

Understanding Cultural Values of Gen Z with Data Mining and Deep Learning *Veri Madenciliği Ve Derin Öğrenme İle Z Kuşağının Kültürel Değerlerini Anlamak*

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ÖZET

Anahtar Kelimeler:

Kültür

Kültürel Normlar

Z kuşağı

Kültürel özellikler

Derin Öğrenme

Veri madenciliği

Makine öğrenmesi

Kültür, bir toplumun ve bireyin temel yapı taşlarından biridir. Farklı paradigmalara, tercihlere, davranışlara sahip olmada ve çevremizdeki dünyayı algılama şeklimizde etkisi vardır. Toplumun farklı kesimlerinde, coğrafyalarda, ülkelerde, örgütsel ortamlarda farklı kültürler, algısal farklılıklar ve tercihlerle karşılaşabiliriz. Kültür ve normlar hem iş ortamlarında hem de sosyal yaşamda kuşaktan kuşağa zaman içinde değişim gösterebilmektedir. Bu çalışmadaki araştırma konusunda keşfedici anlayış ve doğrulayıcı anlayış sağlamak amacıyla derin öğrenme, makine öğrenmesi ve veri madenciliği teknikleri kullanılarak Z kuşağı için bazı kültürel değerler analiz edilmiştir.

Anahtar Kelimeler: Kültür, Kültürel Normlar, Z kuşağı, Kültürel özellikler, Derin Öğrenme, Veri madenciliği, Makine öğrenmesi

Keywords:

Culture

Cultural Norms

Generation Z

Cultural Traits

Deep Learning

Data Mining

Machine Learning

ABSTRACT

Culture is one of the the founding blocks of a society and individual. It has influence in having different paradigms, preferences, behaviors, the way we perceive the world around us. In different parts of the society, geographies, countries, organizational settings we may encounter with different cultures, perceptual differences and preferences. Culture, norms also change during time from generations to generations both in business settings and social life. In this study some of the cultural values for gen z has been analyzed by using deep learning, machine learning and data mining techniques with the aim of providing exploratory understanding and confirmatory understanding in the topic of interest.

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INTRODUCTION

Culture is one of the the founding blocks of a society and individual. It has influence in having different paradigms, preferences, behaviors, the way we perceive the world around us. In different parts of the society, geographies, countries, organizational settings we may encounter with different cultures, perceptual differences and preferences. Culture, norms also change during time from generations to generations both in business settings and social life. In this study some of the cultural values for gen z has been analyzed by using deep learning, machine learning and data mining techniques with the aim of providing exploratory understanding and confirmatory understanding in the topic of interest [1,2,4,5,16].

As Hofstede indicates culture is the collective programming of the mind that distinguishes the members of one group or category of people from other. Power distance, uncertainty avoidance, individualism vs collectivism, masculinity vs femininity, long term versus short term orientation, indulgence versus restraint are some of the

mostly cited cultural dimensions cited in literature by notable scholars. Among these conceptualizations coined over time differences and similarities among several cultures can be assessed and compared. Similarly there are other forms of conceptualizations and classifications that are being used to approach the cultural phenomena in different settings.

As indicated in Hofstede's notable study power distance refers to the distance between manager and manage, in small power distanced societies a holistic view, where all stakeholders are treated equally are applied whereas in large power distanced settings there is a shift from more democratic approaches to autocracy where power is strongly between different levels of hierarchies. Society's tolerance for ambiguity refers to the uncertainty avoidance. In weak uncertainty avoidance values, changes and uncertainties are favored whereas in strong uncertainty avoidance driven cultures intolerance to individualistic and situational differences occur. Individualism comes from the root being individual and single whereas collectivism refers to the level of integration with the society and groups. Masculinity refers to the value distribution and differences among genders. Long term vs. short term orientation refers to the is the level of differences among future or past orientedness. In short term orientation past is given more importance whereas in long term orientation future is given the most importance. Indulgence and restraint refers to the approach paradigms in gratification of desires. In Indulgence cultural setting gratification of natural human desires whereas in restraint cultures gratification of needs are mainly controlled by strict social norms [1,2,4,5,16].

