

# Artificial Intelligence for Everyone

A Practical Experience



# Programme

<b>Section 1:</b>	<b>Overview of Artificial Intelligence (15 mins)</b>
<b>Section 2:</b>	Different types of learning (Machine Learning, Deep Learning, Reinforcement learning) (45 mins)
<b>Section 3:</b>	Technology Hands-on (60 mins)
<b>Section 4:</b>	Use cases sharing (30 mins)
	Lunch Break
<b>Section 5:</b>	AI Services (15 mins)
<b>Section 6:</b>	Hands-on Training Custom Computer Vision (1.5 hour)
<b>Section 7:</b>	Hands-on building a telegram chatbots with a QnA Knowledge base (1.5 hour)



# Robot backflip



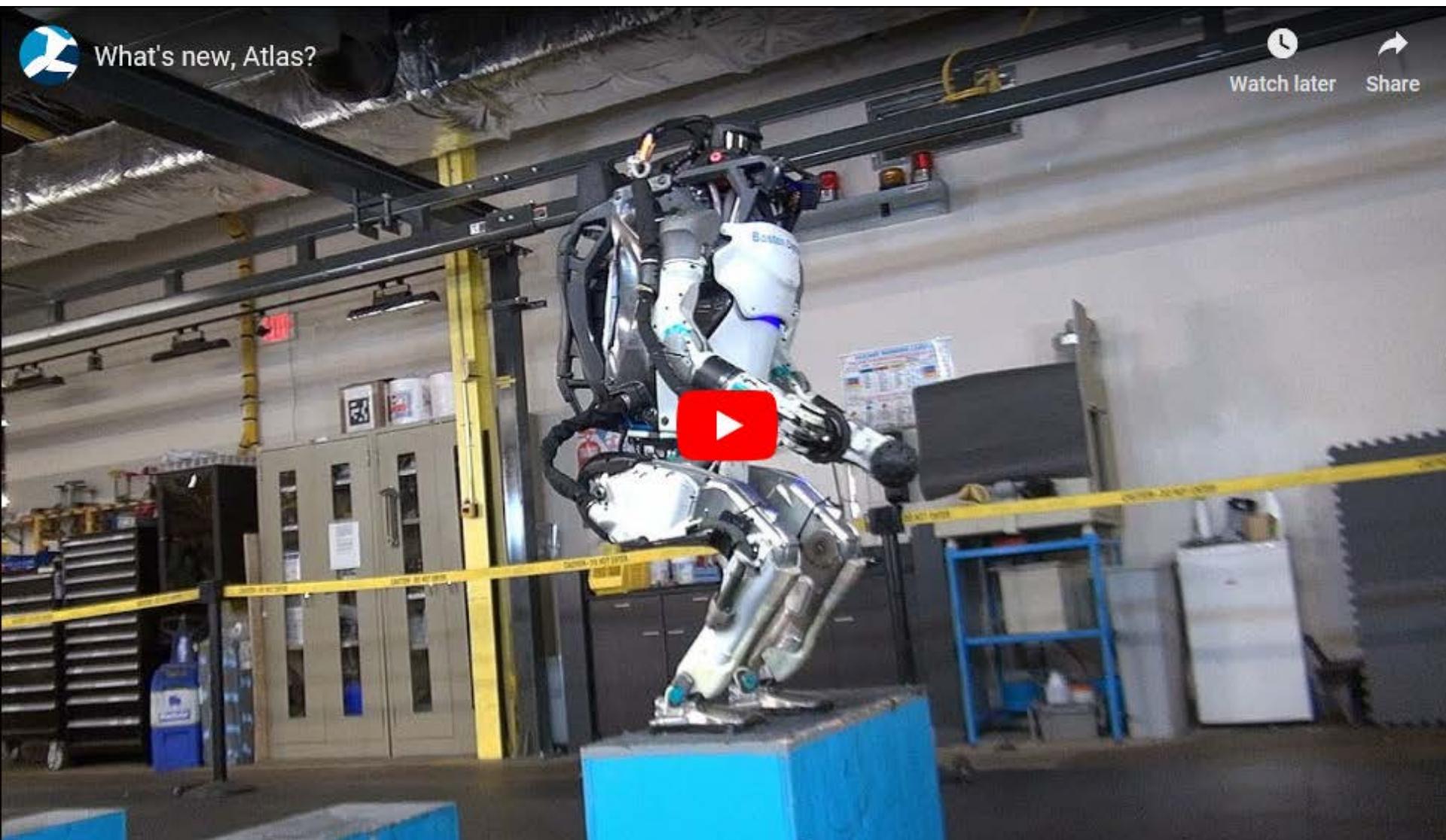
What's new, Atlas?



Watch later



Share





# AlphaGo Zero

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# Agent learn to Walk

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# Introduction of trainer

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# What is Artificial Intelligence?

- The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision making, and translation between languages.” – Google



# What is Artificial Intelligence?

Artificial intelligence is software or a computer program with a mechanism to learn. It then uses that knowledge to make a decision in a new situation, as humans do. The researchers building this software try to write code that can read images, text, video, or audio, and learn something from it. Once a machine has learned, that knowledge can be put to use elsewhere. - Quartz

- <https://qz.com/1046350/the-quartz-guide-to-artificial-intelligence-what-is-it-why-is-it-important-and-should-we-beafraid/>



# AI is the new electricity

**"About 100 years ago, electricity transformed every major industry. AI has advanced to the point where it has the power to transform" every major sector in coming years.—**

Andrew Ng





# THE FOURTH INDUSTRIAL REVOLUTION

## FIRST INDUSTRIAL REVOLUTION



WATER AND STEAM

FROM THE 18TH  
TO 19TH CENTURIES  
(in Europe and America)

