Implementation of Naive Bayes Classifier Algorithm in Classification of Civil Servants

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Abstract. As the executor of the transfer of civil servants, BKD (Badan Kepegawaian Daerah) is required for professionals in carrying out their duties in mutation positions for civil servants. This study implements a mutation system for civil servants by using Naive Bayes Classifier Algorithm. This study is implemented in Secretariat District Regency of Pelalawan, Riau Indonesia, This system uses some attributes such as age, total work period, education background and implemented on a web based application. This approach is an approximation to Bayes theorem which is the principle of statistical opportunity to combine previous knowledge with new knowledge. This system is very effective classification algorithm (get the right results) and efficient which can be a basic reason in mutation civil servants.

Keywords: Civil Servant, Mutation, Algorithm Naive Bayes Classifier, Web.

1. Introduction

The dynamics of a rapid development of a company now requires a balance of efforts in the field of utilization of human resources. If a company wants to go ahead and work well in an ever changing environment, then its human resources must be in a steady state of development. It aims to improve the performance of each employee optimally for the smoothness and efficiency of the productivity of these agencies.

Normally displacement of job positions or workplace movement is carried out regularly between 2 and 5 years which to achieve the quality of personnel [1]. Mutation is a change of position/ position/ place/ job done either horizontally or vertically (promotion/demotion) within an organization [2]. Basically mutations are included in the function of employee development, because the goal is to improve the efficiency and effectiveness of work within the company (government).

Mutation is an employment activity related to the process of transferring the functions, responsibilities, and employment status of the workforce to a particular situation with the aim that the workforce obtains an in-depth job satisfaction and can provide the maximum possible work performance to the organization [3]. The basis employed for determining employee mutations is the length of employment in a job, organizational needs, organizational refreshment, knowledge, and skills and special reasons (eg, taking a husband) [4]. Transfer or mutation is part of coaching, in order to provide greater work experience, responsibilities and skills to employees [5].

The current process mutation cannot make the employee work maximally in accordance with the main tasks and functions provided. Efforts made BKD Pelalawan District need to mutate positions aimed at improving the efficiency and effectiveness of the performance of civil servants concerned [6][7][8].

The Naïve Bayes classification method is often referred to as Naïve Bayes Classifier (NBC) in which this technique is known as the best technique in computation time compared to other data mining
The advantage of using Naïve Bayes is this method requires only a small amount of training data to determine the estimated parameter required in the classification process. Naïve Bayes often works much better in most real-world situations that are more complex than expected [10][11][12]. Probability is a value used to measure the degree of occurrence of a random event. The word probability is often called opportunity and possibilities. In general, probability is an opportunity that something happens [13][14][15]. With the calculation of using Naïve Bayes Classifier with employee classification is expected to help provide solutions and accuracy of the best decisions in the process of mutation of employment positions employee. As a result, it can overcome the problem of incompatibility or inability of employees with previous positions that have been given and will be given.

2. Problem Statement
From the background that has been described, can be formulated problem in research that is "How do we determine the accuracy of placement of civil servant position in positions that will be presented?" How to build an auxiliary application system to locate a civil servant using the Naïve Bayes Classifier method that can be used by the BKD of Pelalawan District in accordance with the needs? In this research, the calculation is done to find the employees to occupy the position of Head of Division at Pelalawan District Secretariat, namely Head of General Section, Head of Legal Section, Head of Governmental Section, Head of Welfare Section, Head of Development Section, and Head of Economic Section.

3. Proposed Method
The research methodology as shown in Figure 1 outlines some core activities, including proposal creation, data collection, data processing, implementation of Naïve Bayes Classifier, test, and result analysis. At the stage of data processing, there are several activities according to the stages of data mining, namely data cleaning, data integration, data selection, and dataset formation which in this research will be used as data training and data testing.

Pre Research. Pay attention and learn about the mutations made during this time in Pelalawan District Government. With this research, the authors expect there is a certain calculation associated with the placement of employees / mutations in certain positions. So it will be expected a calculation accuracy using Naïve Bayes Classifier based on civil servant data ever served before.

Problem Identification. Implementation of mutations in Pelalawan District Government conducted randomly without any fundamental classification, this is not separated from the policy of the leadership. For example a civil servant with medical / health education is placed in the field of SI / IT.

Goal Setting. Looking at the existing situation, the author intends to create an application or create a program / auxiliary applications, then will be analyzed further. The method used using Naïve Bayes Classifier is poured in a web-based help application using php (Hypertext Preprocessor).

