Fake news traceability and verification mechanism

Title	Fake news traceability and verification mechanism
Area/Tech	Blockchain
Version	1
Start Date	
End Date	
Document Contributors	@Jorge Graca @Joao Ferreira @Joana Sousa @Pedro Antunes
Document Status	DRAFT
JIRA	Type / Key / Summary: IPM-301 — Fake news traceability and verification mechanism (1 item, Synced just now)
Project Dependencies	Voiceprint Token
Project Sharepoint	-
Overleaf	-
Git Repository	https://github.com/nosportugal/nosi-fusion-innovation-fake-news Connect your Github account
GCP Bucket	-
IPR	-
Demo	-

Challenge

In the age of digital information, combating fake news has become a critical challenge. Establishing a robust traceability and verification mechanism is essential to ensure the credibility of news sources and combat the spread of misinformation. Thus is critical to implement key strategies to get an effective fake news traceability and verification mechanism:

Source Verification

- Verify the credibility of the source before sharing any news (video+audio+context). Check if the source is reputable, reliable, and known for accurate reporting.
- Cross-reference information with multiple sources to confirm its accuracy and legitimacy.

Fact Checking Tools

- Utilize fact-checking tools and websites to verify the authenticity of news stories. Platforms like Snopes, FactCheck.org, and PolitiFact can help in debunking false information.

Metadata Analysis

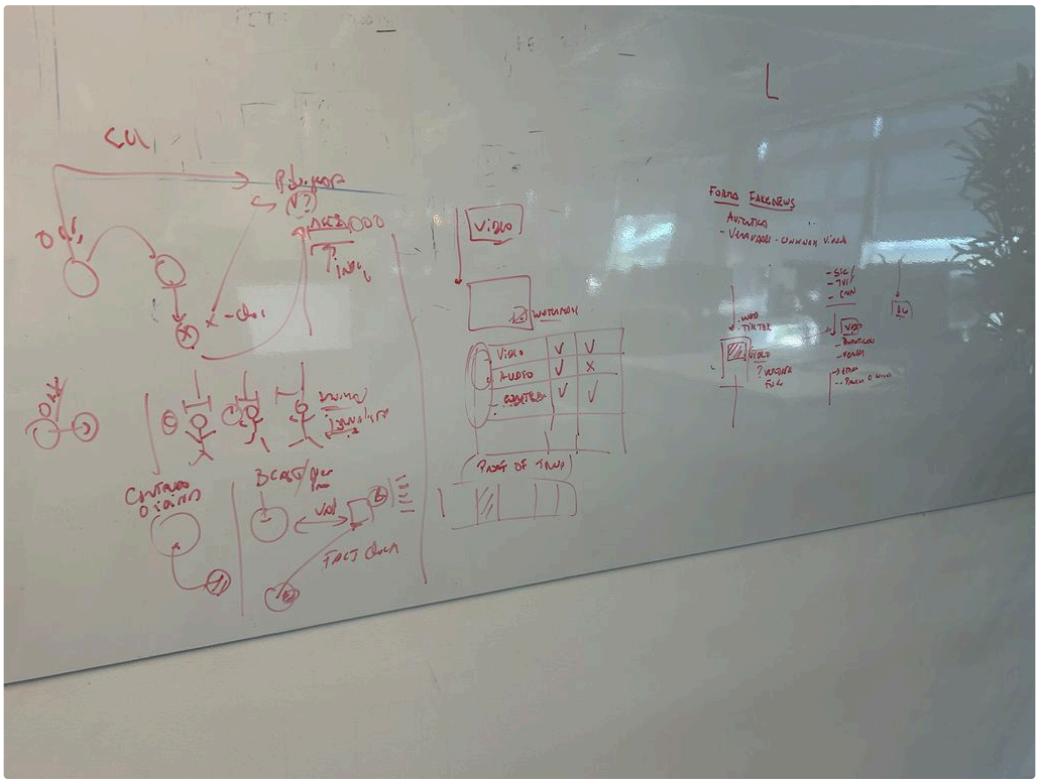
- Examine metadata such as timestamps, locations, and author information to trace the origin of a news story. This can help in identifying potential sources of misinformation.

Reverse Image Search:

- Use reverse image search tools like Google Images or TinEye to verify the authenticity of images accompanying news stories. This can help in detecting manipulated or recycled images.

However, smart solutions to fakenews traceability and verification mechanisms are not clear available and the ones available are focused on text. Video, audio and context are not addressing by these type of tools.

This way, this projects aims at developing a smart system that combining the most advanced AI techniques with blockchain, we van detect when a certain media content has been manipulated, giving some alarms about it.



Goals

Goal	Description
Goal 1	Design a system that combine AI with blockchain for fake news traceability and verification mechanism
Goal 2	Design and implement a Proof-of-Content for video+audio+context
Goal 3	Design a reward system for those who validate the content

Literature Review

Systematic Literature Review: deepfake, blockchain and AI

This systematic review aims at understanding the state-of-the-art from **2017 and 2024** about how technology is helping the detection of deepfake news based on blockchain and AI.

Methodology

The detailed methodology of any systematic review should be fully reported in order to facilitate better understanding of the authenticity and availability of the reviews results. In order to assist in the complete and transparent reporting of systematic reviews, researchers have developed the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) to explain the methods and terms in system reviews of the latest research progress. We follow the PRIMSA methodology in this study. A systematic literature review aims to synthesise scientific research on an explicit subject through accurate analysis of past and present studies. This systematic literature review includes the standard steps: abstract, methods, results, and discussion.

This study covers all the characteristics of a usual systematic review: a clear title and clear purpose; a comprehensive retrieval strategy, a clear inclusion and exclusion criteria, a list of all selected studies, evaluation of the characteristics of each selected study and the quality the research methodology, systematic reporting of research results and assessment of the possibility of any publication bias.

Selection Criteria

Below, we lay out the inclusion and exclusion conditions used for this review and how studies were gathered for synthesis.

Inclusion Criteria:

Blockchain, AI and social media are recent fields of inquiry, and studies have only emerged in recent years. Due to the boom of deepfake news, we have selected 2017 has a starting data for publication, which was an eligibility criterion. Furthermore, papers were included in this SLR if they satisfied the criteria below:

- Papers with a title and abstract explicitly related to both blockchain and fake news
- The information provided by the article is applied in IT field
- The paper are in a jornal, book ou conference
- The paper are written in English
- Papers containing the following keywords: ("Fake News") AND ("Blockchain") OR ("Fake News") AND ("AI" AND "Blockchain")

Exclusion Criteria:

The review excluded:

- Papers for which the full text was not available online;
- Papers with a title and abstract not explicitly related to both blockchain and fake news
- Reviews, reports, case reports, abstract-only papers, patents, magazines, and editorials, as well as books, dissertations, and theses, all of which are hard to find and infrequently available online
- The information provided by the article is not applied in IT field
- The papares are not in journal, book or conference
- The papers are not written in English

Sources

The next step was to determine the online databases and internet materials to be used data collection. We chose five relevant sources by researchers in computer technology-related fields. A final search was carried out on 18 May 2024. The databases were:

- ACM Digital Library (ACM Digital Library)
- IEEE Digital Library (http://ieeexplore.ieee.org)
- Science@Direct (http://www.sciencedirect.com)
- Springer Link (http://link.springer.com)
- Wiley Online Library (https://onlinelibrary.wiley.com)

