Journal of Theoretical and Applied Information Technology
30th September 2022. Vol.100. No 18

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

COMPARISON OF ARTIFICIAL NEURAL NETWORK CLASSIFICATION METHODS FOR DISEASES THAT ARE DOMINATELY SUFFERED BY COASTAL COMMUNITIES

T.H.F HARUMY [1]*, FUZY YUZTIKA MANIK [2], ALTAHA[3]

Faculty Of Computer Sciences Universitas Sumatera Utara Department Of Computer Science Indonesia[1]
Faculty Of Computer Sciences Universitas Sumatera Utara Department Of Computer Science Indonesia[2]
Faculty Of Computer Sciences Universitas Sumatera Utara Department Of Computer Science Indonesia[3]

E-mail : [1]hennyharumy@usu.ac.id, fuzy.yustika@ usu.ac.id, altaha@gmail.com

ABSTRACT

The problem that often occurs in Neural Networks is how to determine the right model, see effectiveness, accuracy, based on parameters, and datasets. Furthermore, various training and testing are needed to determine the best model. In-depth Artificial Neural Network Analysis is required to be analysed and compared with various other classical methods. This study tries to offer the best analytical method, namely Artificial Neural Networks that can be used, especially in the data category. Solution The analytical approach used is to add additional layers to the model until the accuracy is >= 90%. The subject of this research is the health problem of the coastal community, namely the classification of the dominant disease that most suffers from the coastal community. The purpose of this study is to classify using the Protis Neural Network Method approach and compare it with other methods to classify the dominant disease suffered, then measure the level of accuracy of each method and find the best method to classify the dominant disease suffered by coastal communities. The parameters used are region, profession, education, environment, access to health, weather, and dominant disease. The research locations include the regencies of Belawan, Serdang Bedagai, and Central Tapanuli in the Province of North Sumatra, Indonesia. The data used is 100 data. The results showed that the Protis Method approach is known to be able to classify and predict well that the dominant disease suffered by coastal communities is diarrheal disease. From the several methods tested, it is known that the Neural Network Protis is the best method in classifying the dominant disease suffered by the community with an AUC value of 0.9967, a CA value of 0.9504, an F1 value of 0.9505, a Precision value of 0.9523 and a Recall value of 0.9504.

Keywords: *Neural Network, Coastal, Disease, Artificial Intelligence*

1. INTRODUCTION

Indonesia is an archipelagic country which has 8,090 coastal villages, of which around 60% live around coastal areas. and more than 33% of the people work as fishermen. Currently, several dominant diseases that cause death in coastal areas include dengue fever [1], Hipertensi dan Diare (WHO, 2015). This is due to several conditions, namely social factors, environmental factors, economic factors and habits of coastal communities [2][3]. Currently the development of artificial intelligence is growing very rapidly. There are several machine learning methods such as Neural Network, Naive Bayes, SMV and Random Forest which have been extensively researched to carry out the prediction and classification process. [4][5] Each method has a way of interpretation, and a different way of working, as well as the level of accuracy that varies and is sometimes less stable depending on the accuracy of the data, models and variables used.

Furthermore, there is still a need for a lot of research on innovations for classifying the dominant diseases suffered by coastal communities. This is due to the condition of coastal communities who pay less attention to their health conditions.

Due to these problems, an innovation is needed to develop a renewable artificial neural network method that is better adapted to the workings of protic amoeba. [6][7] to optimize the variable classification process by modifying the hidden layer model which is then generated into a new model, namely the Protis Neural Network which is used to

classify the type of supervised model in an effort to produce a classification model that is more accurate and easy to interpret properly.

The main problem in this study is The coastal community health factor is a very important factor as one of the 17 Sustainable Development Goals 2015 – 2030 (Gigliotti, Schmidt-Traub, and Bastianoni 2018), namely improving the quality of health. In addition, 89% pay less attention to the meaning of health (Birawida and Hasanuddin 2019). This must be resolved. It is hoped that the development of the Protis Neural Network classification model with the study of the classification of dominant diseases in coastal areas will later help government and health parties to be able to classify the dominant areas of disease suffered by coastal communities with better, accurate and accurate results. easy to understand and become one of the alternative methods for classifying data to help classify the dominant diseases suffered by the coast so that sustainable development goals can be achieved, especially in coastal areas of Indonesia..[8].

So far, the classification research that has been done has only looked at the extent to which the distribution classification is seen from the demographics [9](Shen, 2014) (Achu, 2008) Next is GIS-Based Application Design Research to Detect Affected Areas (Fernandez, 2015) (Guha-Sapir et al., 2005) Where The Research Uses Logistic Regression Prediction Where The Variables Used Are Patient And Environmental Conditions. It is clear that to do this, and the researcher must consider as much of the available data as possible. This research also discusses how to develop and implement the Protis Neural Network for the classification of Dominant Diseases of the Coastal Community and compare it with other ANN methods.

This Theory Has Supporters In Several Domains To Provide The Assumption That The Cleavage Process Can Make The System Or Become Stronger, Faster And Smarter. The Protis Neural Netowk Algorithm method is expected to be used as one of the better methods to improve classification accuracy, increase learning speed and testing. This algorithmic method focuses on better classification. Then compare the accuracy, learning speed, and testing of the protis algorithm with other methods such as KNN, SVM, Naïve Bayes, and Random Forest. [10][11][12][13][14][15]

2. RESEARCH OBJECTIVE

The scope of this research is to classify the dominant diseases of coastal communities in North Sumatra, Indonesia by developing a Neural Network Algorithm with a Protis Neural Network Model Approach to further compare the Protis Neural Network Method with other Artificial Neural Network methods, namely classical Neural Network, SVM, Random Forest and others formulate a new model with the approach of Protista theory, Probability Theory, and Neural Network Algorithm.

