Customer reviews analytics on food delivery services in social media: a review

Noor Sakinah Shaeeali, Azlinah Mohamed, Sofianita Mutalib
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA (UiTM) Shah Alam, Malaysia

Article Info	ABSTRACT
	Food delivery services have gained attention and become a top priority in developed cities by reducing travel time and waiting time by offering online food delivery options for a variety of dishes from a wide variety of restaurants. Therefore, customer analytics have been considered in business analysis by enabling businesses to collect and analyse customer feedback to make business decisions to be more advanced in the future. This paper aims to study the techniques used in customer analytics for food delivery services and identify the factors of customers' reviews for food delivery services especially in social media. A total of 53 papers reviewed, several techniques and algorithms on customer analytics for food delivery services in social media are Lexicon, machine learning, natural language processing (NLP), support vector machine (SVM), and text mining. The paper further analyse the challenges and factors that give impacts to the customers' reviews for food delivery services. These findings would be appropriate for development and enhancement of food delivery services in future works. *This is an open access article under the CC BY-SA license.*

Corresponding Author:

Noor Sakinah Shaeeali
Faculty of Computer and Mathematical Science
Universiti Teknologi MARA (UiTM)
40450 Shah Alam, Selangor Darul Ehsan, Malaysia
Email: sakinahshaeeali@gmail.com

1. INTRODUCTION

Sentiment analysis, known as opinion mining, was about collection of opinions on many issues and related interest through many forms of communication platform such as blog posts, comments, reviews or tweets. It was also defined as a process of undermining contextual texts, where contexts are identified, extracted, and analysed. Example of this work has helped entrepreneurs to understand the social feelings toward their brands, products or services while monitoring the unstructured text of online review comments. Analysing these contexts allows understanding of the surface information and conclude high-quality insights of the issues or opnions. It is therefore pertinent in sentiment analysis that natural language processing (NLP) are used to tokenize text, detect and classify sentiment [1]. The penetration and advancement of technology in daily life, businesses and organizations have evoked the growth of web data, mobile data, image data, video data, sensor data in volume, variety and velocity which could be used for customer relationship management (CRM) and other services for informed decision making [2]. This means the need to do analyze customer behaviour, trends and preferences in which through this customer analytics (CA) will allow businesses to plan and roll-out necessary actions for sustainability of their ecosystem. CRM's main role was to coordinate the collection and use of customer data by concentrating on customers and attempting to understand their past actions and model it as well and forecast their future behaviour [3]. As Malaysia grows into a fully developed country, urban areas are becoming more hustling and time has become precious

commodity for a better life. There is a birth of many modern needs. One of these modern needs and here to stay is the new food delivery service phenomenon, a fast-growing company that offers services that make food easily available. Nowdays, restaurants are becoming more convenient for consumers with the emergence of new third-party foodservice providers. Consequently, business intelligence plays their role behind the corporate interest in the field of affective computing and sentiment analysis. The goal of this review is to identify and discuss the factors and techniques of CA toward food delivery services through social media.

Next, the paper will present briefly about related works that have been done by previos researchers in sentiment analysis, the relationship between sentiment analysis and social media, customer reviews analytic, customer reviews on food delivery services, relationship between sentiment analysis on reviews of customer using food delivery services in social media and it effects and factors. Subsequetly, the paper will discuss about the method used to obtain the results and finally provides the discussion.

2. RELATED WORKS
2.1. Sentiment analysis
Sentiment analysis known as opinion mining uses content materials in the form of a document or a sentence in natural language, to define and interpret specific opinions [4]. Sentiment means "how one thinks towards something," "external perception of one's own emotions," "a behavior toward something," or "a thought" [5]. In early 2000, sentiment analysis has been growing actively mainly in the area of natural language processiong (NLP). Researchers widely explore areas of mining specifically data preciding in the web, text, images and video for make better decisions. Sentiment Analysis is a concept that involves several activities, such as extraction of sentiment, classification of sentiment, classification of subjectivity, review of opinions or analysis of opinion spam, among others. It intends to examine the thoughts, perceptions, views, emotions of individuals against factors such as goods, persons, issues, organisations, and services [6-7]. Sentiment evaluations and reviews are growing rapidly in e-commerce or other web resources. Nowadays, customers on the e-commerce platform are highly dependent on feedback from existing customers and suppliers as well as service providers [8].

