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Prediction of Understanding of Students Under Course Lecturer Professional Use Neural Network Backpropogation

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Abstract

The process of learning is one of the activities in a college / institution in the intellectual life of the nation. That role is inseparable from professional teachers. In the process of learning the necessity of a two-way relationship between students and professional teachers. This meant that there was good cooperation during the learning process takes place. Evaluations are conducted by the university / institution for teaching and learning process is necessary to end the semester. It is intended that there is an assessment of the students and faculty. For these students aimed at assessing the level of understanding and acceptance of the subjects taught and the teachers in order to assess the extent to which teachers can distribute knowledge on subjects that for 1 (one) semester. So that the university / institution can provide a fair decision. In prediction level of students' understanding of the course to implement Neural Network using backpropagation algorithm. This method was chosen because it is able to determine the level of students' understanding of the course is based on input from questionnaires given. The study was conducted in two ways, namely training and testing. Data will be divided into two parts, the first data for the training process and second data for the testing process. The training process aims to identify or search for goals that are expected to use a lot of patterns, which a will be able to produce the best patterns to train the data. After reaching the goal of training is based on the best pattern will be tested with new data to look at the accuracy of the target by using Matlab 6.1. Based on test results using Matlab 6.1 software can speed up the process of predicting students' understanding of the course is based on faculty at the University Pembangunan Pancabudi of Medan.

Keywords : *Neural Network, Predicting, Backpropogation*

1 INTRODUCTION

Private colleges Pancabudi Development University of Medan has not implemented a system of determining the level of students' understanding of the course is based on professional teaching force. The process of learning is one of the activities in a college / institution in the

intellectual life of the nation. That role is inseparable from professional teachers. Predictions in the context of computing is one of the mathematical activity. This prediction has been done many years before the control computer, using tools such as calculators count. Prediction of students' understanding of the course is based on professional teaching staff can help the universities / institutions in making policies on the future of professional teaching staff.

To determine the level of students' understanding of the course is done by assessing (scoring) through questionnaires. Questionnaires were administered to represent the entire process of assessing the level of understanding of students on the course. Having obtained the target or desired goal of the assessment is carried determination (determination) for the level of students' understanding of the course by professional teachers.

Artificial Neural Networks is one of the information processing system that is designed to mimic the way the human brain works in resolving a problem with the process of learning through weight changes sinapsisnya. There are many techniques that can be used for the implementation of Artificial Neural Networks one of them is Backpropagation. Neural network using backpropagation algorithm has been widely used to solve some of the problems one prediction problem. In a previous study in the journal entitled Application of Neural Networks to Predict Unemployment in East Kalimantan Using Learning Algorithms Backpropogation (Adrijasa MF et al, 2009).

Based on the description of the background of the above problems, then that becomes a problem formulation are: 1) How to determine the parameters of the level of students' understanding of the course is based on professional teaching staff with backpropogation algorithm?, 2) How is the implementation of Artificial Neural Networks to determine the level of students' understanding of the course is based on professional teaching staff at the University of Development Pancabudi Medan?, and 3) How to apply Artificial Neural Networks to the criteria for the level of students' understanding of the course is based on professional teaching force?

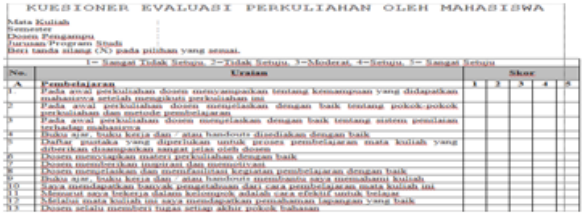
The purpose of this study are: 1) Determine the criteria for determining the level of students' understanding of the course is based on professional teaching staff, 2) Implementation of Neural Networks for the determination of the level of students' understanding of the course is based on professional teaching staff for students of University Development Pancabudi field using backpropagation method, and 3) Test the backpropagation algorithm accuracy in determining the level of students' understanding of the course is based on professional teaching staff.

