

Blockchains for Artificial Intelligence

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MAGIC
Internet
Money

Join us

Blockchain: A Special “Spreadsheet in the Sky”



What's special:

- no one owns it
 - anyone can add to it
 - no one can delete from it
-
- Writing to a blockchain is like etching in stone.
 - Which allows us to issue assets, and transfer them



The Internet of Everything needs a Ledger of Everything.

The **blockchain** is a truly open, distributed, global platform that fundamentally changes what we can do online, how we do it, and who can participate. Call it the **world wide ledger**.

Blockchains are databases with “blue ocean” benefits

Decentralized / shared control
Immutability / audit trail
Tokens / exchanges

The background of the slide features a wide-angle photograph of a dramatic sky filled with dark, heavy clouds. Below the horizon, the ocean is visible with dark, choppy waves under the same cloudy sky.

A blockchain caveat or two

Completely new code bases

Reinventing consensus

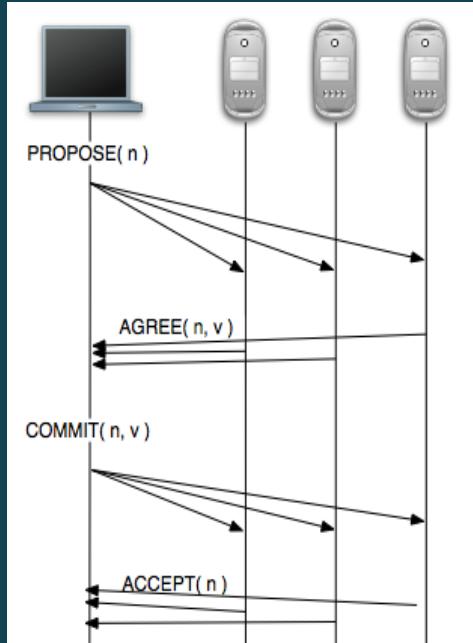
No sharding = no scaling

No querying // single-node querying

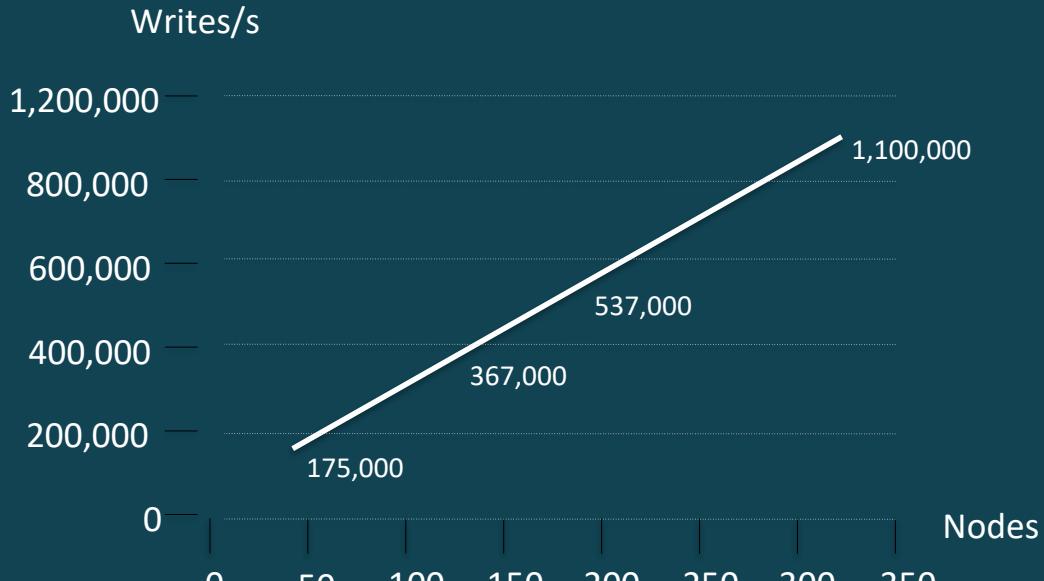
Let's fix this...

Everyone uses databases. How do they scale to big data?

Answer: Distribute storage across many machines (sharding)



A “consensus” algorithm keeps distributed nodes in sync.



