Employee Recruitment with Fuzzy Tsukamoto Algorithm

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Abstract. This research is intended to determine employees who suitable with company criteria. Method which used is Fuzzy Tsukamoto Algorithm. Inferences process on this method done with the rules IF-THEN shaped and use AND operation, where will choose minimum value from two variable. The result of the research is employees who criteria is appropriate. The result is obtain from fuzzy tsukamoto process, start with taking criteria from company as parameter, then do fuzzyfication process that is create fuzzy community from company’s criteria, here in after create membership function, create rules, finished with defuzzyfication and value which obtained is 67.41. Certainly with those value, fuzzy tsukamoto very help company to determine best employees to work in the company.

1. Introduction
Employees have important role on company, because of that company must hire qualified people [1,2]. For obtain qualified people, company must held a recruitment or selecion process which needed to choose or decide employee candidate who have ability and competence to fill vacancies, of course this selection process reffering company criteria [2]. This research is intend to determine employees who suitable with company criteria. Method which used is Fuzzy Tsukamoto Algorithm, because this method is one of many methode which can used for assist decision making process [3-5].

There are several previous research which have correlaton with this research. First, research that discusses comparation between Fuzzy Inference System (FIS) and Fuzzy Neural Network (FNN) [6]. Second, research that discusses application of Fuzzy logic techniques for determined data transmission line on Wireless Sensors Network (WSN) [7]. Third research discusses about fuzzy rules for job selection and employee recruitment [8]. The different between this research and first previous research that is first research just discusses Fuzzy Inference System (FIS) globally then compared with Fuzzy Neural Network (FNN), while this research is directed to FIS tsukamoto. The different between this research and second previous research that is from research subject, on previous research discuss about application fuzzy tsukamoto for Wireless Sensors Network (WSN), while this research shall apply fuzzy tsukamoto on employee recruitment process. The different with third previous research, besides method that used, also dissscussion of focus issue, where previous research is focus on two issue that is job selection and recruitment, while this research is only focus on one issue that is employee recruitment.

Therefore, based on above explanation, then the goal of this research is to determine employee who suitable with company’s criteria. Methode used is Tsukamoto Fuzzy Algorithm. The result is fuzzy community and basic rules which used for decision making. It also adjusted with other research
results, then decided to focus discuss employees recruitment issues with Tsukamoto Fuzzy Algorithm, because this method can get the right decision although initial data is not accurate and ambiguous. This research is intended to determine employees who suitable with company criteria. Method which used is Fuzzy Tsukamoto Algorithm.

2. Experiential Methods
Steps on this research are as follows:

2.1. Data Collection
On this phase, researchers do data collection that used on this research. Data that used on this research is recruitment result.

| No | Name | IPK | Experience (year) | Age (Year) | Portfolio |
|----|------|-----|------------------|------------|-----------|
| 1  | A    | 2,75| 2                | 22         | 10        |
| 2  | B    | 3,5 | 4                | 30         | 30        |
| 3  | C    | 3,55| 3                | 28         | 20        |
| 4  | D    | 2,5 | 1                | 29         | 5         |
| 5  | E    | 2,6 | 5                | 34         | 45        |
| 6  | F    | 2,7 | 3                | 31         | 17        |
| 7  | G    | 2,5 | 1                | 29         | 12        |
| 8  | H    | 3,5 | 0                | 28         | 3         |
| 9  | I    | 3,7 | 1                | 22         | 5         |
| 10 | J    | 3,45| 1,5              | 22         | 15        |

