

# DIVORCE PREDICTION USING CORRELATION BASED FEATURE SELECTION AND ARTIFICIAL NEURAL NETWORKS\*

*Araştırma Makalesi / Research Article*

Yöntem, M. K., Adem, K., İlhan, T. ve Kılıçarslan, S. (2019). Divorce Prediction Using Correlation Based Feature Selection and Artificial Neural Networks. *Nevşehir Hacı Bektaş Veli Üniversitesi SBE Dergisi*, 9(1), 259-273.

Geliş Tarihi: 04.04.2019  
Kabul Tarihi: 13.06.2019  
E-ISSN: 2149-3871

Dr. Öğr. Üyesi Mustafa Kemal YÖNTEM

Nevşehir Hacı Bektaş Veli Üniversitesi, Eğitim Fakültesi, Eğitim Bilimleri Bölümü

[muskemtem@hotmail.com](mailto:muskemtem@hotmail.com)

ORCID No: 0000-0001-7620-0971

Dr. Öğr. Üyesi Kemal ADEM

Aksaray Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Yönetim Bilişim Sistemleri Bölümü

[kemaladem@gmail.com](mailto:kemaladem@gmail.com)

ORCID No: 0000-0002-3752-7354

Prof. Dr. Tahsin İLHAN

Tokat Gaziosmanpaşa Üniversitesi, Eğitim Fakültesi, Eğitim Bilimleri Bölümü

[tahsinilhan73@gmail.com](mailto:tahsinilhan73@gmail.com)

ORCID No: 0000-0002-5007-5022

Öğr. Gör. Serhat KILIÇARSLAN

Tokat Gaziosmanpaşa Üniversitesi, Rektörlük, Enformatik Bölümü

[serhatkic@gmail.com](mailto:serhatkic@gmail.com)

ORCID No: 0000-0001-9483-4425

---

\* Bu eserin bir bölümü International Congress on Politic, Economic and Social Studies 2018'de sözlü bildiri olarak sunulmuştur.

## ABSTRACT

Within the scope of this research, the divorce prediction was carried out by using the Divorce Predictors Scale (DPS) on the basis of Gottman couples therapy. Of the participants, 84 (49%) were divorced and 86 (51%) were married couples. Participants completed the “Personal Information Form” and “Divorce Predictors Scale”. In this study, the success of DPS, was investigated using Multilayer Perceptron Neural Network and C4.5 Decision tree algorithms. In addition, the study also aims to find the most significant features/items in the Divorce Predictors Scale that affect the divorce. The most effective 6 features and their values of significance obtained by applying the correlation-based feature selection method on the divorce data set. When we look at these features, they are related to creating a common meaning and failed attempts to repair, love map and negative conflict behaviors. When the direct classification methods were applied to the divorce data set, the highest success rate was 98.23% obtained with the RBF neural network. After selecting the most effective 6 features using the correlation-based feature selection method on the same data set, the highest accuracy rate obtained was 98.82% with ANN. According to the results, DPS can predict divorce. Family counselors and family therapists can use this scale for contribute to the preparation of case formulation and intervention plan. Also it can be said that the divorce predictors in the Gottman couples therapy were confirmed in the Turkish sampling.

**Keywords:** Data Mining, Artificial Neural Networks, Divorce, Divorce Prediction.

## YAPAY SİNİR AĞLARI VE KORELASYON TABANLI ÖZNİTELİK SEÇME YÖNTEMİ İLE BOŞANMA TAHMİNLEMESİ

### ÖZ

Bu araştırma kapsamında, Gottman çift terapisini temel alan Boşanma Göstergeleri Ölçeği kullanılarak boşanma tahminlemesi yapılmıştır. Katılımcıların 84’ü (%49) boşanmış, 86’sı da (%51) halen evli olan bireylerden oluşmaktadır. Katılımcılara belirtilen ölçek uygulanarak çalışmada kullanılan veri kümesi oluşturulmuştur. Bu çalışmada ölçeğin başarısı Yapay Sinir Ağı, RBF Sinir Ağı ve Karar Ağacı algoritmaları kullanılarak incelenmiştir. Çalışma aynı zamanda Boşanma Göstergeleri Ölçeği’nde boşanmayı etkileyen en önemli özellikleri /maddeleri bulmayı da amaçlamaktadır. Boşanma veri kümesine korelasyon tabanlı özellik seçme yöntemi uygulanarak en etkili 6 özellik ve bu özelliklerin önem değerleri elde edilmiştir. Boşanma veri kümesine doğrudan sınıflandırma yöntemleri uygulandığında en yüksek başarı RBF sinir ağı ile %98.23 olarak elde edilmiştir. Aynı veri kümesine korelasyon tabanlı özellik seçme yöntemi uygulanarak elde edilen 6 özelliğe sınıflandırma yöntemleri uygulandığında ise en yüksek başarı oranı Yapay Sinir Ağı ile %98.82 olarak hesaplanmıştır. Sonuçlara göre, Boşanma Göstergeleri Ölçeği boşanmayı tahmin edebilir. Aile danışmanları ve terapistleri bu

ölçeği vaka formülasyonu ve müdahale planının hazırlanmasına katkıda bulunmak için kullanabilirler. Ayrıca, Gottman çiftleri terapisindeki boşanma göstergelerinin Türk örneklemede doğrulandığı söylenebilir.