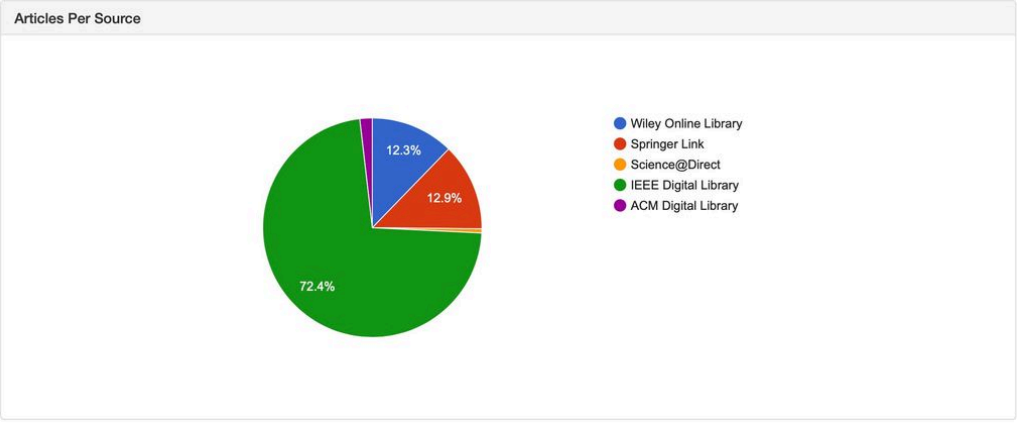
Search Strategy

The search methodology is fundamental for any systematic review. The determination of search terms is the second phase. We first defined a search term relating to our topic: second, we described alternatives for the terms and similar theories. One of the keywords we used was “blockchain”. The other key terms was “Fake news” and “AI”. The search strings were build by combining the keywords with the connectors “AND” and “OR”. Each database uses its own search syntax; thus different query and search strings were constructed as followed:

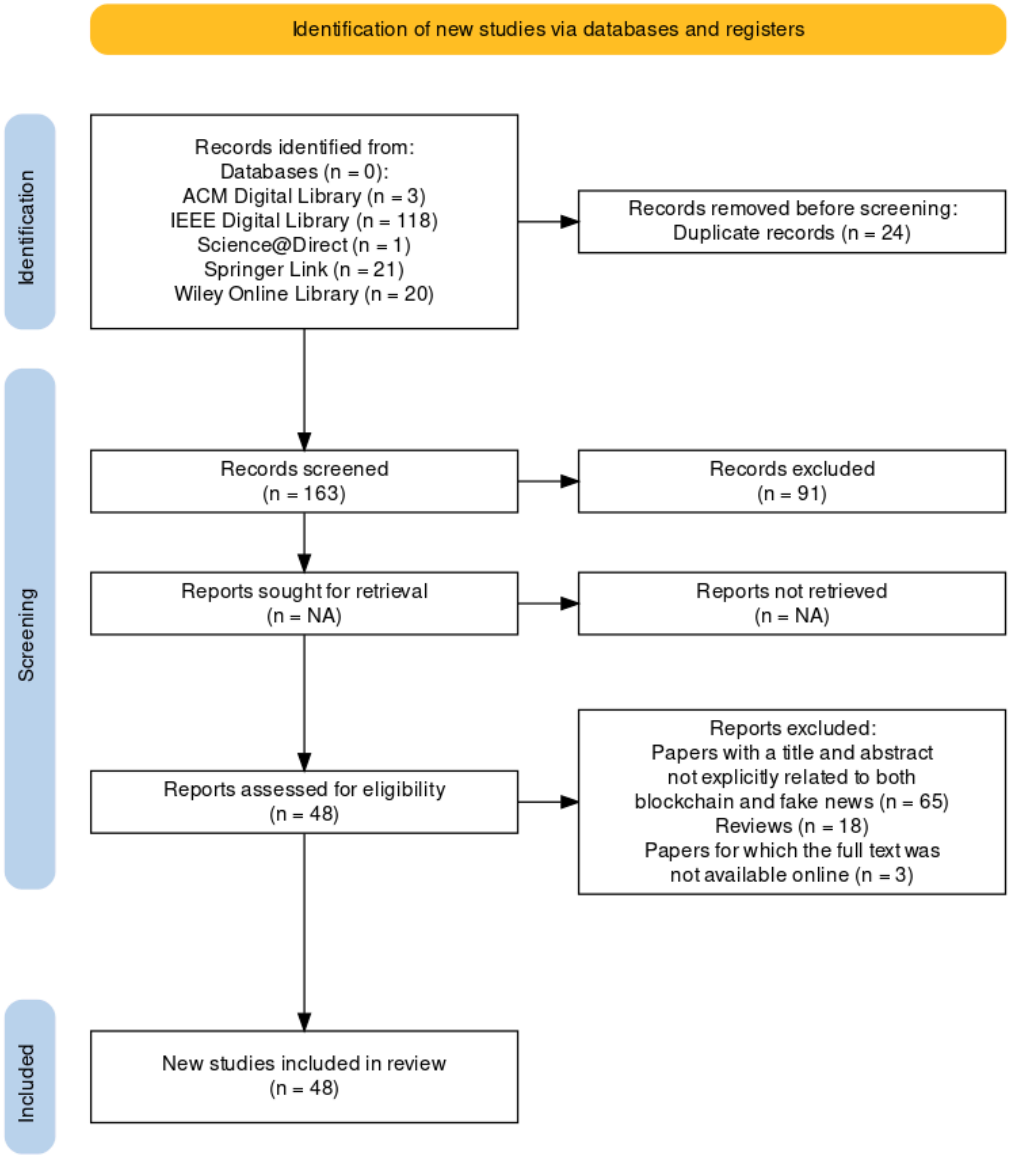
Database	Query Strings
IEEE Explorer	Author Keywords: (("Fake News") AND ("Blockchain") OR ("Fake News") AND ("AI" AND "Blockchain"))
Wiley Online Library	"(("Fake News") AND ("Blockchain") OR ("Fake News") AND ("AI" AND "Blockchain"))" anywhere
ACM Digital Library	*[[[Keywords: "fake news"] AND [Keywords: "blockchain"]] OR [[Keywords: "fake news"] AND [Keywords: "ai"] AND [Keywords: "blockchain"]]] AND [[[Keywords: "fake news"] AND [Keywords: "blockchain"]] OR [[Keywords: "fake news"] AND [Keywords: "ai"] AND [Keywords: "blockchain"]]]*
Springer Link	(("Fake News") AND ("Blockchain") OR ("Fake News") AND ("AI" AND "Blockchain"))

Data Selection Process

Initially, we recovered 163 articles from five databases. The returned results from the most to least were as follows: IEEE Digital Library, 118 items; Springer Link, 21; Wiley Online Library, 20; ACM Digital Library, 3, and Science@Direct, 1. All references found during the search were collected. Duplicated items were subsequently removed.

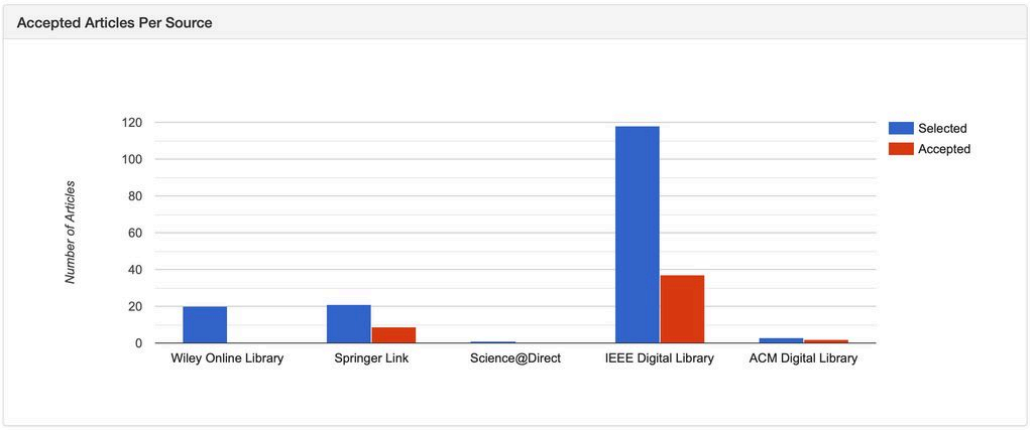


After the duplicates were removed, the eligibility conditions by checking the title, abstract and keywords in light of the research questions and debated which studies should be used for the next filtering. After the initial screening phase, 91 articles were excluded. As a results, 48 items were qualified for inclusion. The process used for screening and selection is should the following Figure.



