

# Building a Recruitment System Based on Blockchain and Federated Learning

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## 1. INTRODUCTION

The problem of data privacy in Facial Recognition is one of the general public concerns. Facial recognition violates citizens' natural right to be constantly under government surveillance and to have their images stored without their permission. In addition, the issue of transparency in curriculum vitae is crucial. Some people are so desperate for a chance that they will do anything to increase their chances, even if it means lying on their resume about their experience.

This system illustrates how Blockchain technology can be used to stop CVs from being false and how federated learning can shield user images from facial recognition. The outcome demonstrates that users are no longer able to fabricate information in their CVs about their experience because that information is now stored in the Blockchain and the user's raw images are kept on their storage devices.

## 3. PROPOSED SYSTEM

In Figure 5. There are three factors who join to the system including candidates, companies, and Blockchain network.

The status of users will vary depending on how many tokens they own. To be able to start applying, candidates need to be whitelisted by the company (supported by a smart contract called Crowdsales). At this stage, the user must send their resume and their wallet address to the company via the system-provided email address. The company will provide an OTP code, which may be used both to create the dataset and obtain the token.

Training feature module based on Federated Learning enables customers to fully control their dataset without submitting it to the company to train faces for the recognition system. By using the webcam to take images and the candidate's device to train the face data, the training feature module will produce a dataset for the candidate during this procedure.

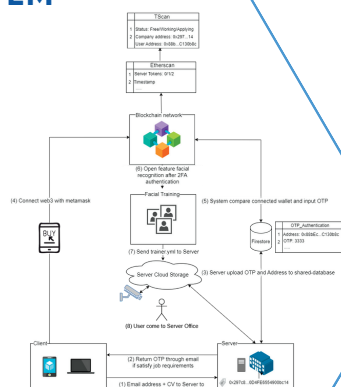


Figure 5

## 5. CONCLUSION

The major objective of this system is to create a secure and transparent recruiting process. The user's job experience information is transparent and it can not tamper. The users' face images can be kept on their devices. The authors use three technologies to develop their system: Blockchain, Federated learning, and Facial Recognition. Additionally, the system has a filter for legitimate transactions called TScan display candidates status by the number of tokens kept in the wallet. The experimental result shows that the candidates take only 0.05 ETH to use the system.

In the future, we will improve this system by automat-ing the CV submission and candidate selection process by applying natural language processing techniques. Moreover, the face recognition feature also needs to be improved to increase the quality of FPS as well as reduce the delay in recognition.

## 2. BACKGROUND AND RELATED WORKS



Figure 1

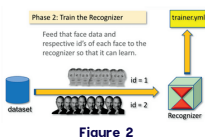


Figure 2

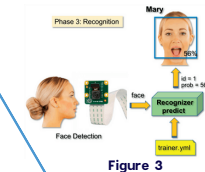


Figure 3

Blockchain is a public, trusted, shared ledger running on a peer-to-peer (P2P) network. The critical idea of the blockchain concept is its decentralization, which means data on the blockchain is not controlled by any single entity or location.

Facial recognition progress includes collecting face images, training the model to learn these images and detecting who is in a new image or video. Marcelo Roval's project aims to build a facial recognition system based on Hacascade. Figure 2, 3 and 4 show the three above facial recognition process.

Federated learning enables the cooperative training of machine learning models across many devices. Devices that store datasets and transmit trained weights to the server are referred to as client nodes in the FL architecture. The device that oversees overall model training is referred to as the server.

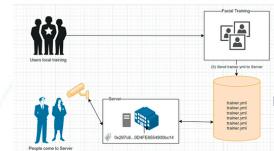


Figure 4

## 4. RESULT

When the user visits the company's office to do identification after receiving 1 company token, the results are showed at Figure 6. The performance of facial recognition feature is highlighted below table.

Parameters	PC	Jetson Nano
Average of FPS	13	5
Average of Delay (ms)	51	85
Average of Accuracy (%)	65	32

Figure 6

The cost to deploy smart contracts for the Ganache powered blockchain-emulated recruiting system is shown at Figure 7. These parameters are only for reference because the cost of implementation may differ based on the current status of the blockchain. The totally cost to perform whole process is around 0.05 ETH at the time we take the experiment.

	Migrations	MyToken	KycContract	MyTokenSale
Gas used	164391 (0x28227)	1091501 (0x10a7ad)	521896 (0x7f6a8)	884242 (0xd7e12)
Gas price (gwei)	20	20	20	20
Fee sent (ETH)	0	0	0	0
Cost (ETH)	0.00328782	0.02183002	0.01043792	0.01768484
Total cost (ETH)	0.0532406			

Figure 7