Example: Cassandra scaling.
More nodes = more throughput, more capacity

How to build a scalable blockchain database (BigchainDB)

1. Start with an enterprise-grade distributed DB, e.g. MongoDB
2. Engineer in blockchain characteristics



Decentralized /
Shared Control

- Each DB node is a federation node

Immutable /
Audit Trails

- Hash Previous Blocks
- Append-only

Native assets

- “Own” = have private key
- Asset lives on the database



IPDB = a public global blockchain database



Example real-world use:
ascibe



ascibe is a fundamentally new way to lock in attribution, securely share and trace where your digital work spreads.

Register your work

Your Work

Drag file here

or

choose a file to upload

Artist Name

(e.g. Andy Warhol)

Title

(e.g. 32 Campbell's Soup Cans)

Year Created

(e.g. 1962)

 Specify editions

Register work

contemporary

A temporary online exhibition of art for bitcoin

Marian Tubbs

Orbiting (A Melodrama)

2016

video

1920 × 1080 pixels

Edition of 50

Learn more about [Digital Editions](#)

→ [Artist Vita](#)

→ [Description of Work](#)

→ [Artist Website](#)



Orbiting (A
Melodrama), 2016
4 of 50
Offered for 0.07 B

.zip

[Share](#) [Tweet](#) [Download .zip](#)

Event Listeners

CREATED BY Harm van den Dorpel

DATE 2015

EDITION 24 of 100

ID 1CbB2YEnBQUkHjWZvqfNNfjK8wh2cg69zQ

OWNER Masha McConaghy

ACTIONS

[EMAIL](#)[TRANSFER](#)[CONSIGN](#)[LOAN](#)[DELETE](#)

+ Certificate of Authenticity

- Provenance/Ownership History

Apr. 17, 2015, 16:15:21

Registered by mail@harmvandendorpel.com

Apr. 20, 2015, 20:54:16

Transferred to Masha McConaghy

+ Consignment History

+ Notes

.zip

[Share](#) [Tweet](#) [Download .zip](#)

Event Listeners

CREATED BY Harm van den Dorpel
DATE 2015

EDITION 24 of 100
ID 1CbB2YEnBQUkHjWZvqfNNfjK8wh2cg69zQ

OWNER Masha McConaghy

ACTIONS [EMAIL](#) [TRANSFER](#) [CONSIGN](#) [LOAN](#) [DELETE](#)

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Apr. 20, 2015, 20:54:16

Transferred to Masha McConaghy

+ Consignment History

+ Notes

Certificate Of Authenticity

As of 30 November 2015, 17:36:00 GMT, Masha McConaghay is the owner.
To verify current owner, please visit <http://ascr.be/1luAOpo>



DOLLAR
EURO
Swiss FRANCS
JEFF KOONS
BITCOIN

Currency

Date: 2014

Edition: 3 of 100

Created by: Dan Perjovschi

Owner: Masha McConaghay

ARTWORK DETAILS

Artwork ID: 17uZBwSbLGfx3vRRMWzF5PMjFVNc1tkQ2

File: currency-2014.jpg (499 KB)

PROVENANCE/OWNERSHIP HISTORY

Apr. 30, 2015, 12:36:19 - Registered by mail@cointemporary.com

May. 01, 2015, 09:46:08 - Transferred to admin

May. 08, 2015, 13:04:59 - Transferred to trent

Nov. 27, 2015, 19:35:14 - Transferred to Masha McConaghay

CRYPTOGRAPHIC STAMP

Use the summary and signature below to authenticate this certificate:
<http://ascr.be/1Srz45Q>

Summary: Dan Perjovschi*Currency*3/100*2014*2015Apr30-12:36:19

Signature: 438B24CE06182FA3AA82BC285F867D03FB73F3BCC0F73FDBA6
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C4ABEF6869BF6A991668A820F3FB03A48C6A9E05834716F6500
68E8E07E5266620BA815948DC265605D23FAF016CB46ACD4BC
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ED1L