Results

We retrieve 163 records from five electronic databases, of which 91 were excluded as duplicates and an additional 91 were removed during the screening. Thus, 48 met the eligibility criteria, and were included in this systematic review. The following table lists the selected papers sorted by title, year, source, country and number of citations.



title	year	source	url	Country	Cited
Video Fraud Detection using Blockchain	2020	IEEE Digital Library	https://ieeexplore.ieee.org/document/9182963	India	9
A blockchain-based secured and trusted framework for information propagation on online social networks	2021	Springer Link	https://link.springer.com/article/10.1007/s13278-021-00754-y	India	16
Protecting Data Privacy and Prevent Fake News and Deepfakes in Social Media via Blockchain Technology	2021	Springer Link	https://link.springer.com/chapter/10.1007/978-981-33-6835-4_44	Malaysia	5
Towards a Location-Aware Blockchain-Based Solution to Distinguish Fake News in Social Media	2022	Springer Link	https://link.springer.com/chapter/10.1007/978-981-19-0468-4_9	China	4
An Effective Hybrid Model for Fake News Detection in Social Media Using Deep Learning Approach	2024	Springer Link	https://link.springer.com/article/10.1007/s42979-024-02698-4	India	0
Machine Learning-Based Fake News Detection System Using Blockchain	2024	Springer Link	https://link.springer.com/chapter/10.1007/978-981-99-7622-5_38	India	1
Fake News Detection using a Decentralized Deep Learning Model and Federated Learning	2022	IEEE Digital Library	https://ieeexplore.ieee.org/document/9968358	Australia	5
WhistleBlower: Towards A Decentralized and Open Platform for Spotting Fake News	2020	IEEE Digital Library	https://ieeexplore.ieee.org/document/9284670	USA	7
Detecting Fake News using Blockchain and Deep Learning	2023	IEEE Digital Library	https://ieeexplore.ieee.org/document/10250728	India	0
A Trusting News Ecosystem Against Fake News from Humanity and Technology Perspectives	2019	IEEE Digital Library	https://ieeexplore.ieee.org/document/8853600	Taiwan	7
Machine Learning based Novel Framework for Fake News Detection and Prevention using Blockchain	2023	IEEE Digital Library	https://ieeexplore.ieee.org/document/10112509	India	0
Social Media Fake News Detection using mNB in Blockchain	2022	IEEE Digital Library	https://ieeexplore.ieee.org/document/9760840	India	3

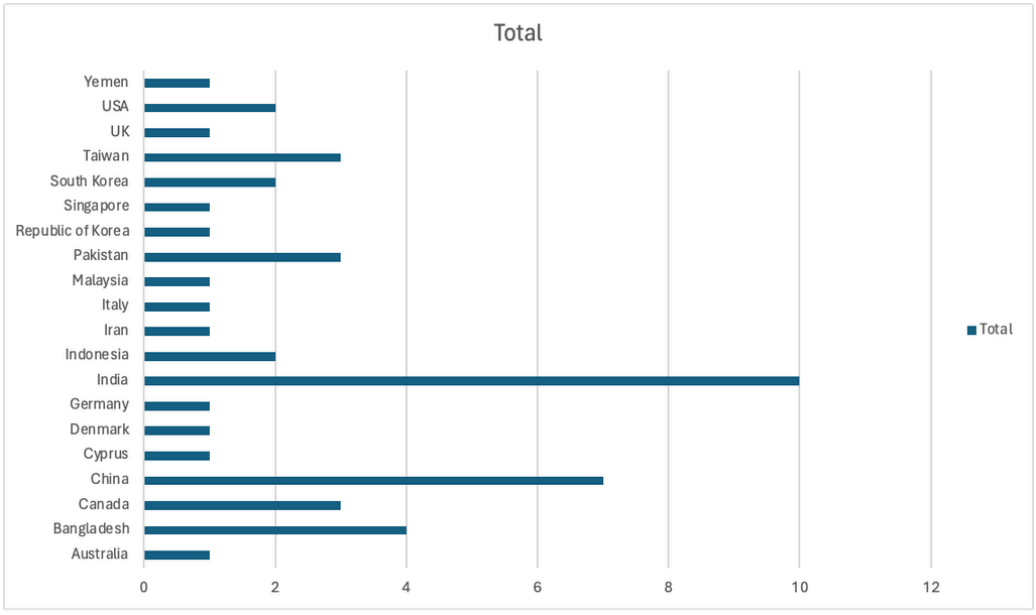
Fake News Detection based on Blockchain Technology	2022	IEEE Digital Library	https://ieeexplore.ieee.org/document/9978074	Italy	1
Application of Blockchain News Production Based on Digital Encryption Technology	2020	IEEE Digital Library	https://ieeexplore.ieee.org/document/9103845	China	4
TRUSTD: Combat Fake Content using Blockchain and Collective Signature Technologies	2020	IEEE Digital Library	https://ieeexplore.ieee.org/document/9202590	UK	18
Fake Media Detection Based on Natural Language Processing and Blockchain Approaches	2021	IEEE Digital Library	https://ieeexplore.ieee.org/document/9536745	South Korea	17
A Reputation System based on Blockchain and Deep Learning in Social Networks	2023	IEEE Digital Library	https://ieeexplore.ieee.org/document/10152658	China	1
Information Dissemination Model Based on Blockchain Social Network	2023	IEEE Digital Library	https://ieeexplore.ieee.org/document/10152564	China	0
Authentic Facts: A Blockchain Based Solution for Reducing Fake News in Social Media	2022	ACM Digital Library	Authentic Facts: A Blockchain Based Solution for Reducing Fake News in Social Media | Proceedings of the 2021 4th International Conference on Blockchain Technology and Applications	Bangladesh	3
EventChain: a blockchain framework for secure, privacy-preserving event verification	2022	ACM Digital Library	EventChain | Proceedings of the 23rd ACM/IFIP International Middleware Conference	Germany	0
Fraudulent Information Prediction using Block Chain Technology and Machine Learning	2022	IEEE Digital Library	https://ieeexplore.ieee.org/document/9793073	India	1
News Verification using Ethereum Smart Contract and Inter Planetary File System (IPFS)	2021	IEEE Digital Library	https://ieeexplore.ieee.org/document/9608826	Indonesia	6
An Implementation of Fake News Prevention by Blockchain and Entropy-based Incentive Mechanism	2021	IEEE Digital Library	https://ieeexplore.ieee.org/document/9671778	Canada	1
Toward News Authenticity: Synthesizing Natural Language Processing and Human Expert Opinion to Evaluate News	2023	IEEE Digital Library	https://ieeexplore.ieee.org/document/10034750	Bangladesh	8
Fighting Against Fake News by Connecting Machine Learning Approaches with Web3	2022	IEEE Digital Library	https://ieeexplore.ieee.org/document/9922927	Pakistan	2
Blockchain-Based Approach for Proving the Source of Digital	2020	IEEE Digital Library	https://ieeexplore.ieee.org/document/9073820	Pakistan	4

