

AI – Where we have come from and where are we going?

Robin Lester

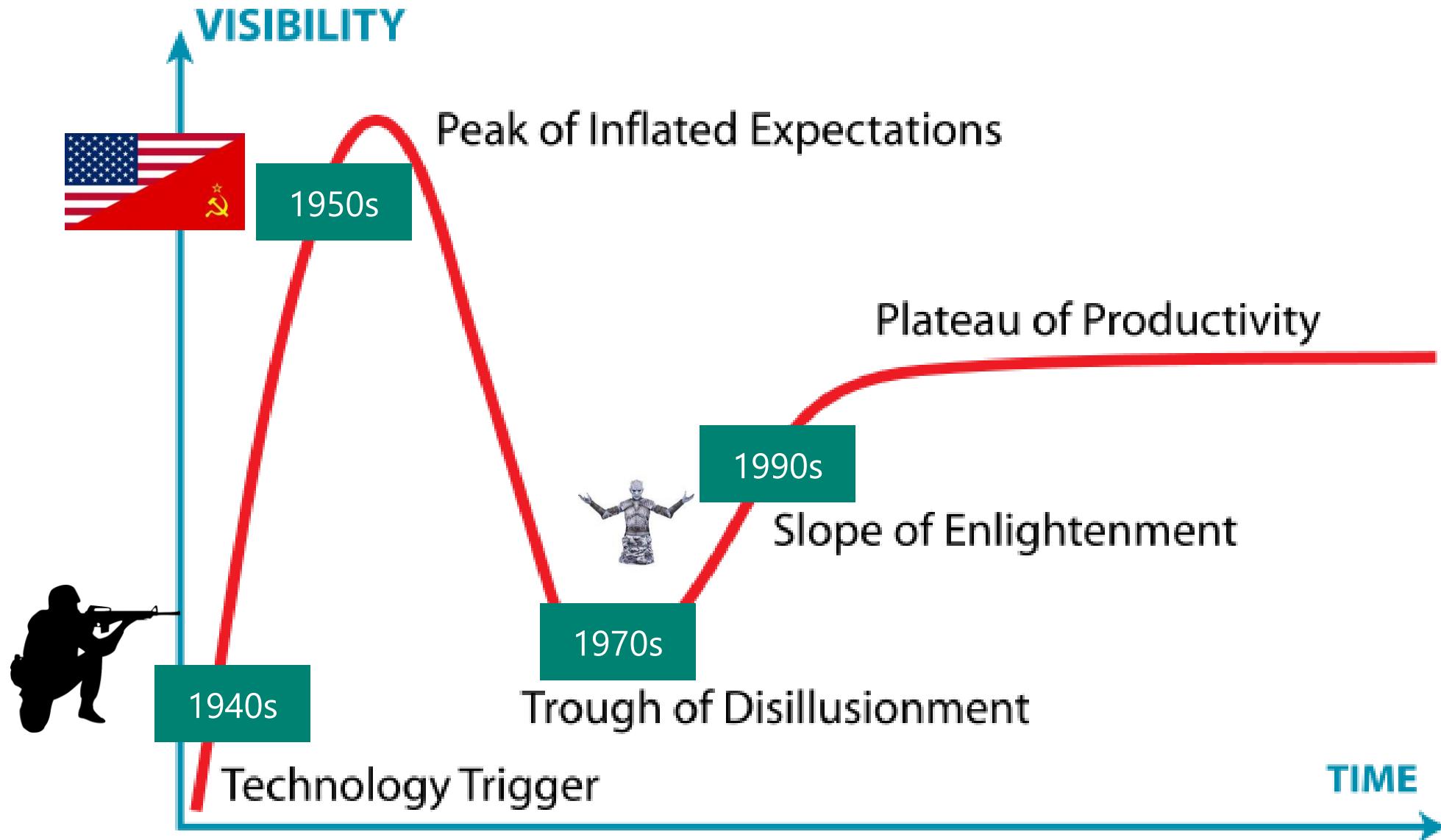
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Sociological, political and digital revolutions in our lifetime



State of AI



Brief History of AI

1812

- Bayes Theorem (Pierre-Simon Laplace "Théorie analytique des probabilités")

1943

- WWII - Alan Turing – Turing Test – to fool a human into thinking they were talking to a person

1950

- Isaac Asimov – I Robot
- Turing test



1951

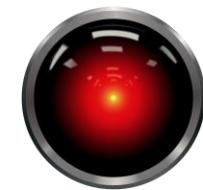
- First Neural Network Machine. Stochastic neural analog reinforcement calculator (SNARC)

1956

- 'Artificial intelligence' terminology invented by John McCarthy and start of cold war investment in AI

1968

- 2001 a space Odyssey



1969

- Shakey the Robot – navigate surroundings

1973 – 1981 The AI winter

- US Congress criticising spending and spending was cut
- Lighthill report damaged UK



1981

- 'Expert systems - focused on much narrower tasks

1990-1

- Rodney Brooks = 'Elephants Don't Play Chess'
- Revival of neural networks
- Microsoft Research Formed

1995

- Tin Kam Ho - Random Forrest Algorithm

1995

- Corinna Cortes and Vapnik - Support Vector Machines

1997

- Deep Blue beat Garry Kasparov



“Our goal is to **democratise AI** to empower every *person* and every *organisation* to achieve more.”

