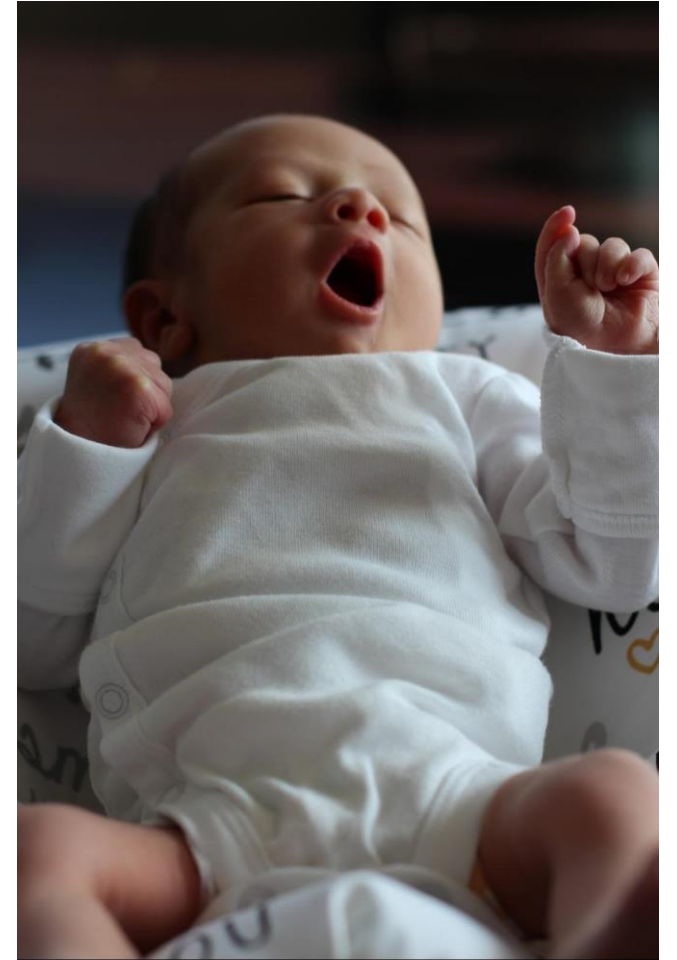


DENIZ APPELBAUM
HUSSEIN ISSA
ANDREA ROZARIO

Blockchain technology for COVID-19: powerful, but is it ethical?

AARON ROZARIO!!!

Questions?
Please forward to:



You can email his mom!!!

Outline

3

Introduction



```
graph TD; A[Introduction] --> B[Motivation and Contribution]; B --> C[Proposed Framework]; C --> D[Discussion];
```

Motivation and Contribution

Proposed Framework

Discussion

Introduction

Deloitte -Blockchain: How it works

Figure 1. Blockchain: How it works

Blockchain allows for the secure management of a shared ledger, where transactions are verified and stored on a network without a governing central authority. Blockchains can come in different configurations, ranging from public, open-source networks to private blockchains that require explicit permission to read or write. Computer science and advanced mathematics (in the form of cryptographic hash functions) are what make blockchains tick, not just enabling transactions but also protecting a blockchain's integrity and anonymity.



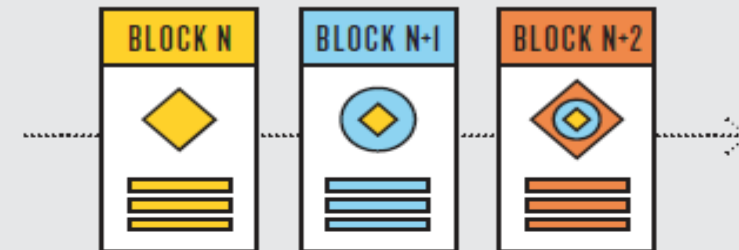
TRANSACTION Two parties exchange data; this could represent money, contracts, deeds, medical records, customer details, or any other asset that can be described in digital form.



