Survey of Characterizing and Predicting Early Reviewers for Effective Product Marketing on E-Commerce Websites

DINU MOL PHILIP

Assistant Professor, Dept. of Computer Science, MG UNIVERSITY, Depaul Institute of Science and Technology, Angamaly, India

FEBILY FRANKLIN M.F , AMRITHA S and LITTY MARIYA

Dept. of Computer Science, MG UNIVERSITY, Depaul Institute of Science and Technology, Angamaly, India

Abstract— Online reviews have become a key source for decision making nowadays. Early reviews of a product tend to own a high result on the following product sales. In this paper, we study the behavior characteristics of early reviewers through their posted reviews in e-commerce platforms, i.e., Amazon and Yelp. In specific, we are dividing product period into three uninterrupted sub-periods- early, majority and straggler. An untimely observer is a user who has posted a review in the early stage. The early reviewers are quantitatively characterized according to their rating behaviors, the helpfulness scores received from others and also the correlation of their reviews with product popularity. It is found that (1) early observer tends to assign a higher average rating score (2) an early observer tends to post reviews which are more helpful. Our analysis of product reviews conjointly indicates that early reviewers' ratings and their received helpfulness scores seem to influence product popularity. By viewing review posting method as a multiplayer competition game, we made a margin-based embedding model for early reviewer divination. In depth experiments on two totally different e-commerce datasets have shown that our proposed approach outperforms variety of aggressive baselines.

Index Terms— Early reviewer, Early review, Embedding model.

I. INTRODUCTION

The emergence of e-commerce websites has enabled users to publish or share purchase experiences by posting product reviews, that contain helpful opinions, comments and feedback towards a product. As such, a majority of shoppers can browse online reviews before deciding what to purchase. It is reported that approximately 71% of shoppers worldwide browse online reviews before getting a product. Product reviews, particularly the first reviews (i.e., the reviews posted in the early stage of a product), have a high impact on subsequent product sales. We call such reviewers as early reviewers who even though contribute a minority portion of reviews, their opinions decide the success or failure of product and services. It is necessary for corporations to spot early reviewers since their feedbacks will facilitate corporations to regulate promoting methods and improve product designs, which might eventually result in the success of their new merchandise. For this reason, early reviewers become the importance to watch and attract at

the first stimulation part of a corporation. The polar role of early reviews has attracted in depth attention from professionals in marketing to convert shopper purchase neutral. For instance, Amazon has advocated The Early Reviewer Program, that helps to get early reviews on merchandise that have few or no reviews. With this program, Amazon shoppers will learn a lot more about the merchandise and reach smarter shopping decisions. As another connected program, Amazon Vine2 asks the foremost trustworthy reviewers on Amazon to post opinions concerning new and prerelease products to assist their fellow customers create educated purchase selections. Since, the early reviewers are particularly necessary for product promoting, in this paper, we consider the originality to study the conduct characteristics of early reviewers through their reviews on illustrative e-commerce platforms, e.g., Amazon and Yelp. The ain here is to conduct effective analysis and create correct prognostication on early reviewers. This downside is powerfully associated with the adoption of innovations. In general, review posting method is an adoption of innovations, that could be a theory that seeks to elucidate how, why, and at what rate new concepts and technology unfold. The analysis and detection of early adopters within the diffusion of innovations have attracted a lot of attention from the research community. Elementary parts of a diffusion method are studied: attributes of innovation, communication channels, and social network structures. However, most of those studies are theoretical examination at the macro level and there is an absence of quantitative explorations. With the ascension of online social platforms and therefore the availableness of a high volume of social networking data, studies of the diffusion of innovations are extensively conducted on social networks. However, in several application domains, social networking links or channel for communication still remain unobserved. Hence, existing processes depending on social network structures or communication channels are not appropriate in our current downside of predicting early reviewers from online reviews. To model the behavior of early reviewers, we tend to develop a way to indicate the method of assumption in two huge real-world review datasets, i.e., Amazon and Yelp. Specially, given a product, the reviewers will be sorted based on their timestamps for posting their reviews. Following, we tend to divide the merchandise lifetime into following consecutive stages- early, majority and laggards. A user who posts review within the early stage is taken into account as commentator. In our work here, we tend to primarily concentrate on the primary task to analyze the overall characteristics of early reviewers compared with the bulk and laggard reviewers. We tend to characterize their rating behaviors and also the helpfulness scores received from others and therefore the correlation of their reviews with product popularity. The second task is to study a forecast model that forecasts early reviewers given a product. To analyze the characteristics of early reviewers, we tend to take necessary metrics related to their reviews, i.e., their review ratings and helpfulness scores allotted by others. We found that (1) The early reviewers tend to assign more average rating score to products; (2) an early reviewer tends to post more useful reviews. These help to find relevance within the classic principles of personality variables theory from social science, that primarily studies how innovation meets time among the participants : (1) earlier adopters have a better favorable angle towards change than later adopters; and (2) earlier adopters have greater degree of opinion leadership than later adopters. We relate our findings with the personality variables theory as follows: higher average rating scores are in favor to the product, and better helpfulness votes of early reviews given by others

