Decision Advantage: Evidence Based Management and Intelligent Software

Dr. Kuan H. Collins, DM

Intelligent SW, Software Solutions Practice

June 2019

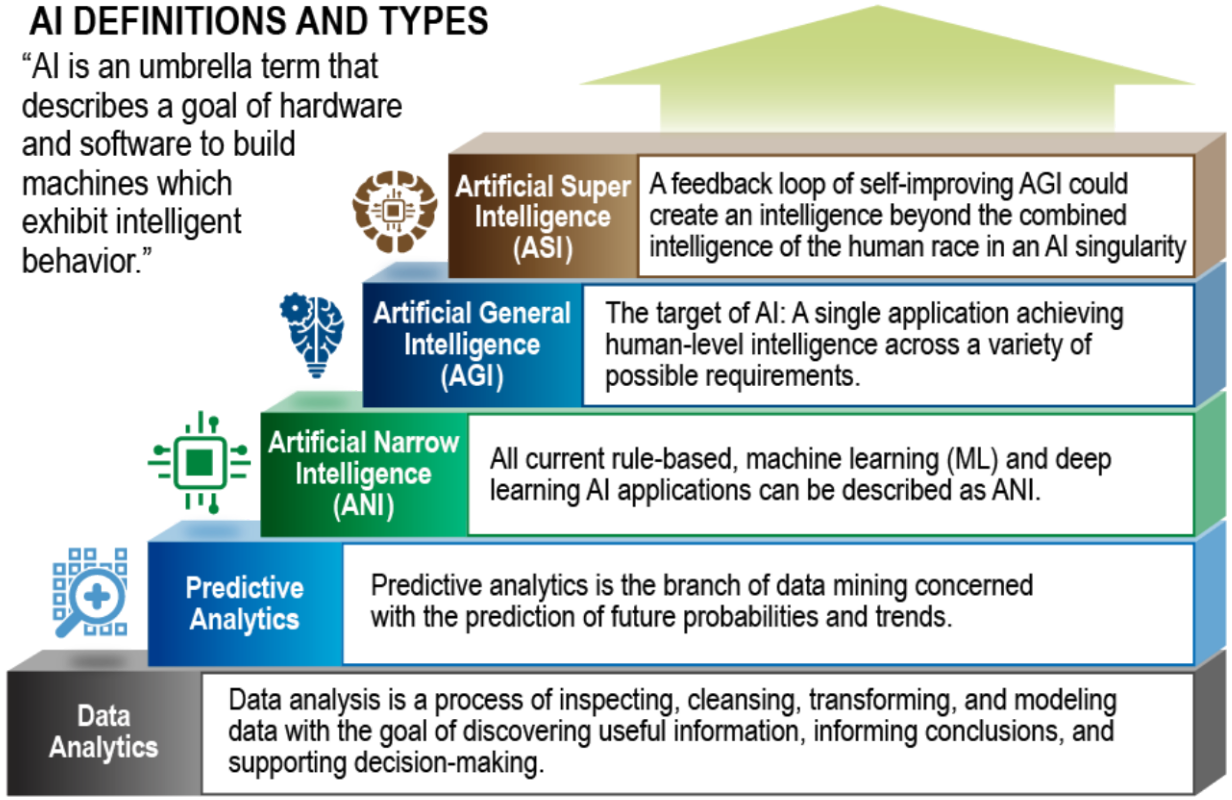
SAIC
Redefining Ingenuity

Overview

- What is Artificial Intelligence?
- Why is it important for National Security?
- How can we build organizations in the context of this set of emerging technologies?

AI is the new electricity.

Evidence Based Decision and Intelligent SW



ACTIONABLE INSIGHTS AT MACHINE SPEED FOR DECISION ADVANTAGE

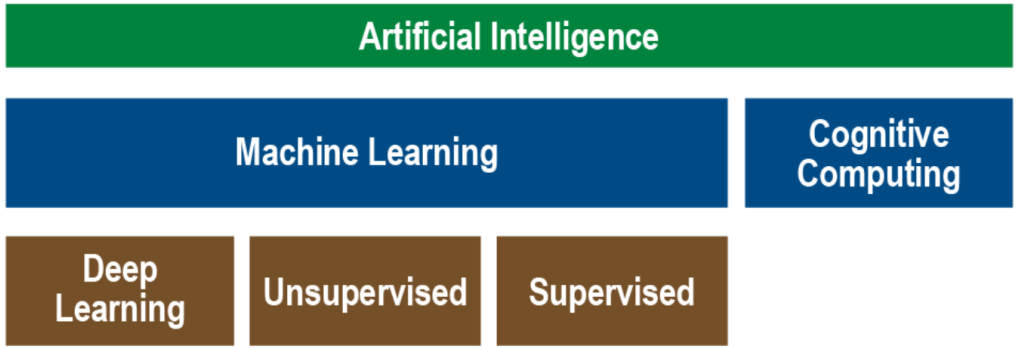
Artificial Intelligence (AI) Subsets and Features

