

Artificial Intelligence Overview and Industry Perspective

presented to
AFCEA Audience

April 27, 2023



Agenda

- Introduction
- History of AI
- AI Terminology, Types and Frameworks
- How AI will shape the future
- Why AI is not a Doomsday scenario
- Conclusion

Introductions

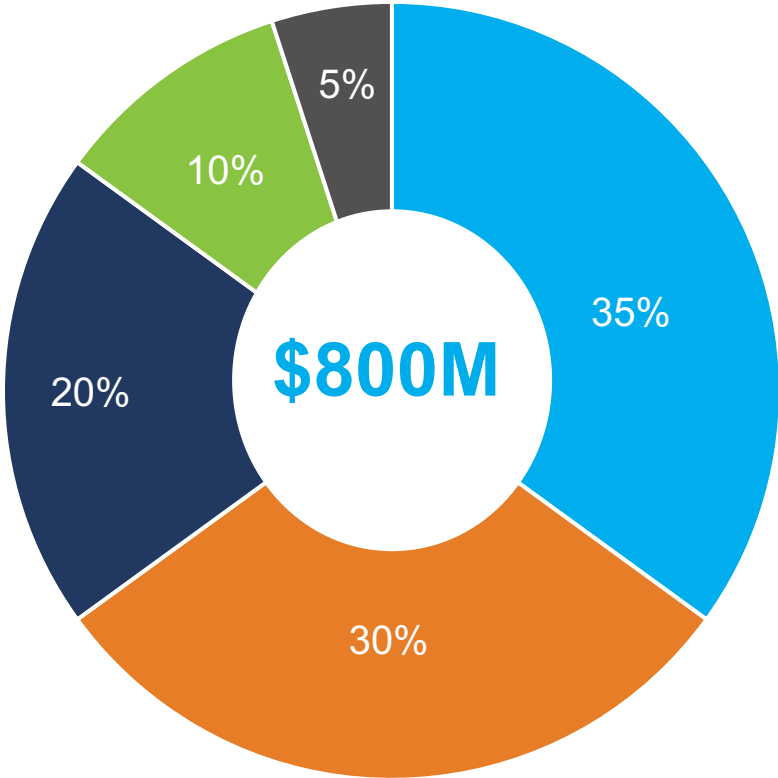
About Me (Michael Ryan)

SVP For the Defense Services Group within the National Security Sector of GovCIO

- PMP
- ITIL 4
- TBM
- CMMI Associate
- CISSP-ISSAP
- CCSK
- CompTIA A+, N+, S+,
- Amazon Certified Associate



Introduction – GovCIO’s Mission



- IT Modernization
- Digital Services
- Management, Advisory & Mission Support
- Cybersecurity
- Data



Customers

460 Contracts

55+ Clients

Core Clients

- Air Force
- Navy / USMC
- Army
- Special Operations
- Department of Commerce
- Department of Defense
- Department of Health and Human Svcs
- Department of Homeland Security
- Department of the Treasury
- Department of Veterans Affairs
- Drug Enforcement Administration

CERTIFICATIONS

We adhere to the highest quality standards. Our quality certifications include:

9001:2015

20000-1:2018

27001

CMMI SVC / 3SM

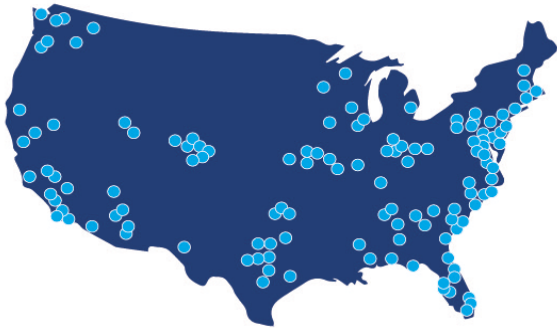
CMMI DEV / 3SM

GovCIO uses IT to transform how government works for the better.

