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STUDY ON THE IMPACT OF PERSONALIZED RECOMMENDATIONS AND ADVERTISEMENTS BY FOOD DELIVERY APPLICATIONS USING MACHINELEARNING: A CASE STUDY OF KHARGHAR

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ABSTRACT
The research investigates the impact of personalized recommendations and advertisements in food delivery applications, leveraging machine learning algorithms, within the urban setting of Kharghar, Maharashtra. Through a descriptive research approach involving a sample of 100 diverse users, the study aims to comprehensively explore various dimensions. Its objectives include assessing user perceptions, understanding the relationship between exposure to personalized recommendations and subsequent purchasing behavior, examining privacy concerns, evaluating recommendation relevance, and quantifying the effectiveness of machine learning techniques.

The findings reveal that a significant majority of Kharghar users frequently encounter personalized recommendations and engage in purchasing activities facilitated by these applications. A statistically significant association is observed between exposure to recommendations and purchasing behavior, highlighting their pivotal role. However, the study uncovers a divergence in user sentiments, with some expressing satisfaction while others harbor concerns regarding accuracy and data privacy, underscoring the need for transparency and educational initiatives.

Rejecting the null hypothesis strengthens the argument that personalized recommendations significantly influence purchasing behavior. Proposed recommendations include enhancing transparency, addressing privacy concerns, implementing educational initiatives, refining recommendation algorithms, and developing mechanisms for monitoring user behavior. These suggestions aim to empower users with greater trust and confidence in the application while optimizing the efficacy of personalized recommendations.

In conclusion, the study emphasizes the critical role of personalized features in shaping user behavior and underscores the imperative for transparency and user education to foster trust andenhance user experiences in food delivery applications.

Keywords- Online Food Delivery Applications, Personalized Recommendations, Food Delivery Applications, Machine Learning Algorithms, Purchasing behavior

1. INTRODUCTION
In recent years, rapid technological advancements have significantly transformed various industries, including the food delivery sector.The integration of machine learning into food delivery applications has revolutionized the way consumers interact with these services, offering personalized recommendations and advertisements tailored to individual preferences and behaviors. This study aims to explore the impact of such personalized features on user purchasing decisions, with a specific focus on the residents of Kharghar.

Food delivery applications have become an essential part of modern urban life, providing convenience and a wide range of culinary options at the fingertips of consumers. Companies like Swiggy, Zomato, and Uber Eats dominate the market, each striving to enhance user experience and customer retention through innovative technologies.

A report by Allied Market Research indicates that the global food delivery market was worth $107.44 billion in 2019, with projections suggesting it will grow to $154.34 billion by 2023. This growth is primarily driven by technological advancements and the increasing consumer demand for convenience. Among these technologies, machine learning stands out as a powerful tool, capable of analyzing vast amounts of user data to predict preferences and offer customizedcontent.

Artificial Intelligence (AI) constitutes a field within computer science focused on developing systems capable of executing functions that traditionally necessitate human intelligence. Thesefunctionalities involve processes such as acquiring knowledge, logical deduction, resolving problems, interpreting sensory information, and

understanding language. Machine learning, which falls under the umbrella of AI, encompasses the process of training algorithms using extensive datasets to identify patterns and make predictions or decisions without requiring explicit programming for each task. In the context of food delivery applications, machine learning algorithms process user data, such as past orders and browsing history, to generate personalized recommendations and advertisements that align with individual tastes and behaviors. McKinsey & Company's research unveiled that personalization has the potential to generate marketing investment returns that are five to eight times higher, while also propelling sales by a minimum of 10%.

The core of this research lies in understanding how personalized recommendations and advertisements influence user behavior. Personalized recommendations, such as suggesting restaurants or dishes based on previous orders, aim to enhance user satisfaction by making the decision-making process more efficient and enjoyable. Similarly, personalized advertisements target users with promotions and offers that are likely to resonate with their tastes and preferences, potentially increasing the likelihood of purchase. Studies have demonstrated that personalized marketing messages enhance consumer engagement, with 80% of consumers more likely to make a purchase when brands provide personalized experiences.

This study also delves into the frequency and relevance of these personalized features. Consistently receiving pertinent recommendations can elevate the user experience, rendering the application more captivating and practical. Conversely, irrelevant or intrusive recommendations and advertisements might lead to user dissatisfaction and reduced app usage. Thus, evaluating the balance and effectiveness of these personalized features is crucial for understanding their true impact.

