AMPLIFYING PRODUCT RECOMMENDATION THROUGH SOCIAL E-COMMERCE

By

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***Abstract*— Recommender systems are being used by an ever-increasing number of E-commerce sites to help consumers find products to purchase. What started as a novelty has turned into a serious business tool. Recommender systems use product knowledge – either hand-coded knowledge provided by experts or "mined" knowledge learned from the behavior of consumers – to guide consumers through the often-overwhelming task of locating products they will like. In this article we present an explanation of how recommender systems are related to some traditional database analysis techniques. We examine how recommender systems help E-commerce sites increase sales and analyze the recommender systems at six market-leading sites. Based on these examples, we create a taxonomy of recommender systems, including the inputs required from the consumers, the additional knowledge required from the database, the ways the recommendations are presented to consumers, the technologies used to create the recommendations, and the level of personalization of the recommendations. We identify five commonly used E-commerce recommender application models, describe several open research problems in the field of recommender systems, and examine privacy implications of recommender systems technology.**

***Keywords*— Electronic commerce, recommender systems, personalization, customer loyalty, cross-sell, up-sell, mass customization, privacy, data mining, database marketing, user interface.**

I. INTRODUCTION

Recommender systems are used by E-commerce sites to suggest products to their customers and to provide consumers with information to help them decide which products to purchase. The products can be recommended based on the top overall sellers on a site, on the demographics of the consumer, or on an analysis of the past buying behaviour of the consumer as a prediction for future buying behaviour. The forms of recommendation include suggesting products to the consumer, providing personalized product information, summarizing community opinion, and providing community critiques. Broadly, these recommendation techniques are part of personalization on a site because they help the site adapt itself to each customer. The consumer experience includes the physical products, which can be customized in function or in appearance, and the presentation of those products, which can be customized automatically or with help from the consumer. Under this broader definition, recommender systems serve to support a customization of the consumer experience in the presentation of the products sold on a Web site. In a sense, recommender systems enable the creation of a new store personally designed for each consumer. Of course, in the virtual world, all that changes is the selection of products shown to the consumer, not an underlying physical store.

Recommender systems are similar to, but also different from, marketing systems and supply-chain decision-support systems. Marketing systems support the marketer in making decisions about how to market products to consumers, Marketing campaigns can then be run to encourage consumers in different segments to purchase products from categories selected by the marketer. By contrast, recommender systems directly interact with consumers, helping them find products they will like to purchase. Supply-chain decision-support systems help marketers make decisions about how many products to manufacture, and to which warehouses or retail stores to ship the products. These decision-support systems use analytic technology to predict how many of which products will be purchased in each location, so the right products are available for consumers to purchase. Many supply-chain decision-support systems answer questions about aggregates: of all the consumers in Minneapolis, how many will buy toothpaste in February? Recommender systems answer questions about individual consumers: which product will this consumer prefer to buy right now?

Recommender systems include processes that are conducted largely by hand, such as manually creating cross-sell lists, and actions that are performed largely by computer, such as collaborative filtering. We will refer to the latter as automatic recommender systems. Automatic recommender systems are specialized data mining systems that have been optimized for interaction with consumers rather than marketers. They have been explicitly designed to take advantage of the real-time personalization opportunities of interactive e-commerce. Accordingly, the algorithms focus more on real-time and just-in-time learning than on model-building and execution. We study both manual and automatic recommender systems since each offers many interesting ideas about the presentation of recommendations to consumers.

II. Related Work

As merchandisers gained the ability to record transaction data, they started collecting and analysing data about consumer behavior. The term data mining is used to describe the collection of analysis techniques used to infer rules from or build models from large data sets. One of the best-known examples of data mining in commerce is the discovery of association rules – relationships between items that indicate a relationship between the purchase of one item and the purchase of another.

More generally, data mining has two phases. In the learning phase, the data mining system analyze the data and builds a model of consumer behavior. This phase is often very time-consuming and may require the assistance of human analysts. After the model is built, the system enters a use phase where the model can be rapidly and easily applied to consumer situations. One of the challenges in implementing data mining within organizations is creating the organizational processes that successfully transfer the knowledge from the learning phase into practice in the use phase.

A. Approaches

Many different approaches have been applied to the basic problem of making accurate and efficient recommender and data mining systems. Many of the technologies used in the actual recommender systems studied are fairly simple database queries.

