

# Fuzzy Logic Based Model for Resource Allocation in Cloud Computing

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## **Abstract**

*To design and improve a fluffy rationale and neural system based trust and notoriety model for safe asset allotment in distributed computing is the most significant aphorism of this exploration. Among the IT experts in current situation, the distributed computing is one of the principle themes speaked. Presently, to change the security, we utilize the trust director and notoriety administrator in our proposed approach at the outset, the client get to an asset hinder through the planning supervisor and a structure will send to the client following getting to the asset square to fill the trademark estimations of Trust Factor (TF) and Reputation Factor (RF). The TF and notoriety esteem is after that figured for the asset community and it is indicated to the fluffy rationale framework and neural system to acquire the Security Score (SS) of an asset place. To offer the security controls is the benefit of our proposed technique in getting to the cloud assets from distributed computing attributable to various security issues happened in systems, databases, asset planning, exchange the board and burden adjusting.*

**Keywords:** *TF, fuzzy logic , SS, resource center, RFr.*

## **1. Introduction**

In current years, cloud computing has become a highlight for the IT specialists due to the potentiality to transform. To execute this technology, immense steps had been taken. To improve this domain [1, 5], the guaranteed profits have found out the companies to spend a big amount of money for research. It is an internet depended service delivery method that presents internet based services, computing and storage for users in all markets that holds financial health care and government. It is attracting massive global investment and this novel economic system for calculating has discovered fertile ground. By issuing services with similar functionality, cloud providers will more and more try to win for customers as the business market is increasing quickly with novel providers entering the market. Based on the offered quality level of those services, there can be massive differences on the other hand. Such an aggressive market requires means to dependably review the quality level of the service providers [7]. In addition, by presenting a variety of computing services cloud computing offers several opportunities for organizations. A lot of researchers pay their consideration to both in the academia and in the industry cloud computing. To work out numerous issues, cloud computing has been broadly employed by both enterprises and individuals [3].

For cloud executions, the distributed computing requires to develop an appropriate security [14], despite the fact that the advantages of distributed computing is exact. A primary issue that needs specific consideration is wellbeing of mists and the Trust Management (TM) is a significant factor for cloud security [4]. In various applications, trust and notoriety frameworks [9] are effectively applied to help the clients to recognize the reliable and dependable suppliers; for instance, eBay, Amazon and application markets for versatile applications. To pick the appropriate dependable cloud suppliers, comparable strategies are important to help the clients. Without remembering different sources and underlying foundations of data, existing trust and notoriety framework relies upon client input. Furthermore, it requires additional parameters [6] that help the clients in picking suppliers in a cloud commercial center. Subsequently, to help the clients in making evident evaluations, trust and notoriety frameworks need to advance into the TM framework [8] before picking consistent dependable cloud suppliers.

In this record, for secure resource assignment in conveyed processing we present a feathery method of reasoning and neural framework based trust and reputation model. We use trust executive and reputation head to amass the trademark regards for Trust Factor (TF) and Reputation Factor (RF) from the customers in the wake of using an advantage. From the beginning, customers will present a task through the arranging executive. The arranging chief in the wake of tolerating the customer's commitment, it conveys to the related resource place which the endeavor requires to wrap up. The customer requires getting to an advantage impede in a benefit network to execute a task. In the wake of doing the endeavor, a structure will be given to the customer to fill the characteristics regards for the trust TF factor and RF subject to the experience.

These trademark esteems are applied to work out the security. The TF value and RF value for the resource center is calculated based on the characteristic values and given as input to the fuzzy logic system. The fuzzy logic system offer the score value for the resource center based on the TF and RF we present as input. From the score value we make a decision whether a resource center is protected or not. The main involvement of our work is as follows:

- We have progressed a mathematical model for computing the TF and RF based on the characteristic values.
- We have suggested Algorithm 1 i.e., trusts and reputations based Security Score (SS) algorithm.

