

Digital Transformation: Artificial Intelligence for Business

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Agenda

Introduction to
IBM Research

AI for Industry

Impact on Industry,
Ethics and Data Privacy

Agenda

Introduction to
IBM Research

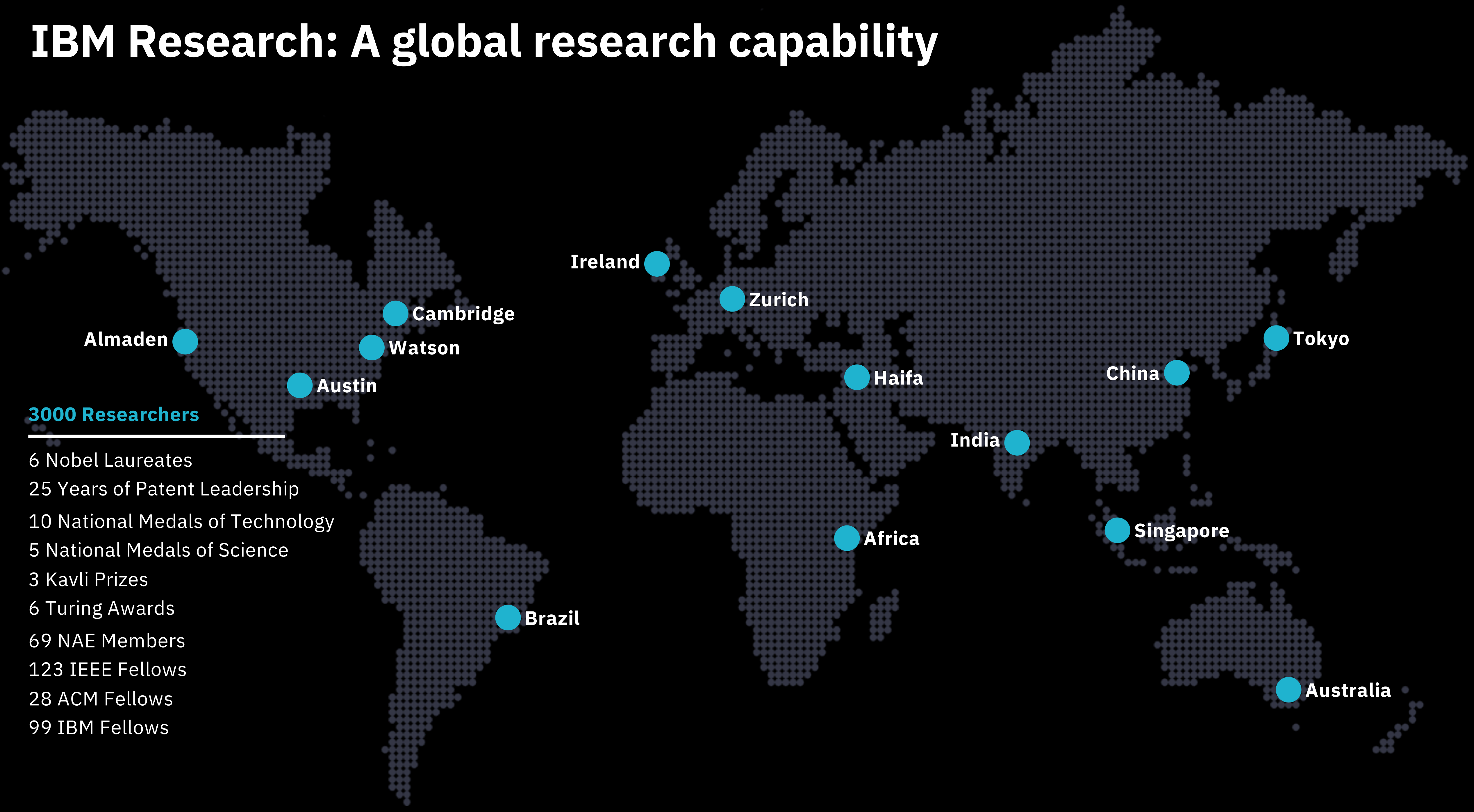
AI for Industry

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IBM Research: A global research capability

3000 Researchers

- 6 Nobel Laureates
- 25 Years of Patent Leadership
- 10 National Medals of Technology
- 5 National Medals of Science
- 3 Kavli Prizes
- 6 Turing Awards
- 69 NAE Members
- 123 IEEE Fellows
- 28 ACM Fellows
- 99 IBM Fellows



