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Determining Employee Eligibility in Equalizing Staffing Status Using the Naïve Bayes

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Abstract: ***The term non-permanent employee first appeared in the rule of law, namely in Act Number 13 Year 2003 concerning Manpower.This Act has an impact on the emergence of clarity about staffing status so that the salaries obtained by employees do not match their workload.Therefore, this study aims to determine employees who are eligible to earn the same income at one of the private universities in Palembang based on university's strategic plan, namely class, employment status, membership, and education permit using the Naïve Bayes method. The results showed that the highest accuracy of predictive conclusions for non-permanent and permanent employees is 83.33%, while the lowest accuracy value is 50%.***

Keywords: Employee Eligibility, Equalizing, Naïve Bayes, Staffing, University

I.INTRODUCTION

The term non-permanent employee first appeared in the rule of law, namely in Act Number 13 Year 2003 concerning Manpower. This provision, for example, can be found in an article of number 64 which states that an enterprisemay subcontract part of its work to another enterpriseunder a written agreement of contractof work or a written agreement for the provision of worker/labor [1].

The Problems with non-permanent employees are still a polemic on staffing issues in Indonesia. Its existence is between needed or not [2].The problem with non-permanent employees related to employment status problems is also a polemic in the Faculty of Medicine at one of the Private Universities in Palembang.

In this case, the conversation is still warm because it is considered still complicated in determining employment status, considering that each staffing status has its own roles, such as aspects of the provision of basic function assignments, the position of relations with permanent employees, the appointment system, or welfare benefits which are still crucial in the discussion of non-permanent employees.

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The staff recruitment model in the pattern of performance or organizational behavior in the field if through private employees is positioned equally and has a clear Standard Operating Procedure (SOP). Such work patterns are actually culturally perpetuating the existence of hierarchical relations and patronage in a modern bureaucratic system that is formed through the form of a system of spoils.

So, it is not surprising that non-permanentemployee often gets the title of the real civil service compared to civil servants who are fully dedicated to carrying out their mandate or duties. Although until now there has been no clarity about employment status or benefits, and salaries that are not in accordance with their performance burden[3].

Similar research uses several classification methods to find student learning retention. Student learning retention is an indicator for measuring academic performance, as well as being used as a basis for decision making by school management authorities [4]–[7]. This study uses three classification methods, namely Naïve Bayes, Support Vector Machine and Decision Three. The results showed that the most accurate method was Naïve Bayes with an accuracy value of 89.50%, then Support Vector Machine with an accuracy value of 83.50%, and the last was Decision Tree with an accuracy value of 81.30%.

Based on research problems and support from previous studies related to the use of the Naïve Bayes method, this study is expected to provide a solution to determine eligible employees in equalizing staffing status using the Naïve Bayes method.

II.RESEARCH METHODS

This section presents research designs and examples of calculations with real data using the Naïve Bayes method.

A. Research Design

The research design for determining employee eligibility is shown in Fig. 1.

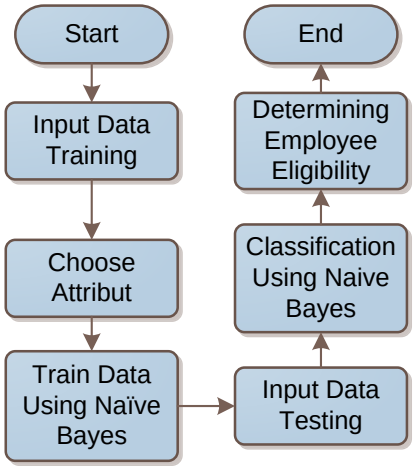

Fig. 1 Research Steps to Determine Employee Eligibility

Whereas, for the representation of functional requirements the system will be used Unified Modeling Language[8]–[11].

B. Data Collection

The data used in this study is staffing data at the Faculty of Medicine at one of the privateuniversities in Palembang. The data will be used as training data and test data.

C. Naïve Bayes Method

Naïve Bayes is a simpleclassification method that implements Bayes theorem for grouping statistics that can be used to predict the probability of members of a class [12].Naïve Bayes works very well compared to other classifier methods[13] and is the most user-friendly model[14], [15].

