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# Expert System for Diagnosis of Inflammatory Bowel Disease Using The Web Based Naive Bayes Method

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ABSTRACT

This research aims to develop the world of computer technology, especially in the health sector. Inflammation of the intestine is a disease of the digestive tract in human organs and can occur at any age, but which often occurs at the age of 15-30 years. Inflammatory bowel disease or inflammatory bowel disease consists of 3 types, namely ulcerative colitis, pancolitis and Crohn's disease, where each type of disease has different symptoms. This study uses an expert system with the naïve Bayes method in determining solutions based on the symptoms experienced by the sufferer. The exact cause of intestinal inflammation is not known with certainty, but it is thought to be related to an immune system disorder in the human body. The main symptoms of inflammation of the intestine vary, depending on the location of the inflammation in the digestive tract. It is hoped that this web-based expert system for diagnosing inflammatory bowel disease will help facilitate the community in handling and solutions if they experience inflammatory bowel disorders independently.



## 1. Introduction

The digestive tract or intestine is a vital organ found in the human body which forms like a pipe which acts to regulate the food tract system. The digestive system in the human body functions as a receiver and digests food so that it becomes a nutrient that can be absorbed by the body and distributed through the blood to other organs.

Inflammation of the intestine is a disease that occurs in the human body, especially the digestive tract. Inflammation of the intestine can be experienced by various groups and ages, but inflammatory bowel disease is more common in the ages of 15-30 years. Many people are negligent about the health of the digestive tract due to an irregular diet and the type of food consumed, and there are other reasons such as busy working so they rarely pay attention to the health of the digestive tract. People with intestinal disease are very at risk if they are not treated immediately, therefore what must be done is to detect disease in the human intestine as early as possible, one of which is by utilizing information technology by building applications that can detect symptoms of intestinal disease, namely an expert system.

An expert system is a computer-based system that adopts the knowledge of a human or an expert in a particular field based on facts and reasoning techniques in solving problems. Knowledge relating to something from an expert or expert will be adopted into a computer-based system. With this web-based expert system, people can easily check their health conditions independently, and on the other hand, they can also help an expert in the world of medicine by using this computer-based expert system as an assistant.

## 2. Research Methodology

### 2.1 Identifying Problems

At this stage, to determine the problems contained in the study with the title "an expert system to diagnose inflammatory bowel disease using the web-based Naive Bayes method". To find out the problem.

### 2.2 Data collection

After identifying the problem, the next stage is collecting data. The data collection comes from books and journals related to expert systems and digestive diseases, as well as studying the naive bayes method. The stages of data collection in this study were carried out in several ways, namely:



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**a. Interview**
This study obtained data relating to the symptoms experienced and solutions that must be done through direct interviews with two doctors in North Sumatra.

**b. Literature study**
This research also carried out a literature study data collection technique by studying methods or literature from journals and references related to this research, such as expert systems, naïve Bayes and the symptoms of inflammatory bowel disease and their prevention solutions.

**c. Data Analysis**
After data collection, the next stage is Data Analysis. The data obtained will be used to support the research, and the chest can be obtained through direct interviews with doctors regarding the symptoms that exist in inflammatory bowel disease.

**d. Manage data with the Naive Bayes method**
At this stage, data is obtained through interviews from doctors about the symptoms of diseases related to inflammation of the intestine and how to prevent inflammatory bowel disease as well as managing data using the Naive Bayes method to simplify the process of this research.

**e. System Design**
The next stage is system design. The system design is carried out to diagnose inflammatory bowel disease using the web-based naïve Bayes method. The design begins with a system model, input design and designing rules that will be used to diagnose inflammatory bowel disease using the web-based Naive Bayes method based on existing data.

**f. Testing the system**
At this stage, the system testing is carried out in designing an expert system to diagnose inflammatory bowel disease using the web-based naïve Bayes method. This system is tested and carried out with procedures for adjusting the rules. The rules that will be matched are the existing facts with the data in the knowledge base.

**g. Implementation of the system**
After designing the system, it is hoped that the system will be able to solve the problem of inflammatory bowel disease, and make it easier for users to obtain information and data about inflammatory bowel disease.

### 2.3 Naive Bayes

Naïve Bayes Classification is a statistical classification that can be used to predict the level of probability in a class. Bayesian classification is based on the Bayes theorem which has the same classification level as the decesion tree and neural network. Bayesian classification has proven accuracy and speed when applied to a large data database. The naïve Bayes formula in general is as follows:

$$p(A|B) = \frac{p(B|A) \times p(A)}{p(B)}$$

Information:
- ✓ p (A | B) is the probability that A results from B;
- ✓ p (B | A) is the probability that B will result from A;
- ✓ p (A) is probability of A regardless of any factor;
- ✓ p (B) is the probability of B regardless of other factors.

