

Artificial Intelligence Primer

An Overview of Artificial Intelligence, Related Challenges, Regulatory Efforts, and more

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Michael Tinsley

Policy Chair, Past President, President-elect

Roadmap

- **Overview**
- Industry
- Regulation

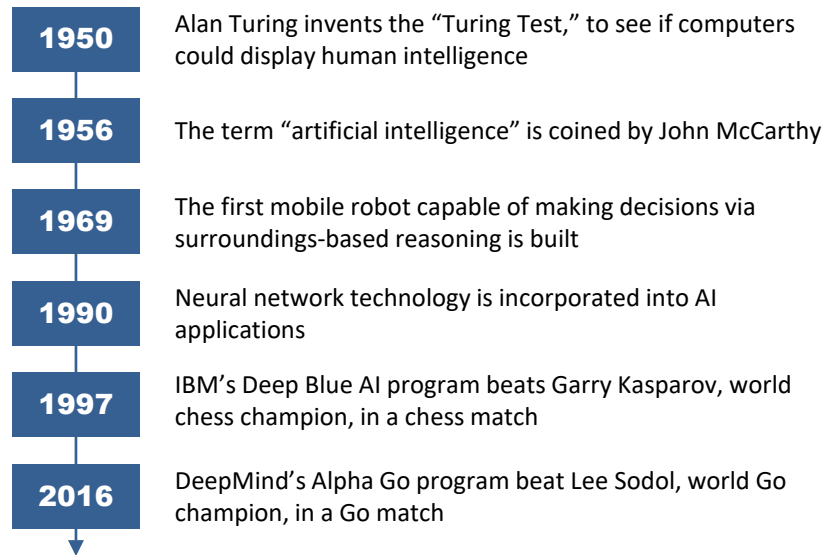


Overview: Artificial Intelligence (AI)

WHAT IS ARTIFICIAL INTELLIGENCE?

- Artificial intelligence (AI) describes machines that can perform tasks without human assistance and learn from the information they collect
- AI systems typically exhibit some tendencies of human intelligence, including learning, knowledge representation, manipulation, motion, perception, problem solving, or reasoning

Timeline



Types of AI

Narrow AI

- Narrow AI describes systems that have been trained or have learned how to execute specific tasks
- All AI programs used today are considered narrow AI

General AI

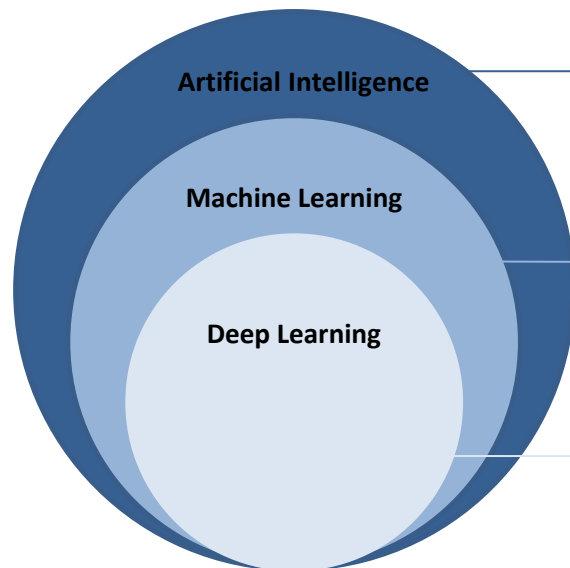
- General AI describes systems with equivalent intelligence to humans, making them self-aware and able to adapt, learn, and solve new problems
- General AI does not yet exist and likely will not for decades



Neural Networks Assist AI systems Learn How to Perform New Tasks

NEURAL NETWORKS

- Artificial neural networks mimic human brain activity, enabling AI programs to identify patterns and solve problems
- Node layers make up neural networks, with each node containing 3 layers: an input layer, one or more hidden layers, and an output layer
- Layers exchange data, all of which is assigned a particular weight. Weights trigger thresholds at different layers, at which point an activated layer will send the data to a deeper layer to process and, ultimately, inform action



Artificial Intelligence

- Artificial intelligence is a broad category that describes computer systems able to carry out human tasks

Machine Learning

- Machine learning is a subset of AI that describes systems that can learn to carry out a task from data they observe, instead of being explicitly programmed to do so

Deep Learning

- Deep learning is a form of machine learning that leverages neural networks comprised of multiple layers, enabling systems to identify complex patterns in large, unstructured data sets
- Virtual assistants, like Amazon's Alexa, rely on deep learning



