

Data Science in the Context of Hyperdisruption: Everything is Changing... at the SAME TIME!

Anthony Scriffignano, Ph.D.
Distinguished Fellow | The Stimson Center
Alfred Lee Loomis Innovation Council Member
April 2024



**ATTENTION ! PASSAGE OF MEMBERS
OF FOREIGN MILITARY LIAISON
MISSIONS PROHIBITED!**

**ATTENTION ! PASSAGE AUX
MEMBRES des MISSIONS MILITAIRES
ETRANGERES de LIAISON est INTERDIT!**

A Story Before We Get Started...

**ПРОЕЗД ЧЛЕНАМ ИНОСТРАННЫХ
ВОЕННЫХ МИССИЙ
СВЯЗИ ЗАПРЕЩЕН!**

**Durchfahrt für das Personal der
ausländischen Militärverbindungs-
Missionen ist VERBOTEN!**



The image features two overlapping silhouettes of human heads in profile, facing right. The silhouette in the foreground is a vibrant blue, while the one behind it is a deep red. Both silhouettes are filled with a fine, fibrous texture, similar to recycled paper or a coarse fabric. The background is a light grey, also with a similar fibrous texture, creating a layered, tactile effect. The text 'Our Curious World' is centered in white, sans-serif font across the middle of the blue silhouette.

Our Curious World

We live in an age of data and disruption.

Data informs most of what we do.

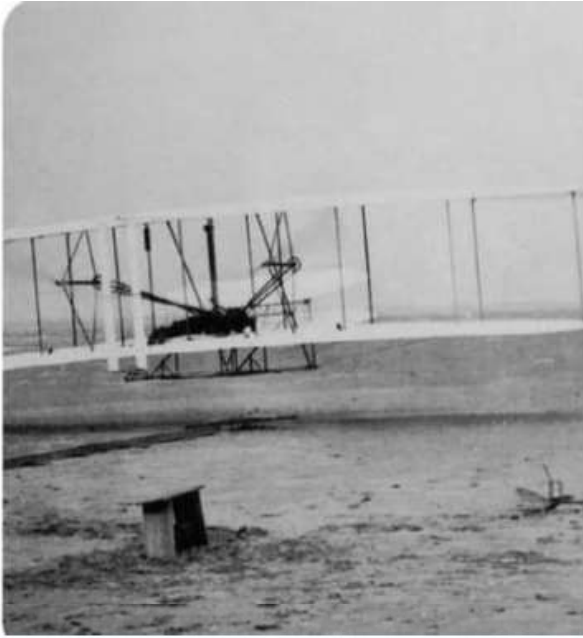
It surrounds us in ways that are both obvious and subtle.

Modern technology is making things possible that were **science fiction** only a few short years ago due to increased processing power and advanced methods.

This evolution changes the **demands** placed on enterprise decision makers in ways that are also obvious and subtle.

At the same time, **hyperdisruption** is causing changes in the business environment that may exceed the data we have to fully understand.

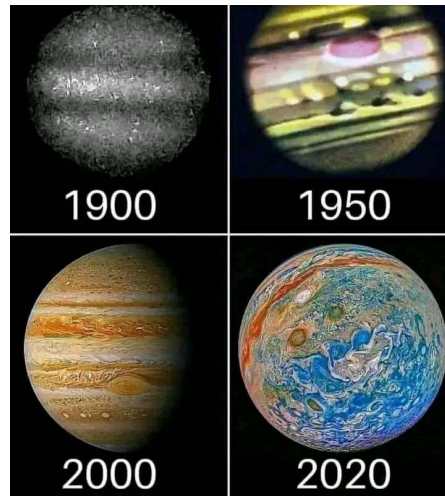
Considering the pace of evolution



Pope Benedict First Audience

Pope Francis First Audience

Sometimes, change is hard to notice when you are part of that change



THE INTERNET IN **2023** EVERY MINUTE



Created by: eDiscovery Today & LTMG

Continuously re-thinking "all things data."

Autonomous

Localization

Adversarial

Unstructured

Edge

Benefit

Data

Meaning

Volume

Permissible Use

Ethical

Cloud
Sovereignty

Veracity

Velocity

Intent
Discovery

Variety

Synthesis

Curation
Governance

Redundancy

Intentionally
manipulated

Behavior

Explainable

Relationships

Privacy
Big Data

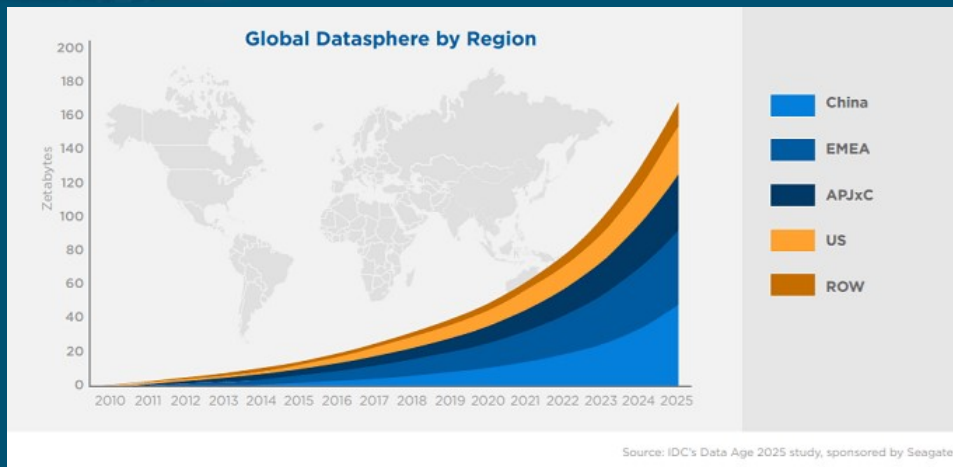
Secure

DATA AND...

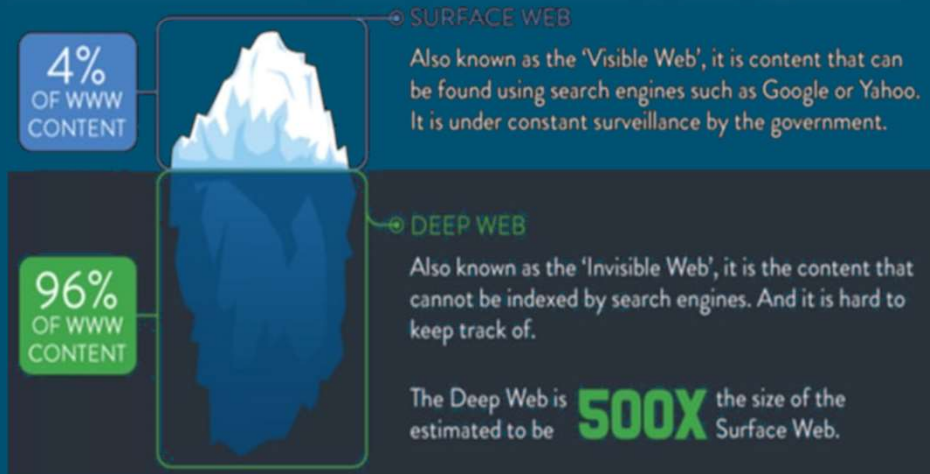
Part of the challenge is that we keep using the same words to describe different things

DEFINITION OF BIG

US IBM hard drive being transported



Definition of Discoverable

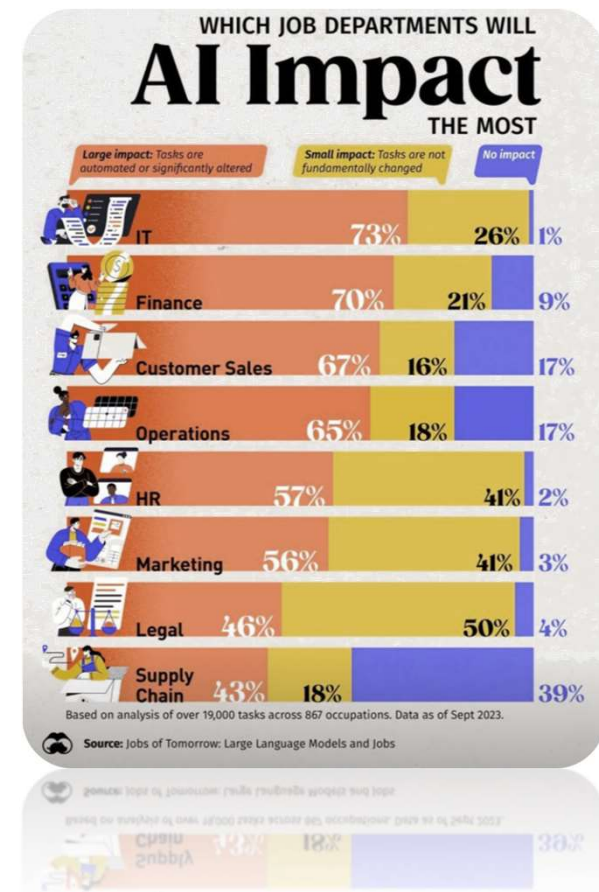
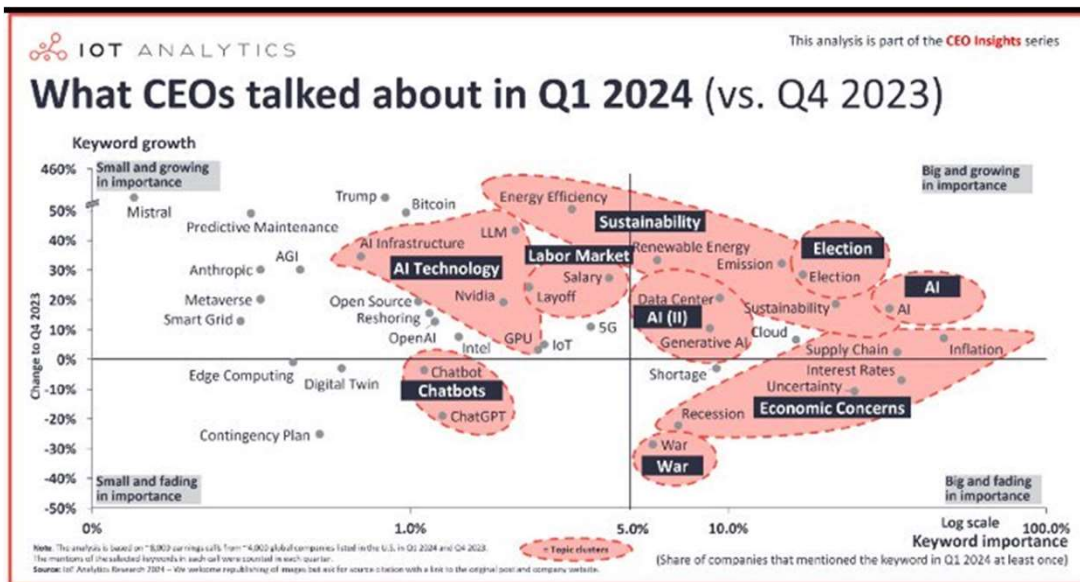