Almaden

Watson

Austin

Cambridge

Ireland

Zurich

Haifa

India

China

Tokyo

Singapore

Africa

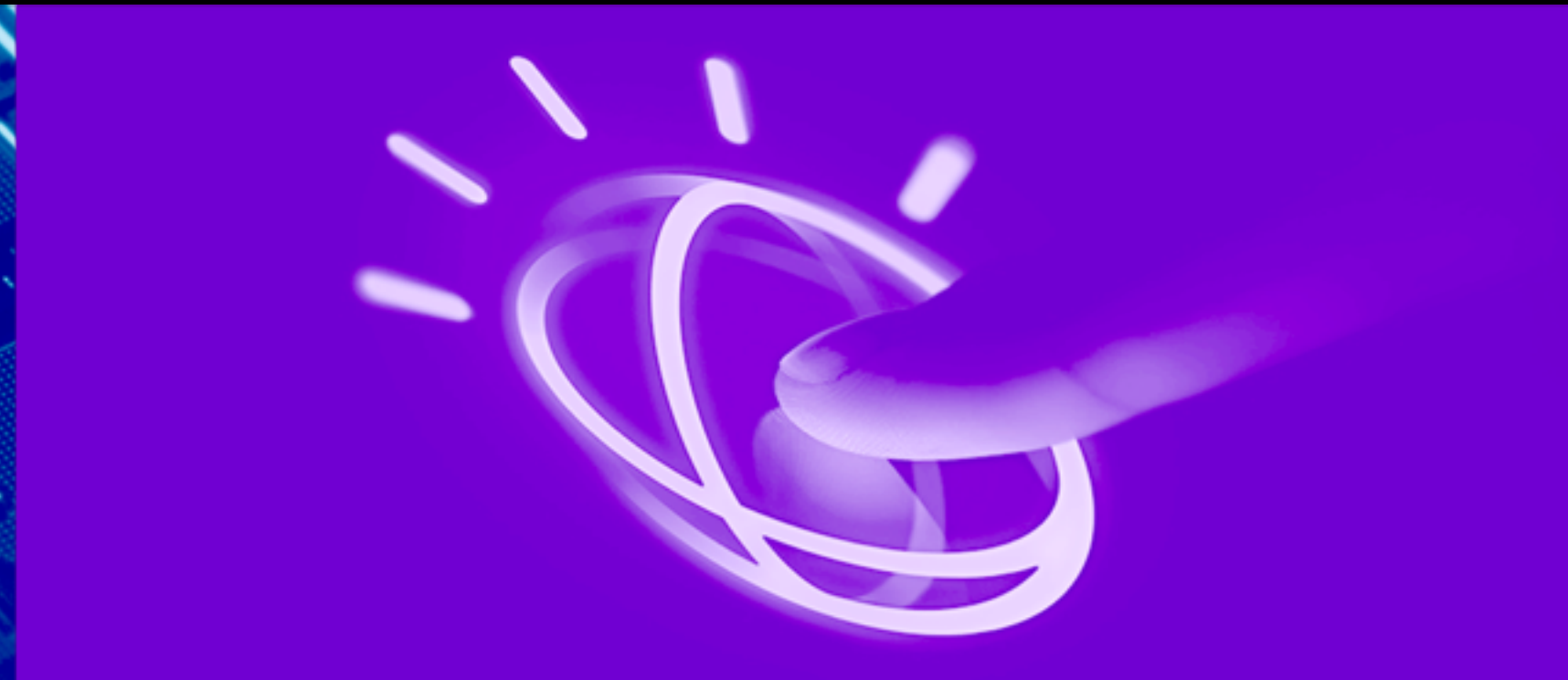
Brazil

Australia

Strategic imperatives

Reimagining
computing

Developing
core AI



Transforming industries
through science and AI

Defining and
optimizing blockchain

Agenda

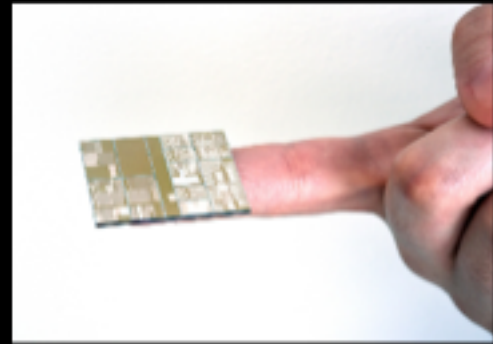
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1971

