ANALYSIS OF THE BEST FIT PRE-TRAIN DEEP LEARNING MODEL (DLMS) THAT CAN INTEGRATE BLOCKCHAIN TECHNOLOGY IN THE HEALTH SECTORS USING NATURAL LANGUAGE PROCESSING (NLP) AS THE MAIN SOURCE OF DATA CLUSTERING

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Abstract

Blockchain technology is a secure digital platform that allows the creation, sharing, and storing of innovative solutions for various datasets within sectors including healthcare. Blockchain technology can be used in the healthcare sector to securely manage and exchange laboratory diagnoses. Advance developments in technology have pushed healthcare sectors into remote care and management systems. Until today, there's no concise and preferred system globally accepted by health sectors due to the unavailable remote systems, and skepticism amongst customers and patients concerning remote healthcare monitoring and surgeries. This paper aims to introduce a pre-train prototype deep learning model (DLMs) based on blockchain technology using natural language processing (NLP) as the main source of data from healthcare. Text content related to healthcare issues was classified into various language structures. A systematic influence of blockchain technology was calculated based on the dataset cluster. The sample texts represent NLP classified into input layers, hidden layers, and output layers of DLMs. The parts of speech used in the study help to explain a possible system integration of Blockchain technology with deep learning based on clustering algorithm pre-determined features of blockchain technology. A "behavior-oriented driven and influential functions" of blockchain was used to measure the influence on healthcare applied NLP. On a scale 1-5 grade, 3.88 was recorded as a predetermine value of blockchain on healthcare applied NLP.

Keywords: Deep leaning models, Natural language processing, Data clustering, Blockchain

JEL Classification: C8

1. Introduction

Blockchain technology is moving away from just being a cryptocurrency platform into a smart contract system, healthcare preferred embodiment center for proper delivery and

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safeguarding of customer's data. Blockchain allows users to store, verify, execute and share codes on a blockchain [1],[2],[3],[4],[5],[6],[7],[8]. Natural language processing (NLP) is system software that enables interactions between humans and computers using text or speech [9],[10],[11],[12]. Deep learning models (DLMs) is computer systems of artificial intelligence that build frames using texts, figure, pictures, and objects to represent human thoughts called neurons [13],[14],[15],[16]. Healthcare Blockchain is the future foundation of hope, maturity, security, reliability, transparency, innovativeness, and growth in healthcare systems [17],[18],[19]. Communications within systems administration are in healthcare or financial are very secure with end-end access to Blockchain technology. Natural language processing with the capability to transform linguistics appraisal into human computers with the support of artificial intelligence can be much more secure with Blockchain technology.

In today's world, cyber-attacks are forcing millions to turn their backs on social media platforms that could be much-more friendly. To give hope to most users, it's really necessary to implement Blockchain technology within social media platforms. Research shows social media platforms play a leading role in the minds of users [21],[22],[20]. The increase in privacy breaches, system hackers, and extensive volume of data within healthcare have necessitated the need for Blockchain technology as one of the most secure and fastest platforms. Securing the platforms enable a balanced society with fewer psychological associated challenges for healthcare providers [23]. Research has indicated that most rich people are less engaged on social media platforms due to their insecure nature [31],[32],[33]. The insecurity within healthcare sectors enables a platform flooded by youths and less of the aging population [25]. To fully engage the whole world at large, there's a need for a secure chain to prevent counterfeiting information and Communication attacks [24]. It is also alert that most entertainment services are moving to most of these social media platforms [27],[28],[29],[30],[26]. There's a need for a speedy system and secure platforms that will engage both the young and aging population. This can be only achieved with the help of Blockchain technology that enables a secure digital platform and market where privacy breaches are less often. Two types of Blockchain exist: Public Blockchain technology and Private Blockchain technology.

