# BLOCKMENT

## A fair massive online open course system with peer grading

International
Blockchain Olympiad

# BLOCKMENT

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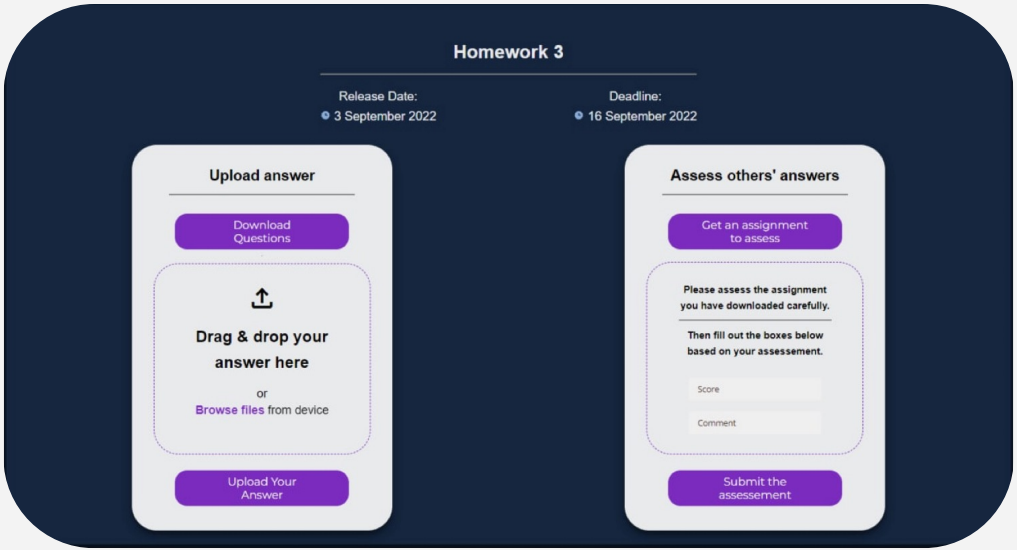
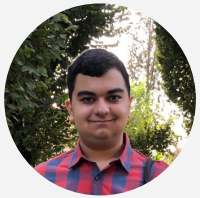
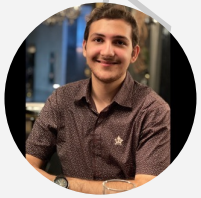


# TEAM MEMBERS

Iman Mohammadi



Seyed Parsa Neshaei



Sina Elahimanesh

Soroush Jahanzad

Parimehr Morassafar

# AGENDA

01 Introduction and Previous Work

02 Why Blockchain? An Overview of Process

03 Privacy, Authenticity, Confidentiality

04 Experiment and Business Plans

# INTRODUCTION

MOOCs are used increasingly every year

- COVID-19 pandemic -> online educational technologies
- Poor internet connection -> live training not always possible
- In massive courses, it takes a long time to assess all the handouts in a centralized manner

# INTRODUCTION

Courses include exams and assignments

- Grading is unfair and inefficient
- Without grading, we can’t find how much students have learned

Proving one has passed a MOOC is not straightforward

- Insufficient validity and transparency of the certificate

# INTRODUCTION

We aim to solve all the mentioned problems using a blockchain-based system called Blockment

# PREVIOUS WORK

There have been previous small-scale work on:

- Issuing certificates using blockchain for integrity [1]
- Decentralizing the assessment process in courses [2]

But no work on combining the two ideas above, in a massive online open course (MOOC) platform

[1]: http://certificates.media.mit.edu
[2]: https://dl.acm.org/doi/fullHtml/10.1145/3491101.3519682

