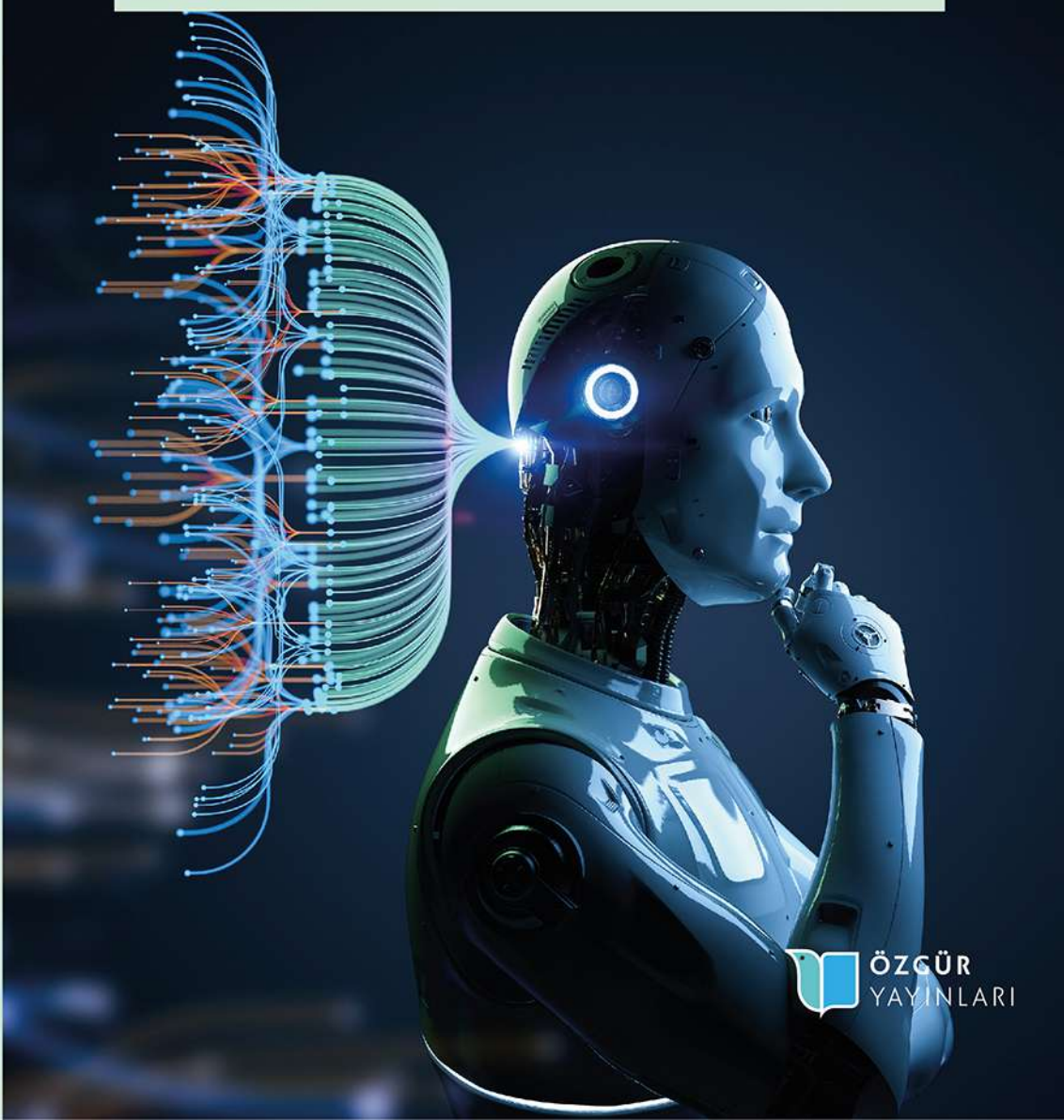
In Today's Research Landscape The Role of Machine Learning, Data Mining and Artificial Intelligence of Computer Engineering in Multidisciplinary Studies

Professor Özerk Yavuz • Professor Hasan Alpago



ÖZGÜR YAYINLARI

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Preface

As Famous Kotler once suggested it is important to understand phenomena around us considering various touch points, factors, variables with a holistic mindset and holistically. In this paradigm basically every variable and discipline which can shed light for the understanding of such phenomena matters. This is not so much different in multidisciplinary studies which borrow several approaches, methods and procedures from other disciplines for exploratory and confirmatory understanding in research phenomena. During the last century importance of quantitative methods composed of machine learning, artificial intelligence, data mining and statistics gained momentum and importance. They became some of the most useful and beneficial research techniques preferred in medical science, marketing, sociology, anthropology, history, management and political science. In this book some of the supervised and unsupervised machine learning methodologies, artificial intelligence approaches in data mining have been applied in several multidisciplinary studies with the aim of providing some insights and ideas, for generalists, specialists, opinion leaders, opinion seekers, decision makers and society at large for the research findings discovered in these particular research domains. Hope you enjoy and like it. Thank you.

With my warmest and kindest regards,
Professor Özerk Yavuz
Eskişehir, 2023

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CHAPTER 1

A Data Mining and Machine Learning Analysis of Perceptions Toward Banning Animal Slaughtering by Law: As an Extension of Animal Rights

Dr. Özerk YAVUZ[1]

INTRODUCTION

Every living being deserves to live and has a reason to be in life. However according to jungle rules where there exists no legislations, rule of law or constitution the dominant specicies with more power have more chance to survive by hunting other specimens or same specimen of their own. In the food chain there exists a line that goes from the more recessive and less powerful specimen to the more powerful hunters when you climb up the ladder. And according to the jungle laws it is perceived totally normal and part of a natural phenomena by some whereas many are sad to see some of the specimen are hunted and eaten by the hunter animals in documenteries or in a jungle setting (Yavuz,

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2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022; Harvard, 2023; Yale, 2023).

Luckily hunting one human's other is considered to be murder and prohibited by law. Similarly there are too many legislations and legislative actions that aim to enhance the rights of animals. Similar to many ethnic groups, women, slaves, students,LGBTQs, workers have earned their rights compared to what had been in the past decades. Today's animals have more rights compared to their ancestors which lived in the past few decades(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022; Harvard, 2023; Yale, 2023)..

I started my research from the debate topic " Should animal slaughtering be banned and Don't all the animals should have the right to live like human beings". Later with the eleboration of the topic, I wanted to measure the perceptions of public with an online administered questionaire which later analyzed with the help of machine learning, data mining and artificial intelligence(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022; Harvard, 2023; Yale, 2023).

Today billions of animals are loosing their lives simly by hunting, in animal farms and slaugher houses because of animal slaughtering since they are less equipped and weaker than human beings.Many say that this is human nature and part of the food chain whereas some advocate we should enhance animal rights and even animal slaughtering should be banned, since all living beings should have the same rights with human beings when it comes to the living. As it is was declared and written in the Unıversal Declaratıon Of Human Rights in Unıted Natıons General Assembly Dated 10 December 1948, article 3," "Everyone has the right to life, liberty and security of person". In the next centuries we will see whether human kind will be more favorable in legislating similar laws for their animal friends or the jungle law principles will be valid and constitutional when it comes to slaughtering animals for their fur, teeth, nail, horn or meat. Some people are in a more wait

and see attitude however this type of animal rights extension has been named and advocated by many including scholars, famous businessman, animal rights organizations, politicians and activists for a long period of time (UN, 2023; Ankara, 2023).

We do not know if the world and all the countries are ready for this type of a legislative action to preserve the living of their animal friends or they can not give up from delicious barbeques with full of fried steaks, chickens salmons or turkeys time will show. But literally if they want this law that banns animal slaughtering to pass then for sure they would need the support of Democrats and Republicans to advocate for them. We may see these types of legislative actions this century or in the next centuries. This process even can be rapidized by simly finding substitutes for animal based meats and indrigients. Many food organizations work on producing artificial meat without the need of feeding or availibility of animal farms which are costly. Also cummulative contribution of animal's on greenhouse gas emmision is a known fact.We don't know what the future will bring. But there's nothing wrong with measuring public's perceptions and tendencies toward this topic with a snowball sampling by using an online administered survey without judging two side view holders applying a quantitative research methodology(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022; Harvard, 2023; Yale, 2023).

In the analysis part of the study artificial intelligence, machine learning and data mining practices have been applied. Comparison of supervised and unsupervised forms of machine learning has been used in the form of classification and clustering. Later association rules in the form of independent and dependent variables have been generated and analysed. Performances of the algorithms have been compared and a top scorer has been selected by comparing key performance indicators as precision, RMSE and correct classification rate(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

RESEARCH METHOD

Today organizations heavily invest in artificial intelligence and analytical systems in order to gain competitive advantage from predictive knowledge and insights driven by data and data sources. Therefore, machine learning, data mining, artificial intelligence and deep learning techniques and concepts gained interest and popularity from business and politics stakeholders. Research budgets dedicated to these innovations therefore gained momentum during the past few years. If we look at these technologies in a more detailed way, we see that the data mining approach can be viewed as a systematic and structured investigative process that focuses on situation analysis, data collection, model building, and model testing. The ideas and insights uncovered from these analyses can be used as a starting point for decision-making by leaders, the scientific community, and society as a whole. Machine learning technique, which is a famous approach in quantitative research methodologies based on data mining, is a form of machine learning. The use of machine learning from data mining can provide an exploratory and confirmatory understanding of the phenomena in question and can provide in-depth insight and uwnderstanding with the option of knowledge discovery, prediction, or forecasting that it offers (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Data Mining techniques, which is considered to be a sub-part of artificial intelligence, are mainly composed of supervised and unsupervised forms of machine learning. In this case classification and regression are two forms of supervised learning whereas association and clustering are examples to unsupervised learning. In classification form of supervised learning the interpretations are handled based on input and output labes where dependent classification variables are pre-labeled whereas in unsupervised learning interpretation is merely done based on input data only without any pre-labeling process. In the regression form of supervised learning a relation between indipendent variables and dependent variables are seeked. Respective influence of the

indipendent variables on the dependent variable is calculated by finding the slopes which is equal to the tangent value at that point. In clustering approach while similarities and convergence for the in group variable values are aimed to be maximized, a divergence from out group member values for other segments and clusters are applied. In association form of unsupervised learning associative relations for several situations and categories are tried to be discovered within the data sets. Both supervised and unsupervised machine learning forms employ several techniques composed of statistics, mathematics and heuristics. In todays world data mining driven research methods are frequently used in several research domains and research topics in medical science, marketing, political science, public and cultural studies as a research method. It is also an important field itself in the scientific body of knowledge and literatures of computer science and quantitative research with its several techniques and algorithms that it employs (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

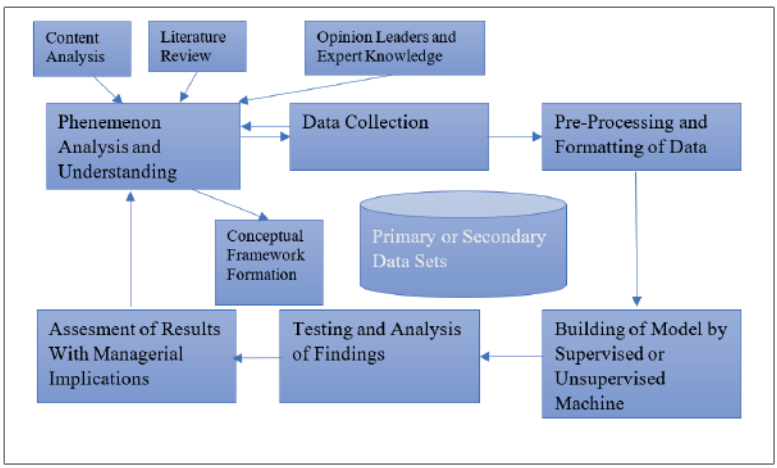

Figure 1. Athena Data Mining Model (Prepared by the Researcher)

In data mining process Athena data mining model has been employed as seen in Figure 1. In this research, several machine learning algorithms have been applied. Among these algorithms, unsupervised machine learning algorithms here assess the instance values and assign these independent values to the respective segment clusters whereas supervised machine learning algorithms mainly focus on mapping the multivariate variables in input layers to class labels in output layers with transformation and mapping functions. Additionally, class-based metrics are evaluated and associated rules are generated in a reinforced fashion some applying forward feeding and backpropagation approaches based on the algorithmic designs and architectures Prediction-focused machine learning functions are also involved in input-output transformation processes which generates the predicted values for the respective variables and attributes Depending on the algorithmic design, algorithmic architecture, complexity of the algorithms these algorithms can generate different results for similar, same or distinct problem For the same dataset with the same parameters performance indicators of the algorithms have been assessed and their results are evaluated. The best performing algorithm for this problem with the respective dataset and parameters has been discovered with the analysis conducted. Knowledge patterns and rules found out have been interpreted and listed. For the supervised machine learning approach, Niagara Falls Model as depicted in Figure 2 is followed. For the unsupervised machine learning approach, Manavgat Falls Model has been employed as depicted in Figure 3. (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

