HYPERTEROID DISEASE ANALYSIS WITH BACKPROPAGATION ARTIFICIAL

by Universitas Potensi Utama

Submission date: 09-May-2023 05:29PM (UTC+0700)
Submission ID: 2088459687
File name: HYPERTEROID_DISEASE_ANALYSIS_WITH_BACKPROPAGATION_ARTIFICIAL.pdf (804.88K)
Word count: 3913
Character count: 19938

2nd International Conference on Information Science and Technology Innovation (ICoSTEC)
February, 25 2023. Yogyakarta, Indonesia

HYPERTEROID DISEASE ANALYSIS WITH BACKPROPAGATION ARTIFICIAL NEURAL NETWORK

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Abstract – In the era of technology 4.0, a system is needed to support the development of a company, both in industry, education, and others to help solve problems. In this study, the authors used the Backpropagation Neural Network Algorithm in recognizing hyperthyroid disease patterns. In this study, in the recognition of hyperthyroid disease patterns. The author uses 11 data variables that will be trained using the back-propagation algorithm where the weighting is done randomly and the second data is trained using the backpropagation algorithm. In this study using Matlab application for processing. From the results of testing data derived from kaggle, namely hyperthyroid disease data above, we can see in the 2-2-1 architecture which shows that the target is reduced by the jst output that the SSE is 0.06571 which indicates that there is an increase in hyperthyroid disease activity in humans. From the data obtained, that the performance of artificial neural network calculations with the Backpropagation Algorithm is 86%. Can be seen by comparing the desired target with the prediction target.

Keywords - Artificial Neural Networks, Backpropagation, hyperthyroid, Matlab.

I. INTRODUCTION

Health is one of the most complex problems in today's modern world.[1]

The most common symptoms of hyperthyroidism are : restlessness, tremors, weight loss, palpitations, excessive sweating [2]. While the clinical signs most often encountered are goiter of the thyroid gland, fibrillation atria, systolic hypertension [3]

Hyperthyroid is a disease in which the thyroid hormone levels are too high in a person's body. Usually this condition of excess thyroid hormone can cause symptoms of heart palpitations, trembling hands, and drastic weight loss and many more symptoms that arise. This disease if left if this continues to be allowed then this disease can cause the body to weaken and can cause death, this disease or thyroid gland usually appears in the neck which is the pengahil teroid hormone, The thyroid is the largest pure endocrine gland in the human body located in the front of the neck, consisting of two parts (right lobe and left lobe) [4]. Therefore, a solution is needed to analyze and create a model, to be able to detect or predict this hyperthyroid disease. There are many algorithms in the field of information technology that can find the best model in analyzing diseases. One of them is an artificial neural network, namely backpropagation. which has been widely used by researchers.

Previous research conducted by [5] entitled "A comparison of classification methods on diag-nosis of thyroid diseases" by producing thyroid da-tasets taken from UCI (University of California - Irvine) machine learning machine learning UCI (Cal-ifornia - Irvine) as many as 215 examples. The test results show that among the six different methods available in WEKA, MLP (Multilayer Per-ceptron) yields the highest accuracy, up to 96.74%, while BPA (Back Propagation Algorithm) yields the lowest accuracy, 69.77%. In previous research conducted by [6] entitled "Application of the backpropagation algorithm to recognize numeric writing patterns with the gradient descent training function with momentum adaptive lr 1,2" which produces with the Artificial Neural Network (ANN) method, the algorithm can produce a system that can recognize handwritten numeric character patterns that can help humans in doing pattern recognition. The results of the testing process using the Backpropagation algorithm reached 95% with a total of 40 training data. The test results of the test data reached 90% of the 40 test data.

Therefore the authors try to use the backporpagation algorithm as an analysis model in analyzing or predicting this hyperthyroid disease.

In the health field of backpropagation algorithms has been widely applied [7]

Risk factors for thyroid disease or disorders can be influenced by various factors such as age over 60 years, the more at risk of hypothyroidism or hyperthyroidism. Female gender is usually more at risk of thyroid disorders [4].