Our People



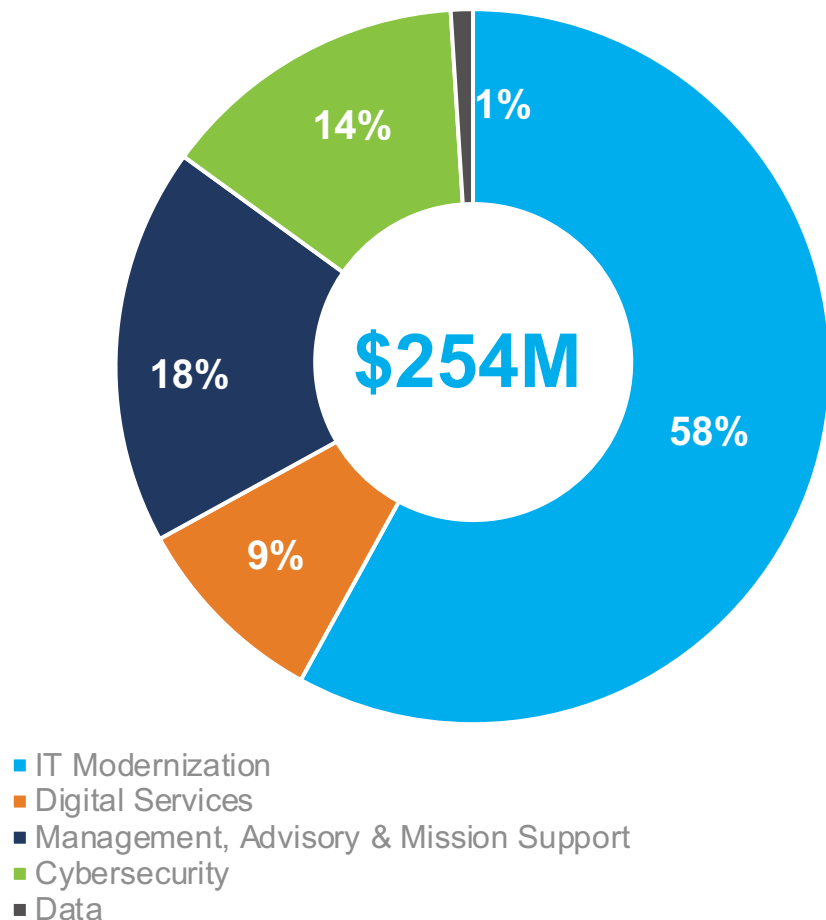
2,800+ Employees



195 Locations

Headquarters: Washington, D.C.
Company sensitive information.

Introduction – Who we Serve



NSS Sector Information

953 Employees

Top Customers

- Air Force
- Army
- Department of Homeland Security
- Navy
- USMC

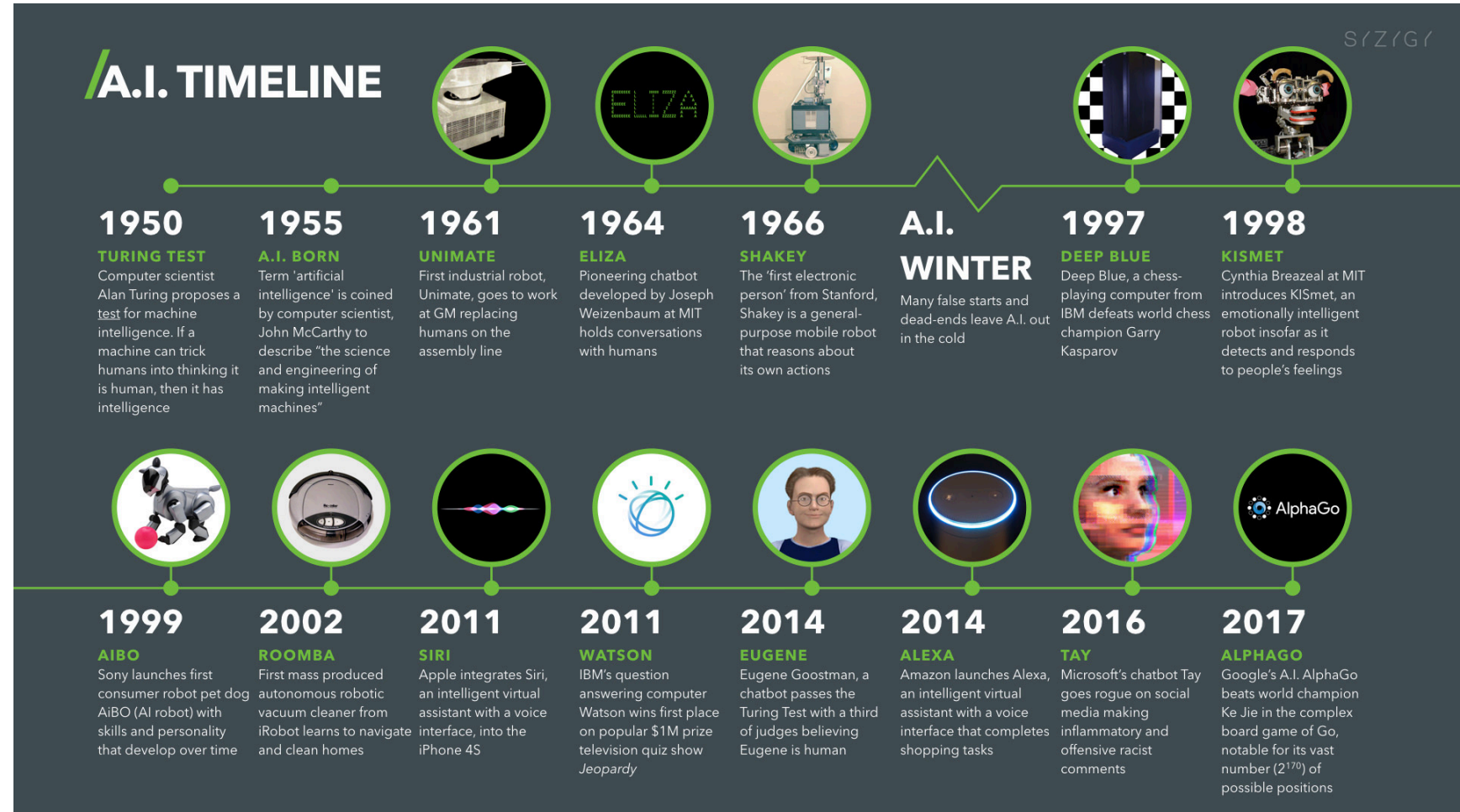
Major Vehicles

- **SEAPORT-E (Navy):** A prime holder of SEAPORT-E, which provides tailored services according to the needs of its geographically-dispersed and diverse offices and programs to help increase efficiency.
- **Alliant 2**
- **Oasis**
- **CIO-SP3 (4 Pending)**
- **Astro (Pending)**

