Prediction Student Graduation On Time Using Artificial Neural Network on Data Mining Students STMIK Widya Cipta Dharma Samarinda

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***Abstract*— This study originated from the author's observation in STMIK WidyaCipta Dharma Samarinda, from the data on the academic and student affairs administration (BAAK) where at the beginning of the academic year 2009/2010, there were 193 students who have been accepted in Informatics Engineering and 10% students who have been graduated on time in 2013. The desire to predict the students who graduate on time is expected to contribute in increasing the number of graduates. There are use artificial neural network learning on the data of students in academic year 2009 to get a pattern of students who graduate on time with the hope that the pattern can be used to predict the graduation of students in the next academic year.**

***Keywords*— Prediction, Student Graduation, Neural Network, Data Mining**

I. Introduction

STMIK WidyaCipta Dharma is one of the College of computers that are in Samarinda in East Kalimantan Province. STMIK WidyaCipta Dharma has a vision to be one of the best universities in the field of informatics and computer in eastern Indonesia.

In this study, the data obtained from the Administrative Section of Academic and Student Affairs (BAAK) STMIK Widya Cipta Dharma Samarinda, database student of Informatics Engineering in 2009 and the data of graduates in 2013.After that will be selected Appropriate and transformed to the format needed. And then, processed using matlab tools with artificial neural network algorithms to be studied and discovered patterns in predicting students who graduate on time

II. Teory AndRelated Work

Data mining is the science, art and technology of exploring large and complex bodies of data in order to discover useful patterns. Theoreticians andpractitioners are continually seeking improved techniques to make the process more efficient, cost-effective andaccurate [1].

Data mining is the process of discovering interesting patterns andknowledge from large amounts of data. The data

sources can include databases, data warehouses, the Web, other information repositories, or data that are streamed into the system dynamically.

Data mining is the process of discovering interesting patterns from massive amountsof data. As a knowledge discovery process, it typically involves data cleaning, data integration, data selection, data transformation, pattern discovery, pattern evaluation,and knowledge presentation[2].

Many people treat data mining as a synonym for another popularly used term, knowledge discovery from data, or KDD, while others view data mining as merely anessential step in the process of knowledge discovery. The knowledge discovery process is shown in Figure 1 as an iterative sequence of the following steps:

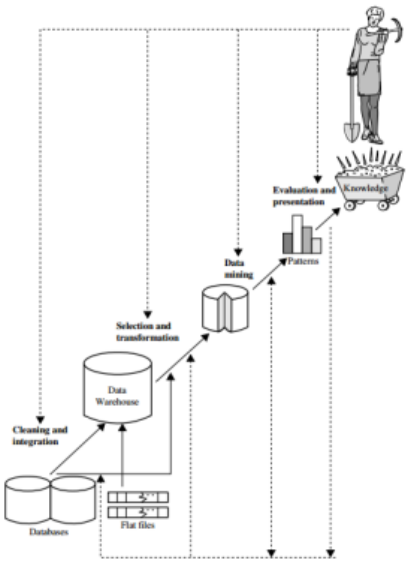


Fig. 1. Data mining as a step in the process of knowledge discovery

a. Data Cleaning (to remove noise and inconsistent data)
b. Data Integration (penggabungan data dari beberapa sumber)
c. Data Selection (where data relevant to the analysis task are retrieved from thedatabase)
d. Data Transformation (where data are transformed and consolidated into forms appropriate for mining by performing summary or aggregation operations)
e. Data Mining (an essential process where intelligent methods are applied to extractdata patterns)
f. Pattern Evaluation (to identify the truly interesting patterns representing knowledgebased on interestingness measures)
g. Knowledge Presentation (where visualization and knowledge representation techniques are used to present mined knowledge to users)

Research that has been done previously performed by NarayanaSwamy and M. Hanumanthappa discuss the implementation of the decision tree method to predict the data taken from the student registration data [3].Jaimin N. Undavia, Prashant M. Dolia, and Nikhil P.Shah discusses of decision support systems use Decision Tree that predict student graduation based on academic performance [4]. Imam Tahyudin, Ema Utami, and Armadyah Amborowati predict students graduate on time by using a classification algorithm comparison, the research method used is the comparative method with experimental approaches [5]. El Gamal, the research presents a data mining models of education for predicting the performance of students in the course of programming, using the Rule Extraction by making Decision Trees, which the Decision Trees is a classic method that is still very popular, but used for classification and regression, but also has a performance prediction the good one.

III. Research Method

This research using case study method with experimental approach.theanalyse method is classification of data mining method. The software used is Matlab 2013 [6]. The research process tha will be carried out shown in Figure 1.The data have cleaned from the blank or noise data will be integrated. After that will be selected and transformed to appropriate the format needed. Then, use artificial neuralnetwork algoritm for learning of the data. Prior learning, the data should be split into data training and data testing [7] [8] [9] .

