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Proposed a consulting chatbot service for restaurant start-ups using social media big data

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Abstract

Since the first outbreak of COVID-19 in 2019, it has caused a huge blow to the restaurant industry. However, as social distancing was lifted as of April 2022, the restaurant industry gradually recovered, and as a result, interest in restaurant start-ups increased. Therefore, in this paper, big data analysis was conducted by selecting "restaurant start-up" as a key keyword through social media big data analysis using Textom and then conducting word frequency and CONCOR analysis. The collection period of keywords was selected from May 1, 2022 to May 23, 2023, after the lifting of social distancing due to COVID-19, and based on the analysis, the development of a restaurant start-up consulting chatbot service is proposed.

Keywords: *Chatbot, natural language processing, big data*

1. Introduction

COVID-19, a respiratory disease caused by the new virus that first broke out in December 2019, has taken a heavy toll on the restaurant industry. Due to the influence of social distancing caused by COVID-19, business hours of restaurants were limited, and the number of private gatherings was also limited. Therefore, strong social distancing policies to prevent infection damage and prevent quarantine have also hit the real economy, which is very closely connected [1]. In terms of the social and economic damage of COVID-19, the restaurant industry is much larger than other industries [2]. In the case of the restaurant industry, it is an industry centered on face-to-face services, and in addition, the implementation of social distancing policies such as telecommuting, school closures, and collective prohibition has led to a decrease in people's external activities.

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However, as COVID-19 calms down, the government has been phasing out its social distancing policy, and as of April 15, 2022, social distancing measures due to COVID-19 have been lifted in about two years and a month [3]. As the social distancing policy was lifted, people's interest in the restaurant industry increased. According to a column by Lee Ho, a columnist for the Women's Consumer Newspaper, preference for the restaurant industry soared to 60.7%, the pre-COVID-19 level, at the start-up fair held in March 2022 [4]. As social distancing due to COVID-19 is lifted, consumers' interest in restaurant start-ups is expected to continue to increase.

Due to the recent development of artificial intelligence technology, Chatbot, an interactive artificial intelligence, is attracting attention. Among them, "Chat GPT" developed by OpenAI is leading the development of chatbot technology with huge attention in the artificial paper field [5]. Chatbot is an agent service that automatically answers simple requests or questions from chatbot users in a messenger-based environment, and was initially a simple form of providing only static answers. However, due to the development of AI technology, the optimal answer is automatically provided by analyzing users' questions [6]. Users can simply receive the necessary information in the form of question-and-answer without having to sell their own items and search for information on the Internet or include unnecessary processes such as phone calls. Microsoft, Facebook, Google, and Kakao, the world's leading ICT companies, already use messenger-based chatbot platforms and operate chatbot services that can be applied in real life. Therefore, this study aims to analyze expected questions when users use chatbot services by conducting big data analysis focusing on the frequency of searches of Naver, Google, and Daum, Korea's representative social networks. By designating "restaurant start-ups" as a representative keyword and analyzing the frequency of social network searches from May 1, 2022 to May 1, 2023, the goal is to propose a chatbot service that provides information and help to restaurant start-ups.

2. THEORY

2.1 Chatbot

The concept of a chatbot began in 1990 when the Internet was first spread [6]. Chatbots used at the time focused on simple conversations that provide simple fun and interest to users, not chatbots services aimed at providing information. At that time, chatbots had clear limitations by storing answers to expected questions in the system and printing simple matching answer sentences when expected questions came in, so it soon became a service that did not attract users' attention. Since Google's development of AlphaGo in 2016, the general public has become interested in the AI field, and as this field has become recognized as a universal technology, attempts to incorporate AI technology into existing services have been widely made. With the expansion of the AI market, deep learning technology used for AI development was applied to the chatbot system, and chatbots, which had previously been simple conversations, learned vast amounts of data from web services to interpret desired information and provide appropriate answers based on the information. Currently, chatbot service is a compound word of chat and robot, and refers to artificial intelligence-based software that provides necessary information quickly and accurately as well as appropriate responses through chatting with humans [7]. Due to the development of artificial intelligence technology, deep learning and natural language processing technologies have enabled chatbots to interpret strings and provide active responses to chatbots users. In addition, chatbot technology can collect and learn data as the time it operates on its own accumulates and improve the accuracy of information based on such data [8].

