# Fake News Detection Leveraging Blockchain Techonology (LEGITIFY – Counter The Misinformation)

By

**Capt Umair Ahmed Chaudhry**

**Capt Haider Sultan**

**Capt Khawaja Zain Uddin Siddiqui**

**Capt Muhammad Abdur Rehman Ali**

Supervised by:

**Lt Col Dr Imran Makhdoom**

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In the name of ALLAH, the Most benevolent, the Most Courteous

# CERTIFICATE OF CORRECTNESS AND APPROVAL

*This is to officially state that the thesis work contained in this report*

**"Fake News Detection Leveraging Blockchain Technology"**

*is carried out by*

**<u>Capt Umair Ahmed Chaudhry</u>**

**<u>Capt Haider Sultan</u>**

**<u>Capt Khawaja Zain ud Din Siddiqui</u>**

**<u>Capt Abdur Rehman Ali</u>**

*under my supervision and that in my judgement, it is fully ample, in scope and excellence, for the*

*degree of Bachelor of Software Engineering in Military College of Signals, National University*

*of Sciences and Technology (NUST), Islamabad.*

**Approved by**
**Lt Col Dr Imran Makhdoom**
**Supervisor**

Date: _____

# DECLARATION OF ORIGINALITY

We hereby declare that no portion of work presented in this thesis has been submitted in support of another award or qualification in either this institute or anywhere else.

# ACKNOWLEDGEMENTS

Allah Subhan'Wa'Tala is the sole guidance in all domains.

Our parents, colleagues and most of all our supervisor, Lt Col Dr Imran

Makhdoom without your guidance this project wouldn't have been possible.

## Plagiarism Certificate (Turnitin Report)

This thesis has 12% similarity index. Turnitin report endorsed by Supervisor is attached.

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Capt Umair Ahmed Ch
NUST Serial no 00000280997

_____

Capt Haider Sultan
NUST Serial no 00000280983

_____

Capt Khawaja Zain ud Din Siddiqui
NUST Serial no 00000280977

_____

Capt M Abdur Rehman Ali
NUST Serial no 00000280996

_____

Signature of Supervisor

# ABSTRACT

Fake News is one of the major problems of the world and also affects Pakistan equally. It is one of those problems which has been highlighted globally and nationally by all big leaders and personalities but aside from curbing of the issue, no concrete solution has been made till date which sorts out this menace from society. The aim of our project is to stop the circulation of Fake News in our society and provide the masses with a means to verify the authenticity of News posted on online web platforms. The solution leverages Blockchain technology to democratize the process of Fake News Detection by consensus mechanism and also incentivize the stakeholders involved in the process. Web 3 is the future technology and the features provided by it are really important for curbing this menace from our society. We are using the feature of traceability, non-repudiation, integrity and consensus mechanism of Blockchain technology in our project model for now to help detect fake News.

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**Chapter 1: Introduction**

World is a global village and with the rise of social media and its users, the authenticity of any story becomes questionable. It is really difficult to differentiate truth from lies and facts from fiction. Everyone is a self proclaimed journalist these days and majority of people don't even check what they post and publish which arises doubt and chaos in the minds of masses and unaware people. Blockchain technology or WEB 3 is a new technology that is getting widely accepted around the world and the uses of Blockchain cannot be ignored. With its traceability, non-repudiation and distributed ledger technology to store multiple copies of the same records it is inevitable to cheat this technology.

Democracy has been widely appreciated all around the world and if democratic process of consensus mechanism is grouped together with Blockchain technology to fight the fake News problem then it is a strong weapon for any nation to be aware of their surroundings and differentiate truth from lies.

## 1.1 Overview

In the ever-growing digital field era, Blockchain technology is a great step forward. It allows us to maintain duplicate record of files and create a single registry which is decentralized. It is a **system of recording the information** in a way that makes it difficult or near to impossible to change or cheat the record without the involvement of 51% of the participants. The transaction and records are maintained on distributed ledgers all across the world by node maintainers which is not controlled by any single entity. The records are stored with a linkage to the previous block which ensures traceability and non-repudiation features. Blockchain also provides us consensus mechanism through democratic voting which is the integral part of our project. Working of a Blockchain model is shown in figure 1.

Step 1: Request for transaction

Step 2: Block creation for transaction

Step 3: Block is broadcasted to all other nodes in network

Step 4: All nodes certify transaction block

Step 5: Block is added to chain
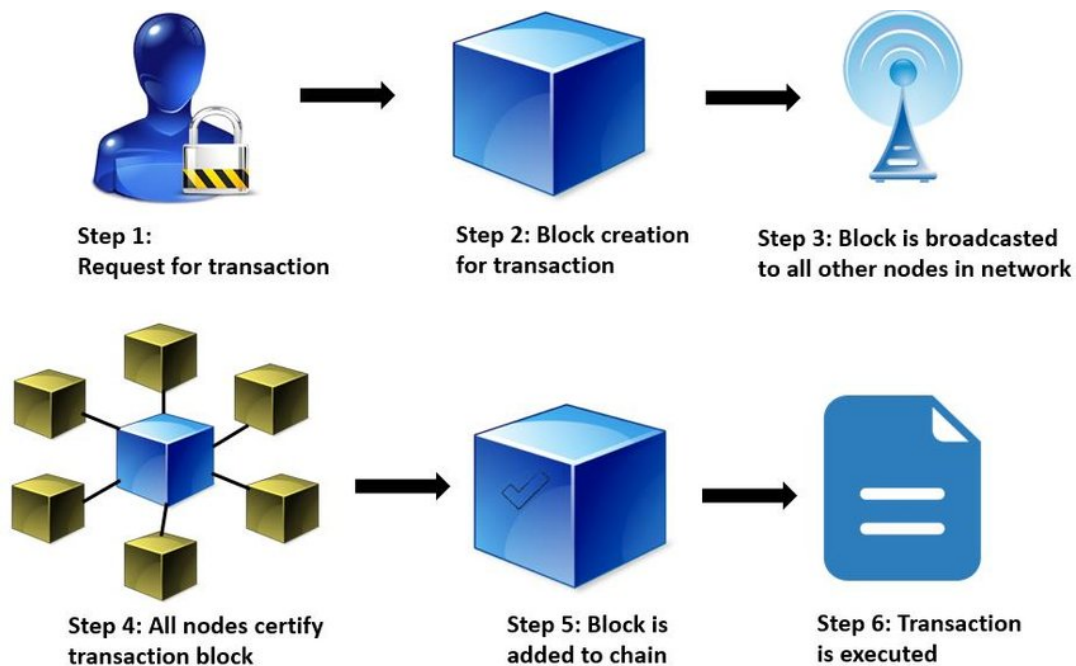
Step 6: Transaction is executed

**Figure 1: Working model of Blockchain Technology**

It is the need of the hour to fashion some policy or mechanism to avoid Fake NEWS circulation and acceptance of it by masses. Hence in our proposed system of Fake NEWS detection, we are focusing on validation of existing NEWS posted on various electronic media platforms through validation by domain experts of the field.