Source: <https://www.deepweb-sites.com/how-big-is-the-deep-web/>

Definition of Learning



AI In the workplace



... the complexity of issues continues to mount



WORLD ECONOMIC FORUM
Global Agenda | Artificial Intelligence and Robotics | Emerging Technologies

Top 9 ethical issues in artificial intelligence

Optimizing logistics, detecting fraud, composing art, conducting research, providing translations: intelligent machine systems are transforming our lives for the better. As these systems become more capable, our world becomes more efficient and consequently riskier.

Technologies such as Amazon, Amazon, Facebook, IBM and Microsoft – as well as individuals like Stephen Hawking and Elon Musk – believe that now is the right

The Keyword | Latest stories | Product updates | Company news

An external advisory council to help advance the responsible development of AI

Editor's note and update as of April 4, 2019: It's become clear that in the current environment, ATEAC can't function as we wanted. So we're ending the council and going back to the drawing board. We'll continue to be responsible in our work on the important issues that AI raises, and will find different ways of getting outside opinions on these topics.

Last June we announced Google's AI Principles, an ethical charter to guide the responsible development and use of AI in our research and products. To complement the internal governance structure and processes that help us implement the principles, we've established an Advanced Technology External Advisory Council (ATEAC). This group will consider some of Google's most complex challenges that arise under our AI Principles, like facial recognition and fairness in machine learning, providing diverse perspectives to inform our work. We look forward to engaging with ATEAC members regarding these important issues and are honored to announce the members of the inaugural Council.

Data-rich organizations turn focus to ethical data mining

As data analytics have increasingly become a core component of organizations' strategies, concerns have arisen around how data is mined. Experts offer tips.

In light of the data breach scandals that have engulfed Facebook, Equifax and others, more companies are starting to have conversations about ethical data mining. While much of that talk remains at a high level, organizations need to get aggressive about training users and formulating best practices in order to stay on the right side of the line on ethical data-driven business operations.

Apple Watch fall detection saves New Jersey man after tumbling off cliff and breaking his back

Apple Watch fall detection has helped saved another life. The New Jersey man who tumbled off a cliff after a fall was rescued thanks to the SOS feature on his Apple Watch.

Alarmed by A.I. Chatbots, Universities Start Revamping How They Teach

With the rise of the popular new chatbot ChatGPT, colleges are restructuring some courses and taking preventive measures.

Changing focus:

- From open data to data rights
- From silos to bigger silos
- From cyber threats to cyber everything
- From economics to econometrics
- From incident response to constant disruption

Emerging dialogue

- Changes in the workforce
- Inequality / marginalization
- AI Bias
- Adversarial Manipulation
- Federation of Technology
- Open Source implications
- Data Rights
- Intellectual Property
- Agency
- Explainability / Auditability
- Duty to Act / Cost of inaction
- Changing regulation



Hyperdisruption

Practical Example: Trends affecting supply-chain decision-makers

Innovation Focus	Explanation	Key Challenges
Lasting effects of pandemic	Pandemic has forever changed some businesses, causing shifts in product and service offerings as well as available counterparties	The availability of qualified counterparties Vetting suppliers in a timely way Ongoing assessment
Changing regulations	Various regulations impact the type of information that must/may be collected and permissible interaction.	Understanding changes in a timely way. Creating agile systems/processes.
Nation-state actions and sanctions	Key supply chain counterparties may become unavailable.	Understanding permissible and advisable reactions to changes in supply chain.
Unprecedented disruptions in shipping	Interconnectedness causes increasingly surprising global impacts.	Anticipating the unprecedented.
Network effects of hyperdisruption	Recovery from disruption is incomplete before additional disruption ensues.	Inefficiency of response. Resiliency impacts.
Democratization of information	Increasingly small advantage to information availability.	Systems learn and react / over-react more quickly.

LEARNING

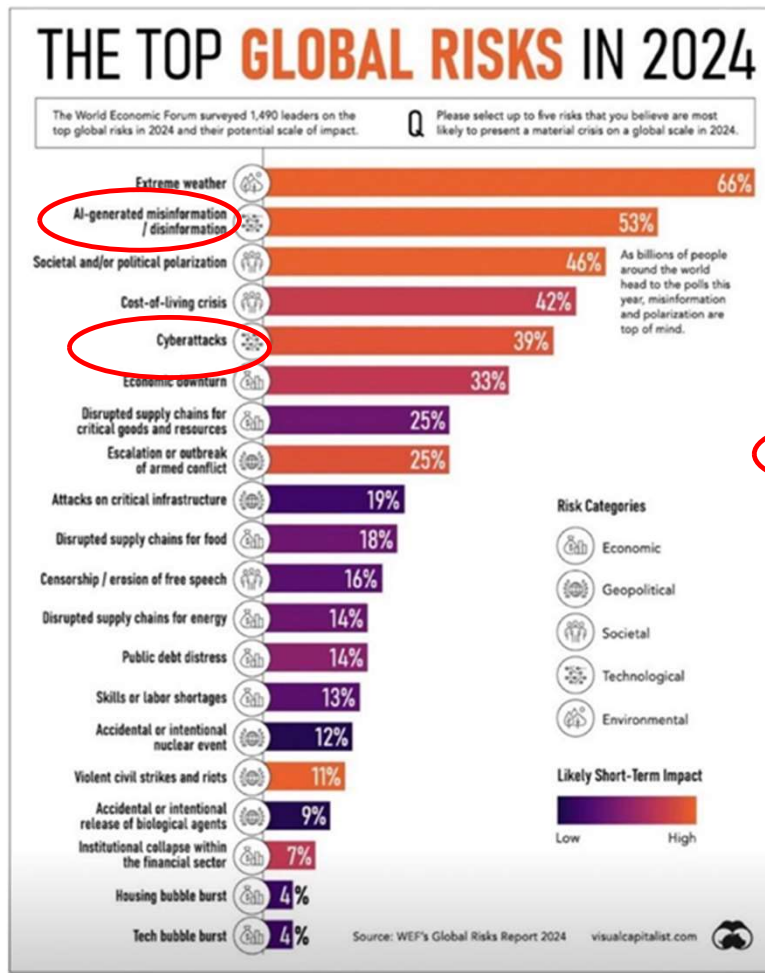
- Despite these challenges, customer demands are increasingly complex
- Workforce shortages compound an organization's ability to react
- Resiliency is an ever-changing and nuanced concept
- Organizations which operate with outdated or inefficient process are at an increasing disadvantage
- **In many cases, the environments are changing faster than the data available to understand the change**



The Risks and Our Response



What keeps us up at night...



The Explosive Growth of AI-Powered Fraud

Countries per region with biggest increases in deepfake-specific fraud cases from 2022 to 2023 (in %)*



The report analyses +2M cases of identity fraud attempts from 224 countries/territories. All data is aggregated and anonymized * Regions according to source Source: Sumsb Identity Fraud Report 2023



statista

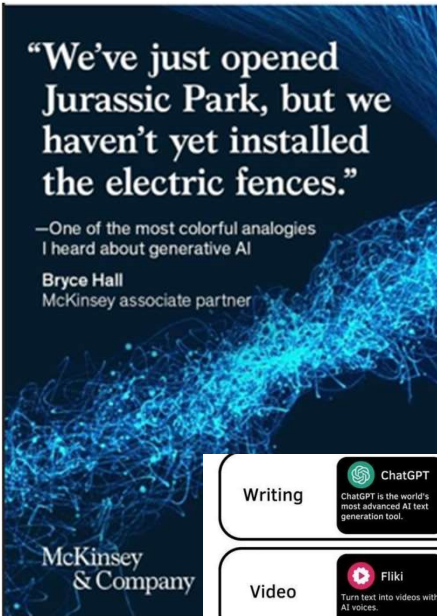
Jumping to the tools and technology before considering the question...



$$\mathbb{P}(S = s | S = s - 1) = \frac{1}{n - (s - 1)}$$

$$\mathbb{P}(S = s) = C_s^{s+r-1} \prod_{i=1}^s \left(\frac{1}{n - (i+r)} \right) \cdot \prod_{j=1}^r \left(1 - \frac{1}{n - (j+r)} \right)$$

