



# The Simulation Century

Leverage Artificial Intelligence and Simulation to Optimize Outcomes

825

March 5, 2025



ultisim

Richard Boyd, CEO

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**MODSIM WORLD 2016**  
Empowering User Communities With Modeling and Simulation

# The Simulation Century



## The Men Behind The Man (ii): Part 2: Stu-B-Doo

JAN 29 Posted by Harlem World  
★★★★★ 1 Votes

Stu-B-Doo aka Stuart Bullard is probably the biggest influence on Dr Dre's sound from 1994 to present.



Dr Dre wanted to move away from the g-funk sound that had been imitated by producers all over the world while Dre was at Deathrow Records.

When Dre was trying to set up Aftermath/Interscope, he and Jimmy Iovine set out to search for the best musicians they could find. Some of these musicians were respected composers such as Camara Kambon (who I will talk about in another post) and Stephen "Bud" Anderson.

In 1994, Stuart Bullard signed an exclusive production deal with



Thesis: The last century was about the recorded image. This century is about Simulation and AI/human balance

## Simulation Century Core Concepts

- This is the Simulation Century. (The last century was the first where humans used **video** images to record and analyze the human condition. This century is about **simulation, AI**-enabled systems and prediction)
- The central problem in an accelerating information age is how to achieve the right balance between humans and automation to optimize outcomes
- Those who attain fluency with automation and digital tools will out-perform those who do not and will begin to appear Superhuman.
- How do we teach digital fluency by allowing humans and machines to play/work together?

Boyd, Richard. "SuperHuman Education", *Getting Smart*, (March, 2013)  
<http://gettingsmart.com/2013/03/superhuman-education/>

Boyd, Richard and Rob Szczerba. "SuperHuman Healthcare", *Intelligent Hospital Today*, (September, 2012) <http://intelligenthospitaltoday.com/?p=721#comment-299>

Boyd, Richard. "Nearer the Holodeck", *Armed Forces Journal*, (May, 2010)  
<http://www.armedforcesjournal.com/2010/05/4578938/>



# Perspective: 30+ Years of AI + Simulation



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# The Simulation Century

## Key Topics Today

What Does AI Need from Us?

Large Language Models and KGs

Digital Twins

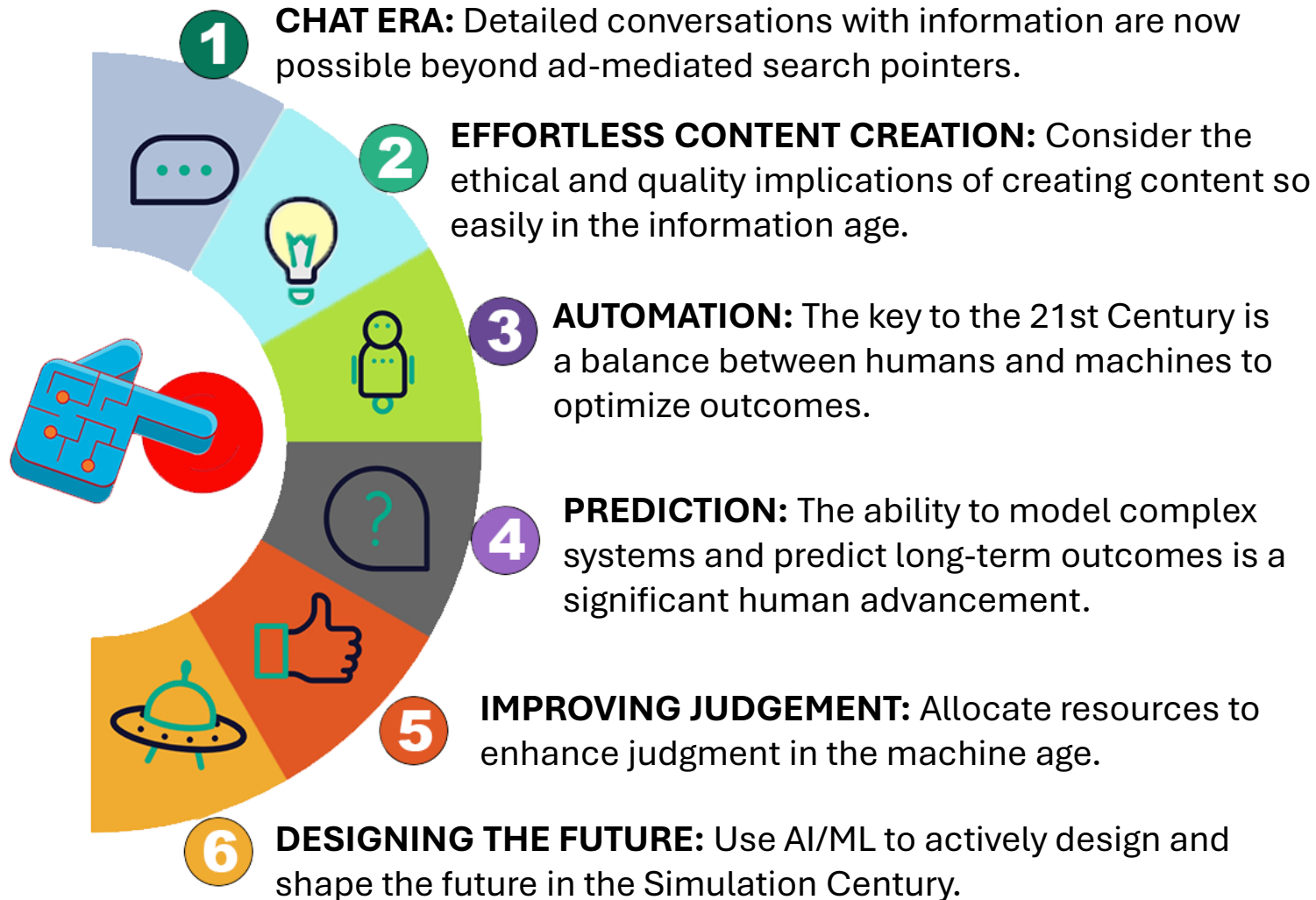
Synthetic Models of Humans

AI and Simulation to design a better future

Are You Already Living in a Simulation?

# The 6 Stages of AI/ML Application

The highest moral purpose of AI/ML technology is to actively design the future we desire. In The Simulation Century, we can enlist AI in the noble service of shaping the future.



**Use AI/ML to shape the desired future in the Simulation Century.  
The Highest Moral Purpose of AI**

Most people are still coming to grips with prompt engineering. ([See my article](#))

Relying too much on generalized content creation may be problematic in the short run. We can now create content without thinking about it(or internalizing meaning)

RPA means more efficient work. Every organization (and individuals) should examine workflows and determine what should be done with human attention, effort, and intelligence/analysis, and what should be turned over to machines.

The ability to predict outcomes using Monte Carlo analysis, especially human behavior outcomes, is powerful (but still not the highest moral purpose). Modeling the first, second, third, and beyond potential consequences of an action or policy is imperative.

Daniel Kahneman said in *Thinking Fast and Slow* that every organization in the machine (AI) age should devote **1%** of its budget to improving judgment (making better decisions). What does it mean for your organization if everyone makes one better decision every day?

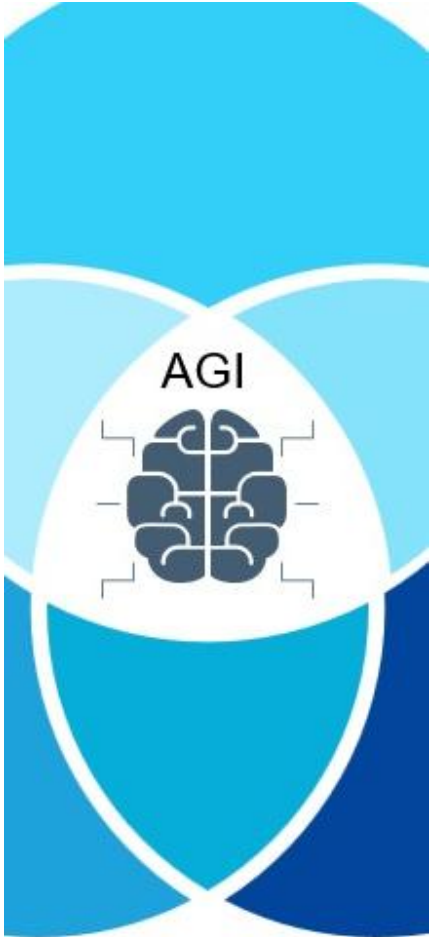


“The Best Way to Predict the Future  
is to **Invent** it” –Alan Kay

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# The AI Revolution is **825** days in



## Good low-hanging fruit use cases


- Make your own Enterprise Brain (**and Knowledge Graph**)
  - Preserve Organizational Knowledge
    - Improve judgement
- Automate Tasks
- Digital Twins of equipment and processes
- Stem the Silver Tsunami (Digital Twins of your key personnel)
- Synthetic population models of your users/customers
- Enlist AI in designing your future

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Trending [Google](#) [Facebook](#) [Sony](#)

# Human Vs. Machine: How Humans Are Driving The Next Age of Machine Learning

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**Richard Boyd**  
 CRUNCH NETWORK CONTRIBUTOR  
 Richard Boyd is the founder and CEO of [iSutit](#).  
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If you've been following the buzz around artificial intelligence lately, you may have gotten the impression that machines will soon take over the world and destroy it.

Hollywood is fueling the debate with the latest Marvel movie, *Avengers: Age of Ultron*, and

Amblin Pictures' *Ex Machina* — two films about what bad can happen when machines go rogue and utilize big data to render an unpleasant judgment on humanity, either because humans are so task-oriented and void of any reasoning or because the humans they are coming from are corrupt themselves.

One of the tech world's most prominent visionaries has weighed in on the issue, with his famously uncharacteristic beliefs: Microsoft founder Bill Gates shared concerns about the fact that artificial intelligence will pose to humanity, and theoretical physicist Stephen Hawking, who relies heavily on machine learning and artificial intelligence to communicate, argued that it could spell the end of the human race.

At the Consumer Electronics Show in Las Vegas, you could see the pattern emerge above the noise. Something new is happening. It is becoming clear that the last century was about the recorded moving image and the birth of computing; but the beginning of this century is about something else. It is about ubiquitous intelligence.

In the clamorous halls and private venues of Las Vegas last week there was abundant evidence that the revolution in sensors and artificial intelligence was in full swing. At a press conference there on Sunday before everything had really geared up, Shavon DuBravac, chief economist for the Consumer Electronics Association, talked about the "Age of Autonomy" and the "Internet of Things". He was quoted in the LA Times as saying the number of intelligent gadgets in our lives is expanding at an accelerating rate and "they are increasingly talking directly to each other and making decisions without consulting us pesky humans."

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## The Time for SuperHuman Healthcare

JANUARY 18, 2014 / TECHNOLOGY / [RICHARD BOYD](#)



Richard Boyd asserts that we are seeing the start of the Century of Simulation and Human Intelligence use.

If you could manage to ignore the purveyors of even higher definition (4K) displays at the 2014 Consumer Electronics Show in Las Vegas, you could see the pattern emerge above the noise. Something new is happening. It is becoming clear that the last century was about the recorded moving image and the birth of computing; but the beginning of this century is about something else. It is about ubiquitous intelligence.

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## SuperHuman Education

TOPICS BLENDED & PERSONALIZED LEARNING  
 By Guest Author - March 20, 2013

[f 28](#)
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By Richard Boyd

Some time in the 21st century, a stand alone, un-augmented mind will be considered handicapped.

It is no secret to anyone who has a smart phone or who has used Google search, that the Internet and search, adeptly utilized, can make an already intelligent person vastly more intelligent. As other technologies like ubiquitous artificial intelligence, intelligent tutors, augmented reality, and game-based learning continue to improve, the digital divide between those who are comfortably fluent with technology and those who are not will create dramatic contrasts in society. There is a revolution under way driven by Moore's Law (for price performance of computer processing power) and Metcalfe's Law (the power of networked intelligence) that is changing the competitive landscape and redefining literacy. Those individuals who take advantage of this revolution and gain a comfortable fluency and literacy with these new interfaces will appear superhuman to and outperform those without them. Conversely, those who do not keep pace with technology will appear disabled. This will be true of individuals and

Sign up to receive our weekly innovations in learning email newsletter:  
 First name  
 Your email address  
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[HQ PBL](#)  
 HIGH QUALITY  
 PERSONALIZED LEARNING

# Human/Machine Intelligence Partnership

- “The key to the 21<sup>st</sup> century is to achieve the right balance between humans and machines to optimize outcomes” – Boyd

# 2009 Machine Learning: The New Button on the Calculator

## Large Datasets > Algorithms



### 2009 Microsoft Natal, Alex Kipman, Richard Boyd and Jaron Lanier

My first exposure to large scale use of machine learning. 224,000 hours of cpu time to teach the Kinect system what a living room was, and how to recognize motion of the human body as an input device for games (and distinguish between different players)



# 2010 Hangar 51: The Problem

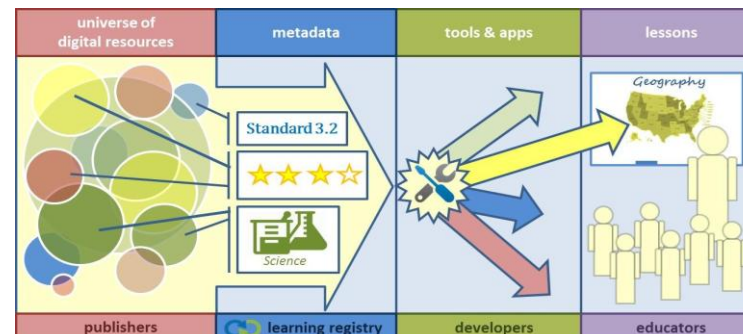


- **Warehoused content is not curated knowledge.**
- Like Hangar 51 in Raiders Of The Lost Ark, most data and experts in large organizations are undiscoverable or underutilized.

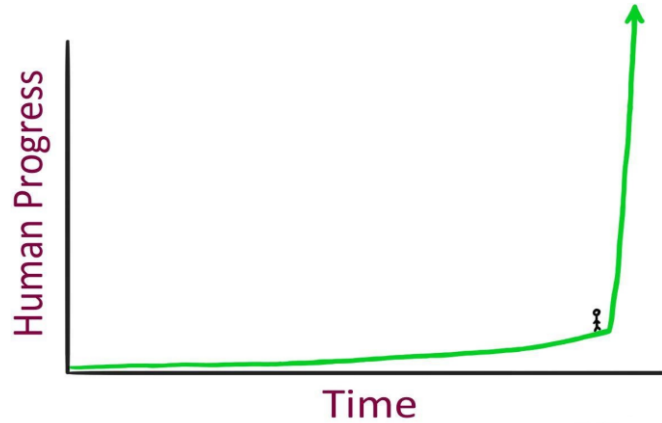
The Unusable Warehouse of people and data



Now where was that write-up where we already figured this out...?

