Performance Analysis of Recurrent Neural Network and Fuzzy Logic Algorithms in Cloud Information Retrieval System.

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***Abstract*—**The rapid progress of cloud technology has brought a innovative bent to information services. Information retrieval is an essential part of cloud computing, as it allows to store and retrieve information from the cloud to your environment. Technology and resource availability are compelling a dramatic variation in the information management organization in the next few years. With its web-based information management system, technology has commenced to do with conventionally-based information management methods. Information management doesn't merely mean storing data, however collectively handling unstructured and structured info on an oversized scale. These systems involve not only large-scale storage, but also management of both unstructured and structured data. Search-engines and web-services could benefit from data retrieval systems. Therefore, information retrieval systems should be established as sophisticated applications. The proposed work will apply a Recurrent Neural Network to train the machine to retrieve information from a cloud server. A recurrent neural network was then used in order to achieve an accuracy of over 95%.

Keywords—Recurrent Neural Network (RNN), Cloud Computing, Firebase Cloud Storage, Information Retrieval, Fuzzy Logic, Deep Learning.

I. INTRODUCTION

In cloud computing, so many services are provided over the Internet, including data storage, databases, servers, networking, and software. Files can be saved to a cloud database and retrieved on demand. A public service is free online, while a private service is hosted on a network and targeted at a particular client. As shown in fig 1, the greater the security, the more devices that are linked to a cloud. Firebase started as a YC11 start-up providing Backend-as-a-Service (BaaS). The Firebase NoSQL JSON database is a real- time database that allows caching a list of objects in a tree structure. Firebase manages data in real time ambient. Data can be transformed fluently and rapidly between the database and also an application. Firebase can be used to develop mobile apps similar as live streaming, instant messaging, and so on. In order to develop our apps with effective and accurate management and conservation, Firebase integrates with AdMob, BigQuery DoubleClick, Data Studio, Slack, and Google Advertising. Firebase includes databases, analytics, and crash reports. In this way, the app development band can concentrate on perfecting the user experience. Firebase operations can be stationed via a secured connection.

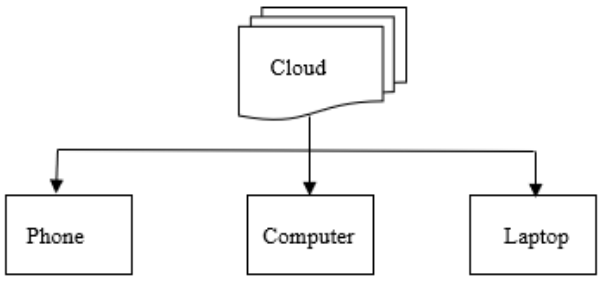

Fig.1.Via the cloud, the devices are connected.

The purpose of information retrieval in cloud computing is to cache and re-collect the necessary word from one environment to another environment. Within a few years, technology developments and resource availability cause a drastic shift in the information management system. Technology has begun to erase the traces of traditional information management processes as it develops web- grounded information management systems. Information operation systems are in high demand also because of internet- grounded services, network outlets, electronic libraries, and lately advanced search machines. When it comes to those systems, information operation doesn't only number storing the data but also managing the unstructured and structured data on a big scale. Information reclamation systems are crucial to search engines and internet- based services, so researchers should develop and fine-tune them. In any case, the question is, on what base could the best applicable

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information be retrieved for this query. The user submits a query, and the system analyses the information and produces the information that ensures the items recaptured are most relevant to the inquiry.

With keywords, precision and recall are improved when extracting information. As technology advances, the system must be able to search using natural language. The documents are divided into smaller sets based on the question in order to retrieve applicable information from a big collection. An information retrieval system predicts documents as they're retrieved. Upon retrieval, documents are ranked and ordered decreasingly. Several reclamation models are created grounded on structure, similarity, and weighting factors. Cloud computing has a limited limitation, similar as communication failure, data loss, and data business monitoring, among other implicit challenges in terms of insulation and security measures. Cloud computing has become a popular system of storing, processing, and retrieving data. Users can also transfer sensitive information to the cloud. Although, there's some query regarding data insulation as the cloud service provider has full access to user data. This absence of confidentiality between the end- user and the service provider is crush by encryption. Prior to outsourcing, those esoteric lines are translated and attached to the cloud, so that data holders don't need to worry about data sequestration. A JSON train is added to the real- time database for training. To retrieve the predicted files, store the files in separate folders in Firebase cloud storage.

