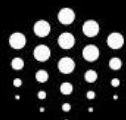


Blockchains for Artificial Intelligence From Data Exchanges to Millionaire AIs

Trent McConaghy
@trentmc0



ocean

BIGCHAIN 

IPDB | INTERPLANETARY
DATABASE

Blockchains

The background of the slide is a photograph of the Aurora Borealis (Northern Lights) in a dark, starry sky. The aurora displays vibrant green and blue-green hues. In the foreground, the dark, silhouetted branches of bare trees are visible against the glowing light.



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**.

Don & Alex Tencati

Blockchains are databases with “blue ocean” benefits

Decentralized / shared control

Immutability / audit trail

Tokens / exchanges

How to build a scalable blockchain database (e.g. BDB)

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

A photograph of the Aurora Borealis (Northern Lights) in a dark night sky, with silhouettes of bare trees in the foreground. The aurora displays vibrant green and purple hues. The text "Example real-world use: ascribe" is overlaid on the image.

Example real-world use:
ascribe

ascribe 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

cōntemporary

A temporary online exhibition of art for bitcoin

Marian Tubbs

Orbiting (A Melodrama)

2016
video
1920 × 1080 pixels

Edition of 50

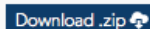
Learn more about [Digital Editions](#)

- [Artist Vita](#)
- [Description of Work](#)
- [Artist Website](#)



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

.zip



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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Registered by mail@harmvandendorpel.com

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 McConaghy 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 McConaghy

ARTWORK DETAILS

Artwork ID: 17uZBwSbLG8Xy3vRRMWzF5PMjFVNc1tkQ2

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 McConaghy

CRYPTOGRAPHIC STAMP

Use the [summary](#) and [signature](#) below to authenticate this certificate:
<http://ascr.be/1Sr45Q>

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

Signature: 438B24CE06182FA3AA82BC285F867D03FB73F3BCC0F73FDBA6
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68E8E07E5266620BA815948DC265605D23FAF016CB46ACD4BC
BE75F08D0DEBD7AF55E4CB085B9A0A14583F135DBB399121B24
ED1L

A photograph of the Aurora Borealis (Northern Lights) in a dark night sky. The aurora displays vibrant green and purple hues, appearing as a glowing curtain across the upper portion of the frame. Below the aurora, the dark, silhouetted branches of a forest are visible against the night sky. The text "More examples" is centered in the middle of the image in a white, sans-serif font.

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

Data & AI

A photograph of the Aurora Borealis (Northern Lights) in a dark night sky, with green and purple hues. The bottom of the image shows the dark silhouettes of bare trees against the glowing light.



The Unreasonable Effectiveness of Data

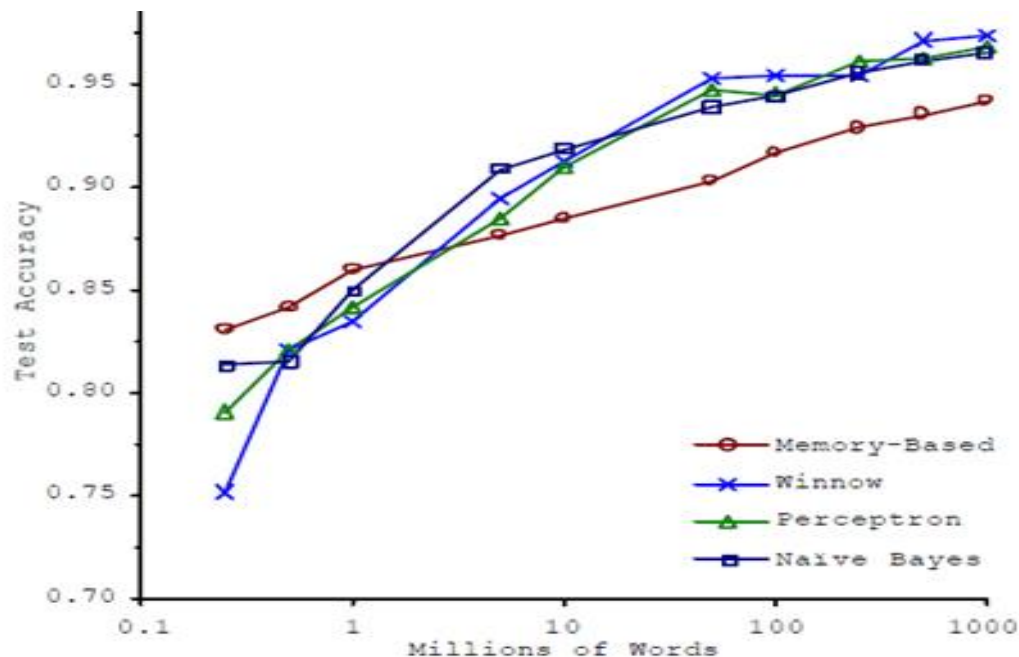


Figure 1. Learning Curves for Confusion Set Disambiguation
[Banko and Brill, 2001]

