PREMIUM E-JOURNAL OF SOCIAL SCIENCES

2687-5640

Yıl / Year : 2022
Cilt / Volume : 6
Sayı / Issue : 18
ss / pp : 01-12

http://dx.doi.org//pejoss.2216
Araştırma Makalesi / Research Article
Makale Geliş / Received : 24.12.2021
Yayınlama / Published : 31.01.2022

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HİZMET PAZARLAMASI VE SATIN ALMA DAVRANIŞINA İLİŞKİN BİR DERİN ÖĞRENME ANALİZİ: BİR TÜKETİCİ DAVRANIŞ FORMU

Özet

Hizmetlerin, maddi olmayan, çabuk bozulan, iade veya depolama olanağı bulunmayan ve çoğunlukla heterojen yapıda olmaları gibi ürünlere kıyasla bazı benzersiz özellikleri vardır. Bazı hizmetler çevrimiçi hizmet kanalları kullanılarak mevcut ve sağlanabilirken, bazıları geleneksel kanalların kullanıldığı geleneksel biçimlerde devam eden popülaritesini korumaya devam etmektedir. Benzer şekilde, bazı tüketiciler çeşitli hizmet seçenekleri için günümüz hizmet kanallarını kullanmayı tercih ederken, bazıları da geleneksel hizmet kanallarında kalmayı tercih etmektedir. Bu bağlamda, hizmetlerle ilişkili tüketicilerin beklentilerini ve özelliklerini ve satın alma davranışının öncü göstergelerini anlamak liderlere, bilim camiasına ve genel olarak toplumun seçkin üyelerine ciddi içgörüler sağlayabilir. Bu nedenle, bu çalışmada ilgilenilen konuyla ilgili keşifsel ve doğrulayıcı bir anlayışa sahip olmak için derin öğrenme, denetimli ve denetimsiz makine öğrenimi metodolojilerinin kullanıldığı bir makine öğrenimi yaklaşımı uygulanmış, keşfedilen tahmine dayalı bilgilerle birlikte ilgili makine öğrenimi metodolojilerinin temel performans göstergeleri paylaşılmıştır.

Keywords: Pazarlama Hizmetleri, Satın Alma Davranışı, Tüketici Davranışı, Derin Öğrenme, Veri Madenciliği, Makine Öğrenmesi

A DEEP LEARNING ANALYSIS OF SERVICE MARKETING AND PURCHASE BEHAVIOR: A CONSUMER BEHAVIOR FORM

Abstract

Services has some unique set of characteristics compared to products such as being intangible, perishable, not availability of return or storage and being mostly heterateragenous in nature. While some services are available and may be provided using online service channels, some remains to preserve its continued popularity in traditional forms using conventational channels. Similary while some consumers prefer to use the contemporary service channels for various service options some prefer to remain in the conventional service channels. In this

context understanding expectaions and characteristics of consumers associated with services, leading indicators of purchasing behavior may provide severeal insights to leaders, scientific community and the distinguished members of the society at large. Therefore a machine learning approach driven with deep learning, supervised and unsupervised machine learning methodologies have been applied in order to have an exploratory and confirmatory understanding of the topic of interest. Key performance indicators of the respective machine learning methodologies with the predictive knowledge discovered presented.

Keywords: Services Marketing, Purchase Behavior, Consumer Behavior, Deep Learning, Data Mining,Machine Learning

1. INTRODUCTION AND LITERATURE REVIEW

"All goods and services should be designed in a way to make customer happy."

-Asst. Prof. Dr. Özerk Yavuz

"If you make the customer happy, it would return to you"

- Asst. Prof. Dr. Özerk Yavuz

"A good company offers excellent products and services. A great company also offers excellent products and services but also strives to make the world a better place."

- Philip Kotler

"To earn the respect (and eventually love) of your customers, you first have to respect those customers."

– Colleen Barrett

"Strive not to be a success, but rather to be of value."