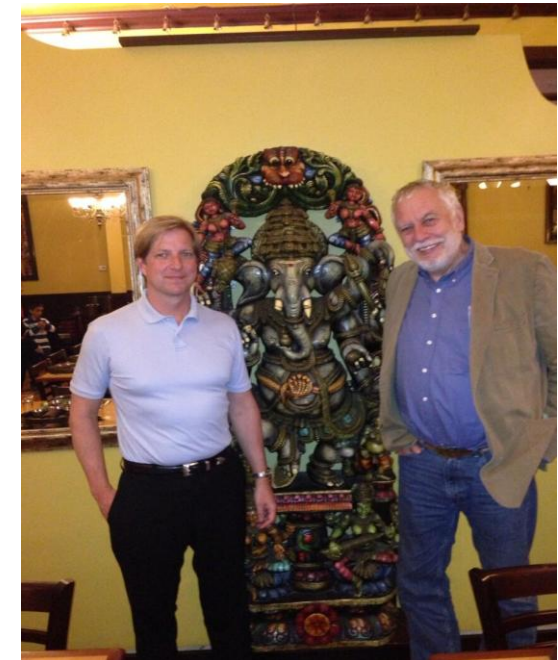


# 2015 Deepmind learns Atari



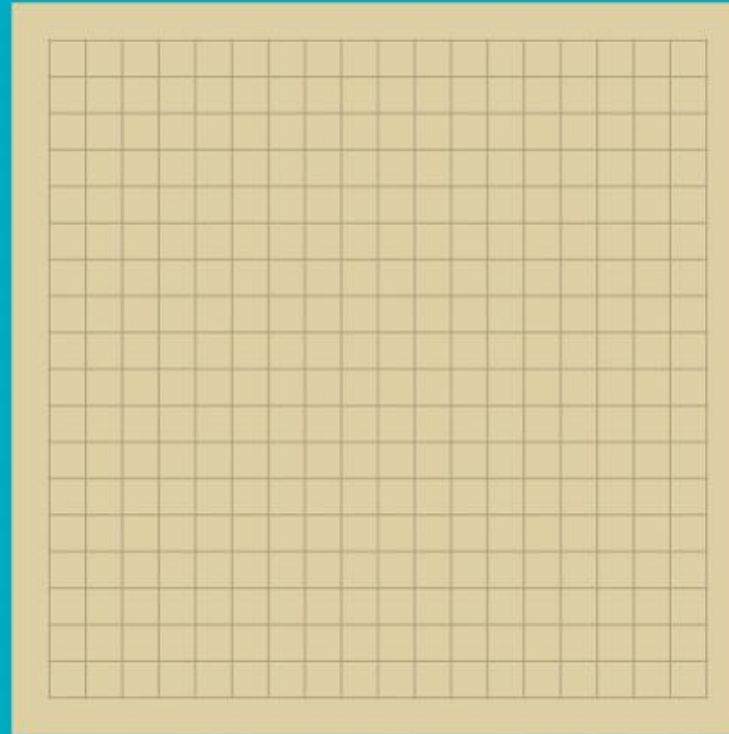
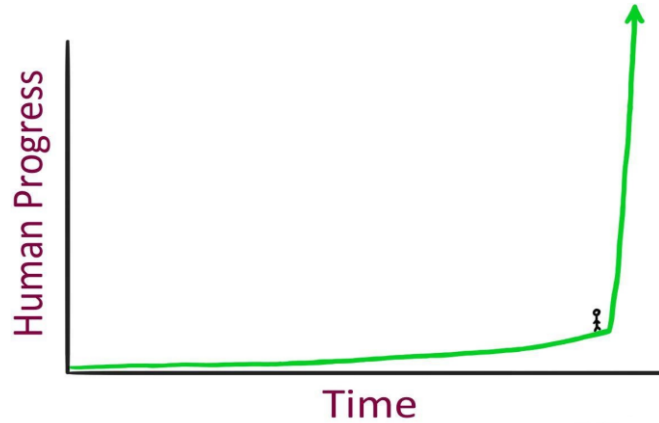
Deepmind is not programmed, it watches video of itself playing.

“[It] learns from the ground up. We give it a perceptual experience and it learns from that directly. It learns and adapts from unexpected things, and programme designers don't have to know the solution themselves.”



Tanjo's Richard Boyd (left) and the man who led Atari and brought us Pac-Man, Nolan Bushnell (right).

# 2016 Deepmind Defeats the World Go Champion



The game of Go has over

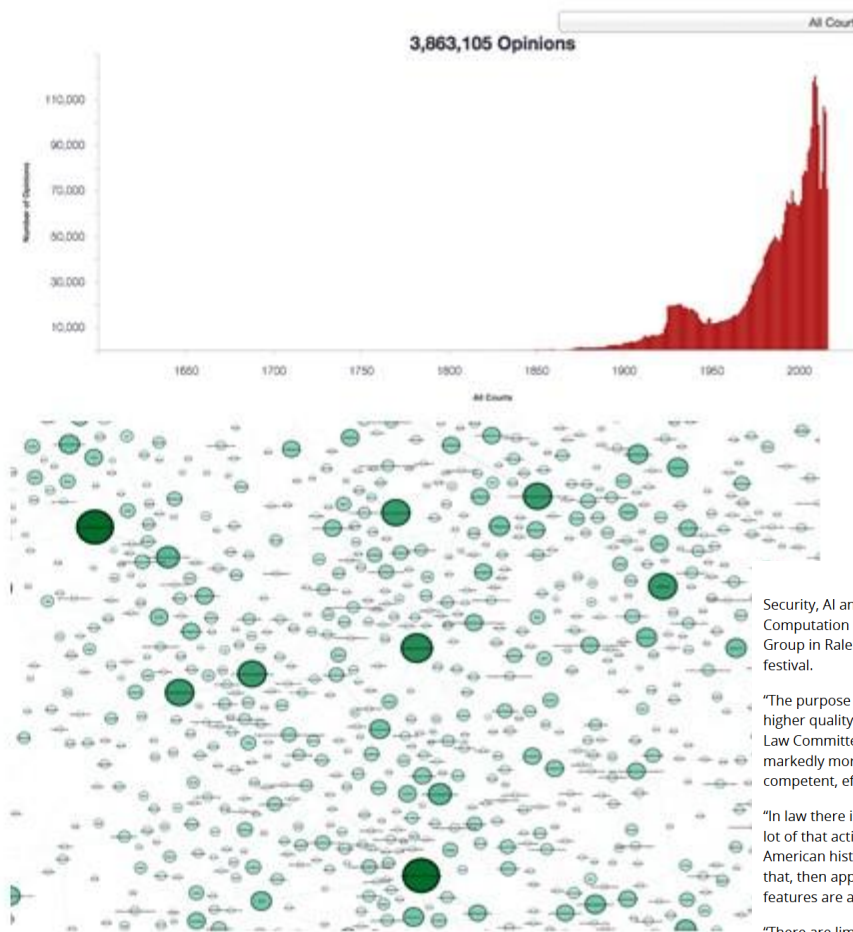
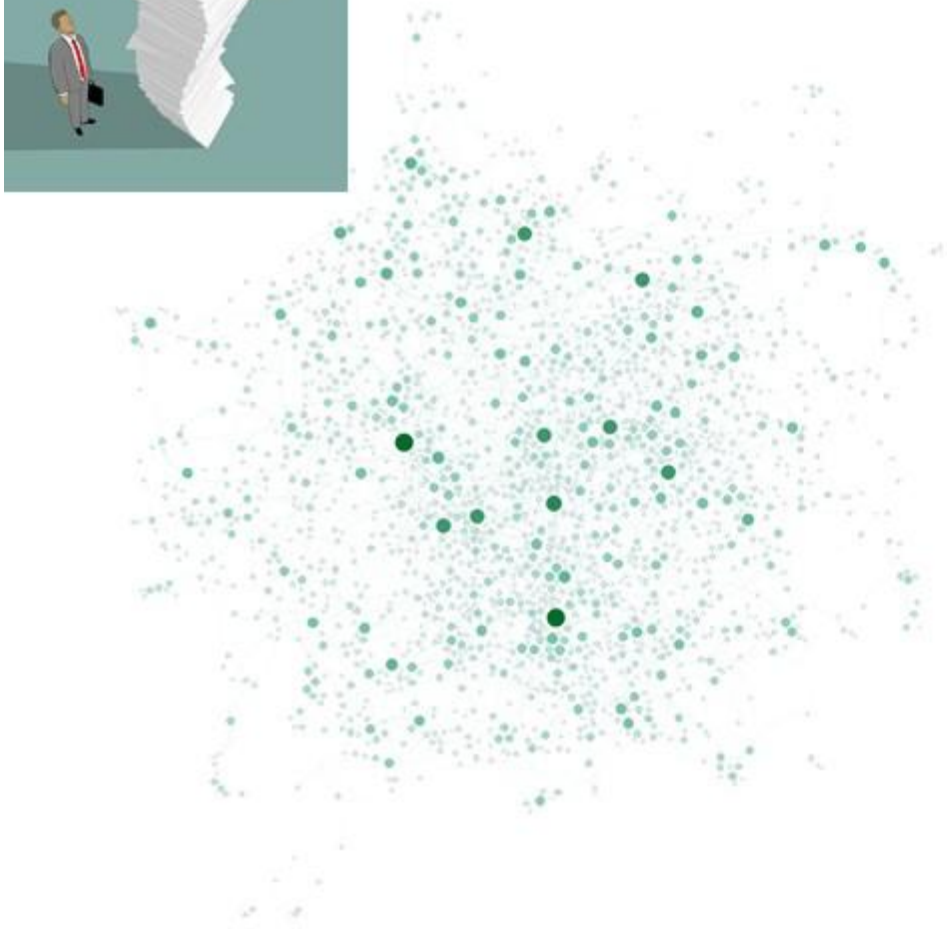
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possible positions.





## TanjoCase-A Machine Learning Map Of Every Case Law Opinion In The United States Since 1797.



Bob Friedman

Security, AI and blockchain need to go hand in hand was the message at a Global Legal Hackers, Computation Law + Blockchain Festival hosted by Campbell University's Legal Hackers Student Group in Raleigh in March. It was one of 24 nodes held around world as part of the international festival.

"The purpose of all the technology is to provide better service for the client efficiently and with higher quality," said Campbell Law School Professor Kevin P. Lee, who chairs the NCBA Future of Law Committee who organized the festival. "In a future where the legal services industry will be markedly more competitive, the best lawyers will be using the best tools to make themselves more competent, effective, and efficient."

"In law there is a lot of reading and researching of documents," said Richard Boyd, Tanjo.ai CEO. "A lot of that activity yields pretty easily to machine learning. Our system reads every legal opinion in American history. No human or teams of humans can do that nor should they. A machine can do that, then apply a set of rules. So, the role of a lawyer today is to figure out what those utility features are and what those values are."

"There are limitations to products and designs and you need to have a version 2 and a version 3," said Tom Snyder, CEO and founder of NCRIOT. "You have to keep innovating and keep improving your security."

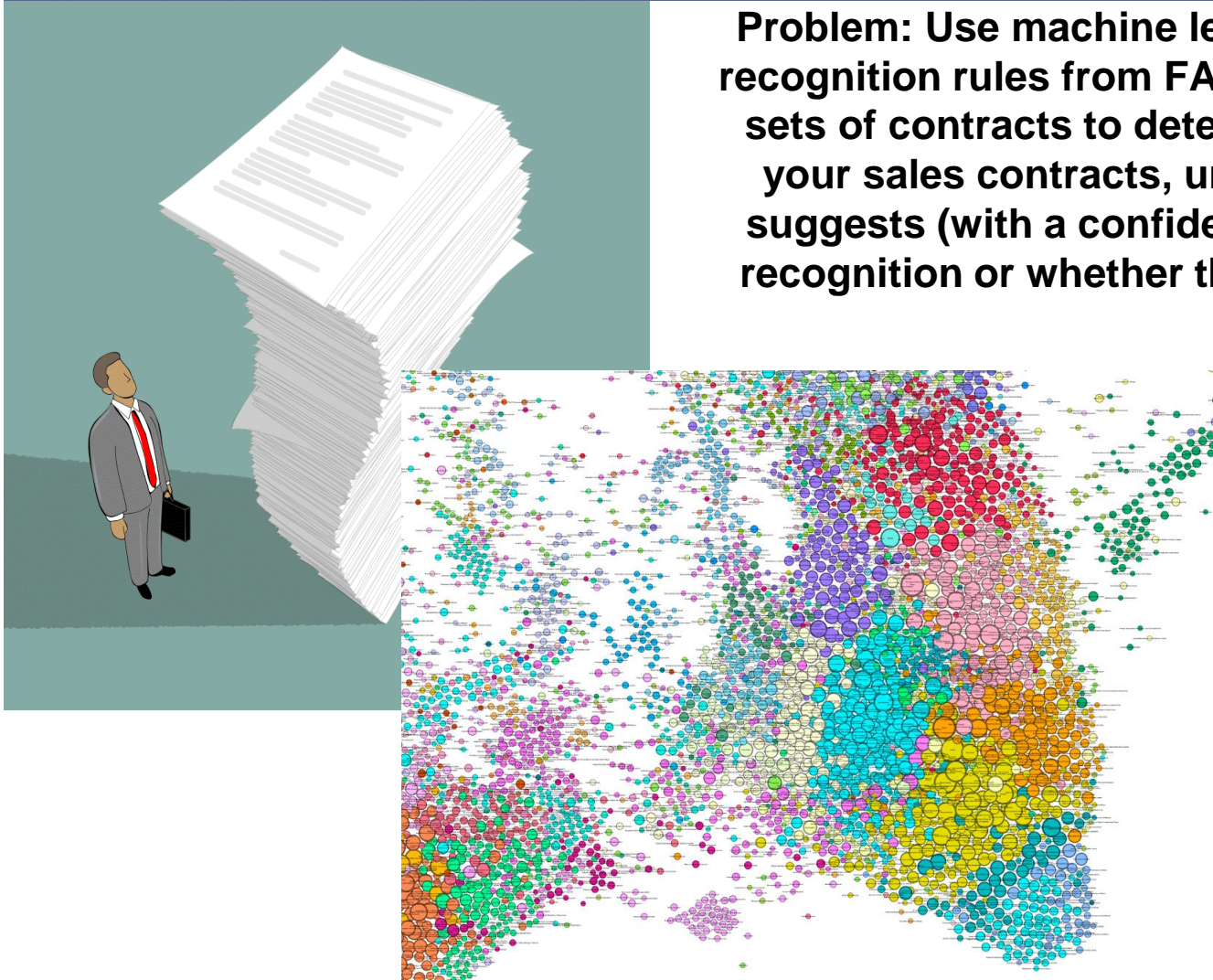
"Blockchain will have several roles for law firms. The most popular being Smart contract development and adoption," said Craig Petronella, president and CEO of the Petronella Technology Group.

The 21st century legal marketplace is experiencing a collision of forces resulting in clients, lawyers, legal professionals and business innovators who are allies rather than adversaries and Lawyers Mutual is a proud supporter of the creative solutions that will abound. Continue this conversation by contacting us at (800) 662- 8843 or camille@lawyersmutualinc.com.

# 2017 RevRecBot

**Problem:** Use machine learning to apply the upcoming new revenue recognition rules from FASBI (which went into effect 12/2017) to large sets of contracts to determine which rules apply. RevRecBot reads your sales contracts, understands the language within them, and suggests (with a confidence score) the correct method for revenue recognition or whether the contract may have a problem that needs human attention.

**Customer:** CPAs

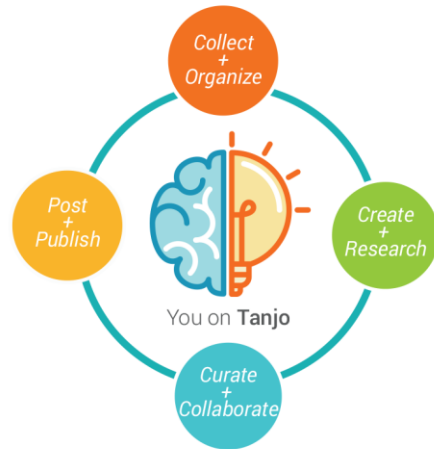




# 2017 The NCCC Brain Mission

PUT MACHINE LEARNING TO WORK FOR YOU

TANJO



- An enduring repository of all NCCC knowledge and best practices
- Improve collaboration. Level the access to information across all campuses
- Allow for the free flow of ideas and expertise throughout the system.
- Stem the tide of the “Silver Tsunami”

## Create + Research

Aided by machine learning bots that serve you and your interests. Filter digital content from the open web and your private sources.

## Curate + Collaborate

Pin items to your smartboards. Invite colleagues to help you curate your boards with notes.

## Collect + Organize

Write your own note cards in collaboration with others. Rate items for relevance, validity, trusted source and quality.

## Post + Publish

Become a Thought Leader! Your machine learning minions will help identify content to post and tell you the optimal time to post to each social media site. Publish to an infinite number of web pages and blogs you control.

*“...It’s like Pinterest for Knowledge”*

*“We used four different tools—now we only use Tanjo”*

Community Colleges NC News

## Artificial ‘brain’ intelligence to digitally transform NC Community College System

By Analisa Sorrells | March 27, 2019



Analisa Sorrells is the Associate Director of Policy and Engagement for EducationNC. Analisa grew up in Winemere, Florida where she attended the local public elementary, middle, and high school. She graduated from the University of North Carolina at Chapel Hill with a bachelor's degree in public policy and a minor in reporting from the UNC School of Media and Journalism. [Read Full Story](#)  
@analissorrells

Jim Parker left his previous position with the NC Department of Information Technology to join the North Carolina Community College System in 2016. As chief information officer and senior vice president for technology solutions, he soon realized that the system was spending a lot of resources to maintain the capabilities it already had, but was not doing as much in the way of technological innovation.