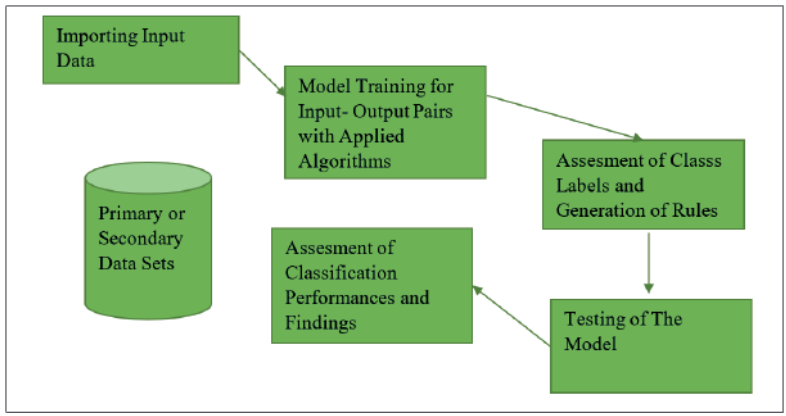

Figure 2. Niagara Falls Machine Learning Flow of Supervised Learning (Prepared by the Researcher)

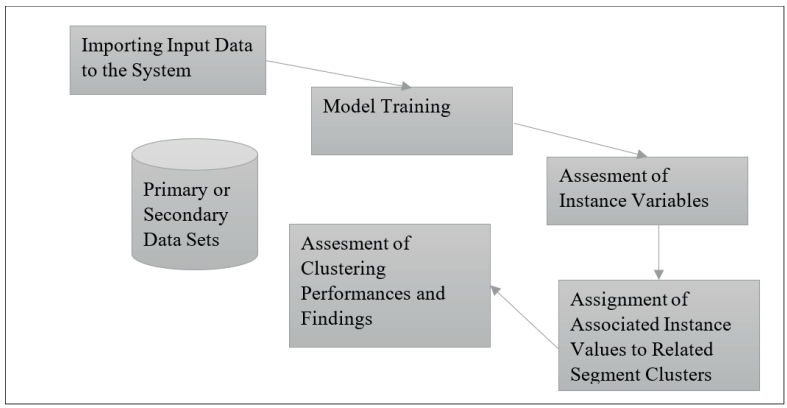

Figure 3. Manavgat Falls Unsupervised Machine Learning Algorithm Flow Composed of Model Building and Testing (Prepared by the Researcher)

DATA GATHERING AND PROCESSING

For the data set and sampling primary data has been used derived from online administered questionares by voluntary participants, 66 percent of the data has been used to train the model and remaining part of the data has been used for testing

(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Table 1. List of Variables Used in Analysis

Variable Name	**Variable**
Perception of Animal Slaghturing	Nominal (Categorical)
Education Level	Nominal (Categorical)
Age	Nominal (Categorical)
Nutrition Type	Nominal (Categorical)
Perception of Meat Towards Other Sources of Nutrition	Nominal (Categorical)
Perception of prohibiting animal slaughtering by law	Nominal (Categorical)

FINDINGS

In data mining analysis, the rules of the association, predictive knowledge with insights have been discovered using classification and clustering algorithms for the relevant domain and problem set. In these approaches, the input-output mapping functions are used to create association rules that correspond to the outer layer projection from inner layers. In some, feed-forward and backward propagation techniques have been applied. The relevant rules with the lowest error rate have been presented as the main rules discovered with the analysis conducted (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Many data mining processes today employ a technical approach to supervised learning in which independent or multivariate indicators and variables are assigned to output class labels using mapping functions. In unsupervised versions of data mining and machine learning, the fundamental values of each group (focal points, centroids) are calculated, the sample and the corresponding characteristic values are assigned to the respective groups in order to maximize convergence and minimize differences in the same group

while divergence is expected among members of different groups. In the supervised and unsupervised machine learning process, rules are created to improve the exploratory and confirmatory understanding of the phenomenon this context, the Model 1. research design path can offer several advantages in understanding these phenomena and can be a good decision support tool for key business leaders, political leaders, and the society (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

In the applied analysis, the same input load was tested with the same parameters using several algorithms. In the analysis of the University of Waikato's Weka data mining package, which includes supervised and unsupervised machine learning applications have been implemented. Then the key performance indicators of the classifications and clusterings were compared and evaluated.Based on the performance metrics associated with data mining analysis, a high-performing algorithm was selected that can be used for such areas and problem sets to gain additional information and insights. For this, the mean square of the error, accuracy (precision), coefficient of correct classification, and coefficient of misclassification were used.Neural Networks method has been the top performer with its lowest RMSE and highest classification rates. The rules and performance indicator values calculated are shown in Tables 2 and 3. (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Table 2. Performance Estimations of Machine Learning Algorithms

Machine Learning Algorithm	Key Performance Indicators			
	RMSE	Precision	% Correctly Classified	% Misclassified
Decision Stump	0.43	0.83	66.66	33.33
Random Forest	0.37	1	100	0
Voted Perceptron	0.45	N/A	66.66	33.33
Neural Networks (Multilayer Perceptron)	0.41	0.83	66.66	33.33
JRip	0.47	N/A	66.66	33.33

In the analysis part of the study artificial intelligence, machine learning and data mining practices have been applied. Comparison of supervised and unsupervised forms of machine learning has been used in the form of classification and clustering. Later association rules in the form of independent and dependent variables have been generated and analysed. Performances of the algorithms have been compared and a top scorer has been selected by comparing key performance indicators as precision, RMSE and correct classification rate. According to analysis results Random Forest Algorithm has been the top performing classification technique among other classification forms of machine learning with RMSE, precision and correct classification rates as key performance indicators.

Table 3. Analysis Results

I.	If perception of animal slaughtering as murder is less than 2 in a likert scale than university graduate if perception of animal slaughtering as murder is greater than 2 than high school graduate
II.	If I eating meat is important for me indicator is true or other then university graduate. If I prefer other sources of food rather if animal slaughtering stops then education level is high school.
III.	For all income types and education level, torchering animals should be considered as crime is true
IV.	Majority disagrees that other sources of protein is sufficient for me as long as animal slaughtering stops
V.	Majority thinks that human beings need to be fed without harming animals
VI.	%62.5 percent thinks that animals have right to preserve their body integrity and living right whereas remaining not
VII.	%75 percent think eating animal meat is right whereas remaining does not think so
VIII.	%37.5 agrees that it would be right to prevent the eating of meat by slaughtering and hunting animals by legal regulation whereas %62.5 part disagree
IX.	%62.5 agrees that every living being in nature has the right to life and that this should be guaranteed by constitutional regulation %37.5 disagrees
X.	If both herbivor and carnivor then age is 60 and above whereas if vegetarian age is between 25-40

If perception of animal slaughtering as murder is less than 2 in a likert scale than university graduate if perception of animal slaughtering as murder is greater than 2 than high school graduate. If I eating meat is important for me indicator is true or other then university graduate. If I prefer other sources of food rather if animal slaughtering stops then education level is high school. For all income types and education level, torchering animals should be considered as crime is true. Majority disagrees that other sources of protein is sufficient for me as long as animal slaughtering stops.

Majority thinks that human beings need to be fed without harming animals. %62.5 percent thinks that animals have right to preserve their body integrity and living right whereas remaining not. %75 percent think eating animal meat is right whereas remaining does not think so. %37.5 agrees that it would be right to prevent the eating of meat by slaughtering and hunting animals by legal regulation whereas %62.5 part disagree. %62.5 agrees that every living being in nature has the right to life and that this should be guaranteed by constitutional regulation %37.5 disagrees. If both herbivor and carnivor then age is 60 and above whereas if vegetarian age is between 25-40.

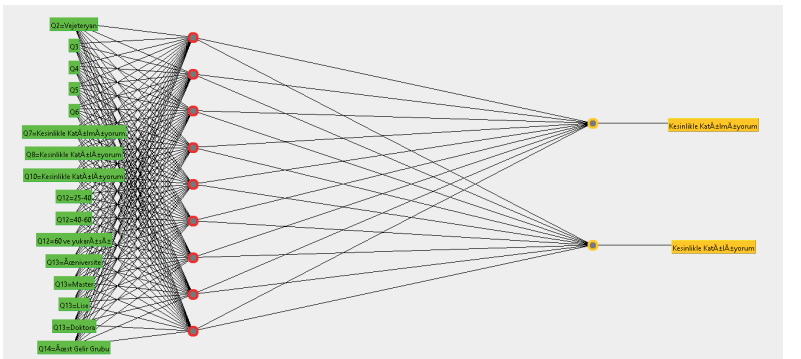

Figure 4. A Neural Network Cross Sectional View of the Generated Model With Neural Networks

In the analysis performance measures and indicators have been chosen as suggested in the literature. It is further concluded that supervised and unsupervised machine learning algorithms, also known as classification and clustering techniques in the data mining literature, can be used as effective and efficient tools for the discovery of meaningful knowledge and insights. Confirmation and exploration of knowledge and insights are possible with data mining flows as in Athena data mining model. Processing times can vary based on the input loads, algorithmic design, architecture, and performance of the algorithm which can be evaluated with

approximation approaches by using metrics such as Big O or Big Ω which can also be used to assess the efficiency and the complexity of these calculations (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

DISCUSSION AND CONCLUSION

Today billions of animals are loosing their lives simly by hunting, in animal farms and slaugher houses because of animal slaughtering since they are less equipped and weaker than human beings.Many say that this is human nature and part of the food chain whereas some advoce we should enhance animal rights and even animal slaughtering should be banned, since all living beings should have the same rights with human beings when it comes to the living. We don't know what the future will bring. But there's nothing wrong with measuring public's perceptions and tendencies toward this topic with a snowball sampling by using an online administered survey without judging two side view holders applying a quantitative research methodology.In the analysis part of the study artificial intelligence, machine learning and data mining practices have been applied. Comparison of supervised and unsupervised forms of machine learning has been used in the form of classification and clustering.

In data mining analysis, the rules of the association, predictive knowledge with insights have been discovered using classification and clustering algorithms for the relevant domain and problem set. In these approaches, the input-output mapping functions are used to create association rules that correspond to the outer layer projection from inner layers. In some, feed-forward and backward propagation techniques have been applied. The relevant rules with the lowest error rate have been presented as the main rules discovered with the analysis conducted (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Analysis results revealed that If perception of animal slaughtering as murder is less than 2 in a likert scale than university graduate if

perception of animal slaughtering as murder is greater than 2 than high school graduate. If I eating meat is important for me indicator is true or other then university graduate. If I prefer other sources of food rather if animal slaughtering stops then education level is high school. For all income types and education level, torchering animals should be considered as crime is true. Majority disagrees that other sources of protein is sufficient for me as long as animal slaughtering stops. Majority thinks that human beings need to be fed without harming animals. %62.5 percent thinks that animals have right to preserve their body integrity and living right whereas remaining not. %75 percent think eating animal meat is right whereas remaining does not think so. %37.5 agrees that it would be right to prevent the eating of meat by slaughtering and hunting animals by legal regulation whereas %62.5 part disagree. %62.5 agrees that every living being in nature has the right to life and that this should be guaranteed by constitutional regulation %37.5 disagrees. If both herbivor and carnivor then age is 60 and above whereas if vegetarian age is between 25-40.

To sum up supervised and unsupervised forms of machine learning can be applied successfuly for such research phenomena and domains. According to analysis results Random Forest Algorithm has been the top performing classification technique among other classification forms of machine learning with RMSE, precision and correct classification rates as key performance indicators. Similar research approaches can be applied in order to enhance exploratory and confirmatory understanding for political leaders, business leaders, practioners, scholars and society at large.

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CHAPTER 2

Analysing Breast Cancer with Artificial Intelligence Driven Data Mining Techniques and Algorithms in Femininus of Homo Sapiens Species

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Asst. Prof. Dr. Hasan ALPAGO[3]

PROLOGUE

In the 21st century, where digital technology and innovations come to the fore, production, consumption and distribution systems do not want to fall behind in the race to gain advantage by using these technological innovations. The money and financial market also wants to further advance the advantage it started with bitcoin (BTC) by using the blockchain system. In this context, the scientific world also wants to take advantage of the advantages offered by new research and data evaluation methods. In this context, data

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mining and machine learning gain value as an important data analysis method. This work is built on this basic idea.

There is a linear relationship between economic status, use of health services and being healthy. It is important to prove how valid this relationship is in the emergence of cases such as cancer and the taking of measures against it. Blockchain technology and the data mining method developed accordingly are increasingly used in scientific studies as it makes it possible to obtain and analyze data. The main purpose of data mining in scientific studies is to obtain the data necessary to obtain scientific findings within the framework of certain methods and processing processes. When data mining evaluates a large number of data with the blockchain algorithm, it has started to take an important place in the evaluation of scientific studies.

Working on data with different properties requires patience and endurance. In Blockchain supported computer systems, important studies can be carried out with an infrastructure based on advanced mathematics, statistics, linear algebra, optimization knowledge, operations modeling techniques and advanced software skills. Since the level of mastery of technology is now proportional to the ability to use and process data correctly, the importance of studies based on blockchain and data mining is increasing in scientific studies. Especially in researches in the field of health, for example, in the fight against cancer, the fact that each discipline does its part requires accurate and rapid analysis of data.

THE EMERGENCE OF BREAST CANCER AND THE IMPORTANCE OF ECONOMIC CONDITIONS IN THE TREATMENT PROCESS

Breast cancer is a disease that is frequently encountered in women and increases the risk of death by spreading throughout the body if not detected in time. Breast cancer, like other types of cancer, is a disease caused by malignant tumors that cause irregular cell division that does not fit normal body functioning.

Although the factors that cause cancer differ, timely recognizing the early signs of cancer and performing the necessary intervention correctly and completely are the main methods of combating it.

