The dark and light of AR

Phil Lelyveld

VR/AR Initiative program lead

Entertainment Technology Center @ USC

PLelyveld@ETCenter.org

PLelyveld@ETCenter.org

ETC℠ | ENTERTAINMENT TECHNOLOGY CENTER

USC School of Cinematic Arts

The Dark and Light of AR

Augmented World Expo, Jun 2, 11:45am - 12:00pm, Santa Clara, CA

Abstract

We are in the process of redefining reality; erasing the boundaries between the real and the virtual. We are building experiences under the assumption that we are doing the right thing...or at least that the technology is morally neutral. We are plugging them into AI resources that we barely understand. But there is a political, social, and moral underpinning to every approach to coding and world building. To date there has been a lack of thoughtful discussion of the intended and unintended consequences of what we are building. Let's at least raise some questions to get the debate started.

etc SM | ENTERTAINMENT TECHNOLOGY CENTER

Founded 1993 by George Lucas to bring together technology and entertainment visionaries to collaborate on the future of entertainment technology

Adamantly neutral

- Discussions
- Collaborations
- Research
- Coverage
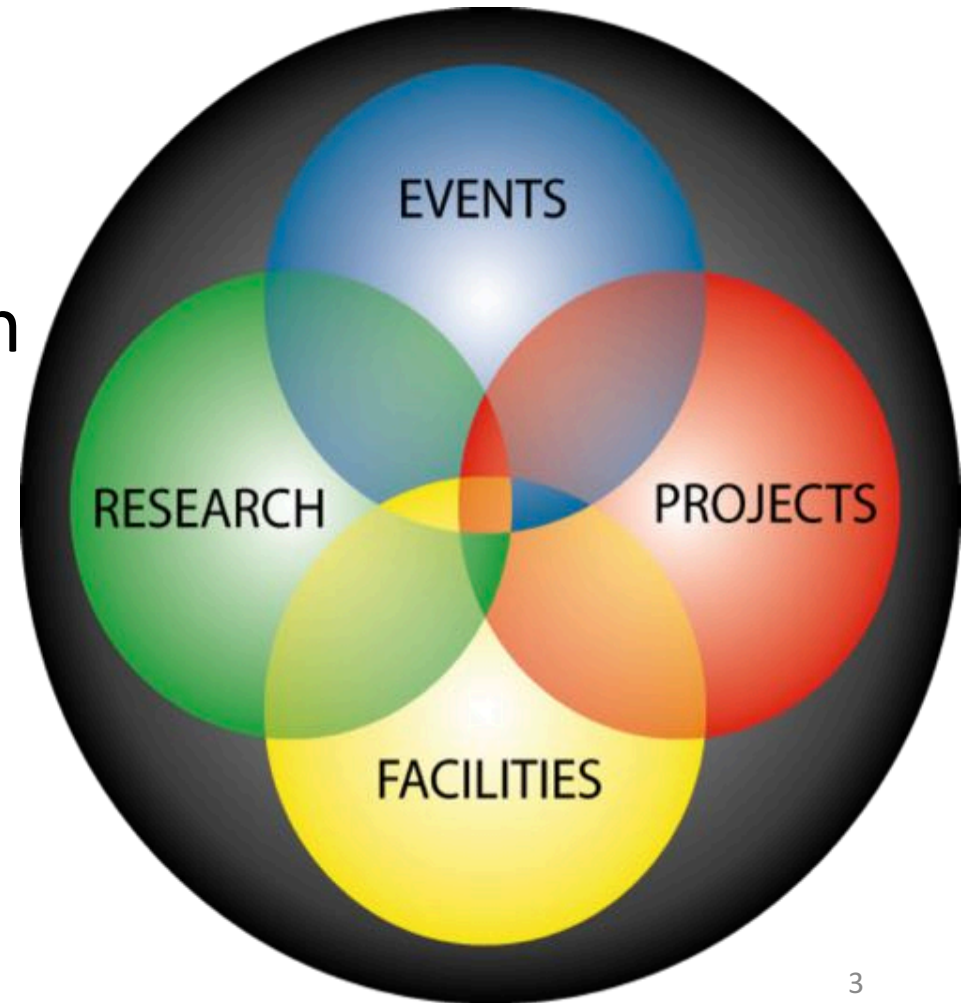
Current Member Companies

ENTERTAINMENT
TECHNOLOGY
CENTER | etc℠

The dark ~~and light~~ of AR

Goal of this talk

**To bring attention
to fundamental issues that
will shape the future of MR
at this early stage in industry development
before there is resistance to change
from established business models**

The dark ~~and light~~ of AR

Goal of this talk

To bring at...
to fu...