Hyperthyroidism is a clinical condition caused by increased concentration thyroid hormone in tissues due to increased hormone synthesis by the thyroid gland in the form of increased release of endogenous thyroid hormone or exogenous extrathyroidal sources[8].

The thyroid is one of the most important parts of the body for humans, the thyroid is gland-shaped and is located under the Adam's apple on the neck. The thyroid is the largest endocrine gland in the butterfly-shaped body. The function of the thyroid gland is to produce thyroid hormones that are useful for maintaining the body's metabolism. To increase the amount of oxygen in cells and stimulate body tissues to produce protein.
Hyperthyroid is a disease that has many factors with ecological factors and genetic factors. Factor genetics accounts for 79% of hyperthyroidism the rest (21%) was contributed by factors ecological [9]

The population density level continues to increase every year. The following graph shows Indonesia's population density as follows:

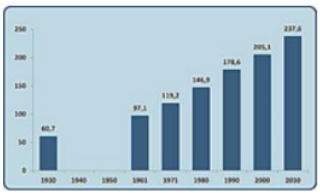

Fig. 1 Indonesia's Population Growth Chart [10]

Artificial neural network is one of the problem solving methods used for this research. Many methods related to artificial neural networks can be implemented into prediction. This is in line with the research to be studied, namely by finding the best architecture pattern from a series of back-propagation models tested using parameters such as learning rate and network architecture [10].
In each process, the relation weights in the network are modified to minimize the Mean Square Error (MSE) value between the predicted value from the network and the actual value [11].
In addition, the solution method used is back-propagatin which consists of two processes, feed forward and back-propagation of the error. The details are as follows:
Step 0: Weight initialization (randomly assigned a small value)
Step 1 : Repeat steps 2 through 9 until the end of iteration condition is met Step 2: For each pair of training data, perform steps 3 through 8 Feedforward propagation.
Step 3 : Each input unit (Xi, i = 1, n) receives the input signal Xi and the signal is propagated to the units of the next section (hidden layer units)
Step 4: Each unit in the hidden layer is multiplied by a weighting factor and summed and added with its bias:

$$Zinj = Voj + Xn\ i=1\ XiVij$$

Then calculate according to the activation function used:

$$Zj = f(Zinj$$

If a sigmoid function is used then the form of the function is:

$$Zj = 1\ /\ 1 + exp\ -zinj$$

Step 5: Each output unit (Y k, k = 1, 2, 3, . . . , m) is multiplied by the weighting factor and summed:

$$Yink = Wok + Xp\ j=1\ ZjWjk$$

Recalculate according to the activation function

$$Yk = f(yink\ )$$

back-propagation and its error
Step 6: Each output unit

$$(Yk, k = 1, m)$$

receives the target pattern according to the input pattern during training and the error is calculated:

$$\delta k = (tk - yk)f\ 0\ (yink\ )$$

Since f 0 (yink) = yk uses a sigmoid function, then:

$$f\ 0\ (yink\ ) = f(yink\ )(1 - f(yink\ )) = yk(1 - yk)$$

Calculating the improvement of the weighting factor (then to correct

$$Wjk)\ \Delta Wkj = \alpha\partial kZj$$

Calculating the correction improvement: ΔWok = α.∂k And using the δk values of all previous unit layers. Step 7: Each of the weights connecting the units of the output layer with the units of the hidden layer (Zj , j = 1, . . . , p) is multiplied by the delta and summed as input to the units of the next layer.

$$\delta inj = Xn\ k=1\ \delta kWjk$$

It is then multiplied by the derivative of the active function to calculate the error.

$$\delta j = \delta inj\ f\ 0\ (yinj\ )$$

Then calculate the improved weights (used to correct Vij)

$$\Delta VIj = \alpha\delta jXi$$

Then calculate the bias correction (to correct Voj) $\Delta Woj = \alpha.\delta j$

Fixed weights and biases
Step 8: Each unit output

$$(yk, k = 1, m)$$

fixed bias and its weights (j = 0, p)

$$Wjk(baru) = Wjk(lama) + \Delta Vjk$$

Each hidden unit (Zj, j : 1, p) has its bias and weights (j = 0, n) fixed.

$$Vjk(baru) = Vjk(lama) + \Delta Vjk$$

Step 9: Test stopping condition (end of iteration) [10]
Step 10: Then the system outputs the results of predicting the pattern of hypertheroid disease Currently, the development of diseases where this disease is a very dangerous disease.

