DIAGNOSIS SYSTEM DESIGN OF DEPRESSION AND ANXIETY WITH NAÏVE BAYES METHOD

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Abstract

Depression and Anxiety are mental illness that arise in the presence of depression and anxiety from within the individual. The depression having features them level a dramatic decline to an interest, trouble sleeping and eat, the guilt or feel having no value self, and usually followed by a feeling of agitated, uneasiness is the norm reasonable like when we will do appearance in front of people. However, for the level of anxiety that must be considered is when the individual experiences an excessive intensity of anxiety unlike other normal individuals. The method in the system used to diagnose depression and anxiety is the Naïve Bayes Method. The process of using the Naïve Bayes Method by using 50 correspondent data then taking 5 samples from the diagnostic results to prove the accuracy of the data generated after being diagnosed, this method can provide diagnosis, then provide therapy as an initial preventive step for sufferers, and as a solution to suppress therapy costs for suffers and sufferers' choice as the first step before seeing the experts in person.

Keywords: Diagnosis, Depression, Anxiety, Naïve Bayes Method

1.0 INTRODUCTION

Good mentality is the key to health and well-being at every level of the individual. However, mental health in Indonesia is still very taboo to discuss. In fact, not a few people who experience symptoms of mental disorder o not get a place and try to cover it up so that in the end it will make it worse.

Mental disorders as people called it, attack the psyche or soul. Types of diseases that are classified as acute mental disorder are schizophrenia and psychosis which can be diagnosed using the Dempster Shafer method, which makes it easier for experts to diagnose patients who experience these symptoms (Angelia & Jollyta, 2019). If there is an individual who is diagnosed with acute mental disorder, it is highly recommended that you go directly to the experts so that the treatment given will be more appropriate. Meanwhile, for lower class diagnosis but vulnerable to each individual are depression and anxiety. Depression has characteristics including drastic decrease in interest rates, difficulty sleeping and eating, feelings of guilt or feeling of lack of self-worth, and is usually followed by feelings of anxiety (Marcus et al., 2012). Anxiety is a common and natural thing like when we are about to make an appearance in public. However, the level of anxiety that must be considered is when the individual experiences an excessive intensity of anxiety unlike other normal individuals (Rector et al., 2011).

Many methods are used to identify mental health either face-to-face or online. The Naive Bayes method was chosen because there have been many studies in the health sector that have achieved an accuracy of above 50%, such as in the research on the diagnosis of digestive disorders in children under five conducted by (Hermanto & Jollyta, 2020). Meanwhile, outside of the health sector, there is also research on slow moving goods analysis (Jollyta et al., 2019), prediction of student satisfaction levels with academic services (Siddik et al., 2019) and further research from (Siddik et al., 2019) concerning the classification of student satisfaction (Siddik et al., 2020). Therefore, the Naive Bayes method was chosen because it is widely used and trusted.

2.0 LITERATURE REVIEW

Information Systems
According to Jogiyanto H.M. (2008), an information system is a system whose purpose is to produce information. As a system, to be able to understand information (Chandra, Renaldo, & Putra, 2018) systems, it would be better if the concept of the system was first understood. Likewise, as an information-producing system, the concept of information needs to be understood first.

System Design
The definition of design or design according to Al-Bahra Bin Ladjamudin (2005) in his book entitled Analysis and Design of Information Systems is as follows: "The design stages aim to design a new system that can solve the problems faced by the company. Obtained from the selection of the best alternative system".

DASS42
Depression Anxiety Stress Scale 42 (DASS 42) is a measuring tool used by Lovibond and Lovibond (1995) to assess and determine levels of depression, anxiety, and stress. This measuring instrument is a measuring instrument that has been accepted internationally. Depression, Anxiety, Stress Scale 42 (DASS 42) aims to identify an individual's emotional status which is usually described as stress. The Depression, Anxiety, Stress Scale 42 (DASS 42) questionnaire can be used for all cultures (Putra & Renaldo, 2020; Mahyuddin, Komara, & Sudarno, 2018), ages, and healthy and sick subjects (Rachmadi, 2014). Anxiety is a feeling of fear of something happening due to the anticipation of danger and is a signal that helps individuals to be prepared to take action against threats. The influence of demands, competition, and disasters that occur in life can have an impact on physical and psychological health. One of the psychological effects is anxiety (Sutejo, 2018). Depression is a feeling or mood disorder accompanied by psychological components in the form of sadness, distress, hopelessness and hopelessness accompanied by biological or somatic components such as anorexia, constipation and cold sweat. Depression is said to be normal if it occurs in certain situations, is mild and in a short time. If the depression occurs out of the ordinary and continues then the depression is considered abnormal (Atkinson, 2010).

