Personalized Interventions for Online Moderation

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ABSTRACT
Current online moderation follows a one-size-fits-all approach, where each intervention is applied in the same way to all users. This naïve approach is challenged by established socio-behavioral theories and by recent empirical results that showed the limited effectiveness of such interventions. We propose a paradigm-shift in online moderation by moving towards a personalized and user-centered approach. Our multidisciplinary vision combines state-of-the-art theories and practices in diverse fields such as computer science, sociology and psychology, to design personalized moderation interventions (PMIs). In outlining the path leading to the next-generation of moderation interventions, we also discuss the most prominent challenges introduced by such a disruptive change.

CCS CONCEPTS
• Human-centered computing → Hypertext / hypermedia; • Information systems → Social networks; Social networking sites.

KEYWORDS
online moderation, moderation interventions, personalization, user modeling, social media

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1 INTRODUCTION
Nowadays, social media play a pivotal role in shaping public opinion. Online users constantly read, create, and share an ever-growing amount of content, with social media now overtaking the more traditional media, especially among the younger generations. On the one hand, this paradigm-shift created new opportunities for civic engagement and for democratizing access to information [25]. On the other hand, this freedom also gave rise to multiple online harms, such as misinformation, polarization, toxic and hateful speech [5]. The consequences of such harms are not limited to online platforms, but also affect the offline world, as demonstrated by recent political riots [20] and by the decreased confidence in vaccines [17].

For this reason, since the 2016 Donald Trump presidential win and the UK Brexit referendum, platforms have been facing a tremendous public and governmental pressure to take action against online harms. Recent dramatic events such as the COVID-19 infodemic and the Russian-Ukrainian conflict increased such pressure even more. Platforms responded to the growing pressure by hastily deploying a number of moderation interventions — actions taken to enforce content policies and rules. For example, Twitter, Facebook and Instagram attached warning labels to disputed posts [28] and banned users, groups, and pages that misbehaved [13]. Pinterest blocked search results for anti-vaccination queries and Reddit quarantined and banned toxic communities [11, 22, 24]. However, despite appearing as reasonable solutions and serving as public evidence of the platforms’ willingness to tackle the issues they contributed to create, these interventions were designed and applied light-mindedly. Recent studies measured limited or no effects at all [3, 11, 24], and showed that some interventions even exacerbated the very issues they aimed to solve [1, 6, 21, 29]. Overall, the design of moderation interventions received limited scholarly attention and progress was sought by trial-and-error rather than by a rigorous scientific approach. Pennycook & Rand concluded an op-ed1 on The New York Times remarking that moderation interventions should «not just rely on common sense or intuition» but that should instead be «empirically grounded». Science-based online moderation is still in its infancy.

2 THE CASE FOR PERSONALIZATION IN ONLINE MODERATION
Until now, online moderation always followed a one-size-fits-all approach, where each intervention was applied in the same way for all users. As a recent example, when Twitter sent warning messages to dissuade users from posting toxic tweets, all users received the exact same message [15]. However, results on user reactions to moderation interventions showed that different users react in different ways to the same intervention, according to their individual characteristics [22, 24]. Theories from the social, psychological, and behavioral sciences support these empirical results [7] and posit that the efficacy of interventions depends on individual and contextual characteristics [27]. In line with this literature, but in contrast to the platforms’ objectives, the interventions recently applied by Twitter and Reddit against toxic users caused a subset of users to become even more toxic and radicalized [11, 15, 24].

1https://www.nytimes.com/2020/03/24/opinion/fake-news-social-media.html
Overall, the existing literature across multiple disciplines opposes the current one-size-fits-all approach to online moderation and instead suggests that interventions should be tailored to the individual characteristics of the users. In other words, the current naïve approach to online moderation neglects individual differences and the advantages of personalization. Indeed, personalization has already proved valuable in several online domains, such as advertising, music and video streaming services, and the improvement of health-related behavior via apps [12, 26]. By taking inspiration from medicine—a field with which online moderation shares many commonalities—we observe that current generic interventions are deployed as a sort of universal cure to treat the ailments of all online users, instead of following the virtuous examples of personalized medicine where patients affected by a disease receive personalized treatment based on their condition, individual characteristics, environment, and behavior.