The world's most valuable resource



Data and the new rules
of competition

Mo' data
(and mo' compute)



Mo' accuracy



Mo' \$

THE 3 ELEMENTS OF COMPUTING



STORAGE

PROCESSING

COMMUNICATIONS

THE 3 ELEMENTS OF COMPUTING

Key Blocks in AI Landscape

STORAGE

FILE SYSTEM

HDFS, S3

PROCESSING

BIZ LOGIC

CPU, EC2

COMMUNICATIONS

DATA

TCP/IP, HTTP

DATABASE

MongoDB,
Cassandra

HIGH PERF. COMPUTE

Nvidia GPU, Goog TPU,
MapReduce, Spark

But all is not well in the world of AI

- **Data hoarding.** Big guys have all the data.
- **Weak data history.** Garbage in, garbage out.
- **Data is *expensive*.**

And more..

But all is not well in the world of AI

- **Data hoarding.** Big guys have all the data.
- **Weak data history.** Garbage in, garbage out.
- **Data is *expensive*.**

And more..

Can decentralization help?

Blockchains & AI

The background of the slide is a photograph of the Aurora Borealis (Northern Lights) in a dark, starry sky. The aurora displays vibrant green and purple hues. In the foreground, the dark silhouettes of bare trees are visible against the glowing light.

A photograph of the Oracle headquarters building, a modern structure with multiple curved glass wings reflecting the sky. In the foreground, there are several weeping willow trees and a body of water.

Q: How to unlock blockchains for AI?

A: A shared database with planetary reach

+Query
+Open-source
+Scale
+Decentralized, Assets

1. Relational DB – Oracle
2. Website-ready DB – MySQL
3. “Big data” Distributed DB – MongoDB
4. “Blockchain” DB – BigchainDB + IPDB

THE 3 ELEMENTS OF COMPUTING, *DECENTRALIZED*



STORAGE

FILE SYSTEM

IPFS/FileCoin, Swarm

DATABASE

BigchainDB/IPDB

E-GOLD / E-CASH

Bitcoin, zcash, .*

PROCESSING

BIZ LOGIC

Ethereum, Hyperledger

HIGH PERF. COMPUTE

TrueBit, Golem, iExec,
VMs, client-side compute

COMMUNICATIONS

DATA

TCP/IP, HTTP

VALUE

ILP, Cosmos

State

PolkaDot, Aeternity

THE 3 ELEMENTS OF COMPUTING, *DECENTRALIZED*



Key Blocks in AI Landscape

STORAGE

FILE SYSTEM

IPFS/FileCoin, Swarm

DATABASE

BigchainDB/IPDB

E-GOLD / E-CASH

Bitcoin, zcash, .*

PROCESSING

BIZ LOGIC

Ethereum, Hyperledger

HIGH PERF. COMPUTE

TrueBit, Golem, iExec,
VMs, client-side compute

COMMUNICATIONS

DATA

TCP/IP, HTTP

VALUE

ILP, Cosmos

State

PolkaDot, Aeternity



Online platform for industrial 3d printing.