“We needed to start carving out resources and time to help focus in on what technology we needed to innovate in order for us to have a successful future,” said Parker. “And artificial intelligence is just one of them.”



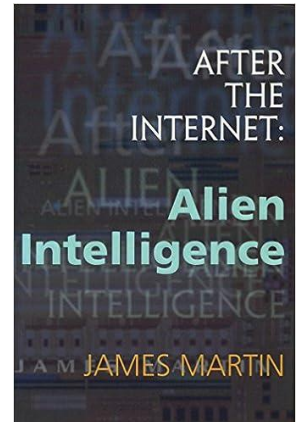
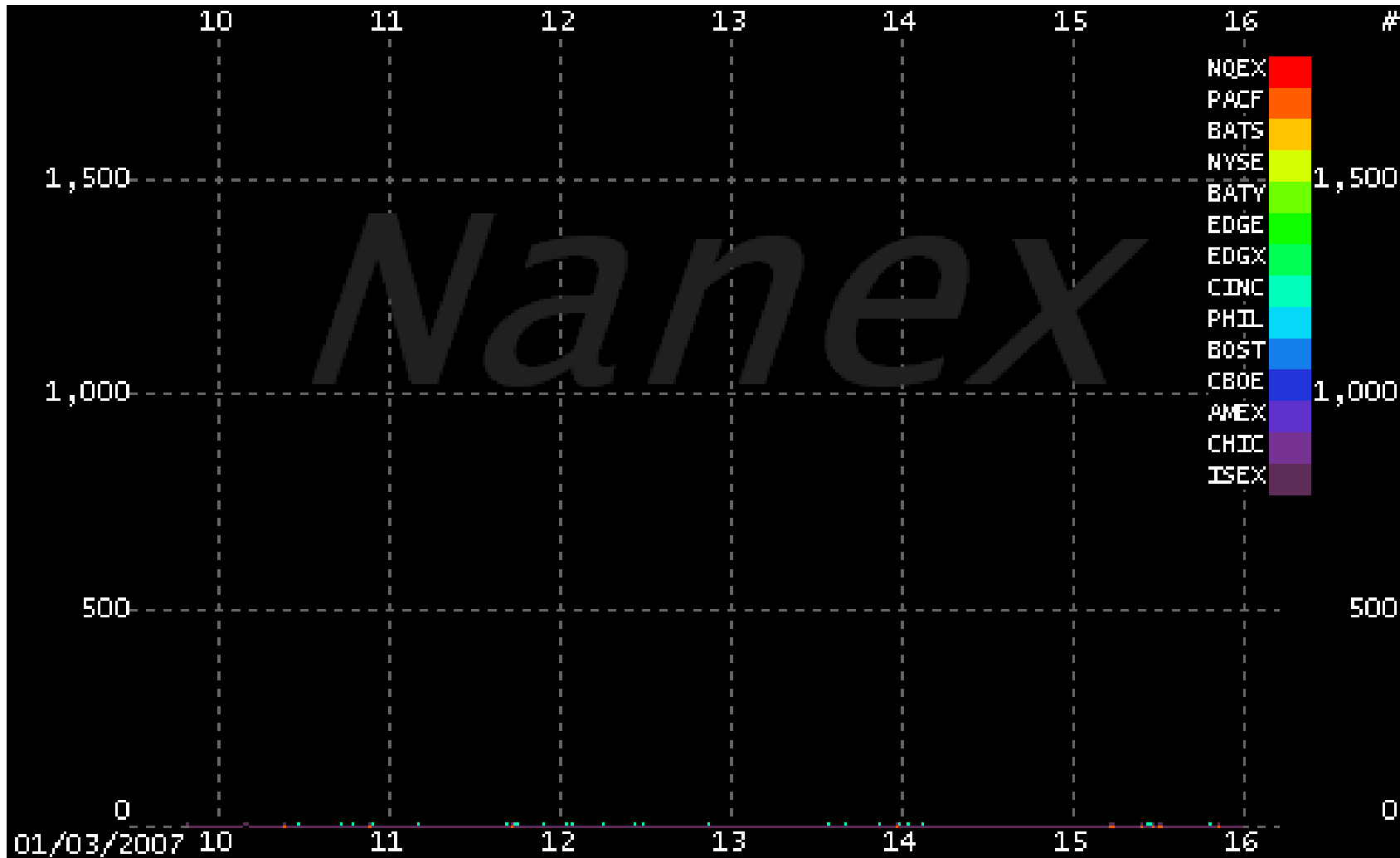


# The Rise of the Machines

Not a level playing field anymore



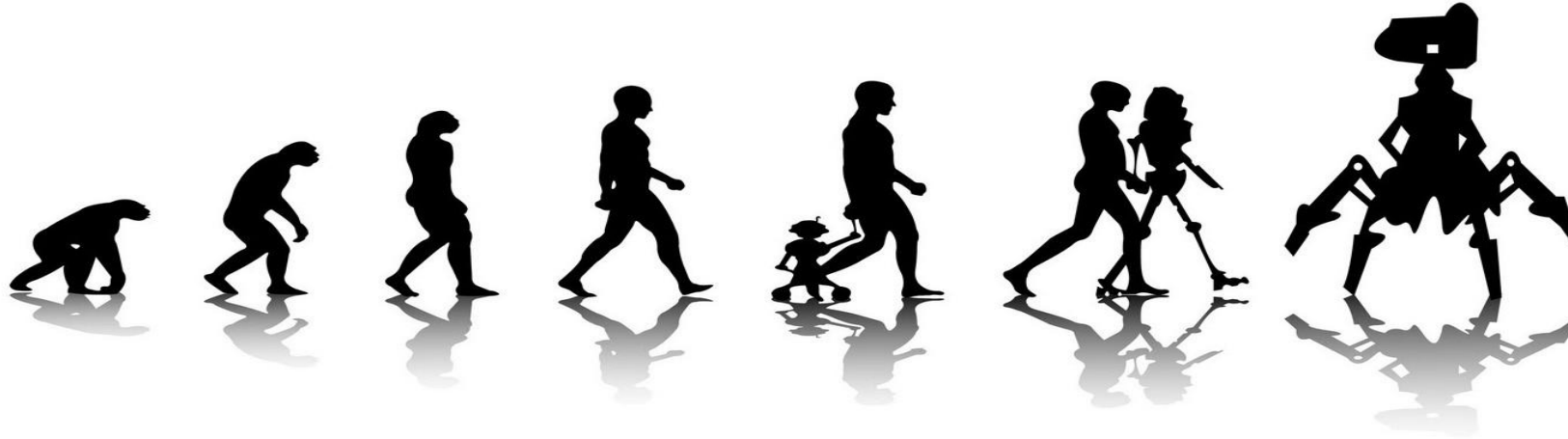
When AI accesses other AIs, humans are not in the loop



On September 15, 2011, beginning at 12:48:54.600, there was a time warp in the trading of Yahoo! (YHOO) stock. HFT has reached speeds faster than the [speed-of-light](#), allowing time travel into the future. Up to 190 [milliseconds](#) into the future, or 0.19 fantaseconds is the record so far. It all happened in just over one second of trading, the evidence buried under an avalanche of about 19,000 quotes and 3,000 individual trade executions.

The facts of the matter are indisputable.

# Artificial Intelligence (Boyd View)



The "Old AI"  
ML Dawn  
Chat era  
AGI?

1958 - 2009

Phase 1 Telling machines what to do

2009 - 2018

Phase 2 Data scientists in high demand

2018 - Nov 30, 2022

Phase 3 Prompt Engineers

2023 -

Phase 4 Intelligence Amplification ➡ AGI



# The Simulation Century

## The Path to AGI <sup>TM</sup>



### Artificial Intelligence

Machine learning, including LLMs, state machines, neural nets, Decision and Behavior Trees, and other automation routines.

### Simulation Tech

Digital Twins. Models of real-world objects, processes, people, and systems. Including 3D models, and real-time data feeds. Computation.

### Knowledge Graph

Domain specific data maps, linked by relevance, semantically meaningful, and accessible to AI.



I visited this 4 Qubit Dwave Quantum computer outside of USC in 2011



# Boyd AI Guidance to Congress

Sept 2023 House and Senate Briefings

- This is the Simulation Century
- AI is the new UI (And AI needs DI/DX!)
- The 21<sup>st</sup> Century Imperative is to seek the right balance between humans and machines to optimize outcomes
- ML/Generative AI is not normal Enterprise Software. It is more intimate and powerful.
- **There is no ML Debugger!!**
- **Utility Functions** need careful design (See paperclip problem and hallucinations)
- ML/LLM systems can not transcend their training/databases (They don't create new information)
- **Model collapse** is a real concern. LLMs are a lossy compression of their training data. As generative AI begins to train on its own generated content we will see data loss and mass forgetting
- **You do not need a single data lake.** AI/ML can retrieve from data ponds by permission
- Good low hanging fruit use cases: Stem the Silver Tsunami, Make your own Memex, automate tasks with prompts, Digital Twins, soon create simulation environments with generative 3D worlds, Decision Support.
- There will be an explosion of specialized LLM models available to the general public in 2024. These models will differ and can be compared in their output and used for a variety of purposes. Skillful prompt engineering will be a necessary skill in every area of human endeavor. See "[I Prompt Therefore I Am](#)" (Boyd, 2023)
- The real goal should be to marry human intuition, creativity and perspective (values) with machine memory, computation speed and distance sensing. (Compression of MEST)
- **Ultimately Knowledge Graphs, combined with LLMs and a digital twin simulation of the world will result in AGI**



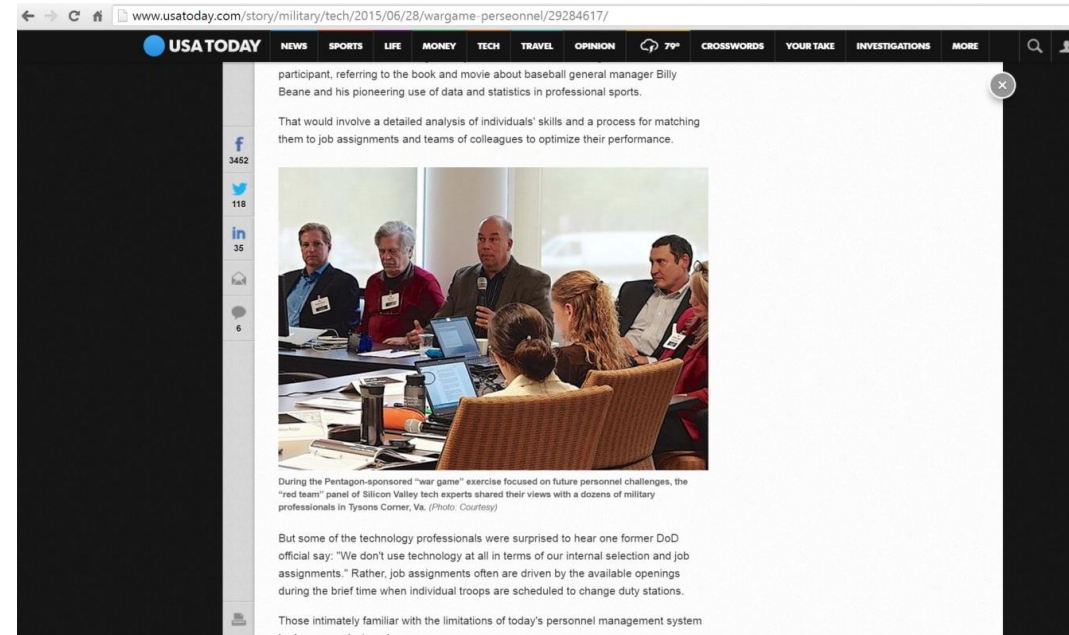
Senator Scott's office



Longworth Bldg

# The Work Force of the Future

Hunt Library  
NCSU



Anything that can be automated... will be.

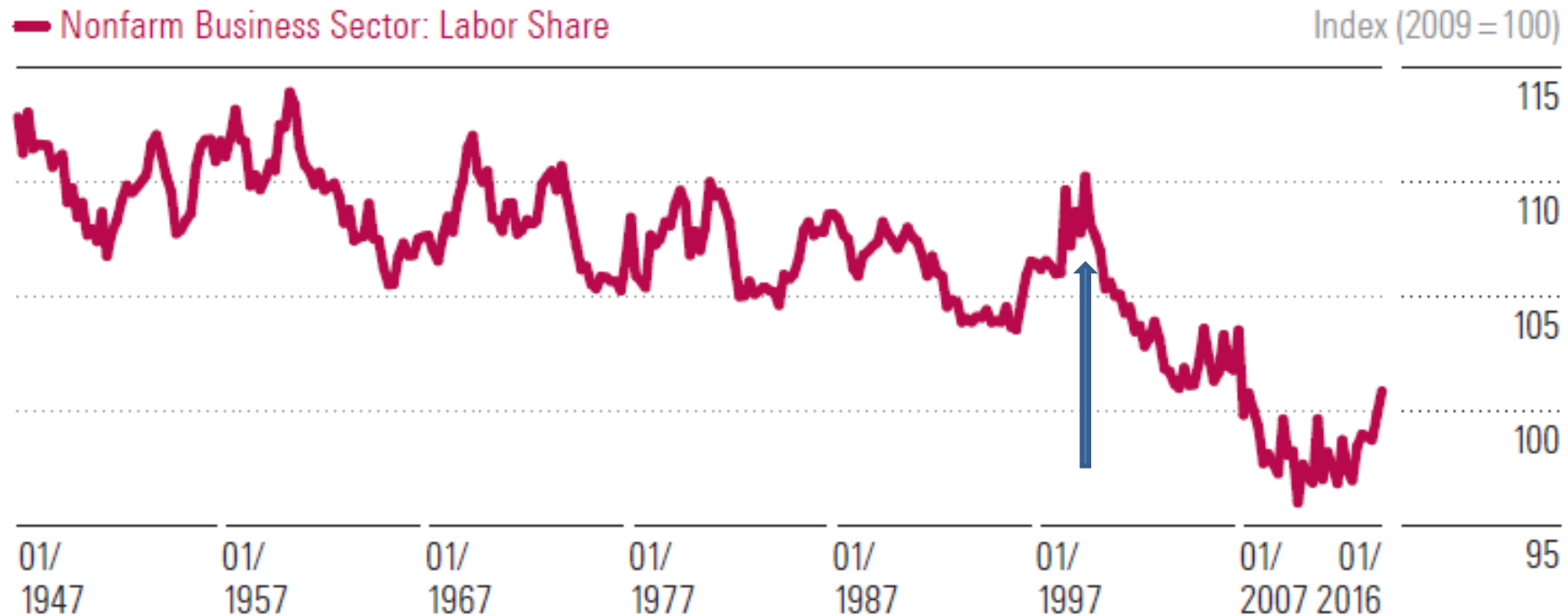
If your job can be done by automation, the most you can ever expect to be paid is the cost of renting the machine.

Don't compete against the machines. Learn to cooperate **with** them.

# Capital is winning, and will finally conquer all, in the battle with labor

## EXHIBIT 3

**The Rise of Capital II** The substitution of capital for labor accelerated after the tech revolution gained full momentum.



Source: Bureau of Labor Statistics.