AI: SUBSETS AND FEATURES, GLOBAL, 2017

Machine Learning

Software builds models that are complex for humans to manually specify

- Designed to predict outcomes and specific use cases
- Optimize weights of variables in the data to make useful inferences about future results
- ML algorithms improve with experience, hence, benefit from the rise of Big Data



Deep Learning

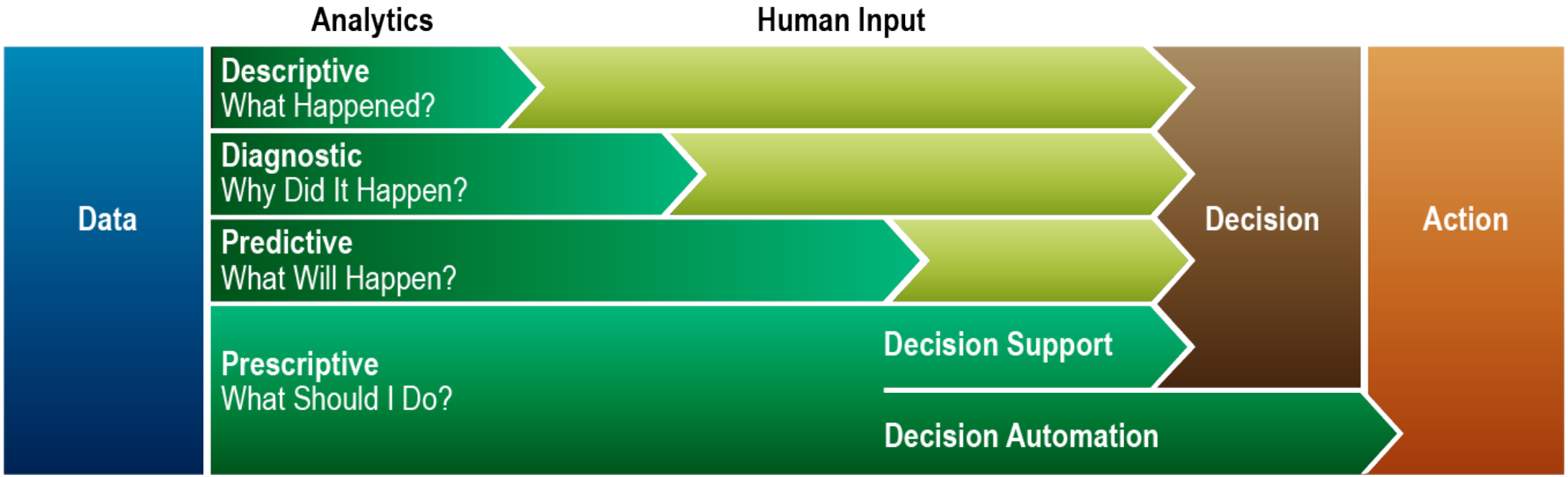
- Infers the features of data without needing annotated inputs and weights given to variables across a number of "layers"; an approximation of a brain-like structure or neutral network
- Large datasets required to build models, uses more computing power than others, and had delivered successful prediction tools for a range of important problems and algorithms
- Examples include DeepMind's AlphsGo, and Tesla's Autopilot

