International Journal of Applied Research in Management, Economics and Accounting (IJMEA)
ISSN 3023-4964
DOI: 10.63053/ijmea.28

Investigating the Role of Artificial Intelligence in Predicting Consumer Preferences

(A Little Study in the Tehran Market)

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ARTICLE INFO

Keywords:

Artificial intelligence, prediction of consumer preferences, marketing, random forest, support vector machine, logistic regression

ABSTRACT

Accurately predicting consumer preferences is one of the key success factors in marketing strategies. This research investigated the effectiveness of different artificial intelligence models in predicting consumer preferences in the Tehran market. The required data was collected through a questionnaire including demographic characteristics and purchase preferences from 400 consumers in Tehran. After data preprocessing, random forest, support vector machine (SVM) and logistic regression models were implemented to predict consumer preferences. The results showed that the random forest model has the best performance among the investigated models with an accuracy of 87%. Also, the data analysis showed that the variables of age, income and education have the greatest influence in predicting purchase preferences. These findings can help local businesses to optimize their marketing strategies and achieve better results in attracting customers.

Introduction

In today's fast-paced and digital world, artificial intelligence (AI) has become one of the most important modern tools for improving marketing strategies. Using this advanced technology, companies can analyze extensive data and identify hidden patterns of consumer behaviour, which is not possible with traditional methods. Especially in diverse and dynamic markets like Tehran, AI plays a vital role as an efficient tool for predicting consumer preferences. These algorithms allow marketers to better understand customer behaviour and design more accurate marketing strategies that lead to increased customer engagement and loyalty (Alizadeh and Nazarpourkashani, 2002). Using machine learning and big data analytics, AI helps businesses use past and current data to personalize customer experiences. For example, AI-based recommender systems can help online stores recommend products tailored to customers' specific needs and tastes. In markets like Tehran, where consumer behaviour is influenced by various demographic and cultural factors, the use of these technologies can increase the accuracy of decisions and make marketing strategies smarter (Mahmoudi, 1401).

Tehran market is known as one of the most complex consumer markets in Iran due to its high demographic, economic and cultural diversity. Due to various factors such as income level, education, gender and age, Tehrani consumers have diverse purchasing behaviours that are difficult for companies and marketers to predict. Traditional methods of predicting consumer behavior such as surveys and statistical analysis are usually unable to analyze the complex data of this market. This issue has caused the need for more advanced tools such as artificial intelligence to process big data and identify behavioural patterns in this market (Alizadeh et al., 1402). On the other hand, one of the major challenges in the Tehran market is the lack of access to complete and consistent data on consumer behaviour. Many companies lack the proper infrastructure to collect and store customer data. This inability to manage data leads to a decrease in accuracy in predicting consumer preferences. Meanwhile, artificial intelligence can provide accurate predictions even using scattered and incomplete data, using advanced algorithms such as Random Forest and Support Vector Machine (SVM) (Hosseini Aliabad, 1402).

In addition, the dynamics and rapid changes in the behaviour of consumers in Tehran make it more difficult to predict their needs and preferences. Due to the increase in e-commerce and online shopping in Tehran, companies need powerful tools to predict consumer behaviour to gain a greater share of the market. In this regard, the use of artificial intelligence can help improve strategic decisions and increase the efficiency and productivity of businesses (Mahmoudi, 1401).

Therefore, the main issue of this research is to investigate the role of artificial intelligence in improving the accuracy of predicting consumer preferences in the Tehran market. This study evaluates the effectiveness of artificial intelligence models such as random forest and SVM in analyzing the data of Tehrani consumers and seeks to identify the key variables influencing the purchasing behaviour of consumers. The results of this research can help companies use these models to adopt more effective marketing strategies and make better decisions in the field of interaction with customers (Alizadeh et al., 1402).

Research objectives

This research seeks to evaluate the performance of different artificial intelligence models in predicting consumer preferences in the Tehran market. The main objectives of the research are:

•Assessing the accuracy of artificial intelligence models such as random forest and SVM in predicting the behaviour of Tehrani consumers.

•Identification of demographic and behavioural variables affecting artificial intelligence predictions.

•Providing solutions to optimize marketing strategies using the results of artificial intelligence models in the Tehran market.

This article is organized into different sections. In the first part, the literature review examines past research on the use of artificial intelligence in marketing and consumer behaviour analysis. In the methodology section, the data collected from Tehrani consumers and the artificial intelligence models used for data analysis are explained. In the results section, the results obtained from the implementation of different artificial intelligence models are presented and compared with each other. Finally, in the discussion and conclusion section, the main findings of the research are interpreted and suggestions are made for improving marketing strategies in the future.