Research shows that psychosomatic, that is, physical disorders of cancer, are not of organic origin, but develop due to psychological reasons and cause physical consequences. These reasons seem to be directly related to living conditions and exposure to diseases such as cancer that cause disruption of the cell development process. In this context, the causes of cancer can be summarized as follows (Terek &Akman, & Dikmen, 2004):

- Genetics: It is important to have a gene test and take timely precautions. It requires economic resources.
- Unhealthy diet, bad environmental conditions, stress and other external factors
- Insufficient education, low level of social awareness, insufficient public support

What is needed in the fight against cancer:

- Regular health screenings
- Preventive health measures
- Sufficient economic resources are available for this purpose.
- Sufficient economic resources to ensure that the necessary drugs are taken and the treatment processes can be followed in the event of the disease.

Health is considered a fundamental human right and achieving the highest possible level of health is one of the most important social goals worldwide. This can be attributed in part to the fact that poor health can have a significant economic impact on people.

Poor health can deplete households' property, borrow money, and reduce their basic consumption because people in poor health not only suffer losses in productivity and income, but also incur out-of-pocket expenses for needed necessities.

The imposition of fees for Healthcare is likely a barrier to accessing adequate healthcare in poor settings. Some views suggest that healthcare fees can generate vital resources at the local level and help provide better quality care. However, other views highlight its negative effects, particularly inequality for poor people. In many low- and middle-income countries, people die from easily preventable diseases such as malaria and tuberculosis due to the low rate of government spending on health, or their quality of life decreases and they can become incapacitated due to these diseases. More importantly, chronic diseases such as diabetes and cancer are increasing in less developed countries. Due to the treatment costs and chronic consequences of these diseases, people face an isolated life by being impoverished and excluded from society instead of a normal life process. Breast cancer, which women encounter more and more frequently, is increasing in underdeveloped countries due to these negative conditions (Güven, Tevfik, Ebru, 2020).

RESEARCH METHOD

Data mining is defined as a methodological approach in the analysis of quantitative data as indicated in the literature. The data mining process is formed of a set of structured steps that make up the data mining research process and methodology. Initially, the understanding and analysis of the business situation and problem are completed, this is later followed by the review and pre-processing of the data. Subsequently, a conceptual framework or model is developed following the literature review and analysis approaches, model testing is performed with supervised and unsupervised versions of machine learning approaches (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

In supervised learning, learning process is usually triggered and activated by anticipatory (feed-forward) approaches which are then followed by backward propagation processes which aim to minimize the cost functions in a stochastic manner. Using the mapping functions, the input layers of the model are mapped to

the output layer taking into account the independent dependent values. The functions and equations involved in this mapping are calculated. Subsequently, in many ways, the rules generated with the lowest error rate measured by respective entropy values are assesed. As in gradient descent forms the lowest cost for the respective variable weights are searched. The equation with the slope which is zero in local minimum or global minimum, which is also the derivative of the cost in the reverse parabolic cost weight diagram is presented as the main association rule. This value can also be calculated by finding the tangent of that point which can be calculated by dividing edge looking to the angle (opposing edge) to adjacent edge in a triangular. To reach the point with the slope zero which is the intersection of the lowest weight and respective weight value meaning the lowest cost in the function at this point is steep to the weight, an iterative traversal is necessary for the opposite direction of the gradient. In this manner rules that provide the closest proximity to the actual results are selected and presented as distinctive association rules. To assess this, a stochastic backpropagation technique is used in many respects. In unsupervised machine learning grouping of several construct value combinations for different variables are assigned to respective clusters by applying mimicry for the pre-unlabeled data (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Classification and regression are two forms of supervised learning whereas association and clustering are examples to unsupervised learning. In classification form of supervised learning the interpretations are handled based on input and output labes where dependent classification variables are pre-labeled whereas in unsupervised learning interpretation is merely done based on input data only without any pre-labeling process. In the regression form of supervised learning a relation between indipendent variables and dependent variables are seeked. Respective influence of the indipendent variables on the dependent variable is calculated by finding the slopes which is equal to the tangent value at that point.

In clustering approach while similarities and convergence for the in group variable values are aimed to be maximized, a divergence from out group member values for other segments and clusters are applied. In association form of unsupervised learning associative relations for several situations and categories are tried to be discovered within the data sets. Both supervised and unsupervised machine learning forms employ several techniques composed of statistics, mathematics and heuristics. In todays world data mining driven research methods are frequently used in several research domains and research topics in medical science, marketing, political science, public and cultural studies as a research method. It is also an important field itself in the scientific body of knowledge and literatures of computer science and quantitative research with its several techniques and algorithms that it employs (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

The data mining approach can be viewed as a systematic and structured investigative process that focuses on situation analysis, data collection, model building, and model testing. The ideas and insights uncovered from these analyses can be used as a starting point for decision-making by leaders, the scientific community, and society as a whole. Machine learning technique, which is a famous approach in quantitative research methodologies based on data mining, is a form of machine learning. The use of machine learning from data mining can provide an exploratory and confirmatory understanding of the phenomena in question and can provide in-depth insight and understanding with the option of knowledge discovery, prediction, or forecasting that it offers (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

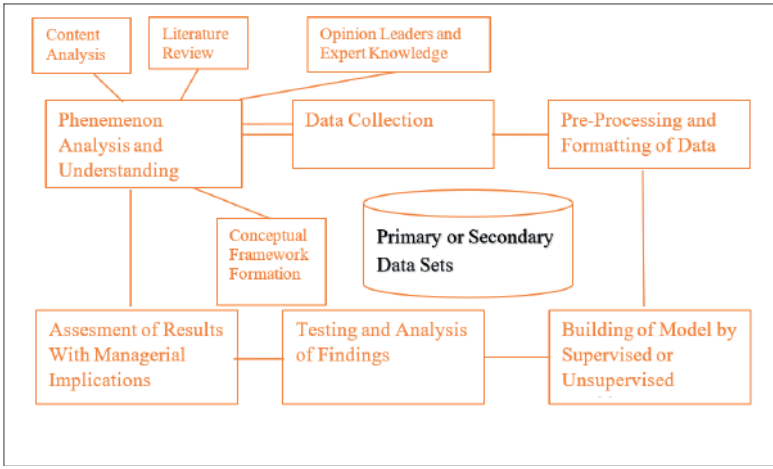

Figure 1. Athena Data Mining Model (Prepared by the Researcher)

In data mining process Athena data mining model has been employed as seen in Figure 1. In this research, several machine learning algorithms have been applied. Among these algorithms, unsupervised machine learning algorithms here assess the instance values and assign these independent values to the respective segment clusters whereas supervised machine learning algorithms mainly focus on mapping the multivariate variables in input layers to class labels in output layers with transformation and mapping functions. Additionally, class-based metrics are evaluated and associated rules are generated in a reinforced fashion some applying forward feeding and backpropagation approaches based on the algorithmic designs and architectures Prediction-focused machine learning functions are also involved in input-output transformation processes which generates the predicted values for the respective variables and attributes Depending on the algorithmic design, algorithmic architecture, complexity of the algorithms these algorithms can generate different results for similar, same or distinct problem For the same dataset with the same parameters performance indicators of the algorithms have been assessed and their results are evaluated. The best performing algorithm for this problem with

the respective dataset and parameters has been discovered with the analysis conducted. Knowledge patterns and rules found out have been interpreted and listed. For the supervised machine learning approach, Niagara Falls Model as depicted in Figure 2 is followed. For the unsupervised machine learning approach, Manavgat Falls Model has been employed as depicted in Figure 3. (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

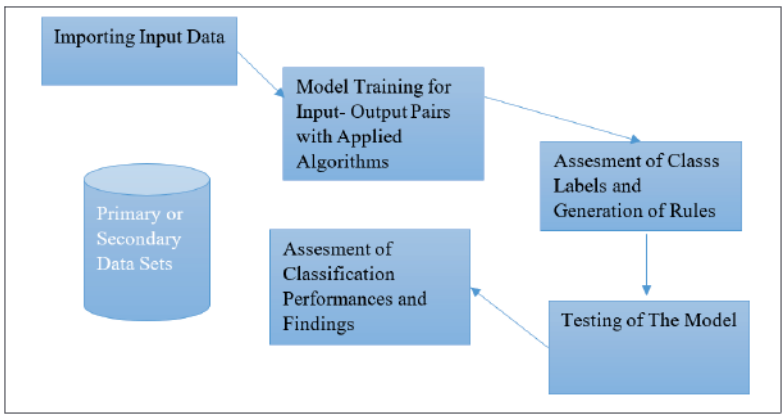

Figure 2. Niagara Falls Machine Learning Flow of Supervised Learning (Prepared by the Researcher)

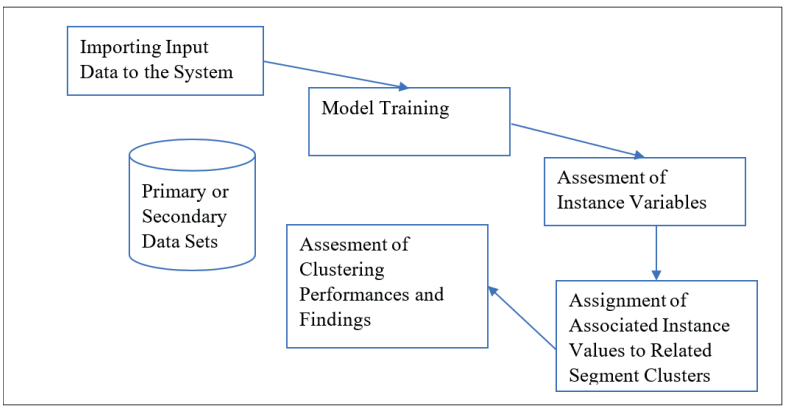

Figure 3. Manavgat Falls Unsupervised Machine Learning Algorithm Flow Composed of Model Building and Testing (Prepared by the Researcher)

DATA GATHERING AND PROCESSING

For the data set secondary data sources of University Medical Centre, Institute of Oncology, Ljubljanahas has been used in the in the machine learning analysis conducted. Later in order to enhance exploratory and confirmatory understanding classification and clustering focused supervised, unsupervised machine learning approaches available in data mining literature employed. In model training and testing, 10 folds cross-validation approach has been used. In this way a solution for the research questions "what are the important antecedents of online and conventional purchase behaviors" with how influential is different factors for conventional and online purchasing behaviors are tried to be examined and understood (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Table 1. List of Variables Used in Analysis

Variable Name	**Variable**
AGE	Nominal/Categorical
MENOPAUSE	Nominal/Categorical
TUMOR-SIZE	Nominal/Categorical
INV-NODES	Nominal/Categorical
NODE-CAPS	Nominal/Categorical
DEG-MALIG	Nominal/Categorical
BREAST	Nominal/Categorical
BREAST-QUAD	Nominal/Categorical
IRRADIAT	Nominal/Categorical
RECURRENCE STATUS INDICATOR	Nominal/Categorical

FINDINGS

In data mining analysis, the rules of the association, predictive knowledge with insights have been discovered using classification and clustering algorithms for the relevant domain and problem

set. In these approaches, the input-output mapping functions are used to create association rules that correspond to the outer layer projection from inner layers. In some, feed-forward and backward propagation techniques have been applied. The relevant rules with the lowest error rate have been presented as the main rules discovered with the analysis conducted (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Many data mining processes today employ a technical approach to supervised learning in which independent or multivariate indicators and variables are assigned to output class labels using mapping functions. In unsupervised versions of data mining and machine learning, the fundamental values of each group (focal points, centroids) are calculated, the sample and the corresponding characteristic values are assigned to the respective groups in order to maximize convergence and minimize differences in the same group while divergence is expected among members of different groups. In the supervised and unsupervised machine learning process, rules are created to improve the exploratory and confirmatory understanding of the phenomenon this context, the Model 1. research design path can offer several advantages in understanding these phenomena and can be a good decision support tool for key business leaders, political leaders, and the society (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

In the applied analysis, the same input load was tested with the same parameters using several machine learning algorithms. In the analysis of the University of Waikato's Weka data mining package, which includes supervised and unsupervised machine learning applications have been implemented. Then the key performance indicators of the classifications and clusterings were compared and evaluated. During the analysis, 10 fold cross-validation technique was used to train the model, and then the model is tested with a test dataset composed of the same variables. Based on the performance metrics associated with data mining analysis, a high-performing algorithm was selected that can be used for such areas

and problem sets to gain additional information and insights. For this, the mean square of the error, accuracy (precision), coefficient of correct classification, and coefficient of misclassification were used (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022). The rules and performance indicator values calculated are shown in Tables 2 and 3. Multilayer Perceptron has been the top scorer among all machine learning algorithms with the highest classification rate, lowest RMSE, and misclassification performance. The maing finding were given in the Table 3.

