

Diabetes Mellitus Detection Expert System Using a WEB-Based Naïve Bayesian Approach

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ABSTRACT

Health is the most important factor in a person's life. If health has been disturbed (sick) then a person's activities will be disrupted. Today, many diseases have a large number of sufferers and are even effective killing machines. One of them is diabetes mellitus, which is a disease with the highest number of patients, which is as many as 230 people. In Indonesia alone, the number of diabetic patients reached 4.5 million people in 1995 and it is estimated that by 2025 there will be 12.4 million people with diabetes and ranks fifth in the world. This increasing number every year is not supported by an increase in the number of specialist doctors who can treat this disease, so that many sufferers are not diagnosed with diabetes. Advances in the world of technology really help the modern world to detect or predict something that will happen. One of them is an expert system used to detect a disease in medicine. The relationship between expert systems and Islam is explained in many ways in the Qur'an, especially in Surah Al-Hasyr verse 18. The word Nadhar means reason or thought. Reasoning activities are related to the brain or reason. In the context of science, nadhar can be interpreted as an expert system. Because both of them have the benefit of knowing things that will happen or for predicting and even detecting things that will happen. Intellect can determine the goodness or badness of something that is non-physical, while the expert system is used to detect or determine the presence or absence of diabetes mellitus in a person.

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1. Introduction

Take care of your health so you don't get sick easily. Maintenance is also called maintenance is also called prevention of disease attacks, this is done on a body that is still healthy. However, if someone has been exposed to the disease, then healing steps should be taken immediately. Such as diabetes mellitus which is the result of not maintaining health and an indifferent attitude towards health as well as a modern lifestyle and irregular eating and drinking. The healing process requires therapy and drugs, but healing is the full right of Allah swt, Diabetes Mellitus (DM) is a disease that is often found with a worldwide prevalence of 4%. Its prevalence will continue to increase and it is estimated that by 2025 it will reach 5.4%. Currently, There are 230 million people in the world who have diabetes. This figure is up 3 percent or an increase of 7 million people every year. In 2025 it is

estimated that there will be 350 million people with diabetes. In Indonesia, in 1995, there were 4.5 million people with diabetes, the 7th most in the world. Now this number has increased to 8.4 million and it is estimated that by 2025 it will be 12.4 million people or the 5th largest in the world.

Diabetes has become the fourth leading cause of death in the world. Every year there are 3.2 million deaths caused directly by diabetes. Diabetes is also the most common cause of leg amputations outside of accidents. It is recorded that more than 1 million people are amputated due to diabetes every year. Compared with ordinary people, people with diabetes are 15-40 times more likely to have leg or lower leg amputations. The number of diabetics obtained in Southeast Asia from data available at the IDF (International Diabetes Federation) are: Singapore 10.4 percent (1992), Thailand 11.9 percent (1995), Malaysia 8 percent more (1997) and Indonesia 5, 7 percent (1992). Currently, it is reported that in big cities such as Jakarta and Surabaya, almost 10 percent of the population has diabetes. The numbers above are increasing day by day in line with the modern lifestyle which is relaxed, instant and sophisticated. The difficulty is, less than half the number of people with diabetes who know and want to try to overcome the disease.

Unfortunately, the increase in the number of diabetes is not matched by the presence of professionals in this field. This often leads to confusion in establishing the diagnosis. Many people with diabetes, especially mild ones, are not diagnosed or even get the wrong diagnosis, this is of course detrimental to the sufferer. For this reason, it is necessary to understand and know about the symptoms of diabetes and increase preventive efforts to prevent diabetes early. Because the earlier it is detected, the greater the chance for recovery. The rapid development of technology lately is very helpful in the process of detecting the early symptoms of diabetes. One of the results of today's technological developments is artificial intelligence or abbreviated AI which tries to make computers think and solve problems like humans. One form of artificial intelligence that is widely used today is an expert system. An expert system is a computer program that imitates thought processes and expert knowledge to solve a specific problem. The implementation of expert systems is widely used for commercial purposes because expert systems are seen as a way of storing expert knowledge in certain fields into computer programs in such a way that they can make decisions and reason intelligently. One implementation that can be applied is in the field of disease diagnosis. An expert system is a computer program that imitates thought processes and expert knowledge to solve a specific problem. The implementation of expert systems is widely used for commercial purposes because expert systems are seen as a way of storing expert knowledge in certain fields into computer programs in such a way that they can make decisions and reason intelligently. One implementation that can be applied is in the field of disease diagnosis. An expert system is a computer program that imitates thought processes and expert knowledge to solve a specific problem. The implementation of expert systems is widely used for commercial purposes because expert systems are seen as a way of storing expert knowledge in a particular field into computer programs in such a way that they can make decisions and reason intelligently. One implementation that can be applied is in the field of disease diagnosis. The implementation of expert systems is widely used for commercial purposes because expert systems are seen as a way of storing expert knowledge in a particular field into computer programs in such a way that they can make decisions and reason intelligently. One implementation that can be applied is in the field of disease diagnosis.