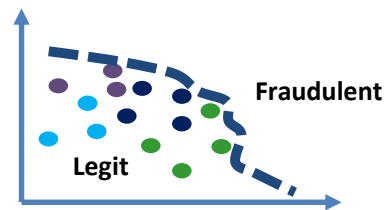
E.g. spare aircraft parts

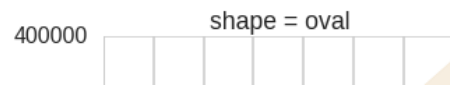
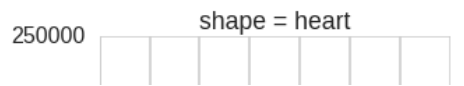
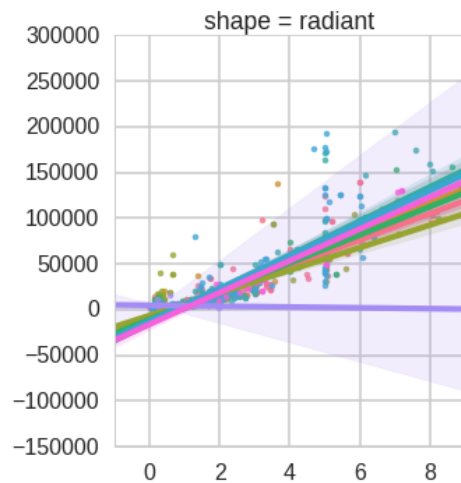
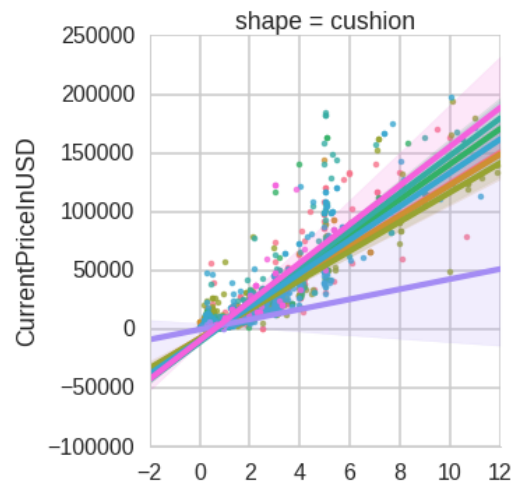
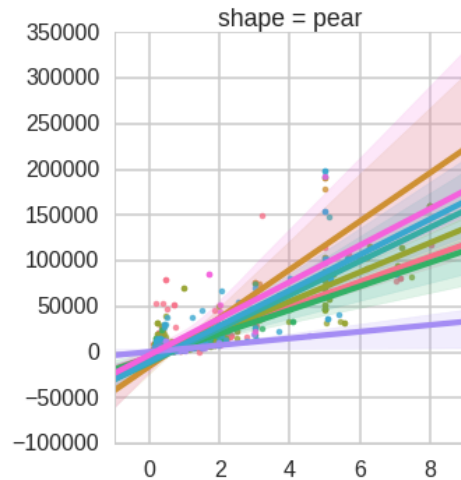
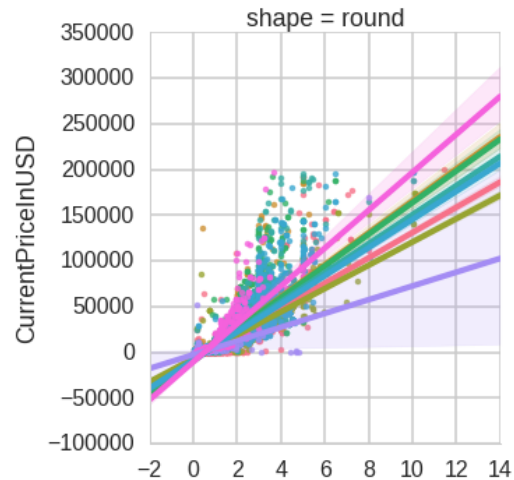
- Find and contract the best 3d printer
- Securely transfer production files
- Pool data in ecosystem → 1-class classifiers for fraud detection

Problem: Data Hoarding

Sol'n: Data Pooling

For More Accurate Models





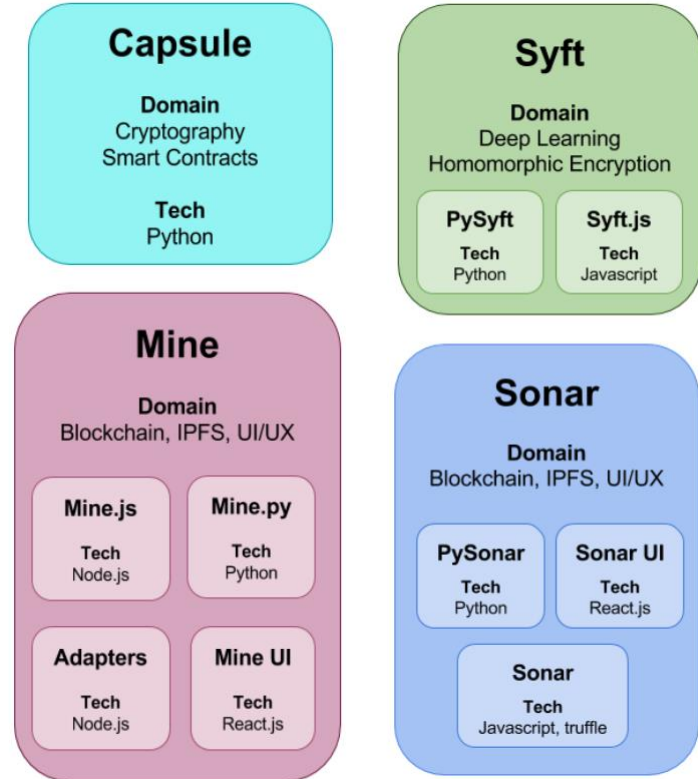
Problem: Data Hoarding (2)
Sol'n: Data Pooling For More Accurate Models

**Diamond price prediction
for fraud detection:
Warn if predicted price \neq
asking price**

Problem: Data Hoarding (3)

Sol'n: OpenMined:
Let the data hoarders hoard,
just compute a model on
their encrypted data

