IPFS And Ethereum Based Decentralized Social Media Platform

Ms. Afrin Ajmuddin Shikalgar, Mrs. Vijaya Dinkar Desai

Computer Science And Engineering Department
Ashokrao Mane Group Of Institutions, Wathar
Affiliated To DBATU University, Lonere, Maharashtra, India

Abstract:
The IPFS-based Decentralized Social Network System with Depression Detection leverages blockchain and machine learning to create a privacy-focused platform where users can share status updates consisting of text and images. Images are stored in the Interplanetary File System (IPFS) for decentralized, secure storage, while the text is analysed for emotion detection using machine learning algorithms. The system integrates blockchain technology (using Ganache) to record user posts with corresponding image IDs and emotional classifications in a tamper-proof manner. An admin can manage and perform classification analysis of user emotions using models such as Naive Bayes, Neural Networks, Random Forest, and SVM, providing insights into user emotional states and detecting potential signs of depression.
Keywords: Blockchain, Decentralized system, IPFS, Depression analysis, Ethereum.

I. Introduction

Since Satoshi Nakamoto introduced Bitcoin to the world [1], blockchain technology has gained increasing popularity over the past few years. Blockchain begins with the core technology as a distributed ledger supporting cryptocurrency exchanges and has shown capability for even other sectors or areas as a secure, immutable and reliable platform to record data and transactions. Social network services, e.g., Facebook and Twitter, have already become part of our daily life and have a significant number of users across the world. There was a data leakage issue from Facebook to Cambridge Analytica [2], which brought the security and privacy issues of social media to a higher level. Many researches and discussions have been running through to seek appropriate solution to tackle the problems existing currently in the social media services. Currently, the main problems challenging the social media networks [3] include many aspects. Due to the traditional client-server model, social media clients often suffer from unavailable service during server downtime or when server faces issues of single point of failure or DDoS attacks. For example, Bitcoin blockchain was used to provide decentralized content trust for docker images to resist potential threats in docker content trust [4]. Besides that, it is well known that social media services are not available in some countries due to the government intervention and censorship based on the IPs used by the social media servers. Some have raised the point that blockchain technology can be used to tackled some of the issues existing in the industry. Blockchain technology enables decentralization and security for the social media services, which make it available during server downtime or even against censorship from governments or Internet Service Providers (ISPs). In this paper, an application is developed to prove the possibility of incorporating blockchain technology into social media network to empower it against existing problems. We use social media industry for our experiment to demonstrate the capability of blockchain to enhance other existing industry. In this paper, we propose a social media application based on Ethereum platform [5] for recording data and use Inter Planetary File System (IPFS) [6] as distributed data storage service to support a decentralized application. The social media application uses a frontend webpage UI to interact with users and save users' information on blockchain while storing the larger file data in the IPFS system. The purpose of developing this application is to give a brief idea about how blockchain technology can be used to enhance the existing industry.

II. Literature Survey

A number of previous and current works have been working on developing decentralized applications with the use of IPFS or Swarm as distributed data store. We will discuss several applications that make use of these technologies and also work that we have been referring to for insights on development of DApps.

Akasha [7] is another social media application developed using Ethereum and IPFS on dedicated blockchain. The Akasha team has found a suitable technology stack to implement a decentralized and distributed Internet after a lot of study and prototyping work. The cornerstones of the Akasha stack are IPFS and Ethereum, augmented by React with Redux, Node.js, and Electron. The Akasha project provides a guideline of how social media applications can be built with the merits of the blockchain system.

Blockchain based decentralization Domain Name System (DNS) proposed in [8] can be used to prevent data tampering by storing hashes of zone files. It also has multiple parallel parsing nodes to avoid collapsing if one of the nodes fails. PingER (Ping End-to-End Reporting) is an end-to-end reporting tool proposed by the authors of [9]. Distributed Hash Tables (DHT) store actual files off-chain, while a private blockchain stores metadata about each file.It has been proposed to implement a system for preventing data fraud [10]. There should be meta-data about how the data was acquired, the owner of the data, and how it was transformed; known as Data Provenance, this package tracks the provenance of data. As long as most participants are trustworthy, malicious modifications to data will be impossible [11]. Attribute-based encryption (ABE) is one solution that has been proposed to deal with the privacy problems posed by traditional cloud storage systems. Consequently, traditional cloud storage systems are susceptible to single points of failure.