Table 2. Performance Estimations of Machine Learning Algorithms

Machine Learning Algorithm	Key Performance Indicators			
	RMSE	Precision	% Correctly Classified	% Misclassified
Multilayer Perceptron	**0.48**	**0.74**	**74.22**	**25.77**
J48	0.48	0.65	68.04	31.95
Bayesian networks	0.69	0.49	70.10	29.89
Voted Perceptron	0.54	0.68	70.10	29.89
Random Tree	0.52	0.68	70.10	29.89

Table 3. Association Rules Generated by Supervised and Unsupervised Machine Learning Algorithms

I.	Cluster analysis revealed that 50-59 age range, premenepose menepouse value, tumor size of 25-29, node caps with a value of no, deg-malig status of 2, breast status of left, breast quadrant value of left low, irridiat with a value of no and no reccurence events are clustered in the same cluster whereas 40-49 age range, premenepose menepouse value, tumor size of 30-34, node caps with a value of yes, deg-malig status of 3, breast status of left, breast quadrant value of left low, irridiat with a value of no and reccurence events are clustered in the other cluster cluster
II.	If inv=nodes is between 0-2 or 3-5 then no irridation if inv nodes is between 6-23 then irridation status is yes
III.	If deg-malig is equal to 1 then tumor size is between 10-14. If deg-malig is equal to 2 then tumor size is between 20-24. If deg-malig is equal to 3 then tumor size is between 30-34.
IV.	If menopause if equal to lt40 then age is in the range of 50-59 If menopause if equal to ge40 then age is in the range of 50-59 If menopause if equal to premenopause then age is in the range of 40-49
V.	If no-recurrence-events then age is in 50-59 range. If recurrence-events then age range is in 40-49
VI.	If irradiation is yes then age group is between 40-49 If irradiat is no then age group is between 50-59
VII.	Tumor size has the maximum and minimum values in 50-59 age range

Figure 4: Breast Cancer Awareness Sign

Source: www.time.com

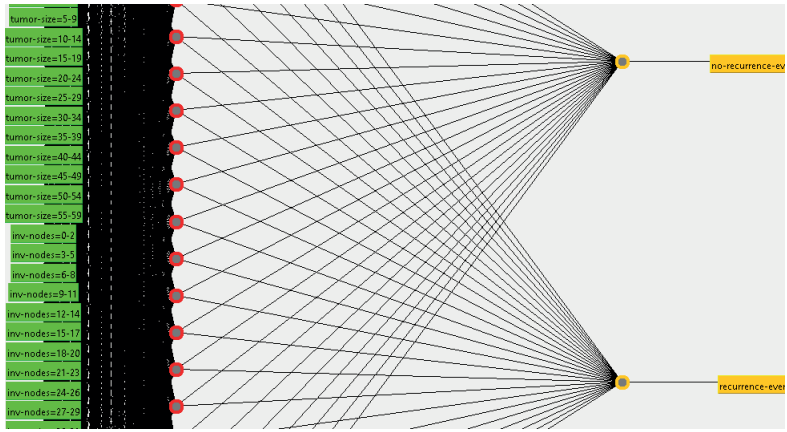

Figure 5. An Intersection view of Neural Network Model Built (Multilayer Perceptron: Recurrence Status Indicator Is the Dependent Variable)

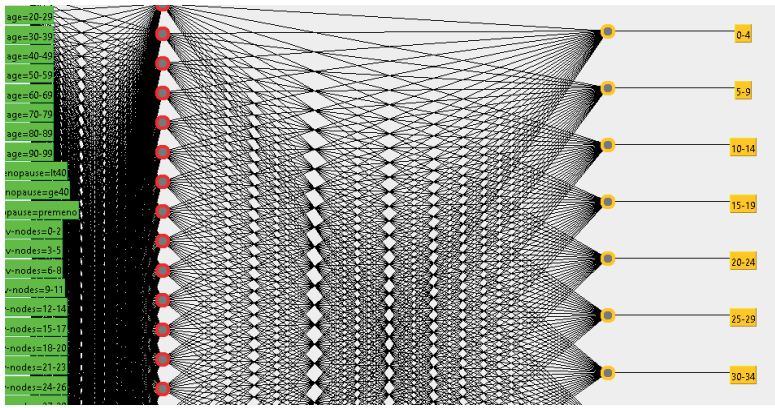

Figure 6. An Intersection view of Neural Network Model Built (Multilayer Perceptron: Tumor Size Is the Dependent Variable)

In the conducted analysis, the Multilayer perceptron method has been the best performing algorithm among other applied supervised machine learning approaches. This technique creative generated a correct classification rate of 75.39 percent with an RMSE of 0.42 and a misclassification rate of 24.60. Performance

measures and indicators have been chosen as suggested in the literature. It is further concluded that supervised and unsupervised machine learning algorithms, also known as classification and clustering techniques in the data mining literature, can be used as effective and efficient tools for the discovery of meaningful knowledge and insights. Confirmation and exploration of knowledge and insights are possible with data mining flows as in Athena data mining model. These ideas can be taken into account by policy-makers and society at large in such areas and in a similar set of issues. Processing times can vary based on the input loads, algorithmic design, architecture, and performance of the algorithm which can be evaluated with approximation approaches by using metrics such as Big O or Big Ω which can also be used to assess the efficiency and the complexity of these calculations (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

DISCUSSION AND CONCLUSION

Data mining is defined as a methodological approach in the analysis of quantitative data as indicated in the literature. The data mining process is formed of a set of structured steps that make up the data mining research process and methodology. Initially, the understanding and analysis of the business situation and problem are completed, this is later followed by the review and pre-processing of the data. Subsequently, a conceptual framework or model is developed following the literature review and analysis approaches, model testing is performed with supervised and unsupervised versions of machine learning approaches (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

In supervised learning, learning process is usually triggered and activated by anticipatory (feed-forward) approaches which are then followed by backward propagation processes which aim to minimize the cost functions in a stochastic manner. Using the mapping functions, the input layers of the model are mapped to

the output layer taking into account the independent dependent values. The functions and equations involved in this mapping are calculated. Subsequently, in many ways, the rules generated with the lowest error rate measured by respective entropy values are assesed. As in gradient descent forms the lowest cost for the respective variable weights are searched. The equation with the slope which is zero in local minimum or global minimum, which is also the derivative of the cost in the reverse parabolic cost weight diagram is presented as the main association rule. This value can also be calculated by finding the tangent of that point which can be calculated by dividing edge looking to the angle (opposing edge) to adjacent edge in a triangular. To reach the point with the slope zero which is the intersection of the lowest weight and respective weight value meaning the lowest cost in the function at this point is steep to the weight, an iterative traversal is necessary for the opposite direction of the gradient. In this manner rules that provide the closest proximity to the actual results are selected and presented as distinctive association rules. To assess this, a stochastic backpropagation technique is used in many respects. In unsupervised machine learning grouping of several construct value combinations for different variables are assigned to respective clusters by applying mimicry for the pre-unlabeled data (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Analysis results revealed that number of times pregnancy, plasma glucose concentration, diastolic blood pressure variables, triceps skin fold thickness, 2-hour serum insulin, body mass index, diabetes pedigree function and age is lower in diabetes negative group whereas same parameter values are comparably higher in diabetes positive group. If plasma glucose concentration is lower and equal than 127 and mass is lower and equal to 26.4 then diabetes status is tested negative. In the case of plasma glucose concentration is higher than 127 and diastolic blood pressure is greater than 61 if age is lower than and equal to 30 then tested negative if age is greater than 30 tested positive. If glucose concentration is higher

than 157 and body mass index is lower and equal than 29.9 then diabetes status tested positive. If mass is lower than and equal to 40.8 then diabetes status is tested negative. If mass is greater than and equal to 40.8 then diabetes status is tested positive.Supervised machine learning analysis results revealed that If age is smaller and equal to 28 then tested negative, If age is between 28 and 62 (upper limit included) tested positive If age is greater than 62 then tested negative.

In the conducted analysis, Multilayer Perceptron has been the top scorer among all machine learning algorithms with the highest classification rate, lowest RMSE, and misclassification performance. Studies of this type may provide exploratory and confirmatory understanding for research community, business leaders, political leaders and society at large for similar research domains.

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CHAPTER 3

Understanding Sexual Tendencies and Behaviors Seen in Adults with The Help of Machine Learning and Data Mining Algorithms

Dr. Özerk YAVUZ[4]

INTRODUCTION

During the life times of human beings some tendencies and behaviors occur and develop based on some set of factors. As mentioned in literature these can be subjective norms, group norms, group influence, positive anticipated emotions, negative anticipated emotions, genetic factors, hormonal levels, environment, societal context, social identity, several predispositions, tendencies, perceived behavioral control, societal pressure, family pressure, outcome expectations, trust, intention, culture, social class, past experiences, income, gender, age, life cycle stage, occupation, lifestyle, motivation, social comparison, perception, beliefs, personality, economic circumstances and attitudes (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

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Based on these factors tendencies, behaviors and habits are formed in human beings. This not so much different when it comes to sexual tendencies, habits and behaviors. Understanding sexual behaviors, tendencies and their relationship with factors behind it can be helpfull in enhancing exploratory understanding in this research phenomena. In this research supervised and unsupervised forms of machine learning have been applied in order to engage in exploratory understanding and knowledge discovery. Human mind is like tabula rasa when a person is first born. Later based on the internal factors, external stimulis and interactions with the peers and environment, some reference points are developed that have influence in the observable behaviors and tendencies. Some of these behaviors can formed of conditioning such as operant conditioning, instrumental conditioning and reinforcement whereas some can be as a result of several antecedents and factors as subjective norms, group norms, group influence, positive anticipated emotions, negative anticipated emotions, genetic factors, hormonal levels, environment, societal context, social identity, several predispositions, tendencies, perceived behavioral control, societal pressure, family pressure, outcome expectations, trust, intention, culture, social class, past experiences, income, gender, age, life cycle stage, occupation, lifestyle, motivation, social comparison, perception, beliefs ,personality, economic circumstances and attitudes (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

For a human being to have a fullfilling life as indicated in the Maslow's needs hierarchy he or she needs to fullfill his/her needs arising from being a human. Physiological, safety & security, love & belonging, self esteem and self actualization are some to name based on famous Maslow's hierarchical pyramid. Sexual needs are considered in the physilogical needs section which is common in many mammals and human beings. Today in the contemporary world individuals engage in these behaviors with their partners, with opposite or same sex based on their preferences and sexual orientations. While some sexual behaviors are observed in some

couples some prefer to engage in different or other sexual tendencies and sexual behaviors in the adult world. Sexual fantasies, role playing, different types of sexual engagement and intercourses are some form of contexts where these behaviors occur. When partners understand each other and each other's expectations, respect them and both sides are on the same page in a sexual relationship then this relationship is considered to be more satisfying and fullfilling for the partners. This would lead to positive consequences such as partner retention, long term relationship and more strong bonds between couples. When this is not succeeded and expectations of couples differ this may lead to an unsatisfied relationship which may lead other undemanded scenarious like break ups, divorces, partner switching behaviors, cheating etc. According to many researches in literature sexual relationships constitute an important part of both relationships and marriages. Therefore couples should take this part of relationships seriously (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

With this in mind couples can invest in understanding their partners' needs, expections, engage in empathy, mutual understanding for a more fullfilling sexual relationship. Talking openly as in depth interviews of qualitative research settings can be helpfull in these efforts. This can be helpfull before and during a relationship, in partner selection and enjoying a sex life where both sides are satisfied and happy with. Partners can try different sexual behaviors and fantasies that both sides are in the same page in in this context. Generally these sexual behaviors as in other forms of behavioral patterns have some antecedents and factors behind, that are formed and developed over time. Based on these behavioral antecedents and factors preferences, sexual behaviors and tendencies among different individuals can vary. Therefore sometimes finding the best match can take some time or if lucky can be in the first place. In this sense talking openly about sexual tendencies, preferences, expectations and behaviors can be helpful for getting to know your partner and your own needs and expectations which may be helpfull in making your sexual and

romantic relationship work with your partner (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

RESEARCH METHOD

Today organizations heavily invest in artificial intelligence and analytical systems in order to gain competitive advantage from predictive knowledge and insights driven by data and data sources. Therefore, machine learning, data mining, artificial intelligence and deep learning techniques and concepts gained interest and popularity from business and politics stakeholders. Research budgets dedicated to these innovations therefore gained momentum during the past few years. If we look at these technologies in a more detailed way, we see that the data mining approach can be viewed as a systematic and structured investigative process that focuses on situation analysis, data collection, model building, and model testing. The ideas and insights uncovered from these analyses can be used as a starting point for decision-making by leaders, the scientific community, and society as a whole. Machine learning technique, which is a famous approach in quantitative research methodologies based on data mining, is a form of machine learning. The use of machine learning from data mining can provide an exploratory and confirmatory understanding of the phenomena in question and can provide in-depth insight and uwnderstanding with the option of knowledge discovery, prediction, or forecasting that it offers (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Data Mining techniques, which is considered to be a sub-part of artificial intelligence, are mainly composed of supervised and unsupervised forms of machine learning. In this case classification and regression are two forms of supervised learning whereas association and clustering are examples to unsupervised learning. In classification form of supervised learning the interpretations are handled based on input and output labes where dependent classification variables are pre-labeled whereas in unsupervised learning interpretation is merely done based on input data only

without any pre-labeling process. In the regression form of supervised learning a relation between indipendent variables and dependent variables are seeked. Respective influence of the indipendent variables on the dependent variable is calculated by finding the slopes which is equal to the tangent value at that point. In clustering approach while similarities and convergence for the in group variable values are aimed to be maximized, a divergence from out group member values for other segments and clusters are applied. In association form of unsupervised learning associative relations for several situations and categories are tried to be discovered within the data sets. Both supervised and unsupervised machine learning forms employ several techniques composed of statistics, mathematics and heuristics. In todays world data mining driven research methods are frequently used in several research domains and research topics in medical science, marketing, political science, public and cultural studies as a research method. It is also an important field itself in the scientific body of knowledge and literatures of computer science and quantitative research with its several techniques and algorithms that it employs (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

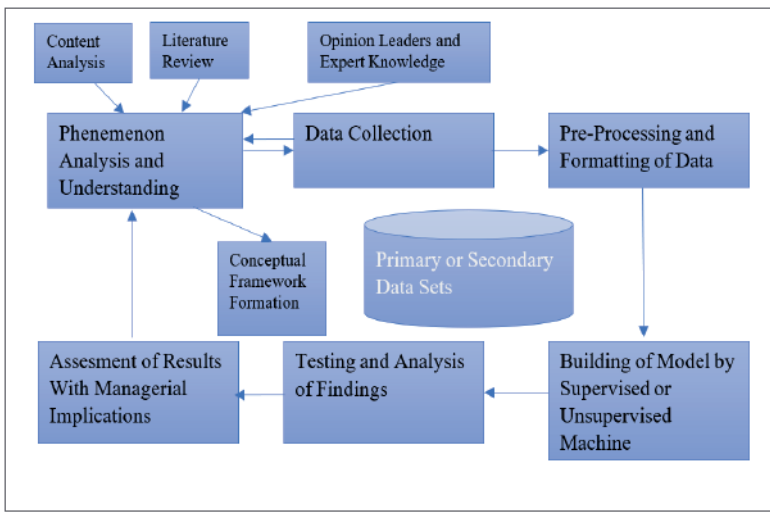

Figure 1. Athena Data Mining Model (Prepared by the Researcher)