Media					
The impact of blockchain on media: Take Bilibili as an example	2021	IEEE Digital Library	https://ieeexplore.ieee.org/document/9525480	China	0
Blockchain-based Notarization for Social Media	2019	IEEE Digital Library	https://ieeexplore.ieee.org/document/8661978	South Korea	22
“Digital Content + Blockchain” Create Value-Take ContentBox as an Example	2021	IEEE Digital Library			
SANUB: A new method for Sharing and Analyzing News Using Blockchain	2019	IEEE Digital Library	https://ieeexplore.ieee.org/document/8985152	Iran	7
Securing Indonesian Hoax News Dataset with Blockchain, IPFS, and Voting Mechanism	2023	IEEE Digital Library	https://ieeexplore.ieee.org/abstract/document/10335318	Indonesia	0
Internet News Traceability Solution Based on Blockchain	2019	IEEE Digital Library	https://ieeexplore.ieee.org/document/8940318	China	0
Fighting Fake News Propagation with Blockchains	2019	IEEE Digital Library	https://ieeexplore.ieee.org/document/8802670	USA	20
Artificial Intelligence Blockchain Based Fake News Discrimination	2024	IEEE Digital Library	https://ieeexplore.ieee.org/document/10488363	Republic of Korea	0
Tracing the Source of Fake News using a Scalable Blockchain Distributed Network	2020	IEEE Digital Library	https://ieeexplore.ieee.org/document/9356086	Denmark	20
Fake News Propagation in the era of Covid-19-Tracing and Combating Fake News using Block Chain Technology	2021	IEEE Digital Library	https://ieeexplore.ieee.org/document/9841145	India	0
Mitigating the Effects of Fake News using Blockchain and Machine Learning	2021	IEEE Digital Library	https://ieeexplore.ieee.org/document/9456205	India	5
ABC-Verify: AI-Blockchain Integrated Framework for Tweet Misinformation Detection	2021	IEEE Digital Library	https://ieeexplore.ieee.org/document/9672392	Singapore	3
Developing more Reliable News Sources by utilizing the Blockchain technology to combat Fake News	2020	IEEE Digital Library	https://ieeexplore.ieee.org/document/9274460	Cyprus	8
AI Blockchain Platform for Trusting News	2019	IEEE Digital Library	https://ieeexplore.ieee.org/document/8884985	Taiwan	30
Ensuring transparency, confidentiality, and deterrence of	2024	Springer Link	https://link.springer.com/article/10.1007/s41870-023-01619-7	Bangladesh	2

political influence in journalism using IPFS, private, public, and semi-public blockchains					
Blockchain-Based Incentive Mechanism to Combat Fake News	2021	Springer Link	https://link.springer.com/chapter/10.1007/978-981-16-8059-5_5	Yemen	1
Fake News Detection Using Ethereum Blockchain	2022	Springer Link	https://link.springer.com/chapter/10.1007/978-3-030-96040-7_11	Canada	0
Fake News Detection in Social Media using Blockchain	2019	IEEE Digital Library	https://ieeexplore.ieee.org/document/8843597	Bangladesh	36
Development of a fake news checking crowdsourcing platform consisting of smart contracts combined with gamification	2021	IEEE Digital Library	https://ieeexplore.ieee.org/document/9603222	Taiwan	1
An incentive-aware blockchain-based solution for internet of fake media things	2020	Springer Link	https://www.sciencedirect.com/science/article/abs/pii/S0306457320308657	Canada	137
Tracing the Source of News Based on Blockchain	2018	IEEE Digital Library	https://ieeexplore.ieee.org/document/8466516	China	21
Using Blockchain to Rein in the New Post-Truth World and Check the Spread of Fake News	2019	IEEE Digital Library	https://ieeexplore.ieee.org/document/8764081	Pakistan	62

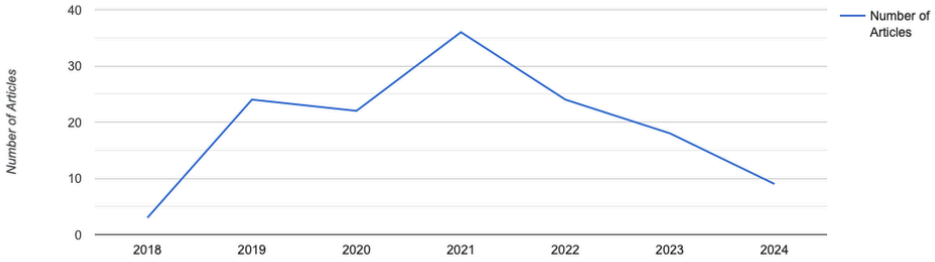
Included Studies by Country

The records illustrate extensive spread across many countries. India leads research on the subject (10 documents), followed by China, Bangladesh, Canada, Pakistan and Taiwan. The following Figure compares the coutnries.



Selected Documents by Year

The distribution of the selected documents per year is shown in the following Figure. The timeframe was from 2017 and 2024. All of the included items were published within the last five years. Globally, a sharp rise in the number of publications can be noticed. Only 3 articles were published in 2018, followed by 24 in 2019, which decrease to 22 in 2020 and then increased to 36 in 2021. After that, the number of papers have been decreased.



Discussion

Different Methods and Techniques Proposed by Past Studies to Leverage Blockchain Technology in Social Media

- **Blockchain-Based Notarization**: One method involves using blockchain for notarization in social media. This leverages blockchain's immutability and transparency to create trust among shared news, ensuring that once information is recorded, it cannot be altered without a trace.
- **Smart Contracts for Governmental Authorities**: Another approach is the development of blockchain-based smart contracts that enable governmental Communication and Media Authorities to provide reliable sources of information and combat misinformation. This method uses blockchain to ensure data correctness and immutability without relying on centralised servers.
- **Virality-Based Review System**: A system where news that surpasses a certain threshold of virality (e.g., 5000 shares) is reviewed by validators. These validators provide ratings that represent the correctness and authenticity of the news, which are then visible to users.
- **Integration of Natural Language Processing (NLP)**: Combining blockchain with NLP and machine learning techniques to detect fake news and predict fake user accounts and posts. This method uses reinforcement learning to improve the accuracy of fake news detection and leverages blockchain for secure digital content authority proof.
- **AI and Blockchain Integration**: A method that tightly integrates AI with blockchain technology to form a social media platform where news can be validated by domain experts and the general population. AI is used to detect and prevent fake news and deepfakes, leveraging blockchain's trust properties to provide a secure platform for publishing trustworthy news.

These methods collectively aim to enhance the reliability and trustworthiness of information shared on social media platforms by leveraging the unique characteristics of blockchain technology.

Current limitations of the state-of-the-art

- **Scalability and Decentralization**: One of the primary limitations of the proposed approach is its scalability. The system needs to handle a large number of transactions efficiently, which can be challenging. Additionally, the ecosystem should be decentralized to avoid central points of failure and to ensure global applicability. This requires a protocol that can interoperate between different subsystems owned by various organisations.
- **Dependence on Official Service Providers**: The approach relies heavily on official service providers to generate and sign digital evidence. This dependence could be problematic if these service providers are compromised or fail to perform their duties effectively. Ensuring the integrity and trustworthiness of these providers is crucial for the system's success.

- **Verification Overhead**: The process of verifying digital signatures and maintaining the integrity of the blockchain can be resource-intensive. This overhead can slow down the system, making it less efficient and potentially less user-friendly.
- **Complexity in Implementation**: Implementing the proposed method requires significant changes to existing social media platforms and the integration of blockchain technology. This can be complex and costly, posing a barrier to widespread adoption.
- **Irreversibility of Decisions**: Once a decision is recorded on the blockchain, it cannot be easily revoked. This could be problematic if new information comes to light that contradicts the initial decision, highlighting the need for a mechanism to handle such scenarios.
- **Lack of Incentives for Fact-Checkers**: Users may not be motivated to participate in fact-checking activities due to the absence of sufficient incentives. This raises questions about the sustainability of such methods and the need for a robust incentive structure to encourage user participation.
- **Bias in Community-Driven Fact-Checking**: Community-driven fact-checking can be biased if the majority of appraisers share similar biases. This can lead to the rapid up-voting of misinformation, undermining the system's credibility. Addressing this bias is essential for the system's effectiveness.
- **Adoption of Secure Multi-Signature Schemes**: The current implementation of the TRUSTD approach can be improved by adopting more secure multi-signature schemes like mBCJ, which are only marginally less efficient than existing schemes but offer provably higher security.
- **Credibility Calculation**: In some extreme cases, the content could be signed by an authority who is not trusted by the user. This highlights the need to extend the way credibility is calculated to ensure that the system's recommendations are reliable and trusted by users.