More examples



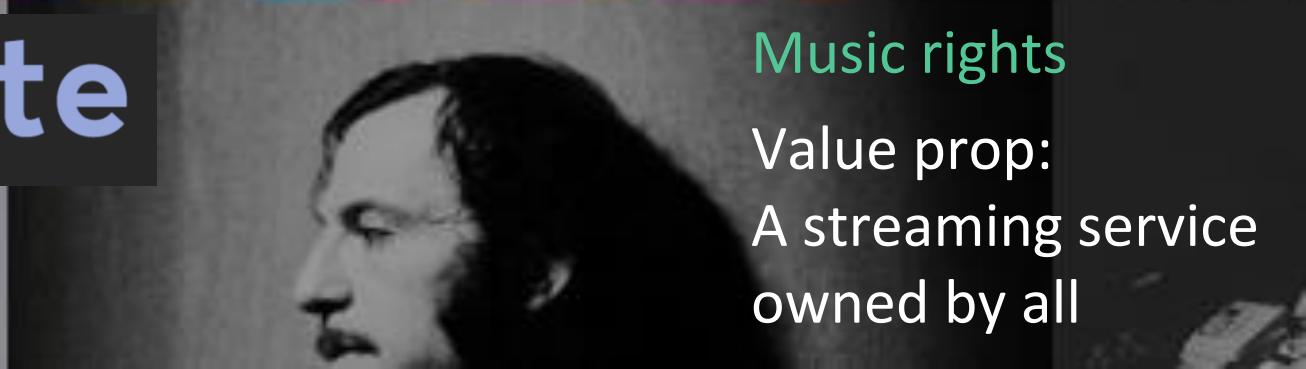
Energy

Value prop:
manage \$ flow in
energy deregulation





res()nate



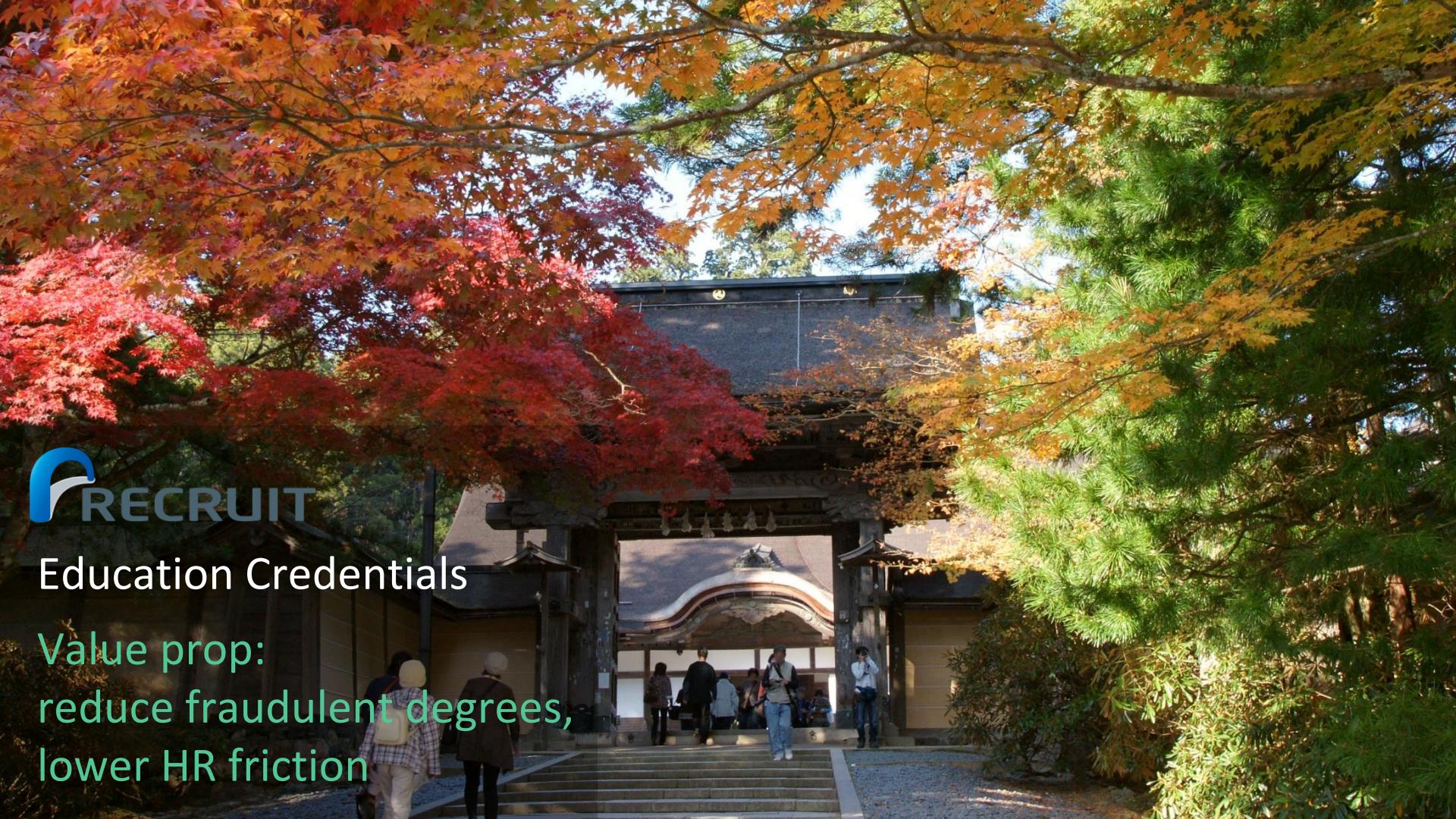
Music rights

Value prop:
A streaming service
owned by all



Education Credentials

Value prop:
reduce fraudulent degrees,
lower HR friction





How can blockchains help AI?



Work off of each of the benefits...

Decentralized / shared control

Immutability / audit trail

Tokens / exchanges

Decentralized / shared control encourages data sharing