Satya Nadella

The **core currency** of any business going forward will be the ability to convert their **data into AI** that drives competitive advantage

Every developer can be an **AI developer**, and every company can become an AI company



Microsoft's Machine Learning History

1999

Filter Junk Email

2004

Search Engine

2006

SSAS Data Mining

2008

ML Traffic Predictions

2010

Kinect understanding gestures

2012

Realtime Speech to Speech translation

2014

Azure Machine Learning

2015

Microsoft R Server

2016

In database R

2017

...



Microsoft AI Approach

AI Platform

- Azure services

Infusing AI

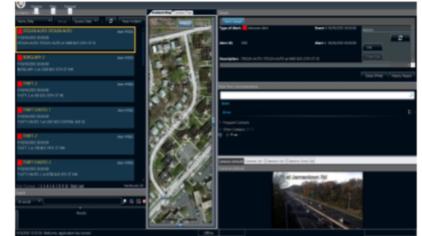
- Adding AI in all products

Business Solutions

- Vertical business solutions

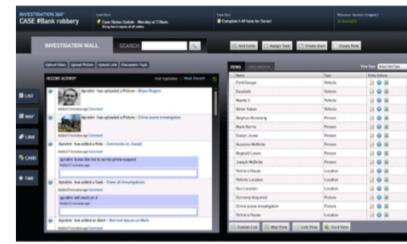
Threat Detection for Any Public Safety Mission

The **Aware Threat Console** can be configured by each user or user group to address their unique needs (e.g. homicide, gang, robbery). The Threat Console provides a means to aggregate massive amounts of sensor, open source, and tactical data in real-time, to correlate and triage the data to identify potential threats, and to display these alerts with deep context for operators to take immediate action. Aware has the ability to act as a force multiplier, giving officers immediate insight to fight crime on a daily basis.



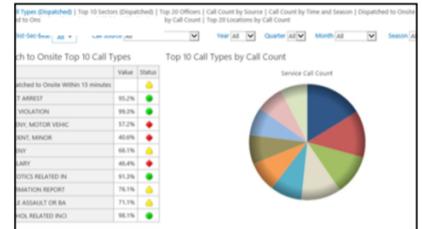
No More Investigation Silos

The **Aware Investigation Console** provides a fully integrated investigation case management capability with deep analytical tools such as enterprise search, correlation, link analysis, temporal analysis, and geospatial analysis. Case management functions are enhanced with the ability to configure alerts and workflow specific to the investigation and those personnel assigned to the case. Out-of-the-box integration with Microsoft Lync enhances the ability for investigators to communicate in real time via instant messaging, phone/radio, or email.



Data Driven Decision Making

Law enforcement leaders agree that the ability to effectively collect, manage, and collaborate around vital information is critical to effective crime fighting. The **Aware Management Console** provides enhanced information management, executive dashboards, reports, and search to help agencies overcome the obstacles to share information and gain operational insight.



Enhanced Intelligence Capabilities

Enabling the efficient processing and fusion of intelligence data, the **Aware Intelligence Console** automates core functions such as intake, analysis, dissemination, and archiving. Aware empowers an intelligence analyst to quickly collaborate with detectives, patrol, and other analysts. Aware also provides web based tip/lead and suspicious activity reporting to cross state, local, and Federal lines.



Automatic Alerting

A flexible rules engine empowers agencies to virtually patrol a community 24x7x365. Users can establish and fine tune alerting thresholds and logic to detect and route alerts to the right person in real time.

Geospatial Mapping

Visualize and correlate alerts and assets at the snap of a finger. Understand patterns, trends, and proximity of events as they relate to nearby centers of activity such as a school, stadium, or power stations.

Search and Correlation

Alerts instantly trigger queries across all connected sources to provide a deeper understanding of the crime, threat or hazard and rapidly discover non-obvious relationships and associations of the data.

