Data in Brief 55 (2024) 110598

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Creating a bias-free dataset with food delivery app reviews under data poisoning attack

Hyunmin Lee, SeungYoung Oh, JinHyun Han, Hyunggu Jung*

Department of Computer Science and Engineering, University of Seoul, Seoul 02504 Republic of Korea

ARTICLE INFO

Article history:
Received 18 December 2023
Revised 29 April 2024
Accepted 31 May 2024
Available online 5 June 2024

Dataset link: Bias-Free Dataset of Food Delivery App Reviews with Data Poisoning Attacks (Original data)

Keywords:
Review events
Fairness AI
Dataset bias

ABSTRACT

In online food delivery apps, customers write reviews to reflect their experiences. However, certain restaurants use a "review event" strategy to solicit favorable reviews from customers and boost their revenue. Review event is a marketing strategy where a restaurant owner gives free services to customers in return for a promise to write a review. Nevertheless, current datasets of app reviews for food delivery services neglect this situation. Furthermore, there appears to be an absence of datasets with reviews written in Korean. To solve this gap, this paper presents a dataset that contains reviews obtained from restaurants on a Korean app which use a review event strategy. A total of 128,668 reviews were gathered from 136 restaurants through crawling reviews using the Selenium library in Python. The dataset consists of detailed information of each review which contains information about ordered dishes, each review's written time, whether the food image is included in the review or not, and various star ratings such as total, taste, quantity, and delivery ratings. This dataset supports an innovative process of preparing AI training data for achieving fairness AI by proposing a bias-free dataset of food delivery app reviews with data poisoning attacks as an example.Additionally, the dataset is beneficial for researchers who are examining review events or analyzing the sentiment of food delivery app reviews.

* Corresponding author.
E-mail address: hjung@uos.ac.kr (H. Jung).
Social media: @yunoa64 (H. Lee), @jakcine880 (S. Oh), @hanj617 (J. Han), @hyunggu (H. Jung)

https://doi.org/10.1016/j.dib.2024.110598

Specifications Table

Subject	Computer Science
Specific subject area	Restaurant reviews on a Korean food delivery app
Data format	Raw
Type of data	Table, csv
Data collection	We created a web crawler using BeautifulSoup and Selenium for data mining. BeautifulSoup is a Python programming language package for parsing HTML documents. Selenium is the library package in Python that we use to crawl web pages. We collected reviews from restaurants that use a review event strategy with our web crawler. To find out which restaurants use a review event strategy, we collected restaurants' introductions and analyzed them to find out whether those reviews use a review event strategy or not. Finally, we collected reviews from restaurants that use a review event strategy which demand users to write five-star reviews with photos.
Data source location	Republic of Korea
Data accessibility	Repository name: Mendeley data Data identification number: 10.17632/rnyrpzyw3h.2 Direct URL to data: https://data.mendeley.com/datasets/rnyrpzyw3h/2

1. Value of the Data

- The dataset is noteworthy for data analysts as it unveils a novel prospect that review texts on food delivery apps may exhibit unintentional bias from consumers who attend review events.
- The dataset provides full information about each review using abundant metadata so that future researchers may use the dataset to analyze or identify trends and find new insights to review texts on food delivery apps.
- Dataset is useful for developers or students who want to build a sentiment analysis model or perform a text analysis.
- As far as we know, a dataset that provides food delivery app reviews written in Korean does not exist or is open to the public.
- This dataset is valuable for researchers seeking to develop a fairness AI model by analyzing real-world data from Korean food delivery app reviews, while minimizing risk.

2. Data Description

In food delivery apps, customers provide feedback to express their opinions. Nevertheless, certain restaurants use a review event strategy to procure favorable reviews from customers to boost profits [1]. Review event is a marketing strategy where a restaurant owner gives free services to customers in return for a promise to write a review (see Fig. 1). Therefore, review events prompt customers to write positive reviews in exchange for additional services, deviating from the primary objective of critiquing the restaurant. Consequently, information prejudice is produced in the dataset of reviews [2,3].

Fig. 1. A translated example of the delivery app restaurant's review event promotion.

Previous researches have presented datasets on consumer reviews [4-12]. Four studies controlled their dataset to minimize the causes that have a negative impact on their dataset [4,7,9,11]. For instance, three studies performed dataset balancing to avoid excessive weighting toward one class [4,7,11], while Li et al. preprocessed the collected review text to minimize bias in dataset construction [9].