Knowledge Gaps Which Future Research Can Address

- **Inter-Group Communication and Fake News Prevention**: Future research can explore mechanisms to enhance communication across different social groups to prevent the spread of fake news. This involves identifying the groups individuals participate in and developing strategies to produce more neutral and factual content.
- **Incentive Mechanisms for Fact-Checking**: There is a need to develop more effective incentive mechanisms to motivate users to participate in fact-checking activities. Current methods lack sufficient incentives, which raises questions about their sustainability.
- **Scalability and Robustness of Blockchain Systems**: Research can focus on improving the scalability and robustness of blockchain systems used in fake news prevention. This includes designing mechanisms to handle crash failures and support scalability more effectively.
- **Political and Regulatory Challenges**: Addressing the political and regulatory challenges associated with publishing solid news against government interests is crucial. Research can explore ways to mitigate political influence on blockchain-based news verification systems.
- **Bias and Weight Calculations in Trust Ratings**: Future studies can improve the accuracy of trust ratings by refining the equations of bias and weight. This will enhance the overall performance of methodologies used to detect fake news.
- **Integration of AI and Blockchain**: Combining artificial intelligence with blockchain technology can be further explored to enhance fake news detection. Research can investigate how different AI characteristics can be integrated with blockchain to improve model performance without risking degradation.
- **Data Availability and Quality for Training**: There is a need for more extensive and high-quality data for training and testing fake news detection models. Future research should focus on accumulating credible fake news data and exploring unsupervised and reinforcement learning approaches to address data shortages and imbalance problems.
- **User Trust and Adoption**: Research can investigate strategies to build user trust and encourage the adoption of blockchain-based solutions in social media. This includes educating users about the benefits and functionalities of blockchain technology.

By addressing these knowledge gaps, future research can significantly enhance the effectiveness and reliability of blockchain applications in social media.

title	Summarized Abstract	Methods Used	Results	Conclusions	Limitations
1812.10508v1.pdf	• Blockchain framework for secure	• Network model evaluation	• Information authenticity checked with 83%	• Proposed framework achieves 83%	• Research lacks criteria for blocking

	information sharing on online social networks. • Evaluates with real Facebook data, achieving 83% accuracy.	• Trust value calculation based on credibility score • Blockchain based information propagation description	accuracy using blockchain framework. • Best results for movies, followed by politics, technology, and research.	accuracy in information propagation evaluation. • Future directions include studying larger network datasets and dynamic networks.	misinformation in the network. • Prior research focused on rumor spreading and information dynamics separately.
2008.13632v1.pdf	• TRUSTD combats fake content using blockchain and collective signatures. • Addresses misinformation impact on society through ML and DL advancements.	• Blockchain technology • Collective signature algorithm • AI-driven analysis techniques • Fact extraction and fact-checking processes	• TRUSTD introduces blockchain for content credibility and user verification. • Users can determine content credibility and specify trusted parties.	• TRUSTD shifts content verification responsibility to users, promoting decentralization. • Users can determine content credibility levels and specify trusted parties.	• TRUSTD limitations include mBCJ scheme adoption and credibility calculation extension. • Delay in content sign-off due to time factors and lack of incentives. • AAs cannot revoke decisions once added to blockchain.
A_Reputation_System_based_on_Blockchain_and_Deep_Learning_in_Social_Networks.pdf	• Paper proposes reputation system using blockchain and deep learning in social networks. • Balances freedom of speech with social stability through smart contracts.	• Deep learning models for rumor detection and sentiment analysis • Smart contracts for message sending, forwarding, and reputation calculation • RoBERTa model for reputation value calculation before message sending	• Proposed reputation system balances freedom of speech with social stability. • System uses deep learning for rumor detection and sentiment analysis. • Performance analysis shows impact on forwarding probability of malicious messages.	• New dynamic reputation mechanism balances false info and user freedom. • Combines blockchain, smart contracts, deep learning, and IPFS for credibility.	• Limits user rights, restricts freedom of expression. • Emphasizes privacy, neglects false information identification.
ABC-Verify_AI-Blockchain_Integrated_Framework_for_Tweet_Misinformation_Detection.pdf	• ABC-Verify integrates AI and blockchain for fake news detection. • Combines AI learning with Ethereum	• AI and Proof-of-stake algorithm for fake news detection. • BERT language model, NLP, ML classifiers for	• ABC-verify improved accuracy from 80% to 93% over iterations. • ABC-verify reduced false	• ABC-verify enhances fake news detection with AI and blockchain integration. • Achieved higher accuracy of 93%	• Community-driven fact-checking limitations include rapid up-voting and lack of incentives.