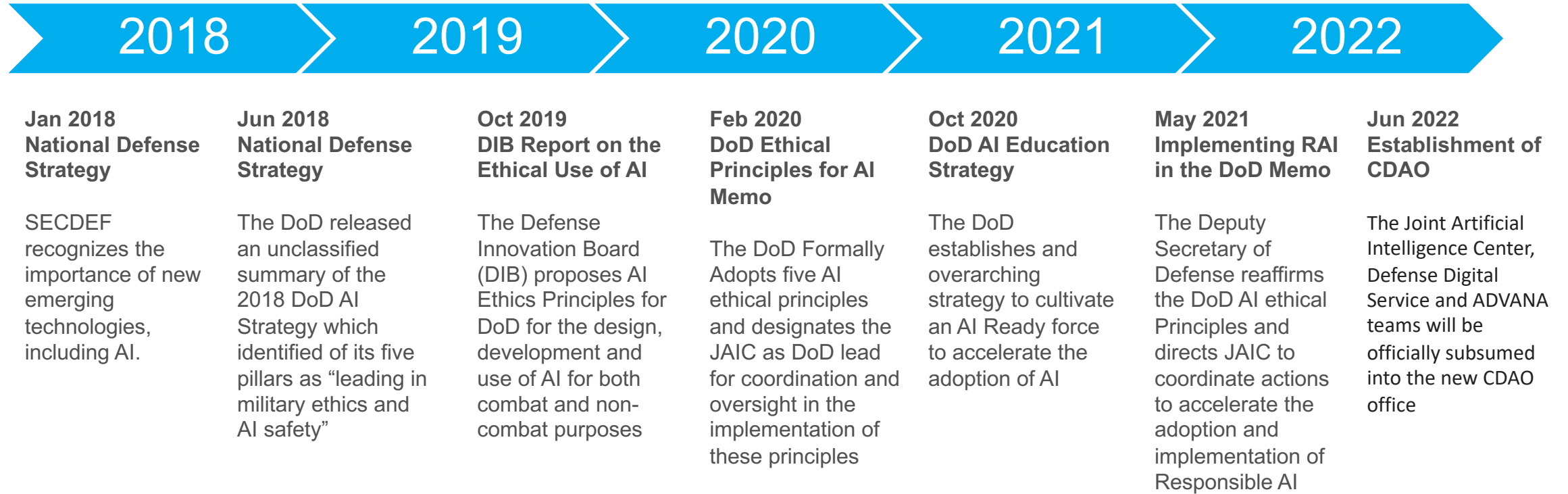
- Broad Support across the USAF (690th ISS, ACC/A26 SPO for AFJWICS, HQ Air Education and Training Command (AETC), AF Civil Engineering Center, 616 ACOMS, USAFA, 67th OSS)
- Broad reach across the NSS, including the military services, COCOMs, and Fourth Estate agencies
- Strong Portfolio of FMS support for USN and USA; 140+ personnel in Saudi Arabia
- Executing programs of scale with 4 contracts in excess of \$70M; 3 such contracts worth almost \$700M.
- Manage SOCOM's long-haul SATCOM networks, achieving **99.99% availability for 25+ classified networks** for critical international communications with US forces and allies.
- \$10.7B total new business pipeline with \$0.1B in proposal development and \$0.7B awaiting award.

History of Artificial Intelligence “AI”

- Not New But Accelerating
- Capability increasing because of
 - Cloud
 - Rapid increase in Storage/Compute Capabilities
 - Threat/Operating Environment

