Cross-Cultural Comparisons of Review Aspect Importance

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Abstract

Previous text mining studies identified key common aspects in online restaurant reviews. However, it is not clear how important these aspects are for consumers. In this exploratory study, we used Yelp restaurant reviews on an ethnic food item, ramen noodles, and assessed the importance of each aspect to both U.S. and Japanese consumers. The results show that food and atmosphere are far more important than the other common aspects in both the U.S. and Japan. However, we found noticeable differences between consumers in the two countries regarding how the food aspect plays a role on star ratings. Both implications and a future research agenda are discussed.

Keywords: online restaurant reviews; text mining; aspect; entity correlation; cross-cultural differences

1. Introduction

Online restaurant reviews are invaluable resources for consumers today. In fact, 58% of consumers searched restaurant ratings in 2014, and a one-star rating increased results in a 5-9% revenue increase for restaurants.

Previous text mining studies primarily focused on summarization of review content. Common aspects (key features and attributes) identified in online restaurant reviews are atmosphere (décor), food, location, menu, service, value (price), and waiting time [1-5]. However, it was not clear how important each aspect is to consumers and restaurants. These ratable aspects are deemed specific to the types of restaurant [1]. Given that there are variances in dietary habits across nations and cultures, the importance of each aspect may well be specific to culture and nationality [e.g., 6].

To explore the specificity of aspect importance, we feature online restaurant reviews concerning a popular ethnic food, the ramen noodle dish (hereafter, ramen). According to the Instant Noodles Association, the 2013 consumption of instant ramen was 105.590 billion servings in the world, Japan being the third and the U.S. the sixth in the ranking. Our research question is how key aspects in online restaurant reviews vary between different cultures or nationalities.

This research-in-progress paper reports the preliminary findings of text mining analyzes on the popular review site, Yelp, in Japan and the U.S.

2. Theoretical Background and Hypothesis

Importance of each aspect. Topical aspects, or simply aspects, are defined as unique or distinct components or attributes of a product upon which consumers' opinions are formed [7, 8]. Previous studies [e.g., 1, 9] typically used variants of Latent Semantic Analysis (LSA) and Latent Dirichlet Allocation (LDA) to identify aspects. Extant studies also ranked aspects based on frequencies [2, 10] and customer satisfaction [5]. There is thus some evidence that the importance of aspects may vary. However, studies have not yet explored how aspect importance relates are different among key aspects, consumers, sentiments, and star ratings. To assess aspect importance, we use the concept of correlation between an aspect and a food item. Specifically, we define the correlation between them as follows:

$$\frac{\#(A \cap T)/\#A}{\#T/\#R}$$

#A: the number of reviews that contain an aspect

#T: the number of reviews that contain the term of a food item

#(A∩T): the number of reviews that contain both aspect and food item term

#R: the total number of reviews

This measure of correlation minimizes potentially misleading correlations caused by sparseness of A∩T, A, or T. In addition, since the reliability of this correlation value decreases as the value of #(A∩T) becomes smaller, we use interval estimation to shrink the low-reliability values and avoid high correlation values with low reliability, thus avoiding misleading analyses.

When comparing aspect importance, we need to be clear on what basis we should judge that importance. In semantic (positive, negative, neural) orientations, neural is commonly considered as no opinion [8]. Thus, we choose the correlation between an aspect and target words of positive and negative sentiments as the basis for aspect importance.

H1: The correlations between the food item and the key aspects for review sentiments vary.

Cultural factors and aspect importance. Culture refers to "the rules, customs, and other shared plans and behaviors" that result from interactions between individuals to try to satisfy their various needs [11, p. 5]. Dietary habits, food, and culture are closely related to one another, especially traditional food items [12, 13]. Therefore, we should expect some cultural differences not only between a food item and aspect importance but also between aspect importance and star ratings of restaurants as outcomes of consumer value judgments. Among the seven commonly recognized key aspects (atmosphere, food, location, menu, service, value, waiting time), food pertains most closely to the generic characteristics of diet items themselves while other aspects relate to non-dietary characteristics of culture. Therefore, we formulate the next two hypotheses as follows.