## 1.2 Problem Statement

Presently the circulation of Fake NEWS is a blatant issue of the society. It is also the major weapon of Hybrid/ $5^{th}$ Generation warfare. With presence of no existing solution to distinguish amongst facts and rumors, any NEWS published on the web is considered to be correct. There is no platform available for general public to have an authenticated and validated source for differentiation/ verification of facts and rumors. Fake NEWS is designed to spread like wildfire which is being used to manipulate the minds of innocent citizens of the society. Few of the prominent issues of Fake NEWS detection are highlighted below:

- Most prominent problem which the general public faces today is the authentication and integrity of the News and respective source.
- The people cannot directly validate any News and believe what they see or hear.
- Govt organizations have no capacity to validate or debunk any News.
- Credibility of the author, agency, or News cannot be verified.
- LEGITIFY solves this problem using Blockchain Technology

## 1.3 Proposed Solution

The main objective of this project is to build a platform to validate the authenticity of national and international News through consensus mechanism using Blockchain technology involving all

major stakeholders such as PEMRA, Ministry of Info and Broadcast, ISPR (Military), News Agencies, other media regulatory bodies and domain experts of the field.

Legitify will help the user base of all levels to distinguish amongst a fake and an authentic News. The system will ensure spreading of correct figures validated by all the stakeholders using democratic voting and in result incentivize the validators.

## 1.4 Working Principle

This platform leverages the principles of Blockchain technology in order to maintain the transaction records of NEWS as well as the results of voting and rating of the particular NEWS. This platform is divided in three major modules and all modules are inter-woven with each other. These modules are:

- Smart Contract on Ethereum Blockchain

- NEWS Scrapping using Python language

- Web Platform on HTML and CSS

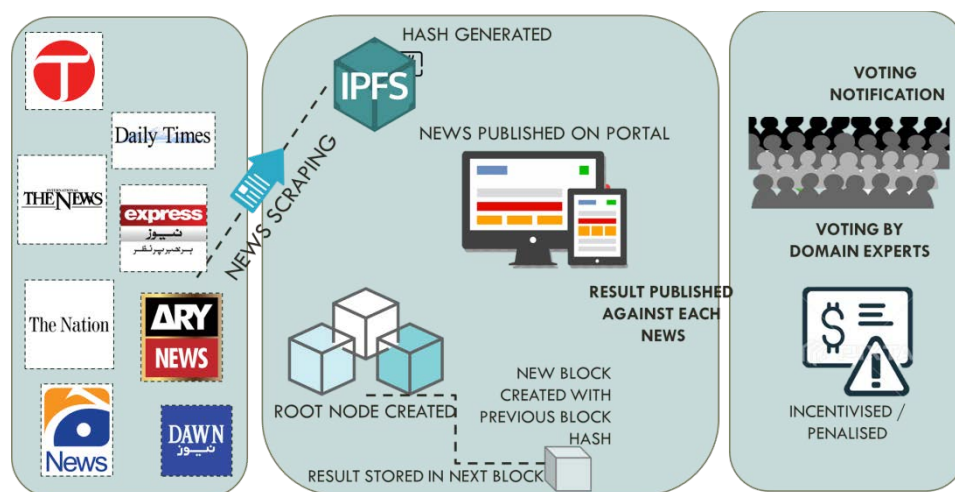Detailed working of Legitify is shown in figure 2:



**Figure 2: Technical working of Legitify Web Platform**

### 1.4.1 Smart Contracts:

Smart Contract acts as the main backbone of working on the Blockchain model. All the conditions that need to be fulfilled in order for the transaction to be successful are programmed/ written in the smart contracts. Smart contract is a digital contract like a real life contract made between two/multiple parties on which an agreement has to be made by all in order for its completion. The working of the Blockchain is done by writing Smart Contracts on Ethereum Blockchain using solidity programming language. Salient features of the smart contract of Legitify are mentioned below:

    a. **Smart Contract Deployment**: Chairperson/ admin who is deploying the smart contract. The admin has no rights to change the smart contract, only the node runners/ validators have the authority to change/ amend any condition on smart contract through 51% of majority agreeing upon any change.

    b. **Voting Rights**: The admin will approve registration of validators/ Domain experts of the field after reviewing their KYC form. The admin has however no rights to stop any approved validator from voting. Voting will only be done by those validators whose KYC has been approved and wallet address has been whitelisted.

    c. **Adding NEWS**: The NEWS can be added manually by any validator for voting by all the validators using the NEWS scrapping algorithm written in Python programming language. Once the NEWS has been added it will be available to all the validators to achieve consensus.

d. **Time Stamp**: As soon as the NEWS has been added it will take the current time and date it was added and the voting timer will begin and end after 6 hours.

e. **Up-voting / Down-voting**: When NEWS is uploaded on platform for consensus, the up-voting and down-voting option will appear in the validator's dashboard. Each validator can vote only once on a particular NEWS.

f. **Validator Rating**: Initial rating of every validator will be 70 points. Upon each correct voting 3 points will be added to the validator rating and on wrong voting 3 points will be deducted from the rating. Any validator with less than 50 points will be barred from voting until the voter reaches to 70 points again.

g. **NEWS Ranking**: Once the validators have up-voted or down-voted particular NEWS within the given voting time the NEWS ranking will be published in the form of Number of up-votes and down-votes along the NEWS.

**1.4.2 NEWS Scraping:** The web scrapers/crawlers are used to fetch the data from desired web-links using the Hyper Text Transfer protocol. Legitify is using the same method to fetch the NEWS from selected E-media platforms.

**1.4.2.1 Newsscraper3k**:

The Newspaper3k bundle Python library is utilized for Web Scraping articles in Legitify, It is based on top of solicitations and for parsing lxml.

**1.4.2.2 Functioning**: we have installed it using using: "pip3 install Newspaper3k" command.

The News on the website have an initial common Url and a number which is at the very end of that Url. This number is used to iterate the NEWS over multiple webpages. We have used this number to iterate NEWS over multiple webpages. Next we downloaded the webpage and parsed it through the **Newscraper3k** library. Once that is done we made a dictionary of the relevant information we needed. Afterwards we appended this dictionary into a larger dictionary (where the other webpage info is stored) and then dumped it into a json file.



**Figure 3: Working model of News Scraper**



**Figure 4: Json file used in Python for News scraping**

### 1.4.3 Web Platform:

Legitify is the main domain of this platform which is the primary GUI for general public as well as KYC (Know Your Customers) members. This platform is performing as a bridge between users and the Blockchain. Web platform is based on web2.0 and integrated with smart contracts written on Ethereum Blockchain at backend.