The benefits of this research are: 1) Can help the process of determining the level of students' understanding of the course is based on professional teaching staff, and 2) Can help colleges / institutions to determine the level of students' understanding of the subjects taught by the professional teaching staff.

2 RESEARCHMETHODOLOGY

2.1 Artificial Neural Networks

Artificial Neural Network (ANN) is one of the artificial representation of the human brain that is always trying to simulate the learning process of the human brain (Aprijani and Sufandi, 2011; Lai, 2006), while Li and Liu (2006); Warsito, et.al (2008), modeling the ANN as a system with inputs and outputs based on neural Biology. Several studies in various fields using methods of problem solving among the Traveling Salesman JST (Puspitorini, 2008).



KUESIONER EVALUASI PERKULIAHAN OLEH MAHASISWA

Mata Kuliah
Semester
Dosen Pengampu
Jurusan Program Studi
Beri tanda silang (X) pada pilihan yang sesuai.

1= Sangat Tidak Setuju, 2=Tidak Setuju, 3=Moderat, 4=Setuju, 5= Sangat Setuju

No.	Uraian	Skor				
A	Pembelajaran	1	2	3	4	5
1	Pada awal perkuliahan dosen menyampaikan tentang kemampuan yang didapatkan mahasiswa setelah mengikuti perkuliahan ini					
2	Pada awal perkuliahan dosen menjelaskan dengan baik tentang pokok-pokok perkuliahan dan metode pembelajaran					
3	Pada awal perkuliahan dosen menjelaskan dengan baik tentang sistem penilaian terhadap mahasiswa					
4	Buku ajar, buku kerja dan / atau handouts disediakan dengan baik					
5	Daftar pustaka yang digunakan untuk proses pembelajaran mata kuliah yang diberikan disampaikan sangat jelas oleh dosen					
6	Dosen menyajikan materi perkuliahan dengan baik					
7	Dosen memberikan inspirasi dan memotivasi					
8	Dosen menjelaskan dan memfasilitasi kegiatan pembelajaran dengan baik					
9	Buku ajar, buku kerja dan / atau handouts memfasilitasi saya memahami kuliah					
10	Saya mendapatkan banyak pengetahuan dari cara pembelajaran mata kuliah ini					
11	Menurut saya bekerja dalam kelompok adalah cara efektif untuk belajar					
12	Melalui mata kuliah ini saya mendapatkan pemahaman tugasan yang baik					
13	Dosen selalu memberi tugas setiap akhir pokok bahasan					

Figure 1: The list of questionnaire question

Problem solving pattern recognition (Hidayatno et al, 2008).

Backpropagation training algorithm to network with one hidden screen (with a binary sigmoid activation function) is (Maru'ao, 2010): Step 0: Initialize all weights to small random numbers.
Step 1: If the termination condition is not met, do steps 2-8.
Step 2: For each pair of training data, perform steps 3-8.
Step 3: Step 3 (steps 3-5 are phase 1).
Each input unit receives the signal and forwards it to the hidden unit thereon.
Step 4: Calculate all the outputs in the hidden units $zj(j = 1, 2...p)$

$$Z\ net_j = V_{jo} + \sum_{n}^{i=1}$$

$$Z_j = f(Z\ net_j) = \frac{1}{1 + exp^{-z\ netj}}$$

Step 5: Calculate all network output in units of output yk (k = 1, 2, ..., m):

$$Ynet_k = W_{ko} + \sum p^{j=1} Z_j W_{kj}$$

Recalculating accordance with the activation function: $Y_k = f(Ynet_k)$

$$Z_j = \frac{1}{1 + exp^{(-ynet_k)}}$$

Step 6: (steps 6-7 is a phase 2)
Calculate the factor δ output unit based on the error in each unit of output $yk(k = 1, 2, ...m)\delta_k = (t_k - y_k)f(y_net_k) = (t_k - y_k)y_k(1 - y_k)t_k = target$
δ_k an error output unit that will be used in the weight changes underneath the screen. Calculate the rate of change in weight wkj with α understanding $\Delta W_{kj} = \alpha\delta_k z_j, k = 1, 2, ..., m, j = 0, 1, ..., p$
Step 7: Calculate the factor hidden units based on the error in each hidden unit $zj(j = 1, 2, ..., p)\delta net_j = \sum m^{k=1}\delta_k W_{kj}$
Factor δ hidden units.