As in Hofstede's cultural dimensions, predisposition to social media, attitude towards meeting people in social media, attitude towards having a relationship with a partner in premarital period, having sexual relationship before marriage, approach to virginity of woman and man, approach to marriage, sexual and romantic relationships among peers are considered to be cultural. In some cultures and geographies, while some forms of cultural values, norms, traditions occur in some others some other cultural traits seem more dominant. In assessing the culture of the society, it should not be forgotten that all cultures are important and valuable whereas it is normal to face several cultural differences and similarities in different social and organizational settings. Mutual understanding, mutual respect and empathy in this context remains to be some of the key drivers of sustaining peace and preventing conflicts that may be occurred based on different cultural norms and values. In order to enhance synergy within a society in different organizational settings, preventing such conflicts that may occur from cultural norms with differences and achieve the success in working multicultural settings, cultural awareness trainings may be helpful in facilitating these efforts. Also stereotype and prejudgemental efforts should be replaced with more objectivist and empathic paradigms [1,2,4,5,16].

As indicated by Drucker, culture eats strategy at breakfast. Therefore in conducting global business operations, having glocal approaches which means thinking global and acting local would give advantages to the organizations in the marketplace in building long term customer relationships which would increase market share and presence, maximize their customer portfolio and boost sales revenues which make significant impact on the organic growth of the businesses and providing more headcounts for the society. Therefore in rolling out processes inside the organization, in change management activities, managing a country or organization, in assessing the rate of adaptation in innovations as several technologies or ideas, having the bond with the customer all cultural dimensions and conceptualizations in literature should be considered for building the right strategy [1,2,4,5,16].

Similarly Gen Z, as all other generations, an important customer segment, a job market candidate for current and future positions and the current or prospective electors which would have a saying in the management of the countries should be understood well in order to satisfy their expectations and needs in the market place, political arena and in different societal settings. Similarly understanding all generations regardless of gender type would make similar impact in these areas. Therefore cultural studies of this type should be facilitated in order to enhance understanding and insights which may be used by leaders and society at large to meet the expectations of different cultures and several cultural norm holders in a society for a more sustainable and peaceful world [1,2,4,5,16].

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 [9, 10, 11].

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 backpropagation 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 learning 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 associations 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, D14jMlpClassifier (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 [9, 10, 11].