# WHY BLOCKCHAIN?

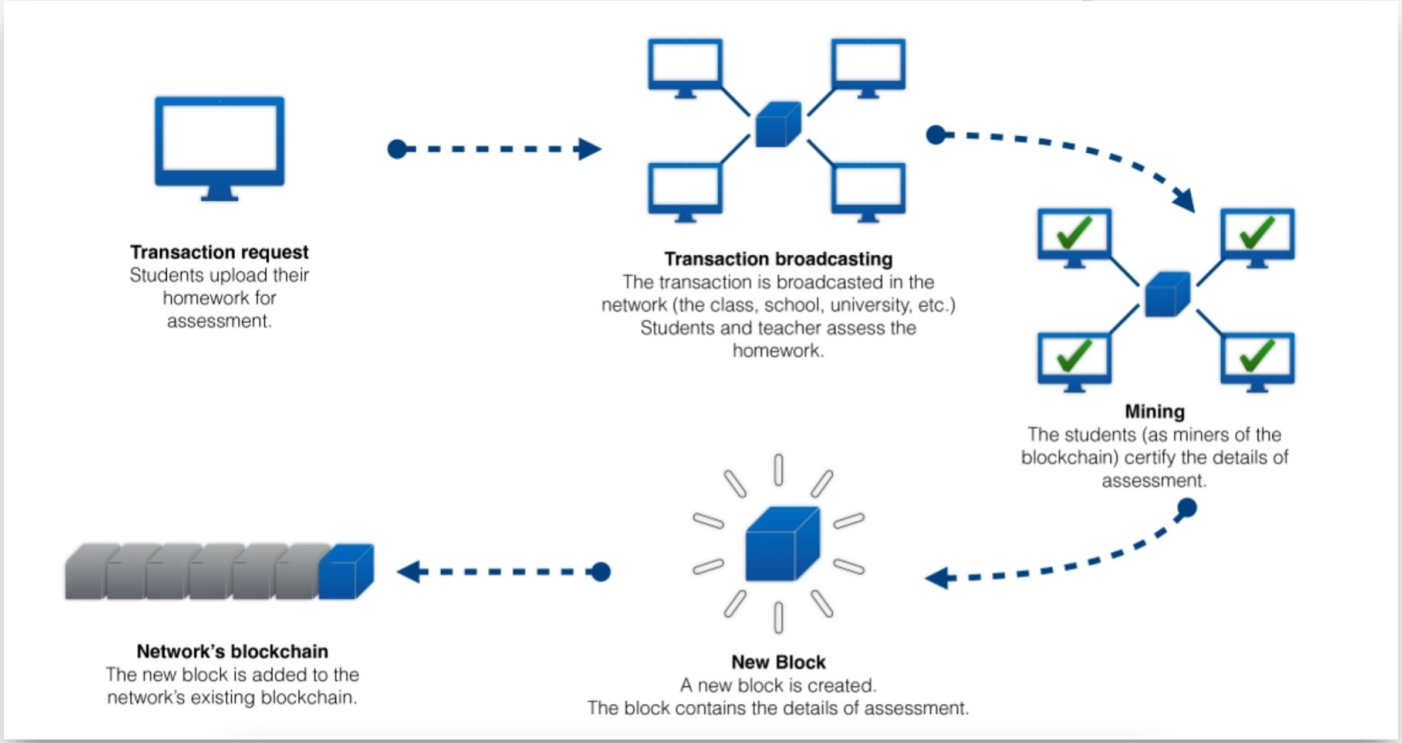
- Centralized systems are controlled by a few people
- Mistakes and biases may happen
- The time limit for instructors/teaching assistants
- Personal problems affect grading
- Reviewing course material by grading is exciting and beneficial for students

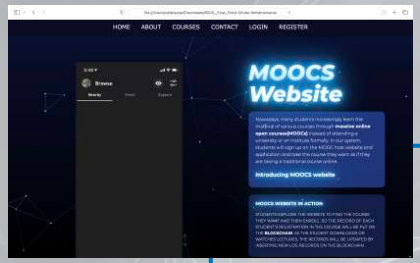
# BY DECENTRALIZING, WE AIM TO…

- Ensure transparency and fairness
- Increase grading speed
- Provide the system over a MOOC to give people from all groups the equal right to access

**Final goal:** Contribute to "inclusive and equitable quality education for all", the fourth goal of the United Nations Sustainable Development

# OVERVIEW OF THE PROCESS



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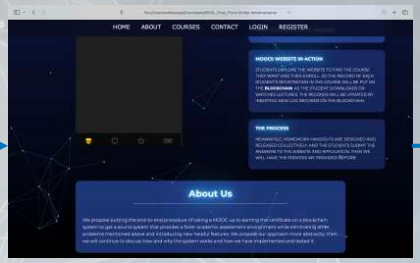