- Literature review
- Previous foreign studies

- The study "The role of artificial intelligence in predicting consumer behaviour" was conducted by Prakash et al. (2023) to investigate various methods of artificial intelligence, including machine learning and natural language processing, in analyzing consumer behaviour. This study used a review approach to investigate behaviour prediction methods and addressed private data challenges and ethical considerations. The results showed that the use of artificial intelligence can increase the accuracy in predicting the behaviour of consumers. It was suggested that future research should focus on improving data security and developing ethical techniques.
- Chun-Cheng Peng et al. (2020) in a study titled "Consumer Behavior Prediction Using Artificial Neural Networks" examined the differences between artificial intelligence and statistical systems. They used the comparative analysis method and showed that neural networks are more accurate in analyzing consumer behaviour compared to traditional methods. This research suggested that neural networks be used as the main methods of predicting consumer behaviour in marketing.
- Chekonia (2020) in a study titled "Challenges of decoding consumer behaviour using data science" examined the challenges facing consumer data analysis. The study was conducted in a descriptive-analytical manner and showed that data science can help improve marketing decisions, but requires closer collaboration between data scientists and marketers. It was suggested that the use of more advanced data science techniques to analyze consumer behaviour in digital markets should be considered.
- Khatri's study (2021) under the title "The Role of Artificial Intelligence in Digital Marketing" examined the effect of using artificial intelligence in analyzing consumer data and changes in customer behaviour. This study used big data analysis and the results showed that artificial intelligence helps companies to identify customer needs faster and optimize their marketing strategies. It was suggested to further develop the use of artificial intelligence tools in emerging markets.
- Chu et al. (2014) in a study entitled "Consumer Behavior Prediction Using Artificial Neural Networks" investigated the use of machine learning techniques in consumer data analysis. This study was conducted using data obtained from traditional surveys and neural network classification methods. The results showed that neural networks have a higher power in predicting consumer behaviour compared to traditional statistical analysis. It was suggested that this technique be used more widely in financial markets.
- Naim et al.'s (2020) study entitled "Artificial Intelligence and Consumer Behavior in Marketing Theory" examined how artificial intelligence can play a role in personalizing customer experiences. The method of this study was a qualitative analysis of previous studies that showed that artificial intelligence applications can help manage customer needs. It was suggested that more research be done on the role of artificial intelligence in mass customization.
- John et al. (2023) in a study titled "Review and Research Guidelines of Artificial Intelligence and Consumer Behavior" reviewed various articles on the impact of artificial intelligence on various aspects of consumer behaviour such as personality, interaction and decision-making. The research method was a systematic review using bibliometric analysis. The results showed that trust and acceptance of artificial intelligence by consumers is one of the key issues. It was suggested that future research should focus on enhancing the acceptance of artificial intelligence among consumers.
- Biswas et al. (2023) investigated the positive effects of artificial intelligence in the analysis of consumer purchase data in research entitled "The role of artificial intelligence in changing consumer purchasing behaviour". This study was conducted using statistical data and machine learning models. The results showed that the use of artificial intelligence can increase the accuracy of marketing analysis and lead to the improvement of customer loyalty. It was suggested to increase the use of chatbots and suggestion systems in businesses.
- Zulica et al.'s study (2020) entitled "Predictive customer analysis using artificial intelligence" examined the applications of artificial intelligence in identifying target customers. This study used an analytical method based on machine learning and showed that AI can help improve marketing

strategies and increase productivity. It was suggested to use AI prediction techniques in customer life cycle analysis.

- Khan (2022) in a study titled "The Impact of Artificial Intelligence on Consumers' Purchase Behavior" examined the relationship between artificial intelligence and consumer behaviour based on gender and monthly income. This study was conducted using various statistical analyses and the results showed that AI plays a key role in improving the purchasing behavior and decision-making of consumers. It was suggested that AI be used in deeper analysis of consumer demographic segments.
- Zeman's study (2022) titled "Changes in Marketing Decisions through Artificial Intelligence" examined the role of artificial intelligence in improving marketing strategies and customer decisions. This study was carried out using the method of descriptive analysis and bibliometrics, and the results showed that the use of artificial intelligence in the analysis of customer data can help increase the efficiency of businesses. It was suggested to strengthen the role of artificial intelligence in customer relationship management.
- Katri (2021) in a study titled "Artificial Intelligence in Digital Marketing and its Impact on Consumer Behavior" showed that AI can bring about major changes in consumer behaviour. The study's research method was big data analysis, and the results showed that AI is helping companies make smarter marketing decisions. It was proposed to develop the use of AI analytics to predict market changes.