2.2. Fuzzy Tsukamoto Use Analysis
On this phase, will be done steps from fuzzy tsukamoto. The First step is Forming Fuzzy community (Fuzzyfication), Fuzzyfication do based on table 1. On this phase GPA, experience, Age and portfolio variable will change to linguistic variable using membership function that save on fuzzy knowledge base [9]. The Second Step is Forming Fuzzy Knowledge Basis (Rule), rule format on fuzzy is using format IF..THEN. Generally, Tsukamoto base model are IF (X is A) and (Y is B) and (Z is C), where A, B, C is fuzzy community [10]. The Third Step is Inference Engine, fuzzy Tsukamoto have inference engine used function implication MIN for obtain α-predikat value every rule on table 3 (α1, α2, α3...an). [11] Then, each α-predikat value is used for calculate inference result output explescitly (crips) each rule (z1, z2, z3,...zn). The Fourth step is Defuzification, defuzzification on Tsukamoto method is use everage method by formula:

\[ Z = \frac{\sum_{i=1}^{n} \alpha_i z_i}{\sum_{i=1}^{n} \alpha_i} \]  

3. Results And Discussion
Early steps analysis Tsukamoto process is deliver fuzzy community as listed on table 2.
Table 2. Variable Linguistic.

| Variable | Variable Linguistic | Domain     |
|----------|---------------------|------------|
| GPA      | Low                 | 2.75 – 3.4 |
|          | High                | 3.5 – 4.00 |
| Experience | Low              | ≤ 2        |
|          | High                | ≤ 5        |
| Age      | High                | 28 – 35    |
|          | Low                 | ≤ 10       |
| Portfolio| High                | ≤ 50       |

Next will created membership function which combined with linguistic variable as follows:

Figure 1. Membership Input.

Next step is forming knowledge basis for appropriateness prospective employes, as follows:

Table 3. Rule Knowledge Base.

| NO | IPK | Experience | Age | Portfolio | Values    |
|----|-----|------------|-----|-----------|-----------|
| 1  | Low | Low        | Low | Low       | Rejected  |
| 2  | Low | Low        | Low | High      | Rejected  |
| 3  | Low | Low        | High| High      | Considered|
| 4  | Low | High       | High| High      | Accepted  |
| 5  | High| High       | High| High      | Accepted  |
| 6  | High| Low        | Low | Low       | Considered|
| 7  | IF  | High       | AND | Low AND   | THEN      |
| 8  | High| Low        | High| Low       | Considered|
| 9  | Low | High       | Low | High      | Accepted  |
| 10 | High| Low        | Low | High      | Considered|
| 11 | Low | High       | High| Low       | Accepted  |
| 12 | High| High       | High| Low       | Accepted  |
| 13 | Low | High       | Low | Low       | Considered|
| 14 | Low | High       | Low | Low       | Considered|
| 15 | High| Low        | High| High      | Accepted  |
| 16 | High| High       | Low | Low       | Accepted  |
Variable or output community membership based on input variable, as follows:

![Membership Output](image)

**Figure 2. Membership Output.**

In Data processing, taken one data prospective employees from table 1, as follows:

| Name | GPA  | Experience | Age  | Porfolio |
|------|------|------------|------|----------|
| B    | 3.5  | 4          | 30   | 30       |

Table 4. Example of Employee Candidate.

First steps is fuzzyfication, on this step is do search membership value, the way is input value from sample to fuzzy membership community function. Results is as follows:

a. GPA

\[ \mu_{\text{GPALow}[3,5]} = \frac{4-3.5}{4-2.75} = 0.4 \]
\[ \mu_{\text{GPAHigh}[3,5]} = \frac{3.5-2.75}{4-2.75} = 0.6 \]

b. Experience

\[ \mu_{\text{ExperienceLow}[4]} = \frac{5-4}{5-2} = 0.33 \]
\[ \mu_{\text{ExperienceHigh}[4]} = \frac{4-2}{5-2} = 0.67 \]

c. Age

\[ \mu_{\text{AgeLow}[30]} = \frac{35-30}{35-22} = 0.38 \]
\[ \mu_{\text{AgeHigh}[30]} = \frac{30-22}{35-22} = 0.62 \]

d. Portofolio

\[ \mu_{\text{PortfolioLow}[30]} = \frac{50-30}{50-10} = 0.5 \]
\[ \mu_{\text{PortfolioHigh}[30]} = \frac{30-10}{50-10} = 0.5 \]