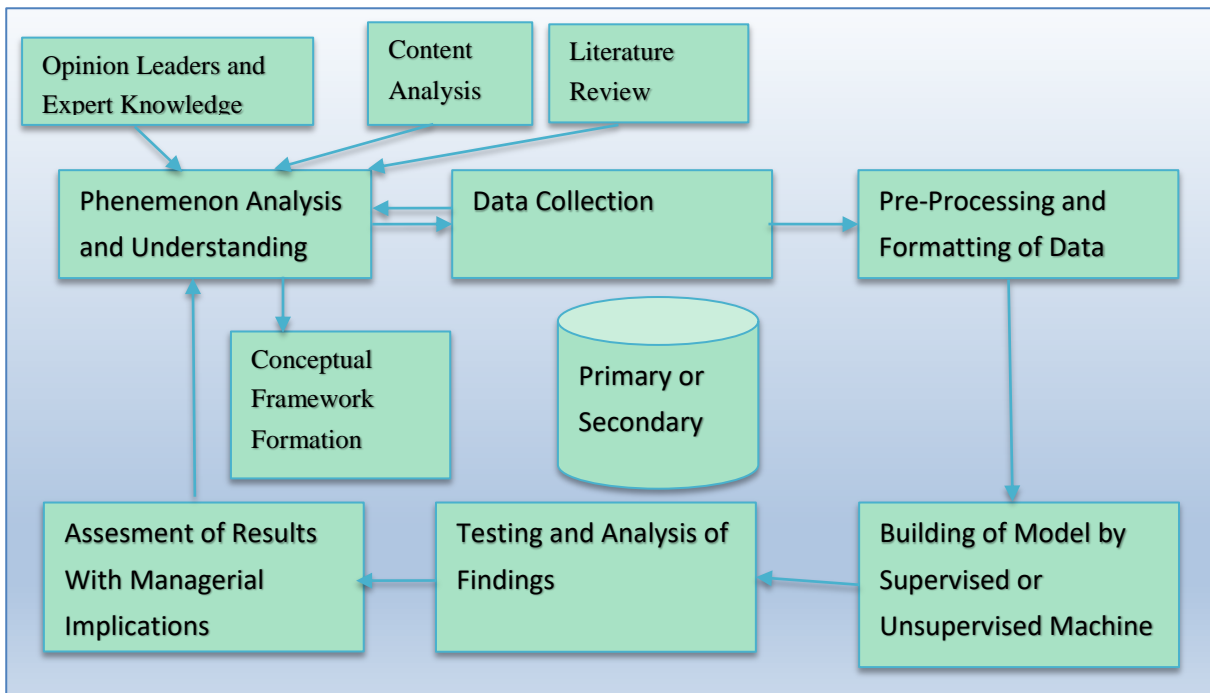


Figure 1. Data Mining Process (Prepared by the Researcher)

In the analysis part, Multilayer Perceptron, Bayesian Networks, D14jMlpClassifier (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 [9, 10, 11, 12, 13, 14]. 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 [9, 10, 11, 12, 13, 14]. 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.

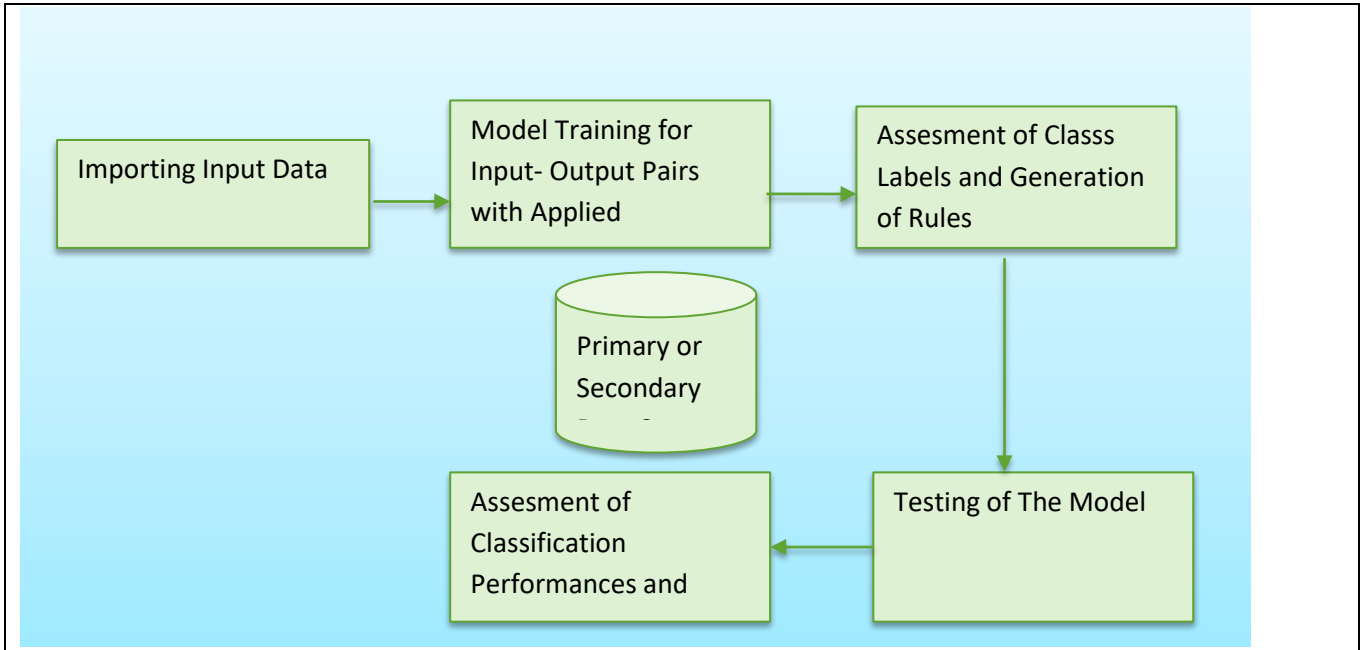


Figure 2. Supervised Machine Learning Process (Prepared by the Researcher)

