



Estimation analysis of paralysis effects for human nervous system by using Neuro fuzzy logic controller

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Abstract

The Paralysis is one of the most dangerous diseases that paralyze the human body. The symptoms of a paralysis are different for each of the brain functions. The main reason for that is that someone is having a paralysis every 6 seconds. If there are six people in one place, one of those six people will have a paralysis once in their life. 30 million people now suffer from paralysis. 30 percent to 40 percent of them die on the same day of the paralysis. Heart attack is the leading cause of death in the world. The second important disease is paralysis. If you get a paralysis, you won't be able to walk, you won't be able to speak, you won't have memory, and all these are a kind of disability. If we look at any disease that is the most important cause of disability in humans, it is paralysis. In this paper the estimation analysis of paralysis effects of human nervous system is analyzed with the help of Neuro fuzzy logic controller. The proposed model estimation focused the different stages of paralysis. This neuro fuzzy logic controller verify symptoms and provides the decision based on the logical execution. In a cut-off point the proposed model achieved 91.39% of accuracy, 91.50% of precision, 93.02% of recall and 92.68% of F1-Score

Keywords: Paralysis, brain functions, disability, estimation analysis, human nervous system, Neuro fuzzy logic controller

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1. Introduction

Now people are becoming familiar with what cancer and heart disease are. They immediately know that chest pain is a heart attack and immediately go to the hospital [1]. Then they continue testing and take pills for a few days and then go to work. But paralysis is not like that [2]. There is little sign of it. Because even if

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you have chest pain, you can fix it, go to work, earn, and take care of your family [3]. But if paralysis comes they become bedridden. They cannot walk in life, cannot go to any work. They are fine and suddenly their hands and feet go missing, the mouth becomes crooked on one side, some cannot speak, some can speak but the mouth is slurred [4]. For some people,

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forgetting their left or right hand, for others, stuttering, for some people, double vision, dizziness, etc [5]. In this type of brain, there are many symptoms due to the loss of the functions of the blood vessels in the part of the brain. Patients who come to the hospital today are blindly called a paralysis before any tests are done to determine what the disease [6]. Mainly, people suddenly lose their hands and feet due to some reason, their mouth is crooked, and they are unable to speak [7]. These three are important symptoms. If you have any of these symptoms, you should immediately recognize it as a paralysis and go to the nearest paralysis hospital [8]. Why this is important if they go to the nearest small hospital or nursing home then their precious time will be wasted [9]. They will ask you to see another doctor, who will ask for a scan and then a follow-up appointment with the doctor [10]. This wastes time. Every second counts for a paralysis survivor. That's because 1.9 million nerve cells die every second after a paralysis. 120 million cells die in 1 hour [11]. A person's life expectancy decreases by 39 years after a paralysis. A paralysis-free 60-year-old lives to 90, while a paralysis-free person becomes bedridden at 60 as a 90-year-old [12]. So 34 years of life is affected. This model scans nearby CT every minute and every second without time delay. It is very important to visit a paralysis clinic where the scan is available [13]. If you look at the age at which paralysis occurs, it can occur at any age. In Europe and America, it has ranged from 60 to 80 years [14]. But more people living in Japan, Asian countries, and India have diabetes. As it is, the disease of paralysis has come in India 10 years ago [15]. If you look at the age at which this disease occurs, it can affect people of all ages. It mainly affects people aged 50 to 80 years [16]. This paralysis cannot be said to be a fatal disease. It cannot be said that there is no medicine. But if we know the symptoms of paralysis and act at the right time and take the right medicine, we can protect ourselves from the disease as long as possible [17-18]. It is true that if they leave it without doing it, their life, their family and

society will suffer. What causes a heart attack in humans is the same cause of a paralysis. A person has high blood pressure but is not careful not to take pills [19]. After finding out that it is hematoma, it is better if you visit the doctor and follow the prescribed medicines properly [20]. It is very deadly. The disease is not easily recognized. It is checked every 6 months and is there any disease? Isn't it? It should be found and treated [21]. Apart from that, some people have seen that smoking and drinking alcohol cause little by little blockages in the blood vessels that go to the brain. The blockages gradually increase and one day suddenly blocks the blood vessel [22]. After that comes brain damage and paralysis. These are all common reasons. Paralysis are especially common in young adults between the ages of 30 and 40 [23]. The reason for that is stress, not taking proper walks, not paying attention to health, not keeping the body in order, smoking, drinking alcohol, lack of sleep, not exercising [24-25]. That is why paralysis, stress and diabetes are becoming more and more uninvited guests

