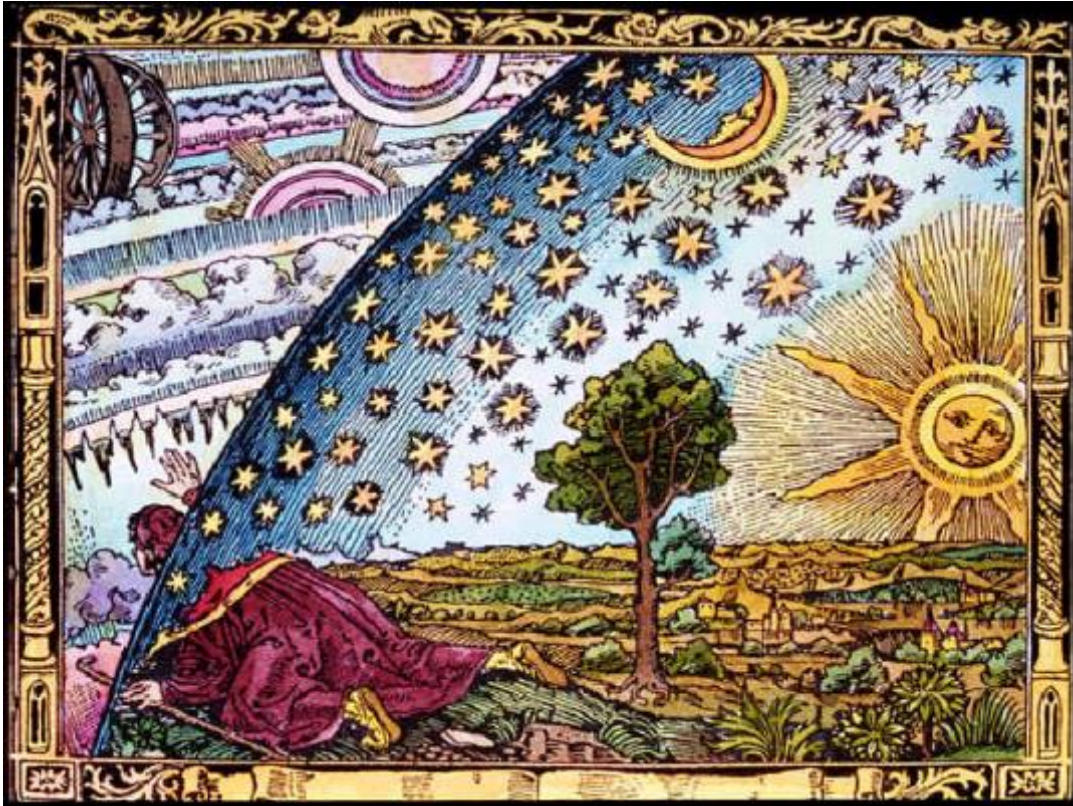


Big Data and Extreme Computing Redux



The future is already here – it's just not evenly distributed.

William Gibson



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Big Data and Extreme Computing (BDEC) lessons



Meetings

Roadmap



Post-Moore chips, accelerators
Memory hierarchies, exascale



Participants

- The “usual suspects”



Meetings

Questions



IoT/Edge, Big instruments, Big data
AI, extreme computing, clouds

Missing participants

- Deep learning community
 - New science demands
 - Infrastructure providers
- Shifting landscape
- Infrastructure capabilities
 - Science expectations

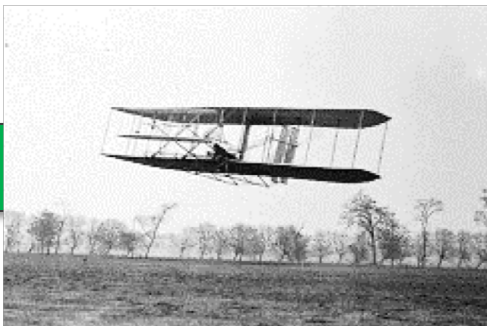
Three computing revolutions ...