II. METHODS

A. *Backpropagation Algorithm*

In an Artificial Neural Network there are forecasting techniques that are often used namely Backpropagation [12].
Even backpropagation has good computational properties especially when the data presented on a large scale [13]
Data communication is the exchange of data between two or more devices through a transmission medium such as a cable. For data communication to occur, devices must communicate with each other or be connected as part of a communication system, which consists of a combination of physical or hardware equipment

(hardware) and application devices or programs (software) [14].

Artificial Neural Network (ANN) or Artificial Neural Network (ANN) is an information processing system with a characteristic resembling the nervous system in humans [15].

The activation function is a function that will transform something input into a certain output [16].

In backpropagation, the activation function used must fulfill the conditions, namely: continuous and differentiable with muhah [14]

Basically, the characteristics of a JST are determined by :

1. Has the ability to produce output on patterns that have never been studied
2. Has the ability to process input that has errors in it with a certain tolerance level
3. Able to adapt to changes that occur to input and output values. This form of adaptation is manifested in changes in weight values [17]

B. JST Architecture

In Artificial Neural Network (ANN) architecture, a neuron will be collected in layers or commonly called layers. In the JST layer from the input layer to the output will go through a hidden layer which is usually called the hidden layer.

Artificial Neural Networks have the understanding that there are several forms of activity that are similar to those made by the human brain that wants to try to implement the training process on
the human brain [18].

C. Activation Function

The activation function is the function used on the neural network to enable or not activate neurons[19].

Activation function is a function used in neural networks to activate or not activate neurons. The characteristics that must be possessed by the activation function of the back propagation network include being continuous, differentiable, and not monotonically decreasing [20]

The activation signal produces the output of the neuron. This output can be the result of the problem or can be considered as an input to other neurons. To create an Artificial Neural Network it is necessary to collect the number of neurons. Neurons are organized on layers. A network must have an input layer (which carries the values of outside variables) and an output layer (the prediction or result) [21].

Generally, neurons located in the same layer will have the same state so that in each layer the same neurons have the same activation function. If neurons in a layer (e.g. hidden layer) will be connected to neurons in another layer (e.g. output layer) then each neuron in that layer (hidden layer) must also be connected to each neuron in the other layer (output layer). There are 3 types of JST architecture, namely: Single layer net This network has only one layer with connected weights. This network only receives input then will directly process it into output without having to go through the hidden layer. In the following figure the neurons in both layers are interconnected. How big the relationship between 2 neurons is determined by the corresponding weights. All input units will be connected to each output unit as shown in Figure 1 below:

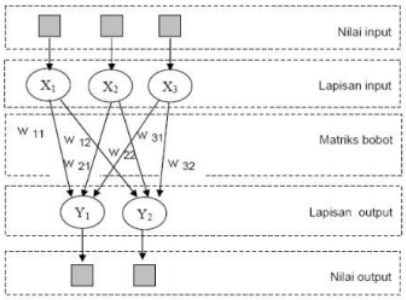

Fig. 2 Single-layer network

D. Prediction

Prediction is an attempt to guess or predict something that will happen in the future using various relevant information at any time previously (historically) through a scientific method [13]