3. RESEARCH CONTRIBUTION

Contribution to this research is to develop and implement an Artificial Neural Network development with a Protis theory approach, namely Protis Neural Network. Furthermore, this method was implemented in the case of Dominant Disease Calcification of Coastal Communities in North Sumatra, Indonesia. Furthermore, testing is carried out by comparing it with other Artificial Intelligence methods

4. LITERATURE REVIEW

The coast is a meeting area between land and sea, towards the land covering parts of the land, both dry and submerged in water, which are still influenced by the characteristics of the sea such as tides, sea breezes, and salt water seepage.[16] Research on the health of coastal communities was first examined by [17] about how to explore public health problems in the Manado Coastal Area where the large part of the problem is environmental factors, behaviour and social factors of coastal communities, then in this study will be developed the variables studied are Economic, Environmental, Social, Health factors. The type of disease suffered by the community in previous studies has been examined regarding the risk of hypertension in coastal communities, which is the dominant disease in suffering [18] and further regarding the spread of dengue fever in coastal areas that have been studied previously [1] [19] about the spread of dengue fever in coastal areas and research on diarrheal diseases that many toddlers suffer from in coastal areas caused by environmental factors and the health of coastal communities [3].

From these previous studies, this research will be developed to classify the dominant diseases suffered by coastal communities by examining

three areas in North Sumatra, namely the Central Tapanuli Region, Serdang Bedagai and Bagan Deli Belawan, Medan City to see the classification of several diseases in the area and their factors. which have been specified. Artificial neural networks (ANNs) are also usually applied to traffic prediction problems because of its advantages, such as their capability to work with multi-dimensional data, implementation flexibility, generalizability, and strong forecasting power [3].Data mining provides an efficient way to resolve many problems in the field of bioinformatics. This paper focuses on finding the best algorithm with high accuracy for the prediction of dengue among several classification algorithms

Neural network is a computational method that mimics a biological neural network system. Artificial Neural Networks are formed to solve a particular problem such as pattern recognition or classification due to the learning process. Like biological neurons, Artificial Neural Networks is also a system that is "fault tolerant" in 2 respects. For example, humans can often recognize someone whose face has been seen from a photo or can recognize someone whose face is slightly different because they haven't seen him for a long time. Second, still able to work even though some of the neurons are not able to work properly. If a neuron is damaged, other neurons can be trained to replace the function of the damaged neuron (Sahat, 2013) in [4].

The protist theory has several phases in how it works, and it is necessary to do many studies to improve the prediction results and performance of the methods contained in machine learning. Protis theory is a suitable model in conducting training and performance processes. From several studies, it is stated that protis has the quality of the training process and performance. By modifying this method, it can significantly predict time series data. The Protis

algorithm will be modification by several other methods, including ANN, which has a good level of accuracy, and the Genetic algorithm, which has good performance for predicting. So that a new method will be producing that will contribute to improving performance and a high degree of accuracy for predicting. In the methods contained in Artificial Intelligent Deep Learning such as SVM, [20] a method on a technique for finding a hyperplane that can separate two sets of data from two different classes.

Next is the method about Random Forest [21], KNN [22], tree[23] [24], [25]and so on. Each method has its own advantages and disadvantages. So that in this study we can see a comparison of the methods we have just developed, namely the Protis Neural Network and other Artificial Intelligence Methods. In the Classification process, the data will be used with the protic Neural Network model. Architecture Evolutionary Protis Theory for Prediction Method (Protis Algorithm). The protis algorithm sees from the way amoeba works to divide itself between making it more demanding and stronger.[7].

The main problem in this study is how to use an Artificial Neural Network with a Protis theory approach to classify the Dominant Diseases of Coastal Communities in North Sumatra, Indonesia by developing a Neural Network Algorithm with a Protis Neural Network Model Approach to further compare the Protis Neural Network Method with Artificial neural methods. Other networks, namely the classical Neural Network, SVM, Simple K-Means, Random Forest and others formulate a new model with the approach of Protista theory, Probability Theory, and Neural Network Algorithms.[8] [26].

So far, the classification research that has been done has only looked at the extent to which the distribution classification is seen from the demographics [9](Shen, 2014) (Achu, 2008) Next is GIS-Based Application Design Research to Detect Affected Areas (Fernandez, 2015) (Guha-Sapir et al., 2005) Where The Research Uses Logistic Regression Prediction Where The Variables Used Are Patient And Environmental Conditions. It is clear that to do this, and the researcher must consider as much of the available data as possible.This research also discusses how to develop and implement the Protis Neural Network for the classification of Dominant Diseases of the Coastal Community and compare it with other ANN methods.

This Theory Has Supporters In Several Domains To Provide The Assumption That The Cleavage Process Can Make The System Or Become Stronger, Faster And Smarter. The Protis Neural Netowk Algorithm method is expected to be used as one of the better methods to improve classification accuracy, increase learning speed and testing. This algorithmic method focuses on better classification. Then compare the accuracy, learning speed, and testing of the protis algorithm with other

methods such as KNN, SVM, Naïve Bayes, and Random Forest. [10][11][12][13][14][15].

Furthermore, the problem statement in this research is first how to use an Artificial Neural Network with a Protis theory approach to classify the Dominant Diseases of Coastal Communities in North Sumatra, Indonesia by developing a Neural Network Algorithm with a Protis Neural Network Model.The Second problem Statement is Approach to further compare the Protis Neural Network Method with Artificial neural methods. Other machine learning methods, namely the classical Neural Network, SVM, Random Forest and others formulate a new model with the approach of Protista theory, Probability Theory, and Neural Network Algorithms.

5. RESEARCH HYPOTHESIS

The first hypothesis in this study is that Artificial Neural Network can classify Dominant Diseases of Coastal Communities in North Sumatra, Indonesia with a significance level of > 90%. The second hypothesis is that the protic neural network in this case classifies better than other classical machine learning methods.