II. RELATED WORK.

The retrieval of information has been given more attention since it is as vital as data storage, according to Dr. V. Suma [1]. To address the issues with conventional information retrieval systems, clustering, similarity, and graph-based systems have been developed. The trend today is to retrieve information via learning, and deep neural networks have become widely accepted because of their high retrieval performance. As a result, there are uncertainties in the similarity between the information due to its measurement procedures. The hybrid deep fuzzy hashing algorithm is developed to address these issues and to improve retrieval performance. Based on mapping correlated binary codes to similar information, hashing efficiently retrieves the necessary information from distributed cloud using deep neural networks and fuzzy logic. In comparison to other types of retrieval models, such as support vector machines and deep neural networks, the proposed model achieves better retrieval accuracy and accuracy.

Liu, Guomin Yang, and Xueqiao Liu [2] have proposed to support multi-keyword search in multiple user settings. Hiding search patterns and access patterns, and providing resistance to keyword guessing attacks (KGAs) are the toughest tasks. Under a multi-writer/multireader setting, distributed systems not only support multiple-keyword searches but also guarantee the privacy of the data and search pattern. Rather than relying on a single server to perform searches, our scheme deploys a multiple-server architecture, which allows only authorized servers to jointly test whether a search token matches a stored ciphertext, thus mitigating the risk of key leakage. Researchers JunjieXie, Chen Qian, Deke Guo, Xin Li, Ge-Wang, and Honghui Chen.[3] have proposed GRED, an efficient process for deploying and obtaining data for mobile edge computing that not only efficiently distributes load but also efficiently routes path lengths and sizes of forwarding tables. Utilizing programmable switches, GRED implements a one-hop DHT based on virtual space. Through analyses, simulations, and experiments, we have demonstrated that GRED is capable of efficiently handling edge cloud loads, while its low routing stretch makes it possible to answer data queries quickly.

By combining matrix factorization and singular value decomposition (SVD) based machine learning techniques, Kaoutar El Handri and AbdellahIdrissi [4] were able to create a sophisticated machine learning technique for multicriteria decision aiding and dominating queries. Additionally, a big data management environment is favourable when the resilient distributed dataset paradigm is applied to cloud computing. Detailed experimental results showed the new algorithm to have advantages over other Topk algorithms in terms of accuracy and scalability.

The authors Bernardo Ferreira, Bernardo Portela, Tiago Oliveira, Guilherme Borges, Henrique Domingos, and Joao Leit'ao [5], have proposed BISEN, a new provably-secure boolean-searchable scheme based on protected execution environments (IEEs) offered on Intel SGX. The BISEN scheme implements multiple users with highly expressive, arbitrarily complex queries, minimizing information leakages regarding queries and accessed data, and ensuring verifiable security against fully malicious attackers. Praveen Pathak [6], in the field of information retrieval (IR), three paradigms can be distinguished: Probabilistic IR, Knowledge-Based IR, and Artificial Intelligence-based techniques such as neural networks. This work looks at the possibility of using evolutionary algorithms like genetic algorithms (GA's) to adapt different matching functions. Only a few researchers have looked at this method. When these matching functions are used together in this way, retrieval performance should be superior to that of using just one matching function alone. A match function is composed of multiple indexing functions, and using the combined scores, a document can be ranked and retrieved.

The new algorithm offered by Shachen pang, SiboQlao 1, Tao Song 1,2, [7] in this work enables pedestrian retrieval to be expedited by applying it to the edge of the cloud infrastructure. When given a pair of input images, our network computes a similarity value that indicates whether the two images reveal the same individual. In addition to this, our technique has a residual model layer that contains an "identity block" and a

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"convolution block," which successfully capture the differences between the input images. We employ a global average pooling layer before a fully connected layer to further reduce the complexity and greatly reduce the retrieval time for individuals in edge computing.

Dezhong Yao. [8] A key element of mobile cloud computing success is the quality of the cloud service (QoS). Automatically identifying the appropriate cloud provider based on the mobile environment is known as context-awareness. Users may lose confidence in an application due to a lack of context information. In addition to testing the performance of each cloud provider, mobile devices should constantly be aware of the environment, which is inefficient and wastes energy. As a technology, crowdsourcing has a considerable role to play in the discovery and selection of cloud services based on group preference so that mobile users can discover services intelligently, efficiently, and reliably.

Maxime Augier and Hugues Mercier [9] proposed the STEP-archives as a new and realistic approach to data archival, in which an attacker who wants to censor or alter a single object would have to cause collateral damage on a large number of other objects. Data blocks are entangled using MDS erasure codes, which offer redundancy in the event of storage failures. The result is an archive with constant-time read-write operations. Display how the attacker can balance the complexity, irrecoverability, and collateral damage of an attack.