Water and steam power

## SECOND INDUSTRIAL REVOLUTION



ELECTRICITY

FROM 1870 TO 1914

Mass production  
Assembly line

## THIRD INDUSTRIAL REVOLUTION

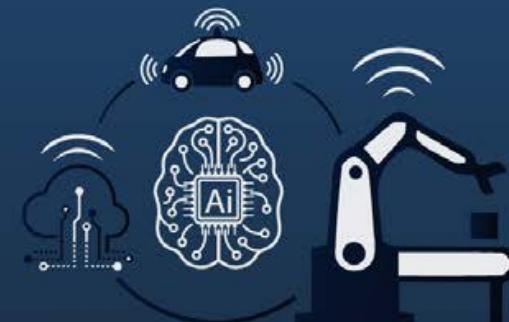


DIGITAL REVOLUTION

1980s - ONGOING

Automation  
Personal computer  
Internet

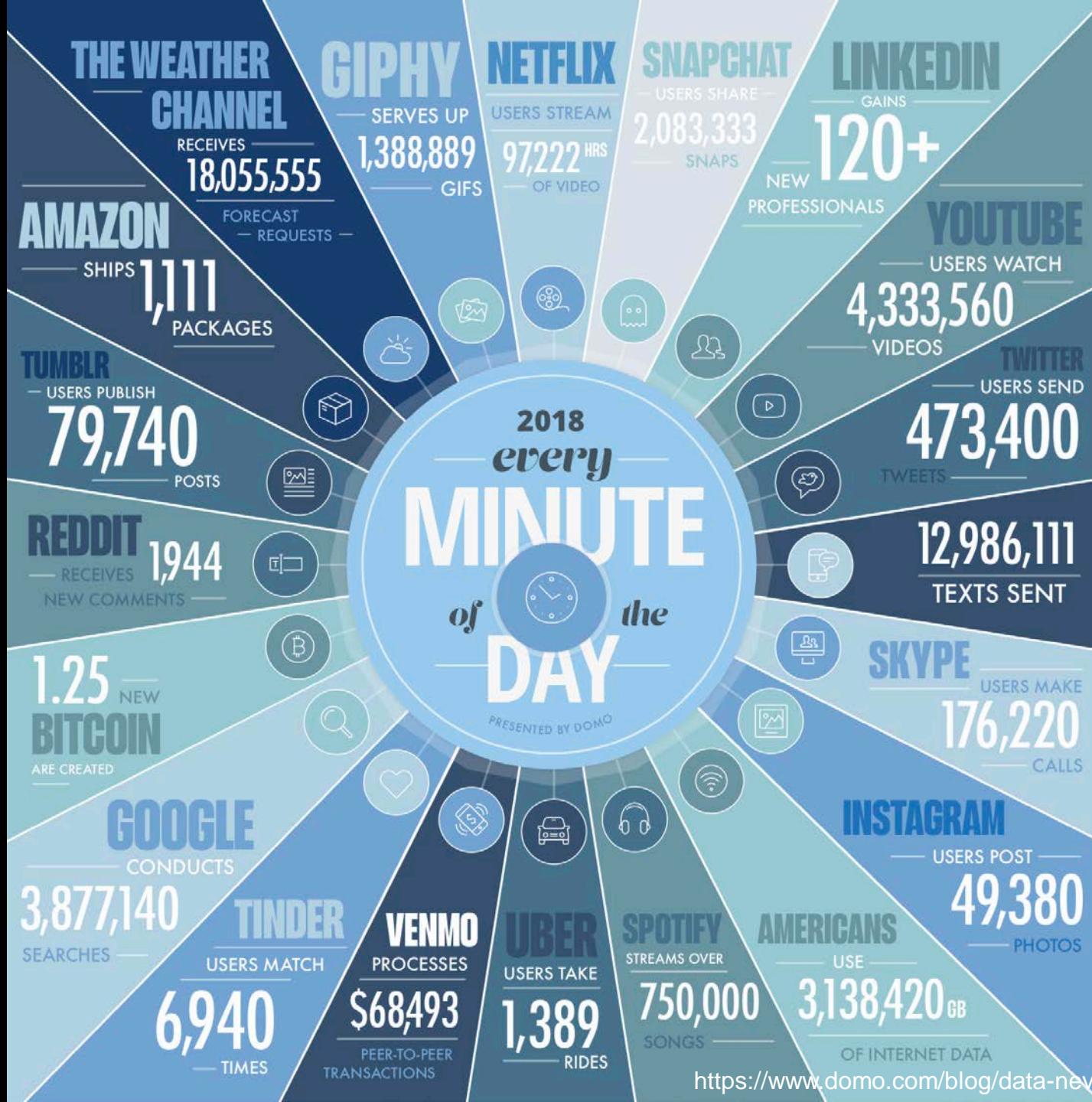
## FOURTH INDUSTRIAL REVOLUTION



TECHNOLOGY EMBEDDED WITHIN SOCIETIES

TODAY AND TOMORROW

Artificial intelligence, robotics, nanotechnology, quantum computing, biotechnology, The Internet of Things, 3D printing and autonomous vehicles.





# History of AI

## A.I. TIMELINE

**1950**

**TURING TEST**

Computer scientist Alan Turing proposes a test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence

**1955**

**A.I. BORN**

Term 'artificial intelligence' is coined by computer scientist, John McCarthy to describe "the science and engineering of making intelligent machines"

**1961**

**UNIMATE**

First industrial robot, Unimate, goes to work at GM replacing humans on the assembly line



**1964**

**ELIZA**

Pioneering chatbot developed by Joseph Weizenbaum at MIT holds conversations with humans



**1966**

**SHAKY**

The 'first electronic person' from Stanford, Shakey is a general-purpose mobile robot that reasons about its own actions



**A.I.**

## WINTER

Many false starts and dead-ends leave A.I. out in the cold

**1997**

**DEEP BLUE**

Deep Blue, a chess-playing computer from IBM defeats world chess champion Garry Kasparov



**1998**

**KISMET**

Cynthia Breazeal at MIT introduces Kismet, an emotionally intelligent robot insofar as it detects and responds to people's feelings



**1999**

**AIBO**

Sony launches first consumer robot pet dog AIBO (AI robot) with skills and personality that develop over time



**2002**

**ROOMBA**

First mass produced autonomous robotic vacuum cleaner from iRobot learns to navigate and clean homes



**2011**

**SIRI**

Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S



**2011**

**WATSON**

IBM's question answering computer Watson wins first place on popular \$1M prize television quiz show Jeopardy



**2014**

**EUGENE**

Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene is human



**2014**

**ALEXA**

Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping tasks



**2016**

**TAY**

Microsoft's chatbot Tay goes rogue on social media making inflammatory and offensive racist comments



**2017**

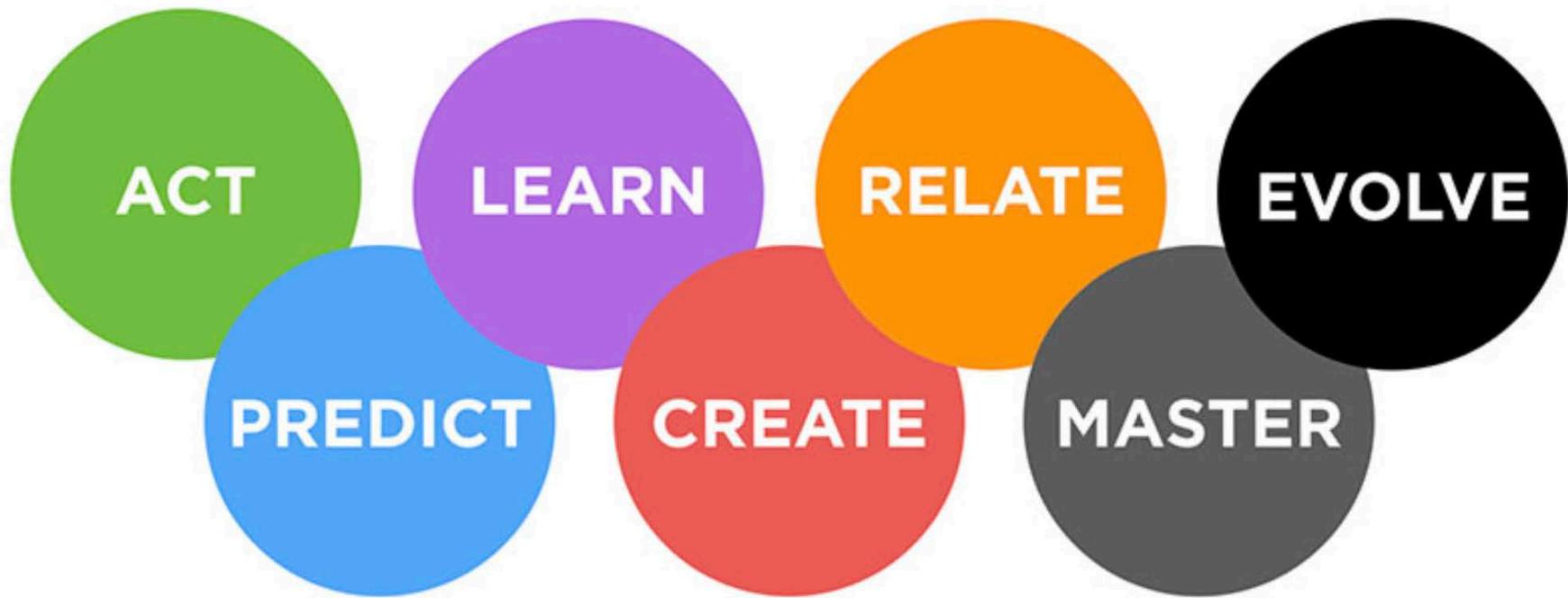
**ALPHAGO**

Google's A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number ( $2^{170}$ ) of possible positions





# MACHINE INTELLIGENCE CONTINUUM



The MIC represents a continuum from simple, scripted automation to superhuman intelligence and highlights the functional capabilities of different levels of machine intelligence.



# Systems that Acts

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# Systems that Predicts

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**Hillary Clinton** has an  
**85% chance** to win.