Cognitive Computing

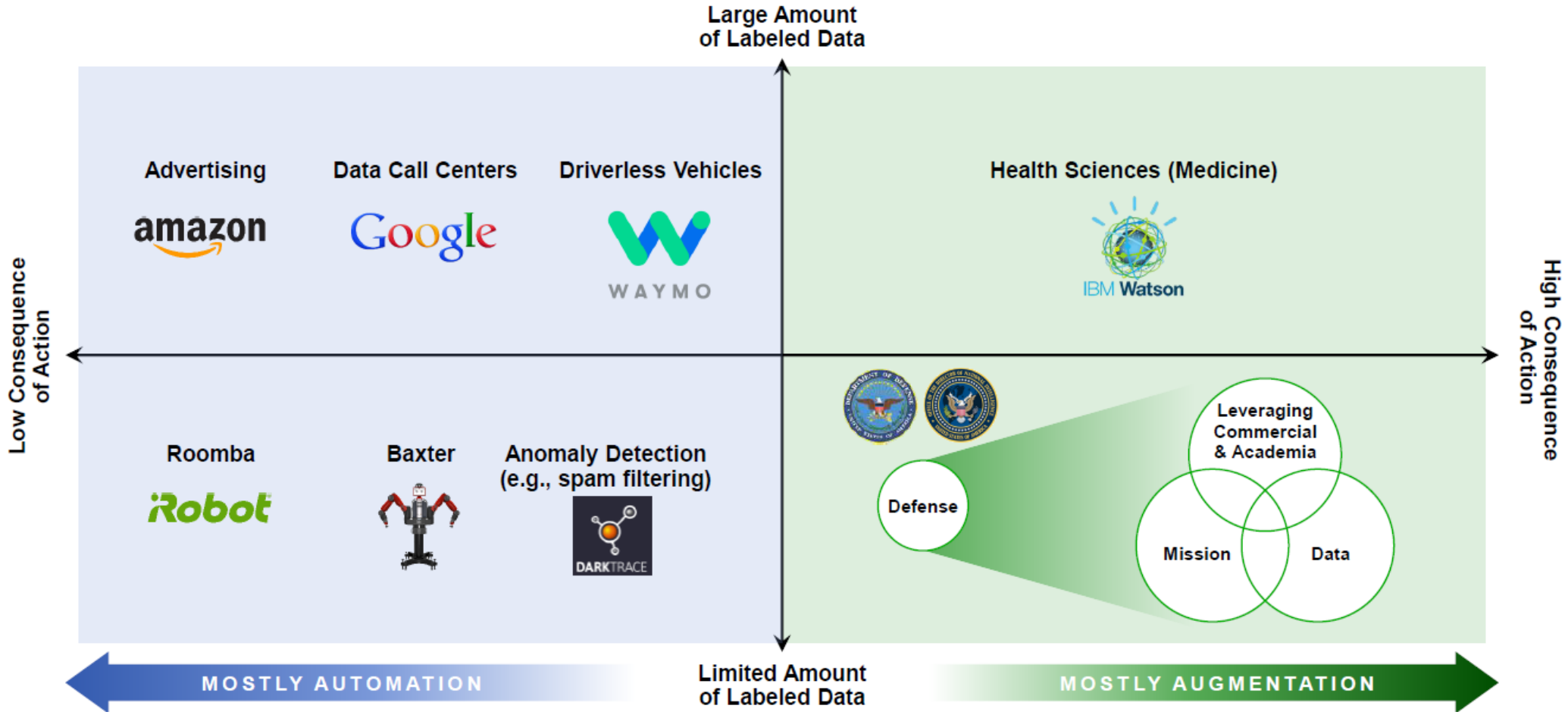
Designed to copy human abilities

- Still a controversial concept
- Expected to use human capabilities of thinking, reasoning, and remembering
- Explore and uncover things without prior knowledge

