of the German Datenethikkommission.

References

- 1 Alexander Filipociv, Christopher Koska, Claudia Paganini. Ethik für Algorithmiker. Bertelsmann Stiftung, 2018, <https://doi.org/10.11586/2018033>.
- 2 Tobias D. Krafft, Katharina A. Zweig. Transparenz und Nachvollziehbarkeit algorithmenbasierter Entscheidungsprozesse. Bundesverband Verbraucherzentrale, 2019, https://www.vzbv.de/sites/default/files/downloads/2019/05/02/19-01-22_zweig_krafft_transparenz_adm-neu.pdf.

3.4 Democratic theory and Recommendations

Natali Helberger (University of Amsterdam, NL)

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Main reference Natali Helberger: “On the Democratic Role of News Recommenders”, *Digital Journalism*, Vol. 7(8), pp. 993–1012, Routledge, 2019.

URL <https://doi.org/10.1080/21670811.2019.1623700>

The argument that this presentation made is that diversity in the media is a concept with a mission: to further the values democratic societies are grounded in. Building on a brief discussion of four selected democratic theories of the media (liberal, participatory, deliberative and critical/antagonistic) and the growing body of literature about the digital turn in journalism, the presentation offered a conceptual framework for assessing the threats and opportunities around the democratic role of news recommenders. The talk concluded with developing a typology of different “democratic recommenders”.

3.5 Legal media policy

Wolfgang Schulz (Universität Hamburg, DE)

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The talk gives a legal perspective on diversity and the recent challenges for the concept. In German broadcasting regulation (like in many other jurisdictions) “diversity” appears as a main goal, meaning – according to the Federal constitutional court – that diversity of existing opinions should be presented in broadcasting as broadly and comprehensively as possible. In consequence, Public service broadcasters are required to promote diversity,

media regulators govern the distribution of broadcasting programs to maximize diversity. The recent draft of an amended Interstate Treaty on Broadcasting tries to extend diversity regulation to intermediaries. They should not discriminate among pieces of media content. However, regulatory concepts reach their limits if they want to apply diversity regulation to media in an information ecosphere where media content is just one among many types that also fulfil information needs of the users.

3.6 Toward Measuring Viewpoint Diversity in News Consumption

Nava Tintarev (TU Delft, NL)

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Main reference Dimitrios Bountouridis, Jaron Harambam, Mykola Makhortykh, Mónica Marrero, Nava Tintarev, Claudia Hauff: “SIREN: A Simulation Framework for Understanding the Effects of Recommender Systems in Online News Environments”, in Proc. of the Conference on Fairness, Accountability, and Transparency, FAT* 2019, Atlanta, GA, USA, January 29-31, 2019, pp. 150–159, ACM, 2019.
URL <http://dx.doi.org/10.1145/3287560.3287583>

The growing volume of digital data stimulates the adoption of recommender systems in different socioeconomic domains, including news industries. While news recommenders help consumers deal with information overload and increase their engagement and satisfaction, their use also raises an increasing number of societal concerns, such as “Matthew effects”, “filter bubbles”, and an overall lack of transparency. Considerable recommender systems research has been conducted on balancing diversification of content with relevance, however this work focuses specifically on topical diversity. For readers, diversity of *viewpoint* on a topic in news is however more relevant. This allows for measures of diversity that are multi-faceted, and not necessarily driven by previous consumption habits. This talk introduced preliminary work together with several Dutch news organizations (e.g., Blendle, Persgroep, and FDMediagroep), aiming to find ways to help users explore viewpoint diversity. This talk also explored transparency for content-providers, and introduced a simulation framework that allows content providers to (i) select and parameterize different recommenders and (ii) analyze and visualize their effects with respect to two diversity metrics. Consequently, this talk introduced first steps toward informing diverse content selection in a way that is meaningful and understandable, to both content providers and news readers.

References

- 1 Nava Tintarev, Emily Sullivan, Dror Guldin, Sihang Qiu, and Daan Odjik. “Same, same, but different: algorithmic diversification of viewpoints in news”. In UMAP workshop on Fairness in User Modeling, Adaptation and Personalization, in association with UMAP’18. 2018.
- 2 Dimitrios Bountouridis, Jaron Harambam, Mykola Makhortykh, Monica Marrero, Nava Tintarev, and Claudia Hauff. “SIREN: a simulation framework for understanding the effects of recommender systems in online news environments”. In ACM Conference on Fairness, Accountability, and Transparency (FAT*). 2019.
- 3 Feng Lu and Nava Tintarev. “A diversity adjusting strategy with personality for music recommendation”. In Recsys workshop on Interfaces and Decision Making in Recommender Systems. 2018.

3.7 Measuring diversity in news recommendations – Or, at least, an attempt

Sanne Vrijenhoek (University of Amsterdam, NL)

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Joint work of Sanne Vrijenhoek, Nadia Metoui, Judith Möller, Daan Odijk, Natali Helberger
URL <https://github.com/svrijenhoek/dart/tree/master/dart>

The University of Amsterdam, in collaboration with RTL News and funded by the SIDN Fonds, has started the development of an open source tool that enables data scientists at media companies to measure diversity in their news recommendations. In this talk we describe the setup of this project and the process of bridging the gap between normative notions of diversity, founded in democratic theory, and computationally viable methods. We identified a set of metrics approaching a subset of characteristics of different models of democracy, and evaluate them by comparing performance between a set of baseline recommender approaches.

References

- 1 Helberger, Natali. “On the democratic role of news recommenders.” *Digital Journalism* (2019): 1-20.

3.8 Computer science perspective: Measures as models of society

Katharina A. Zweig (TU Kaiserslautern, DE)

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Main reference Katharina Anna Zweig: “Network Analysis Literacy – A Practical Approach to the Analysis of Networks”, Springer, 2016.

URL <https://doi.org/10.1007/978-3-7091-0741-6>

Main reference Isadora Dorn, Andreas Lindenblatt, Katharina A. Zweig: “The Trilemma of Network Analysis”, in Proc. of the 2012 International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2012), ASONAM '12, p. 9–14, IEEE Computer Society, 2012.

URL <https://doi.org/10.1109/ASONAM.2012.12>

The talk first reviewed the idea of using centrality indices in complex network analysis and provided a solution of why there are so many of them. This is explained by a suggestion of Borgatti who stated that for every network flow process there is one centrality index that predicts which of the nodes is most heavily used by the network flow process. He characterized network flow processes by only a few characteristics, e.g., the type of paths used in the network or the distribution mode. Thus, each centrality index is tied to a network flow process and vice versa. In other words, centrality indices contain a *model* of a social process to which they can be applied to. This well-understood relationship between a certain class of indices or measures and a social process can be generalized to all kinds of operationalizations of social concepts, e.g., diversity of a news recommender system. If all measures and indices that are supposed to quantify a social term contain a model of a social process or a cultural perspective, it is 1) important to make these implicit assumptions as explicit as possible and 2) vital to only apply any measure to those kind of data and research questions that match with the implicit assumptions.

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