$$\delta_j = \delta net_j f(Znet_j) = \delta net_j Z_j(1 - Z_j)$$

Calculate the weight change rate VJI.

$$\Delta V_{ji} = \alpha\delta_j x_i, k = 1, 2, ..., p, i = 0, 1, ..., n$$

Table 1: The list of criteria

No	Kriteria	Variabel	Keterangan	Bobot
1	Pembelajaran	A	Sangat Setuju	1
			Setuju	0,8
			Moderat	0,6
			Tidak Setuju	0,4
			Sangat Tidak	0,2
2	Keterampilan (Skills)	B	Sangat Setuju	1
			Setuju	0,8
			Moderat	0,6
			Tidak Setuju	0,4
			Sangat Tidak	0,2
3	Penilaian dan Beban Kerja	C	Sangat Setuju	1
			Setuju	0,8
			Moderat	0,6
			Tidak Setuju	0,4
			Sangat Tidak	0,2
4	Bimbingan dan Konseling	D	Sangat Setuju	1
			Setuju	0,8
			Moderat	0,6
			Tidak Setuju	0,4
			Sangat Tidak	0,2
5	Sumber Pembelajaran	E	Sangat Setuju	1
			Setuju	0,8
			Moderat	0,6
			Tidak Setuju	0,4
			Sangat Tidak	0,2
6	Standard dan Target	F	Sangat Setuju	1
			Setuju	0,8
			Moderat	0,6
			Tidak Setuju	0,4
			Sangat Tidak	0,2

Step 8: Calculate the weight of all the changes. Weight change line leading to the unit output,

$$ieW_{kj}(new) = W_{kj}(old) + \Delta W_{kj}$$

$$k = 1, 2, ..., m, j = 0, 1, ..., pn$$

Weight change line leading to the hidden units, namely:

$$V_{ji}(new) = V_{ji}(old) + \Delta V_{ji}$$

$$j = 1, 2, ..., p, i = 0, 1, ..., n$$

2.2 Sum Square Error and Root Mean Square

Error error at the output of the network is the difference between the actual output with the desired output. The resulting difference between the two is usually determined by calculated using an equation. Sum Square Error (SSE) is calculated as follows:

1. Calculate the neural network output to the first input.
2. Calculate the difference between the neural network output and the desired target value for each output.

3. Multiply each output then count entirely

3 RESULTSAND DISCUSSION

3.1 Stage Data Collection on document

In this study, a system of pattern recognition and prediction of students' understanding of the course is based on professional teaching force. Data were obtained from questionnaires distributed to students grouped by subjects who diampuh a professional teaching force. The format of a questionnaire given to students in the form of questions 30 questions with each question represents the study variables. The variable-variable penelitaian are learning, skills (Skill), and workload assessment, guidance and counseling, learning resources and standards and targets. Students enough to give a score of 1 = Strongly Disagree, 2 = Disagree, 3 = moderate, 4 = Agree, 5 = Strongly Agree, such as the following format:

The charging process is done by taking a sample of some of the classes are categorized by subjects who diampuh by professional workforce. The list of criteria to determine the prediction of students' understanding of the course are as follows:

3.2 Determining the Best Pattern

Training and testing were performed multiple times with different parameters to get the best results with Matlab 6.1 software application Neural Network method in determining the best pattern for the level of students' understanding of the course is based on professional teaching staff has a 3 part process, namely:

1. The process of data input and the target includes inputting learning, skills (Skill), and workload assessment, guidance and counseling, learning resources and standards and targets .. As for the target is the level of students' understanding of the course

2. The process of determining the results of the processed data includes the data conversion process into a predetermined weight, calculate the weight value into stages backpropagation.

3. The results of the process of determining the data processed with Matlab 6.1 software application will be used to predict the level of student understanding terhadapat subjects by comparing the value of the minimum error.

