Sixth International Workshop on Health Recommender Systems (HealthRecSys 2024)

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Sixth International Workshop on Health Recommender Systems (HealthRecSys 2024)

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ABSTRACT

Launched in 2016, the Health Recommender Systems Workshop (HealthRecSys) rapidly became a central forum for discussing the transformative capabilities of personalized recommender systems within the health and care sectors. Despite the unforeseen pause due to the COVID-19 pandemic and other challenges, the workshop's influence persisted through its vibrant community and publications. Our aim with the 6th HealthRecSys is to reignite these conversations and provide a forward-thinking platform that revisits the foundational elements that have contributed to the field's growth. However, the workshop aspires to do more by infusing new perspectives and tackling the most pressing global challenges and technological innovations head-on with contemporary themes such as the impact of global health crises, generative AI models, personalized and self-managed care, and the increasing focus on health equity. HealthRecSys is dedicated to strengthening the network of researchers working on health recommender systems, drawing participants from an array of health and care domains. Through our combined interactive and paper based workshop format, we aim at cultivating a cross-disciplinary community that promotes collaboration among recommender systems specialists, healthcare professionals, ethicists, and policymakers, among others.

CCS CONCEPTS

• **Information systems** → **Recommender systems**; • **Applied computing** → **Health care information systems**; **Health informatics**.

KEYWORDS

Health recommender systems; healthy living; well-being; health and care; healthcare; Health-aware computing; Health-aware information systems; Recommender Systems

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1 INTRODUCTION

Launched in 2016, the Health Recommender Systems Workshop (HealthRecSys) [9–11, 24], quickly became a pivotal forum for discussing the transformative potential of personalized recommender systems within the health and care sectors. This annual full-day event has successfully fostered a vibrant community of researchers, sparking engaging discussions on leveraging technology for beneficial health outcomes while emphasizing ethical practices in such a sensitive field. These discussions not only facilitated easier exchanges but also highlighted the workshop's role in fostering responsible technological advancements. The sensitive nature of the health domain facilitated discussions on value-driven design within HealthRecSys, making it easier to apply and extend these principles to other areas within the recommender systems field, e.g., [29].

The initial success and growing interest within the academic community led to the workshop's annual recurrence through 2020. However, the unforeseen challenges posed by the Covid-19 pandemic, coupled with the workshop's reliance on in-person collaboration and the organizers' other commitments, prompted a temporary hiatus. The pause was also seen as an opportunity for introspection and to assess the workshop's evolution within the broader conference context, considering the maturity the topic had achieved.

Over its last four iterations, the workshop received 50 paper submissions, out of which 33 were presented and included in its proceedings, an average of 9 accepted out of 13 submissions per event. HealthRecSys featured an array of distinguished keynote speakers, with certain sessions drawing upwards of 80 attendees. The collaborative and interactive spirit of the workshop even led to the publication of a joint paper [25] from the discussions, further cementing its impact on the field. Additionally, a special issue in the User Modeling and User-Adapted Interaction (UMUAI) journal [14] emerged from the workshop delving into themes central to the HealthRecSys community, underscoring its influence on academic discourse. The research trajectory in the realm of health recommender systems, as illustrated in the accompanying figure 1, mirrors the workshop's active phases, indicating a notable surge in scholarly output.

Reflecting on the landscape of health recommender systems as we move into 2024, it's evident that the hiatus in hosting the HealthRecSys workshop has not dampened the enthusiasm within the community for specialized forums on health and care. The recent workshop focusing on behavior change [23], a critical subset of health recommender systems, is a testament to the ongoing interest and need for such collaborative spaces. This resurgence of interest underscores the community's commitment to advancing the field and exploring new frontiers in health and care-related recommender systems. In light of this, the prospect of reconvening

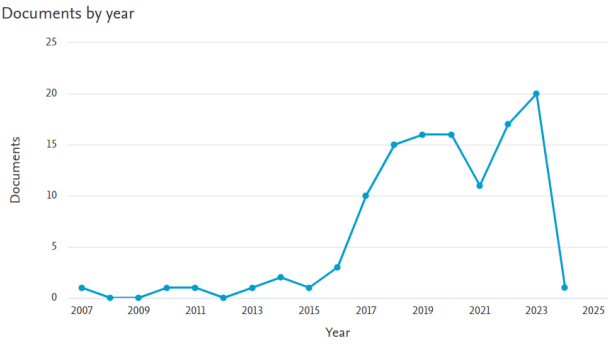

Figure 1: Number of publications per year indexed by Scopus using the keyword "health recommender system*".

for the 6th series of the HealthRecSys workshop holds promise for reigniting fruitful discussions, fostering innovation, empowering collaborations, and furthering research in this vital domain.