Large Language Models have Recently Generated a lot of Attention

LARGE LANGUAGE MODELS

- Large language models (LLMs) harness deep learning to identify, recap, translate, predict, and produce text
- LLMs are trained using massive datasets that can often capture the near entirety of content on the internet over a given time frame
- From this data, LLMs learn words, linguistic concepts, and more, allowing them to anticipate and create content for a variety of use cases

LLM use cases



Chatbots and virtual assistants



Fraud detection



Health care insights and drug discovery research

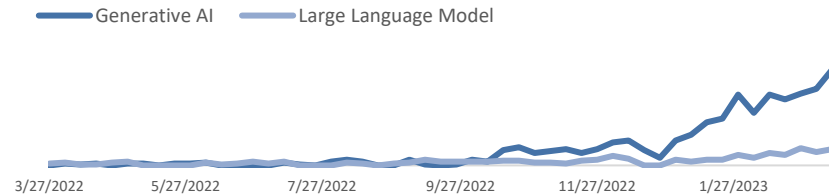


Robotics

The recent launches of chatbots leveraging LLM technology, like OpenAI's ChatGPT, Google's Bard, and Microsoft's Bing chatbot, have increased public interest in such systems

Search interest over time, United States

SOURCE: Google Trends





Various Technologies Support AI Systems and Applications



Advanced Algorithms

- Advanced algorithms allow data to be analyzed more quickly and in higher quantities



Application Programming Interfaces

- Application Programming Interfaces (APIs) are packages of code that can add AI functions to existing products



Computer Vision

- Computer vision leverages pattern recognition and deep learning so that systems can identify pictures or videos



Graphical Processing Units

- Graphical processing units provide the heavy computing power that enables learning via neural networks



Internet of Things (IoT)

- The data collected from devices connected to the IoT can be used by AI systems



Natural Language Processing

- Natural Language Processing (NLP) allows computer systems to process and produce human language



Industries can Leverage AI Capabilities in Different Ways



Automotive

- Semi-autonomous features, like driver assistance
- Traffic analysis
- Vehicle monitoring and maintenance



Defense

- System diagnosis and maintenance
- Target identification
- Unmanned Aerial Vehicles



Energy

- Smart metering
- Grid operation and storage
- Infrastructure maintenance



Finance

- Anti-money laundering support
- Financial planning support
- Fraud detection
- System and process automation



Healthcare

- Disease and diagnosis identification
- Pandemic prediction
- Diagnostic imaging



Manufacturing

- Procedural automation
- Process monitoring and auto-correction
- Supply chain and production support



Multiple Challenges Affect AI Technology

Bias & Discrimination



- AI could enable systems to codify social inequities due to biases in their training data
- Multiple studies of facial recognition systems in the US have demonstrated high error rates when identifying people with darker skin

Cybersecurity



- Any data breach could expose personally identifiable information or sensitive government material, given high volume of data processed by AI systems
- Malicious actors may leverage AI to exploit vulnerabilities in other AI systems

Disinformation



- AI technology is close to creating realistic photos and replicating voices with near-perfect accuracy
- Such features could facilitate the spread of false information and sow distrust in digital media

Surveillance



- Facial recognition system accuracy has improved significantly in recent years
- China is launching a country-wide program to use AI-supported facial recognition technology to track suspicious activity and persons

Roadmap

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Billions Invested in AI each year

