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Zakat Classification with Naïve Bayes Method in BAZNAS

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ABSTRACT

The National Amil Zakat Agency (BAZNAS) of the Banjar Regency, is the regional Zakat Management Agency of the Banjar Regency. BAZNAS Banjar Regency distributes the required alms according to the target to mustahik that is under the criteria or following the provisions of the Shari'a. However, BAZNAS often experiences difficulties in determining mustahik (people who are entitled to receive zakat) due to limited distribution funds and excessive data on Fakir and miskin people who are the main priority. The existence of a system that can determine two groups of recipients of the Fakir and miskin zakat based on data from the underprivileged population can help the distribution of zakat to these 2 groups. In this case, using the Naive Bayes method is very suitable in the classification of the BAZNAS mustahik determination so that it can be used to determine the prospective recipient of zakat. Based on the results of tests conducted on the Naïve Bayes classification with the Confusion Matrix calculation, the accuracy value reached 92.30%.

Keywords: *BAZNAS, fakir, miskin, mustahik, naïve bayes*

ABSTRAK

Badan Amil Zakat Nasional (BAZNAS) Kabupaten Banjar, merupakan Badan Pengelola Zakat Daerah Kabupaten Banjar. BAZNAS Kabupaten Banjar menyalurkan zakat yang dibutuhkan sesuai dengan target kepada mustahik yang memenuhi kriteria atau mengikuti ketentuan syariat. Namun, BAZNAS seringkali mengalami kesulitan dalam menentukan mustahik (orang yang berhak menerima zakat) karena terbatasnya penyaluran dana dan data yang berlebihan yaitu masyarakat fakir dan miskin yang menjadi prioritas utama. Adanya sistem yang dapat menentukan dua kelompok penerima zakat fakir dan miskin berdasarkan data dari penduduk kurang mampu dapat membantu penyaluran zakat kepada 2 kelompok tersebut. Dalam hal ini, penggunaan metode Naive Bayes sangat sesuai dalam klasifikasi penetapan mustahik BAZNAS sehingga dapat digunakan untuk menentukan calon penerima zakat. Berdasarkan hasil pengujian yang dilakukan terhadap klasifikasi Naïve Bayes dengan perhitungan Confusion Matrix didapatkan nilai akurasinya mencapai 92,30%.

Kata Kunci: *BAZNAS, fakir, miskin, mustahik, naïve bayes*

INTRODUCTION

Zakat is an Islamic pillar that must be implemented by every Muslim, zakat consists of two, namely zakat fitrah and zakat mal. Zakat mal is obliged to each Muslim to set aside a portion of

his wealth that has reached his nishab, every Muslim can entrust his zakat to zakat institutions that are scattered, one of which is the National Amil Zakat Agency (BAZNAS). One argument that discusses the mustahiq who are entitled to receive zakat is at At-Taubat Verse 60 (Zaenal et al., 2016).

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Research on the classification of zakat has been carried out using an artificial intelligence approach, several methods such as the decision tree method (Ananda & Wibisono, 2014), the results of the research have reached 85% accuracy. Research conducted by Asa (Asa, 2019) also uses a Decision Tree in distributing Zakat. The results of this study indicate that with the use of the artificial intelligence method the Decision Tree method, the distribution of zakat becomes right on target and takes less time. Until now, research results on zakat classification still allow for higher performance.

In research conducted by Xhemali, Daniela, Chris J. Hinde, and Roger G. Stone said that "Naïve Bayes Classifier has a better accuracy of accuracy than other classifier models with an accuracy of more than 97% even with little sample data" (Xhemali, Hinde, and Stone, 2009). With this system, it is expected that BAZNAS can easily determine two groups of zakat recipients of Fakir and Miskin based on data from the underprivileged population of Banjar Regency, thus helping the distribution of zakat to these two groups. While according to the provisions of BAZNAS, Fakir is more entitled to receive greater zakat than Miskin.