Analytics Framework

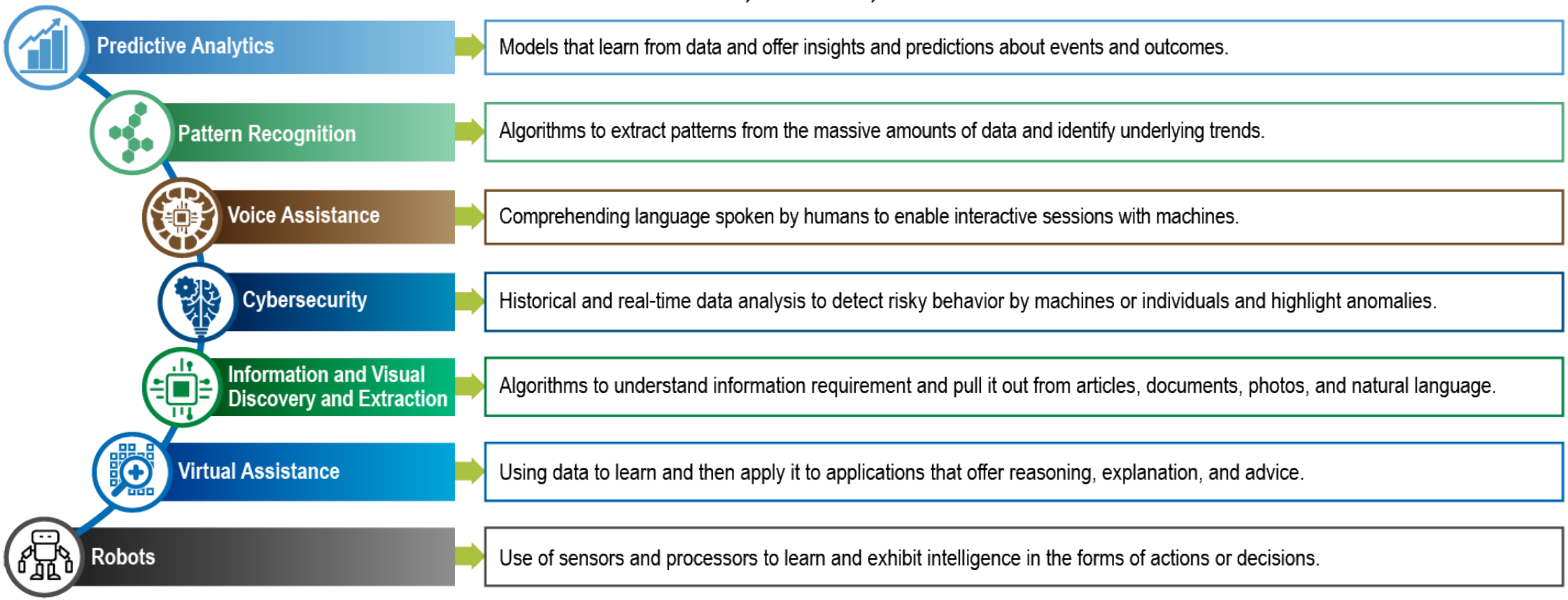


Automation vs Augmentation

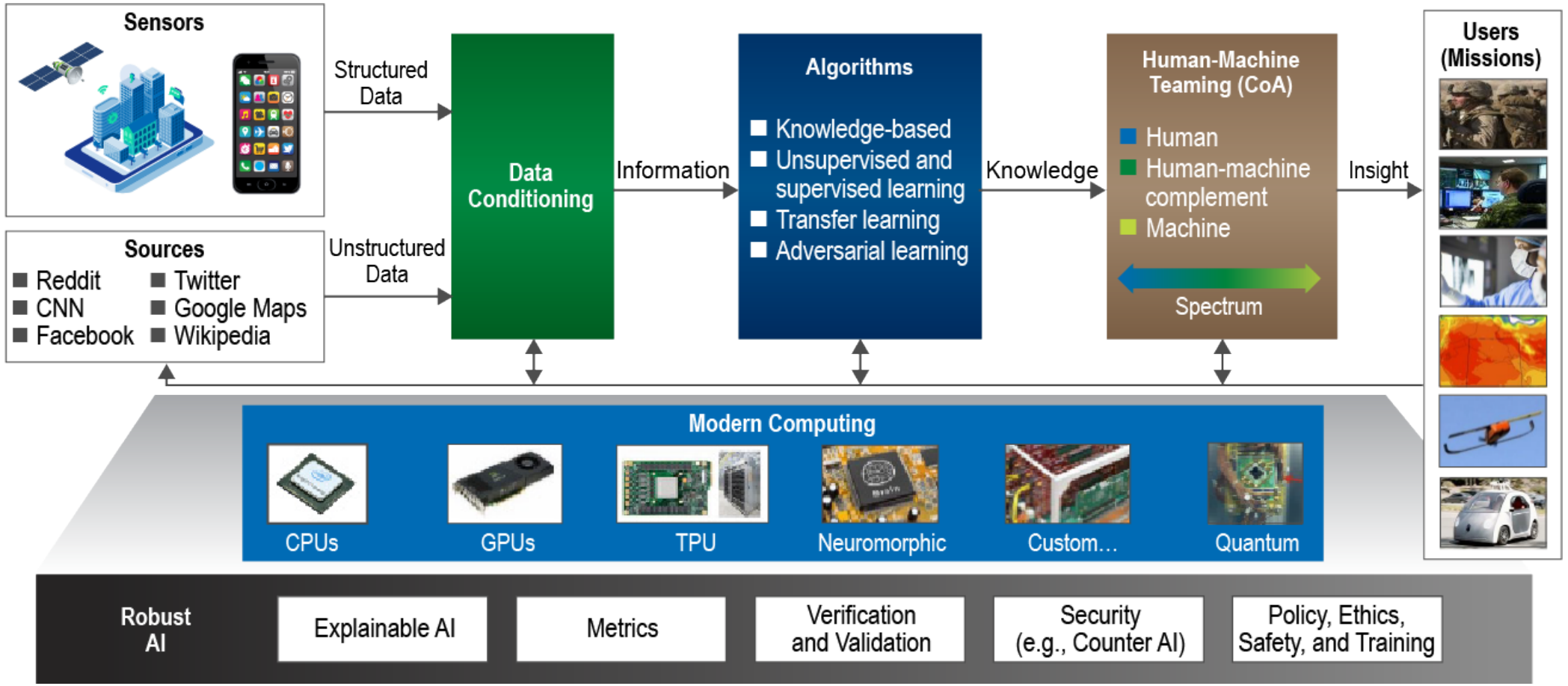


Intelligent SW Use Cases

AI USE CASES*, GLOBAL, 2017–2021



Intelligent SW Architecture



The Role of Intelligent Software and AI

	National Challenges	*Role of AI in Augmenting Humans*
  Intelligent Systems and Autonomy; Information Superiority	Technological dominance in support of national security	Derive actionable intelligence by effective human-machine teaming
	Massive amounts of structured and unstructured data	Leverage rapid advances in data conditioning, algorithms, and computing
	Trust in intelligent machines (Robust AI)	Ascertain robustness *"We had better be quite sure that the purpose put into the machine is the purpose which we really desire"* Norbert Wiener, 1960

Si vis pacem, para bellum (Peace through Strength)

The Chinese Government has indicated plans to invest $150B over the next few years

The Economist (July 2017)

In 2012–16 Chinese AI firms received $2.6B in funding, according to the Wuzhen Institute, a think tank.

