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Method for Ranking the Helpfulness of Online Reviews Based on SOILES TODIM

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ABSTRACT

Online reviews are an essential aspect of online shopping for both customers and retailers. However, many reviews found on the Internet lack in quality, informativeness or helpfulness. In many cases, they lead the customers towards positive or negative opinions without providing any concrete details (e.g., very poor product, I would not recommend it). In this work, we propose a novel unsupervised method for quantifying helpfulness leveraging the availability of a corpus of reviews. In particular, our method exploits three characteristics of the reviews, viz., relevance, emotional intensity and specificity, towards quantifying helpfulness. We perform three rankings (one for each feature above), which are then combined to obtain a final helpfulness ranking. For the purpose of empirically evaluating our method, we use review of four product categories from Amazon review. The experimental evaluation demonstrates the effectiveness of our method in comparison to a recent and state-of-the-art baseline.

Keywords: - In many cases, they lead the customers towards positive or negative opinions without providing any concrete details (e.g., very poor product, I would not recommend it).

I. INTRODUCTION

According to data from the National Bureau of Statistics of China, in 2019, China's online retail sales reached 1.06324 trillion yuan, an increase of 16.5% over the previous year. The online penetration rate of online retail sales reached 20.7%, an increase of 2.3 percentage points over the previous year. The continued boom in online shopping has allowed e-commerce systems to accumulate a large number of online reviews, which are an important basis for consumer decision-making. High quality reviews are effective in helping consumers make purchasing decisions, whereas low-quality reviews waste consumers' time. If reviews are ranked according to their helpfulness and the most helpful information for purchasing decisions is prioritized, then the time cost for consumers to read reviews can be reduced and the efficiency of purchasing decisions can be improved. To investigate this practical problem, this paper studies the ranking problem of the helpfulness of reviews.

At present, research on the helpfulness of reviews mainly focuses n analyzing the influencing factors and constructing prediction models. The objects of study are mainly search products with few experiential products Studies have shown that product types can affect consumers' purchasing decisions [1], and research conclusions on search products are not universal for experiential products. Given the current research status, this paper takes movies as an example to rank the helpfulness of experiential product reviews.

The review helpfulness ranking problem refers to the ranking of online reviews based on the helpfulness index score. Identifying a method of filtering the helpfulness index of reviews and ranking the helpfulness of reviews are the two areas of emphasis of the research. The following is a review of the research status for these two aspects.

Online reviews mainly include the reviewer's emotional attitude and description of product features. Emotional attitude indicates a like or dislike of the product. Ontological features indicates the consumers' functional preferences for products. Ontology refers to the evaluation objects of reviews. Emotional attitude and ontological features comprehensively cover the semantic information that reviews can convey to readers. Bi *et al.* [2] measured the effects of customer sentiments on customer satisfaction; Bi *et al.* [3], Kauffmann *et al.* [4], Liu *et*

al. [5], and Liu *et al.* [6] ranked alternative products using emotion analysis technology; Kumar and Abirami [7] ranked alternative products based on ontological features; Huang and Jiang [8] and Saumya *et al.* [9] calculated the helpfulness score of reviews based on ontological features; and Wang *et al.* [10] realized product ranking by identifying product features and emotional polarity. In addition to semantic information, scholars have constructed statistical indicators to measure the helpfulness of reviews. Singh *et al.* [11] and Shaalan *et al.* [12] built a review ranking model by using information entropy and score distribution. The above studies effectively constructed evaluation indexes of the helpfulness of reviews from semantic and statistical aspects.

Multi attributes of things can reject the nature of the object. Through multi-criteria decision-making (MCDM) about multi attributes, we can solve many problems, such as the prediction of tourist volume [13], the scheduling of shared bikes [14], management of hotels [15], the evaluation of internet of things platforms [16], and the realization of Importance Performance Analysis (IPA) [17]. The ranking process of reviews is also a MCDM problem, which should take into account the uncertainty of review information, the contradiction between attributes, and the decision maker's loss aversion psychology. Specifically, the uncertainty of review information can be rejected by the size of the attribute value, the contradictory relationship between indicators can be rejected by the size of the attribute weight, and the decision maker's loss aversion can be rejected by the loss attenuation coefficient.