2.2. Relationship of sentiment analysis and social media
Social media is a platform that encourages social interaction, promote teamwork, and allow stakeholder deliberation. Other platforms include forums, wikis, media (audio, image, video, text), social networking (Facebook, Twitter, Blog, etc.) and virtual worlds. Other engineering techniques are also used [9-10]. The growth in social media has been closely documented to have a bearing on issues such as work, policy, politics, policy deliberation, patterns of communication worldwide, and how individuals get information and share about common areas such as logistic, news, hotels to private information such as health, adolescent life, parenting, dating and stress levels.

This is even so important for commercialization and communication to understand the context of consumer behavior and marketing for companies, organizations, and institutions, and political groups alike. In addition to that, social media is culturally important since for most people it has become the predominant arena in which they download information and exchange material about themselves, and unleash information of their surrounding [10].

Twitter on the other hand is a base of communication that has greater number of users in the form of short messages. It is the fastest and widest way of communication with many different languages which provide rich resources of texts [11]. The messages also known as tweet filled with opinions and emotions, to be used in determinative opinion and marketing. Therefore, it makes an interesting area to research on and currently still new [12-13]. It is considered text with symbols and text mining can be useful to analyze for better improvement in the services rendered. Meanwhile, [14-16] used data from their experiments as a source especially from Twitter. Twitter offers solutions that can generated by its followers or network of users who refer to each other by using the "@" symbol as a reference to discuss a topic in a semi-supervised environment. In [11] use Twitter data as to determine the polarities comment in social media; either the statement is positive, negative or neutral.

2.3. Customer reviews analytic
Customer analytics was a process that can turn data into a value of life, and improved customer satisfaction and outreach. It became the backbone of all marketing activities including e-commerce with technologies for predictive modeling, visualization, managing information and segmentation to make way to boost their products and amenities [17-18]. In [19] state that it was important to predict consumers opinion because it can achieve more profits and produce the best product for consumers to consume. In [2, 20-21]

papers, the authors state about the characteristic of big data where customer analytic was one of many mentioned. The nature of this type of data mainly categorized as high in volume, a spectrum of variety and high in velocity. Data basically from unstructured reviews are often difficult to handle using traditional business analytics methods, management tools and strategies. However, this type of data is vital for the purpose of an insightful decisions [22]. They need to know and appreciate the essence of a product that their customers want and hate in order to benefit about the reviews that will boost their product. Also, it was important to see a subgroup of clients that have common viewpoints for marketing purposes [23].

2.4. Customer reviews on food delivery services

Customer ordering experiences are determined by website and service quality through trusted website. This will reflect customer satisfaction and loyalty towards the brand or product. Z. Kedah *et al.* [24] in their research shows there is a significant relationship of website quality, service quality, customer satisfaction and loyalty. It is reported that food delivery services in the city provides another avenue to have packed food and food on the go within minutes. Many studies have shown a positive connection between behavioral and attitude in terms of technology. Customers prefer the use of online services due to convenience, usefulness and additional motives or previous online experiences. This is found to be true in services such as Food Panda, Room Service, Grab Food, Go-Jek and more [25-26]. This is further identified in [27] on the mindset and behavioral intention of Indonesia users towards online food delivery [14].

2.5. Relationship of sentiment analysis on customer reviews using food delivery services in social media

Business intelligence is also the key variable in the field of affective computation and sentiment analysis behind the corporate interest. Companies are now investing in marketing strategies and are constantly interested in collecting and predicting the general public's attitudes towards their products and brands [28]. The recent developments in deep learning have considerably improved the ability of algorithms to analyse text. Creative use of advanced techniques of artificial intelligence can be an effective instrument for thorough research. According to [29], they are trying to help pizza companies understand how to perform strategic analyses in the social media industry and turn social media data into insights for making decisions by multi-level decision makers. The use of text mining study to analyse Facebook and Twitter content on the three main pizza chains and shows the CA gives an efficient business value about productivity and change. Nevertheless, in India, Foodtech become a hot talk. In [30] review about the changed of Indian food and beverage industry. Holachef become a platform for chefs and food connoisseurs. It connects well-known chefs with customers to ensure food is delivered by online food delivery and satisfy their customers.

