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Fuzzy Inference System In Predicting Unemployment Levels In Batam City

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Abstract

Batam city is known as an industrial city in Indonesia, this can be seen from the large number of Indonesians who come to the Riau Islands to work. The company standards in accepting industrial employees can be seen from various aspects, such as age, education, company, opportunities, and job vacancies. Each of these aspects can be used as a decision-making system in predicting unemployment in Batam City.The method in completing this research is using Sugeno method by taking the highest score and using the operaator and. Sugeno's work steps are four, the first is the determination of the input value, the second is the inference engine, the third is the application of the Implementation function and the fourth is the definition to get the final value.Application for determining job vacancies using Matlab software.

Keywords: *Fuzzy inference system, Method sugeno, Software Matlab*

1. Introduction

Batam is a city that is growing rapidly in terms of population and income. one of the economic factors causing poverty that hit Batam City, namely the increasing unemployment rate. Unemployment is the most serious problem, because with unemployment, the productivity and income of the community will decrease so that it can cause other social problems to arise. The unemployment rate can be calculated by comparing the number of unemployed with the total labor force expressed in percent. The absence of income causes the unemployed to reduce their consumption expenditure which causes a decrease in the level of prosperity and welfare. Prolonged unemployment can also have a negative psychological effect on the unemployed and their families. The research objectives to be carried out are: 1. The Fuzzy Sugeno method can determine the number of unemployed people in the city of Batam. 2. Can determine the factors causing unemployment in the city of Batam. 3. Analyzing Fuzzy Sugeno in determining the unemployment rate and countermeasures steps in the city of Batam.

Fuzzy Correct decision making in getting the initial value produces an output result. The first discovery about fuzzy was first discovered by Lofti A Zadeh (1965), the first findings announced the basis for dealing with objects of fuzzy set objects, in the form of logic F and T, false or true, semar semar relating to events that occur in accordance with existing statements. This result can also be called a decision-making system [1]. Fuzzy Logic Application Can Be Used In Any Field. Fuzzy Logic Is A System That Can Solve Problems That Are Suitable For Use In A System. Starting from a system that is small, medium and large, such as a network and part of the data control. This application can also be used on computer devices such as hardware and software. In this study, the results are adjusted that all are binary, the results found are only two kinds, namely yes and no or 1 and 0, but it can also be that both have value or not [2].

Fuzzy inference system using Sugeno method, has the characteristic that consequently it is not a fuzzy set, but is a linear equation with the variables according to the input variables. This method was introduced by Takagi-Sugeno Kang in 1985. There are 2

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models for fuzzy inference systems using the TSK method, namely the 0-order TSK model and the 1st-order TSK model. In many ways, Sugeno method is similar to Mamdani method. The difference lies in the type of membership function used in the consequent part. 1 The initial stage is to determine the input variables. 2 The next stage is the fuzzification process. 3 The third stage is the fuzzy logic operation which needs to be done if the antecedent part. 4 The fourth stage is the implication process: applying the implication method to determine the final shape of the output fuzzyset. 5 The fifth stage is aggregation, which is the process of combining outputs where the output is not in the form of a membership function, but a number which changes linearly[3]

2. Research Methodology

2.1. Research design

In conducting a study, a planning and implementation is needed so that research can be carried out systematically[4]. The design of this study is a preliminary survey to identify the determination of the unemployment rate in the city of Batam. Observations are made based on the decision of the labor party. From the initial observations, several hypotheses of the problem need to be solved as outlined in the introductory chapter. These problems are:

a) Many unemployed in the city of Batam.
b) Lack of information, knowledge and education so that it is difficult to findwork.

2.2. Proces logika fuzzy

The qualitative method is a research method based on post-positivism philosophy which is used to examine the condition of natural objects where the researcher is a key research instrument carried out in combination, data analysis is inductive or qualitative and the results of caulitative research emphasize the meaning more than generalization. [5]:

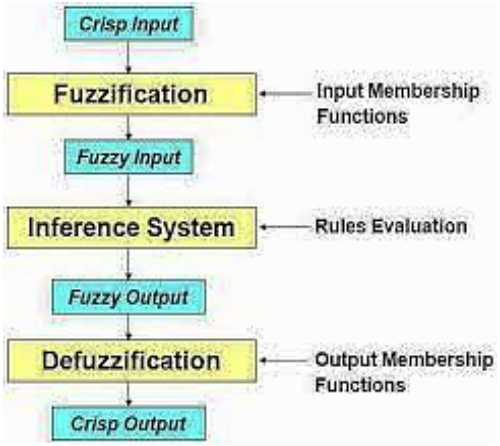

Figure 1. Proces Logika Fuzzy

3. Results and Discussion

One of them is the data used to predict unemployment in the city of Batam. grouping the data to make it easier to carry out the next analysis.