2. Related Work

Blockchain technology applications allow the recording of sensitive information relating to medical records, legal contracts, educational institutions, and other industries. The state of the art introduced here is to help healthcare providers easily make decisions based on text guarder from patients or customers. The public blockchain is an open access chain that does not require any special kind of authorization to join. The general public is allowed to participate without authorization because it is of a decentralized nature and is not controlled by anyone [51],[52]. The public blockchain allows all branches of the chain to be created and validate data for data storage and sharing and it's well encrypted.

The private blockchain is a type of blockchain that allows only one organization to have access to the entire network [53],[54]. This type of Blockchain is very important to the healthcare industry. The private Blockchain is the opposite of a public blockchain because it's not an open network to which anybody has access. The private blockchain is the best solution for organizations. Data is accessible to whom can be trusted with it. One of the

reasons blockchain is so popular is because Blockchain technology provides a safe means for individuals and enterprises to interact with one another without involving third parties. Blockchain technology is a type of database that keeps information in a systematic platform making it easier for users to access. Blockchain technology's main challenge despite some communities pushing for standards and collaboration delay and forces holding the technology back from mainstream global adoption.

Three types of deep learning models recognize as important elements of Deep learning that can adopt Blockchain technology. Recurrent neural networks (RNNs), Classic neural networks and Convolutional neural networks (CNN).

Recurrent neural networks (RNNs). It is a type of neural network that applied an artificial neural network system used in speech recognition and natural language processing [46],[47],[48]. The study uses recurrent neural networks in this study to identify the need for data security, faster acquisition of patient information by healthcare, and encrypted dataset systems incorporation into the healthcare industry. Blockchain technology in artificial neural networks can be created by interconnecting data processing components closely designed to respond to all parts of speech tied to function like the human brain. Classic neural networks or Multilayer perception supervised deep learning Model. It is a type of feedforward Artificial Neural Network that has a training purpose as the technique used to supervise learning known as backpropagation [49]. Convolutional neural networks (CNN). It is an exhibited superior performing type of classification and prediction tasks with a low interpretability level. It is an operation where one function modifies the shape of another [50].

Blockchain systems boost performance, transparency, and security in the exchange and sharing of medical reports and results. Blockchain systems also prevent the fabrication and duplication of medical results. Blockchain systems have a centralized ledger and public ledger that help record, and secure information and prevent unevenly sharing and republicans of medical results. Unlike other applications where they are stored in a dataset, Blockchain systems are stored within networks. Meaning information within Blockchain systems is very secure with end-end access only to those with access. Information retrieval has remained a top challenge within healthcare. The development of natural language processing is to cope with the duplication of data. Blockchain technology helps in retrieving data in crowded databases. Health care systems can benefit from Blockchain in that, it helps create a secure medical buffet zone for medical reports and results. With Blockchain, medical records will enjoy a series of confidentiality benefits of fast updating patient data across multiple entities in no time. One of the most challenging situations within healthcare today is the availability of false content. The world is growing with the increasing quantity of information. There's a need for a secure system that can help process information faster.

Blockchain system technology has its fundamental quality to improve the distributed network of telecommunication of the modern world by computing applications like NLP which allows storing transaction history through text and documenting in the time stamping. Blockchain systems have nodes. Within each Blockchain node in the distribution network processes lies a secure verification ledger that helps record each data input.

Advancing mental safety and positive perception. Within healthcare, it is very important for a patient's psychology. Blockchain technology within healthcare sectors increases overall safety in the health treatment of patients. The mental health of an establishment has

a very great role to play in healthcare in addressing medication validity and drug traceability issues. Good healthcare with a safe environment attracts good and professional workers. The technology behind Blockchain isn't all about financial security and systems security but it also enables fast data acquisition of patients. Any system software that allows for safe interoperability is very important for humanity. The Blockchain technology helps prevent counterfeiting of drugs and manufacturing by bringing real drugs data into the market faster through its security system which is better than dataset systems

Blockchain provides the fastest data transformation in a timely and less costly road. These factors alone secure a well-defined system to handle the lump sum data available within healthcare sectors. Today, most companies are spending money to buy 5G services that can help analyze data generated within their various systems. Blockchain technology helps in mobilizing innovative new, creative, industrialized, and synchronized initiatives that provide a secure means for health practitioners to obtain information and apply it. Blockchain reduces redundant expenses and enables the flow of correct health records [43],[44],[45]. Since Blockchain systems are securely built, they help the system avoid duplicated information. In many instances, due to large datasets and pressure from patients, many mistakes usually occur. Blockchain technology consists of blocks, data, nonce, and hash.