- Albert Einstein

Services has some unique set of characteristics compared to products such as being intangible, perishable, not availability of return or storage and being mostly heterateragenous in nature. While some services are available and may be provided using online service channels, some remains to preserve its continued popularity in traditional forms using conventational channels. Similary while some consumers prefer to use the contemporary service channels for various service options some prefer to remain in the conventional service channels. In this context understanding expectaions and characteristics of consumers associated with services, leading indicators of purchasing behavior may provide severeal insights to leaders, scientific community and the distinguished members of the society at large. Therefore a machine learning approach driven with deep learning, supervised and unsupervised machine learning methodologies have been applied in order to have an exploratory and confirmatory understanding of the topic of interest. Key performance indicators of the respective machine learning methodologies with the predictive knowledge discovered presented. In managing and formulazing marketing strategies, plans and programs for online venues classical marketing approaches, functions with right positioning strategies composed of right marketing mix elements as product, price, place, promotion preserves its importance whereas new approaches and trends also found place in the marketing scientific body of knowledge terminology. Action to call, search engine optimization, use of internet of things or conventional data gathering techniques driven customer data

warehouses and big data for predictive knowledge are some of the trends and contemporary approaches that found in our lives (Kotler, 1991; Kotler, 2000)

As indicated by many notable schloars and studies in literature, one of the best marketing strategies remains to be understanding the customer, being customer centric and satisfying the customer which would lead to a long term profitable relationship, more sales revenues, more customer lifetime value, a good customer portfolio and a good market share both locally and globally. Thinking global, acting local strategies strengthened with multicultural awareness may provide several advantages and a competitive edge to the organizations in this context. In order to be successful in the market place an integrated marketing approach composed of services that have competitive edge with the right price should be provided to the customer using right sales channels strengthened with right communication strategies composed of public relations and advertisements in online or traditional spaces and venues. Also in order to serve to the respected market segments and build a positive image in the minds of the customer, right segmentation, targeting and positioning strategies should be applied.

In this context whole value chain composed of inbound logistics, output logistics and different functions of the organization should holistically be aligned with the aim of providing superior value to the customers with the products and services that have core competiencies and distinctive edge. In providing these goods and services qualified personnel should be attracted and acquired which would score in the market place with the talents that they have in developing cutting edge products and services. Planning, leading, organizing and controlling functions as noted by several scholars in literature should be employed in managing all reseources in the value chain in this customer centric journey. When services marketing literature is examined, it is seen that there are several attributes and highlights that consumers pay attention in their service choices in every phase of the consumer decision making process. Service quality assessments with a targeted customer relationship approach should be applied. Understanding consumer characteristics and expectations for each service segment may provide unique advantages to the businesses and organizations in this (Kotler, 1991; Kotler, 2000)

As seen in several behavioral forms, when purchasing behavior is analyzed and investigated, some antecedents and factors that have influence that behavior to occur is analyzed and tried to be understood by behavioral theorists and consumer behaviorists. As suggested in literature its believed that people engage in behaviors that are likely to produce good outcomes and rewards, whereas distract behaviors that may have negative consequences or risks. In this context several factors as subjective norms, group norms, past behavior, social identity, personality characteristics, positive word of mouth behavior, opinion leaders, reference groups, in group behavior, out group behavior factors, perceived easiness, perceived usefulness of technology acceptance model, attitude towards behavior, intention to that behavior, trust, outcome expectations and anticipated emotions may have influential factors in online purchasing behavior to occur with all other personality characteristics of the consumer and marketing mix elements. In this research some of these factors have been analyzed with the aim of providing exploratory and confirmatory understanding for such phenomena and understand some of the factors associated with such behavior to occur. In this context a scientific, quantitative research methodology applied composed of contemporary machine learning and data mining approaches in literature.

2. RESEARCH APPROACH

In this research a data mining research methodology composed of supervised and unsupervised methodologies involving deep learning techniques have been applied. Data mining is defined as a methodological approach in quantitative data analysis as indicated in literature. Data mining process is composed of some set of structured steps that makes the data mining research process and methodology. Initially understanding and analysis of the situation and business problem is completed

which is followed with the examination and pre-processing of data. Later a conceptual framework or model is devised following the literature review and analysis approaches. Testing of the model with supervised and unsupervised versions of machine learning approaches takes place. Finally predicted analysis results are evaluated and assessed (Kotler, 1991; Kotler, 2000).