In contrast, other researchers collected their reviews without controlling the dataset. Among the five studies, three conducted a sentiment analysis to assign a sentiment label based on the review text [5,6,12]. For example, Plotnikov et al. used the Gunning fog index to assess the review text's readability [8], while Barbopoulos et al. designed a Consumer Motivation Scale (CMS) by surveying Likert scale questions that target the significance of each indicator [10].

Other previous studies aimed to produce an unbiased dataset by addressing information bias [13] and selection bias [14,15]. For instance, Orlando et al. developed a Contact Prediction dataset where the selection bias of 3D structure observation is removed [14]. Alkhaled et al. suggested a metric that evaluates social bias and created a dataset for training models on bias detection [13]. Additionally, Curtó et al. developed an unbiased dataset containing human faces from different ethnic groups by balancing each ethnic group [15].

However, previous studies have three limitations. Firstly, while some prior studies aimed to control the dataset to reduce bias or class imbalances, they did not strive to detect bias in each individual data point within their dataset. Secondly, none of the investigations formed a dataset concerning evaluations of food delivery apps or verified if each review pertained to review events. Additionally, although a few studies sought to establish a dataset devoid of bias, they did not consider the data poisoning attacks. While several studies have attempted to explore the effects of review events on both customers and restaurants through surveys and analyses of review's posting time [16-19], there has been no discussion on creating a dataset consisting of review data from restaurants that use a review event strategy. To address this gap, we have created a dataset of food delivery app reviews that considers the possibility of data poisoning due to such events held at delivery app restaurants.

Our dataset consists of reviews obtained from Yogiyo, a renowned Korean food delivery app. We analyzed a sample of reviews (please refer to Fig 2 for a sample review) and defined 11 metadata, which are explained in Fig. 2 and Table 1. The dataset consists of two csv files which comprises 128,668 reviews gathered from 136 restaurants. Reviews Written in Korean.csv file has an untranslated menu and review texts written in Korean, and Reviews Translated into English.csv file has menu and review texts translated into English for non-Koreans. Translation was done automatically using the GOOGLETRANSLATE function.

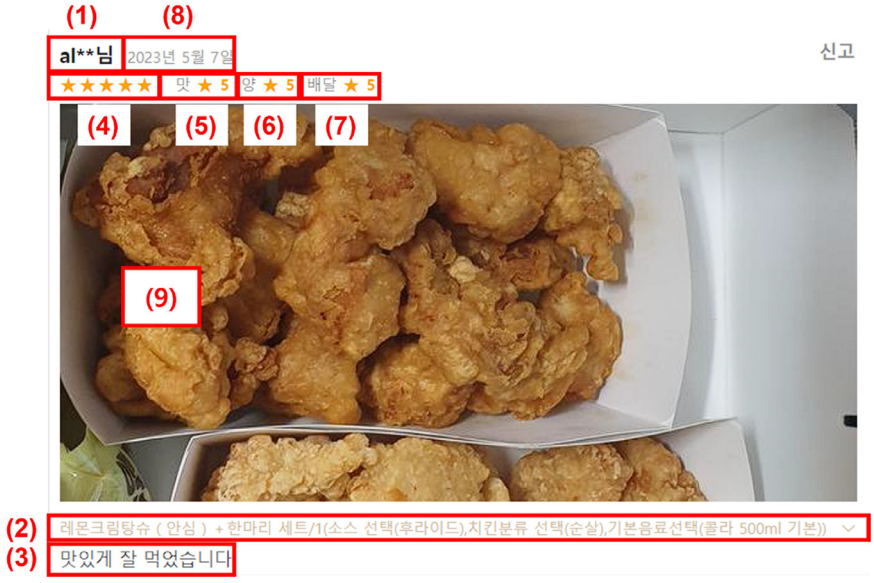

Fig. 2. The Yogiyo delivery app review example. Metadata for reviews is depicted using red boxes.

Table 1
Dataset metadata description.

