Micro-Accreditation for Matching Employer e-Hire Needs

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Motivation and Focus

To connect industry, education, government (and others) helping to align the learning systems and students' skills with employer skill needs

Motivation and Focus

Current hiring process is complicated, requiring many components, rounds of oral interviews, recruitment processes, and paper cuts.
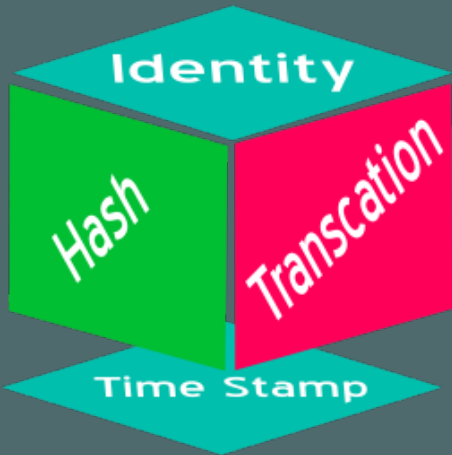
Most complexity is in finding the right candidate to be successful in a position

Accuracy in skills learned may **not match** from one institution to another, so transcripts usually **don't reflect** what was **actually learned** in each course

Problem Definition

We need a way to precisely match employers' requirements with students' knowledge

By tracking student records on a blockchain

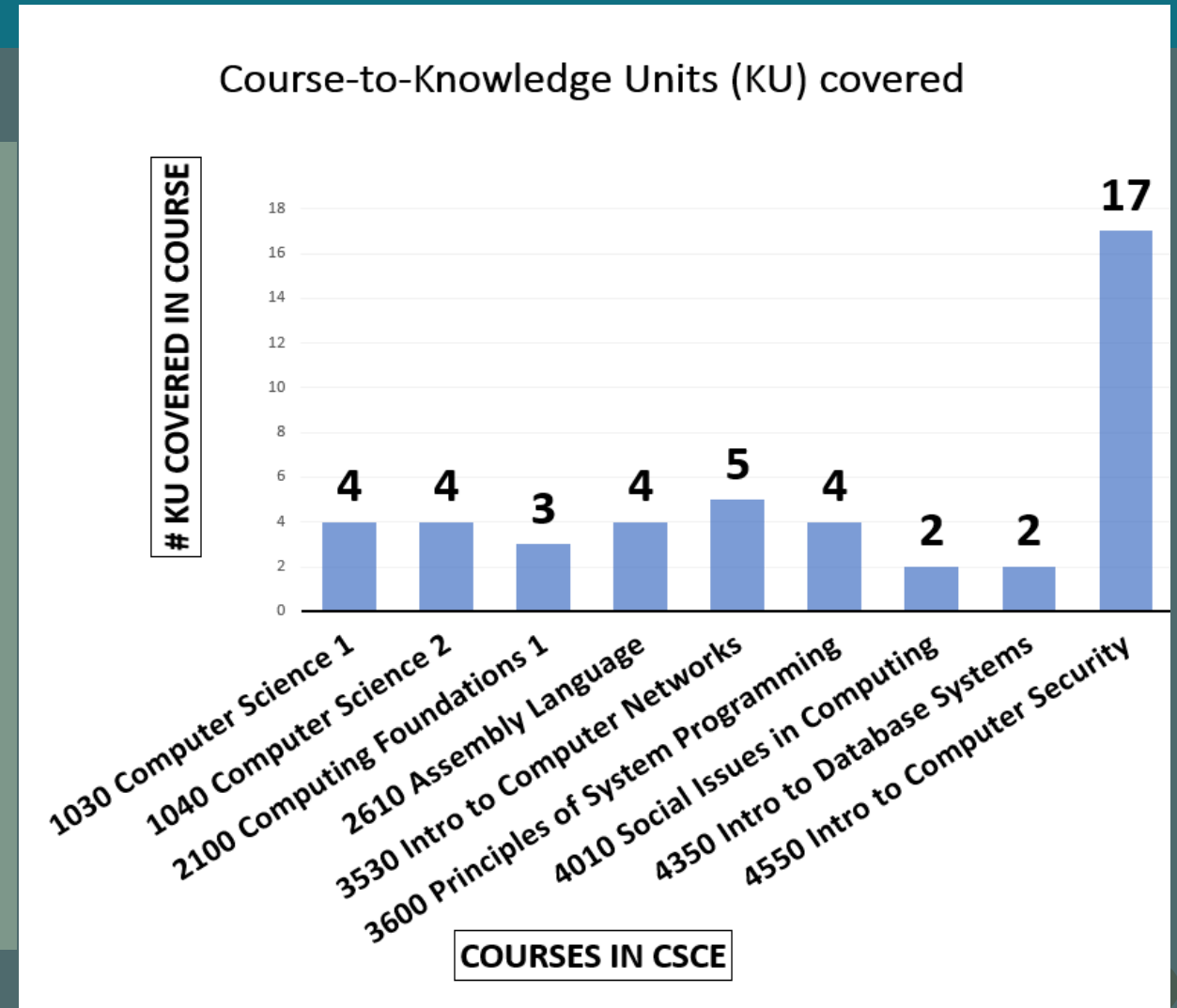Assigning knowledge units, topics, and tasks to each course and assignment