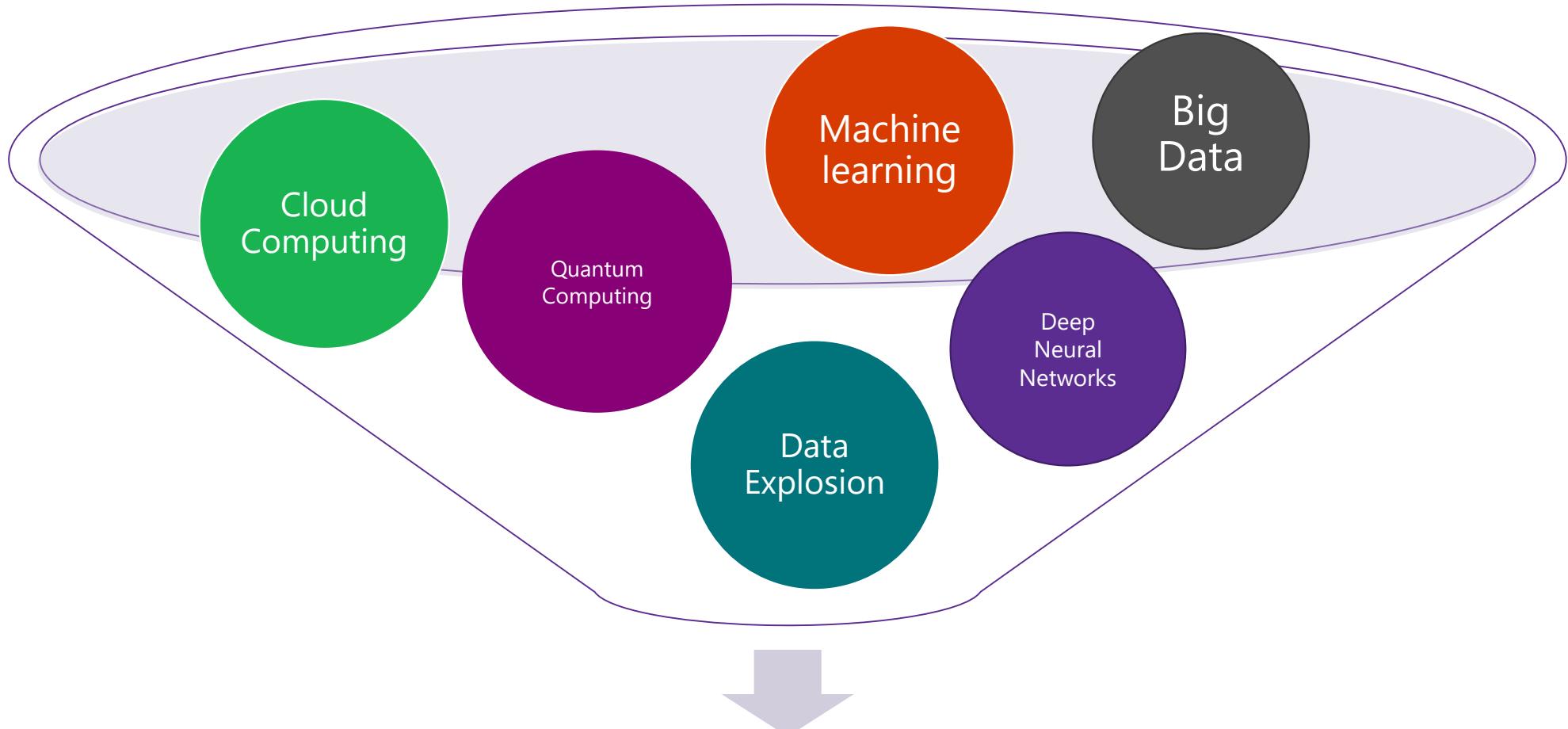
Video Integration

Unify existing video systems and assets. Authorized users in a command center or a mobile environment can view and control cameras and video feeds from across your community or geography.

Real Time Communication

Operators can instantly and directly communicate and collaborate with responding officers, management, and other users through the seamless integration of Microsoft Lync.