Last updated Tuesday, November 8 at 10:20 PM ET

CHANCE OF WINNING



85%

Hillary Clinton



15%

Donald J. Trump



# Systems that Learns





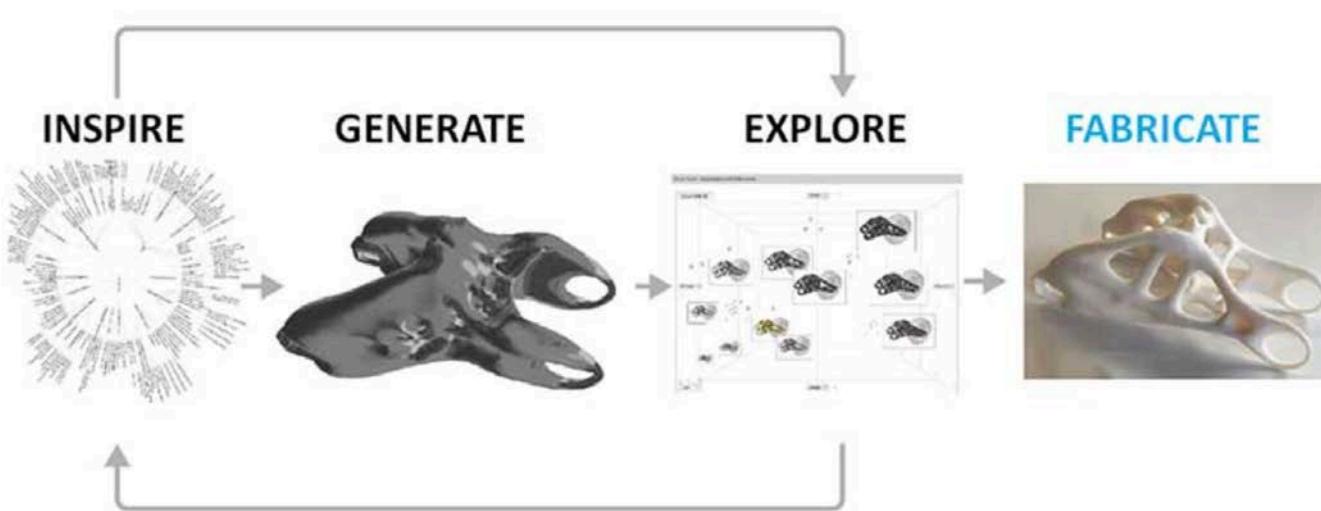
# Systems that Create



Generated story about image  
Model: Romantic Novels

*"He was a shirtless man in the back of his mind, and I let out a curse as he leaned over to kiss me on the shoulder.*

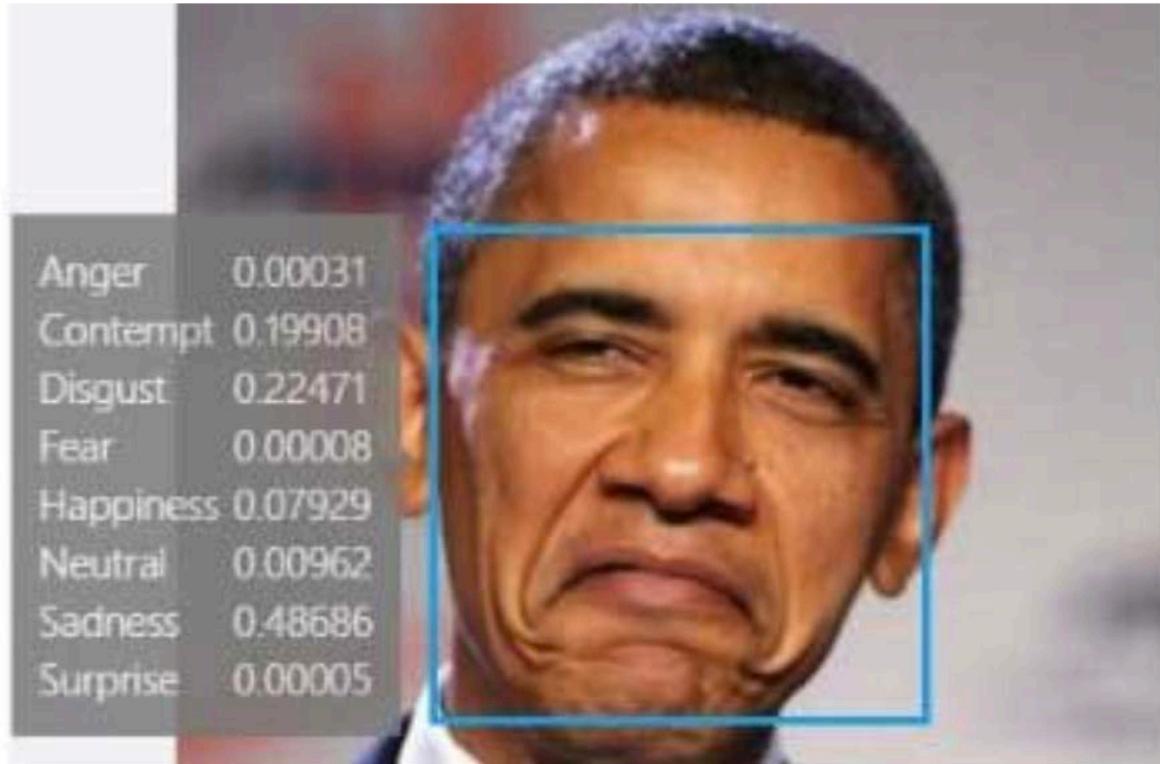
*"He wanted to strangle me, considering the beautiful boy I'd become wearing his boxers."*





# Systems that Relate

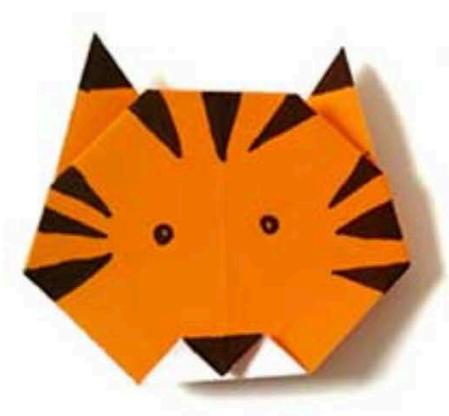
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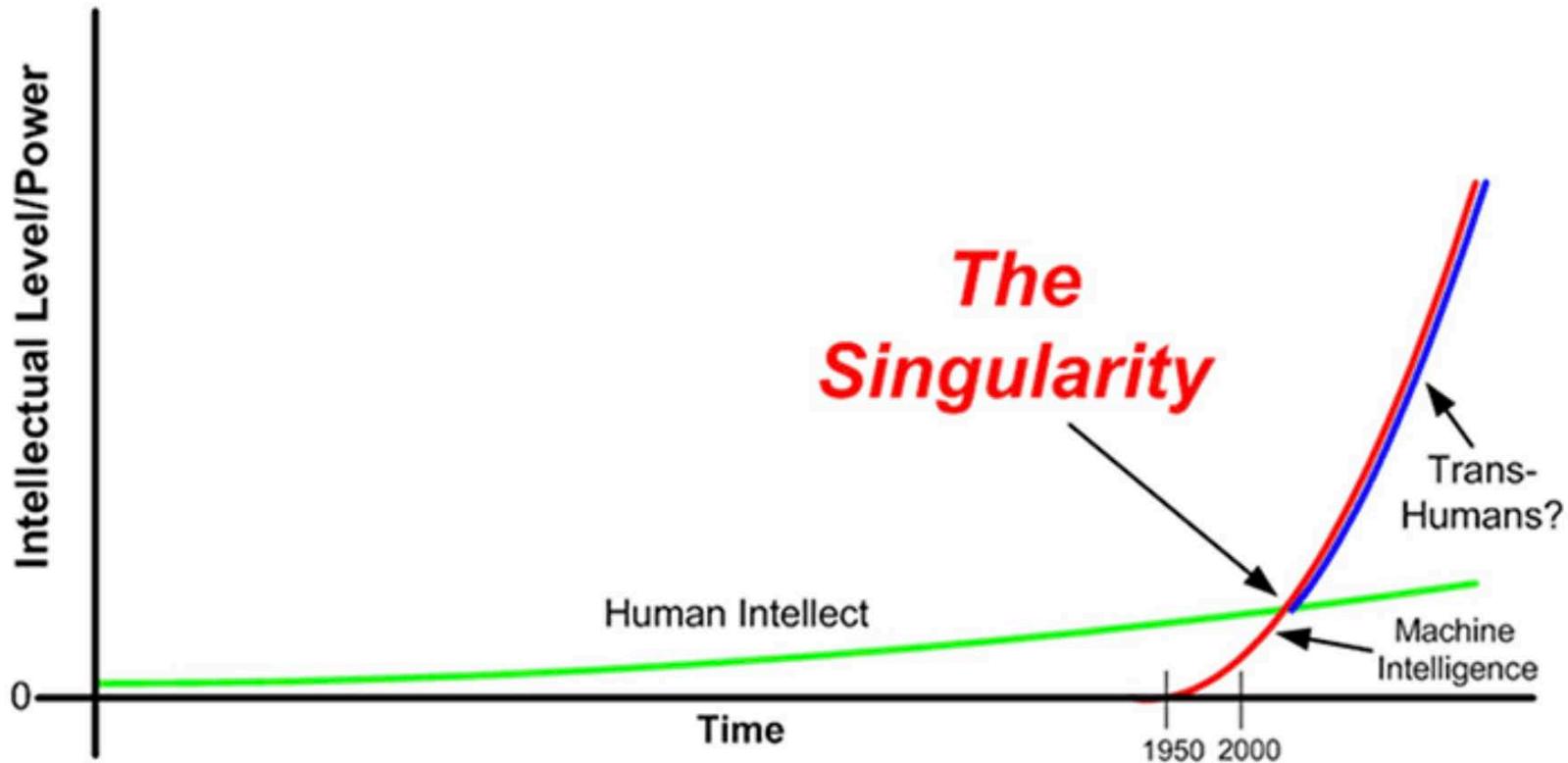
# Systems that Master