This paper is arranged as follows: Section 2 demonstrates a few of the associated works, section 3 demonstrates the requirement for security in resource allocation of cloud computing, section 4 describes our suggested method. Section 5 demonstrates our TR-SS algorithm, section 6 deals our experimental results, and section 7 concludes our method.

## 2. Related Works

This portion shows a couple of the explores found in the writing for trust based secure model and trust notoriety framework in distributed computing and matrix processing condition. For various circulated framework, a trust model has been recommended by Firdhous et al. [4]. The TM frameworks recommended for distributed computing had been inspected with specific accentuation on their capacity, relevance in reasonable heterogonous cloud condition and implementability. It was discovered that no of the frameworks depended on strong hypothetical establishment during the evaluation of those frameworks and besides doesn't take any predominance of administration trademark for shaping the trust scores. Consequently, strong hypothetical basis for building trust models for distributed computing was important. A physical distributed computing security engineering has been proposed by Tripathi and Mishra [14]. Cloud security was transforming into a main differentiator and forceful edge in the midst of cloud suppliers. They have found the security gives that occur in a distributed computing outline work. It highlighted on specialized security viewpoint emerging from the act of cloud administrations and also offered a synopsis of principle security angle identified with distributed computing with the standpoint of a safe cloud engineering condition.

Proactive ventures and specialist organizations utilized this security on their cloud framework, to accomplish security with the goal that they were taken advantage of distributed computing before their rivals Khan and Hamlen [11] have offered and assessed Hatman: The first full-scale, data-centric, reputation depended TM system for Hadoop clouds. By distinguishing the job replica effects for steadiness, Hatman vigorously estimates node integrity. These capitulated agreement feedbacks for a trust managerrely on Eigen trust. Low overhead and high scalability had been attained by creating both consistency- checking and TM as secure cloud computations; as a result, the cloud's disseminated computing power was influenced to make stronger its protection. For a cloud computing marketplace, a multi-faceted TM system structural design has been proposed by Habib *et al.* [7]. This system offers to identify the trustworthy cloud providers based on different characteristics (e.g., security, performance, compliance) estimated by abundant sources and roots of trust information.

Melody et al. [12, 13] have proposed that believed framework registering pressure strong asset

portion with security affirmation at all asset destinations. By absence of security ensure from separated asset destinations, huge scope lattice applications were being holdedup. They have framed a security-restricting framework through site notoriety estimation and trust mix across lattice locales. They didn't deal with the TF deterministically. As a substitute, they have utilized fluffy hypothesis to manage the fluffiness or vulnerabilities following all trust attributes. The joining was reached by rehased supplant of site security data and matchmaking to satisfy client work requests. PKI-based trust framework helps matrices in multi-site confirmation and single sign-on activities. Then again, cross endorsements were not adequate to survey neighborhood security conditions at matrix locales. For spread trust collection, they have proposed a fluffy rationale trust framework through fuzzification and coordination of security qualities. They have acquired the trust list of a framework site, which was fearless by site notoriety from its reputation and self-protection potential ascribed to the hazard conditions and equipment and programming guards masterminded at a network site.

Vivekananth [15] has proposed that lattice framework was an energetic domain where everything shared the assets gave by different substances. The framework allows the synchronized and totaled apply of geologically dispersed assets, regularly possessed by autonomous associations, for turning out to be enormous scope issues in science, building. Then again, application piece, asset the board and planning for those situations were a mind boggling process. Prior to starting any exchange, the asset supplier just as the client ought to be persuaded. Common trust must be made among the client and the supplier. Trust was based on notoriety. The possibility of notoriety was attractive in shared systems. In any case, yet it was not perfect in lattice processing. They have offered a framework of accessible notoriety based frameworks for asset determination.