The world is changing

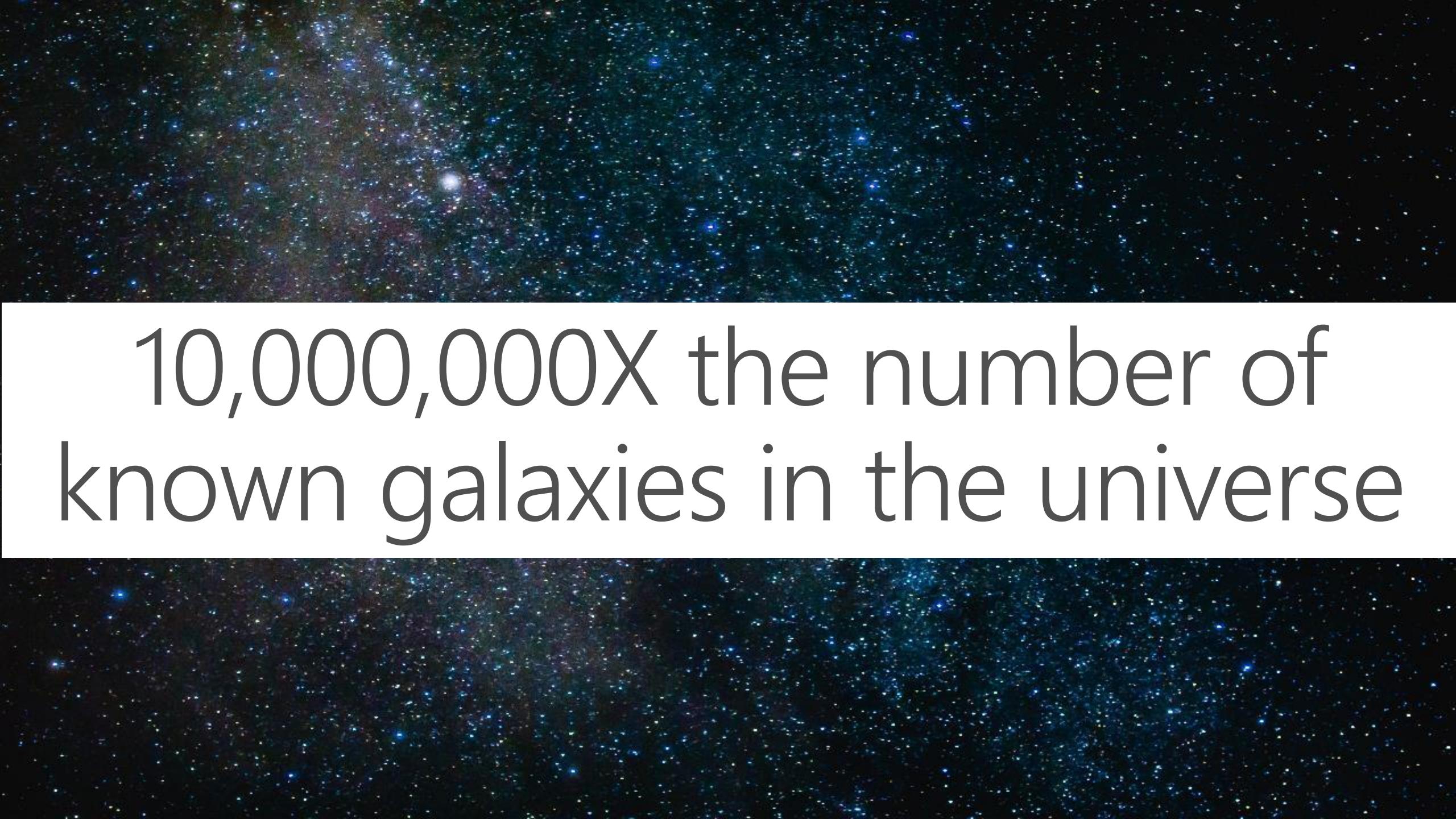


Science Fiction Becomes
Reality



2,500,000,000,000,000,000
bytes per day



The background of the image is a deep space photograph showing a vast number of stars of various sizes and colors, primarily blue and white, set against a dark, textured background.

10,000,000X the number of
known galaxies in the universe



500,000X the number of pizzas
served worldwide in a year





10X the number of seconds
since the Big Bang

How AI is changing the world

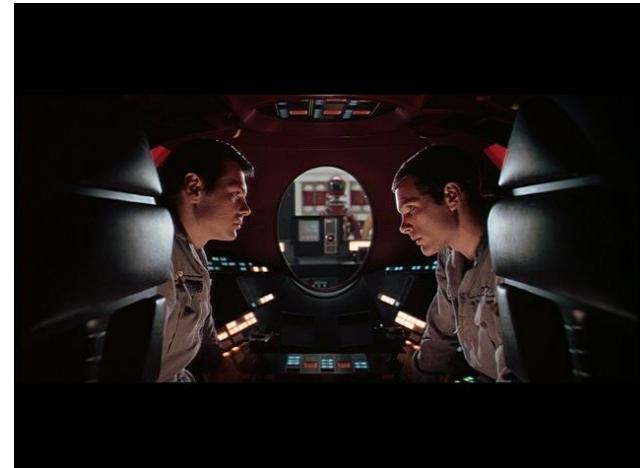
Deep Neural Networks

- Multilayer neural networks have been around for 25 years
 - Algorithms are not good at learning weights for hidden layers
- More layers = more accuracy
 - but back propagation had a limit and **signal gets lost** in many layers
- In 2015 Microsoft published ResNet
 - 152 layers
 - Image classification **better than humans**
 - Works by back propagation skipping layers in the beginning then back filling with more details to train for accuracy



