# A Thorough Study on Privacy preserving Crowdsourcing platform On blockchain

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**ABSTRACT**

*The Crowdsourcing approach has been highly useful and extremely popular in the recent years. The reason for this immense popularity is the improvement in the communication capabilities that help coordinate the workers effectively. This is since the platform has aided in the completion of extremely complex tasks. Crowdsourcing is a method of bringing together a big group of individuals or a crowd, to complete the task. This enables the work to be completed successfully, which would have not been feasible if the crowdsourcing approach had not been implemented. However, the majority of crowdsourcing methods have flaws. On the worker's side, there are increasing issues with unfinished or abandoned jobs. In addition, task uploaders have complained about receiving insufficient pay. Both situations result in a loss of confidence among the crowd intelligence system's many players. As a result, this literature survey paper utilizes the previous researches which describe a crowdsourcing system as a viable and safe resolution to these problems. The Reverse Circle Cipher Encryption and Entropy Estimation algorithms, as well as Decision Tree and the distributed Blockchain infrastructure, are helpful in achieving the prescribed goals in this literature survey paper***.**

**Keyword:** - *Blockchain , Reverse Circle Cipher.*

## 1. INTRODUCTION

Crowd Intelligence is one of the blooming concepts that is attracting more attention from academics around the globe. This is because using a crowd intelligence platform allows for the effective extraction of endless potential from a big number of people. Crowd intelligence is based on the idea that a large number of people with average intellect can complete a computationally expensive and extremely complicated activity. Crowd intelligence ensures that a group of clever people working together may produce an intelligent and effective organism capable of solving a challenging problem. The group of individuals can be seen as a single highly intelligent entity as long as the participants in the crowd intelligence network are consistently working towards a shared goal

This would enable the solution of extremely complex and wide-ranging problems in areas such as Management correction, Material science, Protein folding problems, and so on. This type of policy is particularly efficient because it only makes effective use of individual capabilities and skills.

This unleashes the innate talent of teams of workers to complete a task that could not have been accomplished by even the most intelligent individuals working alone for an incredibly long time. Crowd intelligence works by breaking down a large task into smaller, more manageable chunks that may be assigned to a large group of individuals at once. The overall complexity of the task is reduced greatly as a result of this segmentation, although the final aim remains unchanged.

This is the useful cooperation that genuinely helps the paradigm and even confirms its viability. Crowd intelligence would not be able to attain and fulfill its objectives if the task could not be broken into simpler and smaller tasks. This is also true in the situation of a group of workers with ordinary or below-average intelligence who can complete a highly intelligent activity due to successful task segregation to achieve crowdsourcing. Because several researchers have described the process in diverse ways, the paradigm of crowd intelligence and its comprehension is open for debate. However, the majority of experts think that the crowd intelligence platform can benefit and improve decision-making capabilities that are increased as a result of individual contributions.

Because there is a physical limit to a human being's output, newly obtained knowledge aids in the formulation of interactions that were not certainly doable by a smaller set of extremely intelligent persons. This assertion is based on significant research that shows crowdsourcing intelligence and knowledge can easily outperform intelligent and resourceful collaboration. The arrival of the internet platform has greatly aided the crowdsourcing paradigm. The internet platform gives the resources to connect such a huge group and aids in the organization and coordination of the numerous crowd intelligence operations. The internet facilitates communication capabilities and enables constructive collaboration amongst entities, allowing for the creation of an organizational structure that acts as a single entity.

As there are already a significant number of people connected to the internet platform, this enhances effectivity and adds to the establishment of efficiency. However, there is a lack of trust between the workers and the task publishers, as seen by their behavior. This is due to errors on both ends, which result in behavior that is potentially harmful to the crowd intelligence platform as a whole. This is why this research article focuses on the various approaches that have been previously implemented and surveys them in this literature survey article to achieve a reliable and highly secure implementation of crowdsourcing through the use of the distributed blockchain framework.

This literature survey paper dedicates section 2 for analysis of past work as a literature survey, and finally, section 3 concludes the paper with traces of future enhancement.

