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## On the effects of aggregation strategies for different groups of users in venue recommendation

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### ABSTRACT

Suggesting new venues to be visited by a user in a specific city remains an interesting but challenging problem, partly because of the inherent high sparsity of the data available in location-based social networks (LSBNs). At the same time, in traditional recommender systems, in order to improve their performance in these sparse situations, different techniques have been proposed mainly by augmenting and aggregating the data available in different domains. In this paper, we address the problem of venue recommendation from a novel perspective: we propose two strategies to select a set of candidate cities in order to use their information when performing recommendations for the users in a specific (target) city. In this context, we categorize users into two different groups (tourists and locals) according to their movement patterns and analyze the potential biases in the recommendations received by each of these groups. We provide an experimental comparison of several recommendation algorithms in a temporal split, where we analyze two strategies to select cities and augment the available data: based on the number of interactions and based on the distance with respect to the target city. Our results show that, in general, extending the available data by proximity increases the performance of the majority of the tested recommenders in terms of relevance and coverage, with almost no change in novelty and diversity. We have found that those users belonging to the tourist group tend to obtain better results in terms of relevance. Furthermore, in general, tourists consistently exhibit different performance by some families of recommenders for other evaluation dimensions, evidencing a popularity bias in user behavior and raising potential fairness issues regarding the quality of the received recommendations. We investigate these aspects and provide methods to better understand the problem. We expect these results could provide readers with an overall picture of what can be achieved in a real-world environment.

### 1. Introduction

The great development of location-based social networks (LBSNs) in recent years has encouraged the research on the problem of Point-of-Interest (POI) or venue recommendation, i.e., suggesting new places to visit by analyzing the users' tastes, needs, and movement patterns (Lian et al., 2018). Foursquare and Gowalla are examples of this kind of social networks, where users record the check-ins they make to certain venues (restaurants, cinemas, hotels, etc.) and share their experiences with other users in the system (Ye, Yin, Lee, & Lee, 2011; Zhang & Chow, 2013). This information, if processed and exploited correctly, can then be used to suggest to the users new venues to visit when using a recommendation engine.

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