The HealthRecSys workshop discussions over the years have spanned a broad spectrum of topics, reflecting the multifaceted nature of health recommender systems and the diverse applications and challenges of recommender systems in the health domain. The published papers can be categorized into several key themes within health recommender systems domain: Personalization and context-awareness, e.g., [21], privacy and data security, e.g., [8], diet and nutrition, e.g., [17], clinical and medical applications, e.g., [31], behavior change and motivation, e.g., [22], accessibility, usability, and augmented decision-making, e.g., [13], ethical consideration and user trust, e.g., [20], and methodological innovations, e.g., [6, 12, 30], among others. A recurring strong theme within submission has been on healthy living and behavior change, e.g., [5, 8, 15, 21, 22, 27], highlighting the workshops' commitment to leveraging recommender systems for enhancing public health and personal well-being.

Previous workshops encouraged discussions of the potential of recommender systems in the health domain, various new applications, associated challenges, and practical solutions for existing systems or scenarios. These discussions have not only introduced new challenges to the recommender system community but have also underscored the critical role of human oversight in ensuring the reliability and safety of health recommendations. The diversity of application domains discussed, from mental health to nutrition, and the variety of stakeholders involved, from patients to healthcare providers, underscore the complexity and importance of this research area.

The necessity for the 6th edition of the Health Recommender Systems Workshop (HealthRecSys) stems from both the achievements of previous years and the evolving challenges and opportunities in the health and care sectors, particularly in the wake of the COVID-19 pandemic. The previous editions of HealthRecSys have laid a strong foundation, demonstrated by the vibrant community engagement, the publication of numerous impactful papers, and the fostering of significant discussions around ethical and value-driven design in health recommender systems. These discussions have not only propelled forward the domain of health recommender systems but have also contributed to broader conversations within the field of recommender systems at large.

The hiatus taken after 2020 provided a valuable period for reflection and reassessment, allowing for a deeper understanding of the workshop's role within the larger RecSys community and the unique niche it fills. Our aim with the 6th HealthRecSys is to reignite these conversations and provide a forward-thinking platform that revisits the foundational elements that have contributed to the field's growth. However, the workshop aspires to do more by infusing new perspectives and tackling the most pressing global challenges and technological innovations head-on. The workshop will explore contemporary themes such as the impact of global health crises [7, 18, 19] on recommender systems, the integration of Large Language Models and other generative AI models in health applications, the increasing emphasis on personalized and self-managed care [4, 16, 26, 28], and the increasing focus on health equity leading to consideration of literacy, accessibility and monetary means when building health recommender systems [3, 7]. These topics not only reflect the current state of the world but also align with the broader shifts towards ethical AI [32], and the need for systems that can adapt to and address individual health and care needs. Furthermore, HealthRecSys is dedicated to strengthening the network of researchers working on health recommender systems, drawing participants from an array of health and care domains. This effort is aimed at cultivating a cross-disciplinary community that promotes collaboration among recommender systems specialists, healthcare professionals, ethicists, and policymakers, among others. To enhance cross-sector collaboration, the 6th HealthRecSys workshop will encourage joint projects and funding prospects, in addition to promoting the sharing of resources, datasets, and tools among scholars and industry practitioners.

2 WORKSHOP FORMAT

The HealthRecSys 2024 workshop was conducted as a full-day interactive event, held in conjunction with the ACM Conference on Recommender Systems in Bari, Italy. The workshop was carefully structured, dedicating equal time to paper presentations, keynotes, and discussions, as well as to innovative interactive sessions. The morning session started with a keynote address. Following the keynote, we featured lightning talks from selected submissions, complemented by poster presentations for other accepted works. Between each presentation, time was allocated for focused discussions and feedback, allowing participants to engage deeply with the ideas presented. Key topics from these sessions were documented via social media and in a shared document, accessible to all participants for collaborative editing. The afternoon session was highly interactive, reflecting the fact that we received positive feedback on that approach from previous workshops. The sessions included idea-generation sessions, focused group discussions, and open fishbowl discussions.

