

Dottorato di Ricerca di Interesse Nazionale in
Blockchain and distributed Ledger Technology - Social
Systems and Smart Societies

Research Plan

Doctoral Student: Ricardo Lopes Almeida^{1 2}

Advisor Team:

Fabrizio Baiardi¹,
Damiano Di Francesco Maesa¹
Laura Ricci¹

¹ Dipartimento di Informatica, Università di Pisa, Italia

² Università di Camerino, Italia

November 14, 2024

1 Research Plan

1.1 Introduction

The project presented in this document is the main research idea presented towards the completion of the Doctoral Program of the 38th cycle of the Italian National Program in Doctoral Research - Blockchain and Distributed Ledger Technology in Social Systems and Smart Societies.

I, Ricardo Almeida, graduated in Physics and Chemistry by the University of Evora, and with a Master's in Electronic Engineering and Telecommunications by the University of Aveiro, both universities in Portugal, from where I'm originally from, was awarded a 3 year scholarship towards the execution of a research plan centered on decentralised (blockchain based) electronic voting systems.

1.2 Doctoral Project Outline

The idea for this project was inspired by personal curiosity for blockchain technology, which was developed prior to the decision of engaging in the PhD program, and another parallel interest in general governance, but also motivated by the novelty of new technology and the potential for new solutions to existing problems through a novel decentralised approach. Initially this project had a more generalist approach due to the lack of support from blockchains to voting systems. A review of existing blockchain-based e-voting proposals in academia revealed an environment where researchers were trying to discover how to use blockchains developed with financial purposes in mind, namely cryptocurrency-centered blockchains, towards different applications. The introduction of smart contracts by the Ethereum blockchain opened significantly the spectrum of research possibilities, but the most significant breakthrough in this context came with the popularisation and standardisation of Non-Fungible Tokens (NFT).

NFTs provide an interesting new approach to developing a blockchain-based voting systems. NFTs are inherently scarce, indivisible and individually unique. Also, the mechanics that regulate transferring them among users are transparent, since these are always smart contract functions that can be publicly verified, and secure. All NFT operations, from when they are minted until when they are burned, are recorded permanently in the blockchain, which makes NFTs highly traceable. These properties happen to

be also highly desirable in a voting ballot. From this observation, the idea of including NFTs to abstract voting ballots in a blockchain-based voting system was quite obvious.

1.3 Research Questions

With my doctoral project I intend to research if Non-Fungible Tokens can be

1.4 State of the Art/Related Works

1.5 Proposed Strategy

1.6 Project Timeline

1.7 Conclusion

Todo list