HPC



Deep Learning



Edge & AI

Serious action

Now at the two extremes

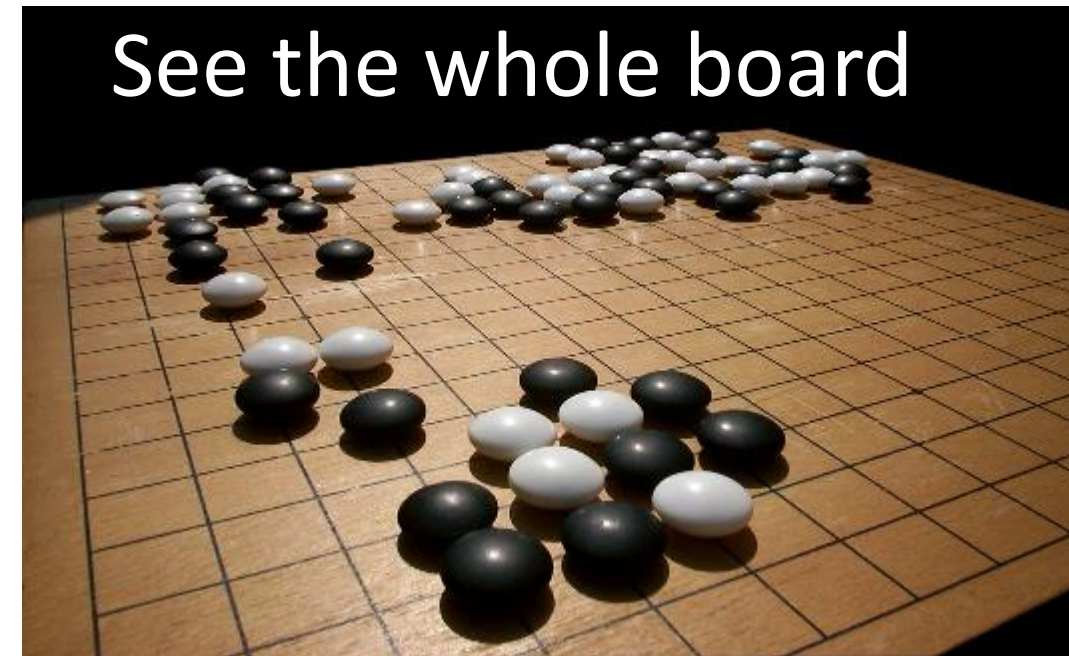
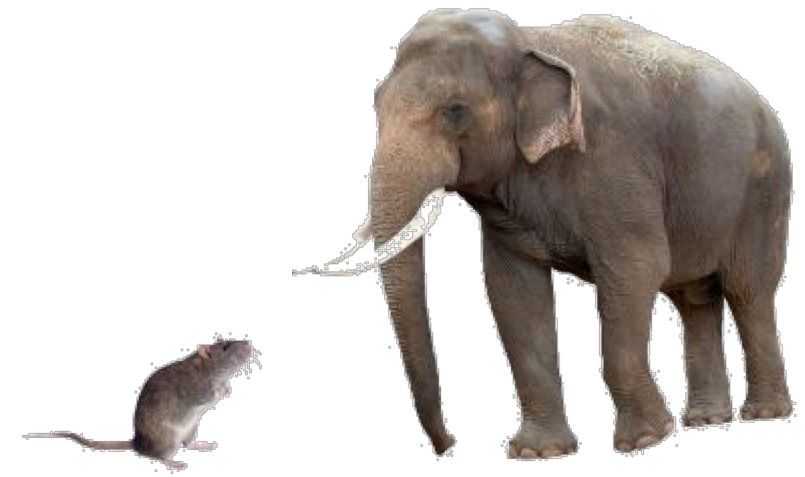
The very small (edge computing and sensors)
The very large (clouds, exascale, and big data)

Technical implications

- Fluid end-to-end cyberinfrastructure
- Interdisciplinary data and infrastructure sharing

Cultural implications

- Change management and strategic planning
- Edge networks for science and society



The computing continuum: holistic thinking needed



Size	Nano	Micro	Milli	Server	Fog	Campus	Facility
Example	Adafruit Trinket	Particle.io Boron	Array of Things	Linux Box	Co-located Blades	1000-node cluster	Datacenter & Exascale
Memory	0.5 KB	256 KB	8 GB	32 GB	256 GB	32 TB	16 PB
Network	BLE	WiFi/LTE	WiFi/LTE	1 GigE	10GigE	40GigE	N*100GigE
Cost	\$5	\$30	\$600	\$3K	\$50K	\$2M	\$1000M