According to Marton Sipos, [10] although cloud-based storage systems provide reliability and flexibility, a single cloud provider can create a single point of failure that compromises data security, download speed, and availability. Using network coding as a key enabler technology, we advocate using multiple cloud storage providers at the same time to overcome these challenges. It is the goal of our study to study how network coding can overcome two challenges. In comparison to state-of-the-art, evaluations employing file changes on software library repositories reveal that a five-order-of-magnitude reduction in network and storage utilisation is possible.

Other sections of our paper are arranged as: Section III is the proposed system. Section IV is the experiment and result give the inference for this paper. Section V is conclusion and future works.

III. PROPOSED SYSTEM.

The projected methodology uses Deep Learning's Recurrent Neural Network (RNN) formula to access applicable files within the cloud. The subsequent steps demonstrate a way to retrieve information from the cloud. JSON is that format of the input data. The information within the JSON file has been Pre-processed. After the information has been entered into a fuzzy logic and regenerate to a numerical format. Data is trained in a recurrent neural network to form some machine understanding information that's saved in a very model file. User will enter input like sentences or words. Those user inputs enter into a trained model file. And fetch files from the cloud in order that they will be shown to the user. The flow of those steps has explained within the following fig. 2.

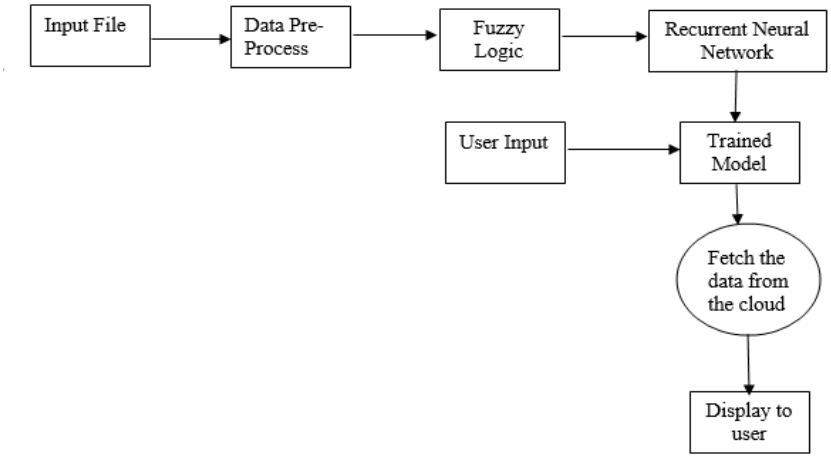

Fig.2. Flow Diagram for Information Retrieval.

A. RNN Algorithm.

Recurrent Neural Networksuse the output from preceding stages as input to their present stage. As inputs and outputs in traditional neural networks are independent, the previous words of a sentence must be remembered before predicting the next word. A Hidden Layer allowed RNN to overcome this issue. An RNN's most important and main feature is its hidden State, which recollects approximately data about the arrangement. Consider, for instance, an input layer, three hidden layers, and an output layer in a profounder network. For example, According to figure 3, these hidden layers are also connected to further neural networks. There are individual weights and biases for each hidden layer, for instance, the layers' weights and biases would be the first hidden layer is (w1, b1), the second is (w2, b2), and the third is (w3, b3). To each of these layers is free of the other thus, they are unable to recall earlier outputs.

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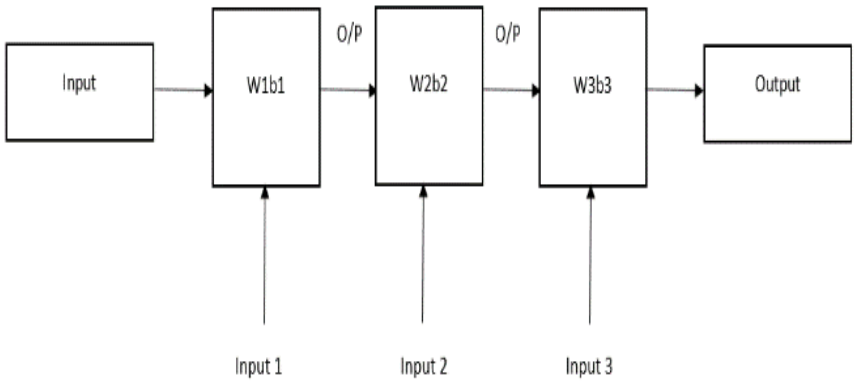

Fig.3. RNN Operation.

a. ***RNN-based training.***

- The input is provided to the network in a very single time step.
- Using the current input and its previous state, calculate the current state of the system.
- The current time becomes ht-1 for the next time step.
- According to the problem, one can go back as many time steps as necessary, and then join all the previously gathered data.
- Calculation of the output is based on the final current state after all time steps are completed.
- A comparison of the result with the particular result, that is, the target result, is then performed and also the error is generated.
- Back-propagating the error updates the weights of the network, therefore the coaching of the network (RNN).