Zakat

Zakat has several meanings; namely the abundance of good, blessing, growth, sanctification and praise of charity is the command of God to give some of his wealth to the worthy. It is also called shadaqah, the word of Allah in the letter At-Taubah verse 60, explaining that shadaqah is the obligatory zakat, not shadaqah sunnah.

Zakat Recipients

Some groups that are obliged to receive zakat include (Bakar & Abd.Ghani, 2011; Fairi, 2020; Zaenal et al., 2016):

1. Fakir is people who have almost nothing; this group is tough to meet their daily needs.
2. Miskin is a group that does not have much wealth, so that it is difficult to meet daily needs.
3. Amil is a group that collects and distributes zakat, even though he is a rich man whose aim is to cleanse his religion.
4. Converts have recently converted to Islam, who need help to adapt to the new environment.
5. The Servant of Sahaya is the group that frees itself.
6. Gharimin is a person who has a debt to be able to meet their daily needs but has difficulty paying.
7. Fisabilillah is those who fight in the name of Allah.
8. Ibn Sabil is a group that requires costs in its journey to get to its destination.

Data Mining

Data mining is a technique by finding patterns in a certain way based on massive amounts of data (Lefebvre-Ulrikson et al., 2016; Tajbakhsh & Suzuki, 2017). Data mining is also called the

process of extracting data from an added value in the form of knowledge that is not known manually. Data mining has several functions, namely (Abiodun et al., 2018; Kapita, Mahdi, and Tempola, 2020; Katarya, Gangwar, and Jaisia, 2018):

1. Prediction function. The process of finding patterns from data using variables to predict other inappropriate variables.
2. Function Description (description). The stage identifies important characteristics of data in the database.
3. Classification Function (classification). Classification is the process of determining a model to describe classes in data. This process can predict important data in the future.
4. Association function (association). Used to identify the relationship that exists in the attribute value in a data set.

Classification Function

One of the functions of data mining is classification. Classification is the process of searching for models that explain data classes with the objective direction in order to estimate the class of an object whose label is unknown. In achieving this goal, the classification process can form a design model that can differentiate data into different classes based on specific rules or functions (Cilimkovic, 2010; Katarya et al., 2018; Ul Hassan et al., 2018).

Naive Bayes

Naïve Bayes is the Naïve Bayes algorithm predicting future opportunities based on previous experience, so it is known as the Bayes Theorem. The main characteristic of the Naïve Bayes Classifier is the very strong assumption of independence of each condition or event. Compared to other class models, Naïve Bayes works very well. It can be proven in the journals Xhemali, Daniela, Chris J. Hinde, and Roger G. Stone. "Naive Bayes vs. decision trees vs. Neural networks in the classification of training web pages.", Said that "The accuracy of Naïve Bayes is better than other classifier models." in the classification process (Besimi et al., 2017; Dangi & Srivastava, 2015; Jalota & Agrawal, 2019; Ren et al., 2009).

The stages of the Naïve Bayes algorithm process are (Farid et al., 2014; Wu et al., 2015; Zhang & Gao, 2013):

1. Count the total number of classes
2. Count the number of cases. Class
3. All class variables are multiplied
4. Make a comparison of results in each class

The statistical model is an efficient model that supports decision-making. Probabilistic is a form of a statistical model (Lee et al., 2018; Mustakim et al., 2018). In this method, all attributes will contribute to decision-making, with the same importance, and each attribute is free from each other. If given k attributes that are mutually independent (independence), the probability value can be given as follows:

$$P(x_{1,,,}x_{k|C}) = P(x_{1|}\mathrm{C})\mathrm{x} \ldots \mathrm{x}\ \mathrm{P}(x_{K|}\mathrm{C}) \quad (1)$$

MATERIALS AND METHOD

Data Processing

Data analysis is carried out to find out the potential recipients of zakat. The training data becomes a parameter to find out the status of the prospective zakat recipients. The training data are analyzed in advance to determine whether in the form of numerical data or non-numeric input data in the form of data from the underprivileged population of Banjar Regency. The data

used is the data of recipients of zakat in 2017-2018, to find out between the Fakir and Miskin groups BAZNAS (National Amil Zakat Agency) has specific criteria, data obtained both from the results of direct surveys and based on reports from districts, villages or village governments.