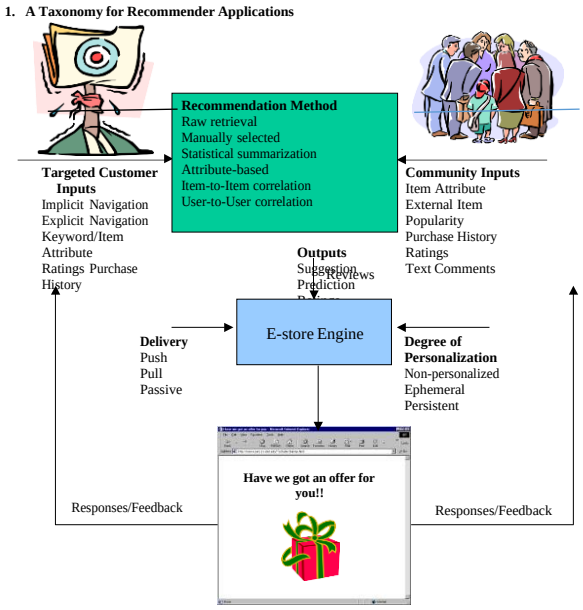
The earliest recommenders used nearest-neighbor collaborative filtering algorithms (Resnick et al. 1994, Shardanand et al. 1995). Nearest neighbor algorithms are based on computing the distance between consumers based on their preference history. Predictions of how much a consumer will like a product are computed by taking the weighted average of the opinions of a set of nearest neighbors for that product. Neighbors who have expressed no opinion on the product in question are ignored. Opinions should be scaled to adjust for differences in ratings tendencies between users (Herlocker et al., 1999). Nearest neighbor algorithms have the advantage of being able to rapidly incorporate the most up-to-date information, but the search for neighbors is slow in large databases. Practical algorithms use heuristics to search for good neighbors and may use opportunistic sampling when faced with very large populations.

B. Marketing Technologies

Recommender systems responded directly to consumers, giving them independent advice modeled after informal "word of mouth." At the same time, new database marketing techniques, data mining, and targeted advertising responded to merchandisers, giving them tools to respond to consumer needs, understand consumer behavior, and best use the limited available customer attention. This section briefly describes database marketing and targeted advertising technologies and their relationship to recommender systems.

III. Proposed System

In our proposed model can be applied to both on the E-commerce based on the learning example sharing some useful recommend product due to its high generality.
We propose a short for Triad based word-of-Mouth recommendation model that can capture both the sharer's influence and the receiver's interest at the same time, which are two significant factors that determine whether the receiver will buy the products or no.
Recommender systems are a technology that helps merchandisers implement a one-to-one marketing strategy. The recommender system analyzes a database of consumer preferences to overcome the limitations of segment-based mass marketing by presenting each customer with a personal set of recommendations.
Recommender systems are a technology that can help businesses decide to whom to make an offer. Such systems allow search engines and advertising companies to suggest advertisements or offers to display based on consumer behavior.