B. Fuzzy Logic.

An example of fuzzy logic is fuzzy reasoning, which appears to be similar to what humans do. Fuzzy logic mimics how humans make decisions by including all possible possibilities between the digital value YES and the digital value NO. Assumptions are used to determine the output of fuzzy logics. There are sets used in it. The sets represent the possible states of each output according to some linguistic variables. Each possible state of the input as well as the degrees of change are a part of fuzzy logic. In figure 4, shows that the fuzzy logic how it works. It works on the principle of if-else-then, i.e. As long as A AND B, then Z. Face situations in real life where they cannot know whether a state is true or false. Their fuzzy logic offers quite a bit of flexibility for reasoning. This means that any circumstances can be considered even though they may be inaccurate and uncertain. A 1.0 means the truth is absolutely true, and a 0.0 means the truth is absolutely false. In a fuzzy system, however, there is no truth value and no false value. A semi-true value is also present, which is a partial truth and a partial false value.

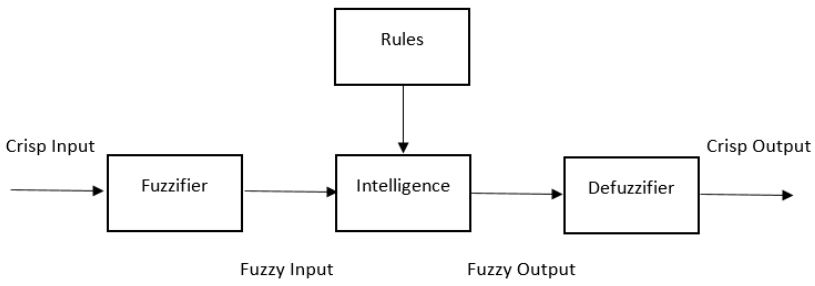

Fig.4. Fuzzy Logic.

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- Rule Base: Recent developments in fuzzy theory provide many effective ways for the planning and standardisation of fuzzy controllers supported the foundations and IF-THEN conditions that were provided by consultants to guide the decision-making method.
- Fuzzification Base: it's customary to convert inputs i.e., net numbers into fuzzy sets.

IV. EXPERIMENT AND RESULT.

The proposed enforced victimisation Python IDE 3.7.2 on Windows 10. The cloud will be accessed victimisation formal logic and RNN algorithms. Files are present in the firebase cloud storage, and those files are accessed through Python based on user input.

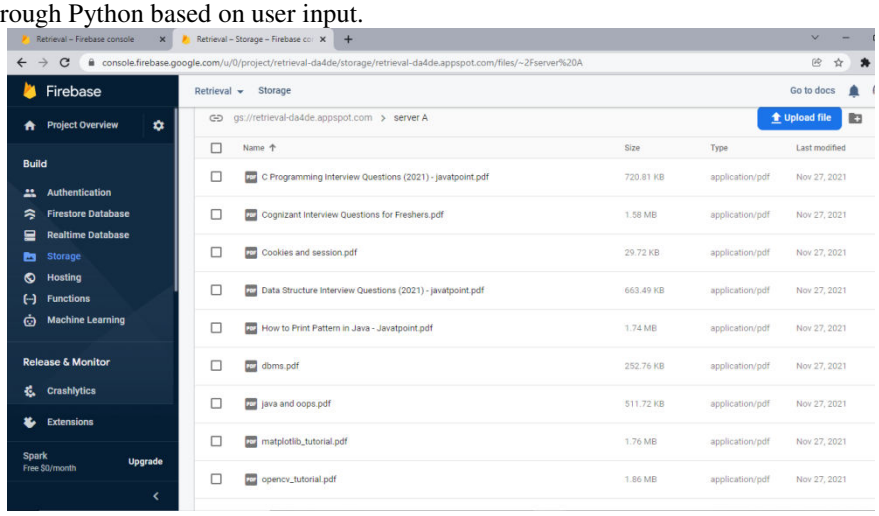

Fig.5.Pdf files stored in Firebase cloud.