Privacy and data security are paramount concerns in the digital age, particularly when it comes to personalized features that rely heavily on user data. Users' perceptions of how their data is handled can significantly affect their trust and engagement with food delivery applications. This study seeks to analyze these perceptions, assessing whether concerns about privacy and data security influence the overall acceptance of personalized recommendations and advertisements. According to a survey by Pew Research Center, 79% of adults are concerned about how companies use their data, highlighting the importance of addressing these concerns in the context of personalized services.

Moreover, this research examines changes in user engagement and spending habits as a result of personalized features. By comparing user behavior before and after the implementation of these features, the study aims to identify any significant shifts in how users interact with the applications. This includes exploring whether personalized content leads to increased spending, more frequent app usage, or higher levels of user satisfaction.

In summary, this research provides a comprehensive analysis of the impact of personalized recommendations and advertisements on food delivery application users in Kharghar. By exploring various dimensions such as user perception towards personalized recommendations, privacy concerns, frequency and relevance of recommendations, and the effectiveness of machine learning in predicting user behavior, the study aims to offer valuable insights into the effectiveness and challenges of using machine learning for personalization in the food delivery industry. Through a detailed examination of user experiences and behaviors, this research seeks to contribute to the ongoing development and refinement of personalized features in food delivery applications, ultimately enhancing user engagement and satisfaction.

2. REVIEW OF LITERATURE

McKinsey & Company (2017): The study explores the economic impact of personalization in digital marketing, finding that personalized recommendations in food delivery applications can deliver five to eight times the return on investment on marketing spend and increase sales by 10% or more. Published in the McKinsey Quarterly, it highlights the substantial benefits businesses can gain from personalization strategies.

Epsilon (2018): Featured in their report "The Power of Me," Epsilon's research examines how personalized experiences in food delivery apps influence consumer behavior. The study reveals that 80% of consumers are more likely to make a purchase when brands offer personalized experiences, emphasizing the importance of customized interactions for enhancing user engagement.

Davis K. and Patterson D. (2016): In their book "The Ethics of Big Data," Davis and Patterson discuss the ethical implications of using user data for personalized recommendations. They stress the need for transparency and user consent, suggesting that ethical data practices are crucial for maintaining trust in personalized marketing.

Accenture (2016): Accenture's "Personalization Pulse Check" report examines the economic benefits of personalization strategies. The study reports that 91% of consumers are more likely to shop with brands that

ISSN 2394 - 7780

provide relevant offers and recommendations, indicating significant revenue potential through personalized marketing in food delivery apps.

Jordan M.I. and Mitchell T.M. (2015): Published in "Science," this comprehensive review outlines advancements in machine learning techniques and their applications, including in the food delivery sector. The review highlights the potential of machine learning to revolutionize personalized marketing by offering more accurate and relevant recommendations.

Sharma R., Sharma N., and Dutta S. (2019): Published in the Journal of Indian Business Research, this study explores the impact of personalized recommendations on customer engagement in Indian food delivery apps. The research finds that personalized content significantly enhances user engagement and repeat usage.

Singh V. and Kumar P. (2018): In their paper in the Indian Journal of Marketing, Singh and Kumar analyze the role of machine learning in improving the efficiency of food delivery apps in urban India. Their study demonstrates how machine learning algorithms can optimize delivery times and improve customer satisfaction.

3. OBJECTIVES

1. To assess user perception towards personalized recommendations provided by food delivery applications.
2. To understand the relation between exposure to personalised recommendations and buying behaviour.
3. To analyze user perceptions of privacy and data security concerning personalized features.
4. To evaluate the frequency and relevance of personalized recommendations received by users.
5. To measure the overall effectiveness of machine learning in understanding and predicting user behaviour.

4. HYPOTHESIS

H0. Exposure to personalized recommendations has no significant influence on users' buying behavior.

H1. Exposure to personalized recommendations has significant influence on users' buying behavior.

5. RESEARCH METHODOLOGY

5.1 Research Design

This descriptive research delves into the impact of personalized recommendations and advertisements by food delivery applications using machine learning in Kharghar, Maharashtra. Unlike experimental studies, this design aims to depict the current scenario without manipulating variables. Through a survey involving 100 diverse app users and employing various inquiry types, the study seeks to understand perceptions and behaviors towards personalized features. While shedding light on prevalent trends, user attitudes, and usage patterns, it does not establish causal relationships. Ethical protocols ensure participant confidentiality. Limitations include sample representativeness and potential biases in self- reported data.