6. Proposed methodology

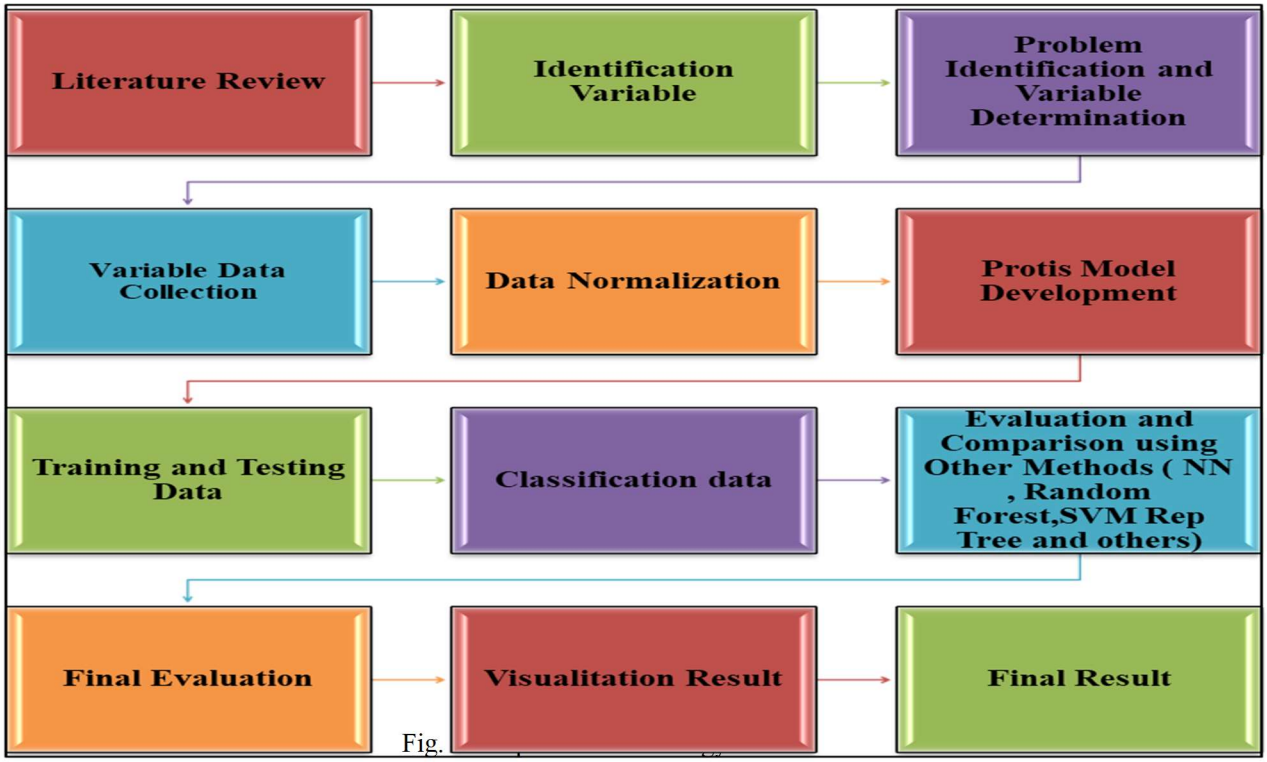


Fig.

This research begins with:

a. Literature Review
Literature by looking at the development of previous studies regarding the classification of dominant diseases of coastal communities.

b. Identification Variable
The variables that will be used in this case are Region, profession, Education, Environment, Health Access, Weather, and Disease and these variables were determined through several previous studies.

c. Variable Data Collection
Data were taken from several coastal areas in North Sumatra, namely Central Tapanuli, Serdang Bedagai and Belawan. Furthermore, the data will be preprocessed so that it can be analyzed properly.

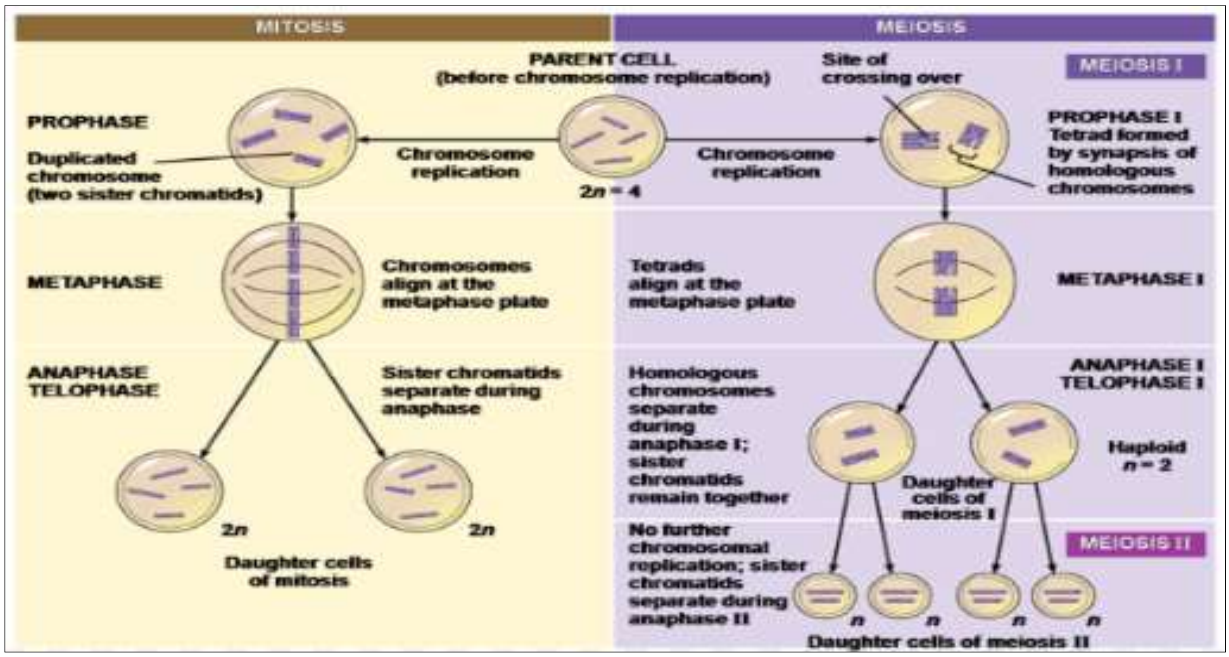
Journal of Theoretical and Applied Information Technology
30th September 2022. Vol.100. No 18

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

d. Build and develop the Protis Neural Network model.
e. Training process with and testing data by dividing the data that is 70% will be used for training and 30% for the Testing process.
f. Data Classification.

In the Classification process, the data will be used with the protic Neural Network model.[27][8] [28][29][30]

Architecture Evolutionary Protis Theory for Prediction Method (Protis Algorithm). The protis algorithm sees how amoeba works to divide itself between making it more demanding and stronger. Furthermore, modifications to carry out evolutionary changes to Protis theory by having 4 phases, namely Prophase, by duplicating chromosomes, then proceeding with hybrids with ANN and genetic algorithms so that the architecture is as follows: Furthermore, modifications to do the evolution of practice theory by having 4 phases, namely Prophase, by duplicating chromosomes, then proceeding with those hybridized with ANN and Genetic Algorithm to make the architecture as follows:



Where the eight input variables will be by entering into the Protis Algorithm Model, which then in the prophetic phase will do a duplicate variable which then processes towards the metaphase phase as a hidden layer learning, then duplicate again in the Anaphase phase and then produce output prediction.