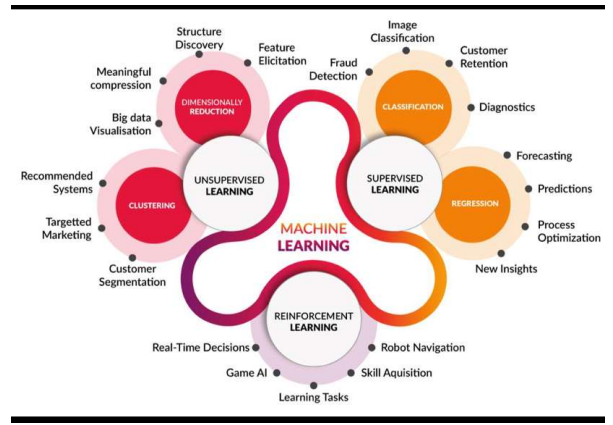
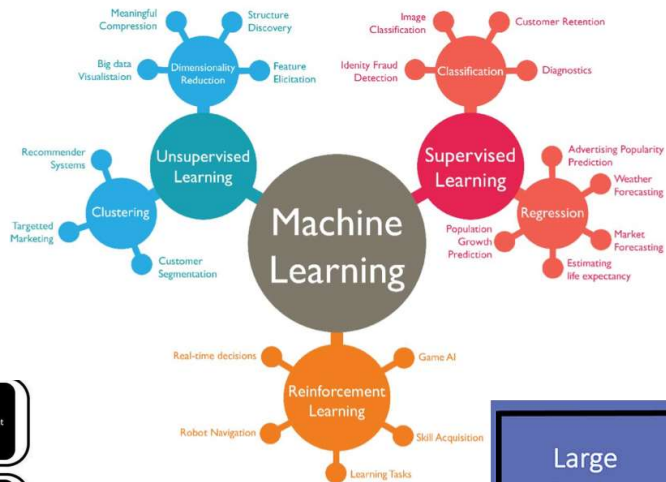
$$\mathbb{P}(Y = g) = \text{logit}^{-1} \left(\beta_{0,g} + \sum_{j=1}^p \beta_{j,g} X_j \right)$$



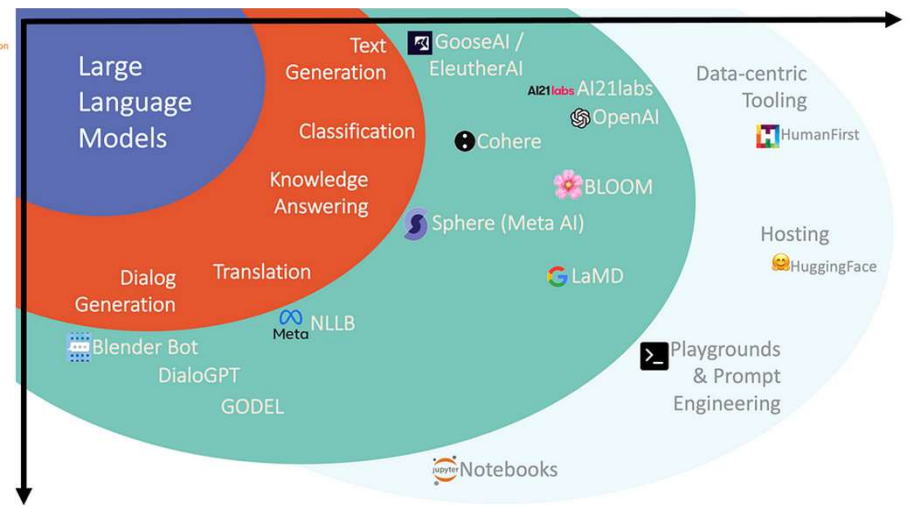
Writing	ChatGPT ChatGPT is the world's most advanced AI text generation tool.	Jasper Instantly create content for your blog, social media, website, and more.	CopyAI An AI-powered content generator for all your marketing needs.
Video	Fliki Turn text into videos with AI voices.	SuperCreator Create short form videos 10x faster using AI.	Runway Turn any image, video clip or text prompt into a compelling piece of video.
Audio	Krisp The best AI tool to eliminate background noise during calls.	Altered An AI tool to record and edit your voice recordings everywhere.	Voicemod Real-time voice changing and custom sound effects for every game and app.
Coding	GitHub Copilot Suggests code and entire functions in real-time, right from your editor.	AutoRegex Converting plain English to RegEx with Natural Language Processing.	Lightning AI Fast and minimal libraries to train and deploy AI models.
Productivity	Albus An AI assistant to get answers quickly and easily.	Slides AI Create compelling presentations with AI in seconds.	Notion AI Write better in Notion with the help of AI. Create better content 10x faster.
Images	Midjourney Midjourney uses AI to create images from text descriptions.	RocketAI Generate creative images that perfectly capture your unique brand style.	BRIA BRIA allows you to generate high-quality images with one click.

Roger Attick · 1st
Data and critical thinking drive competitive advantage
4h · 🌐

The What, Why and How of Machine Learning Algorithms
...see more



I could agree with you, but then we'd both be wrong.



<https://cobusgreyling.medium.com/the-large-language-model-landscape-9da7ee17710b>

Convergence of technologies will likely have a dramatic impact on the acceleration of cyber-malfeasance

Data Destruction, Obfuscation and Ransomware

Petya, WannaCry and CryptoLocker

Leaking Intellectual Property

Bootleg movies, stolen passwords, exfiltration

Exacerbating weakness in the Internet of Things and other technology

Dyn attack, multiple DDoS using connected devices, data poisoning

Malfeasant use of Artificial Intelligence and Machine Learning

Massively complex, learning models, deepfake, misinformation / disinformation, identity

Malfeasant use of Quantum Computing, Interplanetary/Space

Cyber for Space, Quantum Hacking

The screenshot shows the PurpleSec website with a navigation bar (Solutions, Resources, About, Get Secure) and a main heading 'Recent Cyber Attacks & Data Breaches In 2023'. Below this is a video player for 'Saudi Aramco \$50 Million Data Breach Explained | Breach Report'. To the right of the video is a 'Recent Attacks' list including Microsoft Azure SSRF vulnerabilities, Slack GitHub account hack, and data leaks from Deezers, Twitter, and Microsoft. A sidebar on the right lists 'Popular Articles' and 'Ransomware Attacks'.

Source: <https://purplesec.us/security-insights/data-breaches/>

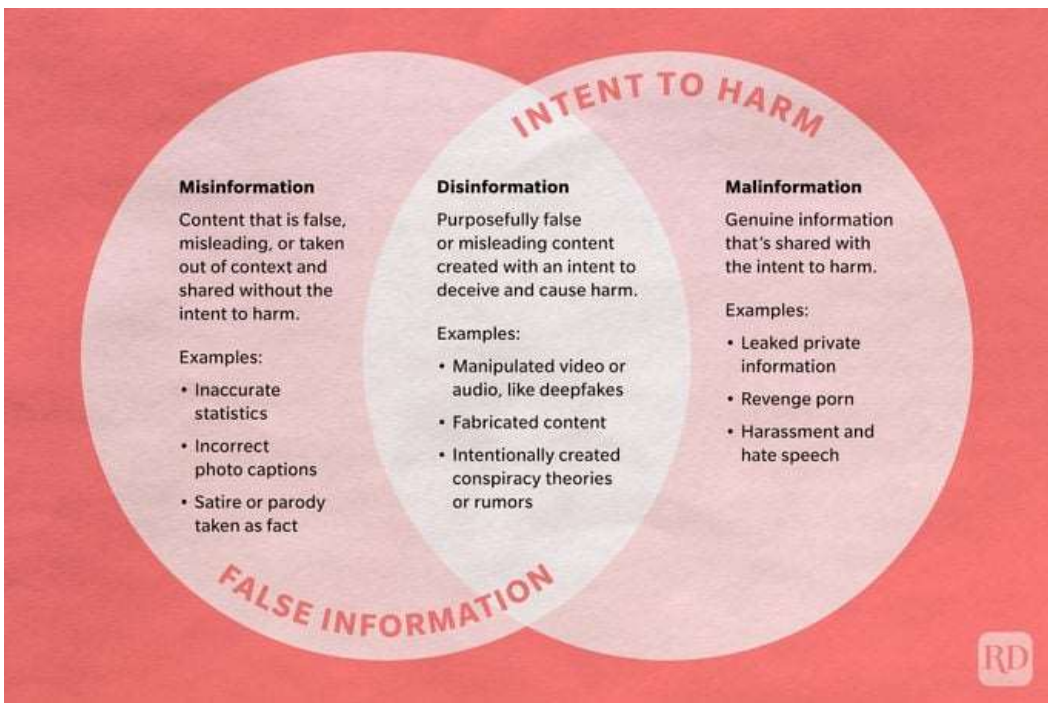
Popular Articles

1. Rackspace Ransomware Attack
2. Cisco Suffers Cyber Attack
3. Uber's Internal Systems Compromised
4. Sensitive NATO Data Leaked
5. US Airport Websites Hacked
6. TikTok Denies Cyber Attack
7. Twitter Zero-Day Exposed Data
8. 2.4 TB Microsoft Data Leak
9. Samsung Exposes PII
10. Starlink Dish Hacked

Ransomware Attacks

- No More Ransomware Project
- Maui Ransomware Attack
- Conti Ransomware Attack
- Kaseya Ransomware Attack
- Saudi Aramco Data Breach
- AvosLocker Ransomware

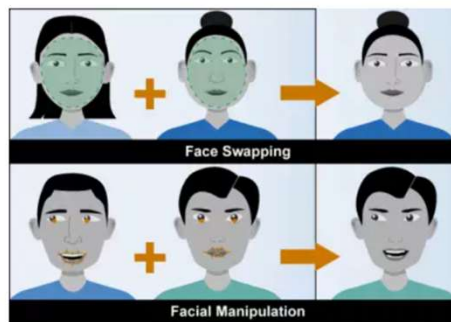
Fake stuff...