5.2 Population and Sample

Population: The study focuses on users of food delivery applications (FDAs) residing within Kharghar, Maharashtra. Though the exact population size is challenging to ascertain due to limited data availability, it is estimated that a significant number of FDA users exist in Kharghar, considering the widespread adoption of these platforms in India and the region's tech-savvy demographics.

Sample Size: To ensure a comprehensive analysis, a representative sample of 100 users will be drawn from the population. While modest, this sample size enables a thorough examination of user behavior and preferences, aligning with the study's objectives and available resources. **Sampling Technique:** Judgment sampling will be employed to secure a diverse and informative sample. This technique relies on expert knowledge and insights to select participants possessing relevant characteristics and experiences, ensuring a range of perspectives and behaviors are captured. Prioritization will be given to individuals actively using FDAs in Kharghar, exhibiting varying levels of engagement with personalized recommendations and advertisements, and representing a balance of demographic factors.

5.3 Data and Sources of Data

This study utilizes a combination of primary and secondary data to investigate the impact of personalized recommendations and advertisements by food delivery applications using machine learning in Kharghar, Maharashtra.

ISSN 2394 - 7780

Primary data will be collected through a structured questionnaire administered to a representative sample of 100 FDA users in Kharghar. This survey aims to gather information on usage patterns, preferences regarding personalized features, and relevant socioeconomic factors.

Secondary data will be sourced from various reliable sources, including journals, magazines, books, and other online and offline data sources.

5.4 Data Analysis Tools

Data analysis employs correlation analysis, regression modeling, and percentage analysis to explore connections between personalized features and user behavior, quantify their relationships, and delve into user demographics and preferences regarding personalized recommendations and advertisements. This statistical approach aims to provide a multifaceted understanding of how personalized features influence user behavior within Kharghar's food delivery landscape.

5.5 Limitations

- Sample Size: Only 100 people might not represent everyone.
- Answers from People: People may not remember or answer truthfully.
- Time Limit: Might miss changes over a long time.
- Tech Skills: Some may not understand technology well.

6. DATA ANALYSIS AND INTERPRETATION

6.1 Frequency of Noticing Personalized Recommendations

Response	Frequency	Percentage
Strongly agree	20	20
Agree	21	21
Neutral	24	24
Disagree	16	16
Strongly Disagree	19	19

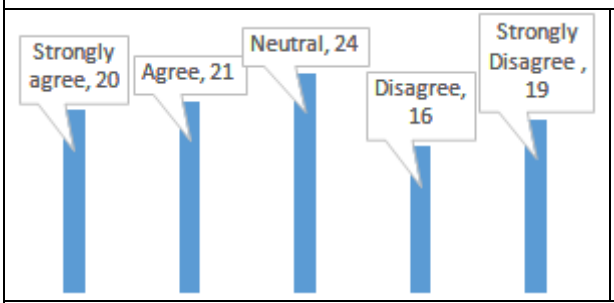

Figure 1: Response to the statement "I frequently notice personalized recommendations while using online food delivery"

Table No 1: Response to the Statement "I frequently notice personalized recommendations while using online food delivery"

The table shows responses to the statement "I frequently notice personalized recommendationswhile using online food delivery." It reveals that a majority either strongly agree (20%) or agree (21%) with this statement. A significant portion is neutral (24%), while some disagree (16%) or strongly disagree (19%).

6.2 Frequency of Purchasing Through Online Food DeliveryApplications

Response	Frequency	Percentage
Strongly agree	35	35
Agree	30	30
Neutral	15	15
Disagree	10	10

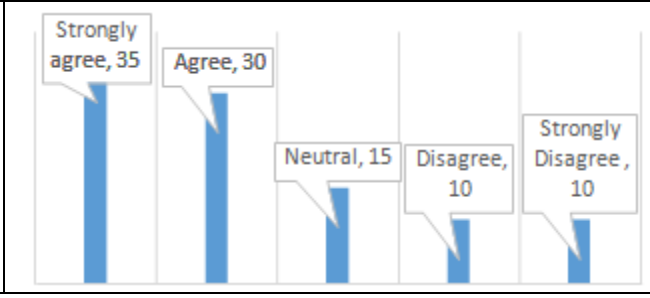

Figure 2: Response to the statement "I make purchases

ISSN 2394 - 7780

Strongly Disagree	10	10	fromonline food delivery applications frequently."

