



5th Workshop on Explainable User Models and Personalised Systems (ExUM)

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ABSTRACT

Adaptive and personalized systems have become pervasive technologies, gradually playing an increasingly important role in our daily lives. Indeed, we are now used to interacting with algorithms that help us in several scenarios, ranging from services that suggest music or movies to personal assistants who proactively support us in complex decision-making tasks. As the importance of such technologies in our everyday lives grows, it is fundamental that the internal mechanisms that guide these algorithms are as clear as possible. It is not by chance that the EU General Data Protection Regulation (GDPR) emphasized the users' right to explanation when people face intelligent systems. Unfortunately, current research tends to go in the opposite direction since most of the approaches try to maximize the effectiveness of the personalization strategy (e.g., recommendation accuracy) at the expense of model explainability. The workshop aims to provide a forum for discussing problems, challenges, and innovative research approaches in this area by investigating the role of transparency and explainability in recent methodologies for building user models or developing personalized and adaptive systems.

CCS CONCEPTS

• **Information systems** → **Recommender systems**; **Personalization**; • **Human-centered computing** → **User models**; • **Computing methodologies** → **Natural language processing**.

KEYWORDS

Explainability, Transparency, Interpretability, User Modeling, Personalization, Recommender Systems

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1 INTRODUCTION

Nowadays, we interact with adaptive and personalized systems that exploit personal data to support us in various scenarios, such as suggesting music to be listened to or movies to be watched. These personalized and adaptive services are continuously evolving, becoming part of our everyday lives and increasingly acting as personal assistants which proactively help us in complex decision-making tasks.

Unfortunately, most of these systems adopt black box models whose internal mechanisms are opaque to end-users. Indeed, users typically enjoy personalized suggestions or like being supported in their decision-making tasks. Still, they are unaware of the general rationale that guides the algorithms in the adaptation and personalization process. Moreover, the metrics that are usually adopted to evaluate the effectiveness of the algorithms reward those opaque methodologies, such as matrix factorization and neural network-based techniques that maximize the accuracy of the suggestions at the expense of the transparency and explainability of the model.

This issue is even more evident in light of the EU General Data Protection Regulation (GDPR). The GDPR further emphasized the need and right for scrutable and transparent methodologies that can guide the users to comprehend which information the systems hold about them and which is the internal behavior of the personalization algorithms. As a consequence, the primary motivation of the workshop is straightforward: *How can we deal with such a dichotomy between the need for effective adaptive systems and the right to transparency and interpretability?* Consequently, this question triggers several important research lines: *building scrutable user models and transparent algorithms, analyzing the impact of*

opaque algorithms on end users, studying the role of explanation strategies, investigating how to provide users with more control in the personalization and adaptation problems.

The ExUM workshop aims to provide a forum to discuss such problems, challenges, and innovative research approaches, by investigating the role of transparency and explainability in the recent methodologies for building user models or developing personalized and adaptive systems.

Topics of interest include but are not limited to:

- Transparent and Explainable Personalization Strategies
 - Scrutable user models;
 - Transparent user profiling and personal data extraction;
 - Explainable personalization and adaptation methodologies;
 - Novel strategies (e.g., conversational recommender systems) for building transparent algorithms;
 - Transparent personalization and adaptation to groups of users.
- Designing Explanation Algorithms
 - Explanation algorithms based on item description and item properties;
 - Explanation algorithms based on user-generated content (e.g., reviews);
 - Explanation algorithms based on collaborative information;
 - Building explanation algorithms for opaque personalization techniques, (e.g., neural networks, matrix factorization);
 - Explanation algorithms based on methods to build group models.
- Designing Transparent and Explainable User Interfaces
 - Transparent user interfaces;
 - Designing transparent interaction methodologies;
 - Novel paradigms (e.g., chatbots) for building transparent models.
- Evaluating Transparency and Explainability
 - Evaluating transparency in interaction or personalization;
 - Evaluating explainability of the algorithms;
 - Designing user studies for evaluating transparency and explainability;
 - Novel metrics and experimental protocols.
- Open Issues in Transparent and Explainable User Models and Personalized Systems
 - Ethical issues (fairness and biases) in user / group models and personalized systems;
 - Privacy management of personal and social data;
 - Discussing recent regulations (GDPR) and future directions.

2 WORKSHOP GOALS

In light of our research question, *how can we deal with the dichotomy between the need for effective adaptive systems and the right to transparency and interpretability?*, the goal of the workshop is to provide a forum for discussing problems, challenges, and innovative research approaches in this area. Thus, we investigate the role of transparency and explainability in the recent methodologies

for building user models or developing personalized and adaptive systems.

