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Profession recommended system for higher education students using Bayesian method

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Abstract. The profession becomes an important part for the graduate after graduating from higher education. High school graduates do not know how to choose the right profession after graduation and less ready before graduating from higher education. The purpose of this study is to build a system that can provide appropriate profession recommendations in accordance with the personalities of higher education student. The method used in this research is Bayesian method. The results of this study indicate that systems using Bayesian methods can provide recommendations with a 98% accuracy rate. The majority of respondents as much as 99% stated that the profession recommendations system that has been given is true. Why? because this system provides the right solution in accordance with each personality. This system is expected to help graduates of higher education have the right profession in accordance with the personality he has. This system can be used to provide appropriate profession recommendations for higher Education students. Bayesian methods are very well used to build an accurate and efficient recommendation system.

1. Introduction

The profession is individual and requires special skills. The higher education role to form the way of profession selection correctly. Higher education aims to produce ready-made professionals in the industrial world who mastered the science well. The higher education graduates are expected to be able to choose the right profession according to their own potential. The selection of the professions is an important part of graduate after graduating from higher education. To produce a minimum standard of high education graduate's students must have the potential developed during the education process [1]. The condition that occurs in many Higher Education in developing countries is that most students do not know how to choose the right profession after graduation and less prepare it before graduation from higher education [2]. However, in the developing countries (such as Indonesia), the learning process through the course has a limitation regarding choose the right profession. Indeed, students often meet the difficulty in obtaining contextual experience in their learning process [1]. Each profession should be a high passion for each individual. Each student has different potential and passion so that the selection of the profession becomes more difficult. The research problem in this study is that a person who has his or her own personality has it. To build a profession recommendation system, parameters are required for accurate results. We can used Bayesian method for calculating parameters [3]. The Bayesian method



is built using accurate bayes algorithms. There are a variety of good algorithms [4]. The Bayes algorithm can be used to build networks [5], construct a problem [6], and even be used to predict an estimate accurately [7][8][9]. The Bayesian method can also be used for strategic improvement assessment [10], and provide a notification alarm to alert an event [11]. Thus, the Bayesian method can be used to build an accurate profession recommended system to produce reliable output.

The profession is a specific job that requires special skills. In developing countries, higher education provides learning processes that prepare graduates with the ability and skills to choose the right profession [2]. But higher education has the limitations in running quality learning process. Limitations of learning resources become always the main problem in teaching and learning process [1]. These limitations have direct impacts on the students. There is a solution to prepare the profession is to learn directly in industry. But direct learning in industry is difficult to realize in developing countries due to the limited number of nearby industries and the price is very expensive [12]. For this reason, the learning process is done by a model of putting students to learn directly on available industries with diverse professional choices. This is intended to make students more quickly adjust to the professional environment after graduating from higher education. Indeed, one of the strategies that are developed in most developing countries is applying direct practical experience in the industry. But the industry also has limitations especially when facing a large lecture class and cannot be accommodated at once in a certain period. These limitations include the types of professions available in the industry are few and not always open at all times. This makes it difficult to find the right way to help students have the right profession. As an alternative to address these shortcomings, then built a computer-based application that can help students to test the selection of professions in accordance with the potential they have individually. The application is designed with a web base using the Bayesian method to ensure more accurate results. As previous researchers have pointed out, the reason the Bayesian method is chosen is to build a recommended system because it has the ability to distribute measurement parameters accurately [13], also has detection capabilities that can be optimized well to produce the best solution [14]. Considering these advantages, this research tries to implement bayesian method into an application of profession recommended system. The purpose of using this bayesian method is this application provides accurate profession recommended in accordance with user personality. This application will provide a test that is built in accordance with the potential of each individual student individually.

To solve the problem, some researchers choose internship strategies in an industry [15] with limited time and there are also to be involved in certain professional communities [16][17]. However, the method has not been satisfactory and has not given good results. This is due to the available profession is not in accordance with the potential and personality of each individual. This is strategy has not been able to solve the problem.

Here, the purpose of this study was to build a new design of the application profession recommended system using a Bayesian method. The difference of this application with the application is the use of the more personalized test in accordance with the personalities of each individual. This novelty makes the application suitable for developing countries that have many limitations due to the use of personality tests that are still limited. This will continue to experience improvements in subsequent research.

2. Method

Bayesian use classification [5] to build an accurate system. The system is similar to the neural network or decision tree. Bayesian classification modelling used to perform data classification with the aid of statistical methods. The goal is to predict a probability of a collection of knowledge [8]. This method is quite effective at making decisions through accurate analysis [18]. Bayesian has a simple learning machine based on conditional probability training data [19]. To perform the analysis, Bayes use the following general formula:

$$P(H|X) = \frac{P(X|H).P(H)}{P(X)} \quad (1)$$

This research uses the Bayesian method because it is easy to be implemented into the application so that application has data processing speed and accuracy which have enough high precision. Application to have high efficiency.