Data mining has been one of the popular research forms that is heavily and frequently used in several sectors and industries as marketing, healthcare, politics, telecommunication, banking and retail. Data mining approach can be considered as a systematical, structured research process which focuses on situation analysis, data gathering, model formation and testing of the model. Later findings and knowledge discovered from these analyses can be used as a decision support point for leaders, science community and society at large. Machine learning technique which is a famous approach in data mining based quantitative research methodologies is a form of learning in machine forms. This learning process is usually triggered and activated by forward feeding approaches which is later followed with backpropogation processes which are stochastic in nature. With the help of mapping functions input layers in the model are mapped to the output layer considering the independent, dependent values. Functions and equations involved in this mapping are calculated. Later in many forms rules generated with the least error rate and which provides the most proximity to actual results are selected and presented as the distinctive association rules. In the evaluation of this a stochastic backpropagation technique is used in many cases. Supervised learning and unsupervised learning are two forms of machine learning in data mining. Supervised learning is a form of classification approach where input and output layer mappings are done with the transformation functions, with the aim of rule discovery and insights discovery. A stochastic backpropagation technique is used in this type of machine learninge in general. In the mapping process independent multivariate variables are assigned to the respective class labels which are considered as the dependent variables in the output layer. Since the initial labeling of the dependent values in the form of nominal values technique, this type of machine learning is named supervised machine learning. On the other hand in unsupervised machine learning several attributes of different instances are assigned to respective clusters with respective values without the requirement of an initial class label declaration. In this form of machine learning several mathematical and statistical functions utilizing heuristics in many cases are applied. In most of the clustering analysis which is also known as unsupervised machine learning centroid values for each independent cluster is calculated and related attribute values for several instances in the data set are assigned to the cluster with the focus on similarity and convergence maximization in one cluster and divergence, difference maximization with other cluster members having other centroid values. In deep learning which is a form of machine learning, feature extraction and classification is integrated in labeling the association rules. In contrast to traditional machine learning algorithms, in deep learning new associatons and features are formed and discovered based on early input values in the latent neurons which is followed with a classification approach in an integrated way. Following the feature extraction and classification steps association rules are assigned to the respective class labels in the model training later the model is tested as in the conventional machine learning approaches. Deep learning can be in the form of supervised, unsupervised or semi supervised fashion. Multilayer Perceptron, Bayesian Networks, Dl4jMlpClassifier (Deep Learning), OneR Method, Hoeffding Tree, Random, Tree, Kmeans have been some of the mostly cited supervised and unsupervised machine learning techniques which utilizes different classification and clustering approaches in literature . Machine learning utilization of data mining can provide exploratory and confirmatory understanding in the phenomena in question and may provide insights and in-depth understanding with knowledge discovery, prediction or forecasting option it provides. In this context a data mining approach strengthened with deep learning techniques have been employed to understand phenomena (Kotler, 1991; Kotler, 2000).