Assigning a rigor score to each assignment linking to those topics

Identity
Hash
Transcation
Time Stamp

Problem Definition (Knowledge Units)

Number of Knowledge Units covered (defined by the CAE Framework) by each course at UNT.
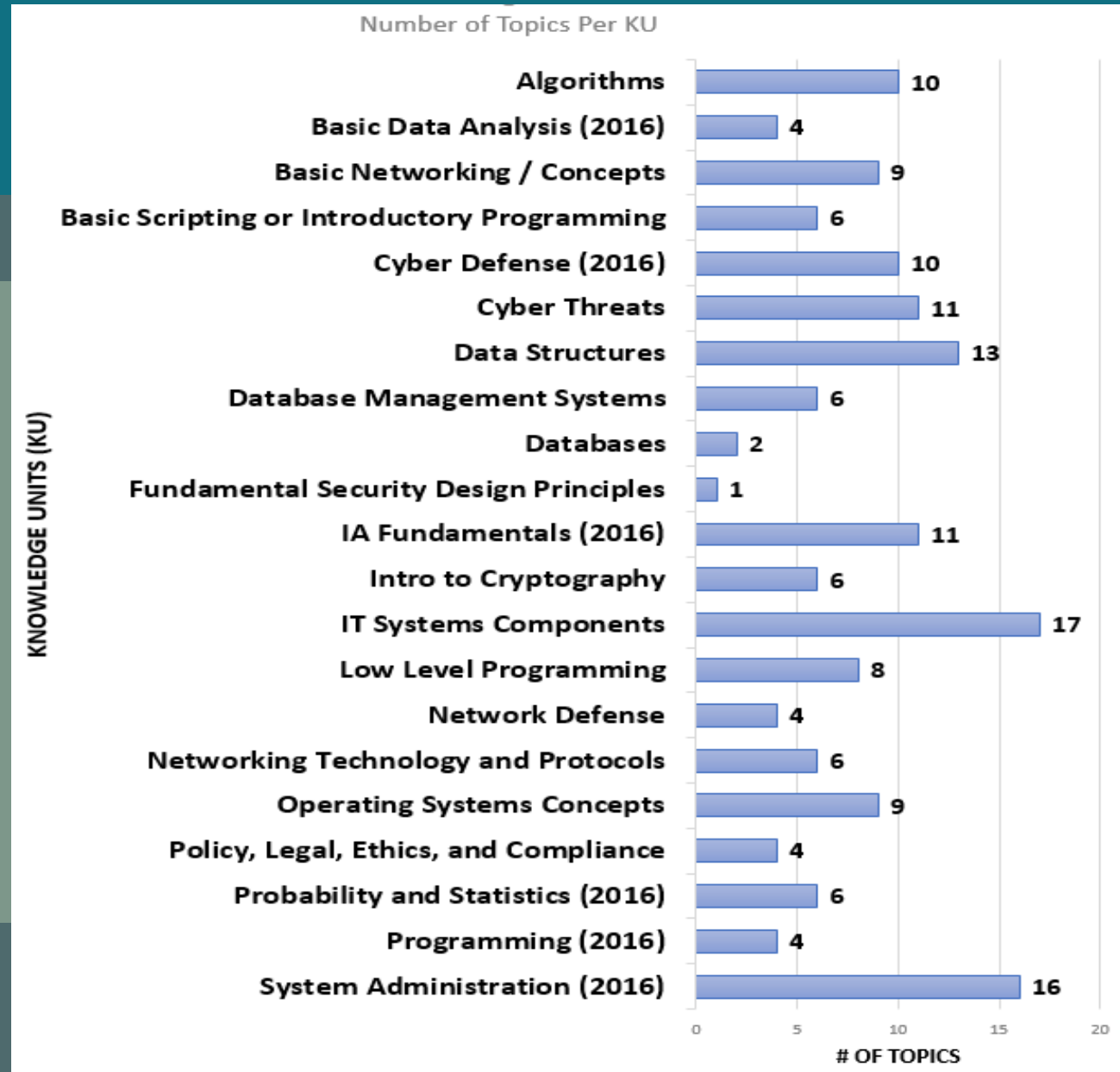
Only some courses are shown.