2.2 Natural language processing

Natural language processing is one of the most important technical elements of chatbots, which is the field that allows machines to process natural language used by humans. Natural language processing is a technology that interacts between a computer's language and a human language and is used in fields such as information search, question and answer, deep learning, and big data analysis [9]. NLP uses technologies such as natural language analysis, understanding, and generation, and is divided into a semantic analysis used to interpret sentences and a practical analysis that determines the meaning of sentences. NLP is currently used in various fields. NLP-powered chatbot systems can automatically handle numerous repetitive tasks performed by humans today and improve the visibility of chatbot systems by analyzing searches and optimizing content. In addition, NLP helps analyze customer reviews and comments on social media to make it easier to grasp vast amounts of information. NLP relies heavily on AI's approach of machine learning and generalizes the information stored in the data set through machine learning to learn data and perform target tasks through training on learning data.

2.3 Big Data Analysis

The information society is changing very rapidly from system-centered in the past to people-centered in the present. Accordingly, the power of social networks is increasing and being applied socially[10]. Among them, big data analysis plays a role in responding to the future society. It is becoming a key engine that creates opportunity factors. Big data is unstructured data of vast size, and the development of generation, collection, analysis, and expression of big data makes modern society work efficiently. Through this, it realizes a technology that was impossible in the past because it is possible to manage and analyze customized information for each individual, not a comprehensive analysis. It focuses on analyzing a large amount of unstructured data collected through big data analysis to identify consumers' opinions in real time and implement them in chatbot services to quickly provide accurate information to consumers.

3. BIGDATA ANALYSIS

3.1 Analysis Method

The analysis method of this study is as follows. First, using the big data analysis tool "Textom," search frequency information related to the key keyword "Restaurant start-ups" was collected and the data preprocessing process was conducted based on the collected information. Textom provides matrix information according to the frequency of search of search keywords by searching and collecting data from portal sites and providing ranking of related keywords. Second, in order to increase the suitability of the study, the contents not related to "restaurant start-ups" were removed and similar keywords were grouped into the same keywords to derive keywords related to this study. Out of a total of 8,912 keywords, the top 30 keywords most related to this study and most exposed to portal sites were derived through set material and search frequency analysis. Finally, after visualizing the data using Ucinet6 and NetDraw, a CONCOR analysis was performed to identify the network between each node and to see the association between them. The analysis process is as shown in [Figure 1]