Previous research has mainly focused on the ranking study of alternative products, which provides a theoretical basis for the ranking study of the reviews on the helpfulness. However, these studies present two deficiencies. First, the evaluation index only considers the emotional factors without considering the ontological characteristics, and since different research objects contain different features, it is necessary to consider ontology features to construct indexes; and second, the weight are calculated by the subjective expert assignment method, which necessitates the design of a quantitative calculation method. In view of the current research status, we improved TODIM method, proposed SO-ILES TODIM, and made up for the two short comings of the above research. Taking movies as the research object, we realized the method for ranking the helpfulness of review.

Our contribution includes two aspects: theoretical value and practical significance. The theoretical contribution of this paper is that we propose a SO-ILES TODIM method (a TODIM method based on the intuitive language evaluation set of emotional and ontological features) that takes into account emotional factors and ontology characteristics, makes the evaluation set more applicable in the field, and can use the regression coefficient method to quantify the index weight, thereby avoiding the subjectivity of the manual assignment method. The practical significance of this paper is that the method we proposed can prioritize reviews that directly evaluate the products, thereby reducing the time cost of consumers reading reviews and improving the efficiency of consumers making purchasing decisions base on reviews.

II. LITERATURE SURVEY

Exploring the influence of online reviews and motivating factors on sales: A meta-analytic study and the moderating role of product category

Online reviews, which significantly influence product sales, have been a central research topic in the field of marketing. Meanwhile, some motivating factors related to online retailers have been linked to product sales. While several articles have examined the impact between online reviews and motivating factors on product sales, many of the conclusions drawn are contradictory. From 28 studies focusing on online reviews and sales, this study performs a meta-analysis to analyze the true impacts of six review-related factors (i.e., the number of reviews, star ratings, standard deviation of ratings, helpfulness, review length and sentiment), and two motivating factors (i.e., price discounts and special shipping) on product sales. Meanwhile, this project also studies how one product-related factor (i.e., product age) and one reviewer-related factor (i.e., reviewer's reputation) influence the relationship between online reviews and product sales. In addition, to study the moderating effect of product category, divide the selected literature into two subgroups which are

search and experience products. The results indicate that only review length and special shipping have no significant impact on product sales, while product category has a valid and specific moderating effect on the relationship between these determinants and sales. The presented conclusions will have important implications for academic research and for future industry practice.

Modelling customer satisfaction from online reviews using ensemble neural network and effect-based Kano model

With the rapid advances in information technology, an increasing number of online reviews areposted daily on the Internet. Such reviews can serve as a promising data source to understand customer satisfaction. To this end, in this paper, we proposed a method for modelling customer satisfaction from online reviews. In the method, customer satisfaction dimensions (CSDs) are first extracted from online reviews based on latent dirichlet allocation (LDA). The sentiment orientations of the extracted CSDs are identified using a support vector machine (SVM). Then, considering the existence of complex relationships among different CSDs and the customer satisfaction, an ensemble neural network based model (ENNM) is proposed to measure the effects of customer sentiments toward different CSDs on customer satisfaction. On this basis, to identify the category of each CSD from the customer's perspective, an effect-based Kano model (EKM) is proposed.

Representing sentiment analysis results of online reviews using interval type-2 fuzzy numbers and its application to product ranking

Online reviews are used as a data source to make a variety of management decisions. An important precondition when using online reviews for decision analysis is knowing how to represent the sentiment analysis results of a large volume of online reviews. Although several approaches have been proposed for this, none of these consider the limited accuracy rates of the sentiment analysis results, which can impact the quality of the decision analysis results. To this end, we propose a new approach for representing the sentiment analysis results using interval type-2 fuzzy numbers that considers the accuracy rates. In the proposed approach, the sentiment analysis results with a 100% accuracy rate are converted into a triangular fuzzy number, and those with limited accuracy rate are regarded as the uncertainty of the membership function.