Highlights from a longer talk
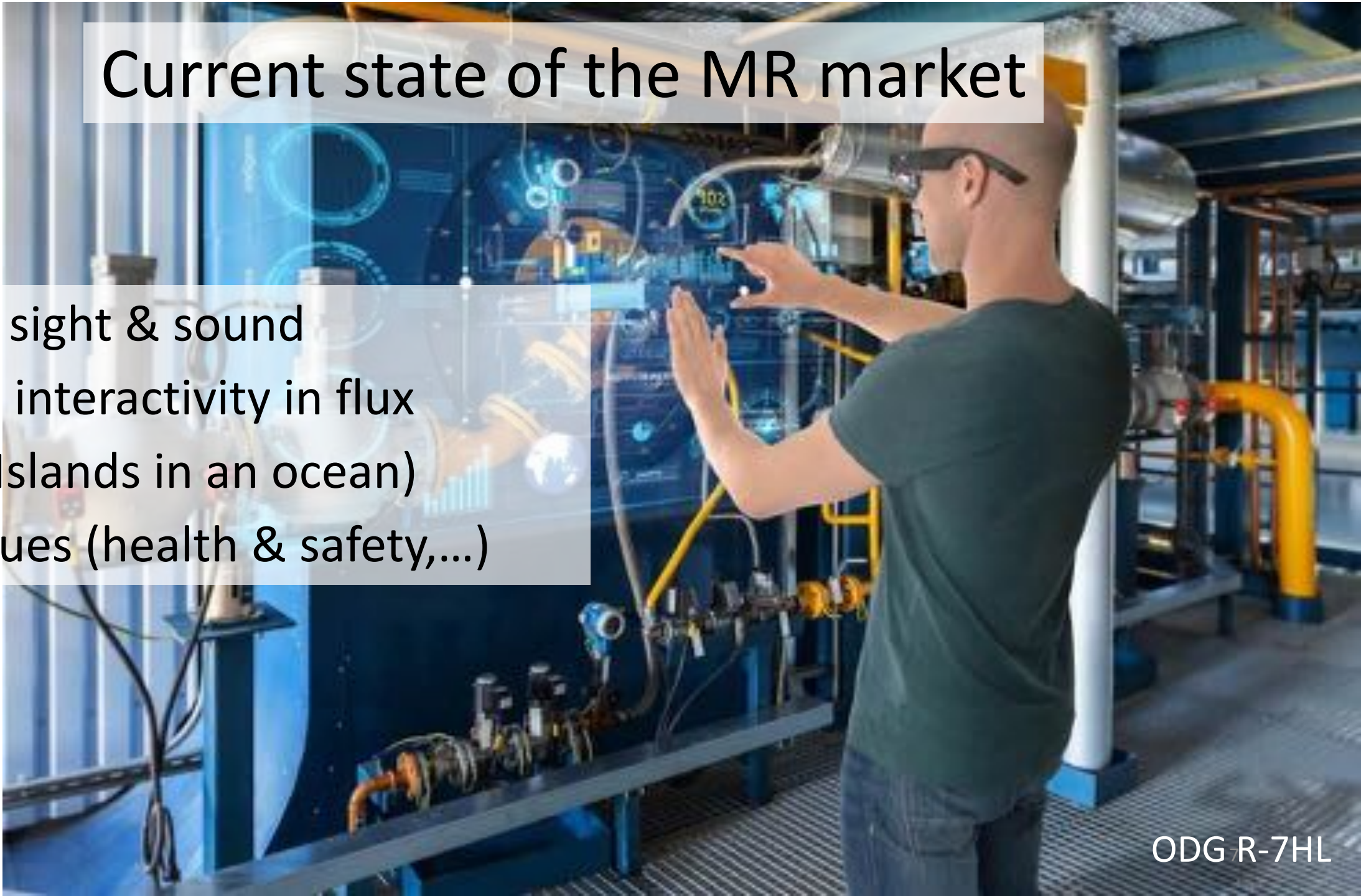
Work in progress

Can't be everywhere, hear everything

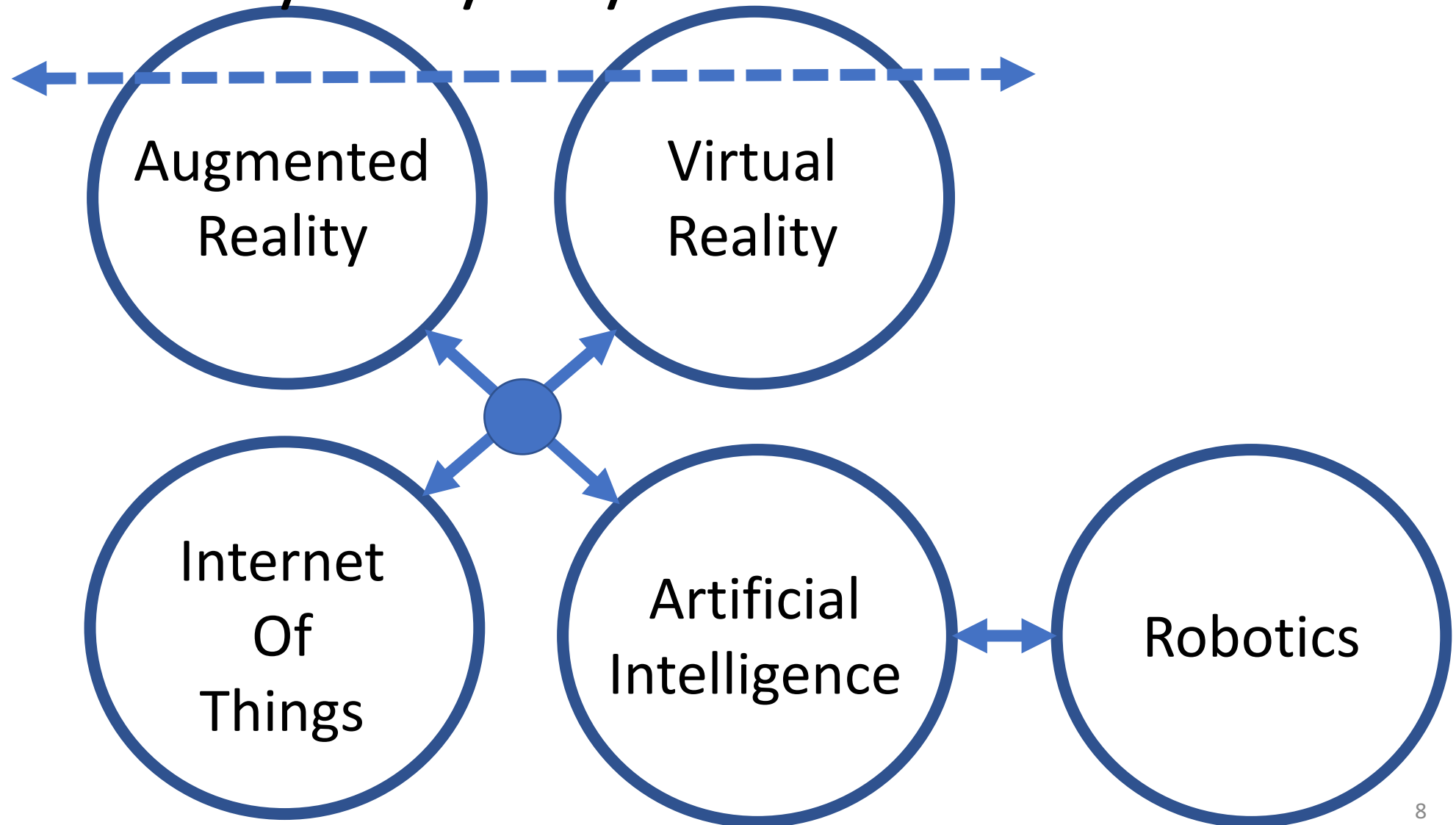I would appreciate your feedback, ideas, ...