may be viewed as a proxy estimate of the perspective leadership. Our analysis additionally indicates that early reviewers' ratings and their received helpfulness scores influence product popularity. It is explained more with the herd behavior studied in economic science and social science. Herd behavior refers to the actual fact that people are powerfully influenced by the selections of others.

1. Datasets

Since it is unreliable to include users or products with very few reviews for evaluation, we remove the products which are associated with less than 50 reviews in Amazon dataset and 10 reviews in Yelp dataset, and users who posted less than 50 reviews in Amazon dataset and 10 reviews in Yelp dataset. The statistics of the data sets used in our experiment, the total number of comparison pairs that can be generated in our evaluation set. A product, associated reviews in our evaluation set are only a subset of all reviews found about this product in the original dataset, the temporal order of these reviews (and the corresponding reviewers) remains the same. We assign the category labels to reviewers based on the original dataset and use them as our ground truth.

Evaluation metrics

Given a product, each candidate method will produce an ordered list of users. Hence, we adopt three ranking-based metrics for evaluation of predicting results.

Overlapping Ratio at rank.
Hit ratio at rank.
Ratio of Correct Comparison Pairs (RCCP).

2. Methods to Compare for Early Reviewer Prediction

Our task is to predict who will become early reviewers of a product. We consider three kinds of methods for comparisons: statistics-based methods, competition-based models and our margin-based embedding ranking model.

Simple Statistics-based Methods
Competition-based Models
Margin-based Embedding Model

3. Results and Analysis

The results on early reviewer prediction can be observed that the simplest baseline of ranking users based on the number of reviews posted before (NR) performs the worst. It indicates that users posted a large number of reviews is not necessarily active in early adoption of products. NER improves over NR, which shows that a user who has acted as an early reviewer for other products before is more likely to adopt new products in the future. PER, outperforms NER in Amazon dataset, while underperforms NER in Yelp dataset. The smoothed PER, i.e., SPER, performs better than PER. The two comparison- based baselines B-T and B-C outperform the statistics-based methods only in some cases, and do not yield significant improvement. These results are consistent with the finding previously reported in that a simple ratio based method works well when the training data is sufficiently large. Over- all, B-C performs better than B-T. Instead of using a single value, B-C adopts a vectorized representation for modeling the player strength. Furthermore, the two competitions- based methods TS and SVM Comp improve upon all the above baselines. Although SVM Comp is slightly better than TS, there is no significant difference between them. TS is a classic competition model for characterizing the player strength, while SVM Comp has been shown to be effective in QA expert finding task.