2.6. Effects and factors of customer reviews on food delivery services

According to [31], through Amazon reviews they use a mining approach to explore concealed factors behind online food shopping. By using topical modeling approach latent dirichlet allocation (LDA), the results show four interpretable factors that have significant impact on customer reviews in Amazon reviews which are Amazon Service ("buy", "order", "purchase", "subscribe", and "shipping"), Physical Feature ("Keurig", "pack", "plastic", and "machine"), Flavor Feature ("taste", "love", "strong", "recommend", and "delicious"), and Subjective Expression ("flavor", "bold", "dark", and "roast"). This has significant business consequences on how to promote more effective feedback and help potential customers make better buying decisions at a later date. The researchers use the customer evaluation data of food products from Amazon from 2004 to 2014 in getting data collection. From their analysis, the physical characteristics and taste characteristics provide more useful information with high-rate ratings. From [32] perspective, Jordan's Limited Service Restaurant they research relationships between quality of services, quality of food, customer satisfaction and retention. The research sample has picked ten (10) restaurants in the university neighborhoods of Amman. The study indicate that the value of service and food quality in serving their consumers' food, food security and sustainability of constraints facilities in the university communities is defined [32-33]. Quality of service is measured by five qualities, measurable, consistent, reliable, reliable and empathic, while value of food is measured by five measures, food is fresh, tasty and healthy, food is variety and food smells [32, 34].

In [32], [35-36], they mentioned that the conventional face-to-face approach has been offered to customer with incentives to evaluate the value of foodstuffs and their safety level subjectively. The Internet's food information is largely self-advertised, making it hard to check the reality of product traceability data, nutrition source and trader's permit classification. Moreover, the current management of the food security chain is still inadequate. In Vietnam, according to [36], Vietnam's food management systems still do not have the policy and regulations on e-commerce for the management of foodservices, especially for new trendy

methods such as social media. This also leads to problems and difficulties when research on online food purchases is not done in advance to ensure the safety of purchased food.

3. METHOD AND MATERIAL

This study approach fact-finding through collecting and analyzing of data from many sources. A review from Pew Research Center [37] has been conducted involving such as the number of people used social networking from 2005 and the percentage of the social media users. The reviews identified were searched using the following keyword terms: "sentiment analysis", "food delivery services", "sentiment analysis of food delivery services", "sentiment analysis in social media", and "customer satisfactions toward food delivery services", and more. Relevant journals and articles were compiled from the span of the last 15 years retrieved from Google Scholar, Science Direct, Springer and IEEE. These reviews focus on the relationship of factors and implications on food delivery services in social media using sentiment analysis. Besides that, these sites are also visited on its availability of information on customer reviews, access to social networking and food suppliers among other things. Meanwhile, the analysis and its algorithm were confined to online food delivery analyses on social media sites. 53 reviews from 2005 to 2020 were reconsidered and analyzed for the above-mentioned reasons. All of these reviewed papers were examined and analyzed according to their publishing years, publishing types and the artificial intelligence (AI) techniques used related to the researched articles. Figure 1, show the number of percentage and number of papers categorized by year, whereby the highest number of papers reviewed in 2018 (19%, 10 papers) followed by 2019 (13%, 7 papers) and 2015 (11%, 6 papers).
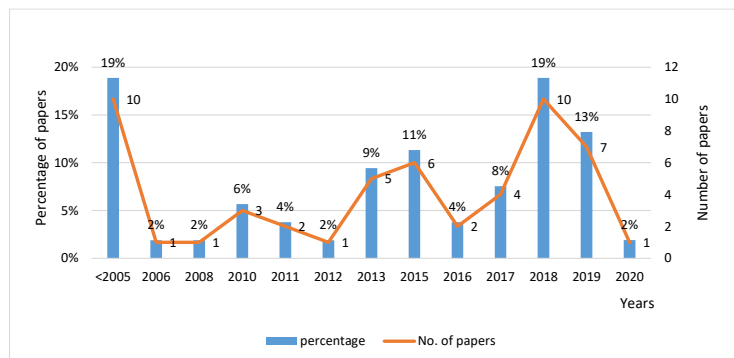