PLelyveld@ETCenter.org

...evelopment
...to change
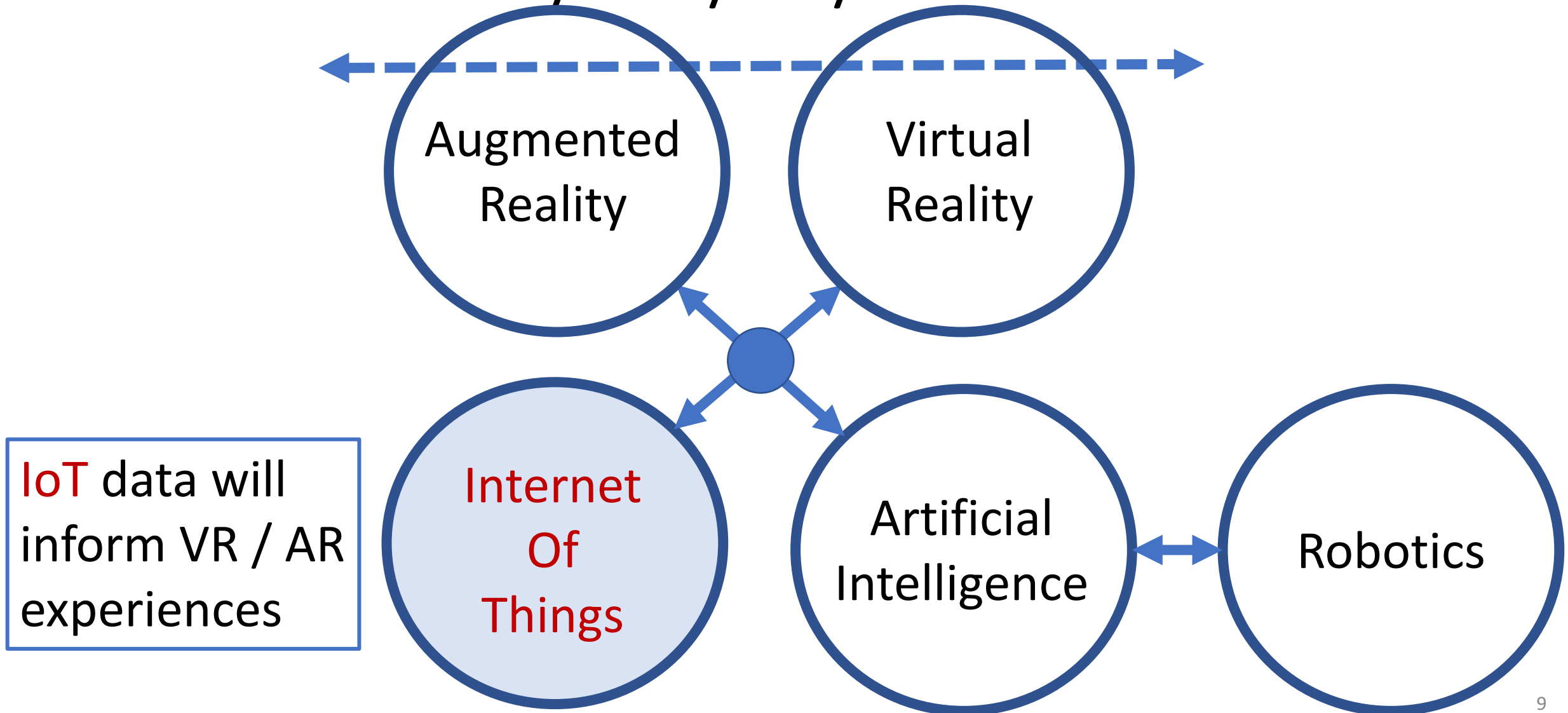...siness models

Current state of the MR market

Focus on sight & sound

UX, UI, & interactivity in flux

Interop (Islands in an ocean)

Other issues (health & safety,...)

ODG R-7HL

Look at the intersection of MR / IoT / AI / Robotics

Augmented Reality

Virtual Reality

Internet Of Things

Artificial Intelligence

Robotics

8

Look at the intersection of MR / IoT / AI / Robotics

Augmented Reality

Virtual Reality

Internet Of Things

Artificial Intelligence

Robotics

IoT data will inform VR / AR experiences

Look at the intersection of MR / IoT / AI / Robotics

Augmented Reality

Virtual Reality

Internet Of Things

Artificial Intelligence

Robotics

AI will shape personalized info, narrative structure, avatar behavior, experience design, 'world' view

Look at the intersection of
MR / IoT / AI / Robotics

Augmented Reality

Virtual Reality

Robotics will reinforce the effectiveness of the A.I. communication

Internet Of Things

Artificial Intelligence

Robotics

Current State of IoT

MR applications use some IoT data
Few data standards
Highly fragmented by industry

Current state of Artificial Intelligence

Machine Learning
- "Learn without being explicitly programmed"
- Changes when exposed to new data

Artificial Intelligence
- Learning and decision-making analogous to a subject-matter expert