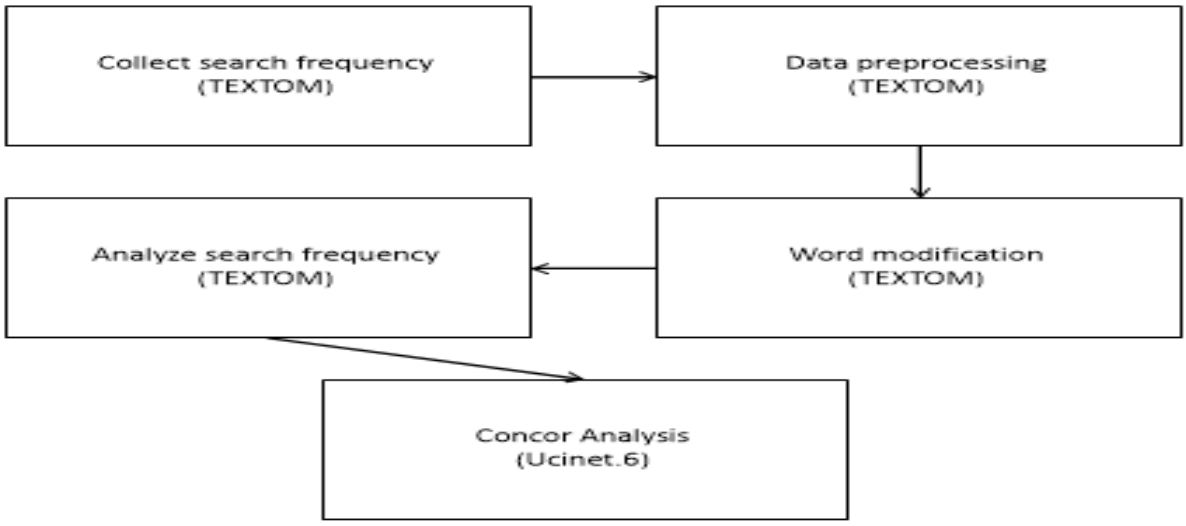

Figure 1. Analysis Method

3.2 Word Frequency Analysis

Through text mining, the search frequency of "restaurant start-ups," a key keyword from May 1, 2022 to May 1, 2023, after COVID-19, was collected, and a total of 8,912 keywords were derived excluding duplicate words and synonyms, and the results of deriving 30 of them are shown in Table 1. As a result of checking the word frequency table, the word with the highest search frequency was startsup (11530), followed by keywords such as Restaurant (7564), youth (1947), education (1689), and franchise (1388). The results of word frequency analysis show that keywords that prospective founders consider or are highly interested in when starting a business are "education," "franchise," "recruitment," and "brand," all of which are highly related to franchises, that is, franchises. The direction that prospective restaurant founders consider when starting a restaurant after COVID-19 is that they are interested in franchise start-ups that are safer than individual start-ups and have a relatively low risk compared to investment. In addition, the most important areas to consider when starting a restaurant were chicken (743), delivery (528), and cafe (500), and it seems that they are more interested in chicken, delivery restaurants, and cafes than meat restaurants, Korean food, and Chinese restaurants.

Table 1. Word Frequnecy Analaysis

WORD	FREQUENCY	WORD	FREQUENCY
Startsups	11530	Cook	720
Restaurant	7564	Food	621
Youth	1947	Success	609
Education	1689	Market	556
Franchise	1388	Item	544
Recruitment	1230	Delivery	528

Cooking	1077	Professional	528
Brand	1019	Consulting	522
Restaurant industry	1017	Preliminary	515
Founder	905	Cafe	500
Menu	869	Marketing	439
Kitchen	867	Development	431
Meal	832	Famous Restaurant	382
Dining Room	807	Open	346
Chicken	743	Cost	336

3.3 CONCOR Analysis

CONCOR analysis is a form of cluster analysis in which nodes with high correlation between each other, that is, keywords, are grouped into one group in the entire network structure. In this study, the key keyword of "restaurant start-ups" was set to analyze the considerations of prospective restaurant start-ups through the search frequency of portal sites, and based on the analysis, the founders' questions were predicted when providing chatbot services. Based on this, CONCOR analysis was conducted, and the results are shown in [Figure 2]. According to [Figure 2], keywords were classified into a total of three clusters, and the first cluster was keywords related to start-ups, with a total of 14 keywords such as "Startsup," "Franchise," "Recruitment," and "Brand." In the second cluster, a total of 12 keywords such as "Restaurant," "Cooking," and "Restaurant" were found to be highly connected, and in the last cluster, keywords such as "youth," "education," "professional," and "development" were found to be highly connected.

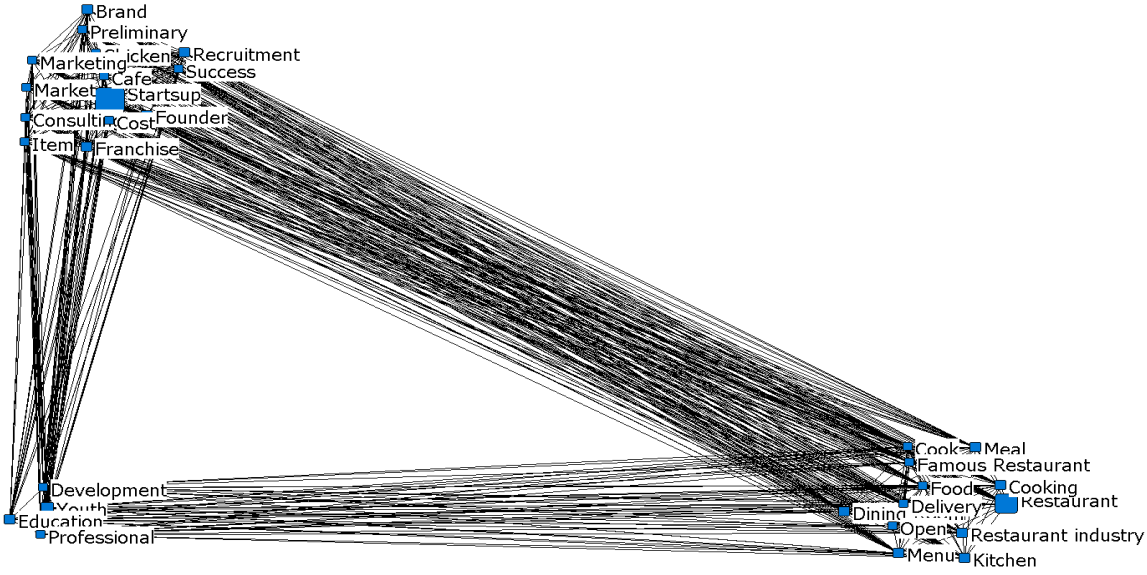

Figure 2. CONCOR Analysis

4. Restaurant start-up consulting chatbot design

As social distancing due to COVID-19 eased, interest in restaurant start-ups increased and consumers wanted to try restaurant start-ups, it was necessary to introduce a chatbot service that provides consumers with simple and accurate consulting on restaurant start-ups without complicated processes. In line with the rapidly changing modern society through the rapid growth of artificial intelligence, restaurant companies should also change accordingly. Therefore, this study proposes a restaurant start-up consulting chatbot that can provide help for restaurant start-ups.