### **3. Resource Allocation of CloudComputing**

To dispatch the examples and patterns to improve the quality, there is a basic need to safely store, oversee, share and look at huge measure of complex data. Because of the basic idea of the applications, it is fundamental that the mists to be secured. The principle security viewpoint with the cloud framework is that the proprietor of the information might not have the ability to know where the information is arranged. The reason is that in the event that one needs using the advantages of distributed computing, one ought to other than use the asset portion and booking introduced by mists. Subsequently, we require ensuring the information in untrusted process. The happening distributed computing framework difficulties to manage the fast development of web associated apparatuses and oversee huge measure of information. Google has now offered the Map Reduce system for managing huge amount of information on item equipment. Apache's Hadoop assigned File System (HDFS) is coming to pass prevalent programming segment for distributed computing joined with fused parts, for example, Map Reduce. The necessity to expand human thinking translation and choice makes capacities that have affected in the rise of semantic web which is a thought that endeavors to change over the web from its current, just intelligible structure to machine processable structure. This thus has affected in various person to person communication destinations with gigantic measure of data to be shared and overseen.

For distributed computing, there are various security issues as it covers a ton of advances including systems, databases, working frameworks, virtualization, asset planning, exchange the executives, load adjusting, simultaneousness control and memory the board. Consequently, the security issues for a portion of these frameworks and advances are identified with distributed computing. For instance, the systems that entwine the frameworks in a cloud must be sheltered. Moreover, the virtualization worldview in distributed computing results in various security concerns. For configuration, mapping the virtual machines to the doctor machines must be executed solidly. The ensured asset distribution in distributed computing can offer the client to peruse immovably. The client can in addition guard their data. We go over SS of an asset in distributed computing by the client given trademark an incentive in this activity. By this novel strategy client can decide about an asset place dependent on SS whether it is secured or not.

#### 4. Resource Allocation in Cloud Computing

Utilizing fluffy rationale and neural system based trust and notoriety, this segment portrays our proposed model for the assignment of asset in distributed computing. The Figure 1 exhibits a model structure of our recommended model. It contain clients, a planning chief, a trust director, a notoriety administrator and asset focuses that has number of asset squares. The general technique is as per the following: To get to the asset hinder, the clients offer an assignment which is in the asset place through the planning director. The planning administrator ensures that the asset square .

where it is arranged gives the way to the related asset community. The client presents the qualities esteem for TF and RF after access the asset square. TF worth and RF esteem are then given to the fluffy rationale framework and afterward neural system to get SS.

