



Expert System to Diagnose Kidney Failure with Web-Based Naïve Bayes Method

Firdhani Novrizal¹, M Iwan Wahyuddin², Ratih Titi Komalasari³

Fakultas Teknologi Komunikasi dan Informatika, Universitas Nasional

Email: dhani69novrizal@gmail.com¹, iwan_whd@yahoo.com², ukhuwahku01@gmail.com³

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ABSTRACT

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Expert system is a development of AI that is designed to meet and facilitate decision making. Although the expert system is artificial intelligence, the expert system has only one domain in problem solving, such as medicine, engineering, and business. The method used in this study is the naïve bayes method. Naïve Bayes is a calculation method with probabilities and statistics in calculations. This research was made by combining information technology knowledge with health science which is intended to facilitate the use of computers in anticipating kidney failure. Kidney failure is a disease that is often experienced by people, especially in Indonesia. Because kidney failure is a deadly disease even though it is often underestimated by the community, especially Indonesia. The purpose of this paper is to assist the public in anticipating kidney failure that is still lacking knowledge and sensitivity to the disease. The application of the expert system is made with the naïve bayes method which has the function to calculate the percentage of presentations due to kidney failure and can help the role of doctors in making decisions in determine the type of kidney failure. In this application, an expert system for diagnosing kidney failure has an accuracy value of 81.67% from 60 test data.

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1. Introduction

An expert system is one of the developments of AI use to assist in solving the problem by using knowledge[1], Although the expert system was developed to solve the problem and not to replace the role of experts but to help to make a decision[2], Expert systems try memecakan same problem with the way the problem memecakan expert[3]And of combining with the conclusion on the basis of specific knowledge with the help of a computer [4], The concept of expert system discount some elements of membership of an expert, the transfer of expertise, inference, rules - the rules, and the ability to explain[5],

Naïve Bayes method is one method of calculation of statistics and probability approach [6] - [8], This method is widely used in the study to calculate the data is not bound to be definitive data[9] - [11], In studies expert system built from renal failure disease data into early determinant of data. To take the decision that is uncertain then butukan naïve Bayes method in determining diagosa[12], [13],

Kidney failure is a disease that attacks the human organ malfunction of the kidneys to work properly or reduction in kidney organ in liquid filtration processes in the body. Patients with kidney disease in general often occurs in humans due to lack of awareness and knowledge about kidney disease and lack of health facilities for early notification of kidney disease. Renal failure has two categories: acute and chronic renal failure[14], [15], In general, the kidney disease is still considered trivial by the people of Indonesia and the lack of knowledge about kidney disease, often people do not care about the health of the kidneys.

The purpose of this study to help to the role of physicians and the public to solve the problem in kidney disease by combining knowledge with knowledge of information technology, namely the health of expert system diagnosis of kidney failure with the counting process with a web-based naïve Bayes. In this study has a value of accuracy of 81.67% with 60 test data.





2. Research Methods

2.1. Stages Research

Stages of this research is a step by step from the author in compiling the journal, and designing an expert system application method, naïve Bayes this study begins with a literature that is read journals are related or similar to memnjadi reference materials in the journal that will be designed, data collection with specialist help wounds to make the symptoms of the symptoms and take samples of journals and hospitals, designing expert systems, system implementation, testing tujaun of testing expert system is to ascertain whether a system or application is made in accordance with the needs and easy to use by all circles, and system analysis, conclusions and suggestions.



Fig 1. Research Stages Flowchart

Figure 1 is a stage of the collection phase of the research journals, data collection of data, designing the manufacturing system to be created, implementing the system made whether according to the needs and easy to use, the conclusions of the application being made.

2.2. Expert System Flowchart

In the flowchart described how the flow course of the application of expert systems, ranging from the login user / admin, after login user to the menu diagnosis and then make the selection of symptoms by experienced by the user, after which the symptoms - gejala selected user is processed using methods Naïve Bayes, and after the calculation process appear diagnosis and the user can print the results of the diagnosis



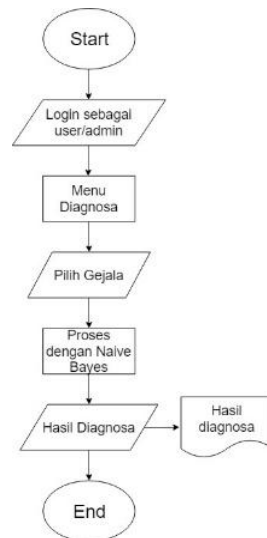


Fig 2. Expert System Flowchart

In Figure 2 is flowchat in designing expert system of login to the main page, the questionnaire of symptoms symptoms dialmi by the user and then in the process of getting the percentage of kidney disease.