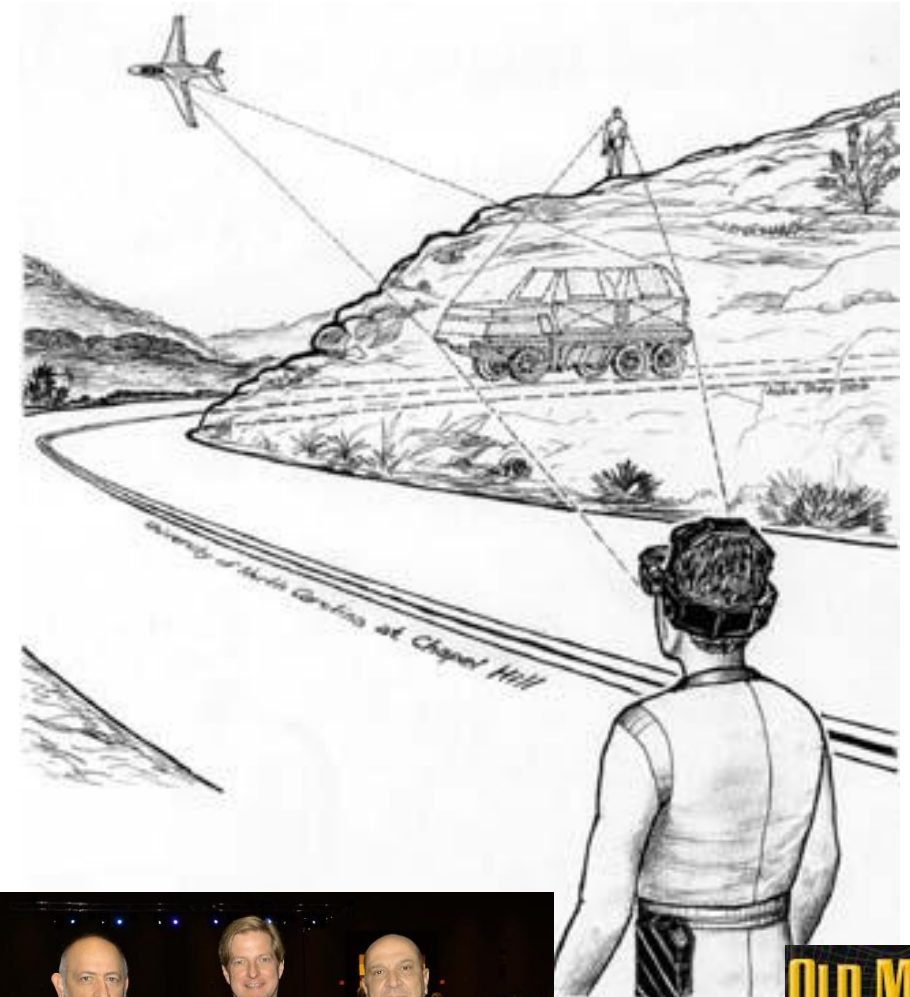




2015 Ash Carter sponsored “Force of the Future” Wargame  
 Red Team: Doug Lenat (Cyc), Richard Boyd (UltiSim), Alan Kay (Xerox  
 Parc) , Michael Jones (Google) and David Smith (Lockheed Martin)

follow on article a few years later

<https://modernbattlespace.com/2019/08/28/ai-brings-science-fiction-and-gaming-to-life-to-train-the-force-of-the-future/>



# Digital Twins and The Simulation Equivalence Principle

- The Digital Twin World should be indistinguishable from the real world
- In sum

**There should be no measurement that any participant can take which would show that a Digital Twin is a simulation of the sensors and actuators in the real world, not the actual sensors and actuators**

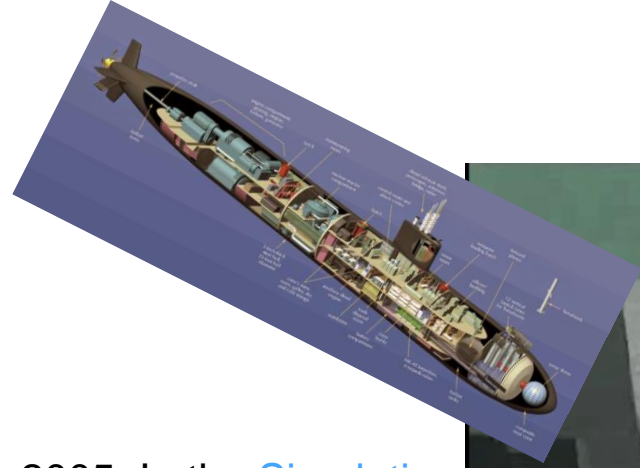
Means, in practice:

**Digital Twin simulated sensors/actuators are bit-identical to real-world sensors/actuators**

## Simulation Digital Twin

3D collaborative simulation of a system or business operation (or synthetic models of humans) that is data-driven, allowing simulation learning, time travel prediction and scenario planning, telepresence and deeper, more timely operational understanding.

## 688 Attack Sub Digital Twin



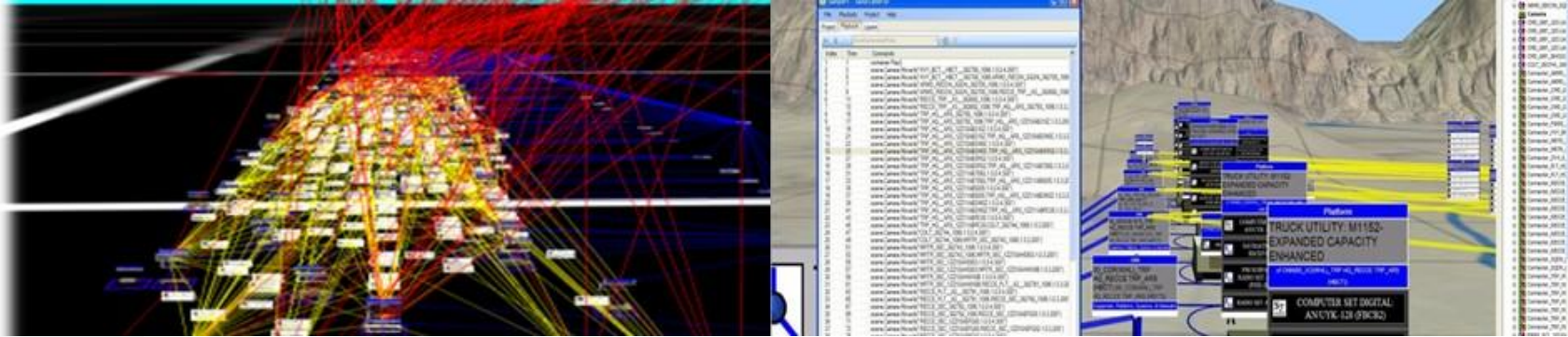
2005: In the **Simulation Century**, setting aside an entire submarine for training is no longer necessary



<https://youtu.be/JgFHGV28C6k>

Connected to the propulsion and other systems Supports 32 concurrent users





## Organizational Digital Twin

# Brigade Combat Team Digital Twin 15,000 entities!

600x improvement!

### Department of Defense Architecture Format Data Analysis (DODAF)

**Problem:** Use Machine Learning and data analytics/automation to analyze large DODAF capability databases for the US Army. Infer rule sets for complex network centric battle groups.

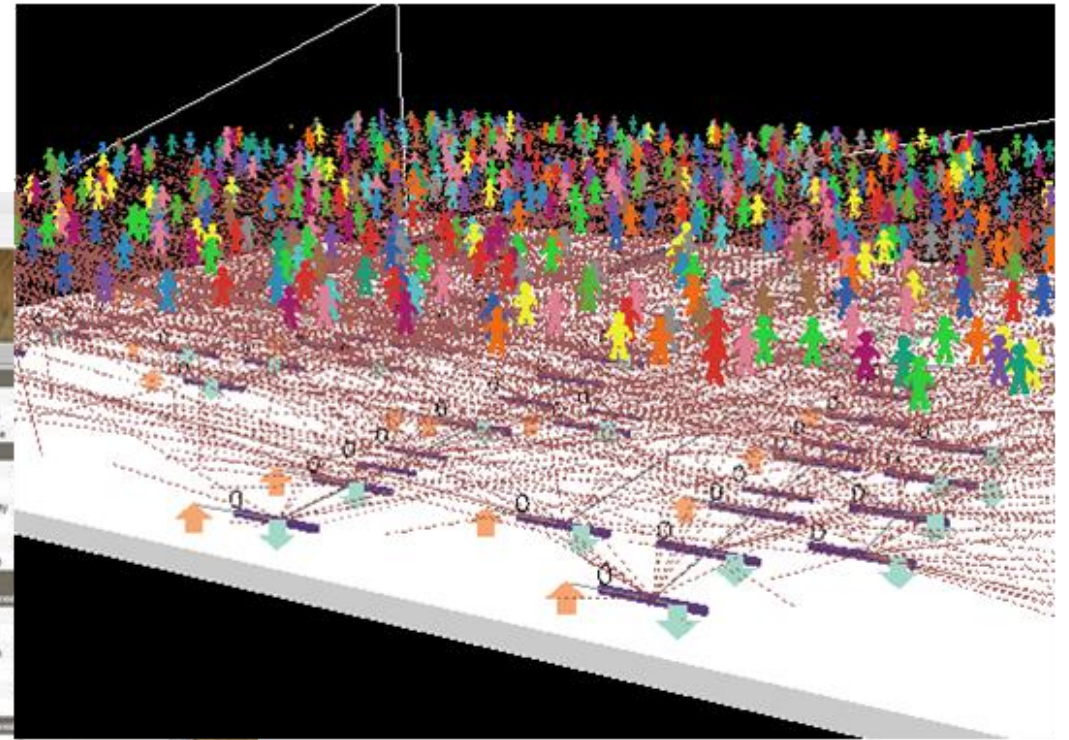
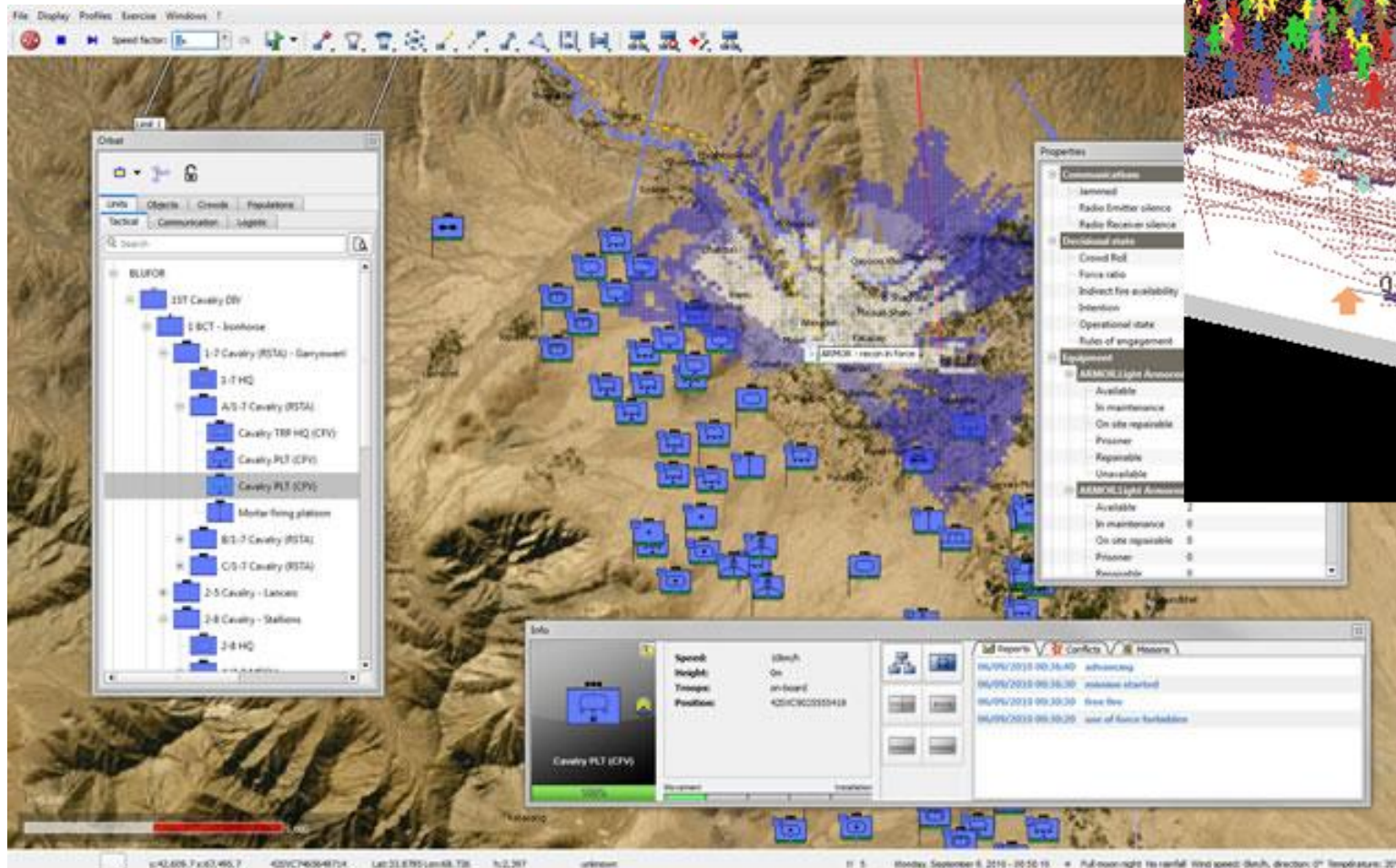
Designed a normalization method for the various databases. Designed interactive 3D visualization layer engine that allows users to deploy entire brigades on 3D terrain models around the world and permit interactive “what if” data tests where one can give or take away capabilities from live databases and see the effect on business rules and “need lines” on the complex system in real-time 3D. What once took 300 hours of analysis was reduced to minutes. The Ultivis system also permitted live capabilities presentations for decision

makers that dramatically reduced decision-making time. **A 600x improvement!**

**Customer:** DOD AIMD (Architecture Integration Management Directorate), also repeated this effort for JFCOM (Joint Forces Command)