Data used in this research process is the secondary of data, the data obtained from BAAK STMIK WidyaCipta Dharma Samarinda and only the program data informatics engineering studies in entry 2009 to 2013 as many as 193 students. Attributes that are used can be seen in Table I.

The values of the attribute data has been cleared converted into the form of numbers between 0 and 1 with the conversion of the values shown in Table II, it aims to make it easier when the data is processed using artificial neural network with activation function logsig.

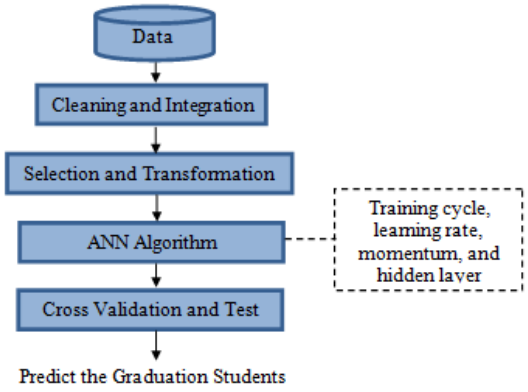


Fig. 2. The Flowchart of the research steps

IV. Result And Analysis

In Figure 2 we can see, the architecture of artificial neural network used is onewith 5 neuron input layer, one hidden layer with 5 neurons, and one output layer with one neuron. If this architecture does not find the pattern as expected, the hidden layer will be added over 5 neurons or increase the number of hidden layer artificial neural network to recognize the pattern.

TABLE I. Attribute Data Used

No	Attribute	Value
1	IPK	< 2.0 ; < 2.7; 2.7 - 3.5; > 3.5
2	SKS	Low, Normal, High
3	Economic Status	Low, Normal, High
4	Employment Status	Employment, unemployment

TABLE II. Conversion Attribute Values

No	Atribute	Range	Value
1	IPK	< 2.0	0.8
		< 2.7	0.6
		2.7 - 3.5	0.4
		> 3.5	0.2
2	SKS	Low	0.9
		Normal	0.6
		High	0.3
3	Economic Status	Low	0.9
		Normal	0.6
		High	0.3
4	Employment Status	Employment	0.8
		Unemployment	0.4
5	Target	On time	0.8
		Not on time	0.4

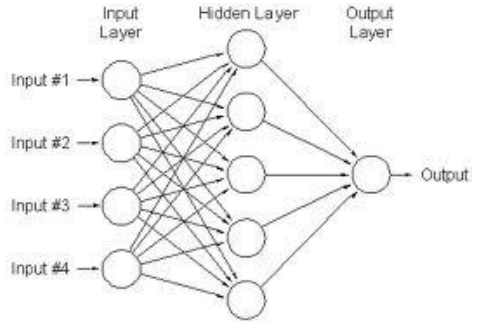
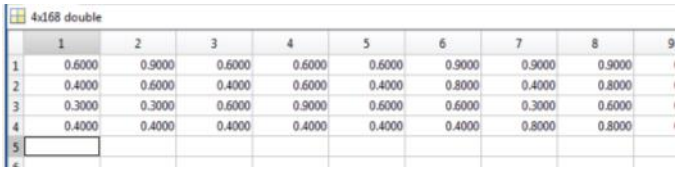
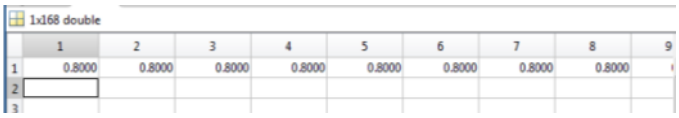


Fig. 3. Artificial Nneural Network Architecture



	1	2	3	4	5	6	7	8	9
1	0.6000	0.9000	0.6000	0.6000	0.6000	0.9000	0.9000	0.9000	
2	0.4000	0.6000	0.4000	0.6000	0.4000	0.8000	0.4000	0.8000	
3	0.3000	0.3000	0.6000	0.9000	0.6000	0.6000	0.3000	0.6000	
4	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.8000	0.8000	
5									

Fig. 4. Data Input



	1	2	3	4	5	6	7	8	9
1	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	
2									
3									

Fig. 5. Data Target

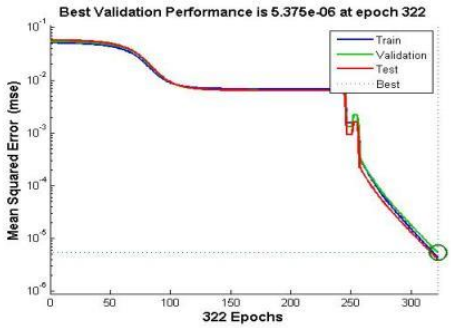


Fig. 6. Best Validation Performance

The data generated from the cleaning process as many as 168 rows of data from 193 the previous data, prepared as a variable for data input and the target, the input data is a matrix 4x168 training data can be seen in figure 3 and in figure 4 is a matrix 1x168 which is the target of the data input.