China Next Generation AI Development Plan (July 2017)

By 2020…China will have established initial AI technology standards, service systems, and industrial ecological system chains…with the scale of AI's core industry exceeding $22.6B, and exceeding $150B as driven by the scale of related industries.

MIT Technology Review (November 2017)

China's goal is "to have major breakthroughs in AI by 2025, and to be the envy of the world by 2030."

DoD R&D Spending is a Fraction of Nation Sales—We are Losing Ground on Patents and Publications

DoD Joint Artificial Intelligence Center (JAIC)

- The Defense Department plans to establish an Artificial Intelligence Center focused on long-term AI technology that can be used both offensively and defensively
- JAIC will be led by Michael Griffin, head of research and engineering at the Pentagon
  - Due to submit a proposal to Congress this summer outlining the joint artificial intelligence center to accelerate military and intelligence use of AI.
- “592 separate AI projects across the department” and the center will help provide “some focus to all of that”
- AI training requires a significant amount of data, which DoD has, but “getting all that data in a place that’s usable, and discoverable, and useful for the mission at hand is crucial”
- Some of the other recommendations include providing 100 engineers to combatant commanders “to go fix things,” making software a separate career path, and rewarding personnel for taking risks, even if their ideas aren’t initially successful
- Science and Technology budget: $13.7B. Artificial intelligence was highlighted as 1 of 7 areas of focus.

Innovation Ecosystem Stakeholder Model

Innovation Factory promotes experimentation

- Fail fast
- Close the loop
- Outcome focused

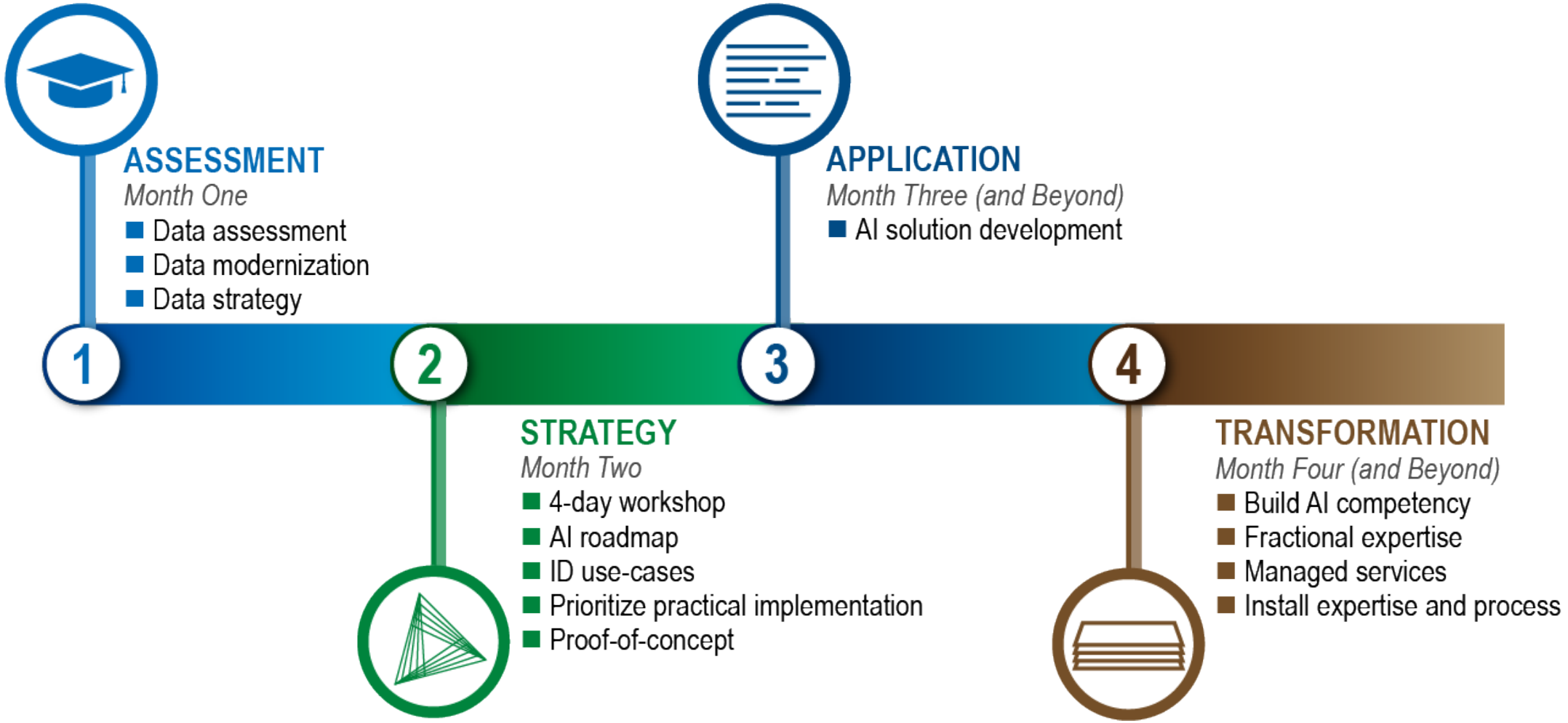
Academic partnerships

Startups
Startup accelerators (e.g. Techstars, Starburst, Capital Factory

System Integrators

http://mitsloan.mit.edu/ideas-made-to-matter/bye-bye-ivory-tower-innovation-needs-ecosystem-to-thrive?utm_source=mitsloanlinkedin&utm_medium=social&utm_campaign=ecosystem