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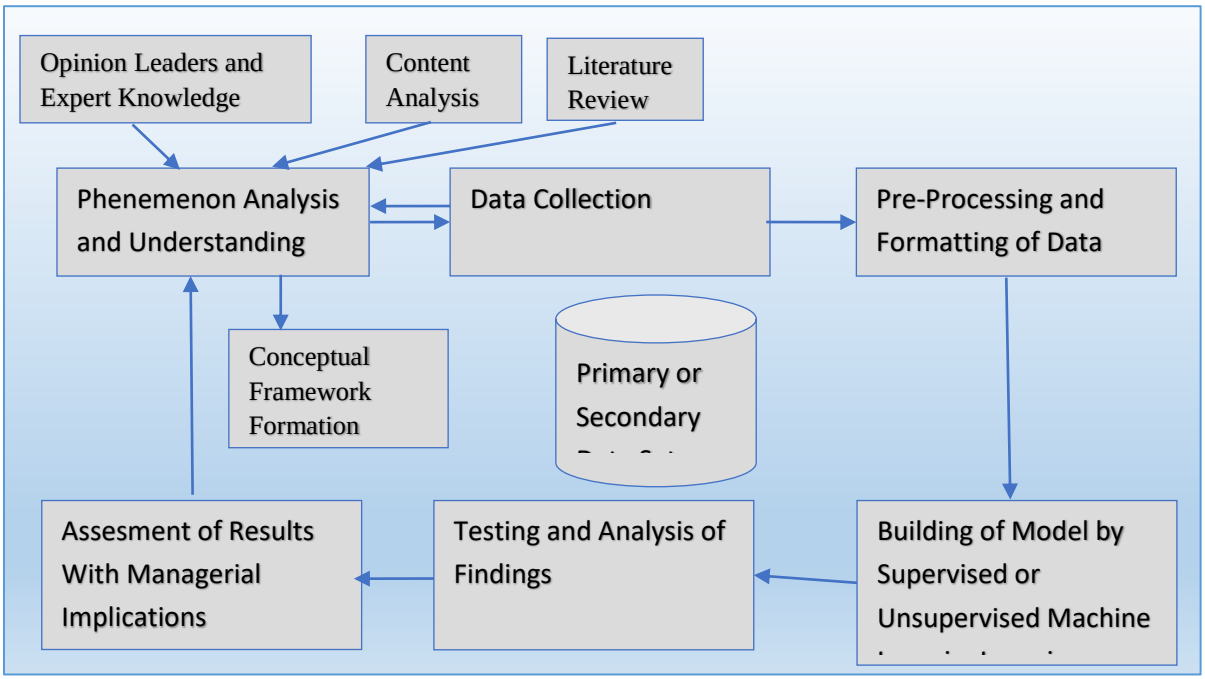
Figure 1. Data Mining Process (Prepared by the Researcher)



In the analysis part, Multilayer Perceptron, Bayesian Networks, Dl4jMlpClassifier (Deep Learning), OneR Method, Hoeffding Tree, Random, Tree, Kmeans were used for machine learning techniques. . The unsupervised machine learning algorithms here evaluate sample values and assign these individual values to sets of relevant segments, while the supervised machine learning algorithms mainly focus on mapping multivariate variables in the input layers to output class labels using transform and mapping functions which is followed by stochastic backpropagation techniques in many cases. In the analysis part the performances of various machine learning approaches are compared and rules with rule functions are built in a reinforced manner, some of them applying forward and backward propagation approaches, depending on their algorithmic architectures and designs (Özerk, 2009, Özerk, 2018, Özerk, 2021; Özerk, 2022). Depending on various factors, such as algorithmic design, algorithmic architecture, algorithmic complexity, these algorithms can produce different results for similar, same or different problem sets and domains (Kotler, 1991; Kotler, 2000). The performance indicators of the algorithms were evaluated and evaluated using the same parameter values with the same data set. With the analyzes performed, the algorithm with the top performer score was discovered with the same data set and parameters maintained. The information patterns and the rules found are listed following the interpretation phase of the research.

Figure 2. Supervised Machine Learning Process (Prepared by the Researcher)