1.4.3.1 **Multiple Pages**: Legitify web platform is based on multiple web pages feature. This feature help the user to navigate through different areas of our platform using links and navigation bar to see the News and interact with the information. Web pages of legitify includes:

      a. Welcome page

      b. Registration page

      c. Validator page

1.4.3.2 **Welcome Page**: At the first glance the user will land on this page of Legitify. Here the general public can view the rating on latest News and the validators can login through their login id and password.
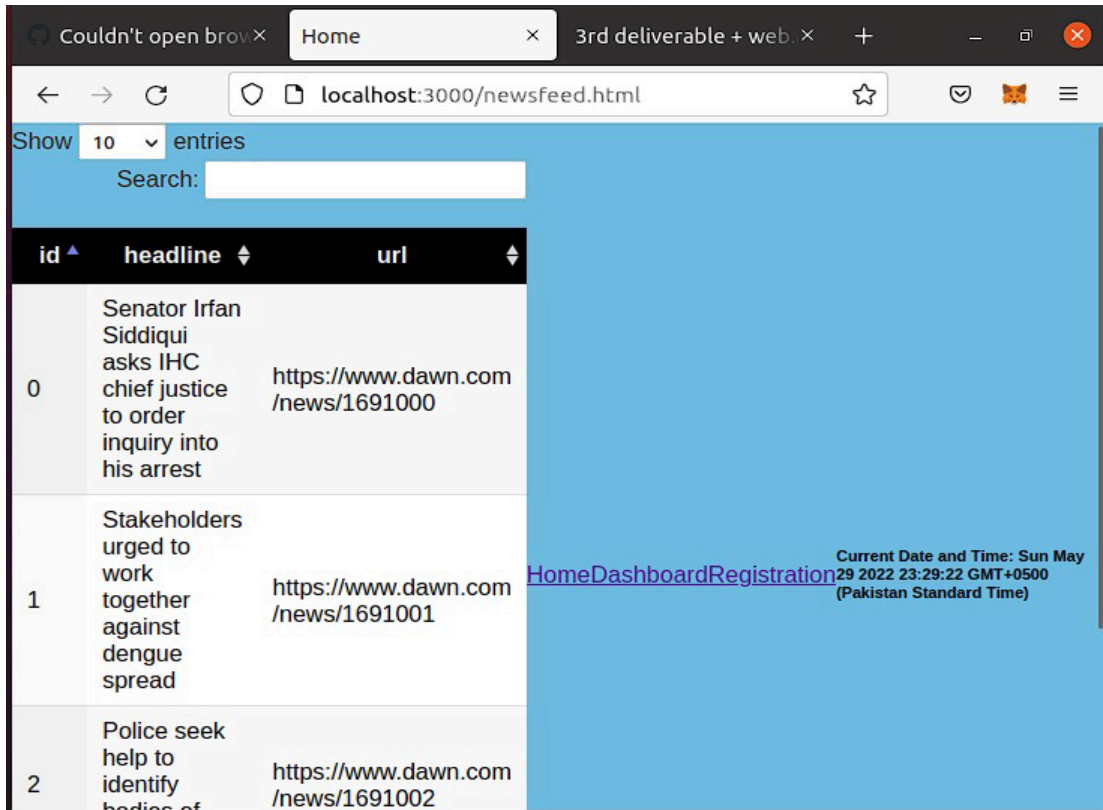
**Figure 5: Home page of Legitify**

1.4.3.3 **<u>Registration Page</u>**:   On the registration page the  user can register as a validator by providing his KYC information and linking his Metamask wallet to the platform.
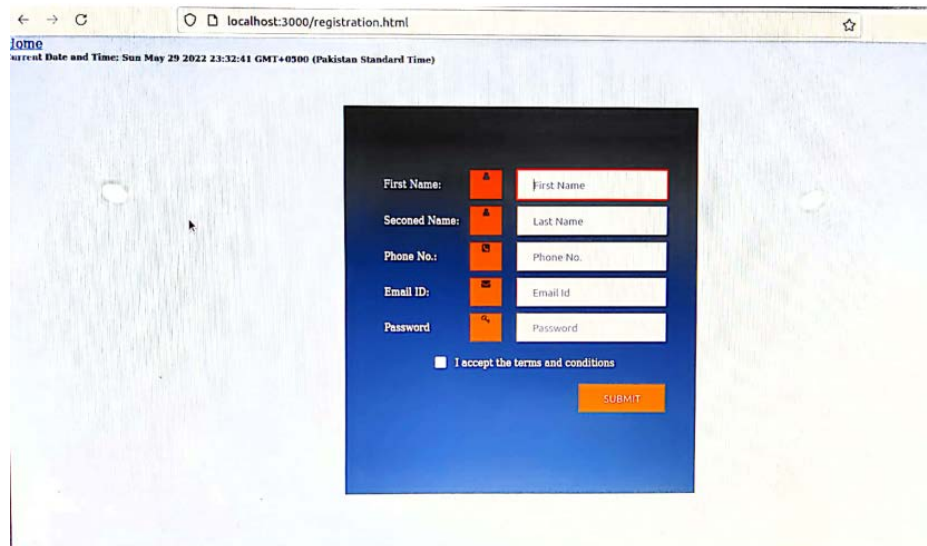


**Figure 6: Registration page of Legitify**

1.4.3.4 **Validator Page**:        The users who have been registered through KYC are called

validator and this page is for them. Here they can see the News uploaded for voting, own

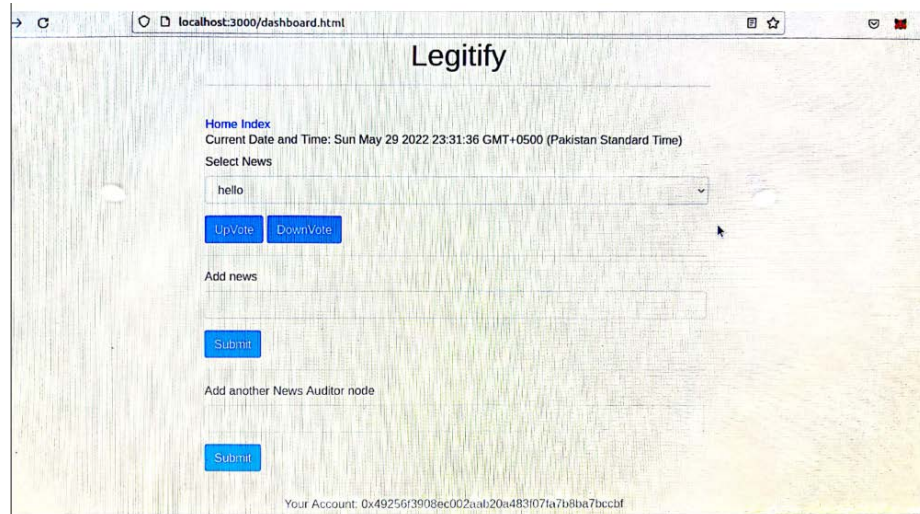rating and validated News rating as well.
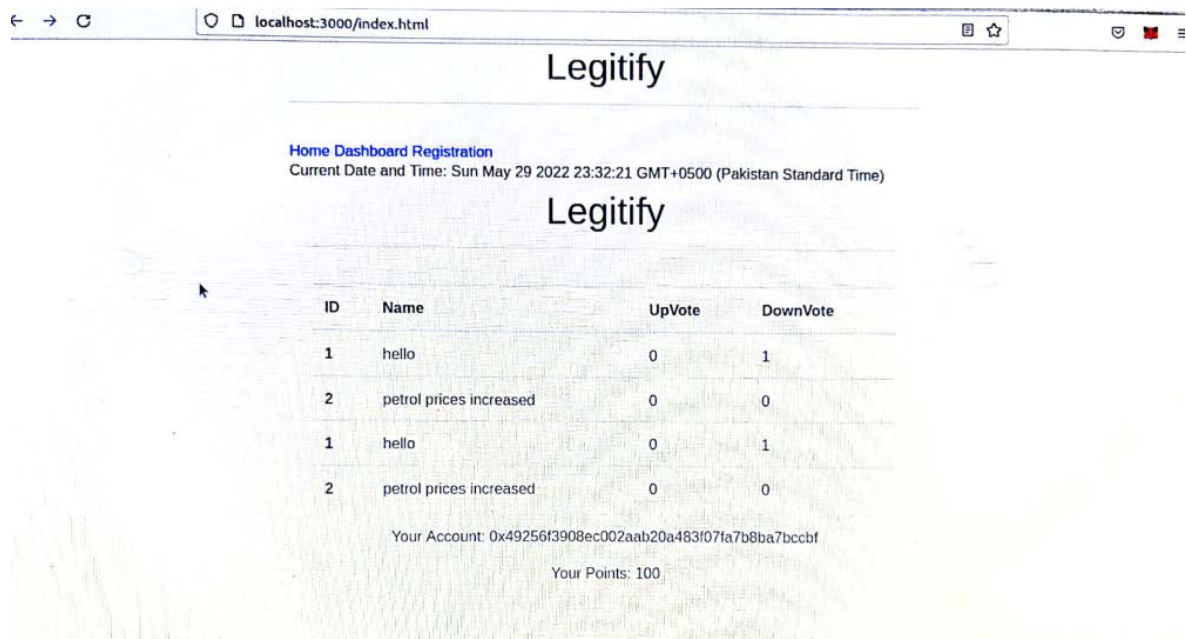


