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A Two-Fold Approach to Tackle Fake News

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Abstract: ***With the revolution and growth of the media industry, and development of new mediums to update citizens with the latest news, in recent years there has been a spurt in the production of articles spreading fake information. Many media channels leverage on the concept of spreading eye-catching malicious news that attracts readers which has been proven to be quite dangerous in most cases. These channels post an exaggerated version of the truth, thus leading to an emerging trend of spreading fake news. To tackle this problem, we propose a two-step solution involving machine learning and block chain. The proposed solution consists of a news verification portal using a two- fold approach, which first detects whether the news article is fake or real leveraging the accuracy of a machine learning algorithm and then verifies the source using human crowd auditors on a block chain platform based on proof-of-stake.***

Keywords: Fake news, blockchain, machine learning, proof-of-stake, deep learning

I. INTRODUCTION

In today's age, one does not have the correct tools to check an article's authenticity and moreover one does not have the time to process such a tedious task. Digital content in the form of images, videos or posts is being created and published at large scales today. Everyone has free access to create and share information on various social media platforms like Facebook, Instagram and other digital platforms, further adding to the problem of the ever-increasing production of fake news articles [3]. With advances in the field of artificial intelligence, the line between fake and authentic content has blurred to a great extent. Information spreads at an extremely fast pace and it has the potential to cause a great impact (positive or negative) on people and real-world events within minutes. Since one does not have time to check the authenticity of messages or videos forwarded on platforms like WhatsApp, many citizens fall prey to the trap of fake news. This piece of news that does not hold authentic information can lead to the manifestation of harm to the society; for instance, it can tarnish an individual's image, can give rise to potential political tensions in certain areas around the world and so on. Therefore, it is important to tackle this urgent issue and to reach out the authenticity of the information, where it has come from and who created it. Machine learning models trained on previous fake data can be used to predict the authenticity of news along with the publisher's history to promote verified news sources [4][5]. With traceable and transparent nature of the block chain, it is possible to verify the authenticity of the information or its sources and build trustable news content displayed on the Internet. Blockchain has the ability to revolutionize the online news industry enabling the content to be produced and distributed over the internet in an immutable and secure way. Due to traceability, transparency and decentralization nature of the blockchain, the problem of fake news can be handled effectively. Blockchain enabled platforms can provide online readers with a reliable way of verifying the content and its source [6] [7].

II. LITERATURE SURVEY

There are common characteristics observed in fake news. There is similarity with spam messages, emails and other kinds of spam content. The similarity as observed are: grammatical mistakes, attempting to affect the reader's opinion on a particular topic and trying to manipulate the reader. This spam content and articles use a similar limited set of words which help in identifying the fakeness. A simple algorithm like Naive Bayes can predict the fakeness of Facebook posts with an accuracy of 75.4% [1]. When predicting fakeness based on title and body of a new article, it is observed that the body is able to predict the fakeness of the article with a much higher accuracy. Testing for the body and the title leads to the best accuracy with simple algorithms like Naïve Bayes, Simple Vector Machine and a simple logistic regression. With smaller training data, neural networks are not very effective. However, with a large dataset, neural networks outperform simpler machine learning algorithms [2]. Algorithms can be improved by doing more data pre-processing like removing stop words, stemming of words, using combinations of words rather than a single word. In a proof-of-stake blockchain, the participants called validators who are responsible for the creation of new blocks. Validators are chosen in a round-robin manner to become the proposer who is in charge of creating and proposing a block for the current round. They are required to post a bond transaction that will lock a set amount of his coins (stakes) for a set duration. If the validator is found to be involved in any malicious activity, he/she can be punished by slashing away his/her deposited stake. After this duration, stakes are unlocked and returned to the validator. A similar implementation of proof-of-stake consensus protocol can be useful for verifying news source.[3]