- **Blocks**: They are made up of many blocks where each block has three basic elements which are data

- **Data.** This can be text or symbols or figures.

- **Nonce**. This is a 32-bit whole number. It generates randomly in a block and also causes the generation of block header

- **Hash.** This is a 256-bit number that is very small and is connected to the nonce.

When a chain a block is created nonce generates a hash which is assigned and tied with the data in the block. Mining of the data from the block makes the nonce and hash be untied with the data. The ability for systems to leverage the energy within artificial intelligence (AI) and natural language processing (NLP) to simplify decision-making for their users and subscribers lies within Blockchain technology. Natural language processing, a system that summarizes textual content in a much easier form is very important for healthcare providers. Blockchain and NLP ensure a lot of trust and confidence in healthcare when it comes to the need for trusted and tamper-proof usable insights. Blockchain systems incorporated with natural language processing will provide a friendly ecosystem environment which will go a long way to enacting a healthy environment.

Advantages of Blockchain for healthcare

- Secure data across blocks

- Cross-border data transfer

- Real-time operating system

- The Supply system constantly monitor

- Encrypted dataset exchange

- Personal identity security

Blockchain technology helps to store accurate data that cannot be altered and is permanent while Machine learning can utilize this data to discover patterns, give accurate predictions and notify the users.

3. Results

In this section, we provide details on how text or speech content can be classified into different parts of the speech based on data obtained via NLP means that help in decision making. Data clustering here helps health practitioners to make proper decisions.

We called this behavior-oriented drive and influential functions. Based on some selective ratings, we offer each a score of one up to five ratings. The rating is based on the author's choice. The Key Benefits are based on the Metrics Score range obtained from the text content. The key benefits score rate is classified into poor, fair, good, very good, and excellent. The behavior score defined the gradient of the key benefits from the summation statistic retrieve from cluster data.

In this study push, factors of blockchain are characteristic of blockchain technology that influences the health sector to obtain vital information from patients or customers to achieve better management. The push factors of blockchain provide healthcare sectors with solutions to enhance and produce good services to customers or users in their daily activities. This Push factors of blockchain will depend on some unique items referred to in this study as dependent parameters. In the study, dependent parameters are (Enabling business activities more efficient, enabling social reasoning more effective, and enabling education in a most reliable, informed, and accessible). The metrics range is made up of MR of *(nouns, adjectives, verbs, adverbs, interjections, prepositions, conjunctions, pronouns, determiners, and numerals) and MR^s Is made up of (nouns, adjectives, verbs, adverbs, interjections, numerals, and prepositions)* measure with a sequence of numbers from (1, 2, 3, 4, 5) that help extract vital information within a speech. The Behavior Score is a unique level determined in the Metrics Range and is made up of words in a sentence classified into parts of speech. Multiple words representing a single part of speech is allowed for each Metrics Range, but one same sentence cannot represent two different parts of speech. The Benefits score rate is a grade allocated for each result defined as a behavior score**.** The answer from every summation will determine the key benefit score.

Formulae

The influence is symbolized as BIF = F(D) which is said "f of d" equal to. $Eq = \int(D)\, {}^{MR^S}_{\sum MR} \times BS$ MR are related such that for every MR, there is a unique part of the speech of MR. That is, F(D) cannot have more than one value for the same d in MR. MR is up of (nouns, adjectives, verbs, adverbs, interjections, prepositions, conjunctions, pronouns, determiners, and numerals). Is made up of (nouns, adjectives, verbs, adverbs, interjections, numerals, and prepositions) The said theory used function related in an element d as defined by MR to an influence F(D) to determine the influence behavior score.