**Figure 7: Validator dashboard Legitify**



**Figure 8: News index for News rating**

### 1.4.4 Integration:

The integration between Blockchain and web platform has been done using web3 library of solidity. Different modules are then integrated in to one stand-alone platform which we named as Legitify. This stand-alone platform is essential for a compact solution.

### 1.4.5 GUI presentation:

The visual demonstration of the project is done through the aid of GUI (graphical user interface).

## 1.5 Objectives

### 1.5.1 General Objectives:

"The main objective of this project is to build a platform to validate the authenticity of national and international News through consensus mechanism leveraging Blockchain technology involving all major stakeholders and domain experts"

### 1.5.2 Academic Objectives:

- Development of a decentralized web platform
- Achieve proficiency in using programming languages
- To leverage Blockchain technology and simulate the results
- To increase productivity by working in a team
- To design a project that contributes to the welfare of society

**1.6 Scope**

This project finds its scope in building a web application using Blockchain within a stipulated timeframe. It is an innovating state of the art web platform integrated with Blockchain and web2 based web application.

**1.7 Deliverables**

### 1.7.1 Legitify

A web platform integrated with smart contract on the backend for voting on scraped News by domain experts of the field.

**1.8 Relevant Sustainable Development Goals**

The project revolves around SDG 4,9,11 and 16. It addresses quality education for the masses by giving them an authentic means of information. Leveraging the Blockchain technology to combat fake News introduces innovation in the society. Pakistan is a multi-ethnic and diverse nation, for sustenance of population by providing them with correct facts they can be saved from chaos and biased reporting of journalists and hence sustain community's mental health and national cohesion. If correct information is provided to general public and trust is built amongst the population giving rise to peace, justice and strong institutions.

**1.9 Structure of Thesis**

Chapter 2: comprises of following

- Literature review

Chapter 3: covers the design and development of the project.

Chapter 4: Includes the conclusion of the project.

Chapter 5 highlights the future work needed to be done for the commercialization of this project.

# Chapter 2: Literature Review

Legitify is the first step towards an indigenous solution of Pakistan which will be highly cost effective, based on a web platform integrated with smart contract written on ethereum Blockchain providing voting rights to domain experts of the field for validation of existing NEWS published on various media houses. We have studied all the competitors and found that except for existing literatures no existing solution is present for combating this glaring issue of the world.

- Research Papers

2.1 Research Papers

We have read following research papers thoroughly to understand the dynamics of working mechanism involved in fake News detection leveraging Blockchain technology and tailored them according to the time available to make this project. Research papers studied/ reviewed for this project along with its publication detail are mentioned below whereas the links will be attached in the references and citations annexure below:

**2.1.1** **ProBlock**: A novel Approach for fake News detection published in Cluster Computing (2021), article number 24:3779-3795  [1]

**Summary**:          With the exponential increase and reliability on digital platforms, there are many people who want to be the first one to break any News. The race of this breaking News first and taking the lead for ranking gives rise for the spread of unverified News. This study focuses on a probabilistic mathematical approach for verification of facts and figures. Validators are ranked on the basis of their voting and the project leverages Blockchain technology to ensure correctness of News.
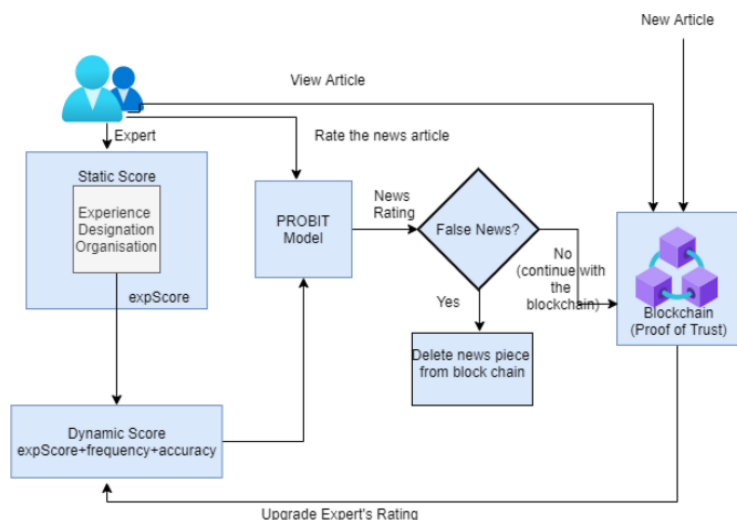
**Fig 9: ProBlock approach solving fake News**

**2.1.2** Fighting Fake News Propagation with Blockchains published in 2019 IEEE conference on communications and Network Security and presented in 2nd International workshop of Distributed Ledger of Things [2]

**Summary**: The authors consider fake News as one of the major problems with distressing consequences. The key design of the model is that any News generating platform should store the News on Blockchain, all the News shared from there onwards would store the metadata of the person sharing the News and store it in the subsequent blocks of the chain. Any modification done from the source can be verified by tracing back the News to the root node. Hashes will be used to store the News so that storage space is not maximized and target is also achieved.
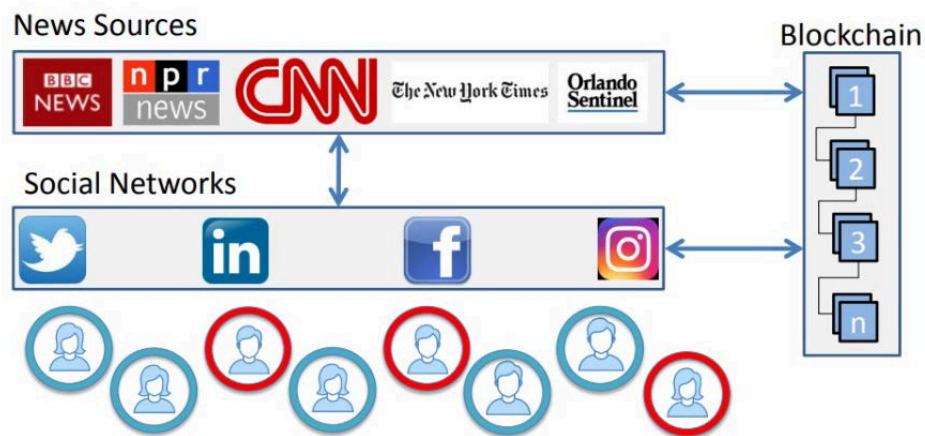