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III. PROPOSED ARCHITECTURE

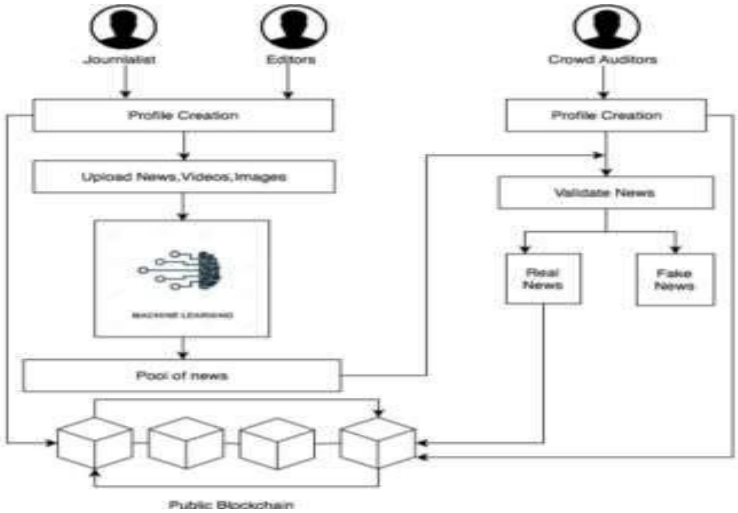


Fig. 1 System Architecture

The Fig 1. above shows the basic architecture for the proposed system. Based on the extensive research and literature survey that was conducted related to detection and generation of fake news, we propose a two-fold solution based on an approach related to machine learning algorithms and blockchain technology. The proposed system is a web portal which will be accessible to three types of users: readers, journalists and crowd auditors; to browse verified and authentic news articles and rate the same. Rating of articles leads to implementation of the credibility feature. Editors/Journalists will be able to submit their work; the system will run a machine learning algorithm based on certain parameters to detect the authenticity of the article. If the article proves to be one with real content and passes the accuracy required to be touted as an article with authenticate content and not fake news, then this article will be pushed to be available in the pool of articles for crowd auditors who hold a certain amount of stake in the system. Crowd auditors take part in the implementation of proof of stake consensus of blockchain. A crowd auditor will be allocated an article based on his/her stake and will proceed to verify an article from the pool of articles, and validate parameters like source of article, verified writer etc. and create a block for the article. On receiving a distributed consensus from the other crowd auditors, the block will be a validated block and will be added to the blockchain; available as an article to be read by users of the portal. The block will contain all the details required to check the authenticity, validity and other parameters related to the article. Editors and crowd auditors whose articles will be validated will earn system rewards. All validated articles published on blockchain based portal will make articles immutable and also eliminate generation of fake articles.

IV. MODULES

The proposed solution consists of three main modules: the machine learning algorithm which mainly detects the sentiment in the news article, the blockchain to keep a track of new articles and selecting a crowd auditor, the web portal for interaction among various users.

A. Machine Learning Algorithm

The input for this module is the news article uploaded by the journalist. The journalist uploads the headline, body of the news article along with an image and news sources. The machine learning module works only on the title and body. The text data is first converted into a vector of 300 values using the pre-trained google word2vec vectorization. Google word2vec gives an array of 300 numbers of every word. To utilize this technique for entire sentences and paragraphs, the mean value is taken for all the words in the text. This process is followed for the title as well as the body of the news article. Once the vectorization is complete, the vectors are passed onto two individual pre-trained Keras models. One model is used for the title and one model for the body. If anyone of the models detects the article as fake, the article is considered fake and not allowed to go to the auditing stage. Both models have been trained separately on a labeled dataset consisting of 28,711 news articles. The models consist of 5 layers which include 4 hidden layers and 1 output layer. Relu activation function is used for the 4 hidden layers. The hidden layers consist of 500, 400, 300 and 100 units respectively. The final output layer consists of 1 unit and uses a sigmoid activation function. Articles were trained for 90 epochs using a batch size of 10.

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B. Blockchain

Once the news article has been verified by the machine learning algorithm, it is passed on to the next stage. All the crowd auditors in the blockchain have an amount of stake [5]. A weighted randomizer is used to select an auditor for testing of the article based on the proof-of-stake algorithm. The journalist in no way can influence the auditor selected. The auditor selected is valid only for a selected time, in this case: 8hrs. During this period, the auditor has to review the submitted article and decide to approve or decline it. The auditor's main job is to verify the facts of the article. He/ She has access to the news source which has been uploaded by the journalist. After the article has been approved by the crowd auditor, a block has to be created. Once the block is created, it is sent to other users of the blockchain to verify its integrity. After receiving a consensus from other blockchain users, the block is added to the blockchain. The blockchain allows transparency of news articles and makes the articles tamper-proof.

C. Web Portal

The web portal can be accessed by three entities namely a crowd auditor, a journalist and a reader each having their separate logins. The journalists are permitted to upload their articles. The crowd auditor is allowed to approve or decline an article through the portal. A separate page for editing stake is available to the auditor. The reader can read the article after final verification. The reader is also given an option to like, rate and comment on the articles making the portal interactive. The portal also has a function of featuring the top-rated articles and top-rated journalists. The journalist's dashboard allows him/ her to view relevant statistics such as views, ratings and comments with respect to each individual article.

V. OUTCOME

Based on the proposed two-fold approach, implementing the first step of the approach and leveraging the machine learning approach, the following results were achieved: The dataset was divided using a 90-10 split before training both the Keras models. A total of 2370 samples were used for testing purposes. The accuracy obtained for the title model was 69.59% while that for the body model was 87.17%.

Confusion matrix for title model:
[[1090, 450]
[380, 810]]
Confusion matrix for body model:
[[1280, 220]
[130, 1100]]