Artificial General Intelligence (AGI)
- General unbounded AI

Advancing on all fronts

Current State of Robotics

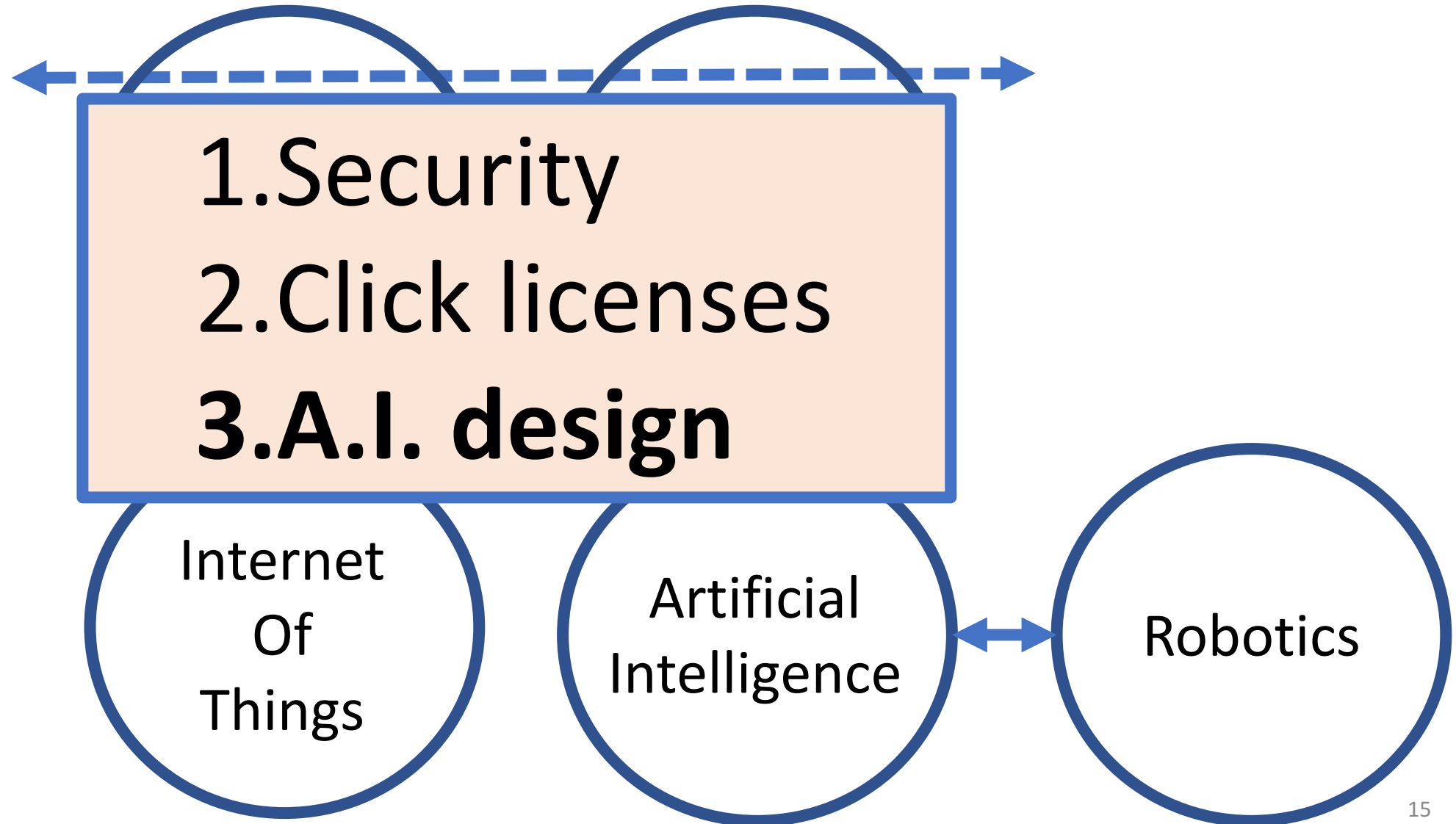Robots could be the embodiment of AGI

Advancing rapidly

"Robots will come to life as organisms."
"Emergent, surprising behavior."
Goal of Hanson Robotics founder David Hanson

Sophia
By Hanson Robotics

The dark ~~and light~~
of MR / IoT / AI / Robotics

1.Security
2.Click licenses
3.A.I. design

Internet Of Things

Artificial Intelligence

Robotics

Basic issue #1 – Lack of security protections

Constant data-gathering is fundamental to effective MR Systems work better with more data

Security adds cost and complexity

Focus on how to make things work,
with **little attention** to the ramifications of
how things could fail

Why is Security Important?

Potential damage from **<u>hijacking</u>** the power of immersion

- Adults
  - **Interference** in activities
  - **Distortion** of data, information, 'reality' **pushed to you**

- Children
  - In clinical VR trials children have difficulty telling reality from fake*
 - **Emotional trauma** and false memories

* Research by Jeremy Bailenson, Stanford Virtual Human Interaction Lab

Path to a
Possible Solution

THE JEEP HACKERS ARE BACK TO PROVE CAR HACKING CAN GET MUCH WORSE

1. Self-driving car computing network is **MISSION CRITICAL**
2. Car will want to access, use, and share personal and public data
3. Car and home will want to exchange data