Intelligent SW Readiness and Rapid Prototyping



Agile AI

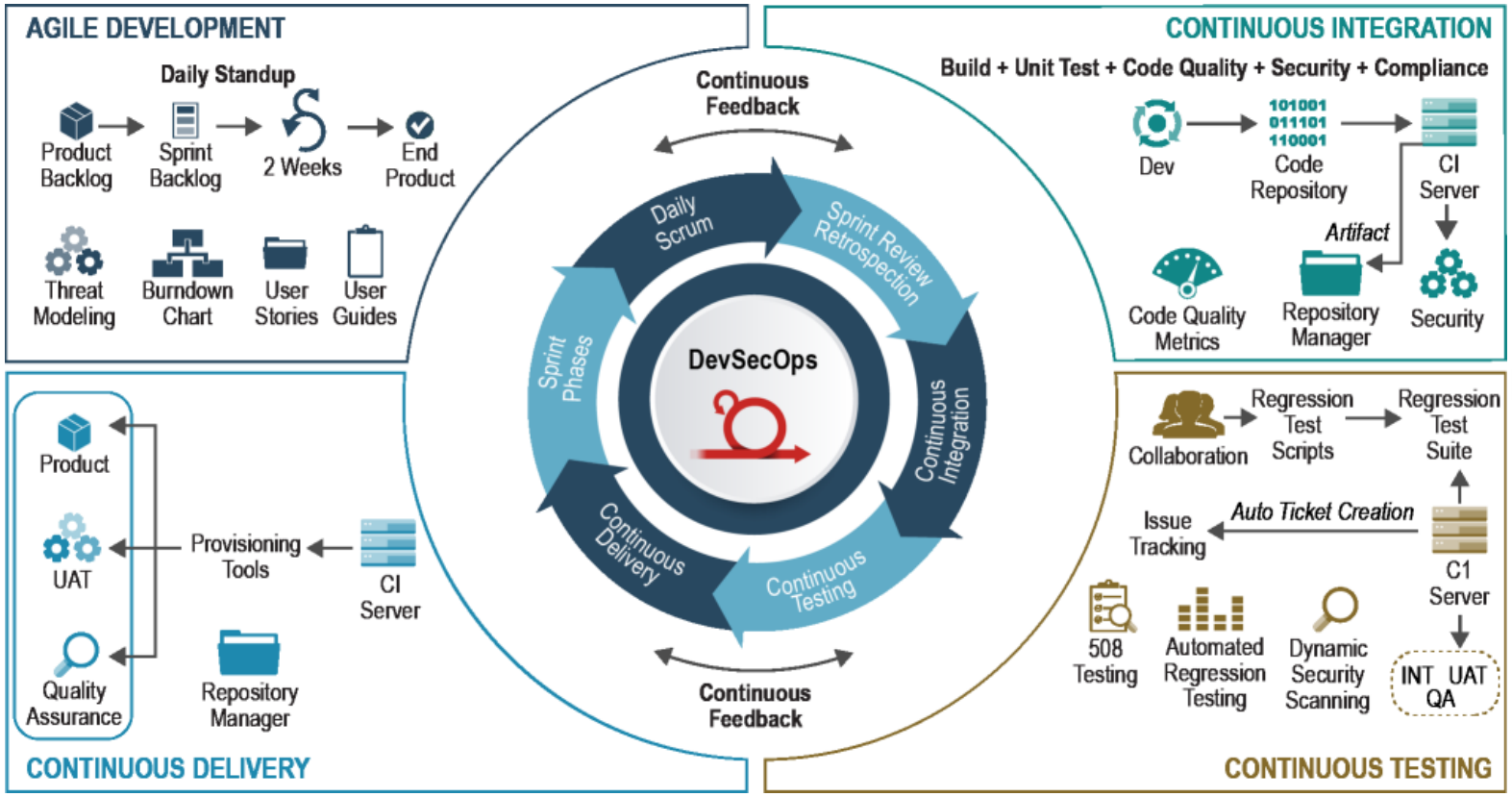
New Thinking

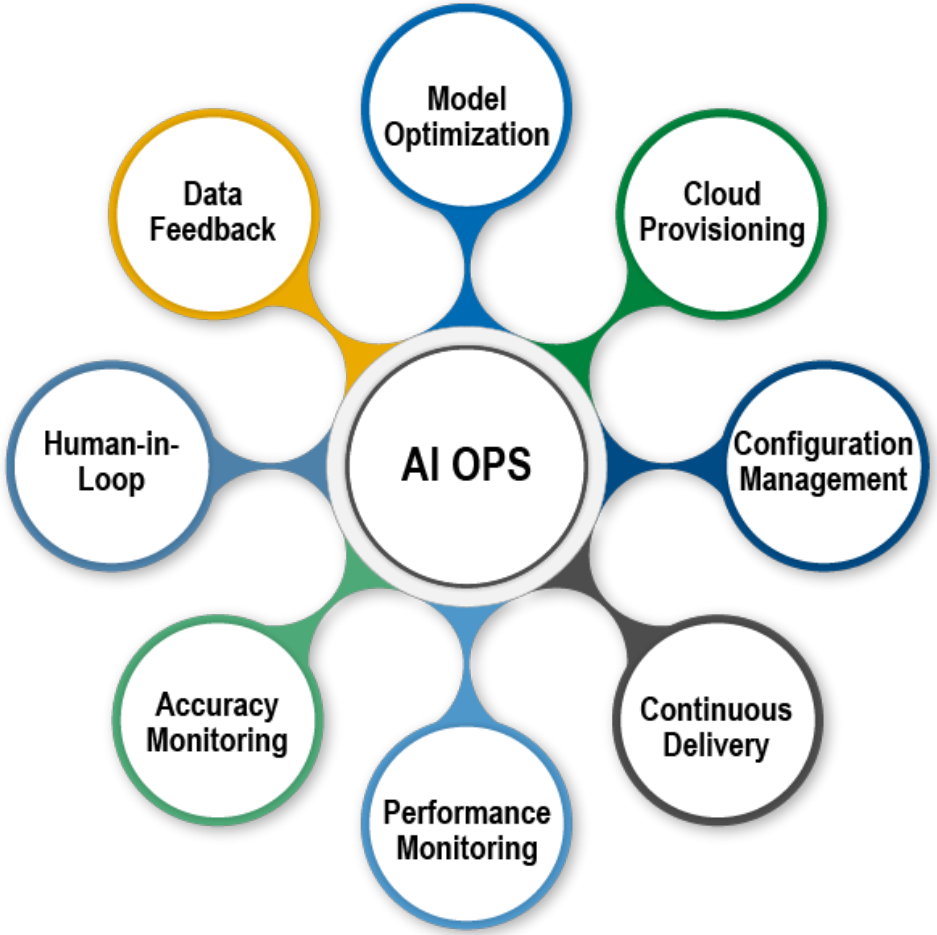
- Content: Models not programs
- Process: Training not debugging
- Release: Retraining not patching
- Results: Probabilities not answers