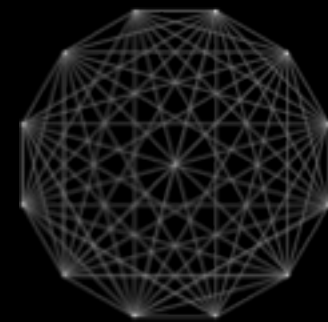
Moore's Law



Transistors

1995

Metcalfe's Law



Network Volume

Today

Watson's Law

Knowledge



Data

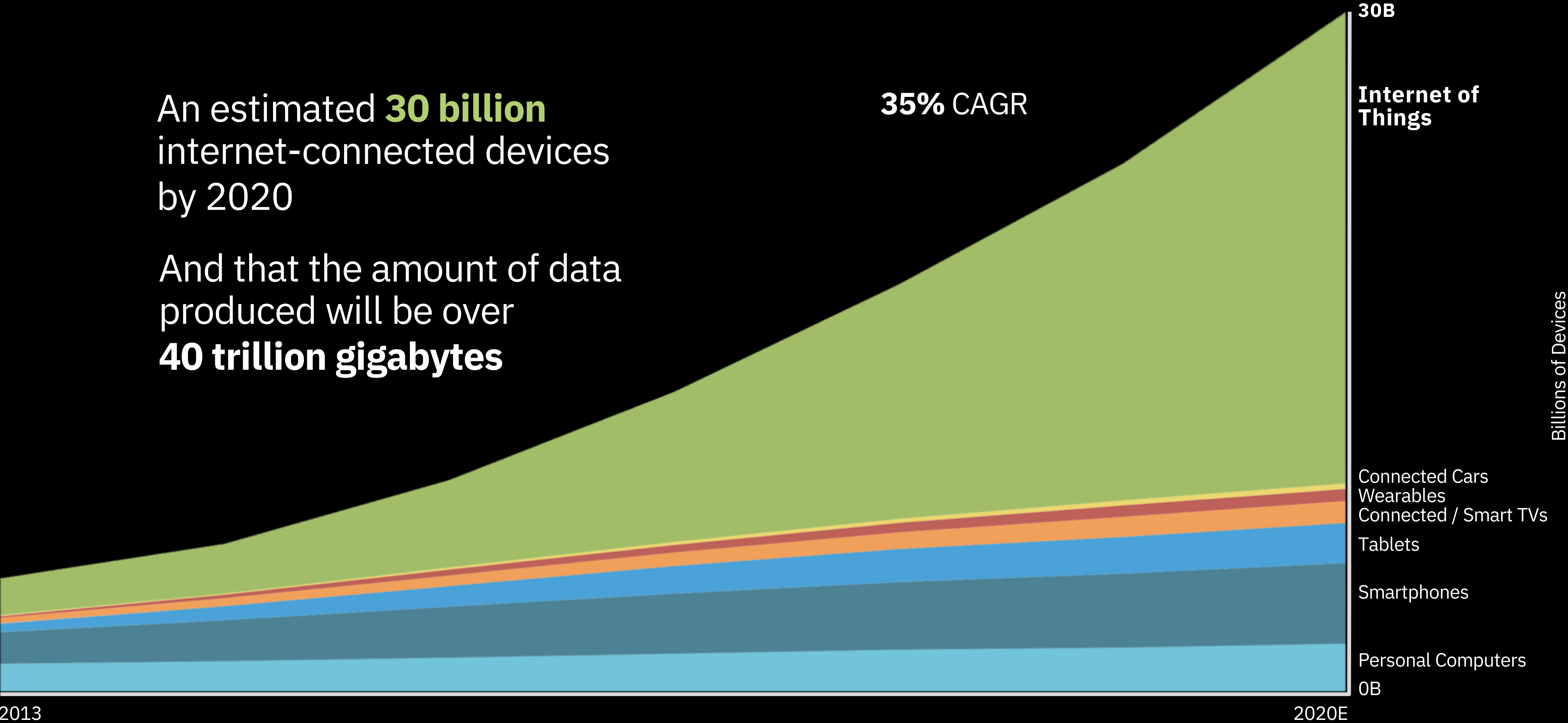
IoT Growth Explosion

Number of devices in the Internet of everything

An estimated **30 billion** internet-connected devices by 2020

And that the amount of data produced will be over **40 trillion gigabytes**

35% CAGR