**Anahtar Kelimeler:** Veri Madenciliği, Yapay Sinir Ağları, Boşanma, Boşanma Tahminleme.

## 1. INTRODUCTION

When we look at the divorce data of 33 member countries of the Organization for Economic Co-operation and Development (OECD), it is seen that Turkey is among the 12 countries with increasing divorce rate. This puts forth the necessity of developing scientific-based policies and practices on the causes and prevention of divorce. Within the scope of this research, the divorce prediction was carried out by using the Divorce Predictors Scale (DPS) developed by Yöntem and İlhan (2017, 2018) on the basis of Gottman couples therapy (Gottman, 2014; Gottman and Gottman, 2012). The reason for this is that Gottman couples therapy is a model that explains the causes of divorce based on empirical research. The criteria defined in the sound relationship house theory, within this model, are important divorce predictors. The most important divorce predictors in the model are the four horsemen of the apocalypse. Gottman describes them as Criticism, Contempt, Stonewalling and Defensiveness (Gottman, 2014; Gottman and Gottman, 2012)

In his longitudinal study conducted with newly married couples, Gottman (2014) has estimated that the couples would divorce in the future with an 85% success rate by using these four variables alone. Similarly, in their 14 years of study, Further, Gottman and Levenson have found that this quadruple structure predicts divorces by 95% success rate. According to Gottman, another predictor of divorce is the failure of repair attempts (Gottman, 1999; Gottman and Silver, 2015). When the failed repair attempts are combined with the "four horsemen", the divorce at the end of five years is estimated by a 97.5% success rate (Gottman, 1999). In addition, how the issue is first opened for discussion is also important in terms of addressing the conflict issues by couples. It has been observed that the data required for the prediction of divorce or continued marriage can be obtained only in a few minutes for 96% of the couples (Gottman, 1999). According to this, the behaviors and reactions of couples in just a few minutes following an argument give an idea about divorce. Thus, harsh start up in an argument is one of the most obvious predictors that a debate or marriage will not go well (Gottman and Silver, 2014). In addition, Gottman and Silver (2015) stated that the decisive factor in satisfaction of couples with sexuality, love and passion in their marriages depends on the quality of friendship between husband and wife by 70%. And, this friendship is expressed as a love map

(Barnacle and Abbott, 2009; Gottman, 1999; Gottman and Silver, 2015).

As can be seen, Gottman couples therapy provides important findings in the prediction of divorce. In this study, the predictive power of Gottman divorce predictors in estimating divorce in Turkish sample was investigated. Although there are numerous different estimation methods and analysis in statistics, the method known as data mining is used to reveal previously unknown and potentially useful information. Although there are no studies on the prediction of divorce by data mining methods, it is seen that numerous data mining methods such as classification, estimation and clustering are used in many studies in the field of psychology and psychiatry (Baba-Garcia, et al., 2006; Song, 2010; Qinghua, 2016).

Using data mining methods, Baca-Garcia et al. (2006) have estimated the hospitalization decisions of psychiatrists in 509 suicide attempters evaluated in the emergency department. According to the findings of the study, patients have been correctly classified by a 99% success rate using the Forward Selection method. In his study, which investigated the psychological evaluation data of college students, Song (2010) has used kNN, Bayes and SVM data mining methods. The best result obtained for the binary classification model was achieved by using SVM with a success rate of 79.1%. Nguyen X et al. (2010) have used data mining methods to evaluate the results of insomnia symptoms in the treatment of long-term sleep apnea syndrome. In their study, they have demonstrated using decision trees the negative responses to treatment have not been associated with long-term adjustment studies. Qinghua (2016) has applied data mining technology based on the back-propagated artificial neural network to enhance the operational efficiency of the students in psychological data management system. The study has intended to prevent psychological crises in particular. In their study, Erikson, Werge, Jensen and Brunak (2014) have used techniques for temporal data mining to determine adverse drug reactions. The developed method is able to complement existing drug safety monitoring methods in the future, and make it possible to detect adverse drug reactions by reducing the risk of manual reporting. Rosenthal, Dalton and Gervy (2007) have used data mining methods to investigate the factors affecting occupational outcomes in the occupational rehabilitation process of individuals with psychiatric disabilities who received occupational rehabilitation services. With the help of the CHAID algorithm used, it has been shown that there is a positive effect on occupational outcomes for people receiving job placement services. Bae, Lee, Park, Hyun and Yoon (2010) have used decision tree algorithms, among the data mining methods, to investigate the variables that have a significant effect on patients with schizophrenia in terms of good social functionality. As a result, they have shown that three variables of the best social functionality, which are the