From a series of experiments performed using Matlab 6.1 software application with a model 6-50-1, 6-75-1 models, the model 6-100-1, 6-50-75-1 models and models 6-75-100- 1 obtained the best architectural pattern in the model parameters 6-50-1 with the following attributes:
Activation function to Hidden Layer: Tansig
Activation function to Output Layer: Logsig
Type Trainning: Traingd
Number of Hidden Layer Neurons: 50
Learning rate: 0.1
Error Limit Maximum: 0,001
Show Limits: 1000
Limit Maximum Epoch: 5000000

Table 2: Comparison of Each Model Epoch and MSE any architectural models

	6-50-1	6-75-1	6-100-1	6-50-75-1	6-75-100-1
Epochs	166828	> 2000000	38820	25145	19255
MSE	0,0009991940	Tidak Terdefenisi	0,0009995025	0,0009997820	0,0009993985

Table 3: Data Categorization Prediction

No	Keterangan	Error Minimum
1	Paham	0,0000 0,0010
2	Tidak paham	0,0011 - 0,0100

Momentum: 0.8

Of the parameters used to model architectural epochs 6-50-1 with 0.0009991940 MSE 166 828 and shown in Figure 2.

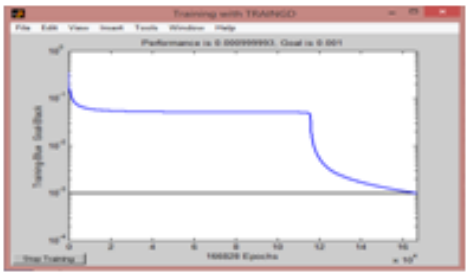


Figure 2: 6-50-1 architecture Achieve Goal

The data comparison of each model can be seen in the table below 5:19 this:

3.3 Prediction Level Student Understanding of the Course

The last stage is the prediction of student understanding of the subjects that diabawakan by professional teachers. This stage is done by comparing the value of the minimum error of the results obtained. With 6-50-1 architecture model, the data would be predicted to see how accurate the model is able to recognize the data. The desired results of this final stage is to get the minimum error value for the prediction of architectural patterns. The results are as follows:

1. Categorization understand and do not understand
2. Categorization understand is determined by the minimum error rate where familiar with weights 1 and are not familiar with weights 0
3. Categorization minimum error for prediction understand and do not understand the data can be seen in Table 3:

Table 4: Examples of writing table

Prediksi 6-50-1		Prediksi		Ket
No	NIM	Data Real	JST	Hasil
1	2.012E+11	1	0,00092	Benar
2	2.012E+11	0	0,00033	Benar
3	2.012E+11	0	0,00036	Benar
40	2.013E+11	1	0,00056	Benar
41	2.013E+11	1	0,00032	Benar
42	2.013E+11	1	0,00056	Benar
43	2.013E+11	1	0,0076	Salah
44	2.013E+11	1	0,0093	Salah
45	2.013E+11	1	0,0076	Salah
46	2.013E+11	1	0,0056	Salah
47	2.013E+11	1	0,0373	Benar
48	2.013E+11	1	0,00056	Benar
49	2.013E+11	1	0,0387	Benar

The data would be predicted to see level can be seen in table 4 below.Table 4 Results Prediction Model 6-50-1.By using 6-50-1 architecture model prediction results obtained 87.75%. In other words, this model is good enough to predict the level of students' understanding of the subject.

4 CONCLUSION

Based on the results and analysis of the previous chapter, the authors can conclude as follows:

1. Adding lots of hidden layer during training and testing, not a maximum results. To 5-designed architectural models, 6-50-75-1 is a model that has the largest MSE is 0.028540763

2. After the experiment in the process of training and testing of the system is done using Matlab 6.1 software application. Neural Network Model used is 6-50-1, 6-75-1 models, the model 6-100-1, 6-50-75-1 models and models 6-75-100-1, can be obtained good results with a view MSE smallest and fastest epochs is 6-50-1.

3. With 6-50-1 architecture model, can perform a prediction of students' understanding of the subject by showing the performance above 92%

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