2 VERIFICATION Depending on the network's parameters, the transaction is either verified instantly or transcribed into a secured record and placed in a queue of pending transactions. In this case, nodes—the computers or servers in the network—determine if the transactions are valid based on a set of rules the network has agreed to.

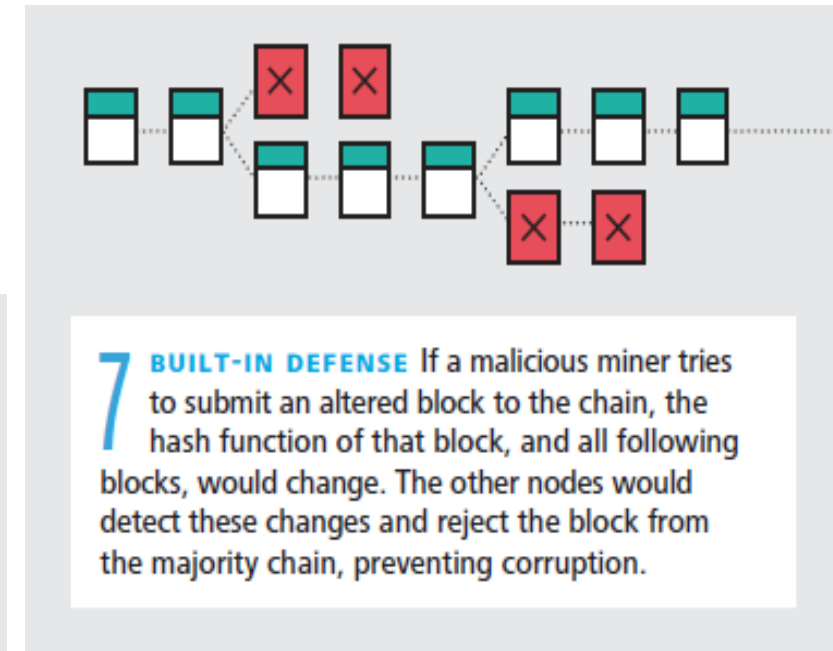
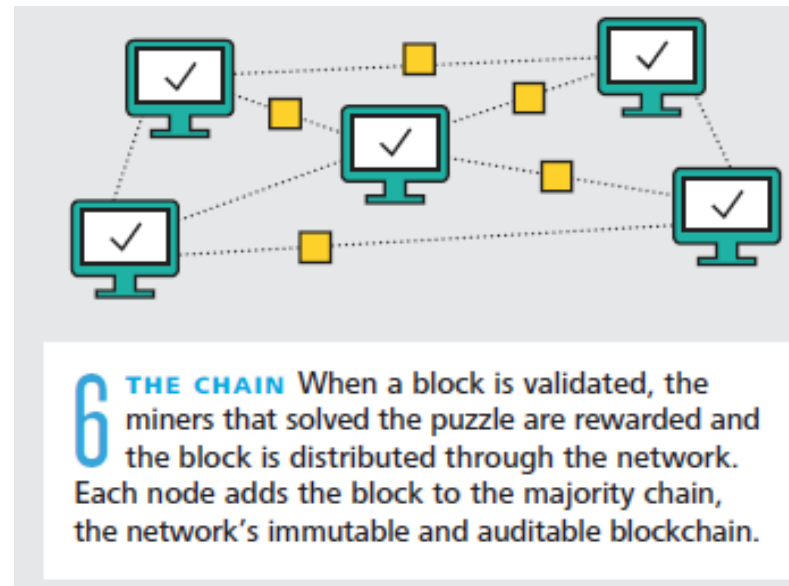
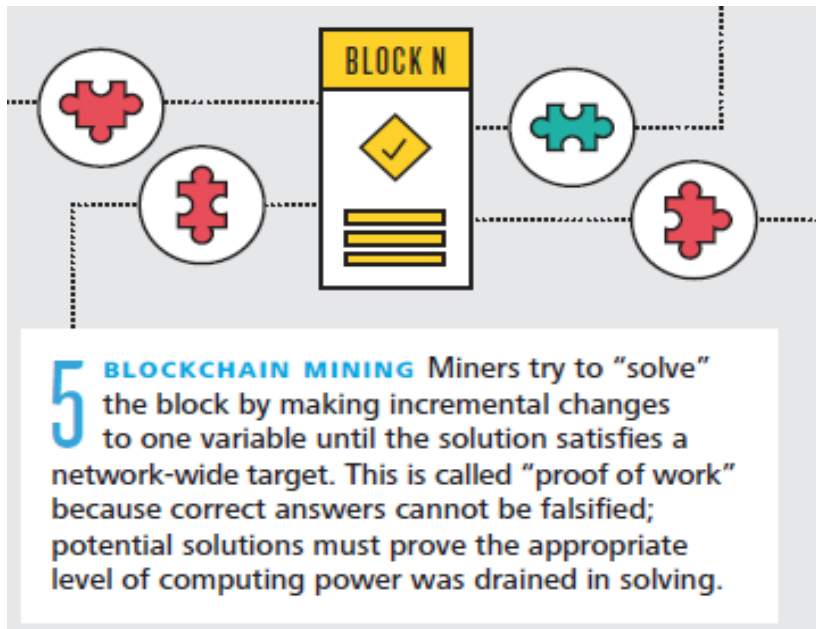


