



TechTalk with AI Recommendation System in Smart Tourism by Prof. Francesco Ricci

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Interview at a glance

“We proposed to use reinforcement learning and to relay on the current position to suggest what to visit next. The contextual approach is hugely important to generate impact of AI recommender system in tourism industry, which shows a remarkable product complexity.” The Interview with Prof. Francesco Ricci leaved numerous lessons to understand what AI recommender systems are and suggestions for their proper adoption. He highlighted that the analysis of tourist behavior and situational needs is vital to AI recommender systems, not just for providing tourism information in general.



1. Convergence of IT and Tourism

By comparing the past and present, tourism industry has been experiencing tremendous changes caused by the digital transformation wave. In the previous study (Werthner & Ricci, 2004), a structural view of the tourism market illustrating the relationship of customer, DMO/planners/administration, intermediaries, and suppliers was presented and argued the possibility to reshape the tourism industry structure. As an author of this research, Prof. Ricci mentioned, “After 20 years most of the players shown in the original diagram are still operating, but with different roles and completely diverse importance.”

In his description, the intermediaries (i.e., travel agent, tour operator, CRS/GDS, incoming agent, etc) have increased their importance. Furthermore, the suppliers are now more active in

directly promoting their services. He claimed, “What we could not predict 20 years ago was the development of the social platforms and the big IT players in providing information and market access even in the tourism sector.” This has created new intermediaries, taking a middleware functionality, to connect customers to suppliers. For example, social networks help customers to access tourism related information and products both directly and indirectly.

That new information management technology has a fundamental role in promoting destinations, creating new tourism styles, customer behaviours, and leading the paradigm shift of tourism industry. The interviewee enthused that Destinations which are not present in these platforms are out of the game.

2. Recommender System and Artificial Intelligence

2.1 Definition of Recommender System

Recommender systems (RSs) are digital tools that provide suggestions and provoke user’s interests for items (e.g., products, contents, and services to consume) that might be of use for a particular user (Ricci et al., 2023). More particularly, Prof. Ricci offered a definition of “promotion” as below.

“Promotion means that the recommended items are prioritized in the user interface and users can more directly access the recommended content.” In his explanation, RSs can function transparently in many online platforms for instance Amazon.com online store. User could not be even aware of recommender system activity.

However, RSs try to identify the items that may attract more attention and they ease the process of finding and purchasing products and services, among an overwhelming quantity of information of any type.

2.2 The Past, Present and Future of Artificial Intelligence RSS technology

“This technology started at the end of the nineties’ and many

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of the original ideas, such as collaborative filtering, are still used today." The interviewee recollected the beginning of Artificial Intelligence technology. According to Dr. Ricci, the basic focus of RSs in the past was on recommending products and services. However, now the major attention moves to information. Information is about everything: news, activities, destinations, lifestyle, etc. Furthermore, this technology is pervasive, and it is often hard to recognise the presence of recommender system. Most of the major platforms use AI RSs to promote and stimulate decision-making in certain information to customers.

However, there is an issue in terms of reliability and appropriateness of the system functionality. Dr. Ricci stressed that, "Still, the main difficulty today is not in providing information to users, but in understanding their needs and wants." He mentioned that understanding customers is accomplished through the observation of users' online actions, but this data source is not entirely dependable, and understanding users' exact intentions when they access a website can be challenging. However, the advancement of generative AI and large language models presents a promising opportunity to enhance and simplify user preference elicitation and interaction. Users will have the ability to express their information requirements more easily and provide additional contextual details.

2.3 Advantages and disadvantages of AI recommender systems in the tourism field

Accordingly, the disadvantages of RSs in tourism are related to the difficulty to provide relevant recommendations to tourists that have never visited a destination before. Thus, the system might offer information to solicit the elicitation of the user preferences and needs, and to better involve the user in the system interaction. Prof. Ricci argued, "This is called the cold start problem, and in particular, there is the new user problem." There are solutions for tackling that problem, but these are not simple to implement and yet not perfect.

To contribute to providing solution for the problems, Dr. Ricci and researchers presented a new technology at the last User Modeling, Adaptation and Personalisation ACM conference 2023, and they received the best paper award.

"We propose to use reinforcement learning and to relay on the current user position to suggest what to visit next."

Continuous tracking of user behaviour and the provision of recommendations lead to the continuous improvement of these recommendations. Prof. Ricci also offers a suggestion for individuals interested in pursuing a career in this exciting research field.

"There are numerous advantages as many critical issues remain unresolved, leaving ample opportunities for significant advancements and improvements."

3. The Features of AI Recommender Systems

3.1 Personalization by AI Recommender System

In another article (Pilliponyte et al., 2023), a new system, which is a tool for running simulations of the effects that a personalised recommendation campaign, such as a promotion marketing campaign may have, was presented. The user of the new tool may predict the effect that a campaign can have on the global distribution of tourists in a region.

"We are interested in this research because we would like to develop practical solutions for the DMOs so that they can better design their marketing campaigns, either on Instagram, or on their web site."

According to this paper, the user/system interaction plays a vital role in determining the acceptance rate of recommendations.

This is crucial to the ability to foresee the broader impact on the overall movement of tourists in a region. With the proposed tool, it is possible to test the effect on tourists when they are exposed to recommendations that respect the environment, promote sustainability, and avoid exacerbating over-tourism in heavily frequented destinations.