good continuous attention, good theory of mind, and the sense of disgust, have lower sensitivity. As can be seen, although data mining is used in the fields of psychology and psychiatry, it can be said that it is not used sufficiently in the estimation of a phenomenon with long-term negative effects, such as divorce. However, if divorce predictors of married couples can be estimated early, many divorces can be prevented. In this study, the success of Divorce Predictors Scale was investigated using Multilayer Perceptron Neural Network and C4.5 Decision tree algorithms. In addition, the study also aims to find the most significant features/items in the Divorce Predictors Scale that affect the divorce.

## **2. METHOD**

### **2.1 Study Group**

Of the participants, 84 (49%) were divorced and 86 (51%) were married couples. There were 84 males (49%) and 86 females (51%) in the study group. The ages of the participants ranged from 20 to 63 ( $\bar{X}$  = 36.04, SD = 9.34). Although the study data were collected from seven different regions of Turkey, the data were predominantly from the Black Sea region (n=79). Of the participants, 74 (43.5%) were married for love, and 96 (56.5%) were married in an arranged marriage. While 127 (74.7%) of the participants had children, 43 (25.3%) had no children. In addition, 18 (10.58%) of the participants were primary school graduate, 15 (8.8%) were secondary school graduate, 33 (19.41%) were high school graduate, 88 (51.76%) were college graduate, and 15 (8.8%) had master's degree. The monthly incomes of the participants were as follows: 34 (20%) individuals had under 2000 TL, 54 (31.76%) had between 2001-3000 TL, 28 (16.47%) had between 3001-4000 TL and 54 (31.76%) individuals had a monthly income over 4000 TL.

### **2.2 Data Collection Instruments**

#### **2.2.1. Personal Information Form**

The personal information form, developed by the researchers, include questions on gender, marital status, age, monthly income, family structure, type of marriage, happiness in marriage and divorce thought.

#### **2.2.2. Divorce Predictors Scale**

The scale, developed by Yöntem and İlhan (2018), consists of 5 sub-scales. In order to reveal the construct validity of the scale, Exploratory Factor Analysis based on the Principle Components Analysis was performed, and 54 items were found to have a factor load value of .40 and

above. The variance explained by the five-factor structure was 60.43%. After the exploratory factor analysis, confirmatory factor analysis was performed with the other half of the data set. The goodness of fit values for the model tested were acceptable. While Cronbach's  $\alpha$  internal consistency coefficient for the whole scale has been .95, the Cronbach's  $\alpha$  internal consistency coefficients of the sub-scales ranged from .78 to .96. In this study, however, Cronbach's  $\alpha$  internal consistency coefficient for the whole scale was found to be .98, whereas Cronbach's  $\alpha$  internal consistency coefficients for the sub-scales were between .92 and .96.

### ***2.3 Data Collection***

Research data were collected using the face-to-face interview technique and via Google Drive. Divorced participants answered the scale items by considering their marriages. And, of the married participants, only those with happy marriages, without any thought of divorce, were included in the study.

### ***2.4. Analysis of the Data***

Among the data mining methods, correlation-based feature selection and artificial neural network techniques were used in the analysis of data. The methods in our study were evaluated with WEKA (Waikato Environment for Knowledge Analysis) software, which is widely used in data mining. The system used in the study for the application has Intel Core i5 7200U 2.5 GHZ processor, 4GB DDR3 RAM. At this point, it would be useful to briefly mention data mining.

#### ***2.4.1. Data Mining***

Various data mining methods, such as feature selection and classification, are used to reveal previously unknown and potentially useful information (Fayyad, Piatetsky-Shapiro, Smyth and Uthurusamy, 1996; Han, Kamber and Pei, 2006). An overview of the feature selection and classification algorithms used in the study is provided in this section. Classification is an estimation phenomenon that reveals common features or differences within the data set. And, the feature selection process is used to find out the most significant attributes by eliminating unnecessary and noisy attributes, which negatively affect the classification performance during the training of classification methods (Kaynar, Aydın and Görmez, 2017).