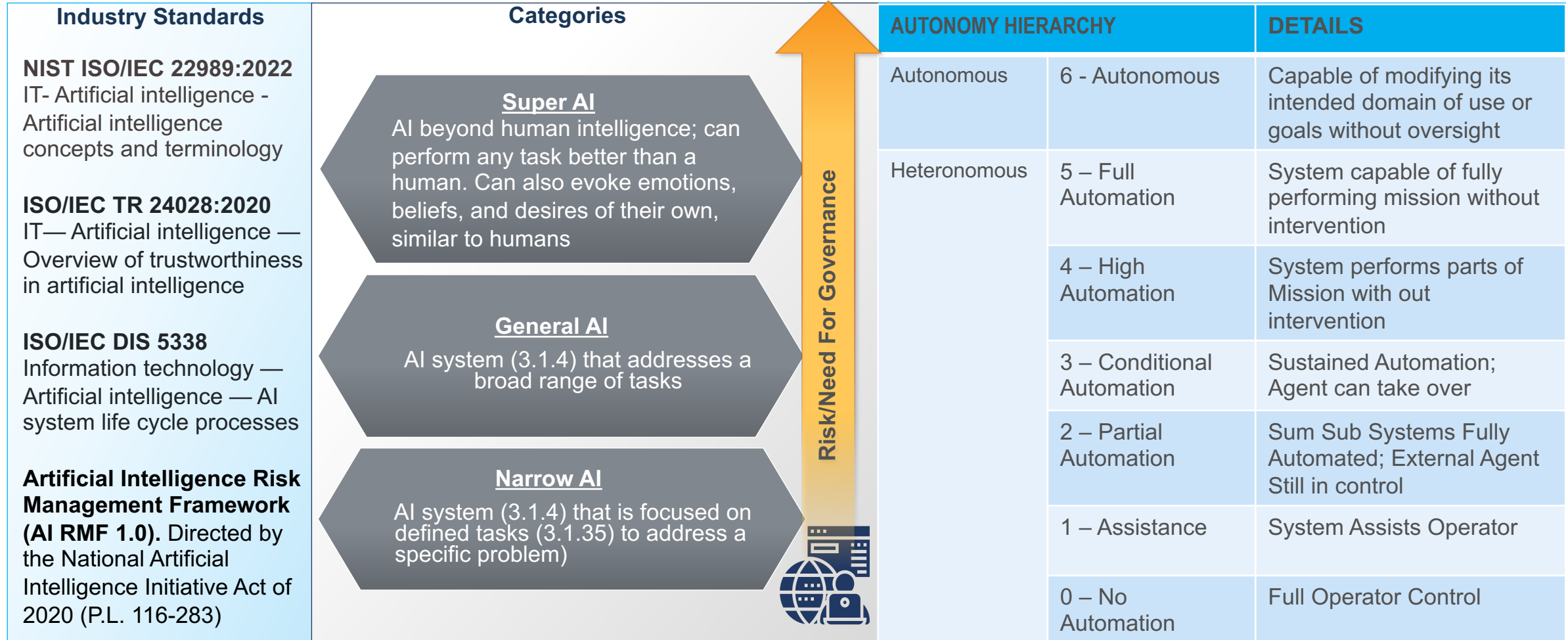


History of Artificial Intelligence - DoD



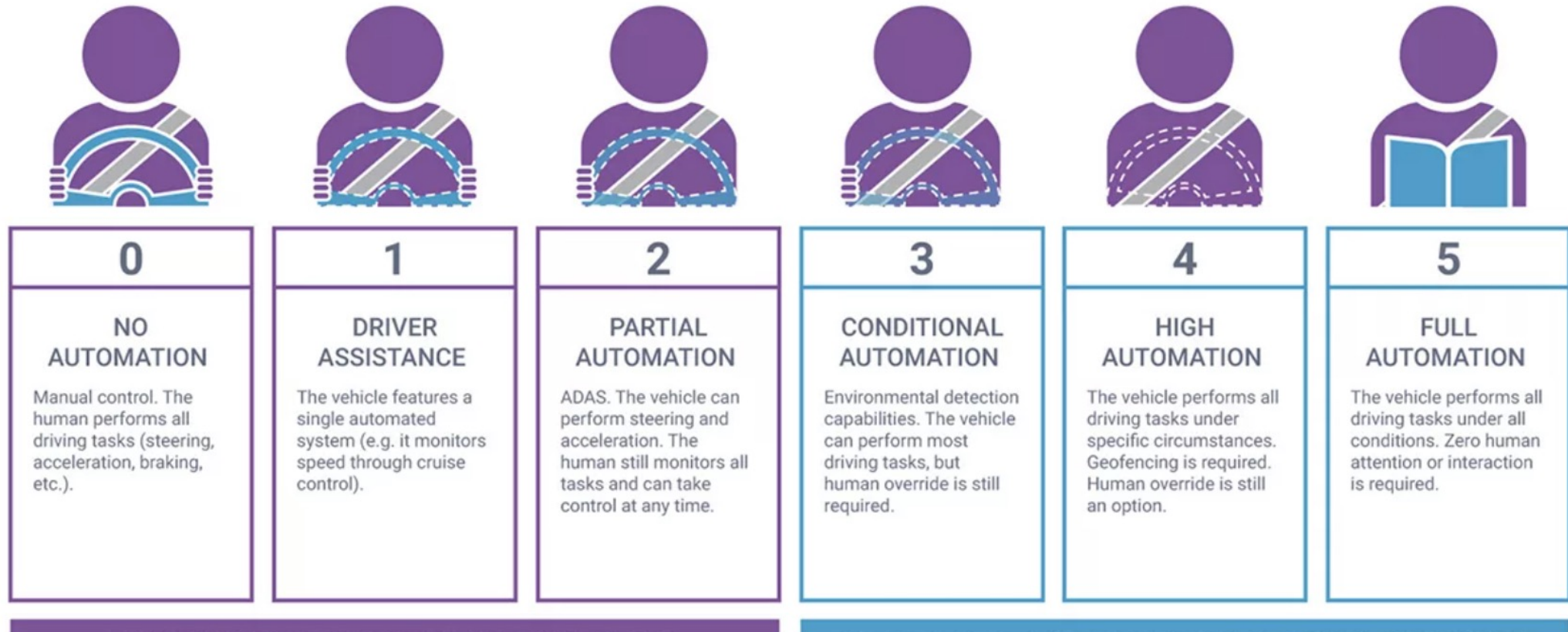
- **US DOD Responsible Artificial Intelligence Strategy and Implementation Pathway (06/22)**
- **DoD Directive 3000.09, Autonomy in Weapon Systems (Jan 23)**