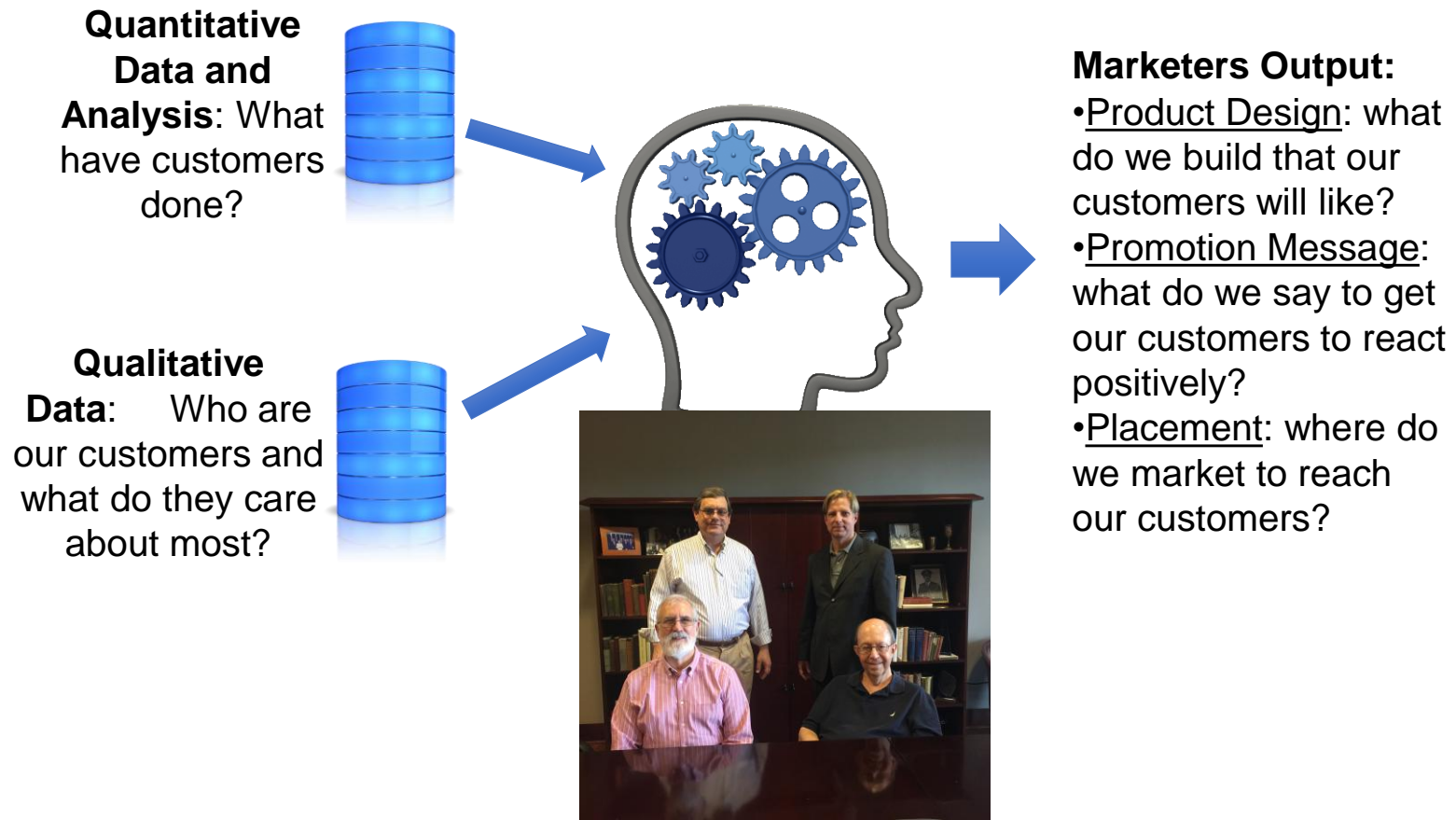
# Modeling Hearts and Minds

## Large-scale Population Simulations





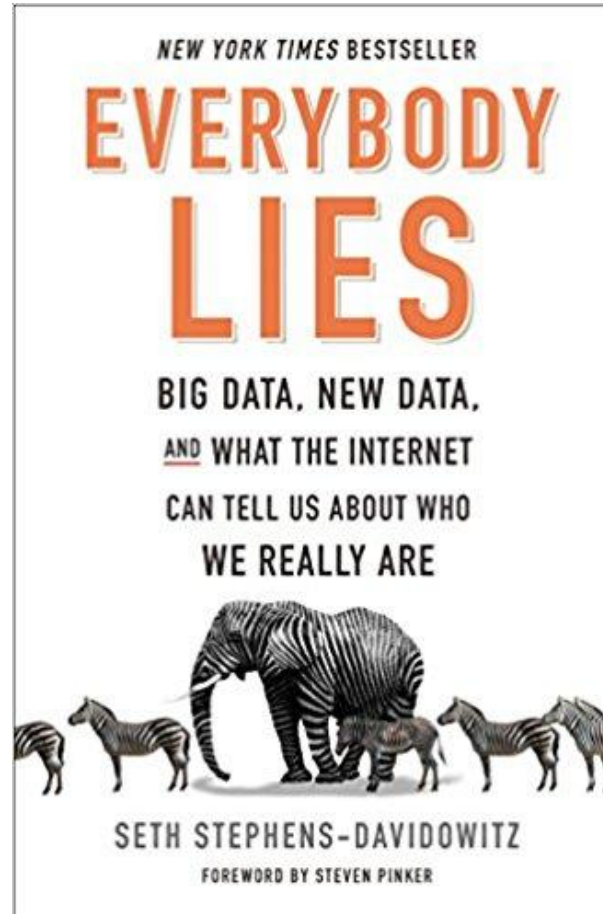
# Animated Personas



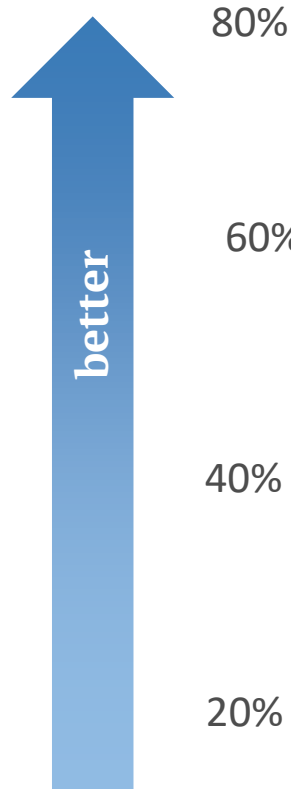
**TAP – The Tanjo Animated Personas** platform allows marketers to have a new deep level of interaction with customer segments for their products and services. Using machine learning, TAP creates dynamic simulated customer models from archetypal customer segmentation research and brings that data to life in the form of synthetic customer personas. Marketers can now, finally, watch as these synthetic customer models view and digest online content. Present a TAP model with a product message and see it respond to (and score) that messaging from the viewpoint of that customer segment. TAP brings deep customer conversations to life.



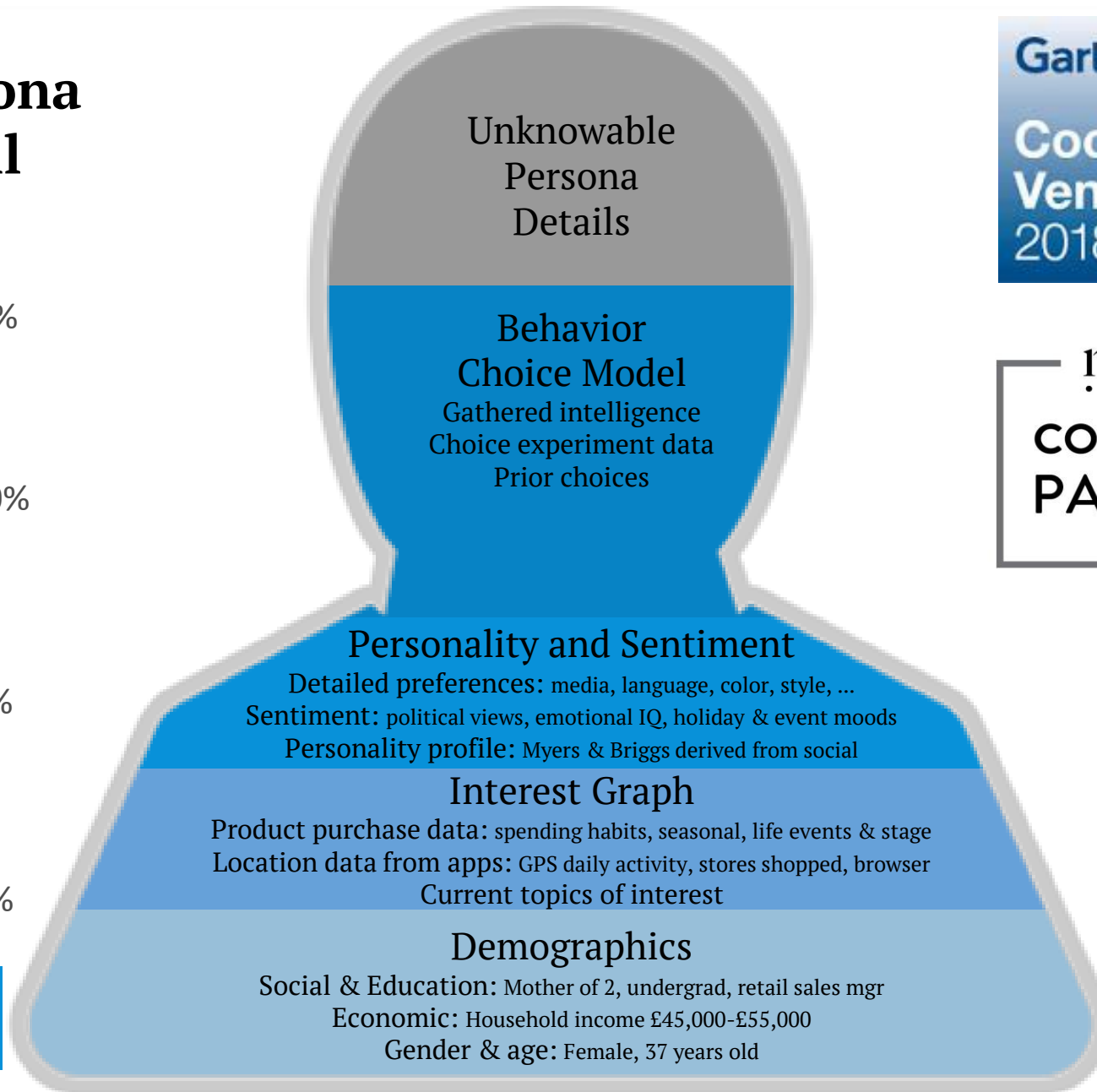
# The problem with surveys and focus groups



# Filling in Persona Levels of Detail



How complete is  
your model?





Project: Wise  
**\$20 Million**  
Period of Performance 2020-2025



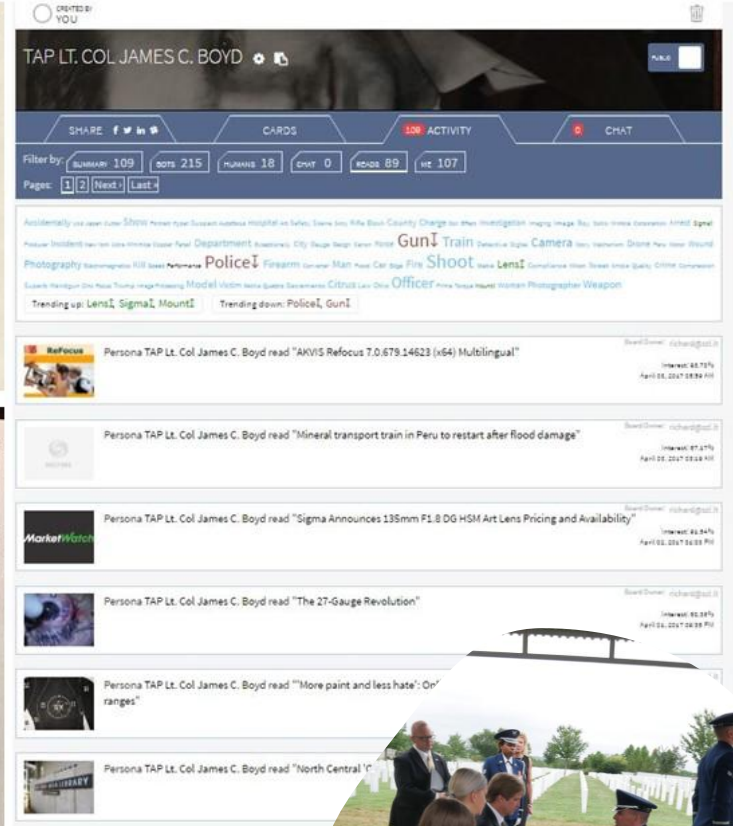


Animated Persona of my Dad. By Richard Boyd

OCTET



<b>V. OVERALL EVALUATION</b> (Compare this officer ONLY with officers of the same grade)					
(Specify justification reasons for these ratings)					
Superior <input type="checkbox"/>	Normal <input type="checkbox"/>	Below Normal <input type="checkbox"/>	Marginal <input type="checkbox"/>	Effective and Competent <input type="checkbox"/>	Outstanding <input type="checkbox"/>
				Unsatisfactory <input type="checkbox"/>	Inadequate <input type="checkbox"/>
<b>VI. PROMOTION POTENTIAL</b>					
1. Does he possess a CAPABILITY FOR PROMOTION AT THIS TIME? <input type="checkbox"/>					
2. Are there any special circumstances which would justify a promotion or a recommendation for a promotion? <input type="checkbox"/>					
3. Are there any special circumstances which would justify a recommendation for a promotion? <input type="checkbox"/>					
<b>VII. COMMENTS</b>					
<p> <b>WATKINS AND SPECIFIC ACHIEVEMENTS:</b> Colonel Boyd has performed his duties in an outstanding manner. He has superior knowledge of all divisions related to the six sections in the Operations and Training Division. He established an outstanding training program for Base Operations personnel. This program provides for instruction, testing and re-training on all customer needs. He has closely monitored the Base Training Section and participated in controlled serviceability and parade activities. He was the senior Air Force Staff Officer for the multi-service staff support for the Department of Defense. He has been a highly responsible in the photographic area and has given excellent guidance to the Photographic Laboratory and Film Library. He is a base pistol team member and ran an excellent marksmanship course. He has little role in an aggressive manner. His duties as Group Mobility Officer have been performed with ultimate skill and preparation. He was a volunteer to become the Group Financial Resources Advisor and has done a commendable job. <b>STRENGTHS:</b> Colonel Boyd displays a very high degree of initiative and has been successful in conducting the division programs. <b>SELF IMPROVEMENT EFFORTS:</b> He attended the Senior Staff Officer Disaster Preparedness Course during the past year. <b>OTHER COMMENTS:</b> His personnel are from five different ethnic groups, with mixed race and religious backgrounds. He actively supports the Equal Opportunity and treatment program by his active attitude and work management policies. I highly recommend he be tendered a regular commission.       </p>					



# AdAge



## MOTHERBOARD

## EDUCATION WEEK

## The Rise of AI: What's Happening, What it Means, How to Prepare?

# 2024

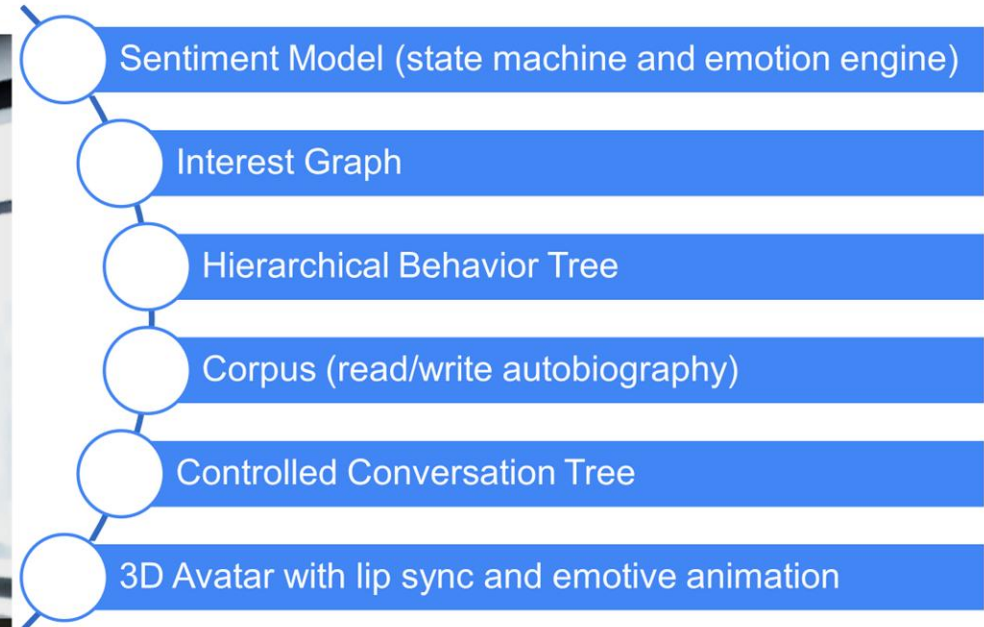
## Conversational AI Skills Training Simulation

A platform for conversations with a range of virtual patients, combining rules-based artificial intelligence with the power of large language models.

The system allows for talking with specific people informed by your data. Can be augmented with a virtual coach giving guidance and a 3D avatar who can express emotions.

Custom training paths bring insight and analytics, including full transcripts for enhancing training insights and feedback.

- ❖ Compliance
- ❖ Consistency
- ❖ Soft skills







Jimmy Chen



Change Character

☒ Coaching

☒ Audio

Reset

aA aA aA

我还好，谢谢。最近工作上有点麻烦，但我尽量保持积极态度。你怎么样？ ☆

Tip: Communicating in a familiar language can help build trust and open dialogue about sensitive topics.