e.g. 4550 covers Cyber Defense, Cyber Threats, Security Design, and 15 other KUs

Course-to-Knowledge Units (KU) covered

Problem Definition

(Knowledge Units to Topics)
Each Unit has a number of Topics associated with it.

e.g. Network Defense has 4 topics: Network monitoring tools, Network operations, etc

Number of Topics Per KU

Knowledge Unit (KU)	# of Topics
Algorithms	10
Basic Data Analysis (2016)	4
Basic Networking / Concepts	9
Basic Scripting or Introductory Programming	6
Cyber Defense (2016)	10
Cyber Threats	11
Data Structures	13
Database Management Systems	6
Databases	2
Fundamental Security Design Principles	1
IA Fundamentals (2016)	11
Intro to Cryptography	6
IT Systems Components	17
Low Level Programming	8
Network Defense	4
Networking Technology and Protocols	6
Operating Systems Concepts	9
Policy, Legal, Ethics, and Compliance	4
Probability and Statistics (2016)	6
Programming (2016)	4
System Administration (2016)	16

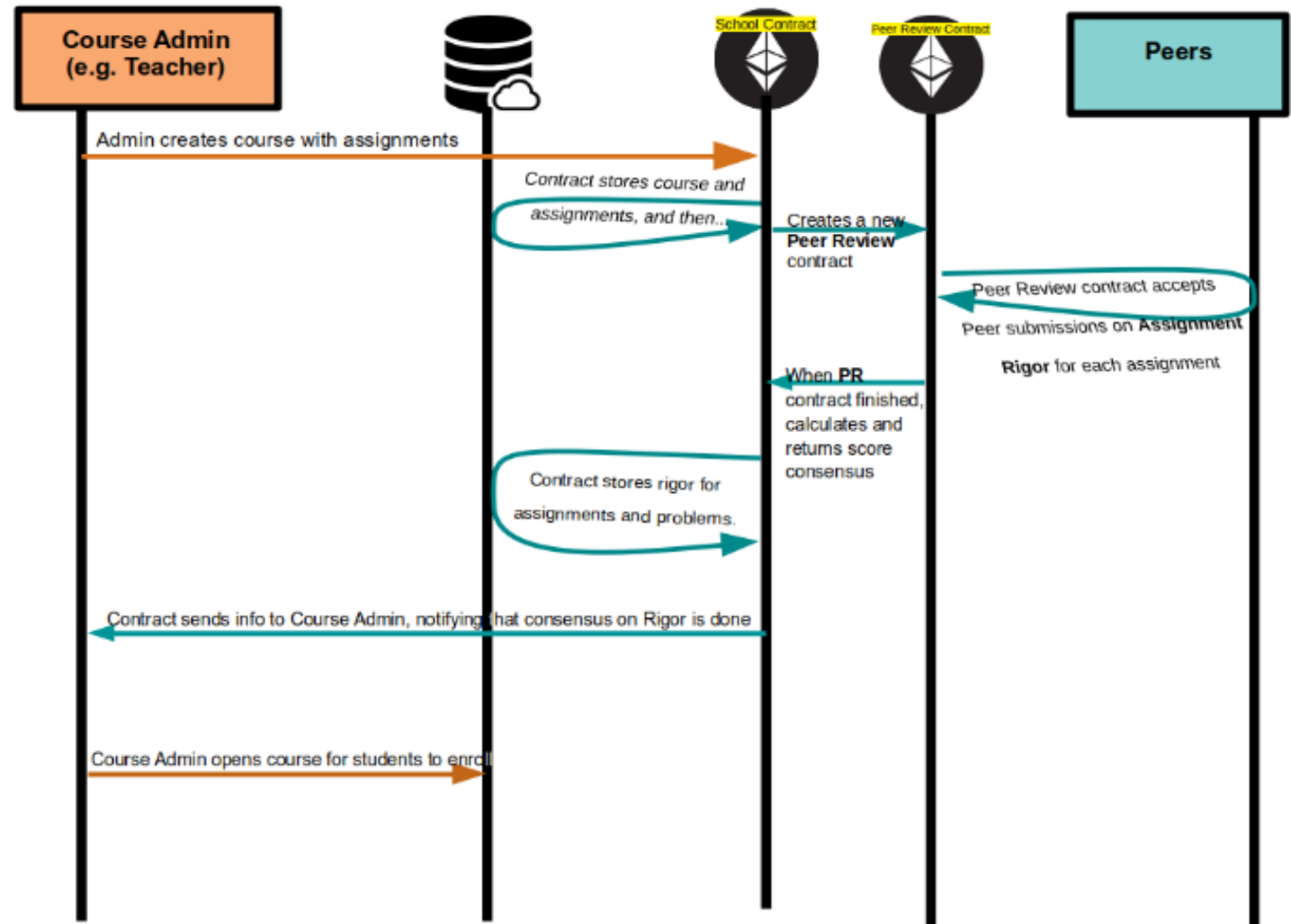# Problem Definition (Rigor Score)