H2: The correlations between the food item and the key aspects of restaurant reviews vary between two different cultures.

H3: The correlations between the food aspect and star rating vary between two different cultures.

3. Method

To test the hypotheses, we used 10,268 Yelp reviews in Japanese on restaurants in the Tokyo and Osaka areas, and 39,552 Yelp reviews in English on restaurants in the Phoenix area. Of these, 821 reviews (8.0%) discussed ramen or ramen restaurants in Tokyo and Osaka. Likewise, 3920 reviews (9.9%), addressed those in Phoenix. We used IBM Watson Explorer Content Analytics 10.0 for the analyses. This text mining software can be used for both English and Japanese, using the same analytical technology called TAKMI (Text Analysis and Knowledge Mining) [14] with an accurate sentiment detector [15]. For H1 and H2, extracted entities were first categorized into seven categories (atmosphere, food, location, menu, service, value, waiting time). We then averaged the correlations of the entities within each category. For H3, correlations were calculated based on three key ingredients of ramen (broth, noodles, andtoppings).

4. Results

Table 1 lists how seven key aspects vary by the two countries as well as by positive and negative sentiments. Figure 1 shows the graphical representations of differences between aspects.

Table. 1. Comparisons of correlation between seven key aspects and sentiments

Country	Japan		US	
Sentiment	Positive	Negative	Positive	Negative
atmosphere	1.22	0.49	0.62	
food	1.92	0.35	2.74	1.40
location	0.24	0.08		0.36
menu	0.20		1.27	0.55
service	0.67		0.84	0.20
value	0.33	0.03	0.76	0.41
waiting time		0.04		0.31