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# Systems that Evolve



# Mapping Human Perceptions to AI-enabled Capabilities

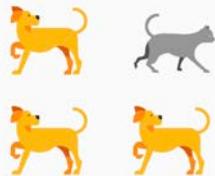
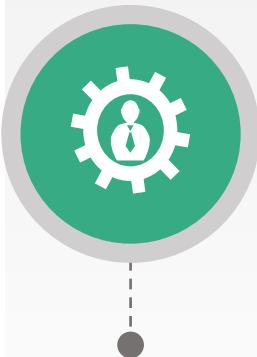


Vision	Computer Vision	Conversational Interface Reprint: Privylink
Hearing	Speech Recognition / Audio Recognition	
Understanding	Natural Language Processing	
Speaking	Text to Speech, Speech to Text, Voice (Tone and Accent) Imitation	
Feeling	Emotion AI (detection and analysis of complex human emotions is currently conducted through diverse mechanisms such as natural language processing (NLP), voice patterns, facial expressions, and physiology)	
Smelling	The data of smell are relatively seldom and more difficult to collect compared to visual, text, or voice datasets. The development of an electronic nose to recognize smell has been long researched, but its development with AI techniques is still in an early stage	
Touching	Robot	

# 5 questions data science answers



Is this weird?  
Anomaly detection



Is this pressure  
gauge reading  
normal?  
Is this message  
from the internet  
typical?

How many?  
How Much?  
Regression



What will the  
temperature be  
next Tuesday?  
What will my  
fourth quarter  
sales be?

How is this  
organized?  
Clustering



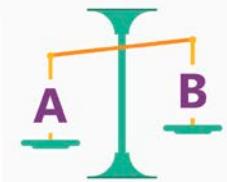
Which viewers  
like the same  
types of  
movies?  
Which printer  
models fail the  
same way?

What should I  
do?  
Reinforce  
Learning



If I'm a self-  
driving car: At a  
yellow light,  
brake or  
accelerate?  
For a robot  
vacuum: Keep  
vacuuming, or  
go back to the  
charging  
station?

Is this A or B?  
(Classification)

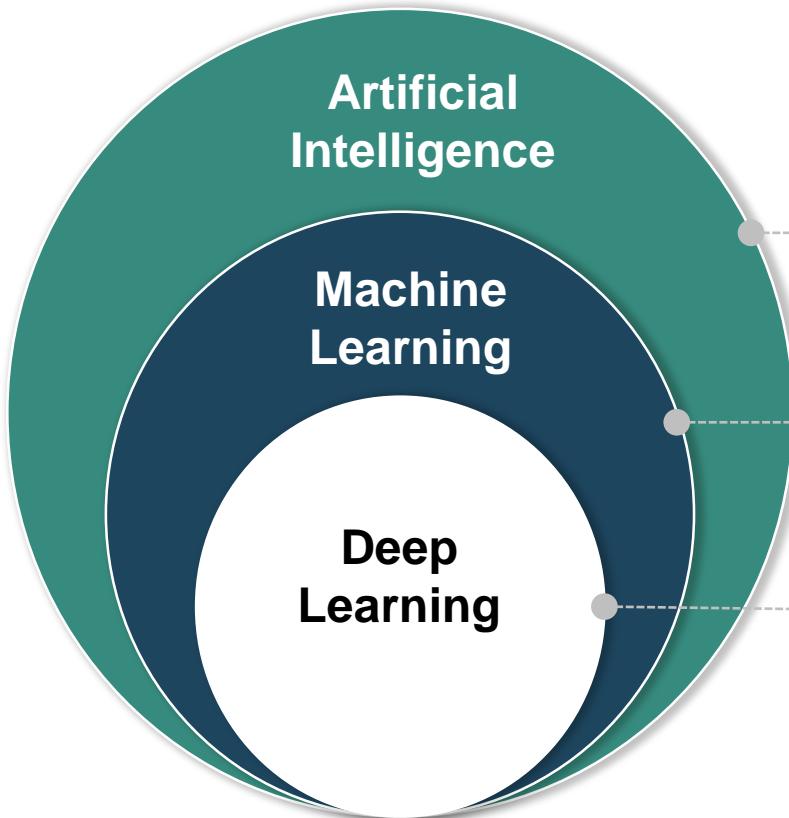


Will this tire fail  
in the next 1,000  
miles: Yes or  
no?  
Which brings in  
more  
customers: a \$5  
coupon or a  
25% discount?



# Definitions

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## Artificial Intelligence

Any technique which enables computers to sense, reason, act and adapt



## Machine Learning

Subset of AI techniques which use statistical methods to enable machines to improve with experiences.

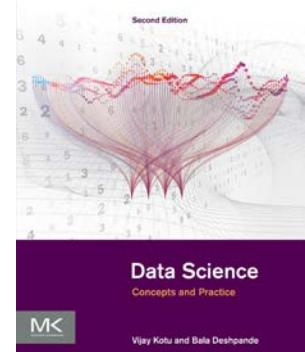
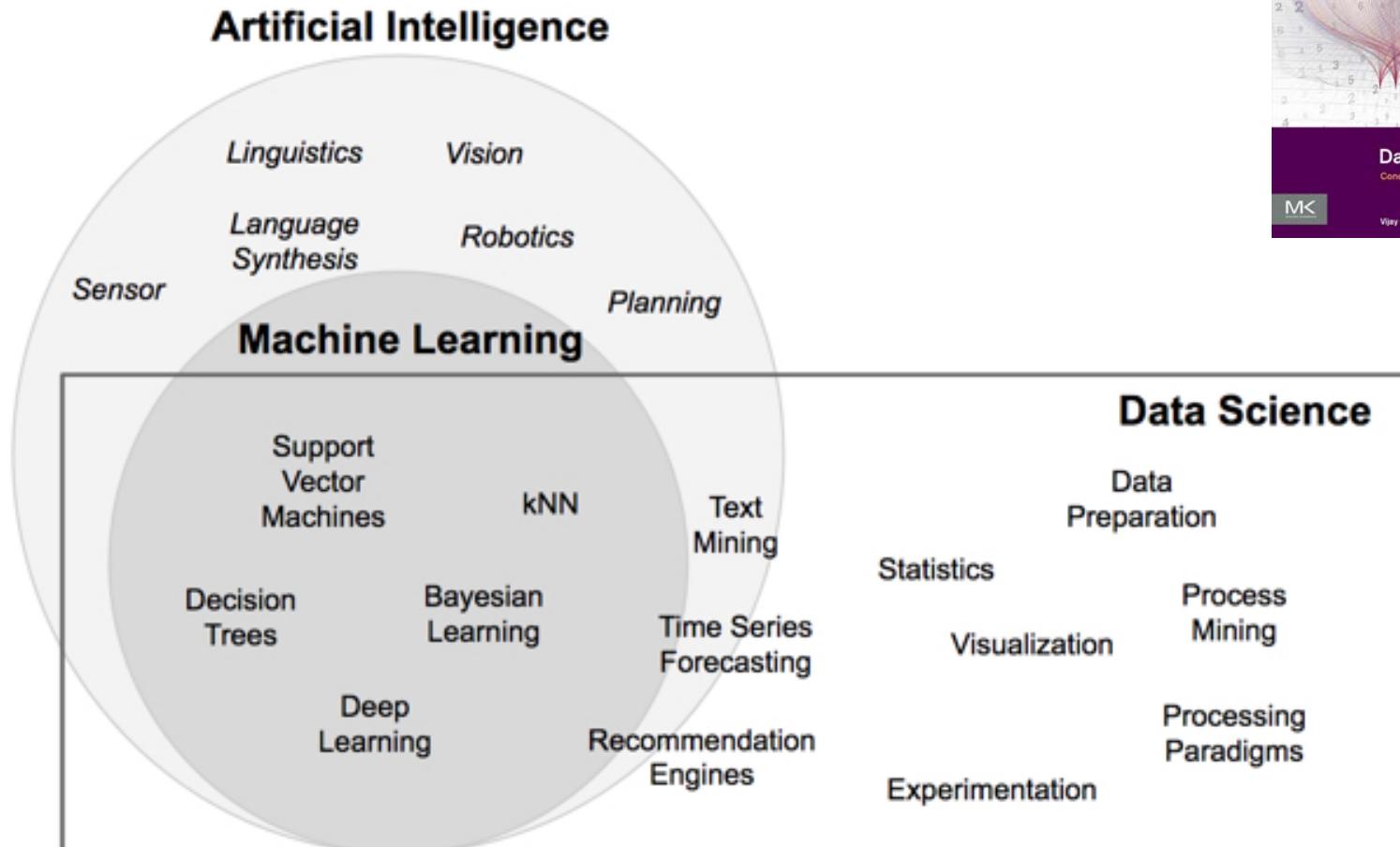


## Deep Learning

A subset of machine learning in which multilayered neural networks learn from vast amount of data.