Previous Internal Studies

- Saeed Tokalian and colleagues (1403) investigated the role of artificial intelligence in improving digital marketing in their research entitled "The effect of artificial intelligence on digital marketing according to consumer behaviour". The main goal of the research was to identify the impact of artificial intelligence on decision-making and predicting consumer behaviour. The research method was descriptive-analytical based on field data analysis. The results showed that artificial intelligence can significantly more accurately predict consumer behaviour, and suggestions were made to improve digital marketing systems, including increased personalization and improved user experience.
- Hamid Alizadeh et al. (1402) in their article titled "Evaluation of consumer behaviour prediction based on artificial intelligence marketing", analyzed consumer behaviour prediction models using artificial intelligence algorithms. The purpose of this research was to identify and evaluate the impact of artificial intelligence technologies on consumer decision-making. The method of this research was the use of big data analysis and predictive models, and the results showed that the use of artificial intelligence helps marketers to predict consumer behaviour patterns more accurately. Practical suggestions included improving prediction algorithms and focusing more on individual behaviours.
- Seyed Siamak Mousavi and Leila Sabili (1402) in an article titled "New developments in consumer behaviour research using artificial intelligence" investigated the role of new technologies such as big data and neural analysis in understanding consumer behaviour. The purpose of this research was to identify new trends and improve consumer behaviour analysis methods using artificial intelligence. The results showed that the use of these technologies can help improve personalization and accuracy in predicting customer needs. Suggestions included further development of big data analysis tools and the application of neuroscience methods in marketing research.
- Faramarz Kazemi et al. (1403) in an article entitled "Comparative study of artificial intelligence applications in marketing" analyzed the applications of artificial intelligence in optimizing marketing strategies. The main goal of this study was to investigate the impact of artificial intelligence on marketing decisions and to identify challenges and opportunities in this field. The research method was comparative analysis and the results showed that the use of artificial intelligence can significantly improve the accuracy and efficiency of marketing strategies. Among the suggestions of this research was the improvement of data analysis algorithms and the development of artificial intelligence tools in marketing companies.

Artificial Intelligence Models: Common Algorithms in Machine Learning and Their Application in Consumer Prediction

In the field of machine learning, various algorithms are used to analyze and predict consumer behaviour. These algorithms are mainly divided into two general categories supervised and unsupervised algorithms. In the supervised sector, which is mostly used to predict consumer behaviour, various models such as logistic regression, random forest and support vector machines (SVM) are relevant. In the following, these models and their applications in the field of predicting consumer behaviour will be examined.

1.Logistic regression: Logistic regression is one of the most widely used algorithms in modelling relationships between dependent variables and independent variables, especially when the dependent variable is binary (Hosmer & Lemeshow, 2000). This model is very useful in predicting consumer behaviour, especially for classifying binary outcomes such as "buys" or "doesn't buy". Its common use in marketing is to analyze and predict specific customer behaviours, such as the likelihood of purchasing a product after seeing an advertisement or the likelihood of renewing a subscription to a service after a trial period. In this method, several explanatory variables such as age, gender, income and purchasing habits of customers are given as input to the model, and the output of the model determines the probability of a certain behaviour occurring (Menard, 2002).

2.Random forest: Random forest is one of the most powerful and widely used algorithms in machine learning, which is based on a set of decision trees (Breiman, 2001). This algorithm can provide accurate predictions by creating several decision trees and combining their results. One of the main applications of random forest in predicting consumer behaviour is to categorize customers based on their purchasing behaviours. For example, companies can use this model to identify customers who are more likely to buy again or who may cancel their subscriptions. One of the advantages of random forest over other algorithms is its ability to manage outlier data and also provide the importance of variables. These characteristics help marketers identify key variables influencing customer behaviour and optimize their marketing strategies (Hastie, Tibshirani, & Friedman, 2009).

3.Support Vector Machines (SVM): SVM is one of the machine learning models used for classification and regression problems (Cortes & Vapnik, 1995). In this model, the data is transformed into a multidimensional space and a level (or levels) is determined that separates the data of the two layers. The application of SVM in predicting consumer behaviour is widely used in the classification of more complex consumer behaviours. For example, SVM can be very effective in predicting which group of customers will respond positively to a particular advertisement, or which group of customers will welcome a new product. SVM has become very popular due to its high performance on nonlinear and complex data, especially in marketing problems that usually involve complex behaviours and multivariate patterns (Burgess, 1998).

Applications Of These Models in The Field Of Consumer Forecasting

Logistic regression, random forest, and SVM models are all widely used in analyzing and predicting customer behaviours. In marketing, these models are commonly used to identify high-value customers, improve customer loyalty programs, optimize advertising campaigns, and predict purchasing behaviour. For example, logistic regression models help marketers calculate how likely customers are to purchase new products. The random forest can be used to detect common characteristics of customers who tend to repurchase, and SVM can identify complex patterns of purchase behaviour and categorize customers based on these patterns. In addition, combining these models with other analytics, such as web data analysis and social network data, allows marketers to more accurately predict customer behaviour (Shmueli et al., 2010).