2.3. Use Case Diagram

Use case diagram is a diagram to describe the concept of user interaction with the system,

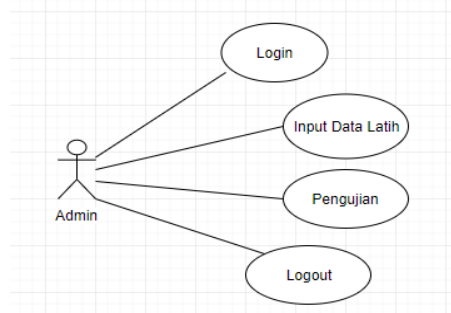


Fig 3. Use Case Diagram Admin

Figure 3 is an admin interface that looks the diagram above, as the admin there are some rights that can do such entities admin login, input training data, pengujian, and logout.

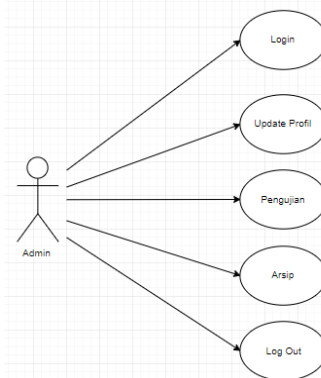


Fig 4. Use Case Diagram User

Figure 4 is a user interface that is visible from the diagram above, as the user has the right like, login, profile updates, pengujian, archives, and logout.

2.4. Expert System



An expert system is one of the developments of AI designed to widely, especially to solve the problem which is owned by the community. Although the expert system is designed to solve the problem but the system has only one domain experts, such as medical applications localized for menrancang menyelesaikan medical problems.

2.5. Naïve Bayes

Naive Bayes method is a method that uses probability and statistics put forward by a British scientist Thomas Bayes is predicting the probability of the future based on the experience of earlier. Naïve Bayes algorithm is included *insupervised learning*, Then the initial knowledge needed to make a decision. The initial steps are:

- a) Counting the number of categories of each variable in each training.
- b) Calculate the probability of each category.
- c) Determine the frequency of each word in each category.

classification:

- a) Calculate for each category.
- b) Specify category with the maximum value.

Probability formula is:

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

Where :

X = Data with unknown class

H = hypothesis X data is a specific class

P (H | X) = probability of the hypothesis H is based on the condition X (a posteriori probability)

P (H) = probability of the hypothesis H (prior probability)

P (X | H) = probability X based on the conditions on the hypothesis

P (X) = probability of X

2.6. Train Data

Training data is a set of data would not have been used for research, and this research dikelompokan.dalam the use of 100 data to determine the probability perhingan. In Tables Table 1 below which is a training data used in this study were 100 training data:

Table 1.
Train Data Expert System Diagnosis of Kidney Failure

No.	G1	G2	G3	G4	G5	G6	G7	G8	KET
1	V	V	V	X	X	X	V	X	GGK
2	V	V	X	X	X	X	X	V	GGA
3	V	X	V	V	V	V	X	V	GGK
4	X	X	X	X	V	X	X	X	GGA
5	V	X	X	V	V	X	V	V	GGK
6	V	X	X	V	X	V	X	V	GGK
7	V	V	X	V	X	V	V	X	GGK
8	V	X	V	X	X	V	V	V	GGK
9	X	V	V	X	V	V	X	X	GGA
10	X	V	V	V	X	X	V	V	GGA
11	V	V	V	V	X	X	X	X	GGA
12	X	V	X	X	V	X	X	V	GGA
13	V	V	V	X	V	V	X	X	GGK
14	V	V	X	V	X	V	V	X	GGK
15	V	V	X	X	X	X	X	X	GGK
16	V	V	X	V	X	V	V	X	GGK
17	V	V	X	X	V	V	V	X	GGK
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
82	V	V	X	X	V	V	X	V	GGK
83	X	V	X	X	V	V	V	X	GGK
84	V	X	X	X	X	X	X	X	GGK
85	V	V	X	V	X	V	X	V	GGA
86	V	V	V	V	X	X	X	V	GGA
87	X	X	X	X	V	X	X	X	GGA