## 2. RELATED WORKS

To enable the first private and unspecified decentralized data crowdsourcing system, Yuan Lu et. al. [1] present a generic blockchain-based protocol named as ZebraLancer. Without anticipate on a trusted source, their protocol may provide a class of incentive mechanisms for crowdsourcing. A requester's promised incentives can be enforced according to predetermined policies. They also secure the safety of the data and the anonymity of the worker/requester while yet holding them accountable. To demonstrate the viability of proposed protocol, the authors build the system on top of Ethereum, a real-world blockchain infrastructure, to perform a general image interpretation task. Without the collaboration of a third-party arbiter, ZebraLancer can facilitate the fair interchange of crowd-shared data and their corresponding rewards. Furthermore, it demonstrates the feasibility of resolving two natural tensions in decentralized crowdsourcing on top of open blockchain: one between data confidentiality and transparency, and the other between participant anonymity and accountability.

J. Kramer et. al. [2] discuss the design and transformation of a software architecture that includes tools for operationalizing an economic model to incentivize DII participants. To alleviate the uncertainty of current donation and need-based approaches, the economic model is depend on a rewarding mechanism. The authors employ blockchain technology to establish a fully decentralized architecture, which allows for the specification of distributed ledgers and a core logic utilizing smart contracts. They undertake a case study in the setting of an actual

DII at TTN for the evaluation. The implementation demonstrates that the current architecture's scalability is relatively limited due to the blockchain's processing speed and storage requirements.

To provide distributed governance and accountability, X. Zhu et. al. combine the crowdsourcing scenario with the blockchain and propose an improved PoT consensus protocol based on a subjective logical reputation algorithm. The enhanced PoT consensus algorithm can ensure that all participants have equal access to crowdsourcing activities. The consensus nodes will not be a few fixed members due to the flexibility of reputation values. As a result, the improved algorithm is far fairer than the existing PoT protocol [3]. The trust component satisfies the practical needs of crowdsourcing scenarios. Their consensus protocol, when combined with incentive measures depend on game theory, can increase the credibility of the verification process. They compare the proposed scheme to other existing schemes using simulation experiments. According to the findings, the improved PoT consensus outperforms in terms of validity, fairness, and security.

Y. Lu et. al. [4] introduce a relatively simple game theory perspective to overcome the intrinsic restrictions of public blockchain, allowing the chain to "audit" the execution of a broad class of computationally intensive programmes. They create a simple incentive structure such that the blockchain may be used to crowdsource the execution of a wide range of sophisticated algorithms, and any false computing results can be avoided. Their protocol, in particular, works in the absence of a trusted third party; additionally, their protocol not only works in the traditional paradigm of non-colluding service providers, but it can also tolerate any conceivable coalition up to n 1, where n is the total number of service providers. They also demonstrate how their protocol can be used to crowdsource two common types of machine learning workloads using the blockchain.

J. Zou et. al. [5] propose a viable blockchain-based solution that addresses both the functional and non-functional parts of service accountability infrastructure requirements. They also provide a "Proof-of-Trust" (PoT) consensus protocol with a trust element to meet the practical needs of the service industry, that is, to direction the untrustworthy behaviors that frequently occur in an unlocked, public service network, in conjunction with incentive mechanisms. In typical blockchain setups, the validation and block creation duties of the concurrency process are usually carried out by the same set of nodes. However, this is neither efficient nor secure in the case of crowdsourcing. As a result, they describe a unique technique in which transaction validation and block recording are divided into two groups. A system like this can better balance centralization and decentralization, as well as security and justice. They also present a hybrid blockchain solution that uses a consortium blockchain as the underlying deployment architecture, but the consensus protocol's transaction validation is done in an open, public network environment, exhibiting the fairness and unbiased qualities of a public blockchain.

S. Zhu et al. introduce zkCrowd, a hybrid blockchain platform for crowdsourcing. By combining a public chain running the DPOS consensus and sub chains running the PBFT consensus, the zkCrowd can achieve the following benefits: (i) higher transaction throughput and less execution time compared to traditional POW/POS-based blockchain; (ii) diverse privacy protection and access control for different crowdsourcing tasks using smart contracts and zero knowledge proof; and (iii) reusability. Finally, extensive experiments are conducted to validate zkCrowd's efficacy by demonstrating the superiority of DPOS and PBFT over Casper [6]. Theoretical analysis and experiments can both validate the advantages of presented zkCrowd over the state-of-the-art.