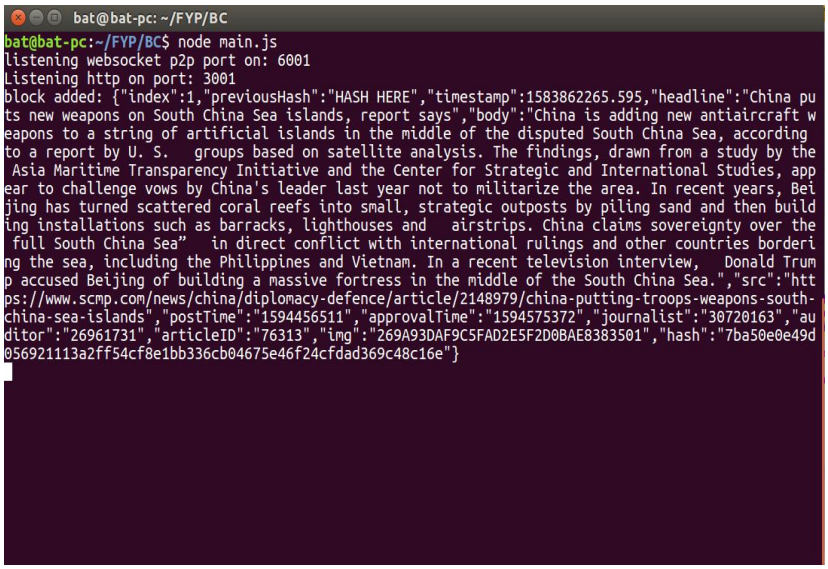


Fig. 2 Blockchain Implementation

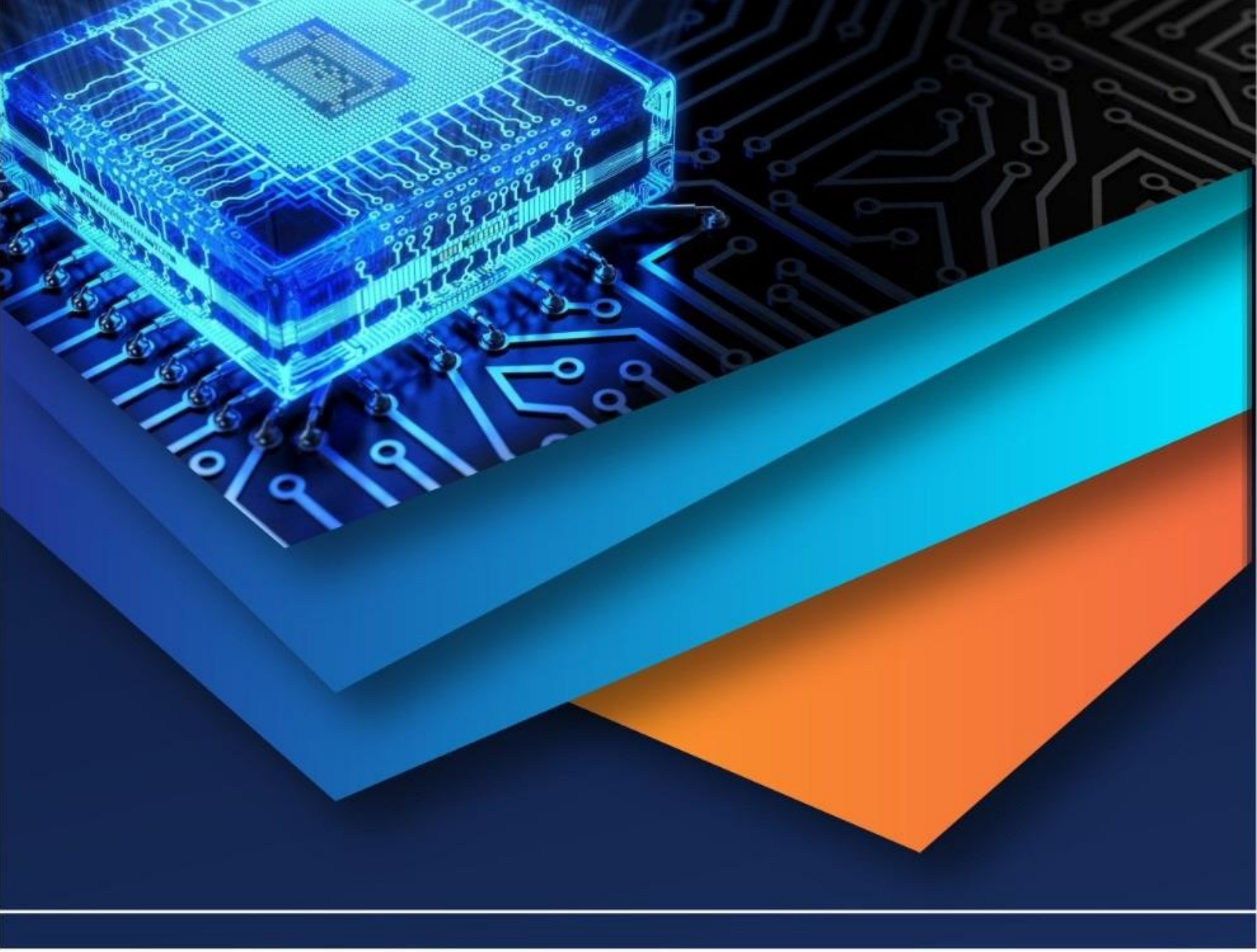
The Fig 2 above shows that the block has been added and successful implementation of blockchain in our system. The fields present in each block are: index, previous block hash, timestamp, headline, body, source of article, post and approval time of article, identity of journalist and crowd auditor along with the MD5 hash of the image uploaded along with the article.

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