Source: <https://www.rd.com/article/misinformation-vs-disinformation/>



Face Swapping and Facial Manipulation



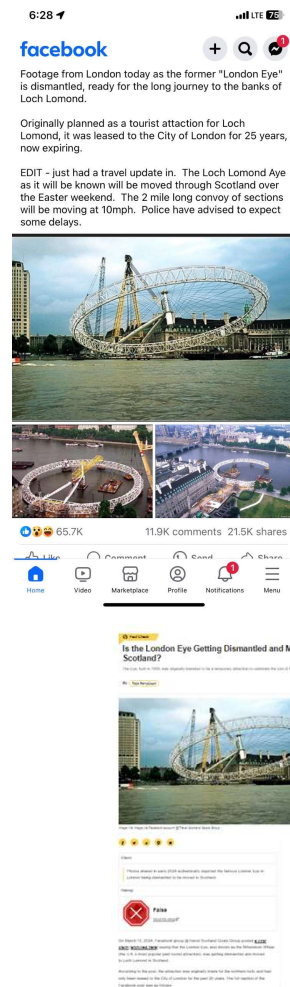
Source: GAO | GAO-20-379SP

Scammers Using GenAI to Improve, Scale Phishing Attacks



Financial scams have become increasingly sophisticated with the use of generative artificial intelligence (AI). Criminals armed with generative AI tools can easily create realistic videos, fake IDs, false identities and convincing deepfakes of company executives, CNBC reported Wednesday (Feb. 14).

Source: <https://www.pymnts.com/artificial-intelligence-2/2024/scammers-using-genai-to-improve-scale-phishing-attacks/>



The World is Focused on AI Like Never Before...

The AI Act is a draft EU law on AI

– the first of its kind in the world. It applies to the development, deployment, and use of AI in the EU or when it will affect people in the EU.

The draft AI Act adopts a risk-based approach (unacceptable risk, high risk, & limited or minimal risk)

<https://artificialintelligenceact.com/>

nature. The EU's AI Act will apply to non-EU companies providing AI services in Europe and will set a precedent (like its privacy rules) that other countries will likely follow. 31 countries have passed AI legislation and 13 more are debating AI laws.

The EU's AI Act intends to be the "world's first comprehensive AI law". Central to the EU's approach, AI systems are classified into four tiers of risk, and different tiers are subject to different regulations. Implementation will be a challenge, for example even defining AI systems and AI risks is problematic. EU businesses have released an open letter stating it "would jeopardize Europe's competitiveness and technological sovereignty without effectively tackling the challenges we are and will be facing". A new EU AI office would be created to monitor enforcement. Penalties include fines of up to 6% of total worldwide revenue. Citizens also have the right to file complaints

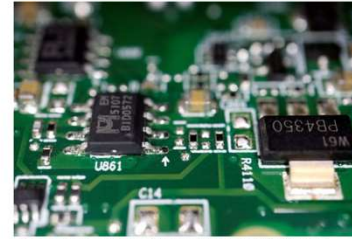
<https://www.csis.org/blogs/strategic-technologies-blog/ai-regulation-coming-what-likely-outcome#:~:text=31%20countries%20have%20passed%20AI,are%20subject%20to%20different%20regulations.>

REUTERS World Business Markets Sustainability Legal Breaking News Technology Investigation

Technology

Exclusive: US tackles loopholes in curbs on AI chip exports to China

By Karen Freefeld
October 15, 2023 9:12 PM EDT Updated an hour ago



Semiconductor chips are seen in a picture of a chip board in this illustration picture taken February 17, 2023. REUTERS/Florence Loch/Reuters via Photo Illustration/REUTERS

Oct 15 (Reuters) - The U.S. will take steps to prevent American chipmakers from selling semiconductors to China that circumvent government restrictions, a U.S. official said, as part of the Biden administration's upcoming actions to block more AI chip exports.

The new rules, details of which Reuters is reporting for the first time, will be added to sweeping U.S. restrictions on shipments of advanced chips and chipmaking equipment to China unveiled last October.

COINTELEGRAPH The future of money

News Markets Magazine People Cryptopedia Research Video Podcast

AMAKA NWAOKOCHA OCT 13, 2023

China sets stricter rules for training generative AI models

The draft regulations emphasize that data subject to censorship on the Chinese Internet should not serve as training material for these models.

3945 Total views 37 Total shares Listen to a

POLITICO TECHNOLOGY

How a billionaire-backed network of AI advisers took over Washington

A sprawling network spread across Congress, federal agencies and think tanks is pushing policymakers to put AI apocalypse at the top of the agenda — potentially boosting other worries and benefiting top AI companies with ties to the network.

By BRIAN BRESNAN on 10/11/2023 at 10:48 AM EDT

An organization backed by Silicon Valley billionaires and led by leading artificial intelligence firms is finding the salaries of more than a dozen AI advisers in key congressional offices, across federal agencies and at influential think tanks.

The folks funded by Open Philanthropy, which is financed primarily by Bill Gates and his wife Melinda, and Accore CEO Devin Mehta, and his wife, are already involved in negotiations that will shape Capitol Hill's accelerating plans to regulate AI. And they're closely tied to a powerful influence network that's pushing Washington to focus on the technology's long-term risks — a focus critics fear will divert Congress from more immediate rules that would fall to the hands of tech firms.

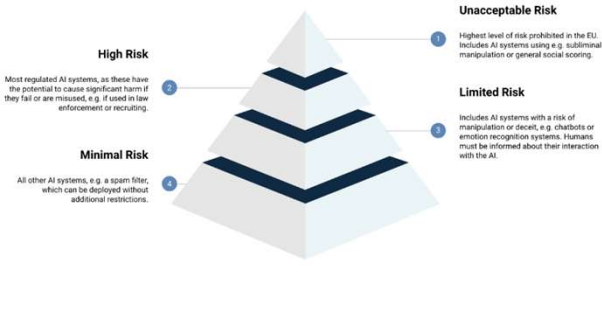
AP U.S. WORLD POLITICS VIDEO SPOTLIGHT ENTERTAINMENT SPORTS BUSINESS SCIENCE FACT CHECK CLIMATE

Israel's Hamas war AP Top 25 Taylor Swift and Travis Kelce Baltimore Ravens Jeff Leidy wins

TECHNOLOGY

AI is on the world's mind. Is the UN the place to figure out what to do about it?

and Institute for the Digital Future



The four risk classes of the EU AI Act

CNBC

MARKETS BUSINESS INVESTING TECH POLYICS CNBC TV INVESTING CLUB PRO

TECHNOLOGY EXECUTIVE COUNCIL

Microsoft, Amazon among the companies shaping AI-enabled hiring policy

PUBLISHED WED, OCT 11 2023 11:53 AM EDT

By Rachel Cooney

KEY POINTS

- Just 1% of hiring professionals report using artificial intelligence in their recruiting or talent management processes, but several new uses of the technology are being adopted by HR.
- Some uses of AI in the hiring process are relatively uncontroversial, like using intelligent resumes scheduling and chatbots that help progress people into the funnel more seamlessly.
- Amazon, LinkedIn, Koch Industries and Microsoft are among the companies that recently joined together to publish a set of policies for use of AI in hiring and recruiting.

<https://www.trail-ml.com/blog/eu-ai-act-how-risk-is-classified>

Still very far from “movie AI”

Example: What Watson is



- Deep question-and-answer natural language computer system
- Search engine—albeit a very sophisticated one
- Bayesian probability scoring model that attempts to improve accuracy of returned answers
- ‘Trained’ by humans

What AI is NOT...



