

Tutorial: Sequence-Aware Recommender Systems

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ABSTRACT

Recommender systems are widely used in online applications to help users find items of interest and help them deal with information overload. In this tutorial, we discuss the class of sequence-aware recommender systems. Differently from the traditional problem formulation based on a user-item rating matrix, the input to such systems is a sequence of logged user interactions. Likewise, sequence-aware recommender systems implement alternative computational tasks, such as predicting the next items a user will be interested in an ongoing session or creating entire sequences of items to present to the user. We propose a problem formulation, sketch a number of computational tasks, review existing algorithmic approaches, and finally discuss evaluation aspects of sequence-aware recommender systems.

CCS CONCEPTS

• Information systems → Recommender systems; Collaborative filtering.

KEYWORDS

Recommender Systems; Sequence-Aware; Session-Based

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1 BACKGROUND

Recommender systems are omnipresent in the online world. They can be found on almost all major e-commerce, social media, and e-commerce sites and help user find relevant information in times of information overload. During the last twenty years, the dominant problem abstraction in academia is that of a user-item rating (or interaction) matrix, where the goal is to predict the relevance of each unseen items for a given user. While this abstraction has shown to be helpful in different ways, it also has a number of limitations [1]. For example, when timestamps of interactions are available, they are typically considered only within special “time-aware” algorithms. Furthermore, the user-item rating matrix abstraction does not support the representation of multiple interactions of one user with a given item over time.

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In real-world environments, it is probably not uncommon to keep track of *all* interactions of a user with a website, resulting in a sequence of user actions, including, for example, purchases, streaming activities, or “like” statements. Research on how to leverage this much richer information is however comparably sparse. In the tutorial, we discuss the family of sequence-aware recommender systems [2], which are based on such sequential logs and on a richer set of recorded user interactions, thereby supporting a number of computational tasks that are highly relevant in practice.

2 TUTORIAL CONTENT

After providing examples where the user-item rating matrix abstraction has its limitations in practice, we discuss an application-independent characterization of sequence-aware recommendation problems in terms of inputs, outputs and computational tasks, see also Figure 1.

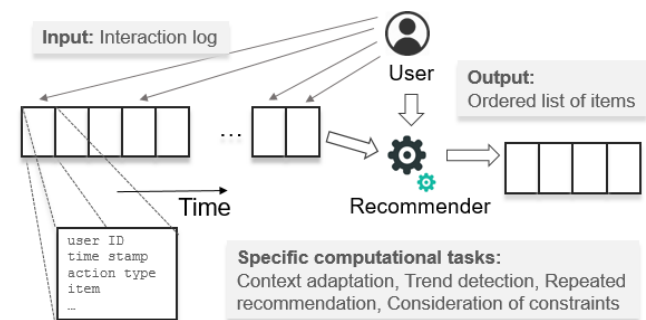


Figure 1: High-level overview of the Sequence-aware Recommendation problem, adapted from [2].

We then consider the “context adaptation” task in more detail and focus on the problem of *session-based* and *session-aware* recommendation, which received increased interest in recent years. Besides the discussion of selected algorithmic approaches designed, e.g., for the next-item prediction problem, we also look at today’s research practice in terms of the academic evaluation of such algorithms. A practical demonstration complements the presentations of the tutorial.

REFERENCES

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