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Epoch in a neural network for brain stroke

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ABSTRACT

A neural network is a data processing system consisting of a large number of simple and highly interconnected processing elements in an architecture inspired by the structure of the cortical regions of the brain. Therefore, neural networks can often do things that humans or animals can do, but traditional computers are often lousy. This research discusses brain tumors that can be detected by artificial intelligence. Stroke includes the sudden death of brain cells due to lack of oxygen, blockage of the circulatory system, or severance of flexible pathways to the brain. Therefore the need for action that must be faster to be able to detect this deadly disease. The method used is a Neural Network which can collect knowledge by detecting patterns and relationships between data and learning experiences. So that the detection process is carried out more quickly and the patient can be given medical action as soon as possible. In the study I conducted brain stroke from the number of strokes with a value of 0 4733 and 1 out of 248. This research has a test conducted by conducting epoch training from 1 to 300, the highest score accuracy is in epoch 1 and 2 with more high scores.

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1. INTRODUCTION

Stroke is a reason for disability in adults and their cause of most Dead with position fifth in the world[1]. The loss of function brain happens only in some minutes and the running deficit is long enough to resolve motor function that occurs in some cases[2]. Stroke cases each year always increase and the cost economy very takes effect on system care health[3]. This stroke treatment has many kinds of that is ischemic or hemorrhagic[4]. Ischemic often occurs with experience the clot that can cover Genre blood in the brain. Need conducted operation to remove lumps them as well as need intensive treatment to better again[5]. While hemorrhagic stroke occurs if there is bleeding in the brain[6]. Treatment with to control blood and remove pressure in the brain with use drugs so that you can dilute freezing blood and lower pressure blood, or to do surgery for vessels the blood could be repaired with good and can to do therapy in need time long term in patients[7].

This research discusses brain tumors that can be detected by artificial intelligence. Stroke includes the sudden death of brain cells due to lack of oxygen, blockage of the circulatory system, or severance of flexible pathways to the brain. There fore the need for action that must be faster to be able to detect this deadly disease. The method used is a Neural Network which can collect knowledge

by detecting patterns and relationships between data and learning experiences. So that the detection process is carried out more quickly and the patient can be given medical action as soon as possible. Strokes included Dead sudden cells brain because of deficiency of oxygen, blockage of system circulation blood, or cut-off track flexible to the brain[8]. As pointed out by the Organization of World Health in the years coming, the stroke will Keep going continue with the number of continuous death increases. Lots of work has been conducted to identify strokes [9]. Method sensitive artificial for predict type of stroke and stroke using technique typical learning. Kind are ischemic stroke, hemorrhagic stroke, stroke ischemic transient[10]. Data collection varies from context to clinical. Preprocessing techniques erase notes duplicates, missing data, and conflicting data. Calculation of Reference Segment Test is calculation used for reduce forecast and beyond use, prediction is patient will had a stroke. To predict stroke, with added clustering using deep learning[11]. After information detail on patients is available, they will check with models and measurements that have been prepared for various types of stroke. This especially works to focus on more ways_good for predicting stroke and various types of stroke [12].

Based technique intelligence artificial (AI) with fast Becomes famous in the related field with health, and have proven capable help officer health in diagnosis and prediction disease[13]. Method learning supervised machine could learn structure complex use training data set and implementing knowledge that for predict results from the situation is not observed [14]. Artificial Neural Networks are from learning supervised machines[15]. Network simulates structure and function system nerves, collect knowledge with detect pattern and relationship between data and learning experience [11]. The most common ANN implemented has a multi-layer design, consisting of from input layer, hidden layer, and layer output, every layer consist of many neurons[16]. Every neuron is connected to many other neurons, and connections could strengthen or hinder the effect on the state activation of connected neurons [17]. ANN-based models can be efficient predict the connection between complex nonlinear Among input and output variables by repeating the training and validation process until the desired regression achieved [18].