Naïve Bayes
According to Prasetyo (2012) "Bayes is a simple probabilistic prediction technique based on the application of the Bayes theorem (or Bayes' rule) with the assumption of strong independence (naive). In other words, in Naïve Bayes, the model used is an independent feature model.

$$P(H|E) = \frac{P(E|H).P(H)}{P(E)}$$

Annotation:
P(H|E)   : Conditional final probability (a hypothesis H occurs if evidence E occurs).
P(E|H)   : The probability an E based on occurring will influence hypothesis H.
P(H)   : The probability that the initial hypothesis H occurs regardless of any evidence.
P(E)   : The probability that the initial evidence E occurs regardless of the hypothesis.

The error rate of a rule is the amount of training data that has a class that does not match the majority. OneR selects the rule that has the lowest error rate (Arifin, 2009).

Artificial Intelligence
Artificial intelligence is one part of computer science that makes computers do work like humans do by adopting knowledge from humans in order to solve problems like an expert (Kusumadewi, 2003).

3.0 METHODOLOGY

Information Systems Design Method
In this design, a descriptive method combined with SDLC method is used with discussions ranging from the stages of problem formulation, data collection to analysis using the Naive Bayes method. As we can see, Figure 1 shows the descriptive steps that combined with SDLC method.
   a)   Formulation of The Problem

The problem raised in this research is how to design a system (Renaldo, Sudarno, & Hutahuruk, 2020) that can determine the level of depression of a student or anxiety from a student of FILKOM, Pelita Indonesia Institute of Technology, Pekanbaru by using the Naive Bayes method.

b) Data Collection and Data Processing

In designing the system to determine the level of depression or anxiety in students, there are several attributes used, namely: data on symptoms of depression and data on anxiety symptoms. Both of these data the writer will describe in the form of symptoms and distributed to students in the form of a questionnaire. As the output is the result of the diagnosis that has been selected by the student (depression or anxiety).

c) System Design Using Naïve Bayes Method

The diagnostic prediction system that will be made web-based using the Code Igniter framework.

d) Making Design Using Naïve Bayes Method

In making the system, several helper applications are used, such as: XAMPP, MySQL, Visual Studio Code, Google Chrome.

e) System Testing Using Naïve Bayes Method

At this stage, testing of the system that has been made is carried out. System testing is done by calculating the level of system accuracy and error rate for diagnosing depression or anxiety in students.

f) Conclusion Withdrawal

This step is the final step of the research. Drawing conclusions is based on the results of the analysis of the research.
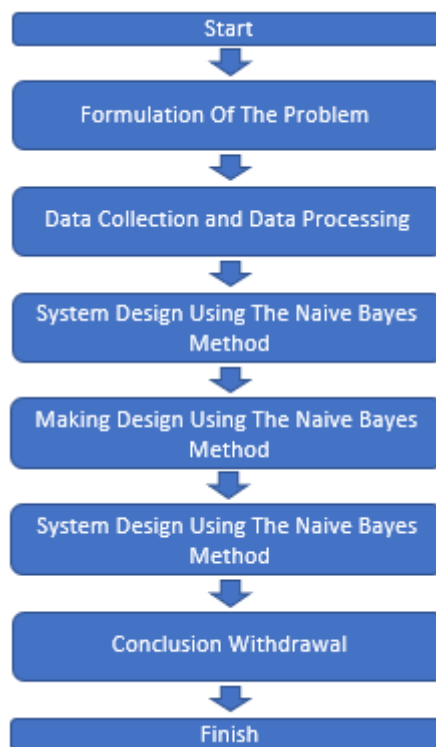

Figure 1. Steps of Descriptive Method combined SDLC Method

4.0 RESULTS AND DISCUSSION

Symptom Data

Table 1 will show 22 symptoms and will be divide by two mental illness either depression or anxiety. We will have eleven main symptoms of depression and anxiety.