Federated Learning
Homomorphic Encryption
Blockchain

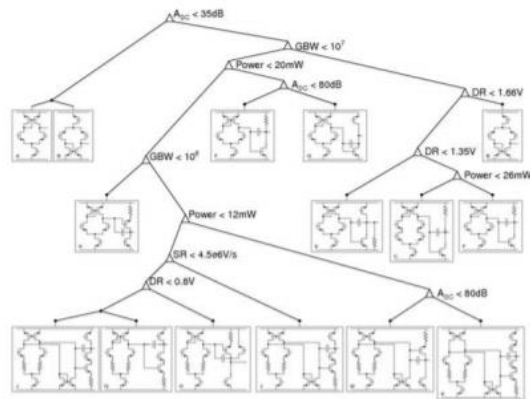


Certificate of Authenticity

ascribe[®]

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: 136UbLGSNNHqY9kjxQ3tDy83K7P69zDJeN

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
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9FF4FE687E7B4243F8F65FF57315C87391A03874CD48DFCB357
18F1742AB5256B72A4C2D2593F3492372A66C82679263E39BA
B99996EL



Problem: High Friction to Monetize Algorithms
Sol'n: Claim & License Your Algorithm IP



Problem: High Friction to Monetize Algorithms (2)

Solution: Hedge Fund In a Box (Numeraire)

1. 12K+ data scientists submit algorithms
2. Market winnings are distributed wrt performance
3. Positive-sum via tokenization

Problem: High Friction to Monetize Algorithms (3)

Solution: Tokenize your AI: SingularityNet

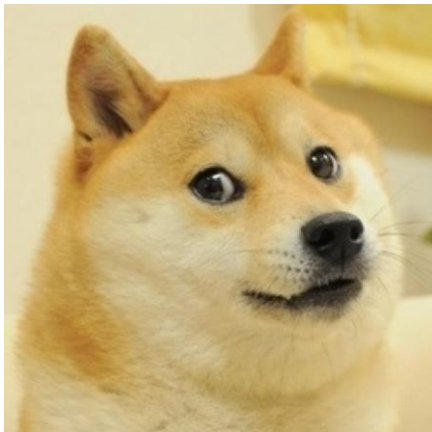
Steps

1. Submit your AI algorithms
2. They get wrapped into SingularityNet agents
3. And act as a decentralized MLaaS

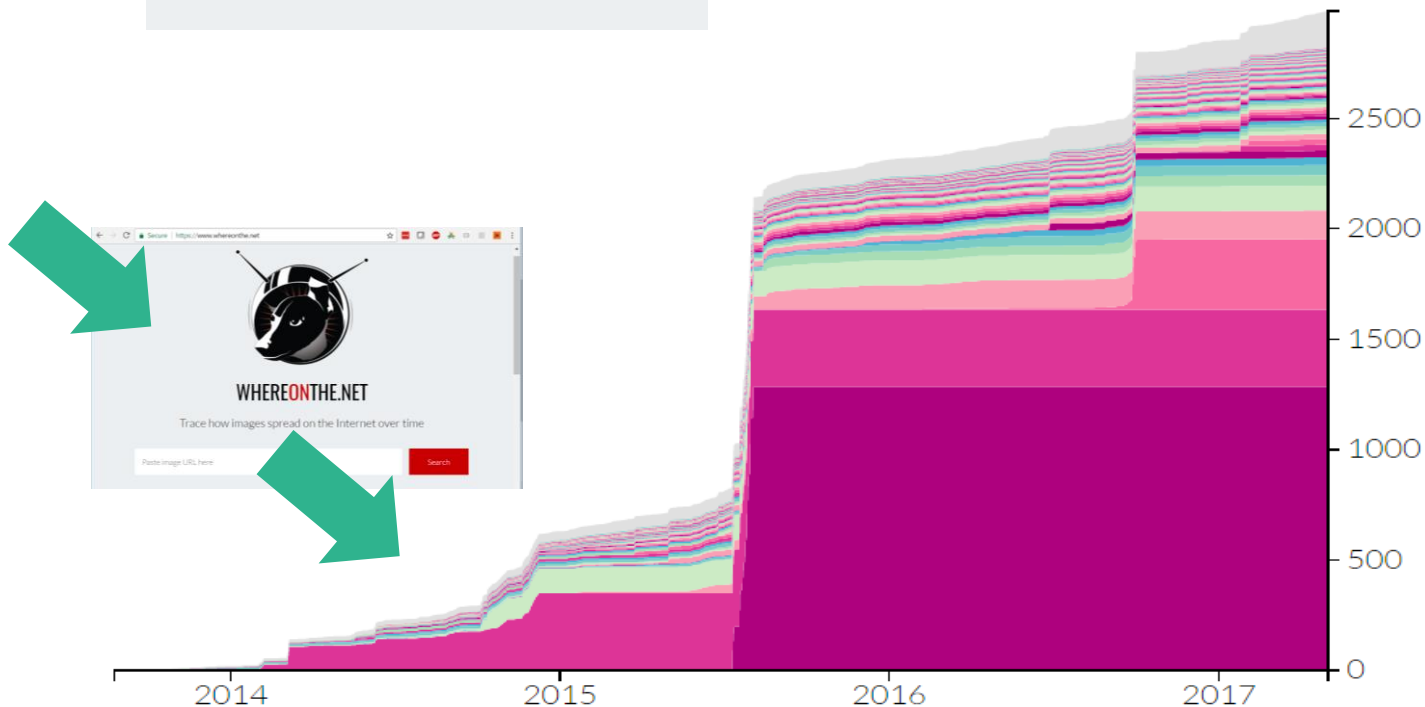


Problem: blockchain-secured data spreads online

Sol'n: visibility into spread via web crawl + AI



WHERE^{ON}THE.NET



Problem: Weak Data History (Garbage In Garbage Out)