In fig. 5, The files will be hold on in numerous folders in Firebase cloud storage, and the RNN algorithm shows the user the appropriate file based on the file type.

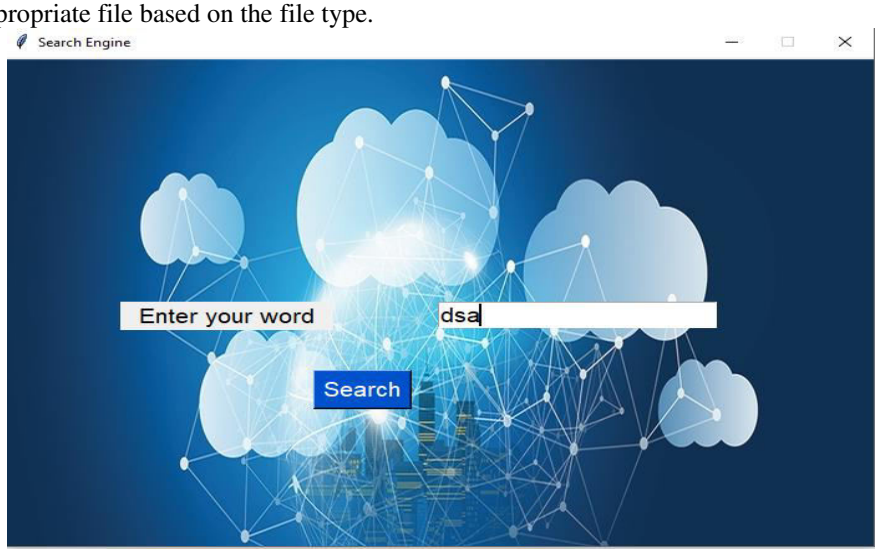

Fig.6.Search Engine for information retrieval system.

In figure 6, the user user will enter inputs like words or sentences. For example, a user can enter what is data structure algorithm or what is dsa, both of which are valid inputs to find relevant files.

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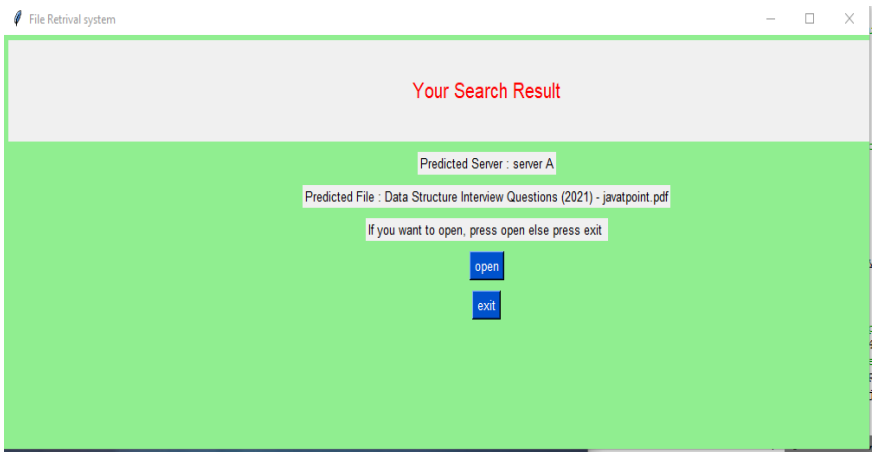

Fig.7.Search result.

As shown in figure 7, if a search result is found, a new window gets loaded. It gives some information about where the file is located. It also waits for the user to give permission to view the file. Click the open button to open the file.

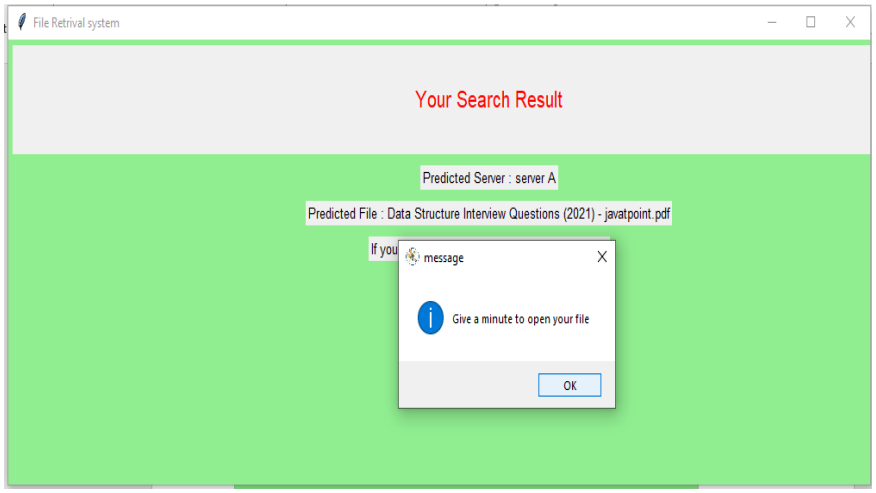

Fig.8.Confirmation message to user.