**Fig 10: Fake News propagation published in IEEE 2019**

2.1.3 SocialTruth Project Approach to Online Disinformation (Fake News) Detection and Mitigation published in European Union's Horizon 2020 research and innovation program under grant agreement No. 825477. [3]

**Summary**: The authors consider advent of social media platforms in combination with their poor governance and lack of quality control as major reason for spreading of fake News like wildfire. The solution authors have proposed is a

combination of two major technologies; machine learning and Blockchain. The study focuses on natural language processing in which the text of any News is compared with already declared fake News for generation of News rating in terms of correctness and fakeness. The next step is to collect images/ videos from articles and after cross referencing them with any previous available data increment or decrement the News rating. The next step is giving a reputation score to the writer or source providing the News and reflects it in the News rating. Lastly storing all the process in Blockchain to ensure non-repudiation and traceability of all the data.
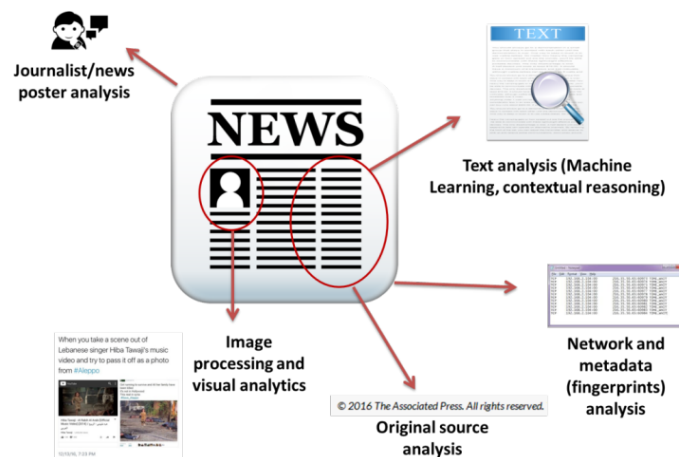


**Fig 11: Social Truth Project**

2.1.4      Using Blockchain to rein in the New Post-Truth World and Check the Spread of Fake News written by Adnan Qayum, Junaid Qadir, M umer Janjua and Falak Sher of ITU University Lahore, Pakistan. [4]

**Summary**:          In this paper the proposed architecture of News verification through leveraging Blockchain technology includes three components. The first component is a publisher management protocol in which all the writers/ editors/ publishers who verify themselves on a web platform will be issued a secret key. All the News

published by these verified publishers will be encrypted against their secret key and checked against the public key issued by the platform. Any News originating from someone without the secret key will be marked as unverified.

The second component is the smart contract portion where the published News will be stored on the Blockchain and broadcasted to authenticators for verification. In this way News integrity will be ensured.

The third component includes building a framework for miners who will have the responsibility to achieve consensus over the News published by the verified and unverified publishers. The miners will also check whether the News is part of the Merkle tree included in the Blockchain node or not.
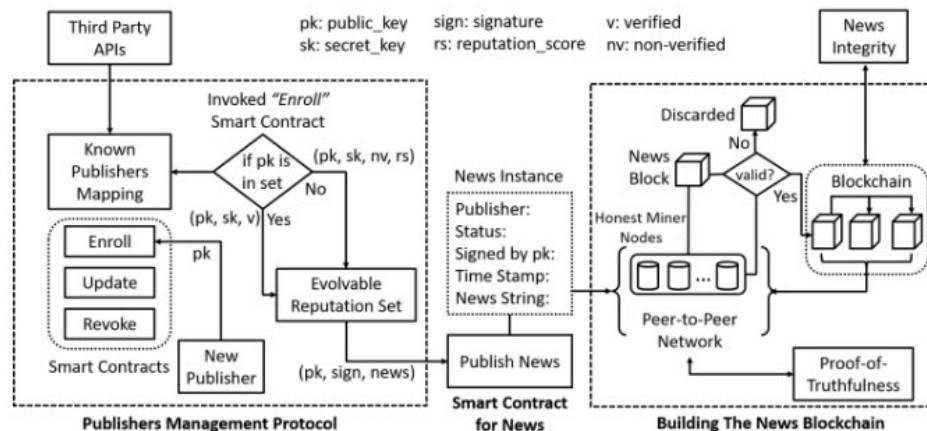


**Fig 12: ITU University Lahore**

2.1.5     Fake News Detection in Social Media using Blockchain published in 2019 7th International Conference on Smart Computing & Communications (ICSCC). [5]

**Summary**:         The research is based upon use of Blockchain technology in conjunction with a weighted voting mechanism for fair and democratic News sharing. The authors have proposed a solution of integrating all available social media platforms on to the Blockchain. A keyword related search algorithm to be made which

will search a specific article/ News posted across any social media platform. Furthermore a group of third party validators are hired to vote on the News posted across these platforms. The authors also want to include a breadth first search node traversal to find the distance between the Geo location from where the News has been posted and the validators who are in the nearest perimeter of the News origination site. They have also proposed a mathematical formula for calculating value of vote based on weighted voting algorithm. The voters who are nearest to the News origination point will have the highest weight in the vote count as they are more likely to be aware of the authenticity of the particular News. All the process will be stored on Blockchain starting from posting of any News on the social media platforms till the voting process is completed.
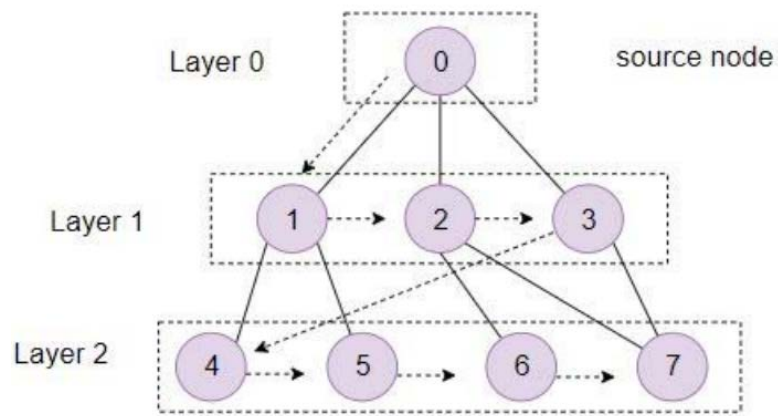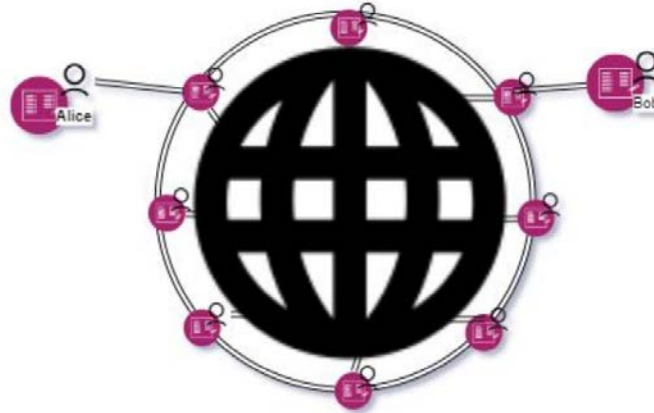