3.1. Design Analysis

Fuzzy analysis begins with the prediction data for unemployment in the city of Batam using the Sugeno method comparison to determine the variables, then the formation of the fuzzy set, after the variables are determined and the fuzzy set has been formed the next step is to enter the data into the application. In determining the system design, there are 5 input variables and 1 output variable. In which the input variables consist of Education,

Vacancies, Age, Opportunities and Company. The output variables are decisions or decisions. this can be seen in Figure 2.

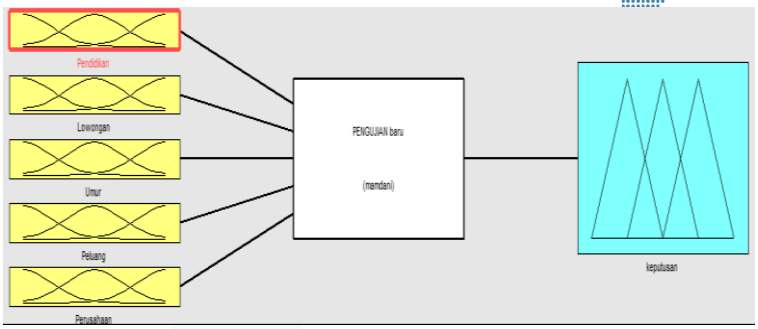

Figure 2. The output variables

3.2. Data Analysis

The following is the research data obtained from the fuzzy logic process

Table 1.Blurred Sets

Function	Variable Name	The Universe of Talks
Input	Pendidikan	[0 100]
	Lowongan	[0 100]
	Umur	[0 100]
	Peluang	[0 100]
	Perusahaan	[0 100]
Output	Prediksi Pengangguran	[0 100]

Table 2. *Fuzzy set Domain*

Variable	Fuzzy set	Domain
Pendidikan	Sangat Tinggi	[60 100]
	Tinggi	50 70]]
	Cukup Tinggi	[40 60]
	Kurang Tinggi	[30 50]
	Rendah	[0 40]
Lowongan	Sangat Banyak	[70 100]
	Banyak	[60 80]
	Cukup Banyak	[60 70]
	Kurang Banyak	[40 60]
	Tidak Banyak	[0 50]
Umur	Sangat Besar	[65 100]
	Besar	[60 70]
	Cukup Besar	[55 65]
	Kurang Besar	[50 60]
	Tidak Besar	[0 55]
Peluang	Banyak	[50 100]
	Kurang Banyak	[30 79]
	Tidak Banyak	[0 50]
Perusahaan	Besar	[75 100]
	Sedang	[60 90]
	Kecil	[0 75]
Keputusan	Diterima	[60 100]
	Pertimbangan	[35 80]
	Ditolak	[0 40]

3.3. System Analysis for Educational Variables

Education is very important not only to understand and realize this. However, education is also very important for moving towards future prospects, such as in terms of livelihoods, especially in the search for jobs for the community. Higher education will affect their livelihoods, the higher the education, the higher the level of work that will be obtained.

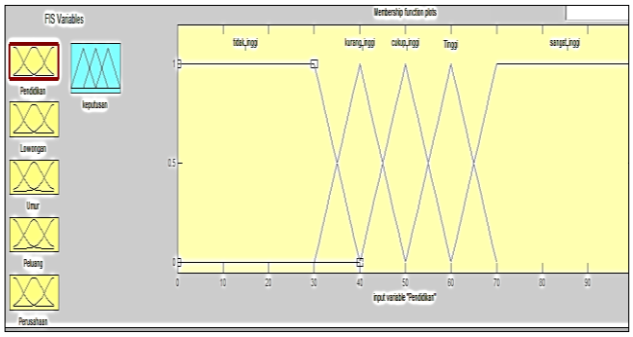

Figure 3. The membership function diagram for the Education

3.4. System Analysis for Job Vacancy Variables

Job Vacancies Variable is an opportunity to work in a certain position or position, in this case it has a fairly simple meaning. Each job vacancy will list the type of job along with the position / position that can be chosen by job seekers. In this context, job seekers can choose a certain position or position according to their talents and expertise.

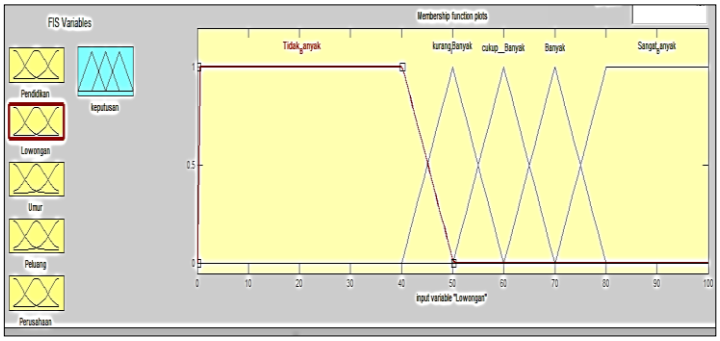

Figure 4. The membership function diagram for the Vacancies

3.5. System Analysis for Age Variables

Variable Several types of companies are often "more comfortable" looking for workers who are old and experienced, because they are considered capable of overcoming various problems related to their work and in different situations, while workers who are still young are often considered not having adequate experience related to their work. "flying hours" of his job. However, this is different from the type of company engaged in technology, this type of company is more dominated by young workers.