Expert systems will feel more effective and efficient if users can access the system easily and quickly to get information anytime and anywhere. This can be done by connecting the expert system to the internet using the World Wide Web (WWW), which is a distributed system based on hypertext which is a method for storing, recalling and displaying information based on computer processing power. The purpose of using the World Wide Web (WWW) media is so that this program can be

accessed freely, so it is hoped that there will be an exchange of information to complement the existing information. So it is hoped that the development of the implementation of an expert system in the field of diagnosis as a support for web-based decision making will assist in providing health services to the community. Because web applications are no longer limited to providing static information, but also capable of providing information that changes dynamically, by connecting to a database.

2. Method

2.1 Data collection

Several methods were used in data collection:

- a. Literature study in this method the author will search, learn from various kinds of literature and documents that support the work. This final project is specifically related to an expert system for detecting diabetes mellitus.
- b. Observation Observing the data studied, conducting interviews with parties related to program development, namely diabetes mellitus experts, patients and parents.
- c. Browsing Observing various websites on the internet that provide information relevant to the problems in making this system

2.2 Analysis of Collected Data

Make an analysis of the data that has been obtained from the results of observations by combining it with survey reports and user policies into a structured specification using modeling.

2.3 Bayes' Theorem Method Analysis

Bayesian probability is one way to overcome data uncertainty by using the Bayesian formula which is stated:

$$P(H|E) = \frac{P(E | H) \cdot P(H)}{P(E)} \dots\dots\dots (1)$$

Where :

- P(H|E) = Probability of hypothesis H if given evidence e.
- P(E|H) = probability of emergence of evidence E if known hypothesis H
- P(H) = The probability of hypothesis H regardless of any evidence

This Bayes theorem formula is used to get the percentage value of symptoms obtained from calculating the probability of each symptom with yes and no classifications. The calculation of the probability of diabetic disorders diagnosis based on symptoms.

This result is then compared with the results of the previous calculation, namely the results of the calculation of polyuria. If the "yes" result is greater then it can be said that diabetes is detected, while if the "yes" result is smaller than the "no" result, then diabetes is not detected. Meanwhile, to determine the type of diabetes whether it is type 1 or type 2 diabetes, what is seen is the age of the participant who is diagnosed, if the age of the participant is less than 21 years, then the participant is detected with type 1 diabetes and if the age of the participant is greater than 21 years, the participant has type 2 diabetes. .

3. Results and Discussion

3.1 Result

a. Charging Symptoms

The filling of symptoms can be seen in the table below:

TABLES 1.
 CHARGING SYMPTOM 1

No	Polyuria	polydipsia	Polypagia	Cramps	tingling	Taste_Thick	BB_Down
1	Yes	yes	Yes	no	no	no	yes
2	Yes	yes	Yes	yes	yes	no	no
3	no	yes	Not	no	no	yes	yes

No	Polyuria	polydipsia	Polypagia	Cramps	tingling	Taste Thick	BB_Down
4	Yes	no	Not	yes	no	yes	no
5	no	no	Not	yes	no	yes	yes
6	Yes	no	Yes	yes	yes	no	no
7	Yes	yes	Not	no	yes	no	yes
8	no	yes	Yes	yes	no	yes	yes
9	no	no	Yes	no	no	yes	yes
10	no	yes	Not	yes	no	no	no
11	Yes	yes	Yes	no	no	no	no
12	Yes	no	Not	no	yes	yes	yes
13	no	yes	Yes	yes	yes	yes	no
14	Yes	yes	Not	no	yes	yes	yes
15	no	yes	Yes	yes	yes	no	no
16	Yes	no	Yes	no	no	no	yes
17	Yes	yes	Yes	no	yes	no	no
18	no	no	Not	yes	no	yes	yes