**Fig 13: Node traversal**

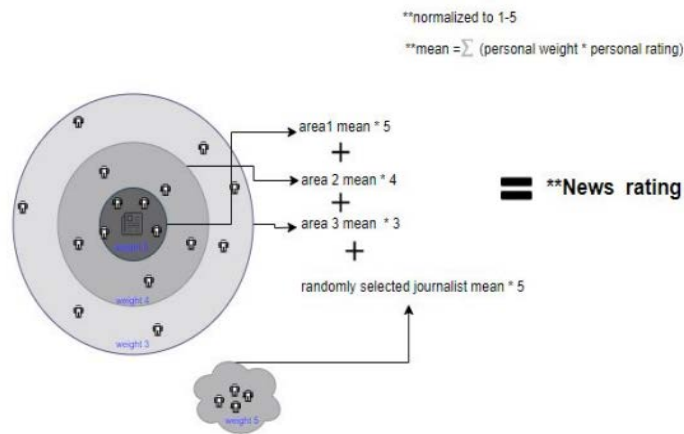**Fig 14: News sharing on social media platforms in Blockchain**



**Fig 15: weight based News rating algorithm**

## 2.2    **Analysis**

All the above mentioned research papers discussed in detail different models to combat fake News or detection of fake News. We took different features from all the research papers and designed Legitify according to the academic proficiency of an undergraduate level student.

# Chapter 3: Interfacing and Detection

3.1 **Architectural Design**

The block diagram below shows the principal parts of the system and their interactions.
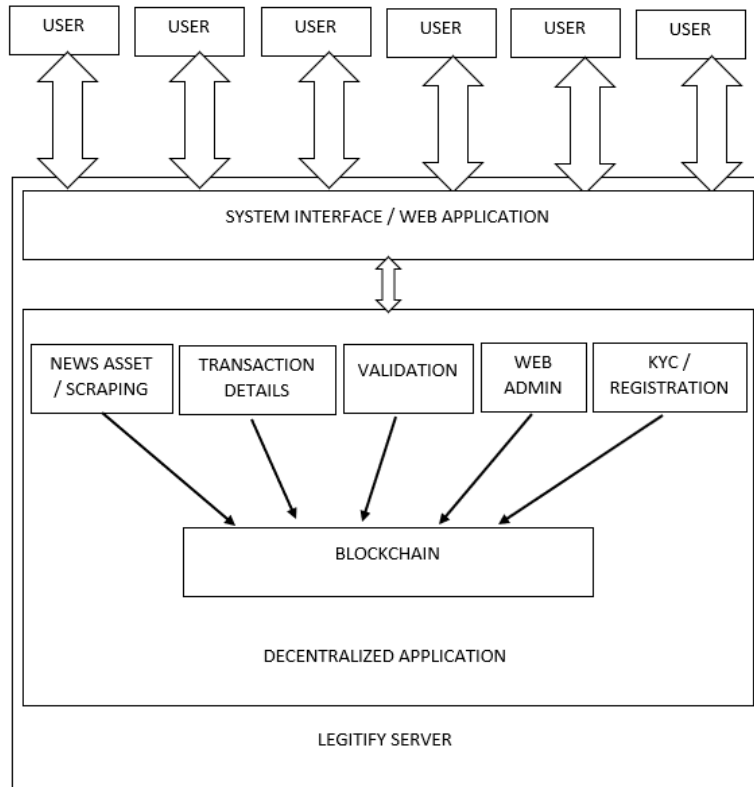
**Fig 16: Principal parts of Legitify web platform**

End users interact with web platform which integrates Blockchain at the back end. News scrapping, transactions and validations are saved via IPFS on Blockchain. Center of Gravity in this architecture is the web application.

**3.2 Context diagram**

It is showing the main actors interacting with the system. Web portal is the center of gravity, integrating Blockchain technology. Regulatory bodies, crowd auditors and general public are the stakholders involved that require onboarding. News scrapping is being carried out to fetch content. Blockchain voting through consensus mechanism is to get results on validity of News.
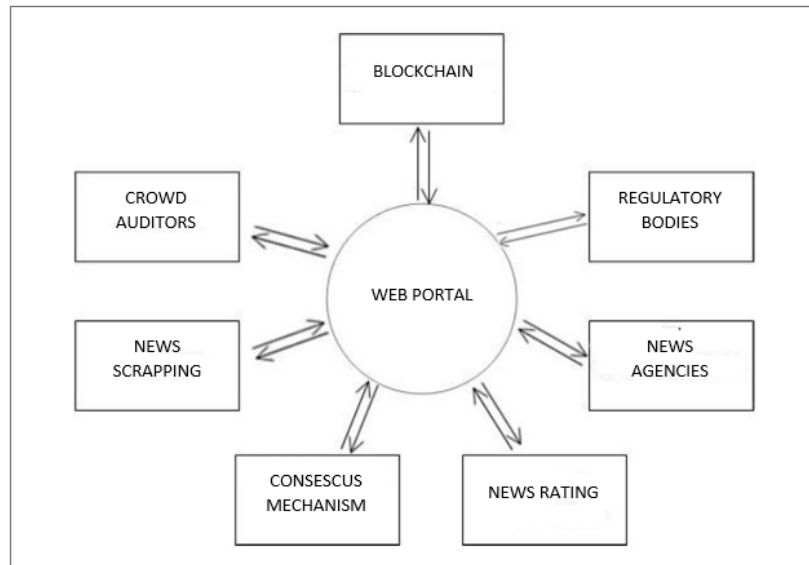
**Fig 17: Context Diagram**

## 3.3 Decomposition Description

The purpose of this description is to model how the system responds to varied events that happen during the operation, i.e the model system behavior. The decomposition of the subsystems within the *Legitify* system and operation.
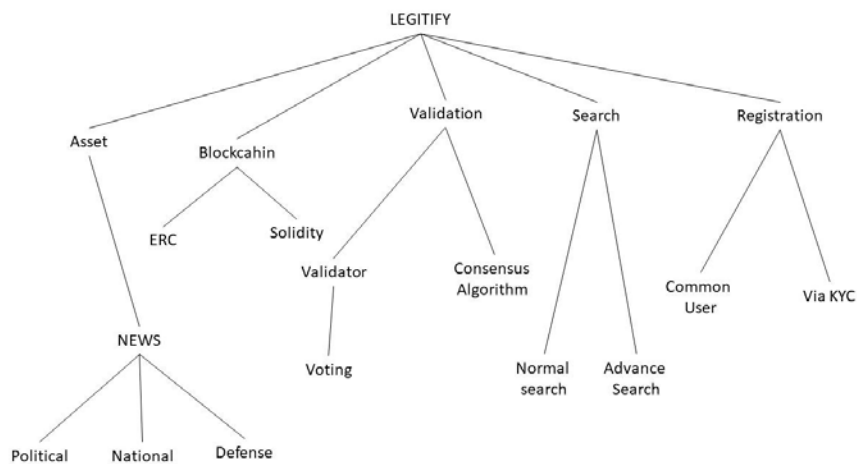


**Fig 18: Decomposition Description**

The scenarios in our system are:

- NEWS Scrapping from E-News websites
- Root node generation on Blockchain

- Upload for validation through consensus algorithm
- NEWS ranking and publishing based on votes which can be viewd by users
- Users need to register whether as general public or allotted role

## 3.4    Sequence Diagram

scrapping algorithm scraped News against keywords from selected News platform on daily basis.