#### ***2.4.2. Correlation Based Feature Selection***

The correlation-based feature selection, proposed by Hall in 1999,

uses a search algorithm as well as a function that measures the information values of feature subsets (Hall, 1999). The approach that this method uses to measure the values of feature subsets takes into account the internal correlation values in addition to its success in estimating the class label of each feature (Hall and Smith (1998). This approach is based on the hypothesis that good feature subsets consist of features highly correlated with the corresponding class, albeit having lower correlation with each other (Hall, 1999). This method is used to find the most significant attributes in the data set.

#### ***2.4.3. Artificial Neural Networks***

Artificial Neural Networks (ANN) has been developed to learn from data, to derive new information through learning, and to work with unlimited number of variables (Çelik, Atalay and Bayer; 2014; Ertunc, Ocak and Aliustaoğlu, 2013; Kaynar, Taştan and Demirkoparan, 2011; Schalkoff, 1997). The ANN model emerged with the idea of imitating brain on computers, focused on the mathematical modeling of biological neurons, and simulates the way the human brain works in a simple way (Karahan, 2015). This system consists of interconnected artificial neurons. Artificial neurons are composed of four parts. If we look at their counterparts of these parts in the human brain, the dendrites transmit the inputs from the sensory organs to the core. The total value obtained by multiplying these input values by different weights is transmitted to the axons. The axons pass this value from the core through the activation functions and send it to the synapses at the other end of the neuron (Karaatlı, Helvacıoğlu, Ömürbek and Tokgöz, 2012). In accordance with the system designed in ANN model, sigmoid, threshold, hyperbolic tangent and linear activation functions are used. According to the distribution of the data set, one of these activation functions is selected, and the weight values are automatically updated until achieving the target output values based on the learning rules. With the completion of the training process, the network can classify the data set given for the test together with the final weight value.

### **3. RESULTS**

ANN, random forest and RBF classification methods were directly applied to the divorce data set used in the study. In addition, in order to find the most significant features, correlation-based feature selection method was applied together with the classification methods. The effective features and their values of significance obtained by applying the correlation-based feature selection method are presented in Table 1.

**Table 1.** Use of Correlation Based Feature Selection Method

Feature	Values of significance
x2	0.9
x6	0.89
x11	0.87
x18	0.84
x26	0.84
x40	0.83

The most effective 6 features and their values of significance obtained by applying the correlation-based feature selection method on the divorce data set are presented in Table 1. According to this, it is seen that the most significant feature (item) x2 that affects the divorce is "I know we can ignore our differences even if things get tough sometimes". Other attributes, include: x6 "We don't have a common time we spent together at home."; x11 "When I look back in the future, I think I'll that my spouse and I had our paths harmoniously intertwined."; x18 "We have similar ideas with my spouse about how a marriage should be."; x26 "I know the basic concerns of my spouse."; x40 "We're starting to fight before I know what's going on." respectively. When we look at these items, we see that x2, x6, x11 and x18 are related to creating a common meaning and failed attempts to repair, whereas the item x26 is related to love map and the item x40 is related to negative conflict behaviors. The classification methods were applied on the data set consisting of features both directly determined and selected after applying the feature selection methods to the divorce data set. The results of the experimental studies are presented in Table 2.

**Table 2.** Methods Used in the Study and Their Success Rates

Feature Selection	Classification	Number of Feature	Accuracy (%)	Kappa Value
None	ANN	54	97.64	0.9529
	RBF		98.23	0.9647
	Random Forest		97.64	0.9529
Correlation based feature selection	ANN	6	<b>98.82</b>	<b>0.9765</b>
	RBF		97.64	0.9529
	Random Forest		97.64	0.9529



As seen in Table 2, when the direct classification methods were applied to the divorce data set, the highest success rate was 98.23% obtained with the RBF neural network. After selecting the most effective 6 features using the correlation-based feature selection method on the same data set, the highest accuracy rate obtained was 98.82% with ANN. As a result of the experimental studies that apply data mining methods on the divorce data set, it was observed that the most successful result is obtained with ANN model applied together with correlation-based feature selection.

#### **4. DISCUSSION**

When the overall results of the study are examined, it is seen that the Divorce Predictors Scale developed within the scope of Gottman couples therapy can predict divorce rates by a 98.23% accuracy. According to this finding, it can be stated that the predictions of Gottman couples therapy were confirmed within the scope of Turkish sampling. And, the failure of repair attempts, which is an important feature in research findings, is expressed as giving negative responses to the attempts to correct the mistakes of the hurting party (Babcock, Gottman, Ryan and Gottman, 2013; Barnacle and Abbott, 2009; Gottman, 1999; Gottman and Silver, 2015). According to Gottman (1999), when the failed repair attempts are combined with "four horsemen", the divorce at the end of five years is estimated by a 97.5% success rate.