Rigor score is peer-reviewed

Before a course is released to students, assignments are put on the blockchain for review

Peers review the course and assignments, assigning a rigor score with additional notes

A consensus on the rigor is determined of each assignment

Peer Review

Work flow of the Rigor score being peer-reviewed

Problem Definition (Rigor Score)

Peer-reviewed rigor scores provide

Most accurate measure of the value of what was learned by a student

Most accurate comparison of a course from multiple institutions

An important part of the calculation to match students with employers' requirements

Problem Definition (Rigor Score)

Peer-reviewed rigor scores and knowledge topics linked.

Employers are more open to less common channels for recruiting (community colleges, or trade schools), since students' credentials most accurately reflect ...

what specifically they learned and **how well**.

Problem Definition (cont)

The rigor is the heart of the system that ensures the most exact match between students and industry

Without an honest rigor, one is left with only grades to measure the value of what is learned (current system)

So did you learn anything or was this just a complete waste?

someecards
user card

Solution (1/3)

Applying micro-accreditation of topics and rigor scores to students' courses and associated tasks.

This makes it easier for employers to explore students' records, verifying their success in specific skills

- Allowing employers to make better hiring decisions
- Reducing or eliminating the need of 3rd party HR staff
- Thus, reducing overhead and risk costs of new hires

Solution (2/3)

For students, this confers a solid way for students to prove the quality of their skills and abilities

Credentials are store on a blockchain, so their student records are **assured**, regardless of access to the originating learning system / school

Makes transfer from one institution to another easier when connecting what was learned to future class enrollment

Solution (3/3)

For all participants, it normalizes courses, reducing disparity and uncertainty of between institutions and for evaluation.

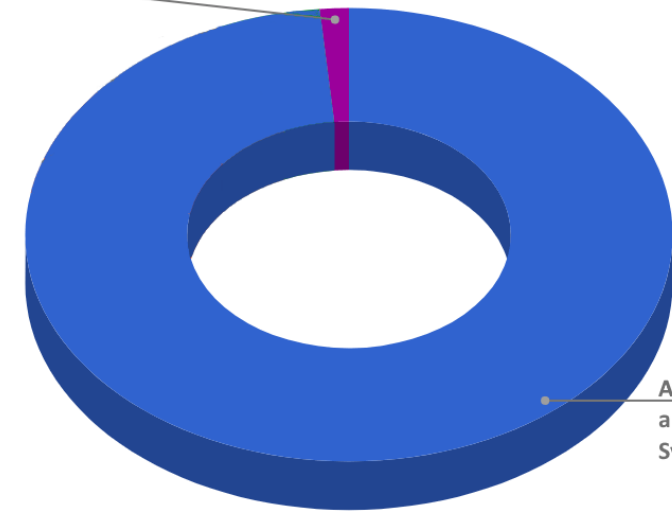 What was precisely learned and how well it was learned is then known.