Figure 1. Percentage and number of review papers

Figure 2 shows the number of AI techniques and algorithms identified and compiled from all articles. Before that, Hybrid techniques were not taken in the analysis as they are the result of a combination of other techniques together. From Figure 2, the result shows that support vector machine (SVM) was the popular algorithm from the total number of research articles, but it does not mean it was the best algorithm used. Meanwhile, Regression and Naïve Bayes have similar count of research articles.
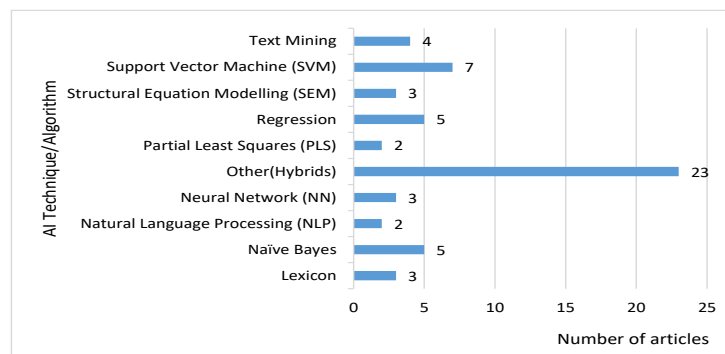

Figure 2. AI technique and algorithm used

4. RESULT AND DISCUSSION

In this section, the relationship between the factors that affect customer reviews on food delivery service in social media and sentiment analysis were discussed. Besides that, the implications of the factors towards the changing customers' behavior were also studied and discussed. We found that about 28 factors were defined as a factor that can give effect to food delivery services from customers' review in social media. Table 1 shows the summarization of factors that have been identified in each of the papers stated in the table below.

Table 1. Summarization of factors

Factor/Reference	[1]	[25]	[27]	[31]	[32]	[33]	[34]	[35]	[39]	[40]	[41]	[42]	[43]	[44]
Cleanliness												/		
Convenience		/											/	
Customer experience	/				/	/	/	/	/	/		/	/	/
Ease-of-use							/						/	
Flavor feature			/											
Food quality				/	/	/	/					/		/
Food safety					/	/	/							
Inconsistency of customer review									/	/	/			
Information quality								/		/				
Kindness of the employees												/		
Listing													/	
Loyalty								/						
Payment system								/						
Physical feature				/										
Quality control													/	/
Search of restaurant													/	
Security/privacy								/						
Service quality				/	/	/	/	/	/					
Societal pressure													/	
Star rating											/			
Subjective expression				/										
Sustain-ability					/	/								
Taste of food				/			/					/		
Text review										/	/			
Time saving			/											
Usage usefulness		/	/											
Various food delivery service			/											/
Website quality			/					/						

Ranking was done for the most important factors selected and be discussed further. Table 1 above presents the highest factors that affect customer reviews are 'customer experiences', followed by 'food quality', 'service quality' and 'quality control' respectively. These four factors are taken for further categorization. Table 2 shows the results after all the factors are categorized into four groups: customer experiences, food quality, service quality and quality control. The process for categorizing each of these factors has been done using the synonyms concept. For example, *'fresh'* and *'delicious'* factors are synonym with *'food quality'*, thus those factors will be categorized into 'Food Quality' groups.

Table 2. List of factors based on the four groups

Customer Experience	Food Quality	Service Quality	Quality Control
Satisfaction	Fresh	Tangible	Website design/quality
Delivery experience	Delicious	Reliability	Star rating
Existing customer reviews	Nutritious	Responsive	Payment system
Inconsistent	Variety of menu	Assurance	Loyalty
Persons' online purchase experience	Smell of food	Empathy	Society pressure
Text review	Food safety	Time	Subjective expression
	Flavor feature	Various service	Security /privacy
		Usage usefulness	Physical feature
		Sustain-ability	Listing
		Search of restaurant	Kindness
		Convenience	Information quality
			Ease-of-use
			Cleanliness

Despite the growing food demand through the internet suppliers, greater emphasis should be put on how consumer satisfaction impacts food quality, customer experience, quality of service and quality control. Based on our study on various research articles, we found several indicators that other authors used to test customer satisfaction with products in food delivery service by sentiment analysis. These factors were collected and analyzed using AI algorithms. These techniques and its accuracy are as shown in Table 3 towards customers' review factors.