Count = 10^9
Size = 10^1

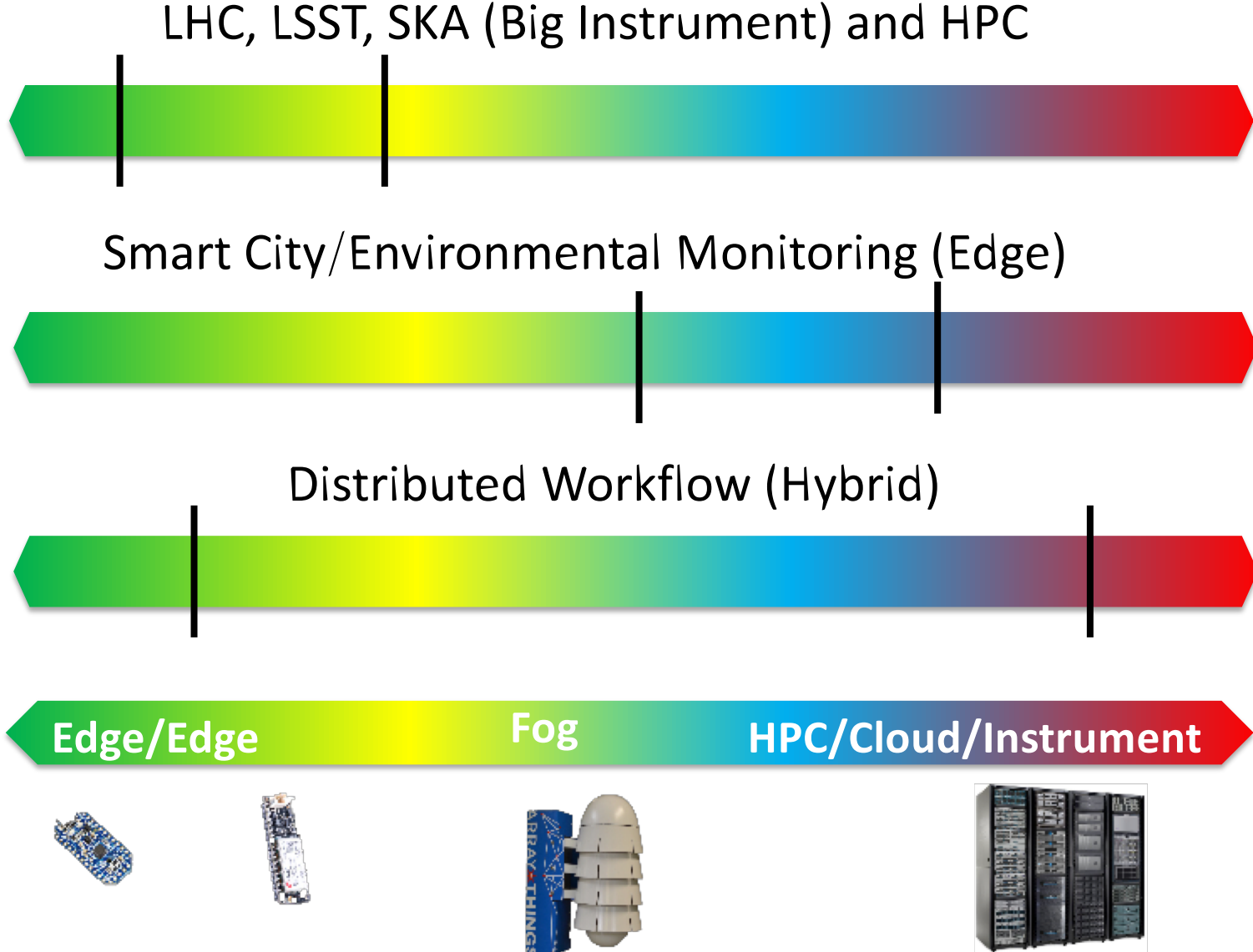


Count = 10^1
Size = 10^9

Count x Complexity = ~Constant

Stateful vs. Stateless

Building fluid cyberinfrastructure: Late binding



Mapping

- What
- Where
- When

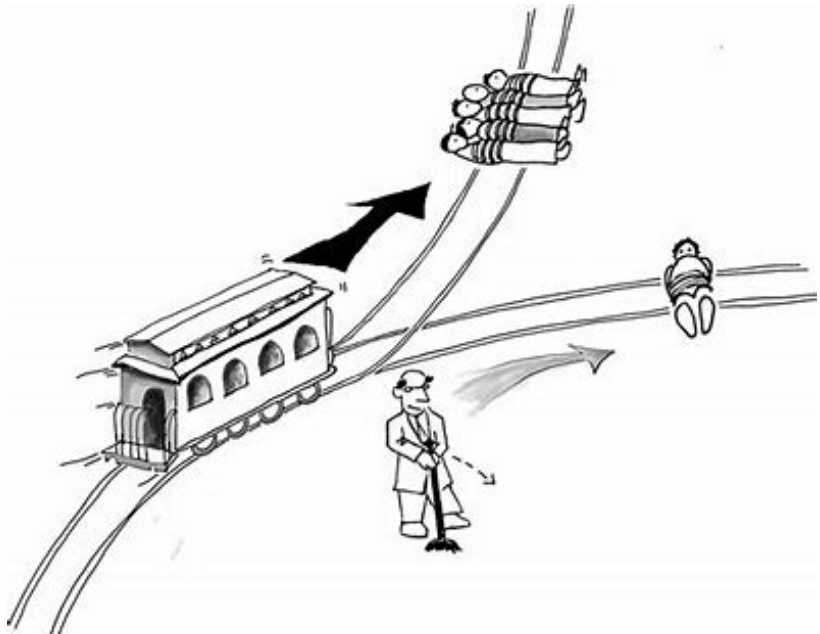
Subject to

- Speed
- Capacity
- Latency
- Resilience
- Security
- ...