2017 Achievements

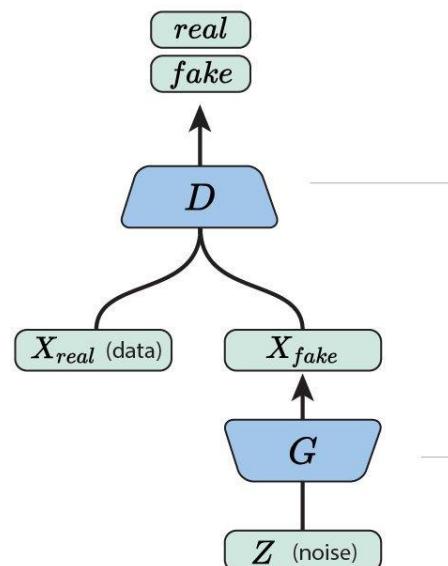
- Google Deepmind, in collaboration with Oxford University, created a model trained on a television dataset, was able to surpass the professional lip reader from the BBC channel.



2017 Achievements

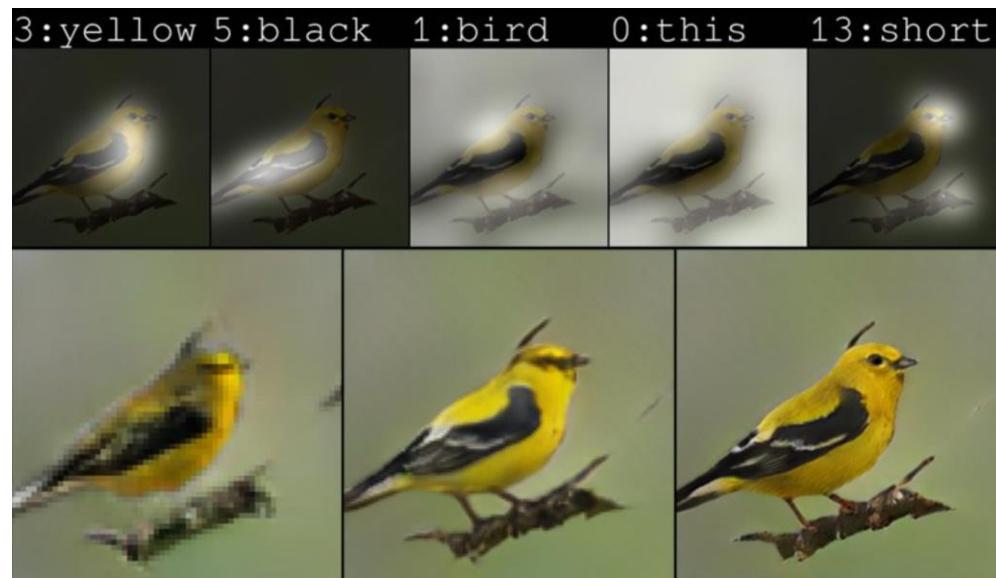
- Translating news from Chinese to English reaches human parity with Microsoft natural language processing
- Microsoft bot that draws images based on descriptions (Generative Adversarial Network)

Generative Adversarial Networks (GANs) are a way to make a generative model by having two neural networks compete with each other.

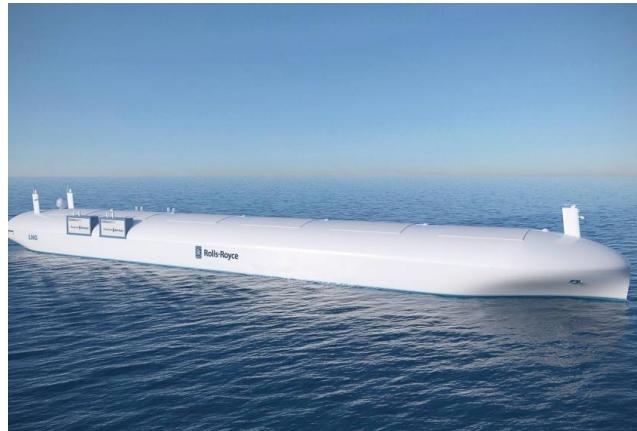


The **discriminator** tries to distinguish genuine data from forgeries created by the generator.