In data mining process Athena data mining model has been employed as seen in Figure 1. In this research, several machine learning algorithms have been applied. Among these algorithms, unsupervised machine learning algorithms here assess the instance values and assign these independent values to the respective segment clusters whereas supervised machine learning algorithms mainly focus on mapping the multivariate variables in input layers to class labels in output layers with transformation and mapping functions. Additionally, class-based metrics are evaluated and associated rules are generated in a reinforced fashion some applying forward feeding and backpropagation approaches based on the algorithmic designs and architectures Prediction-focused machine learning functions are also involved in input-output transformation processes which generates the predicted values for the respective variables and attributes Depending on the algorithmic design, algorithmic architecture, complexity of the algorithms these algorithms can generate different results for similar, same or distinct problem For the same dataset with the same parameters performance indicators of the algorithms have been assessed and their results are evaluated. The best performing algorithm for this problem with the respective dataset and parameters has been discovered with the analysis conducted. Knowledge patterns and rules found out have been interpreted and listed. For the supervised machine learning approach, Niagara Falls Model as depicted in Figure 2 is followed. For the unsupervised machine learning approach, Manavgat Falls Model has been employed as depicted in Figure 3. (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

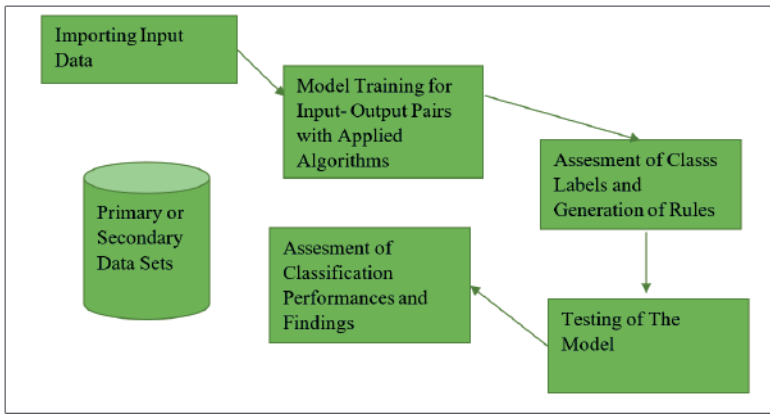

Figure 2. Niagara Falls Machine Learning Flow of Supervised Learning (Prepared by the Researcher)

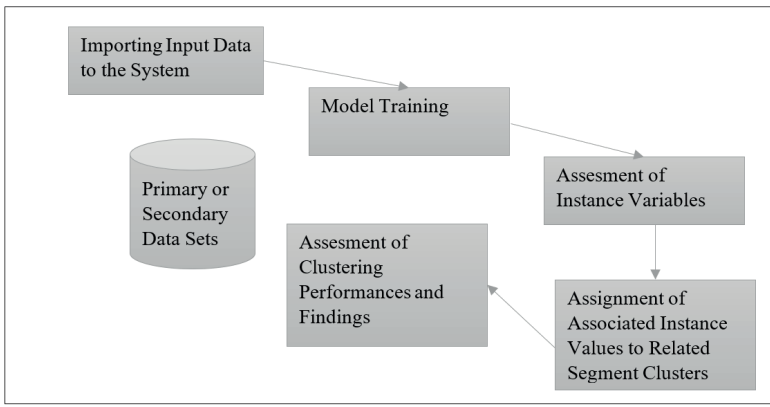

Figure 3. Manavgat Falls Unsupervised Machine Learning Algorithm Flow Composed of Model Building and Testing (Prepared by the Researcher)

DATA GATHERING AND PROCESSING

For the data set and sampling primary data has been used derived from online administered questionares by voluntary participants, 66 percent of the data has been used to train the model and remaining part of the data has been used for testing

(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Table 1. List of Variables Used in Analysis

Variable Name	**Variable**
Age	Nominal (Categorical)
Sex	Nominal (Categorical)
Making Sex Status Indicator	Nominal (Categorical)
Perceived Importance of Sex	Numerical
importance of partner's education	Nominal (Categorical)
importance of social status of partner	Numerical
importance of social status of partner	Nominal (Categorical)
Younger Partner Preference Status Indicator	Nominal (Categorical)
DemandedSex Frequency	Nominal (Categorical)
Intention of Having Sex	Nominal (Categorical)
Older Partner Preference Status Indicator	Numerical
Demanded Relationship Status	Nominal (Categorical)
Sex Status	Nominal (Categorical)
Vaginal Sex	Numerical
Oral Sex	Numerical
Anal Sex	Numerical
Rimming	Numerical
Pegging	Numerical
Dominancy Status Indicator	Numerical

FINDINGS

In data mining analysis, the rules of the association, predictive knowledge with insights have been discovered using classification and clustering algorithms for the relevant domain and problem set. In these approaches, the input-output mapping functions are used to create association rules that correspond to the outer layer projection from inner layers. In some, feed-forward and

backward propagation techniques have been applied. The relevant rules with the lowest error rate have been presented as the main rules discovered with the analysis conducted (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Many data mining processes today employ a technical approach to supervised learning in which independent or multivariate indicators and variables are assigned to output class labels using mapping functions. In unsupervised versions of data mining and machine learning, the fundamental values of each group (focal points, centroids) are calculated, the sample and the corresponding characteristic values are assigned to the respective groups in order to maximize convergence and minimize differences in the same group while divergence is expected among members of different groups. In the supervised and unsupervised machine learning process, rules are created to improve the exploratory and confirmatory understanding of the phenomenon this context, the Model 1. research design path can offer several advantages in understanding these phenomena and can be a good decision support tool for key business leaders, political leaders, and the society (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

In the applied analysis, the same input load was tested with the same parameters using several algorithms. In the analysis of the University of Waikato's Weka data mining package, which includes supervised and unsupervised machine learning applications have been implemented. Then the key performance indicators of the classifications and clusterings were compared and evaluated.Based on the performance metrics associated with data mining analysis, a high-performing algorithm was selected that can be used for such areas and problem sets to gain additional information and insights. For this, the mean square of the error, accuracy (precision), coefficient of correct classification, and coefficient of misclassification were used. Input Mapped Classifier method has been the top performer with its lowest RMSE and highest classification rates. The rules and performance indicator values

calculated are shown in Tables 2 and 3. (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Table 2. Performance Estimations of Machine Learning Algorithms

Machine Learning Algorithm	Key Performance Indicators			
	RMSE	**Precision**	**% Correctly Classified**	**% Misclassified**
Neural Networks (Multilayer Perceptron) Decision	0.50	0.78	73.33	26.66
Random Tree	0.51	0.78	73.33	26.66
J48	0.42	0.80	80	20
Voted Perceptron	0.44	0.80	80	20
InputMappedClassifier	**0.41**	**0.80**	**80**	**20**

In the analysis part of the study artificial intelligence, machine learning and data mining practices have been applied. Comparison of supervised and unsupervised forms of machine learning has been used in the form of classification and clustering. Later association rules in the form of independent and dependent variables have been generated and analysed. Performances of the algorithms have been compared and a top scorer has been selected by comparing key performance indicators as precision, RMSE and correct classification rate. According to analysis results Random Forest Algorithm has been the top performing classification technique among other classification forms of machine learning with RMSE, precision and correct classification rates as key performance indicators.

Table 3. Analysis Results

I.	If gender is male then statement "I have had a sexual relationship in the last few months" is true whereas if gender is female then statement "I have had a sexual relationship in the last few months" is false
II.	If gender is female then importance of sex is 5 if gender is male then importance of sex is 3.8
III.	If gender is female then importance of partner's education is 5 if gender is male then importance of partner's educatio is 3.75
IV.	If gender is female then importance of social status of partner is 3.3 if gender is male then importance of social status of partner is 5
V.	If gender is female then importance of income of partner is 2 if gender is male then importance of social status of importance of income of partner is 3.38
VI.	Male prefers younger partners whereas female prefers younger partners not
VII.	Demanded sex frequency per week for man is 3-5 whereas for women below 3
VIII.	For male "older partner is not an issue for me" is 2.33 whereas for female "older partner is not an issue for me" is 4.66
IX.	If gender is female "intention of having sex in the upcoming months" is no whereas If gender is male "intention of having sex in the upcoming months" is true
X.	If age is between 30-40 and gender is male then the individual looks for a relationship and dating If age is between 30-40 and gender is female then the individual looks for a **ck buddy If age is between 21-25 then then individual looks for a relationship with sex If age is between 40-50 then the individual looks for a sexual relationship If age is between 25-30 then the individual looks for relationship and dating
XI.	If age is between 30-40 then vaginal sex demand is 3.8 if age is between 21-25 then vaginal sex demand is 5
XII.	If gender is female anal sex demand is disagreed if If gender is male anal sex demand is agreed
XIII.	If gender is female oral sex demand is 2.8 if If gender is male oral sex demand is 5

XIV.	If age is between 30-40 then oral sex demand is 5 if age is between 25-30 then oral sex demand is 2.8
XV.	Female prefers hardcore sex whereas men prefers both hardcore and softcore sex
XVI.	If gender is female rimming demand is 2.33 if If gender is male oral sex demand is 3.58
XVII.	If gender is female pegging demand is 3.6 if If gender is male pegging demand is 1.1
XVIII.	If age is between 21-25 then individual wants to be dominant with a score of 3.8 in a sexual relationship If age is between 30-40 then individual wants to be dominant with a score of 1in a sexual relationship
XIX.	If gender is male then individual wants to be dominant with a score of 3.5 in a sexual relationship If gender is female then individual wants to be dominant with a score of 3.33 in a sexual relationship
XX.	If age is between 30-40 then individual wants to be dominant in a relationship with a score of 3 and below If age is between 21-25 then individual wants to be dominant in a relationship with a score of 3 and above
XXI.	If gender is male then individual wants to be dominant with a score of 3.18 in a relationship If gender is female then individual wants to be dominant with a score of 1.25 in a relationship

If gender is male then statement "I have had a sexual relationship in the last few months" is true whereas if gender is female then statement "I have had a sexual relationship in the last few months" is false. If gender is female then importance of sex is 5 if gender is male then importance of sex is 3.8. If gender is female then importance of partner's education is 5 if gender is male then importance of partner's educatio is 3.75. If gender is female then importance of social status of partner is 3.3 if gender is male then importance of social status of partner is 5. If gender is female then importance of income of partner is 2 if gender is male then importance of social status of importance of income of partner is 3.38. Male prefers younger partners whereas female prefers younger partners not. Demanded sex frequency per week for man is 3-5 whereas for women below 3. For male "older partner is

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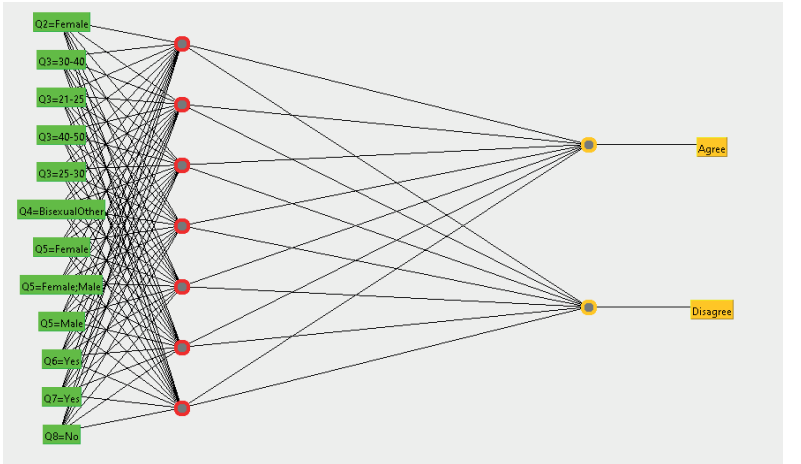

Figure 4. A Neural Network View of the Generated Model With Neural Networks

In the analysis performance measures and indicators have been chosen as suggested in the literature. It is further concluded that supervised and unsupervised machine learning algorithms, also known as classification and clustering techniques in the data mining literature, can be used as effective and efficient tools for the discovery of meaningful knowledge and insights. Confirmation and exploration of knowledge and insights are possible with data mining flows as in Athena data mining model. Processing times can vary based on the input loads, algorithmic design, architecture, and performance of the algorithm which can be evaluated with approximation approaches by using metrics such as Big O or Big Ω which can also be used to assess the efficiency and the complexity of these calculations (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

DISCUSSION AND CONCLUSION

During the life times of human beings some tendencies and behaviors occur and develop based on some set of factors. As mentioned in literature these can be subjective norms, group norms,

group influence, positive anticipated emotions, negative anticipated emotions, genetic factors, hormonal levels, environment, societal context, social identity, several predispositions, tendencies, perceived behavioral control, societal pressure, family pressure, outcome expectations, trust, intention, culture, social class, past experiences, income, gender, age, life cycle stage, occupation, lifestyle, motivation, perception, beliefs ,personality, economic circumstances and attitudes.Based on these factors tendencies, behaviors and habits are formed in human beings. This not so much different when it comes to sexual tendencies, habits and behaviors. Understanding sexual behaviors, tendencies and their relationship with factors behind it can be helpfull in enhancing exploratory understanding in this research phenomena. In this research supervised and unsupervised forms of machine learning have been applied in order to engage in exploratory understanding and knowledge discovery.