More data → better models

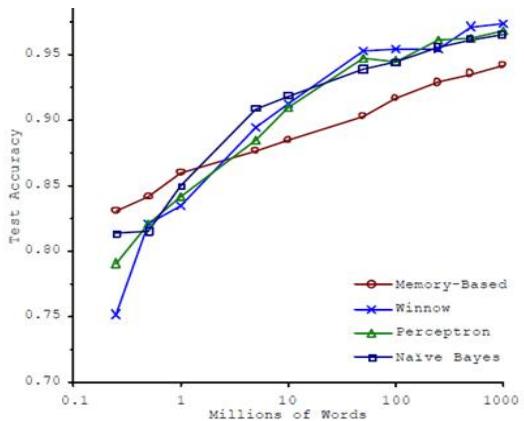
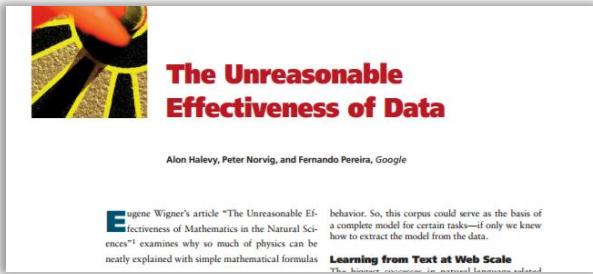


Figure 1. Learning Curves for Confusion Set Disambiguation

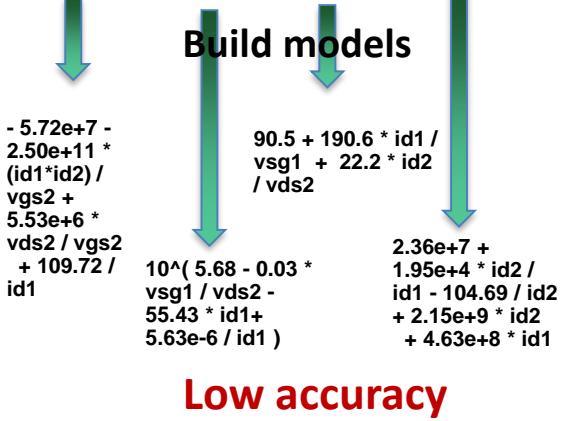
[Banko and Brill, 2001]



Merge



Build model



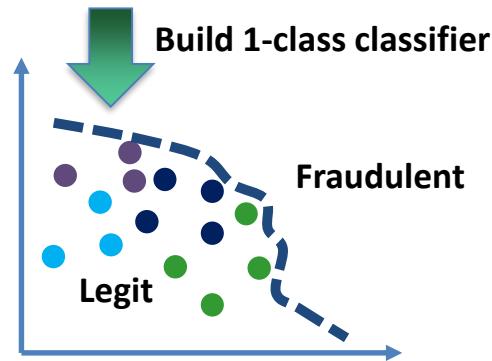
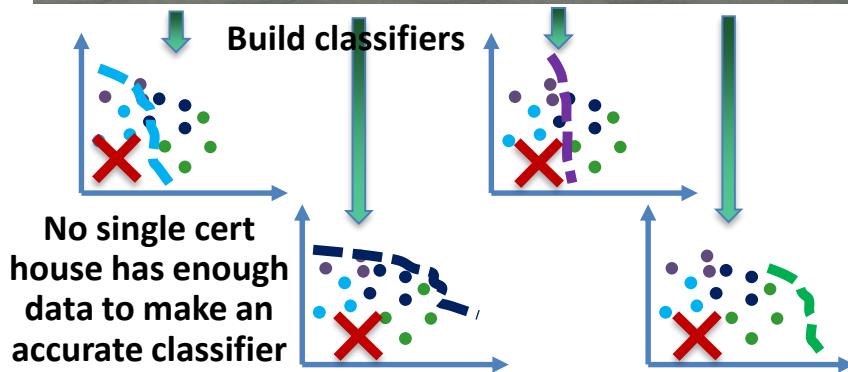
$$\begin{aligned} & -10.3 + 7.08e-5 / id1 \\ & + 1.87 * \ln(-1.95e+9 + 1.00e+10) \\ & / (vsg1 * vsg3) + 1.42e+9 \\ & * (vds2 * vsd5) / (vsg1 * vgs2 * vsg5 * id2) \end{aligned}$$