Another important feature in the research is related to love maps (Barnacle and Abbott, 2009; Gottman, 1999; Gottman and Silver, 2015) and creation of shared meaning (Babcock, Gottman, Ryan and Gottman, 2013; Holman and Jarvis, 2003; Shapiro, Nahm, Gottman and Content, 2011). Gottman and Silver (2015) state that having a love map can estimate the marital adjustment by 70%. Gottman and Silver (2015) stated that the decisive factor in satisfaction of couples with sexuality, love and passion in their marriages depends on the quality of friendship between husband and wife by 70%. In addition, factors such as value systems of couples, their views of love, perceptions and attitudes about trust are important for creating a shared meaning (Gottman, 2014). It has been found in many experimental studies attempting to increase communication between couples that increasing the shared meaning among couples together with other variables increases the marital adjustment positively (Babcock, Gottman, Ryan and Gottman, 2013; Holman and Jarvis, 2003; Shapiro, Nahm, Gottman and Content, 2011).

In the research findings, though beginnings emerged as an important feature. How the issue is first opened for discussion is important in terms of

addressing the conflict issues by couples. It has been observed that the data required for the prediction of divorce or continued marriage can be obtained only in a few minutes for 96% of the couples (Gottman, 1999). According to this, the behaviors and reactions of couples in just a few minutes following an argument give an idea about divorce. Thus, harsh start up is one of the most obvious predictors that a debate or marriage will not go well (Gottman and Silver, 2014) In his research, Gottman stated that the four horsemen of the apocalypse were able to predict the divorce by 85%-95% alone (Gottman, 1999). In their study, Hollman and Jarvis (2003) stated that the conflicts between couples can be explained by the four horsemen.

Finally, according to the results of this study, DPS can predict divorce. This may be beneficial for ministries that have direct contact with families such as the Ministry of Family and Social Policies, the Ministry of National Education, and the Ministry of Health, in order to use DPS in their screening activities. The counseling services staff working on family counseling and family therapies can use this scale as a means of knowing the individual. Scores obtained from the scale may contribute to the preparation of case formulation and intervention plan. In addition, it can be said that the divorce predictors in the Gottman couples therapy were confirmed in the Turkish sampling. In future studies, it would be useful to test the functionality of the techniques of intervention in the Gottman couples therapy model in the Turkish sample. This can be achieved with experimental studies. Therefore, there is a need for experimental studies by designing Gottman couples therapy based psychoeducation programs in the studies to be conducted on couples.

## REFERENCES

- Babcock, J.C., Gottman, J., Ryan, K. and Gottman, J. (2013). A Component Analysis of a Brief Psycho-Educational Couples' Workshop: One-year Follow-up Results. *Journal of Family Therapy*, 35(3), 252-280.
- Baca-García, E., et al. (2006). Using Data Mining to Explore Complex Clinical Decisions: A Study of Hospitalization After Suicide Attempt. *Journal of Clinical Psychiatry*, 67(7), 1124-1132.
- Bae, S. M., Lee, S. H., Park, Y. M., Hyun, M. H., and Yoon, H. (2010). Predictive Factors of Social Functioning in Patients With Schizophrenia: Exploration For The Best Combination of Variables Using Data Mining. *Psychiatry Investigation*, 7(2), 93-101.
- Barnacle, R. ES, and Abbott, D. A. (2009). The Development and Evaluation of a Gottman-Based Premarital Education Program: A Pilot Study. *Journal of Couple and Relationship Therapy*, 8(1), 64-82.
- Çelik, E., Atalay, M. and Bayer, H. (2014). Yapay Sinir Ağları ve Destek Vektör