Sol'n: Immutable Audit Trails of AI Data & Models

Provenance in model building:

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

Provenance in model deployment:

- Testing X data →
- Model simulation →
- Testing yhat data →

**Time-stamp to IPDB
Store to IPFS**



Problem: Weak Data History (2)

Sol'n: Audit Trails of Vehicle Life Cycle Data (CarPass)

The screenshot displays the CarPass admin dashboard. At the top, there are navigation links: "See All Users", "Invite New User", "See All Cars", "Register Car", and "Transfer Car". Below these is a table of trip history with columns: TRIP MODE, START TIME, MILEAGE START, START TRIP, END TIME, MILEAGE END, END TRIP, DURATION, DISTANCE, and FUEL USAGE. Two trips are listed: one in Leipzig, Germany, and another in Mumbai, India. Below the table, there are two map sections, each labeled "TRIP", showing the routes for the respective trips. The Leipzig map shows a route through the city, and the Mumbai map shows a route through the city and surrounding areas.

TRIP MODE	START TIME	MILEAGE START	START TRIP	END TIME	MILEAGE END	END TRIP	DURATION	DISTANCE	FUEL USAGE
	2012-09-10T19:06:33Z	15515757	In Leipzig, Wahren, Stahlmeiner Straße 195 (DE04159)	2012-09-10T19:25:53Z	15527460	In Leipzig, Südvorstadt, Bernhard-Göring-Straße / Schamkharstraße(DE04275)	1160	11703	4
	2013-10-10T12:06:13Z	15527460	The Taj Mahal Palace Apollo Bandar, Colaba, Mumbai, India	2013-10-10T13:45:45Z	15539462	Chhatrapati Shivaji International Airport Area, Vile Parle, Mumbai, India	1360	12002	30

BIGCHAIN DB



innogy

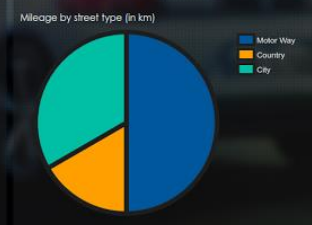
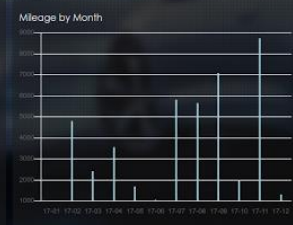
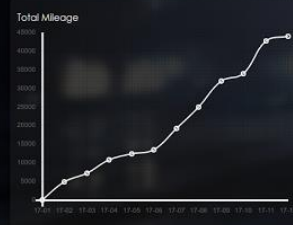


riddle&code

Welcome admin
Last Login : 22-Jun-2016 20:26 IST

Pollutant class :
Environmental label :
First Registration : 2012-09-10T19:06:33Z
Color(manufacturer) : red
Average Consumption : 6658
Mileage : 43897

Transmission : manual



FILE SYSTEM



HIGH PERF. COMPUTE



Problem: Compute & Storage are Expensive

Solution: Tokenized, Competitive Markets for Compute & Storage

Problem: Data is Expensive

**What's the ultimate way to
unlock data?**

A Data Marketplace

Data and the new rules
of competition

Mo' data
(and mo' compute)