Table 1. Table Symptom

Symptom Code	Symptom Name
G01	No positive feelings
G02	Unable to do anything
G03	There is no hope of life

Symptom Code	Symptom Name
G04	Sad and depressed
G05	Lose interest
G06	Feel worthless
G07	Feeling life is useless
G08	Can't have any pleasure
G09	Feeling hopeless
G10	Did not feel enthusiastic
G11	Difficult to take the initiative
G12	Mouth feels dry
G13	Out of breath / asphyxiate
G14	Shaking frequently
G15	Being in an anxious situation
G16	Dizzy / Vertiginous
G17	Sweating without cause
G18	Frightened
G19	Difficulty swallowing
G20	Be aware of the action of the heart
G21	Close to panic
G22	Helpless

Illness Data

There will be two main diseases to be diagnosed, namely depression and anxiety as will be shown as in Table 2. Also, weights for both would appear to simulate higher ratings for depression and lower scores for anxiety.

Table 2. Table Illness

Illness Code	Illness Name	Weights (Probability of Disease Occurrence Without Seeing Symptoms)
P01	Depression	0.8
P02	Anxiety	0.5

Probability Data

The probability data for each symptom is simulated between a value of 0 to 50. Where 0 is the lowest value even there are no symptoms and 50 is the absolute value of the symptom. As shown in Table 3 there will be no absolute value because every symptom could be overlapping between depression and anxiety.

Table 3. Table Probability

Rule Based (Probability of Disease Due to Symptoms)	Depression	Anxiety
No positive feelings	10	-
Unable to do anything	10	-
There is no hope of life	10	-
Sad and depressed	20	-
Lose interest	10	-
Feel worthless	10	-
Feeling life is useless	30	-
Can't have any pleasure	10	-
Feeling hopeless	20	-
Did not feel enthusiastic	20	-
Difficult to take the initiative	10	-
Mouth feels dry	-	10
Out of breath / asphyxiate	-	30
Shaking frequently	-	20
Being in an anxious situation	-	40

Dizzy / Vertiginous	-	10
Sweating without cause	-	10
Frightened	-	10
Difficulty swallowing	-	30
Be aware of the action of the heart	-	20
Close to panic	-	30
Helpless	-	10

Simulation of Naïve Bayes Calculations

Calculation simulations using the Naive Bayes method are taken based on a random sample that has been selected based on the application design trials that have been made. Table 4 shows the symptoms that have been selected by one of the trial samples.

Table 4. Symptom Selection

No	Symptom Selected
1	No positive feelings
2	Can't have any pleasure
3	Did not feel enthusiastic
4	Difficult to take the initiative
5	Sweating without cause
6	Frightened
7	Close to panic

$$P(H|E) = \frac{P(E|H).P(H)}{P(E)}$$

$P(H|E) = (10 \times 10 \ \times 20 \times 10) \times 0.8 = 1600$
$P(H|E) = (10 \times 30 \times 30) \times 0.5 = 4500$
$Total = 1600 + 4500 = 20500$

$$P(H|E)_1 = \frac{1600}{20500} = 0.780487805 = 78\%$$

$$P(H|E)_2 = \frac{4500}{20500} = 0.219512195 = 22\%$$

In the first option indicates depression and the second is anxiety. The calculation results show that the first sample is more dominant in depression but is followed by symptoms of anxiety.

5.0 CONCLUSION

From the discussion and the results that have been done it can be concluded as follows: (1) The design of a depression and anxiety diagnosis system can be combined from the DASS42 and the Naive Bayes method. (2) With this combination method, the system designed can achieve 90% accuracy. (3) With a sufficiently qualified level of accuracy, this system design can be used as a medium for consultation. (4) This diagnostic system is supported using the PHP and MySQL programming languages so that it is easily accessible to users and is compatible with all devices.

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