Some of the questions that the workshop aims to explore are:

- How can we build transparent user models? Can we design transparent data extraction strategies?
- Can we propose new recommendation and personalization strategies to consider transparency and explainability?
- What is the role of explanation algorithms in light of transparent and explainable personalization pipelines?
- Can we introduce explanation strategies in opaque models such as neural networks and matrix factorization techniques?
- What kind of novel metrics can go beyond accuracy and reward more transparent and explainable recommendations?
- Can we think about novel personalization paradigms (e.g., chatbots, conversational recommender systems) that enable a more transparent interaction?
- What is the role of end-users in personalization and adaptation algorithms?

3 ACCEPTED CONTRIBUTIONS

We accepted six contributions, namely five research papers and one project description:

Research papers:

- (1) ***Branching Preferences: Visualizing Non-linear Topic Progression in Conversational Recommender Systems*** by Lovis Bero Suchmann, Nicole Krämer, and Jürgen Ziegler proposes a GUI design that harnesses the capabilities of conversational recommender systems and enhances them with human-like conversational aspects. More precisely, the proposed GUI employs a branch-and-merge design paradigm, where users can visualize the progression of several conversational topics, compare and explore several recommendation scenarios, and receive suggestions for future utterances.
- (2) ***Computer Vision, Human Likeness, and Problematic Behaviors: Distinguishing Stereotypes from Social Norms*** by Jahna Otterbacher takes a normative approach to analyze the behavior of computer vision tools performing image tagging in terms of their human-like capabilities, and reflects on possible evaluation methods for computer vision tools to ultimately improve human-AI interaction.
- (3) ***Ethical issues in explanations of personalized recommender systems*** by Elaheh Jafari and Julita Vassileva provides an overview of ethical issues and challenges that could emerge during the design, implementation, and evaluation of explanations in recommender systems. Furthermore, the paper also explores solutions — prioritizing transparency and user-centered design of explanations — and provides insight for future work directions to address these ethical issues.
- (4) ***Synchronized Multi-list User Interfaces for Fashion Catalogs*** by Angelo Geninatti Cossatin, Noemi Mauro, Gianmarco Izzi, and Liliana Ardissono proposes a novel user interface to better visualize and explore fashion products, based on a synchronized multi-list model. More precisely, the model allows users to browse vertically in several carousel multi-lists and

thus get a concise and compact overview of the suitability of a given fashion product for a multitude of evaluation criteria.

- (5) **Validation of the EDUSS Framework with Transparent User Model for Self-Actualization: A Qualitative Study** by *Mouadh Guesmi, Clara Siepmann, Mohamed Amine Chatti, Shoeb Joarder, Qurat Ul Ain, and Rawaa Alatrash* presents the results of a qualitative user study aiming to validate the effectiveness of a previously proposed conceptual framework with interactive visualizations for self-actualization of transparent user models in terms of five goals — explore, develop, understand, scrutinize, socialize. In general, participants agree the framework helps them achieve the goals of understanding and scrutiny, and other goals, to a certain extent.

Project description:

- (1) **Exploring cognitive models to augment explainability in Deep Knowledge Tracing** by *Concha Labra and Olga C. Santos* presents a preliminary research plan for building Deep Knowledge Tracing models that exhibit high explainability capabilities while maintaining good prediction performance.

4 ORGANIZATION

- **Cataldo Musto** – Assistant Professor at the University of Bari, Italy. His research focuses on the adoption of natural language processing techniques for semantic content representation in recommender systems and user modeling platforms.
- **Amra Delic** – Assistant Professor at the University of Sarajevo, Bosnia and Herzegovina. Her research focuses on personalized systems that support group decision-making processes by exploiting various user, group, and interrelationship features and on investigating the role of explanations in group recommender systems.
- **Oana Inel** – Postdoctoral Researcher at the University of Zurich, Switzerland. Her research focuses on investigating the use of explanations as a means of providing transparency for decision-support systems and fostering reflection in people.
- **Marco Polignano** – Research Assistant at the University of Bari, Italy. His research interests include Recommender Systems, Natural Language Processing, Machine Learning, and User Profiling.
- **Amon Rapp** – Assistant Professor at the University of Torino, Italy, where he leads the Smart Personal Technology Lab at ICxT. His research focuses on how people interact with self-tracking technologies, wearable devices, video games, gamified applications and behavior change systems.
- **Giovanni Semeraro** – Full Professor at the University of Bari, Italy, where he leads the Semantic Web Access and Personalization (SWAP) "Antonio Bello" research group. His research interests include AI, recommender systems, intelligent information access, semantic and social computing, the Semantic Web, NLP, machine learning, eXplainable AI and personalization.
- **Jürgen Ziegler** – Full Professor at the University of Duisburg - Essen where he directs the Interactive Systems Research Group. His main research interests lie in the areas of human-computer interaction, human-AI cooperation, recommender systems, information visualization, and health applications.

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