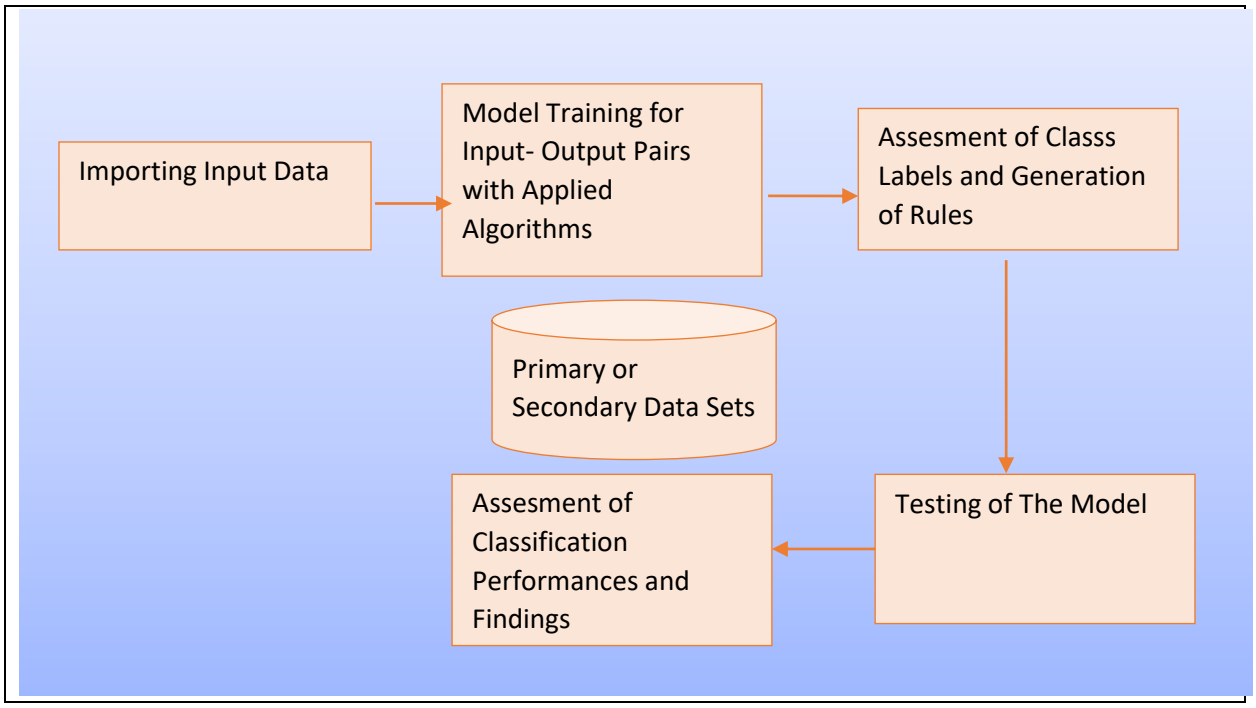
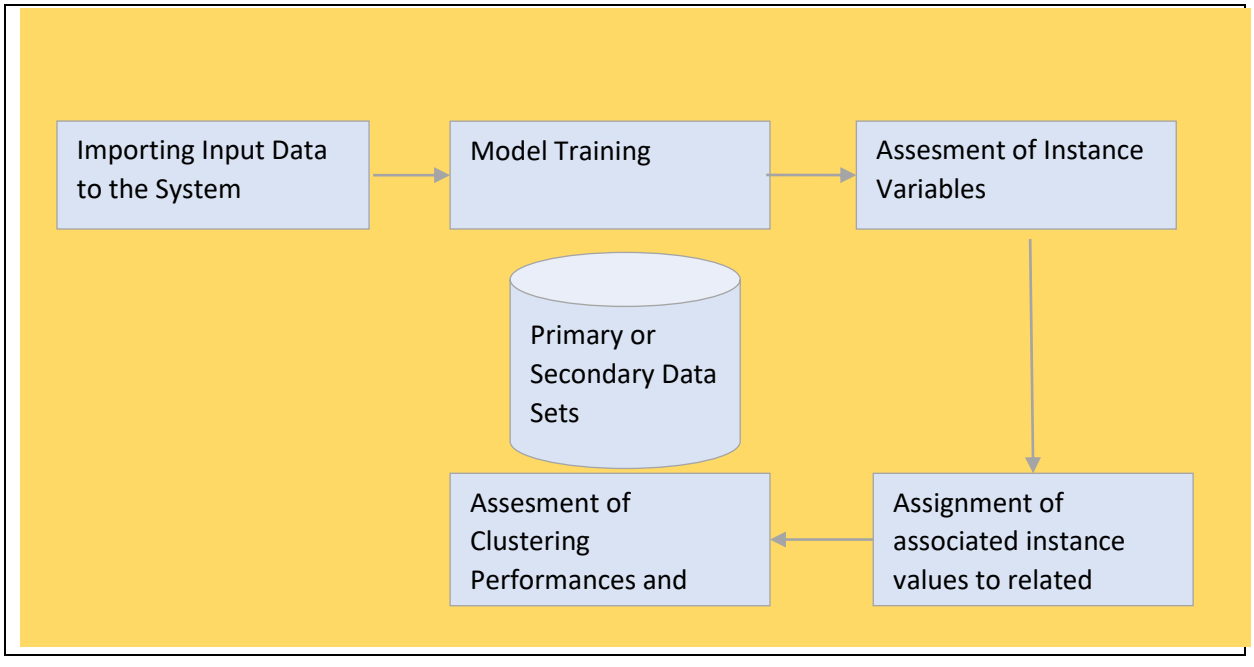