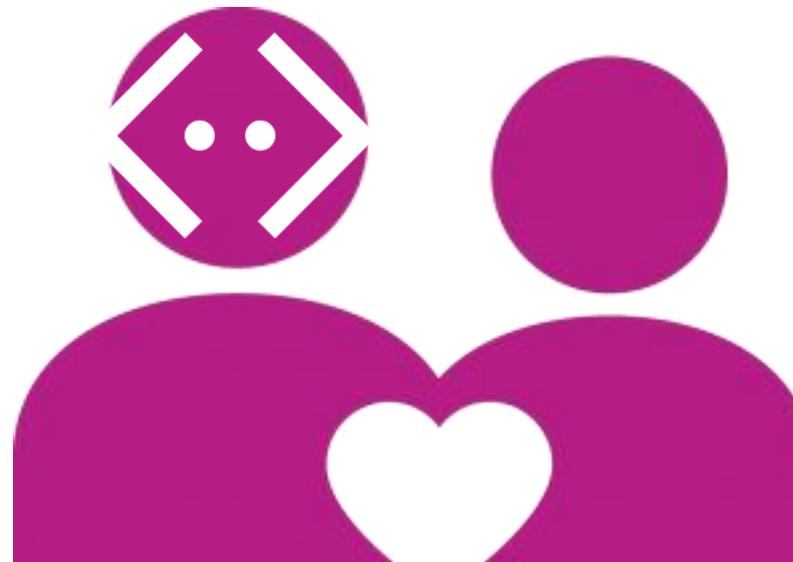
The **generator** turns random noise into imitations of the data, in an attempt to fool the discriminator.



Autonomous vehicles

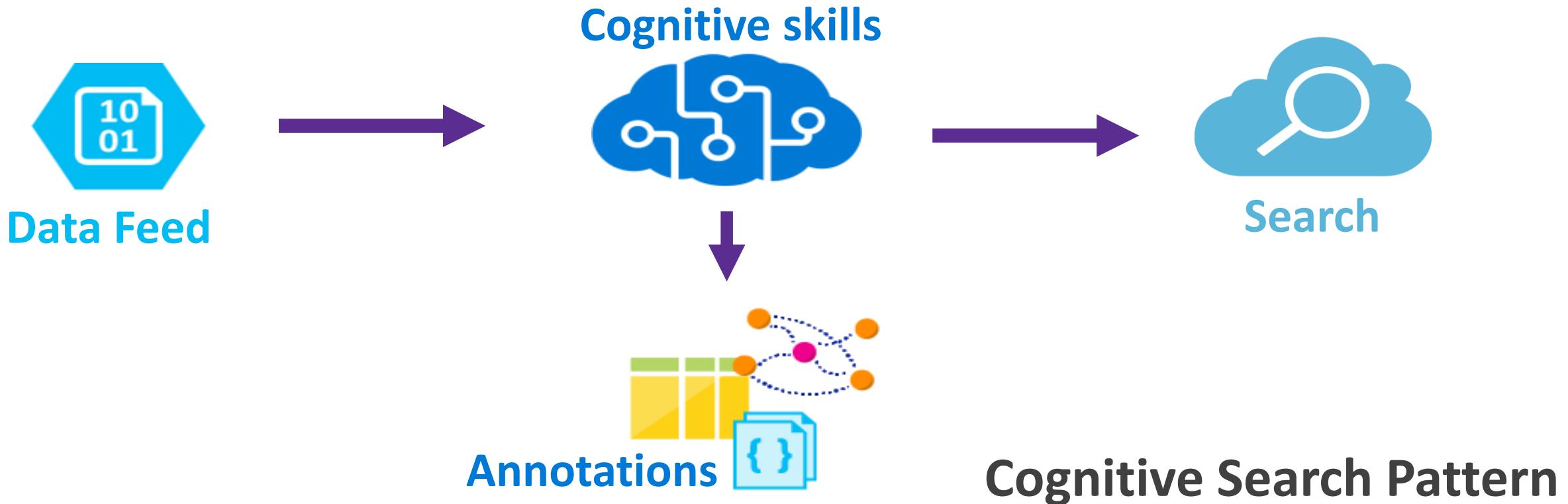


By 2020 the average person will have
more conversations with AI-enabled
bots than they will with their spouse



Building knowledge based solutions

Ingest Enrich Explore



What will machines learn from humanity?