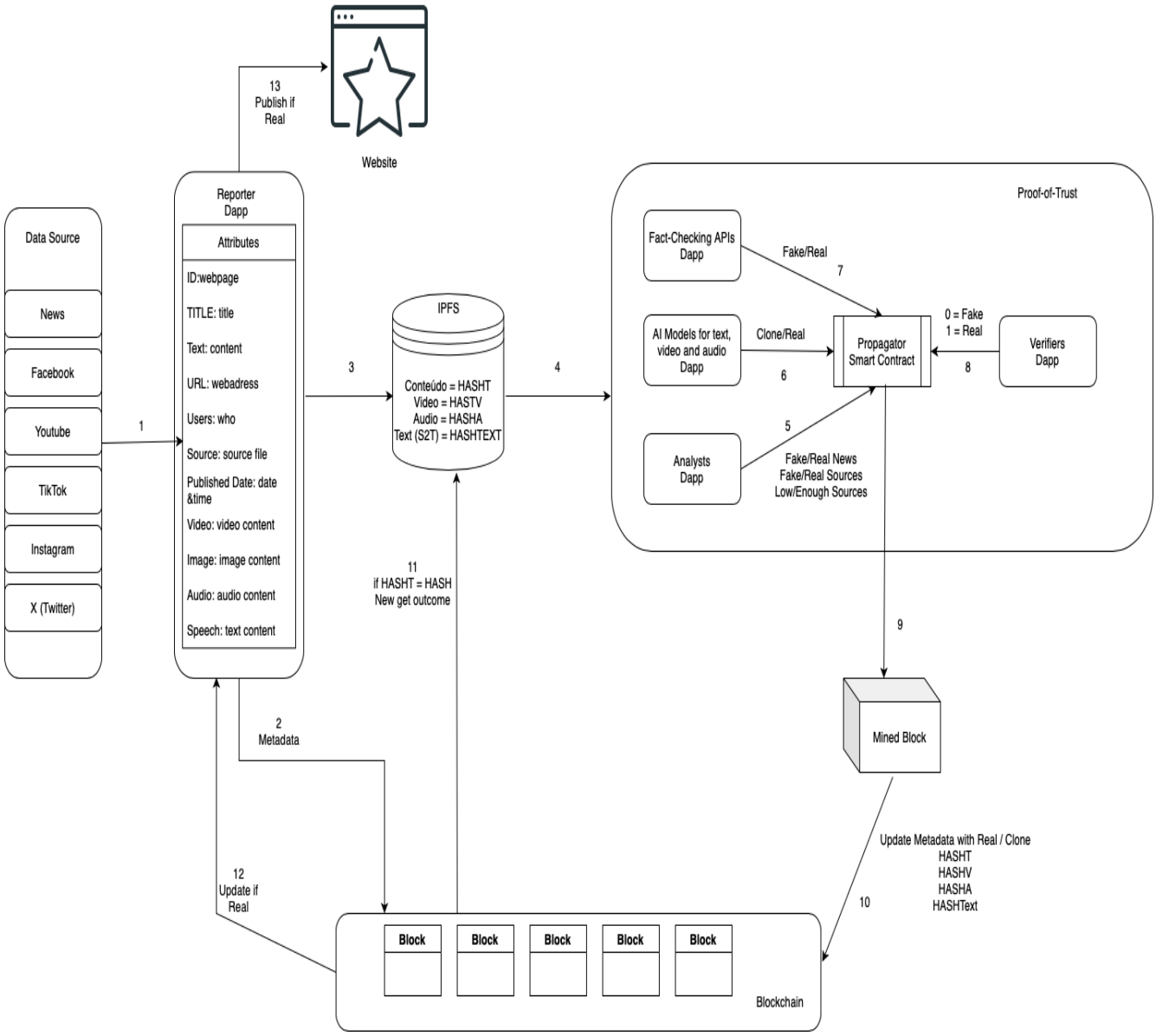
	blockchain for misinformation control.	COVID-19 fake news. • Twitter API, data cleansing, tokenization for AI model training.	positive rate from 60 to about 20. • Smart contract validators enhanced AI model predictions in ABC-verify.	and reduced false positives by 66%. • Incentivization boosts user motivation and addresses crowdsourcing limitations.	• Detection flaws in posts circulating in private groups.
AI_Blockchain_Platform_for_Trusting_News-2.pdf	• AI blockchain platform for factual news against fake news propagation. • Collaboration among researchers and news media to combat misinformation.	• News propagation modeled as blockchain supply chain for fact-checking. • AI analyzes blockchain ledger to identify fact news creators. • Fact-checking by domain topic experts and AI tools used.	• Mechanism building factual news database. • AI blockchain platform for trusting news ecosystem.	• Proposes AI blockchain platform to combat fake news with factual data. • Emphasizes collaboration among researchers and news media for factual news.	• AI algorithms and social interventions have limited effects on fake news. • Challenges include personalization of intervention mechanisms and fake news prediction models. • Building trustful data entry mechanisms for news blockchain supply chain.
An_Implementation_of_Fake_News_Prevention_by_Blockchain_and_Entropy-based_Incentive_Mechanism.pdf	• Fake news prevention using stake-based incentives and human appraisers. • Implemented Hyperledger Fabric, Schnorr signatures for system feasibility. • Mechanisms for crash failure prevention and scalability enhance system robustness. • Proposed entropy-based incentive mechanism to resist attacks.	• Proof of stake entropy-based incentive mechanism proposed for reliability enhancement. • Implementation of blockchain via Hyperledger Fabric to prove feasibility.	• Proposed proof of stake entropy-based incentive mechanism for fake news prevention. • Implemented blockchain via Hyperledger Fabric to prove system feasibility.	• Proposed proof of stake mechanism enhances fake news prevention system reliability. • Implemented Hyperledger Fabric to prove quorum-based system feasibility. • Designed crash failure prevention and scalability mechanisms for system robustness. • Provided various experiment results for system performance reference.	• Automatic detection accuracy lower than manual detection due to AI limitations. • Centralized and decentralized verification methods have control and expertise challenges.

Artificial_Intelligence_Blockchain_Based_Fake_News_Discrimination.pdf	• Paper focuses on AI, blockchain to combat fake news spread. • Explores AI, blockchain tech for fake news detection and prediction.	• Verification using Blockchain, ANN, CBR, and MDA. • Experiment with 5-fold cross-validation for performance testing. • Analysis and prediction with LSTM-based AI techniques.	• Experiment verified fake news reduction using Blockchain and AI technology. • Proposed system to distinguish authorized news from fake news. • Blockchain news media platform faces challenges in market responsiveness.	• Proposed fake news reduction plan using Blockchain was implemented successfully. • System to distinguish authorized news from fake news needs further research.	• Multi-channel data access control limitations in design. • Difficulty in discriminating fake news from misinformation within authorized news.
Blockchain-based_Notarization_for_Social_Media.pdf	• Blockchain-based notarization service for social media to combat fake news. • Architecture for authentic archiving of social media contents using blockchain.	• Novel approach: Service providers generate snapshots for notarization. • PKI protocol for verification of evidence to prevent forgery.	• Proposed blockchain-based notarization service for social media to combat fake news. • Introduced a solution to falsifying data attacks on blockchain technology.	• Proposed blockchain solution combats falsifying data attacks on social media. • Official service providers sign authentic data to reduce fake content.	• Scalability issue and reputation system for future enhancement.
Developing_more_Reliable_News_Sources_by_utilizing_the_Blockchain_technology_to_combat_Fake_News.pdf	• Paper combats fake news using blockchain for reliable news sources. • Decentralized app on Ethereum blockchain for self-verifying trustworthy news sources.	• Blockchain technology with smart contracts for reliable news sources. • Decentralized application on Ethereum blockchain to combat fake news.	• Proposed decentralized app on Ethereum to combat fake news effectively. • Smart contract for self-verification of news sources. • Special-purpose smart contract deployed on Ethereum Ropsten Test Network.	• Decentralized app on Ethereum to combat fake news with smart contracts. • Register reliable news sources for self-verification by users.	• Limitations include lack of detailed experimental results and extensive analysis.

Development_of_a_fake_news_checking_crowdsourcing_platform_consisting_of_smart_contracts_combined_with_gamification.pdf	• Fake news platform 'One For All' uses gamification and smart contracts. • Aims to increase public participation and trust in fake news checking.	• Hybrid architecture with smart contracts and gamification for fake news checking. • User categories: Publisher, Membership Grading, and Development of specific titles.	• Proposed 'One For All' platform combines smart contracts with gamification. • Platform rules enforced through smart contracts to enhance transparency and fairness.	• Smart contracts and gamification enhance fake news checking platform participation. • Octalysis core drives used to increase crowdsourcing participation effectively.	• Insufficient manpower in crowdsourcing platforms to combat fake news spread. • Trust issues in crowdsourcing addressed through smart contracts and gamification.
Fake_Media_Detection_Based_on_Natural_Language_Processing_and_Blockchain_Approaches.pdf	• Paper focuses on fake media detection using NLP and blockchain. • Aims to predict fake news and user accounts on social media. • Utilizes reinforcement learning and blockchain for security enhancement.	• Natural Language Processing • Blockchain integration • Reinforcement Learning technique applied for fake news detection	• Performance evaluation of blockchain framework using Reinforcement Learning technique. • Execution results based on Hyperledger Fabric framework for news sharing. • Performance evaluation of transactions based on number of users.	• Combines blockchain and ML for trust-based news architecture. • Reinforcement learning enhances decision-making for fake news detection.	• PBFT has poor scalability due to high message transmission. • Lack of trustable information and fake news on social media.
Fake_News_Detection_based_on_Blockchain_Technology.pdf	• Fake news detection algorithm using Blockchain technology for credibility proof. • Parameters include writing style, sentiment analysis, and news context evaluation.	• Text style analysis • Sentiment analysis • Blockchain technology for digital contents authority proof	• Proposed algorithm effectively isolates fake news from real ones. • Model classifies articles based on text style, sentiment analysis, and context. • Utilized Blockchain technology for digital content authority proof.	• Proposed fake news detection algorithm using text style and news context. • Utilized sentiment analysis and Ethereum smart contract for classification. • Tested detector on Kaggle dataset, evaluating performance and system.	• Ongoing project with open issues needing further research. • Future direction includes extensive analysis of news producers.
Fake_News_Detection_in_Social_Media_	• Blockchain detects fake news in social media using	• Natural language processing techniques	• Final ratings determine news trustworthiness on a scale of 1-5.	• Proposed method aids in detecting fake news in	• Political influence hinders solid news against government.