3 WORKSHOP RESULTS

Our primary objective for the workshop was to foster collaboration, a strategy that has consistently proven effective in previous years. Past outcomes included the co-authorship of a position paper [25], the formation of new partnerships, and the establishment of a

project consortium. In this year's iteration, we aimed to build on this success by continuing to effectively document the workshop's outcomes. Additionally, we introduced a dedicated project track that was designed to stimulate deeper discussions on collaborative ventures and catalyze the formation of new project alliances.

To ensure the continued dissemination of high-quality research, we maintained the practice of selecting the best papers for recognition, as has been the tradition in previous editions of our conference [1, 2]. These selected papers were submitted to CEUR-WS.org for online publication, thereby enhancing their visibility and ensuring broader accessibility within the academic community.

4 DISSEMINATION STRATEGY

The call for papers was widely distributed through various channels to ensure maximum outreach. This included distribution across multiple academic mailing lists, such as SIGIR, SIGWEB, SIGCHI, and UM, among others. To complement this approach, we also leveraged social media platforms, specifically Twitter and LinkedIn, to post the Call for Papers (CfP) and to issue reminders as the submission deadline approached. Comprehensive details, including submission guidelines and deadlines, were accessible on our dedicated workshop website, available at https://healthrecsys.github.io. This multifaceted strategy aimed to engage a broad spectrum of researchers and practitioners from the recommender systems and health and care communities, encouraging diverse and high-quality submissions.

5 SELECTION PROCESS

We invited submissions for research papers (4-6 pages) and short position papers (2 pages), adhering to the ACM conference paper format. Participants could choose to focus their contributions on either research or project-based inquiries. Selected standout papers were offered the opportunity to deliver a flash talk presentation, while others were showcased through poster presentations. The submission categories were as follows: (i) Research Submission: This category welcomed innovative research ideas, preliminary findings, or system prototypes that contribute new knowledge to the field; (ii) Project Submission: This category was designed for presentations on funded research initiatives, collaborations between industry and academia, or partnerships between healthcare entities and research institutions.

Submissions were encouraged to include links or demos as attachments to enhance their presentations. All submissions underwent a rigorous peer review process to ensure quality and originality. It was imperative that the submitted work was not under review at any other conference, workshop, or journal and contained original unpublished contributions.

6 TOPICS

The workshop called for submissions on a wide array of topics within health recommender systems. This included systems aimed at health promotion, preventive, curative care, and recommender systems that are health-aware. The scope of topics for the workshop was extensive, covering various aspects within the domain of health recommender systems and health-aware recommender systems, which included, but were not limited to:

- Accessibility, Usability, and Augmented Decision-Making
- Adherence and Patient (User) Compliance
- Algorithms and Recommendation Strategies
- Behavioral Interventions
- Case studies of Health Recommender Systems, Success and Failures and Lesson learned
- Domain Knowledge Representation
- Electronic Health Records Integration
- Empowerment and Autonomy
- Ethics
- Evaluation and Metrics
- Equity
- Explanations and Justifications in Health Recommendations
- From Participatory Design and Co-Creation to HealthRecSys
- Gamification and Serious Games
- Generative AI
- Health-Aware Recommender Systems
- Health and Care Workers and Interactive Intelligent Systems
- Human/Expert-in-the-Loop
- Human-RecSys Collaboration for Personalized Health
- Interfaces, Visual, Context-aware, Conversational, Mobile
- In-the-Wild Personalization
- Longitudinal Studies
- LLM-based recommendations in Health
- Medical Evaluation Techniques
- Mobile Health Recommender Systems
- Multi-objective Challenges
- Multi-stakeholder Challenges
- Patient Needs/Satisfaction
- Personalization
- Persuasion/Nudging/Behavioral Change
- Pervasive Systems
- Privacy and Security
- Research Methods and tools
- Recommendations VS. Not Clinical Decision Supports
- Regulations and Standards
- Self-Care
- Trust and Transparency
- User Interaction Design
- User Profiling and Adaptive Systems
- Value-Driven Design of Health Recommender Systems
- Wearables for Recommender Systems

