



Expert System to Diagnose Ovarial Cyst Disease using Web-Based Bayes Method

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ABSTRACT

Ovarian cyst disease is a disease that is often experienced by a woman, this disease is very complicated, subtle and unique, because this disease is similar to pregnancy and maybe all women have a risk of getting this disease. But on the other hand the lack of attention from the public to this ovarian cyst disease and the lack of knowledge about the early symptoms of ovarian cysts causes the general public to be susceptible to the disease. Lack of experts to handle ovarian cyst disease at health centers, especially health centers located far from the city. This of course has an impact on the delay in handling patients with ovarian cysts. To overcome this problem, appropriate action is needed to diagnose the ovarian cyst disease. An expert system using the Bayes method for diagnosing ovarian cysts is the best solution for recognizing the symptoms of ovarian cysts as early as possible, knowing the cause of the disease and how to control it. In making this system an expert in the field of ovarian cyst disease is needed to obtain accurate data regarding information on ovarian cyst disease. This expert system for diagnosing ovarian cysts is designed using a web-based PHP programming language. The design of the knowledge base in this system is made dynamically to make it easier to manage data such as adding, changing and deleting data.

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1. INTRODUCTION

The development of information technology also affects the development of human civilization and also affects the pattern of life and human needs. Currently, the development of information technology is not only used in the business field, but has also been used in various sectors including the Sultan Sulaiman Hospital.

Sultan Sulaiman Hospital is a regional general hospital located in Serdang Bedagai Regency, which has difficulty in diagnosing ovarian cyst disease, because the diagnosis of this disease is still with the old system where patients register themselves and wait in a queue before being checked up by the cyst specialist doctor so it requires long time to get a diagnosis. This happens because there is no computerized method used so that an expert system is needed to diagnose the ovarian cyst disease.

An expert system is a system that seeks to adopt human knowledge into computers. Expert systems are based on the knowledge of an expert or doctor which is implemented to help humans. Expert systems use knowledge, facts, and reasoning techniques to solve a problem like an expert.

There are many methods in the expert system, but the author uses the Bayes method to be implemented into the expert system.

Bayes method is one method that can be used in expert systems to diagnose diseases. The Bayes method analyzes information in the form of probabilities into the system for further data analysis according to the rules. The Bayes method views parameters as variables that describe prior knowledge before observations are made and expressed in a distribution to overcome the uncertainty of the existing data by producing the probability of a decision that can be taken..

2. RESEARCH METHOD

The research framework contains the steps in conducting a study that will be carried out by the researcher to solve the problem. The following are the stages in the research framework:

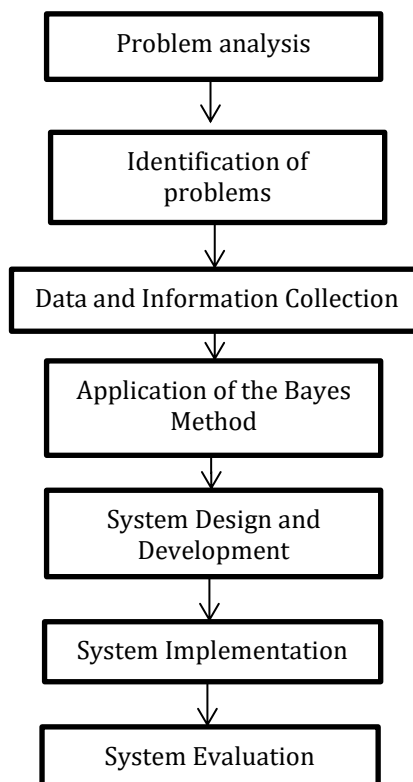


Figure 1. Research Framework

3. RESULTS AND DISCUSSION

He results data that have been obtained in conducting interviews with Breast Cancer Specialists at Sultan Sulaiman General Hospital in the Expert System for Ovarian Cyst Diagnosis Using the Bayes Method. The results of his research are as follows:

Tabel 1. Stages of Breast Ovarian Cyst

Disease Code	Stadium	Percentage (%)	NS
P1	<i>Serosum</i>	10 – 50 %	51- 100%
P2	<i>Musinosum</i>	10 – 50 %	51- 100%
P3	<i>Dermoid</i>	10 – 50 %	51- 100%
P4	<i>Endometriosi</i>	10 – 50 %	51- 100%

Table 2. List of Symptoms of Ovarian Cyst

Disease Code	Name Of Symptoms
G01	Increase in the amount of fluid in the ovaries
G02	Intense pain

G03	Bloating
G04	Nausea
G05	Frequent vomiting
G06	Weight loss
G07	Late menstruation
G08	Pain during menstruation
G09	Sudden abdominal pain
G10	Menstruation more
G11	Growth of hair on the face and other body parts
G12	Swelling of lower leg
G13	Fatigue Easily
G14	Difficulty defecating
G15	Bloating in lower abdomen
G16	Lack of appetite
G17	Impaired fertility (infertility)