Conclusions

"If you're only looking at … the top ten universities in the U.S. then yes, there are hardly any candidates."
-Tod Beardsley
(Director of Research at Rapid7)

This may prove useful in finding and filling the many positions left unfilled due to a **perceived** skills-gap

Knowledgeable and Skilled Candidates for a Position

Top 10 Schools

All Other Schools and Learning Systems
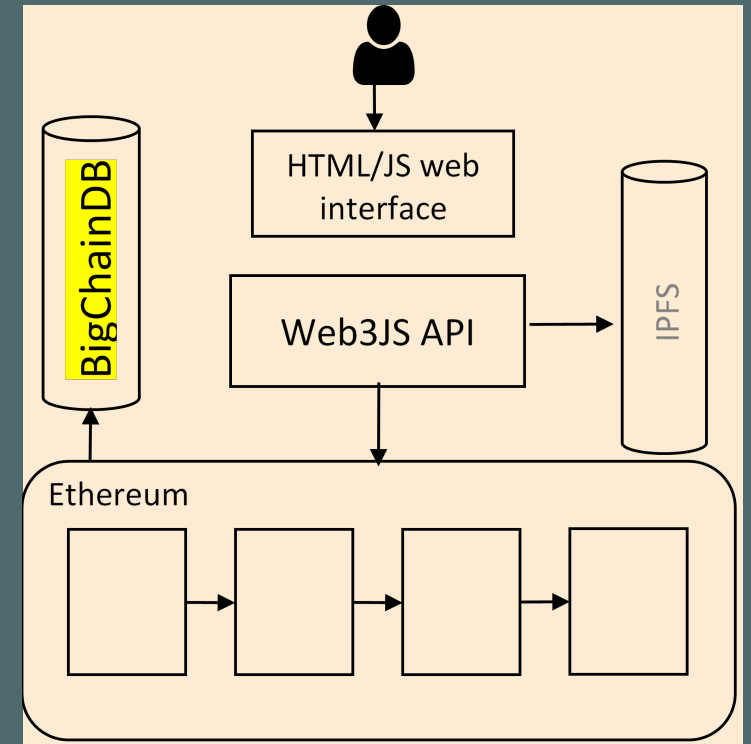
Conclusions

Our approach opens widely the pool of candidates
to fill positions
by assuring student knowledge
and employers understanding what was accurately learned,
regardless of school reputation

This may prove useful in finding and filling the many positions
left unfilled due to a perceived skills-gap
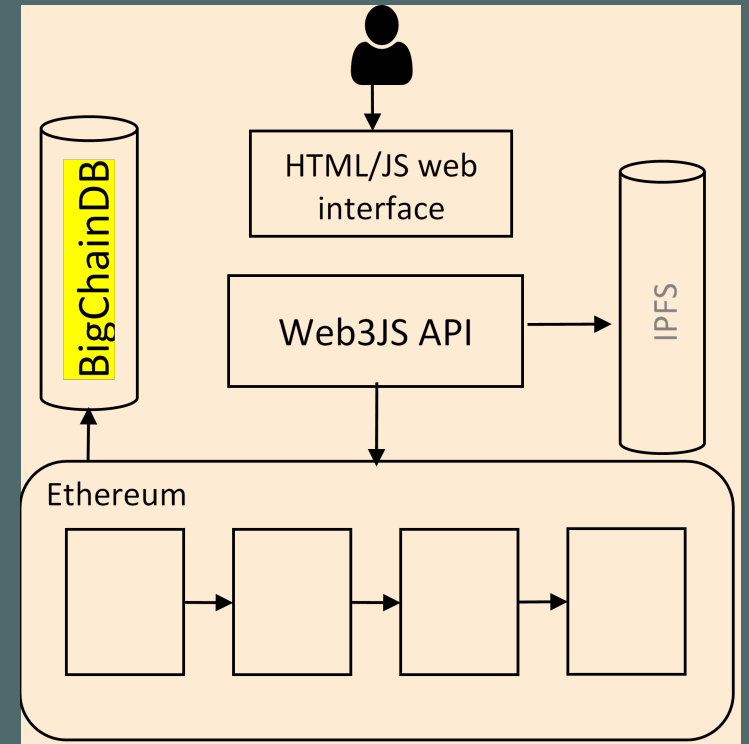
Conclusions (Architecture)