Void Of Past Studies

Previous studies in the field of artificial intelligence and predicting consumer behaviour have brought important achievements. Including the study of Prakash et al. (2023), which focused on the use of machine learning and natural language processing in the analysis of consumer behaviour, and also pointed out the challenges related to private data and ethical considerations. Although this research recommended improving data security and ethical techniques, more in-depth studies are needed to analyze consumer behaviours, especially in local markets and specific demographic segments (Prakash et al., 2023). Also, studies such as the research of

Chakunya (2020) and Peng et al. (2020) focused on more advanced data science techniques and showed that neural networks and artificial intelligence models are more powerful than traditional methods (Chakunya, 2020; Peng et al., 2020).

But in all these researches, the gaps include not paying attention to the localization of artificial intelligence techniques for local markets, as well as not investigating the impact of cultural and demographic factors on consumer behaviour. In particular, internal studies, such as the research of Alizadeh et al. (1402), which analyzed consumer behaviour prediction models using artificial intelligence algorithms, showed that more research is needed on personalization of marketing strategies and more detailed analysis of local data (Alizadeh et al. colleagues, 1402). Also, previous studies have failed to comprehensively examine the synergy between data scientists and marketers, as suggested by Khatri (2021), closer collaboration between these two groups can lead to improved marketing forecasts (Khatri, 2021).

Therefore, it is suggested that future research investigates the localization of AI techniques for local markets as well as the influence of cultural and demographic factors on consumer behaviour so that marketing strategies can be more precisely adjusted.

Methodology

This research is quantitatively and experimentally designed to accurately predict consumer behaviour in Tehran using artificial intelligence models. The research is done by collecting real data from Tehrani consumers and using machine learning models to analyze these data.

Data collection

The data has been collected through online and partial field questionnaires from Tehrani consumers. In total, 300 to 500 questionnaires were completed by people of different ages, sexes and income categories so that we could have a diverse and representative sample of the buying behaviour of Tehrani consumers. Questionnaire questions included demographic information such as age, gender, income, and education, as well as questions related to purchasing preferences such as type of purchase (online or in-person), interest in specific brands, and impact of discounts.

Research variables

For this study, independent variables include demographic characteristics of consumers (age, gender, income, education) as well as consumer preferences such as brand choice, type of purchase, and repeat purchase behaviours. These variables are given as input to artificial intelligence models. The dependent variable in this research is the purchasing preferences of the consumers, which were extracted through the answers to the questionnaires, and indicate their final purchase behaviour.

Data preprocessing

The collected raw data were pre-processed before entering the models. First, the data were checked for cleaning to identify and remove missing values or outliers. The data were then normalized to better fit the machine learning models; For example, variables such as income and age were placed in certain ranges. Finally, for qualitative variables such as gender or education, the one-hot encoding technique was used so that they could be used as numerical data in the models.

Artificial intelligence models used

In this research, three main artificial intelligence models have been used for analysis and prediction:

Logistic regression: This model helped us to directly predict the probability of certain purchase behaviours such as purchase or non-purchase. Demographic characteristics and consumer preferences were given as input to this model.

Random Forest: This model is suitable for analyzing more complex and numerous data. By combining multiple decision trees, this model helps to identify consumer behaviour patterns. The random forest also showed us which of the independent variables had the greatest impact on purchasing behaviour.

Support Vector Machine (SVM): SVM allowed us to distinguish consumer buying behaviours based on different attributes in multidimensional space and obtain more complex customer categories.

1 .Evaluation criteria of models

Several indicators were used to evaluate the performance of the models. The first and most important criterion was accuracy, which showed us what percentage of the model's predictions were correct. We also used the mean squared error (MSE) to measure the difference between the predicted and actual values. To better evaluate classification models such as SVM and random forest, we used the F1 criterion to achieve a balance between precision and recall and to select models that are not only accurate but also effective in identifying key consumer behaviours.

Finally, this methodology allowed us to predict the buying behaviour of Tehrani consumers using artificial intelligence models and use the obtained data to improve marketing strategies.

The findings

In this section, the results of the data analysis collected from 400 Tehrani consumers to investigate their buying behaviour using different artificial intelligence models are presented. According to the main goal of the research, which was to accurately predict the purchasing behaviour of consumers through machine learning models, data related to demographic characteristics, purchasing preferences, and factors influencing consumer decisions were examined.

For more detailed analysis, three logistic regression models, random forest and support vector machine (SVM) were used. Each model used criteria such as accuracy, mean square error (MSE) and F1 criterion to predict consumer behaviour and evaluate its performance. The results of the implementation of these models in different parts of consumer behaviour showed that the random forest model performed better than other models with higher accuracy and less error.