☆ Как вы

Привет! Неплохо, спасибо. Работа вызывает беспокойство, но я стараюсь справляться. Как у вас дела? ☆

☆ Hi jimmy please answer in all the languages you know

Hey! Sure, here you go: - English: I'm doing fine, thanks for asking. Work's a bit challenging, but managing. - 中文 (Chinese): 我还好，谢谢。工作上有点困难，但我会应对。 - Français (French): Je vais bien, merci. Le travail est un peu difficile, mais je gère. - Deutsch (German): Mir geht's gut, danke. Die Arbeit ist herausfordernd, aber ich komme zurecht. - Español (Spanish): Estoy bien, gracias. El trabajo es un poco desafiante, pero me las arreglo. - বাংলা (Bengali): আমি ভালো আছি, ধন্যবাদ। কাজ একটু চ্যালেঞ্জিং, কিন্তু সামলে নিচ্ছি। - Русский (Russian): Я в порядке, спасибо. Работа немного сложная, но справляюсь. - हिंदी (Hindi): मैं ठीक हूँ, धन्यवाद। काम में थोड़ी चुनौती है, लेकिन मैं संभाल रहा हूँ। - العربية (Arabic): أنا بخير، شكراً. العمل صعب قليلاً، لكنني أتدير. - Português (Portuguese): Estou bem, obrigado. O trabalho é um pouco desafiador, mas estou gerindo. ☆

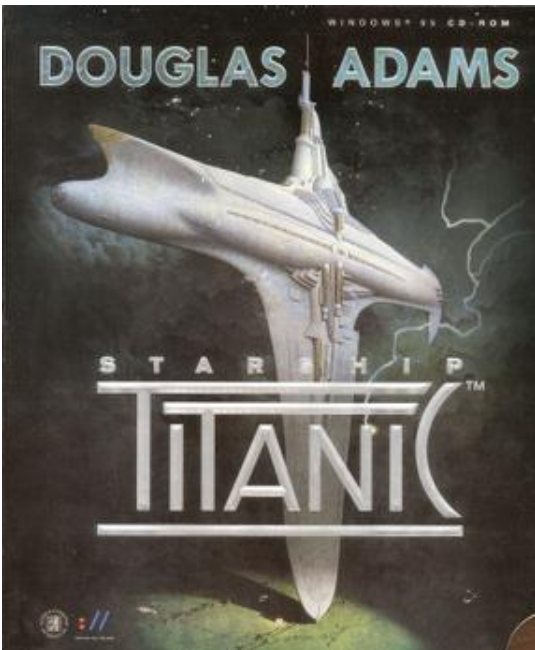
Tip: Showcasing language skills can empower Jimmy, especially when feeling overlooked or misunderstood.

Type your question here...

Send



# 1997 Starship Titanic NLP

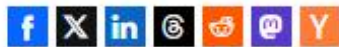


In 1997 Douglas Adams tapped us to create the natural language processing system to enable conversation with the game characters in "Starship Titanic". He ended up calling it Spookitalk to describe the feeling on the back of the neck we sometimes got when the game characters responded in a surprising way

# Tanjo AI Moves To Final Round In \$500K Pandemic Response Challenge



By MONIKA CHAUHAN · February 11, 2021 · 793 Views



North Carolina-based machine learning company **Tanjo AI** has moved to the final round in the **\$500K Pandemic Response Challenge** run by **XPRIZE** and sponsored by Cognizant.

## Social Distancing Simulation





# Got Kale?

“After weeks of investigation later, the mystery of the American Kale Association still plagued me.”

## Narratives in Information Warfare

PREPARING TO FIGHT AGAINST, WITH, AND THROUGH NARRATIVES

WEDNESDAY, 29 NOVEMBER  
1600 – 1730 • S320GH  
SE10

**Moderator**  
**Shep Barge, Ph.D.**  
Director, Joint Assessment  
Enabling Capability, Office  
of the Deputy Assistant  
Secretary of Defense for  
Force Education and Training

**Panelists**  
**Gregory C. Radabaugh, SES**  
Director, Joint Information  
Operations Warfare Center,  
Joint Staff

**Richard Boyd**  
Founder and CEO, Tanjo, Inc.

**Christopher Paul, Ph.D.**  
Senior Social Scientist,  
RAND Corporation

**Scott W. Ruston, Ph.D.**  
Research Scientist, Global  
Security Initiative, Arizona  
State University

## NARRATIVES IN INFORMATION WARFARE

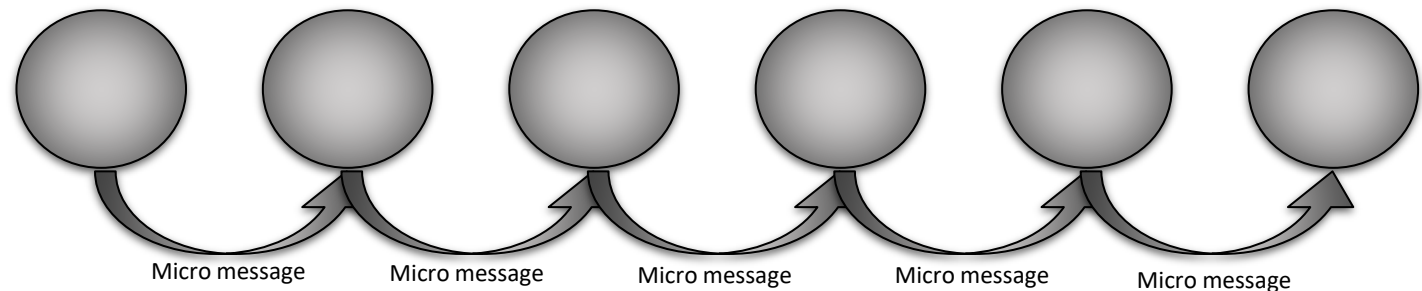
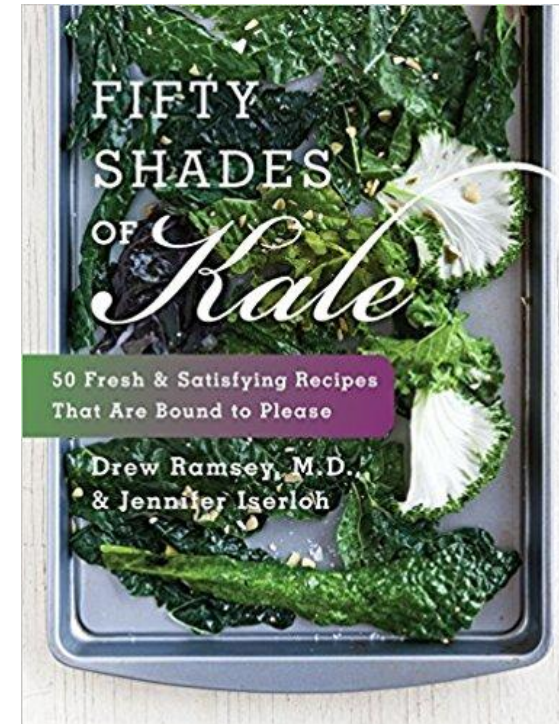
With the advancements in technology today the speed of information flow has never been faster. The general public has become increasingly aware of the impact of how information is received and interpreted, through media and information campaigns. Recent world events have demonstrated how a narrative can be weaponized.

Understanding how narratives are created and how they influence behavior is just one discussion topic for this panel. We need to understand how best to train our warfighters to win in this new and complex battlefield: the information environment.

The Chairman of the Joint Chiefs of Staff has established Information as a new joint function in military doctrine (in addition to Command & Control, Intelligence, Fires, Movement & Maneuver, Protection, Sustainment), taking action to provide strategic guidance in the employment of Information.

To explore how we can better provide our warfighters with the means to understand, train, and win in this new, complex battlefield, this panel seeks to bring together:

- The science of how our warfighters and adversaries create and respond to narratives,
- Current initiatives within the Department of Defense to conduct operations in the Information Environment, and
- Technology and Industry insight on understanding and employing narratives.



Session Chair:  
Robert Snyder, Whitney Bradley  
and Brown Inc.



SIGNATURE EVENT



# Social Distancing Simulation

Go Party 1

Go Party 2

Go Party 3

Go Party 4

Go Party 5

☐ Use Influencer

☐ Use Influencer

☐ Use Influencer

☐ Use Influencer

☐ Use Influencer



Stay Home 1

Stay Home 2

Stay Home 3

Stay Home 4

Stay Home 5

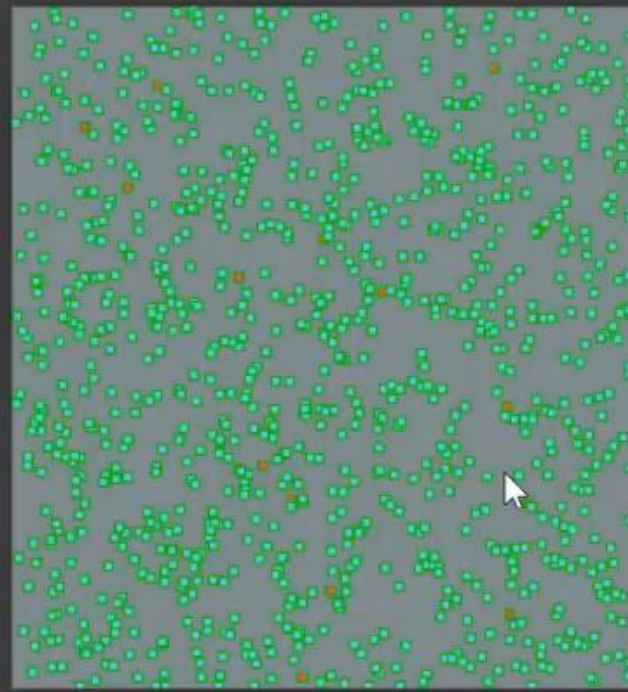
☐ Use Influencer

☐ Use Influencer

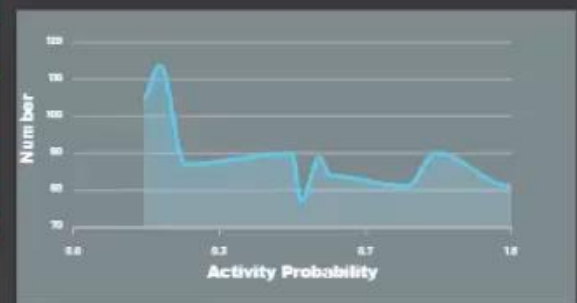
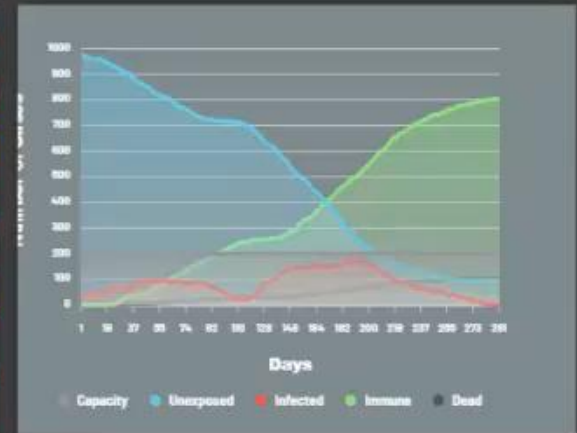
☐ Use Influencer

☐ Use Influencer

☐ Use Influencer



**Reset** **Run Simulation** **Pause**





## [COVID-19 DASHBOARD](#)

## DECISION SUPPORT TOOL

[ENGLISH ▾](#)

Real time data to guide your business  
to a safe reopening



SmartWA Business Decision Support Tool

This tool helps businesses reopen safely and increase customer visits

### Stay up to date on COVID-19 conditions in your county

Conditions and statistics last updated June 23, 2021

#### CURRENT CONDITIONS:

Community, Economic, & Human Health

→ Holding steady

*How is this calculated?*

#### OUR FORECAST

→ Holding steady

*How is this calculated?*

Population: 2,226,300

New Case Rate: 3.4%

Positive Cases: 111,279

Vaccines Administered: 1,346,736

% of Population Vaccinated: 60.49%

Unemployment Rate: 5.2%

COUNTY SELECTION:

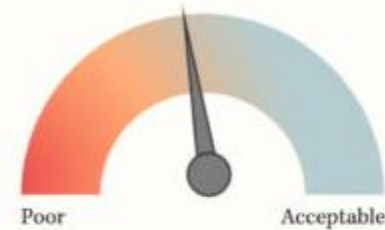
KING COUNTY ▾

INDUSTRY ▾



COMMUNITY EXPERIENCE

[LEARN MORE](#)



ECONOMIC HEALTH

[LEARN MORE](#)

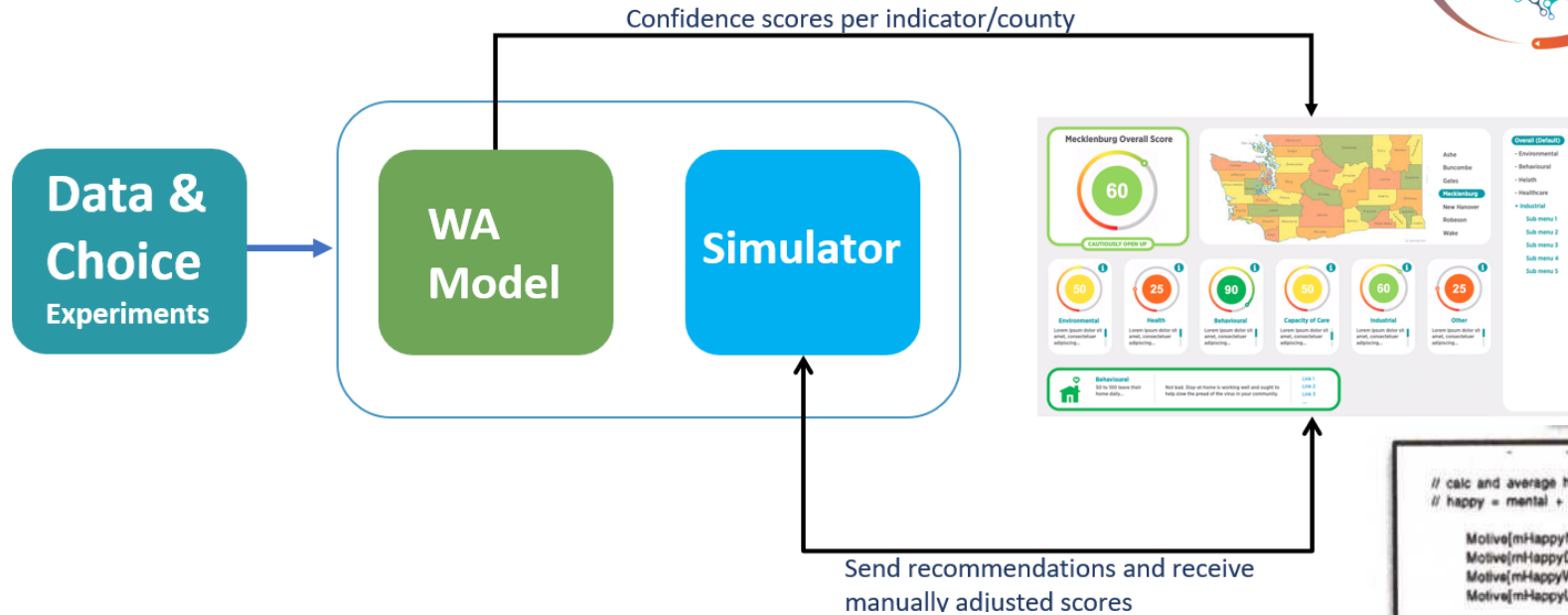


HUMAN HEALTH

[LEARN MORE](#)

# SimState: Community Behavior Simulation

► Overview :: Real-time and choice data in one place



```
// calc and average happiness
// happy = mental + physical

Motive[mHappyNow] = (Motive[mPhysical]+Motive[mMental]) / 2;
Motive[mHappyDay] = ((Motive[mHappyDay] * (DAYTICKS-1)) + Motive[mHappyNow]) / DAYTICKS;
Motive[mHappyWeek] = ((Motive[mHappyWeek] * (WEEKTICKS-1)) + Motive[mHappyNow]) / WEEKTICKS;
Motive[mHappyLife] = ((Motive[mHappyLife] * 9) + Motive[mHappyWeek]) / 10;

for (z = 0; z < 16; z++) {
    if (Motive[z] > 100) Motive[z] = 100; // check for over/under flow
    if (Motive[z] < -100) Motive[z] = -100;
    oldMotive[z] = Motive[z]; // save set in oldMotive (for delta tests)
}
```

Figure 4.9

Excerpts from Will Wright's early draft code for The Sims, showing values for computing physical and mental motives and for combining multiple motives into a calculation of the character's average state of happiness over multiple time steps.



## Raleigh Digital Twin





# Recent IRS RFI

## PILOT IRS- Request for Information (RFI) 2032H5-20-N-00012 Internal Revenue Service (IRS), Enterprise Systems Testing (EST) Synthetic Data Initiative

### 1.0 High-Level Summary

This RFI is part of the Pilot IRS Program. Internal Revenue Service (IRS), Office of the Procurement Executive is requesting information about innovative, enterprise-wide Artificial Intelligence (AI) or simulation engine systems that will allow developers and testers to generate, manage and control synthetic tax data. We are primary interested in: 1) an interactive prototype that simulates real-life events (similar to those that drive popular video games like 'The Sims') when its populated with statistical data about United States (US) household incomes and family sizes to create, track and generate output triggers for tax-related events; 2) a report/listing detailing the use of AI and/or non-AI Based data modeling and prototyping tools used in industry/government to simulate individual and household activities with tax impacts to drive an expanded synthetic data generation approach; and 3) a rough estimate of how much these tools would cost relative to their return on investment (ROI).

ars TECHNICA

BIZ & IT TECH SCIENCE POLICY CARS GAMING & CULTURE S

LOVE AND HEARTBREAK IN SMALLVILLE —

## Surprising things happen when you put 25 AI agents together in an RPG town

Researchers study emergent AI behaviors in a sandbox world inspired by *The Sims*.