Table 1. *Zakat recipients data*

NIK	Name	Sex	Districts	Age	Residential building status	Job	Physical disability	Chronic Illness	Label
6303011607820000	Wahid Hasyim	M	Aluh-aluh	>=55	No	No	Yes	Yes	Fakir
6303011712790000	Komarudin	M	Aluh-aluh	<55	Alone	No	No	No	Miskin
6303012704760000	Muhammad	M	Aluh-aluh	<55	Alone	Work	Yes	No	Miskin
6303012709740000	Juariah	F	Aluh-aluh	>=55	No	No	Yes	Yes	Fakir
6303011111750000	M. Mulkani	M	Aluh-aluh	<55	Alone	Work	No	No	Miskin
6303012407940000	Nurhayati	F	Aluh-aluh	>=55	No	No	Yes	Yes	Fakir
6303015504680000	Syahrawardi	M	Aluh-aluh	<55	Alone	Work	Yes	No	Miskin
6303010704770000	Saipullah	M	Aluh-aluh	<55	No	No	Yes	Yes	Fakir

Table 2. *Zakat recipients data after reduction*

Sex	Districts	Age	Residential building status	Job	Physical disability	Chronic Illness	Label
M	Aluh-aluh	>=55	No	No	Yes	Yes	Fakir
M	Aluh-aluh	<55	Alone	No	No	No	Miskin
M	Aluh-aluh	<55	Alone	Work	Yes	No	Miskin
F	Aluh-aluh	>=55	No	No	Yes	Yes	Fakir
M	Aluh-aluh	<55	Alone	Work	No	No	Miskin
F	Aluh-aluh	>=55	No	No	Yes	Yes	Fakir
M	Aluh-aluh	<55	Alone	Work	Yes	No	Miskin
M	Aluh-aluh	<55	No	No	Yes	Yes	Fakir

After reduction, there are 7 attributes used and the label classes are Fakir and Miskin.

Naïve Bayes calculation process

1. At this stage the Naïve Bayes calculation process will be explained into the system as for the calculation steps as follows:
2. Calculation of class and label P (Y = Fakir) = 115/234 "The amount of fakir data in the training data divided by the sum of all data". P (Y = Poor = 119/234 '' The amount of poor data in the training data divided by the total data amount ".
3. Calculation of the same number of cases with the same class
   P (Age = <55 years | Fakir) = 4/115
   P (Age = <55 years | Miskin) = 113/119
   P (Occupation = Working | Fakir) = 1/115
   P (Occupation = Working | Miskin) = 104/119
   P (Residence = Self | Fakir) = 2/115 P (Residence = Self | Miskin) = 103/119 P (Disability = Not | Fakir) = 115/115
   P (Disability = No | Miskin) = 118/119
   P (Chronic Disease = No | Fakir) = 18/115
   P (Chronic Disease = No | Miskin) = 116/119
4. Multiply all the results of the Fakir and Miskin variables

P (Sex = P (male | Fakir) * P (District = Peat | Fakir) * P (Age = <55 years | Fakir) * P (Occupation = No | Fakir) * P (Residence = No | Fakir) * P (Disability = No | Fakir) * P (Chronic Disease = No | Fakir) * P (Fakir) = 4/115 * 1/115 * 2/115 * 115/115 * 18/115 * 115/234 = 0.0000404625

P (Gender = P (male | Miskin) * P (District = Peat |Miskin) * P (Age = <55 years | Miskin) * ¬¬¬P (Occupation = Not | Miskin) * P (Residence = No | Miskin) * P (Disability = No | Miskin) * P (Chronic Disease = No | Miskin) * P (Miskin) = 113/119 * 104/119 * 103/119 * 118/119 * 116/119 * 119/234 = 0.35308990498

5. Compare the results of the Fakir and Miskin.
   The results of the above calculation, it appears that the P value is the highest value in the class (P | Miskin) so that it is concluded that the prospective recipient of the zakat is classified as "Miskin".