using_Blockchain.pdf	decentralized applications. • Explores blockchain's security, immutability, and transparency to create trust. • Detects fake news using Ethereum smart contracts and BFS algorithm. • Proposed method helps detect fake news, improving trustworthiness ratings.	• Naive Bayes Classifier • K-nearest neighbor algorithm • Text-based analysis • Weight-based validation	• Validators in Blockchain are rewarded for valid news reviews.	social media effectively. • Equations of bias and weight enhance trustiness rating accuracy.	• Difficulty in detecting news based on politics and religion. • Computational power consumption is a significant concern.
Fighting_Against_Fake_News_by_Connecting_Machine_Learning_Application_with_Web3.pdf	• Paper combats fake news using NLP, ML models, and blockchain. • Implements LSTM, KNN, and Multinomial Naive Bayes for detection.	• Multinomial Naive Bayes, KNN, LSTM models applied for accuracy. • NLP techniques, topic modeling, stance detection, and blockchain integration utilized.	• Multinomial NB achieved 95% accuracy, outperforming other algorithms. • LSTM model using GloVe and Word2Vec reached 99% accuracy. • KNN model surpassed previous research with 89% accuracy.	• NLP and blockchain enhance news classification accuracy with feature engineering. • IPFS integration makes the system effective and tamper-proof. • User-friendly Dapp for clients with Web3 and ReactJS.	• Lack of clarity in connecting CNN algorithm with blockchain. • Ambiguity in end user interaction with decentralized news architecture.

Architecture



The blockchain provides a platform for people evaluate or detect fake news. We believe that its detection can be done by people, APIs and AI models. Thus, we propose a decentralised Blockchain-based application for evaluating news. The following Figure presents an overview of the frameworAccording to Figure, data comes from several social networks and media will be feed a “Publish DApp” (1). This “Publish data” will be responsible by:

- store the text attribute as a metadata in the blockchain (2) and
- the content as a whole should be store in the IPFS (3) and should also be divided into Video, Audio and Context (through S2T) (3). Each one would have an HASH and the whole content should be composed by all hashes (“HASH”T = HASHVideo + HASHAudio + HASHContext).
    - In case of a certain HASH already exist in the blockchain (11), the system will retrieve the outcome (Fake/Real) without pursue the following process.

Then, the information in IPFS with be send to a Propagator Smart Contract (4), which will be responsible for analysing and evaluating news. There are two thees of entities: system users and propagator smart contract.

System users

Users do not get any payments. Analysing news are a social responsibility, so incentives for participating in the system are help detecting fake news and increasing their credits.

Users: We have 4 different roles and 2 types of credits as defined below:

- **Analyser:** the analyser can be a Journalist, reviewer or other type of people want to contribute to the evaluation of news. Each user can search for tags and track related news using their DAPP. They will analyse the news about whether the news is valid or not. This validation should be related to the video, audio and text with are related to a certain content. For example, when the analyser select a certain contain, he/she should classify the content as a whole but he/she have to indicate which of the components are fake, if the video, audio ou context. The main classification is “Fake or real”. However, they can also provide information about “Fake/Real sources” and “Low/Enough sources”. This information will be store in the Propagator Smart Contract.
- **Verifier:** Verifiers are accredited organisations such as RTP, SIC, TVI, LUSA, BBC, among others that will give either score one or zero to each news. This information will be store in the Propagator Smart Contract. Different to analysts, verifiers do not analyse the news. The users will receive news from their DAPP and will provide feedback using it too. Based on their own data sources, they score said news. The information will be store in the Propagator Smart Contract.
- **Fact-Checking API:** fact-checking organisations aims at providing accurate, unbiased analysis of statements made public to correct public misperceptions and increase knowable of important issues. Also, there are some API tools to get the outcomes we want to check. This “user” will check the text news and will also provide a classification of “Fake/Real”. This result will be store in the Propagator Smart Contract.
- **AI Models:** The main goal of using AI models is to applied the most advanced technology to detect fake videos, audios and context. In this sense, AI models will be divided into three classes:
  - Class 1: Video Fake, based on face detections or video fingerprinting
  - Class 2: Audio fake, of cloning voice
  - Class 3: Change context that can come from subtitles or speech-to-text

  Each AI model will have each own ML implementation and will provide information about “Fake/Real”. This information will be store in the Propagator Smart Contract

Smart Contracts

The system will implemented, at least, 2 smart contracts.

- **Reporter Smart Contract:** the main task of this smart contract is to get the attributes that come from social media as well as to store the media content into the IPFS and the metadata (the attributes) into the blockchain. As soon as a certain news is considered True in the Propagator Smart Contract, the reporter Smart Contract will receive this information. This smart contract will be connected to the Reporter DAPP.
-
- **Propagator Smart Contract:** The main task of this smart contract is to propagate the news on the network (analysts, verifiers, AI models and Fact-Checking APIs). This smart contract will keep a list of analyses of each person, list of news and their tags. Also, it will manage the analysis and evaluations of news. This smart contract will be connected to the Fact-checking, AI Models, Analysis and Verifiers DAPPs, and will store the classification into the blockchain, updating the previous metadata. After each user scoring, this smart contract will summarises the user scores and calculate the final score for the news, updating the credit of the analysts.

DAPPs

The system will have, at least, 2 DAAPs: Reporter DAPP and Validator DAPP.

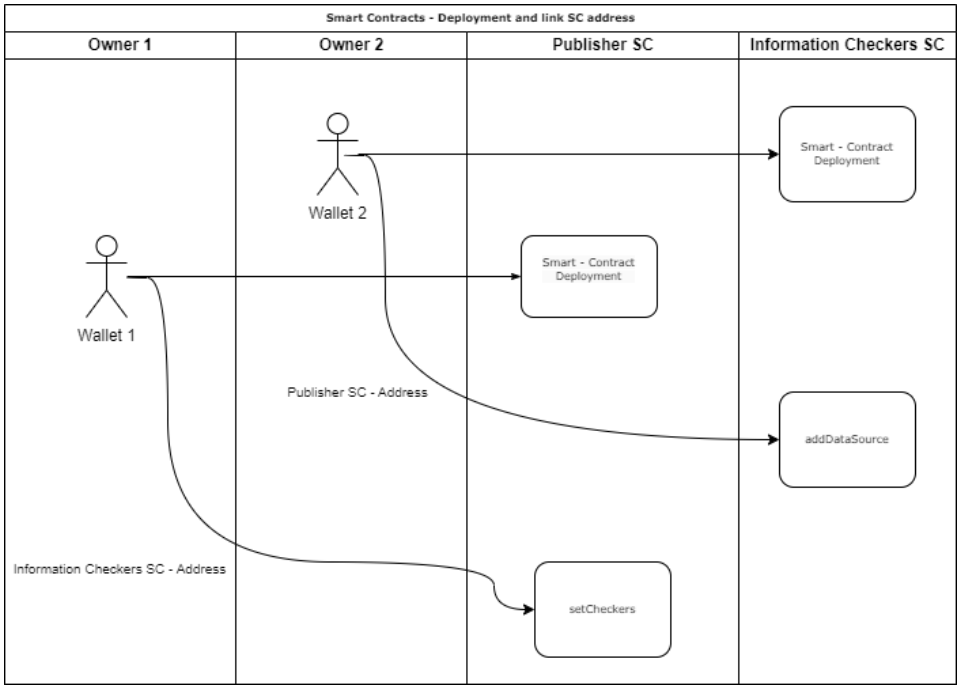
Reporter DAPP: This DAPP is connected to the Reporter Smart Contract and will receive the news and its attributes. Also, it will be connected to a website where the true news should be published.