Sensors, big data, AI, HPC, and ethics

The Trolley paradox



Flooding



Wildfires

nature

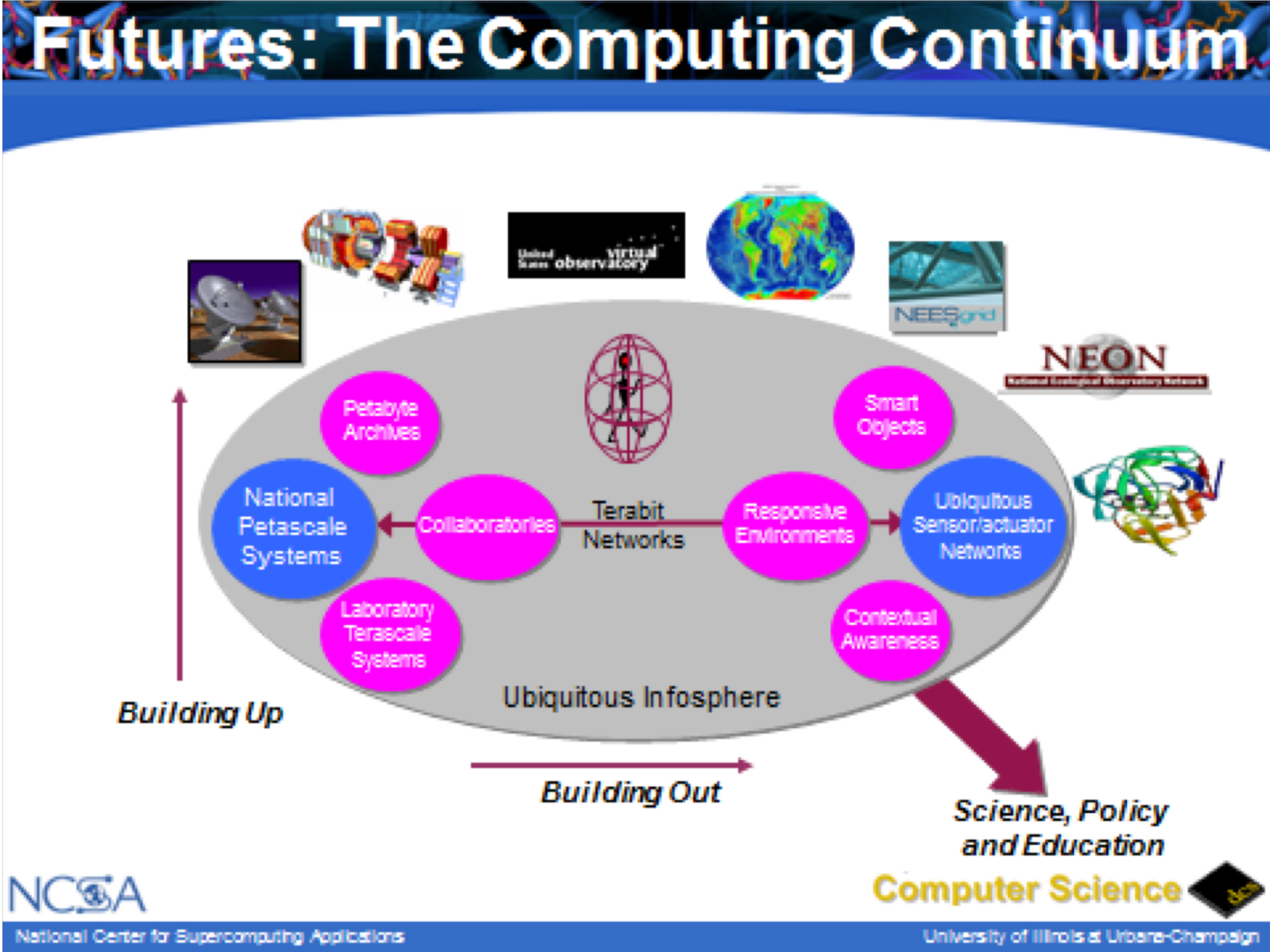
NEWS • 24 OCTOBER 2018

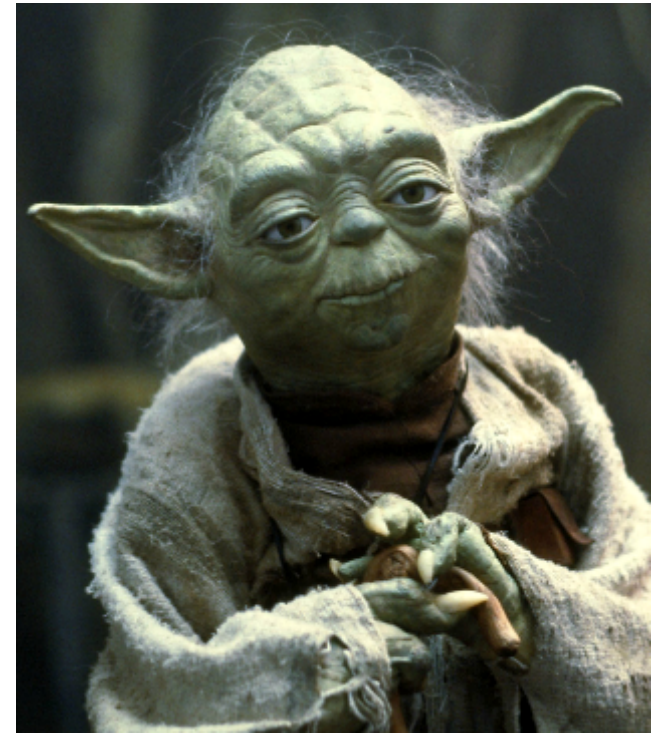
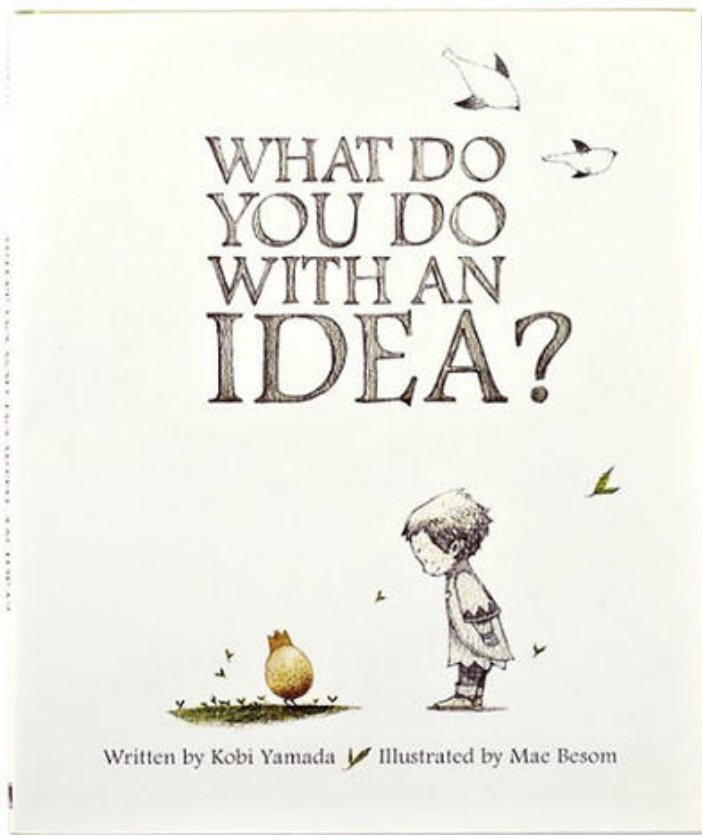
Self-driving car dilemmas reveal that moral choices are not universal

Survey maps global variations in ethics for programming autonomous vehicles



Not yet fully realized ... my 2002 prediction





Do or do not.
There is no try.

This Room Is Equipped With
Edison Electric Light.
Do not attempt to light with
match. Simply turn key
on wall by the door.

The use of Electricity for lighting is in no way harmful
to health, nor does it affect the soundness of sleep.



Thank You

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