The Naïve Bayes formula is shown inequation (1).

$$P(Y|X) = P(X|Y) * P(Y)/P(X) \quad (1)$$

Where:

X=Data on unknown classes

Y=Data hypothesis in a specific class

P(Y|X)=Probability of a hypothesis is based on the condition of X (posterior probability)

P(Y) =Probability of hypothesis Y (prior probability)

P(X|Y) =Probability of X when the condition of hypothesis Y

P(X) = Probability of X

D. Determination of Attributes

The attributes used for the analysis process in the study consisted of two variables[16]:

- Dependent Variable (Y)

The dependent variable (Y) is a variable whose value is bound. The dependent variable used inthis study is Equalization (Y).

- Independent Variable (X)

The independent variable (X) is a variable whose value does not depend on the value of other variables. The independent variables used in this study consist of 4 variables as follows: (1) Group (X_1); Status (X_2); Membership (X_3); and Education Permit (X_4), with the dataset listed in Table 1 [17].

Table. 1 Staffing Dataset

No	Name	X_1	X_2	X_3	X_4	Y
1.	rifki	2A	permanent	yes	no	noneligible
2.	fadli	3A	permanent	yes	no	noneligible
3.	najib	3A	permanent	yes	yes	eligible
4.	efri	2A	permanent	no	yes	eligible
5.	malik	2A	non-permanent	yes	no	noneligible
6.	adi	3A	permanent	yes	yes	noneligible
7.	rio	3A	permanent	yes	no	eligible
8.	imam	2A	non-permanent	yes	no	non eligible
9.	yuni	3A	permanent	no	yes	noneligible
10.	dini a	2C	non-permanent	no	no	noneligible
11.	ica	2C	permanent	yes	yes	eligible
12.	neema	3A	permanent	no	yes	eligible
13.	tris	3A	permanent	yes	yes	eligible
14.	fitri	3A	non-permanent	no	no	noneligible
15.	rahma	3A	permanent	no	no	eligible
16.	novi	2C	permanent	yes	yes	eligible
17.	dwi	3A	permanent	yes	yes	eligible
18.	hendri	3A	permanent	yes	no	eligible
19.	rendi	3A	permanent	no	no	noneligible
20.	tauhid	2A	non-permanent	yes	no	noneligible
21.	jauhari	2C	non-permanent	no	no	noneligible
22.	tika	3A	permanent	no	yes	noneligible
23.	nopri	3A	permanent	yes	yes	eligible
24.	fadli	3A	permanent	yes	no	eligible
25.	holil	3A	permanent	no	yes	eligible

E. Probability Calculation

Based on data from Table 1, the amount of data is eligible and the probability of eligibility for each the data can be calculated using Equation (1) as shown in Table 2.

Table. 2 The Amount of Data is Eligible and Its Probability

Equalization (Y)				
Eligible (E)				12
Non-Eligible (N)				13
Total				25
Equalization Probability: P(Y)				
P(E)				0.48
P(N)				0.52
Data Testing				
X_1	**X_2**	**X_3**	**X_4**	**Y**
2A	permanent	yes	no	non-eligible
P(X|Y)				
Group (E)				0.08
Group (N)				0.33
Status(E)				1.00
Status(N)				0.50

Membership(E)	0.69
Membership(N)	0.50
Education Permit(E)	0.31
Education Permit(N)	0.75
P(X|Y=Eligible)	0.02
P(X|Y=Non-Eligible)	0.06
P(X|Y) * P(Y)	
Eligible	0.01
Non-Eligible	0.03

III.RESULT AND DISCUSSION

A. Testing Scenario

Testing the use of the Naïve Bayes method is done three times by dividing the dataset into several parts to obtain the results of credible accuracy.

The first test uses 12 data (48%) sequentially in the dataset. The second test uses 8 data (32%) sequentially in the dataset, apart from the data in the first test. The third test uses 5 data (20%) sequentially in the dataset, apart from the data in the first test and the second test. All training data are 25 samples.

B. Accuracy Testing

Accuracy is a critical measure that will be used to evaluate system performance in this study. Accuracy is the proximity of the calculated value to the real value (actual value or reference value).

Meanwhile, the level of accuracy (%) in providing predictive conclusions in this study was measured using Equation (2)[18].

$$accuracy\ \% = \frac{Amountofdatathatisaccurate}{Amountofalldata} x100\% \quad (2)$$

The following are three times the tests performed.