BIF=Behavior oriented drive and influential function

F=push factors of Blockchain

D=Dependent parameters

MR=Metrics Range

MR^S*= Metrics Range Substitute*

BS=Behavior Score

KBS=key benefits score

$$Eq = \int (D)_{\sum MR}^{MR^S} \times BS$$

Metrics Range	Nouns	Adjectives	Adverbs	Verbs	Prepositions	Pronouns	Conjunctions	Interjections	Determiners	Numerals
Metrics Range Substitute	Nouns	Adjectives	Adverbs	Verbs	Prepositions	Interjections	Numerals			

Table 1. Metric range. Source: Owner

Table 1 above represents elements of the part of speech that the study uses to evaluate the influence of blockchain technology application with a deep learning model using natural language processing. The classification is following the English language standard.

Table 1 above also represents substituted elements of the part of speech that the study uses to evaluate the influence of blockchain technology application with a deep learning model using natural language processing. This selection is based on its close look as compared to others that directly explain human situations, actions, and express feelings. The classification is per the English language standard.

key benefits score grades	Poor	Fair	Good	Very good	Excellent
Behavior Score	1	2	3	4	5

Table 2. Key benefits score rate. Source: Owner

Table 2 represent arrange of selected score that the study uses to measure the level of influence of blockchain on applied deep learning model using natural language processing. The score grade is determined after each summation and data clustering. The answer obtains from the solution after clustering determines each of the score grades above.

Push Factors of Blockchain	Dependent Parameter
Consensus for decision making	Enabling business activities more efficient
	Enabling social reasoning more effective
	Enabling education in a most reliable, inform and accessibility.
Security & Unanimity	Enabling business activities more efficient
	Enabling social reasoning more effective
	Enabling education in a most reliable, inform and accessibility.
Encrypted dataset exchange	Enabling business activities more efficient
	Enabling social reasoning more effective
	Enabling education in a most reliable, inform and accessibility.
Faster data integration & analysis	Enabling business activities more efficient
	Enabling social reasoning more effective
	Enabling education in a most reliable, inform and accessibility.
Faster data acquisition and ease in settlements	Enabling business activities more efficient
	Enabling social reasoning more effective
	Enabling education in a most reliable, inform and accessibility.

Table 3. Behavior oriented drive and influential function of Blockchain on healthcare.
Source: Owner

Table 3 above represents the characteristics of blockchain that push healthcare services and centers willing to accept blockchain technology. According to the study each factor is measured with a specific list of determiners. The determiners are areas of interest on the side of healthcare unites that depend on the characteristics of blockchain refer to in this study as push factors of blockchain.

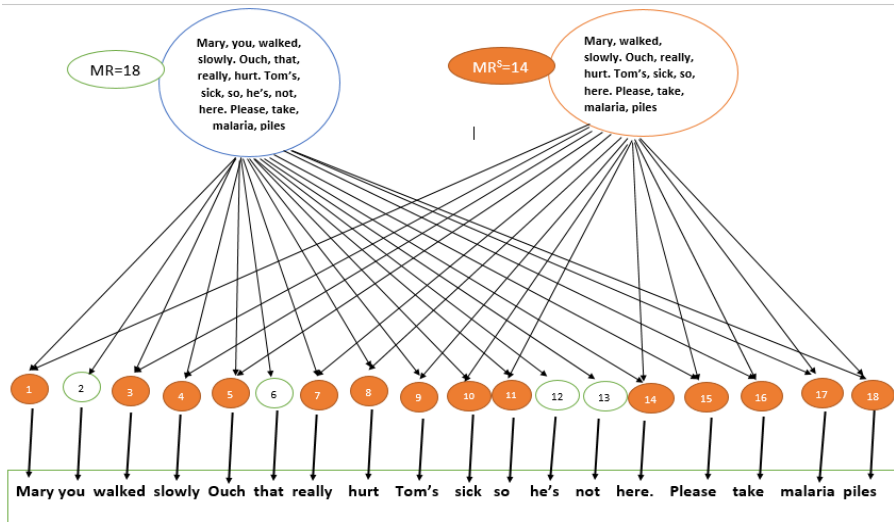***Determination of Behavior oriented drive and influential function of Blockchain on healthcare***

