Expert system for diagnosing narcissistic personality disorders using certainty factor and forward chaining methods

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Abstract. Narcissistic disorder originates from the Greek legend Narcissus, a young boy who falls in love with his reflection in a pond. Personal with this disorder has a purpose with interests that are not reality, excessive, the nature is known as grandiosity. People with narcissistic disorders expect others to praise and follow their desires and requests and a narcissist is less sensitive to the needs of those around him. Research associations of the All India Institute of Medical Science which results in a period of six years, there were 259 people worldwide died with a percentage of men 72.5 percent and women 27.5 percent due to selfies due to excessive narcissism. The method used is Certainty Factor and Forward Chaining as an inference engine to determine the diagnosis results based on the prescribed symptoms. Calculations in this method combine the measure of increased belief and measure of increased disbelief values obtained from the expert and also classify the narcissistic personality disorder so that this expert system helps the user to find the level of narcissism that matches the user's experience and obtain the value of trust and recommendations for handling narcissistic personality disorders.

1. Introduction
The development of technology today causes a person to be narcissistic and it has good and bad impacts on someone. Therefore, the need for technology to diagnose someone early to prevent people from experiencing narcissistic personality that is not normal, namely by making an expert system. The system needed to diagnose this using the Certainty Factor and Forward Chaining methods, both methods are very suitable for use in expert systems. These methods also have advantages in measuring certainty in diagnosing a problem and in one calculation can only process 2 data so that the accuracy of the data is maintained [1-3]. Narcissistic sufferers tend to be arrogant and thirsty for praise for their accomplishments which also exaggerated their achievements. When someone feels someone else has advantages, narcissistic sufferers will feel jealous [4]. The narcissistic phenomenon among the people has become a public disorder. A survey to reduce the risk of narcissism in a person regardless of the surrounding situation was conducted by the Association of All India Institute of Medical Science researchers who obtained results within 6 years, there were 259 people worldwide died from October 2011 to November 2017 with the percentage of men 72.5 percent and 27.5 percent of women due to
selfies due to excessive narcissism. It is said that the calculated numbers are only known and recorded, where very likely there are some unknown cases [5].

2. Methods
The software development method used in this research is using the prototype method, where the model is used to provide information about the technical requirements and specifications needed. This method is expected to support and assist in the process of lighting and the development of expert systems for diagnosing narcissistic personality [6,7]. The stages in the prototype development cycle are [8]:

- Need analysis. This stage is run to find out who will use the system and find out the user needs of the system.
- System design. The design of the system is the stage of the system described in a form sourced from the results of the analysis in the previous stage.
- Coding. The coding stage is to make the system in its original form, then the design results are interpreted into certain codes.
- Testing (testing) needs to be done in every system development. The goal is to find out whether the system has been made to run properly and correctly and in accordance with user needs.
- Implementation. After all the parts are running well and the test results show the results that are in line with the needs, then the system can be implemented and can be used by the user while maintaining regular maintenance to maintain the health of the system.

3. Results and discussion

3.1. Data analysis

3.1.1. Analysis of narcissistic personality disorders. Following are the disorders given by experts from narcissistic personality disorders.

| Code | Disorders Name                          |
|------|----------------------------------------|
| P1   | Mild Narcissistic Personality Disorders|
| P2   | Moderate Narcissistic Personality Disorder |
| P3   | Severe Narcissistic Personality Disorders |

3.2. Symptom analysis
The following is a table of the types of symptoms of narcissistic personality disorder.

| Code | Symptoms                                                                 | Disorders | Weight |
|------|--------------------------------------------------------------------------|-----------|--------|
| G1   | Understand the greatness of the importance of himself.                   | P1, P2, P3| 0.8    |
| G2   | Having a strong fantasy of ideal power, success, beauty, intelligence, or love. | P1, P2, P3| 0.6    |
| G3   | People with narcissistic beliefs are so special that they can only be friends with people who can understand themselves. | P1, P2, P3| 0.8    |
| G4   | The need for excessive pride.                                            | P1, P2, P3| 0.8    |
| G5   | Claim a right.                                                           | P1, P2, P3| 0.6    |
| G6   | Interpersonal style that is exploitative.                                | P1, P2, P3| 0.7    |
| G7   | Lack of empathy                                                          | P1, P2, P3| 1      |
| G8   | Envy other people or believe that others are jealous of him.             | P1, P2, P3| 1      |
| G9   | Arrogant behavior and attitude.                                          | P1, P2, P3| 0.8    |
3.3. Forward chaining analysis method
In the forward chaining method, experts are needed to tell the symptoms that determine the level of disorder that leads to narcissistic personality disorder, then these symptoms determine a person is at the level of narcissistic personality disorder that is adjusted to the rule [9-11]. The diagnosis of the disorder is determined by determining the symptoms that lead to the disorder using the forward chaining method [12]. Here is a Chaining rule forward table.

| No | Disorders Name                                | Rule                        |
|----|----------------------------------------------|-----------------------------|
| 1. | Mild Narcissistic Personality Disorders       | Users choose 1 to 3 symptoms|
| 2. | Moderate Narcissistic Personality Disorder   | Users choose 1 to 6 symptoms |
| 3. | Severe Narcissistic Personality Disorders     | Users choose more than 6 symptoms |