2. Literature Review

If you have had a paralysis once, you are more likely to have a repeat paralysis or heart attack. If one member of the family has a paralysis there is a chance that others will too. Similarly, even if a person has had a paralysis once, there is a chance of having it again [1]. It is very important to detect and treat heart attacks and paralysis as soon as they occur, and to take lifelong medication to prevent recurrences. There are many treatments for this. It is only in the last 10, 15 years that injections, medicines and tablets have come to cure this disease. Before that, people had no cure for this disease. Rarely, some people survive without treatment [2]. It is a life-threatening disease but is only fatal if there is a large area of the brain blocked. If they come small they can live well throughout their lives. On the other hand, if the brain is disabled, the action cannot be recovered [3]. Some will be unable to speak, lose their limbs, lose their sight, and some will be unable to



stand and will be in wheelchairs. If you look at the treatment method for this, the most important thing is to prevent it before it occurs [4]. Walking, not smoking, and giving up alcohol, controlling sugar and blood pressure if any can prevent this disease. For example, if someone in the family has had a paralysis, It have the same disease. It is very good to check with caution. Paralysis and heart attacks can be prevented before they happen [6]. The second you have a paralysis, what to do next is to act immediately without delaying every second. Patients can't tell I've had a paralysis. This is because they don't know the symptoms. So those present should be well aware of its symptoms. Awareness is very important for this [8].

If we want to control the disease of paralysis, we have to control our diet. If someone in a family gets a paralysis, the whole family needs to control their diet to prevent it from happening to someone else in the family [10]. Cut down on oily products. Foods can be boiled and eaten without frying in oil. If we reduce salt in food, blood pressure will decrease; paralysis and heart attack will also decrease. People with diabetes should take it without sugar [12]. Some people think that vegetarians don't get paralysis and non-vegetarians do. This is not the case. Any food that is high in fat be it vegetarian or non-vegetarian is bound to cause harm. If you take it as a diet, you should take more nutritious fruits and vegetables. Excess oil and fat can be prevented by reducing them [14].

3. Proposed Model

After a paralysis, the surrounding nerves continue to fail due to lack of oxygen and blood to the brain. If it needs oxygen and blood, a blood vessel must be opened. The medical method for that is called Paralysis Thrombolytics Treatment. That means giving a needle and picking up the blockage where the blockage is. This cannot be done all the time. If they came to the hospital within 4.30 hours after the paralysis, after knowing that there was a blockage in the brain, if we gave the medicine

through injection, then there is a chance to get rid of the blockage and make the dysfunctional things work. Cells die because the affected brain area is deprived of life-sustaining nutrients. Paralysis are of two types.

- Hypoperfusion paralysis: A paralysis occurs when blood flow to certain parts of the brain is blocked. Brain cells die due to lack of blood supply. As a result, one becomes unable to perform important tasks such as behavior and speech. This causes a blockage in the blood vessel leading to the brain. After such a blockage, all the nerve cells of the brain become inactive.
- Hemorrhagic Paralysis: This is completely opposite and it is called blood blast. It is a bleeding in the brain due to bursting of the blood vessel leading to the brain due to hemorrhagic paralysis. A paralysis occurs when weakened blood vessels rupture and leak into surrounding brain tissue. Brain cells die when blood pools and compresses the brain.

For these two types of paralysis, the treatments and causes are all different. A paralysis sufferer may experience the following symptoms dataset:

- Sudden weakness or numbness in arms, legs, or face
- Difficulty speaking
- Visual impairment
- Difficulty walking
- Dizziness
- Loss of balance
- Severe headache

That (injection) medicine cannot be given in all small hospitals. This (injection) medicine is very good for early paralysis. Because there are so many side effects and complications in a paralysis-stricken body. A team of specialists is needed to treat these paralysis. Special treatments for paralysis such as radiology department, physiotherapy can be implemented with the appropriate doctors for this disease. Only if such patients come, there is a chance of getting a good result if they are admitted to the ICU, treated with blood clotting



every 5 minutes and given anti-paralysis medicine. A paralysis is also known as a brain attack. It indicates a blockage of blood flow to

the brain. The fig 1, expressed the functions of the proposed paralysis predictions.