AI Terminology



AI Terminology – USE Case

LEVELS OF DRIVING AUTOMATION

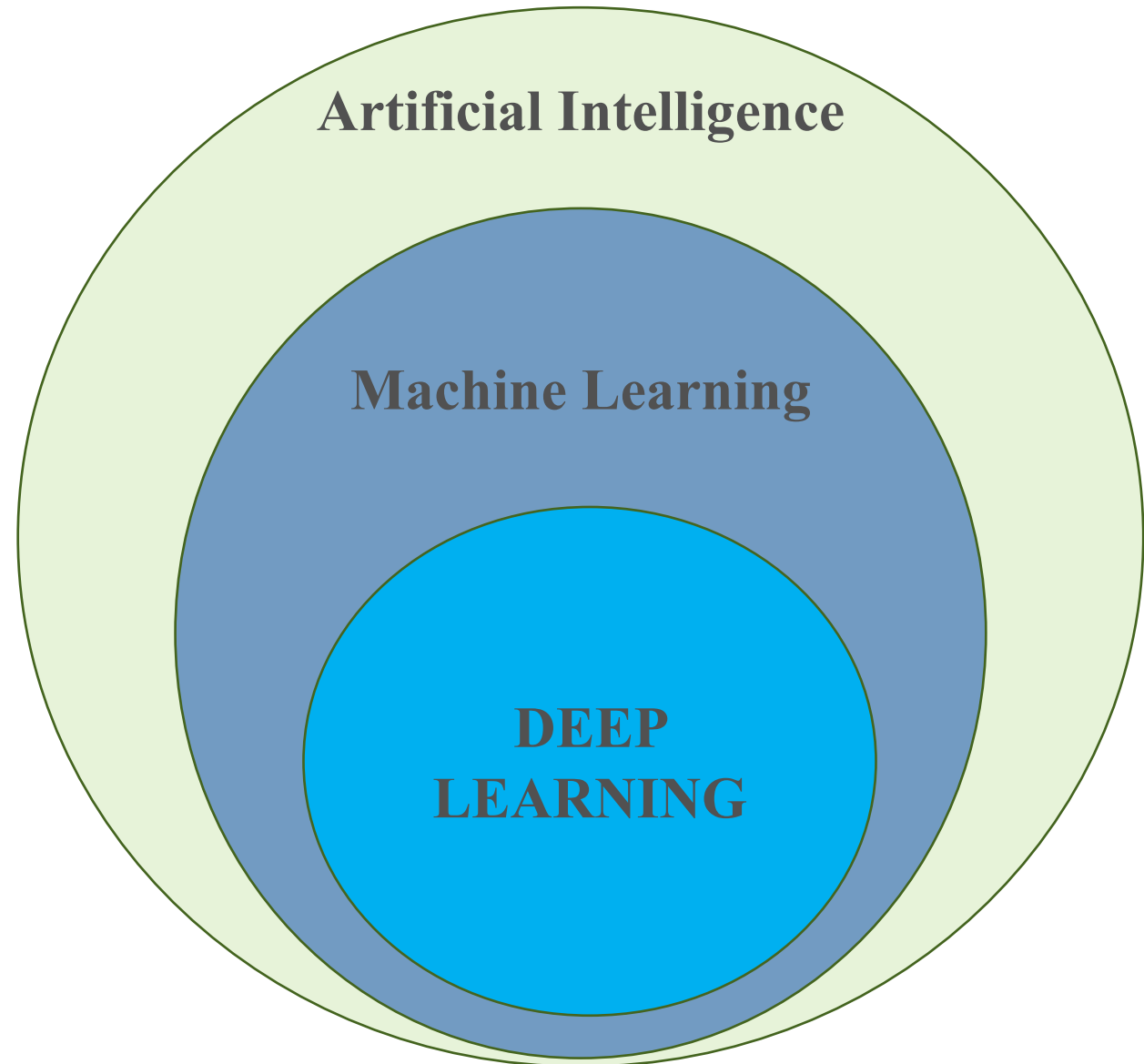


AI Types

Artificial Intelligence: Engineered system that generates outputs such as content, forecasts, recommendations, or decisions for a given set of human-defined objectives

Machine Learning: Process of optimizing model parameters through computational techniques, such that the model's behavior reflects the data or experience

Deep Learning: Learning approach to creating rich hierarchical representations through the training of neural networks with many hidden layers



AI Types – Neural Networks

A basic neural network has interconnected artificial neurons in **three layers**:

Input Layer

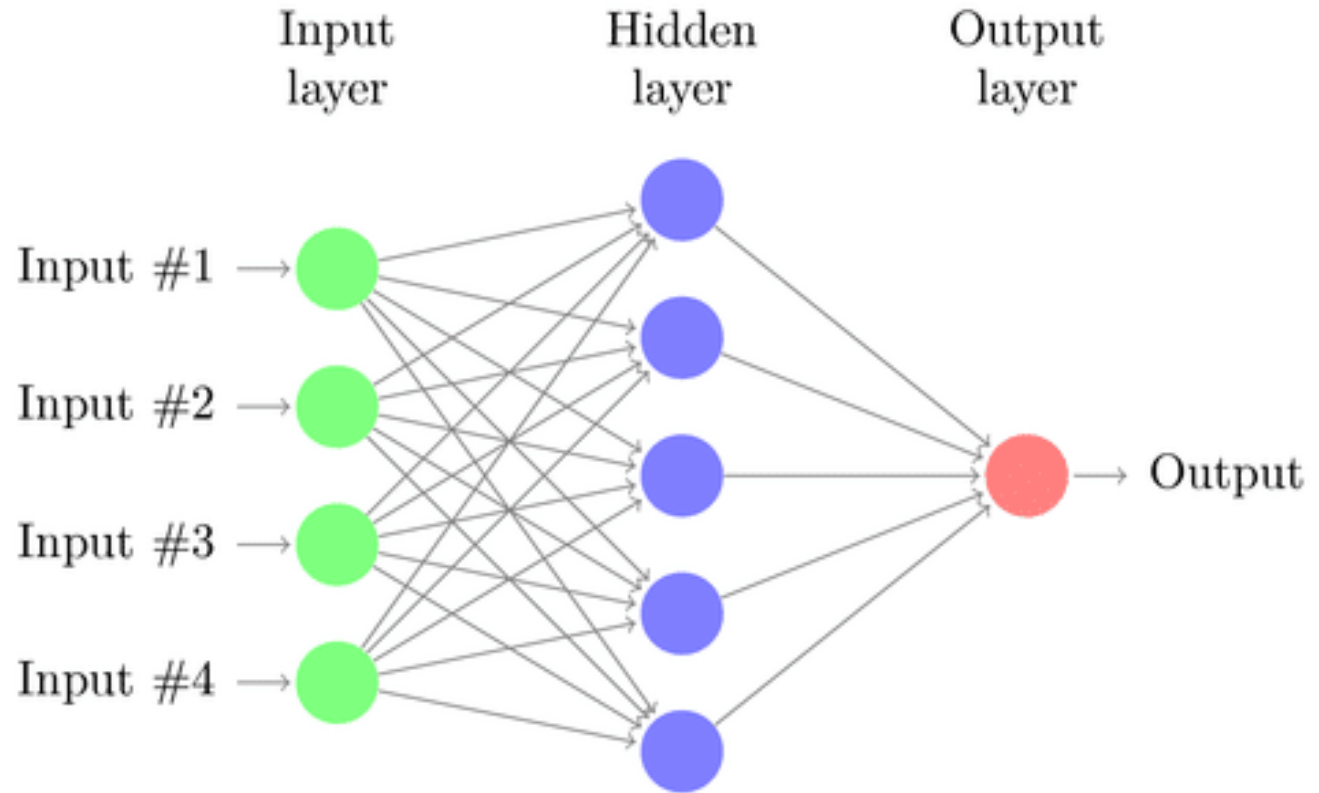
Information from the outside world enters the artificial neural network from the input layer. Input nodes process the data, analyze or categorize it, and pass it on to the next layer.

Hidden Layer

Hidden layers take their input from the input layer or other hidden layers. Can have a large number of hidden layers. Each hidden layer analyzes the output from the previous layer, processes it further, and passes it on to the next layer.

Output Layer

The output layer gives the final result of all the data processing by the artificial neural network. It can have single or multiple nodes.



AI Types – Neural Networks

Artificial neural networks can be categorized by how the data flows from the input node to the output node. Below are some examples:

Feedforward neural networks

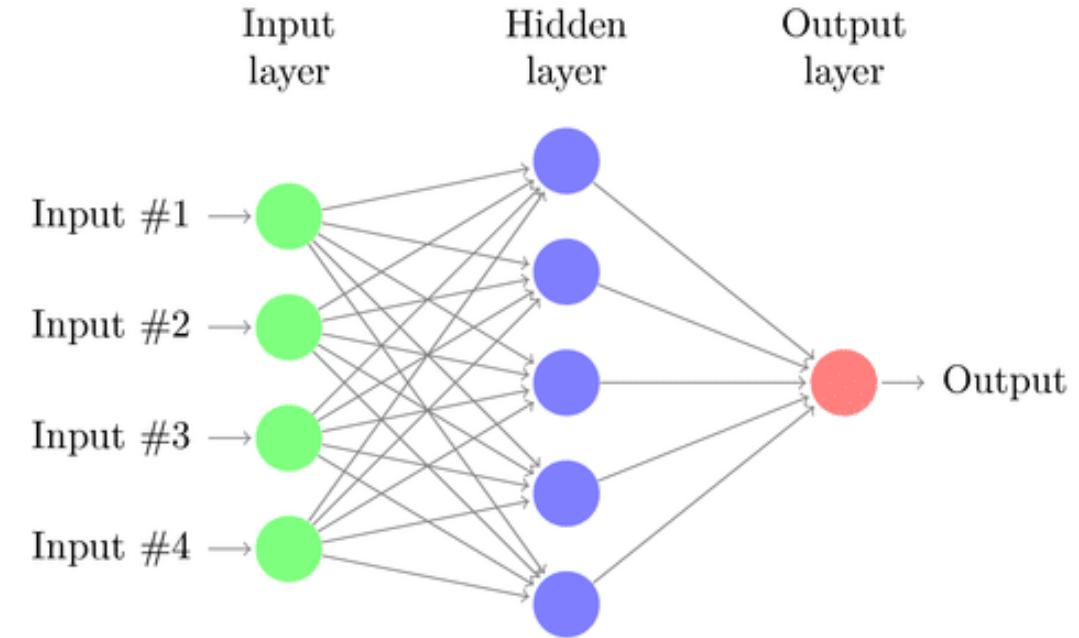
Feedforward neural networks process data in one direction, from the input node to the output node. Every node in one layer is connected to every node in the next layer. A feedforward network uses a feedback process to improve predictions over time.

