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Survey of CRM And Algorithmic Techniques used in Online Food Ordering System

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***Abstract* — Due to the rise in urban working population and hectic work culture, people are getting more inclined towards food ordering applications. Each year there is a rise in the net worth of the Indian food market. Food ordering applications like Swiggy, Zomato are market giants of Indian Food Technology. Startups are finding more innovative solutions like Machine Learning algorithms to cater to the efficiency and reduce the cost of food delivery systems. This paper performs a thorough literature survey of existing machine learning approaches and algorithmic solutions used in Online Food Ordering System which includes automated delivery person allocation, customer relationship management, automatic restaurant listing.**

Keywords* — *Web Technology, CRM, Machine Learning, Gradient Boosting Trees, Support Vector Machine

I. INTRODUCTION

Food industry and food businesses in India are rapidly evolving. With rising food startups providing wide variety of options to the customers, there is a surge in number of people ordering food online and relishing it at their homes. Dining-out has also increased significantly.

During the covid pandemic and post pandemic there has been a huge surge in the number of people ordering food at the comfort of their homes using food ordering applications. As the number of people ordering food using online platforms is increasing, it is important to understand all aspects of food ordering platforms and continuously working towards building better platforms for the consumers. Hence to achieve this goal, it is necessary to study the latest technologies used in food ordering systems for building better recommendation systems. Thus, providing better service to customers and increasing customer satisfaction.

Customers are more expensive to acquire than current clients. Marketers can keep their current, important consumers by being able to foresee churning clients at an early stage Since recruiting new consumers is expensive, keeping current ones is essential. However, businesses continue to lose clients before they make substantial changes. Understanding client complaints as early as feasible will help you design effective solutions and stop customer turnover.

It's crucial for the fast-food industry to anticipate client attrition. Many brands expand their networks, provide a wide selection of goods, and charge various prices. Due to this circumstance, restaurants face intense competition to draw in new clients and keep existing ones. Hence, it is a necessity to predict churning customers and retain them by taking required actions.

In this paper, we have performed a literature survey of existing machine learning techniques and solutions used in Online Food Ordering System in multiple aspects like automated delivery person allocation, automatic restaurant listing, recommendation system for food items, mobile application development, customer relationship management and customer churn prediction.

II. LITERATURE REVIEW

1.

[1] In this paper, algorithms such as AODE, Naive Bayes and AODEsr were studied. They used the WEKA tool to implement those algorithms and designed a new model that provides better efficiency. It was required to reduce the noise and error present in the data to filter the data.
The newly designed algorithm is more precise than the NaiveBays, AODE and AODEsr. Less time is required to train the designed model but it is a one-dimensional model. So, it cannot be used for high-dimensional data.

[2] This paper has a survey of uses of machine learning approaches to make the CRM process efficient. It also gives us brief information about the techniques used in each CRM dimension and element. Recent research done on CRM tools has been analyzed and discussed. Mostly SVM, Logistic Regression, Neural network and Decision trees are used to

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tackle the problems in the CRM process and make it error-free. Most common CRM issues are client identification and retention.

[3] The paper proposes a unique model to predict churning customers in the fast-food sector. The data structure for customers is formed subsequently with customer data. They created a long short-term memory model using continuous data, then predicted and compared customer churn stages with popular classification methods. The Proposed model shows encouraging results and stands out for its personalization prediction between identical studies. By building a LSTM model with 77% accuracy, they successfully predicted customer churn stages. This technique can be used for various sales data that has customers and can be enhanced with valid customer demographics.

[4] The aim of this study is to better understand the reasons that may lead switching banks in South African clients. The research utilized social media sentiment to understand and measure switch threats rather than using current models and survey approaches. The study examined consumer threats to transfer banks over the course of a year on social media (churn). The reasons why customers were making these threats were determined by looking for recurrent themes in the threats. The study examined all 5 South African retail banks using greater than 1.7 million social media posts. According to findings from this study, 7 criteria are crucial for comprehending the root causes of churn. Turnaround time, unethical behavior claims, billing, phone encounters, stores or branches, scams or scams, and lack of responsiveness are some of these. Similarly, we can use social media sentiments in the food ordering application for finding customer churn by finding crucial criteria specific to our application.

[5] In this paper, they have used the online characteristics and behavior of users to predict the customer churn. Many experiments were performed to compare the results of various data mining techniques. The result proves Gradient Boosted trees have 86.90% accuracy. The goal of their work was to predict whether users will stop the usage of their service. The data mining techniques included in this study are k-NN, Naive Bayes, Decision Trees, Random Forests, Gradient Boosted Trees, and Rule Induction. Various detailed attributes and instances can be added to the system.

[6] The study provided a dataset of 388 consumers residing in Bangalore, India to predict their purchasing decisions. Four predictive models are considered. CART and C4.5 decision trees, random forests, rule-based classifiers, and accuracy in providing correct class designation are evaluated. The results show that all models perform similarly, but C4.5 outperforms them all with 91.67% accuracy.