1) First Accuracy Testing

Table. 3 First Accuracy Testing

No	Name	Y		Accuracy
		Real	Test	
1.	rifki	non-eligible	non-eligible	100
2.	fadli	non-eligible	non-eligible	100
3.	najib	eligible	eligible	100
4.	efri	eligible	eligible	100
5.	malik	non-eligible	non-eligible	100
6.	adi	non-eligible	eligible	0
7.	rio	eligible	eligible	100
8.	imam	non-eligible	non-eligible	100
9.	yuni	non-eligible	eligible	0
10.	dini a	non-eligible	non-eligible	100
11.	ica	non-eligible	eligible	0
12.	neema	eligible	eligible	100

After being tested in Table 3, using real data then the data is testedwith the Naïve Bayes method, knowing twelve data that are in accordance with real data and then the accuracy obtained after processing with the Equation (2) is 83.33%.

2) Second Accuracy Testing

Table. 4 Second testing

No	Name	Y		Accuracy
		Real	Test	
13.	tris	eligible	eligible	100
14.	fitri	non-eligible	non-eligible	100
15.	rahma	eligible	non-eligible	0
16.	novi	eligible	eligible	100
17.	ica	eligible	eligible	100
18.	neema	eligible	eligible	100
19.	tris	non-eligible	eligible	0
20.	fitri	non-eligible	non-eligible	100

After being tested in Table 4, using real data then the data is testedwith the Naïve Bayes method, knowing eight data that are in accordance with real data and then the accuracy obtained after processing with the Equation (2) is 75.0%.

3) Third Accuracy Testing

Table. 5 Third Testing

No	Name	Y		Accuracy
		Real	Test	
21.	rahma	non-eligible	non-eligible	100
22.	tika	non-eligible	eligible	0
23.	nopri	eligible	eligible	100
24.	fadli	eligible	non-eligible	0
25.	holil	eligible	eligible	100

After being tested in Table 5, using real data then the data is tested with the Naïve Bayes method, knowing five data in accordance with the real data and then the accuracy obtained after processing with the Equation (2)is 60.0%.

C. Results of Accuracy Testing

The test results are obtained from the accuracy of each test that has been done. The highest accuracy value from the test results is 83.33%, while the lowest accuracy value is 60.0%. The comparison of the accuracy values for each test can be seen in Fig. 2.

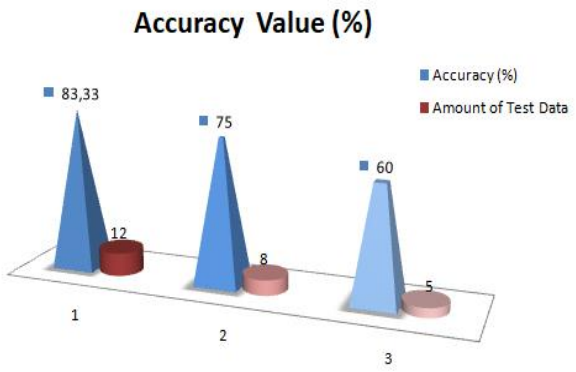

Fig. 2Comparison of accuracy value for each testing

In general, the results of accuracy testing are at a moderate level. The results of this study occur because the amount of training data is relatively small (this study only uses 25 data) resulting in testing accuracy that tends to below. External factors (subjectivity) greatly influence the results of testing. In addition, choosing the right training data can also affect the level of accuracy of testing.

IV.CONCLUSIONS AND RECOMMENDATIONS

Based on the results of testing the level of accuracy of employee eligibility, it can be concluded that the Naïve Bayes method can help determine the equalization of the status of eligible or non-eligible employees in the Faculty of Medicine at one of the Private Universities in Palembang. Tests are carried out based on the university's strategic plan, namely focus on class, employment status, membership and education permits. The results of this test indicate that the accuracy of the highest predictive conclusion for non-permanent and permanent employees is 83.33%, while the lowest accuracy value is 50%.

Large or small levels of accuracy are influenced by determining the amount of training data. The greater the amount of training data, the greater the level of accuracy because the training data pattern will be used as a rule to determine the results in testing the data.

In the next study, researchers can apply another classification method as a comparison method to get more accurate results and then make it a decision support system.