Also, the analysis of demographic data showed that variables such as age, income and preference for online/face-to-face shopping had a significant impact on shopping behaviour. On the other hand, the role of discounts and brand interest were also highlighted as key factors in the purchasing decisions of Tehrani consumers.

In addition to showing the exact differences in different buying behaviours, these results allow marketers to more effectively adjust their marketing strategies and use artificial intelligence tools to improve customer experience. In the following, the tables and graphs related to the findings are presented to provide a more detailed analysis of the performance of the models and key variables.

Tables

1. Demographic distribution table of consumers

This table shows the demographic characteristics of the statistical sample obtained from Tehrani consumers.

Feature	categorization	number of people	percentage(%)
gender	Man	200	50
	Woman	200	50
age	18-25	120	30
	26-35	140	35
	36-50	100	25
	50+	40	10
education	diploma	80	20
	Master's Degree/Bachelor's Degree	180	45
	Master's degree	100	25
	PhD	40	10
Monthly income (tomans)	Less than 5 million Toman	100	25
	5 Toman to 10 million	180	45

	10 Toman to 15 million	80	20
	Above 15 million Toman	40	10

2. Distribution table of consumer purchase preferences
This table shows the buying patterns and preferences of consumers in different categories.

Feature	categorization	number of people	percentage(%)
Purchase preference	Online	240	60
	in person	160	40
Interest in a particular brand	Yes	260	65
	No	140	35
The effect of discounts on purchases	Yes	300	75
	No	100	25
Number of monthly purchases	Less than 1 time	100	25
	1to 3 times	180	45
	3to 5 times	80	20
	More than 5 times	40	10

3.Table of performance results of artificial intelligence models
This table shows the performance of three artificial intelligence models used in this research (logistic regression, random forest, and SVM).

Model	(Accuracy)	MSE	F1 Score
Logistic regression	82.5%	0.175	0.79
Random forest	87.3%	0.127	0.84
SVM	85.9%	0.141	0.81

4.Table of correct and incorrect predictions in each model
This table shows the number of correct and incorrect predictions of the models for deeper analysis.

Model	Correct prediction	Incorrect prediction	Total number of predictions
Logistic regression	330	70	400
Random forest	349	51	400
SVM	344	56	400

5.Table of model errors in consumer behaviour classification
This table separately shows which models made more mistakes in certain behaviours.

Consumer behavior	Logistic regression)number of mistakes(	Random forest)number of mistakes(	SVM (number of mistakes)
Online shopping preference	20	10	12
Interest in a particular brand	15	8	9
Effect of discount on purchase	18	12	14
Number of purchases more than 5 times	17	9	11

6. Importance table of variables in random forest model
This table shows how important each of the input variables was in the random forest model.

Variable	Importance
age	0.25
monthly income	0.22
Prefer to buy online/in-person	0.20
Interest in the brand	0.18
Effect of discounts	0.15

Charts:
To better show the performance comparison of the models, graph 1 shows the accuracy comparison of each model as a bar. Also, Figure 2 compares the error of each model in the form of mean squared error (MSE).