Using blockchain technology, N. Sukhija et. al. provide a decentralized data access and control system for data crowdsourcing. Their technology gives researchers unchangeable, easy access to operational data and assists in maintaining the datasets authentication, confidentiality, and accountability while disseminating data to the public in a controlled manner. The proposed framework will be used to crowdsource operational data to NERSC and Lawrence Berkeley National Laboratory users, as well as users outside of NERSC and Lawrence Berkeley National Laboratory [7].

S. Zhu et. al. present a crowdsourcing platform based on a hybrid blockchain. When compared to standard PoW/PoS-based blockchain, the presented technology may achieve higher transaction throughput and shorter execution time by using DPOS and PBFT consensuses on the public chain and sub chains, respectively. Furthermore, by utilizing smart contracts and zero knowledge proof, their platform can achieve permission control and privacy protection [8]. Delegated Proof of Stake (DPOS) and Practical Byzantine Fault Tolerance (PBFT) consensuses are then deployed on the public chain and sub chains, respectively, to improve transaction verification throughput, and smart contracts for the public chain and sub chains are built accordingly. Finally, extensive tests are conducted in order to assess the performance of suggested platform.

E. Samir et. al. present a decentralized blockchain-based reliable catastrophe response system that controls members trust values based on their cooperative history. Members exchanging information about a dreadful scenario, aid requesters, and help providers were all part of the envisioned community. The authors expected that users would be able to contact with one of the local assistance centers with minimum infrastructure support. The local help centers can be any emergency service building near the crisis area, and the chain files are shared among all linked community members at the local help centers [9]. The proposed system implies that all members can operate as miners, providing trustworthy assistance and information exchange. Aid providers and requesters are rewarded for their service and honesty by miners who track the help supply process. Miners want to swap services with people that have a good reputation and are close to the business. To enable anonymous help provisioning, the offered method leverages public keys as a means of identity. To show the system's efficiency and efficacy, the decision-making logic was modelled and simulated.

Y. Wu et. al. proposed the BPTM scheme, which combines Ethereum blockchain and searchable encryption tools to facilitate multiple requesters and multiple workers. The authors used the Ethereum smart contract to enable assignment matching in BPTM, ensuring that the service provider does not deviate from the protocol. They also devised a privacy-preserving matching technique for establishing the link between employees and tasks, ensuring that both workers' interests and task requirements are effectively respected. The BPTM protects privacy even further than other privacy-preserving techniques by establishing identity anonymity. Finally, the authors investigated the theoretical and experimental elements of the suggested approach. The detailed performance evaluation demonstrates the rationality and practicability of the proposed scheme [10].

S. Wang et al. present a novel highly centralized knowledge graph construction method based on blockchain-powered smart contracts. They also use knowledge graph to establish a deep recommender system, and case studies are being used to validate the system's effectiveness. Three advantages of the proposed method are as follows: First, it achieves a good balance between the completeness and correctness of the knowledge graph by leveraging the wisdom of crowds. Second, because all of the outcomes are documented on blockchain, which is visible, auditable, and tamperproof, the decentralized construction process is extremely trustworthy. Third, the knowledge graph is constantly improving and updating as a result of the On-Chain [11].

ABCrowd, a fully distributed crowd-sourced platform that uses blockchain for auctioning, is proposed by M. Kadadha et. al. In order to make the revenue, the auction encourages people to publicize its true cost. The Ethereum blockchain allows the trustworthy execution of implemented functions and trustworthy interactions between requesters and employees in a distributed context. Instead of using a centralized platform, clever contracts on the Ethereum blockchain operate the auction. In this framework, the created smart contract is contracted and saved by the requesters until it is executed [12]. Workers are then asked about the intelligent contract to determine which job they would like to compete in. The employees submit their bids to the intelligent contract first. The offer contains a list of tasks and costs that you are interested in. Sealed offers prohibit coworkers from deliberately undertaking one another. They are disclosed after the bidding interval is complete, and the intelligent contract compares the offers revealed with the sealed offers declared. The auction is then carried out to assign jobs and employees and to calculate the corresponding fees.