Fase Metafase: Optimization Using Function Bipolar or Sigmoid biner.

$(y = f(x) = \frac{1}{1+exp^{-\delta x}})$ or $(y = f(x) = \frac{1+exp^{-x}}{1+exp^{-\delta x}}$

……(2)

Accept input Xi and distribute the signal to all chromosomes in the top layer of each input chromosome (Xi, I = 4,5,6,..., n) Generate (hidden layer). The input value for hidden chromosomes (Zi, j = 4,5,6,..., p) is computed using the weight value:

$z\_in_j = v_{oj} + \sum_{i=1}^{n} x_i v_{ij}$ ……..(3)

then perhaps the value of the output is computed using the kernel function that was employed.: $z_j = f(z\_in_j)$

.....(4)

When a basic sigmoid/ Tansig activation function is employed as the activation function, the following equation is utilized:

Metafase Optimization Using bipolar or stochastic biner functions $(y = f(x) = \frac{1}{1+exp^{-\delta x}})$,$(y = f(x) = \frac{1+exp^{-x}}{1+exp^{-\delta x}}$

……..(5)

Journal of Theoretical and Applied Information Technology
30th September 2022. Vol.100. No 18

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Each parameter output is sent to all neurons in the cell above. Divide the input value by the weight of each output chromosome…….. (Yk, k = 4,5,6,..., n):

$y\_in_k = w_{ok} + \sum_{i=1}^{p} z_i w_{jk}$ [2]... ……..…….. (6)

Next, to use the activation function, the output value is computed: $y_k = f(y_{in_k})$ ……. …. (7)

Anaphase/Telophase : Optimization Using Function :

$(y = f(x) = \frac{1}{1+exp^{-\delta_x}})$ [2], ……(8)

Xn =(Random(0,1)=P<Prob) …….…… (9)

($y = f(x) = \frac{1+exp^{-x}}{1+exp^{-\delta_x}}$)[2,] (Xn = (Random (0,1) =P<Prob)……..(10)

Then the correction is computed, which is subsequently used to update the value. w_{jk} :

$\Delta w_{jk} = (\alpha \delta_k z_j$ [2])..…..……..(11)

Determine a skew adjustment, which will be used to update the value. w_{0k}: $\Delta w_{ok} = \alpha \delta_k$ …… (12)

Determine the adjustment to the weighting factor that is being used to renew v_{ij} :$\Delta v_{ij} = \alpha \delta_j x_i$ [2]..…. ….13)

Additionally, the maximum likelihood function is compared, which is used to adjust this result v_{oj} : $\Delta v_{oj} =$ $\alpha \delta_j$ [2]...……..…..……..…..…(14)

Adjusting the probabilities At the chromosome result (Yk, k), with the prejudice threshold and value (j = 0,..., p) = 4,5,6, ..., m) ……..(15)

are updated:

w_{jk} (new) = w_{jk} (previous) + Δij…….....(16)

V_{ij} (new) = V_{ij} (previous) + Δij…… ……(17)

Here is a Comparison of Classical Neural Network Architectures and Protis Neural Networks. The development of the Protis Neural Network Model is based on the workings of the Protis amoeba in the hidden layer formation architecture system. Here is the Architectural comparison:

[$y\_in_k = w_{ok} + \sum_{i=1}^{p} z_i w_{jk}$ [2]..…… ……..….(18)

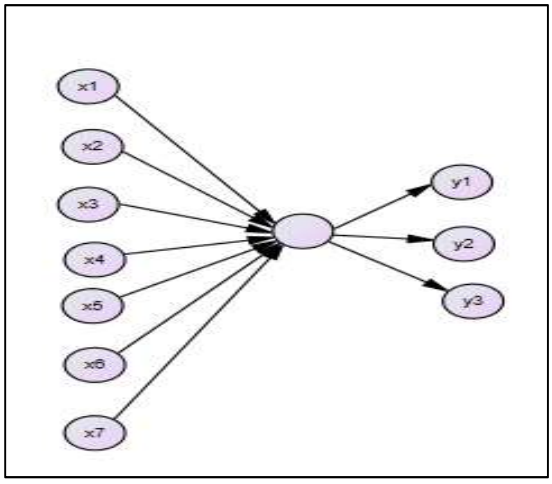


Fig. 3. Architecture Classic Neural Network

In the Architecture Classic Neural Network, you can determine the hidden layer used as a learning network. Furthermore, in the Protis Neural Network, the network that will form is like an amoebic network, namely:

Where each hidden layer will continue to be multiplied by 2 with the iterations that have been determined in a structured manner until a better model accuracy is produced.[30][27].

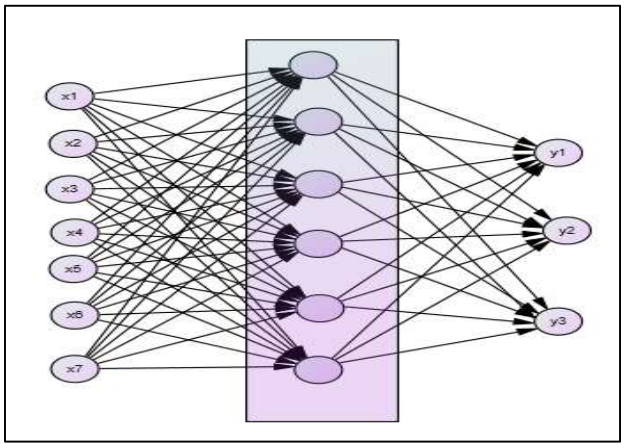


Fig. 4. Architecture Protis Neural Network

Journal of Theoretical and Applied Information Technology
30th September 2022. Vol.100. No 18

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

So that the Protis Neural Network Architecture model forms a more structured Neural network until the network finds the best Neural Network model both in classification and Prediction implementation. The next steps are:

g. Comparison with other Artificial Intelligence algorithms For comparison and testing is done with Classical Neural Network, Logistic Regresioan SVM, Random Forest, KNN, Naïve Bayes and others
h. Furthermore, testing the best method by looking at the value of Precision, F1, recall and others.