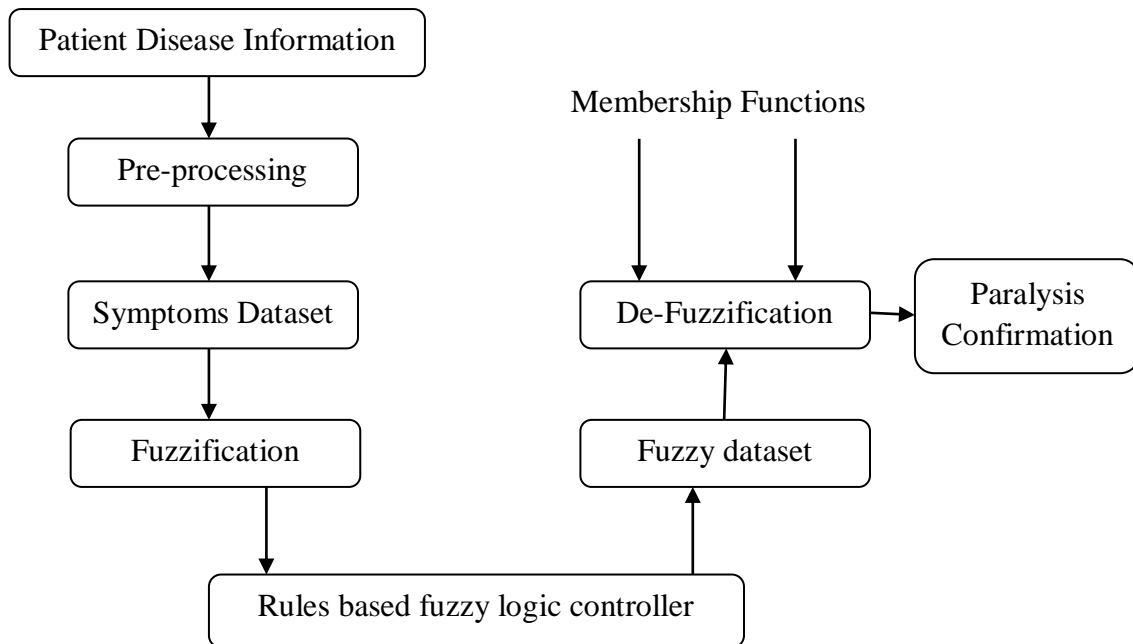


Fig 1: Proposed paralysis predictor

There are some of the important performance terms are described which is used in the estimate the values.

- Exact optimistic (E_o) Logic – This exact optimistic vaues are the absolutely identified true and positive values while the neuro fuzzy logic controller compare the paralysis symptoms with the paralysis dataset.

- Exact pessimistic (E_p) Logic - This exact pessimistic vaues are the absolutely identified true and negative values while the neuro fuzzy logic controller compare the paralysis symptoms with the paralysis dataset
- Approximate optimistic (A_o) Logic – This exact optimistic vaues are the absolutely identified false and positive values while the neuro fuzzy logic controller compares



the paralysis symptoms with the paralysis dataset.

- Approximate pessimistic (A_p) Logic - This exact pessimistic values are the absolutely identified false and negative values while

the neuro fuzzy logic controller compares the paralysis symptoms with the paralysis dataset