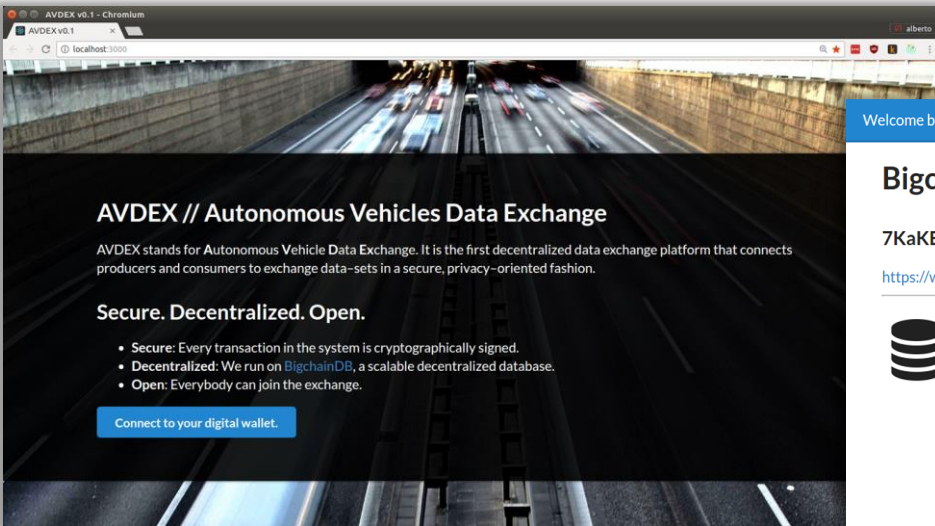
Mo' accuracy



Mo' \$

Problem: Data is Expensive

Sol'n: A Decentralized Data Market for Self-Driving Car Data




Welcome back, BigchainDB [Home](#) [Create offer](#) [My Offers \(2\)](#) [Search Offers](#) [Logout](#)

BigchainDB

7KaKEt27hS5wDfPMZmdzQo28BSGJCJK3djR8kLUMankE

<https://www.bigchaindb.com/>



CH2_002

\$1500 4.4 GB [transaction](#) ★ ★ ★ ★ ★

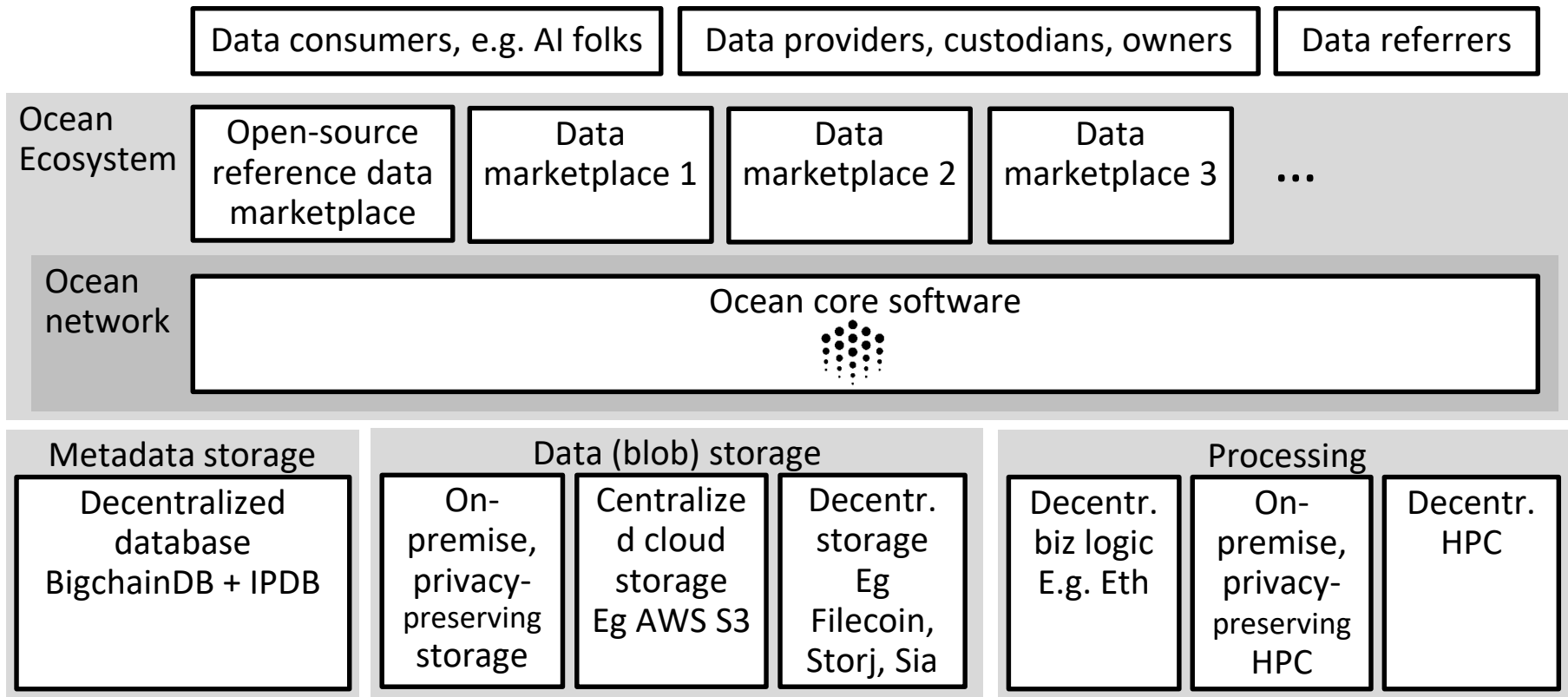
Date	Lighting Conditions	Duration	Compressed Size	Direct Download	Torrent	MD5
11/18/2016	Daytime/Shadows	--	4.4GB	None	None	