4 VALIDATION Blocks must first be validated to be added to the blockchain. The most accepted form of validation for open-source blockchains is proof of work—the solution to a mathematical puzzle derived from the block's header.



3 STRUCTURE Each block is identified by a hash, a 256-bit number, created using an algorithm agreed upon by the network. A block contains a header, a reference to the previous block's hash, and a group of transactions. The sequence of linked hashes creates a secure, interdependent chain.

Blockchain: How it works (cont.)



INNOVATORS: INSIDE A BITCOIN MINE

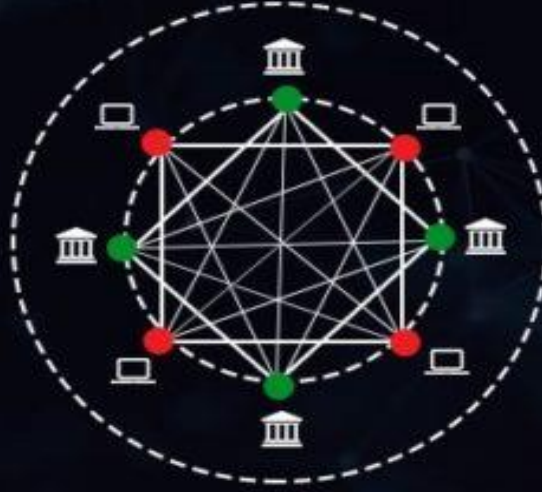


DIGITAL TRENDS

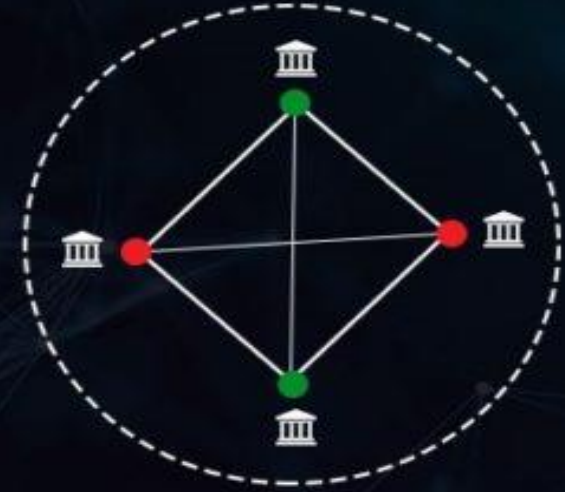
What Are the Types of Blockchain?