7. RESULT AND DISCUSSION

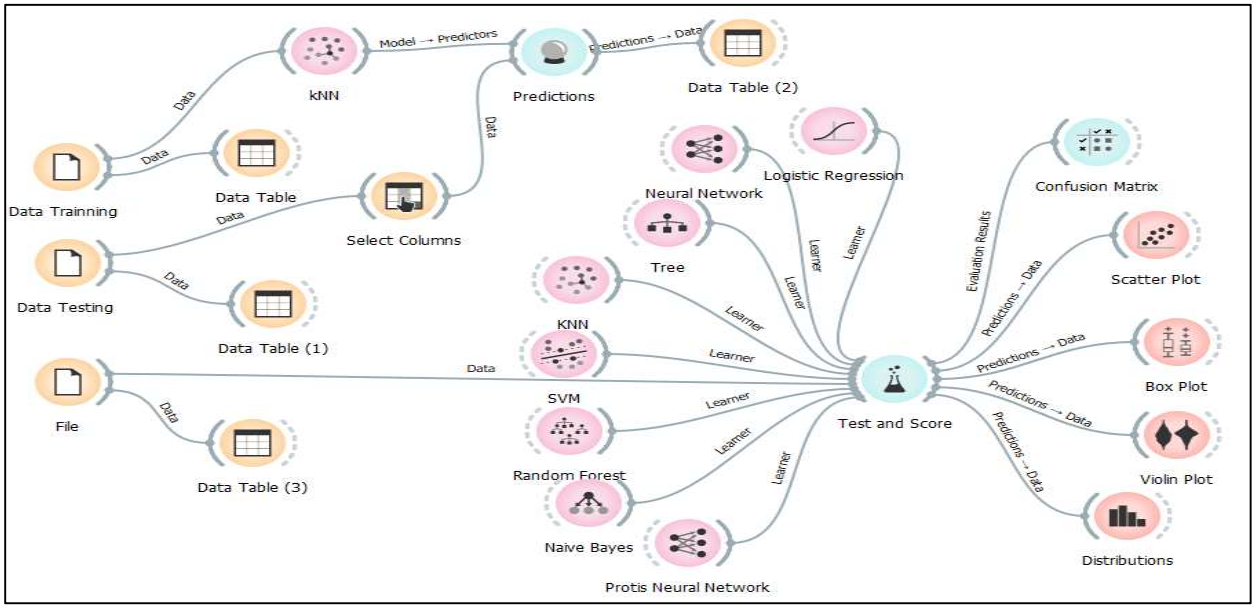


Figure 5. Result Research

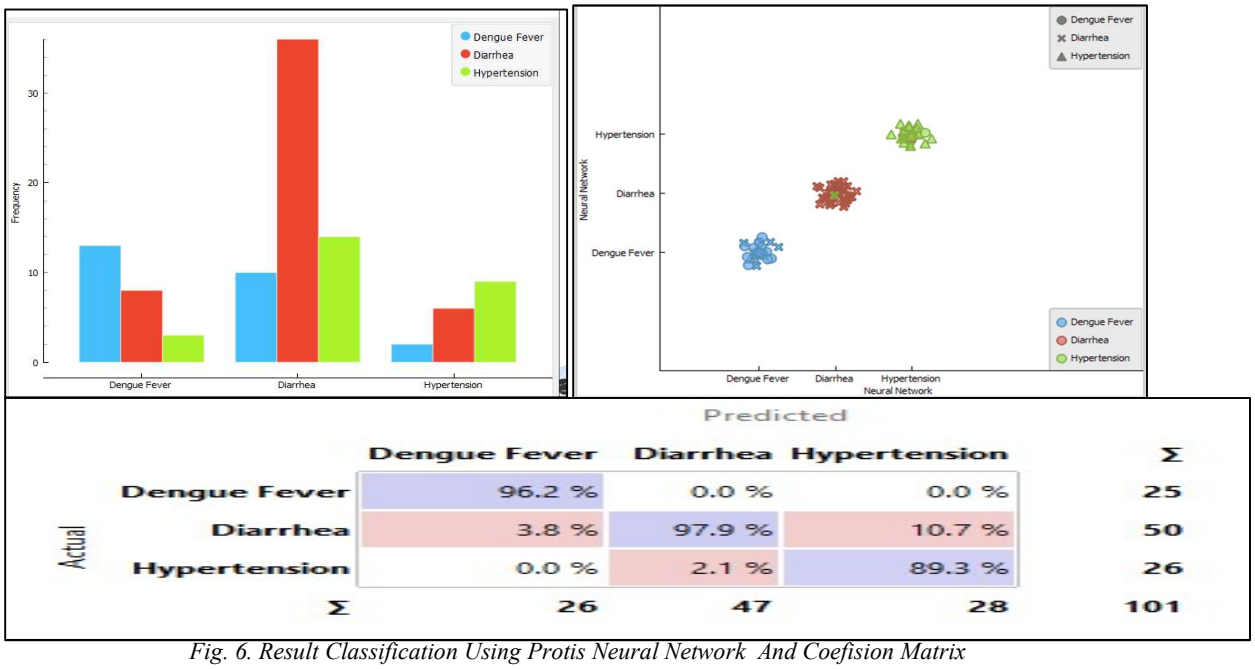


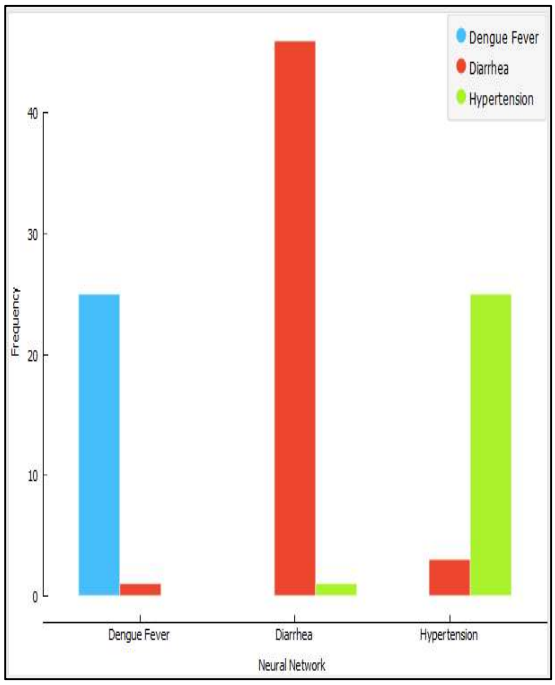
Fig. 6. Result Classification Using Protis Neural Network And Coefision Matrix