Figure 1. metric range and metric range substitute. Source: Owner

Above figure 1, provide data classified into different groups. The group mark with red is metric range substitute while the whole list both in red and while blocks is metric range. To obtain influence rate, metric range substitute is divided by sum of metric range then multiple by behavior score. The text annotation in red consists of matric range substitute while white consist of metric range. *MR =18 and MR^S=14*

BIF=Behavior oriented drive and influential function

F=push factors of Blockchain

D=Dependent parameters

MR=Metrics Range

MR^S= Metrics Range Substitute

BS=Behavior Score

KBS=key benefits score

$Eq = \int(D) \, {}^{MR^S}_{\Sigma MR} \times BS$

$====)))) \int(D) = \frac{14}{18} \times 5$

$====))) \underline{\int(D) = 3.88}$

The statistics above detailed how relevant blockchain technology is to the healthcare. From the statistics we can say that the influence score is grade "Good" as per classification. The

score 3.88 is the influential function determining the need and desire of blockchain technology in this study as determine by the classification according to the author.

4. Method and Discussion

The increased demand for computing power from the business world, pharmacological entities, agricultural industries, and scientific communities to classify huge applications and process huge data is on the rise. One of the biggest challenges in achieving this is the time constraint [37],[38],[39]. Present-day applications take a lot of time to process the available data. Sometimes it goes for days and weeks to provide the much-needed data to reach a decision. The pharmaceutical industry, agricultural industries, educational institutions, and business processes require to be completed at a significantly fastest time scale than before.

The Blockchain distributed ledger for data clustering underlines the need and reason to achieve real-time execution of tasks and overcome the lag caused by the delay in integrating such a technology [40],[41],[42]. Incentivizing resource sharing is one of the centralized model's reasons to adopt Blockchain technology to help keep the information era secure and safe from fraudulent activity and hackers. The need for data security and fast transactions necessitated the coming to life of this article. To better understand how important Blockchain technology is to healthcare, the following figures below explore the areas, methods of implementation, and stages required to achieve Blockchain technology in deep learning models using natural language processing as a source of data.

4.1 Stages of data clustering

Blockchain technology layers focus on what they can do individually and that gives provable large-scale storage with long track records and good accountability and transaction support. The study lays out the following stages to properly develop and adopt Blockchain technology in deep learning models using a natural language processing approach.

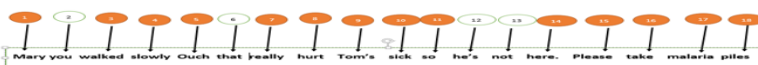Figure 2a General identification of parts of speech

Figure 2b Classification into metric range substitute (MR^S) and metric range (MR)
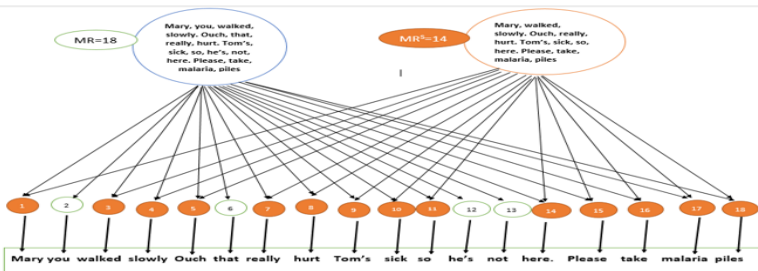
Figure 2c Metric range and Metric range Substitute Data Cluster

Figure 2a represents how data should be first of all identified according to the parts of speech then label according to sentence flow. Figure 2a indicated a sentence made up of 18 words. The 18 words each belong to a part of speech. The following texts are classified following Standard English language parts of speech. The general identifications of parts of speech are according to the author's view and knowledge of the English language. The study however understands that the English language is broad and also different languages have their standard structures.