Research findings suggest that, if gender is male then statement "I have had a sexual relationship in the last few months" is true whereas if gender is female then statement "I have had a sexual relationship in the last few months" is false. If gender is female then importance of sex is 5 if gender is male then importance of sex is 3.8. If gender is female then importance of partner's education is 5 if gender is male then importance of partner's educatio is 3.75. If gender is female then importance of social status of partner is 3.3 if gender is male then importance of social status of partner is 5. If gender is female then importance of income of partner is 2 if gender is male then importance of social status of importance of income of partner is 3.38. Male prefers younger partners whereas female prefers younger partners not. Demanded sex frequency per week for man is 3-5 whereas for women below 3. For male "older partner is not an issue for me" is 2.33 whereas for female "older partner is not an issue for me" is 4.66 . If gender is female "intention of having sex in the upcoming months" is no whereas If gender is male "intention of having sex in the upcoming months" is true. If age is between 30-40 and gender is male then the individual looks for a relationship and dating. If age is between 30-40 and gender is female then the

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In the analysis performance measures and indicators have been chosen as suggested in the literature. Among the classification methods applied Input mapped classifier has been the top scorer with its RMSE, Precision and correct classification rates. It is further concluded that supervised and unsupervised machine learning algorithms, also known as classification and clustering techniques in the data mining literature, can be used as effective and efficient tools for the discovery of meaningful knowledge and insights for such problem domains in other to enhance exploratory understanding.

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CHAPTER 4

A Machine Learning, Artificial Intelligence and Data Mining Approach in Examining Fertility Rates

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INTRODUCTION

All living beings, especially homo sapiens, go through a process of developmental change and transformation in line with the conditions they find in them. The main determining power of this process is undoubtedly the economic power. In this context, the fertility rate, most importantly, healthy birth and the future of both the one who gives birth and the one who is born after birth is largely indexed to the economic power one has. An individual's quality of life is determined primarily by health, housing and socioeconomic conditions. This also has an impact on population growth and fertility rate. On the other hand, physical and psychological

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changes are exposed to various effects that can impair fertility and threaten health throughout human life. These include, first of all, environmental and luxury toxins and various general diseases that disrupt the hormonal balance of themselves or drug therapy. Of course, age also plays a very important role here. Whether and to what extent external factors reduce a woman's or a man's fertility often cannot be definitively clarified in individual cases. Especially because some people live very unhealthy and are still fertile, while others take care of their health and face their fertility decline. A combination of different factors is often the determining factor for fertility disorders. If a person's fertility has already decreased for other reasons, external influences can lead to complete infertility. Conversely, limited fertility can improve under certain conditions by avoiding certain stresses. In this study, fertility factors and rates are examined by data mining method.

THE EFFECT OF ECONOMIC CIRCUMSTANCE AND QUALITY OF LIFE ON FERTILITY

Health is the head of everything. This is not only a metaphor, but also a basic condition for a sustainable and worth living life. As a matter of fact, after the corona epidemic, health expenditures increased on a global basis. Because the health sector has been the only institution that provides intensive service without interruption during the corona crisis. In this way, the place of health in human life has been better understood in terms of both the individual and the society (Zırhlıoğlu, 2007).

Being healthy is not only important for the individual's well-being and quality of life on a micro basis. Being healthy is also an indispensable basic requirement for social peace and welfare in macro terms. As a matter of fact, according to research conducted so far, when developed countries have healthier populations, their economic growth is more stable. Thus, it is seen that there is a connection between the health status of people and the economic performance of a society.

Acemoglu and Johnson (2007), according to their research, has the effect of health, represented by life expectancy at birth, on economic growth. According to this research, from the 1940s onwards, international health interventions have achieved improvements in life expectancy through more effective public health measures and the introduction of new chemicals and drugs. According to the results of the study, advances in the field of health have led to the prevention and treatment of many diseases on a global basis and have led to great decreases in mortality rates.

Most importantly, developments in the field of medicine have led not only to success in treatment processes, but also to many positive developments in infertility treatment and healthy birth. These positive developments have increased the fertility of individuals who want to have children. In this respect, both sperm and egg health are increased, and those who want to have children are also supported by innovations such as in vitro fertilization (Ricklefs, 1993).

RESEARCH METHOD

Data Mining techniques, which is considered to be a sub-part of artificial intelligence, are mainly composed of supervised and unsupervised forms of machine learning. In this case classification and regression are two forms of supervised learning whereas association and clustering are examples to unsupervised learning. In classification form of supervised learning the interpretations are handled based on input and output labes where dependent classification variables are pre-labeled whereas in unsupervised learning interpretation is merely done based on input data only without any pre-labeling process. In the regression form of supervised learning a relation between indipendent variables and dependent variables are seeked. Respective influence of the indipendent variables on the dependent variable is calculated by finding the slopes which is equal to the tangent value at that point. In clustering approach while similarities and convergence for the in group variable values are aimed to be maximized, a divergence

from out group member values for other segments and clusters are applied. In association form of unsupervised learning associative relations for several situations and categories are tried to be discovered within the data sets. Both supervised and unsupervised machine learning forms employ several techniques composed of statistics, mathematics and heuristics. In todays world data mining driven research methods are frequently used in several research domains and research topics in medical science, marketing, political science, public and cultural studies as a research method. It is also an important field itself in the scientific body of knowledge and literatures of computer science and quantitative research with its several techniques and algorithms that it employs (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

The data mining approach can be viewed as a systematic and structured investigative process that focuses on situation analysis, data collection, model building, and model testing. The ideas and insights uncovered from these analyses can be used as a starting point for decision-making by leaders, the scientific community, and society as a whole. Machine learning technique, which is a famous approach in quantitative research methodologies based on data mining, is a form of machine learning. The use of machine learning from data mining can provide an exploratory and confirmatory understanding of the phenomena in question and can provide in-depth insight and uwnderstanding with the option of knowledge discovery, prediction, or forecasting that it offers (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

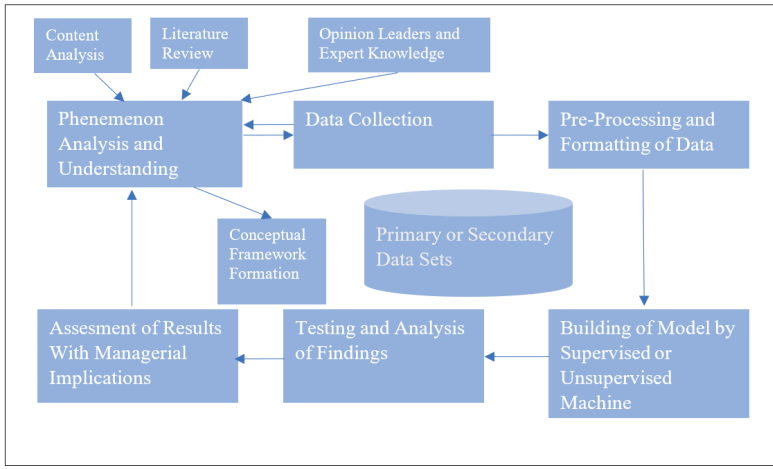

Figure 1. Athena Data Mining Model (Prepared by the Researcher)

In data mining process Athena data mining model has been employed as seen in Figure 1. In this research, several machine learning algorithms have been applied. Among these algorithms, unsupervised machine learning algorithms here assess the instance values and assign these independent values to the respective segment clusters whereas supervised machine learning algorithms mainly focus on mapping the multivariate variables in input layers to class labels in output layers with transformation and mapping functions. Additionally, class-based metrics are evaluated and associated rules are generated in a reinforced fashion some applying forward feeding and backpropagation approaches based on the algorithmic designs and architectures Prediction-focused machine learning functions are also involved in input-output transformation processes which generates the predicted values for the respective variables and attributes Depending on the algorithmic design, algorithmic architecture, complexity of the algorithms these algorithms can generate different results for similar, same or distinct problem For the same dataset with the same parameters performance indicators of the algorithms have been assessed and their results are

evaluated. The best performing algorithm for this problem with the respective dataset and parameters has been discovered with the analysis conducted. Knowledge patterns and rules found out have been interpreted and listed. For the supervised machine learning approach, Niagara Falls Model as depicted in Figure 2 is followed. For the unsupervised machine learning approach, Manavgat Falls Model has been employed as depicted in Figure 3. (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

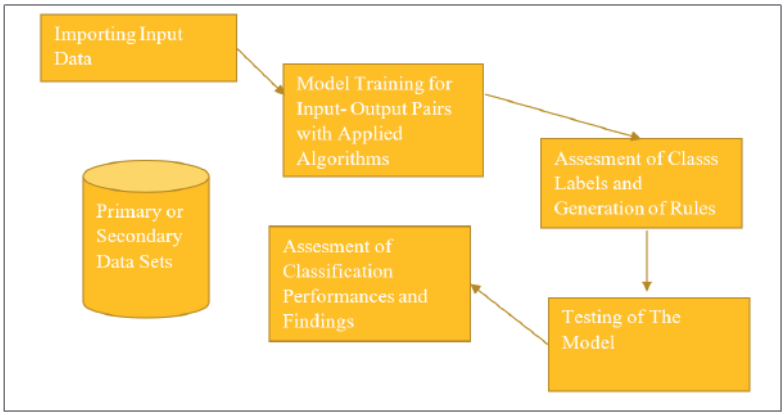

Figure 2. Niagara Falls Machine Learning Flow of Supervised Learning (Prepared by the Researcher)

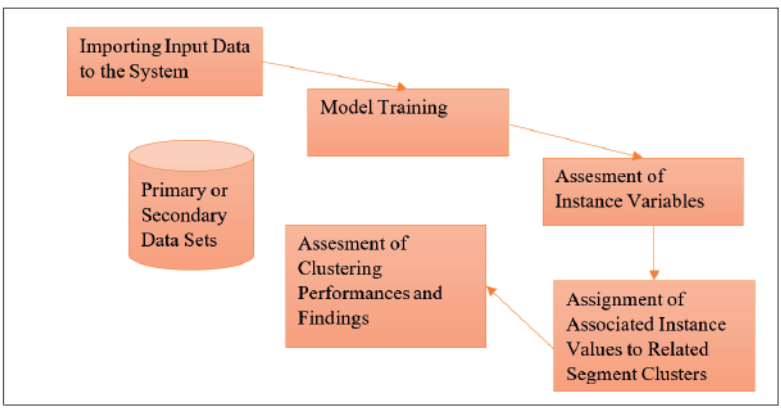

Figure 3. Manavgat Falls Unsupervised Machine Learning Algorithm Flow Composed of Model Building and Testing (Prepared by the Researcher)

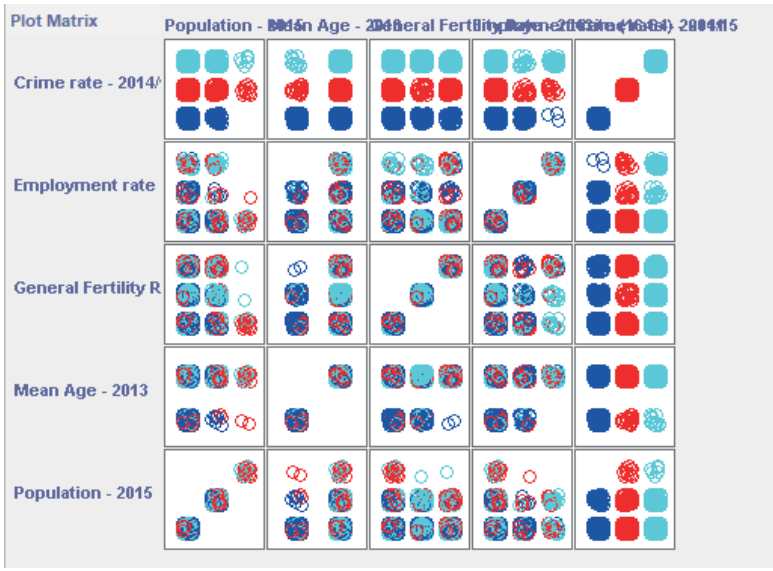

Figure 4 Overview of Crime Rate, Employment Rate, Population Rate , General Fertility Rate

DATA GATHERING AND PROCESSING

For the data set and sampling secondary data has been used from US Department of Labor. In model training and testing, 66 percent of the data has been used to train the model and remaining part of the data has been used for testing.. In this way a solution for the research question "What are the leading indicators of General Fertility Rate in Female" Some of the main hypothesis tested as follow. (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Table 1a. Main Hypothesis of the research

h1: Employment Rate has influence on General Fertility Rate	**Accepted**
h2: Population Rate has influence on General Fertility Rate	**Accepted**
h3: Crime Rate has influence on General Fertility Rate	**Accepted**
h4: Age Mean has influence on General Fertility Rate	**Accepted**

Table 1b. List of Variables Used in Analysis

Variable Name	**Variable**
Employment Rate	Nominal (Categorical)
Crime Rate	Nominal (Categorical)
Age Mean	Nominal (Categorical)
General Fertility Rate	Nominal (Categorical)

FINDINGS

In data mining analysis, the rules of the association, predictive knowledge with insights have been discovered using classification and clustering algorithms for the relevant domain and problem set. In these approaches, the input-output mapping functions are used to create association rules that correspond to the outer layer projection from inner layers. In some, feed-forward and backward propagation techniques have been applied. The relevant rules with the lowest error rate have been presented as the main rules discovered with the analysis conducted (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Many data mining processes today employ a technical approach to supervised learning in which independent or multivariate indicators and variables are assigned to output class labels using mapping functions. In unsupervised versions of data mining and machine learning, the fundamental values of each group (focal points, centroids) are calculated, the sample and the corresponding characteristic values are assigned to the respective groups in order to

maximize convergence and minimize differences in the same group while divergence is expected among members of different groups. In the supervised and unsupervised machine learning process, rules are created to improve the exploratory and confirmatory understanding of the phenomenon this context, the Model 1. research design path can offer several advantages in understanding these phenomena and can be a good decision support tool for key business leaders, political leaders, and the society (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

In the applied analysis, the same input load was tested with the same parameters using several algorithms. In the analysis of the University of Waikato's Weka data mining package, which includes supervised and unsupervised machine learning applications have been implemented. Then the key performance indicators of the classifications and clusterings were compared and evaluated. During the General Fertility Rate. Based on the performance metrics associated with data mining analysis, a high-performing algorithm was selected that can be used for such areas and problem sets to gain additional information and insights. For this, the mean square of the error, accuracy (precision), coefficient of correct classification, and coefficient of misclassification were used (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022). The rules and performance indicator values calculated are shown in Tables 2 and 3. The maing findings and performances of the algorithms were given in the Table 3.