The most effective way to induce a behavioral change in a user—the goal of moderation interventions—depends on the personal characteristics and context of the user itself [7]. To this regard, sociology and psychology can provide the theories and knowledge needed to profile users and design persuasive PMIs. Each user could be described in terms of its social and personality profile [14], including its social vulnerabilities [27]. The former characteristics are linked to the emergence of online misbehavior [16], while the latter are linked to the effectiveness of a given intervention for a given user [2, 10]. Knowledge of such individual characteristics is instrumental in the development of effective PMIs.

Then, successful personalization requires accurate user models, powerful analytics and a significant degree of automation to reach scalability. In this regard, many areas of computer science can provide massive contributions to the development of PMIs. For example, the application of theories and practices from human-computer interaction (HCI) can drive the process of user modeling. In addition, HCI can contribute to design the way in which moderation interventions are tailored and presented to the users [4], while also leveraging machine and deep learning (ML/DL) techniques for obtaining accurate and scalable user representations. For instance, ML/DL can be leveraged to infer personal characteristics of the users based on their publicly available data, such as account information, posting or browsing history, and online social relationships [19]. Furthermore, ML/DL can also be profitably applied to design multimodal interventions that combine personalized counter-narratives, generated with natural language processing (NLP) techniques, and images [23]. In addition, PMIs require to match each user with a favorable intervention. Again, this step can be carried out by resorting to ML/DL techniques and by introducing a new task: estimating the most effective moderation intervention for any given user. The novelty of the task mandates the development of new datasets, sensible baselines, and novel methodologies. At the same time however, its similarity with traditional tasks in the area of recommender systems implies that established techniques in that area will likely represent good initial solutions also for the development of PMIs [18].
Finally, validating PMIs and assessing their improvement over generic interventions mandates to go beyond mere correlations and associations, by following rigorous causal inference approaches. These could be applied to draw conclusions from survey experiments, or from simulations and field experiments on real online platforms. Recently, many of such statistical techniques have been successfully adopted to estimate the effects of generic interventions, such as those techniques designed to detect causal effects in time series data resulting from a given event [3, 11, 24]. In the future, the same, or similar, techniques could be adapted to evaluate the effects of PMIs.

4 CHALLENGES AND OPPORTUNITIES

In addition to cleverly combining existing knowledge and to developing new one, PMIs will also mandate solving a number of open challenges. First and foremost, deploying PMIs entails solving a number of ethical challenges regarding the use of personal data for user modeling, the right to explanation, and the fairness of automated moderation mechanisms, which must scale in line with sound theory from social and personality psychology. Overcoming such challenges will involve developing agreed-upon ethical standards as well as adopting privacy-preserving computational techniques (e.g., federated learning, anonymization). Motivating the interventions and guaranteeing fair and unbiased decisions will also require the adoption of best practices in explainable and fair recommendation, opening up the opportunity to improve platform transparency and accountability, two areas in which online platforms are being harshly criticized. Some technical and methodological challenges are also limiting our capacity to accurately estimate the effects of moderation interventions, such as the difficulty at accounting for confounders and possible exogenous causes [11, 24]. In addition, validating new interventions, such as PMIs, involves performing extensive field experiments on online platforms, which typically cannot be carried out without the participation of the platforms themselves, thus more efforts are needed to strengthen collaborations between these and scholars.