Figure 3. Unsupervised Machine Learning Process Composed of Model Building and Testing (Prepared by the Researcher)



For data set an online administred survey has been conducted using a snowball sampling process [9, 10, 11, 12, 13 ,14].

Table 1. List of Attributes

Service Price Sensitivity Indicator	Numeric
Service Feature Sensitivity Indicator	Numeric
Service Channel Sensitivity Indicator	Numeric
Service Related Advertisement Sensitivity Indicator	Numeric
Service Related Public Relations Sensitivity Indicator	Numeric
Service Related Celebrity Endorsement Sensitivity Indicator	Numeric
Service Related Sex Appeal Sensitivity Indicator	Numeric
Service Related Brand Value Sensitivity Indicator	Numeric
Online Purchase Behavior	Nominal
Conventional Purchase Behavior	Nominal
Age	Nominal
Gender	Nominal
Marital Status	Nominal

3. ANALYSIS RESULTS

It is known that data mining is one of the important research methodologies applied in todays contemporary world in order to gain insights and knowledge associated with several phenomena. As Özerk claims, many data mining processes today apply a technical approach in supervised learning where independent or multivariate indicators and variables are assigned to output class labels using functions of mapping. In unsupervised versions of data mining and machine learning, the core values of each cluster (centroids) are calculated, the corresponding sample and attribute values are assigned to the respective clusters so as to maximize convergence and minimize differences in the sam cluster, whereas a divergence is expected with the members of different clusters. In the process of supervised and unsupervised machine learning, rules are created to improve the exploratory and confirmatory understanding of the phenomenon (Özerk, 2009, Özerk, 2018, Özerk, 2021; Özerk, 2022). In this context, an Aristotelian research design path can bring several advantages in understanding these phenomena and can be a good decision support tool for key business leaders, political leaders and society in general.

In data mining analysis, association rules, knowledge and understandings are discovered with the help of classification and clustering algorithms for the relevant problem set and domain. In these approaches, input-output mapping functions are used to create association rules that map the outer layer to the inner layer. In some, feed forward and back propagation techniques have been applied. The relevant rules with the least error rate are presented as the main rules of the analysis (Özerk, 2009, Özerk, 2018, Özerk, 2021; Özerk, 2022).

The same input load with the same parameters was tested using machine learning algorithms, Multilayer Perceptron, Bayesian Networks, Dl4jMlpClassifier (Deep Learning), OneR Method, Hoeffding Tree, Random, Tree, Kmeans. The University of Waikato's Weka data mining package, which includes supervised and unsupervised machine learning applications, was used in the analysis. Then, the performance of classification and clustering was compared and evaluated. In the analysis, 10 fold cross validation method has been used to train and test the model. Based on the performance indicators associated with the data mining analysis, a high performance algorithm was chosen and can be used for such areas and sets of problems to gain additional insight and insight. For this purpose, values of mean squared error, precision, correct classification rate and misclassification rate were used (Özerk, 2009, Özerk, 2018, Özerk, 2021; Özerk, 2022). The analysis revealed the performance indicator values and rules as in Tables 2 and 3.