RESULTS AND DISCUSSION

Testing results using the Confusion Matrix, in this process carried out to measure the extent of the accuracy of the Naïve Bayes method of data classification. The test calculations using Confusion Matrix are as follows:

Table 3. *Confusion Matrix*

	Positive	**Negative**
True	13(TP)	11(TN)
False	1(FP)	1(FN)
Total	14(P)	12(N)

From the results of a comparison between training data from BAZNAS with testing data with a total amount of data 260 data is divided into 234 training data and 26 test data, in this case "Fakir" means negative and "Miskin" means positive results are obtained:

1. 13 True Positive (TP) data, data with positive classes that are correctly classified by the system.
2. 11 True Negative (TN) data, data with negative classes that are properly classified by the system.
3. 1 False Negative data (FN), which is data with a negative class but is classified incorrectly by the system.
4. 1 Positive Flase (FP) data is data with a positive class but is classified incorrectly by the system.

Calculating Precision, Recall and Accurate:

1. Calculating Precision
   $$Precesion = \frac{13}{13+1} = 0{,}928571 = 92{,}8571\%$$

2. Calculating Recall
   $$Recall = \frac{13}{13+1} = 0{,}928571 = 92{,}8571\%$$

3. Calculating Accuracy

$$Accuracy = \frac{13+11}{13+11+1+1} = 0{,}923076 = 92{,}3076\%$$

Training					*Testing*				
Total Data	F	M	Kriteria	Prediksi	Total Data	F	M	Kriteria	Prediksi
234	115	119	P(Umur = <55 tahun|Fakir) = 4/115 P(Umur = < 55 tahun|Miskin) = 113/119 P(Pekerjaan = Bekerja|Fakir) = 1/115 P(Pekerjaan = Bekerja|Miskin) = 104/119 P(Tempat Tinggal = Sendiri|Fakir) = 2/115 P(Tempat Tinggal = Sendiri |Miskin) = 103/119 P(Cacat = Tidak|Fakir) = 115/115 P(Cacat = Tidak|Miskin) = 118/119 P(Penyakit Kronis = Tidak|Fakir) = 18/115 P(Penyakit Kronis = Tidak|Miskin) = 116/119	Miskin=0,0646288421 Fakir= 0,0000006682 1	26	14	12	P(Umur = <55 tahun|Fakir) = 2/14 P(Umur = < 55 tahun|Miskin) = 9/12 P(Pekerjaan = Bekerja|Fakir) = 2/14 P(Pekerjaan = Bekerja|Miskin) = 9/12 P(Tempat Tinggal = Sendiri|Fakir) = 2/14 P(Tempat Tinggal = Sendiri |Miskin) = 7/12 P(Cacat = Tidak|Fakir) = 14/14 P(Cacat = Tidak|Miskin) = 12/12 P(Penyakit Kronis = Tidak|Fakir) = 2/14 P(Penyakit Kronis = Tidak|Miskin) = 11/12	Miskin=0,300781 Fakir= 0,020408

Figure 1. Comparison of calculation results for Training and Testing Data

From the figure 1 above can be a comparison between training and testing data with the same input criteria prediction results obtained from training data that is Miskin = 0.0646288421 and Fakir = 0.0000066821 then on testing data that is Miskin = 0.300781 and Fakir 0.020408 can be concluded that with the same input criteria, the predicted results obtained are "Miskin".

CONCLUSION

The conclusions of this study is as follow:

1. Generating data patterns for the determination of prospective recipients of zakat by applying data mining with the Naïve Bayes classification, so that it can be used to determine the prospective recipients of zakat.
2. The accuracy of the method applied to this system has reached 92.3076%.

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