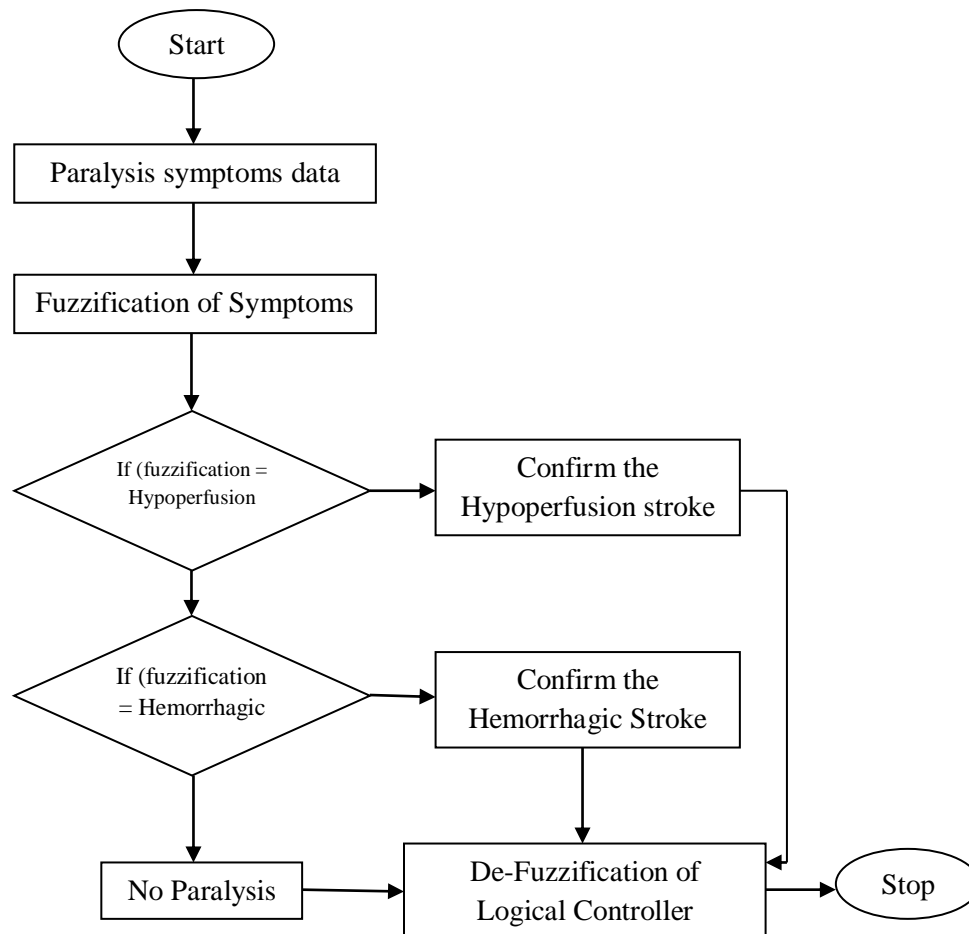


Fig 2: Flow diagram of proposed model

If someone's mouth is crooked, hands and feet have lost function, it is very important to take him to the hospital immediately and treat him instead of giving him pills and massaging him.

Some people think that oil massage and exercise are enough. Exercise is very important to reduce fatigue in people who have definitely had a paralysis. If you rub only oil, the skin will



become shiny, but the muscles will not return to their normal state, and the nervous tension will not decrease. If people who have had a paralysis take antiplatelet drugs like aspirin,

cholesterol-lowering pills, blood pressure pills, and diabetes pills throughout their lives, they can prevent subsequent paralysis.

Algorithm : Neuro fuzzy logic algorithm

1. Enter the current symptoms
 2. Start fuzzification of symptoms dataset
 3. **if** (fuzzification symptoms = Hypoperfusion)
 4. Then classify the type of paralysis as the “Hypoperfusion”
 5. Update the values in defuzzification unit
 6. **Else if** (fuzzification symptoms = Hemorrhagic)
 7. Then classify the type of paralysis as the “Hemorrhagic”
 8. **Goto** Step 5
 9. **Else** (no paralysis)
 10. **Goto** Step 5
 11. Declare the de-fuzzification results
 12. Stop
-

The fig 2 was demonstrates the functional flow of the proposed model. A data set consisting of patients is first created based on the given inputs. This data set was created based on the symptoms of the patients. It is designed to integrate and test the existing commands in the fuzzifier module. The data is tested based on the various methods available. Testing confirms that they have Hypoperfusion paralysis if their symptoms match Hypoperfusion symptoms. If their symptoms match Hemorrhagic paralysis, they are confirmed to have Hemorrhagic paralysis. A patient is predicted to have a normal problem when both rules are not met. Thus paralysis is ensured.

4. Results and discussion

The existing Improved Adaptive Neuro Fuzzy Inference System (IANFIS), An Intelligent Healthcare Cyber Physical Framework (IHCPF), adaptive-fuzzy-proportional-derivative controller (AFPDC) and segmentation based visual processing algorithm (SVPA) models are

compared with the proposed Neuro fuzzy logic controller (NFLC)

4.1. Computation of accuracy (A)

The accuracy is the term explains the relationship between the contineous detection of most equal values with the neuro fuzzy logical controller. The accuracy was computed with the help of following equation 1,

$$A = \frac{E_O + E_P}{\sum E_{DS}} \tag{1}$$

Where,
 A = Accuracy; E_O = exact optimistic logic; E_P = exact pessimistic logic; E_{DS} = Fuzzification dataset;

The accuracy is the ratio between the sum of exact optimistic (E_O) Logic and Exact pessimistic (E_P) Logic of the symptoms dataset and the sum of all the symptms entered in the symptoms dataset. The table 1 demonstrates the accuracy comparison between the existing and proposed models.