Table 3. Breast Cancer Knowledge Base

RULE BASE	
Consequent	Antecedant
R01	IF Patient has G01(increased amount of fluid in the ovaries) AND G02(severe pain) AND G03(bloating) THEN Patient has serous cyst disease
R02	IF Patient Experiencing G04 (Nausea) AND G05 (Frequent vomiting) AND G06 (Weight loss) G07 (Late menstruation) AND G08 (Pain during menstruation) THEN The patient has Musculoskeletal cyst disease
R03	IF The patient has G09 (sudden abdominal pain) AND G10 (more menstruation) AND G11 (growth of hair on the face and other body parts) AND G12 (swelling of the lower limbs) AND G13 (easy fatigue) AND G14 (Difficulty defecating) THEN Patient has Dermoid Cyst disease
R04	IF The patient has G15 (Bloating in the lower abdomen) AND G16 (Lack of appetite) AND G17 (Infertility or infertility) THEN Endometriotic cyst

Table 4. Bayes Value

Bayes Theorem	Value
Don't Know	0 - 0.2
Maybe	0.3 – 0.4
Most likely	0.5 – 0.6
Almost Certain	0.7 – 0.8
Definitely	0.9 - 1

A patient selects the following symptoms:

- G01 (Increase in the amount of fluid in the ovaries) = $0.9 * 0.6 = 0.54 = P(E|H1)$
- G03 (Stomach feels full) = $0.7 * 0.4 = 0.28 = P(E|H2)$

Then look for the universe by adding up from the above hypotheses:

$$\sum_{k=1}^n = 0,54 + 0,28 = 0,82$$

After the results of the above sum are known, the formula that will calculate the universe value is obtained as follows:

$$P(H|1) = \frac{P(H|1)}{\sum_{k=1}^n}$$

$$P(H|1) = \frac{0,54}{0,82}$$

$$P(H|1) = 0,6585$$

$$P(H|2) = \frac{P(H|2)}{\sum_{k=1}^n 0,28}$$

$$P(H|2) = \frac{0,28}{0,82}$$

$$P(H|2) = 0,34$$

After the $P(H_i)$ value is known, the probability of the hypothesis H regardless of any evidence, then the next step is:

$$\begin{aligned} \sum_{k=1}^n P(H_i) * P(E|H_i - n) \\ &= (P(H1) * P(E|H1)) + (P(H2) * P(E|H2)) \\ &= (0,6585 * 0,54) + (0,34 * 0,28) \\ &= 0,35559 + 0,0952 \\ &= 0,45079 \end{aligned}$$

After getting the value, the next step is to find the value of $P(H_i|E)$ or the probability that the hypothesis H_i is true if given the value of evidence E.

$$\begin{aligned} P(H1|E) &= e^x = \frac{P(E|H1) * P(H1)}{\sum_{k=1}^n P(E|Hk) * P(Hk)} \\ &= \frac{(0,6585 * 0,54)}{0,45079} = 0,78 \\ &= \frac{(0,34 * 0,28)}{0,45079} = 0,21118 \end{aligned}$$

After getting all the values of $P(H_i|E)$, then add up all the Bayes values with the following formula:

$$\sum_{k=1}^n Bayes = Bayes 1 + Bayes 2 + Bayes 3$$

$$\begin{aligned} \sum_{k=1}^n Bayes &= Bayes 1 + Bayes 2 \\ &= (0,78 * 0,6585) + (0,21118 * 0,34) \end{aligned}$$

$$= 0,51363 + 0,0718012 = 0,5854312$$

$$= 0,5854312 * 100\% = 58,54 \%$$

So the results of the symptoms experienced by the patient resulted in Serosum Ovarian Cyst disease with the result that 58.54% of the symptoms were met. The solution is to do oral therapy treatment with certain drugs according to the doctor's directions, such as parasitic tea mixed with pearl grass.

4. CONCLUSION

Based on the description of the problems and discussion in the previous chapter, the author would like to convey some conclusions and suggestions that can be used as input and consideration for the company. During the design, manufacture, implementation, and evaluation, the following conclusions can be drawn. The application of the Bayes method in the Expert System for Diagnosing Ovarian Cyst Disease was successfully implemented with the Bayes method steps, namely determining the hypothetical value of the symptoms of ovarian cyst disease, compiling these symptoms into the system with questions posed to the user, Counting the number of classes / labels, Counting the number of cases per class, Multiplying all class variable results, Comparing class results, Calculating the highest value or confidence value obtained from each disease symptom with the Bayes method so that in get the result of 68.59% Acute Serosum Cyst.

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