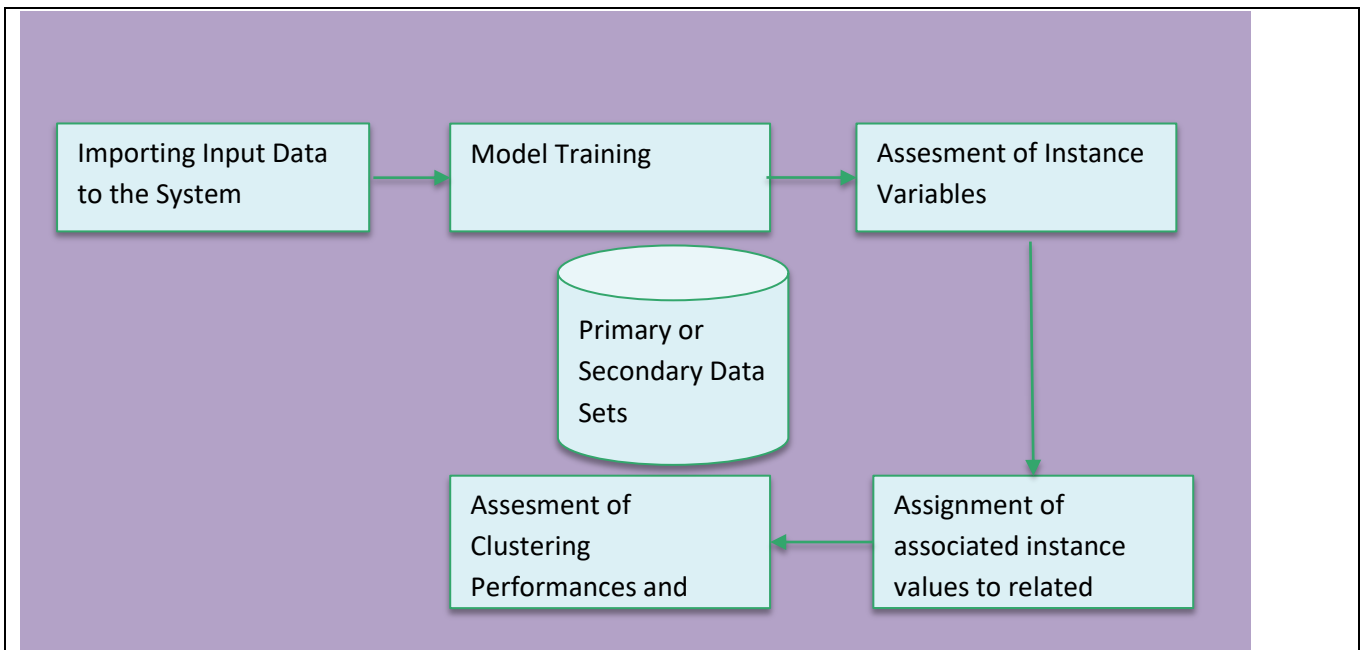


Figure 3. Unsupervised Machine Learning Process Composed of Model Building and Testing (Prepared by the Researcher)

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

Social Media Usage Status Indicator	Nominal
Meeting Strangers in Social Media Status Indicator	Numeric
Approach to Relationship Before Premarital Status Indicator	Nominal
Approach to Having Sexual Relationship Before Marriage Status	Nominal
Predisposition Towards Virginitiy	Nominal
Virginitiy Status Indicator	Nominal
Income Status	Nominal
Age	Nominal
Gender	Nominal
Marital Status	Nominal
Sexual Orientation	Nominal
Smoking Status	Nominal
Drinking Alcohol Status	Nominal
Political View Status	Nominal

ANALYSIS RESULTS

It is known that data mining is one of the important research methodologies applied in today's 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 same 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 [9, 10, 11, 12, 13, 14]. 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 [9, 10, 11, 12, 13, 14].

The same input load with the same parameters was tested using machine learning algorithms, Multilayer Perceptron, Bayesian Networks, D14jMlpClassifier (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 [9, 10, 11, 12, 13, 14]. 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	0.28	0.30	0,31	0.16
Correctly Classified %	40	80	80	80	100
Incorrectly Classified %	60	20	20	20	0