Literature Review. To support this research, the authors look for journals, books, and other information related to the Naïve Bayes Classifier theory as the basic calculations to be outlined in the auxiliary programs / applications.

Data Collection. At the Data Collection stage, it can be done with various sources and various ways. When viewed from the source data, then the data collection can use primary sources, and secondary sources. Primary sources are data sources that directly provide data to data collectors. While secondary sources are sources that do not directly provide data to data collectors, such as through other people / intermediaries or through documents.
Figure 1. Research Methodology

**Data Cleaning.** Based on the case, to become the Chief of the Section at least at the rank / group of PenataMudaTk.I (III / b) and maximally in the rank / group of Pembina Tk.I (IV / b), this is based on Head of Section data who once served in Secretariat Pelalawan District from 2000 to 2016.

**Data Integration.** The data has been obtained from the Regional Personnel Agency (BKD) Pelalawan District, which will then be merged data of each part of the candidate into a unity to be done in the next stage of data selection.

**Selection of Data.** Data obtained from the Regional Personnel Agency (BKD) Pelalawan District, then made an election that meets the following criteria: Rank / Classroom Minimum Penata Musa Tk. I (III / b), maximum of Pembina Tk. I (IV / b), Minimum Bachelor of Education (S-1), Age when nominated, Total Work Period.

**Data Validation.** Based on the result of the data selection, the researcher did reconcile the correctness of the selected data which then compare the real data to the Regional Personnel Agency (BKD) of Pelalawan Regency with the respective section of the place where the candidate is currently placed, is it correct to be able to proceed at a later stage.

**Data Transformation.** For data that has been obtained and true, researchers in the transformation of data at the level of class and level of education only. It is based that class and education can not be counted.

**Dataset.** After the training data / test of Head of Section who had served in Pelalawan District Secretariat obtained from Regional Personnel Board (BKD) Pelalawan District, the researcher did recaps the data in accordance with the data required for the calculation. As the basis of this calculation, the researcher uses data related to Rank / Group, Total Work Period, Age, and Education.
4. Result Analysis

The criteria used in the determination of candidates for Head of District Secretariat is 1. Rank/Classroom (data category), 2. Age (data numeric) 3. Education (data category) 4. Total working period (data numeric). Data training is taken from data section head who had served in the Regional Secretariat of Pelalawan District from 2000 until 2016, which numbers 39. From the attribute table data, the next is to find the probability value Rank / Group, Age probability, Probability of Work Period, and the probability of Education in each Kabag position on which the calculation is based. Next is to look for the class probability value of each part which is the final probability value for each class based on the existing data. After the calculation to find the probability values performed, the results of these calculations can be used to find employees who can or not to occupy the position of Head of Section. By using Naive Bayesian Classification (NBC), all attributes will contribute to decision making, with the same attribute weights are important and each attribute is independent of each other [10]. The hypothetical listing page will list the data hypotheses of each section head and display the probability value as shown in Figure 2.

![Figure 2. Page list of hypotheses](image)

Consultation Page Calculation as shown Figure 3 here the user is required to fill in the full name to start the consultation calculation and after completing the full name followed by selecting the continue button and will go to the new page select criteria that is in accordance with rank, age, employment and education in accordance with existing data, then will be calculated to get the final result value.
If the selection criteria has been selected, then the user selects the continue button (result) to know the results of calculation through this application. Then it will lead to the results / consultation result page.

The results of consultation calculations, will display the final value of a person to hold one of the positions to be the head of the section in a sequence of 7 (seven) heads of the presented positions. The highest value will be positioned in the first place, and this is the reference of a person's calculation to become the head of the regional secretariat of Pelalawan Regency.
After the calculation to find the probability values, the results of the calculation can be used to find employees who can or not to occupy the position of Head of Section.

5. Conclusion
Using a web-based auxiliary application with the Naïve Bayes Classifier method can accelerate the time in determining candidates for the position of Head of Section at the Regional Secretariat of Pelalawan Regency. By using a web-based aids application with the Naïve Bayes Classifier method, it can help the Regional Personnel Board (BKD) of Pelalawan Regency to help determine the civil servant to become Head of Division at the Regional Secretariat of Pelalawan Regency with the help of this auxiliary application. Analyze with other classification techniques such as decision tree, rule base classification, and so forth can be conducted.

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