Table 2. Performance Estimations of Machine Learning Algorithms

Machine Learning Algorithm	Key Performance Indicators			
	RMSE	Precision	% Correctly Classified	% Misclassified
Vote	0.33	N/A	80	19.19
Random Subspace	0.33	N/A	80	19.19
Naive Bayes Updatable	0.32	N/A	80	19.19
Multilayer Perceptron	0.32	N/A	80	19.19
Random Tree	0.32	N/A	80	19.16

Table 3. Association Rules Generated by Supervised and Unsupervised Machine Learning Algorithms

Table 3. Predicted and Discovered Rules of Data Mining Algorithms

I.	Cluster analysis revealed that low employment rates lead to low fertility rates in women whereas higher employment rates are associated with more female fertility rates
II.	Low population rates lead to higher fertility rates in women whereas lower population rates are associated with more female fertility rates
III.	Locations with higher levels of crime are associated with lower levels of fertility whereas locations with lower levels of crime rates are associated with higher levels of general fertility
IV.	In post young category there exists both low and moderate fertility rates whereas in young category there exists low, moderate and high fertility rates together

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with higher levels of general fertility. In post young category there exists both low and moderate fertility rates whereas in young category there exists low, moderate and high fertility rates togetherNeural network view of the research model can be seen in figure 7.

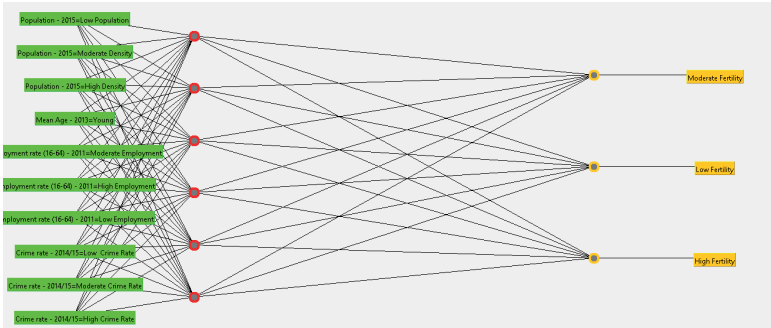

Figure 7. A Neural Network Cross Sectional View of the Generated Model (Multilayer Perceptron: Fertility Rate is the Dependent Variable)

In the analysis performance measures and indicators have been chosen as suggested in the literature. It is further concluded that supervised and unsupervised machine learning algorithms, also known as classification and clustering techniques in the data mining literature, can be used as effective and efficient tools for the discovery of meaningful knowledge and insights. Confirmation and exploration of knowledge and insights are possible with data mining flows as in Athena data mining model. These ideas can be taken into account by policy-makers and society at large in such areas and in a similar set of issues. Processing times can vary based on the input loads, algorithmic design, architecture, and performance of the algorithm which can be evaluated with approximation approaches by using metrics such as Big O or Big Ω which can also be used to assess the efficiency and the complexity of these calculations (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

DISCUSSION AND CONCLUSION

Data Mining is a quantitative research method that employs several analysis algorithms and techniques. It is viewed as a systematic and structured investigative process that focuses on situation analysis, data collection, model building, and model testing. The ideas and insights uncovered from these analyses can be used as a starting point for decision-making by leaders, the scientific community, and society as a whole. Machine learning technique, which is a famous approach in quantitative research methodologies based on data mining, is a form of machine learning. The use of machine learning from data mining can provide an exploratory and confirmatory understanding of the phenomena in question and can provide in-depth insight and uwnderstanding with the option of knowledge discovery, prediction, or forecasting that it offers (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

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CHAPTER 5

Artificial Intelligence and Data Mining Analysis of Employee's Job Satisfaction Status with Expectations from Employer and Career

Dr. Özerk YAVUZ[7]

INTRODUCTION

Human beings usually engage in working life and working in early ages for various reasons such as earning the funds to sustain their lives, built and sustain their families, to earn the necessary funds to satisfy their needs in the form of goods and services, make their hobbies and continue their lives. Some people are lucky enough to hit the jackpot or get a good fortune from their enterpreneurship success stories or heritage that they derived from their ancestors. This lucky group may have a flexibility in working and working hours however they still may require to work in order to built their self esteem and self actualization needs as suggested by Maslow. However general wisdom and many researches indicate

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that an average person spends more than half of his day and life for his/her work and work related activities. She/He engages in commitment and dedication in many cases sacrificing from his/her private life or private time where he or she can expect to spend with their friends, families or peers or on hobbies that they like the most. Therefore in such a commitment and dedication from their personal lives generally employees engage in expectations from these commitments such as high salaries, bonuses, reward programmes, company stocks, annual flight tickets, holiday packages, meal, transportation, accomodation aids,private health insurance, several benefits packages are to name a few. In the end employees dedicate their times that they can spend with the loved ones to their works and tasks, see their bosses maybe more than their family members so these expectations rise in an understandable way. Also many want to see theirselves with a career roadmap full of achievements, success under good leadership with coaching and career planning from their superiors, leaders and managers(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Organizations who are succeding in these items and satisfying their employees are more likely to retain them which are named as the internal customers of an organization. Therefore similar to customer satisfaction policies seen in the B2B or B2C level to retain customers some investment in the employee relations, similar internal customer satisfaction policies which I name it here the internal customers of the organization as might be cited in many resources in literature. In this way the employees can be satisfied from their organizations and works which would lead to the lowering of employee turnovers and increasing the employee retention which many successful organizations strive to achieve for. In this way your organization can have a good brand image in the marketplace many employers admire(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Therefore satisfying the employee needs with several benefits packages and pampering them literally in a way that they expect from the organization can make a positive impact in this context

which may lead to a decrease in employer switching behaviors as well. If the expectations of the employees are satisfied in a superior way than the internal customers what I name employees as cited by the famous Kotler can be delighted similar to traditional customer forms. If the satisfaction would be lower than the expected threshold than employer switching behaviors, lower employee retations and higher employee turnovers arising from this dissatisfaction are likely to occur (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Of course as all businesses aim to reach for a surplasses with high revenues in all their quarter results that point to a good financial performance in many aspects whereas try to avoid deficits and losses which can be perceived as lower financial performances in many mediums and contexts in the business landscape. There is nothing wrong to preserve your organization from banckruptcy however in good quarterly results with good financial performances it should not be forgotten that it's employee's right to ask for more for her/his performances as many prefer to do so. Therefore societal contribution of employeers and organization to foster a good, happy society where work life balance is sustained, neccessary salary funds and budgets with the benefits package that employees deserve are dedicated where there is no gender pay gap, modern day slavery or any form of discrimination in the workplace and society at large. So unfortunately as many organizations might do to make up their financial results more appealing for their investors and stakeholders close to the last quarters unneccesary cost cuttings or lay offs should be avoided if it is not mandatory and does not make a huge impact. In the end societal responsibillity, corporate responsibility of organizations and a more green world target of the business world should not be forgotten keeping "all employees are using their salaries to live from pay check to pay check, afford their children's, family's or their own needs" in mind. So if there exists a chance to invest more in your employees and the society at large, this should be considered in the first place(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Despite the fact that there are too many macro and micro variables that have influence in the recessions generally decrease in governmental spending and lowering budgets with layoffs and cost cutting means less consumer confidence which would likely to lead to less consumer spending and shrink of economy which would likely to result more layoffs of organizations for balancing debts and credits in their ledgers arising from lowered revenues and lowered debt-credit or revenue/cost ratio. This may lead to a domino effect both in local and global economies and result short term recessions to long term recessions and global economical crises in a more broader landscape. This means sometimes a cumulative greedy approach following excessive cost cutting and layoffs may lead to a more broader recession and economical crises even in a global level. Recession means shrinking in economical activities in two consecutive quarters which is highly triggered by low spending of customers by various reasons as lay offs or loosing customer confidence. Interestingly in order to break the deadlock of recession governments may require to re-increase liquidity by printing M1/M2 or re-increase governmental spending and pumping cash to the system to make it working while preserving their surplass statuses in many cases for more sustainability. In this context less budget cuts both governmentally in G2B, G2C or in the business landscape in B2B or B2C transactions mean more payrolls more jobs which can lead to more consumer spending and hiring of other employeers based on other organization's increased revenues and better financial standings in the business landscape. Profits can also be increased not only by unnecessary cost cutting, dedicating 10 men jobs to 1 individual and creating modern day slavery settings but also by being a good brand which has a good image in the market place which increases its sales revenue by delivering superior value to its customers. A simple worker problem states that if a worker completes a work in one day two workers can complete the same task in half day. So more smart, targeted, achieveble and result oriented key performance indicators can be more ethical in assesing the performance of

employees. Organizations should also think strategically and plan their budgets for human and other resources without sacrificing from employee rights, human rights and labour law. As mentioned which means more employee satisfaction, employee retention, lower employee turnover,less employer switching behavior and a better image in the marketplace among competitors and other market actors (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

In this research Artificial Intelligence and Data Mining Analysis of Employee's Job Satisfaction Status with Expectations from Employer and Career has been conducted. In the analysis both classification and clustering approaches in supervised and unsupervised machine learning applied with the aim of providing insights, exploratory and confirmatory understanding for todays and tomorrow's business leaders, political leaders, employers, scholars, practioners and other stakeholders who have interest in this research domain(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

RESEARCH METHOD

Today organizations heavily invest in artificial intelligence and analytical systems in order to gain competitive advantage from predictive knowledge and insights driven by data and data sources. Therefore, machine learning, data mining, artificial intelligence and deep learning techniques and concepts gained interest and popularity from business and politics stakeholders. Research budgets dedicated to these innovations therefore gained momentum during the past few years. If we look at these technologies in a more detailed way, we see that the data mining approach can be viewed as a systematic and structured investigative process that focuses on situation analysis, data collection, model building, and model testing. The ideas and insights uncovered from these analyses can be used as a starting point for decision-making by leaders, the scientific community, and society as a whole. Machine learning technique, which is a famous approach

in quantitative research methodologies based on data mining, is a form of machine learning. The use of machine learning from data mining can provide an exploratory and confirmatory understanding of the phenomena in question and can provide in-depth insight and uwnderstanding with the option of knowledge discovery, prediction, or forecasting that it offers (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Data Mining techniques, which is considered to be a sub-part of artificial intelligence, are mainly composed of supervised and unsupervised forms of machine learning. In this case classification and regression are two forms of supervised learning whereas association and clustering are examples to unsupervised learning. In classification form of supervised learning the interpretations are handled based on input and output labes where dependent classification variables are pre-labeled whereas in unsupervised learning interpretation is merely done based on input data only without any pre-labeling process. In the regression form of supervised learning a relation between indipendent variables and dependent variables are seeked. Respective influence of the indipendent variables on the dependent variable is calculated by finding the slopes which is equal to the tangent value at that point. In clustering approach while similarities and convergence for the in group variable values are aimed to be maximized, a divergence from out group member values for other segments and clusters are applied. In association form of unsupervised learning associative relations for several situations and categories are tried to be discovered within the data sets. Both supervised and unsupervised machine learning forms employ several techniques composed of statistics, mathematics and heuristics. In todays world data mining driven research methods are frequently used in several research domains and research topics in medical science, marketing, political science, public and cultural studies as a research method. It is also an important field itself in the scientific body of knowledge and literatures of computer science and quantitative research with its several techniques and algorithms that it employs

(Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

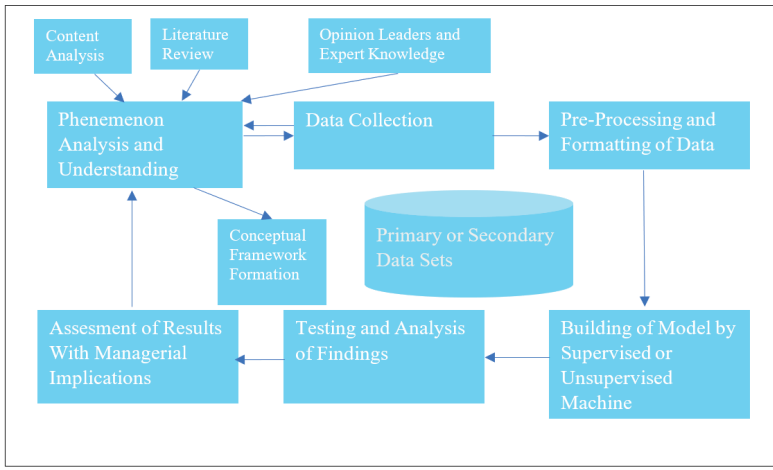

Figure 1. Athena Data Mining Model (Prepared by the Researcher)