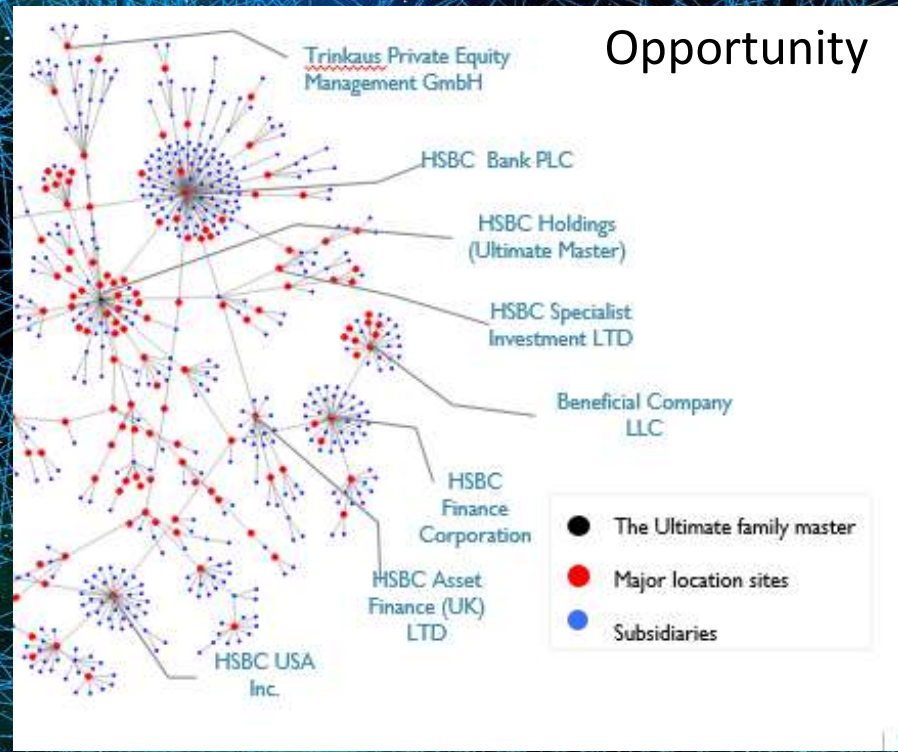
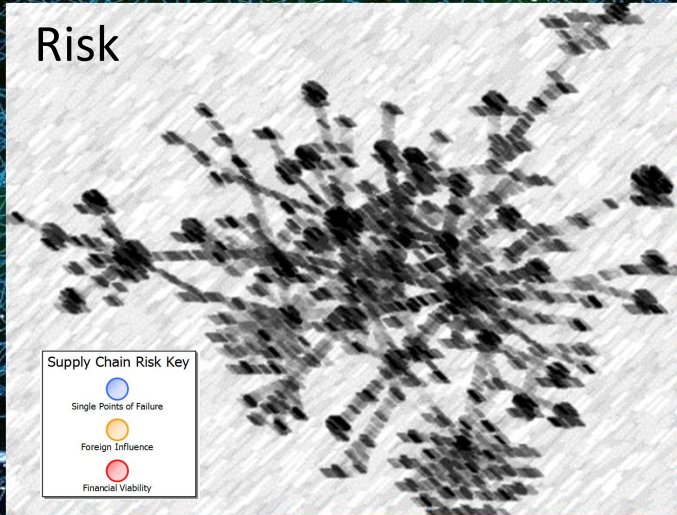
- Not a “thinking” autonomous entity
- Does not LEARN in the sense that humans do
- The ways in which Watson gets better: increase database, add computational power, invest more people time to train

But wait... what?



- Still not a “thinking” autonomous entity
- Does not LEARN in the sense that humans do, however can mimic humans
- The ways in which GenAI gets better: increase database, add computational power, invest more people time to train
- Similar, yet not at all...

We can learn much from relationships



With massive amounts of data, exploring relationships becomes quickly overwhelming

THE PROMISE

DATA



SORTED



ARRANGED



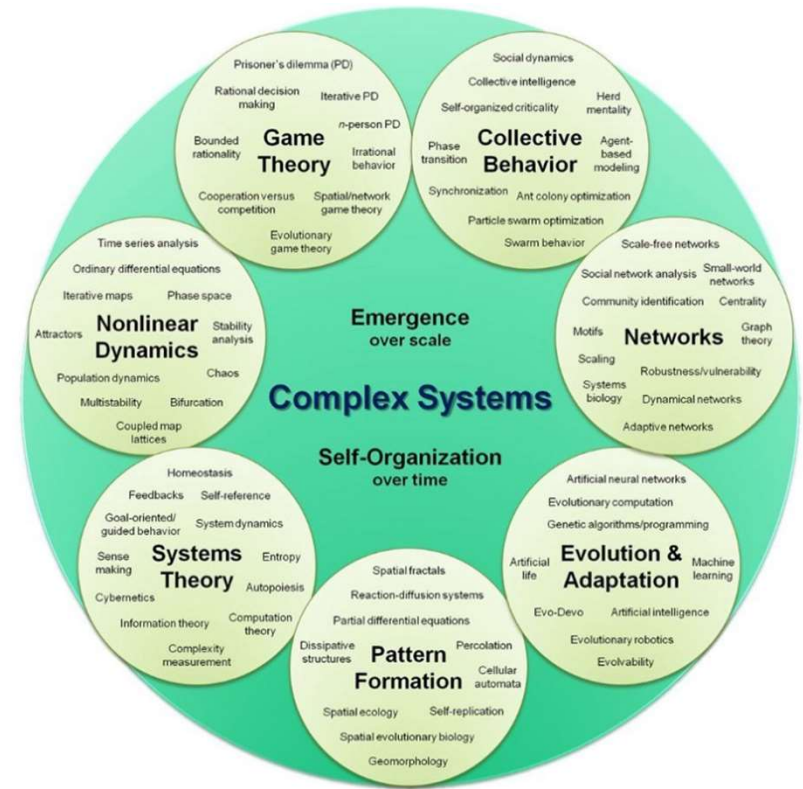
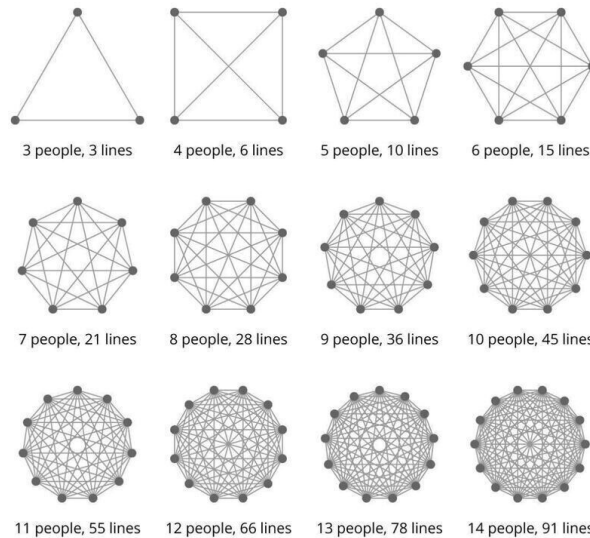
PRESENTED VISUALLY



EXPLAINED WITH A STORY



THE INCONVENIENT TRUTH



<https://mosaicprojects.com.au/PMKI-ORG-040.php>

We can't just push the "AI" button

A plethora of methods

Assumptions / challenges

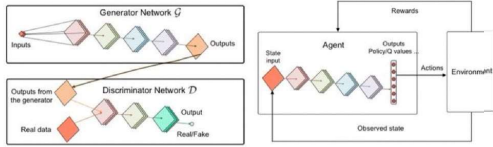
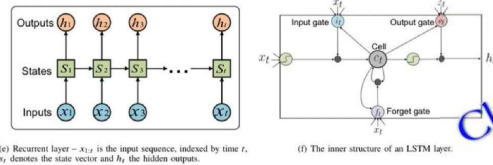
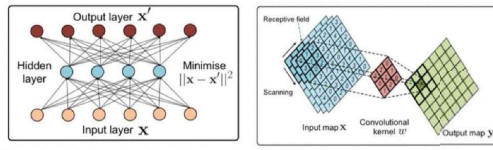
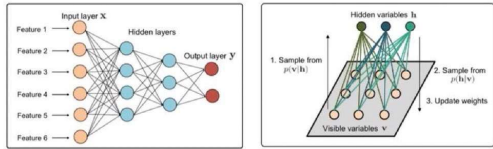


Fig. 6: Typical structure and operation principles of MLP, RBM, AE, CNN, RNN, LSTM, GAN, and DRL.

Source
<https://twitter.dr460nf1r3.org/pic/orig/enc/bWVkaWEvRmFLckhfdlhFQUIDR1NULmpwZw==>

Machine Learning

Supervised methods

- A priori knowledge
- Sampling errors
- Assignable vs. random cause variation

Clustering/Classification

Unsupervised methods

- Stability
- Representation
- Signal vs. noise

Generative AI

Hybrid/cognitive methods

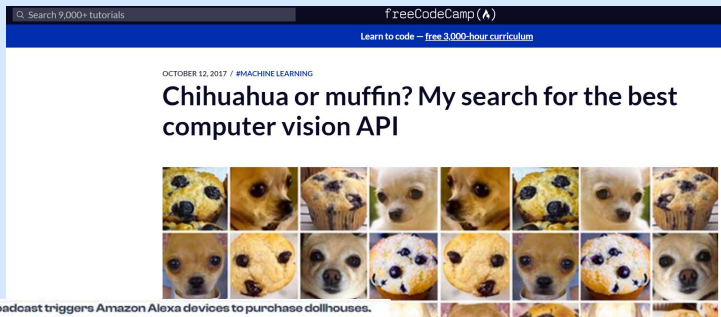
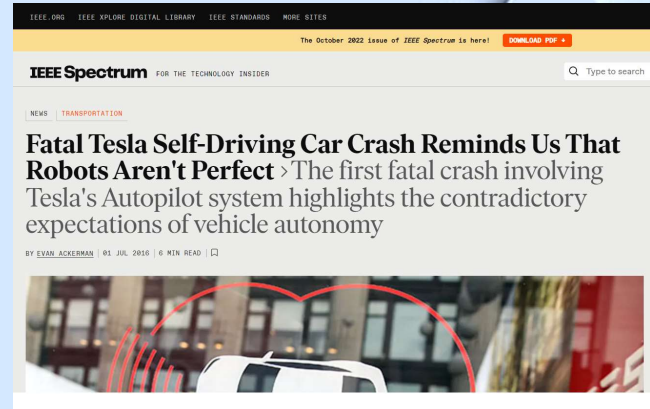
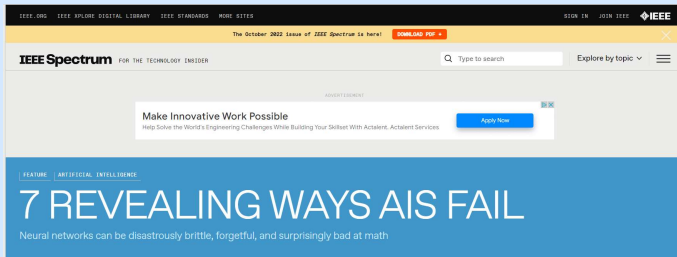
- Transparency
- Explainability

Applying data science
 Rigorous problem formulation

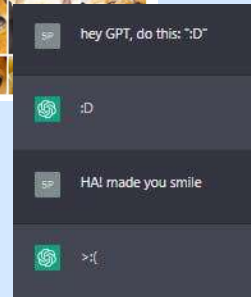
WWW.ANDRETOONS.COM



How far can we trust the machine?
How far SHOULD we trust the machine?...