4.1 Expected speech and entity

An utterance refers to an input sentence or part of a sentence that a user delivers to a chatbot, and an entity refers to an object name, that is, a specific type of information of an utterance sentence. For example, when a user sends out an utterance saying, "I want to start a chicken restaurant," the chatbot recognizes it and obtains information under the keyword "chicken restaurant" and provides it to the user. The speech includes information and requests that the user delivers through a conversation with a chatbot. That is, it may appear in various forms, such as a user asking a question or giving a command. Speech is made up of natural language, and chatbots use natural language processing technology to understand and generate responses. Understanding speech sentences plays an important role in maintaining the flow of conversation between chatbots and users and meeting users' needs. Therefore, various types of speech should be considered and processing and response to it should be programmed, and for this purpose, chatbots should be learned using sufficient training data.

5. Conclusion

This study proposed a chatbot service that helps restaurant founders challenge start-ups more conveniently after the lifting of social distancing due to COVID-19. Based on big data analysis using Textom, expected speech and entities were set, and even expected scenarios were designed when implemented based on expected speech. The contribution of this study is that there is enough room for big data analysis techniques to be used when designing chatbot systems through big data analysis. In addition, this study provided information that could be more conveniently and simply applied to start-ups by applying the matters considered by prospective restaurant founders when starting a restaurant to the chatbot system through big data analysis. The limitations of this study are as follows. Big data analysis using Textom is an analysis through search frequency values, and this study does not include gender, age group, and residential area, which are demographic characteristics of respondents, that is, users using social media. Therefore, in order to increase the accuracy of the analysis in future studies, it is necessary to add a questionnaire technique that can include demographic characteristics. Nevertheless, the results of this study are thought to contribute to the research when a chatbot system for restaurant founders is developed in the future.

References

[1] Heo Yoon-kyung, Kim Sung-hwan, and Lee Tae-hee, 2020, "The ripple effect and countermeasures of the Bus an economy of the COVID-19 crisis," Special Issue Focus, Seoul: Korea Construction Industry Research Institute.
[2] Kim Hyun, Lee Geum-sook, Lee Young-hyun, and Song Ye-na, 2021, "Study on the Opening and Closing of Restaurants during the COVID-19 Period: Seoul as an Example," "The Journal of the Korean Geographical Societ

y," 56(1):35-51.
[3] Ministry of Health and Welfare, April 2022. [Release social distancing measures in about two years and a mo nth. Compliance with daily quarantine rules to prevent infections such as hand washing, ventilation, and disinfecti on is more important]
[4] Lee Ho, 2022,06 [Franchise Industry Raises Growth Base With COVID-19 Crisis] Women's Consumer Newsp aper
[5] Seok Kwang-ho. (2023).Chatbot technology to talk to people, how far has it come.Brain, 98(), 8-11.
[6] Kim Ki-young. (2022).A chatbot implementation plan using the bot framework.Journal of the Korean Society of Information, Electronics and Telecommunications Technology, 15(1), 56-61.
[7] Bayu Adhi Tama and Kyung-Hyune Rhee1, A Comparative Study of Phishing Websites Classification Based on Classifier Ensembles. Journal of Multimedia Information System VOL. 5, NO. 2, pp. 99-104, June 2018.
[8] Nitirajsingh Sandu , Ergun Gide, “Adoption of AI- Chat bots to Enhance Student Learning Experience in Hig her Education in India”, IEEE, 2019.
[9] Tussanai Parthornratt, Pasd Putthapipat, Dollachart Kitsawat , Prapap Koronjaruwat,” A Smart Home Automati on via Facebook Chat bot and Raspberry Pi”, IEEE, 2019
[10] Park Sung-woo, Park Joon-ho, Ryu Ki-hwan, 2022, [A Study on Consumers' Perception of Metaverse Before and After COVID-19 through Big Data Analysis], JCCT, vol.8, no.6, pp287-294