Figure. 1. Correlations by the key aspects
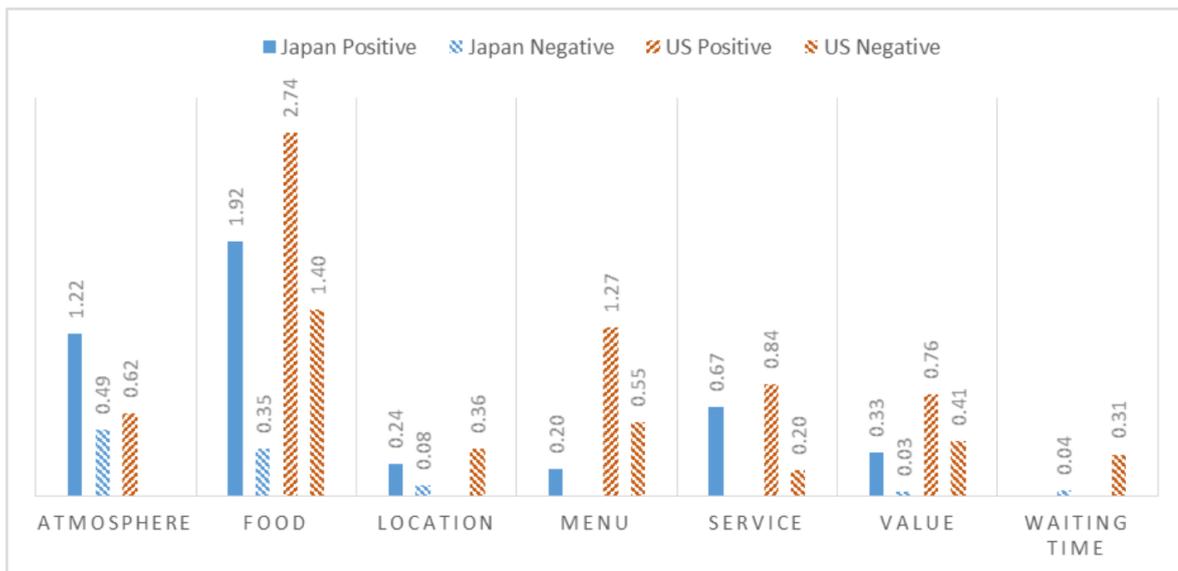
The numbers in Table 1 support H1 and H2 as they vary within and across countries and sentiments. Figure 2 shows how the correlations between ramen and its three main ingredients relate to star ratings on restaurants by consumers. While these ingredients play a role in restaurant star ratings, the quality of the broth is a more pronounced factor for the lower ratings (1 through 3) in the U.S. The quality of noodles, too, appears a more decisive issue when the U.S. consumers gave the lower star ratings to restaurants than when the Japanese consumers did the same. The role of toppings is the opposite in comparison to those of broth and noodles: Japanese consumers gave lower ratings when the quality of toppings did not meet their expectations. These results are supportive of H3.
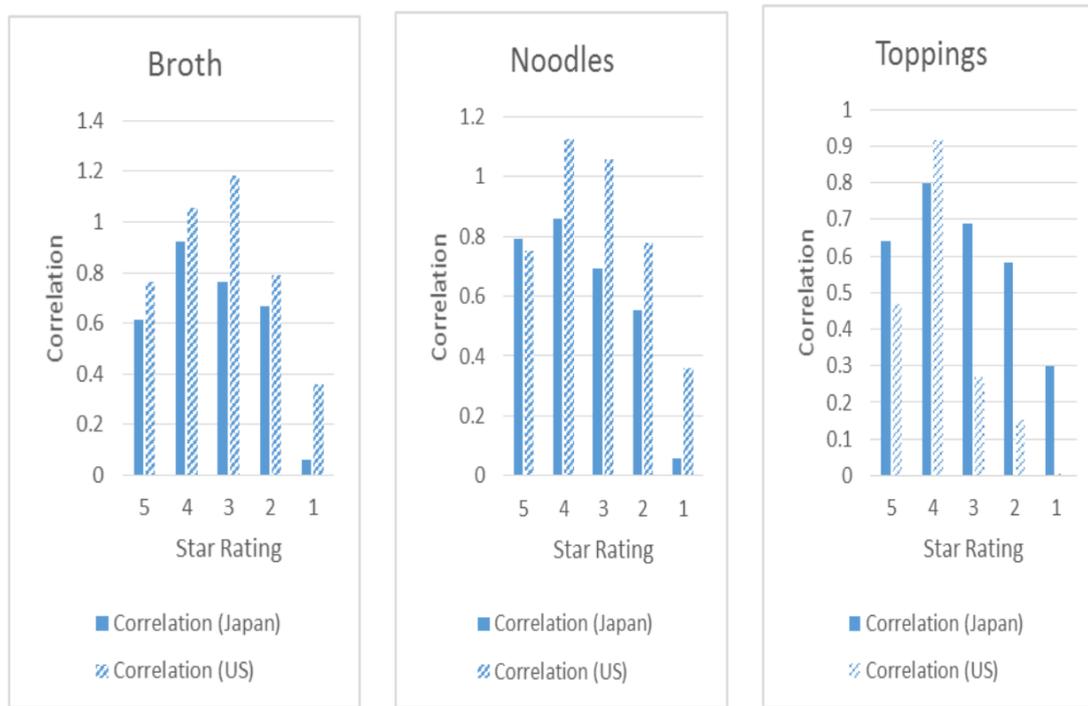
Figure. 2. Relation between "food" aspect and star rating

5. Implication and Conclusion

This research-in-progress paper reports the preliminary text analytic results of consumer reviews on U.S. and Japanese restaurants that serve ramen. There are several important research and practical implications. The importance of each aspect varies. Figure 1 shows a more distinct pattern of unequal aspect importance that those reported by Blair-Goldensohn et al. (2008) and Ganu et al. (2009). This may be because these two studies used reviews on all types of food items. Another important finding is that Japanese consumers seem to care about the atmosphere or decor of restaurants much more than U.S. consumers do when they rated restaurants both positively and negatively. Finally, Figures 1 and 2 illustrate that the same aspect may play different roles when consumers form positive and negative opinions. That is, addressing negative opinions does not necessarily mean that the restaurant receives excellent star ratings.