These two methods perform best among our baselines. Our proposed model MERM achieves significant improvement in comparison to all the baselines. Compared with other baselines which only measure the earliness level of a user with a single value, MERM learns the multidimensional representation of users from comparative pairs. Although B-C also adopts a multidimensional representation for modeling player strength, it does not perform very well in our task. A possible reason is that B-C needs to learn more parameters (i.e., both blade vectors and chest vectors); while, in our datasets, the comparison pairs for training are sparse. The key difference of MERM is that it learns product embeddings also based on the side information involving both the title and category information of products. It effectively projects both product and user embeddings into the same continuous space for direct comparison and ranks users by optimizing a margin-based ranking objective function in a product dependent manner. In our second sets of experiments, we further examine the impact of the amount of training data on the results of early reviewer prediction. We present the results of Amazon dataset; the results of Yelp dataset are similar and are omitted here. By fixing the test data at 20%, we vary the remaining 80% training data at five different splits: {20%, 40%, 60%, 80%, 100%}. Overall, we observe that all the methods suffer from performance drop with the decrement of training data. Our method MERM performs generally better than other methods with any amount of training data. We also vary the number of dimensions (i.e., 2L) for user and product representation in B-C and MERM, and report the results. It can be observed that the dimensionality of 200 yields the best performance.

II. LITERATURE REVIEW

Ting Bai, Jian-Yun Nie[1] found that an early reviewer tends to assign more average rating score; (2) an early reviewer tends to post a lot more of useful reviews. Our analysis of product reviews additionally indicates that early reviewers' ratings and their received helpfulness scores influence product popularity. In viewing review posting procedure as a multiplayer competition game, we have proposed a unique embedding model based on margin for early reviewer forecast. Experimenting on different e-commerce datasets have shown that our proposed system outperforms various competitive baselines. Julian McAuley, Alex Yang[2] Provided online audits often are our initial port of decision when considering products and buys on the web. When assessing a possible purchase, we can have a specific inquiry as a main priority. To answer such inquiries we should either swim through volumes of buyer audits aiming to discover one which will be pertinent, or usually recommend our communication starter to the network using a Q/A framework. In this paper we meld these ideal models: given a large volume of beforehand addressed questions about products, we have a tendency to trust to consequently understand if an audit of a product is critical to a given question. we refer to this as a machine learning issue utilizing a mix of-specialists compose system— here every audit will be a 'specialist' that gets the chance to vote on the reaction to a particular question; when we have a tendency to soak in an importance capacity with the final goal that 'applicable' audits will be those who vote accurately. At test time this scholarly importance work allows to surface audits that become necessary to new queries . Matthew J. Salganik, Peter Sheridan Dodds, Duncan J. Watts [3] provided cooperative filtering has proved to be valuable for recommending products in various

domains. Here, we will explore the employment of cooperative filtering to suggest research papers, making use of the citation web between papers to form the ratings matrix. We tested the flexibility of cooperative filtering to suggest citations that will be appropriate for extra references to focus on a research paper. On analyzing six ways for choosing citations, evaluating this through offline demonstration against a database of over 186,000 research papers hold in Research Index. An additional web demonstrate was performed with over a hundred and twenty users for measurement of user opinion of the effectiveness of the algorithms and of the utility of such recommendations for common research tasks. Massive variations were seen within the accuracy of the algorithms during the offline experiment, specially when balanced for coverage. During the online experiment, users felt they received quality recommendations, and were excited on the thought of receiving recommendations in this domain. Julian McAuley, Christopher Targett, Qinfeng (‘Javen’) Shi, Anton van den Hengel[4] intrigued here in revealing connections between the appearances of sets of products, and particularly in displaying the human plan on which objects supplement one another and which can be viewed as satisfactory choices. Accordingly we demonstrated what is on a basic level human plan of the visual association between articles, as opposed to displaying the visual similitude between them. There has been some enthusiasm in displaying the visual style of spots, and objects. We, curiously, don't seem to be trying to point out the individual appearances of objects, however the presence of a question might impact the engaging visual characteristics of another. Daichi Imamori , Keishi Tajima [5] provided approach for concept because of the dynamicity, new well known records consistently show up and vanish in miniaturized scale blogging administrations. Early identification of recent records that may land up thought in future is a vital issue that incorporates a few applications, for instance, slant location, viral showcasing, and client suggestion. Estimation of prominence of a record is in addition valuable for approximating the character of data it posts. Estimation of the character of data is significant in various applications, still it is for the exhausting to gauge with no human mediation. Comparative thought has in addition been effectively connected to small scale web journals with connecting capacities. These certainties showed that there exists a high relationship between the notoriety and the character of data. This way, the estimation of forthcoming notoriety of recent records, that have not settled the prevalence they have an advantage, is in addition useful for estimation of the quality.