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

Based on the cluster analysis, income of gender Z is either below 5000 or in the range of 5000-10000
All income groups of the Z-Gen is single
If virginity status is "I want to preserve my virginity until I am married" then Female. If virginity status is "I am virgin" then Female. "If virginity status is I lost my virginity" then Male
In the cluster analysis I lost my virginity is associated with both male segments and female segments.
All income groups are open to a relationship with a partner during the premarital period.
If "I am open to a relationship with a partner during the premarital period" is false then female whereas if "I am open to a relationship with a partner during the premarital period" is true then male
If "virginity is an important factor for the initiation and maintenance of a marriage then lower income group if "virginity is an important factor for the initiation and maintenance of a marriage" is true it is higher income group
If "I am positive about having a sexual relationship before marriage." Is false then male if "I am positive about having a sexual relationship before marriage." Is true then female
If heterosexual then male, if bisexual then female.
In the cluster analysis heterosexual segments occur in all gender types
Both heterosexuals and bisexuals are in the income segment 5000 and below
For all income groups individual is single
If single then female, if having a relationship male
Both females and males are social media users
If female alcohol drinking status is true, if male alcohol drinking status is true
If female smoking status is true, if male smoking status is false
If smoking status is no then "I am positive with meeting people I do not know on social media" score is low if smoking status is yes then "I am positive with meeting people I do not know on social media" score is high
If "I am open to a relationship with a partner during the premarital period." Is false then Alcohol drinking status is no, If "I am open to a relationship with a partner during the premarital period." Is true then Alcohol drinking status is true,
If alcohol drinking status is false then "I am positive about having a sexual relationship before marriage" is false, if If alcohol drinking status is true then "I am positive about having a sexual relationship before marriage" is true
For all political views income is below 5000 TL
If conservative then Muslim, If democrat with an income lower than 5000 TL and heterosexual than other, if democrat with an income lower than 5000 TL and bisexual then Muslim, If income is between 5000 and 10000 then other, if income is greater than 10000 then muslim, if liberal and income is below 5000 Muslim
If Muslim with an income below 5000 and heterosexual than conservative, if muslim with an income below 5000 and bisexual then democrat, if income is between 5000-10000 then conservative, if income is above 10000 and heterosexual than democrat, if income is above 10000 and bisexual than democrat, if atheist then liberal, if other then democrat, if Christian then liberal.
Higher income groups are associated with nationalistic political view whereas lower levels of income groups are democrat or liberal

The analysis results revealed that Based on the cluster analysis, income of gender Z is either below 5000 or in the range of 5000-10000. All income groups of the Z-Gen is single. If virginity status is "I want to preserve my virginity until I am married" then Female. If virginity status is "I am virgin" then Female. "If virginity status is I lost my virginity" then Male. In the cluster analysis I lost my virginity is associated with both male segments

and female segments. All income groups are open to a relationship with a partner during the premarital period. If “I am open to a relationship with a partner during the premarital period” is false then female whereas if “I am open to a relationship with a partner during the premarital period” is true then male. If “virginity is an important factor for the initiation and maintenance of a marriage then lower income group if “virginity is an important factor for the initiation and maintenance of a marriage” is true it is higher income group. If ”I am positive about having a sexual relationship before marriage.” is false then male if “I am positive about having a sexual relationship before marriage.” is true then female. If heterosexual then male, if bisexual then female. In the cluster analysis heterosexual segments occur in all gender types. Both heterosexuals and bisexuals are in the income segment 5000 and below. For all income groups individual is single. If single then female, if having a relationship male. Both females and males are social media users. If female alcohol drinking status is true, if male alcohol drinking status is true. If female smoking status is true, if male smoking status is false. If smoking status is no then “I am positive with meeting people I do not know on social media” score is low if smoking status is yes then “I am positive with meeting people I do not know on social media” score is high. If “I am open to a relationship with a partner during the premarital period.” Is false then Alcohol drinking status is no, If “I am open to a relationship with a partner during the premarital period.” Is true then Alcohol drinking status is true, If alcohol drinking status is false then “I am positive about having a sexual relationship before marriage” is false, if If alcohol drinking status is true then “I am positive about having a sexual relationship before marriage” is true. If conservative then Muslim, If democrat with an income lower than 5000 TL and heterosexual than other, if democrat with an income lower than 5000 TL and bisexual then Muslim, If income is between 5000 and 10000 then other, if income is greater than 10000 then muslim, if liberal and income is below 5000 Muslim. If Muslim with an income below 5000 and heterosexual than conservative, if muslim with an income below 5000 and bisexual then democrat, if income is between 5000-10000 then conservative, if income is above 10000 and heterosexual than democrat, if income is above 10000 and bisexual than democrat, if atheist then liberal, if other then democrat, if Christian then liberal. Higher income groups are associated with nationalistic political view whereas lower levels of income groups are democrat or liberal.