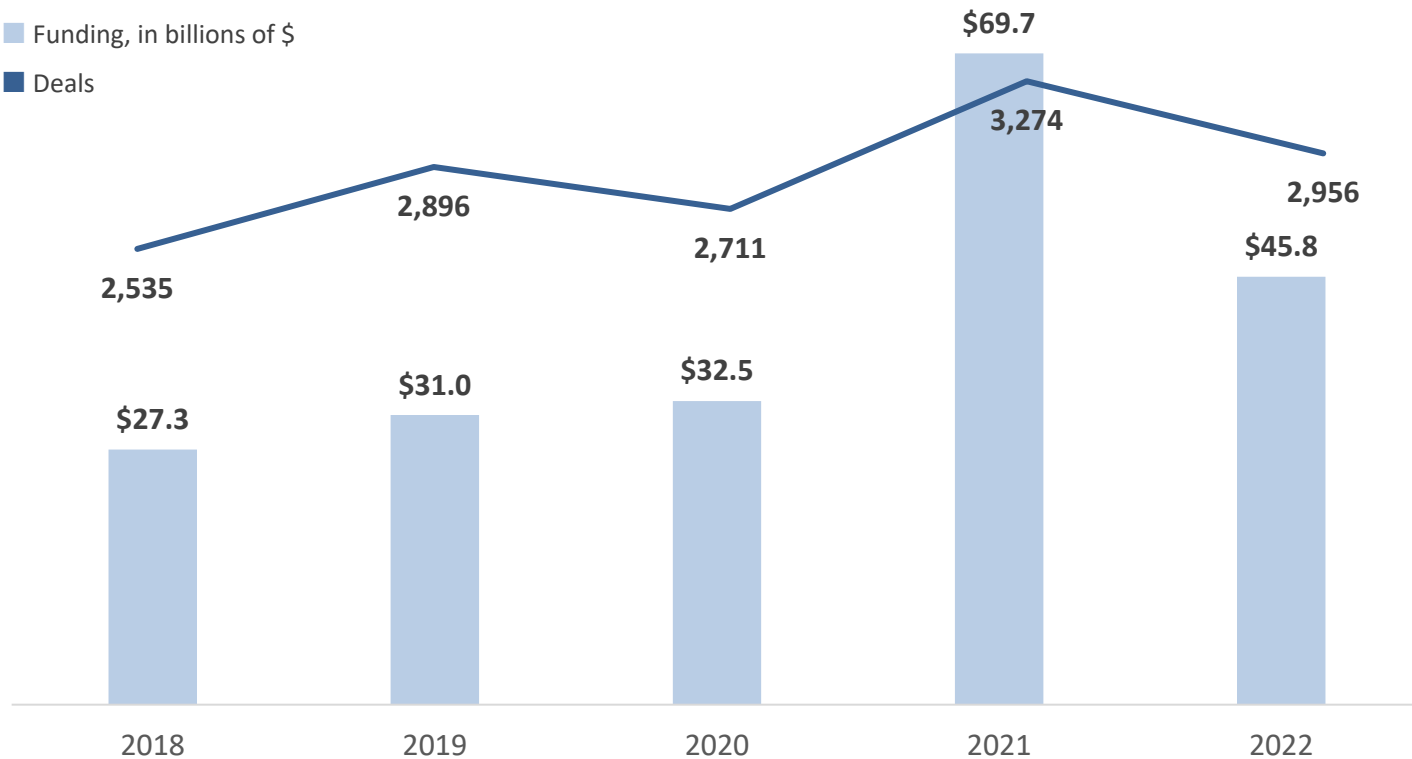
Funding fell 34% in 2022

Global AI funding, by year

SOURCE: CB Insights

■ Funding, in billions of \$

■ Deals

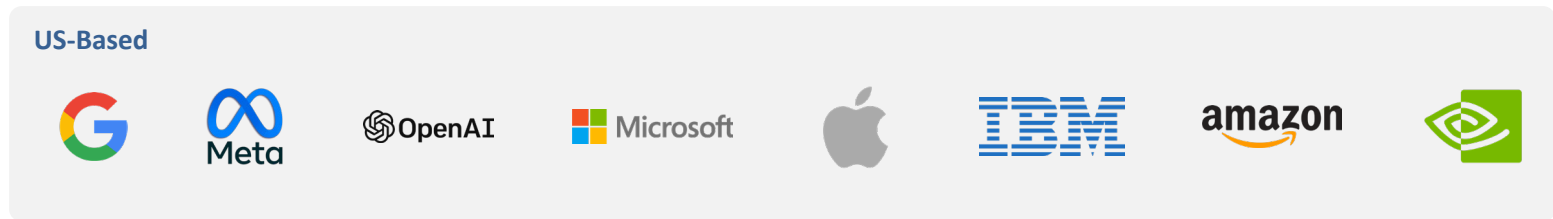
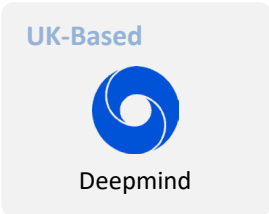
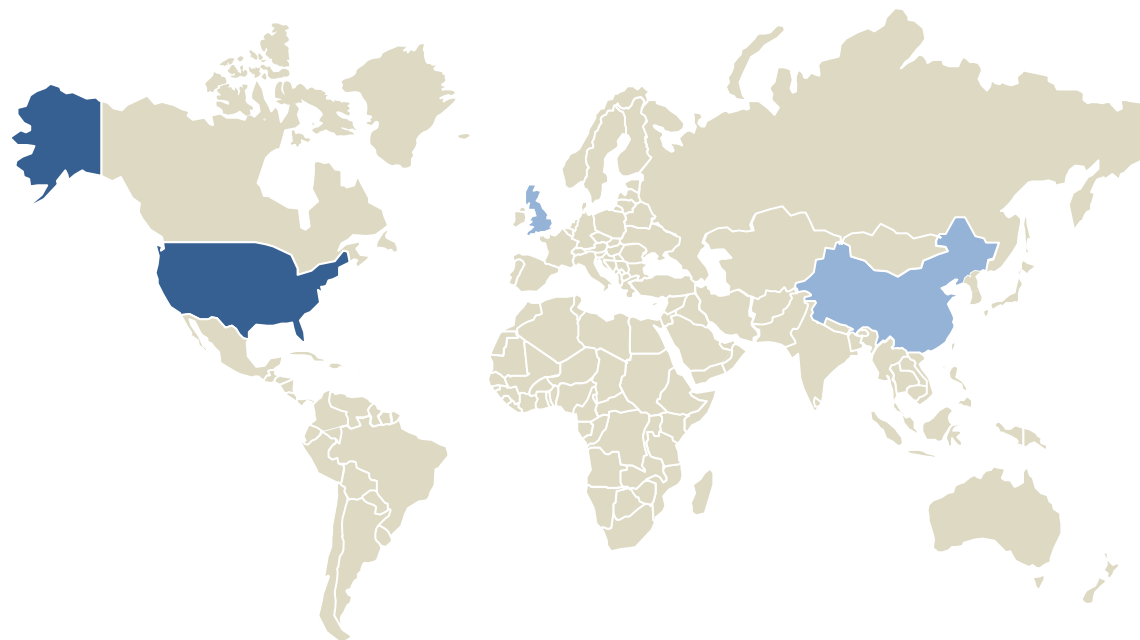