TABLE 2.
 CHARGING SYMPTOM 2

Skin	itch	boil	infection	whiteness	wound	hungry	Shaky
no	yes	no	no	no	yes	no	yes
no	no	no	yes	yes	no	yes	yes
yes	yes	yes	yes	yes	no	yes	no
yes	yes	no	yes	no	no	no	no
yes	yes	yes	yes	yes	no	yes	yes
no	no	no	no	no	yes	no	yes
no	no	no	no	yes	yes	no	no
yes	yes	no	no	yes	no	yes	yes
yes	no	yes	yes	no	no	no	no
no	no	no	no	no	yes	yes	yes
yes	yes	yes	yes	no	no	no	no
no	no	no	no	no	no	no	no
no	no	yes	yes	yes	yes	no	no
no	yes	yes	yes	yes	yes	no	no
yes	no	no	no	no	no	no	no
no	no	no	no	no	yes	no	no
yes	yes	yes	yes	yes	no	yes	yes

TABLE 3.
 CHARGING SYMPTOM 3

Weak	Concentration	Sweat	pounding	Dizzy	Nervous	Coma	Diabetes
yes	no	yes	yes	no	no	yes	yes
no	no	no	no	yes	yes	no	yes
no	yes	no	yes	yes	yes	yes	no
no	no	yes	yes	no	no	no	no
no	yes	no	yes	yes	yes	yes	no
yes	no	yes	no	yes	yes	no	yes
yes	no	yes	no	no	no	no	yes
yes	no	yes	no	yes	yes	no	yes
no	yes	no	yes	no	no	yes	no
yes	yes	yes	no	no	no	no	yes
no	yes	no	yes	no	yes	yes	no
yes	no	yes	no	yes	yes	yes	yes
yes	no	yes	no	yes	no	no	yes
yes	no	yes	no	no	no	no	yes
yes	yes	yes	yes	yes	yes	no	yes
yes	no	yes	no	no	no	no	yes
no	yes	no	yes	yes	yes	yes	no
yes	no	no	yes	no	yes	no	no
yes	yes	yes	no	no	no	no	yes

b. Home Menu Page

The page on the home menu is the initial display when the program is run, where in this home there is a description of the purpose of making the program as well as information about diabetes. The page designs are:



Figure 1.Home Menu

c. Profile Menu Page

The page on the profile menu describes the programmers who created and designed the Diabetes Mellitus Detection Expert System. The page designs are:

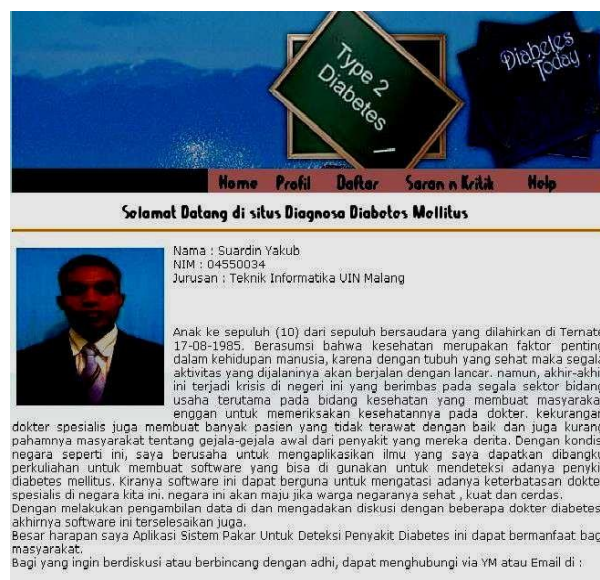


Figure 2.Profile Menu Page

d. List Menu Page

In this page, if the user wants to carry out the consultation process, then the user is required to register on the registration page, so that the user will get a username and password which will be used to login on the member login menu page. The page design is as follows

Prevenegah Lebih baik daripada mengobati...

Home Profil Daftar Saran n Kritik Help

Diagnosa Diabetes Mellitus

Form Pendaftaran Peserta Diagnosa Diabetes

Silahkan anda mengisi daftar pengguna secara lengkap untuk mendapatkan username dan password yang akan digunakan pada diagnosa. Jika daftar berhasil silahkan pilih menu diagnosa dan masukkan username dan password anda yang telah anda buat.

Daftar Pengguna

Username =>hafalkan username anda

Password =>hafalkan password anda

Nama

Jenis Kelamin

Umur

Alamat

Telepon

Kirim Batal

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[Obat Diabetes](#) | [Tambang Diabetes](#) | [Diagnosa](#) |
soevriah@suardin.yakub

Figure 3. Register Menu Page

e. **Suggestions and Criticism Menu Page**

On this critique menu page, users can fill in some suggestions and criticisms that function to improve the Diabetes Mellitus Detection Expert System program. The page design is as follows:

Prevenegah Lebih baik daripada mengobati...