PUBLIC

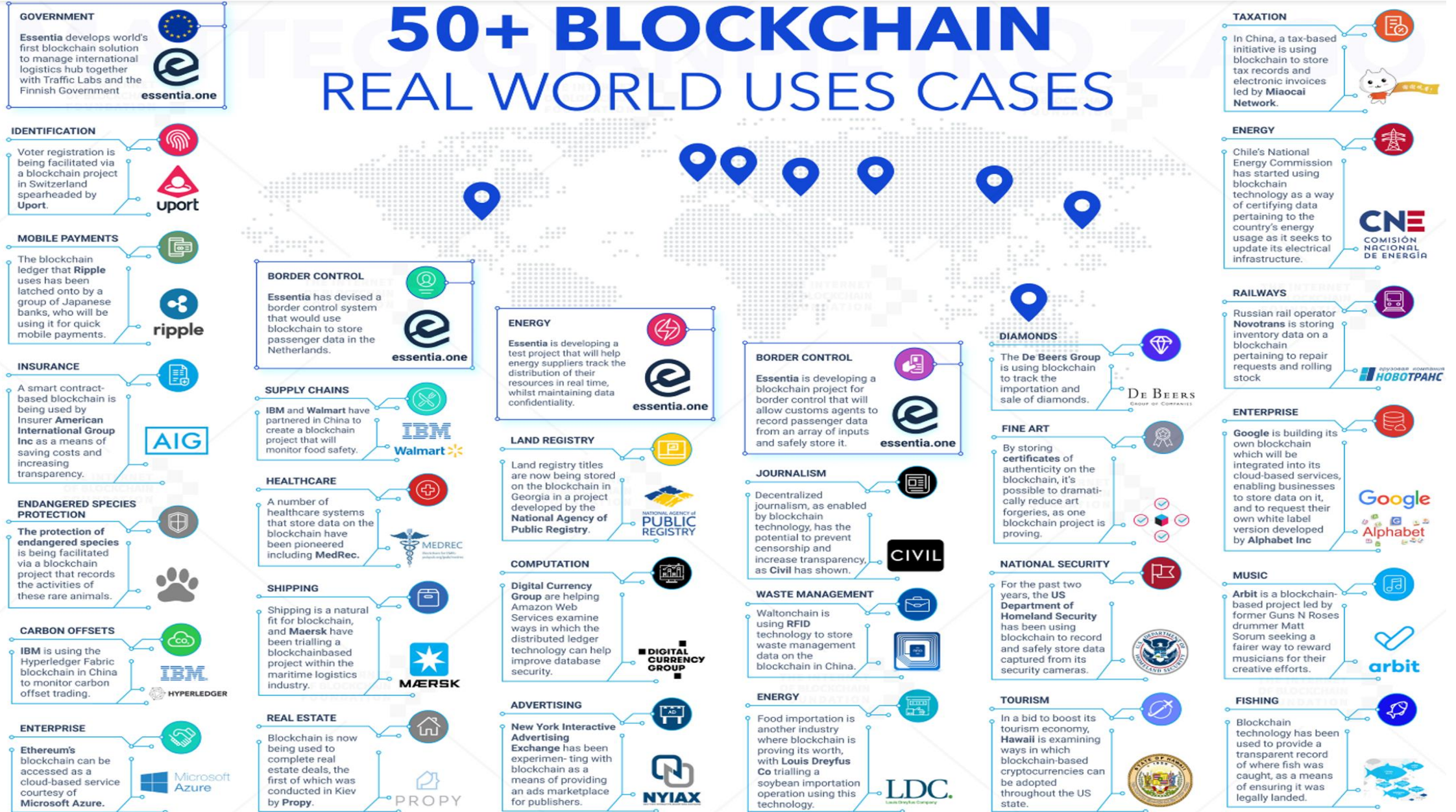


HYBRID



PRIVATE

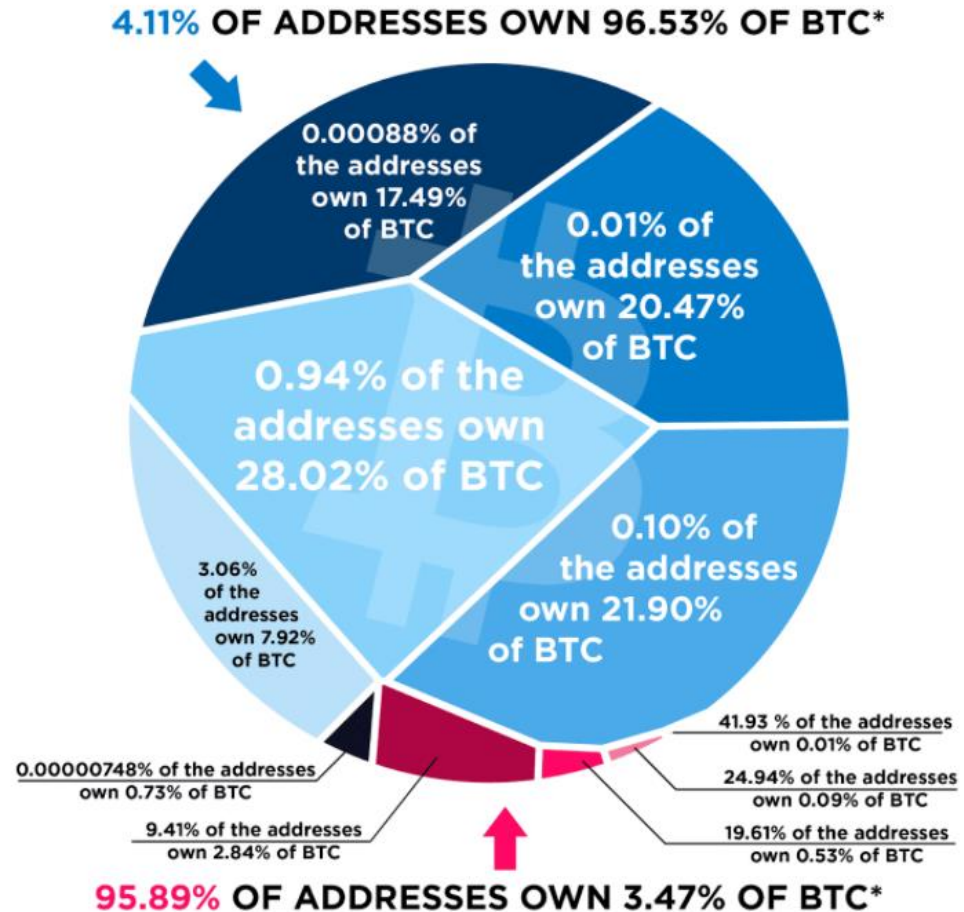
50+ BLOCKCHAIN REAL WORLD USES CASES



Subsystem	Measure	Bitcoin (Gini)	Ethereum (Gini)	Bitcoin (Data Source)	Ethereum (Data Source)
Mining	Block reward	0.4	0.82	blockchain.info/pools	etherscan.io/stat/miner?range=1&blocktype=blocks
Client	Unique codebases	0.915	0.92	bitnodes.21.co/api/#list-nodes	ethernodes.org/network/1/nodes
Developer	Commits to main client	0.79	0.91	github.com/bitcoin/bitcoin	github.com/ethereum/go-ethereum
Exchange	24 hour volume	0.83	0.85	coinmarketcap.com/currencies/bitcoin/#markets	coinmarketcap.com/currencies/ethereum/#markets
Node	Distribution across countries	0.84	0.85	bitnodes.21.co/api/#list-nodes	ethernodes.org/network/1/nodes
Owner	Distribution across addresses with >\$500k [Jul 2017]	0.65	0.76	bitinfocharts.com/top-100-richest-bitcoin-addresses-0.html	etherscan.io/accounts
Maximum Gini		0.915	0.92		

<https://blog.dshr.org/2018/10/gini-coefficients-of-cryptocurrencies.html>

The bitcoin Wealth Distribution



* Data as of September 12th, 2017

Article and Sources:

<https://howmuch.net/articles/bitcoin-wealth-distribution>

<https://bitcoinprivacy.net/>

howmuch.net

Motivation and Contribution

Motivation

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- ▶ Importance of data collection increases when they include sensitive information.
- ▶ Example: health data and contact tracing practices in the fight against **COVID-19**
- ▶ Blockchain is claimed to be revolutionary in changing how value (data) is transferred.
- ▶ Blockchain promises a secure and transparent trail of data.