3.2 Group Recommender and AI Recommender Systems

"I do believe that group recommender systems will be the next frontier. In tourism applications, most of the case, we deal with groups, from very small ones (a couple) to rather large units. Moreover, groups may be stable or ephemeral."

According to Baltrunas et al. (2010), group recommendations are provided to members of a group, and each member independently evaluates them. The evaluation involves comparing the predicted ratings or rankings of the recommended items with the actual ratings or rankings observed in the user's test set. Group recommendations are created to cater to the preferences of all users within the group simultaneously.

Prof. Ricci state, "A recommender system that is designed to work for a group must accommodate the preferences of all the group members and be used by some of them, with asynchronous interactions between group members, mediated by the system." Furthermore, he observed that group members change both the required algorithms and the user/system interaction from A to Z.

In a new tool, Prof. Ricci and his research group has developed a solution to let a member of the group to make a choice, of a restaurant, on behalf of the group.

"We have solved the problem of how to support an individual to reason for the group, that is, to remember the preferences of the other group members and find a restaurant that will fit all these preferences."

3.3 Information Responsibility Issue

The researcher highlighted this topic during the interview.

"This is a very important issue. In Europe, by law, online platforms must provide recommender systems that undergo an auditing procedure, to assure the quality of the recommendations."

In the system presentation, recommendations must be justifiable, thus it can be understandable which personal data the recommender system has used and how the system has come to the recommendations.

In addition, it is legally required for platforms to provide users with the possibility to opt out of the profiling conducted by the system. These functionalities collectively define a responsible Recommender System (RS).

"In the future only these types of RSs will have a market, especially in sensible application domains, such as information and media. But I guess that also in the tourism market such functionalities will be required."

3.4 AI and Next-POI Recommendation

Considering the above-mentioned constraints of RSs implementation, an RS could not possess enough information about the target user preferences. However, the system can observe the customer behaviour and decision online, during the recommendation session; what the user browse, where is located, in which direction is moving.

To explain the term of "Next-POI (next points of interest) recommendation," Dr. Ricci made the description below.

"In this way the system can try to predict what could be the next stop of the tourist, given the incomplete profile information that has acquired, and also leveraging the knowledge of the global behaviour of the tourists that has observed so far."

To apply Massimo and Ricci's study (2021), it is crucial to comprehend how tourists naturally navigate within an area, such as following main attractions' routes and relying on visual cues to identify interesting zones to explore. The proposed tourist's next-Point of Interest Recommender System utilizes a combination of these information sources to provide recommendations.

4. The future of AI Recommender System and Smart Tourism

4.1 For Industry Practitioners

AI RSs encompass various aspects, ranging from analysing tourists' behavioural data and predicting consumption trends to identifying emerging hotspots. The fundamental mechanisms employed largely fall under the domain of Machine Learning, wherein algorithms can independently adapt to dynamic situations and enhance their performance through data mining.

Prof. Ricci predicted that as Large Language Models and Generative AI continue to advance, there will be a significant increase in conversational systems that can interact with users naturally and be capable of responding to a wide range of queries on almost any topic.

"This is something that we did not imagine it was so close to come, just a couple of years ago."

4.2 For Researcher and Academia

The interest regarding Recommender Systems has been increasing in general, but the field of tourism lags the advancements achieved by other application scenarios: social media or streaming platforms, to name a few examples. The primary constraint in the tourism sector is the presence of many small players. In fact, only a the large players possess the technical and financial capacity to independently operate an R&D department capable of developing and maintaining an efficient RS (e.g., Booking.com). Small and medium enterprises lack the resources to do so. Therefore, it becomes crucial to design solutions that are feasible and accessible for these smaller players as well.

"Moreover, we must design solutions that can be effectively used in the typical tourism scenario, i.e., with many cold users and items, with groups, for recommending bundles of services and ultimately with solutions that are sustainable and will produce a benefit for all the tourism stakeholders: service providers, local communities, tourists, and destinations."

Declaration of competing interests

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Interviewee Biography

Francesco Ricci is Full Professor at the Faculty of Engineering, Free University of Bozen–Bolzano. He has established a reference point for the research on recommender systems in Bolzano. He has been active with this community as President of the Steering Committee of the ACM Conference on Recommender Systems, from 2007 to 2010. He was previously Senior Researcher and the Technical Director of the E-commerce and Tourism Research Lab (eCTRL), ITC-IRST, Trento, Italy, from 2000 to 2006. From 1998 to 2000, he was System Architect with the Research and Technology Department (process and reuse technologies), Sodalìa S.p.A. His research interests include recommender systems, user modeling, machine learning and ICT applications to travel and tourism. He is the author of more than two-hundred refereed publications. According to Google Scholar, he has an h-index of 61 and around 24,000 citations. He is the Co-Editor of the Recommender Systems Handbook (Springer 2011, 2015 and 2022).

Author Biographies

Suejung Kang is a PhD candidate in Smart tourism at Kyung Hee University, South Korea. She has 7 years of professional experience in the convention and exhibition industry. Her research interests include consumer behavior, experience design, economical behavior, and tourism management.

Chulmo Koo (Ph.D.) Dr. Chulmo Koo is currently a Professor of Smart Tourism Education Platform (STEP), College of Hotel and Tourism Management at Kyung Hee University, South Korea. Dr. Koo has a strong record of smart tourism research and scholarship with significant contributions to both instruction and service.