Scholar Publishing Group
Nature Environmental Protection
https://doi.org/10.38007/NEP.2022.030402
ISSN 2790-2684 Vol. 3, Issue 4: 13-22

Changing Relationship of Environmental Carrying Capacity of Decision Trees in Nature Conservation Environment

Shiwei Chu*

Forestry College of Beijing Forestry University, Beijing, China

chushiwei2022@bjfu.edu.cn

**corresponding author*

Keywords: Environm Ental Carrying Capacity, Decision Tree, Nature Protection Environment, Multiple Linear Regression Analysis

Abstract: With the increase of vegetation coverage, the decrease of forest landscape, the change of climate conditions, water and soil loss and other reasons, the decision tree and its surrounding vegetation have a significant fluctuation relationship in the changes of environmental carrying capacity and carrying capacity. Based on the change relationship of environmental carrying capacity of decision trees, this paper discusses the influencing factors of decision trees in the natural protection environment, and tests the correlation among the factors by using multiple linear regression analysis. The results show that different individuals have different environmental carrying capacity in different periods. With the increase of deforestation and the aggravation of water and soil loss, the selection of vegetation types has a significant negative impact on the carrying capacity of decision trees in the natural protection environment; With the expansion of vegetation coverage and the aggravation of water and soil loss, the carrying capacity of forest canopy in the natural protection environment shows an upward trend.

1. Introduction

It is very common to destroy the ecological environment in the process of resource development, so corresponding measures should be taken to deal with this phenomenon; However, with the increasing development and utilization of natural resources such as water resources and the increasingly serious environmental damage, people should pay enough attention to this; In addition, when people understand that some natural disasters may also lead to fluctuations in the carrying

Copyright: © 2022 by the authors. This is an Open Access article distributed under the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (https://creativecommons.org/licenses/by/4.0/).

capacity of decision trees in the ecological protection environment, they should also take corresponding measures to deal with them.

Ecotourism is a tourist area where tourists with tourism style take natural and historical and cultural landscapes as the main tourist objects. With the purpose of understanding, appreciating and improving their self-cultivation and ecological protection, it protects the natural and ecological environment, improves the social and economic environment, and makes positive contributions to the tourism industry. Through the analysis of the environmental status quo, Qin Wang preliminarily designed the evaluation index system of the environmental carrying capacity of the new area from the three dimensions of water environment, atmospheric environment and geological environment [1]. Oluwaseun Sharomi proposed a new dynamic economic model, which describes the interaction between physical capital, environmental quality and population dynamics [2]. With the emphasis on environmental protection, the participation of local residents and the development of educational functions around the world, many scenic spots, under the banner of "eco-tourism", have started the development and construction of tourism projects in a hurry, which has led to the deterioration of the environment, making the scale of tourism far beyond the carrying capacity of the ecological environment. Therefore, Mingju Liu proposed that in order to better guide the development of ecotourism, it is of great significance to study the environmental carrying capacity of ecotourism [3]. Therefore, this paper studies the change relationship of ecological carrying capacity of decision trees in the natural protection environment, and provides a theoretical basis for the role of decision trees in the natural protection environment.

This paper analyzes the spatial distribution, spatial pattern and changes in economic development of environmental carrying capacity in the past five years, and discusses the change relationship of environmental carrying capacity of decision trees in the natural protection environment, in order to provide a theoretical basis for the role of decision trees in the natural protection environment. The results show that the decision forest can effectively improve the productivity of vegetation in the natural protection environment, thus providing a good ecological environment and living conditions for human beings in the natural protection environment.

2. Research on the Change Relationship of Environmental Carrying Capacity of Decision Trees in Natural Protection Environment

Ecological environment is the basic condition for human survival and development. The ecosystem service function and biodiversity are of great significance in natural conservation and ecological restoration [4, 5]. Taking the forest ecosystem as an example, it can effectively improve the structure and function of different scales in the terrestrial ecosystem. The community composition system formed by different vegetation types, hierarchical structures and functions in the forest ecosystem is the material basis of ecological service functions. Therefore, exploring the material basis of forest ecosystem service functions is of great significance for in-depth research on the material basis and evolution law of forest ecosystem service functions [6, 7].