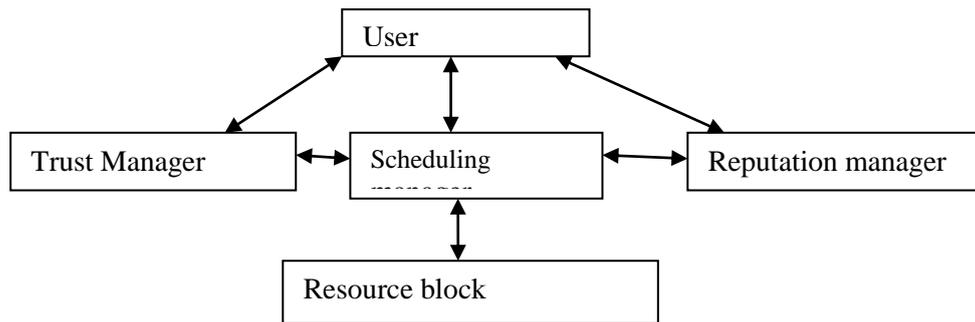


Figure 1. Sample structure of proposed technique

##### 4.1. TF of ResourceCenter

- The sure factor of asset focus is the all out aggregate of TF of each asset obstruct in the asset place. Trust is a significant factor in both human culture and the internet security. All of us is aware of the significance of confiding in somebody. Since, of reality that the parameters of the trust are commonly close to home, the idea of the trust is usually decentralized. Trust can be named as certainty that a specific gathering would work in a normal way regardless of checking or controlling the gathering. Trust is respected positive and presents great outcome in questionable situations. For the most part, there has a dark locale in communicating the constancy of a PC site [1]. Identified with the human relationship, trust is determined by a semantic term rather numerically. Trust would get vary dependent on schedule and condition. Azzedin and Maheswaran [2] introduced the definition for the trust and it is as per the following: Trust is a solid conclusion in capability of an element to go about true to form and the solid sentiment is anything but a fixed worth related with the element but instead it is dependent upon the element's demeanor and utilizes just inside a specific setting at a predetermined time. The extreme feeling can be depicted as a unique worth that is found to remove over a lot of qualities shift from reliable to extremely dishonest. In light of the past experience and is offered for a specific setting, the TF is framed. The TF depends on the predetermined time occasion, as the trust level relating two substances isn't huge to be comparative for now when contrasted with a year back. A couple of the attributes we viewed for the TF are as per the following:

Anti-Virus Capability: It is the ability of the asset to prepare for infections and malevolent codes.

- Firewall Capability: It is the capacity to shield the asset from other system gets to.
- Secured Job Execution: It is the capacity of the assets to ensure the protected usage of an occupation.
- Copyright Date: Users trust shopping with more than once amended sites. For instance, if the copyright of the site says 2000, at that point it would be a major warning for clients.
- Corporate Logos: Incorporate the organization logos on your site. So that, clients will confide

in your item and administrations.

- About Us: The about us page exhibits the itemized history of the organization and the client may confide in dependent on the history.
- Privacy Policy: The security arrangement incorporates a significant level of trust since, it shows that you give it a second thought and regard the client's very own data.
- Business Address: The place of work on site page exhibits that you have a real area that incorporates an extensive degree of trust among the clients.

At first, we need to work out the TF of every asset obstructs in every asset place. The calculation of TF of every asset square is as per the following: offers an arrangement for creating trust through social control by methods for the network based input about the past experience of substances. Azzedin and Maheswaran [2] depicted that notoriety of an element is an expectation of its demeanor dependent on different elements assessments or data about the elements past mentality at a predefined time. A couple of the notoriety qualities we viewed for RF are as per the following:

- Consistency: The capacity of the asset to execute the foreseen work under expressed conditions for a specific timeframe.
- Confidentiality: The capacity of hiding data from unapproved clients.
- Robustness: The capacity of the framework to remain alive from the attacks expected towards that framework.
- Contents Look Current: If the site is in old arrangement, the clients will give no consideration to it. Subsequently, the site ought to be fresh out of the box new with current patterns, substance and pictures.

RF of an asset community is moreover registered by the comparative method utilized to work out the TF of the asset focus. The recipe to register RF for the asset community is shown by a condition indicated We require to working out the TF for the asset place in the wake of finding the TF esteem for every asset obstruct in an asset community. For instance, in Figure 1, the primary asset place has four asset squares and to beneath:

$$RF(rc) = \frac{1}{N} \sum_{k=1}^N RF_k(rb) \quad (1)$$

Find the TF of the primary asset place, we should realize the TF estimation of all the four asset squares. The TF for the asset place is figured as follows: Where RF(rc): Reputation Factor of an asset community, RFk(rb): Reputation Factor of every asset hinder in an asset place, and N: Total number of asset obstructs in an asset community.

$$TF(rc) = \sum TF(rb)_k \quad (2)$$

To discover RF for the asset place, we ought to discover RF for every asset hinder in the asset center. Where TF (rc): TF of an asset community, and N: Total number of asset obstructs in an asset center. The recipe to survey RF for every asset hinder in an asset place.