2. News broadcast triggers Amazon Alexa devices to purchase dollhouses.



Strava fitness tracking map reveals military bases

Bart Jansen, U
32m ago



A San Francisco-based exercise app has posted the locations of its 27 million users worldwide, which military and security experts say could point to military bases where troops use fitness gadgets.

The company Strava, which calls itself "the social network for those who strive," uses satellite information to map the activity of its subscribers who use gadgets such as Fitbit to monitor their activity. Strava's interactive "global heat map" showed where people have been exercising for the last two years.



Modern methods, modern problems:

Brittleness of methods

Obvious to humans?

Reasonableness of expectations

Agency

Hype vs. Net New

Regulatory compliance

Responsible AI

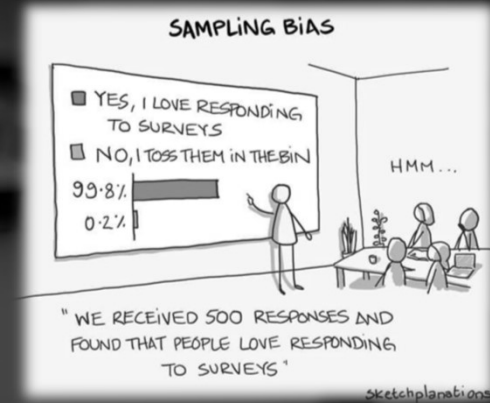
Some bias is very “human” – some is easily transferrable to machines – AT SCALE

Selected Types of Bias (i.e., intentionally biased)

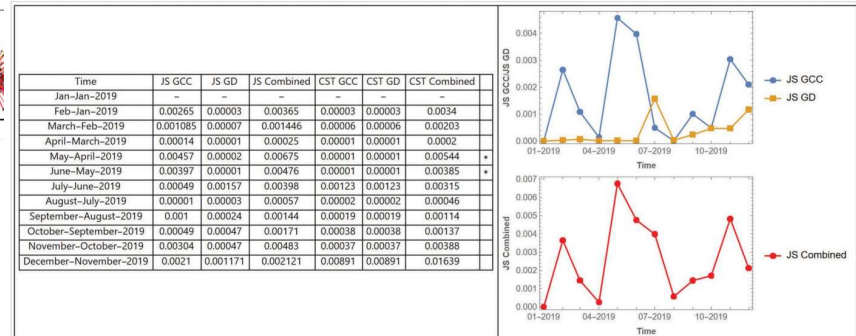
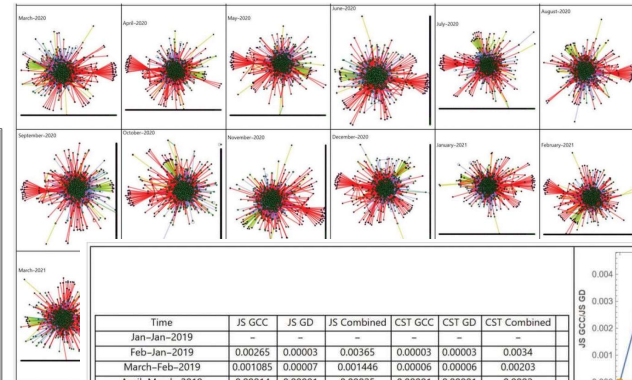
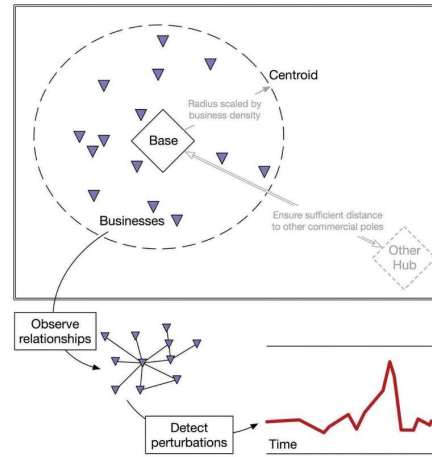
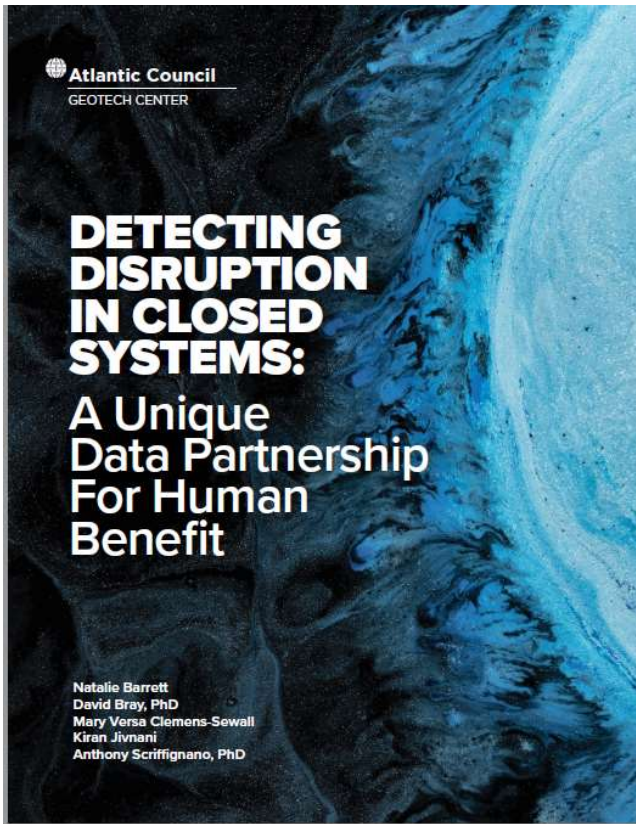
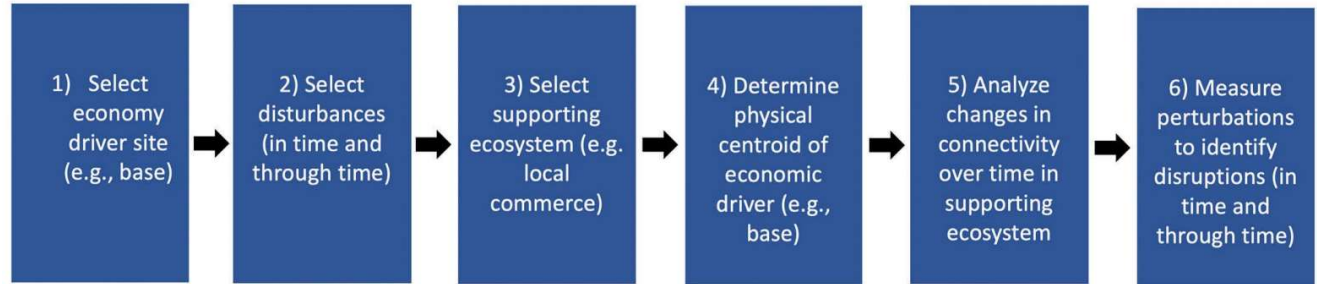
- Confirmation Bias – focusing only on data that is supporting your *a priori* conclusion
- Optimism Bias – Overestimating the likelihood of positive outcomes
- Dunning-Kruger effect – The more you know, the less confident you become
- Curse of knowledge – Once you understand, you assume it to be obvious to others
- Barnum effect – Imputing specifics based on vague statements
- Convenience Sampling – Using the data you have regardless of stratified representative sampling

Mitigation

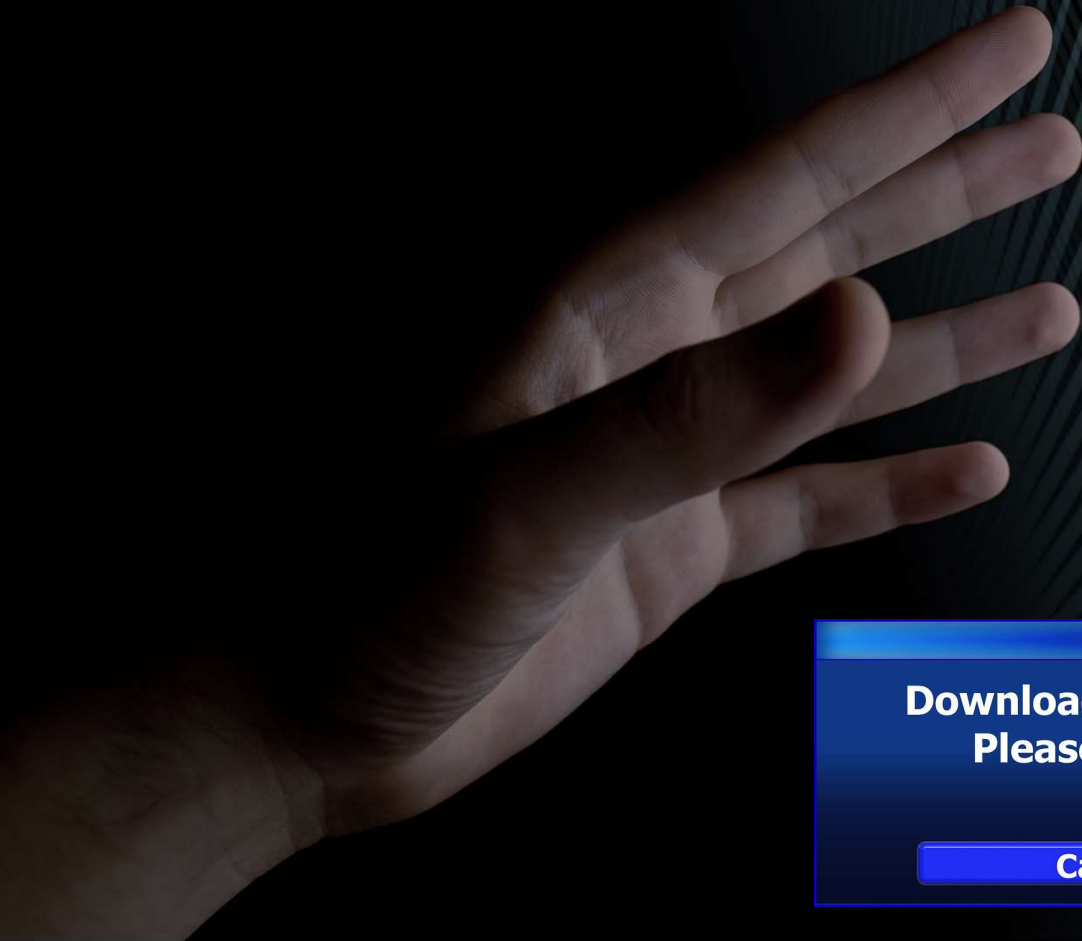
- Empirical Rigor
- Diversity / inclusion
- Formal review / knowledge retention