E. Momentum

In standard backpropagation, weight changes are based on gradients which happened for the pattern inserted at the time. Modifications that can done is to use momentum i.e. by doing weight change based on the direction of the last pattern gradient and pattern previously that was entered. Momentum addition is intended for avoiding noticeable weight changes resulting from data which is very different from the others. Momentum variables can increase training time and stability of the training process[22]. momentum formula according to Fausett [23]

$$w_{ik}(t+1) = w_{ik}(t) + \alpha\delta_k z_i + \mu[w_{ik}(t) - w_{ik}(t-1)]$$

And

$$v_{ii}(t+1) = v_{ii}(t) + \alpha\delta_i x_i + \mu[v_{ii}(t) - v_{ii}(t-1)]$$

Information

$w_{ik}(t)$ = The first weight of the second pattern

$\alpha\delta_k z_i$ = The result of the calculation of the 6th step (Δw_{jk})

$w_{ik}(t-1)$ = First weights on the 1st data of the first iteration

μ = Momentum value

$v_{ii}(t)$ = The first weight of the second pattern

$\alpha\delta_i x_i$ = The result of the calculation of the 7th step (Δv_{ii})

$v_{ii}(t-1)$ = The first weight on the 1st data of the first iteration

F. Data Used

To get maximum results, researchers collected some input data. In summary, the input data for data design with artificial neural networks for training and testing data, 12 input variables are used, namely:

X1. Heart palpitations
X2. Tremor or trembling in the hands
X3. Feeling hot and sweaty easily (hyperhidrosis)
X4. Restless
X5. Irritable
X6. Drastic weight loss
X7. Sleeplessness
X8. Decreased Concentration
X9. There is a Goiter
X10. Diarrhea
X11. Blurred vision
X12. Hair loss

G. Flowcart

The following system flowchart is used for the program:

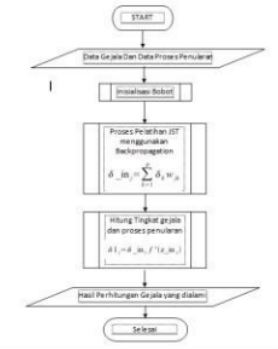

Figure 3. System Flowchart

III. RESULTS AND DISCUSSION

Artificial neural networks are one of the problem-solving methods used for this research. Many methods related to artificial neural networks can be implemented into predictions. This is in line with the research to be studied, namely by finding the best architecture pattern from a series of backpropagation models tested using parameters such as learning rate and network architecture. From related research on health that has quite complex data in its detection. Then the Backpropagation Algorithm is a good enough algorithm to be used in this study because it is able to detect using complex calculations.

In this stage the author only conducts the testing stage to get the accuracy of the output value that is close to the target. The author conducts several stages of testing to get maximum results from the output target and get a small error value to recognize hypertheroite disease. And also get grapics towards the goal or target specified. At this stage, it will produce the best output value to approach the desired pattern. Each input data will produce a different output value according to the architecture used. At this stage the author will use the 7-2-1 architecture to get the output value of the specified target.

Testing on the 7-2-1 architecture gets the maximum value and can be seen in Figure 4 below:

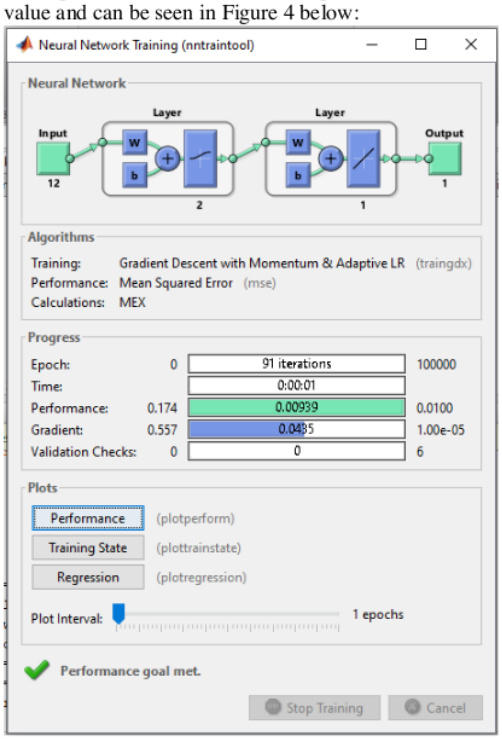

Figure 4. Architecture data testing 7-2-1

When testing data using 12-2-1 architecture to get the output value of the specified target then the process the calculation took 0,01 seconds. To see the graphic form of this graphic architecture, see Figure 5 below:

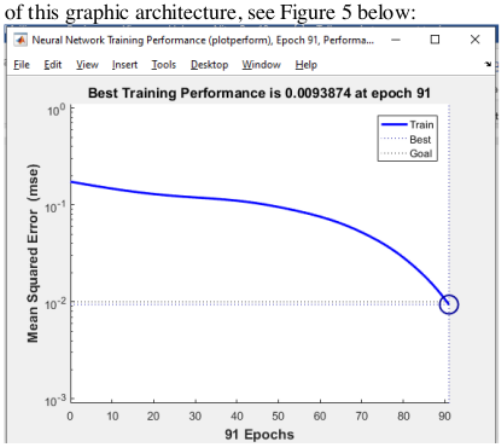

Figure 5. Shape Graph towards Goal

From the results of stage 1 testing, it will get the error and output of the specified target as well as MSE (Mean Square Error) and the amount of accuracy in

how many percent (%) to go to the desired target. The following can be seen in table I below:

TABLE I
MSE Accuracy Results Training
Data Training (Pelatihan)

No	Target	Output JST	Error	SSE	result
1	0,1800	0,1915	-0,01150	0,00013	1
2	0,1800	0,1898	-0,00979	0,00010	1
3	0,1800	0,1872	-0,00725	0,00005	1
4	0,1000	-0,1403	0,24028	0,05773	0
5	0,1800	0,1915	-0,01150	0,00013	1
6	0,1800	0,2003	-0,02034	0,00041	1
7	0,1000	0,1846	-0,08456	0,00715	1
				0,06571	86
			MSE	0,00263	

By using this architecture, the closest to the accuracy of the best output value is only 4. As well as the accuracy in percent (%) only gets 86%, with a total error of 0.00054215 and a total MSE (Mean Square Error) of 0.00009036which in the calculation of this stage has not reached the specified target. The script used to get the output value and error uses matlab: *[a,Pf,Af,e,Perf]=sim(net,p,[],[],t)*
The weight value obtained for the hidden layer can be seen in Table 2 below:

TABLE II
Weights to hidden Layer

variabel	***Weight to hidden layer***			
X1	65.4893	63.2937	-72.8988	63.1450
X2	12.5163	-28.5272	-19.6722	32.544
X3	95.1534	72.4756	-66.8805	71.8497
X4	0	0	0	0
X5	95.1296	-2.2810	58.6845	-54.7034
X6	-6.2803	64.8446	57.1067	70.1895
X7	0	0	0	0
X8	0	0	0	0
X9	58,2758	47,6909	31,611	77,3575
X10	36,1717	62,473	24,481	-52,736
X11	-56,231	21,5174	-6,5775	-27,5058
X12	0	0	0	0

To get the weight value of using matlab as follows: *net.IW{11}*
Meanwhile, to get the bias value can be seen in table III as follows:

TABLE III
Bias

Hidden layer	Value
1	-50.2572
2	60.384
3	75.998
4	-12.8791

The table above is the bias value from the to the hidden layer, while for the value of the *The weight from the hidden layer to the output can be seen in table IV below:*

TABLE IV
Output Value

Value	*Weight*			
1	-0.8640	-1.7577	-1.5603	12.528

Selection of Best Architecture Artificial neural network. The results of the Matlab 2016b application software used for the 7-3-1 architecture model,, 7-7-1 architecture and 7-2-1, 7-5-1 architecture. obtained the best architecture pattern. The best architecture model assessment is seen from several aspects such as epoch, minimum error and truth accuracy. For more details can be seen in the following.