III. CONCLUSION

We studied the novel task of early reviewer characterization and prediction on real-world online review datasets. Our actual analysis strengthens a series of theoretical conclusions from social science and economic science. It is found that early reviewers tend to assign a bigger average rating score; also that an early reviewer tends to post a lot more of useful reviews. Our experiments additionally indicate that early reviewers’ ratings and their received helpfulness scores influence product popularity at a later stage. We adopted a competition-based viewpoint to model the review posting method, and developed an embedding ranking model (MERM) based on margin for predicting early reviewers in a very cold-start setting.

IV. REFERENCES

[1] N. Aaraj, S. Ravi, S. Raghunathan, and N. K. Jha, "Architectures for efficient face authentication in embedded systems," inProc. Design, Autom. Test Eur., Mar. 2006, vol. 2, pp. 1–6.

[2] M. D. Marsico, M. Nappi, and D. Riccio, "FARO: Face recognition against occlusions and expression variations," IEEE Trans. Syst., Man, Cybern. A, Syst., Humans, vol. 40, no. 1, pp. 121–132, Jan. 2010.

[3] F. Abate, M. Nappi, D. Riccio, and G. Tortora, "RBS: A robust bimodal system for face recognition,"Int. J. Softw. Eng. Knowl. Eng., vol. 17, no. 4, pp. 497–514, 2007.

[4] N. J. Belkin, P. B. Kantor, E. A. Fox, and J. A. Shaw, "Combining evidence of multiple query representation for information retrieval," Inf. Process. Manag., vol. 3, no. 31, pp. 431–448, 1995.

[5] R. M. Bolle, J. H. Connell, S. Pananti, N. K. Ratha, and A. W. Senior, "The relation between the ROC curve and the CMC," inProc. 4th IEEE Work. Automat. Identification Adv. Technol., 2005, pp. 15– 20.

[6] D. Delgado-Gomez, F. Sukno, D. Aguado, C. Santacruz, and A. ArtesRodriguez, "Individual identification using personality traits,"J. Netw. Comput. Appl., vol. 33, no. 3, pp. 293–299, May 2010.

[7] M. D. Marsico, M. Nappi, and D. Riccio, "HERO: Human ear recognition against occlusions," inProc. IEEE Comput. Soc. Workshop Biometrics—In Assoc. IEEE Conf. Comput. Vis. Pattern Recognit.— CVPR, San Francisco, CA, 18 Jun. 2010, pp. 320–325.

[8] R. Distasi, M. Nappi, and D. Riccio, "A range/domain approximation error based approach for fractal image compression," IEEE Trans. Image Process., vol. 15, no. 1, pp. 89–97, Jan. 2006.

[9] K. Sarkar and H. Sundaram, "How do we find early adopters who will guide a resource constrained network towards a desired distribution of behaviors?" in CoRR, 2013, p. 1303.

[10] D. Imamori and K. Tajima, "Predicting popularity of twitter accounts through the discovery of link-propagating early adopters," in CoRR, 2015, p. 1512.

[11] X. Rong and Q. Mei, "Diffusion of innovations revisited: from social network to innovation network," in CIKM, 2013, pp. 499– 508.

[12] Mele, F. Bonchi, and A. Gionis, "The early-adopter graph and its application to web-page recommendation," in CIKM, 2012, pp. 1682–1686.

[13] Y.-F. Chen, "Herd behavior in purchasing books online," Computers in Human Behavior, vol. 24(5), pp. 1977–1992, 2008.