Main Part of Project:
1. **Details of frontend Project:**
2. **Framework:** The frontend is built using HTML, CSS, JavaScript, and Bootstrap for responsive design.
3. **Design Approach:** Focuses on a clean and minimal interface. Features an easy-to-navigate layout for users to view and create posts.
4. **Home Page:** Users see a timeline view with posts displayed, including text and images. Each post contains the user's name, timestamp, and emotional analysis results.
5. **Post Creation Page:** A form where users can write a status update and upload an image. Includes image previews before uploading.
6. **User Profile Page:** Displays user details, their posts, and emotional history, providing insights into the emotional trends over time.
7. **Admin Dashboard:** Accessible to the admin, displaying overall emotional analysis insights and flagged posts for potential depression detection.

Details of backend Project
8. **Framework:** Developed using Django for web application functionality and other APIs.
9. **Data Handling**: Stores user information, posts, and emotional analysis results in a MySQL database.
10. **Image Storage:** Uploaded images are sent to the IPFS using a Python IPFS client library, and the corresponding hash (image ID) is saved in the blockchain (Ganache).
11. **Emotion Detection**: A machine learning model implemented using scikit-learn is trained to detect emotions in user text posts. This includes Naive Bayes, Neural Networks, Random Forest, and SVM algorithms.
12. **Blockchain Integration**: Leveraging Ganache to simulate the Ethereum blockchain. Posts are recorded as blockchain transactions with image IDs and emotional classifications.

MVT Design:

The MVT (Model View Template) is a software design pattern. It is a collection of three important components Model View and Template. The Model helps to handle database. It is a data access layer which handles the data.

The Template is a presentation layer which handles User Interface part completely. The View is used to execute the business logic and interact with a model to carry data and renders a template. Although Django follows MVC pattern but maintains its own conventions. So, control is handled by the framework itself. See the following graph that shows the MVT based control flow.
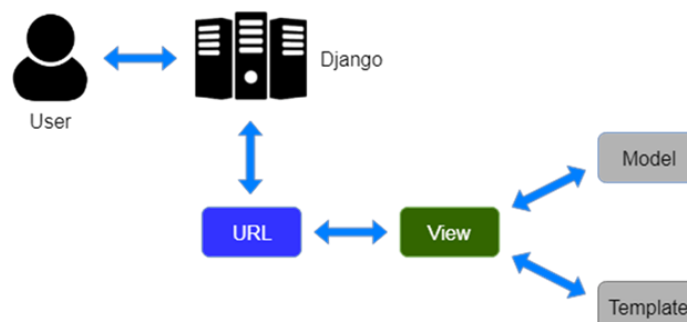
Implementation Screenshot:
Homepage:
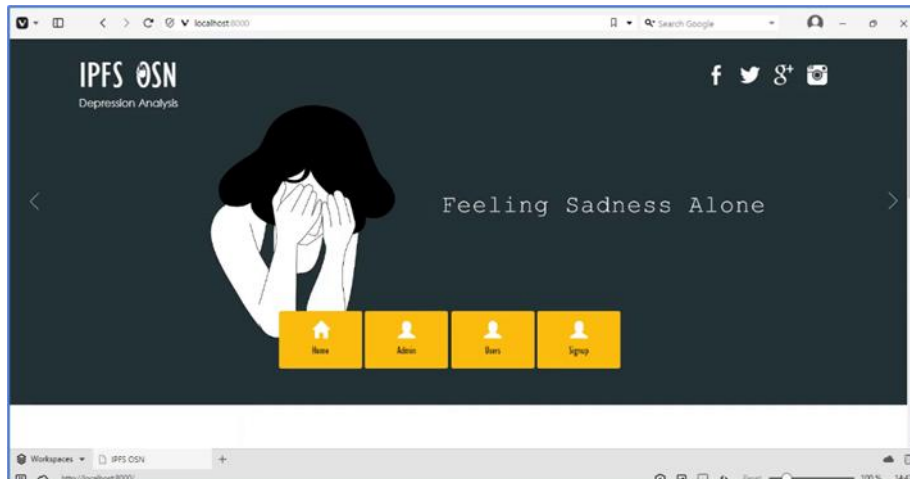
Admin login page
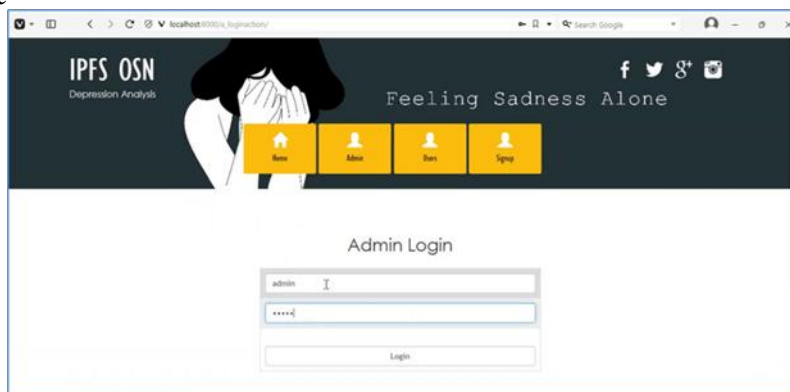
III.   Conclusion