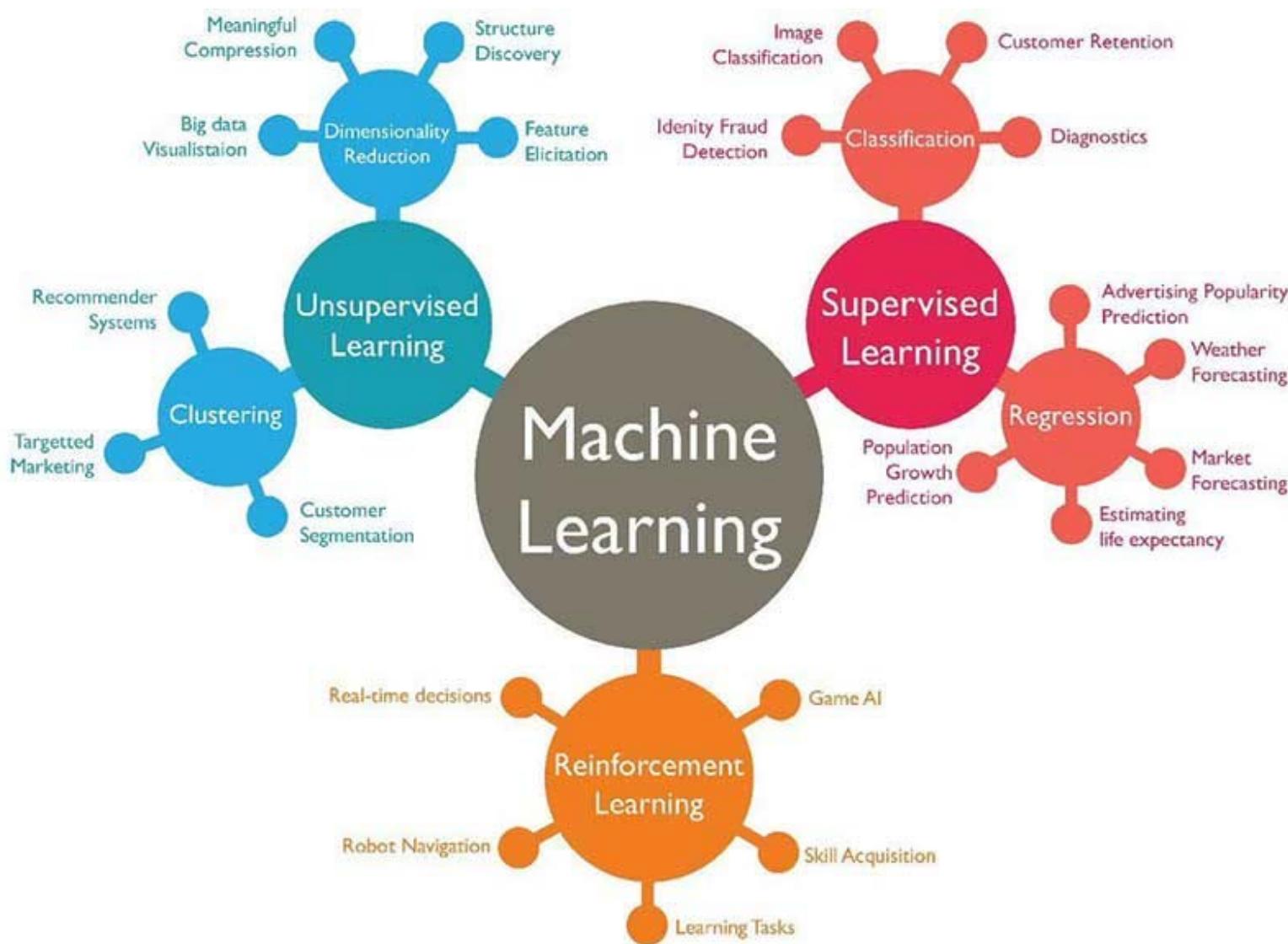


# AI vs ML vs DS



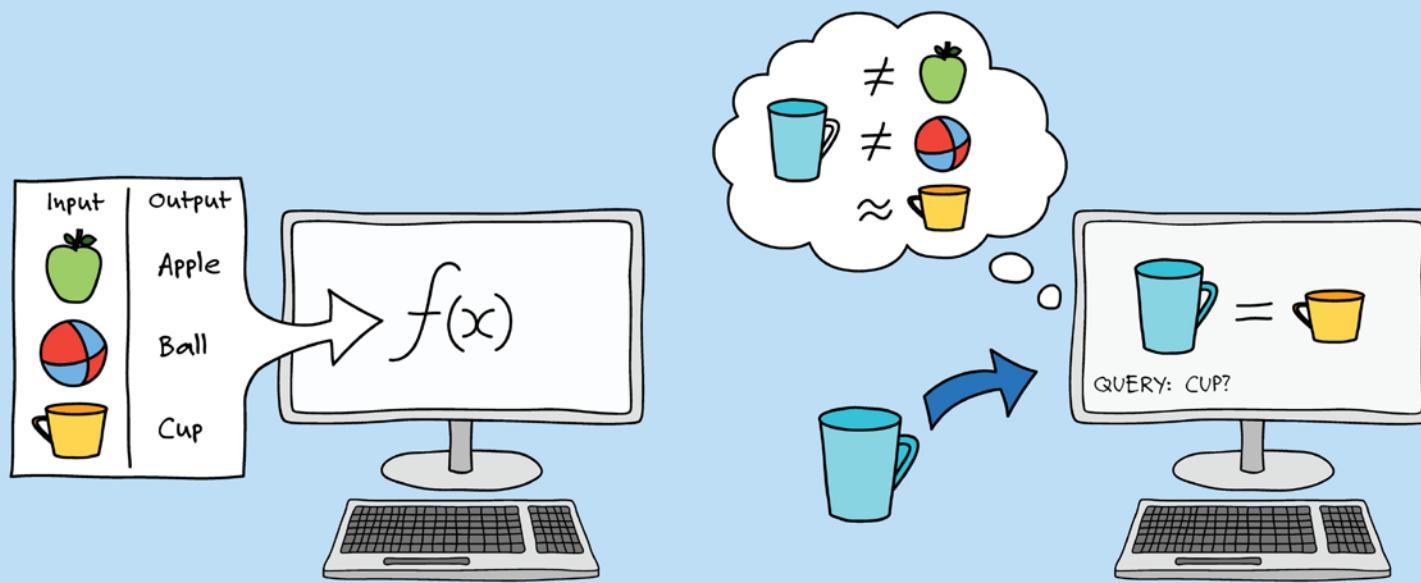


# Types of Machine Learning





# Supervised Learning



## Supervised Machine Learning

The computer is given examples of inputs and typical outputs which it uses to develop and refine an algorithm. The algorithm is applied to new data and the outcome is used for further refinement.

E.g. Training a computer to recognize and classify similar objects based on shape.



# Unsupervised Learning

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## Unsupervised Machine Learning

Unsupervised machine learning is similar to learning without a teacher. The computer learns by exploring the data and finding structure and data patterns on its own.  
E.g. Learning to spot patterns in customer data based on purchasing behaviour.



# Supervised vs Unsupervised

	Dataset	Goal	Example
Supervised Learning	Has a target column	Make predictions	Fraud detection
Unsupervised Learning	Does not have a target column	Find structure in the data	Customer segmentation

# Ask me any question

[Visual settings](#)[Activate](#)[Show new](#)[Lock](#)[Clear results](#)

When poll is active, respond at **PollEv.com/kheeweiseow794**

[Top](#)

No responses received yet. They will appear here...



