

# Workshop on Context-Aware Recommender Systems

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## ABSTRACT

Contextual information has been widely recognized as an important modeling dimension both in social sciences and in computing. In particular, the role of context has been recognized in enhancing recommendation results and retrieval performance. While a substantial amount of existing research has focused context-aware recommender systems (CARS), many interesting problems remain under-explored. The CARS 2019 workshop provides a venue for presenting and discussing approaches for next generation of CARS and application domains that may require a variety of dimensions of contexts and cope with its dynamic properties.

## CCS CONCEPTS

• **Information systems** → **Recommender systems**; • **Data mining**; • **Computing methodologies** → **Machine learning**;

## KEYWORDS

context-aware recommendation, context, sequence-aware recommendation

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## 1 INTRODUCTION

Over the last decade, there has been an extensive and growing interest in the recommender systems (RSs) community in studying how to properly model and leverage contextual information, such as the activity of the user, time, location and weather [4]. While a substantial amount of research has already been performed, many existing approaches to context-aware recommender systems (CARS) focus on the so-called “representational view” that incorporates pre-defined and static contextual factors (such as time and

location) in the recommendation process. There have been several CARS workshops organized in the past, where the addition of contextual information to traditional recommender systems has been discussed, including the CARS workshop series (2009–2012) organized in conjunction with RecSys [1–3, 6], and the CARR (context-aware retrieval and recommendation) workshop series (2011–2014) organized in conjunction with IUI, WSDM, and ECIR [9–12, 16].

However, in the past few years, various new CARS techniques have been introduced, such as sequence-aware recommender systems [15] and latent context-aware recommender systems [18]. Moreover, new application areas, such as education, health, cooperative work, and affective computing, require the modeling of complex, partially observable and dynamic contextual factors.

Hence, the primary goal of this CARS workshop is to revive the CARS topic and broadly discuss the main features of the next generation of CARS and application domains that may require the use of novel types of contextual information and cope with their dynamic properties. In this respect, the main challenge of the next generation of CARS is to introduce more flexible and comprehensive approaches to modeling and using contextual information.

Although most of the CARS literature has focused on the representational approach, which suggests modeling context using a set of observable attributes that are known a priori, an argument has been made that the context may not be known in advance in many CARS applications and, therefore, needs to be discovered [5]. Recent research has shown that modeling context as a latent space may address the sparsity and dimensionality challenges. For example, latent context-aware recommender systems [18] utilize unsupervised learning techniques for modeling implicit context information derived from mobile devices. Other recent studies [13, 14, 17] have shown that sequential context information can improve recommendation accuracy since sequences enable modeling of both the long and short-term preferences of the user.

Many studies incorporate explicit contextual information [5], referred to as contextual factors, about the ratings given. The specific contexts describe the circumstances of the information collection, e.g., weather conditions (“sunny,” “cloudy,” “raining,” etc.) or precise location conditions (“at home,” “at work,” etc.). Discovering other types of context information from multiple types of data (semantic web, graphs) and media (text, images, video, speech) can subsequently be used for providing better recommendations. For example, the utilization of user reviews to discover contextual information [8] can be used to enhance recommendations. In addition, the relevance of each contextual dimension could be dependent on

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the particular contextual state, hence creating a dynamic model of context [7, 14].

The goal of the CARS workshop is to bring together researchers with wide-ranging backgrounds to identify important research questions, to exchange ideas from different research disciplines, and, more generally, to facilitate discussion and innovation in the area of the next generation of context-aware recommender systems.

## 2 WORKSHOP FORMAT AND TOPICS

CARS workshop was organized as an interactive, half-day workshop. The workshop started with keynote presentations from academia and industry that presented their latest results and identified new trends and challenges in the following topics: context in decision making, models for hidden context, and human context and health applications. The second half of the workshop included paper sessions, for which short and long papers (4-8 pages in length) were solicited. Accepted submissions have been invited for short oral presentations with equal time for discussion.

Submission have been peer-reviewed by the Organizing Committee that selected the most interesting works that meet the objectives of the workshop for the oral presentations. The proceedings will be published in the CEUR workshop proceedings. Evaluation criteria for acceptance included novelty, diversity, significance for theory/practice, and quality of presentation. Finally, the workshop was closed with an open discussion panel to promote and facilitate future research and foster interaction with the participants.

Relevant topics for the CARS workshop included:

- Sequence-aware recommender systems
- Latent context-aware recommender systems
- Mobile recommender systems and wearables
- Human context recognition for health applications
- Context-aware proactive recommender systems
- Context-aware user modeling for recommender systems
- Data sets for context-dependent recommendations
- Algorithms for detecting the relevance of contextual data from multiple types of data (semantic web, graphs) and media (text, images, video, speech)
- Interacting with context-aware recommender systems
- Novel applications for context-aware recommender systems
- Large-scale context-aware recommender systems
- Evaluation of context-aware recommender systems
- Context in decision making

## 3 WORKSHOP SUBMISSIONS

A total of 13 papers were submitted to the workshop, which were reviewed by a program committee of international experts in the field. These papers focused on a wide range of topics in context-aware recommendations, including: leveraging information from multiple sources for context-aware recommendations, dynamic representations of context in CARS, such as sequences, prediction of context from mobile data, and time-aware recommendations.

## 4 WEBSITE AND PROCEEDINGS

The workshop material (list of accepted papers, invited talks, and the workshop schedule) can be found on the CARS workshop website at <https://cars-workshop.com>. The proceedings will be made

available online from the workshop website. A summary of the workshop will appear in SIGIR Forum to increase cross-disciplinary awareness of recommender systems research.

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