#	Column Name	Type	Numerical Range	Description
(1)	UserID	object	NaN	The reviewers' identifier (ID)
(2)	Menu	object	NaN	The dishes which the customer ordered
(3)	Review	object	NaN	The review text
(4)	Total	numerical	1 ∼ 5	Star rating to rate the overall service
(5)	Taste	numerical	1 ∼ 5	Star rating to rate the taste of the food delivered
(6)	Quantity	numerical	1 ∼ 5	Star rating to rate the quantity of the food delivered
(7)	Delivery	numerical	1 ∼ 5 or NA	Star rating for rating the delivery services, which has a value of 1 ∼ 5. For packing services, the value "NA" was assigned since there were no delivery services in that case.
(8)	Date	date	NaN	The information about when the review was written
(9)	HasPicture	boolean	0 ∼ 1	An indicator that indicates whether the food image is included in the review
(10)	BiasFree	boolean	0 ∼ 1	Boolean value indicating whether the review is free from the risk of review event
(11)	RestaurantID	numerical	NaN	The ID of the source restaurant of the review data

3. Experimental Design, Materials and Methods

We have created a dataset of customer reviews of restaurants that indicates whether each review has the possibility of being biased. In this section, we describe a method for collecting and labeling such reviews. Initially, we selected a target food delivery app. Subsequently, we selected restaurants on this app and collated and categorized reviews of the chosen establishments. The workflow of our data collection process is shown in Fig. 3. The data collection processes were

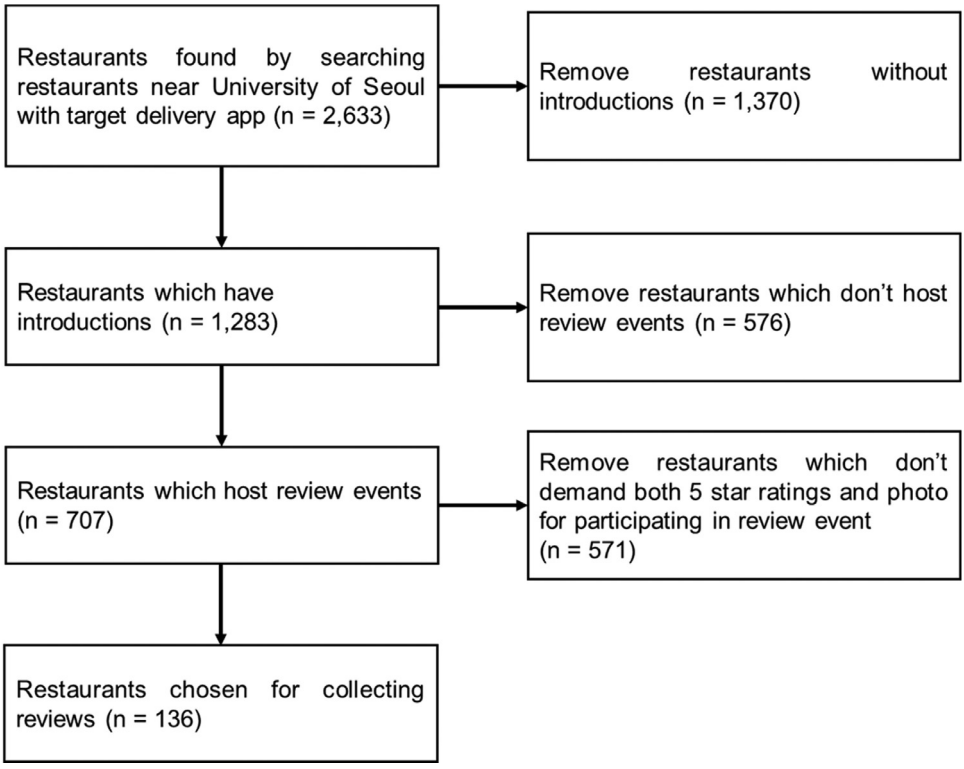

Fig. 3. The process for collecting restaurant reviews in the delivery app.

conducted utilizing a computer equipped with an AMD Ryzen 7 5700 U processor and a Radeon graphics card, running at 1.80 GHz, with 64 GB of RAM and operating on Windows 11 Home.

3.1. Choosing a target delivery app

To choose a target delivery app, we established eligibility criteria and applied them to the delivery apps. The criteria are as follows: 1) The delivery app must have a website available on PC. 2) It must be possible to access restaurants' reviews using web crawling. 3) The delivery app contains restaurants which use a review event strategy. We collected delivery app reviews from the "Yogiyo" delivery app, which was the only delivery app that fulfills the above criteria and does not have a restriction concerning crawling in terms of use at the same time.