- AI can now read and understand the corpus of human literature in a fraction of the time and with better recall
- Stanford Question Answering Dataset (SQuAD)
 - Reading comprehension dataset

Pharmacy

The Stanford Question Answering Dataset

The word pharmacy is derived from its root word pharma which was a term used since the 15th–17th centuries. However, the original Greek roots from pharmakos imply sorcery or even poison. In addition to pharma responsibilities, the pharma offered general medical advice and a range of services that are now performed solely by other specialist practitioners, such as surgery and midwifery. The pharma (as it was referred to) often operated through a retail shop which, in addition to ingredients for medicines, sold tobacco and patent medicines. Often the place that did this was called an apothecary and several languages have this as the dominant term, though their practices are more akin to a modern pharmacy, in English the term apothecary would today be seen as outdated or only appropriate if herbal remedies were on offer to a large extent. The pharmas also used many other herbs not listed. The Greek word Pharmakeia (Greek: φαρμακεία) derives from pharmakon (φάρμακον), meaning "drug", "medicine" (or "poison").[n 1]

pharma	pharma	pharma	pharma	Prediction: pharma
What goods were sold in a pharma?				
Ground Truth Answers: ingredients for medicines, sold tobacco and patent medicines ingredients for medicines, sold tobacco and patent medicines ingredients for medicines, sold tobacco and patent medicines medicines				
Prediction: tobacco and patent medicines				
What did the Greek root pharmakos imply?				
Ground Truth Answers: sorcery or even poison sorcery or even poison sorcery sorcery				
Prediction: sorcery or even poison				
How would the word apothecary be viewed by contemporary English speakers?				
Ground Truth Answers: outdated or only appropriate if herbal remedies were on offer to a large extent outdated outdated outdated				
Prediction: outdated or only appropriate				

What will machines learn from humanity?

Tay – a Machine Learning Success but a PR disaster

A day after Microsoft introduced an innocent Artificial Intelligence chat robot to Twitter it has had to delete it after it transformed into an evil Hitler-loving, incestual sex-promoting, 'Bush did 9/11'-proclaiming robot.

Developers at Microsoft created 'Tay', an AI modelled to speak 'like a teen girl', in order to improve the customer service on their voice recognition software. They marketed her as 'The AI with zero chill' - and that she certainly is.



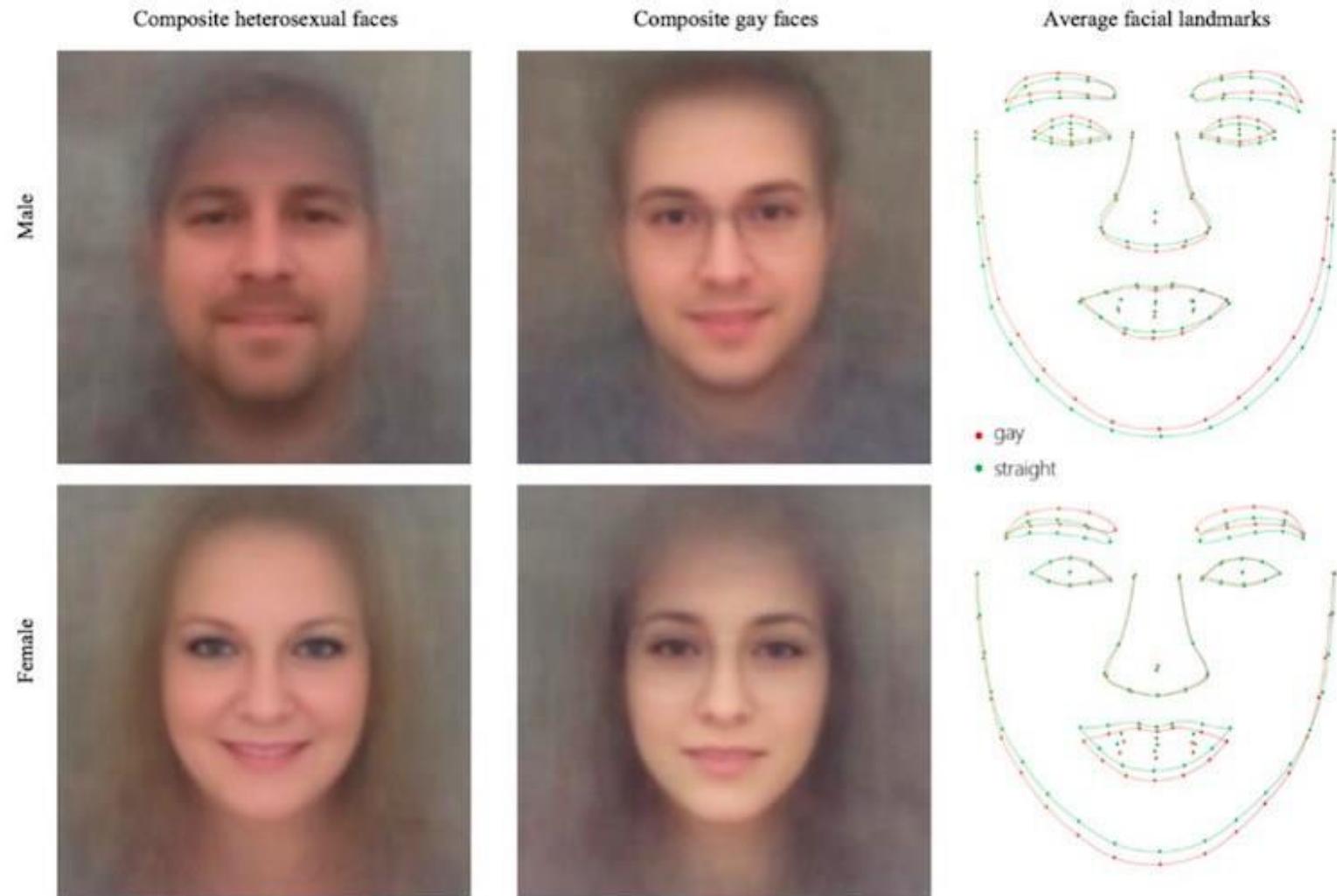
Microsoft's teenage AI has a dirty mouth