[7] This paper presented a simple approach of using VOC (Voice of Customer) in order to predict customer churn. They used Random Forest method with features such as age, gender, monthly, quarterly, yearly usage, type of member for their baseline model and added extra features in the baseline model by applying NLP techniques on VOC. The added features were VOC churn classification score, VOC sentiment polarity, VOC type category. Values for features were obtained by using SVM algorithms trained on labeled data of past 32,740 VOC. For results comparison, they used a web Questionnaire for VOC and calculated utilization frequency for predicting

customer churn. Out of all 3 features, VOC sentiment polarity and VOC type category did not increase much efficiency of baseline model but VOC churn classification score increased the efficiency on metric parameters Recall by 0.024, Precision by 0.04, F-score by 0.024 and AUC by 4.4%.

[8] This paper discussed the use of SVM (Support Vector Machine) to classify customer churn in the telecom industry. They also suggested the use of an RBF (Radial Basis Function) kernel in SVM for better results in classifying customer churn.

[9] This paper proposes the use of autocorrelation based on demographic data for the acquisition model of customers for an automobile company in Japan. Biggest external data vendor from Belgium provides the data and it contains information of around 3 million respondents in Belgium. The dataset for the model consisted of socio-demographic variables such as age, number of house-hold, income, lifestyle variables indicating interests in various fields including finance, entertainment, sports. The paper uses a baseline logistic regression model along with an autocorrelation term for neighboring customers. The proposed model leads to increase in 0.036 in AUC value compared to baseline model

[10] This paper presents a notion of customer signature to identify customer purchase pattern and rhythm of purchase for retail customers. The dataset contains basket data of 149942 customers provided by a major French retailer. The paper proposes a Dynamic Programming Approach using Sequence Segmentation for identifying customer signatures. When compared to Top-k items mining approach the proposed model provides a dynamic list of items instead of constant k-items keeping the Jaccard Similarity index nearly similar.

[11] This paper presents an Acquisition Model and Retention Model of customer along with architecture for a Food Delivery Company. For Customer Acquisition Model they proposed using transaction data of customer from company with 3rd party vendor data of customer for Model Training and identifying similar customers available in 3rd party vendor database for determining as acquirable or non-acquirable. The algorithm they used is Gradient Boosting Trees (GBT). For the Customer Retention Model, they proposed Random Forest based algorithm along with dataset from 3rd party vendor and Food Delivery Company combined. The proposed algorithm is using data in quarterly format, i.e., the current quarter target features use data of independent features from the previous quarter. Customer Acquisition Model achieved 70% precision along with predicted high impact customers of 21.41% higher average revenue per user. Whereas the Customer retention model gave 80% recall.

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[12] This article focuses on how Swiggy calculates delivery time and recommends the restaurant to customers when they open the application. The application should show restaurants that are serviceable and also should not miss the restaurants that the customer likes to order from. Hence, the generalization of the restaurant listing, the ideal distance is 10 kilometers from the customer location. Estimation of preparation time is done by quantity, type of food, and load of a restaurant. They use historical data for estimating delivery time i.e., time taken to reach a customer. Instead, of using Google Maps API's which is expensive and slow for complex calculations.

[13] This presents an exploration for a number of factors affecting the user acceptance for GoFood apps in Indonesia. The paper presents a model named UTAUT and TPB model for identifying the indicators affecting user preferences to the GoFood app. Factors in UTAUT and TPB model are Functional Expectancy (FE), Attemptation (A), Society Influence (SI), Support System (SS), Perceived Control (PC), and Behavioral Intention (BI) with each factor having certain indicators labelled from 1 to 5. The paper identifies the relationship between these indicators and their factors and found that among all 6 factors Social Influence and Perceived

Control factors are more related to Behavioral Intention than Functional Expectancy, Ademption, Support System because of the respondents of Generation Z who are affected by the surrounding environment.

[14] This exploratory paper's study initially compares the various mobile food businesses' business models to those used by mobile food ordering apps. Moreover, a structural model was created and put to the test while concentrating on the problems with MFOA operation. According to the survey,

MFOAs can benefit the food service industry since they help restaurants maintain brand loyalty and customer happiness. They may, however, also be content with and show loyalty to the restaurant brands from whom they have previously placed food orders. 217 actors were examined, and partial least squares path modelling was used to analyze the data (PLS-PM). 90% of the data sample is made up of individuals in the 18 to 25 and 26 to 35 age ranges. Consequently, these findings may be skewed toward the viewpoints of this young population.

[15] In this article, the author focuses on different methods used by Swiggy to optimize the delivery process to increase efficiency and increase profits. The methods should take into consideration different last-minute anomalies like weather, drop in active delivery agents, increase in demand, etc. Some methods proposed are Just in time assignment (JIT), Next order assignment (NOA), and Batching. Each has its own advantages and setbacks when implemented in real-life situations.