2. RESEARCH METHOD

Backpropagation is algorithm learning supervised and generally used by Perceptron with some layer for modifying related weight with neurons in the layer hidden [18]. The back-propagation algorithm uses output error to shift score weight in opposite direction [19]. To get an error at the point this, forwarding must be conducted more first [20].

Deep neuron imitation structure network nerve imitation is element processing that can behave like neurons [21]. Amount input signal a is multiplied with each w weight. Then conducted summation all results multiplication and output continue to function Activation for getting signal output level F(a,w)[22]. Though still far from perfect, cloned neuron performance this identical to cell the biology that we know now.

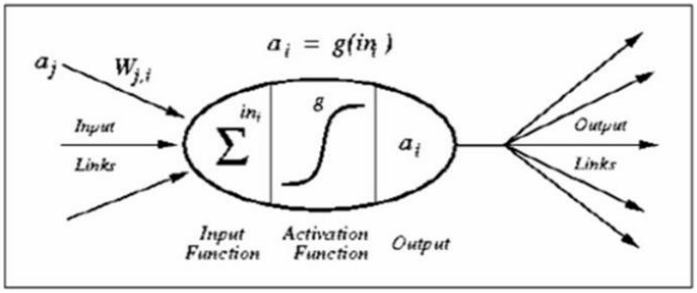

Figure 1. Artificial Neural Network (ANN)

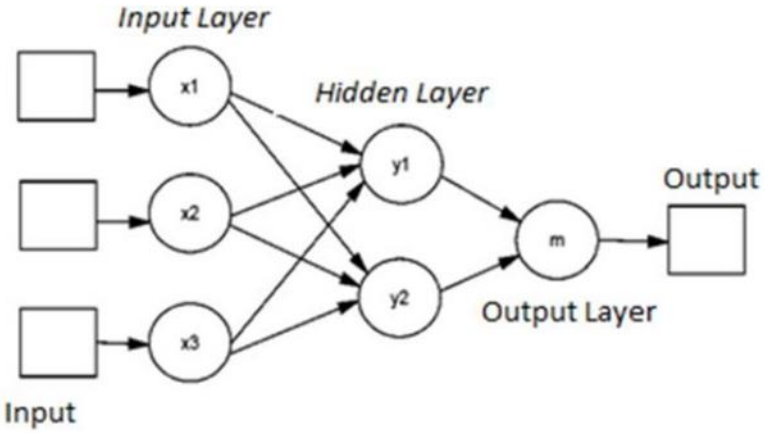

Figure 2. The Architecture of Multilayer Artificial Neural Network (ANN)

Network nerves imitation consist of many layers, each layer consists of a set of nodes, and the nodes are the place computing takes place [23]. Each node takes the input vector, together with the weight for the score vector, for apply function and sends the output to the layer next. The following picture show knot simple.

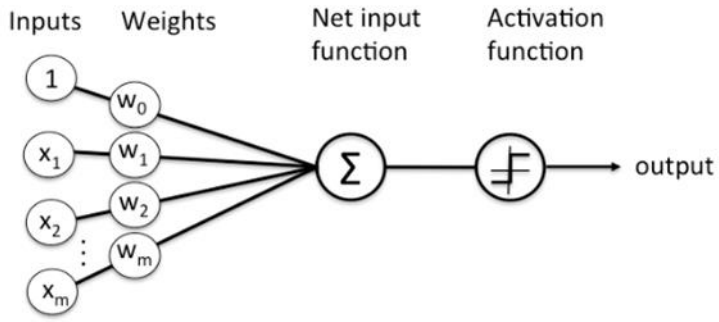

Figure 3. Knot Simple Neural Network

Network nerve learns data input pattern with reading input data set and apply various calculations to him. But network nerves not only produce it once but learn it repeatedly, using biased input and output data sets of testing before.