Traditional web-based dApp architecture with web3.js interface and HTML UI connected to Ethereum blockchain

Different (but basic) interfaces for Professors, Students, and Employers for testing purposes.
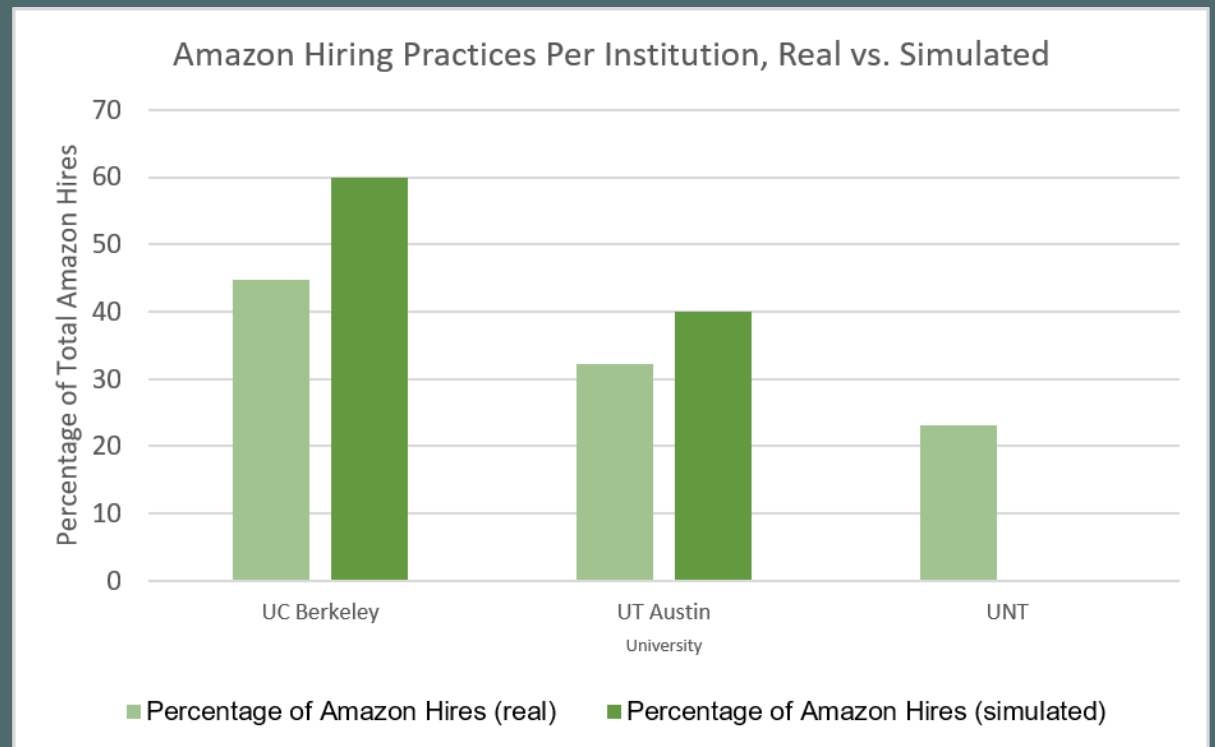
Conclusions (Architecture)

To measure success, simulated a representative dataset from Amazon's LinkedIn hiring data