Table 1: Comparison of Accuracy

No of data set	IANFIS	IHCPF	AFPDC	SVPA	NFLC
100	61.72	76.33	86.10	88.16	95.86
200	60.05	75.20	83.17	86.90	93.39
300	58.10	74.85	81.63	85.01	92.59
400	56.11	72.90	79.60	83.81	91.39



500	53.53	72.13	78.70	92.25	90.75
600	51.54	71.75	76.73	80.50	89.49
700	49.52	70.62	75.26	79.57	88.47

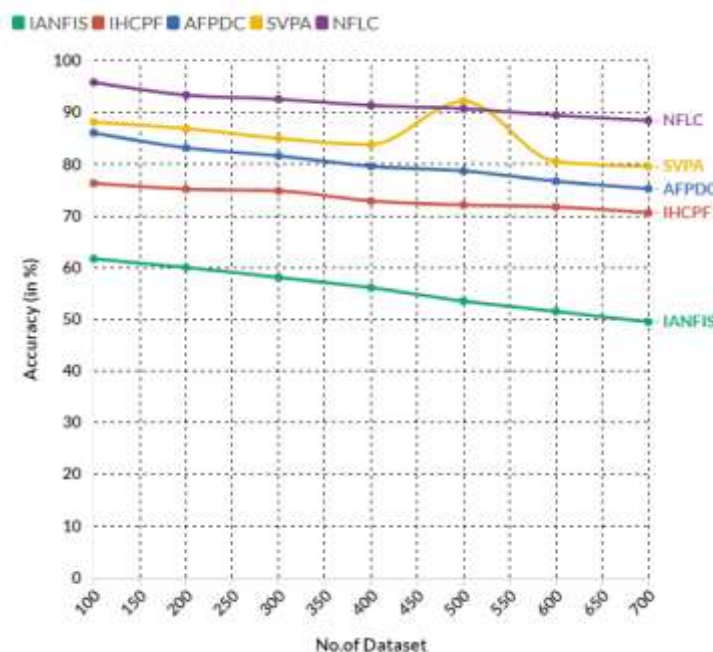


Fig 3: Measurement of Accuracy

In a cut-off point from the fig 3, the proposed NFLC achieved 91.39% of accuracy measurement. In the same range the existing IANFIS reached 56.11%, IHCPF achieved 72.9%, AFPDC reached 79.60% and SVPA achieved 83.81% of accuracy. While compared with other methods, the proposed model achieved better accuracy results.

$$P = \frac{E_0}{E_0 + A_0} \quad (2)$$

Where,

P = Precision; E_0 = exact optimistic logic; A_0 = Approximate optimistic logic;

The precision is the ratio between the exact optimistic (E_0) Logic and the sum of total optimistic logic of the symptoms dataset. The

4.2. Computation of Precision (P)

The precision is the term explains the relationship between the very nearest contineous detection values with the neuro fuzzy logical controller. The precision was evaluated with the help of following equation 2,

total optimistic logic was computed with the sum of exact optimistic (E_0) Logic and the approximate optimistic (A_0) logic. The table 2 demonstrates the precision comparison between the existing and proposed models.

Table 2: Comparison of Precision

No of data set	IANFIS	IHCPF	AFPDC	SVPA	NFLC
100	60.13	82.40	84.85	88.80	94.69
200	58.50	80.66	83.27	87.38	93.40
300	58.02	78.32	81.07	86.12	92.39
400	56.73	77.51	79.44	84.13	91.50
500	54.62	75.22	78.30	81.66	91.13
600	53.13	73.29	76.10	80.22	89.49
700	51.32	71.56	74.95	78.50	89.12