Table 2. Performance Scores of Machine Learning Algorithms

Method Applied / Performance Indicator	Dl4jMlpClassifier (Deep Learning)	Naive Bayes	J48	Random Tree	Multilayer Perceptron
RMSE	0.49	0.25	0.25	0.36	0.25
Correctly Classified %	60	93.33	93.33	86.66	93.33
Incorrectly Classified %	40	6.66	6.66	13.33	6,66

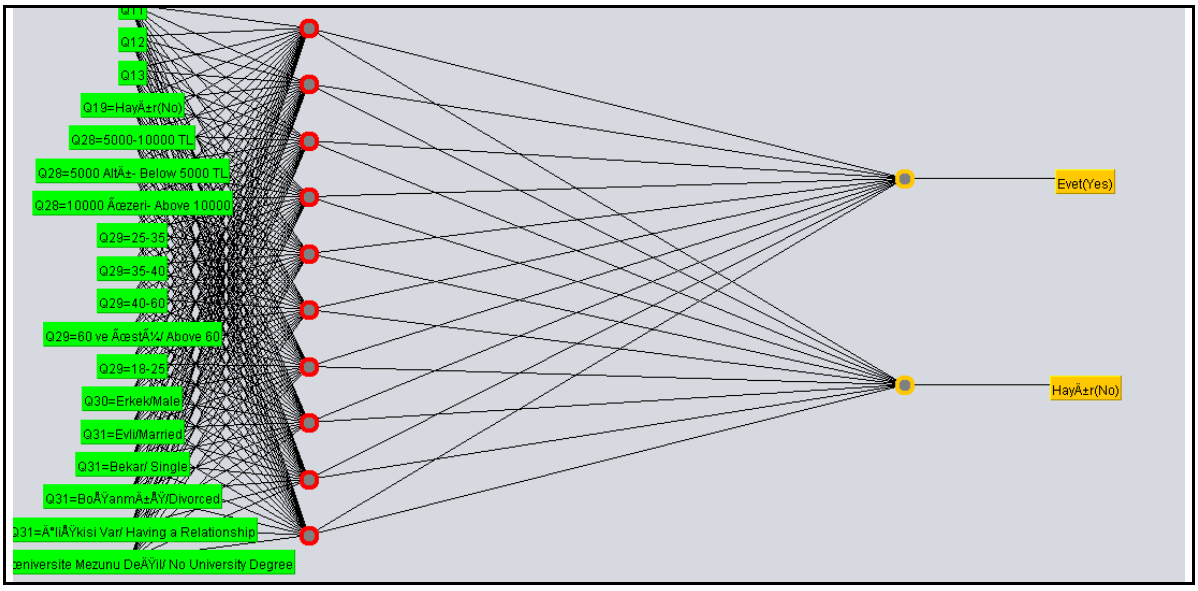
Table 3. Association Rules Generated by machine learning algorithms in data mining

If Having a good brand value of a service<2.5 and price sensitivity associated with a service<4 then online purchase behavior indicator is false, If If Having a good brand value of a service <2.5 and price sensitivity associated with a service >=4 then online purchase behavior indicator is true
If Service Related Public Relations Sensitivity Indicator is greater than or equal to 4.5 then the consumer uses online channels in service preference
If the consumer is price sensitive then it turns to online sales whereas if consumer is not price sensitive then he/she does not use online sales channels in service preference
Both university graduates and non-university graduates use online channels in services
All consumers for each of the marital statuses use traditional sales channels in services
All consumers for each of the marital statuses use online sales channels in services
Female and male consumers who uses online channels also use traditional channels whereas consumers regardless of gender who does not use online channels use traditional channels in service preference meaning online channels for service is not adapted for all consumer groups.
Low income groups favor celebrity endorsement more compared to higher income groups
Price counciouss consumers are in higher income groups whereas non-price counciouss consumers are in lower income groups
Lower income groups find sex appeal more favourably compared to higher income groups
Consumers with a marital status married favor more to celebrity endorsement

compared to their single counterpartners
Female consumers slightly favour more to celebrity endorsement compared to their male counterpartners
Male consumers slightly favour more to advartisements compared to their female counterpartners
Non-university graduates gives more importance to public relations compared to university graduates