Table 3. Accuracy of AI algorithm used

Algorithm	Factors	Average Accuracy	Reference
Lexicon	Customer experiences, Quality control	87.33%	[46]-[48]
Natural language processing (NLP)	Quality control, Customer experiences	71.67%	[41], [50], [51]
Support vector machine (SVM)	Quality control	69.70%	[1], [7], [12], [39], [52], [53]
Text Mining	Quality control, Food quality, Service quality, Customer experience	67.94%	[12], [13], [29], [42]

The average accuracy for each technique and algorithm was considered by the total accuracy divide by number of researchers using the same algorithm. As we can conclude, Lexicon gave an average accuracy of 87.33%, where the factor involved is customer experiences and quality control. According to [51], the authors suggest that the textual analysis may add to their comprehension of the effect of stock returns and, while media opinion sometimes does not affect direct returns, it could also be an advantage in collecting other information sources for analysis.

On the other hand, [3, 9, 11, 37] explained that text mining can work with all kinds of factors and achieve a moderate level of accuracy. In Table 3 above, Text Mining with its prediction average accuracy of 67.94% did not gave any huge differences. Thus, it shows that Text Mining was working efficiency with all factors of quality control, customer experience, food quality and service quality; however, when working with other factors they still produce average accuracy. Moreover, according to [12], some categorization included (1) transportation, (2) travel, (3) electrical cash, (4) instant message, (5) foodservice, and (6) security and stability of apps. Each category has been divided into the positive and negative polarity of the tweets. The tweets were divided into twelve classes, and the result is that food delivery service gain 83 total number of tweets: 10 positive tweets and 73 negative tweets. In [41], they compared 1113 opinion words manually extracted which contain 38 emoticons from 500 review icons randomly selected from 800 reviews. They extract 38 emoticons in their experiment and 977 opinion words specific in customer feedback, while another 66 opinions word cannot be extract and 98 opinions were incorrect. The accuracy was 85% and the error obtains 15%.

Meanwhile, natural language processing (NLP) prediction average accuracy was 71.67%, corporate with the factors of customer experiences and quality control. Due to the large number of businesses that use social networks, the monitoring and regulation of their social media platforms, evaluation and comparison were of great importance to organizations in terms of "Quality" [13]. Lastly, followed by SVM produced prediction average accuracy of 69.70%. The data was represented by unigrams, bigrams, trigrams, word entity, and word dependency. Data inequality was managed by modifying the output threshold during training using samples and during evaluation [12, 34, 39, 53]. The results of this analysis rely heavily on theoretically of the variables and features used during the pre-processing process. Tasks on pseudo-Subjectivity and pseudo-Classification are tested. SVM has surpassed all other alternatives to pseudo-subjectivity with cross validation reliability of 91.2% [46]. With just minor tuning, SVM can also operate effectively. Findings have shown the importance to a classifier for a forecast in the social, educational, family and psychological evaluation. In this context, the factor involved was the quality control.

5. CONCLUSION

This paper reviewed and discussed past research on the main factors that affect customer reviews towards food delivery services using social media. Several AI algorithms were reviewed and analyzed based on the categorized factors. It was found that a good quality of food and services depicted mostly were among the positive reviews or feedbacks from customers. An accurate prediction will help food manufacturers or other organizations to manage their customers' behavior towards the review of their food quality and services to give a perfect service for the customers. These strategies can help them in improving and increasing their performance and eventually make more profit. The analysis of all articles that have been studied shows some AI algoritms namely Lexicon, SVM, NLP and Text Mining were used to predict the realibility of sentiment analysis to evaluate customer reviews of food delivery services on social media. These models evaluated

several variables and four variables found to have the highest ranking mainly customer experiences, food quality, service quality and quality control. The analysis of all reviewed research articles in this paper revealed Lexicon's ability in forecasting the reliability of sentiment analysis during the evaluation of customer reviews with the achievement accuracy of 87.33% compared to other methods. In conclusion, the impact of this study was intended to help future analysts create a real model which can easily and accurately forecast the evaluation of the consumer through sentiment analysis. Further work on real model can be developed and enhanced to provide better food delivery services.