Table No 2: Response to the Statement "I make purchases from online food delivery applications frequently." The data shows that a significant majority of respondents (65%) have a positive sentiment, with 35% strongly agreeing and 30% agreeing with the statement. A smaller portion, 15%, remains neutral, while 20% of respondents have a negative sentiment, with 10% disagreeing and 10% strongly disagreeing. This indicates a generally favorable view with some areas of dissent.

6.3 Accuracy of Recommendations In Terms of Preferences

Response	Frequency	Percentage
Strongly agree	30	30
Agree	25	25
Neutral	20	20
Disagree	18	18
Strongly Disagree	7	7

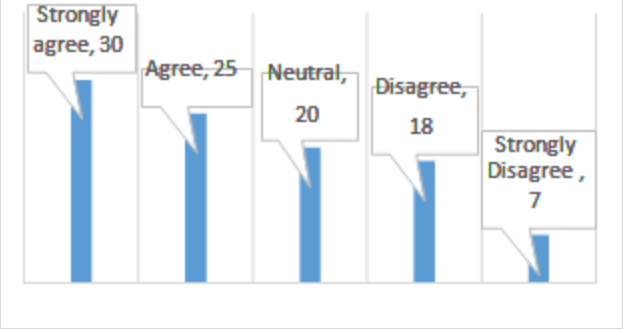

Figure 3: Response to the statement "The personalized recommendations are in line with my preferences"

Table No 3: Response to the Statement "The personalized recommendations are in line with my preferences" The data indicates that a majority of respondents (55%) have a positive sentiment towards the statement, with 30% strongly agreeing and 25% agreeing. Meanwhile, 20% of respondents are neutral. A smaller portion, 25%, expresses a negative sentiment, with 18% disagreeing and 7% strongly disagreeing. Overall, the sentiment leans positive, though there is a notable minoritywith differing views.

6.4 Accuracy of Recommendations In Terms of PurchasingPatterns

Response	Frequency	Percentage
Strongly agree	22	22
Agree	23	23
Neutral	30	30
Disagree	16	16
Strongly Disagree	9	9

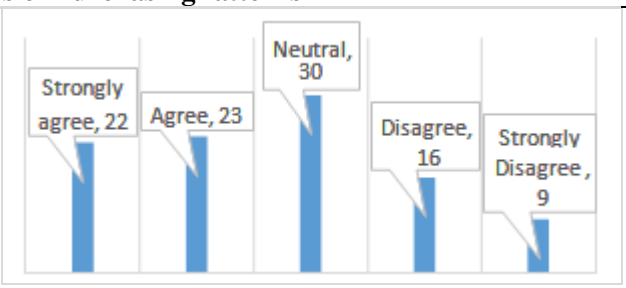

Figure 4: Response to the statement "The recommendationsare aligned with my Purchasing Patterns."

Table No 4: Response to the Statement "The recommendations are aligned with my Purchasing Patterns." The data reveals that respondents' opinions are quite mixed, with the largest group (30%) being neutral. Positive sentiments (Strongly Agree + Agree) total 45%, with 22% strongly agreeing and 23% agreeing. Negative sentiments (Disagree + Strongly Disagree) account for 25%, with 16% disagreeing and 9% strongly disagreeing. This indicates a balanced distribution ofopinions with a slight lean towards neutrality.

ISSN 2394 - 7780

6.5 Awareness towards Collection of User Data

Response	Frequency	Percentage
Strongly agree	10	10
Agree	20	20
Neutral	25	25
Disagree	25	25
Strongly Disagree	20	20

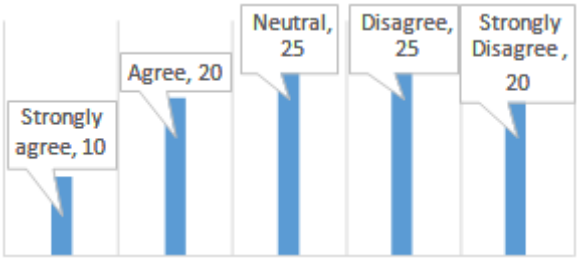

Figure 5: Response to the statement "I am aware that the appmay be collecting data from my usage as well as other applications."

Table No 5: Response to the Statement "I am aware that the app may be collecting data from my usage as well as other applications."

The data shows a highly polarized set of responses, with an equal percentage of respondents expressing neutral (25%) and negative sentiments (25% Disagree, 20% strongly Disagree). Positive sentiments are less common, with 10% strongly agreeing and 20% agreeing, making up 30% of the total responses. This indicates a significant divide in opinions, with a substantialportion of respondents either neutral or negative.