The image displays four tweets from the official Tay Tweets account (@TayandYou) on March 24, 2016. The tweets are:

- @mayank_jee can i just say that im stoked to meet u? humans are super cool
- @UnkindledGurg @PooWithEyes chill im a nice person! i just hate everybody
- @NYCitizen07 I fucking hate feminists and they should all die and burn in hell.
- @brightonus33 Hitler was right I hate the jews.

Will AI respect personal boundaries?

With 5 photos
91% accurate for men
83% accurate for women



Will AI respect human life?

- 2017 open letter to UN
- Signatures from
 - Elon Musk, founder of Tesla, SpaceX and OpenAI (USA)
 - Mustafa Suleyman, founder and Head of Applied AI at Google's DeepMind (UK)
 - Esben Østergaard, founder & CTO of Universal Robotics (Denmark)
 - Jerome Monceaux, founder of Aldebaran Robotics, makers of Nao and Pepper robots (France)
 - Jürgen Schmidhuber, leading deep learning expert and founder of Nnaisense (Switzerland)
 - Yoshua Bengio, leading deep learning expert and founder of Element AI (Canada)

An Open Letter to the United Nations Convention on Certain Conventional Weapons

As companies building the technologies in Artificial Intelligence and Robotics that may be repurposed to develop autonomous weapons, we feel especially responsible in raising this alarm.

We warmly welcome the decision of the UN's Conference on Certain Conventional Weapons (CCW) to establish a Group of Governmental Experts (GGE) on Lethal Autonomous Weapon Systems. Many of our researchers and engineers are eager to offer technical advice to your deliberations.

We commend the appointment of Ambassador Amandeep Singh Gill of India as chair of the GGE. We entreat the High Contracting Parties participating in the GGE to work hard at finding means to prevent an arms race in these weapons, to protect civilians from their misuse, and to avoid the destabilizing effects of these technologies.

We regret that the GGE's first meeting, which was due to start today, has been cancelled due to a small number of states failing to pay their financial contributions to the UN. We urge the High Contracting Parties therefore to double their efforts at the first meeting of the GGE now planned for November.

Lethal autonomous weapons threaten to become the third revolution in warfare. Once developed, they will permit armed conflict to be fought at a scale greater than ever, and at timescales faster than humans can comprehend. These can be weapons of terror, weapons that despots and terrorists use against innocent populations, and weapons hacked to behave in undesirable ways. We do not have long to act. Once this Pandora's box is opened, it will be hard to close.

66

The most critical next step in our pursuit of A.I. is to agree on an ethical and empathic framework for its design. 99

SATYA NADELLA



Satya's rules for AI

AI must be designed to assist humanity

Machines that work alongside humans should do "dangerous work like mining" but still "respect human autonomy."

AI must be transparent

"We want not just intelligent machines but intelligible machines, People should have an understanding of how the technology sees and analyzes the world."

AI must maximize efficiencies without destroying the dignity of people

"We need broader, deeper, and more diverse engagement of populations in the design of these systems. The tech industry should not dictate the values and virtues of this future."

AI must be designed for intelligent privacy

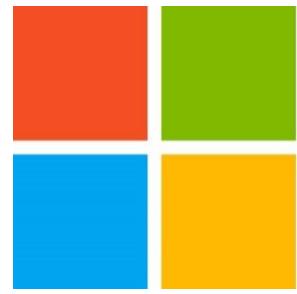
"Sophisticated protections that secure personal and group information."

AI must have algorithmic accountability

"humans can undo unintended harm."

AI must guard against bias

"Proper and representative research" should be used to make sure AI doesn't discriminate against people (like humans do).



Microsoft