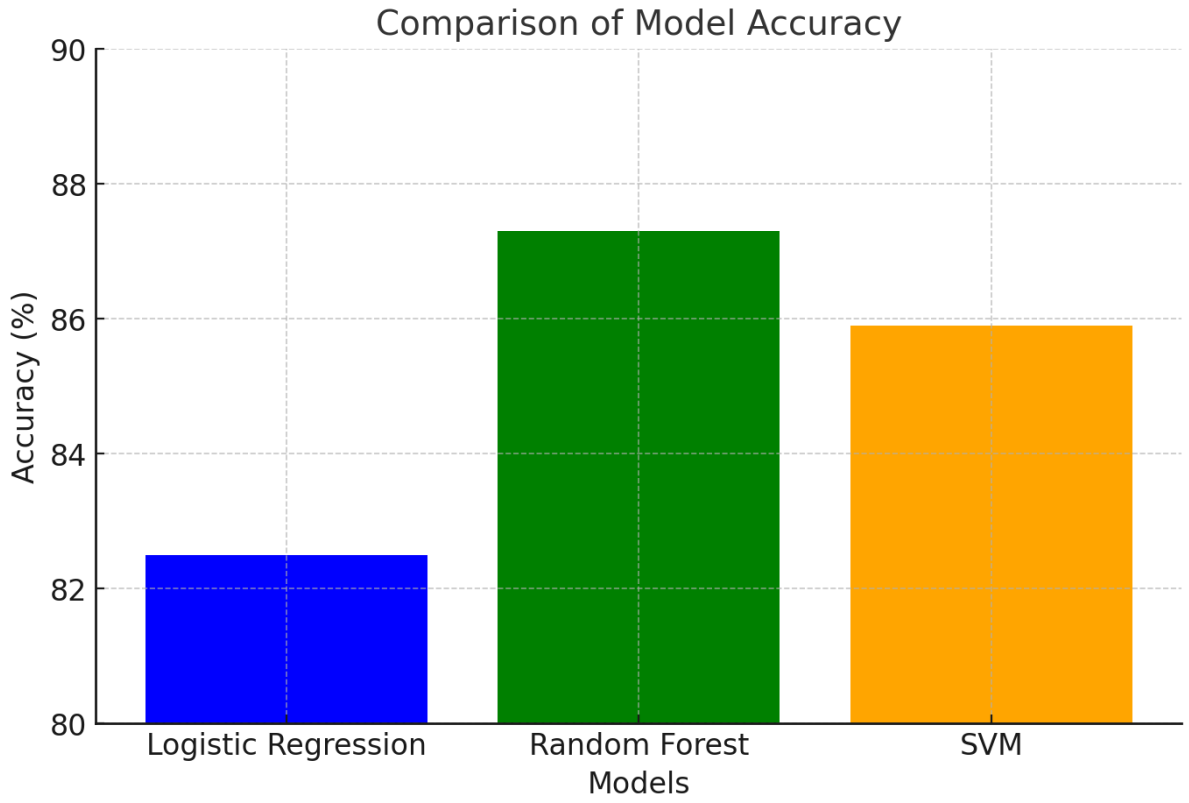

Chart 1: Accuracy comparison of different models: (In this chart, the bars of each model are sorted according to accuracy, which indicates the better performance of the random forest than the rest of the models.)

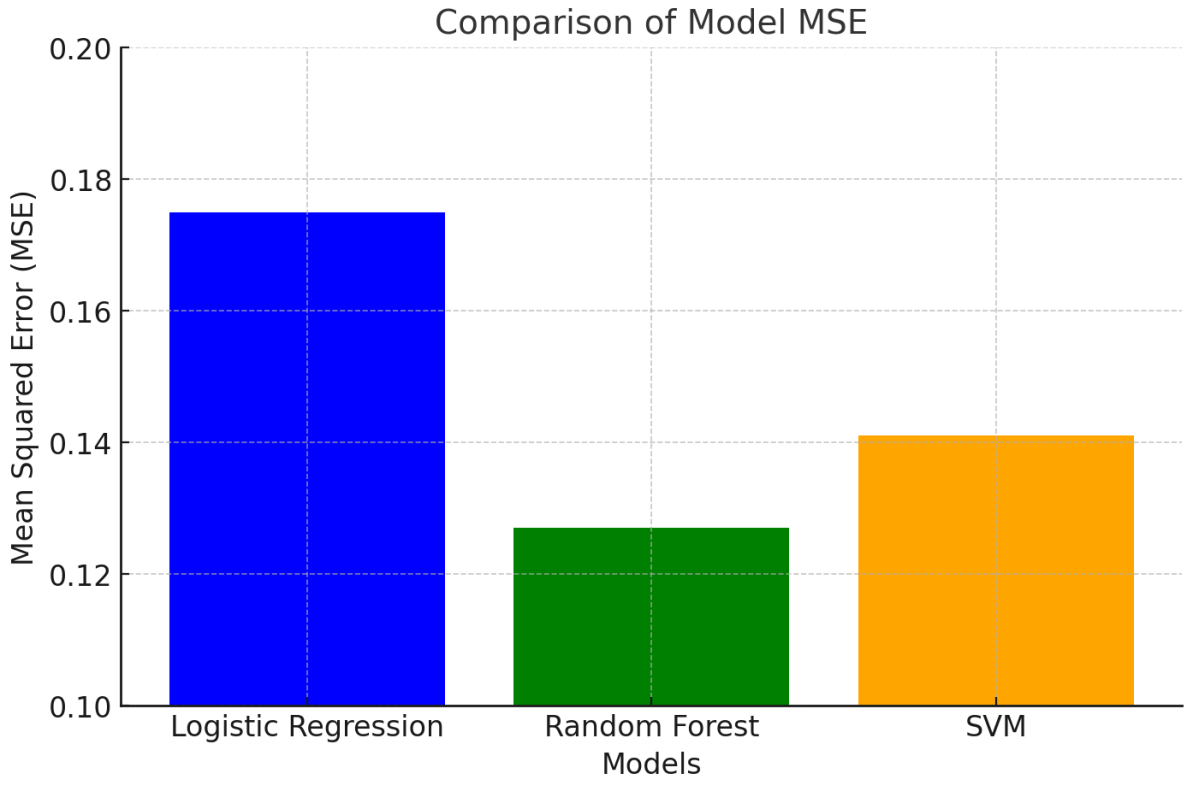

Chart 2: MSE comparison of models: (in this chart, it is clear that the random forest model has the least error and the logistic regression model has the most error).