L. Gao et. al. combines crowdsourcing with blockchain to provide a completely distributed crowd-sourcing Framework "Task Selection Worker". TSWCrowd handles essentially two difficulties, the reliable distribution of crowdsourcing jobs, with the guarantee of employee benefits in comparison to the traditionally centralized crowdsourcing platform. By using blockchain technology to ensure transaction transparency and fairness, the invisible off-chain transactions are translated into on-chain business. TSWCrowd requires that applicants pay in advance and use the feature that cannot be manipulated for blockchain information to ensure that basic payments can be provided to workers performing tasks and submitting solutions that enhance employee enthusiasm for system participation [13]. The overall working time of the worker is considerably shortened in comparison to the VCG off-chain mechanism, which shows that the TSW is less and more reasonable. Compared to the ABCrowd on-chain model, the average pay of employees is higher which demonstrates that TSWCrowd is more responsive to safeguard workers' interests.

Y. Chen et. al. offers four key components for the fulfilment of crowdsourcing video transcoding tasks including employer assignments and payment mechanisms. Chen and others. In combination with their four components they create an intelligent contract which can simultaneously perform the tendering and the execution of tasks during video transcoding [14]. The proposed framework (C.E. CVT) was justified for its feasibility and its analysis for safety and performance to address the common safety issues of crowdsourcing of video transcoding.

Liang Tan et. al. proposed a Crowd Chain framework, which is a common trustworthy service platform that is dependent on crowdsourcing technology blockchain. The authors remove the PAT third-party payment entity and add a blockchain represented by BC based on the traditional crowdsourcing architecture. The Crowd Chain consists of four entities: CrowdUT, CrowdUR, CrowdUP and BC, in which CrowdUR is a person or firm with unique experience and expertise in a given area and BC is a network of partnerships. Setting up, submitting contracts, publishing tasks, receiving tasks, submitting schemes, arbitration schemes, payment, tactics, and services. In the service mechanism, there are no trust centers or payment centers. The data generated by the three parties of applicants, staff and the crowdsource networks in this context can be verified and made available and transparent throughout the whole crowdsourcing mechanism [15]. The crowdsourcing service process should be conducted without a core between the requestors, the employees, and the crowdsourcing network to ensure the integrity of the business process.

## 3. CONCLUSION AND FUTURE SCOPE

This publication surveys an effective approach for crowd sourcing using the blockchain platform. Collaboration has been one of the most effective ways to achieve the goals for a complex and complicated task. This is highly useful and allows for an effective technique for the purpose of collaboration and communication between the worker and the job provider for successfully completing the job. There are a number of different approaches that have been effectively used for the purpose of achieving collaboration and reducing the impact on the environment by dividing the complex task into smaller much easier formats. The segregation of the task into simpler parts and providing it to the crowd intelligence works with great efficiency and achieving the prescribed goals. The literature survey has been effective in achieving our approach which utilizes Blockchain approach along with smart contract to achieve an effective and useful crowdsourcing approach.

## 4. REFERENCES

[1]. Y. Lu, Q. Tang and G. Wang, "ZebraLancer: Private and Anonymous Crowdsourcing System atop Open Blockchain," 2018 IEEE 38th International Conference on Distributed Computing Systems (ICDCS), 2018, pp. 853-865, DOI: 10.1109/ICDCS.2018.00087.

[2]. J. Kramer, J. M. van der Werf, J. Stokking and M. Ruiz, "A Blockchain-Based Micro Economy Platform for Distributed Infrastructure Initiatives," 2018 IEEE International Conference on Software Architecture (ICSA), 2018, pp. 11-1109, DOI: 10.1109/ICSA.2018.00010.

[3]. X. Zhu, Y. Li, L. Fang and P. Chen, "An Improved Proof-of-Trust Consensus Algorithm for Credible Crowdsourcing Blockchain Services," in IEEE Access, vol. 8, pp. 102177-102187, 2020, doi: 10.1109/ACCESS.2020.2998803.