After obtain degree of membership from each variable, then calculation on each rules is commited. One of them is as follows:

\[ [R5] \alpha\text{-predikat} = \text{IF } \mu_{\text{GPAHigh}[3,5]} \text{ AND } \mu_{\text{ExperienceHigh}[4]} \text{ AND } \mu_{\text{AgeHigh}[30]} \text{ AND } \mu_{\text{PortfolioHigh}[30]} \text{ THEN Value(ACCEPTED)} \]

\[ [R5] \alpha\text{-predikat} = \mu_{\text{GPAHigh}[3,5]} \cap \mu_{\text{ExperienceHigh}[4]} \cap \mu_{\text{AgeHigh}[30]} \cap \mu_{\text{PortfolioHigh}[30]} \]

\[ [R5] \alpha\text{-predikat} = \text{MIN}(\mu_{\text{GPAHigh}[3,5]}, \mu_{\text{ExperienceHigh}[4]}, \mu_{\text{AgeHigh}[30]}, \mu_{\text{PortfolioHigh}[30]}) = \text{MIN}(0.6 ; 0.67 ; 0.6 ; 0.5) = 0.5 \]

Final step, MIN \( \alpha\text{-predikat} \) is use for calculate inference result output explicitly (crips) on each rule. On previous example, rule which used is Rule 5, based on feasibility results “Accepted”. The calculation is as follows:

\[ \mu_{\text{Accepted}} = \frac{z - 70}{90 - 70} = 0.5 \]
\[ z_3 = 70 + (0.5 * (90-70)) = 80 \]
Defuzification will calculated using average method, as follows:

\[ z = \frac{\alpha_1 z_1 + \alpha_2 z_2 + \alpha_3 z_3 + \ldots + \alpha_{16} z_{16}}{\alpha_1 + \alpha_2 + \alpha_3 + \ldots + \alpha_{16}} \]

\[ z = \frac{376,176}{5,58} = 67,41 \]

Based on all process earlier, then according to data from table 1 and after compared with rule on table 3, and then fuzzyfication process, inference engine and defuzzification, the results as follows:

**Table 5. Value of employee recruitment.**

| No | Name | IPK | Experience (Year) | Age (Year) | Portfolio | Values     |
|----|------|-----|-------------------|------------|-----------|------------|
| 1  | A    | 2,75| 2                 | 22         | 10        | Rejected   |
| 2  | B    | 3,5 | 4                 | 30         | 30        | Accepted   |
| 3  | C    | 3,55| 3                 | 28         | 20        | Accepted   |
| 4  | D    | 2,5 | 1                 | 29         | 5         | Considered |
| 5  | E    | 2,6 | 5                 | 34         | 45        | Accepted   |
| 6  | F    | 2,7 | 3                 | 31         | 17        | Accepted   |
| 7  | G    | 2,5 | 1                 | 29         | 12        | Considered |
| 8  | H    | 3,5 | 0                 | 28         | 3         | Accepted   |
| 9  | I    | 3,7 | 1                 | 22         | 5         | Considered |
| 10 | J    | 3,45| 1,5               | 22         | 15        | Considered |

After all process is run, obtained employee recruitment status. Table 5 is showing prospective employee data status. When compared with previous researches which explained on preface [1,3, 6-8], this method is very suitable for use in research, because even though preliminary data is ambiguous, with through fuzzification process can obtained clearer set of data, so can used for decision making parameter. Previous research also help implementation of this research, because there are several relevant theory can used for process this research.

4. Conclusions

Conclusion from this research, that is Algorithm Fuzzy Tsukamoto method can be used for decision making process, which employee is suitable to work in the company. Those result conclusion is obtained from tsukamoto process, so get the value 67,41, certainly thos value can used as decision making parameter. Although initial data is ambiguous, however at the end has got accurate and measurable results.

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