Conclusions

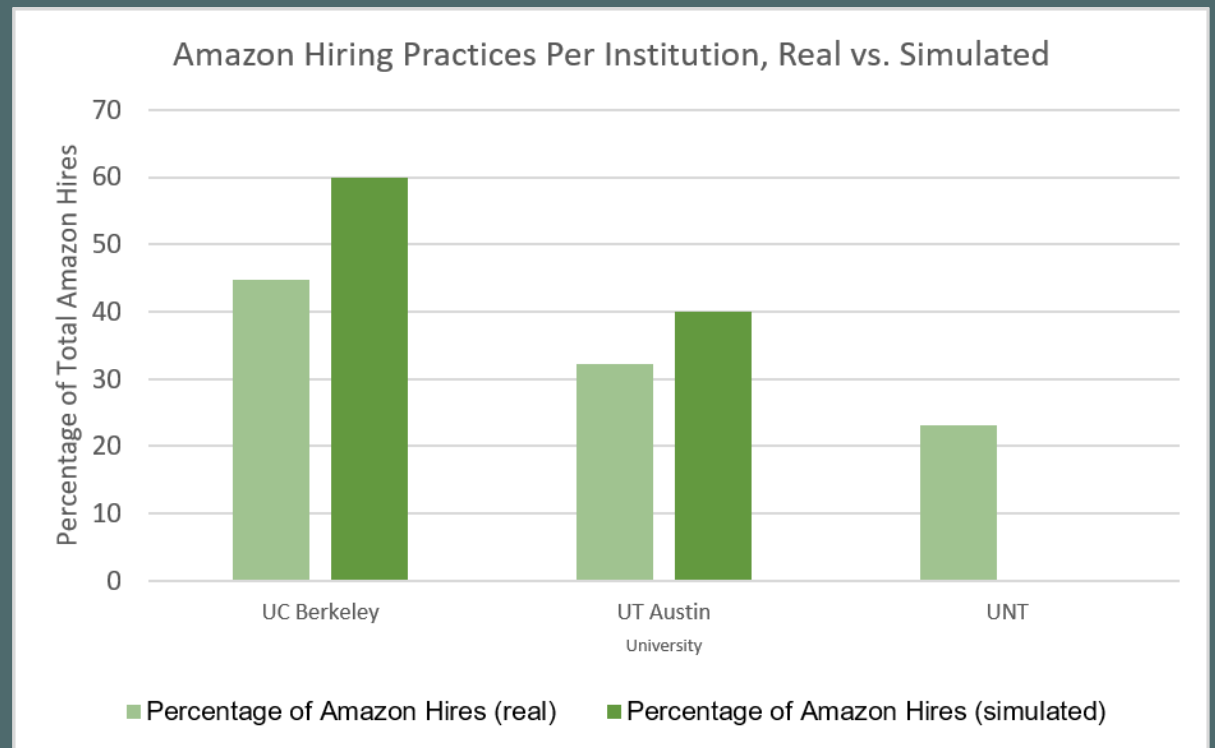## Currently, rigor scores are simulated (1/2)

The rigor score has been manually figured for matching students with employers, simulated using test data from Amazon's LinkedIn hiring data for three universities

Amazon Hiring Practices Per Institution, Real vs. Simulated

Percentage of Total Amazon Hires (y-axis: 0, 10, 20, 30, 40, 50, 60, 70)

University (x-axis: UC Berkeley, UT Austin, UNT)

■ Percentage of Amazon Hires (real) ■ Percentage of Amazon Hires (simulated)

Conclusions

Further investigation is needed (2/2)

Hiring rates from UT Austin and UC Berkeley, was quite close together. However, the algorithm places a lot of weight on rigor, which will use our new protocol.

Amazon Hiring Practices Per Institution, Real vs. Simulated

Conclusions / Future Work

Future work is to fully implement the micro-accreditation system with peer-reviewed rigor to achieve the most accurate testing and results.

Further investigation is needed to find the relationship between the rigor of an institution and hiring rates. For testing, future work includes testing with cleaner data sets in order to fully replicate real-world hiring scenarios

Conclusions / Future Work

Finding the best way for a permissioned system so courses, and student records are private with exceptions

Finding the best blockchain network that could handle the load reasonably, both in cost and speed. Fine-tuning the dApps' algorithms to gain the best on Ethereum or other network. New consensus model might be needed, instead of Proof of Work.

Thank you