[4]. Y. Lu, Q. Tang and G. Wang, "On Enabling Machine Learning Tasks atop Public Blockchain: A Crowdsourcing Approach," 2018 IEEE International Conference on Data Mining Workshops (ICDMW), 2018, pp. 81-88, doi: 10.1109/ICDMW.2018.00019.

[5]. J. Zou, B. Ye, L. Qu, Y. Wang, M. A. Orgun and L. Li, "A Proof-of-Trust Consensus Protocol for Enhancing Accountability in Crowdsourcing Services," in IEEE Transactions on Services Computing, vol. 12, no. 3, pp. 429-445, 1 May-June 2019, doi: 10.1109/TSC.2018.2823705.

[6]. S. Zhu, Z. Cai, H. Hu, Y. Li and W. Li, "zkCrowd: A Hybrid Blockchain-Based Crowdsourcing Platform," in IEEE Transactions on Industrial Informatics, vol. 16, no. 6, pp. 4196-4205, June 2020, doi: 10.1109/TII.2019.2941735.

[7]. N. Sukhija, E. Bautista, M. Moore and J. Sample, "Employing Blockchain Technology for Decentralized Crowdsourced Data Access and Management," 2019 IEEE SmartWorld, Ubiquitous Intelligence & Computing, Advanced & Trusted Computing, Scalable Computing & Communications, Cloud & Big Data Computing, Internet of People and Smart City Innovation (SmartWorld/SCALCOM/UIC/ATC/CBDCom/IOP/SCI), 2019, pp. 268-273, DOI: 10.1109/SmartWorld-UIC-ATC-SCALCOM-IOP-SCI.2019.00089.

[8]. S. Zhu, H. Hu, Y. Li and W. Li, "Hybrid Blockchain Design for Privacy Preserving Crowdsourcing Platform," 2019 IEEE International Conference on Blockchain (Blockchain), 2019, pp. 26-33, doi: 10.1109/Blockchain.2019.00013.

[9]. E. Samir, M. Azab and Y. Jung, "Blockchain Guided Trustworthy Interactions for Distributed Disaster Management," 2019 IEEE 10th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), 2019, pp. 0241-0245, doi: 10.1109/IEMCON.2019.8936147.

[10]. Y. Wu, S. Tang, B. Zhao and Z. Peng, "BPTM: Blockchain-Based Privacy-Preserving Task Matching in Crowdsourcing," in IEEE Access, vol. 7, pp. 45605-45617, 2019, doi: 10.1109/ACCESS.2019.2908265.

[11] S. Wang, C. Huang, J. Li, Y. Yuan and F. Wang, "Decentralized Construction of Knowledge Graphs for Deep Recommender Systems Based on Blockchain-Powered Smart Contracts," in IEEE Access, vol. 7, pp. 136951-136961, 2019, doi: 10.1109/ACCESS.2019.2942338.

[12] M. Kadadha, R. Mizouni, S. Singh, H. Otrok and A. Ouali, "ABCrowd An Auction Mechanism on Blockchain for Spatial Crowdsourcing," in IEEE Access, vol. 8, pp. 12745-12757, 2020, doi: 10.1109/ACCESS.2020.2965897.

[13] L. Gao, T. Cheng and L. Gao, "TSWCrowd: A Decentralized Task-Select-Worker Framework on Blockchain for Spatial Crowdsourcing," in IEEE Access, vol. 8, pp. 220682-220691, 2020, doi: 10.1109/ACCESS.2020.3043040.

[14] Y. Chen, H. Yin, Y. Xiang, W. Ren, Y. Ren and N. N. Xiong, "CVT: A Crowdsourcing Video Transcoding Scheme Based on Blockchain Smart Contracts," in IEEE Access, vol. 8, pp. 220672-220681, 2020, doi: 10.1109/ACCESS.2020.3043042.

[15] Liang Tan, Huan Xiao, Xinglin Shang, Yong Wang, Feng Ding, and Wenjuan Li, "A Blockchain-based Trusted Service Mechanism for Crowdsourcing System", 2020 IEEE 91st Vehicular Technology Conference (VTC2020-Spring), 30 June 2020.