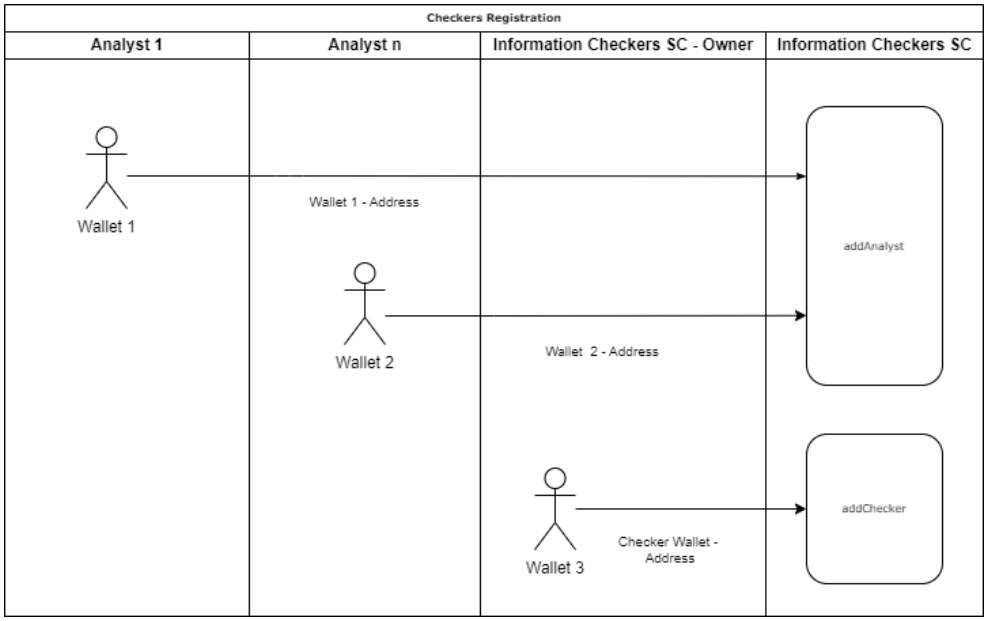
Validator DAPP: This DAPP is connected to the Propagator Smart Contract and it will distributed to all defined users. It will be the front-end to the users receive the news, provide feedback and receive its confirmation about the classification.

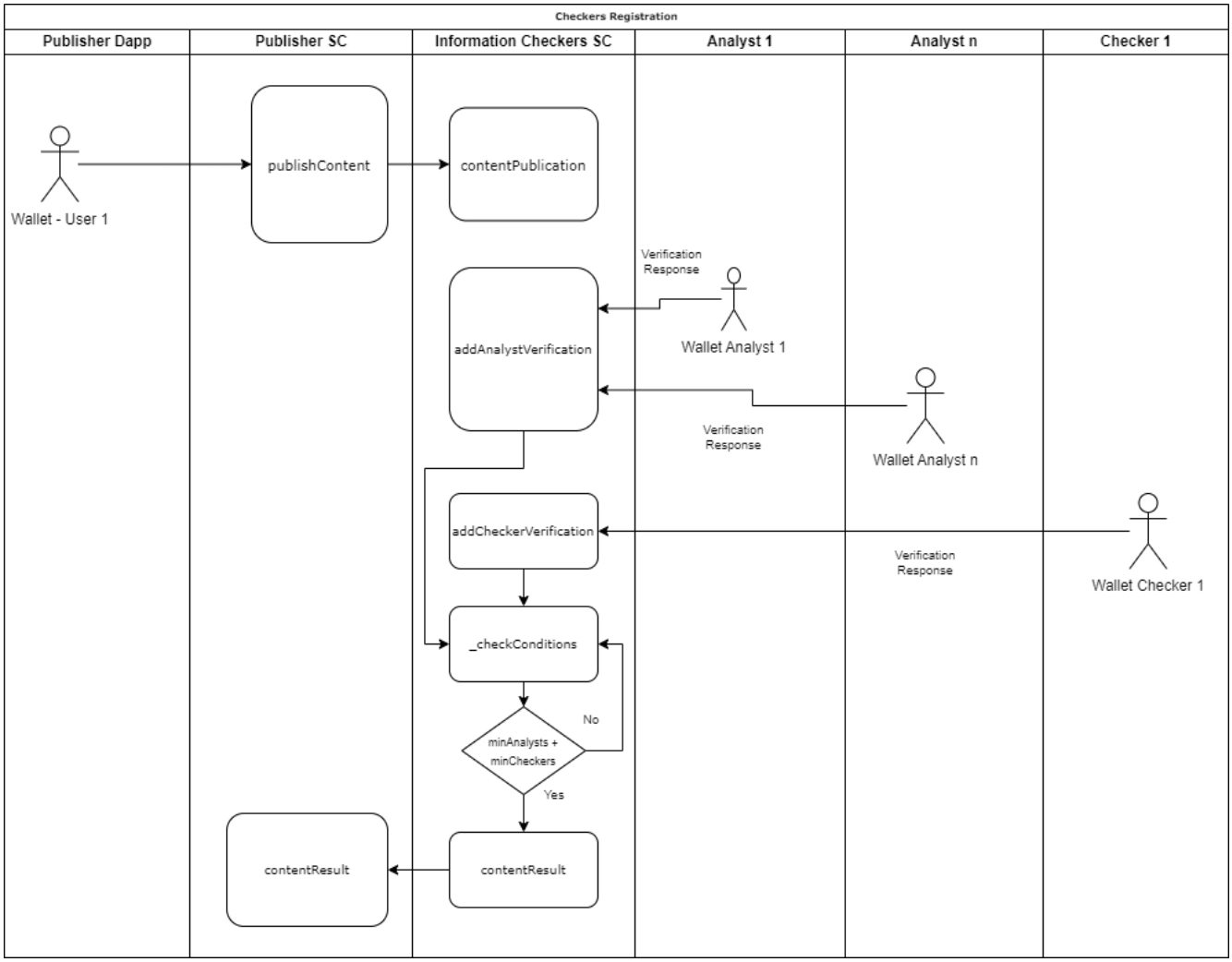
Website

A webpage will be available with all TRUE content that comes from the system. Anyone can interact with the page to see the true content.

Flow Diagram







Implementation

Next Steps

Step	Description
Step	Description
Step	Description

Future features

Cypher media content	IPFS is public, and all the content go clear, but it's possible to send to IPFS cyphered content, and the SC contains de pK, and only the verifiers are able to get the key, and see the content.
Step	Description

Step	Description

Project Data

References

Reference	Description
News Fact-Checking: Snopes	Snopes.com
News Fact-Checking: FactCheck.org	FactCheck.org
News Fact-Checkin: PolitiFact	PolitiFact
Reverse image search tools	Google Images
Reverse image search tools	TinEye Reverse Image Search
Blockchain-based fake news traceability and verification mechanism	https://www.sciencedirect.com/science/article/pii/S2405844023042925
Using the power of blockchain to combat deepfake video	Using the power of blockchain to combat deepfake videos
Can blockchain block fake news and deep fakes?	Can blockchain block fake news and deep fakes? - IBM Blog
SANUB: A new method for sharing and analyzing news using blockchain	https://ieeexplore.ieee.org/document/8985152
Google Fact Check API	Fact Check Tools API | Google for Developers
Fake News site lists Compilation of lists of unreliale, fake-news, clickbait, and hate sites.	unreliable-news/data at master · hearvox/unreliable-news
Tools/APIs for fact-checking APIs and online tools athat return domain data useful in detecting unreliable sources.	https://github.com/hearvox/unreliable-news/blob/master/ref/apis-for-fact-checking.md
Unreliable News Sites (UNS)	https://github.com/hearvox/unreliable-news/blob/master/ref/README.md
WordLift API	WordLift Fact-Checking API | WordLift Developer Documentation
How fact-checking works	How fact-checking works | Transparency Center
IFCN Fact-Checking Network	International Fact-Checking Network - Poynter used by : Poligrafo 

EFCSN	European Fact-Checking Standards Network (EFCSN) 
Blockchain-Based Platform to Fight Disinformation Using Crowd Wisdom and Artificial Intelligence	Blockchain-Based Platform to Fight Disinformation Using Crowd Wisdom and Artificial Intelligence
LIAR Dataset	Papers with Code - LIAR Dataset