III. SYSTEM ANALYSIS

Existing system

Lin *et al.*designed an entropy measurement method to measure theuncertainty of probabilistic language term sets; Wu *et al.* extended VIKOR methods based on the interval type-2 fuzzy best-worst; Liu and Teng , Zhang *et al.* , Wuand Zhang , and Lin *et al.* optimized the MCDM algorithm by constructing attributes and attribute values,which are specifically reflected by the use of the extendedprobability language TODIM (PL-TODIM) method, fuzzyemotion word framework, intuitionist fuzzy emotion wordframework and probabilistic uncertain linguistic term set; Davoudabadi*et al.*, Wang *et al.*, and Wu *et al.*optimized the MCDM algorithm via a quantitative weightcalculation, which was specifically reflected in the sortingstudy of alternative schemes by aggregating objective andsubjective weights, developing entropy weighting technologyand combining network analysis and entropy weight methods,respectively; and Xiao *et al.* developed novel operationallaws for a hesitant fuzzy linguistic term set (HFLTS)and applied them to derive the attribute weights. The aboveresearch realizes the continuous optimization of the MCDMalgorithm.

Disadvantages

1) The system is not implemented by SO-ILES TODIM Concept.
2) The system doesn't implement an Identifying a method of filtering the helpfulness index of reviews and ranking the helpfulness of reviewsare the different areas of emphasis of the research.

Proposed System

In view of the currentresearch status, we improved TODIM method, proposedSO-ILES TODIM, and

made up for the two shortcomingsof the above research. Taking movies as the researchobject, we realized the method for ranking the helpfulnessof review.

Our contribution includes two aspects: theoretical valueand practical significance. The theoretical contribution ofthis paper is that we propose a SO-ILES TODIM method(a TODIM method based on the intuitive language evaluationset of emotional and ontological features) that takesinto account emotional factors and ontology characteristics,makes the evaluation set more applicable in the field, andcan use the regression coefficient method to quantify theindex weight, thereby avoiding the subjectivity of the manualassignment method. The practical significance of thispaper is that the method we proposed can prioritize reviewsthat directly evaluate the products, thereby reducing thetime cost of consumers reading reviews and improving theefficiency of consumers making purchasing decisions basedon reviews.

Advantages

(1) Based on emotion analysis andontological feature model, we propose a new intuitive languageevaluation set (SO-ILES).

(2) Based on the regressioncoefficient, we proposed the regression coefficient method,which realized the scientific calculation of the weight value.

(3) In order to solve the problem of repeated attribute occurrencein a review, we designed new scoring function andprecise function, so that TODIM method can better solve theranking problem of review helpfulness.

IV. IMPLEMENTATION:

Admin

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as

Login, View All Users And Authorize, Add Filter, Add Products, View All Products, View Products Reviews, View Products Ratings, View Positive Reviews, View Negative Reviews, View Raking Results, View Product Rate Results

View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

User

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password. Once Login is successful user will do some operations like Register and Login, My Profile Search Products, View All User Products Reviews, View Products_ Ratings,

V. CONCLUSION

Online reviews are an important basis for consumers to make purchasing decisions when shopping online. This paper studies the helpfulness ranking of online reviews to improve the purchasing efficiency by prioritizing helpful reviews. The research in this paper extends the research depth of the helpfulness of reviews, enriches the research method of the helpfulness ranking of reviews, and provides insights about the effective management of online reviews by businesses.