TABLE V
Architecture Model Recapitulation

No	Arsitektur	Epoch	Training		Testing	
			MSE	Akurasi	MSE	Akurasi
1	7-2-1	91	0.002628465	86	0.002781246	86
2	7-3-1	79	0.002768209	86	0.002726334	71
3	7-5-1	84	0.002742757	86	0.002764341	86
4	7-7-1	87	0.002616854	86	0.002662085	71
5	7-9-1	85	0.002684098	86	0.002728874	86

From the results of testing data derived from kaggle, namely hyperthyroid disease data above, we can see in the 7-2-1 architecture which shows that the target is reduced by the jst output that the SSE is 0.06571 which indicates that there is an increase in hyperthyroid disease activity in humans. From the data obtained, that the perfomance of artificial neural network calculations with the *Backpropagation* Algorithm is 86%. Can be seen by comparing the desired target with the prediction target.

IV. CONCLUSIONS AND SUGGESTIONS

A. CONCLUSIONS

From the results of the research described above, the authors get the following conclusions:

1. In this algorithm, the Backpropagation Algorithm can perform learning to recognize the pattern of hypertheroid disease.
2. Backpropagation artificial neural networks can recognize disease patterns based on the symptoms obtained.

B. ADVICE

In this study there are still many shortcomings and weaknesses, therefore there are several suggestions for further research:

1. For the future, it is recommended to use other algorithms for consideration.
2. It is recommended to use more data.

REFERENCES

[1] A. Latifah, A. D. Supriatna, and K. Hawaari, “Rancang Bangun Media Pembelajaran Obat

Tradisional Untuk Penyakit Kulit Berbasis Android," *J. Algoritm.*, vol. 17, no. 2, pp. 394–401, 2021, doi: 10.33364/algoritma/v.17-2.394.

[2] R. Apriliana, A. Damayanti, and A. B. Pratiwi, "Sistem Pakar Diagnosa Hipertiroid Menggunakan Certainty Factor dan Logika Fuzzy," *Contemp. Math. Appl.*, vol. 2, no. 1, p. 57, 2020, doi: 10.20473/conmatha.v2i1.19302.

[3] "Indonesian Clinical Practice Guidelines for Hyperthyroidism," *J. ASEAN Fed. Endocr. Soc.*, vol. 27, no. 1, pp. 34–39, 2012, doi: 10.15605/jafes.027.01.05.

[4] S. Agustiani, A. Mustopa, A. Saryoko, W. Gata, and S. K. Wildah, "Penerapan Algoritma J48 Untuk Deteksi Penyakit Tiroid," *Paradig. - J. Komput. dan Inform.*, vol. 22, no. 2, pp. 153–14), 2020, doi: 10.31294/p.v22i2.8174.

[5] I. M. D. Maysanjaya, H. A. Nugroho, and N. A. Setiawan, "A comparison of classification methods on diagnosis of thyroid diseases," *2015 Int. Semin. Intell. Technol. Its Appl. ISITIA 2015 - Proceeding*, no. May, pp. 89–92, 2015, doi: 10.1109/ISITIA.2015.7219959.

[6] B. H. H. Putrama Alkhairi, "Penerapan algoritma backpropagation untuk mengenali pola tulisan angka dengan fungsi pelatihan gradient descent with momentum adaptive lr 32," vol. 1, no. 3, pp. 126–139, 2022.

[7] D. Setiawan, R. N. Putri, and R. Suryanita, "Perbandingan Algoritma Genetika dan Backpropagation pada Aplikasi Prediksi Penyakit Autoimun," *Khazanah Inform. J. Ilmu Komput. dan Inform.*, vol. 5, no. 1, pp. 21–27, 2019, doi: 10.23917/khif.v5i1.7173.

[8] P. R. Srikandi, "Hipertiroidismee Graves 19ease:Case Report," *J. Kedokt. RAFLESIA*, vol. 6, no. 1, pp. 30–35, 2020, doi: 10.33369/juke.v6i1.10986.

[9] S. A. Ersantika Sari Erent, Setyawan Henry, Udiyono Ari, "Faktor Risiko Hipertiroid pada Wanita Subur," *J. Kesehat. Masy.*, vol. 3, no. 3, pp. 1–10, 2019.