SOURCE: CB Insights.

Slide Updated by Michael Tinsley on 6/1/23



8 of the World's top 10 Companies working on AI are Headquartered in the US



SOURCE Robotics Business Review.

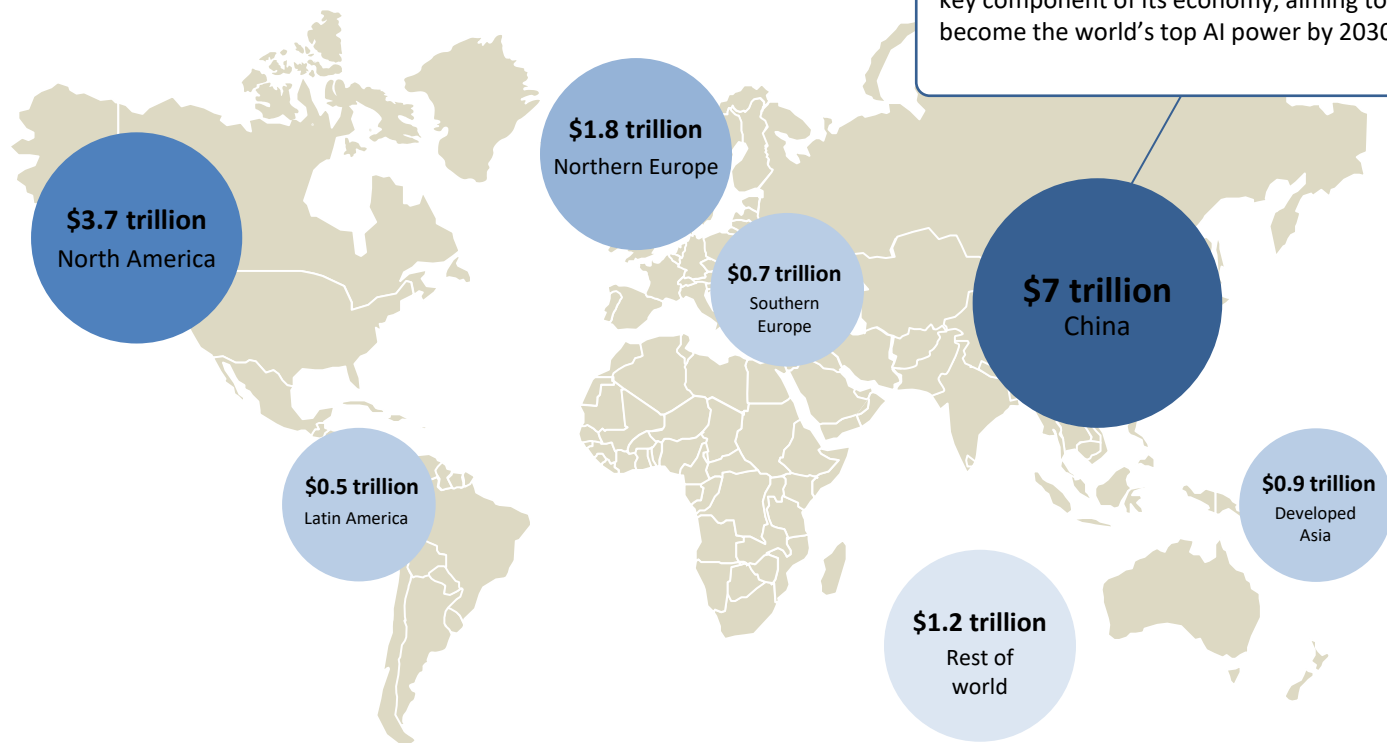
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By 2030, AI could Contribute up to \$15.7 Trillion to Global GDP