Home Profil Daftar Saran n Kritik Help

Selamat Datang di situs Diagnosa Diabetes Mellitus

Form Saran dan Kritik Pengguna

Silahkan Anda mengisi saran dan kritik baik mengenai situs ini atau mengenai permasalahan diabetes. Saran dan kritik yang membangun sangat kami harapkan. Atas saran dan kritik saudara kami ucapkan terima kasih.....!!!!!!

Saran & Kritik

Nama

Alamat

Telepon

Email

Saran

Kirim Batal

Admin Program | [TIPS](#) |
[Obat Diabetes](#) | [Tambang Diabetes](#) | [Diagnosa](#) |
soevriah@suardin.yakub

Figure 4. Suggestions and Criticism Menu Page

f. **Help Menu Page**

The page on the help menu is a page that serves to assist users in the process of using the expert system program for diabetes mellitus detection. The page design is as follows:



Figure 5.Help Menu Page

g. Diabetes Member Login Page

The member login menu page is intended if the user wants to carry out the consultation process. The username and password entered in the member login menu are obtained from the previous process, namely registration on the list menu carried out by the user. The page design is as follows:

Figure 6.Diabetic Participants Login Page

h. Symptom Select Page

On the select symptom page, it is used to select the symptoms of diabetes which will later be used as a diagnostic process. The page design is as follows



Figure 7. Symptom Select Page

i. Diagnostic Results Page

This page displays the results of the diagnosis, in the form of patient data, selected symptoms, Bayesian calculations and also therapy according to the type of diabetes suffered. The page design is as follows:

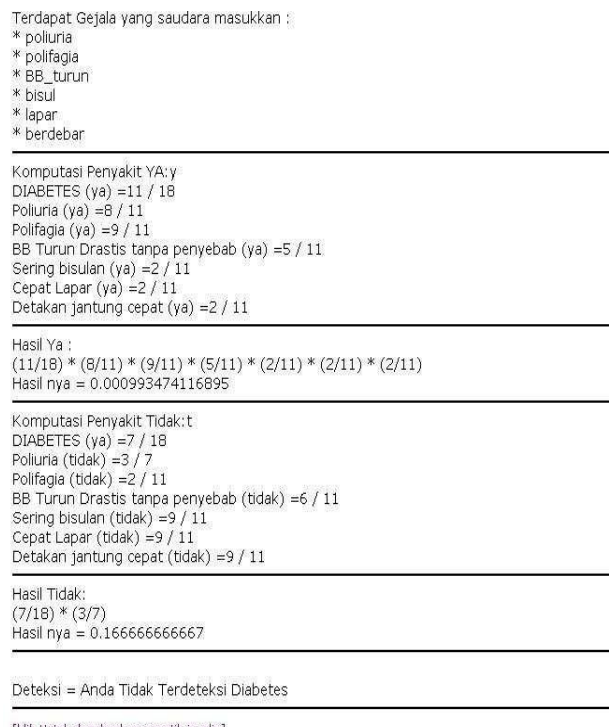


Figure 8. Diagnostic Results Page

j. Admin Home Page

The admin home page is the first screen after logging in. On this home page, there is an explanation of the work menu in the administrator and an explanation for the admin itself as well as the admin work menu. The page design is as follows:



Figure 9. Admin Home Page

k. Rule Input Page

The input rule page is an admin work page to enter diabetes symptoms. The page design is as follows:



Figure 10. Rule Input Page

l. Rule Report Print Page

The rule report print page is a page to print the rules entered from the rule page. The page design is as follows:

Website Diagnosis Diabetes

Laporan Rule

Kode Poliklinik	Poliklinik	nama	semenan	ewa	total	BB	umur	Kelamin	Qwaid	Qwaid	Berul	infeksi	kegatalhan	Laba	L4pura	Oraneta	Lezamb	Koncentrasi	Keringat	Uredkloru	pasang	gulaah	homa	diabetes
001	Ya	Ya	Ya	Tidak	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Tidak	Tidak	Ya	Tidak	Ya	Ya	Tidak	Ya	Ya	Tidak	Tidak	Ya	Ya	
002	Ya	Ya	Ya	Ya	Ya	Tidak	Tidak	Tidak	Tidak	Tidak	Ya	Ya	Tidak	Ya	Ya	Tidak	Tidak	Tidak	Tidak	Ya	Ya	Tidak	Ya	
003	Tidak	Ya	Tidak	Tidak	Tidak	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Tidak	Ya	Tidak	Tidak	Ya	Tidak	Ya	Ya	Ya	Ya	Tidak	
004	Ya	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Ya	Ya	Tidak	Ya	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Ya	Ya	Tidak	Tidak	Tidak	Tidak	
005	Tidak	Tidak	Tidak	Ya	Tidak	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Tidak	Ya	Ya	Tidak	Ya	Tidak	Ya	Tidak	Ya	Ya	Ya	Tidak
006	Ya	Tidak	Ya	Ya	Ya	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Ya	Tidak	Ya	Ya	Tidak	Ya	Tidak	Ya	Ya	Tidak	Ya	
007	Ya	Ya	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Tidak	Tidak	Tidak	Ya	Ya	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Ya	Tidak	Tidak	Tidak	Ya
008	Tidak	Ya	Ya	Ya	Tidak	Ya	Ya	Ya	Ya	Tidak	Tidak	Ya	Ya	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Ya	Ya	Tidak	Ya	
009	Tidak	Tidak	Ya	Tidak	Tidak	Ya	Ya	Ya	Ya	Tidak	Tidak	Ya	Tidak	Ya	Ya	Tidak	Ya	Tidak	Ya	Tidak	Ya	Tidak	Tidak	Ya
010	Tidak	Ya	Tidak	Ya	Tidak	Tidak	Tidak	Ya	Tidak	Ya	Ya	Tidak	Tidak	Tidak	Tidak	Ya	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Tidak	Ya
011	Ya	Ya	Ya	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Tidak	Tidak	Tidak	Tidak	Ya
012	Ya	Tidak	Tidak	Tidak	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Tidak	Tidak	Tidak	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Ya	Ya	Tidak	Ya
013	Tidak	Ya	Ya	Ya	Ya	Ya	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Ya	Ya	Ya	Ya	Ya
014	Ya	Ya	Tidak	Tidak	Ya	Ya	Ya	Tidak	Tidak	Ya	Ya	Ya	Ya	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Ya	Tidak	Tidak	Ya	Ya
015	Tidak	Ya	Ya	Ya	Ya	Tidak	Tidak	Tidak	Ya	Ya	Ya	Ya	Ya	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Ya	Tidak	Tidak	Tidak	Ya
016	Ya	Tidak	Ya	Tidak	Tidak	Tidak	Ya	Ya	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Ya	Ya	Ya	Ya	Ya	Tidak	Ya	Ya
017	Ya	Ya	Ya	Tidak	Ya	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Tidak	Ya	Tidak	Tidak	Ya	Tidak	Ya	Tidak	Ya	Tidak	Tidak	Tidak	Ya
018	Tidak	Tidak	Tidak	Ya	Tidak	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Tidak	Ya	Ya	Tidak	Ya	Tidak	Ya	Tidak	Ya	Ya	Ya	Tidak

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Figure 11. Rule Print Page

m. List Report Print Page

On this page displays the results of patient registration, in the form of patient data. The page design is as follows:

Selamat Datang di situs Diagnosis Diabetes Mellitus

Laporan Pendaftaran Pasien

Nama Field	Data / Value
Username:	: Adhie
Password:	: Aku
Nama:	: Suardin
Jenis Kelamin:	: Laki-laki
Umur:	: 56
Alamat:	: Merjosari
Telp:	: 090909092019
Username:	: David
Password:	: Ok
Nama:	: David
Jenis Kelamin:	: Laki-laki
Umur:	: 34
Alamat:	: Dinoyo
Telp:	: 00202493854
Username:	: Heru
Password:	: 123
Nama:	: Heru Semeru
Jenis Kelamin:	: Laki-laki
Umur:	: 30
Alamat:	: Dinoyo
Telp:	: 0823384943

[\[cetak Laporan\]](#)

Figure 12. List Report Print Page

3.2 Discussion

In this discussion, this expert system was tested on 10 people with different symptom criteria and different age specifications with the aim of whether this expert system was able to recognize someone who was detected with diabetes from the selected symptoms. While the age specification is used to

determine the type of diabetes suffered by a person, then therapy is given. To check the correctness of this system, the researchers compared the data from patient trials, the data used were 5 patient lab test results.

4. Conclusion

Based on the problems that have been discussed and resolved through this report, there are several conclusions, namely; based on the results of the tests carried out, that the application of this expert system can be used to assist and facilitate users in obtaining information about diabetes disorders and getting diabetic disorders diagnosis results. The material contained in this program is still not representative of the overall expertise in diabetes disorders. The calculation results are obtained from calculations using the naive Bayes formula by counting the number of yes and no symptoms, then from the results of the calculations a comparison is made to get the conclusion.

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