REFERENCES

[1]   A. Balahur, "Sentiment Analysis in Social Media Texts," Association for Computational Linguistics, 2013.
[2]   D. G. Dobolyi and A. Abbasi, "Advanced Customer Analytics : Strategic Value Through Advanced Customer Analytics : Strategic Value Through Integration of Relationship-Oriented Big Data," no. April, 2018.
[3]   D. H. B. Bednall and S. Adam, "Marketing research and customer analytics : Interfunctional knowledge integration Marketing research and customer analytics : interfunctional knowledge integration Sharman Lichtenstein *," no. December 2014, 2008.
[4]   T. Luo and G. Xu, "Chapter 4-Sentiment Analysis," *Springer Sci. Media New York 2013*, no. June, 2013.
[5]   M. Farhadloo and E. Rolland, "Fundamentals of Sentiment Analysis and Its Applications," no. March, 2016.
[6]   V. A. and S. S. Sonawane, "Sentiment Analysis of Twitter Data: A Survey of Techniques," *Int. J. Comput. Appl.*, vol. 139, no. 11, pp. 5-15, 2016.
[7]   J. Serrano-Guerrero, J. A. Olivas, F. P. Romero, and E. Herrera-Viedma, "Sentiment analysis: A review and comparative analysis of web services," *Inf. Sci. (Ny).*, vol. 311, pp. 18-38, 2015.
[8]   S. Chang, X. Zhenzhong, and G. Xuan, "Fake Comment Detection Based on Sentiment Analysis.", 2010.
[9]   F. Michahelles, "Understanding Social Media Marketing : A Case Study on Topics , Categories and Sentiment on a Facebook Brand Page," pp. 175-182, 2011.
[10] S. Asur and B. A. Huberman, "Predicting the future with social media," in *Proceedings - 2010 IEEE/WIC/ACM International Conference on Web Intelligence, WI 2010*, 2010, vol. 1, pp. 492-499.
[11] N. S. A. Abu Bakar, R. A. Rahmat, and U. F. Othman, "Polarity classification tool for sentiment analysis in Malay language," *IAES Int. J. Artif. Intell.*, vol. 8, no. 3, pp. 258-263, 2019.
[12] Z. Zulkarnain, I. Surjandari, and R. A. Wayasti, "Sentiment Analysis for Mining Customer Opinion on Twitter: A Case Study of Ride-Hailing Service Provider," in *Proceedings - 2018 5th International Conference on Information Science and Control Engineering, ICISCE 2018*, pp. 512-516, 2019.
[13] W. He, H. Wu, G. Yan, V. Akula, and J. Shen, "A novel social media competitive analytics framework with sentiment benchmarks," *Inf. Manag.*, vol. 52, no. 7, pp. 801-812, Nov. 2015.
[14] S. Wahyu Handani, D. Intan Surya Saputra, Hasirun, R. Mega Arino, and G. Fiza Asyrofi Ramadhan, "Sentiment analysis for go-jek on google play store," in *Journal of Physics: Conference Series*, vol. 1196, no. 1, 2019.
[15] S. Kumar, M. Yadava, and P. P. Roy, "Fusion of EEG response and sentiment analysis of products review to predict customer satisfaction," *Inf. Fusion*, vol. 52, pp. 41-52, Dec. 2019.
[16] D. M. E. D. M. Hussein, "A survey on sentiment analysis challenges," *J. King Saud Univ. - Eng. Sci.*, vol. 30, no. 4, pp. 330-338, Oct. 2018.
[17] N. M. N. Mathivanan, N. A. M. Ghani, and R. M. Janor, "Performance analysis of supervised learning models for product title classification," *IAES Int. J. Artif. Intell.*, vol. 8, no. 3, pp. 299-306, 2019.
[18] M. Edy Susanto, *Customer analytics for dummies*, vol. 53, no. 9. 2019.
[19] M. A. Al-Hagery, "Extracting hidden patterns from dates' product data using a machine learning technique," *IAES Int. J. Artif. Intell.*, vol. 8, no. 3, pp. 205-214, 2019.
[20] N. Elgendy and A. Elragal, "Big Data Analytics: A Literature Review Paper BT - Advances in Data Mining. Applications and Theoretical Aspects," pp. 214-227, 2014.
[21] T. M. Le and S. Liaw, "Effects of Pros and Cons of Applying Big Data Analytics to Consumers ' Responses in an E-Commerce Context," 2017.
[22] S. Atul Khedkar and S. K. Shinde, "Customer Review Analytics for Business Intelligence," *2018 IEEE Int. Conf. Comput. Intell. Comput. Res. ICCIC 2018*, pp. 1-5, 2018.
[23] F. V. Ordenes, B. Theodoulidis, J. Burton, T. Gruber, and M. Zaki, "Analyzing Customer Experience Feedback Using Text Mining: A Linguistics-Based Approach," *J. Serv. Res.*, vol. 17, no. 3, pp. 278-295, 2014.
[24] Z. Kedah, Y. Ismail, and S. Ahmed, "Key Success Factors of Online Food Ordering Services : An Empirical Study," vol. 50, no. 2, pp. 19-36, July-Dec 2015.
[25] D. Suhartanto, M. Helmi Ali, K. H. Tan, F. Sjahroeddin, and L. Kusdibyo, "Loyalty toward online food delivery service: the role of e-service quality and food quality," *J. Foodserv. Bus. Res.*, vol. 22, no. 1, pp. 81-97, Jan. 2019.
[26] V. C. S. Yeo, S. K. Goh, and S. Rezaei, "Consumer experiences, attitude and behavioral intention toward online

