

# BLOCKMENT

A fair massive online open course system with peer grading



International  
Blockchain Olympiad

# BLOCKMENT

A fair massive online open course system with peer grading

The screenshot displays the 'Homework 3' interface. At the top, it shows the 'Release Date: 3 September 2022' and 'Deadline: 16 September 2022'. Below this, there are two main sections: 'Upload answer' and 'Assess others' answers'. The 'Upload answer' section includes a 'Download Questions' button, a 'Drag & drop your answer here' area with an upload icon, and a 'Browse files from device' link. At the bottom of this section is an 'Upload Your Answer' button. The 'Assess others' answers' section includes a 'Get an assignment to assess' button, a text prompt 'Please assess the assignment you have downloaded carefully.', and a sub-prompt 'Then fill out the boxes below based on your assessment.'. Below these prompts are input fields for 'Score' and 'Comment'. At the bottom of this section is a 'Submit the assesment' button.

Homework 3

Release Date: 3 September 2022

Deadline: 16 September 2022

**Upload answer**

Download Questions

Drag & drop your answer here

or

Browse files from device

Upload Your Answer

**Assess others' answers**

Get an assignment to assess

Please assess the assignment you have downloaded carefully.

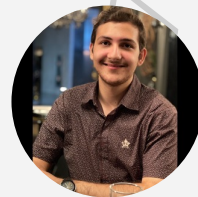
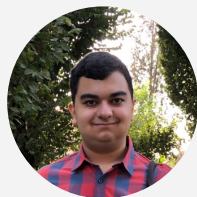
Then fill out the boxes below based on your assessment.

Score

Comment

Submit the assesment

# TEAM MEMBERS



Iman Mohammadi

Seyed Parsa Neshaei

Sina Elahimanesh



Soroush Jahanzad



Parimehr Morassafar



# AGENDA

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Previous Work

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Why Blockchain? An  
Overview of Process

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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 <sup>1</sup>
- Decentralizing the **assessment** process in courses <sup>2</sup>

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



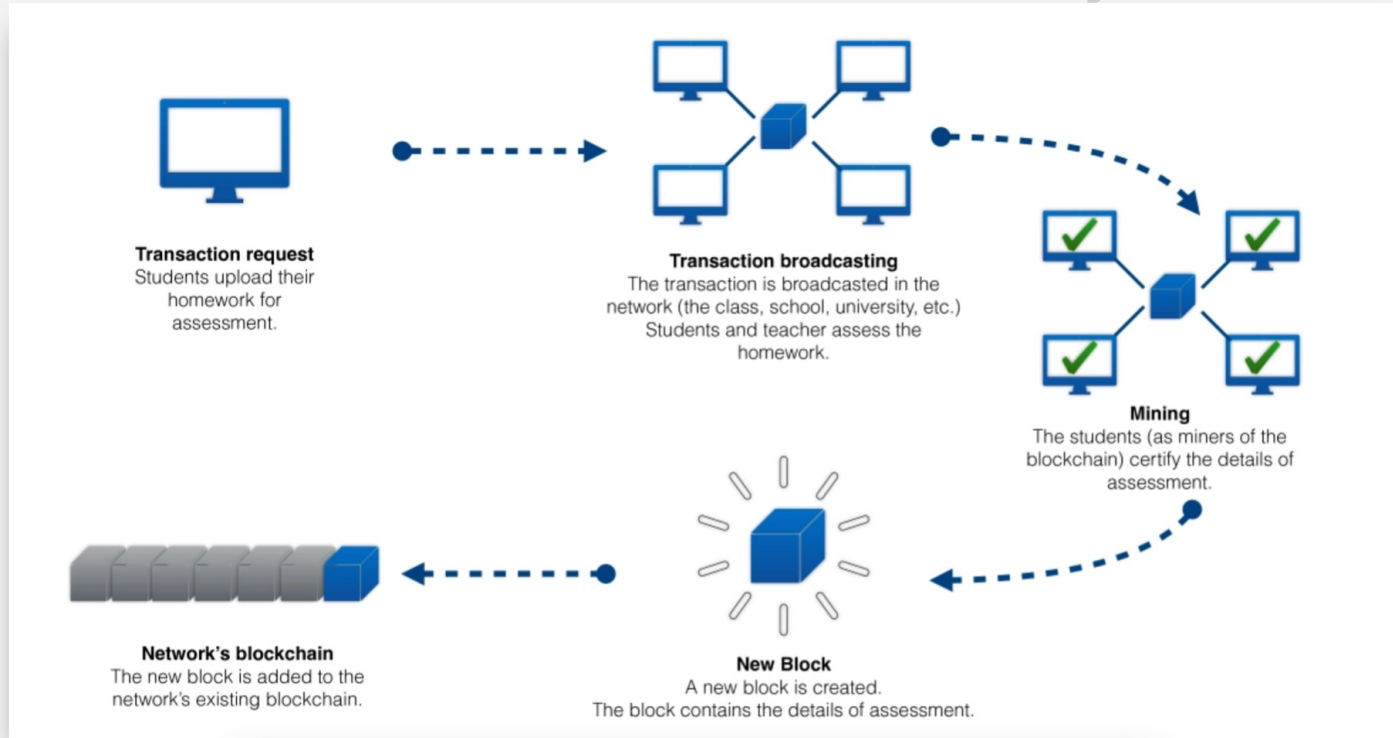
## BY DECENTRALIZING, WE AIM TO...