New capabilities require new players

- AI Product Manager
- Data Scientist
- ML Engineers

AI OPS





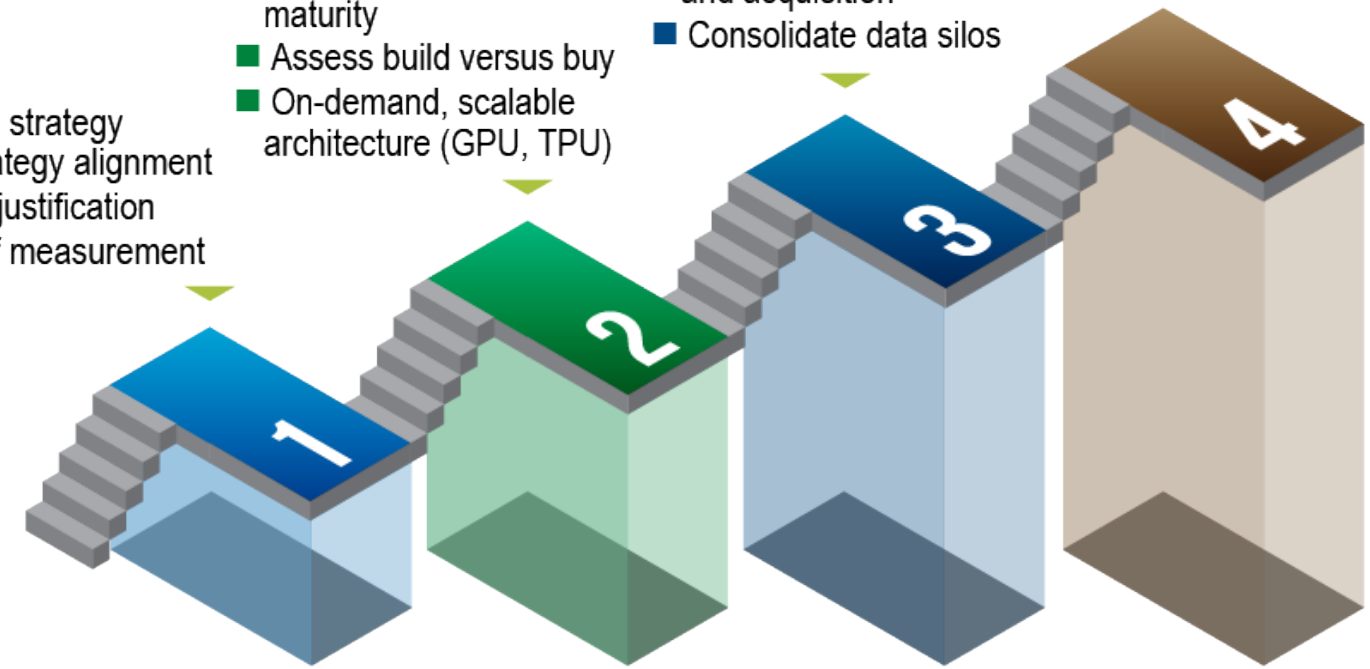
Business Transformation

BUSINESS
- Corporate strategy and AI strategy alignment
- Business justification
- System of measurement

TECHNOLOGY
- Digital transformation maturity
- Assess build versus buy
- On-demand, scalable architecture (GPU, TPU)

DATA
- Data strategy
- Continuous data collection and acquisition
- Consolidate data silos

(NEW) LEARNING
- Monitor performance
- Human in the loop
- Recursing learning process



ORGANIZATION
- AI product and program management
- Establish governance
- Agile and Ops methodologies
- Data dictionary, library, and collaboration

Summary

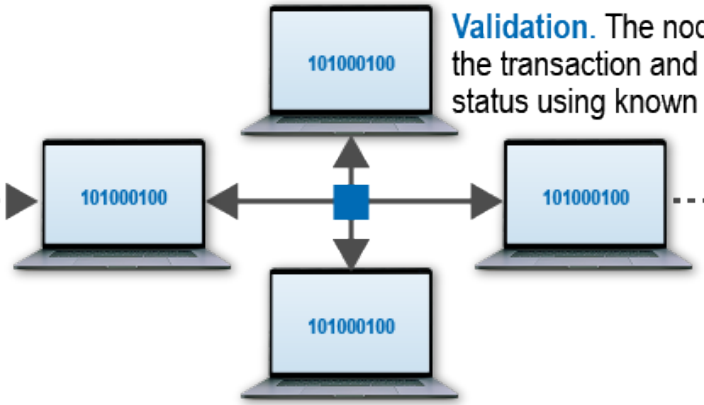
- US can regain leadership in Intelligent SW by strategically partnering with small and large commercial companies as well as academia
- Intelligent SW will be a technological enabler to defend our homeland and abroad
- Emphasis on multiple elements of the overarching architecture is needed across our organizations
- Develop an ecosystem to allow training of the next generation of military and civilian workforce in Intelligent SW
  - Agile prototyping of Intelligent SW capabilities with operational users
  - Execute challenges, hackathons and pitch competitions
  - Facilitate Intelligent SW readiness workshops

Backup

Blockchain

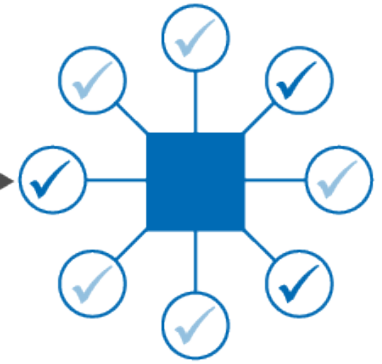
Distributed and Tamperproof Digital Ledger

Someone requests a transaction.

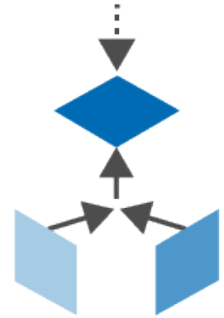


Validation. The nodes validate the transaction and the user's status using known algorithms.

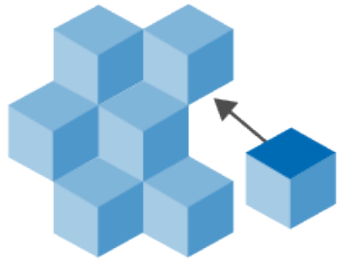
The requested transaction is broadcast to a peer-to-peer **network consisting of nodes.**



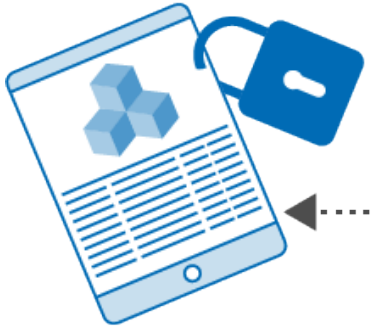
A verified transaction can involve cryptocurrency and other **digital tokens,** records, or other information.



Once verified, the transaction is combined with other transactions **to create a new block of data for the ledger.**



The new block is then added to the existing blockchain, in a way that is permanent and unalterable.



The transaction is complete.