In data mining process Athena data mining model has been employed as seen in Figure 1. In this research, several machine learning algorithms have been applied. Among these algorithms, unsupervised machine learning algorithms here assess the instance values and assign these independent values to the respective segment clusters whereas supervised machine learning algorithms mainly focus on mapping the multivariate variables in input layers to class labels in output layers with transformation and mapping functions. Additionally, class-based metrics are evaluated and associated rules are generated in a reinforced fashion some applying forward feeding and backpropagation approaches based on the algorithmic designs and architectures Prediction-focused machine learning functions are also involved in input-output transformation processes which generates the predicted values for the respective variables and attributes Depending on the algorithmic design, algorithmic architecture, complexity of

the algorithms these algorithms can generate different results for similar, same or distinct problem For the same dataset with the same parameters performance indicators of the algorithms have been assessed and their results are evaluated. The best performing algorithm for this problem with the respective dataset and parameters has been discovered with the analysis conducted. Knowledge patterns and rules found out have been interpreted and listed. For the supervised machine learning approach, Niagara Falls Model as depicted in Figure 2 is followed. For the unsupervised machine learning approach, Manavgat Falls Model has been employed as depicted in Figure 3. (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

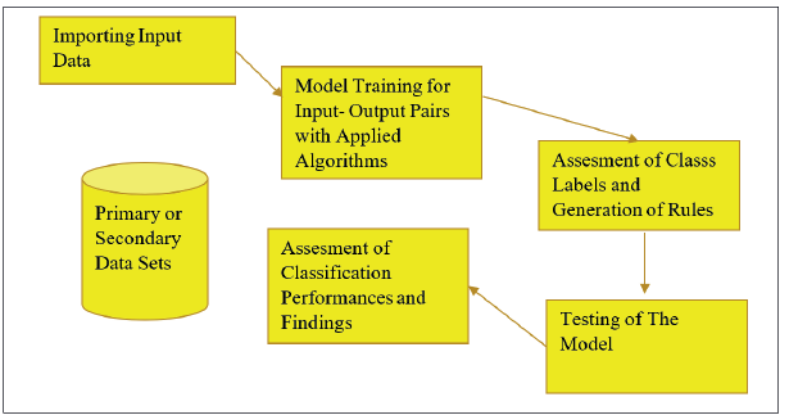

Figure 2. Niagara Falls Machine Learning Flow of Supervised Learning (Prepared by the Researcher)

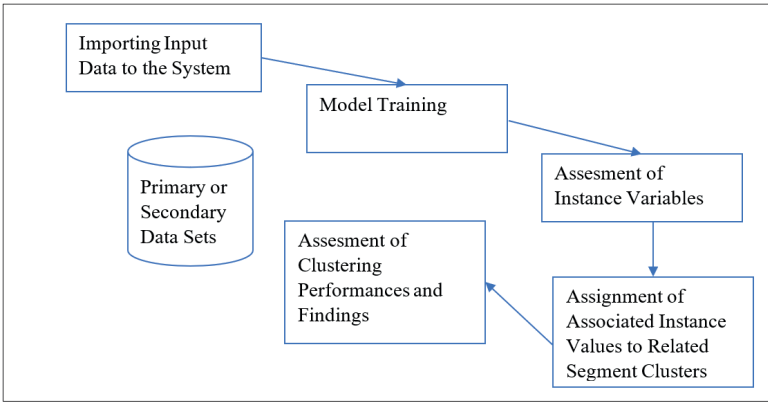

Figure 3. Manavgat Falls Unsupervised Machine Learning Algorithm Flow Composed of Model Building and Testing (Prepared by the Researcher)

DATA GATHERING AND PROCESSING

For the data set and sampling primary data has been used derived from online administered questionares by voluntary participants, 66 percent of the data has been used to train the model and remaining part of the data has been used for testing (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Table 1. List of Variables Used in Analysis

Variable Name	Variable
Gender	Nominal (Categorical)
Age	Nominal (Categorical)
Education Level	Nominal (Categorical)
Demanded Income	Nominal (Categorical)
Perceived Work Difficulty	Nominal (Categorical)
Accommodation, Road, Food Help demand Status	Nominal (Categorical)
Annual flight ticket demand Status	Nominal (Categorical)
Holiday cheque demand Status	Nominal (Categorical)
Demanded Future Position	Nominal (Categorical)
Scare of Unemployment Status Indicator	Nominal (Categorical)
Work Satisfaction Level Indicator	Nominal (Categorical)

FINDINGS

In data mining analysis, the rules of the association, predictive knowledge with insights have been discovered using classification and clustering algorithms for the relevant domain and problem set. In these approaches, the input-output mapping functions are used to create association rules that correspond to the outer layer projection from inner layers. In some, feed-forward and backward propagation techniques have been applied. The relevant rules with the lowest error rate have been presented as the main rules discovered with the analysis conducted (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Many data mining processes today employ a technical approach to supervised learning in which independent or multivariate indicators and variables are assigned to output class labels using mapping functions. In unsupervised versions of data mining and machine learning, the fundamental values of each group (focal points, centroids) are calculated, the sample and the corresponding characteristic values are assigned to the respective groups in order to maximize convergence and minimize differences in the same group while divergence is expected among members of different groups. In the supervised and unsupervised machine learning process, rules are created to improve the exploratory and confirmatory understanding of the phenomenon this context, the Model 1. research design path can offer several advantages in understanding these phenomena and can be a good decision support tool for key business leaders, political leaders, and the society (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

In the applied analysis, the same input load was tested with the same parameters using several algorithms. In the analysis of the University of Waikato's Weka data mining package, which includes supervised and unsupervised machine learning applications have been implemented. Then the key performance indicators of the classifications and clusterings were compared and evaluated.Based

on the performance metrics associated with data mining analysis, a high-performing algorithm was selected that can be used for such areas and problem sets to gain additional information and insights. For this, the mean square of the error, accuracy (precision), coefficient of correct classification, and coefficient of misclassification were used.Neural Networks method has been the top performer with its lowest RMSE and highest classification rates. The rules and performance indicator values calculated are shown in Tables 2 and 3. (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

Table 2. Performance Estimations of Machine Learning Algorithms

Machine Learning Algorithm	**Key Performance Indicators**			
	RMSE	**Precision**	**% Correctly Classified**	**% Misclassified**
Neural Networks (Multilayer Perceptron)	0.19	1	100	0
J48	0.33	1	100	0
Random Tree	0.23	1	100	0
JRip	0.33	1	100	0
PART	0.33	1	100	0

Table 3. Association Rules Generated by Supervised and Unsupervised Machine Learning Algorithms

I.	If demanded position in the future is high level executive than I am happy at my work, If demanded position in the future is president of a country than I am satisfied at my work, If demanded position in the future is Hollywood Star than I enjoy my work
II.	If demanded position in the future is high level executive than university graduate, If demanded position in the future is president of a country than high school graduate, If demanded position in the future is Hollywood Star than having a master degree
III.	If perceived work difficulty is exhausting than women, if perceived work difficulty is heavy(too much) or pleasent than men
IV.	If job satisfaction indicator is I enjoy than gender is women, If job satisfaction indicator is I am happy than men
V.	If demanded income is between 5000-10000 USD than women, if demanded income is below 1000 USD than men, if demanded income is open cheque than men
VI.	If education level is high school, university or master then expected income is 5000-10000 USD. If education level is Doctorate then expected income is open cheque.
VII.	Both female and male groups demand holiday check from the employer
VIII.	If age is between 35-50 then demanded future career is presidentship if age is 60 and above demanded career is being executive
IX.	If age is between 35-50 then there is a scare of being unemployed if age is above 60 then there is not a scare of being unemployed
X.	If gender is male then there is a scare of being unemployed if gender is female then there is not a scare of being unemployed
XI.	In the sampling If education status is university or doctorate then men, if education status is high school or master degree than women
XII.	Accommodation, Road, Food Help demanders, annual flight ticket demanders and holiday cheque demanders are in the same cluster with the female group whereas Accommodation, Road, Food Help demanders, no annual flight ticket demand and no holiday cheque demand are in the same cluster with male group

Cluster analysis revealed that If demanded position in the future is high level executive than I am happy at my work, If demanded position in the future is president of a country than I am satisfied at my work, If demanded position in the future is Hollywood Star than I enjoy my work.If demanded position in the future is high level executive than university graduate,If demanded position in the future is president of a country than high school graduate, If demanded position in the future is Hollywood Star than having a master degree. If perceived work difficulty is exhausting than women, if perceived work difficulty is heavy(too much) or pleasent than men. If job satisfaction indicator is I enjoy than gender is women, If job satisfaction indicator is I am happy than men. If demanded income is between 5000-10000 USD than women, if demanded income is below 1000 USD than men, if demanded income is open cheque than men. If education level is high school, university or master then expected income is 5000-10000 USD. If education level is Doctorate then expected income is open cheque. Both female and male groups demand holiday check from the employer. In the sampling If education status is university or doctorate then men, if education status is high school or master degree than women. Accommodation, Road, Food Help demanders, annual flight ticket demanders and holiday cheque demanders are in the same cluster with the female group whereas Accommodation, Road, Food Help demanders, no annual flight ticket demand and no holiday cheque demand are in the same cluster with male. If age is between 35-50 then demanded future career is presidentship if age is 60 and above demanded career is being executive. If age is between 35-50 then there is a scare of being unemployed if age is above 60 then there is not a scare of being unemployed. If gender is male then there is a scare of being unemployed if gender is female then there is not a scare of being unemployed

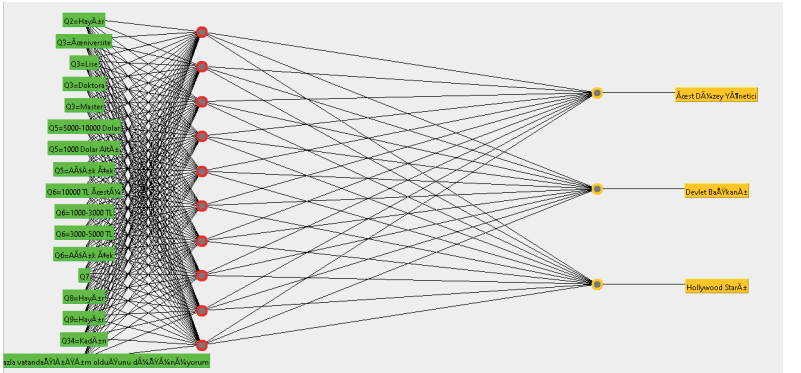

Figure 4. A Neural Network Cross Sectional View of the Generated Model (Multilayer Perceptron: Demanded Future Career is the Dependent Variable)

In the analysis performance measures and indicators have been chosen as suggested in the literature. It is further concluded that supervised and unsupervised machine learning algorithms, also known as classification and clustering techniques in the data mining literature, can be used as effective and efficient tools for the discovery of meaningful knowledge and insights. Confirmation and exploration of knowledge and insights are possible with data mining flows as in Athena data mining model. Processing times can vary based on the input loads, algorithmic design, architecture, and performance of the algorithm which can be evaluated with approximation approaches by using metrics such as Big O or Big Ω which can also be used to assess the efficiency and the complexity of these calculations (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

DISCUSSION AND CONCLUSION

In this research Artificial Intelligence and Data Mining Analysis of Employee's Job Satisfaction Status with Expectations from Employer and Career has been conducted. In the analysis both classification and clustering approaches in supervised and

unsupervised machine learning applied with the aim of providing insights, exploratory and confirmatory understanding for todays and tomorrow's business leaders, political leaders, employers, scholars, practioners and other stakeholders who have interest in this research domain.

Understanding employees, factors that have influence in their job satisfaction, expectations from their employers and careers can provide many advantages in many aspects such as lowering high employee turnover, satisfying and retaining employees and minimizing employer switching behavior in the career paths that employees prefer to follow. In this research Artificial Intelligence and Data Mining Analysis of Employee's Job Satisfaction Status with Expectations from Employer and Career has been conducted. In the analysis both classification and clustering approaches in supervised and unsupervised machine learning applied with the aim of providing insights, exploratory and confirmatory understanding for todays and tomorrow's business leaders, political leaders, employers, scholars, practioners and other stakeholders who have interest in this research domain.

Data Mining is a quantitative research method that employs several analysis algorithms and techniques. It is viewed as a systematic and structured investigative process that focuses on situation analysis, data collection, model building, and model testing. The ideas and insights uncovered from these analyses can be used as a starting point for decision-making by leaders, the scientific community, and society as a whole. Machine learning technique, which is a famous approach in quantitative research methodologies based on data mining, is a form of machine learning. The use of machine learning from data mining can provide an exploratory and confirmatory understanding of the phenomena in question and can provide in-depth insight and uwnderstanding with the option of knowledge discovery, prediction, or forecasting that it offers (Yavuz, 2009; Yavuz, 2013, Yavuz, 2018, Yavuz, 2019; Yavuz, 2021; Yavuz, 2022).

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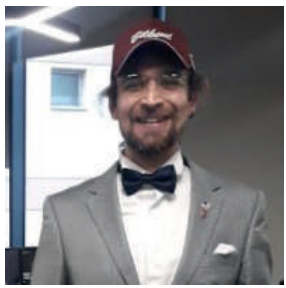

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