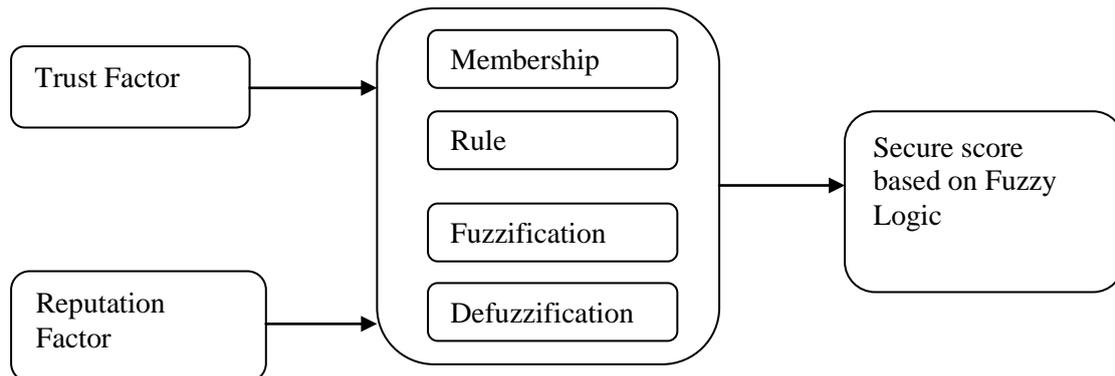
#### 4.2. RF of a ResourceCenter

The notoriety instrument is one of the most significant techniques which structure the reason for the allotted application and framework wellbeing, for its improved versatility and flexibility. One can confide in another on premise of good notoriety since of the reality. Notoriety is depicted as a proportion of reliability in the feeling of trustworthiness. For producing trust through social control lacking of confiding in outsiders, notoriety framework [11] present an arrangement. The notoriety component Where Pa: Probability of clients applied the asset square, Bij: RF qualities esteems indicated by the client, li: Weight estimation of every RF attributes, L: Total weight estimation of the

qualities respected for RF,  $n$ : Total number of attributes respected for RF, and  $u$ : Total number of users. The calculation of absolute weight esteem  $L$  of the attributes for the RF is determined underneath.

### 4.3. Fuzzy Logic Model

blunder signal that depicts relative commitment to the complete mistake. In light of the mistake signal got, association loads are then refreshed by every unit to make the system meet toward an express that In our strategy, this area depicts the use of fluffy rationale framework. TF esteem  $TF(rc)$  and RF esteem  $RF(rc)$  are giving as contribution to the fluffy rationale framework to find SS of the asset place. Figure 2 exhibits the square chart of the utilization of fluffy rationale framework in our technique.



**Figure 2. fuzzy logic system used .**

The info factors are mapped by set of enrollment works in the fluffy rationale framework. The demonstration of changing the info incentive to fluffy worth is called Fuzzification. The Fuzzification in the fluffy rationale framework would be founded on the standard and the Defuzzification is moreover founded on rule. After Defuzzification we will acquire a solitary yield for the predetermined number of information sources. In Figure 2 we give TF and RF as contribution to the fluffy rationale framework. The fluffy rationale framework from the start utilizes the info estimations of the enrollment capacities and the Fuzzification and Defuzzification will be finished dependent on the standard. permits all the preparation examples to be encoded. The system prepares, the hubs in the middle of the road layers sort out themselves with the end goal that various hubs figure out how to perceive various highlights of the all out information space. In the wake of preparing, when given a subjective information design that is uproarious or deficient, the units in the concealed layers of the systems will react with a functioning yield if the new info contains an example that takes after the component the individual units figured out how to perceive during preparing. The shrouded layer units tend to repress their yields if the information design doesn't contain the component that they were prepared to perceive. The signs proliferate through the various layers in the system, the movement design present at every upper layer can be thought of as an example with highlights that can be perceived by units in the resulting layer. The yield design created can be thought of as an element map that gives a sign of the nearness or nonappearance of a wide range of highlight blends at the information. The alteration of the weight esteems depend on the back proliferation calculation. The neural system inevitably gives a SS by methods for the TF worth and RF esteem given as information. SSs dependent on the fluffy rationale framework and the neural system is converged to get the security for the asset place. SS for the asset community is determined as follows:

A definitive yield we get from the fluffy rationale framework is SS dependent on fluffy rationale framework. It is meant by a condition underneath: SS is the asset place and I is the score acquired dependent on fluffy rationale framework and Where I: Score we accomplished as yield from fluffy rationale framework,  $TF(rc)$ : TF we present as contribution to fluffy rationale framework, and  $RF(rc)$ : RF we present as contribution to fluffy rationale framework.

