University of Plymouth

MAL3018 Computing Project

ScholarChain: Blockchain-Driven Framework for E-Transcript Validation

Final Report

BSCS2309531

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1. Abstract

With the world becoming more digital and interconnected, authenticating academic qualifications is still manual, takes time, and is vulnerable to forgery. ScholarChain seeks to solve this problem through a blockchain-based web application to safely provide, maintain, and authenticate academic transcripts. The system leverages Ethereum smart contracts on the Sepolia testnet to ensure data integrity, immutability, and transparency, while MongoDB Atlas supports scalable data storage.

ScholarChain allows universities to issue tamper-proof transcripts, students to share verifiable academic records, and employers to authenticate credentials in real-time—eliminating the reliance on traditional paper-based verification. A key innovation in the system is the incorporation of gamification features, which award blockchain-based digital badges for academic achievements, enhancing student motivation and visibility of accomplishments.

The system was developed using a modular architecture comprising frontend, backend, and smart contract layers and was subjected to rigorous functional, security, and performance testing. While limitations such as smart contract immutability, usability challenges for non-technical users, and dependency on blockchain infrastructure were identified, ScholarChain demonstrates a secure and scalable foundation for transforming academic credentialing. Future work will focus on deploying to Ethereum Layer-2 solutions, enhancing gamification, implementing smart contract upgradability, and achieving cross-institutional interoperability.

2. Introduction

This project focuses on developing and implementing a blockchain-based framework for transcript validation, known as ScholarChain. The proposed system leverages blockchain technology and smart contracts to authenticate academic transcripts securely, providing an immutable and transparent verification process. Given the increasing need for reliable document verification in the digital age, particularly in academic and employment sectors, this research addresses the challenges of fraud, forgery, and inefficiencies in traditional verification systems. The project uses decentralised technology to revolutionise how academic transcripts are issued, verified and shared across different platforms.

Link:

Subject	Link
GitHub Repository	https://github.com/honsheang/MAL3018-ScholarChain.git
Figma Design	https://www.figma.com/design/XTgxRfJDwNDnPrLjmoBgjN/ScholarChain?node-id=0-1&t=ohnOIX0CEXSgBaJT-1
Video	https://youtu.be/vGuYyXEP6cQ
Poster & Thumbnail	https://www.canva.com/design/DAGf_6dQICg/r0C_l_YfILoh9NkYzhL-mA/edit?utm_content=DAGf_6dQICg&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

2.1 Background

a. Context of Use

In this rapidly globalized and digitized job market, academic fraud has raised alarms in the minds of employers and institutions. Hiring fake academic transcripts and degrees can adversely affect hiring decisions, pose a significant problem for organizational credibility, and result in expensive legal penalties. Traditional forms of credential verification are manual, slow, and susceptible to human error or manipulation. Additionally, there is a challenge with the validation process and a lack of clarity in presenting the legitimacy of students' academic work to employers outside of their home countries.

ScholarChain is introducing a blockchain-based platform and has developed effective methods for securely and transparently issuing and verifying transcripts. The issuance of digital transcripts, secure sharing by students, and instant verification without third-party involvement are made possible through immutable, real-time validation of an academic record using Ethereum smart contracts, decentralized storage through IPFS, and the interfaces to Web3.js.

ScholarChain operates in the context of:

- University transcript issuance workflows
- Student-employer credential sharing
- Academic certificate verification by hiring organizations
- Blockchain integration with existing university systems

It promotes transparency, decentralization, and trust in academic credentialing—while reducing administrative burdens and fraud risks.

b. Potential Users

ScholarChain is designed for a broad range of stakeholders in the academic and professional ecosystem:

User Group	Role in ScholarChain	Benefits
Universities	Issue digital transcripts to students and record them on the blockchain.	Secure, efficient issuance with auditability and fraud protection.
Students	Receive verifiable transcripts, share them with employers.	Own and manage credentials, reduce waiting time in job applications.
Employers	Verify the authenticity of candidate academic records.	Instant, trusted validation—no need to contact institutions directly.