- Makineleri ile Deprem Tahmininde Sismik Darbelerin Kullanılması. *22nd Signal Processing and Communications Applications Conference (SIU)*, 730-733.
- Eriksson, R., Werge, T., Jensen, L. J., and Brunak, S. (2014). Dose-Specific Adverse Drug Reaction Identification in Electronic Patient Records: Temporal Data Mining in an Inpatient Psychiatric Population. *Drug Safety*, 37(4), 237-247.
- Ertunc, H. M., Ocak, H. and Aliustaoglu, C. (2013). ANN-and ANFIS-based Multi-Staged Decision Algorithm for the Detection and Diagnosis of Bearing Faults. *Neural Computing and Applications*, 22(1): 435-446.
- Fayyad, U. M., Piatetsky-Shapiro, G., Smyth, P. and Uthurusamy, R. (1996). *Advances in Knowledge Discovery and Data Mining*. American Association for Artificial Intelligence Menlo Park, CA, USA.
- Gottman, J. M. (1999). *The Marriage Clinic: A Scientifically-Based Marital Therapy*. New York: WW Norton and Company.
- Gottman, J. M. (2014). *What Predicts Divorce? The Relationship Between Marital Processes and Marital Outcomes*. New York: Psychology Press.
- Gottman, J. M. and Gottman, J.S. (2012). *Çiftler Arasında Köprüyü İnşa Etmek: Gottman Çift Terapisi Eğitimi 1. Düzey Kitabı*, [Level 1 Clinical Training. Gottman Method Couples Therapy. Bringing to Couple Chasm.] İstanbul: Psikoloji İstanbul.
- Gottman, J. ve Silver, N. (2014). *Aşk Nasıl Sürdürülür. Aşk Laboratuvarından Sırlar*. (trans. Gül, S.S.) [What Make Love Last. How to Build Trust and Avoid Betrayal. 2012]. İstanbul: Varlık Yayınları.
- Gottman, J. and Silver, N. (2015). *Evliliği Sürdürmenin Yedi İlkesi*. (trans. Gül, S.S.). [The Seven Principles for Making Marriage Work. 1999] İstanbul: Varlık Yayınları.
- Hall, M. (1999). *Correlation-Based Feature Selection for Machine Learning*. Phd Thesis, Department Of Computer Science, Waikato University, New Zealand, 26-28.
- Hall, M. A. and Smith, L. A. (1998). *Practical Feature Subset Selection for Machine Learning*. In *Computer Science'98 Proceedings of the 21st Australasian Computer Science Conference ACSC*, 98: 181-191.
- Han, J., Kamber, M. and Pei, J. (2006). *Data Mining: Concepts and Techniques*. The Morgan Kaufmann Series in Data Management Systems. *Morgan Kaufmann Publishers*, 230-240.
- Holman, T. B. and Jarvis, M. O. (2003). Hostile, Volatile, Avoiding, and Validating Couple-Conflict Types: An Investigation of Gottman's Couple-Conflict Types. *Personal Relationships*, 10(2): 267-282.
- Karaatlı, M., Helvacıoğlu, Ö. C., Ömürbek, N. and Tokgöz, G. (2012). Yapay Sinir Ağları Yöntemi İle Otomobil Satış Tahmini. *Uluslararası Yönetim İktisadi ve İşletme Dergisi*, 8(17): 87-100.
- Karahan, M. (2015). Turizm Talebinin Yapay Sinir Ağları Yöntemiyle Tahmin Edilmesi. *Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi*

*Dergisi*, 20(2), 195-209.

Kaynar, O., Aydın, Z. and Görmez, Y. (2017). Sentiment Analizinde Öznitelik Düşürme Yöntemlerinin Oto Kodlayıcı Derin Öğrenme Makinaları ile Karşılaştırılması. *Bilişim Teknolojileri Dergisi*, 10(3): 319-326.

Kaynar, O., Taştan, S. and Demirkoparan, F. (2011). Yapay Sinir Ağları ile Doğalgaz Tüketim Tahmini. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 25.

Nguyên, X., Chaskalovis, J., Rakotonanahary, D. and Fleury, B. (2010). Insomnia Symptoms and CPAP Compliance in OSAS Patients: A Descriptive Study Using Data Mining Methods. *Sleep Medicine*, 11(8): 777-784.

Qinghua, J. (2016). Data Mining and Management System Design and Application for College Student Mental Health. Intelligent Transportation, Big Data and Smart City (ICITBS), *International Conference on IEEE*: 410-413.

Rosenthal, D. A., Dalton, J. A., and Gurvey, R. (2007). Analyzing Vocational Outcomes of Individuals With Psychiatric Disabilities Who Received State Vocational Rehabilitation Services: A Data Mining Approach. *International Journal of Social Psychiatry*, 53(4): 357-368.

Schalkoff, R. J. (1997). *Artificial Neural Networks* (Vol. 1). New York: McGraw-Hill.

Song, Q. (2010). The Comparison and Analysis of Classification Methods for Psychological Assessment Data. Information Science and Engineering (ICISE), *2nd International Conference on.(IEEE)*. 4133-4135.

Shapiro, A. and Gottman, J. (2005). Effects on Marriage of a Psycho-Communicative-Educational Intervention with Couples Undergoing the Transition to Parenthood, Evaluation at 1-year Post Intervention. *Journal Of Family Communication*, 5(1), 1-24.

Shapiro, A. F., Nahm, E. Y., Gottman, J. M., and Content, K. (2011). Bringing Baby Home Together: Examining the Impact of a Couple-Focused Intervention on the Dynamics within Family Play. *American Journal of Orthopsychiatry*, 81(3), 337.