Every footsteps training of the input data set is called an epoch. So epoch refers to cycle through training dataset full [24]. Usually, training network nerves need more than a number of the day. Increasing the number of epochs is not mean the network will perform better. So basically, try multiple epochs with the same result after many cycles.

3. RESULTS AND DISCUSSIONS

This research requires experimental data to be tested on the neural network method regarding brain stroke, so that later it can be implemented in brain stroke patient s[25]. This is an experimental method using data obtained from Kaggle. The data has been analyzed so that it has column types to identify. Analyzed data in which the final column is considered the target, and the other columns are the attributes. The shared datasets become training sets, validation sets, and test sets [26].

3.1 Testing.

Data has been analyzed to have a type column for identification. Moment analyzes data, column final treated as target and column other will enforced as input field. Shared dataset into training data, validation sets, and testing data. The following is the data table used:

Table 1. Brain Stroke Data

gender	age	hyperte nsion	heart disease	Ever marrie	work type	Residence type	Avg glucose level	BMI	Smoking status	stroke	
0	Male	67	0	1	Yes	Private	urban	228.69	36.6	formerly smoked	1
1	Male	80	0	1	Yes	Private	Rural	105.92	32.5	never smoked	1
...	Male	...	...	...	...	...	...	...	...	...	...
4976	Male	41	0	0	No	Private	Rural	70.15	29.8	formerly smoked	0
4977	Male	40	0	0	Yes	Private	urban	191.15	31.1	smoke	0
4978	Female	45	1	0	Yes	Govt_job	Rural	95.02	31.8	smokes	0
4979	Male	40	0	0	Yes	Private	Rural	83.94	30	Smokes	0
4980	Female	80	1	0	Yes	Private	urban	83.75	29.1	never smoked	0

Based on the table above, detected a brain stroke from the number of strokes with 0 values of 4733 and 1 of 248 which can be seen on the graph under this:

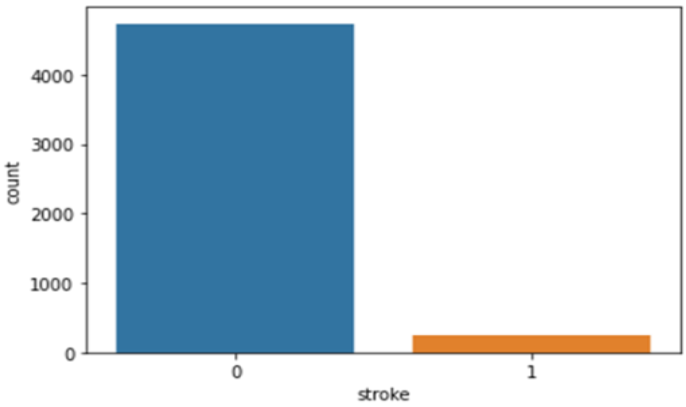

Figure 4. Stroke Status

The picture explains that patients who did not have a stroke had an accuracy of 95.02% and those who did not stroke by 4.97%. Following are chart results testing group brain stroke patients from the smoking status as follows:

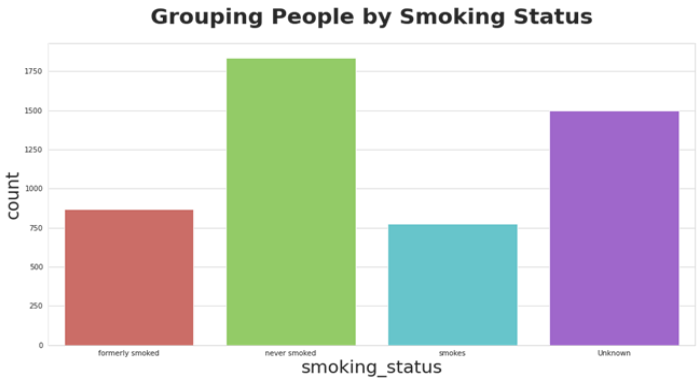

Figure 5. Smoking Status

Whereas chart results testing brain stroke sufferers from people with hypertension are as follows:

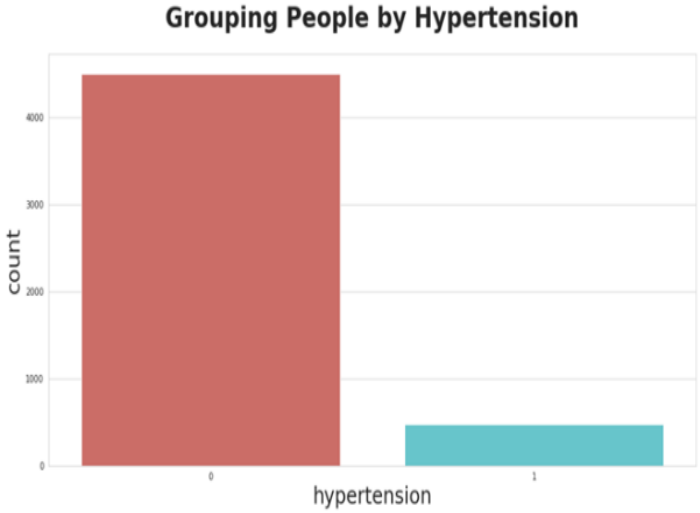

Figure 6. Hypertension

Chart sufferer brain stroke from People based on Work Type

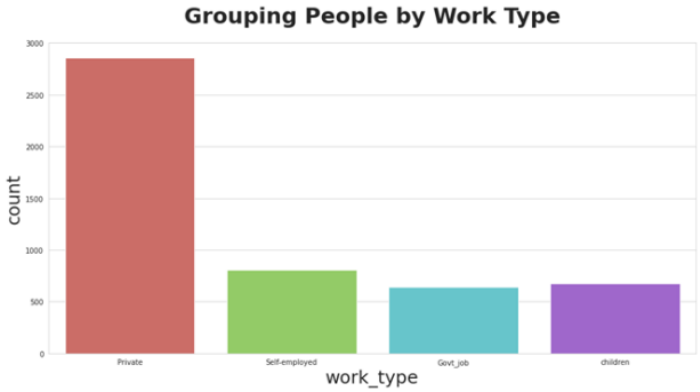

Figure 7. Work Type

The table could be applied in the graphic that can be shown score accuracy based on epoch testing carried out :

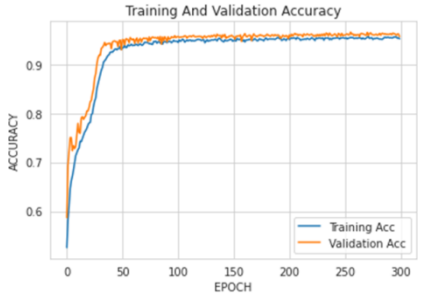

Figure 8. Training and Validation Accuracy

Following Graph of Training and Validation Loss from epoch data that has been tested

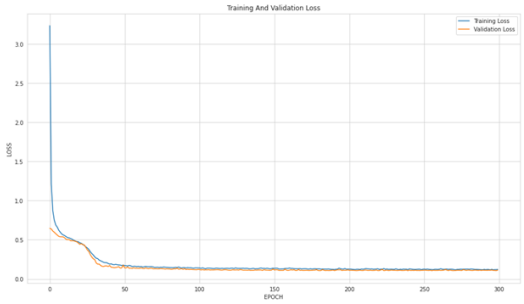

Figure 9. Training and Validation Loss

Based on tests carried out with do training epochs from 1 to 300, there are score accuracy highest is in the 1st and 2nd epochs with more value high.