The IPFS-based Decentralized Social Network System with Depression Detection successfully combines machine learning and blockchain technologies to provide a privacy-focused platform for users to share and interact with content. By leveraging the Random Forest algorithm for emotion detection, the system achieves a commendable accuracy of 97%, ensuring reliable identification of user emotions from textual posts. The use of IPFS for decentralized image storage and Ganache for recording posts in a tamper-proof manner further reinforces data integrity and privacy. Overall, the system presents a novel approach to emotional analysis while maintaining transparency and security.

Bibliography

[1]   S.Nakamoto, "Bitcoin:Apeer-To-Eerelectroniccashsystem,"2008.
[2]   (2018) Facebook Cambridge Analytica Data Scandal. [Online]. Available:
        Https://En.Wikipedia.Org/Wiki/Facebook%E2%80%93cambridgeanalytica_Data_Scandal
[3]   Y.Li, Z.Zhang, Y.Peng, H.Yin, And Q.Xu, "Matching User Accounts Based On User Generated Content A Cross Social Networks,"
        Future Generation Computer Systems, Vol.83, Pp.104–115, 2018.
[4]   Q.Xu, C. Jin, M.F.B.M.Rasid, B.Veeravalli, And K.M.M.Aung, "Blockchain-Based Decentralized Content Trust For Docker
        Images,"Multimedia Tools And Applications,Pp.1–26, 2017.
[5]   Ethereum Project. [Online]. Available: Https://Www.Ethereum.Org/
[6]   Inter Planetary File System. [Online].Available:Https://Ipfs.Io/
[7]   Q.Xu, K.M.M.Aung, Y.Zhu, And K.L.Yong, "A Blockchain-Based Storage System For Data Analytics In The Internet Of Things,"
        In New Advances In The Internet Of Things. Springer, Pp.119–138. 2018.
[8]   N.Z.Benisi,M.Aminian,Andb.Javadi,''Blockchain-Based Decentralized Storage Networks: A Survey,'' J. Netw. Comput. Appl., Vol.
        162, Jul. 2020, Art. No. 102656, Doi: 10.1016/J.Jnca.2020.102656.
[9]   A. Shah, N. Sheoran, And S. Gupta, ''Decentralized Storage Network With Smart Contract Incentivisation Candidate's Declaration,''
        Bachelor Technol. Comput. Sci. Eng., Tech. Rep., 2018.
[10]   M. Aloqaily, O. Bouachir, A. Boukerche, And I. A. Ridhawi, ''Design Guidelines For Blockchain-Assisted 5G-UAV Networks,''
        IEEE Netw., Vol. 35, No. 1, Pp. 64–71, Jan. 2021.
[11]   M.Firdaus And K. H. Rhee, ''On Blockchain-Enhanced Secure Data Storage And Sharing In Vehicular Edge Computing Networks,''
        Appl. Sci., Vol. 11, No. 1, Pp. 1–21, Doi: 10.3390/App11010414, 2021.