Backpropagation algorithm

Artificial neural networks learn continuously by using corrective feedback loops to improve their predictive analytics. In simple terms, you can think of the data flowing from the input node to the output node through many different paths in the neural network. Only one path is the correct one that maps the input node to the correct output node. To find this path, the neural network uses a feedback loop

Convolutional neural networks

The hidden layers in convolutional neural networks perform specific mathematical functions, like summarizing or filtering, called convolutions. They are very useful for image classification because they can extract relevant features from images that are useful for image recognition and classification. The new form is easier to process without losing features that are critical for making a good prediction. Each hidden layer extracts and processes different image features, like edges, color, and depth.



AI Types – Neural Networks Uses

Computer vision:	Ability of computers to extract information and insights from images and videos. With neural networks, computers can distinguish and recognize images similar to humans. Computer vision has several applications, such as the following:	<ul style="list-style-type: none"> • Visual recognition in self-driving cars so they can recognize road signs and other road users • Content moderation to automatically remove unsafe or inappropriate content from image and video archives • Facial recognition to identify faces and recognize attributes like open eyes, glasses, and facial hair • Image labeling to identify brand logos, clothing, safety gear, and other image details
Speech Recognition	Neural networks can analyze human speech despite varying speech patterns, pitch, tone, language, and accent.	<p>Virtual assistants like Amazon Alexa and automatic transcription software use speech recognition to do tasks like these:</p> <ul style="list-style-type: none"> • Assist call center agents and automatically classify calls • Convert clinical conversations into documentation in real time • Accurately subtitle videos and meeting recordings for wider content reach
Natural language processing	Natural language processing (NLP) is the ability to process natural, human-created text. Neural networks help computers gather insights and meaning from text data and documents.	<ul style="list-style-type: none"> • Automated virtual agents and chatbots • Automatic organization and classification of written data • Business intelligence analysis of long-form documents like emails and forms • Indexing of key phrases that indicate sentiment, like positive and negative comments on social media • Document summarization and article generation for a given topic
Recommendation Engines	Neural networks can track user activity to develop personalized recommendations. They can also analyze all user behavior and discover new products or services that interest a specific user.	<ul style="list-style-type: none"> • helps brands convert social media posts into sales. • intelligent product tagging (IPT) service to automate the collection and curation of user-generated social content.

AI Frameworks

Deep Learning Frameworks



TensorFlow

TensorFlow is used widely for production AI development and deployment. Its primary API is based on Python*, and it also offers APIs for a variety of languages such as C++, JavaScript*, and Java*.



PyTorch is an AI and machine learning framework based on Python, and is popular for use in both research and production.



This open source, deep learning framework is highly portable, lightweight, and designed to offer efficiency and flexibility through imperative and symbolic programming.



Machine Learning Frameworks

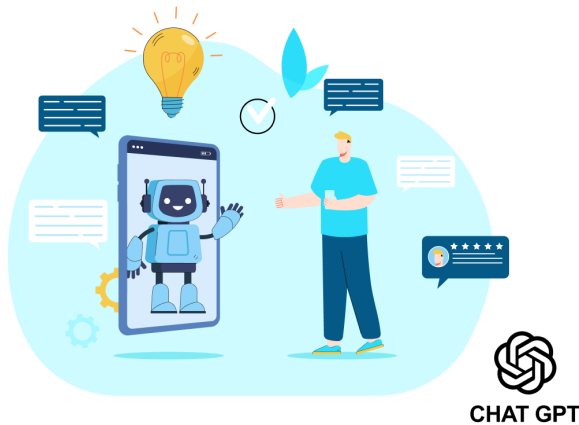


scikit-learn* is one of the most widely used Python packages for data science and machine learning



XGBoost is an open source, gradient boosting, machine learning library that performs well across a variety of data and problem types

AI – Leading AI Capabilities



GPT-3 and GPT-4 are two of the most advanced artificial intelligence software developed by OpenAI. They are part of a family of AI models known as Generative Pre-trained Transformers (GPTs), which are designed to *generate human-like language and complete a wide range of language tasks*.