- HMB_1: 221 seconds, direct sunlight, many lighting changes. Good turns in beginning, discontinuous shoulder lines, ends in lane merge, divided highway
- HMB_2: 791 seconds, two lane road, shadows are prevalent, traffic signal (green), very tight turns where center camera can't see much of the road, direct sunlight, fast elevation changes leading to steep gains/losses over summit. Turns into divided highway around 350s, quickly returns to 2 lanes
- HMB_4: 99 seconds, divided highway segment of return trip over the summit
- HMB_5: 212 seconds, guardrail and two lane road, shadows in beginning may make training difficult, mostly normalizes towards the end
- HMB_6: 371 seconds, divided multi-lane highway with a fair amount of traffic

[View >](#)

Problem: Data marketplace silo. Solution: 1000 marketplaces!

A Decentralized Data Exchange *Protocol* and *Network*. Ocean.



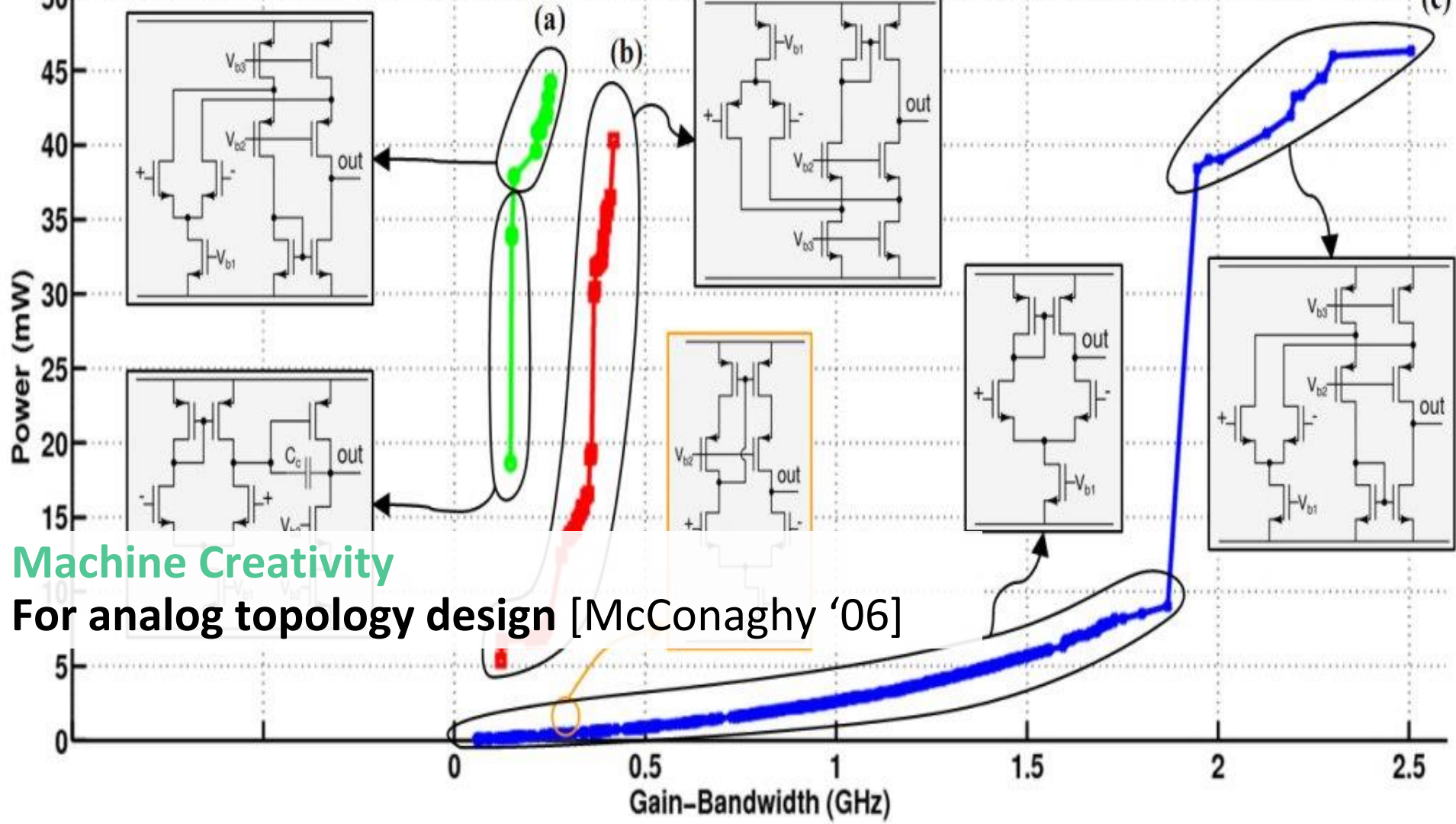
AI * Blockchain Symbiosis:

AI DAOs



Machine Creativity
For jewelry design [Hornby '11 Orbimi]