3.2 Test result.

This research requires experimental data to be tested on the neural network method regarding brain stroke, so that later it can be implemented in brain stroke patients. This is an experimental method using data obtained from Kaggle. So that it can be simulated to see the achievement of searching for the highest accuracy and can be used in the medical field in analyzing patients with brain stroke using predetermined attributes. The resulting achievement was successful by obtaining the highest value from the epoch experiment carried out in the analysis process. The table below this will be shown the results of data analysis from epochs 1 to 300. Comparison results Among target networks (0 and 1). More clear information could be seen in the table under this:

Table 2. Epoch Training

Epoch	Times	loss	Accuracy	Val_Loss	Val_accuracy
Epoch 1/300	1s 34ms/step	3.2338	0.5259	0.6459	0.5871
Epoch 2/300	0s 17ms/step	1.2113	0.5816	0.6387	0.6932
Epoch 3/300	0s 17ms/step	0.8717	0.6103	0.6117	0.7228
Epoch 4/300	0s 17ms/step	0.7498	0.6459	0.5964	0.7503
Epoch 5/300	0s 18ms/step	0.6886	0.6623	0.5776	0.7503
Epoch 6/300	0s 18ms/step	0.6609	0.6716	0.5604	0.7239
Epoch 7/300	0s 17ms/step	0.6223	0.6846	0.5436	0.7339
Epoch 8/300	0s 17ms/step	0.5968	0.6997	0.5392	0.7281
Epoch 9/300	0s 17ms/step	0.5742	0.7135	0.5377	0.7328
Epoch 10/300	0s 17ms/step	0.561	0.7196	0.5365	0.7566
Epoch 11/300	0s 17ms/step	0.5531	0.7257	0.5235	0.7793
Epoch 12/300	0s 17ms/step	0.5385	0.7291	0.5054	0.7608
Epoch 13/300	0s 17ms/step	0.5274	0.7431	0.5025	0.7592
Epoch 14/300	0s 17ms/step	0.5237	0.7421	0.5019	0.7904
Epoch 15/300	0s 17ms/step	0.5154	0.7484	0.4873	0.793
...	...	...	...	...	...
Epoch 300/300	0s 16ms/step	0.1219	0.9521	0.1127	0.9567

Based on the test results table, it can be seen that the dataset is 4980 data with 10 characteristics. Testing with epoch 100 and without using steps per epoch produces an accuracy rate of 94.73%, using steps per epoch 100 produces an accuracy rate of 95.62%, while with steps per epoch 150 produces an accuracy rate of 95.93% and at epoch 300 produces a level accuracy of 95.67%. From this comparison it can be seen that the number of epochs and steps per epoch affect the level of accuracy. The more number of epochs and steps per epoch used, the higher the level of accuracy obtained. In addition, the use of steps per epoch can also improve the accuracy obtained during the training process.

4. CONCLUSION

The results of research on brain tumors that can be detected with artificial intelligence. Stroke includes the sudden death of brain cells due to lack of oxygen, blockage of the circulatory system, or severance

of flexible pathways to the brain. Therefore it is necessary to have action that must be faster to be able to detect this deadly disease. The method used is a Neural Network which can collect knowledge by detecting patterns and relationships between data and learning experiences. So that the detection process is carried out faster and the patient can be given medical action as soon as possible. In my research I did brain strokes from the number of strokes with a value of 04733 and 1 out of 248. This research has tests done by doing epoch training from 1 to 300, the highest score accuracy is on epoch 1 and 2 with higher scores. The epoch is a hyperparameter that can determine which neural network algorithm can do the job by going through all datasets either backward or forward. One epoch is reached when all batches have been successfully passed through the neural network once. In the example above, 1 epoch is reached when 300 batches of training data samples have been processed. This study succeeded in implementing deep learning using the Neural Network method with the Tensorflow library resulting in a good level of training accuracy, namely 95.67%. The training process is carried out using a comparison between the number of epochs and steps per epoch. The conclusion obtained is that the more the number of epochs and steps per epoch, the higher the level of training accuracy obtained.

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