In the overall bearing capacity of the natural environment protection environment (LSE), decision trees have become one of the more important factors in the natural environment protection environment because of their advantages in promoting vegetation growth and improving the productivity of the forest ecosystem [8]. Based on the positive role played by decision trees in the natural protection system and the ecological benefits represented by decision trees, it can be considered that decision trees are resources with significant environmental benefits and ecological values. At the same time, different geographical locations and forest land areas provide different uses and different environmental carrying capacities. In the natural environment protection environment, with the urbanization process and the increasing population size, the ecological

environment has undergone tremendous changes. Its overall carrying capacity has increased sharply due to the changes of three characteristics: gradually rich resource endowment, rapid economic development and highly developed urbanization. With the continuous growth of the population and the rapid growth of the population's demand for high-quality resources and good lifestyle, the disorderly expansion of the population and production activities have increasingly increased the impact on the original natural protection environment; On the other hand, the economic construction has posed a threat to human survival due to the pollution of land resources and the environment, which will make the natural environment protection system vulnerable; Ecosystem carrying capacity has become a global forest and biodiversity facing enormous pressure and challenges. Therefore, the analysis of the positive impact of decision trees on the natural protection environment will help to propose targeted solutions for relevant departments [9-10].

2.1. Characteristics of Bearing Capacity of Natural Protection Environment

The analysis of the environmental carrying capacity of natural protection can show that when the environmental carrying capacity changes, its environmental quality shows an obvious trend of change. It can be considered that the change of environmental carrying capacity can reflect the decline trend of environmental quality to a certain extent, but the overall environmental quality has declined in the past decades [11]. This is mainly due to the increase of resources and living standards due to the continuous expansion of population, the increasing demand for resources and the higher requirements for people's living conditions due to climate change. This is especially true for forest resources. With the continuous growth of population and the acceleration of urbanization process, a series of problems have become increasingly prominent, such as the sharp reduction of forest area, serious structural damage, intensified quality degradation, accelerated species degradation, intensified biodiversity loss, and intensified ecosystem degradation, which further increases the various environmental pressures faced in natural protection and social development.

Due to the different natural environment of each region, the bearing capacity of the natural protection environment represented by the decision tree and its various factors is different. Therefore, tree factors and their growth potential should be appropriately selected for different regions as the key to natural conservation and sustainable development [12, 13]. At the same time, with the urbanization process and the increase of population size, serious harm has been caused to natural resources and the environment, and effective protection and management measures must be implemented for these natural environmental protection factors; The different environmental carrying capacity provided by different regions is also caused by the local environment and location. Therefore, it is necessary to strengthen the protection and management measures for these factors, and strengthen supervision and management to promote the decision tree effect to play and effectively promote sustainable socio-economic development.

2.2. Rectification Policy

(1) Strengthen forest management to avoid ecosystem degradation

As it is difficult to achieve effective management results in the short term, many forest resources have been destroyed. Therefore, in order to protect forest resources, scientific management of forest resources must be carried out according to the requirements of forest resources planning and local environmental conditions, so as to achieve rational utilization of forest area and avoid excessive utilization of existing forest land area [14, 15]. Forest management must adhere to scientific principles and means to manage, protect and utilize forest resources. At the same time, adopt scientific and reasonable methods for bioremediation according to different habitats. Bioremediation can effectively solve the problem of forest destruction, increase forest carbon

storage and water conservation, water and soil conservation, and resist wind and sand. In view of the current situation of forest landscape structure and the need for biodiversity protection, the local species should be rationally utilized, and wetland plant protection should be actively carried out to promote the healthy development of wetlands.

(2) Improve soil fertility and ensure healthy growth of vegetation

The formation of forests requires a lot of soil nutrients, mainly from soil microorganisms, plant root activities, mineral nutrients and other substances, so it is necessary to reasonably adjust the soil structure and properties to maintain the growth of trees. The results show that the formation conditions of forest land in the process of forest growth are better than those of farmland and pastoral areas. According to the change law of forest soil nutrients, measures such as artificial promotion of tillage and irrigation can be considered. For example, appropriate planting of grass and other plants can effectively increase the content of organic matter in soil. At the same time, in order to ensure soil fertility, reasonable fertilization can also be carried out, such as deep ploughing and tillage with organic fertilizer and organic fertilizer to increase soil organic matter content and ensure sustainable supply of soil nutrients [16].