Figure 2b represents the classification into metric range and metric range substitutes. The metric range according to the study is made up of all the parts of speech. Both the words Mark with red and white are of metric range. Metric range substitutes are selected parts of speech. The author observed that the parts of speech recognize in the study as metric range substitutes are closely related to human aspects of life that can help others easily feel the pain or happiness other people go through Just by observing their text.

Figure 2c represents the metric range and metric range substitutes after classification referred to in this paper data cluster. Figure 2c presents a total of 18 parts of speech in total. The 18 parts of speech. On the other hand, metric range substitutes consist of 14 parts of speech. The total parts of speech allocated to metric range substitutes. Figure 2a, 2b, and 2c present the invention of the modern start of arts in data clustering that follows strict rules of Blockchain technology. Blockchain technology characteristics are very exciting and present a very secure system that is difficult to break through. The author exploited this system and introduced deep learning models.
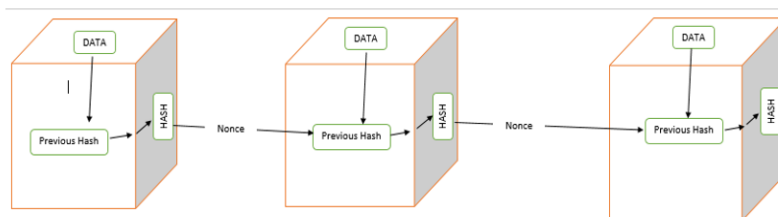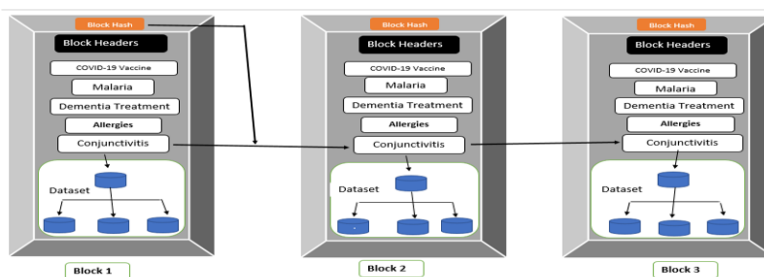

Figure 3a Blockchain technology

Figure 3b Blockchain technology

Figure 3a presents elements that make up a Blockchain technological system. The elements that make up the Blockchain technology are Data, mining, Data. It is the type of information stored in a Blockchain system. The type of data stored in a block is different based on the

blockchain type and purpose. All data registered in a Blockchain consist of the sender, receiver, and transaction amount. Mining. The systematic process of adding blocks to the blockchain. Hash. A hash is the fingerprint structure of a Blockchain that identifies, records, and stores a unique level of data belonging to a unique user. Whenever a block is created a hash is computed. Whenever something changes within the block, the hash will change as well. That is why hashing helps in detecting changes in a blockchain.

Previous hash. A previous hash block is the first piece in a blockchain. The hash of a preceding block helps in the creation of chains. As a result, chains in a blockchain are extremely secure to trust and use.

Figure 3b presents a Blockchain technology system where information is stored in a Blockchain. The information contained type, sender, receiver, and network. Figure 3b presents a perfect distribution within 3 blocks used block chain named conjunctivitis. The flow within the Blockchain from block 1 through block 2 to block 3, maintains the Blockchain identity called conjunctivitis.
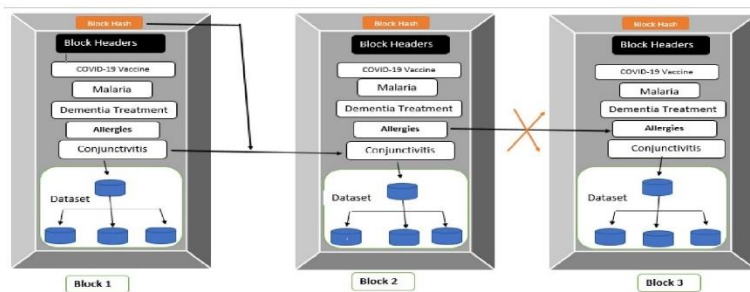