Then use the network trained epochs, learning rate, and maximum fail different, activation function use traingda and training function traingdm use to get the value of the smallest goal or Mean Squared Error (MSE), the smallest.

In Table III we can see that the experiment number 4 looping has been discontinued iteration to 322 with the smallest MSE value, then the network is used to predict graduation.

TABLE III. RESULT EXPERIMENTS OF ARCHITECHTUR ANN FOR DIFFERENT VALUES

No	Hidden Layer	Epochs	Learning rate	Goal	Max Fail	MSE
1.	1 (5 neuron)	2000	0.1	0.001	6	0.00988
2.	1 (5 neuron)	3000	0.01	0.0001	6	0.000380
3.	1 (5 neuron)	2000	0.3	0	2000	0.00643
4.	1 (5 neuron)	322	0.001	0	6	4.38e-06
5.	1 (5 neuron)	349	0.01	0	1000	3.30e-06
6.	1 (5 neuron)	2000	0.1	0	1000	0.00318
7.	1 (5 neuron)	2000	0.001	0.003	6	0.00774
8.	1 (5 neuron)	2000	0.001	0.002	6	0.00731
9.	1 (5 neuron)	2000	0.01	0.003	6	0.000857
10.	1 (5 neuron)	2000	0.01	0	1000	0.00538

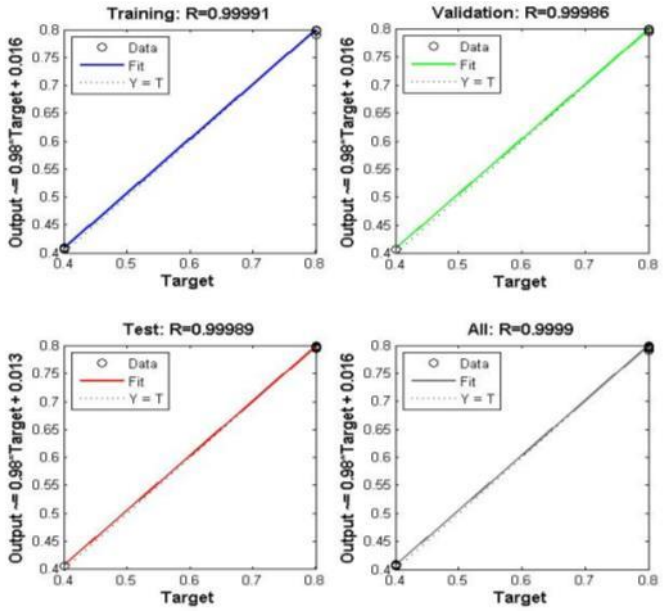


Fig. 7. Plot Regression

```
>> wawan = [0.3;0.2;0.3;0.2;0.4]

wawan =

    0.3000
    0.2000
    0.3000
    0.2000
    0.4000

>> prediksi = sim(network4,wawan)

prediksi =

    0.4059
```

```
>> sandy = [0.3;0.6;0.6;0.4;0.8]

sandy =

    0.3000
    0.6000
    0.6000
    0.4000
    0.8000

>> prediksi = sim(network4,sandy)

prediksi =

    0.7987
```

Fig. 8. Sample Prediction

At figure 5 is a gradient descent who demonstrate excellent gradient decline in network experiment number 4.

Figure 6 shows the results of training, testing, and validation have managed to find a pattern in which each target data is able to be found to the right.

Artificial neural networks have been trained is then used to predict the graduation. The first prediction with student name wawan and predicted results showed the 0.4059 or close to 0.4, which means wawan will graduate on time. The second prediction with sandy student names and the predicted results showed the 0.7987 or close to 0.8, which means sandy do not graduate on time.

The results are shown on the second sample predictions have shown that neural networks with back propagation algorithm can predict accurately graduation.

V. CONCLUSION

Prediction student graduates on time can be carried out using neural networks, in which the neural network capable of learning patterns contained in large data and make precise predictions. Results of some experiments on the research shows that the neural network with one input layer (5 neurons), one hidden layer (5 neurons), one output layer (one neuron), learning rate = 0.001, activation function traingda, learning function traingdm can be used to to predict with precision.

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