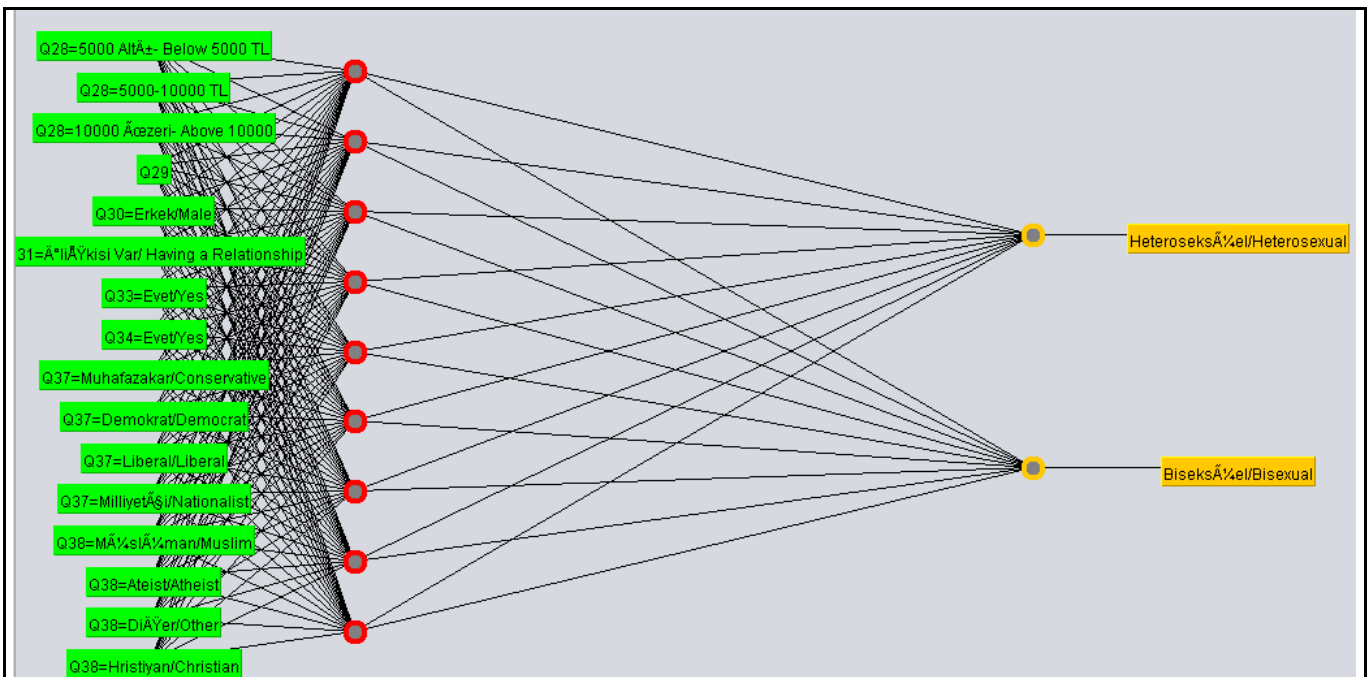


Figure 4. A Neural Network View of the Model Generated (Multi-Layer Perceptron- Sexual Orientation is the dependent variable)

Among several methods applied Multilayer Perceptron technique has been the top performing algorithm with its 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 [9, 10, 11, 12, 13 ,14].

CONCLUSION

Culture is one of the the founding blocks of a society and individual. It has influence in having different paradigms, preferences, behaviors, the way we perceive the world around us. In different parts of the society, geographies, countries, organizational settings we may encounter with different cultures, perceptual differences and preferences. Culture, norms also change during time from generations to generations both in business settings and social life. In this study some of the cultural values for gen z has been analyzed by using deep learning, machine learning and data mining techniques with the aim of providing exploratory understanding and confirmatory understanding in the topic of interest [1,2,4,5,16].

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Among several methods applied Multilayer Perceptron technique has been the top performing algorithm with its 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.

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 Nişantaşı University, Faculty of Economics, Administrative and Social Sciences, 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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