[10] B. H. Hayadi, I. G. I. Sudipa, and A. P. Windarto, "Model Peramalan Artificial Neural Network pada Peserta KB Aktif Jalur Pemerintahan menggunakan Artificial Neural Network Back-Propagation," *MATRIK J. Manajemen, Tek. Inform. dan Rekayasa Komput.*, vol. 21, no. 1, pp. 11–20, 2021, doi: 21 30812/matrik.v21i1.1273.

[11] Julpan, E. B. Nababan, and M. Zarlis, "Bipolar Dalam Algoritma Backpropagation Pada," *J. Teknovasi*, vol. 02, pp. 103–116, 2015.

[12] Y. D. Lestari, "Jaringan Syaraf Tiruan Untuk Prediksi Penjualan Jamur Menggunakan Algoritma Backropagation," *J. ISD*, vol. 2, no. 1, pp. 40–46, 2017.

[13] D. I. S. Utara, P. Algoritma, and M. Produksi, "Prediksi, Produksi, Beras," vol. 4, no. 1, pp. 77–86, 2018.

5

[14] H. S. Tambunan, "Pengenalan Pola Hiv Dan Aids Menggunakan Algoritma Kohonen Pada Jaringan Syaraf Tiruan Backpropagation," *InfoTekJar (Jurnal Nas. Inform. dan Teknol. Jaringan)*, vol. 1, no. 1, pp. 65–69, 2016, doi: 4 .30743/infotekjar.v1i1.44.

[15] H. Putra and N. Ulfa Walmi, "Penerapan Prediksi Produksi Padi Menggunakan Artificial Neural Network Algoritma Backpropagation," *J. Nas. Teknol. dan Sist. Inf.*, vol. 6, no. 2, pp. 100–107, 2020, doi: 10.12 77/teknosi.v6i2.2020.100-107.

[16] A. C. Sitepu and M. Sigiro, "Analisis Fungsi Aktivasi Relu dan Sigmoid menggunakan optimizer SGD dengan Representasi MSE pada Model Backpropogation," *Pros. SeNTIK*, vol. 1, 15 12–25, 2021.

[17] B. S. Mózo, "Transaksi," *J. Chem. Inf. Model.*, vol. 53, no. 9, pp. 1689–1699, 2017.

[18] A. Suryawinata, "Program Studi Teknik Informatika 2021," vol. 5, no. 1, pp. 9–13, 2021.

[19] G. Z. Muflih, T. Informatika, and F. Teknik, "Penentuan Parameter Pembelajaran Jaringan Saraf Tiruan Backpropagation 15n Pengaruhnya Terhadap Proses Pelatihan," vol. 1, no. 2, pp. 17–17, 2021, doi: 10.53863/juristik.v1i02.363.

[20] Julpan, E. B. Nababan, and M. Zarlis, "Bipolar Dalam Algoritma Backpropagation Pada Prediksi Kemampuan Siswa," *J. Teknovasi*, vol. 20 pp. 103–116, 2015.

[21] Agus Perdana Windarto, "Implementasi Jst Dalam Menentukan Kelayakan Nasabah Pinjaman Kur Pada Bank Mandiri Mikro Serbelawan Dengan Metode Backpropogation," *J-SAKTI (Jurnal Sains Komput. dan Inform.*, 13 . 1, no. 1, pp. 12–23, 2017.

[22] O. N. A. AL-Allaf, "Improving the performance of backpropagation neural network algorithm for image compression/decompression system," *J. Comput. Sci.*, vol. 6, no. 11, pp. 1347–1354, 8 10, doi: 10.3844/jcssp.2010.1347.1354.

[23] R. Ridwan, H. Lubis, and P. Kustanto, "Implementasi Algoritma Neural Network dalam Memprediksi Tingkat Kelulusan Mahasiswa," *J. Media Inform. Budidarma*, vol. 4, no. 2, p. 286, 2020, doi: 10.30865/mib.v4i2.2035.

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