(3) Actively develop forestry industry to prevent impacts on natural protected animals

It can be seen from this article that the dependence of nature protected animals on forest resources is getting higher and higher, so the development and protection of forests should pay attention to the utilization of forest resources and the protection of biodiversity. For nature protected animals, attention should be paid to the protection of natural secondary forest resources in the process of rational utilization of forest resources. When China is short of natural resources and has poor environmental carrying capacity, try to reduce the direct impact of human activities on natural protected animals [17, 18]. For example, for wild animals, their living environment and habitat environment are extremely fragile. For example, forest cutting or operation may have a direct pollution impact on wildlife. Therefore, we must do a good job in wildlife protection and minimize human activities.

(4) Make full use of natural advantages and use resources scientifically and effectively

At present, the state has issued many relevant policies and regulations, but in the process of protecting the natural protection environment, it has not found an effective measure that can be perfectly combined, that is, the best choice is to use the ecological value in the natural protection environment and combine other aspects. Therefore, we must make full use of the ecological value of natural resources in the natural protection environment, and make full use of it in combination with the awareness of sustainable development of human society. The good effect of the decision tree in the natural protection environment also shows that it has a strong carbon fixation effect. In the future, the tree species can be scientifically and rationally developed and cultivated to make it play a more significant role in the environmental carrying capacity.

(5) Improve the management level of natural resources to prevent uncontrolled development and utilization of natural resources

If we want to control the uncontrolled development and utilization of natural resources, we must improve the level of natural resource management. For different ecosystem types, corresponding management strategies should be formulated according to the characteristics of ecosystem types to protect ecosystem health. At the same time, we should reasonably control the scale of land resources development and utilization.

3. Research and Design Experiment on the Change Relationship of environmental Carrying Capacity of Decision Tree in Natural Protection Environment

Based on the relevant literature at home and abroad on ecotourism, nature reserves, tourism

environmental carrying capacity, nature reserves, and referring to the national classification of surface water, noise, atmosphere, entertainment land, and tourism resources, this paper puts forward the research direction and content.

The tourist quantity table of national nature reserves in the middle and second half of 2017-2021 is obtained through data sorting, and the details are as follows:

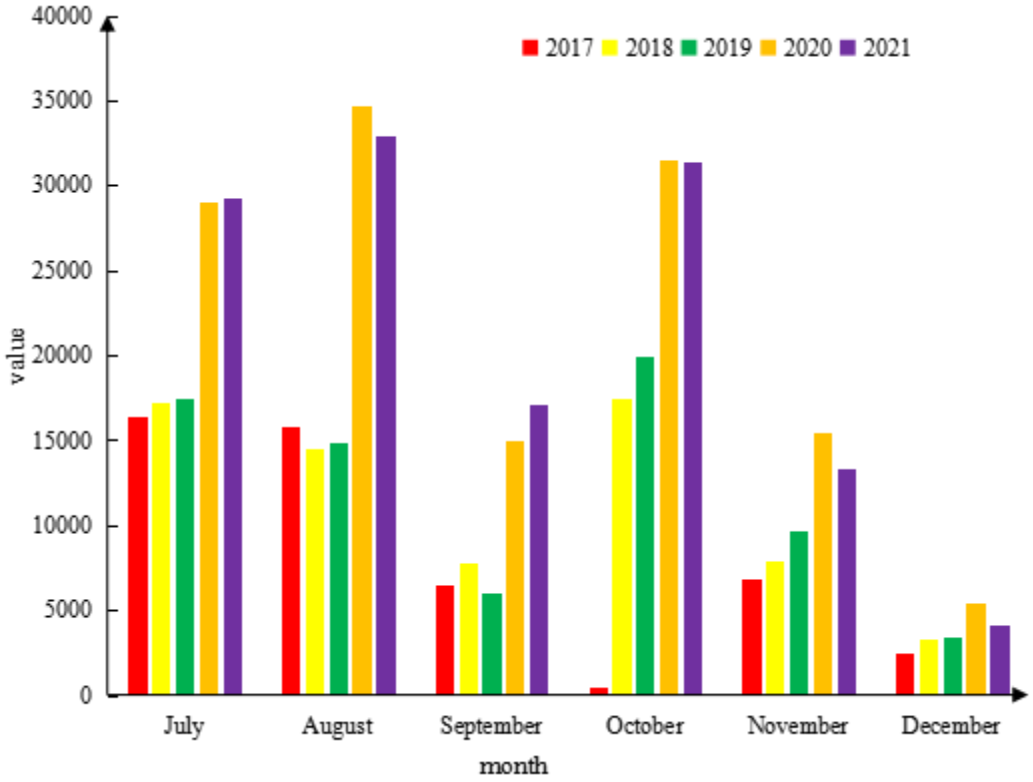

Figure 1. Number of tourists to tianmu mountain from July 2017 to December 2021

According to the statistics of the number of tourists, it is not difficult to see that December is the off-season of the scenic spot every year, and July to November is the peak tourist season, of which August and October are the most visited months. Based on the above characteristics, this paper selects the tourism environment carrying capacity of mid week (Friday, August 6, 2020) and weekend (Saturday).

In this paper, multiple linear regression model is used to test the correlation of various factors. In its model, the least squares estimator $P(y)$ of parameter $y=(y_0,y_1,y_2,..,y_n)'$ should minimize the sum of error squares φ, namely:

$$P(y)=\min_{\varphi} P(\varphi) \tag{1}$$

Including:

$$P(\varphi)=\sum_{d=1}^{m}\beta_d^2=\sum_{d=1}^{m}\left[b_d-(\varphi_0+\beta_1 a_{d1}+,..,\beta_n a_{dn})\right]^2=(B-E\varphi)'(B-E\varphi) \tag{2}$$

By comparing the nine indicators with the comparison table of ecological carrying capacity grades, we can get the degree of attention that should be paid to this functional area.

Table 1. Comparison of ecological bearing capacity levels

Overall bearing grade	Significant conflicts of concern	Degree of concern
Below standard	0	No more attention
Approaching standards	1-2	Need to increase low-level attention
At standard	3	Need to increase medium and high level attention
Above standard	>3	Need to increase high-level attention

As shown in Table 1, if the ecological carrying capacity index does not exceed the standard index, the ecological conflict coefficient is 0, indicating that the scenic spot governance is relatively smooth and the ecological carrying capacity is not affected; If it exceeds 1-2 indicators, it indicates that the ecological carrying capacity of the scenic spot has reached a certain degree, and the current ecotourism has had a certain impact on the ecological environment of the scenic spot. Countermeasures: In the current governance level, we should pay more attention to it. For example, we should carry out targeted governance beyond the scope. If there are more than three indicators, it can be determined that the ecological carrying capacity of the scenic spot meets the standard, and the current ecological tourism has had a great impact on the ecological environment of the scenic spot. Countermeasures: more attention should be paid to the existing management level, such as adjusting regional tourism policies, including managers and tourists; If three or more indicators exceed the standard, it is deemed that the overall ecological carrying capacity of the scenic spot exceeds the standard, indicating that the current ecotourism has had a serious impact on the ecological environment of the scenic spot. Measures should be taken: to improve the overall ecological carrying capacity of the area, or even to close and re plan the management system of the protected area.