## 3. Results and Discussion

### 3.1 Analysis using Naive Bayes

The expert system for diagnosing inflammatory bowel disease using the web-based naïve Bayes method requires data related to inflammation of the intestine through an expert, in this case a doctor, as for the data needed such as disease data, symptoms and solutions when experiencing inflammatory bowel disease. The following is data on inflammatory bowel disease:

**TABLE 1**
IMFLAMMATORY BOWEL DISEASE

| 3.1 DISEASE ID | 3.2 DISEASE NAME | 3.3 NDISEASE |
|---|---|---|
| 3.4 P1 | 3.5 Kolitis Ulseratif | 3.6 0.3 |
| 3.7 P2 | 3.8 Pancolitis | 3.9 0.3 |
| 3.10 P3 | 3.11 Crohns Disease | 3.12 0.4 |



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**TABLE 2**
RULE BASE

| Id Symptoms | Question | Facts Yes | Facts Not | Acute Symptoms | Chronic Symptoms | Periodic Symptoms | Route |
|---|---|---|---|---|---|---|---|
| G1 | Does the stomach experience pain | Stomach Pain | No Pain | 0.83 | 0.75 | 0.33 | G2 |
| G2 | Does the stomach have cramps | Stomach cramps | Not cramp | 0.83 | 0.88 | 0.67 | G3 |
| G3 | Is frequent nausea | Nausea | No nausea | 0.83 | 1 | 0.83 | G4 |
| G4 | Is it hard when defecating | Difficult when defecating | Not difficult | 0.67 | 0.5 | 0.33 | G5 |
| G5 | Does the genital area appear like canker sores / sores | Sprue / sores appear on the genitals | No canker sores / sores appear on the genital area | 0 | 0.5 | 0.17 | G6 |
| G6 | Does the mouth and rectum feel like inflammation | The mouth and rectum area feels like inflammation | Do not feel inflammation in the mouth and rectum | 0.5 | 0.38 | 0.67 | G7 |
| G7 | Is experiencing like anemia | Feeling like anemia | Don't feel like anemia | 0.67 | 0.38 | 0.5 | G8 |
| G8 | Have diarrhea | Diarrhea | Don't have diarrhea | 0.33 | 0.83 | 0.17 | G9 |
| G9 | Has decreased appetite | Decreased appetite | Appetite is not reduced | 0.17 | 0.5 | 0.5 | G10 |
| G10 | Does Bloody Chapter | Chapter Bleeding | Chapter not bleeding | 0.17 | 0.25 | 0.83 | G11 |
| G11 | Is your stomach bloated | Bloating | No Bloating | 0 | 1 | 0 | Final |

**TABLE 3**
Solution

| Id Solution | Solution | Id symptoms |
|---|---|---|
| S0 | You are not detected to have inflammatory bowel disease | P0 |
| S1 | Pain relievers for stomach pain, such as ibuprofen and paracetamol | P2 |
| S2 | Corticosteroids to relieve inflammation of the digestive tract | P3 |
| S3 | Avoid cold drinks, and try drinking ginger water | P1 |
| S4 | Cut down on hard foods | P2 |
| S5 | Take calcium and vitamin D supplements | P3 |
| S6 | Immunosuppressive drugs for immunity from attacking the intestines | P1 |
| S7 | Iron supplements, if you have anemia | P2 |
| S8 | Take a diarrhea reliever | P3 |
| S9 | Take vitamins and eat lots of fruits | P1 |
| S10 | Loperamide medicine / medicine to relieve diarrhea | P3 |
| S11 | Drink lots of warm water | P2 |

### 3.2 Design Aplications

In the design of the system for diagnosing inflammatory bowel disease using the web-based Naive Bayes method, it has several menu design views that can make it easier for patients / users to diagnose inflammatory bowel disease independently, including the following :

**a. Home display**

Home is the main menu when you first enter the web-based inflammatory bowel disease diagnosis system.