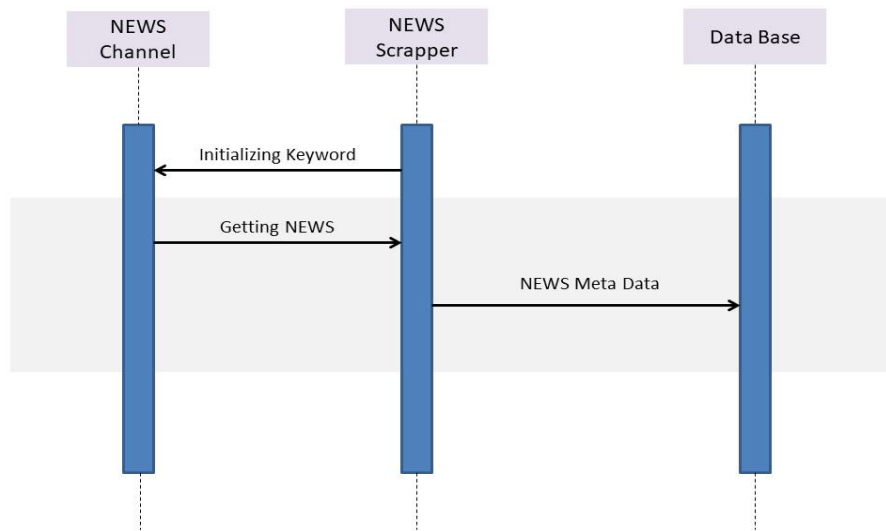System imported it with time stamp and complete information with News content.



**Fig 19: Sequence Diagram 1**

System created the root node on Blockchain including the time stamp, News source name, textual

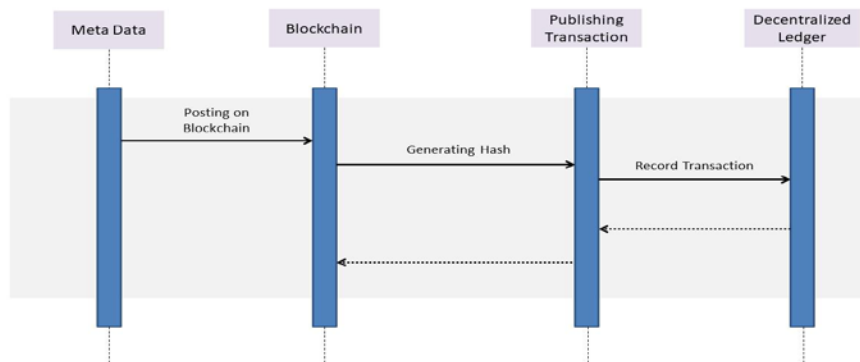content of News and News originator.



**Fig 20: Sequence Diagram 2**

After scraping NEWS the system created the root node on Blockchain including the time stamp, NEWS source name, textual content of NEWS and NEWS originator.
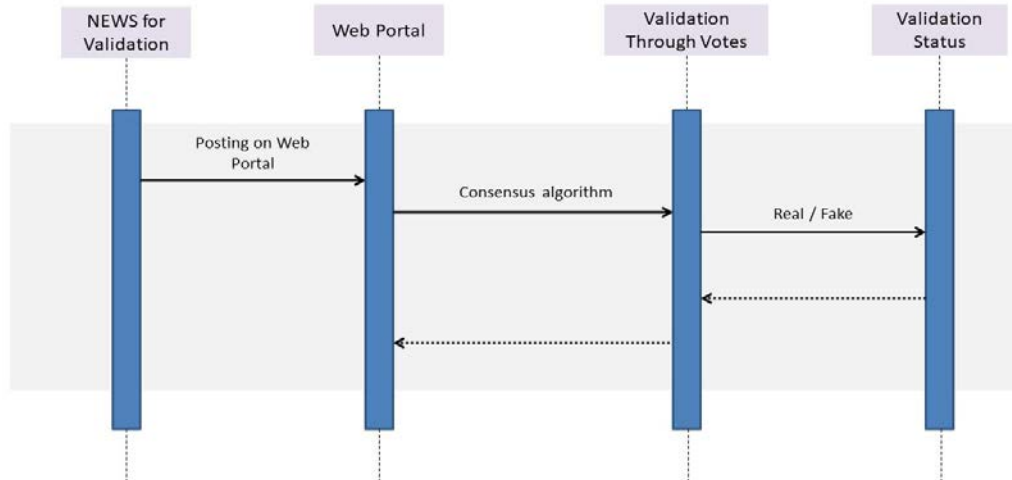
**Fig 21: Sequence Diagram 3**

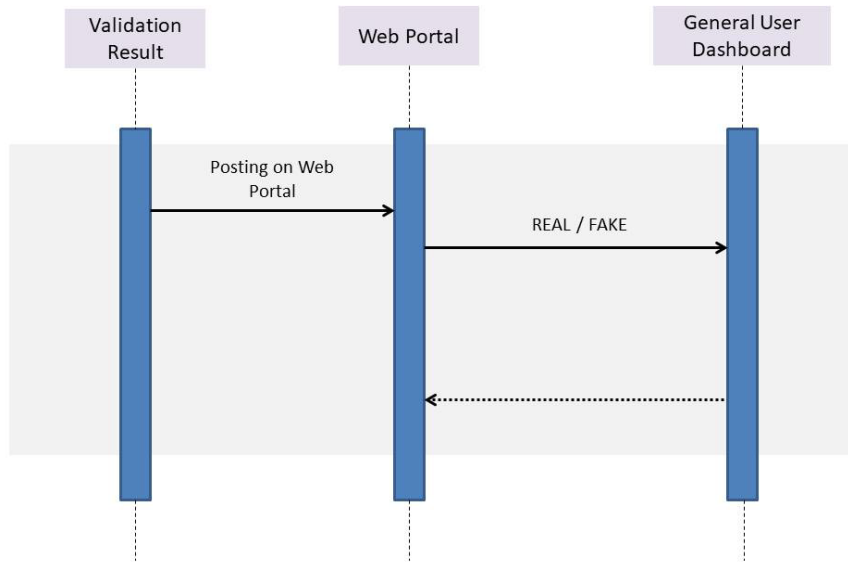System then uploaded the News on our web platform for validation from the registered validators.

**Fig 22: Sequence Diagram 4**

After validation process through voting from validators the system published the News with status stamp (fake / legit) and store it in central repository including time stamp, validating status, validators ID and transaction ID

## 3.5    Activity diagram

Newspaper inititialized relevant keyword containing News and collected meta data.



**Fig 23: Activity Diagram 1**

This meta data was sorted against our given categories and was then posted on Blockchain. Hash

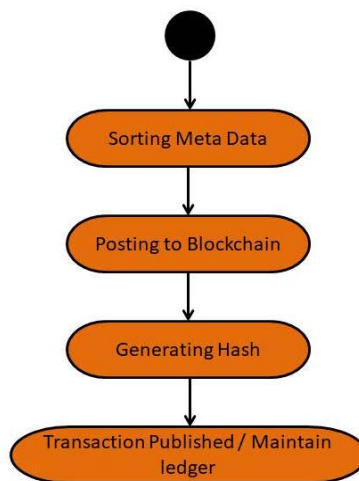was generated and transaction published on Ethereum Blockchain.