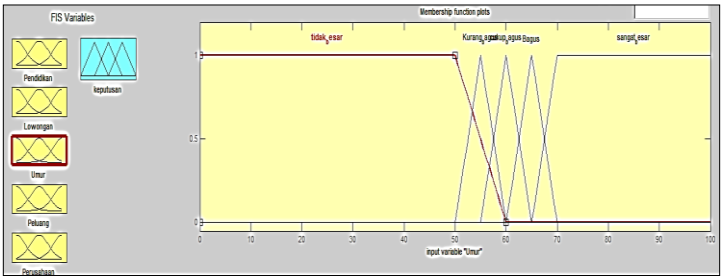

Figure 5. membership function diagram for the Age variable

3.6. System Analysis for Opportunity Variables

Opportunities It is a job opportunity for applicants to get a job. Every applicant tries to find opportunities to get the desired job.

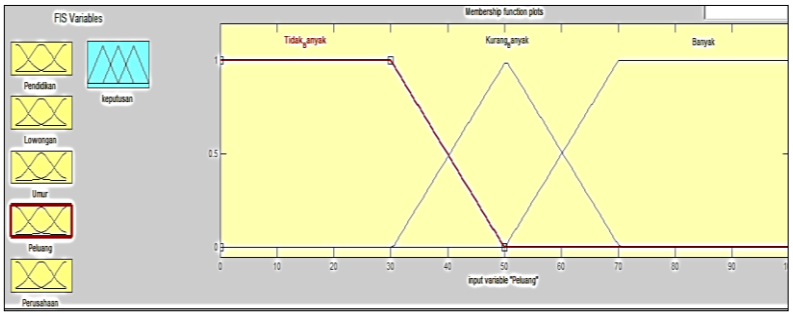

Figure 6. The membership function diagram for the Opportunity variable

3.7. System Analysis for Company Variables

Work is an important factor affecting motorbike loans.Job Variable is an input which is an average value of Large, Small and Medium.

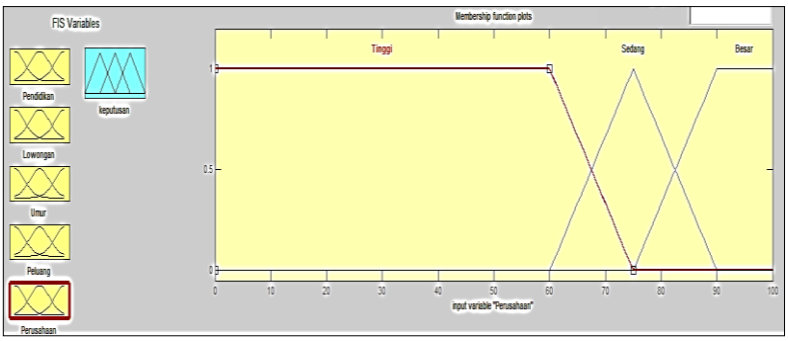

Figure 7. The membership function diagram for the Job variable

3.8. System Analysis for Decision Variables

Is the final result of the final reasoning, the decision variable consists of being rejected, considered and accepted.

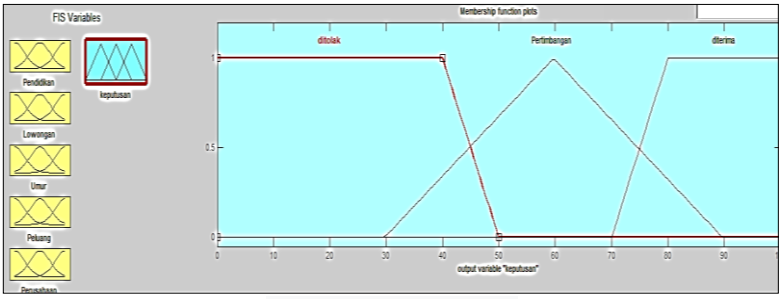

Figure 8. Decision

3.9. Fuzzyfication

The process of converting existing real values into the membership function. FIS takes the entries and determines the degree of membership in all fuzzy sets using the membership of each fuzzy set.