Self-driving car could drive security into the entire network*

 * George Gerba, ETC@USC

18
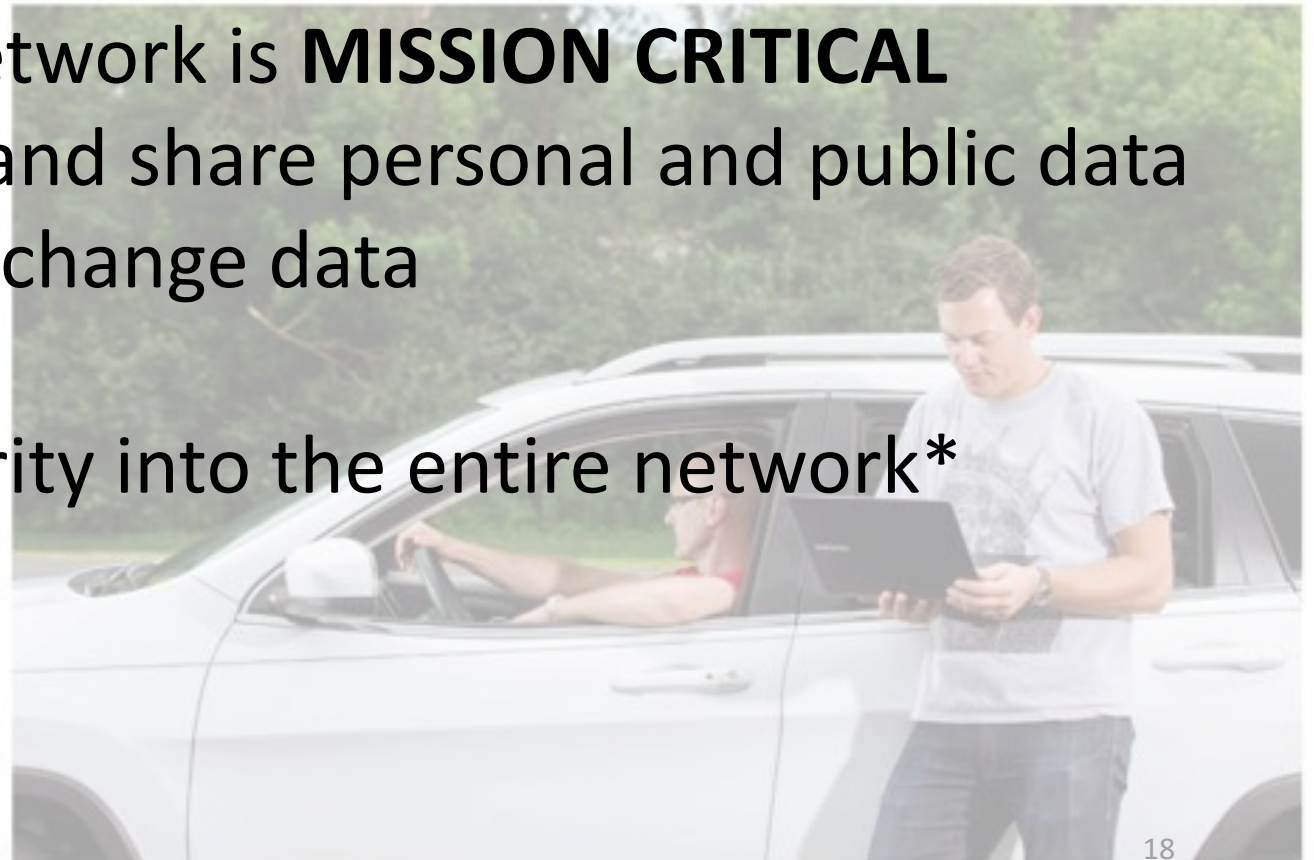
Basic issue #2 –
Personal Data, MR and the Click License
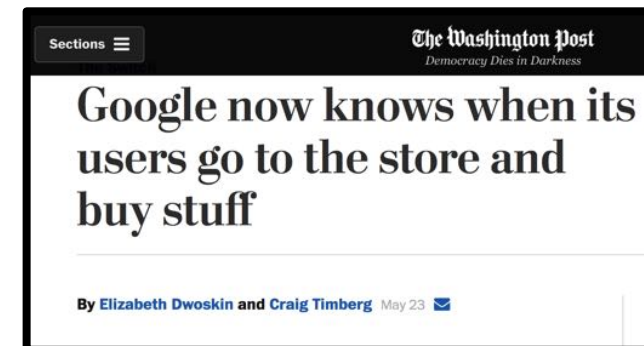
Click license terms are **non-negotiable**

> I Agree

Every move you make, every choice you make ….
- Needed for proper functioning MR

MR is a sudden windfall of personal data collection
- Redefines what is **"valuable data"**

The Washington Post
Democracy Dies in Darkness

Sections ≡

Google now knows when its users go to the store and buy stuff

By Elizabeth Dwoskin and Craig Timberg May 23

Why is personal data, MR and the Click License important now?

MR is an opportunity to **rebalance** the trade-off of revenue-generating **personal data** for personalized consumer **services**

Path to Possible Solution

Control

Give people control over their data, and a way to carve out private, semi-private, and public sharing,[1] possibly using **blockchain** infrastructure[2]

Marketplace

Create a marketplace for exchanging selected personal data for targeted access[3]

Make privacy and anonymity the starting point[4]