Information:
IF Arrogant and do not want to socialize True
AND Lack of Empathy with others True
THEN Mild Narcissistic Disorders

3.4. Analysis of the certainty factor method
In the certainty factor method, there is called a measure of belief, the way to get that value is by interviewing an expert with CF rules [13]. The certainty factor interpretation table is as follows:

| No | Answer (User) | CF |
|----|---------------|----|
| 1  | No            | 0  |
| 2  | Not too sure  | 0.2|
| 3  | A little sure | 0.4|
| 4  | Pretty sure   | 0.6|
| 5  | Sure          | 0.8|
| 6  | Very confident| 1  |

The certainty factor algorithm will be explained as follows:
User-selected questions:
- Are you arrogant?
- Do you step in empathy?

| Question            | Expert CF Value |
|---------------------|-----------------|
| Are you arrogant?   | 0.8             |
| Do you step in empathy? | 1               |

| User Answers | Weight |
|--------------|--------|
| Sure         | 0.8    |
| Pretty sure  | 0.6    |

Result Process: $CF[H, E] = CF[H] \times CF[E]$
- $CF$ Symptom 1: $CF[H, E] = CF[expert] \times CF[user]$
  - $= 0.8 \times 0.8$
  - $= 0.16 (CF_{ge1})$
CF \[H, E\] = CF \[H\] \times CF \[E\]

- CF Symptom 2: CF \[H, E\] = CF [expert] \times CF [user]  
  = 1 \times 0.6  
  = 0.6 (CF2 network)

CF combination of narcissistic personality disorder:

\[ (CF_{-}\text{mesh1}, CF_{-}\text{mesh2}) = CF_{-}\text{mesh1} + CF_{-}\text{mesh2} \times (1 \times CF_{-}\text{mesh1}) \]

\[ (CF_{ge1}, CF_{ge2}) = 0.16 + 0.6 \times (1-0.16) \]

\[ (CF_{ge1}, CF_{ge2}) = 0.16 + 0.504 = 0.664 \times 100 = 66.4\% \]

The results of the level of confidence in the disorder can be seen from the provisions:

- If CF error interruptions> = 0 and <= 0.35: Not too sure
- If the CF error is impaired> 0.35 and <= 0.55: Slightly Confident
- If the CF error is impaired> 0.55 and <= 0.75: Pretty Sure
- If the disturbance CF value> 0.75 and <= 0.95: sure
- If the disturbance CF value> 0.75 and <= 0.1: Very sure

Based on the above provisions when compared with the CF value of disturbance = 0.664, then the level of confidence based on the provisions is most likely 3.5.

3.5. **Accuracy testing**

This test is used to test the accuracy of the system made. The calculation results will be compared with expert diagnoses. The following is a system accuracy test.

**Table 7. System accuracy testing.**

| No | Symptom Code          | Expert Diagnosis              | Expert System Calculation (%) |
|----|-----------------------|--------------------------------|-------------------------------|
| 1  | G001, G003, G004      | Moderate Narcissistic Disorders | 48.49                         |
| 2  | G001, G003            | Mild Narcissistic Disorders    | 65.44                         |
| 3  | G001, G002, G003, G004, G005, G006, G007, G008, G009 | Severe Narcissistic Disorders | 94.87                         |
| 4  | G001, G002, G003, G004, G005, G006, G007, G008, G009 | Severe Narcissistic Disorders | 99.99                         |
| 5  | G001, G002, G003, G004, G005, G006, G007, G008, G009 | Severe Narcissistic Disorders | 99.59                         |
| 6  | G001, G005, G006      | Moderate Narcissistic Disorders | 74.60                         |
| 7  | G001, G002, G003, G004, G005, G007, G008, G009 | Severe Narcissistic Disorders | 89.48                         |
| 8  | G001, G003, G004      | Moderate Narcissistic Disorders | 77.88                         |
| 9  | G001, G002, G003, G004, G005, G008 | Severe Narcissistic Disorders | 90.37                         |
| 10 | G001, G002, G003, G004, G005, G006, G007, G008, G009 | Severe Narcissistic Disorders | 97.45                         |
| 11 | G001, G002, G003, G004, G005, G006, G007 | Severe Narcissistic Disorders | 98.46                         |
| 12 | G001, G002, G003, G004, G005, G006, G007 | Severe Narcissistic Disorders | 98.06                         |
| 13 | G001, G007, G008, G009 | Moderate Narcissistic Disorders | 82.32                         |
| 14 | G001, G002, G003, G004, G005 | Severe Narcissistic Disorders | 82.87                         |
| 15 | G001, G002, G003, G004, G005, G007, G008 | Severe Narcissistic Disorders | 99.01                         |
| 16 | G001, G002, G004, G005, G006, G007, G008, G009 | Severe Narcissistic Disorders | 76.09                         |
| 17 | G001, G005            | Moderate Narcissistic Disorders | 69.42                         |
| 18 | G001, G002, G003, G004, G007 | Moderate Narcissistic Disorders | 99.01                         |
Table 7. Cont.