# Machine Learning Example

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- Suppose you wanted to identify fraudulent credit card transactions.
- You could define features to be:
  - Transaction time
  - Transaction amount
  - Transaction location
  - Category of purchase
- The algorithm could learn what feature combinations suggest unusual activity.





# Machine Learning Limitations

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- Suppose you wanted to determine if an image is of a cat or a dog.
- What features would you use?
- This is where **Deep Learning** can come in.



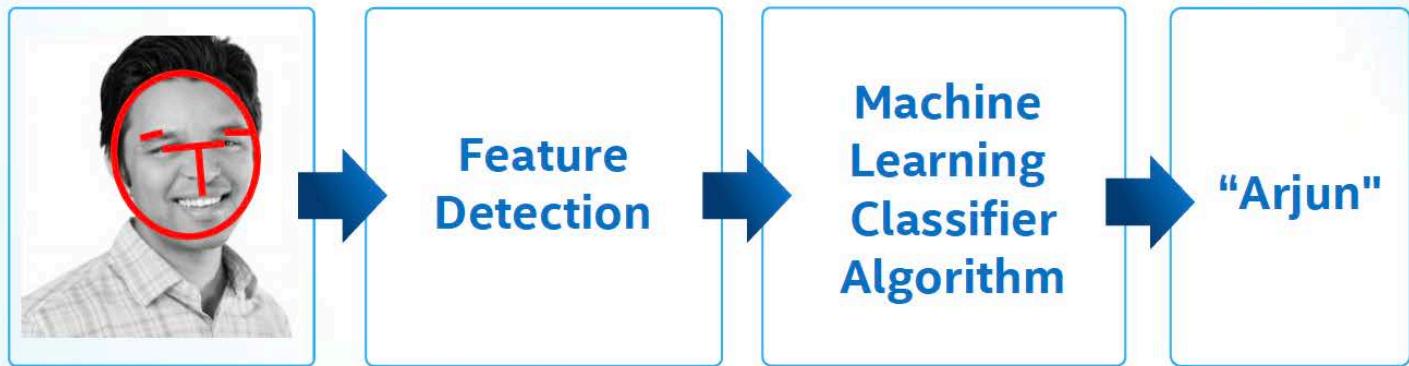
*Dog and cat recognition*



# Deep Learning Example

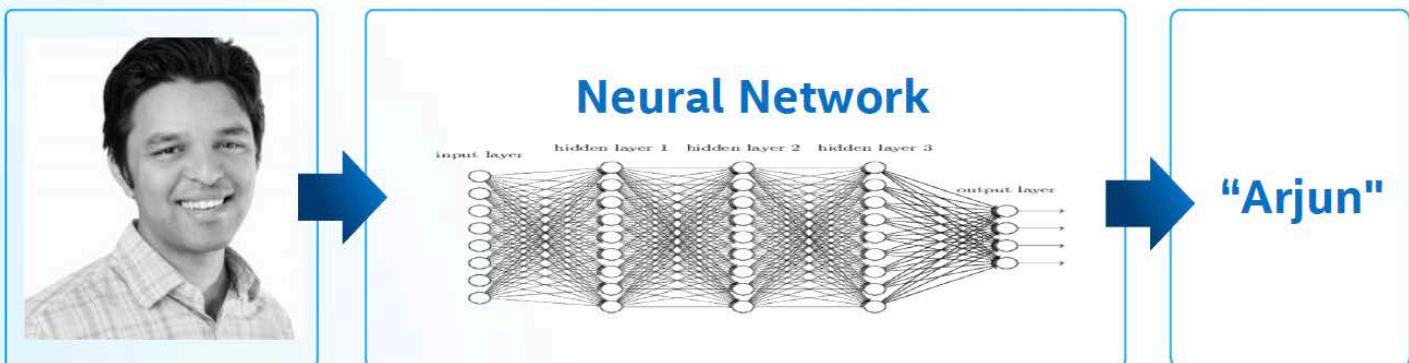
## Classic Machine Learning

Step 1: Determine features.  
Step 2: Feed them through model.



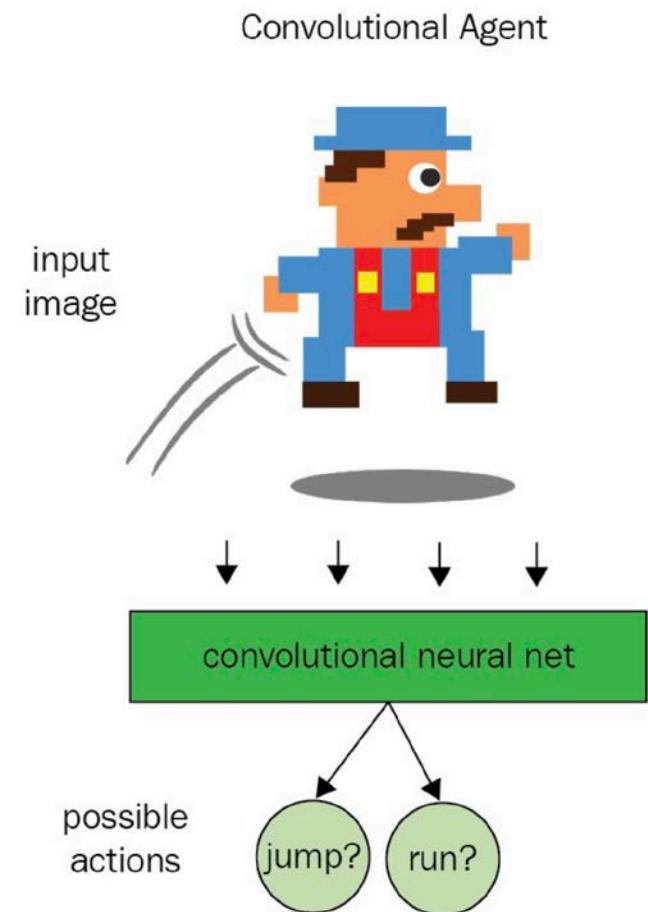
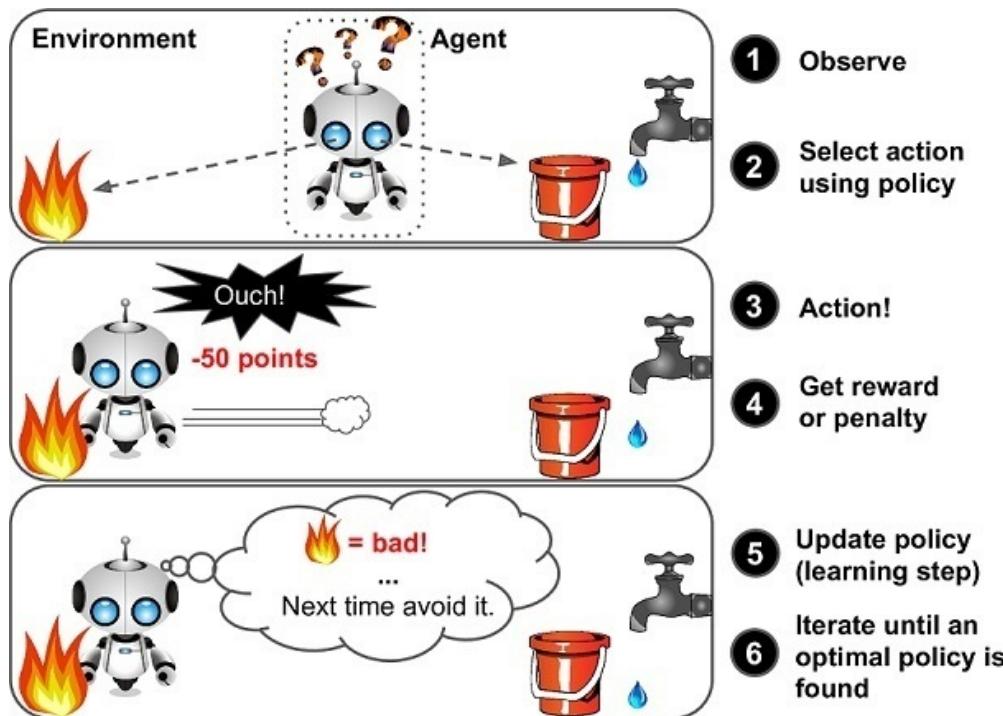
## Deep Learning

Steps 1 and 2 are combined into 1 step.