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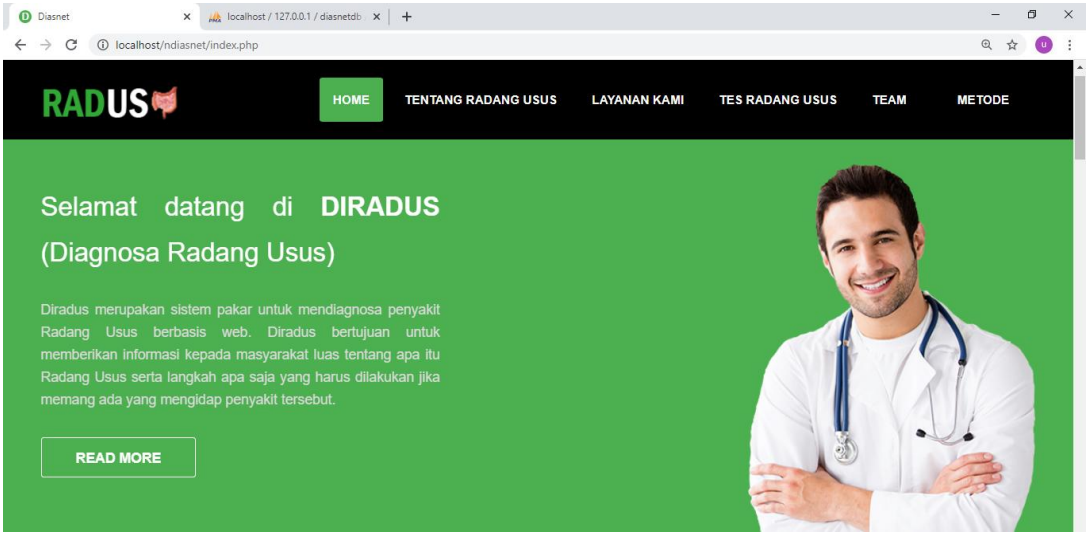


**Fig 1.** Display Home

**b. Display Intestinal Inflammation Test**

In the intestinal inflammation test menu, there are two sub menus, namely the list menu and the start menu. The list menu functions as a registration menu for patients or users who want to independently diagnose web-based inflammatory bowel disease.


**Fig 2.** Display Display Intestinal Inflammation Test

**c. Diagnostic Start Display**

This menu is the core menu of the web-based inflammatory bowel disease diagnosis program, where patients will answer questions related to inflammatory bowel disease symptoms.



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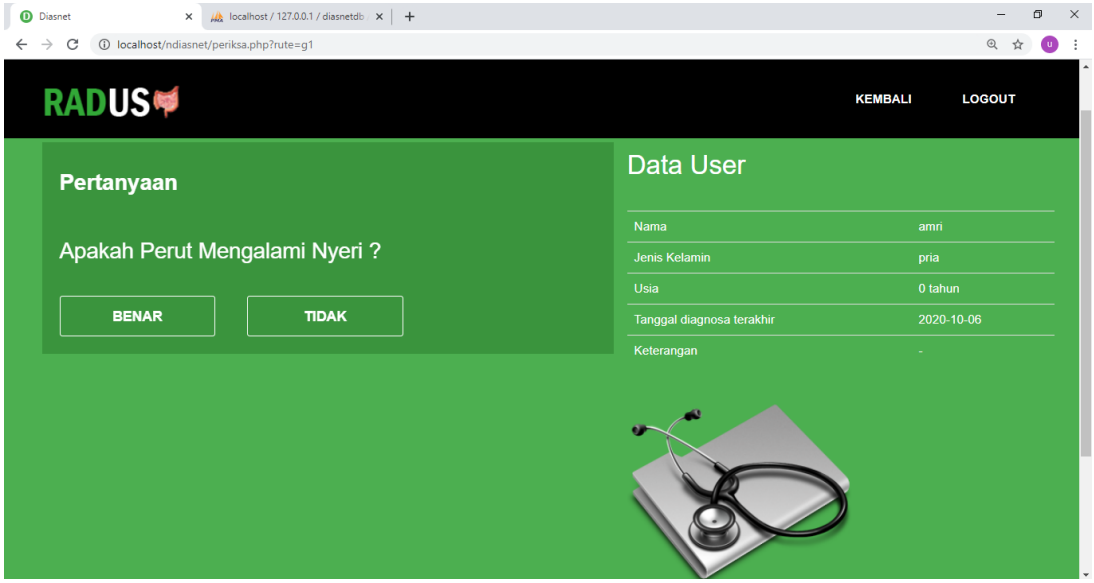