The analysis results revealed that if having a good brand value of a service<2.5 and price sensitivity associated with a service<4 then online purchase behavior indicator is false, If If Having a good brand value of a service <2.5 and price sensitivity associated with a service >=4 then online purchase behavior indicator is true. If Service Related Public Relations Sensitivity Indicator is greater than or equal to 4.5 then the consumer uses online channels in service preference. If the consumer is price sensitive then it turns to online sales whereas if consumer is not price sensitive then he/she does not use online sales channels in service preference. Both university graduates and non-university graduates use online channels in services. All consumers for each of the marital statuses use traditional sales channels in services. All consumers for each of the marital statuses use online sales channels in services. Female and male consumers who uses online channels also use traditional channels whereas consumers regardless of gender who does not use online channels use traditional channels in service preference meaning online channels for service is not adapted for all consumer groups. Low income groups favor celebrity endorsement more compared to higher income groups. Price counciouss consumers are in higher income groups whereas non-price counciouss consumers are in lower income groups. Lower income groups find sex appeal more favourably compared to higher income groups. Consumers with a marital status married favor more to celebrity endorsement compared to their single counterpartners.Female consumers slightly favour more to celebrity endorsement compared to their male counterpartners. Male consumers slightly favour more to advartisements compared to their female counterpartners. Non-university graduates gives more importance to public relations compared to university graduates.

Figure 4. A Neural Network View of the Model Generated (Multi-Layer Perceptron- Purchase Behavior is the dependent variable)



Among several methods employed, Naive Bayes, J48 and Multilayer Perceptron methods have been the top performing algorithm with a RMSE, correct classification and incorrect classification rates among other supervised machine learning approaches applied. To sum up, supervised and

unsupervised machine learning algorithms, which are also known as classification and clustering techniques in data mining literature can be used as an effective and efficient tool for knowledge discovery or confirmation in exploratory and confirmatory research designs. These insights may be considered by decision makers and society at large in such problem sets and domains. Based on the input loads, algorithmic design, architecture and performance of the algorithm which can be assessed with approximations, metrics as Big O or Big Ω which are used to assess the efficiency and the computational complexity (Özerk, 2009, Özerk, 2018, Özerk, 2021; Özerk, 2022).

CONCLUSION

Services has some unique set of characteristics compared to products such as being intangible, perishable, not availability of return or storage and being mostly heterateragenous in nature. While some services are available and may be provided using online service channels, some remains to preserve its continued popularity in traditional forms using conventational channels. Similary while some consumers prefer to use the contemporary service channels for various service options some prefer to remain in the conventional service channels. In this context understanding expectaions and characteristics of consumers associated with services, leading indicators of purchasing behavior may provide severeal insights to leaders, scientific community and the distinguished members of the society at large. Therefore a machine learning approach driven with deep learning, supervised and unsupervised machine learning methodologies have been applied in order to have an exploratory and confirmatory understanding of the topic of interest. Key performance indicators of the respective machine learning methodologies with the predictive knowledge discovered presented.

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Biography of Author

Asst. Prof. Dr. Özerk Yavuz received his Ph.D. degree in Business Administration-Marketing from Bahcesehir University, Istanbul, M.Sc. degree in Computer Engineering from Bahcesehir University, Istanbul and his B.Sc. degree in Computer Technology and Information Systems from Bilkent University, Ankara. Several papers and articles of him have been published in respected and prestigious refereed, international scientific journals, books, book chapters, conference proceedings and presented in international conferences and congresses. Dr. Özerk Yavuz also has been referee, reviewer, moderator or editor of several notable, trusted international scientific journals and international, scientific, academic books. He is interested in management information systems, software engineering, computer engineering, data mining, virtual communities, virtual networks, marketing, management, and business administration. Dr. Özerk Yavuz has abroad and domestic working experiences in several institutions and countries, in various fields of business and higher education. He is interested in Salsa, Rumba, Cha-cha, East Coast Swing, Argentine Tango, American Tango, Vienna Waltz, Milonga and has been an active member of Bilkent University dance community. In his free time, he loves travelling, swimming and enjoying different kitchens. Dr. Özerk Yavuz has worked with several respected and distinguished scholars, leaders and teenagers in his work life. He has been a member of several distinguished scientific communities, Bilkent University and Bahçeşehir University alumni organizations. He is currently working in Halic University, Faculty of Management, Management Information Systems department as Asst. Prof. Dr. and continues his academic, administrative works.

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Google Scholar: https://scholar.google.com/citations?user=hR7QlJMAAAAJ&hl=en

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