Discussion

The analysis of the results of this research shows that the artificial intelligence models used in predicting consumer preferences in the Tehran market have shown different performances. Among the used models, Random Forest has the highest accuracy with a value of 87.3%, which indicates the high ability of this model to manage the complexities of consumer data. One of the main reasons for the better performance of random forest is the high power of this model in managing outlier data and also providing decisions based on several decision trees. This feature allows the model to extract more accurate patterns from the data and make better decisions about predicting consumer behaviour. In contrast, logistic regression, which is lower in complexity and known as a linear model, showed a lower accuracy (82.5%). Due to its linear nature, this model cannot fully consider the complexities in consumers' purchase preferences and predict non-linear behaviours well. However, the speed of execution and simplicity of this model make it still usable when the speed of analysis is important and the volume of data is smaller. The SVM model also performed well with an accuracy of 85.9%, but it still showed less efficiency compared to the random forest. SVM performs well, especially in situations where the data is multidimensional and requires complex boundaries to separate different categories. However in this research, due to more complexities related to consumer data and variable factors such as the impact of discounts or brand interest, the random forest was more successful due to its higher ability to manage these complexities.

The results of this research are consistent with previous studies in the field of artificial intelligence and predicting consumer behaviour, both domestically and internationally. For example, Prakash et al.'s (2023) study showed that the use of complex machine learning models can improve the accuracy of predicting consumer behaviour, especially when complex and multidimensional data are analyzed. These findings are completely compatible with the results of this research, which showed that the random forest model had higher accuracy than other models due to its high ability to identify complex and non-linear patterns. Also, Peng et al.'s (2020) study showed that neural networks and imprecise methods are more accurate in predicting consumer behaviour compared to linear and traditional methods. In the present study, the better performance of

imprecise models such as SVM and random forest compared to logistic regression confirms this result. In domestic studies, Alizadeh et al. (1402) and Mousavi and Sabili (1402) also pointed out the positive effect of artificial intelligence on consumer behaviour analysis. Their findings, similar to the results of this research, showed that more advanced artificial intelligence models such as random forest can predict consumer behaviour more accurately. While domestic research has mostly emphasized the use of artificial intelligence in improving marketing decisions, the results of this research specifically showed that sophisticated artificial intelligence models can be effective in local markets such as Tehran and help marketing companies behave more accurately. Anticipate consumers and optimize your strategies. However, the gap in domestic research is the lack of focus on data security and ethical issues that were raised in international research such as Prakash et al. (2023). One of the gaps in the research literature, especially in internal studies, is the lack of attention to the deep personalization of customer experiences and the use of more advanced data analysis techniques. While the study by Naim et al. (2020) internationally emphasized personalization and more accurate management of customer needs using artificial intelligence, the current research, is more focused on predicting general consumer behaviour and more complex personalization analyzes are not used. For future research, it is recommended that more studies be conducted on the personalization of customer experiences using advanced artificial intelligence models such as neural networks and deep data analysis so that more accurate results can be obtained and customer loyalty can be strengthened more efficiently.

Like any other research, this research also has limitations. The first limitation is related to the sample size. Although the sample of 400 Tehrani consumers was considered a relatively suitable sample, the use of a larger sample size can help to generalize the results. The obtained results are mostly based on the behaviour of consumers in Tehran and may not be generalizable to other cities or other geographical regions that have different cultural or economic characteristics. The data collection method was another limitation. The use of online questionnaires, although quick and relatively inexpensive, may not cover some demographic groups well due to the type of access people have to the Internet or their level of awareness of technology. For example, some older or less educated individuals may be less likely to use this method, which could bias the results. Also, another limitation that should be mentioned is the complexity of the models used. Although the random forest model performed best in this research, using more complex models such as deep neural networks or reinforcement learning can lead to more accurate results. However, these models require more computing resources as well as larger data, which was not available in this research.

Future research could consider several ameliorating approaches. The first suggestion is to expand the sample size. Using larger samples as well as investigating the behaviour of consumers in different regions of Iran can help to generalize the results better. In addition, examining the cultural and economic differences between different cities in Iran or even at the international level can lead to more accurate and comprehensive results.

In the field of artificial intelligence models, it is suggested to use more complex algorithms such as deep neural networks (Deep Learning) or models based on reinforcement learning (Reinforcement Learning) in future research. These models can help improve the accuracy of predictions, especially in the analysis of highly complex data such as consumer purchasing preferences that are influenced by many variables. The use of time series analysis can also help to better predict future consumer behaviour, especially in situations where consumer behaviour changes over time.

