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Editorial

Special Issue on Information Retrieval, Recommender Systems and Adaptive Systems

Marco Polignano * and Giovanni Semeraro

Deptartment of Computer Science, University of Bari Aldo Moro, University Campus, Via E. Orabona 4, 70125 Bari, Italy

* Correspondence: marco.polignano@uniba.it

The current spread of the Internet across an ever-increasing number of devices, including mobile and IoT devices, has created an enormous flow of data. Therefore, in the era of big data, there is an increasing need for tools to support the end user in their exploration. It is common for the end user to spend several hours finding what they are looking for and need on the web. In this regard, adaptive and personalized systems play an increasingly important role in our daily lives, as we increasingly rely on systems that adapt their behavior according to our preferences and needs, and support us in a wide range of heterogeneous decision-making tasks. Among various information filtering and retrieval techniques, recommender systems have proven to be a valuable tool in addressing the problem of information overload. Specifically, a recommender system is capable of directing a user to a new not-yet-considered item that the algorithm believes may be relevant to the current needs and context of use. The user can then browse the recommendations, choose whether or not to accept them, and provide (immediately or at a later stage) implicit or explicit feedback. User actions and feedback can be stored in a database for use in generating new recommendations in future user–system interactions. This process leads to a constant increase in system performance based on the number of interactions with the system.

With the increasing popularity of machine learning and deep learning in application domains such as natural language processing, an increasing number of researchers have also begun to incorporate machine learning methods to address relevant tasks in information retrieval, recommender systems and adaptive systems. The evolution of these approaches has uncovered new threats, limitations and challenges that require our attention. The cost of performance, the development of strategies to properly evaluate algorithms, to exploit the context of use and to integrate psychological reactions, emotional reactions, risk and security issues are just some of the possible new research trends.

This Special Issue "Information Retrieval, Recommender Systems and Adaptive Systems" aims to inform industrial and academic researchers who apply non-traditional methods to tasks related to the management of huge amounts of information in the era of big data and machine learning.

Collen et al. [1] present the application of a user-centric process for the visualization of automated decision-making security interventions in the context of Internet of Things (IoT)-enabled environments. The user interface (UI) development was guided by iterative feedback collection from user studies on the visualization of a dynamic risk assessment (DRA)-based security solutions for regular lay users. The definition and refinement of the user interface (UI) was controlled by the survey feedback loop from end user studies on their general technological knowledge, experience with smart homes, cybersecurity awareness and privacy preservation needs.

Margaris et al. [2] aim to explore, in a broader context, the factors related to rating prediction accuracy in sparse collaborative filtering datasets. They indicate that recommending the items that simply achieve higher prediction values than others, without considering other factors, can reduce recommendation accuracy and negatively affect the recommender

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system's success in some cases. An extensive evaluation was conducted using sparse collaborative filtering datasets. It was found that the number of near neighbors used for the prediction formulation, the rating average of the user for whom the prediction is generated and the rating average of the item concerning the prediction can indicate, in many cases, whether the rating prediction produced is reliable or not.

Saias et al. [3] describe a churn-prediction solution included in a broader recommendation platform for the level of subscription of cloud services, and to support CSPs' customer-retention strategies. By signaling CSPs about their customers with the greatest propensity to churn, actions can be taken to decrease customer loss. In addition to possible discounts or promotions, these actions may include changes to the service subscription level to better address the real customer needs at the time.

Al-Nafjan et al. [4] present a comparative study of three MF algorithms, namely SVD, SVD++, and NMF. The analysis of these algorithms was based on location-based social networks (LBSNs). The primary task of the implemented recommender system is to predict each user's restaurant ratings and make recommendations based on these predictions. This experiment was evaluated using two performance metrics, namely RMSE and MAE. The SVD method confirmed its efficiency by having the lowest RMSE, whereas the SVD++ method exhibited the lowest MAE metric.

Sarkar et al. [5] propose a crow-search optimization-based hybrid recommendation model to obtain accurate suggestions based on clients' preferences on a tourism dataset. The hybrid recommendation is performed by combining collaborative filtering and content-based filtering. As a result, the advantages of collaborative filtering and content-based filtering are utilized. Moreover, the intelligent behavior of crows assists the proper selection of neighbors, the rating prediction and the in-depth analysis of the contents. Accordingly, an optimized recommendation is always provided to the target users.

Zheng [6] delivers a review of existing context-aware collaborative filtering models using context similarity. Particularly, they also provide an empirical study of these models based on six real-world contextual rating datasets. The experimental results showed that using context similarity can alleviate the sparsity issue and improve the recommendation models. More specifically, the models based on the matching-based context similarity may perform well in the rating prediction task, while the context-aware collaborative filtering approaches using learned context similarity usually work better in the top-N recommendations.

Kopsachilis et al. [7] aim to connect the quantitative elements of the earth observation satellite images with qualitative information, modelling this knowledge in a marine phenomena ontology and developing a question-answering mechanism based on natural language that enables the retrieval of the most appropriate data for each user's needs. The main objective of the presented methodology is to realize the content-based search of earth observation images related to the marine application domain on an application-specific basis that can answer queries such as "Find oil spills that occurred this year in the Adriatic Sea".

Esheiba et al. [8] propose a hybrid knowledge-based recommender system that assists customers in selecting previously customized PSS variants from a wide range of available ones. The recommender system (RS) utilizes ontologies for capturing customer requirements, as well as product-, service- and production-related knowledge. The RS follows a hybrid recommendation approach, in which the problem of selecting previously customized PSS variants is encoded as a constraint satisfaction problem (CSP), to filter out PSS variants that do not satisfy customer needs, and then uses a weighted utility function to rank the remaining PSS variants. Finally, the RS offers a list of ranked PSS variants that can be scrutinized by the customer. The proposed recommendation approach was applied to a real-life large-scale case study in the domain of laser machines.

Yu et al. [9] mainly proposes an approach for integrating textual semantic relationships into a session-based recommendation system. Due to an advantage of the graph neural network, whereby it can efficiently reflect the complex relationship between items through

nodes, edges and its own topological structure, the weight of the edge can be used to record the closeness between adjacent items—this is reflected in this paper as the semantic similarity between adjacent texts. Therefore, during training and transmission, this model can continuously carry out the calculation work of updating parameters according to the rich matrix information, so as to better preserve the relationship information between each other, which also effectively avoids the incomplete utilization of information in the traditional recommendation method. Authors have conducted experiments on two real-life academic datasets from CiteULike.

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