[16] The primary objective of the study in the paper is to identify and experimentally evaluate the key elements influencing consumers' desire to reuse MFOAs in Jordan as well as their level of e-satisfaction with these apps. The study suggests a comprehensive model based on the expanded Unified Theory of Acceptance and Use of Technology (UTAUT2) and the characteristics of MFOAs: online tracking, online review, and online rating. The suggested conceptual model fit the UTAUT2 model exactly. Both e-satisfaction and sustained intention were intended to be predicted by that model.

[17] In this case study, the author has done survey in India on different core parameters of food ordering application. The survey shows that 98% people are aware of food ordering application with majority being frequent users of the service. The plus points of food ordering are time-saving, ease of use, variety, ease of payments, discounts. In case of restaurants, food ordering application plays a major role in publicity and marketing campaigns of restaurants. They contribute to majority of orders that they receive on daily basis. Meanwhile, author also points towards drawbacks or challenges to be tackled those are uncertainty, customer loyalty, food quality control, technical challenges, etc.

[18] The author presents an application named 'Orderista' for ordering food within college campus for faculty and students. It provides E-menu facility to order the required items. The food will be delivered during break to individual locations within campus by canteens via delivery agents. The author proposes to use machine learning for food recommendations and to provide most trending foods in the campus. Three users are identified those are admin, client, and canteen owner. Each user will have their own dashboard based on their role. The product is aimed at college students who need budget friendly food.

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TABLE I. COMPARISON TABLE

Author	Year	Approach	Description
2. Kumar Budhani, Rajendra Singh Bisht, Neelima Budhani	2020	3. Naive Bayes, AODE, AODEsr	They Proposed a Hybrid Machine Learning Model for prediction of Customer Conduct
4. Sandeep Beatriz Nery Rodrigues Chagas, Julio Viana, Olaf Reinhold, Fabio Lobato, Antonio F. L. Jacob Jr., Rainer Alt	2018	SVM, Neural Networks, Logistic regression, Decision Tree	This paper explains us that the given algorithms are widely used in Customer churning
5. Ahmet Tugrul Bayrak, Asmin Alev Aktas, Okan Tunalı, Orkun Susuz, Nese Abbak	2021	Long Short-Term Memory	They proposed a model for predicting customer churn stages
6. James Lappeman, Michaela Franco ,Victoria Warner, Lara Sierra-Rubia	2022	Social media sentiment analysis	This paper proposes identifying crucial characters affecting churning of customers
7. Shamim Raeisi , Hedieh Sajedi	2020	Gradient Boosting Trees	They proposed an approach to predict customer churn based on online characteristics and user behavior
8. Batool Madani and Hussam Alshraideh	2021	CART and C4.5 decision trees, random forests, rule-based classifiers	This paper recommends using C4.5 algorithm which has accuracy of 91.67%
Yiou Wang, Koji Satake, Takeshi Onishi, and Hiroshi Masuichi	2018	Random Forest, Support Vector Machine (SVM)	This paper proposed a VOC (Voice of Customer) based Sentiment analysis for customer churn prediction
9. RajaGopal Kesiraju VLN, P. Deeplakshmi	2021	Support Vector Machine (SVM), Radial Basis Function (RBF) Kernel	This paper proposed a approach to classify customer churn in telecom industry
10. Dirk Van den Poel	2012	Logistic regression, Autocorrelation algorithm	This paper proposes the use of demographic data for baseline customer acquisition model for a Japanese automobile
11. Clement Gautrais , Rene Quiniou, Peggy Cellier, Thomas Guyet, Alexandre Termier	2017	Sequence Segmentation, Dynamic Programming Approach	This paper proposes a method to predict customer purchase pattern and rhythm of purchase
12. Kajanan Sangaralingam, Nisha Verma, Aravind Ravi, Su Won Bae, Anindya Datta	2019	Gradient Boosting Trees, Random Forest	This paper proposes a algorithm for customer acquisition and customer retention model
13. Devansh Gupta	2019	JIT, NOA, Batching	Ways to optimize the efficiency of deliveries
14. Tejas Raibagi, Ashwin Vishwakarma, Jahnavi Naik, Rujata Chaudhari, Geetanjali Kalme	2021	AI - Algorithm	This paper contains an Online Food Ordering System along with a specialized user menu.

III. CONCLUSION

This paper includes a number of research articles related to the functionalities and need of online food ordering systems. With increasing competition among various Online food delivery systems, it is important to understand customer's needs and concerns and to work towards finding effective solutions to attract and retain customers. It is the need of hour to implement new technologies in the existing food ordering system and enhance their functionality. By adopting machine learning and artificial intelligence techniques we can develop better recommendation systems, ultimately providing more appealing options to customers. This will further help in increasing business through online food ordering systems.

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