1- Build a Better Monster: Morality, Machine Learning, and Mass Surveillance, by Maciej Ceglowski, 4/18/17
2- A Path to Self-Sovereign Identity essay by Christopher Allen
3- Harvard Business Review, Nov. 2014, New Deal on Data, With Big Data Comes Big Responsibility
4- Voices of VR Podcast – Episode #533, Philip Rosedale interview by Kent Bye, 5/8/17
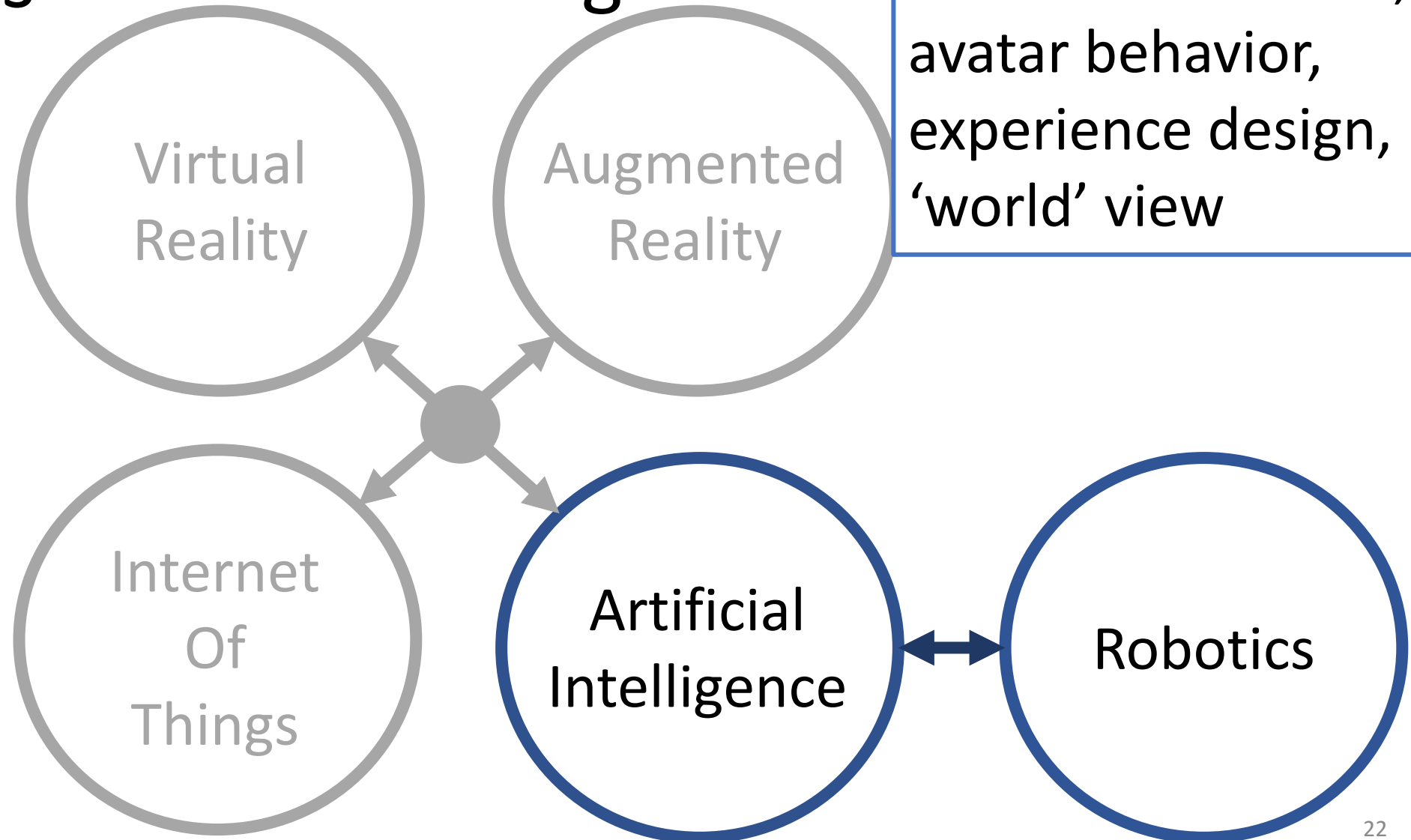
Security

Click licenses

Basic issue #3
A.I. design

AI will shape personalized info, narrative structure, avatar behavior, experience design, 'world' view

Virtual Reality

Augmented Reality

Internet Of Things

Artificial Intelligence

Robotics

A.I. Basics

Building an AI system requires

1) Training data set – representing the past and the starting state

2) Definition of success – what you are looking for

Source: Cathy O'Neil TED2017 talk, Weapons of Math Destruction, 4/27/17

A.I. and Biases of all types

"Architecture is Politics" Mitch Kapor, 1970s
The **architecture** (structure and design) of processes, **not their content**,
is determinative of what can be accomplished

"Algorithms are opinions embedded in code" Cathy O'Neil*, TED2017

Maybe not quite for AI....

amazon Prime

PhotoMagnets
Architecture is politics. - Mitchell Kapor -
quotes fridge magnet, White
Be the first to review this item

Price: $4.95 & FREE Shipping

Note: Not eligible for Amazon Prime.

* Author of Weapons of Math Destruction

A.I. and Biases of all types

For AI, algorithms are morally neutral

It's the training sets and definitions of success

ACTION

REACTION

MODIFICATION

Source: Dr. Meghana Bhatt, CalTech behavioral and neuroeconomics PhD
Founder, Prizma AI engagement platform

Path to possible solution: A.I. Audit*

1) **Data integrity check** – is the data good and a reasonable choice

2) **Definition of success** – are you looking at useful things and ignoring irrelevant things (orchestra blind auditions)

3) **Diversity in reviewing panel** – are there errors in assumptions and design that could help or hurt different populations?