7 PROGRAM COMMITTEE

We thank the programme committee for supporting this workshop:

- Miguel Angel Portaz Collado, UNED. Madrid
- Alejandro Bellogin, University of Madrid
- Arianna Boldi, University of Turin
- Ludovico Boratto, University of Cagliari
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- Andre Calero Valdez, University of Lübeck
- Martijn Willemsen, Eindhoven University of Technology
- Martin Wiesner, Heilbronn University

8 WORKSHOP CHAIRS

Hanna Hauptmann is an assistant professor at the Human-Centered Computing Group of Utrecht University. She previously worked at the Data Analysis and Visualization group of the University of Konstanz on human-centered design for interactive intelligent systems by providing, among others, explainable AI, personalization, persuasion, guidance, and gamification. She received her doctoral degree at the Technical University of Munich on building socio-technical systems for healthy nutrition. Hanna was a co-organizer of the past five workshops and has published conference and workshop papers in various fields such as visual analytics (e.g., VIS'19) and personalized food recommendation (e.g., IUI'19).

Christoph Trattner is a Full Professor (1404) at the University of Bergen and the Founder and the Center Director of the Research Centre for Responsible Media Technology & Innovation - SFI MediaFutures worth around 26 million EUR in funding and in-kind. He is also the Founder and Leader of the DARS research group at UiB and hold a 10% Research Professor (Forsker I) position in NORCE (NKLM, department of Health) one of Norway's largest research institutions. He has received a PhD (with distinction), an MSc (with distinction) and a BSc in Computer Science and Telematics from Graz University of Technology (Austria). He is an ACM Senior Member and a former Austrian Research Promotion Agency (FFG) fellow, Marshall Plan and European Research Consortium for Informatics and Mathematics (ERICM) fellow and have been working at Graz University of Technology from 2009-2012, the University of Pittsburgh from 2011-2012, the Norwegian University of Science and Technology from 2014-2015, and have been visiting Yahoo! Labs Barcelona in 2014 and CWI Amsterdam in 2015 two times. My research is positioned in the Information Science research field and lies in the intersection of "Behavioral Data Analytics" and "Recommender Systems". Since 2009, he published over 120 scientific articles in top venues about my work and have acquired over 54 million Euros in funding on European and (inter) national level - 30 million as the PI. Examples of outlets where my work has been published includes NATURE Food, NATURE Sustainability, JASIST, EPJ Data Science, UMUAI, WWW, AAAI ICWSM or ACM SIGIR. He is also the winner of several Best Paper/Poster Awards and Nominations, including, the Best Paper Award Honorable Mention at the prestigious CORE A* ranked The Web Conference in 2017. He regularly act as a (senior) PC member on several top-tier - CORE A* ranked - conferences and co-organize or co-chair a number of workshops and conferences. Recent examples include ACM RecSys in 2018 - 2020 (as Workshop/Late-Breaking Results co-chair) and ACM SIGIR 2020 - 2021 (as senior PC). He is a former board member of Media City Bergen, Norway's largest Media Cluster, a board member of preforma, an amazing Norwegian health-tech start-up focused on health for women, an advisor to the company caneat, a fantastic food start-up, and a member of the editorial board of Elsevier's journal on Online Social Networks and Media, the Open Access Journal Future Internet, Frontiers in Big Data, Springer's Journal of Intelligent Information Systems, and Springer's AI and Ethics journal. Since 2009, he has taught over 2000 students in Austria and Norway, in over 35 courses on BSc, MSc, MBA and PhD level about ICT, and he supervised over 35 students on their Master or PhD thesis. Since June 2021, he is an appointed ACM Distinguished Speaker.

Helma Torkamaan is an assistant professor of AI in health systems at Delft University of Technology. Her research focuses on designing innovative digital solutions and methods for complex health challenges in different areas, such as mental health, pain management, and behavior change among others. She leverages her expertise in health recommender systems, ubiquitous computing, persuasive design, and multi-objective personalization to enhance the experiences and outcomes for both stakeholders and users. Helma has served as a co-organizer of the HealthRecSys workshop for four years and has contributed to the organization and program committees of various related events.

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