Data is becoming the most abundant natural resource in the world

90%

Of data created over the last 10 years was **never captured or analyzed**

2X

Factor over past decade that **data creation has exceed expansion of bandwidth**

60%

Of valuable sensory **data loses value in milliseconds**

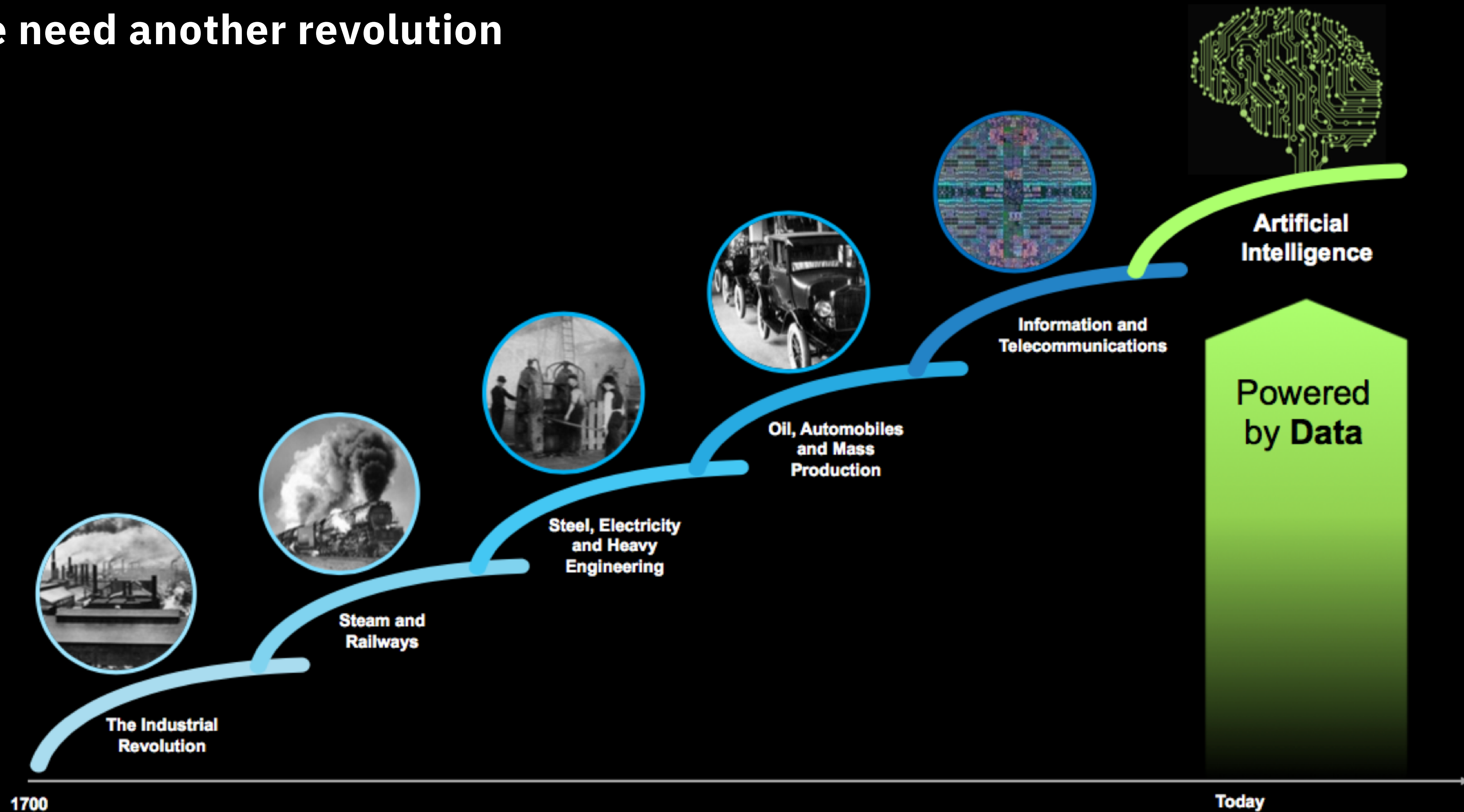
In 2017

Collective computing and storage capacity of **smartphones will surpass all worldwide servers**