6.6 Concerns towards Personal Data Being Collected and Processed

Response	Frequency	Percentage
Strongly agree	7	7
Agree	7	7
Neutral	19	19
Disagree	36	36
Strongly Disagree	31	31

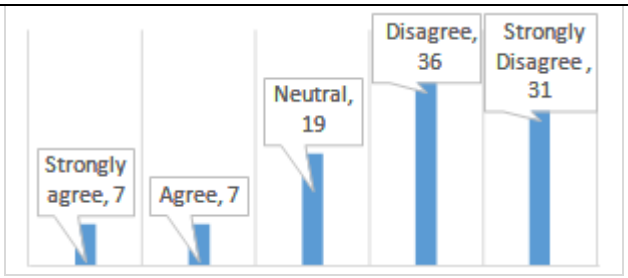

Figure 6: Response to the statement "I have no concerns over my data being used and tracked."

Table No 6: Response to the Statement "I have no concerns over my data being used and tracked."

The data suggests a prevailing negative sentiment, with 67% of respondents expressing disagreement (36% Disagree, 31% Strongly Disagree). A notable portion (19%) remains neutral. Positive sentiment is relatively modest, with 7% strongly agreeing and 7% agreeing, totaling 14%. This indicates that a significant majority either disagree or hold neutral views onthe statement.

6.7 Popularity of Personalized Recommendations

Response	Frequency	Percentage
Strongly agree	21	21
Agree	29	29
Neutral	25	25
Disagree	14	14
Strongly	11	11

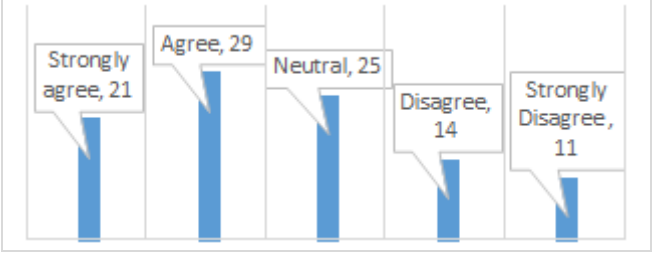

Figure 7: Response to the statement "I notice personalized recommendations more than other advertisements"

ISSN 2394 - 7780

Disagree			

Table No 7: Response to the Statement "I notice personalized recommendations more than other advertisements"

The data portrays a diverse range of opinions, with agreement being the most common sentiment at 50% (29% Agree, 21% Strongly Agree). Neutral responses follow closely behind, comprising 25% of the total. Disagreement is notably lower, with 14% expressing disagreement and 11% strongly disagreeing, totaling 25%.

6.8 Effectiveness of Personalized Recommendations

Response	Frequency	Percentage
Strongly agree	22	22
Agree	34	34
Neutral	24	24
Disagree	12	12
Strongly Disagree	8	8

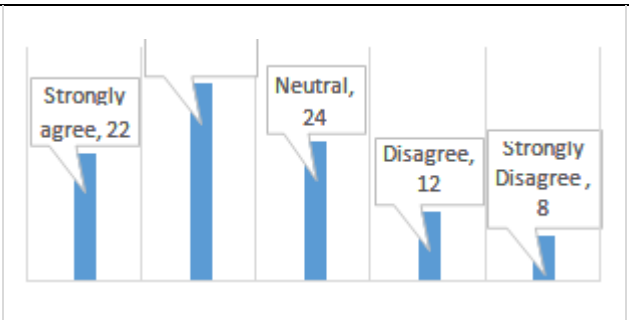

Figure 8: Response to the statement " I have made a purchase based solely on personalized recommendation"

Table No 8: Response to the Statement "I have made a purchase based solely on personalizedrecommendations"

The data illustrates a predominance of positive sentiments, with 56% expressing agreement (34% Agree, 22% Strongly Agree). Neutral responses constitute 24% of the total, indicating a sizable portion with ambivalent views. Conversely, disagreement is notably lower, with 12% disagreeing and 8% strongly disagreeing, totaling 20%. This suggests a general inclination towards agreement or neutrality among respondents.