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REFERENCES

1. President of Republic of Indonesia, Manpower, no. 13. Republic of Indonesia, 2003, pp. 1–94.
2. J. Wasisto Raharjo, “Analisa status, kedudukan, dan pekerjaan pegawai tidak tetap dalam uu no. 5/2014 tentang aparatur sipil negara,” J. Borneo Adm., vol. 11, pp. 100–120, 2015.
3. B. A. Diana and R. Harta, “Analisis Beban Kerja Pegawai Pada Kantor UPBJJ-Universitas Terbuka Bandung,” J. Manaj. Pelayanan Publik, vol. 1, no. 1, pp. 1–11, 2017.
4. Y. Zhang, S. Oussena, T. Clark, and H. Kim, “Use Data Mining to Improve Student Retention in Higher Education - A Case Study,” in the 12th International Conference on Enterprise Information Systems, 2010, no. June, pp. 190–197.
5. R. Gustriansyah, “Sistem Pendukung Keputusan Pemilihan Dosen Berprestasi dengan Metode ANP dan TOPSIS,” in Seminar Nasional Teknologi Informasi dan Komunikasi (SENTIKA), 2016, pp. 33–40.
6. R. Gustriansyah, D. I. Sensuse, and A. Ramadhan, “Decision support system for inventory management in pharmacy using fuzzy analytic hierarchy process and sequential pattern analysis approach,” in 2015 3rd International Conference on New Media (CONMEDIA), 2015, pp. 1–6.
7. R. Gustriansyah, D. I. Sensuse, and A. Ramadhan, “A sales prediction model adopted the recency-frequency-monetary concept,” Indones. J. Electr. Eng. Comput. Sci., vol. 6, no. 3, pp. 711–720, 2017.
8. R. Gustriansyah, N. Suhandi, and F. Antony, “The Design of UML-Based Sales Forecasting Application,” Int. J. Recent Technol. Eng., vol. 7, no. 6, pp. 1507–1511, 2019.
9. A. Sanmorino and R. M. Fajri, “The Design of Notification System on Android Smartphone for Academic Announcement,” Int. J. Interact. Mob. Technol., vol. 12, no. 3, p. 192, 2018.
10. Husnawati, G. F. Fitriana, and S. Nurmaini, “The development of hybrid methods in simple swarm robots for gas leak localization,” in 2017 International Conference on Signals and Systems (ICSigSys), 2017, pp. 197–202.
11. A. Heryati et al., “The design of smart notification on android gadget for academic announcement,” TELKOMNIKA (Telecommunication Comput. Electron. Control., vol. 17, no. 1, p. 147, 2019.
12. Informatikalogi, “Algoritma Naive Bayes,” informatikalogi.com, 2017. [Online]. Available: https://informatikalogi.com/algoritma-naive-bayes/. [Accessed: 16-Jul-2019].
13. D. Xhemali, C. J. Hinde, and R. G. Stone, “Naïve Bayes vs. Decision Trees vs. Neural Networks in the Classification of Training Web Pages,” Int. J. Comput. Sci., vol. 4, no. 1, pp. 16–23, 2009.
14. A. Mohammad Esmaieeli Sikaroudi and A. Esmaieeli Sikaroudi, “A data mining approach to employee turnover prediction (case study: Arak automotive parts manufacturing),” J. Ind. Syst. Eng., vol. 8, no. 4, pp. 106–121, 2015.
15. A. Prakesakwa, A. Suryani, and R. Gustriansyah, “Sistem Pendukung Keputusan untuk Subsidi Biaya Perbaikan Kerusakan Kontainer Menggunakan Naive Bayes,” J. Teknol. dan Sist. Komput., vol. 7, no. 3, 2019.
16. R. Khan, “Naive Bayes Classifier: theory and R example,” South Dakota State University, 2017. [Online]. Available: https://rstudio-pubs-static.s3.amazonaws.com/347013_371e59e8867549ddb922ea7b530e5c6a.html. [Accessed: 17-Jul-2019].
17. Universitas Muhammadiyah Palembang, “Strategic Plan (Renstra),” Palembang, 2013.
18. N. Kamarudin, A. Wahab, and Y. Rozaidi, “Neuro-Physiological porn addiction detection using machine learning approach,” Indones. J. Electr. Eng. Comput. Sci., vol. 16, no. 2, pp. 964–971, 2019.