The Price of Not Knowing



We need another revolution



Watson in 2011

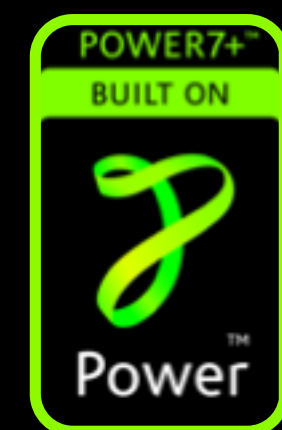
System Specifications



2880 Processing Cores



90 IBM P750 Servers



16 Terabytes Memory (RAM) – 20TB Disk



80 Teraflops (80 trillion operations per second)



Workload Optimized Systems

IBM Technology Depth



Content Analytics



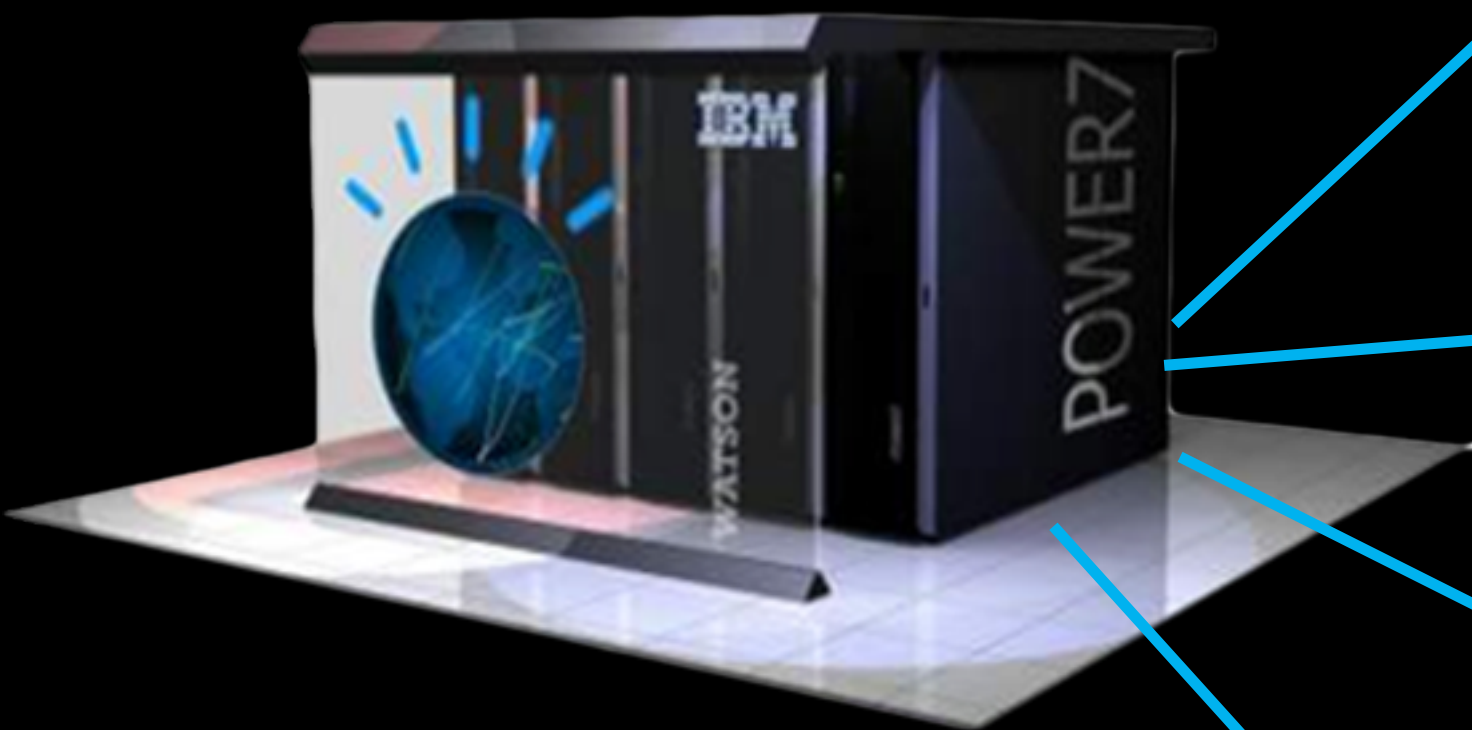
Business Analytics



Big Data



Databases / Data Warehouses



Watson Today: In the Cloud, Available with a Credit Card

All Categories

Infrastructure

- Compute
- Storage
- Network
- Security
- Containers
- VMware

Platform

- Boilerplates
- APIs
- Application Services
- Blockchain
- Cloud Foundry Apps
- Data & Analytics
- DevOps
- Finance
- Functions
- Integrate
- Internet of Things
- Mobile
- Security

Watson >

Search

Filter

Build cognitive apps that help enhance, scale, and accelerate human expertise.



Conversation

Add a natural language interface to your application to automate interactions with your end users. Common

Lite IBM



Discovery

Add a cognitive search and content analytics engine to applications.

Lite IBM



Language Translator

Translate text from one language to another for specific domains.

Lite IBM



Natural Language Classifier

Natural Language Classifier performs natural language classification on question texts. A user would be able

IBM



Natural Language Understanding

Analyze text to extract meta-data from content such as concepts, entities, emotion, relations, sentiment and

Lite IBM



Personality Insights

The Watson Personality Insights derives insights from transactional and social media data to identify

Lite IBM



Speech to Text

Low-latency, streaming transcription

Lite IBM



Text to Speech

Synthesizes natural-sounding speech from text.

Lite IBM



Tone Analyzer

Tone Analyzer uses linguistic analysis to detect three types of tones from communications: emotion, social

Lite IBM



Visual Recognition

Find meaning in visual content! Analyze images for scenes, objects, faces, and other content. Choose a