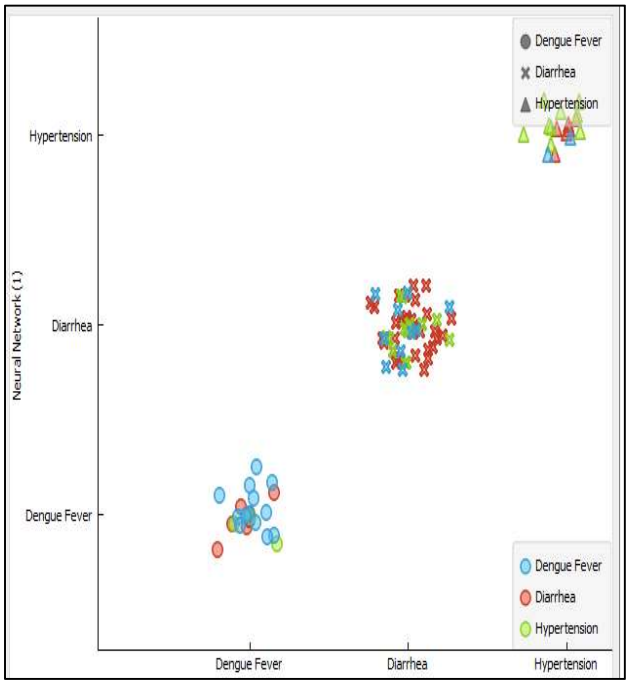
Journal of Theoretical and Applied Information Technology
30th September 2022. Vol.100. No 18

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

The results of the classification measurement using the Protis Neural Network method. The results showed that the dominant disease suffered by coastal communities was diarrheal disease. In this study, there were differences in the dominant disease suffered in previous studies, namely hypertension. [18]. Furthermore, the results of this study have the same results as those carried out by [3] about the spread of dengue fever in coastal areas and research on diarrheal disease that many toddlers suffer from in coastal areas caused by environmental factors and the health of coastal communities so that it reinforces that the dominant disease that is mostly suffered by coastal communities is diarrheal disease. So that it can be used as a recommendation to the government and the community to pay more attention to environmental factors and public health.

The best method is the Protis neural network with an AUC value of 0.9967, a CA value of 0.9504, an F1 value of 0.9505, a Precision value of 0.9523 and a Recall value of 0.9504. This states that the Protis Neural Network method is considered better than other Deep learning Neural Network methods for Categorical data cases.





Predicted

Actual	Dengue Fever	Diarrhea	Hypertension	Σ
Dengue Fever	54.2 %	16.7 %	11.8 %	25
Diarrhea	33.3 %	60.0 %	35.3 %	50
Hypertension	12.5 %	23.3 %	52.9 %	26
Σ	24	60	17	101

Fig. 7. Result Classification Using Neural Network And Coefision Matrix

Journal of Theoretical and Applied Information Technology
30th September 2022. Vol.100. No 18

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Next is the measurement Using Neural Network. The measurement results show that the AUC value of 0.794, a CA value of 0.574, an F1 value of 0.563, a Precision value of 0.567 and a Recall value of 0.574. it can be seen that the results of the classification of the Neural Network Protis Neural Network is better than the classification using the classical Neural Network.

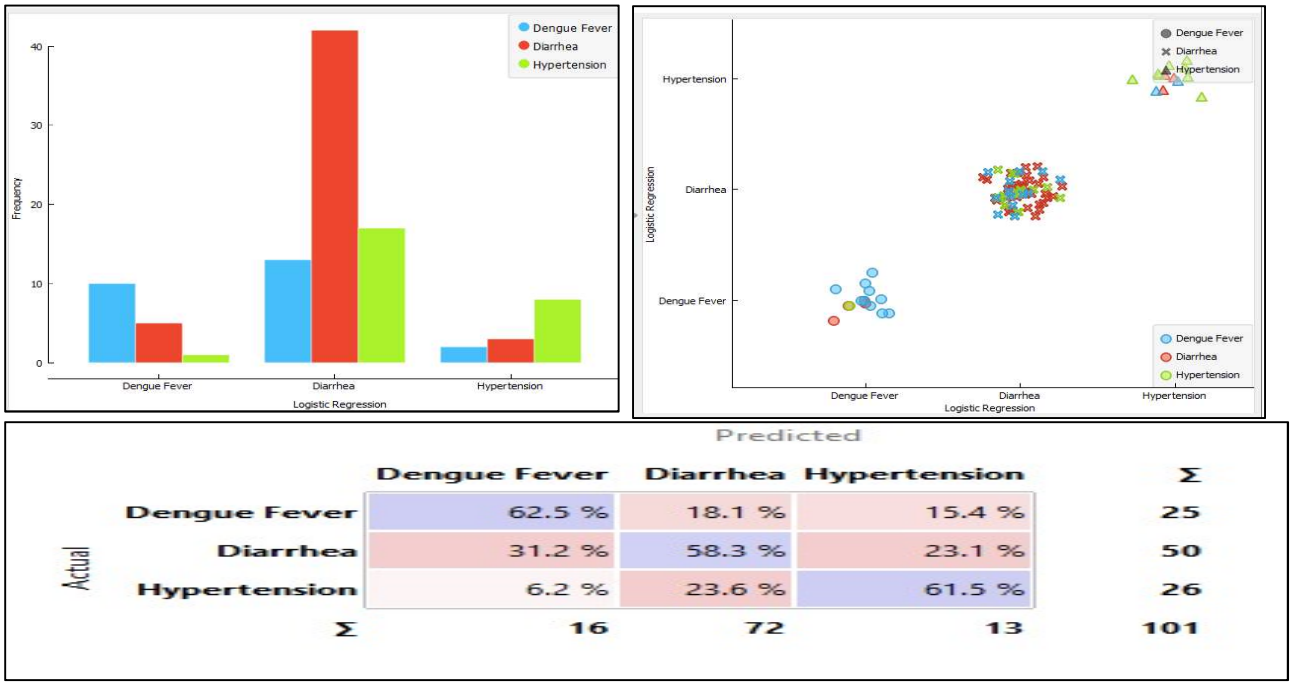


Fig. 8. Result Classification Using Logistic Regression And Cofision Matrix

In the measurement results for classification using Logistic Regression. The measurement results show that the AUC value is 0.747, the CA value is 0.594, the F1 value is 0.567, the Precision value is 0.602 and the Recall value is 0.594. it can be seen that the Protis Neural Network classification is better than the classification using Logistic Regression.