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**Fig 24: Activity Diagram 2**

The News was then uploaded on Legitify. A notification was sent to validators automatically.
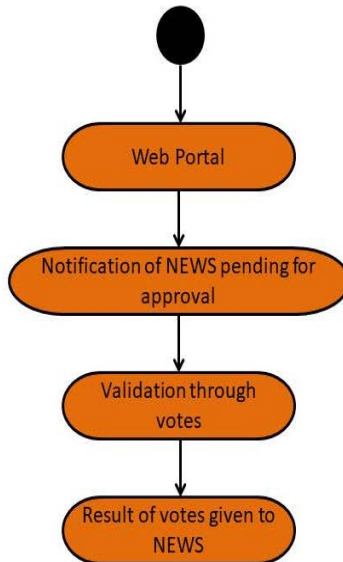


**Fig 25: Activity Diagram 3**

Validators voted on the authenticity and the result was published on the platform which was also visible in user dashboard of validators and general public alike. News had a  legit/fake indicator with the voted upon News.
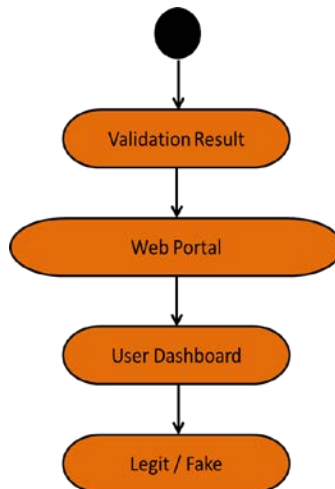


**Fig 26: Activity Diagram 4**

## Chapter 4: Conclusion

In this thesis, we discussed a Fake NEWS Detection system on Blockchain that can handle fake NEWS efficiently. It is the first indigenous solution to the existing problem of fake NEWS. To-date there is no existing mechanism serving as National level repository to differentiate between Real & Fake NEWS at one platform.

Legitify will help the user base of all levels to differentiate between a fake and an authentic News. The system will ensure circulation of validated News by all the stakeholders using consensus mechanism and incentivize the authenticators providing fair voting.

**This will curb the common practice of circulating Fake NEWS caused by race of Breaking the NEWS without fact checking**

# Chapter 5: Future Work

Future milestones that need to be achieved to commercialize this project are the following.

## 5.1 Decentralized Autonomous Organization (DAO):

The main future work is to make Legitify a Decentralized Autonomous Organization constructed by protocols, rules and regulations as software program which will be transparent and controlled by organization members and will not be influenced by any centralized leadership or government. Its financial records and programs rules will be maintained on the Blockchain.
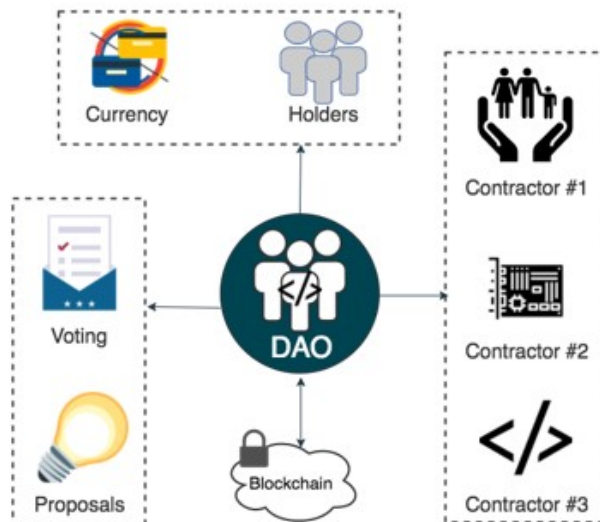


**Figure 27: DAO**

### 5.2 Native Token for Incentivization:

Blockchain allows to provide a fairer and just mechanism to monetize and make transparent rewards system. Launch of a native token currency in the system to provide automated rewards to auditors giving correct voting on the NEWS and penalizing those voting on fake NEWS.

A native token of the LEGITIFY platform will be launched with the symbol LGT on Ethereum Blockchain. The token will be a necessary element for voting rights. The token will be tradable on global centralized and decentralized exchanges like Binance, Kucoin, UniSwap, Pankcake Swap after it fulfills the enlisting criteria of these exchanges. Initial Liquidity and funds will be brought in using Sponsorships, VC funding, presales, public sales and private sales of the token with proper marketing in the future
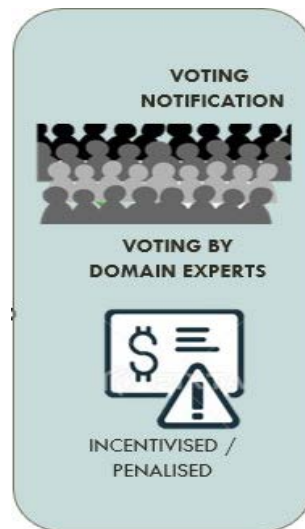


**Figure 28: Native Token for Incentivization**

### 5.3 Revenue Generation Through Web Advertisements:

A stream of revenue be generated by running advertisements on the web platform of Legitify. Revenue accumulated through web advertisements will be given to the validators for their keen interest and providing correct News to the project.



**Figure 29: Revenue Generation Through Web Advertising**

### 5.4 Weighted Voting

NEWS which will be area sensitive will have location-based voting (as shown in figure below). The system swill use Geo location of validators and set their voting weight from 1 to 5 depending upon the closeness to the incident area.
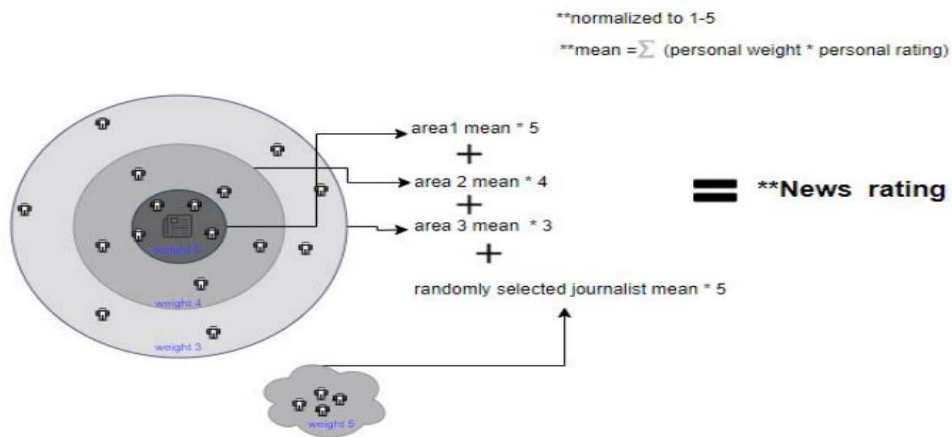


**Figure 30: Weighted voting**

## Chapter 6 : References

[1]https://link.springer.com/article/10.1007/s10586-021-03361-w

[2]https://ieeexplore.ieee.org/abstract/document/8843597

[3]https://www.researchgate.net/publication/335092525_SocialTruth_Project_Approach_to_Online__Disinformation_Fake_News_Detection_and_Mitigation

[4]https://www.researchgate.net/publication/332070196_Using_Blockchain_to_Rein_in_The_New_Post-Truth_World_and_Check_The_Spread_of_Fake_News#pf6

[5]https://www.researchgate.net/publication/335935182_Fake_News_Detection_in_Social_Media_using_Blockchain