**Fig 3.** Diagnostic Start Display

**d. Display of Diagnostic Results**

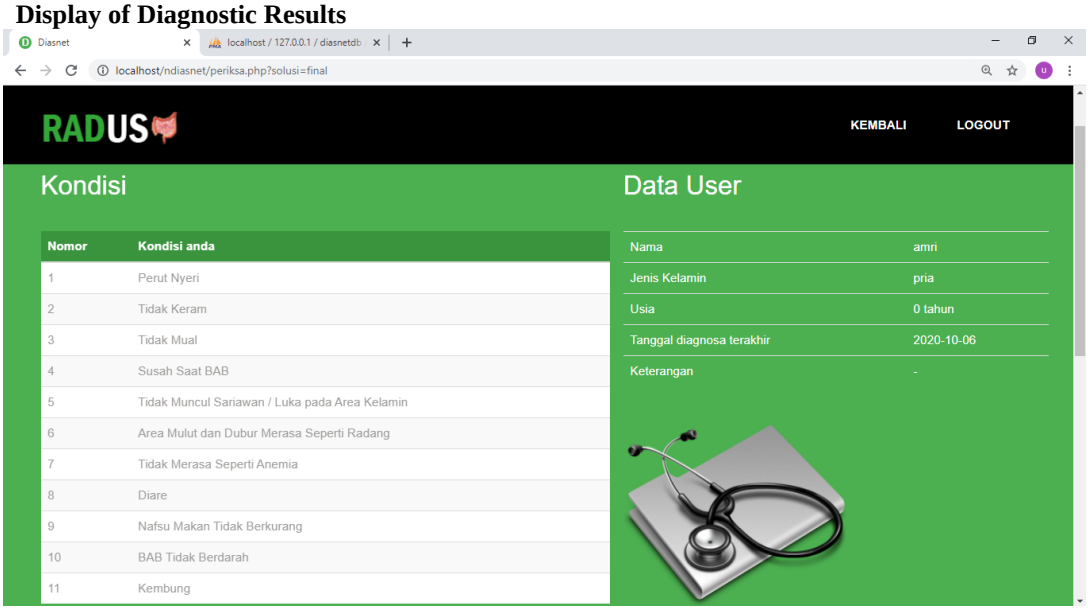


**Fig 4.** Display of Diagnostic Results

**e. Display Solution**

After conducting an interaction in the form of an independent question and answer using a diagnosis system for inflammatory bowel disease, the patient will know the results of the diagnosis that is experienced based on the symptoms that come from an expert, so that the patient can find out a solution to prevent or treat it when suffering from inflammatory bowel disease.



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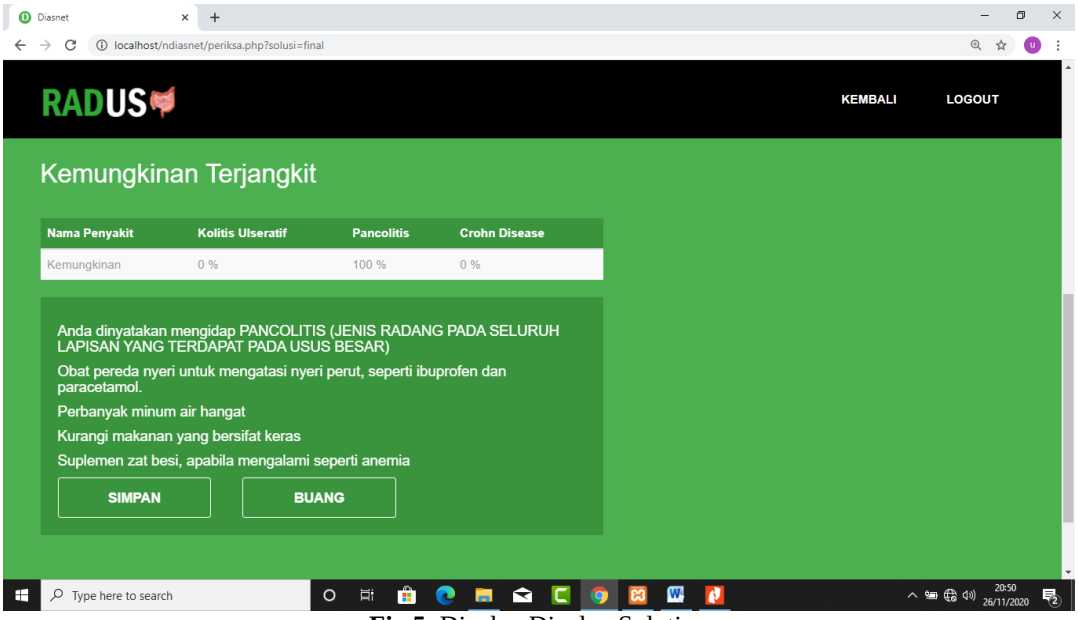


**Fig 5.** Display Display Solution

## 4. Conclusion

Based on a discussion of an expert system to diagnose inflammatory bowel disease using the web-based naïve Bayes method, it can be concluded as follows:

a. The Naive Bayes method can be used as a method in the analysis process to detect inflammatory bowel disease in the form of a web-based expert system application.
b. Information in diagnosing inflammatory bowel disease presented by a web-based expert system application can be used as a reference for the prevention of inflammatory bowel disease.
c. Preventive information about inflammatory bowel disease provided by the expert system application can be used as a reference medium for the prevention and management of inflammatory bowel disease so that steps can be implemented to avoid further fatal effects.

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