There are a couple of imitations in this study. First, we focused on one ethnic food item, ramen. In the future, we should use at least a few food items for purposes of comparison. Second, comparisons between two countries are still qualitative in nature at this point. We plan to use a statistical method to show the significance of the differences in the next stage.

References

[1] I. Titov, R. McDonald, Modeling online reviews with multi-grain topic models, in: 17th International Conference on World Wide Web, ACM, Beijin, China, 2008, pp. 111-120.

[2] S. Blair-Goldensohn, K. Hannan, R. McDonald, T. Neylon, G.A. Reis, J. Reynar, Building a sentiment summarizer for local service reviews, in: WWW Workshop on NLP in the Information Explosion Era, 2008, pp. 14-24.

[3] J. Zhu, H. Wang, B.K. Tsou, M. Zhu, Multi-aspect opinion polling from textual reviews, in: Proceedings of the 18th ACM conference on Information and knowledge management, ACM, Hong Kong, China, 2009, pp. 1799-1802.

[4] G. Ganu, N. Elhadad, A. Marian, Beyond the Stars: Improving Rating Predictions using Review Text Content, in: WebDB, 2009, pp. 1-6.

[5] I.S. Pantelidis, Electronic Meal Experience: A Content Analysis of Online Restaurant Comments, Cornell Hospitality Quarterly, 51 (2010) 483-491.

[6] L. Guerrero, M.D. Guàrdia, J. Xicola, W. Verbeke, F. Vanhonacker, S. Zakowska-Biemans, M. Sajdakowska, C. Sulmont-Rosse, S. Issanchou, M. Contel, Consumer-driven definition of traditional food products and innovation in traditional foods. A qualitative cross-cultural study, Appetite, 52 (2009) 345-354.

[7] A. Bagheri, M. Saraee, F. de Jong, Care more about customers: Unsupervised domain-independent aspect detection for sentiment analysis of customer reviews, Knowledge-Based Systems, 52 (2013) 201-213.

[8] B. Liu, Opinion Mining and Sentiment Analysis, in: Web Data Mining, Springer Berlin Heidelberg, 2011, pp. 459-526.

[9] Y. Jo, A.H. Oh, Aspect and sentiment unification model for online review analysis, in: Fourth ACM International Conference on Web Search and Data Mining, ACM, Hong Kong, China, 2011, pp. 815-824.

[10] Y. Lu, C. Zhai, N. Sundaresan, Rated aspect summarization of short comments, in: Proceedings of the 18th international conference on World wide web, ACM, 2009, pp. 131-140.

[11] E.N. Anderson, Everyone eats: Understanding food and culture, NYU Press, 2014.

[12] Z. Pieniak, W. Verbeke, F. Vanhonacker, L. Guerrero, M. Hersleth, Association between traditional food consumption and motives for food choice in six European countries, Appetite, 53 (2009) 101-108.

[13] B. Ozieblo-Rajkowska, M.D. Narbona-Carrión, Codifying the national self: spectators, actors, and the American dramatic text, Peter Lang, 2006.

[14] T. Nasukawa, T. Nagano, Text analysis and knowledge mining systems, IBM systems journal, 40 (2001) 967-984.

[15] H. Kanayama, T. Nasukawa, H. Watanabe, Deeper sentiment analysis using machine translation technology, in: Proceedings of the 20th International Conference on Computational Linguistics, Association for Computational Linguistics, 2004, pp. 494-500.