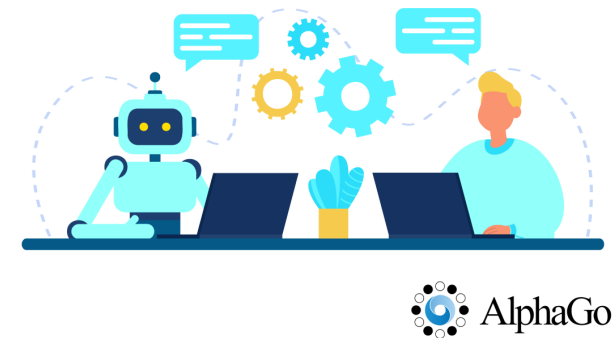


Anastasia Kovalevskaya Apr 07, 2023

<https://litslink.com/blog/3-most-advanced-ai-systems-overview#:~:text=GPT%2D3%20was%20released%20in,its%20predecessor%2C%20GPT%2D2.>



Watson is an advanced artificial intelligence software developed by IBM that combines natural language processing, machine learning, and other AI technologies to *analyze and understand large amounts of unstructured data*.

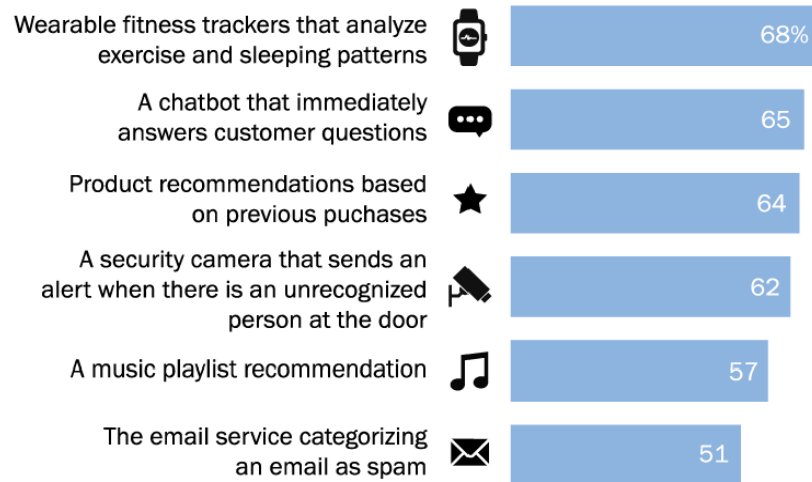


AlphaGo is the most advanced artificial intelligence software developed by Google DeepMind that was designed to play the board game Go. The technology gained widespread attention in 2016 when it defeated the world champion, Lee Sedol, in a best-of-five match. Considered to be one of the most intelligent AI systems in the industry due to its advanced capabilities and its ability to learn and adapt over time.

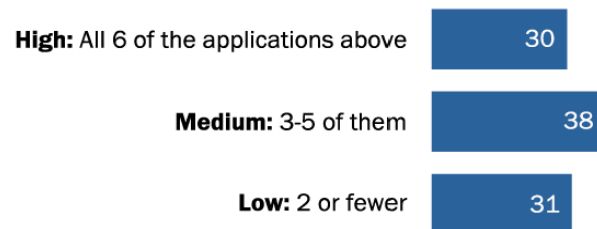
How AI will Shape the Future

Half of Americans or more aware of common uses of AI, but fewer can identify AI's role in all six examples

% of U.S. adults who identify that the following use artificial intelligence in multiple choice questions



% of U.S. adults who correctly identify ___ as using AI



Today's Common Uses

1. Biometrics
2. Social Media/News
3. Communications (Email, Messaging, Chat)
4. Search (Google)
5. Digital Voice Assistance
6. Smart Home Devices (Alexa, Google)
7. Enabled Travel (Google Maps, Driving Assistance)
8. Assisted Banking
9. Streaming Entertainment (Netflix, Prime)
10. Technology Support (Cloud, Chatbots, SDN, Scaling)

Where We Could Be Headed

1. Zero Trust Living
2. IO/Propaganda
3. Advanced Deep Fake Phishing (Friends, Family, Co-Workers)
4. Advanced Censorship
5. Outsourcing of jobs
6. Autonomous Home and Office Devices
7. AI Controlled and supported travel (DMV records, warrants, etc.)
8. Full Digital Currency Market
9. Linked Entertainment to Economic/Political Agendas
10. Fully Autonomous Systems, Architectures and Platforms

Responsible Artificial Intelligence

1. **Responsible:** DoD personnel will *exercise appropriate levels of judgment and care*, while remaining responsible for the development, deployment, and use of AI capabilities.
2. **Equitable:** The Department will take deliberate steps to *minimize unintended bias*
3. **Traceable:** The Department's AI capabilities will be developed and deployed such that relevant personnel possess an appropriate understanding of the technology, development processes, and operational methods applicable to AI capabilities, *including transparent and auditable methodologies, data sources, and design procedure and documentation*.
4. **Reliable:** The Department's AI capabilities will have explicit, well-defined uses, and the safety, security, and effectiveness of such capabilities will be *subject to testing and assurance* within those defined uses across their entire life-cycles.
5. **Governable:** The Department will design and engineer AI capabilities to fulfill their intended functions while *possessing the ability to detect and avoid unintended consequences*, and the *ability to disengage or deactivate deployed systems* that demonstrate unintended behavior.

https://www.ai.mil/docs/Ethical_Principles_for_Artificial_Intelligence.pdf

Chief Digital and Artificial Intelligence Office

Why AI is not a Dooms Day Scenario

1. Governance
2. Awareness
3. Natural Dis-Trust
4. The ultimate power of humans over machine :
(Power and Connectivity)



Conclusion