3.2. Choosing a target restaurant

After selecting a delivery app, we chose restaurants from which to collect reviews. First, we created a list of restaurants by setting the current location to the University of Seoul and retrieving every restaurant that was included in the search results. We acquired a list of 2653 restaurants and their IDs. We used the restaurant IDs to find the URLs of those restaurants' main pages and collected their reviews by using a web crawler we created.

Additionally, we ascertained which of the restaurants on the list use a review event strategy by examining the introduction text to determine if such events were mentioned. First, we

excluded 1370 restaurants without introductions from the list because we could not confirm that those restaurants use a review event strategy. We then reviewed the text introductions of the remaining 1283 restaurants to identify if they were use a review event strategy. We found that 707 restaurants use a review event strategy. Next, we analyzed the restaurant introductions that run review events and checked the criteria for participating in the events requested by the restaurant owners. To analyze the review's bias as conservatively as possible, we selected only two criteria that are determined by using review data alone (see Table 2). Finally, we chose 136 restaurants that met the two selected criteria (see Fig. 3).

Table 2
Criteria for delivery app users to participate in a review event. To analyze the review's bias as conservatively as possible, we chose solely two criteria (indicated as "V" on the "Selected" column) because only these criteria are able to be determined by using review data alone.

Criterion	Selected
Take a photo of the menu that was delivered to you and include it when you write your review.	V
Give five-star ratings in your review.	V
If you wish to participate in the review event, please provide your identifying information.	
Add the restaurant to the user's list of favorite restaurants.	
Indicate that the user wishes to participate in the review event.	
Add at least one of the main menu items to your order.	

3.3. Collecting and labeling restaurant reviews

After selecting the target restaurants, we collected and analyzed all the reviews of the restaurants. First, we gathered reviews by utilizing metadata that we defined after analyzing them (see Fig. 2). See Table 1 for detailed information on our dataset's metadata. In this way, each review was collected from the target restaurants and presented as tabular data.

Second, we analyzed each review to determine if it met the two criteria necessary for the restaurant to participate in the review event. We checked the criterion "Include a picture of the delivered menu in your review" effortlessly by verifying the presence of a picture in the review. However, restaurants that required a five-star rating on Yogiyo did not specify which of the four types of star ratings they meant. Therefore, we considered the "five-star rating" standard fulfilled if a minimum of one star rating received a value of 5. For reviews that matched both criteria, we assigned a value of "0" to the BiasFree column. These reviews meet the conditions for participating in review events, so it's not certain that they were not written for review events. For reviews that do not meet the conditions for attending the review event, the BiasFree column was assigned a value of "1" since it is obvious that these reviews are not intended for review events.

Limitations

The reviews were exclusively collected from restaurants near the University of Seoul, utilizing solely the Yogiyo app. Therefore, the small size of the resulting dataset may result in bias towards a certain location. Also, there might be some reviews which have a BiasFree column with a value "1" might be a review written in genuine and not faked. Thus, detecting any main differences in sentiments compared with other five star reviews are limited.

Ethics Statement

Our work did not involve human subjects, animal experiments, and social media platforms.

Data Availability

Bias-Free Dataset of Food Delivery App Reviews with Data Poisoning Attacks (Original data) (Mendeley Data).

CRediT Author Statement

Hyunmin Lee: Conceptualization, Methodology, Investigation, Software, Data curation, Writing – original draft, Writing – review & editing; **SeungYoung Oh:** Writing – original draft, Writing – review & editing; **JinHyun Han:** Writing – review & editing; **Hyunggu Jung:** Supervision, Conceptualization, Methodology, Writing – original draft, Writing – review & editing.