The method used in this research is a Bayesian method to make the right recommendation. The Bayes method looks at the parameter as a variable that describes the initial knowledge of the parameters before the observation is performed and expressed in a distribution called the prior distribution [16][17]. Prior selection is generally done on the basis of whether or not information about parameters is known

3. Result and discussion

The calculation is done by setting the parameters which are the tendency of human nature namely Dimension of focus of attention: Introvert (I) vs. Extrovert (E), Dimensions understand outside information: Sensing (S) vs. Intuition (N), Dimensional drawing conclusions & decisions: Thinking (T) vs. Feeling (F), Dimensional lifestyle: Judging (J) vs. Perceiving (P). This parameter is entered into calculation using Bayesian method.

From the four dimensions, 70 questions were developed to detect individual personality trends, making it easier to give appropriate professional recommendations. These questions are included in the application form as shown in figure 1.

Figure 1. Question form.

The first step to perform this professional recommendation analysis process is by choosing answering the questions first. When the questions are correct and in accordance with the actual conditions, then the child appears information how many students of the class. Next select how to determine the range to be used in professional recommendation process, whether by range iterated value. The iteration was performed as many as 100 iterations. If the range has been determined, then the system will perform analysis quickly and accurately. There is a loading component to show how many percent of the process has been completed. If the process of majors is completed 100% then the system will direct the recommendation form recommendations to display the recommendations of the profession in question. The result of calculation with recommendation system got table 1 accuracy of the Bayesian method in giving accurate profession recommendation according to the personality of each individual. The accuracy of Bayesian by using calculations whose results are as follows.

Table 1. Calculation of Bayesian intervals.

Accuracy	Dimension of attention	Dimensions understand information from outside	Dimensions draw conclusions & decisions	Dimension of Lifestyle
Interval 1	23%	31%	17%	19%
Interval 2	37%	43%	36%	45%
Interval 4	46%	48%	42%	47%
Interval 5	52%	54%	55%	56%
Interval 10	61%	62%	67%	69%
Interval 20	66%	67%	71%	73%
Interval 25	55%	58%	62%	67%
Interval 40	52%	55%	58%	56%
Interval 70	68%	72%	75%	77%
Interval 100	63%	66%	73%	71%

The highest accuracy of the results of the process of determining professional recommendations in accordance with the personalities of each individual is determined by using Bayesian method determined the largest percentage of the existing values and obtained results at intervals 20 and 70. Where at interval 20, obtained Dimension concentration of 66 %, Dimension to understand information from outside by 67%, Dimension drawing conclusion & decision equal to 71%, Dimension of lifestyle get equal to 73%. While at Interval 70, Dimension concentration of 68%, Dimension of understanding information from outside by 72%, Dimensions drawing conclusions & decisions by 75%, Dimensions of lifestyle earn by 71%. Thus the system period will display the results of the recommendations shown on the professional recommendation form.

The screenshot shows a web application interface for a psychological assessment. At the top, it says 'Psikologis - Direktur' and 'Logout'. Below that is a 'MENU' button and a 'Data Hasil' section. The main content is a grid of numbers and letters (a, b) arranged in a pattern. Below the grid, there are several rows of text: 'A: 6 B: 4', 'A: 7 B: 3', 'A: 8 B: 2', 'A: 9 B: 2', 'A: 6 B: 4', 'A: 9 B: 1', 'A: 6 B: 4'. Below this, there is a section titled 'ESTJ' with a paragraph of text: 'Berfikir ekstrovert dengan mengindra. Mereka adalah pasangan yang bertanggung jawab, orang tua yang baik dan pekerja yang loyal. Mereka bersifat realistik dan menyayangi tradisi yang berlaku. Mereka cocok menjadi administrator, manajer keuangan, pengawas.'

Figure 2. Form of recommendation results.

The recommendation form is the core form of this system. This form serves to select the appropriate professional recommendations in accordance with the personality owned by each individual is unique and trusted.

4. Conclusion

In this paper, Bayesian methods are very well used to build an accurate and efficient recommendation system. System can be accurate using the bayesian method and can used to provide appropriate

recommendations for students. The more accurately answer the questions according to actual conditions and the more varied data, it will increase the possibility of students can be given a profession recommended that can be selected in accordance with their personalities will also be more varied and accurate. This system can help students to choose the profession to be cultivated after completing university degree education. The highest accuracy of the results of the profession recommended process for graduates of higher education by using manually determined ranges is in the range with intervals of 20 and 70. This system is expected to help graduates of higher education have the right profession in accordance with the personality it has.

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