No.	G1	G2	G3	G4	G5	G6	G7	G8	KET
88	V	X	X	V	X	V	X	V	GGA
89	V	X	X	X	X	X	X	X	GGK
80	V	X	V	X	X	X	X	V	GGK
91	V	X	V	V	V	X	X	X	GGK
92	V	X	V	V	V	V	X	X	GGA
93	X	V	X	X	X	X	V	X	GGK
94	X	X	X	V	X	V	V	V	GGK
95	V	X	V	V	X	V	V	V	GGK
96	V	V	X	V	X	V	X	X	GGK
97	V	V	V	V	X	X	V	X	GGA
98	X	V	V	V	X	X	X	V	GGA
99	V	X	X	X	V	V	V	X	GGA
100	V	X	X	V	V	X	V	X	GGK

In Table 1 it is training data or training data is the data uncertain as tools perhtungan naive Bayes methods.

Information :

- G1 : Frequent Nausea Merakan
- G2 : Pain In The Chest
- G3 : Reduced Body Weight
- G4 : Bangkak In The Hands and Feet
- G5 : Back Pain Rear section
- G6 : Decreased appetite
- G7 : Urinating Accompanied Blood
- G8 : Skin and Face Looks Pale
- GGA : Acute Renal Failure
- GGK : Chronic Renal Failure
- V : Yes
- X : No

3. Results and Discussion

3.1. Display Interface

A. Admin

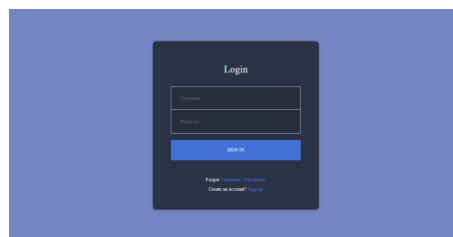


Fig 5. display Log

In Figure 5 is the earliest pages of applications that can be accessed by administrators and users. The purpose of making this login figtur to overcome in the use of the system and facilitate the administrators and doctors in charge of data and view data without having to look at from the databases.

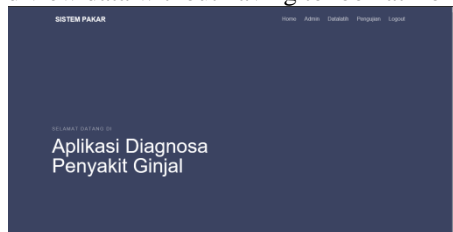


Fig 6. Display Home Admin

In Figure 6 is a view home that there is a menu - a menu for user and admin. There is a difference between a home user with a home that is on the menu admin, admin and admin are datalatih.





Fig 7. views Datalatih

In Figure 7 is a page that aims to fill datalatih used to make the calculation method naïve Bayes methods expert system application 471agnose kidney disease. In this datalatih is a history of the patient's kidney disease.

Fig 8. Testing display of Admin

In Figure 8 is a test page from the admin side are only done by the doctor or expert systems admin kidney failure. Testing of the admin can only be done by a user who already registered.

B. User

Fig 9. Display Update User Profile

In Figure 9 is in the form of user information or personal data and bio patient or user can be changed if there are errors in the registration.

Fig 10. Kidney Disease Information Display

In Figure 10 is in the form of a brief info about kidney disease and renal failure with these types of diseases such as differences in acute renal disease with chronic kidney disease.

Fig 11. Views From User Testing,

In Figure 11 tests to be carried by the user to mengisis symptom questionnaire with symptoms that exist on the web and then will be in the process of collecting data and calculated by the method of naïve Bayes.





Hasil Diagnosa

Nama: rani
 Email: rani@gmail.com
 Tgl Lahir: 16/08/1997
 Jenis Kelamin: Perempuan

Anda terdiagnosa : Gagal Gigit Alut

Cajala Yang Anda pilih :

1. Sering mengalami mual: Ya
2. Terasa nyeri dibagian dada: Tidak
3. Berat badan menurun: Tidak
4. Mengalami pembengkakan di bagian tangan dan kaki: Ya
5. Terasa kaku di bagian pinggang terutama dibagian belakang: Tidak
6. Nafsu makan berkurang: Tidak
7. Urin tembusur dengan darah: Ya
8. Kulit terasa kering dan muka terlihat pucat: Tidak

Penjelasan : Penyakit gagal ginjal akut (GGA) kondisi ini terjadi saat ginjal Anda tiba-tiba mengalami kerusakan secara mendadak sehingga tidak bisa berfungsi sebagaimana mestinya.