4) **Long-term monitoring**; check regularly for long-term effects, such as the feedback loops, that could bloom into biases or an echo chamber
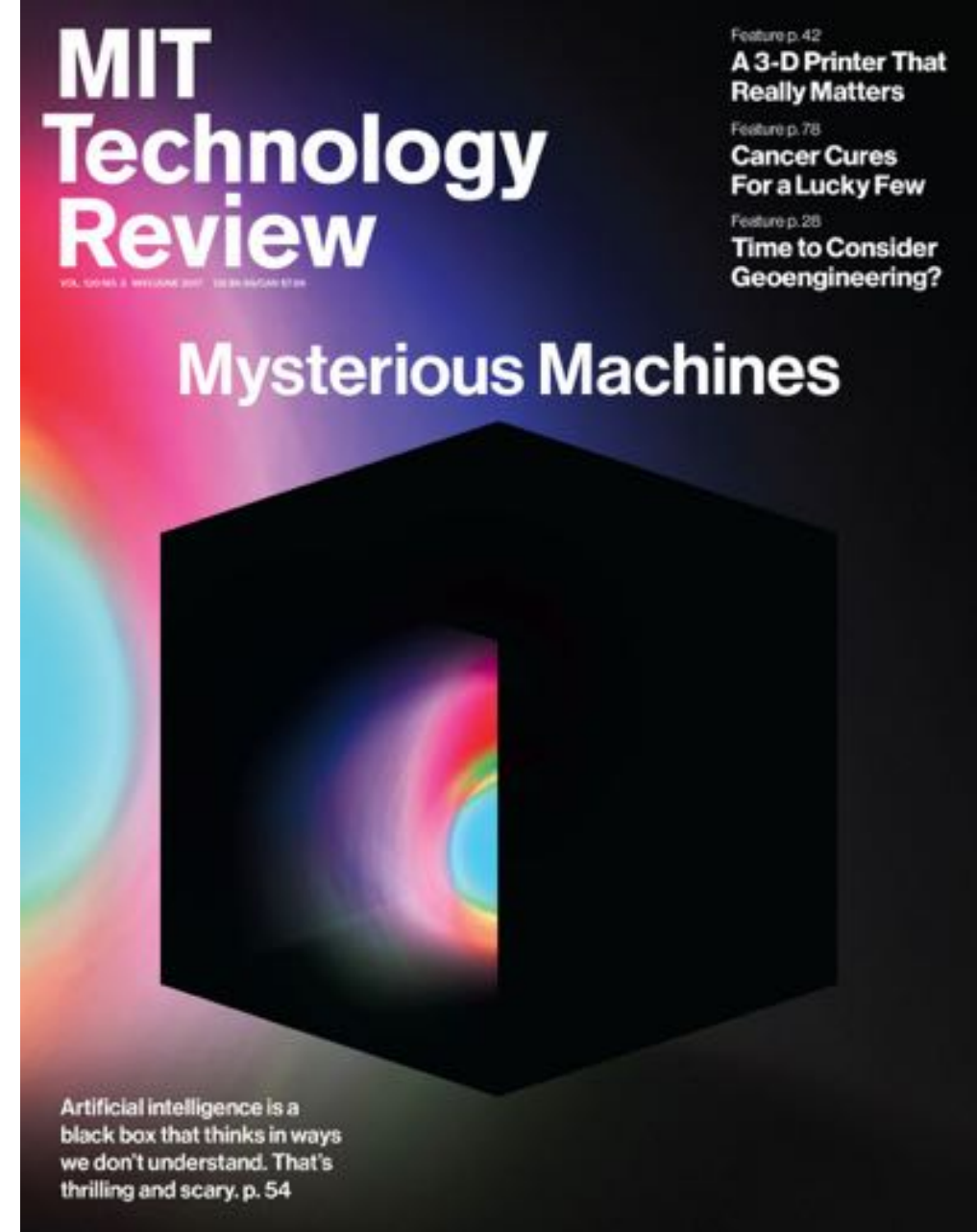
Source: Cathy O'Neil, Weapons of Math Destruction, book summary

A.I. does not explain outcomes

Missing piece – no clear way to communicate how AI reaches a decision or determines a response

"We can build these models, but we don't know how they work."*

"How well can we get along with machines that are unpredictable and inscrutable?" *

MIT Technology Review

Feature p. 42
A 3-D Printer That Really Matters

Feature p. 78
Cancer Cures For a Lucky Few

Feature p. 28
Time to Consider Geoengineering?

Mysterious Machines

Artificial intelligence is a black box that thinks in ways we don't understand. That's thrilling and scary. p. 54

* Joel Dudley, Deep Patient team leader, Mount Sinai Hospital, N.Y., from MIT Technology Review
** The Dark Secret at the Heart of A.I., by Will Knight, MIT Technology Review, May/June 2017

Why it matters: emotional manipulation in MR by A.I. (or by people)

Research* shows that the concept of The Self is really fragile

- Embodiment, you quickly adjust to super long arms or a child's body

- **Emotionally, how you are responded to in MR can have a strong impact on your self-image and self-worth**

* Mel Slater, ICREA Research Prof. at Univ. of Barcelona, Spain, leader of the Experimental Virtual Environments (EVENT) Lab for Neuroscience and Technology

Japan's Democratic Party released a VR game

How well can you endure questioning from DP President Renho during Diet deliberations

Game displays the player's level of composure and heart rated

Robotics

When talking to empathetic robots versus sterile mechanical robots, people were more open to sharing difficult memories and felt better about themselves.   Guy Hoffman, Assist Prof at Cornell U.

Sophia
By Hanson Robotics

Possible Solution
(embedded bias and emotional manipulation in AI)

"O'Neil calls on modelers to take more responsibility for their algorithms and on policy makers to regulate their use. But in the end, it's up to us to become more savvy about the models that govern our lives."*

* Description of Weapons of Math Destruction, by Cathy O'Neil,
https://weaponsofmathdestructionbook.com

A.I. <u>can</u> explain outcomes

Well-designed A.I. improves over time

"Engineers typically know enough math to get themselves into enormous trouble, but not enough to get out of it."*

A.I. development teams should include pure quantitative people (math, computer science PhDs) <u>**AND**</u> domain-specific experts **(psychologists, anthropologists, sociologists, economists, etc.)**

- they will **understand how to extract the framework** for the A.I.'s responses

* Yves Bergquist, Project Manager, Data & Analytics, ETC@USC, and
　　　Founder, Novamente.ai, a global A.I. engineering firm

Possible Solution
(embedded bias and emotional manipulation in AI)

O'Neil calls on modelers to take more responsibility for their algorithms and on policy makers to regulate their use. But in the end, it's up to us to become more savvy about the models that govern our lives.*

How Facebook's tentacles reach further than you think

By Joe Miller
Business reporter

26 May 2017 | Business

f y ● ✉ < Share

* Description of Weapons of Math Destruction, by Cathy O'Neil,
https://weaponsofmathdestructionbook.com

Evolution of food and eating habits*

For Millennia people ate what they could gather, but we developed a craving for sweet, salty, and fatty.