food delivery (OFD) services," *J. Retail. Consum. Serv.*, vol. 35, pp. 150-162, Mar. 2017.

[27] G. T. Prabowo and A. Nugroho, "Factors that Influence the Attitude and Behavioral Intention of Indonesian Users toward Online Food Delivery Service by the Go-Food Application," 2019.

[28] E. Cambria, "Affective Computing And Sentiment Analysis," 2016.

[29] W. He, S. Zha, and L. Li, "International Journal of Information Management Social media competitive analysis and text mining : A case study in the pizza industry," vol. 33, pp. 464-472, 2013.

[30] B. Sampat and N. Jain, "Holachef : Worth Craving For," pp. 22-27, 2017.

[31] Y. Heng, Z. Gao, Y. Jiang, and X. Chen, "Exploring hidden factors behind online food shopping from Amazon reviews: A topic mining approach," *J. Retail. Consum. Serv.*, vol. 42, pp. 161-168, May 2018.

[32] A. A. Al-Tit, "The effect of service and food quality on customer satisfaction and hence customer retention," *Asian Soc. Sci.*, vol. 11, no. 23, pp. 129-139, Oct. 2015.

[33] R. Akkerman, P. Farahani, and M. Grunow, "Quality, safety and sustainability in food distribution: A review of quantitative operations management approaches and challenges," *OR Spectr.*, vol. 32, no. 4, pp. 863-904, 2010.

[34] H. Tan, X. Lv, X. Liu, and D. Gursoy, "Evaluation nudge: Effect of evaluation mode of online customer reviews on consumers' preferences," *Tour. Manag.*, vol. 65, pp. 29-40, Apr. 2018.

[35] by Zulkarnain Kedah, Y. Ismail, A. Ahasanul Haque, and S. Ahmed, "9 Malaysian Management Review Key Success Factors of Online Food Ordering Services: An Empirical Study," 2015.

[36] A. K. Dang, B. X. Tran, C. T. Nguyen, H. T. Le, and H. T. Do, "Consumer Preference and Attitude Regarding Online Food Products in Hanoi , Vietnam," no. 2, 2018.

[37] Pew Research Center, "Social Media Use Continues to Rise in Developing Countries but Plateaus Across Developed Ones: Digital divides remain, both within and across countries," vol. June, pp. 1-46, 2018.

[38] A. Bevanda, "Customer Intelligence Analytics on Social Networks," no. November 2018, 2016.

[39] K. Ravi and V. Ravi, "A survey on opinion mining and sentiment analysis: Tasks, approaches and applications," *Knowledge-Based Syst.*, vol. 89, pp. 14-46, Nov. 2015.

[40] V. Cheow, S. Yeo, S. Goh, and S. Rezaei, "Consumer experiences , attitude and behavioral intention toward online food delivery (OFD) services," *J. Retail. Consum. Serv.*, vol. 35, no. December 2016, pp. 150-162, 2017.

[41] Y. M. Aye and S. S. Aung, "Senti-Lexicon and Analysis for Restaurant Reviews of Myanmar Text," *Int. J. Adv. Eng. Manag. Sci.*, vol. 4, no. 5, pp. 380-385, 2018.