Pencegahan : Memperbanyak minum air putih dan memakan makanan yang sehat dengan di sertai buah-buahan terutama yang mengandung banyak air, karena dapat membantu memelihara racun yang berada di dalam tubuh.

Saran : Membiasakan diri pakai dan dengan pola hidup sehat.

Waktu Diagnosa : 2 Februari 2020 jam 13:24:16 WIB

Fig 12, Diagnosis Result Display

Figure 12 is a view when they fill out a questionnaire with the symptoms and the symptoms are the result of the calculation of the diagnosis.

No	Waktu	Hasil Diagnosa
1	9/11/3, 8:00:22 AM WIB	Apakah Anda Sering Mengalami Mual? Tidak Apakah Anda Mengalami Cepat Lelah? Ya Apakah Mengalami Muka Yang Terlihat Pucat? Tidak Apakah Anda Sering Merasakan Sakit Pinggang? Ya Apakah Mengalami Muka, Tangan, Kaki dan Mata Anda Benar-benar Runging? Ya Apakah Anda Sering Membuang Air Kencing (Sakit) di Setae Olan Darah? Tidak Apakah Mengalami Luka yang Lama Sembuh? Ya Apakah Anda Mengalami Bengkak, Dibagian Tubuh? Tidak Anda terdiagnosa Mengalami penyakit: Gagal Gigit Kronis

Fig 13, Diagnosis Data Archive display or user

In Figure 13 is an archival or historical loading results 472iagnose that have been performed by the user, when the user wants to see results472iagnose back can through this page without doing472iagnose again.

3.2. Testing of the Accuracy of the Expert System

Testing accuracy rate is aimed to determine the suitability of applications with 472iagnose suffered by the user. How to test the accuracy of the way Microsoft applications Exel rock with naïve Bayes formula and expert assistance in the disease. Here are 15 data from 60 data.

Table 2.
Testing Data

NO	symptoms symptoms	System	Specialists
1	G5, G6, G7	Chronic Renal Failure	valid
2	G4, G6, G7	Chronic Renal Failure	valid
3	G2, G4, G7	Acute Renal Failure	valid
4	G1, G4, G6, G8	Acute Renal Failure	valid
5	G2, G4	Acute Renal Failure	valid
6	G4, G6, G7, G8	Acute Renal Failure	No valid
7	G1, G2, G3, G6, G8	Acute Renal Failure	valid
8	G2, G3, G6	Acute Renal Failure	valid
9	G1, G2, G3, G4	Acute Renal Failure	valid
10	G1, G2, G3, G5, G8	Acute Renal Failure	valid
-	-	-	-
-	-	-	-
-	-	-	-
56	G1, G4, G5	Chronic Renal Failure	valid
57	G1, G8	Chronic Renal Failure	No valid
58	G2, G3, G4, G5, G6, G7, G8	Acute Renal Failure	No valid
59	G3, G7, G8	Acute Renal Failure	No valid
60	G1, G7, G8	Acute Renal Failure	No valid

- G1 : Frequent Nausea Merakan
- G2 : Pain In The Chest
- G3 : Reduced Body Weight
- G4 : Bangkai In The Hands and Feet
- G5 : Back Pain Rear section





G6 : Decreased appetite
G7 : Urinating Accompanied Blood
G8 : Skin and Face Looks Pale

From Table 2 is the results of the calculation accuracy of the data 60 of kidney failure diagnosis expert system has an accuracy value of 81.67%.

4. Conclusion

Based on these results it can be concluded that the application of expert system diagnosis of kidney failure, that motede naïve Bayes can apply well to the application of expert system diagnosis of renal failure and can help the role of physicians in determining the initial diagnosis of the disease to kidney failure where the results of the diagnosis in the form of a percentage. simplify and knowing other people without having to go to hospital and be able to know panyakit kidney failure from the outset. With the naïve Bayes methods of diagnosis can be known berdasarkan probability of symptoms and the symptoms experienced berdasarkan accuracy testing that applications are built have akursi value of 81.67%.

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