Uğur, A. and Kınacı, A. C. (2006). Yapay Zeka Teknikleri ve Yapay Sinir Ağları Kullanılarak Web Sayfalarının Sınıflandırılması. *XI. Türkiye'de İnternet Konferansı (inet-tr'06)*.

Yöntem, M.K. and İlhan, T.(2018). Boşanma Göstergeleri Ölçeği: Güvenirlik ve Geçerlik Çalışması. *X. Uluslararası Eğitim Araştırmaları Kongresi*. Nevşehir, Turkey.

Yöntem, M.K. and İlhan, T. (2018). Boşanma Göstergeleri Ölçeğinin Geliştirilmesi. [Development of the Divorce Predictors Scale]. *Sosyal Politika Çalışmaları Dergisi*. 41, 339-358.

Yöntem, M. K., Adem, K., İlhan, T., and Kılıçarslan, S. (2018). Çok Katmanlı Algılayıcı Sinir Ağı ve C4. 5 Karar Ağacı Algoritmaları ile Boşanma Tahmini.

## **GENİŞLETİLMİŞ ÖZET**

### **Amaç**

İktisadi İşbirliği ve Gelişme Teşkilatı'na (OECD) üye 33 ülkenin boşanma verileri incelendiğinde Türkiye'nin boşanma oranı artan 12 ülke arasında yer aldığı görülecektir. Bu durum boşanma nedenleri ve önleyici çalışmalar konusunda bilimsel temelli politika ve uygulamaların geliştirilmesi gerekliliğini ortaya koymaktadır. Bu araştırma kapsamında boşanma tahmini Gottman çift terapisi kapsamında Yöntem ve İlhan (2017, 2018) tarafından geliştirilen Boşanma Göstergeleri Ölçeği kullanılarak gerçekleştirilmiştir. Bunun nedeni Gottman çift terapisinin boşanma nedenlerini görgül araştırmalara dayanarak açıklayan bir model olmasıdır. Bu modelde yer alan güçlü ilişki evi teorisinde tanımlanan kriterler önemli birer boşanma göstergesidir. (Gottman, 2014; Gottman ve Gottman, 2012). Bu araştırmada Türk örneğinde Gottman boşanma göstergelerinin boşanmayı tahmin edebilme düzeyi incelenmiştir. İstatistikte çok farklı tahmin yöntem ve analizleri bulunmakla birlikte son zamanlarda veri madenciliği olarak bilinen yöntem, daha önce bilinmeyen ve potansiyel olarak faydalı olan bilgileri ortaya çıkarmak için kullanılmaktadır. Her ne kadar veri madenciliği yöntemi ile boşanma tahmini konusunda çalışmalara rastlanılmasa da psikoloji ve psikiyatri alanında yapılan birçok çalışmada sınıflandırma, tahminleme ve kümeleme gibi veri madenciliği yöntemlerinin kullanıldığı görülmektedir. Bu çalışma ile Yöntem ve İlhan (2017) tarafından geliştirilen boşanma göstergeleri ölçeğinin boşanmayı tahmin etme başarısı Çok Katmanlı Algılayıcı Sinir Ağı ve C4. 5 Karar ağacı algoritmaları kullanılarak araştırılmıştır. Ayrıca boşanma göstergesi ölçeğindeki boşanmayı etkileyen en anlamlı özniteliklerin/maddelerin bulunması amaçlanmıştır.

### **Yöntem**

Katılımcıların 84'ü (%49) boşanmış 86'sı (%51) evli çiftlerden oluşmaktadır. Araştırma grubunda 84 erkek (%49) ve 86 kadın (%51) bulunmaktadır. Katılımcıların yaşları 20 ile 63 arasında değişmektedir (=

36.04, Ss= 9.34). Araştırma verileri Türkiye'nin yedi farklı bölgesinden toplanmakla birlikte veriler ağırlıklı olarak Karadeniz bölgesinden elde edilmiştir (n=79). Katılımcıların 74'ü (%43.5) anlaşmalı/severek evlenmişken 96'sı (%56.5) görücü usulü ile evlenmiştir. Katılımcıların 127'sinin (%74.7) çocuğu varken 43'ünün (%25.3) çocuğu yoktur. Ayrıca katılımcıların 18'ü (%10.58) ilkokul, 15 'ü (%8.8) ortaokul, 33'ü (19.41) lise ve 88'i (%51.76) üniversite ve 15'i (%8.8) lisansüstü mezunudur. Katılımcıların aylık gelirleri ise 2000 TL altı 34 (%20) kişi, 2001-3000 TL arasında 54 (%31.76) kişi, 3001-4000 TL arası 28 (%16.47) kişi 4000 TL üzeri 54 (%31.76) kişi şeklindedir. Araştırmada veri toplama aracı olarak kişisel bilgi formu ve Boşanma Göstergeleri Ölçeği (Yöntem ve İlhan, 2018) kullanılmıştır. Verilerin analizinde veri madenciliği yöntemlerinden korelasyon tabanlı öznitelik seçme ve yapay sinir ağları teknikleri kullanılmıştır. Çalışmamızdaki yöntemlerin değerlendirilmesi veri madenciliğinde yaygın olarak kullanılan WEKA (Waikato Environment for Knowledge Analysis) yazılımı ile gerçekleştirilmiştir. Çalışmada kullanılan sistemde Intel Core i5 7200U 2.5 GHZ işlemciye sahip, 4GB DDR3 rami bulunan sistem üzerinde uygulama gerçekleştirilmiştir.