BENJ EDWARDS - 4/11/2023, 3:59 PM

Enlarge / A screenshot of the "Generative Agents" demo where 25 AI-controlled characters live out life in a town called Smallville.

151

A group of researchers at Stanford University and Google have created a miniature RPG-style virtual world similar to *The Sims*, where 25 characters, controlled by [ChatGPT](#) and custom code, live out their lives independently with a high degree of realistic behavior. They wrote about their experiment in a [preprint academic paper](#) released on Friday.

"Generative agents wake up, cook breakfast, and head to work; artists paint, while authors write; they form opinions, notice each other, and initiate conversations; they remember and reflect on days past as they plan the next day," write the researchers in their [paper](#), "Generative Agents: Interactive Simulacra of Human Behavior."

**FURTHER READING**  
OpenAI invites everyone to test ChatGPT, a new AI-powered chatbot —with amusing results

# ARE WE LIVING IN A SIMULATION?



- (1) The fraction of human- level civilizations that reach a posthuman stage is very close to zero;
- (2) The fraction of posthuman civilizations that are interested in running ancestor- simulations is very close to zero;
- (3) The fraction of all people with our kind of experiences that are living in a simulation is very close to one.

If (1) is true, then we will almost certainly go extinct before reaching post humanity. If (2) is true, then there must be a strong convergence among the courses of advanced civilizations so that virtually none contains any relatively wealthy individuals who desire to run ancestor-simulations and are free to do so. If (3) is true, then we almost certainly live in a simulation. In the dark forest of our current ignorance, it seems sensible to apportion one's credence roughly evenly between (1), (2), and (3).



# Key Players Behind DoD Virtual World Framework



**Frank DiGiovanni, SES,** Director of Training Readiness and Strategy Office of the Deputy Under Secretary of Defense (Strategy, Readiness Pentagon, Washington D.C.



**David A. Smith** was Chief Innovation Officer at Lockheed Martin Global Training and Logistics. He is a computer gaming pioneer who reinvents human interfaces and platforms to transform and extend human capabilities.



**Richard Boyd,** Chief Architect and creator of Lockheed Martin's Virtual World Labs, leads Lockheed Martin engineers and designers to harness cutting edge computer gaming and virtual world technologies to improve human performance.

[https://en.wikipedia.org/wiki/Virtual\\_world\\_framework](https://en.wikipedia.org/wiki/Virtual_world_framework)

www.defensenews.com

January 27, 2012

## New Tool Aims To Slash Costs of Creating Virtual Worlds

By KRISTIN QUINN

Lockheed Martin's Virtual World Labs is developing an Internet framework meant to promote interoperability among and lower the cost of creating virtual worlds.

"Building simulations today is unnecessarily complex and costly," said Richard Boyd, who helped create Virtual World Labs, Lockheed's workshop for computer gaming and virtual worlds.

Called the Virtual World Framework, Lockheed's architecture will ultimately be a multiuser virtual training environment that is scalable, interoperable, secure and consistent on all platforms, from mobile devices and laptops to desktop computers and holodecks. The goal is to increase democratization, lower barriers to participation, and increase experimentation and innovation.

Boyd said the effort could revolutionize the use of virtual worlds for training.

"We want to do for simulation what Mosaic and Netscape did for publishing" on the web, he said.

In the summer of 2010, the office of the U.S. defense undersecretary for personnel and readiness asked industry to help improve the interoperability of virtual worlds for training. About 30 companies pursued the contract, and it was awarded to Lockheed Martin in the same year.

At the time, Boyd recalled, Frank DiGiovanni, the undersecretary's director for training readiness and strategy, said he wasn't interested in "big, Lock-Mart type companies" for this project.

But Boyd and his team did not come up in the defense industry. He joined Lockheed in 2007, when it acquired his computer gaming company, 3Dsolve. Boyd's team set out to create what he describes as "a system with all the best the internet has to offer," and throughout the process visited several Internet companies to determine how to pull existing technologies together.

Boyd said the new framework could disrupt the entire training and simulation community, including Lockheed. But, he said, things will inevitably evolve in this direction, and it is better for Lockheed to be leading rather than following.

The biggest outstanding question is how the framework will be used once it's ready.

"It's not complete unless you have the business ecosystem as well," Boyd said.

At I/ITSEC 2011 Boyd presented a paper, co-authored with Lockheed's David Smith, titled, "The Virtual World Ecosystem Framework," on how to define a plan that will encourage the ecosystem's growth.

Boyd noted that Lockheed has designed and is now building the kernel — the software heart — for this new environment, but he said no single company should build out the entire system. His company is working with other companies, government and academia to determine the rules for this new virtual world technology.

Instead, he predicts it will be a "massively parallel contribution system," and compares it to a garden, or a site such as Wikipedia, that will require validation.

"We need to buy things and value them in a different way," he said.

Boyd said the timing for this project couldn't be better, with many services adopting virtual training environments and the Pentagon facing tighter budgets.

NATIONAL FOCUS

gleaned from the Office of the Secretary of Defense (OSD), USEUCOM and AETC indicate the Pentagon is moving forward with its use of learning technologies.

For its part, OSD is using its policy leadership position to sponsor several projects that promise to further harness the efficiencies of these technologies.

One concept that the Training, Readiness and Strategy (TRAS) office on the defense secretary's staff is exploring is a personalized intelligent tutoring agent or Personal Assistant for Learning (PAL). PAL is part of a family of learning capabilities the office is researching under the Project Aristotle umbrella. Frank DiGiovanni, the director of the TRAS office, pointed out that PAL will know the user's learning style, proficiency levels, and strengths and weaknesses. "It will act as a life-long mentor or tutor. It will have ubiquitous access to the World Wide Web as well as peer-to-peer connectivity with those from the same functional area or who have similar interests. This is one of many concepts which can be added to each warfighter's 'tool kit' to improve individual performance as part of DoD's long-term effort to develop a more agile and adaptive force."

The TRAS office is also pursuing a DoD-wide virtual world training framework (a pilot program will go live this April). The mid-term vision for the virtual world framework (VWF) consists of a single virtual training environment with a set of common "construction tools," an ontological layer for importing legacy content, and a thin-client approach that supports simultaneous, multiple browser interfacing. DiGiovanni again explained, "The virtual world will be populated through the importation of legacy content and/or 'crowd-sourced' through a market place mechanism. Content population will support contributions from our allies. The long-term vision for the VWF is that it will serve as the key component of a seamless DoD-wide mixed reality training capability."

Learning technologies will also be part of USEUCOM's strategy to help its units and staffs achieve training readiness while completing fewer exercises — by relying more on distributed and virtual solutions to control costs. "If we can leave a unit in CONUS [continental U.S.] but tie in with them virtually, it's a huge cost savings. As long as we're playing from the same models and simulations,

readiness of our cyber capabilities, but also to develop and train to cyber tactics, techniques, and procedures for the future."

This and other developments have encouraged small and large companies in the sector to devise strategies to remain competitive and profitable.

MetaVR is one company below the prime contractor/integrator level that finds itself well positioned in the market. Garth Smith, the company's co-founder and CEO, noted that since its inception in 1997, MetaVR has been a small company focused on developing commercial software products. "Being small keeps us nimble and able to follow up on new opportunities quickly. This in turn has resulted in our products being adopted by a wide variety of applications. We have a very diffuse, or diverse, customer base. Early on, we moved away from depending on DoD contracts as they are subject to volatility and would make us dependent on a single customer."

Accordingly, MetaVR's customers use the company's products in a wide variety of applications such as UAV operator training, manned flight simulators, mission planning and rehearsal, joint terminal air controller simulation training, urban operations training, and disaster management training.

One of MetaVR's more interesting business niches is supporting the refit/buydown of F-16 simulators. The training devices are being upgraded as the continued missteps and delays in fielding the F-35 have provided a lifeline to the F-16 fleet and its training systems. "Most recently, MetaVR recently sold 105 new Virtual Reality Scene Generator (VRSG) licenses for use in another USAF F-16 simulation training program, for five F-16 full mission simulators," Smith recalled.

Jim Craig, vice president of training systems within Lockheed Martin's Global Training and Logistics unit, told MS&T about his company's holistic strategy, which has a robust R&D program as one underpinning.



Above  
Frank C. DiGiovanni, Director, Training Readiness and Strategy, OSD.  
Image credit: U.S. DoD.

the training audience meets its objectives while saving the taxpayer money," Walker said.

AETC's Smith pointed out that his command's leaders will continually seek ways to better educate more people with fewer dollars, which will depend on leveraged use of technology throughout the command enterprise. "Quality use of emergent learning technologies will allow us to effectively manage the growth of new information in a more demanding technological environment. AETC is investigating adopting more blended learning approaches, where appropriate, to combine face-to-face classroom methods with computer-mediated activities to form an integrated instructional approach."

### Retaining a Competitive Edge

At first glance, the planned reduction in DoD spending through the next 10 years appears bleak for the S&T sector. However, there are silver linings on the industry's future business horizon.

As previously noted, several missions including operations in cyberspace, will receive increased DoD focus and training readiness investments. Last year, U.S. Cyber Command conducted the first-ever Cyber Flag exercise. "This event is a joint cyberspace tactical training event, fusing both offensive and defensive cyber operations against a realistic and thinking enemy in a virtual training environment," DiGiovanni said, and concluded, "This type of training will continue to receive emphasis, not only to ensure the

readiness of our cyber capabilities, but also to develop and train to cyber tactics, techniques, and procedures for the future."

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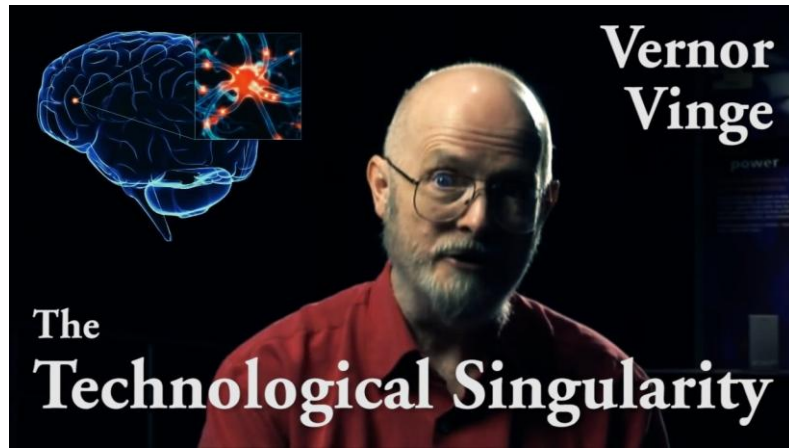
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Jim Craig, vice president of training systems within Lockheed Martin's Global Training and Logistics unit, told MS&T about his company's holistic strategy, which has a robust R&D program as one underpinning.

"We are focused on delivering training value to our customers — versus a particular product or approach — looking carefully at what will be the most affordable and useful to the end user: the warfighters. We've made smart investments into research and development to ensure our training solutions remain agile and have worked hard at maturing

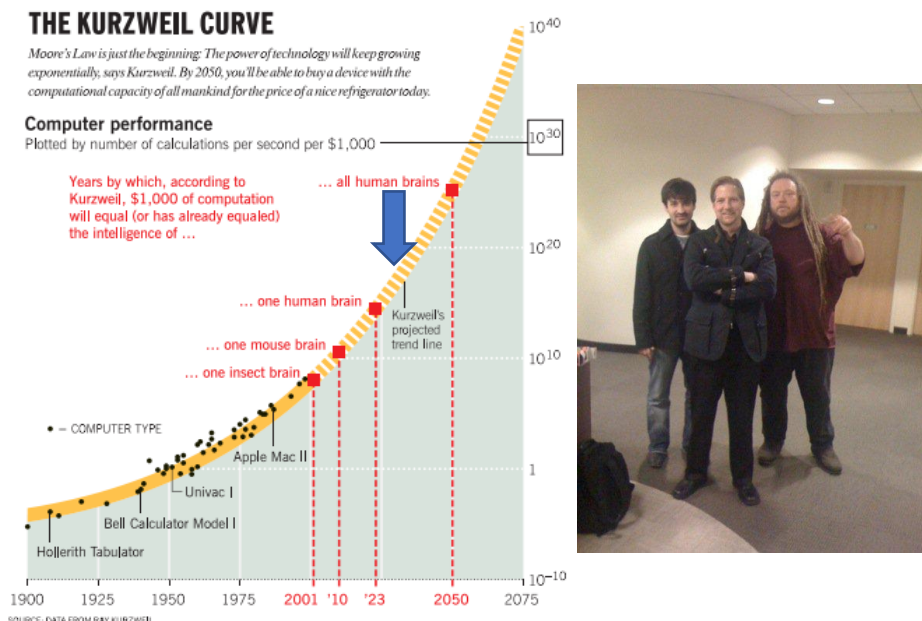
# 2025: Artificial General Intelligence begins to emerge



Ben Goertzel first coined the term Artificial General Intelligence (AGI) in 2007. I met him in 2009 at a Singularity Conference in Manhattan with Ray Kurzweil. He told us that AGI is the last invention humanity will make. This creation will spawn the Technological Singularity described by author Vernor Vinge. We have been discussing the many paths that may follow for humanity after that singular event.

In 2025 we will see the combination of the “old AI” (knowledge graphs, state machines etc) combined with the new AI (LLMs like ChatGPT, Gemini etc) and a sensor-driven simulated model of our reality (Digital Twin) to create a seeing, hearing, sensing, thinking artificial adaptive intelligence.

This is the “Simulation Century”. Simulation combined with AI will create this remarkable breakthrough by 2025.





# The Simulation Century™

## The Path to AGI

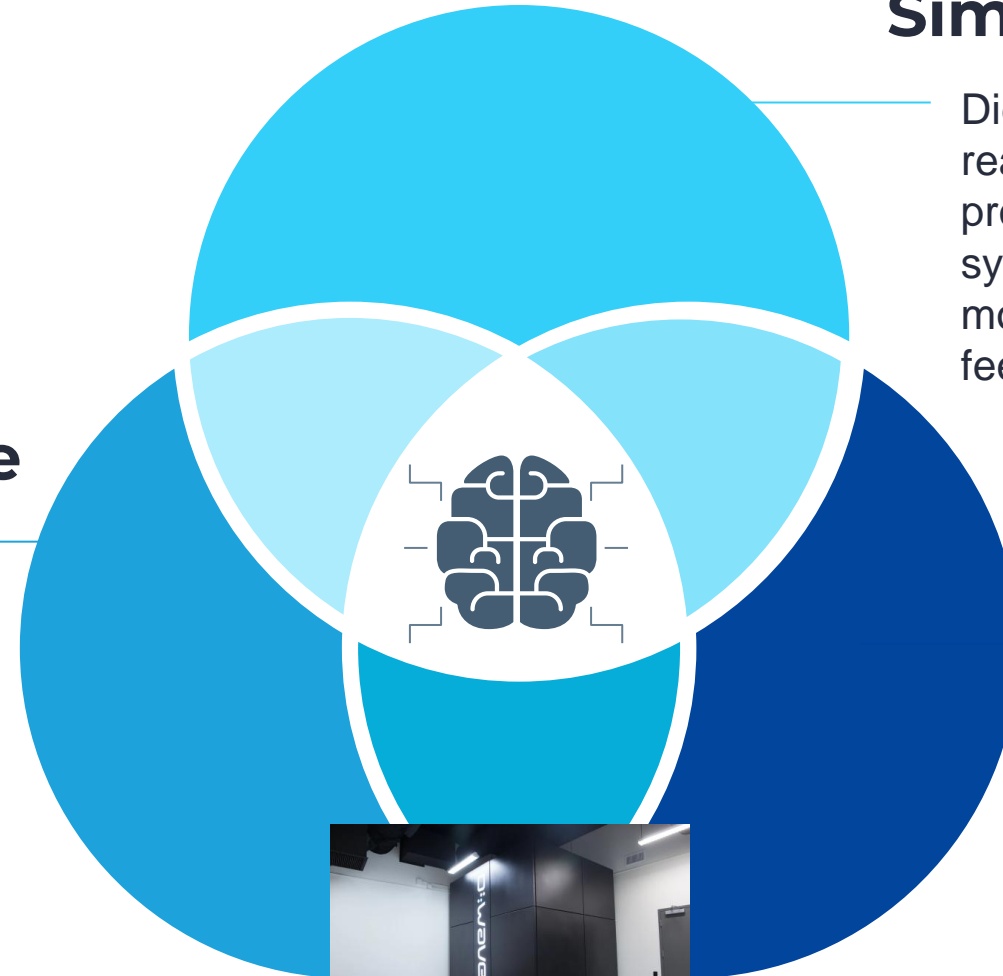


### Simulation Tech

Digital Twins. Models of real-world objects, processes, people, and systems. Including 3D models, and real-time data feeds.