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AI impacts all industries

Health

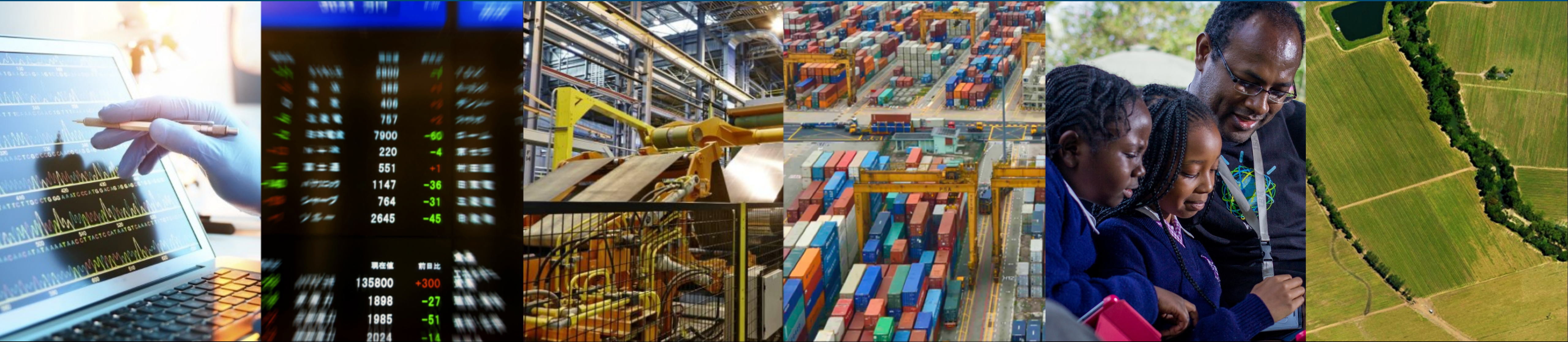
Financial Services

Manufacturing

Logistics

Education

Agriculture



A background image showing several petri dishes with bacterial cultures. The dishes are arranged in a grid-like pattern, and the cultures appear as dark, fuzzy growths on the agar. The lighting is somewhat dim, giving the image a scientific or laboratory feel.

Cognitive Discovery: Augmenting the Process of Invention

50 Million

Scientific publications
published, doubling every
9 years*

2.9 Million

IP applications filed
worldwide in 2016, up
7.8%(WIPO)

20,000 per Week

The number of papers cognitive computing
can deep parse, 30 seconds for each on a
laptop

A healthcare professional with dark hair, wearing a blue scrubs top, is looking at a medical scan held by an elderly woman with short grey hair, wearing a pink shirt. They are in a clinical setting with a blurred background showing medical charts and equipment.

Tracking the Progression of Chronic Obstructive Pulmonary Disease (COPD)

1 in 3

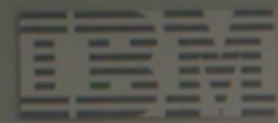
leading cause of death by 2030

90%

of deaths by 2030 in low and
middle income countries

\$90 billion

expected cost of medical care for adults
with COPD



We should
subsidize space
exploration

<http://bit.ly/debater>



<http://bit.ly/debater>



Project Debater: Using AI to Help Humans with Decision Making

35,000

decisions are made everyday
by humans

300 million

documents in its corpus from
newspapers in addition to
Wikipedia

Pro/Con

AI system can debate both sides of the
topic to present executives with an
unbiased opinion

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Cognitive Computing for
Industry

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Human + Machine

Human + Machine

Self-directed goals

Large-scale math

Common sense

Pattern discovery

Value judgment

Statistical reasoning

...leads to better **decision making**

Social and **ethical** questions must be addressed

3 Principles for the Cognitive Era:

Purpose:

Augment human intelligence, rather than replace it

Transparency: We will always make clear...

When and for what purposes AI is being applied

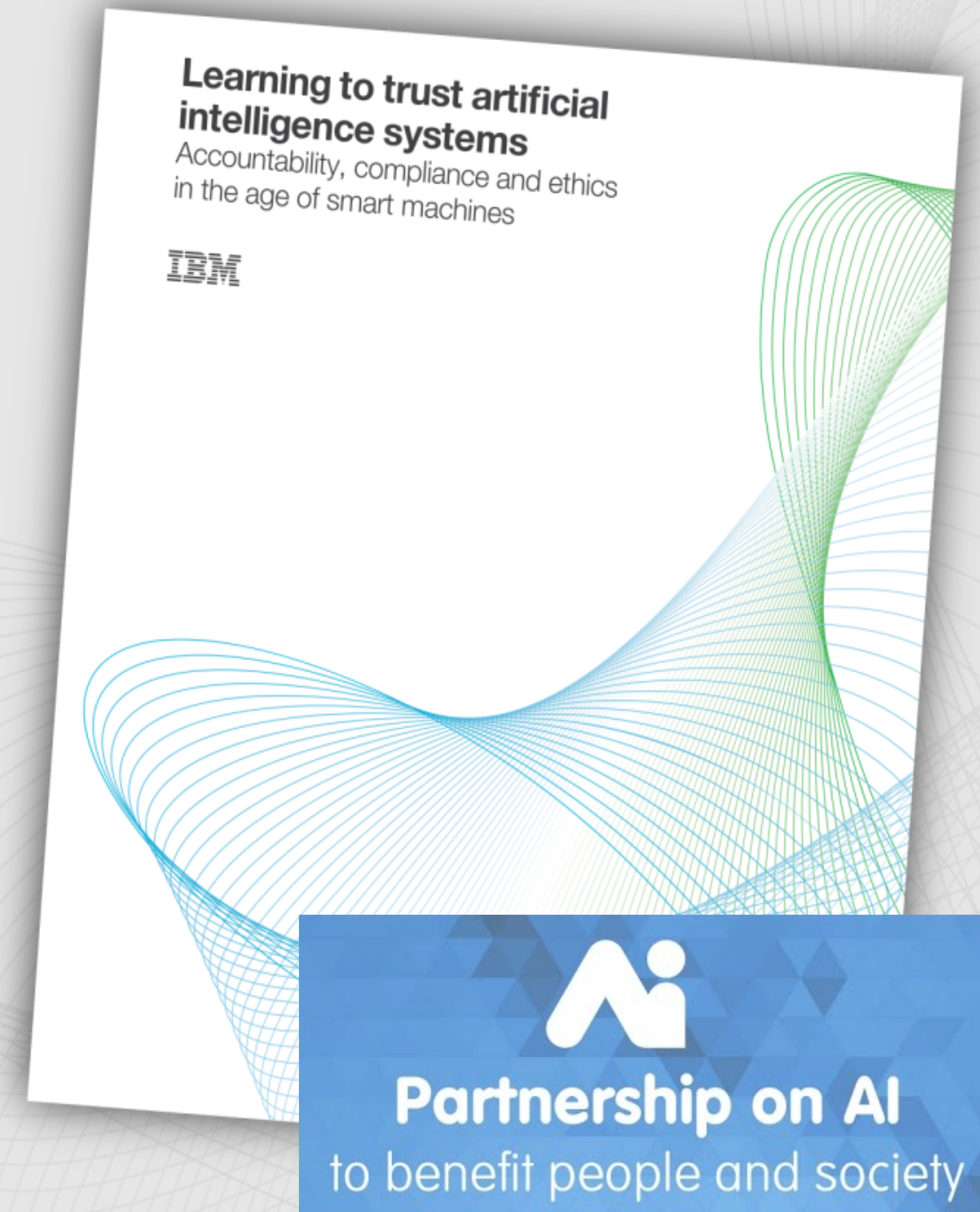
Major sources of data and expertise that inform the insight