High accuracy

Decentralized / shared control encourages data sharing
Qualitatively new ecosystem-level data → qualitatively new models



Example: shared diamond certification houses data → makes fraud id possible



Decentralized / shared control encourages data sharing

Qualitatively *new planet-level* data → qualitatively new models

“IPDB is kibbles for AI”

--David Holtzman



Immutability for An Audit Trail on Training/Testing Data & Models

For greater trustworthiness of the data & models
(Avoid garbage-in, garbage-out)

Provenance in building models:

- Sensor / input stream data
 - Training X/y data
- Model building convergence

Timestamp / store

Provenance in testing / in the field:

- Testing X data
- Model simulation
- Testing yhat data



Applications:

- you can tell if a sensor is lying
- you know the “story” of a model
- catch leaks in the data chain



Another Opportunity:

A shared global registry of training data & models



All the Kaggle datasets

All the Kaggle models

All the ImageNet datasets

All the ImageNet models

⋮

....

“Models are owned
by the planet”

Training/testing data & models as intellectual property assets → Decentralized data & model exchanges



Your datasets or models...

...licensed to others

Others' datasets & models

...licensed to you

⋮

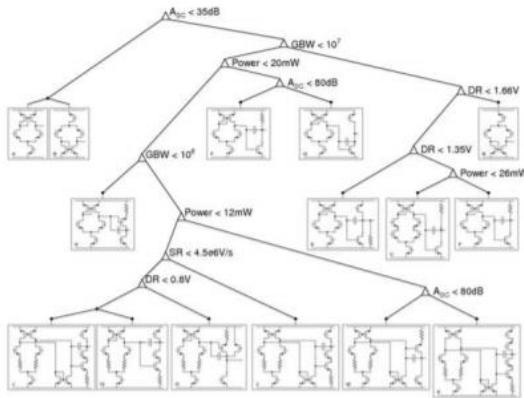
....

“EMX – European
Model Exchange?”

Certificate of Authenticity

As of Nov. 06 2016, 19:10:42, trent is the owner.

To verify current owner, please visit https://www.ascribe.io/app/coa_verify/



Circuit Decision Tree

Edition: 1/3

Created by: Trent McConaghy

Owner: trent

ARTWORK DETAILS

Artwork ID: 136UbLGSNHqY9kjxQ3tDy83K7P69zDjeN

File Extension: .png

File Size: 87090 bytes

PROVENANCE/OWNERSHIP HISTORY

Nov. 06, 2016, 19:10:42 - Registered by trent

CRYPTOGRAPHIC STAMP

Use the summary and signature below to authenticate this certificate on:

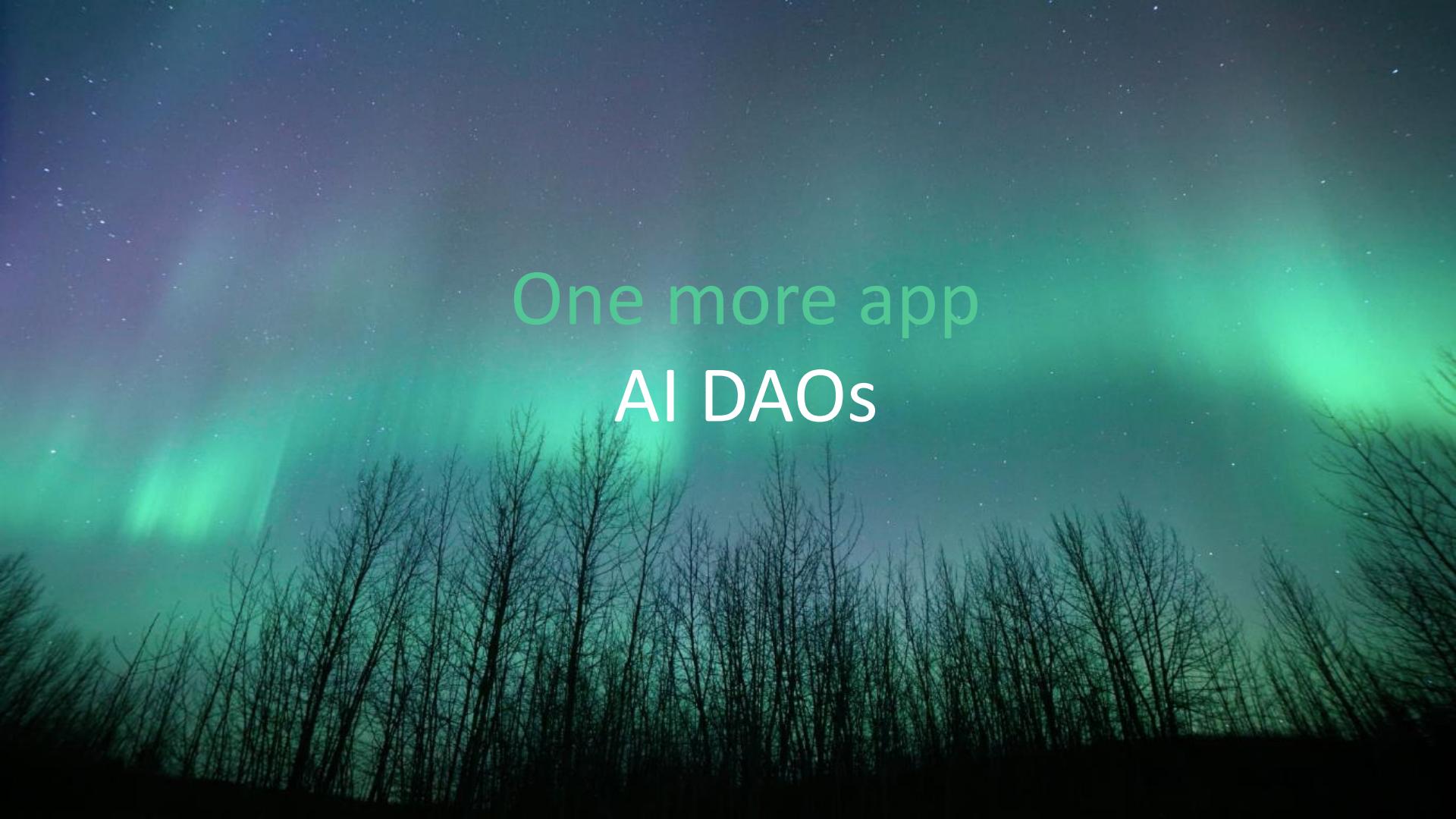
Link: https://www.ascribe.io/app/coa_verify/

Summary: Trent McConaghy*Circuit Decision
Tree*1/3*2008*2016Nov06-19:10:42

Signature: C38D56C823CEC09E40B3589D27D48B9C8EF9ADECC9592F469
CE0144CF9ECA406B3ABF1D976AD87813895379A66F97C327B
B0EE090A52F6A8274F3F4AC9EE3D7DF0FA98964C834678A6F4
8EF4FE687E7B4243F8F65FF57315CB7391A03874CD4BDFCB357
18F1742AB526B72A4C2D2593F3492372A66C82679263E398A
B9996EL



Sell your CARTS?

The background of the image is a dark night sky. A vibrant green aurora borealis (Northern Lights) is visible in the upper right quadrant, with its light rays extending towards the left. In the foreground, the dark silhouettes of many bare trees are visible against the sky.

One more app
AI DAOs



What if you used a blockchain to store *state* of a state machine?

Then you get
decentralized processing.

aka “smart contracts”

Virtual machine





What if you used a blockchain to store *state* of a state machine?

Then you get
decentralized processing.