BUT!

- ▶ What about societal implications?
- ▶ How does blockchain morally influence society?
- ▶ Moral compass of the technology?
- ▶ What are the potential ethical risks associated with BC?
- ▶ How can we possibly reduce such risks?

Why BC ethical concerns matter during COVID-19?

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Ethical concerns exacerbated by the sudden need to work remotely:

- ▶ Remote work → More transfer of data
- ▶ Remote work → More digital transactions (except U.S. voting)
- ▶ High unemployment → Greater incentive to commit computer fraud
- ▶ High unemployment → More susceptible to blockchain fraud schemes and wallet theft
- ▶ More blockchain transactions → greater energy demand
- ▶ More blockchain transactions → greater opportunity for human rights violations with mining consortiums

Contribution

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- ▶ Draws from the ethics literature pertaining to technology (in general)
- ▶ Approaches Blockchain from an ethical perspective
- ▶ Proposes a framework that :
 - ❑ Categorizes and discusses potential ethical issues into six categories
 - ❑ Ethical risks are observed and categorized according to the idiosyncrasies of each type of Blockchain
 - ❑ Discusses possible ways and stakeholders who can help mitigate/reduce such risks

Proposed Framework

Why is BC different?

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WHAT MAKES BLOCKCHAIN DIFFERENT

To understand why blockchain's highly touted features are so prized by users, let's compare a blockchain system with a traditional, centralized record-keeping system, like the one your bank might use to keep track of your balances.

Adapted from Madnick, 2020

FEATURE	TRADITIONAL SYSTEM	BLOCKCHAIN SYSTEM
Transparency	The database holding the account ledger is locked away in the bank's central computer system. Likewise, the software used is carefully guarded and not generally available to the public.	The blockchain ledger becomes highly visible by being distributed and copied onto hundreds, or even thousands, of computers operated by many different organizations. The software is made publicly available because it needs to run on all these servers.
Distributed Control	The central computer processes all the transactions and makes the necessary alterations to the account ledger.	Each copy of the blockchain ledger has a server that processes it. The same software is used across servers, and the consistency of all copies is assured via a verification process.
Anonymity	Usually, you need to identify yourself when you open a bank account. You're also asked to choose a password to access your account.	Each user has a private key, and that's all that is needed to operate on the blockchain. The private key is a 256-bit number (approximately 78 digits) and likely impervious to being guessed.
Immutability	When you make deposits or withdrawals, your balance changes. Separate transaction records may be kept, but they are not a part of the account ledger.	Nothing is ever changed or deleted in a blockchain — only additions are allowed. The account balance at every point in time is preserved.

Potential ethical concerns Specific to BC

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- ▶ Economic factors
- ▶ Environmental impact
- ▶ Impact on the individual
- ▶ Impact on the organization
- ▶ Cybersecurity and dark web
- ▶ Governance

		Permission-less	Semi-permissioned	Who can lead the mitigation effort?
Economic factors	Wealth distribution	Yes	Yes	Regulators
	Concentration of Wealth (GINI Coefficient)	Yes	Possible	Regulators
Environmental impact	Mining	Yes	Possible	Miners
	Verification	Yes	Yes	Coders/Miners
	Energy	Yes	Yes	Coders/Miners
Impact on the individual	Impact on Employees		Yes	Management/Regulators
	Privacy of the users	Yes	Yes	Regulators
Impact on the Organization	Challenges for smaller companies		Yes	Management
	Centralization of Mining (inclusion issue)		Yes	Management/Miners
	Inclusion		Yes	Management
Cyber security & dark web	Cybersecurity	Yes	Yes	Regulators/Management
	Dark web	Yes	No	Regulators
Governance	Transparency issues	Yes	No	Regulators/Management
	Auditability	Yes	Yes	Regulators/Management
	Ethics of the platform	Yes	Yes	Regulators/Management
	Distributed and automated decision making	Yes	Possible	Management/Coders