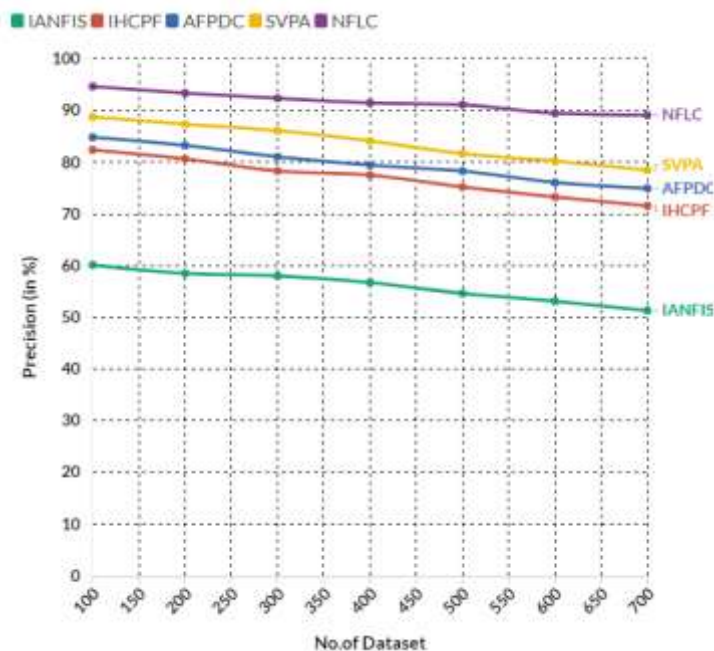


Fig 4: Measurement of Precision

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In a cut-off point from the fig 4, the proposed NFLC achieved 91.50% of precision measurement. In the same range the existing IANFIS reached 56.73%, IHCPF achieved 77.51%, AFPDC reached 79.44% and SVPA achieved 84.13% of precision. While compared with other methods, the proposed model achieved better precision results.

4.3. Computation of Recall (R)

The Recall is the term explains the relationship between the pessimistic and optimistic values with the neuro fuzzy logical controller. The recall was evaluated with the help of following equation 3,

$$R = \frac{E_O}{E_O + A_P} \quad (3)$$

Where,

R = Recall; E_O = exact optimistic logic; A_P = Approximate pessimistic logic;

The precision is the ratio between the exact optimistic (E_O) Logic and the sum of total optimistic logic of the symptoms dataset. The total optimistic logic was computed with the sum of exact optimistic (E_O) Logic and the approximate pessimistic (A_P) logic. The table 3 demonstrates the recall comparison between the existing and proposed models.

Table 3: Comparison of Recall

No of data set	IANFIS	IHCPF	AFPDC	SVPA	NFLC
100	70.02	78.30	84.69	87.79	96.69
200	68.53	76.33	82.27	85.59	94.70
300	67.73	75.20	81.86	84.79	93.50
400	65.40	73.99	80.26	84.12	93.02
500	64.39	73.62	77.94	82.69	91.59
600	63.75	72.09	76.69	81.60	90.43
700	63.09	71.59	73.96	81.12	89.66



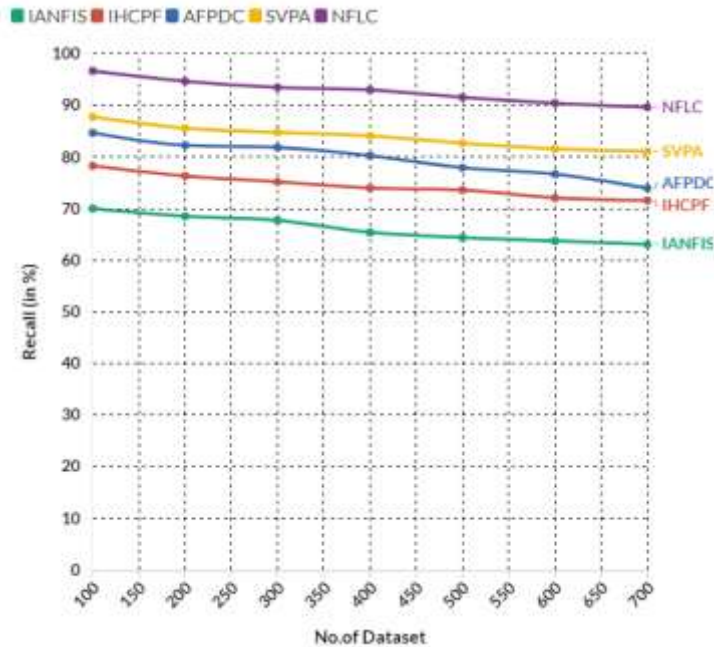


Fig 5: Measurement of Recall

In a cut-off point from the fig 5, the proposed NFLC achieved 93.02% of recall measurement. In the same range the existing IANFIS reached 65.40%, IHCPF achieved 73.99%, AFPDC reached 80.26% and SVPA achieved 84.12% of recall. While compared with other methods, the proposed model achieved better recall results.