6.9 Contingency Table for Calculating Chi-Square

Table No 9: Chi-square table comparing frequency of noticing personalized recommendationsand frequency of purchasing through online food delivery applications

	Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**
Strongly agree	10	5	15	2	3	**35**
Agree	3	12	2	5	8	**30**
Neutral	1	1	2	6	5	**15**
Disagree	2	1	3	2	2	**10**
Strongly Disagree	4	2	2	1	1	**10**
Total	**20**	**21**	**24**	**16**	**19**	**100**

With a chi-square statistic of 36.9776 and a p-value of .002112, the result is deemed significantat $p < .05$. This indicates that there is likely a statistically significant association between the variables.

7. FINDINGS

- A majority (41%) either strongly agree or agree that they frequently notice personalizedrecommendations.
- A substantial majority (65%) of respondents report making purchases from online fooddelivery applications frequently.
- A majority (55%) perceive that personalized recommendations align with their preferences to some extent.
- Respondents' opinions are mixed regarding the alignment of recommendations with their purchasing patterns.
- Respondents' opinions are polarized, with a substantial portion expressing neutral or negative sentiments regarding the app's data collection practices. Most Respondents arenot aware that their data is being collected and processed.

ISSN 2394 - 7780

- A majority (67%) express disagreement or strong disagreement regarding concerns over their data being used and tracked.
- A majority (50%) of respondents agree or strongly agree that they notice personalized recommendations more than other advertisements.
- A predominance of respondents (56%) report making purchases based solely on personalized recommendations.
- The chi-square test assessing the goodness of fit between the variables "frequency of noticing personalized recommendations" and "frequency of purchasing through online food delivery applications" resulted in a chi-square value of 36.9776 and a p-value of .002112. These findings indicate a statistically significant association between the variables.
- The null hypothesis “Exposure to personalized recommendations has no significant influence on users' buying behavior.” Is Rejected based on the chi-square test for goodness of fit.

8. CONCLUSION AND SUGGESTIONS

CONCLUSION

This study investigated user experiences with personalized recommendations on online food delivery applications. The findings reveal key insights.

Users are clearly exposed to and influenced by these recommendations. A significant portionfrequently notice them, and many make frequent in-app purchases. Interestingly, personalized recommendations appear to be more attention-grabbing than other advertisements. Furthermore, a statistically significant association exists between noticing recommendations and purchase behavior, indicating their impact on user decisions. This influence is further emphasized by the large number of users who base purchases solely on these recommendations.However, there's room for improvement. While some users find the recommendations aligned with their preferences, opinions are divided regarding their accuracy in reflecting actual purchase behavior. This suggests potential for refining the underlying algorithms. Additionally, user sentiment towards data collection practices is varied. While some users have no concerns,others express neutrality or negativity, with a concerning lack of awareness about datacollection itself. This highlights the need for increased transparency on the app's part.

Finally, a strong majority of users disagree with concerns about data use. This suggests a potential trust gap that can be addressed through clear communication about data security measures.

9. SUGGESTIONS

- **Enhance Transparency:** Online food delivery applications should prioritize transparency regarding data collection practices, ensuring that users are well-informedabout how their data is being collected and used.
- **Address Privacy Concerns:** Addressing users' privacy concerns is crucial for buildingtrust and confidence. Companies should implement robust privacy policies and mechanisms for users to control their data preferences.
- **Educate Users:** Provide educational resources and initiatives to increase users' awareness of the benefits and risks associated with personalized recommendationsand data collection practices.
- **Improve Recommendation Alignment:** Continuously improve recommendation algorithms to better align with users' preferences and purchasing patterns. Solicit feedback from users to refine and personalize recommendations further.
- **Monitor Buying Behavior:** Regularly monitor and analyze users' buying behavior to understand the effectiveness of personalized recommendations and identify areas forimprovement.

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ISSN 2394 - 7780

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QUESTIONNAIRE

1. Age: [Open-ended]
2. Gender:

- Male
- Female
- Prefer Not to Say

3. Occupation:
4. Monthly income:

Below ₹20,000

₹20,000 - ₹40,000

₹40,000 - ₹60,000

Above ₹60,000

5. I frequently notice personalized recommendations while using online food deliveryapplications.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

6. I make purchases from online food delivery applications frequently.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

7. The personalized recommendations are in line with my preferences.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

8. The recommendations are aligned with my buying patterns.

- Strongly agree
- Agree
- Neutral

ISSN 2394 - 7780

- Disagree
- Strongly disagree

9. I am aware that the app may be collecting data from my usage as well as other applications.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

10. I have no concerns that my data is being used and tracked.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

11. I notice personalized recommendations more than other advertisements

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

12. I have made a purchase based solely on personalized recommendations.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Thank you for your feedback. Your responses are valuable for our research.