Taking film reviews as the research object, the SO-ILES TODIM method is proposed to rank the helpfulness of reviews. This method constructs a new language evaluation set, the intuitive language evaluation set based on emotion and ontological features (SO ILES), which can effectively extract the characteristic information of research objects and is more applicable in the field. In addition, this method includes a calculation formula for index attribute value based on statistical rules and proposes the calculation method of index weight based on the logit regression model. These two points realize the quantitative calculation of attribute value and weight value, which, effectively avoids the subjectivity of manual assignment.

The case analysis demonstrates that the SO-ILES TODIM method can prioritize direct evaluation

reviews of a film, which proves the effectiveness of the SO-ILES TODIM method. A comparative analysis of the choice of the emotional intensity index shows that its effect on the final review ranking is not significant. The choice of the emotional intensity index can be made according to the business environment. The parameter sensitivity analysis shows that the loss attenuation coefficient can not only ensure that the parameters reject the decision maker's loss avoidance psychology but also ensure the relative stability of the review ordering in certain range when the parameters change, which proves that the SO-ILES TODIM method is scientific

REFERENCES

[1] K. Li, Y. Chen, and L. Zhang, ``Exploring the in_uence of online reviews and motivating factors on sales: A meta-analytic study and the moderating role of product category," *J. Retailing Consum. Services*, vol. 55, Jul. 2020, Art. no. 102107.

[2] J.-W. Bi, Y. Liu, Z.-P. Fan, and E. Cambria, ``Modelling customer satisfaction from online reviews using ensemble neural network and effect-based kano model," *Int. J. Prod. Res.*, vol. 57, no. 22, pp. 7068_7088, Nov. 2019.

[3] J.-W. Bi, Y. Liu, and Z.-P. Fan, ``Representing sentiment analysis results of online reviews using interval type-2 fuzzy numbers and its application to product ranking," *Inf. Sci.*, vol. 504, pp. 293_307, Dec. 2019.

[4] E. Kauffmann, J. Peral, D. Gil, A. Ferrández, R. Sellers, and H. Mora, ``A framework for big data analytics in commercial social networks: A case study on sentiment analysis and fake review detection for marketing decision-making," *Ind. Marketing Manage.*, vol. 90, pp. 523_537,
Oct. 2020, doi: 10.1016/j.indmarman.2019.08.003.

[5] Y. Liu, J.-W. Bi, and Z.-P. Fan, ``Ranking products through online reviews: A method based on sentiment analysis technique and intuitionistic fuzzy set theory," *Inf. Fusion*, vol. 36, pp. 149_161, Jul. 2017.

[6] Y. Liu, J. Bi, and Z. Fan, ``A method for ranking products through online reviews based on sentiment classi_cation and interval-valued intuitionistic fuzzy TOPSIS," *Int. J. Inf. Technol. Decis. Making*, vol. 16, no. 6, pp. 1497_1522, 2017.

[7] A. K. J and A. S, ``Aspect-based opinion ranking framework for product reviews using a Spearman's rank correlation coef_cient method," *Inf. Sci.*, vols. 460_461, pp. 23_41, Sep. 2018.

[8] C. Huang and W. Jiang, ``Aspect-based personalized review ranking," in *Proc. IEEE SmartWorld, Ubiquitous Intell.Comput., Adv. Trusted Comput., Scalable Comput. Commun., Cloud Big Data Comput., Internet People Smart City Innov. (Smart-World/SCALCOM/UIC/ATC/CBDCom/IOP/SCI)*,
Oct. 2018, pp. 1329_1334. [Online]. Available: https://ieeexplore.ieee.org/abstract/document/8560209

[9] S. Saumya, J. P. Singh, A. M. Baabdullah, N. P. Rana, and Y. K. Dwivedi, ``Ranking online consumer reviews," *Electron. Commerce Res. Appl.*, vol. 29, pp. 78_89, May 2018.

[10] W. Wang, H. Wang, and Y. Song, ``Ranking product aspects through sentiment analysis of online reviews," *J. Experim. Theor. Artif. Intell.*, vol. 29, no. 2, pp. 227_246, Mar. 2017.

