**LITERATURE SURVEY**

**1) Opportunity model for E-commerce recommendation: Right product; right time**

**AUTHORS:**  J. Wang and Y. Zhang

Most of existing e-commerce recommender systems aim to recommend the right product to a user, based on whether the user is likely to purchase or like a product. On the other hand, the effectiveness of recommendations also depends on the time of the recommendation. Let us take a user who just purchased a laptop as an example. She may purchase a replacement battery in 2 years (assuming that the laptop's original battery often fails to work around that time) and purchase a new laptop in another 2 years. In this case, it is not a good idea to recommend a new laptop or a replacement battery right after the user purchased the new laptop. It could hurt the user's satisfaction of the recommender system if she receives a potentially right product recommendation at the wrong time. We argue that a system should not only recommend the most relevant item, but also recommend at the right time.

This paper studies the new problem: how to recommend the right product at the right time? We adapt the proportional hazards modeling approach in survival analysis to the recommendation research field and propose a new *opportunity model* to explicitly incorporate time in an e-commerce recommender system. The new model estimates the joint probability of a user making a follow-up purchase of a particular product at a particular time. This joint purchase probability can be leveraged by recommender systems in various scenarios, including the zero-query pull-based recommendation scenario (e.g. recommendation on an e-commerce web site) and a proactive push-based promotion scenario (e.g. email or text message based marketing). We evaluate the opportunity modeling approach with multiple metrics. Experimental results on a data collected by a real-world e-commerce website(shop.com) show that it can predict a user's follow-up purchase behavior at a particular time with descent accuracy. In addition, the opportunity model significantly improves the conversion rate in pull-based systems and the user satisfaction/utility in push-based systems.

**2) Retail sales prediction and item recommendations using customer demographics at store level**

**AUTHORS:** M. Giering

This paper outlines a retail sales prediction and product recommendation system that was implemented for a chain of retail stores. The relative importance of consumer demographic characteristics for accurately modeling the sales of each customer type are derived and implemented in the model. Data consisted of daily sales information for 600 products at the store level, broken out over a set of non-overlapping customer types. A recommender system was built based on a fast online thin Singular Value Decomposition. It is shown that modeling data at a finer level of detail by clustering across customer types and demographics yields improved performance compared to a single aggregate model built for the entire dataset. Details of the system implementation are described and practical issues that arise in such real-world applications are discussed. Preliminary results from test stores over a one-year period indicate that the system resulted in significantly increased sales and improved efficiencies. A brief overview of how the primary methods discussed here were extended to a much larger data set is given to confirm and illustrate the scalability of this approach.

**3) Amazon.com recommendations: Item-to-item collaborative filtering**

**AUTHORS:** G. Linden, B. Smith, and J. York

Recommendation algorithms are best known for their use on e-commerce Web sites, where they use input about a customer's interests to generate a list of recommended items. Many applications use only the items that customers purchase and explicitly rate to represent their interests, but they can also use other attributes, including items viewed, demographic data, subject interests, and favorite artists. At Amazon.com, we use recommendation algorithms to personalize the online store for each customer. The store radically changes based on customer interests, showing programming titles to a software engineer and baby toys to a new mother. There are three common approaches to solving the recommendation problem: traditional collaborative filtering, cluster models, and search-based methods. Here, we compare these methods with our algorithm, which we call item-to-item collaborative filtering. Unlike traditional collaborative filtering, our algorithm's online computation scales independently of the number of customers and number of items in the product catalog. Our algorithm produces recommendations in real-time, scales to massive data sets, and generates high quality recommendations.

**4) The new demographics and market fragmentation**

**AUTHORS:** V. A. Zeithaml

The underlying premise of this article is that changing demographics will lead to a splintering of the mass markets for grocery products and supermarkets. A field study investigated the relationships between five demographic factors-sex, female working status, age, income, and marital status-and a wide range of variables associated with preparation for and execution of supermarket shopping. Results indicate that the demographic groups differ in significant ways from the traditional supermarket shopper. Discussion centers on the ways that changing demographics and family roles may affect retailers and manufacturers of grocery products.

**5) We know what you want to buy: A demographic-based system for product recommendation on microblogs**

**AUTHORS:** W. X. Zhao, Y. Guo, Y. He, H. Jiang, Y. Wu, and X. Li

Product recommender systems are often deployed by e-commerce websites to improve user experience and increase sales. However, recommendation is limited by the product information hosted in those e-commerce sites and is only triggered when users are performing e-commerce activities. In this paper, we develop a novel product recommender system called METIS, a MErchanT Intelligence recommender System, which detects users' purchase intents from their microblogs in near real-time and makes product recommendation based on matching the users' demographic information extracted from their public profiles with product demographics learned from microblogs and online reviews. METIS distinguishes itself from traditional product recommender systems in the following aspects: 1) METIS was developed based on a microblogging service platform. As such, it is not limited by the information available in any specific e-commerce website. In addition, METIS is able to track users' purchase intents in near real-time and make recommendations accordingly. 2) In METIS, product recommendation is framed as a learning to rank problem. Users' characteristics extracted from their public profiles in microblogs and products' demographics learned from both online product reviews and microblogs are fed into learning to rank algorithms for product recommendation. We have evaluated our system in a large dataset crawled from Sina Weibo. The experimental results have verified the feasibility and effectiveness of our system. We have also made a demo version of our system publicly available and have implemented a live system which allows registered users to receive recommendations in real time.