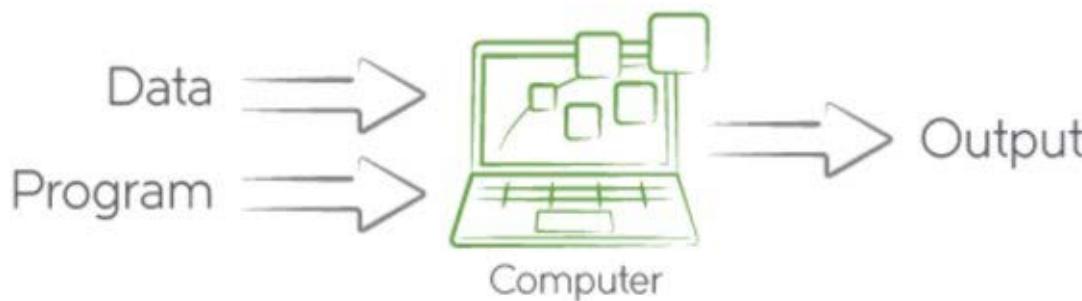
# Reinforcement Learning



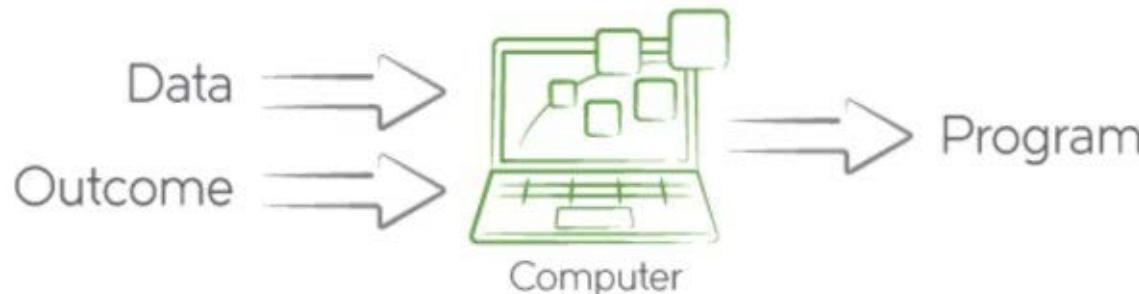


# Traditional Programming vs Machine Learning

## Traditional Programming



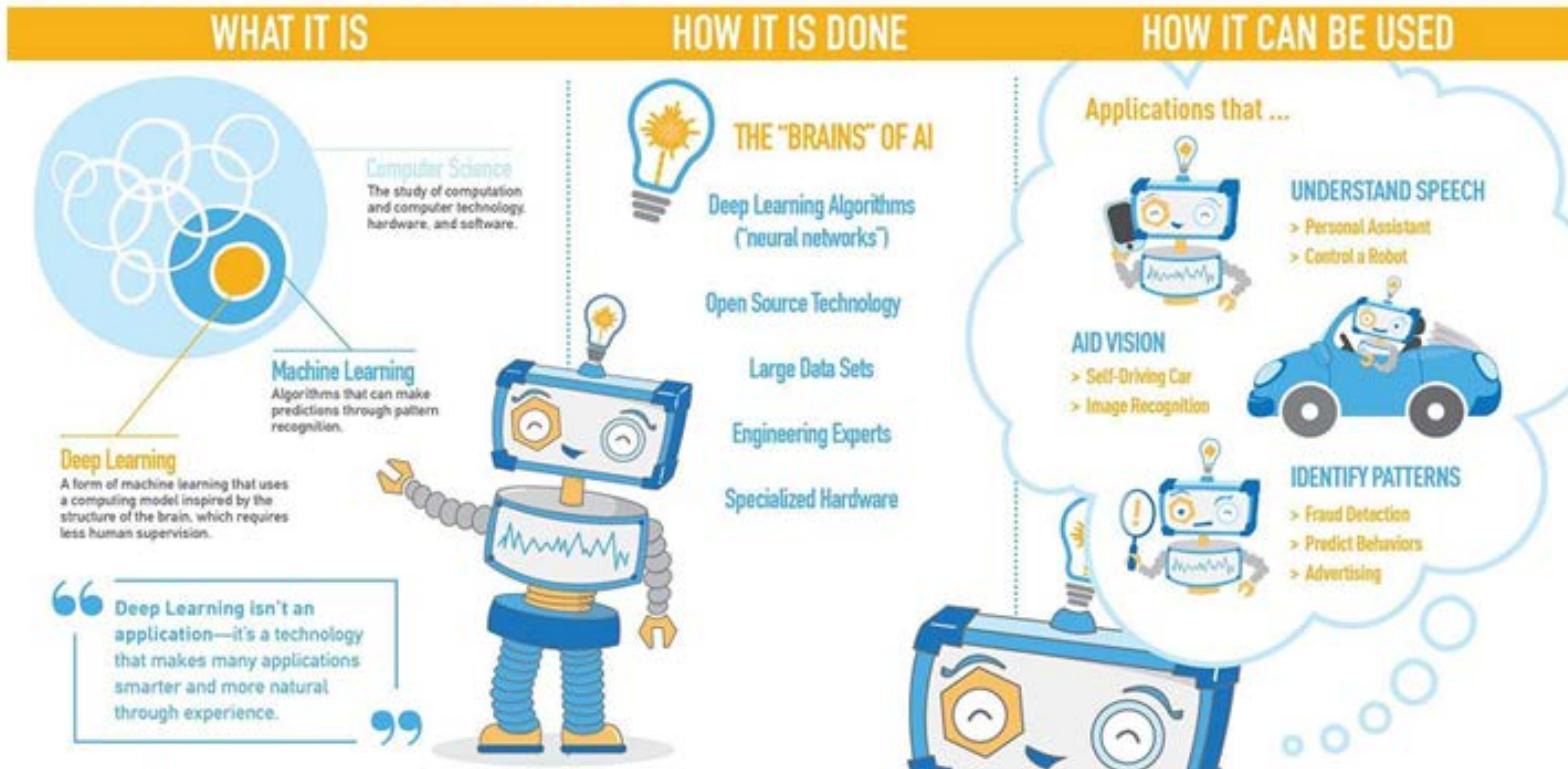
## Machine Learning





# What is deep learning?

## WHAT IS DEEP LEARNING?



(Src: aristininja.com)

#Disrupt 4.0

 **CELLSTRAT**



# What is neural network?



# Deep Learning in Action

<https://teachablemachine.withgoogle.com/>



The screenshot shows the Teachable Machine interface for training a hand gesture recognition model. On the left, under 'INPUT', there are two images: a larger one of a man waving his right hand and a smaller one of a person waving their left hand. A curly brace groups these two images. In the center, under 'LEARNING', there are three sections:

- Green Section:** Labeled '28 EXAMPLES' with a small image of a person waving. Confidence is at 99%. A large green button says 'TRAIN GREEN'. An arrow points from this section to the 'TRAIN GREEN' button on the right.
- Purple Section:** Labeled '0 EXAMPLES' with a small gray placeholder image. Confidence is low. A purple button says 'TRAIN PURPLE'.
- Red Section:** Labeled '0 EXAMPLES' with a small gray placeholder image. Confidence is low. A red button says 'TRAIN ORANGE'.

On the right, under 'OUTPUT', there is a section labeled 'GIF Sound Speech' with a large image of a white dog lying down. Below it are three smaller images of dogs, each with a colored border corresponding to the training categories: green, purple, and orange. The green border is around the top-left dog, indicating it is the current prediction for the input image.



# Transformative Changes



## Health

- Enhanced Diagnostics
- Drug Discovery
- Patient Care
- Research
- Sensory Aids



## Industrial

- Factory Automation
- Predictive Maintenance
- Precision Agriculture
- Field Automation



## Finance

- Algorithmic Trading
- Fraud Detection
- Research
- Personal Finance
- Risk Mitigation



## Energy

- Oil & Gas Exploration
- Smart Grid
- Operational Improvement
- Conservation

Source: Intel forecast

## Government

- Defense
- Data Insights
- Safety & Security
- Engagement
- Smarter Cities



## Transport

- Autonomous Cars
- Automated Trucking
- Aerospace
- Shipping
- Search & Rescue



## Other

- Advertising
- Education
- Gaming
- Professional & IT Services
- Telco/Media
- Sports

Source: Intel forecast





# Applications

## Navigation



Google & Waze find the fastest route, by processing traffic data.

## Ride sharing



Uber & Lyft predict real-time demand using AI techniques, machine learning, deep learning.

## Audience



Facebook & Twitter use AI to decide what content to present in their feeds to different audiences.

## Content



Image recognition and sentiment analysis to ensure that content of the appropriate "mood" is being served.