#### 4.4. Neural Network Model

TF and RF esteems are given to the neural system to get SS. The neural system learns a predefined set of info/yield sets. At first, two info neurons are utilized in the information layer and four neurons in the concealed layer lastly one neuron in the yield layer. An information design has been applied as a boost to the primary layer of system units; it is spread through every upper layer until a yield is produced. The yield design is then contrasted with the ideal yield and a mistake signal is registered for each yield unit. The mistake signals are then transmitted in reverse from the yield layer to every hub in the middle of the road layer that contributes legitimately to the yield; every unit in the transitional layer gets just a segment of the absolute blunder signal, in view of on relative commitment the unit made to the first yield. This procedure rehashes, layer by layer, until every hub in the system has gotten a NNS is the score acquired dependent on neural system and  $\alpha$  is the weight an incentive for fluffy rationale based score and  $\beta$  is the weight an incentive for neural system based score.

### 5. TR-SS Algorithm

This segment clarifies about our TR-SS calculation. TR-SS calculation is a TF and RF based SS calculation which applies fluffy rationale framework. We are working out the SS for an asset community by methods for this TR-SS calculation. An asset place has various asset squares. From the start, client presents an assignment to execute and the planning administrator guides it to the fundamental asset place which has the asset square to execute that task. We need to discover the TF and RF for the asset obstruct by the client determined qualities after the client applied the asset square.

TF encases a few qualities and RF holds a few attributes. The qualities for the attributes are filled by the client after they utilized the asset. TF and RF for the asset square is figured dependent on the trademark esteem and the likelihood of clients utilized that asset square.

By adding the TF esteems and RF estimations of the asset obstructs in that asset community, TF and RF for the asset place is registered. TF and RF of the asset community is next given to the fluffy rationale framework and the neural system. The fluffy rationale framework fuzzifies the data sources we offer and defuzzify dependent on the principles and gives a score and the neural system would likewise give a score. Both the scores from the fluffy rationale framework and the neural system are combined and offer the SS for the asset community as yield.

Algorithm 1:

Input: Obtained the values .

compute TF and RF.

1. Work out the probability of number of users Pa employed a resource block RB.
2. compute the trust TF factor.
3. Do again the fourth steps for next resource blocks in the resource center.
4. compute RF.
5. Do again the seventh steps for next resource block in the resource center.
6. Work out the TF for resource center. Compute RF for resource center.
  
7. TF and RF as input to the fuzzy logic system
8. Fuzzify TF and RF based on rules
9. defuzzify based on rules.
10. Merge the scores obtained from fuzzy logic system and neural network.
11. Output: SSs for resource center.

### 6. Results and Discussions

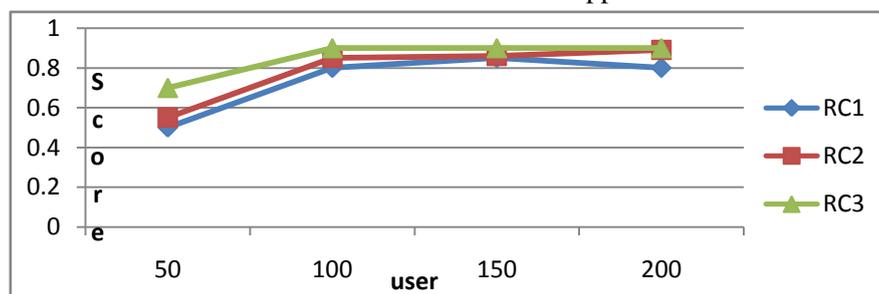
This segment shows the impact of our recommended work. It encases the test arrangement, fluffy plan result and the introduction investigation of our method. With 4GB RAM, our technique is executed in java (jdk1.6) that has the framework design as is processor. We have utilized three

disparate datasets which are money related, clinical and RDB for our technique. We applied four divergent asset places that have three distinctive asset obstructs in our strategy. The datasets we applied are as asset squares. With various number of clients we analyze the introduction of our strategy in light of the fact that the clients will introduce the property estimations for TF and RF after they applied the asset.