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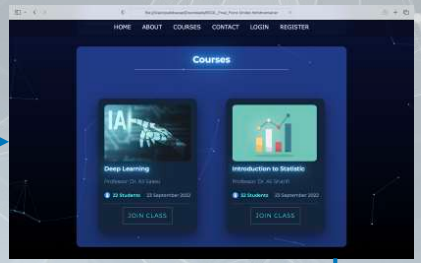
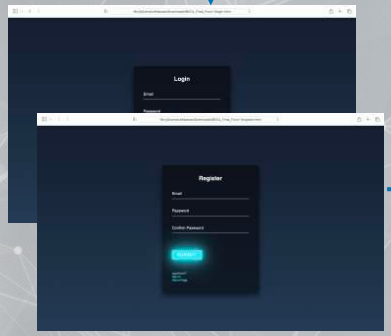
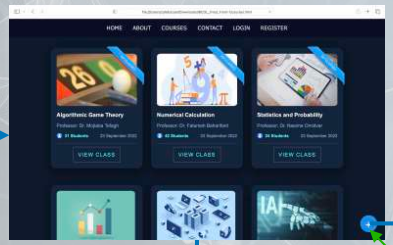
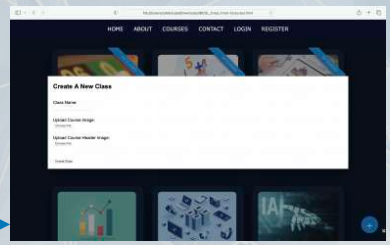



Register/Login



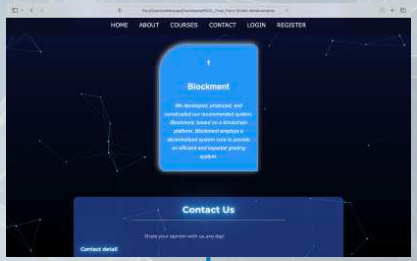

Courses Page




If the user is a Teacher, this button will be shown to him, that he will be able to create a new class. In the case of student, the button is hidden!

Scroll Down

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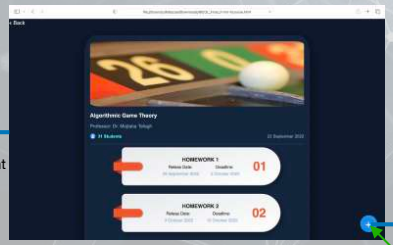
A Course Page


An assignment Page





If the user is a Teacher, this button will be shown to him, that he will be able to create a new assignment. In the case of student, the button is hidden!

# PRIVACY, AUTHENTICITY, CONFIDENTIALITY

- **Privacy:** users enter the system via a centralized login system, the instructors set login info
  - Identities are protected from the students but not the admins (as necessary in a MOOC)
  - Decentralized user and identity management was not a goal of Blockment

# PRIVACY, AUTHENTICITY, CONFIDENTIALITY

- **Authenticity:** due to the transparency of blockchain and the confirmation by the peer “miner” nodes, Blockment can be trusted
  - Verifiers see the grading history in a transparent format in the blockchain log
  - More trust than the traditional courses where the instructor can freely change the grades

# PRIVACY, AUTHENTICITY, CONFIDENTIALITY

- **Confidentiality:** the system doesn't allow actions from non-relevant parties in the grading system
  - Students, instructors and TAs in a course can provide grades, but not for other courses in the MOOC platform
  - No one can set a grade freely for themselves, due to the API design consideration

# EXPERIMENT RESULTS

| Question | Our Method | | Traditional Method | | p-value |
|---|---|---|---|---|---|
| | M | SD | M | SD | |
| Fairness of your grade | 8.49/10 | 1.29 | 7.89/10 | 1.97 | 0.0159 |
| Overall fairness of all grades | 8.13/10 | 1.39 | 7.38/10 | 2.18 | 0.0146 |
| Grading speed | 7.76/10 | 2.51 | 5.44/10 | 2.27 | 0.0001 |

| | Mean Score | Standard Deviation | p-value |
|---|---|---|---|
| Phase 1 | 8.65/10 | 1.74 | 0.0150 |
| Phase 2 | 9.00/10 | 1.77 | 0.0020 |
| Phase 3 | 8.86/10 | 1.61 | 0.0179 |
| Overall | 8.79/10 | 1.73 | 0.0034 |

# POSSIBLE BUSINESS PLANS

Providing Blockment in two main schemes:

- *Course-based:* Use Blockment for the assessment of a single course
- *Institute-based:* Use Blockment MOOC system as a whole for all courses provided in an institute

# Thank you!