Table 2. Comparison of facility bearing capacity levels

Overall bearing grade	Maximum utilization rate of non rest days in peak season	Maximum utilization rate of rest days in peak season	Degree of concern
Below standard	<40%	<60%	No more attention
Approaching standards	40%-59%	60%-79%	Need to increase low-level attention
At standard	60%	80%	Need to increase medium and high level attention
Above standard	>60%	>80%	Need to increase high-level attention

As shown in Table 2, the selected equipment utilization rate is compared with the equipment bearing capacity comparison table. When the maximum utilization rate of holiday break time is less than 60%, the carrying capacity of the surveyed site facilities does not meet the requirements, so no further attention is needed; If the maximum utilization rate on the rest day in the peak season is 60% - 79%, it is considered that the carrying capacity of the facilities in the survey site has met the requirements, and a lower degree of attention should be paid. If the maximum utilization rate on the rest day in the peak season is more than 80%, it is considered that the carrying capacity of the

facilities in the survey site meets the standards, and a medium level of attention should be paid. If the maximum utilization rate on the rest day in the peak season is more than 80%, it is considered that the carrying capacity of the facilities in the survey site is higher than the standards, and a high level of attention. On this basis, the utilization ratio of non rest days in peak season and rest time in off season is compared with the corresponding benchmark.

4. Experimental Analysis on the Change Relationship of Environmental Carrying Capacity of Decision Trees in Natural Protection Environment

4.1. Investigation Results and Analysis of Ecological Carrying Capacity of Tourist Concentration Area

The survey results and analysis of the ecological carrying capacity of tourist gathering areas In terms of ecological carrying capacity, many indicators are recorded mainly according to the ecological conflict record table, such as bare land (A), soil erosion (B), garbage quantity (C), tree root exposure (D), broken branches (E), broken stems (F), informal paths (G), muddy conditions (H), environmental health, etc. (I). This paper makes quantitative statistics and qualitative description of nine aspects of tourist gathering places. According to these indicators, several scenic spots are randomly selected for each monitoring. The record uses the real-time registration method, that is, taking the entrance as the starting point, the statistics are made every 200 meters, and all the data within the recorded range are recorded. The statistics of recorded results are shown in Table 3:

Table 3. Record of investigation results of ecological carrying capacity in tourist concentration area

	Parking lot entrance	Paragraph 1	Paragraph 2
A	agreement	agreement	agreement
B	0	0	2
C	0	0	0
D	0	1	1
E	1	0	1
F	1	1	1
G	0	0	1
H	good	good	good
I	good	good	good

The observation results of the above nine indicators are compared with the ecological carrying capacity level table in Figure 1. It is found that the indicators of mountains and tourist areas are lower than the corresponding standards. Therefore, it can be considered that the ecological carrying capacity in tourist areas does not exceed the standards, and there is an ecological conflict. Countermeasures: maintain the current business level without too much effort.

4.2. Survey Results and Analysis of Social Carrying Capacity in Tourist Concentration Areas

The survey method of social carrying capacity is mainly based on tourists' perception. The main problems in this regard are the degree of crowding of tourists, the number of tourists in the scenic area, the waiting time and the overall feeling of the scenic area. On the basis of field survey, 368 tourist questionnaires were collected and 362 valid questionnaires were collected, 98.4% of which were valid.