[11] J. Singh, S. Irani, P. Rana, Y. Dwivedi, S. Saumya, and P. Roy, ``Predicting the `helpfulness' of online consumer reviews," *J. Bus. Res.*, vol. 70, pp. 346_355, Jan. 2017.

[12] Y. Shaalan, X. Zhang, and J. Chan, ``Learning to rank items of minimal reviews using weak supervision," in *Advances in Knowledge Discovery and Data Mining*, vol. 10937. Cham, Switzerland: Springer, 2018, pp. 631_643, doi: 10.1007/978-3-319-93034-3_50.

[13] J. Bi, Y. Liu, and H. Li, ``Daily tourism volume forecasting for tourist attractions," *Ann. Tourism Res.*, vol. 83, Jul. 2020, Art. no. 102923.

[14] M. Lin, C. Huang, and Z. Xu, ``MULTIMOORA based MCDM model for site selection of car sharing station under picture fuzzy environment," *Sustain. Cities Soc.*, vol. 53, Feb. 2020, Art. no. 101873.

[15] J.-W. Bi, Y. Liu, Z.-P. Fan, and J. Zhang, ``Exploring asymmetric effects of attribute performance on customer satisfaction in the hotel industry," *Tourism Manage.*, vol. 77, Apr. 2020, Art. no. 104006.

[16] M. Lin, C. Huang, Z. Xu, and R. Chen, ``Evaluating IoT platforms using integrated probabilistic linguistic MCDM method," *IEEE*

Internet Things J., vol. 7, no. 11, pp. 11195_11208, Nov. 2020.
[17] J.-W. Bi, Y. Liu, Z.-P. Fan, and J. Zhang, ``Wisdom of crowds: Conducting importance-performance analysis (IPA) through online reviews," *Tourism Manage.*, vol. 70, pp. 460_478, Feb. 2019.
[18] Q. Wu, W. Lin, L. Zhou, Y. Chen, and H. Chen, ``Enhancing multiple attribute group decision making _exibility based on information fusion technique and hesitant pythagorean fuzzy sets," *Comput. Ind. Eng.*, vol. 127, pp. 954_970, Jan. 2019.
[19] M. Lin, Z. Chen, H. Liao, and Z. Xu, ``ELECTRE II method to deal with probabilistic linguistic term sets and its application to edge computing," *Nonlinear Dyn.*, vol. 96, no. 3, pp. 2125_2143, May 2019.
[20] Q. Wu, L. Zhou, Y. Chen, and H. Chen, ``An integrated approach to green supplier selection based on the interval type-2 fuzzy best-worst and extended VIKOR methods," *Inf. Sci.*, vol. 502, pp. 394_417, Oct. 2019.
[21] P. Liu and F. Teng, ``Probabilistic linguistic TODIM method for selecting products through online product reviews," *Inf. Sci.*, vol. 485, pp. 441_455, Jun. 2019.
[22] D. Zhang, C. Wu, and J. Liu, ``Ranking products with online reviews: A novel method based on hesitant fuzzy set and sentiment word framework," *J. Oper. Res. Soc.*, vol. 71, no. 3, pp. 528_542, Mar. 2020.
[23] C. Wu and D. Zhang, ``Ranking products with IF-based sentiment word framework and TODIM method," *Kybernetes*, vol. 48, no. 5, pp. 990_1010, May 2019.
[24] M. Lin, Z. Xu,Y. Zhai, and Z.Yao, ``Multi-attribute group decision-making under probabilistic uncertain linguistic environment," *J. Oper. Res. Soc.*, vol. 69, no. 2, pp. 157_170, Feb. 2018.
[25] R. Davoudabadi, S. Mousavi, and V. Mohagheghi, ``A new last aggregation method of multi-attributes group decision making based on concepts of TODIM, WASPAS and TOPSIS under interval-valued intuitionistic fuzzy uncertainty," *Knowl. Inf. Syst.*, vol. 64, no. 4, pp. 1371_1391, 2020.