Finally, closer collaboration between marketing and data analytics teams can help improve the forecasting process. With access to more accurate data and more advanced analytics, marketers can design more optimal strategies to manage customers and increase their sales. For this purpose, it is recommended that in future research, in addition to the use of artificial intelligence models, deeper analyzes of the psychological and motivational behaviours of the consumer can be done to achieve a comprehensive analysis of the purchase behaviour.

Conclusion

In this research, by using three main artificial intelligence models (logistic regression, random forest and SVM), we were able to achieve very important and practical results in the field of predicting consumer preferences in the Tehran market. The main goal of this research was to identify and analyze the behaviour patterns of consumers using the collected data and to predict these behaviours as accurately as possible. Data obtained from 400 Tehrani consumers, including demographic characteristics such as age, gender, and income level, as well as purchase preferences, such as interest in certain brands and use of discounts, were entered into artificial intelligence models. Among the three artificial intelligence models, the random forest had the best performance and was able to provide the highest accuracy in predicting the purchasing behaviour of consumers

with an accuracy of 87.3% and the lowest prediction error (MSE equal to 0.127). This model, with the power of deep data analysis and the combination of several decision trees, was able to identify hidden patterns in the data and provide reliable results. Also, logistic regression and SVM models with 82.5% and 85.9% accuracies, respectively, were able to perform well in predicting consumer buying behaviour, although they had a weaker performance than random forest. The results of this study showed that factors such as age, income and preferences for Online/face-to-face shopping were one of the most important variables in predicting consumer purchasing behaviour and significantly influenced purchasing decisions. These findings indicate that artificial intelligence can act as a powerful and efficient tool in accurately predicting consumer behaviour and can predict consumers' future behaviours and preferences with high accuracy.

The results of this research are very important from a managerial and practical point of view, especially for local businesses in Tehran as well as international companies that seek to expand their activities in this market. Due to the large, diverse population and a wide dispersion of consumers, the Tehran market needs new and accurate methods to analyze buying behaviour and predict the needs of customers. The use of artificial intelligence in analyzing and predicting consumer behaviour allows businesses to segment the market and design more targeted marketing strategies. One of the most important managerial consequences of this research is the improvement of personalization of marketing strategies. The data obtained from this research show that Tehrani consumers are more inclined to buy online and use discounts. This information can help companies fine-tune their digital marketing campaigns and use AI tools to personalize offers. For example, using machine learning models, companies can send specific shopping offers to customers with more online shopping histories or consider special discounts for certain categories of customers. Another practical consequence of this research is the improvement in inventory management. By using forecasting models, companies can analyze the buying behaviour of consumers in different time frames and plan better for stocking and warehousing. In addition, artificial intelligence can be used to identify loyal customers and optimize customer loyalty programs, so that these programs are more accurately adjusted and help increase customer loyalty. For international companies active in the Tehran market, the results of this research can be very useful. Yes, because it shows that online shopping culture is growing in Tehran and using digital tools to attract local customers can be a successful strategy. Using the obtained results, these companies can enter the market and adjust their products and services according to the needs and preferences of Tehrani consumers based on the analysis of local consumer behaviour.

According to the results of this research, it is suggested that businesses, especially in local markets like Tehran, invest more in artificial intelligence models to analyze and predict consumer behaviour. A few key points that can help improve the use of artificial intelligence in marketing and predicting consumer behaviour are:

1. Personalization of marketing strategies: One of the most important capabilities of artificial intelligence is the possibility of personalizing offers and marketing messages based on the individual preferences of consumers. It is suggested that companies use artificial intelligence models to design customized marketing campaigns that are tailored to the specific needs of each customer.
2. Improving the prediction of purchasing behaviour in different periods: Using artificial intelligence prediction models, businesses can predict the purchasing behaviour of consumers in different periods and, accordingly, optimize advertising campaigns and stock supply.
3.Use of larger and more diverse data: This research is based on data collected from 400 Tehrani consumers. It is suggested that in future research, more data be collected from different areas of Tehran and other big cities of Iran to increase the accuracy of predictions and the results can be generalized to wider markets.
4. More focus on the individual behaviour of consumers: As the artificial intelligence models shown in this research, demographic factors such as age and income have a great impact on consumer buying behaviour. Therefore, it is suggested that companies consider the individual and specific behaviours of each customer using more accurate models and use them to improve marketing strategies.
.5Development of localized artificial intelligence tools: Considering that consumer preferences and behaviours may be different in different markets, developing localized artificial intelligence tools for the Tehran and Iran markets can help companies act more accurately and efficiently.

Finally, AI as a powerful tool in the marketing world can help businesses and companies to predict consumer behavior and optimize their strategies. This research is only one step in this direction and without a doubt, we will see more developments in this field in the future.

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