Projected AI gains by 2030, by region

SOURCE: PwC



China's AI Ambitions: In 2017, China announced a three-part plan to make AI a key component of its economy, aiming to become the world's top AI power by 2030

Roadmap

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The US lacks Comprehensive Federal AI Legislation

National AI Initiative

- The National Artificial Intelligence Act of 2020, which passed via the 201 NDAA, established the National AI Initiative, housed within the White House Office of Science and Technology Policy (OSTP), to coordinate AI activities across the federal government
- The Initiative's work falls under six pillars: Advancing Trustworthy AI, Applications, Education and Training, Infrastructure, Innovation, and International Cooperation

Blueprint for an AI Bill of Rights

- In October 2022, the OSTP released a nonbinding "blueprint for a n AI Bill of Rights," outlining five principles to guide AI development and deployment
- The blueprint calls for safe and effective systems, maintains that AI should not discriminate, urges privacy by design, asks developers to offer accessible explanations for AI uses, and suggests users be allowed to opt out of automated technology when possible

AI Risk Management Framework (RMF)

- The National AI Act of 2020 directed the National Institute of Standards and Technology (NIST) to develop the framework, which it released on January 26, 2023
- The framework is intended to serve as a voluntary tool to improve AI trustworthiness through guidance on its design, developments, and use
- The AI RMF was written to complement the White House's Blueprint for an AI Bill of Rights



Challenge

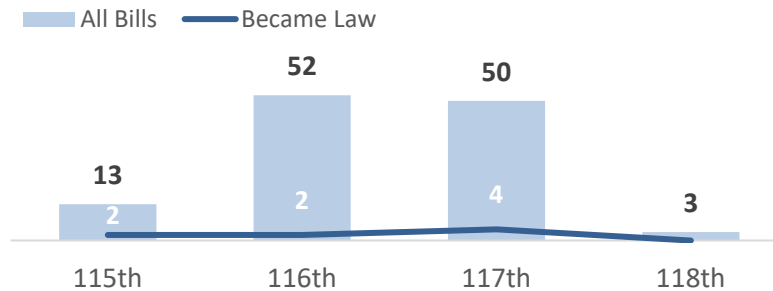
- One key obstacle for federal AI policy is balancing filling the regulatory gaps while also fostering innovation



State legislatures are leading the way on AI legislation

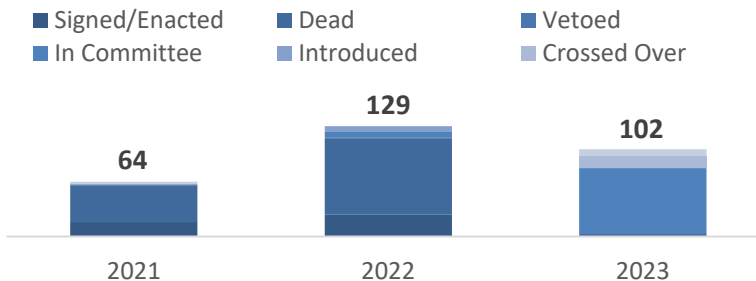
AI-related bills in Congress

SOURCE: Congress.gov



Artificial intelligence bills in state legislatures

SOURCE: BillTrack50



2022 state highlights

Alabama: AL S.B. 56

- Prohibits law enforcement from solely relying on facial recognition matches to establish probable cause or make an arrest

Colorado: CO S.B. 113

- Establishes a task force to examine facial recognition technologies

Illinois: IL H.B. 53

- Requires employers relying only upon AI to determine if job applicants will advance to an interview to collect and report certain demographic data

Vermont: H.B. 410

- Creates an Artificial Intelligence Commission to support the ethical development and deployment of AI

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