Figure 4a Blockchain technology rules of block change applied in deep learning model of hidden layers
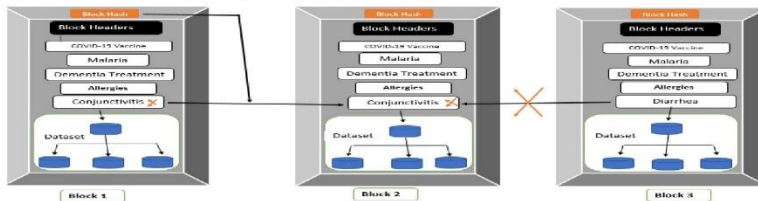

Figure 4b Blockchain technology rule of Data change applied in deep learning model of hidden layers
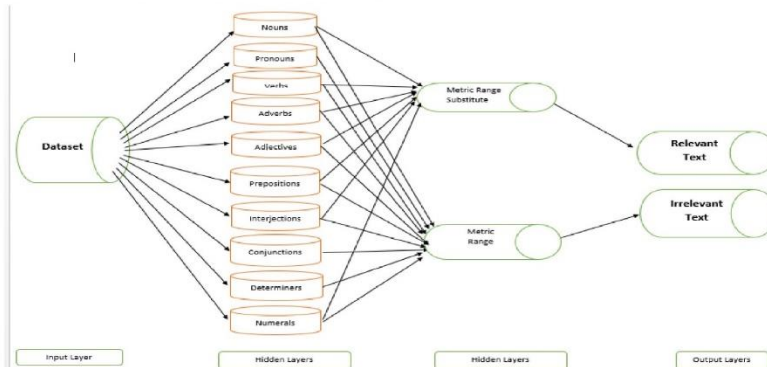

Figure 4c Blockchain technology rule and deep learning model of Recurrent Neural Network Data Classification

Figure 4a Blockchain technology rules of block change applies in deep learning models of hidden layers. Figure 4a explains that blockchain is a system that provides a powerful method of storing data in such a way that it is difficult and impossible to edit, hack, or trick the system. Blockchain system technology is essential for modern-day digital ledgers for transactions that can be copied and distributed across the blockchain's wide network of computer systems. Figure 4a presents a Blockchain where data is distributed to three blocks. From block 1 to block 2, the data was very fine until in block 3 when the direction of information changed. From figure 4a we can see a rejection that shows a well-defined system that can't be tampered with.

Figure 4b presents a similar situation where data has been changed in one of the blocks. From block 1 to block 2 and a reverse action is observed in block 3 as data is altered. Figure 4a presents a situation where the network line changes in block 3 and the whole system was disrupted. From block 1 Nonce was in conjunctivitis to block 2 and in block 3 it changes to allergies and the system Blockchain technology was rejected.

Figure 4b, if any further action is needed there must be changes made in block 1 and block 2 to reflect the changes in block 3. Figure 4b shows a change of data name conjunctivitis in block 3 to diarrhea. To ensure a smooth system flow, changes are required to start from block 1 through block 2 to reflect the changes in block 3.