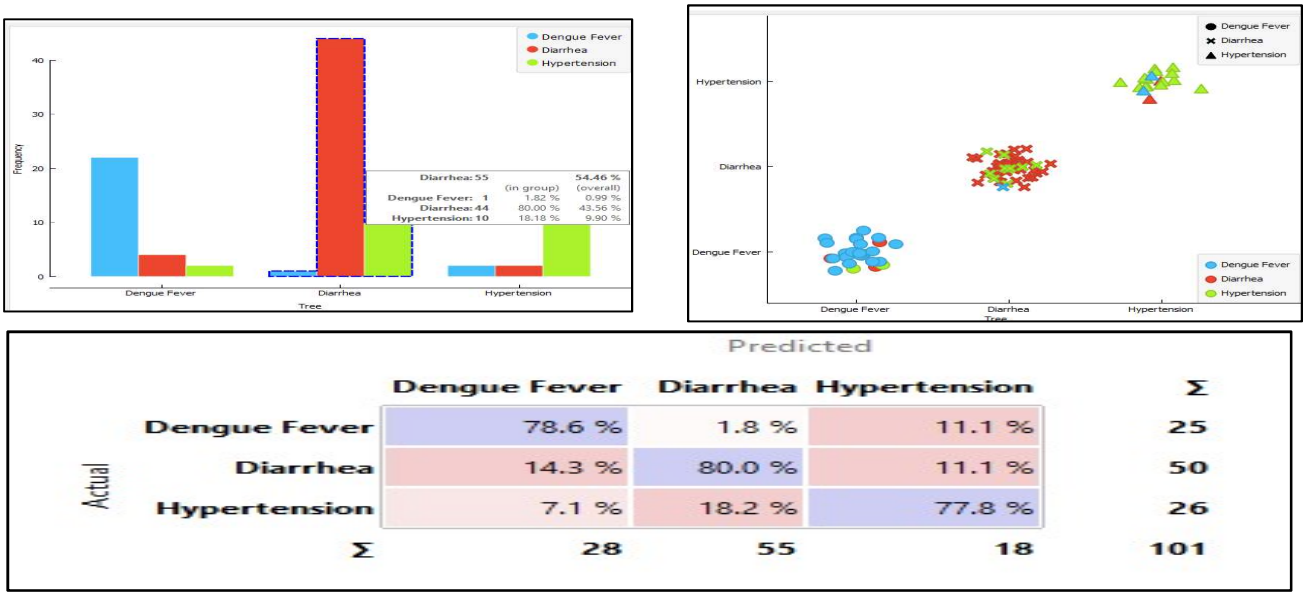


Fig. 9. Result Classification Using Tree And Coefision Matrix

Model	AUC	CA	F1	Precision	Recall
kNN	0.855	0.703	0.697	0.704	0.703
Tree	0.936	0.792	0.784	0.791	0.792
SVM	0.561	0.723	0.695	0.810	0.723
Random Forest	0.923	0.792	0.787	0.798	0.792
Neural Network	0.997	0.950	0.951	0.952	0.950
Neural Network	0.749	0.574	0.563	0.567	0.574
Naive Bayes	0.739	0.554	0.537	0.537	0.554
Logistic Regression	0.747	0.594	0.567	0.602	0.594

Figure 10. Evaluation Result

9. CONFLICTS OF INTEREST

The author declares that there is no conflict of interest in this study, both at the time of data collection and research results.

10. AUTHOR CONTRIBUTIONS

For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should.

11. ACKNOWLEDGMENTS

"This work was supported by The TALENTA Research Lemabaga Penelitian Universitas Sumatera Utara 2021. be used as follows: For Conceptual Design, protis Neural Network adapts the workings of the amoeba's way of life which consists of 4 life phases, namely Metaphase, Anaphase/Telophase, Mitosis, and Meiosis which divides itself. Next for Software Using Orange Tools. Furthermore, after analyzing the data using various types of methods, it is known that the Protis Neural Network for categorical data analysis is a better method than other classical machine learning methods

REFERENCES

[1] G. THF.harumy, D S, "Sistem Informasi Geografis Prediksi Wilayah Penyebaran Demam," *JNKTI(J. Nasionalkomputasi dan Teknol. Inf.)*, vol. 3, no. 3, pp. 229–233, 2020.

[2] Z. Aidha and A. A. Tarigan, "Survey Hipertensi Dan Pencegahan Komplikasinya Di Wilayah Pesisir Kecamatan Percut Sei Tuan Tahun2018," *Jumantik(Jurnal Ilm. Penelit. Kesehatan)*, vol. 4, no. 1, p. 101, 2019.

[3] S. Nurnaningsi, Y. Sabilu, and A. Fachlevy, "Faktor Yang Berhubungan Dengan Kejadian Diare Pada Balita Di Wilayah Kerja Puskesmas Abeli Bagian Pesisir Kota Kendari Tahun 2017," *J. Ilm. Mhs. Kesehat. Masy. Unsyiah*, 2017.

[4] D. Harumy, T.H.F., "Neural Network Prediksi Industri Hilir Aluminium Untuk Peningkatan Pendapatan Daerah (Pt Inalum Asahan)," in *Semnasteknomedia 2017*, 2017, pp. 3.9-7.

[5] M. Fatima and M. Pasha, "Survey of Machine Learning Algorithms for Disease Diagnostic," pp. 1–16, 2017.