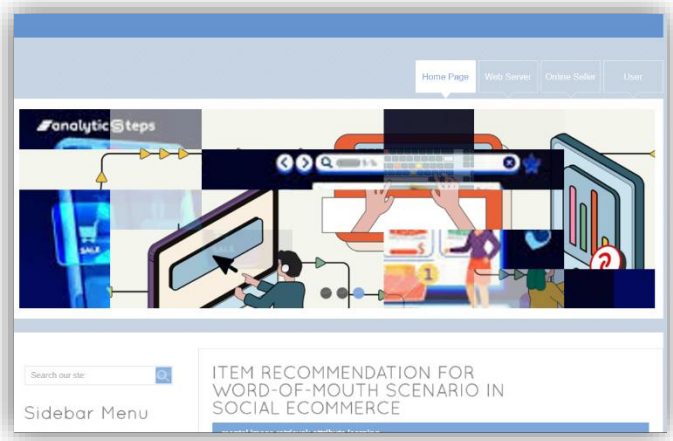


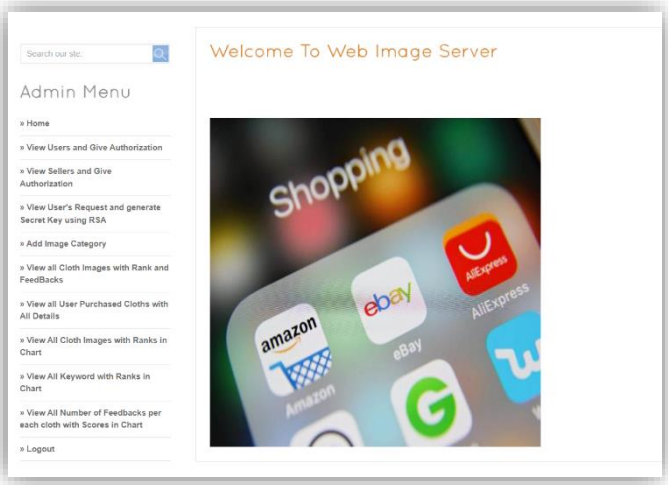
A. Outputs

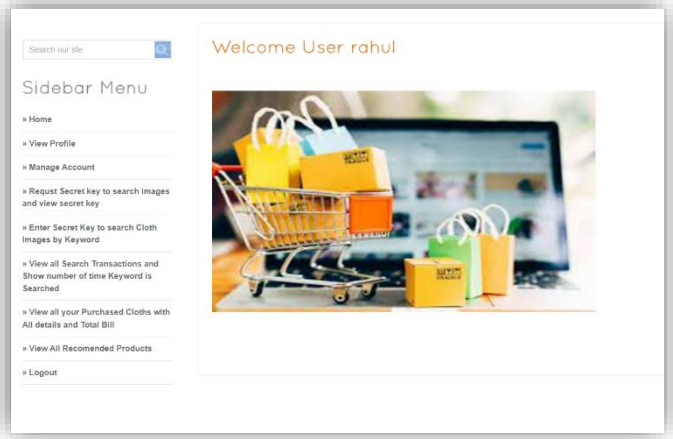
Output recommendations of specific items vary in type, quantity, and look of the information provided to the customer. The most common type of output can be considered a suggestion. This often takes the form of "try this," or simply placing "this" in the web page viewed by the user. The simplest form of "this" is the recommendation of a single item. By recommending only a single item, the e-merchant increases the chance that the customer will seriously consider the item since the recommendation takes little time to process. However, it also places all of the risk in a single recommendation, which may be rejected because the customer already owns the item or has other outside knowledge.

Several recommender algorithms present consumers with a prediction of the rating they would give to an item. These estimates can be presented as personalized estimates for individual consumers or as non-personalized estimates for typical community members. These predicted ratings can help customers understand the strength of a recommendation. Predicted ratings can be displayed in the context of individual

recommendations or lists of recommendations, or they can be displayed in the context of general item information.







IV. CONCLUSION

Recommender applications address a variety of E-commerce business needs. They allow businesses to practice mass customization (Pine 1993) by creating a customized experience through a set of standard products and by allowing product components to be assembled into customized products. As businesses focus on long-term customer value (Peppers & Rogers, 1997), they need advantages that help them retain customers. In E-commerce, the advantage of location is gone, and businesses must depend more heavily on information advantages. Recommender systems allow businesses to leverage their customer history to create more personalized experiences for their customers. Those customers will quickly discover that the business that "knows them best" is the one that can serve them most effectively, recommending the right products rather than treating them like strangers.

In this paper, we have surveyed the recommender applications used by several of the largest E-commerce companies. We identified several design parameters and developed a taxonomy that classifies these applications by their inputs, output, recommendation method, degree of personalization, and delivery method. Classifying the applications revealed a set of application models that reflect the state of practice. We have also explored promising directions in recommender systems, including application ideas built on innovative models that transcend current practice. Finally, in the appendix, we discuss some of the critical social acceptance issues surrounding recommender applications in E-commerce including privacy and trust.

Customer comments and ratings can help sites supplement their credibility and create a greater sense of community. Reviewers are likely to visit the site each time they consume a product since they enjoy sharing their opinions and comment readers may come to depend on reviews to help guide their purchases

Product-associated recommendations allow businesses to respond to each customer's current interests and allow the natural associations among different products to guide customers to the right purchase. These recommendations combine the helpfulness of a knowledgeable salesperson who can recommend items to match ones of interest with the layout of a good store where complementary items are conveniently shelved near each other, even if that means they are shelved in many locations. Customers appreciate good help and good organization and will return to a business that provides a pleasant shopping experience. They also make larger purchases when suggestive selling leads them to products they may have otherwise done without or bought later at another retailer.

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