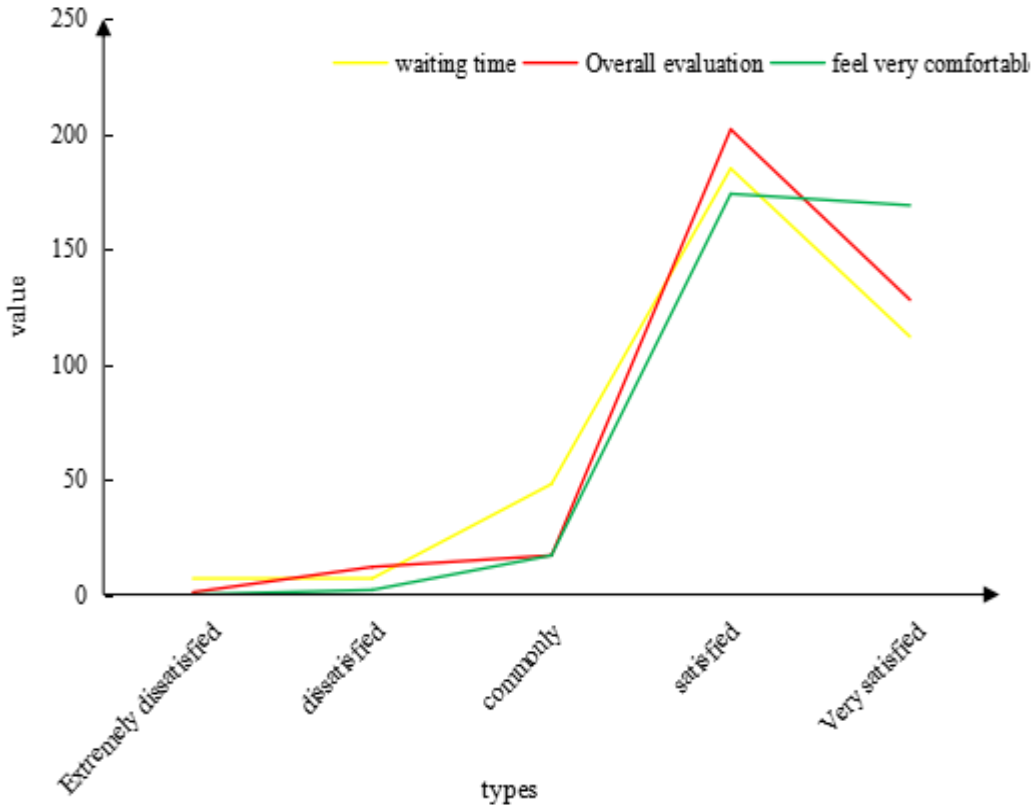

Figure 2. Statistical table of tourists' perception of social carrying capacity in tourist concentration area

Through the comparison between the social carrying capacity and the level of social carrying capacity in the tourist concentration area (see Figure 2), it can be seen that the average scores of the number of tourists, waiting time and overall evaluation in the tourist concentration area are 4.41, 4.08 and 4.23, which are lower than the standard. In terms of the management of existing tourist distribution centers, the Reserve is relatively effective.

5. Conclusion

Based on the background of natural protection environment, this paper studies the characteristic change relationship of environmental carrying capacity of decision trees and their surrounding vegetation, and tests the factors affecting the environmental carrying capacity of decision trees through multiple linear regression analysis and variance decomposition tools. The results show that with the increase of canopy coverage, land use change, water and soil loss and other reasons, the environmental carrying capacity presents a significant fluctuation relationship; With the expansion of vegetation coverage and water and soil loss, the environmental carrying capacity shows an upward trend; The bearing capacity of decision trees and their surrounding vegetation in the natural protection environment is at a medium level, and shows obvious regional differences. From the perspective of the degree of deforestation, forests in different regions are subject to different degrees of deforestation; From the perspective of vegetation coverage area, the vegetation coverage area in different regions shows an upward trend; From the perspective of land use, there are large differences in land use in different regions; From the perspective of land types, soil types in different regions have different impacts on environmental carrying capacity.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] *Qin Wang, Yan Zhang. Evaluation of Environmental Carrying Capacity in Xiong'an New Area Based on Fuzzy Comprehensive Evaluation Method. J. Comput. Methods Sci. Eng. (2022) 22(5): 1737-1750. https://doi.org/10.3233/JCM-226158*

[2] *Oluwaseun Sharomi, Davide La Torre, Tufail Malik. A Multiple Criteria Economic Growth Model with Environmental Quality and Logistic Population Behaviour with Variable Carrying Capacity. INFOR Inf. Syst. Oper. Res. (2019) 57(3): 379-393.*

[3] *Mingju Liu, Shijun Wang. Method for Evaluating the Eco-Tourism Environmental Carrying Capacity with Hesitant Fuzzy Linguistic Information. J. Intell. Fuzzy Syst. (2017) 33(3): 1733-1740. https://doi.org/10.3233/JIFS-161057*

[4] *Mohamed Amgad, Lamees A Atteya, Hagar Hussein, Kareem Hosny Mohammed, Ehab Hafiz, Maha A T Elsebaie, Pooya Mobadersany, David Manthey, David A Gutman, Habiba Elfandy, Lee A D Cooper. Explainable Nucleus Classification Using Decision Tree Approximation of Learned Embeddings. Bioinform. (2022) 38(2): 513-519. https://doi.org/10.1093/bioinformatics/btab670*