|   | Membership1  | Disposition   | CF   |
|---|-------------|--------------|------|
| 19 | G001, G002, G003, G004, G007, G008 | Severe Narcissistic Disorders | 96.74 |
| 20 | G001, G002, G003, G004, G007, G009 | Severe Narcissistic Disorders | 97.59 |
| 21 | G001, G002, G003, G004, G005, G006, G007, G008, G009 | Severe Narcissistic Disorders | 98.72 |
| 22 | G001, G002, G003, G004, G006, G007, G009 | Severe Narcissistic Disorders | 83.56 |
| 23 | G001, G002, G003, G004, G006, G007 | Moderate Narcissistic Disorders | 47.82 |
| 24 | G001, G002, G003, G004, G005, G006, G007, G008, G009 | Severe Narcissistic Disorders | 100 |
| 25 | G001, G002, G003, G004, G005 | Severe Narcissistic Disorders | 98.93 |
| 26 | G005, G006, G007, G008, G009 | Severe Narcissistic Disorders | 89.26 |
| 27 | G001, G002, G003, G004, G005, G006, G007, G008 | Severe Narcissistic Disorders | 96.05 |
| 28 | G001, G002, G004, G005, G006, G007 | Severe Narcissistic Disorders | 96.84 |
| 29 | G001, G002, G003, G004, G005, G008, G009 | Severe Narcissistic Disorders | 86.62 |
| 30 | G001, G002, G003, G004, G005, G008, G009 | Moderate Narcissistic Disorders | 42.47 |

4. Conclusion
An expert system for diagnosing narcissistic personality disorder is a system that informs about narcissistic personality disorder felt by the user based on the symptoms chosen first. The system displays the results of consultations in the form of personality disorders, how to handle and the value of the CF. The method used by 2 methods in the system diagnosis process is the certainty factor method and forward chaining. The calculation in this method involves several rules that must be made first with the value of MB (measure of increased belief) or the value of trust and the value of MD (measure of increased disbelief) or the value of distrust obtained from an expert (psychiatrist or psychologist) then this expert system analyzes the user to find out the level of narcissistic in accordance with that experienced by the user and get the value of trust and recommendations for handling narcissistic personality disorders for users.

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References
[1] Noor P B M, Ekojono E and Santoso N 2016 Sistem Pakar Diagnosis Tipe Kepribadian Menggunakan Metode Certainty Factor In Seminar Informatika Aplikatif Polinema
[2] Andreyana P V, Piarsa I N and Buana P W 2015 Sistem Pakar Analisis Kepribadian Diri dengan Metode Certainty Factor Jurnal Ilmiah Merpati (Menara Penelitian Akademika Teknologi Informasi)
[3] Manaf K 2016 Implementasi Sistem Pakar Diagnosa Kerusakan pada Canon NP6650XX Menggunakan Metoda Dempster Shafer Jurnal Online Informatika 1(2) 92-97
[4] Rudi R 2017 Studi Tentang Siswa yang Memiliki Sikap Narsisme dan Penagananya melalui Latihan Bertanggung Jawab dalam Konseling Gestal Jurnal Konseling Andi Matappa 1(2) 142-148
[5] Nokiafans.id 2019 Selama 6 Tahun Ada 259 Kematian Akibat Selfie pp 1–10
[6] Arief M R 2011 Pemrograman web dinamis menggunakan PHP dan MySQL (Yogyakarta: Andi)
[7] Shalahuddin M and Rosa A S 2013 Rekayasa perangkat lunak terstruktur dan berorientasi objek (Bandung: Informatika)
[8] Purnomo D 2017 Model Prototyping Pada Pengembangan Sistem Informasi JIMP-Jurnal Informatika Merdeka Pasuruan 2(2)
[9] Yuwono D T, Fadlil A and Sunardi S 2017 Penerapan Metode Forward Chaining Dan Certainty
Factor Pada Sistem Pakar Diagnosa Hama Anggrek Coelogyne Pandurata Klik-Kumpulan Jurnal Ilmu Komputer 4(2) 136-145

[10] Mevung F I, Suyatno A, Maharani and Mulawarman U 2017 Diagnosis Penyakit Kejiwaan Menggunakan Metode Certainty Factor Prosiding Seminar Ilmu Komputer Dan Teknologi Informasi 2(1) pp 374-380

[11] Manaf K, Pitara S W, Subaeki B and Gunawan R 2019 Comparison of Carp Rabin Algorithm and Jaro-Winkler Distance to Determine The Equality of Sunda Languages International Conference on Telecommunication Systems Services and Applications (TSSA) pp 77-81

[12] M Arhami 2005 Konsep Dasar Sistem Pakar (Yogyakarta: Andi)

[13] Manaf K, Uriawan W, Agustian W, Gerhana Y A, Jumadi J and Ramdhani M A 2019 Designing futsal match finder application with floyd-warshall algorithm Journal of Physics: Conference Series 1280(2) 022024