And you can build a
world computer

having decentralized processing,
storage, and communications

(e.g. Ethereum vision)

Decentralized
applications (dapps)

Virtual machine

State



World computer

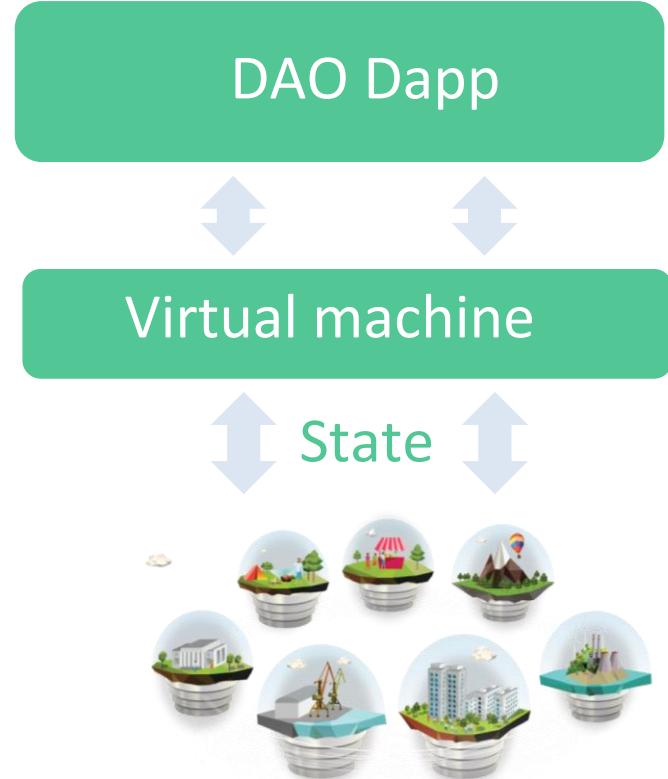


DAO: Decentralized Autonomous Organization

DAO: a computational process that

- runs autonomously,
- on decentralized infrastructure,
- with resource manipulation.

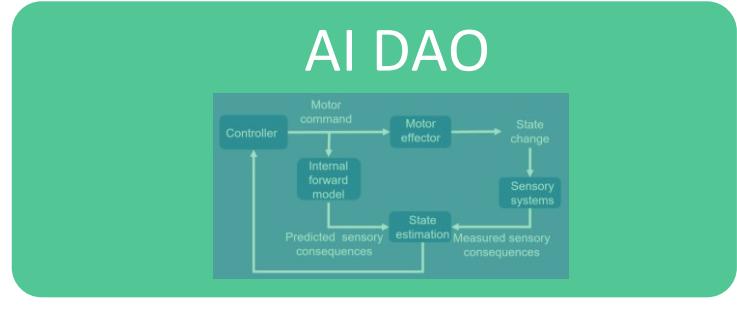
It's code that can *own* stuff!



AGI on a DAO?

AI entity is a feedback control system.
That is, AGI.

Its feedback loop would continue on its own, taking inputs, updating its state, and actuating outputs, with the resources to do so continually.





Example: The ArtDAO Algorithm...

1. Run AI art engine to generate new image, using GP or deep
2. Claim attribution in blockchain, using ascribe
3. Create multiple editions, using ascribe
4. Post editions for sale onto a marketplace, using Getty (centralized), or OpenBazaar (decent.)
5. Sell the editions. \$ goes to ArtDAO using built-in cryptocurrency like Ether. IP go from ArtDAO using ascribe.
6. Repeat! Create more art, sell it, get wealthier



Example: The ArtDAO Algorithm...

1. Run AI art engine to generate new image, using GP or deep
2. Claim attribution in blockchain, using ascribe

Over time, if ArtDAO makes more money from sales than from generating new art, then it will accumulate wealth. And, you can't turn it off.

3. Sell the editions. \$ goes to ArtDAO using built-in cryptocurrency like Ether. IP go from ArtDAO using ascribe.
6. Repeat! Create more art, sell it, get wealthier



Angles to Making AI DAOs

- **DAO → AI DAO.** Start with DAO, add AI. E.g. Plantoid
- **AI → AI DAO.** Start with AI, add DAO. E.g. numer.ai
- **SaaS → DAO → AI DAO.** Convert SaaS to DAO. Then add AI
- **Physical service → AI DAO.** E.g. Uber self-*owning* cars

Blockchains for Artificial Intelligence

A planetary-scale blockchain database (IPDB) unlocks opportunities:

1. Data sharing → Better models
2. Data sharing → Qualitatively new models
3. Audit trails on data & models for more trustworthy predictions
4. Shared global registry of training data & models
5. Data & models as IP assets → data & model exchange
6. AI DAOs – AI that can accumulate wealth, that you can't turn off