[5] *Veruska Borges Santos, Carlos Eduardo S Pires, Dimas Cassimiro do Nascimento, Andreza Raquel Monteiro de Queiroz. A Decision Tree Ensemble Model for Predicting Bus Bunching. Comput. J. (2022) 65(8): 2044-2062. https://doi.org/10.1093/comjnl/bxab045*

[6] *Antonella Plaia, Simona Buscemi, Johannes Fürnkranz, Eneldo Loza Mencía. Comparing Boosting and Bagging for Decision Trees of Rankings. J. Classif. (2022) 39(1): 78-99. https://doi.org/10.1007/s00357-021-09397-2*

[7] *P Parthasarathi, S Shankar. Decision Tree Based Key Management for Secure Group Communication. Comput. Syst. Sci. Eng. (2022) 42(2): 561-575. https://doi.org/10.32604/csse.2022.019561*

[8] *Ferdinand Bollwein, Stephan Westphal. Oblique Decision Tree Induction by Cross-Entropy Optimization Based on the Von Mises-Fisher distribution. Comput. Stat. (2022) 37(5): 2203-2229. https://doi.org/10.1007/s00180-022-01195-7*

[9] *Chaitanya Manapragada, Heitor Murilo Gomes, Mahsa Salehi, Albert Bifet, Geoffrey I Webb. An Eager Splitting Strategy for Online Decision Trees in Ensembles. Data Min. Knowl. Discov. (2022) 36(2): 566-619. https://doi.org/10.1007/s10618-021-00816-x*

[10] *Elena Dumitrescu, Sullivan Hué, Christophe Hurlin, Sessi Tokpavi. Machine Learning for Credit Scoring: Improving Logistic Regression with Non-Linear Decision-Tree Effects. Eur. J. Oper. Res. (2022) 297(3): 1178-1192. https://doi.org/10.1016/j.ejor.2021.06.053*

[11] *Pravin S Game, Vinod Vaze, Emmanuel M. Optimized Decision Tree Rules Using Divergence Based Grey Wolf Optimization for Big Data Classification in Health Care. Evol. Intell. (2022)*

15(2): 971-987.

[12] Archana R Panhalkar, Dharmpal D Doye. A Novel Approach to Build Accurate and Diverse Decision Tree Forest. Evol. Intell. (2022) 15(1): 439-453. https://doi.org/10.1007/s12065-020-00519-0

[13] Hamid Reza Ghaffari. Choosing Decision Tree-Based Boundary Patterns in the Intrusion Detection Systems with Large Data Sets. Int. Arab J. Inf. Technol. (2022) 19(3): 363-369. https://doi.org/10.34028/iajit/19/3/10

[14] Yoshifumi Saito, Wakaha Ogata. Private Decision Tree Evaluation by a Single Untrusted Server for Machine Learnig as a Service. IEICE Trans. Fundam. Electron. Commun. Comput. Sci. (2022) 105-A(3): 203-213. https://doi.org/10.1587/transfun.2021CIP0004

[15] Hikaru Tsuchida, Takashi Nishide, Yusaku Maeda. Private Decision Tree Evaluation with Constant Rounds via (Only) SS-3PC over Ring and Field. IEICE Trans. Fundam. Electron. Commun. Comput. Sci. (2022) 105-A(3): 214-230. https://doi.org/10.1587/transfun.2021 CIP0018

[16] A Anitha. Disease Prediction and Knowledge Extraction in Banana Crop Cultivation Using Decision Tree Classifiers. Int. J. Bus. Intell. Data Min. (2022) 20(1): 107-120. https:/doi.org/10.1504/IJBIDM.2022.119957

[17] Sharon Christa, V Suma, Uma Mohan. Regression and Decision Tree Approaches in Predicting the Effort in Resolving Incidents. Int. J. Bus. Inf. Syst. (2022) 39(3): 379-399. https://doi.org/10.1504/IJBIS.2022.122342

[18] Cheolhee Park, Dowon Hong, Changho Seo. Evaluating Differentially Private Decision Tree Model over Model Inversion Attack. Int. J. Inf. Sec. (2022) 21(3): 1-14. https://doi.org/10.1007/s1 0207-021-00564-5