Acknowledgements

We appreciate HCAIL members for their constructive feedback on our initial manuscript.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] S. Choi, Consumers' Propensity of Post Fake Online Reviews, The Pennsylvania State University, 2015 [Unpublished Master's Thesis].
[2] B.C. Choi, A.L. Noseworthy, Classification, direction, and prevention of bias in epidemiologic research, J. Occup. Med. 34 (3) (1992) 265–271, doi:10.1097/00043764-199203000-00010.
[3] H. Lee, M. Chun, H. Jung, PORDE: explaining data poisoning attacks through visual analytics with food delivery app reviews, in: Companion Proceedings of the 28th International Conference on Intelligent User Interfaces, Sydney, NSW, Australia, 2023, pp. 46–50, doi:10.1145/3581754.3584128.
[4] M. Visalli, M. Dubois, P. Schlich, F. Ric, J.-M. Cardebat, N. Georgantzis, A dataset on the sensory and affective perception of Bordeaux and Rioja red wines collected from French and Spanish consumers at home and international wine students in the lab, Data Br. 46 (2023) 108873, doi:10.1016/j.dib.2022.108873.
[5] R. Sutoyo, S. Achmad, A. Chowanda, E.W. Andangsari, S.M. Isa, PRDECT-ID: indonesian product reviews dataset for emotions classification tasks, Data Br. 44 (2022) 108554, doi:10.1016/j.dib.2022.108554.
[6] M.F. Manzoor, A. Abid, N.A. Nawaz, A. Alvi, Aspect based sentence segregated dataset of hybrid car's consumers online reviews, Data Br. 42 (2022) 108293, doi:10.1016/j.dib.2022.108293.
[7] F. Restrepo, N. Mali, L.P. Sands, A. Abrahams, D.M. Goldberg, J. White, L. Prieto, P. Ractham, R. Gruss, N. Zaman, J.P. Ehsani, Injury prevention for older adults: a dataset of safety concern narratives from online reviews of mobility-related products, Data . 42 (2022) 108044, doi:10.1016/j.dib.2022.108044.
[8] A. Plotnikov, A. Shcheludyakov, V. Cherdantsev, A. Bochkarev, I. Zagoruiko, Data on post bank customer reviews from web, Data Br. 32 (2020) 106152, doi:10.1016/j.dib.2020.106152.
[9] J. Li, D. Lowe, L. Wayment, Q. Huang, Text mining datasets of β-hydroxybutyrate (BHB) supplement products' consumer online reviews, Data Br. 30 (2020) 105385, doi:10.1016/j.dib.2020.105385.
[10] I. Barbopoulos, L.-O. Johansson, The Consumer Motivation Scale: a detailed review of item generation, exploration, confirmation, and validation procedures, Data Br. 13 (2017) 88–107, doi:10.1016/j.dib.2017.04.054.
[11] K. Boland, A. Wira-Alam, R. Messerschmidt, in: Creating an Annotated Corpus For Sentiment Analysis of German Product Reviews, GESIS - Leibniz-Institut für Sozialwissenschaften, Mannheim, 2013, p. 16.
[12] H. Bellut, M. Arrayago, M. Amara, A. Roujansky, M. Micaelo, F. Bruneel, J.-P. Bedos, Real-life use of ceftobiprole for severe infections in a French intensive care unit, Infect. Dis. Now 54 (1) (2023) 104790, doi:10.1016/j.idnow.2023.104790.
[13] L. Alkhaled, T. Adewumi, S.S. Sabry, (2023). *Bipol: a Novel Multi-Axes Bias Evaluation Metric with Explainability for NLP.* arXiv preprint arXiv:2304.04029.
[14] G. Orlando, D. Raimondi, W.F. Vranken, Observation selection bias in contact prediction and its implications for structural bioinformatics, Sci. Rep. 6 (2016) 36679, doi:10.1038/srep36679.

[15] J.D. Curtó, I.C. Zarza, F. De La Torre, I. King, M.R. Lyu, (2017). High-resolution deep convolutional generative adversarial networks. arXiv preprint arXiv:1711.06491.
[16] J.H. Jung, H.I. Chung, Z.K. Lee, An analysis of mobile food delivery App 'Baemin' by using text mining and ARIMA model, J. Digit. Contents Soc. 22 (2) (2021) 291–299, doi:10.9728/dcs.2021.22.2.291.
[17] S.I. Kim, H.G. Koo, A study on the types of consumer information activity: focused on food delivery service app reviews, J. Consum. Stud. 32 (2) (2021) 101–123, doi:10.35736/JCS.32.2.5.
[18] H.M. Park, Y. Pan, A study on the guidelines for participation-induced review of O2O food delivery platform service, J. Next-Gener. Converg. Inf. Serv. Technol. 10 (2) (2021) 133–146, doi:10.29056/jncist.2021.04.03.
[19] M. Kim, The effect of review promotion on authenticity and purchase intention: focusing on the moderation effects of word-of-mouth information, Korean Manag. Consult. Rev. 22 (1) (2022) 85–95.