[6] S. Y. Demin, M. A. Berdieva, and Y. I. Podlipaeva, "Karyotyping of Amoeba proteus," no. July, 2017.

[7] T. H. F. Harumy, M. Zarlis, S. Effendi, and M. S. Lidya, "Prediction Using A Neural Network Algorithm Approach (A Review)," in *2021 International Conference on Software Engineering & Computer Systems and 4th International Conference on Computational Science and Information Management (ICSECS-ICOCSIM)*, 2021, pp. 325–330.

[8] T. Harumy and D. S. B. Ginting, "Neural Network Enhancement Forecast of Dengue Fever Outbreaks in Coastal Region," *J. Phys. Conf. Ser.*, vol. 1898, no. 1, p. 012027, 2021.

[9] N. Iqbal and M. Islam, "Machine learning for dengue outbreak prediction : An outlook Available Online at www.ijarcs.info International Journal of Advanced Research in Computer Science Machine learning for dengue outbreak prediction : An outlook," no. February, 2017.

[10] H. Wang, R. Czerminski, and A. C. Jamieson, "Neural Networks and Deep Learning," *Mach. Age Cust. Insight*, pp. 91–101, 2021.

[11] B. Nithya, "Predictive Analytics in Health Care Using Machine Learning Tools and Techniques," pp. 492–499, 2017.
[12] S. Gilda, "Evaluating Machine Learning Algorithms for Fake News Detection," 2017.
[13] T. Henny Febriana Harumy and A. D. Tarigan, "Trap (Rumpon) environment friendly based on microcontroller to increase fisherman's revenue," *J. Adv. Res. Dyn. Control Syst.*, vol. 10, no. 4 Special Issue, pp. 1576–1580, 2018.
[14] T. H. F. Harumy, H. Y. Chan, and G. C. Sodhy, "Prediction for Dengue Fever in Indonesia Using Neural Network and Regression Method," in *Journal of Physics: Conference Series*, 2020.
[15] D. S. Ginting, H. Mawengkang, and S. Efendi, "Modification of A priori Algorithm focused on confidence value to association rules," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 420, no. 1, pp. 0–6, 2018.
[16] T. H. . . Muhammad Iqbal, Muhammad Zarlis, Harumy, "Inovasi Aplikasi Check In Spot nelayan binaan Kecamatan Bagan Deli Medan," 2017, no. November, pp. 1–6.
[17] O. J. Sumampouw, Soemarno, S. Andarini, E. Sriwahyuni, and J. E. Nelwan, "Eksplorasi Masalah Kesehatan Masyarakat di Daerah Pesisir Kota Manado," *Univ. Sam Ratulangi*, no. August, 2015.
[18] Khairul, "Gaya Hidup sebagai Faktor Risiko Hipertensi pada Masyarakat Pesisir Pantai," *J. Major.*, vol. 5, no. 3, pp. 118–123, 2016.
[19] W. Handoyo, R. Hestinigsih, and M. Martini, "Hubungan Sosiodemografi Dan Lingkungan Fisik Dengan Kejadian Demam Berdarah Degue (Dbd) Pada Masyarakat Pesisir Pantai Kota Tarakan (Studi Kasus Pada Daerah Buffer Kantor Kesehatan Pelabuhan Kelas Ii Tarakan) the Correlation of Sociodemographic and Ph," *J. Kesehat. Masy.*, vol. 3, no. 3, pp. 186–195, 2015.
[20] R. M. Khalil and A. Al-jumaily, "Machine Learning Based Prediction of Depression among Type 2 Diabetic Patients," pp. 0–4, 2020.
[21] S. Thaiparnit, N. Chumuang, and M. Ketcham, "A Comparitive Study of Clasification Liver Dysfunction with Machine Learning," in *2018 International Joint Symposium on Artificial Intelligence and Natural Language Processing, iSAI-NLP 2018 - Proceedings*, 2018.
[22] E. K. Adhitya, R. Satria, and H. Subagyo, "Komparasi Metode Machine Learning dan Metode Non Machine Learning untuk Estimasi Usaha Perangkat Lunak," *IlmuKomputer.com J. Softw. Eng.*, vol. 1, no. 2, pp. 109–113, 2015.
[23] S. R. Guruvayur, "A Detailed Study On Machine Learning Techniques For Data," *Int. Conf. Trends Electron. Informatics ICEI 2017 A*, vol. 978-1–5090, pp. 1187–1192, 2017.
[24] F. Yustika Manik, S. Kana Saputra, and D. Sartika Br Ginting, "Plant Classification Based on Extraction Feature Gray Level Co-Occurrence Matrix Using k-nearest Neighbour," *J. Phys. Conf. Ser.*, vol. 1566, no. 1, 2020.
[25] F. Y. Manik, Y. Herdiyeni, and E. N. Herliyana, "Leaf Morphological Feature Extraction of Digital Image Anthocephalus Cadamba," *Telkomnika (Telecommunication Comput. Electron. Control.*, vol. 14, no. 2, pp. 630–637, 2016.
[26] T. H. F. Harumy, R. Fauziah, and S. Dini, "Sentiment Analysis Using Simple K-Means to Cluster Tourist in Ecotourism Destination in Sumatera-Indonesia," *2021 Int. Conf. Data Sci. Artif. Intell. Bus. Anal. DATABIA 2021 - Proc.*, pp. 58–63, 2021.
[27] T. H. . Harumy, R. Fauziah, and S. Dini, "Sentiment Analysis Using Simple K-Means to Cluster Tourist in Ecotourism Destination in Sumatera – Indonesia," pp. 58–63, 2021.
[28] D. Fimoza, A. Amalia, and T. H. F. Harumy, "Sentiment Analysis for Movie Review in Bahasa Indonesia Using BERT," pp. 27–34, 2021.
[29] T. H. F. Harumy, "Optimization Neural Network of Election of Investment Sector and Mapping of the Best Investment Are in the Terrible Area," *J. Phys. Conf. Ser.*, vol. 1566, no. 1, pp. 1–6, 2020.
[30] T. H. F. Harumy, F. Yustika Manik, and Altaha, "Optimization Classification of Diseases Which is Dominant Suffered by Coastal Areas Using Neural Network," pp. 136–141, 2021.
[31] K. Protista and A. Protista, "Prokaryotic organisms found in extreme environments," pp. 1–14.