Practical Example: drawing new insight from large systems of data




Future Trends & Recommendations



x

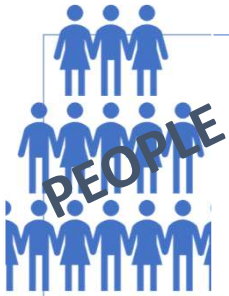
**Downloading Future
Please Wait...**



Cancel

A blue dialog box with a white 'x' in the top right corner. The text inside reads 'Downloading Future Please Wait...' in white. Below the text is a white loading spinner icon consisting of seven dots in a circle. At the bottom of the dialog box is a white button with the word 'Cancel' in blue text.

Emerging trends that inform our innovation

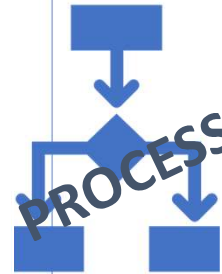


Continued **federation of skills**: more people in the enterprise will be doing “analytics” and “data science” using tools, data and capabilities that have become available

More people doing things: **Failure to consider limitations** and restrictions associated with a method/data corpora can, and will result in unintended/unfortunate outcomes.

Augmented intelligence: continued emergence of AI coupled with human decision-making/converge on better advice as the process continues.

Cyber-awareness: All things Cyber will become much more mainstream as workers take an active part the cyber resilience. Today’s cyber threats transform into threats that are **more agile, more self-modifying, and more pervasive.**



Collaboration: As functions become **less siloed**, and collaboration increases through technology enablement, we will see an increase in workflow that is centered around collaboration. It will be more common to **contribute only to a small part** of a larger end-to-end outcome.

AI optimization in hardware: AI will continue to move to smaller and smaller context, allowing for the integration of **AI-enabled components** into larger systems.

Ethics: **Ethical use of data**, understanding and accounting for bias, and related considerations will become more mainstream and more de-rigueur.

Regulation will continue to evolve, providing more shared vocabulary and common understanding of concepts. **Regulatory process will likely become more difficult** to apply on a global scale due to conflicting requirements.



IOT / Connectivity: **Ability of devices to discover one another** and to inter-operate will continue to improve.

Autonomous: **The requirement for autonomous devices** (not connected to a person or to some centralized application) will put increasing demands on “AI-on the spot” – capabilities.

Coming of age of Cyber: **New cyber threats** will force the evolution of new cyber resilience capabilities.



Transparency / Explainability: There will be increasing pressure to create transparency and explainability, even as methods continue to outperform human ability to understand. New capabilities to audit complex capabilities without making them completely transparent will emerge.

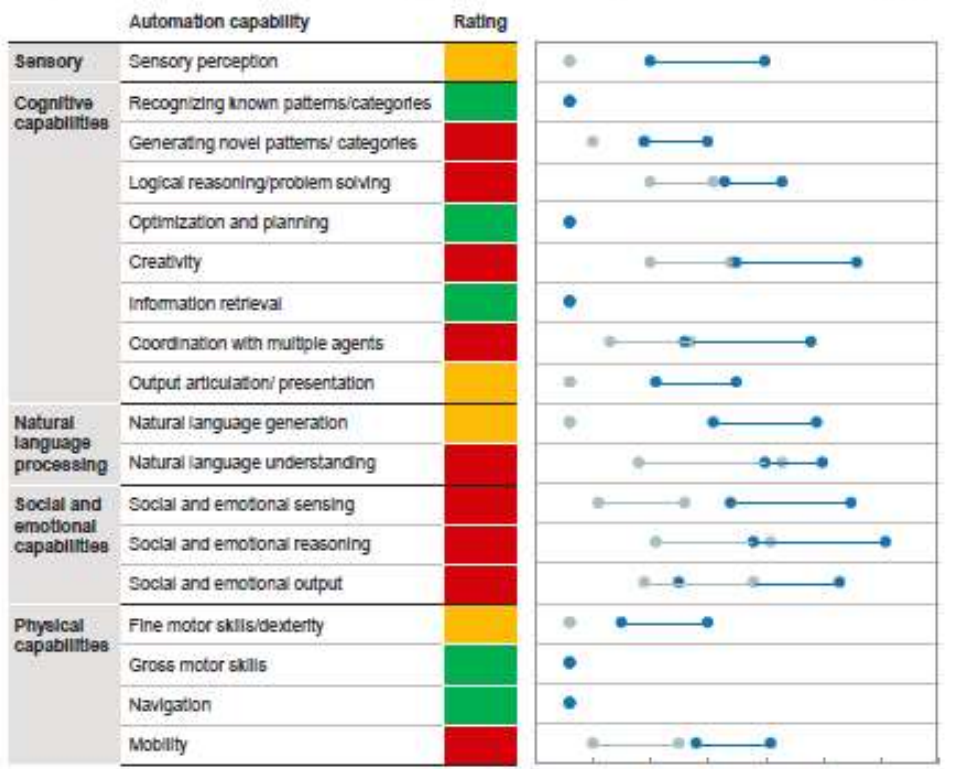
Permissible use: There will be increasing pressure to **explain by what right** certain data and capabilities are being used in any particular context.

Clinical mindset: As systems become increasingly complex and interconnected, the job of data and analytics practitioners will be come much more like that of clinical practitioners: forming differential diagnoses and selecting interventions in complex systems in order to achieve a desired outcome.

Myths vs. reality

Ranges of estimated time frames to reach the next level of performance for 18 human-related performance capabilities

Rating ■ Below median ■ Median ■ Top quartile Human performance ● Median ● Top quartile



SOURCE: McKinsey Global Institute analysis

Myths:

- We will all report to a robot
- AI will take over everything
- The only meaningful jobs will be to serve the machines
- Everything we do will be judged by an algorithm

Realities:

- We will take some direction from machines
- AI will augment decision making
- In critical situations AI will make the decision when we can not or should not
- New skills and new opportunities will emerge

New skills...

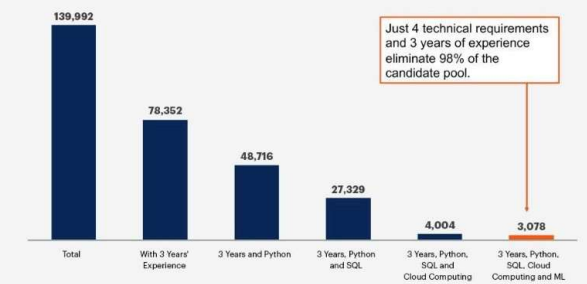
In the past, we looked for...

- Data Curator
- Analyst
- Modeler
- Statistician
- Methodologist

Now, we need all of that and more!

- Coder?
- Sampling Guru
- Methodology Savant
- Governance Expert
- Problem Formulator
- Detective
- Visionary
- Story-Teller
- Diplomat

Superstar AI Talent Is Hard to Find



n = 139,992
Source: Gartner TalentSource™
© 2023 Gartner, Inc. and/or its affiliates. All rights reserved. 2062043

Gartner.