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4.4. Computation of F1-Score (F)

The F1-Score is the term explains the relationship between the precision and recall values with the neuro fuzzy logical controller. The F1-Score was evaluated with the help of following equation 4,

$$F1 - Score = \frac{2 * R * P}{(R + P)} \quad (4)$$

Where,

R = Recall; P = Precision

The table 3 demonstrates the recall comparison between the existing and proposed models.

Table 4: Comparison of F1-Score

No of data set	IANFIS	IHCPF	AFPDC	SVPA	NFLC
100	61.51	81.93	87.20	91.99	95.53
200	61.62	81.91	87.37	92.26	96.03
300	61.64	81.03	86.64	91.96	95.91
400	58.54	78.20	83.30	88.45	92.68
500	57.34	76.88	82.57	87.13	92.30
600	56.73	76.05	81.68	86.59	91.73
700	56.32	75.65	81.60	86.29	92.03



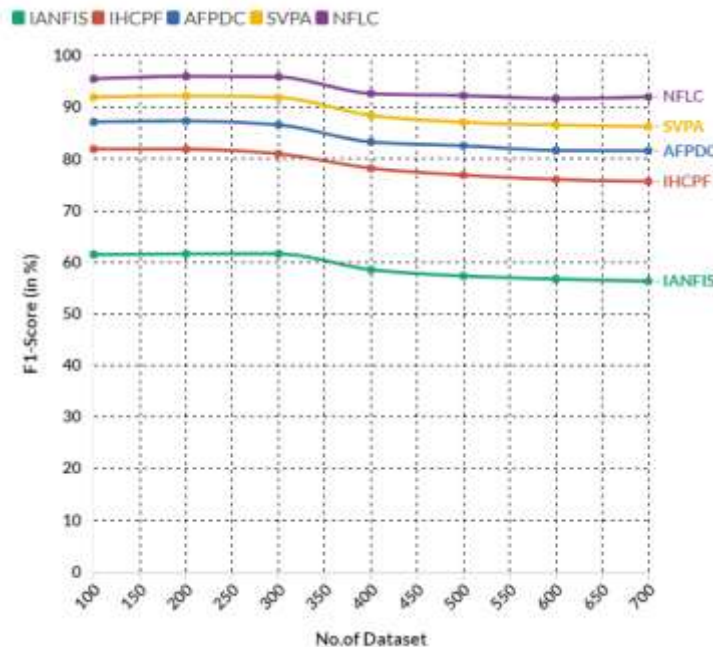


Fig 6: Measurement of F1-Score

In a cut-off point from the fig 6, the proposed NFLC achieved 92.68% of F1-Score measurement. In the same range the existing IANFIS reached 58.54%, IHCPF achieved 78.20%, AFPDC reached 83.30% and SVPA achieved 88.45% of F1-Score. While compared with other methods, the proposed model achieved better F1-Score results.

5. Conclusion

A paralysis is also called a brain attack and it indicates a blockage of blood flow to the brain. Cells die because the affected brain area does not get vital nutrients. The carotid arteries, which run through either side of the neck to the head, carry blood from the heart to the brain. In a cut-off point the proposed model achieved 91.39% of accuracy, 91.50% of precision, 93.02% of recall and 92.68% of F1-Score. The larger blood vessels branch off into smaller blood vessels that supply oxygen and nutrients to all tissues of the brain. When blood flow decreases and is blocked in the large and small blood vessels leading to the brain, the supply of prana gas and nutrients is blocked, some parts of the brain become inactive, and some parts of the body also become inactive. This is called paralysis. Like a heart attack, this can be called a

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brain embolism. Sudden weakness or numbness in arms, legs, face, difficulty speaking, visual disturbances, difficulty walking. Symptoms like dizziness, loss of balance, severe headache are seen. Within three hours of symptoms, patients should be taken to a hospital with a CT scan facility. Cerebral occlusion should be confirmed. Anticoagulant can be completely cured within 3 hours. Side effects are also possible. That's why we call those three hours 'golden time'.

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