From the results of fuzzification, it produces 3 fuzzy inputs, namely:

a) Education = Very High (0) and High (0)

b) Tunnels = Very Many (0.5) and Many (0.5)
c) Age = Very Large (0.7) and Large (0.2)
d) Opportunity = Very Many (0.17) and Many (0.75)
e) Job = Decent (0.5) and Many (0.5)

3.10. Inference

The rules used are based on a distributed questionnaire, namely the maximum rules that can be formed and the ones that are chosen the most by the respondents to state the relationship between input and output. From this mapping, it can be seen that the maximum rules are as follows:

a) [R1] IF (Education is Not High) AND (Not Many Vacancies) AND (Age Not Very Big) AND (Not Many Opportunities) AND (Small Company) Then (Decision Is Rejected).
b) [R2] [R1] IF (Education is Not High) AND (Not Many Vacancies) AND (Age Not Very Large) AND (Not Many Opportunities) AND (Medium Company) Then (Decision is Rejected).
c) [R3] IF (Education is Not High) AND (Not Many Vacancies) AND (Age Not Very Big) AND (Not Many Opportunities) AND (Large Company) Then (Decision Is Rejected).
d) [R4] IF (Education is Not High) AND (Not Many Vacancies) AND (Age Not Very Big) AND (Less Opportunities) AND (Small Company) Then (Decision is Rejected).
e) [R5] IF [R1] IF (Education is Not High) AND (Not Many Vacancies) AND (Age Not Very Big) AND (Many Opportunities) AND (Small Company) Then (Decision is Rejected).

By using the defuzzy weighted average method, credit disbursement is as follows:

$$Z^* = \frac{(0,*80)+(0,5*65)+(0,7*60)+(0,8*80)+(65*0,17)}{0+0,5+0,7+0,8+0,17} +$$

$$Z^* = \frac{149.55}{2.17}$$

$$Z^* = 68.91$$

Based on the results of the above equation, the defuzzification results are obtained = 71.77 included in the accepted table range. By using the defuzzy weighted average method, credit disbursement is as follows:

$$Z = \frac{\alpha_{54}Z_{54}+\alpha_{55}Z_{55}+\alpha_{56}Z_{56}+\alpha_{149}Z_{149}+\alpha_{150}Z_{150}}{\alpha_{54}+\alpha_{55}+\alpha_{56}+\alpha_{149}+\alpha_{150}}$$

$$Z = \frac{(1)(80)+(1)(80)+(1)(80)+(1)(80)+(0,75)(80)}{1+1+1+1+0,75}$$

$$Z = \frac{380}{4,75}$$

$$Z = 80$$

The Z value lies in the fuzzy output set of job vacancies prediction.

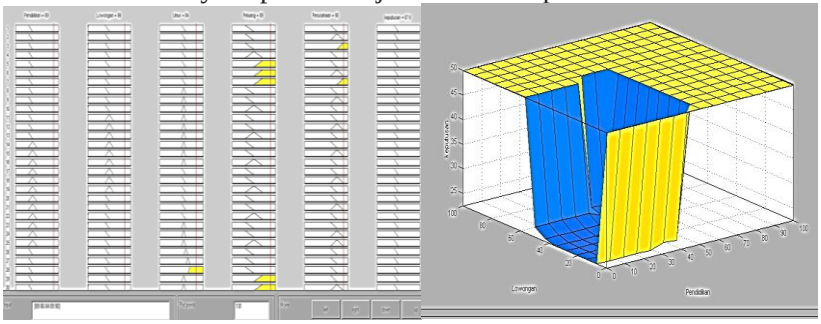

Figure 9. Aplication MATLAB and (Surface Viewer)

Based on Figure 4.10, it can be seen that the output value of the Job Vacancies Prediction is 87.5. The value lies in the accepted fuzzy set. Besides the rule viewer, you can also display the surface viewer of job vacancies. In Figure 4.11, the surface rule of the Prediction of Job Vacancies in Batam is displayed.

4. Conclusion

Based on the discussion of research and analysis that has been carried out, several things can be concluded, namely:

a) To determine the results of the prediction of the causes of job unemployment requires input and output variables. Input variables consist of education, age, job vacancies, opportunities and companies. Meanwhile, the output variables are accepted, rejected and considered.
b) Based on manual calculations with the results of the first test with a value of 80 which is in the accepted range
c) Fuzzy Logic with the Sugeno method can be implemented to determine predictions of job vacancies in Batam City by entering input values.

As the end of this research, the authors provide suggestions that might be useful for anyone who is interested in using this system.

a) In this research, prediction of job vacancies using the Sugeno method is very limited, so that in the future it can be developed, to make it even better.
b) It is hoped that by developing this decision support system, the number of rules used will be more so that the results obtained are even better from researchers.
c) For further research, other fuzzy logic methods can be used, such as the Tsukamoto and Mamdani methods.

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