Figure 4c presents Blockchain technology rules application in the deep learning model of recurrent neural networks data classification. Figure 4c presents the input layer, hidden layers, and output layer skeleton of a deep learning model that will classify data strictly based on 10 parts of speech. The 10 parts of speech are divided into matric range and metric range substitutes.
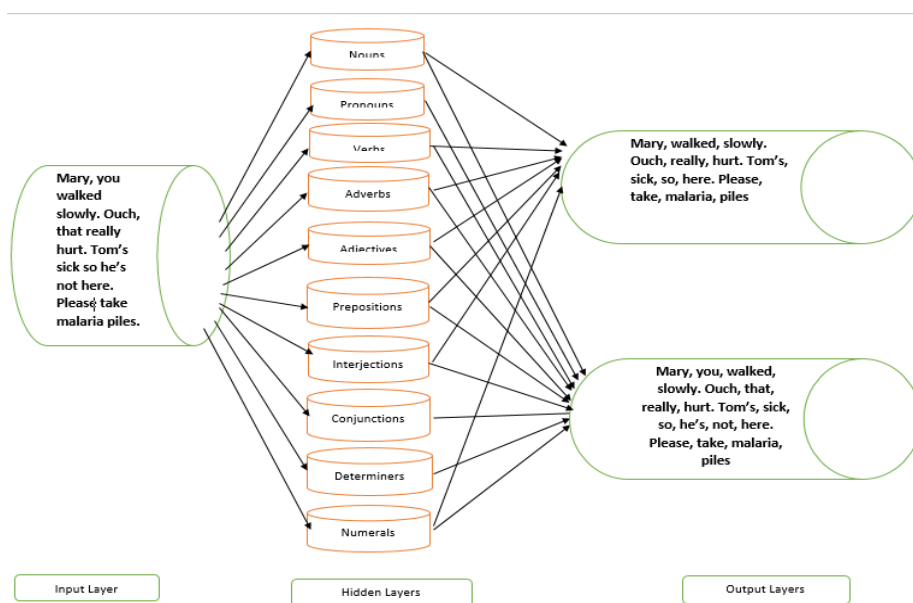

Figure 5 metric range and metric range substitutes adopted Blockchain into recurrent neural networks data classification. The figure is based on the principle of immutable and

distributed fundamentals of blockchain technology properties. The principles of the immutability of the ledger mean you can always trust it to be accurate. Once distributed protects the blockchain from the network. The modern virtual documentary system requires a system of Blockchain technology for a secure free environment. Figure 5 indicates that the transactions recorded on the Blockchain ledger are stored in a block. The information contained in a block of a Blockchain is dependent on a link to the information in a previous block and over some time forms a chain of transactions. Unlike spoken words, they depend on various parts of speech. There's no way a text can be out of the scope of language structure. If such a situation occurred, then a new dictionary of the English language is required.

The use of a peer-to-peer distributed network by Blockchain system directly reflects a neural networks system used in deep learning models [34],[35],[36]. The use of neural networks in deep learning models ensures the decentralized nature of the technology, unlike Blockchain systems technology. We all know that every device that connects to the network is considered a node. In Blockchain technology there exist nodes unlike in deep learning models. The difference is that in the deep learning model nodes represent the human brain while in Blockchain nodes represent data network systems. That is why this study exploited the advantage to introduce text data clustering to ensure smooth data acquisition and retention for decision making.

5. Conclusion

Blockchain technology is a secure digital platform that will enable the creation, sharing, and storing of innovative solutions for various datasets within sectors including healthcare. Blockchain technology will be used in the healthcare sector to securely manage and exchange laboratory diagnoses. Advance developments in technology have pushed health sectors into remote care and management systems is indeed a positive push for the modern society. Three deep leaning models show excellent integration with blockchain technology. The best fit deep learning model that matches blockchain technology according to the study is recurrent neural network model of deep learning.

To safeguard the much-needed issues related to data access and safekeeping, we need to apply blockchain technology in healthcare. Security concerns about data safety for transactions in healthcare system are much safer with blockchain technology. Blockchain system architects has the potential to improve and advanced security in healthcare through remote patient monitoring using system automated delivery with encrypted end-to-end data exchange. The art of clustering introduce in this study indicates that healthcare sectors can do better and delivery fast results ever to patients. Blockchain technology is not just fast but it very secure.

Declaration Conflict of Interest

We certify that we have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials

discussed in this manuscript. We have no financial or proprietary interests in any material discussed in this article.

Declaration of material used

All data underlying the results are available as part of the article and no additional source data are required or reserved somewhere.

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