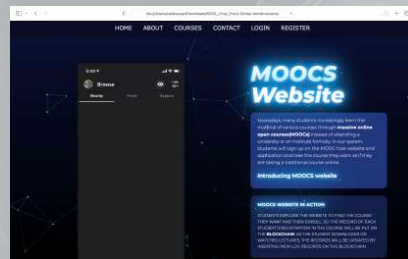
- Ensure **transparency** and **fairness**
- Increase grading **speed**
- Provide the system over a MOOC to give people from all groups the **equal right** to access

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

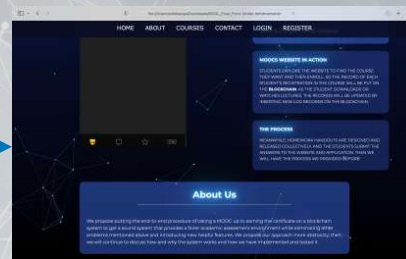


# OVERVIEW OF THE PROCESS





Scroll Down

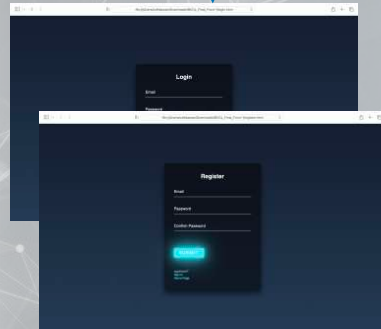


Scroll Down

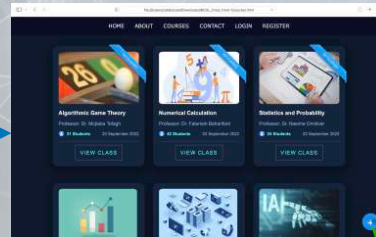


Scroll Down

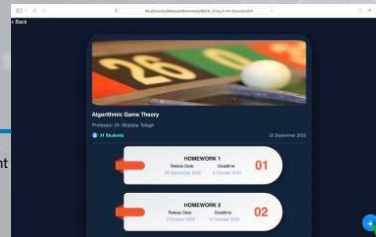
Register/Login



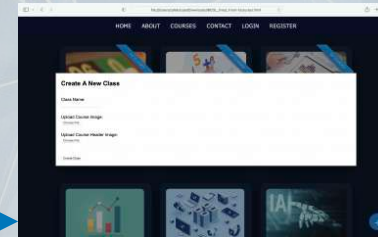
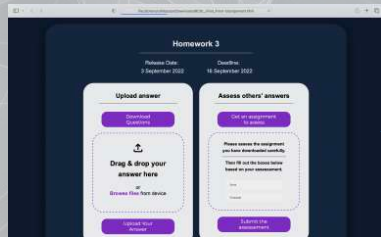
Courses Page



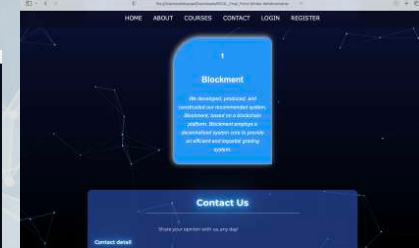
A Course Page



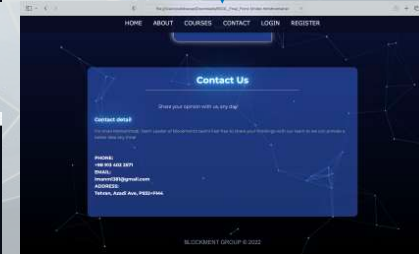
An assignment Page



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



Scroll Down



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



The background features large, flowing orange shapes on the left, top, and right sides. Scattered across the light gray background are several geometric icons: a solid gray plus sign in the top left, a hollow gray plus sign in the top center, a hollow gray circle in the top right, a hollow gray triangle in the middle left, a solid gray plus sign in the bottom left, a hollow gray triangle in the bottom right, a hollow gray cross in the center, a gray circle with diagonal stripes in the top right, and a 3x3 grid of small gray dots in the bottom center.

Thank you!