Data based decisions in the context of disruption

What are the questions: Challenging our assumptions

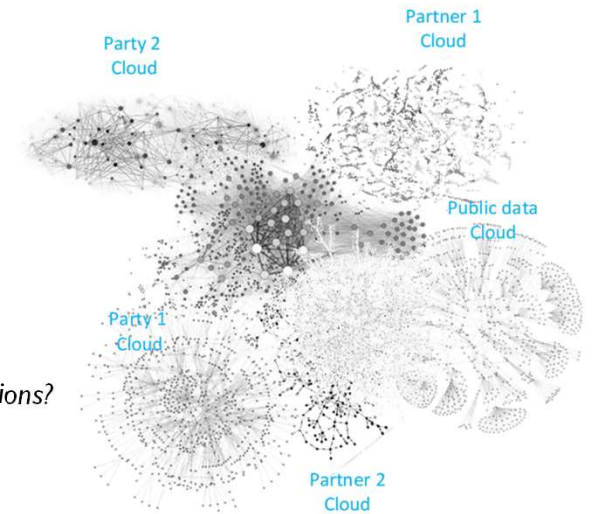
- *Is this situation enough like something in the past to permit drawing inference from experience*
- *How is the situation manifesting vs. what is assumed to be going on?*
- *What are the aspects of the situation which must be assumed to be true in order to move forward?*
- *How precise must we be in order to make a decision vs. cost of NOT making a decision?*

What information is available: Assessing the data landscape

- *How does the rate of change in the environment compare to the rate of change in the data?*
- *How can we understand the impact of veracity in the data?*
- *How will we know when the situation has changed sufficiently that we need to change any of our assumptions?*

What are we missing: The balance between “necessary” and “sufficient”

- *What are others doing?*
- *Are there opportunities for collaboration that are enabled by the disruption?*
- *How are we addressing organizational fatigue, unrelated risks, and ongoing demands?*



Thoughts on innovation in the context of disruption

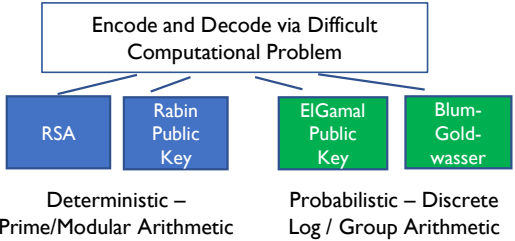
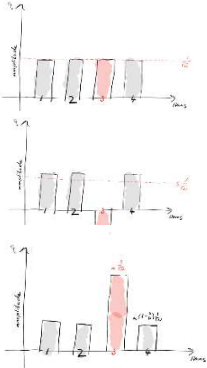
Innovation Focus	Explanation	Key Challenges
Understand the Universe	Assess data curation vs. rate of change in the environment. What is no longer true? What assumptions have changed?	Rate of disruption exceeds rate of curation. Lack of ground truth. Actions taken to react may not be visible with old discovery methods.
Understand Patterns of Disruption	Establish methods to assess disruption based without relying on “learning” from prior trends.	Many traditional modeling and machine learning methods are not appropriate.
Support Decisions	Provide information to enterprise and agencies in a timely manner to reduce the impact of the crisis.	Recognize, react, adapt, recover, repeat. – Plan future scenarios before disruption to increase resiliency.
Analytics for the “New Normal”	Establish AI and analytic methods that survive ongoing disruption.	Hybrid methods, confirmation bias, other sources of variation.
Innovation in the context of Disruption	Deliver products and services in time to be relevant.	Regulatory compliance, permissible use, veracity, regression..
Opportunity Cost	Understanding the cost and impact of a failure to act.	Market pressure, increasing customer demands, timing/relevance.

LEARNING

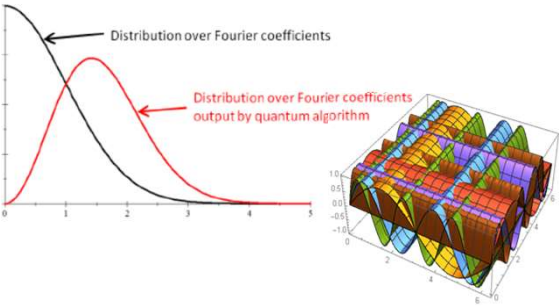
- Some best practice can be borrowed from “Disaster Remediation” – however new methods are crucial as the situation matures.
- Due to the non-simultaneous impact of the crisis, location data and regional dependencies are extremely important.
- Resiliency is quite varied by industry, location, and other factors.
- Sharing of information and capabilities is an emerging critical success factor.
- Innovation resiliency will be put to the test in ways we are only beginning to understand

Practical Example: Keeping an eye on emerging future technology and what it makes possible

Quantum algorithms can 'solve' problems which would otherwise be computationally intractable

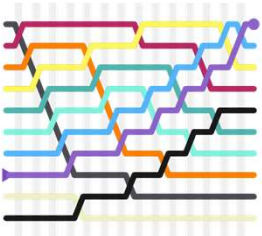


Randomness, and thus dependency quantification is a shifted paradigm in Quantum Computation



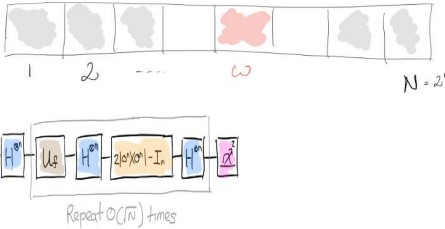
Pre-Quantum:

- Quick Sort, Bubble Sort, Greedy Sorts



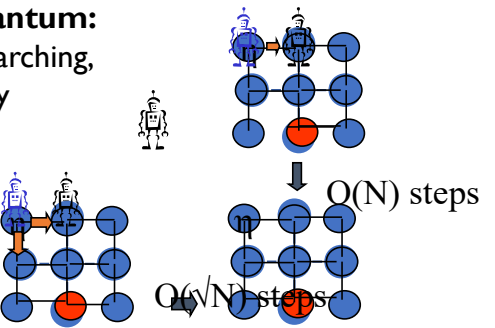
Proto-Quantum:

- Grover's Algorithm, Deutsch-Josza Algorithm, Heuristic Sort: Probabilistic Sorts



Fully Realized Quantum:

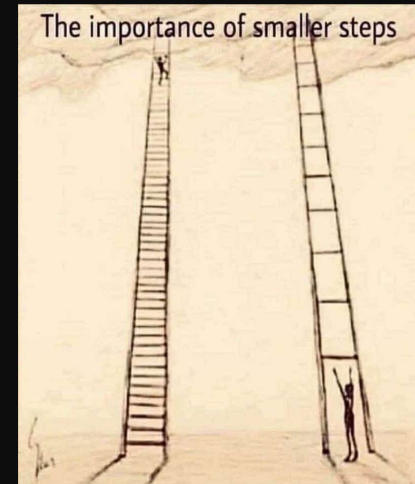
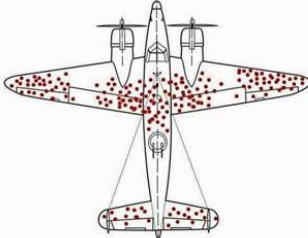
- Spatial Quantum Searching, Hyper-Cryptography



Always look for the
“Aha!”

Model Airplane News 2d · 🌐

During World War II, fighter planes would come back from battle with bullet holes. The Allies initially sought to strengthen the most commonly damaged parts of the planes to increase combat survivability. A mathematician, Abraham Wald, pointed out that perhaps the reason certain areas of the planes weren't covered in bullet holes was that planes that were shot in certain critical areas did not return. This insight led to the armor being re-enforced on the parts of returning planes where there were no bullet holes.





Change is everywhere

Change begets
change

Change =
survival

Change is messy

The only people who
really like change all
the time are wet
babies!

A few final thoughts

Tools are not “the answer”
– they are tools!

We will be forced to react
more quickly – it’s up to us
to do that wisely

We must learn to ask better
questions, not simply
“click” for answers

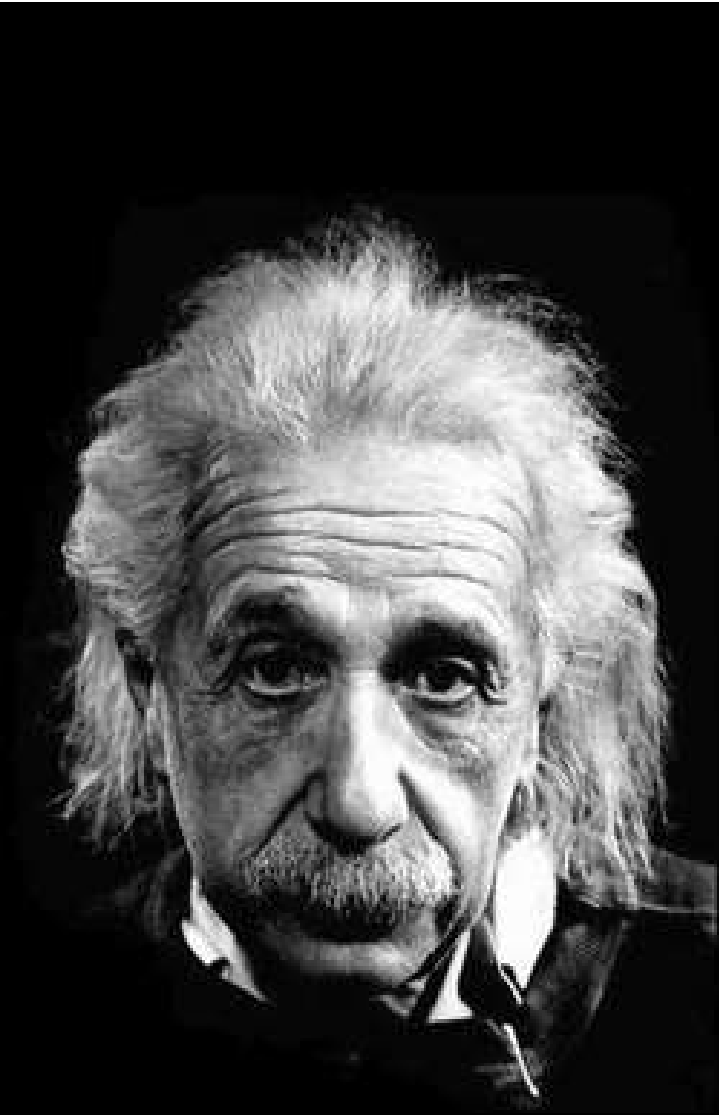
We must become more
clinical, and better
observers of change



Disruption is a great teacher –
but only if we learn from it

Working together produces
synergy, but has a cost

Moving quickly... enough, but
not so quickly that we repeat
our mistakes



“ We can't solve problems by using the same kind of thinking we used when we created them. ”

“ Everything should be made as simple as possible, but not simpler. ”

Albert Einstein

What will you do tomorrow?