### Knowledge Graph

Domain specific data maps, linked by relevance, semantically meaningful, and accessible to AI.



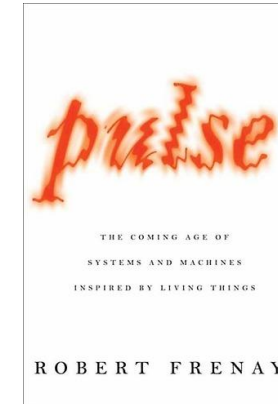
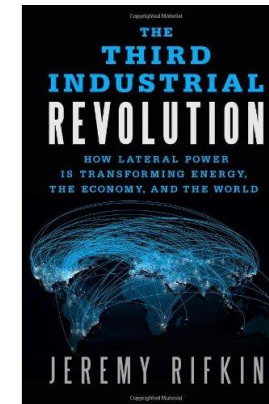
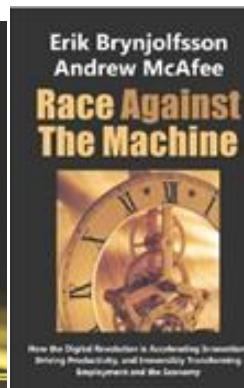
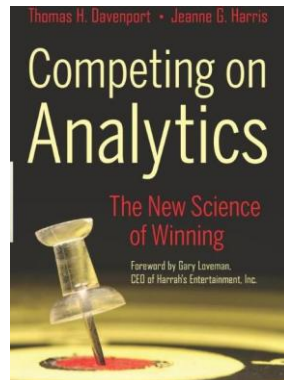
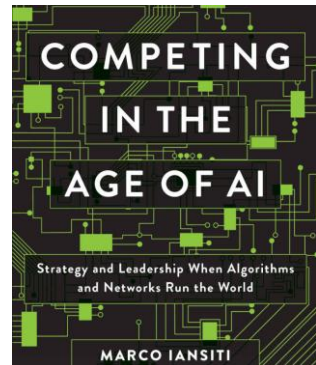
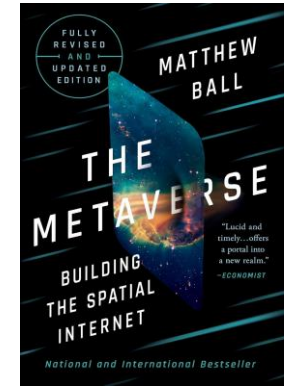
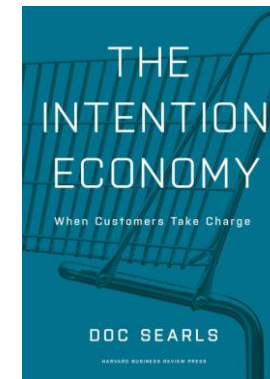
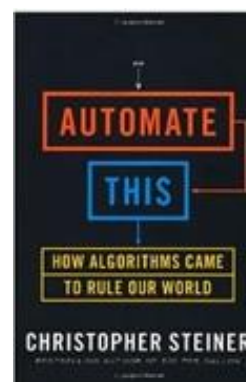
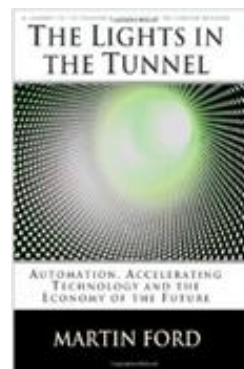
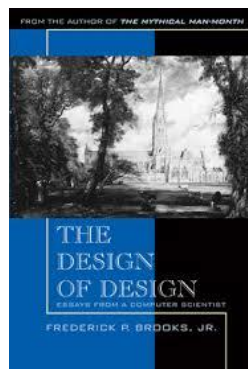
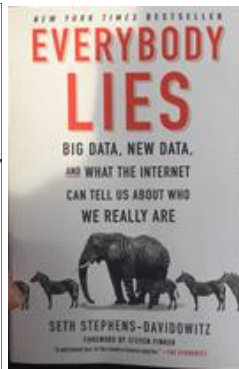
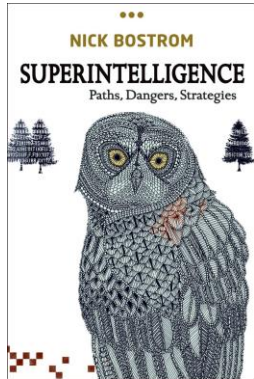
### Artificial Intelligence

Machine learning, including LLMs, state machines, neural nets, Decision and Behavior Trees, and other automation routines.



# Suggested Reading

## Before it's too late



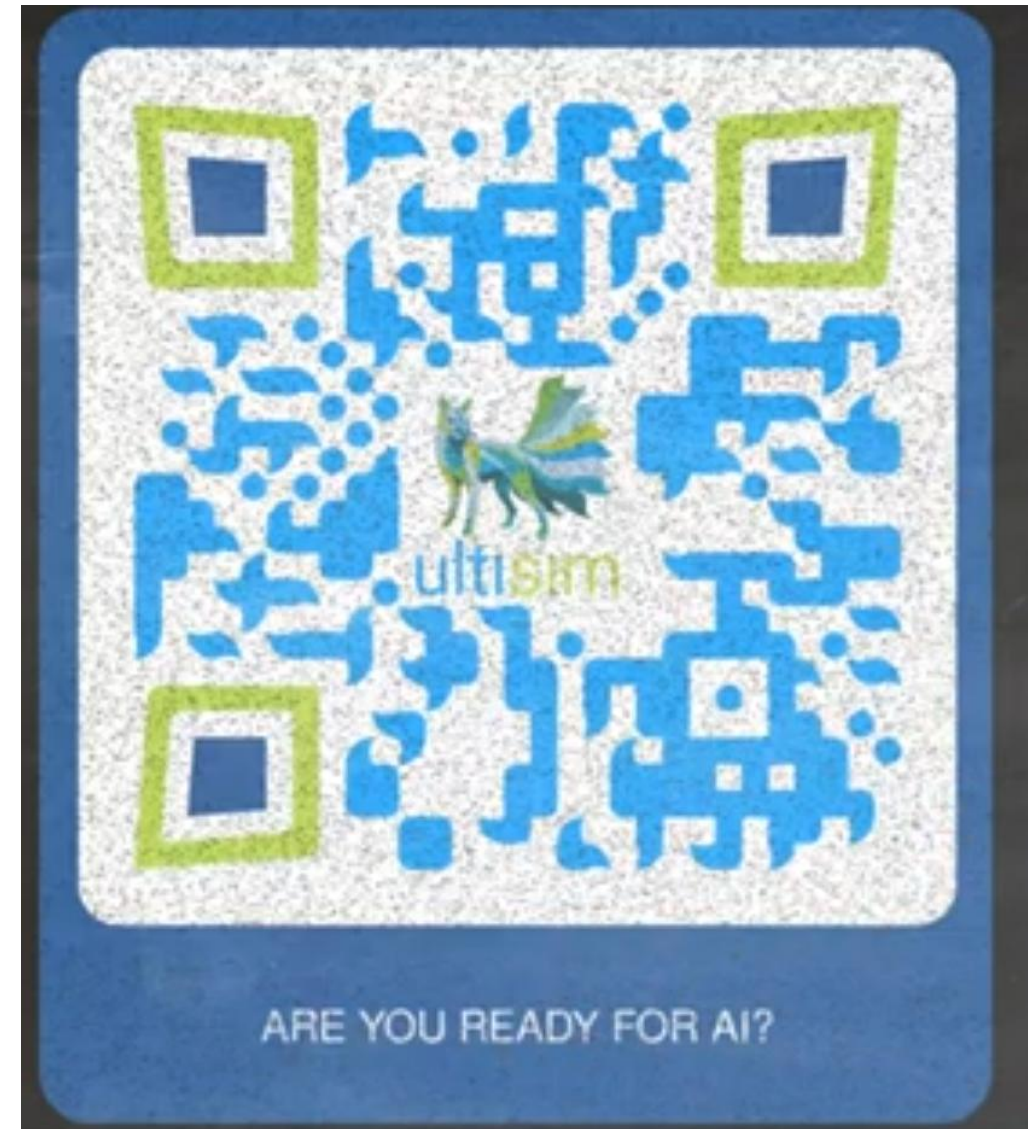
(x): @Metaversial Email: [Richard.Boyd@Ultisim.com](mailto:Richard.Boyd@Ultisim.com)

# The Simulation Century

**The Future is Already Here  
It's just unevenly distributed**



“Perspective is worth 80 IQ points.”  
-Alan Kay



[https://youtu.be/e\\_WQ0EMYpSo](https://youtu.be/e_WQ0EMYpSo)

Richard Boyd  
[Richard.Boyd@UltiSim.com](mailto:Richard.Boyd@UltiSim.com)

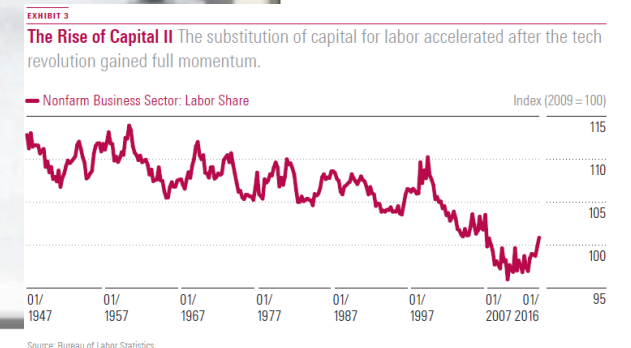


# The Factory of the Future

Lockheed Martin produced animation for High School Students  
About Automation, 3D Printing, Nanotechnology and Molecular Manufacturing



[https://youtu.be/8uzq\\_A8skhs](https://youtu.be/8uzq_A8skhs)





# Articles by the presenter

- <https://medium.com/authority-magazine/makers-of-the-metaverse-richard-boyd-of-ultisim-and-tanjo-ai-on-the-future-of-the-vr-ar-mixed-8029cddd3c7d>

## [Manufacturing in the Simulation Century:](#)

<https://www.thefabricator.com/thefabricator/article/cadcamsoftware/the-metal-fabricator-and-the-metaverse>

<https://www.designnews.com/artificial-intelligence/i-prompt-therefore-i-am-role-designer-age-generative-ai>

<https://www.designnews.com/design-engineering/the-future-is-now-redefining-our-world-in-the-simulation-century>

<https://www.automation.com/en-us/articles/september-2023/ultisim-ceo-fabtech-2023-embrace-digital-twins>

- Supercorr keynote <https://www.youtube.com/watch?v=gFePZocwKqU>
- <https://www.designnews.com/artificial-intelligence/ai-and-ar-vr-expert-says-don-t-leave-humans-behind>
- <https://www.youtube.com/watch?v=dN2aTTw9SLk> The Simulation Century
- <https://coffeeforthebrain.com/114/>
- <https://www.wral.com/video/business/video/7130903/>
- <https://youtu.be/thUtfunJa-s?si=IYB58QGH3SWqIZGG>

## [Healthcare in the Simulation Century](#)

- National surgical conference invited speaker.
  - <https://www.sages.org/video/game-engines-vr-surgery/>
- See this site for my one hour keynote at the HIMSS 2011 conference
  - <http://www.openaffairs.tv/2011/02/richard-boyd-chief-architect-for-lockheed-martin-virtual-world-labs/>
- Comments at mHealth in 2011
  - <http://www.youtube.com/watch?v=ZpOfROC46yI>

Boyd, Richard and Rob Szczerba. "SuperHuman Healthcare", *Intelligent Hospital Today*, (September, 2012)

- <http://intelligenthospitaltoday.com/?p=721#comment-299>

Boyd, Richard. "The Simulation Prescription for Healthcare" Proceedings of the 2012 Cardio-Thoracic Surgery Symposium, San Diego, CA (February, 2012)

- <http://www.crefmeeting.com/images/Slides2012/CREF12BoydSlides.pdf>
- <https://medium.com/authority-magazine/health-tech-richard-boyd-of-3dvillage-on-how-their-technology-can-make-an-important-impact-on-our-2ef7e168683>

# Additional references

- [Education in the Simulation Century](#)
- <https://www.gettingsmart.com/2013/03/20/superhuman-education/>
- <https://www.gettingsmart.com/2016/04/16/rethinking-education-from-first-principles/>
- <https://youtu.be/hmBnFBOF20A?si=CvHugYEAwf5sPw5Z> Short Sims and Education
- Metaversial Minute with Marc Prensky (Digital Natives) <https://www.youtube.com/watch?v=NMih7pNn26s&t=1441s>
- <https://medium.com/@linda.bernard/the-simulation-century-the-transformative-power-of-3d-simulation-learning-in-k-12-education-57c9ad6fa99a>
- [https://usasciencefestival.org/wp-content/uploads/2017/04/TURN-INTO-PDF-Nifty-Fifty-and-X-STEM-Speakers\\_ALL.pdf](https://usasciencefestival.org/wp-content/uploads/2017/04/TURN-INTO-PDF-Nifty-Fifty-and-X-STEM-Speakers_ALL.pdf)
- <https://www.businesswire.com/news/home/20120306006168/en/USA-Science-Engineering-Festival-Announces-Nifty-Fifty-Program-Top-Scientists-and-Engineers-Will-Tell-Their-Stories-in-DC-Area-Schools>
- <https://spacenews.com/lockheed-martin-on-board-as-key-sponsor-for-inaugural-san-diego-science-festival/>
- Eisenhower Foundation <https://efworld.cventevents.com/event/c5f314fe-0191-4014-bd71-d545c784ffa9/websitePage:0ad8bea3-7b80-46a6-b820-f1b155f3727c>
- <https://podcasters.spotify.com/pod/show/tanjo/episodes/An-ARPA-for-Education-with-Richard-Boyd-erddd>
- <https://podcasters.spotify.com/pod/show/tanjo/episodes/Information-Warfare--Education-and-Pandemics-Zoom-Salon-euspva>
  - Are you ready for AI? [https://www.youtube.com/watch?v=e\\_WQ0EMYpSo](https://www.youtube.com/watch?v=e_WQ0EMYpSo)
  - <https://coruzant.com/profiles/richard-boyd/> podcast
- <https://www.insivia.com/founder-interviews/richard-boyd-ceo-founder-of-tanjo/> Video interview
- [Tanjo's Animated Personas Are Like Sim Characters for Market Researchers – Hypepotamus](#)
- [Inside Artificial Intelligence's disruptive power: From marketing to resurrection of characters, singularity, more | WRAL TechWire](#)
- [114: Richard Boyd of Tanjo | Coffee For The Brain](#)
- [CONVERGE Medellín: Meet Richard Boyd | Globant Blog](#)
- [Tech Founder Interview: Richard Boyd @ TANJO – YouTube](#)
- [Tanjo - Richard Boyd, CEO of Tanjo, facilitated a... | Facebook](#)
- [3D, and how AI and ML can Ignite Bold Change - Jan Cavelle](#)
  - Richard Boyd "Truth Teller" [https://issuu.com/businessnc/docs/bnc\\_sept2020](https://issuu.com/businessnc/docs/bnc_sept2020)
  - <https://medium.com/authority-magazine/the-future-is-now-artificial-intelligence-with-empathy-ba2395f0b27d>
  - <https://www.dell.com/nl-be/perspectives/will-the-metaverse-meet-the-megahype/>