Finally, online moderation also carries important philosophical challenges. The present proposal embodies the vision to develop the theoretical and technological tools that will enable PMIs. However, the effectiveness of online moderation depends only in part on the availability of powerful and accurate technological tools. Most importantly, it depends on the strategic goals and the regulatory context of the platforms that perform (or not) the moderation. As remarked by Gayo-Avello, the paramount goal of online platforms is to «commoditize and monetize individual communication» and their commitment to scientifically-sound and thorough moderation can only exist to the extent that it does not «affect their investors or the laws under which they operate» [8]. Furthermore, the effects that PMIs will have on the safety and reliability of online platforms will depend on the use that humans will make of them, as it always happens when new technologies are introduced. As such, some actors might use PMIs to manipulate, rather than to persuade, or to censor and silence, rather than to support plurality of opinions and free speech [9]. Overcoming some of these challenges will probably require social, cultural and regulatory changes, in addition to mere technological advancement.

5 CONCLUSIONS

Personalized moderation interventions (PMIs) promise to transform online moderation by shifting from a coarse-grained, platform-centered approach to a fine-grained, user-centered one. By taking into account the peculiar traits and individual characteristics of the users, PMIs will enable nuanced and effective interventions. Despite this promising outlook, the challenges along this research direction are manifold. Solving them will require combined endeavors from multiple interrelated scientific communities, that we call to join the effort.

REFERENCES

[1] Christopher Bail et al. 2018. Exposure to opposing views on social media can increase political polarization. Proceedings of the National Academy of Sciences 115, 37 (2018), 9216–9221.
[2] Michał Bilewicz, Patrycja Tempnka, Gniewoz Leibo, Maria Dowgijallo, Michalina Tatiska, Rafal Urbaniak, and Michał Wroczyński. 2021. Artificial intelligence
against hate: Intervention reducing verbal aggression in the social network environment. *Aggressive Behavior* 47, 3 (2021), 260–266.

[3] Edwar Chandrasekharan, Shagun Jiave, Amy Bruckman, and Eric Gilbert. 2020. Quarantined! Examining the effects of a community-wide moderation intervention on Reddit. *arXiv:2009.11483* (2020).

[4] Anna L. Cox, Sandy JJ Gould, Marta E Cecchinato, Ioanna Iacovides, and Ian Renfrey. 2016. Design Frictions for mindful reactions: The case for macrobounded interventions. In *The 34th CHI Conference on Human Factors in Computing Systems (CHI ’16)*. 1389–1397.

[5] Roberto Di Pietro, Maurantonio Caprolu, Simone Raponi, and Stefano Cresci. 2021. New Dimensions of Information Warfare: Advances in Information Security. Vol. 84. Springer: 268 pages.

[6] Nicholas Dias, Gordon Pennycook, and David G Rand. 2020. Emphasizing publishers does not effectively reduce susceptibility to misinformation on social media. *Harvard Kennedy School Misinformation Review* 1, 1 (2020).

[7] Elżbieta Drążkiewicz. 2022. Study conspiracy theories with compassion. *Nature* 603, 7903 (2022), 765–765.

[8] Daniel Gayo-Avello. 2015. Social media, democracy, and democratisation. *IEEE Multimedia* 22, 2 (2015), 10–16.

[9] Daniel Gayo-Avello. 2017. Social media won’t free us. *IEEE Internet Computing* 21, 4 (2017), 98–101.

[10] Dominik Hangartner et al. 2021. Empathy-based counterspeech can reduce racist hate speech in a social media field experiment. *Proceedings of the National Academy of Sciences* 118, 50 (2021).

[11] Manoel Horta Ribeiro et al. 2020. Do platform migrations compromise content moderation? Evidence from r/The_Donald and r/XeIns. In *The 24th ACM Conference On Computer-Supported Cooperative Work And Social Computing (CSCW’21)*. 1–24.

[12] Kurt Jacobson, Vidiya Murali, Edward Newett, Brian Whitman, and Romain Yon. 2016. Music personalization at Spotify. In *The 10th ACM Conference on Recommender Systems (RecSys’16)*. 373–373.

[13] Shagun Jiave, Christian Boylston, Diyi Yang, and Amy Bruckman. 2021. Evaluating the effectiveness of deplatforming as a moderation strategy on Twitter. In *The 24th ACM Conference On Computer-Supported Cooperative Work And Social Computing (CSCW’21)*. 1–30.