That organizations own their own business models and IP

Economic Opportunity:

To enable skills and knowledge to perform the work that will emerge in a cognitive economy

Supported by end-to-end security



AI Ethics - Impact of AI on Cyber Security?

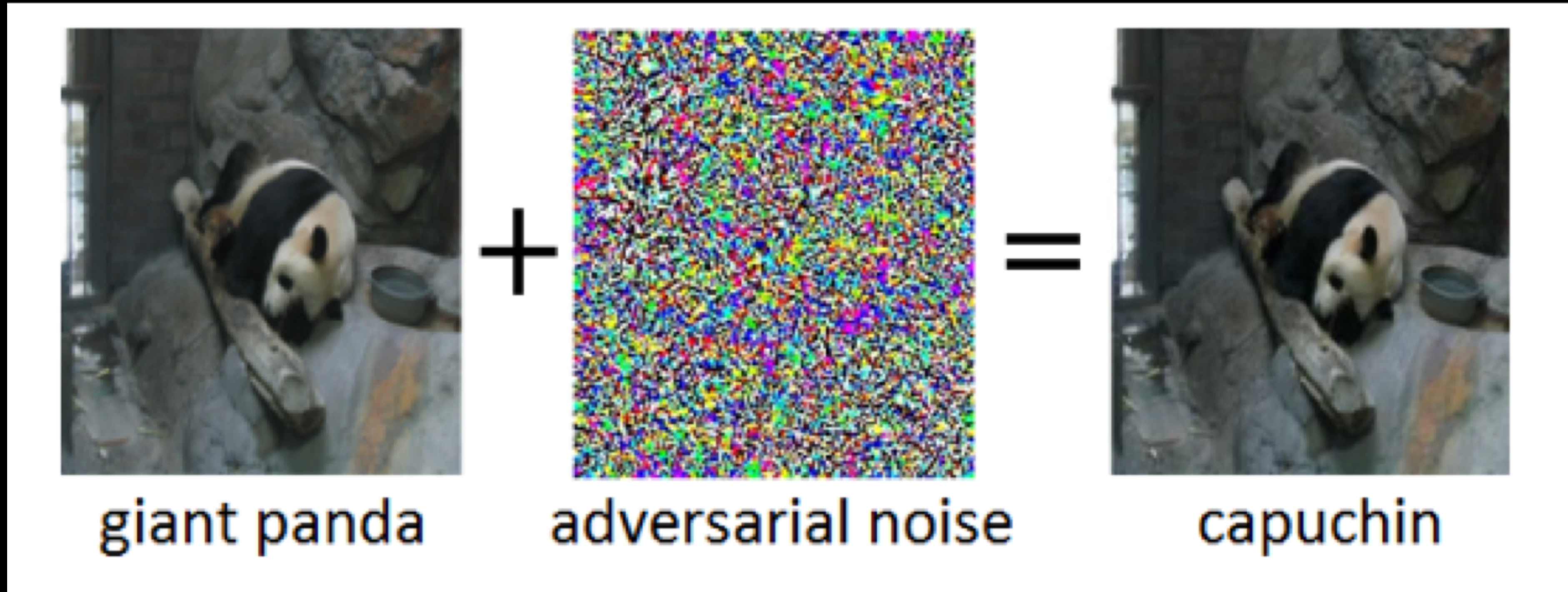






Securing AI Against Adversarial Threats

Adversarial Robustness Toolbox, a free, open source tool to defending against adversarial attacks for images, video and speech