- Processed food industry perfected products that deliver sweet, salty, and fatty – potato chips, Cheetos.

Decades later, America has an obesity epidemic.

Some people are motivated to develop self-protection strategies (eat healthy, mindful eating, …)

Question: How did Yellow Journalism fall from favor? Is that a relevant model?

*Source: Dr. Meghana Bhatt, CalTech behavioral and neuroeconomics PhD
Founder, Prizma AI engagement platform

Possible Solution
(embedded bias and emotional manipulation in AI)

O'Neil calls on modelers to take more responsibility for their algorithms **and on policy makers to regulate their use.** But in the end, it's up to us to become more savvy about the models that govern our lives.*

People whose data is in these systems
and who are the intended customers of these systems
should have the tools and data
needed to understand these systems.

* Description of Weapons of Math Destruction, by Cathy O'Neil,
https://weaponsofmathdestructionbook.com

Possible Solution
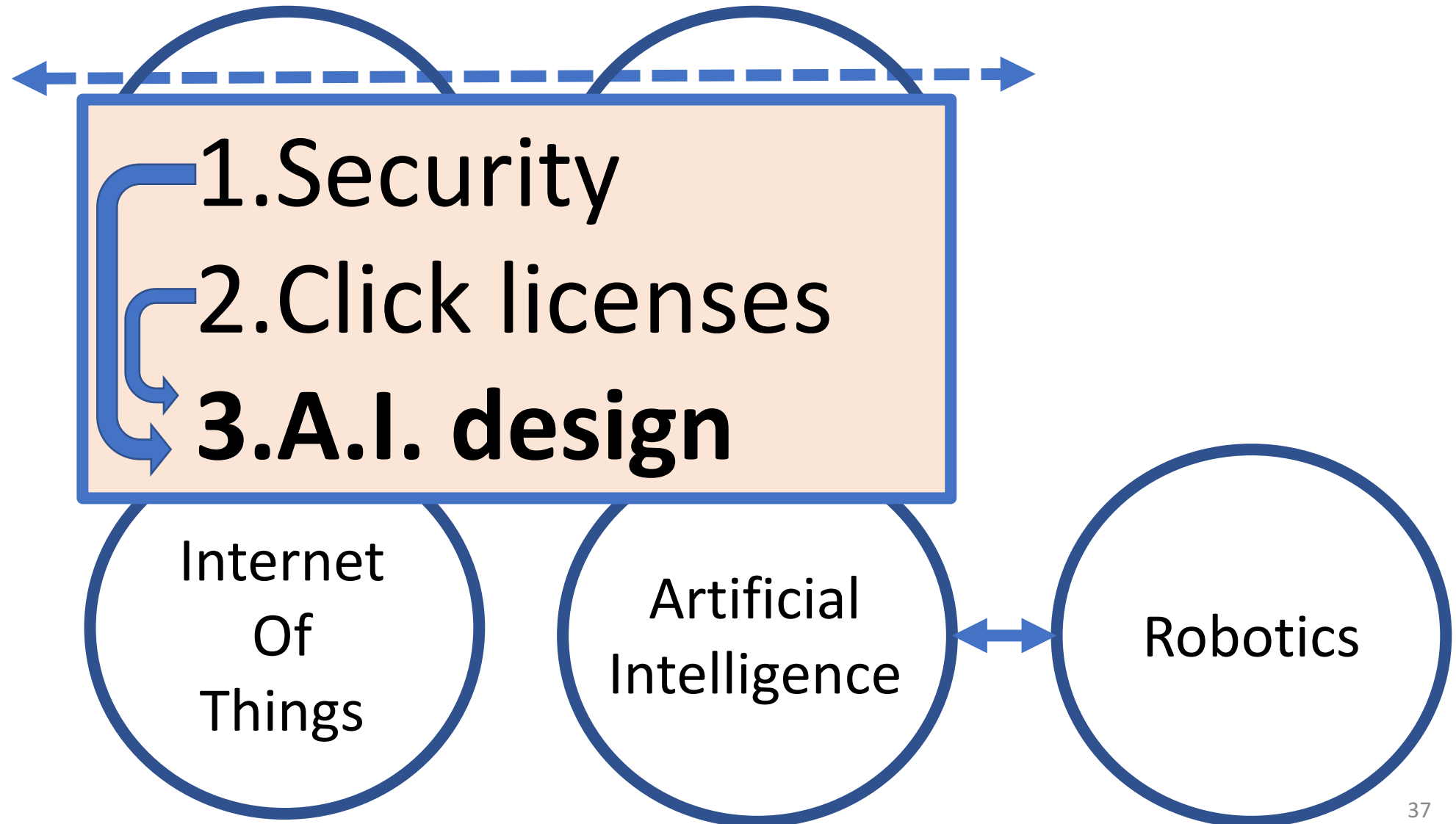# (embedded bias and emotional manipulation in AI)

"…if ambient technology is to become as integrated into our lives … we need to subject it to the digital equivalent of enforceable building codes and auto safety standards."

Walter Mossberg, from his final column before retiring 5/25/17

People whose data is in these systems
and who are the intended customers of these systems
should have the tools and data
needed to understand these systems.

* Description of Weapons of Math Destruction, by Cathy O'Neil,
https://weaponsofmathdestructionbook.com

Close

1. Security
2. Click licenses
3. **A.I. design**

Internet Of Things

Artificial Intelligence

Robotics

These are not *problems*, they are known elements of an emerging system that should be part of any planning discussion

Alan Kay – *"Technology is anything that wasn't around when you were born."*

We are defining the starting point and 'training set' for future generations

Let's add these issues to the discussion now, while resistance to new ideas and to change is low

Thank you
Phil Lelyveld
VR/AR Initiative program lead
Entertainment Technology Center @ USC
PLelyveld@ETCenter.org