[14] Dimitra Karanatsiou, Pavlos Sermpesiz, Jon Gruda, Konstantinos Kafetsios, Ilias Dimitriadis, and Athena Vakali. 2022. My tweets bring all the traits to the yard: Predicting personality and relational traits in Online Social Networks. *ACM Transactions on the Web (TWEB)* (2022).

[15] Matthew Katsaros, Kathy Yang, and Lauren Fratamico. 2022. Reconsidering Tweets: Intervening During Tweet Creation Decreases Offensive Content. In *The 16th International AAAI Conference on Web and Social Media (ICWSM’22)*.

[16] Manoel Horta Ribeiro et al. 2021. Empathy-based counterspeech can reduce racist hate speech in a social media field experiment. *Proceedings of the National Academy of Sciences* 118, 50 (2021).

[17] Sahil Loomba, Alexandre de Figueiredo, Simon J Piatek, Kristen de Graaf, and Anna Kurek, Paul E Jose, and Jaimee Stuart. 2019. ‘I did it for the LULZ’: How the dark personality predicts online disinhibition and aggressive online behavior in adolescence. *Computers in Human Behavior* 98 (2019), 31–40.

[18] Selim Loomba, Alexandre de Figueiredo, Simon J Piatek, Kristen de Graaf, and Heed J Larson. 2021. Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. *Nature Human Behaviour* 5, 3 (2021), 337–348.

[19] Claudio Lucchese et al. 2019. Learning to Rank in Theory and Practice: From Gradient Boosting to Neural Networks and Unbiased Learning. In *The 42nd International ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR’19)*.

[20] Yash Mehta, Navonil Majumder, Alexander Gelbukh, and Erik Cambria. 2020. Recent trends in deep learning based personality detection. *Artificial Intelligence Review* 53, 4 (2020), 2313–2339.

[21] Eshwar Chandrasekharan, Shagun Jhaver, Amy Bruckman, and Eric Gilbert. 2017. The long fuse: Misinformation and the 2020 election. Technical Report. Center for an Informed Public, Digital Forensic Research Lab, Graphika, Stanford Internet Observatory.

[22] Gordon Pennycook, Adam Bear, Evan T Collins, and David G Rand. 2020. The implied truth effect: Attaching warnings to a subset of fake news headlines increases perceived accuracy of headlines without warnings. *Management Science* 66, 11 (2020), 4944–4957.

[23] Haji Mohammad Saleem and Derek Ruths. 2018. The aftermath of disbanding an online hateful community. *arXiv:1804.07354* (2018).

[24] Serra Simen Tekeroglu, Yi-Ling Chung, and Marco Guerini. 2020. Generating Counter Narratives against Online Hate Speech: Data and Strategies. In *The 58th Annual Meeting of the Association for Computational Linguistics (ACL’20)*. 1177–1190.

[25] Joshua A Tucker, Tannis Theocharis, Margaret E Roberts, and Pablo Barberá. 2017. From liberation to turmoil: Social media and democracy. *Journal of Democracy* 28, 4 (2017), 46–59.

[26] Liyuan Wang and Lynn Carol Miller. 2020. Just-in-the-moment adaptive interventions (JITAI): A meta-analytical review. *Health Communication* 35, 12 (2020), 1531–1544.
Visual-Meta Appendix

The data below is what we call Visual-Meta. It is an approach to add information about a document to the document itself, on the same level of the content (in style of BibTeX).

It is very important to make clear that Visual-Meta is an approach more than a specific format and that it is based on wrappers. Anyone can make a custom wrapper for custom metadata and append it by specifying what it contains: for example @dublin-core or @rdfs.

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When listing the names of the authors, they should be in the format 'last name', a comma, followed by 'first name' then 'middle name' whilst delimiting discrete authors with ('and') between author names, like this: Shakespeare, William and Engelbart, Douglas C.

Dates should be ISO 8601 compliant.

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