[42] L. Wright, "Classifying textual fast food restaurant reviews quantitatively using text mining and supervised machine learning algorithms", paper 451, 2018.

[43] A. Ray, A. Dhir, P. K. Bala, and P. Kaur, "Why do people use food delivery apps (FDA)? A uses and gratification theory perspective," *J. Retail. Consum. Serv.*, vol. 51, pp. 221-230, Nov. 2019.

[44] M. Maimaiti, X. Zhao, M. Jia, Y. Ru, and S. Zhu, "How we eat determines what we become: opportunities and challenges brought by food delivery industry in a changing world in China," *Eur. J. Clin. Nutr.*, vol. 72, no. 9, pp. 1282-1286, Sep. 2018.

[45] V. Victor, J. J. Thoppan, R. J. Nathan, and F. F. Maria, "Factors influencing consumer behavior and prospective purchase decisions in a dynamic pricing environment-an exploratory factor analysis approach," *Soc. Sci.*, vol. 7, no. 9, 2018.

[46] D. Gräbner, M. Zanker, G. Fliedl, and M. Fuchs, "Classification of Customer Reviews based on Sentiment Analysis," in *Information and Communication Technologies in Tourism 2012*, Springer Vienna, 2012, pp. 460-470.

[47] M. M. Mostafa, "Clustering halal food consumers: A Twitter sentiment analysis," *Int. J. Mark. Res.*, vol. 61, no. 3, pp. 320-337, May 2019.

[48] D. Gayo-Avello, P. T. Metaxas, and E. Mustafaraj, "Limits of Electoral Predictions Using Twitter.", 2011.

[49] K. Kaviya, C. Roshini, V. Vaidhehi, and J. D. Sweetlin, "Sentiment Analysis for Restaurant Rating," no. August, pp. 140-145, 2017.

[50] L. Zhang and L. Corporation, "Deep Learning for Sentiment Analysis : A Survey.", 2018.

[51] Y. Yu, W. Duan, and Q. Cao, "The impact of social and conventional media on firm equity value: A sentiment analysis approach," *Decis. Support Syst.*, vol. 55, no. 4, pp. 919-926, Nov. 2013.

[52] C. Tan, L. Lee, J. Tang, L. Jiang, M. Zhou, and P. Li, *User-Level Sentiment Analysis Incorporating Social Networks Chenhao*, Apte, Chid. ACM, 2011.

[53] A. Pak and P. Paroubek, "Twitter as a Corpus for Sentiment Analysis and Opinion Mining," pp. 1320-1326, 2010.

BIOGRAPHIES OF AUTHORS

Noor Sakinah Shaeeali received her bachelor's degree of Intelligent System in 2014 from Univerity Teknikal Malaysia Melaka (UTeM). Currently, she is a master's degree student of Information System in Intelligent Systems at the Center of Information System Studies, Universiti Teknologi Mara (UiTM) Shah Alam, Selangor.

Azlinah Mohamed is a Professor in the Information Systems Center of Studies at the Universiti of Teknologi MARA of Malaysia. She holds a M.Sc. (Artificial Intelligence) from Bristol University and Phd (Decision Support Systems) from National University of Malaysia. Prior to this she was a tutor in University of Bristol and a Research Fellow in National University of Malaysia. Her current research interests are in the areas of Big Data, Soft Computing, Artificial Intelligence, and Web-based Decision Support Systems using intelligent agents in electronic government applications. She has published well over 140 peer-refereed journals, conference publications and book chapters internationally and locally. Besides that, she has also contributed as an examiner and reviewer to many conferences, journals and universities academic activities. In addition, she had also held administration post pertaining to academic development at the university level as Head of Academic Development, Special Officer on Academic Affairs and Development to the Vice Chancellor and Dean of the Fakulti Sains Komputer dan Matematik (FSKM) for 7 years.

Sofianita Mutalib is a senior lecturer of Information System in Universiti Teknologi MARA. She received a master's degree in Information Technology from the National University of Malaysia in 1998. She teaches courses related to Intelligent Systems such as intelligent system development, decision support systems and data mining. Her primary research interests involve intelligent systems, data mining as well as machine learning.