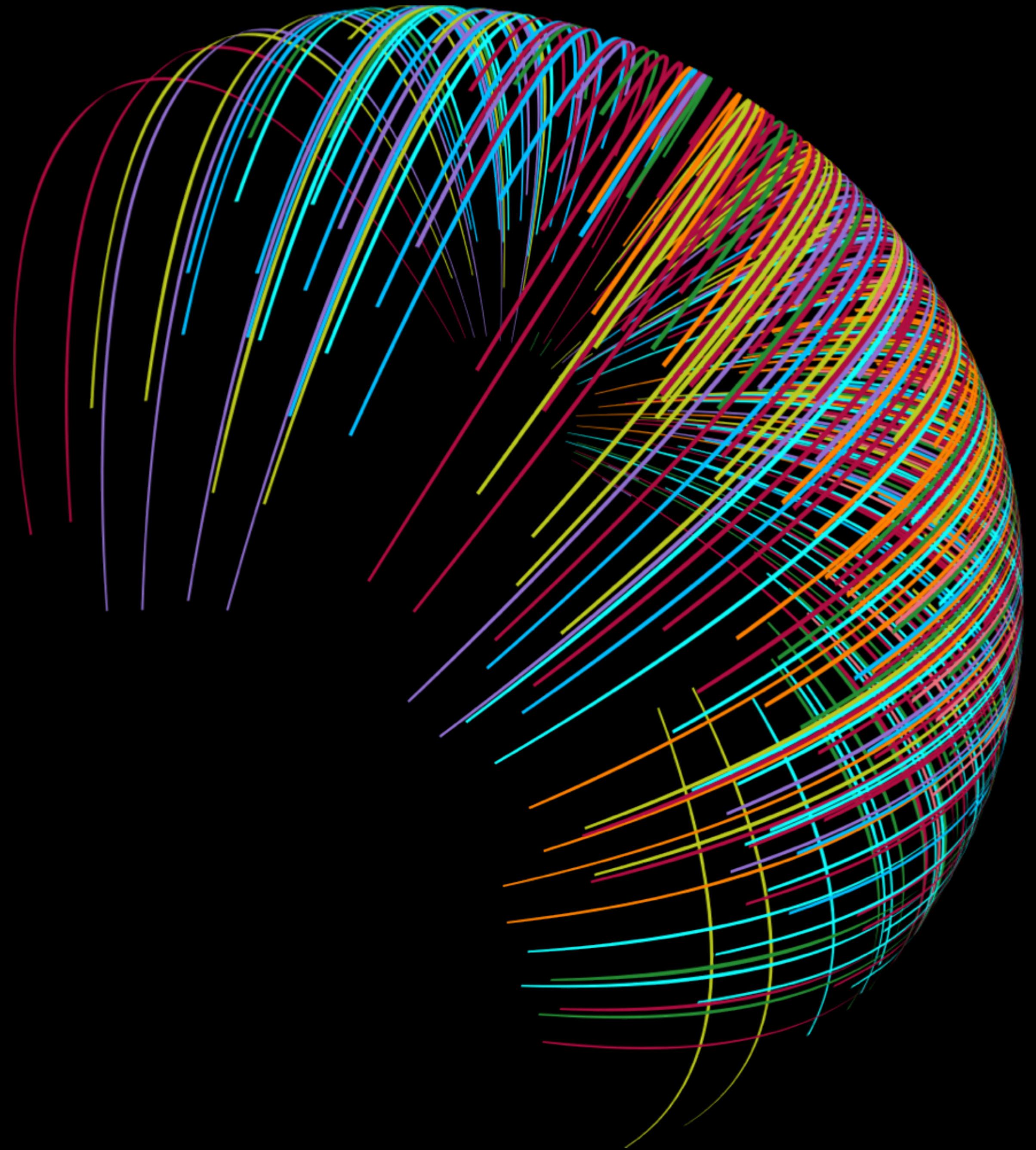


Adversarial example (right) obtained by adding adversarial noise (middle) to a clean input image (left). While the added noise in the adversarial example is imperceptible to a human, it leads the Deep Neural Network to misclassify the image as “capuchin” instead of “giant panda”.

AI everywhere

Artificial intelligence (AI) will rapidly evolve from narrow capabilities to broader intelligence with integrated knowledge and adaptive learning.

AI will permeate every discipline and all industries from finance to manufacturing to healthcare boosting productivity and enabling brand new opportunities.





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