Discussion and Conclusion

Discussion

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Role of Regulators

- ▶ Privacy of the users
- ▶ Cybersecurity and dark web
- ▶ Wealth distribution
- ▶ Concentration of Wealth (GINI Coefficient)
- ▶ Transparency issues
- ▶ Auditability
- ▶ Ethics of the platform

Discussion

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Role of Management

- ▶ Impact on Employees
- ▶ Challenges for smaller companies
- ▶ Centralization of Mining (inclusion issue)
- ▶ Inclusion
- ▶ Cybersecurity
- ▶ Transparency issues
- ▶ Auditability
- ▶ Ethics of the platform
- ▶ Distributed and automated decision making

Discussion

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Role of Coders

- ▶ Verification
- ▶ Energy
- ▶ Distributed and automated decision making

Discussion

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Role of Miners

- ▶ Mining
- ▶ Verification
- ▶ Energy
- ▶ Centralization of Mining (inclusion issue)

Conclusion

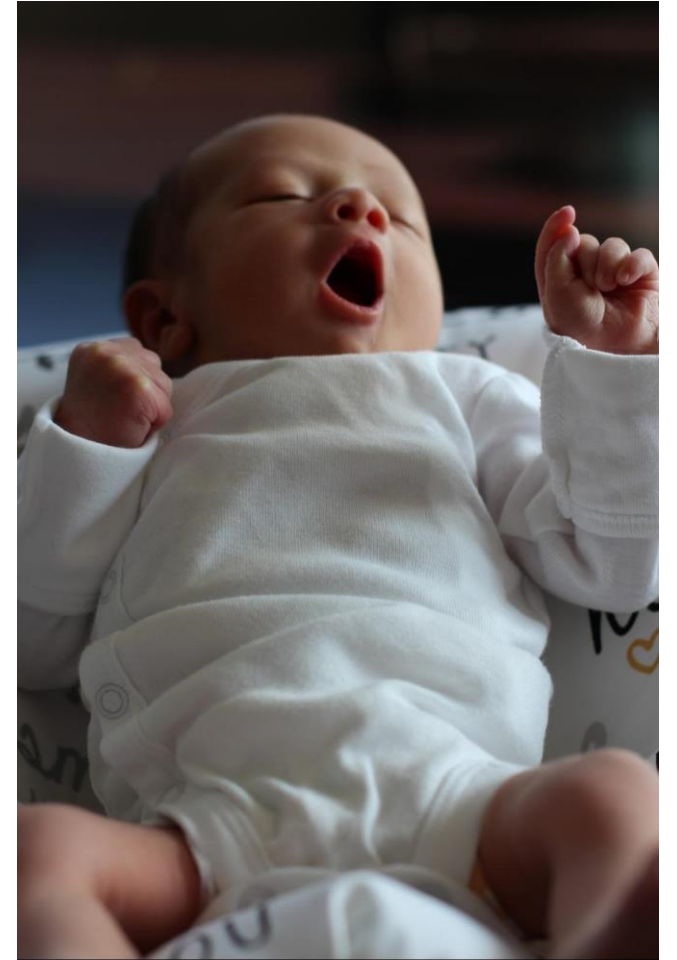
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Open questions?

- ▶ What is the role of academic research for combining BC and Transparency?
- ▶ COVID-19 contact tracing: could BC be the solution?
- ▶ Why hasn't BC been adopted more widely?
- ▶ What about government use of BC?
- ▶ Why not for e-voting? Especially during COVID-19

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Blockchain

— *Simply explained* —