### **Bulgular**

Boşanma veri kümesine korelasyon tabanlı öznitelik seçme yönteminin uygulanması sonucu en etkili 6 öznitelik ve bu özniteliklerin önem değerleri verilmiştir. Buna göre boşanmayı etkileyen en anlamlı öznitelğin (madde) x2 "İşler bazen zorlaşsa bile, farklılıklarımızı göz ardı edebileceğimizi biliyorum." olduğu görülmektedir. Diğer öznitelikler ise sırasıyla x6 "Evde ortak olarak geçirdiğimiz zamanlar yok.", x11 "Gelecekte bir gün geriye dönüp baktığımda, eşimle yollarımızın uyumlu şekilde, iç içe geçtiğini göreceğimi düşünüyorum.", x18 "Evliliğin nasıl olması gerektiğine dair eşimle benzer düşüncelere sahibiz", x26 "Eşimin temel endişelerini biliyorum.", x40 "Daha ben olanı biteni anlamadan kavgaya başlamış oluyoruz." 'dır. Bu maddeler incelendiğinde x2, x6, x11 ve x18. maddeler ortak anlam yaratma ve başarısız onarma girişimleri ile ilgili iken; x26. sevgi haritası ve x40. madde negatif çatışma davranışları ile ilişkilidir. Boşanma veri kümesine hem doğrudan hem de öznitelik seçme yöntemi uygulandıktan sonra tespit edilen özniteliklerden oluşan veri kümesi üzerinde sınıflandırma yöntemleri uygulanmıştır.

Boşanma veri kümesine doğrudan sınıflandırma yöntemleri uygulandığında en yüksek başarının RBF sinir ağı ile %98.23 doğruluk değerine ulaştığı görülmüştür. Aynı veri kümesine korelasyon tabanlı öznitelik seçme yöntemi kullanılarak en etkili 6 öznitelik seçilmiş ve en yüksek başarının YSA ile %98.82 doğruluk değerine ulaştığı görülmüştür. Deneysel çalışmaların sonucunda boşanma veri kümesi üzerinde veri madenciliği yöntemleri uygulandığında en başarılı sonucun korelasyon

tabanlı öznitelik seçme ile birlikte YSA modeli ile sağlandığı görülmüştür

### **Tartışma ve Sonuç**

Araştırma bulguları genel olarak incelendiğinde Gottman çift terapisi kapsamında geliştirilen boşanma göstergeleri ölçeğinin tamamı boşanmaları %98.23 oranında tahmin edebilmektedir. Bu bulgu doğrultusunda Gottman çift terapisinin öngörülerinin Türk örnekleminde doğrulandığı ifade edilebilir.

Bu araştırma bulgularına göre BGÖ boşanmayı tahmin edebilmektedir. Aile ve Sosyal Politikalar Bakanlığı, Milli Eğitim Bakanlığı, Sağlık Bakanlığı gibi aileler ile doğrudan temasa sahip bakanlıkların BGÖ'ni tarama faaliyetlerinde kullanması yararlı olabilir. Aile danışmanlığı ve aile terapileri üzerine çalışan psikolojik yardım hizmetleri çalışanları bu ölçeği bireyi tanıma aracı olarak kullanabilirler. Ölçekten elde edilen puanlar vaka formülasyonu ve müdahale planı hazırlanmasına katkı sağlayabilir. Ayrıca Gottman çift terapisinde yer alan boşanma göstergelerinin Türk örnekleminde doğrulandığı yorumu yapılabilir. Bundan sonra yapılacak araştırmalarda Gottman çift terapisi modelinde yer alan müdahaleye yönelik tekniklerin işlevselliğinin de Türk örnekleminde sınanması faydalı olacaktır. Bu durum deneysel araştırmalar ile sağlanılabilir. Bu nedenle çiftler üzerine yapılan çalışmalarda Gottman çift terapisi temelli psikoeğitim programları tasarlanarak yapılacak deneysel araştırmalara ihtiyaç duyulmaktadır.