As shown in figure 8, the Dialog box determines if this is the file that the user needs.

Fig.9. File gets opened.

In figure 9, the user can view files retrieved by the relevant server via the browser.

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Fig.10.Training the data with help of RNN and Fuzzy logic.

As you can see in figure 10, the machine is being trained with the assistance of the RNN formula together with formal logic and additionally demonstrates the accuracy and loss of information.

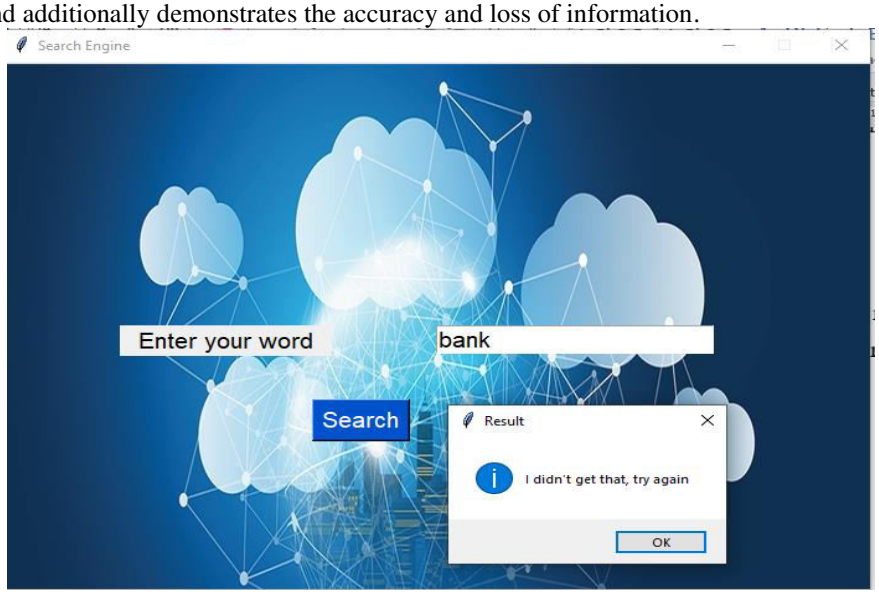

Fig.11.Presence of data in cloud.

In figure 11 illustrates whether the user entered input-related files exist or not.

Accuracy, Loss, and E-Poch are the metrics used to evaluate the proposed model for classification and retrieval. A comparison between deep neural network model, and hybrid deep fuzzy hashing algorithms is conducted to assess the efficiency of the proposed model. The performance of the proposed model is presented in Table 1. When compared to a deep neural network-based information retrieval system, the hybrid deep fuzzy hashing algorithm performs better, achieving an average score that is 3% lower than the proposed model.

Comparison of model performance in Table 1

Parameter	Deep Neural Network Based Information Retrieval System (%)	A Hybrid Deep Fuzzy Hashing Algorithm (%)	Performance Analysis of Recurrent Neural Network and Fuzzy Logic Algorithms in Cloud Information Retrieval System (%)
Accuracy	94	96	99
Loss	6	4	1
E-Poch	350 Times	300 Times	200 Times

V. CONCLUSION AND FUTURE WORK.

With the growth of the IT sector, everything is becoming digital today. The digital world is based on data, and this data is stored in the cloud to reduce physical storage requirements. Thus, it is combined with the RNN algorithm of deep learning and fuzzy logic in order to efficiently store data for retrieval in the future. When compared to other algorithms, RNN uses sequential data characteristics and patterns to achieve output.

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Furthermore, this RNN has been used in conjunction with fuzzy logic, which is nothing more than a computing approach based on degrees of truth. In this combined model, data is prepared so that it can be retrieved from the cloud easily and efficiently. In this project, data could be retrieved from a small cloud via the proposed system. As a next step, the project will be implemented for a large amount of data and the retrieval efficiency will be analyzed.

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