The fluffy framework result is the method of info we are giving and the yield we get from the fluffy rationale framework. Figure exhibits a model score esteem we accomplished from the fluffy rationale framework for the participation states of TF and RF. This area characterizes the introduction of our recommended technique. To confirm the introduction, we utilize two secure asset places and two shaky asset communities. In view of the input of the clients, the first and second asset habitats are uncertain and the third and fourth asset places are secure and let us perceive how our framework functions. The introduction of our framework is confirmed with unique number of user's. In this part, the portrayal 'High' in the diagram shows that the asset place is made sure about and the portrayal 'Low' in the chart demonstrates that the asset community isn't made sure about. The explanation of the introduction we achieved for our strategy as demonstrated figures.

Figure exhibits the introduction of our strategy dependent on the criticism of fifty client's by contrasting the edge we set after fluffy rationale framework along with neural system framework to pick whether an asset community is ensured or not. Presently, when we set the limits as 0.2, 0.4 and 0.6, our framework shows the total asset communities we applied as made sure about and when we set the edge as 0.8, our framework exhibits the third and fourth asset places as made sure about and for the edge 1, our framework shows the total asset habitats we applied for our strategy isn't made sure about. The introduction of our framework dependent on the remark of hundred clients is shown in Figure for various edge esteems. Presently, for the thresholds 0.2 and 0.4, our framework exhibits that the entire asset habitats we applied are secure and for the limits 0.6, 0.8 and 1, our framework shows the asset communities we applied as uncertain.

remark we think about for 200 clients, the score an incentive for the primary asset community is 0.067161597 and for the subsequent asset place is 0.067174059 and for the third asset place is 0.074504212 and it is 0.079140074 for the fourth asset place. At the point when we think about the input for 200 and fifty clients, the score esteems are as per the following: 0.067118327 for the primary asset place, 0.067153199 for the subsequent asset community, 0.080761123 for the third asset place and 0.049212507 for the fourth asset center. users by differing the limit which we applied to choose whether an asset community is secured or not. Presently, when we place the limits as 0.2, 0.4 and 0.6, our framework shows the entire asset communities we applied for our technique is made sure about and when the edge is 0.8, the first and second asset habitats are not made sure about and the third and fourth asset places are made sure about. At the point when we place the limit as 1, and notoriety director our framework exhibits that the focuses we applied as not made sure about.



**Figure 3. Score values obtained for different resource centers.**

The score esteems we achieved from the fluffy rationale framework along with neural system for the asset communities we applied in our experimentation are represented in Figure for the remarks of various quantities of clients. , the score an incentive for the principal asset focus is 0.057161597 and

for the subsequent asset place is 0.067164059 and for the third asset community is 0.074504212 and it is 0.079240074 for the fourth asset community. At the point when we think about the input for 200 and fifty clients, the score esteems are as per the following: 0.067118327 for the main asset place, 0.067153199 for the subsequent asset community, 0.080762123 for the third asset community and 0.049222507 for the fourth asset community.

### Conclusions

We have proposed a technique for secure asset allotment in distributed computing by methods for fluffy rationale

furthermore, neural system based trust and notoriety model in this paper. Presently, we have applied the trust director to change the security of an asset community. From the start, client executed an errand through the planning chief and following the undertaking, client give the trademark esteems for TF and RF of the asset client applied. In view of the attributes esteems determined by the clients, TF and RF is registered and indicated to the fluffy rationale framework and neural system framework to find the SS of an asset place. With the remark of different number of clients, we have executed the experimentation of our technique and with disparate edge esteems to settle on a choice whether an asset place is ensured or not.

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