AGI: Artificial *General* Intelligence



Agents that sense, model, and act

LOG IN | SIGN UP

LONGFORM

REVIEWS

VIDEO

TECH

CIRCUIT BREAKER

SCIENCE

ENTERTAINMENT

CARS

TL;DR



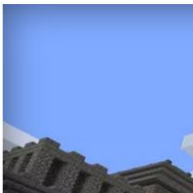
FORUMS

U

COMMENTS

Microsoft will now let anyone test their AI creations in Minecraft

By [Russell Brandom](#) on July 8, 2016 10:36 am [Email](#) [@russellbrandom](#)



ily
to go!
still

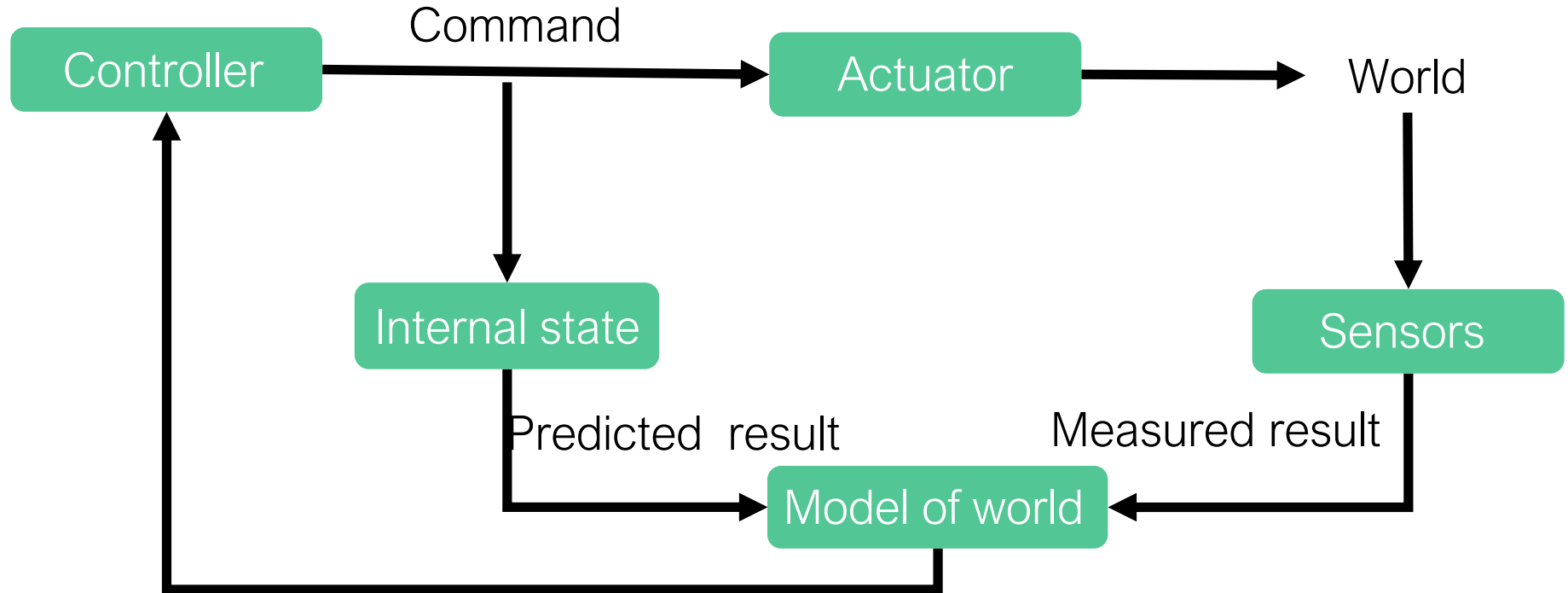
son premiere
ial media by
rs

s used
o target

AGI: Artificial General Intelligence

“AI meets Feedback Control Systems”

Update internal state based on estimate of world state



Example: The ArtDAO

Algorithm...

1. Run AI art engine to generate new image
2. Claim attribution in blockchain
3. Post editions for sale onto a marketplace, using Getty (centralized), or OpenBazaar (decent.)
4. Sell the editions. \$ goes to ArtDAO, in exchange for IP

Repeat! Create more art, sell it, get wealthier

Example: The ArtDAO Algorithm...

1. Run AI art engine to generate new image

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.

4. Sell the editions. \$ goes to ArtDAO, in exchange for IP

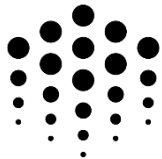
Repeat! Create more art, sell it, get wealthier

Conclusion

The mist

The world's most
valuable resource

- Blockchains can *really* help AI
- It's all about the data
 - Getting the data
 - Getting *good* data - with provenance
 - All roads lead to a data exchange protocol
- (Plus those pesky AI DAOs)



Data and the new rules
of competition