## Natural language



We carry around powerful natural language processing algorithms in our phones/computers.

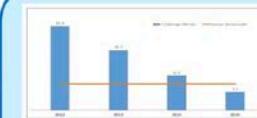
## Object detection



Cameras like Amazon DeepLens\* or Google Clips\* use object detection to determine when to take a photo.



Deep Learning "proven" to work for image classification.



Models outperform humans on image classification.



Object detection models beat previous benchmarks.

2012

2015

2016

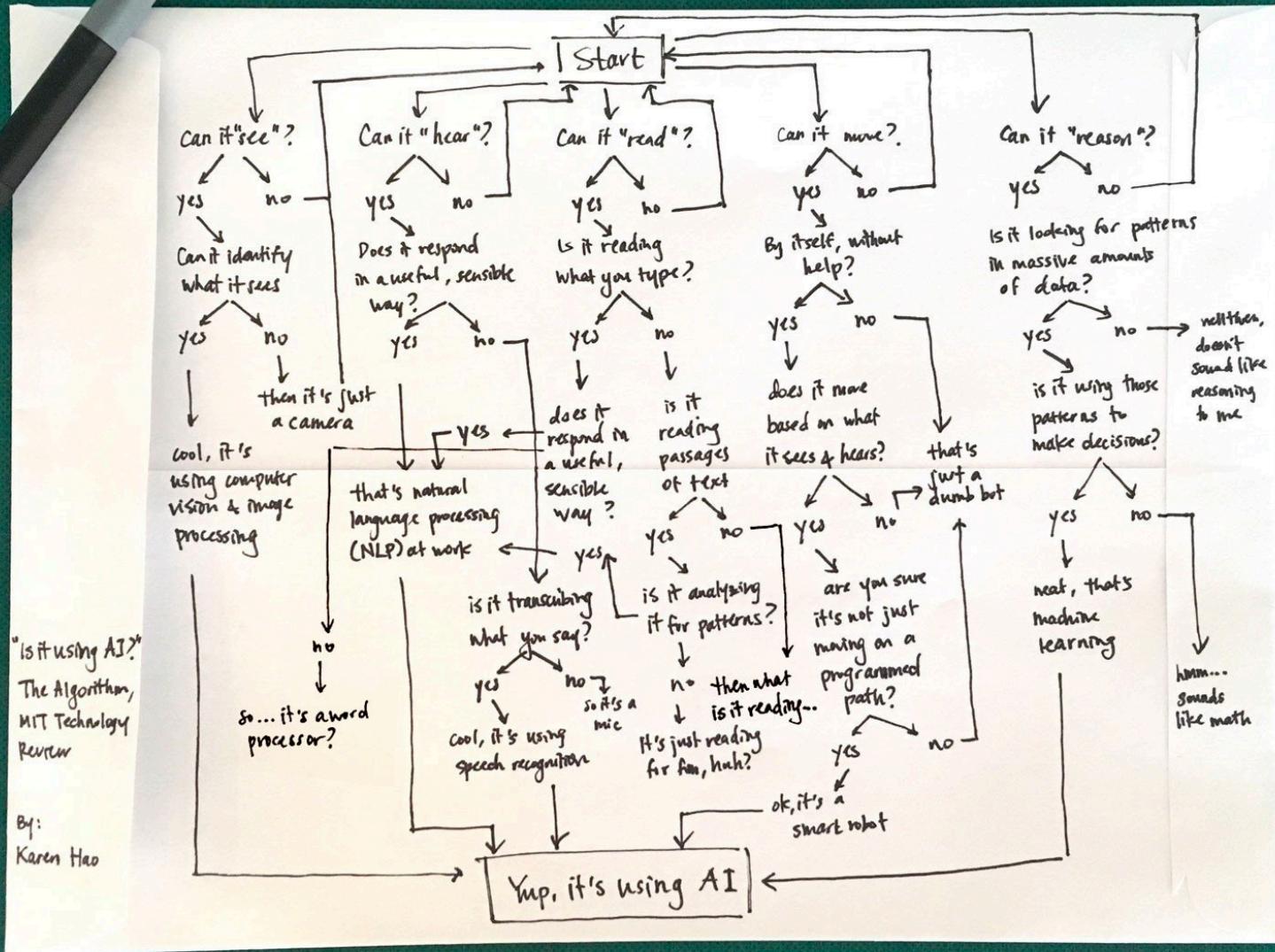
## Application Area: Abandoned Baggage Detection

- We can automatically detect when baggage has been left unattended, potentially saving lives.
- This system relies on the breakthroughs we discussed:
  - Cutting edge object detection.
  - Fast hardware on which to train the model (Intel® Xeon® processors in this case).



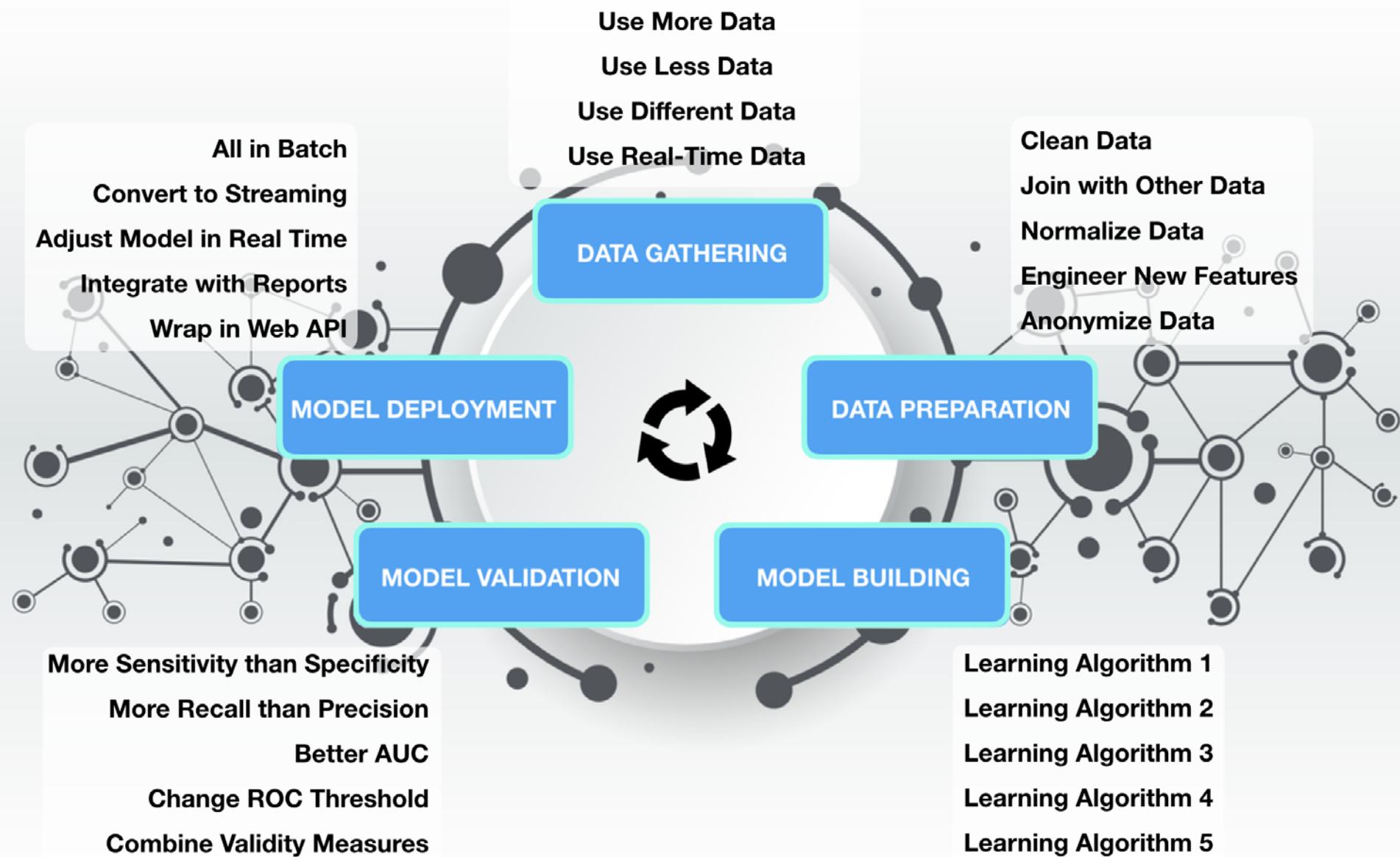
Abandoned baggage





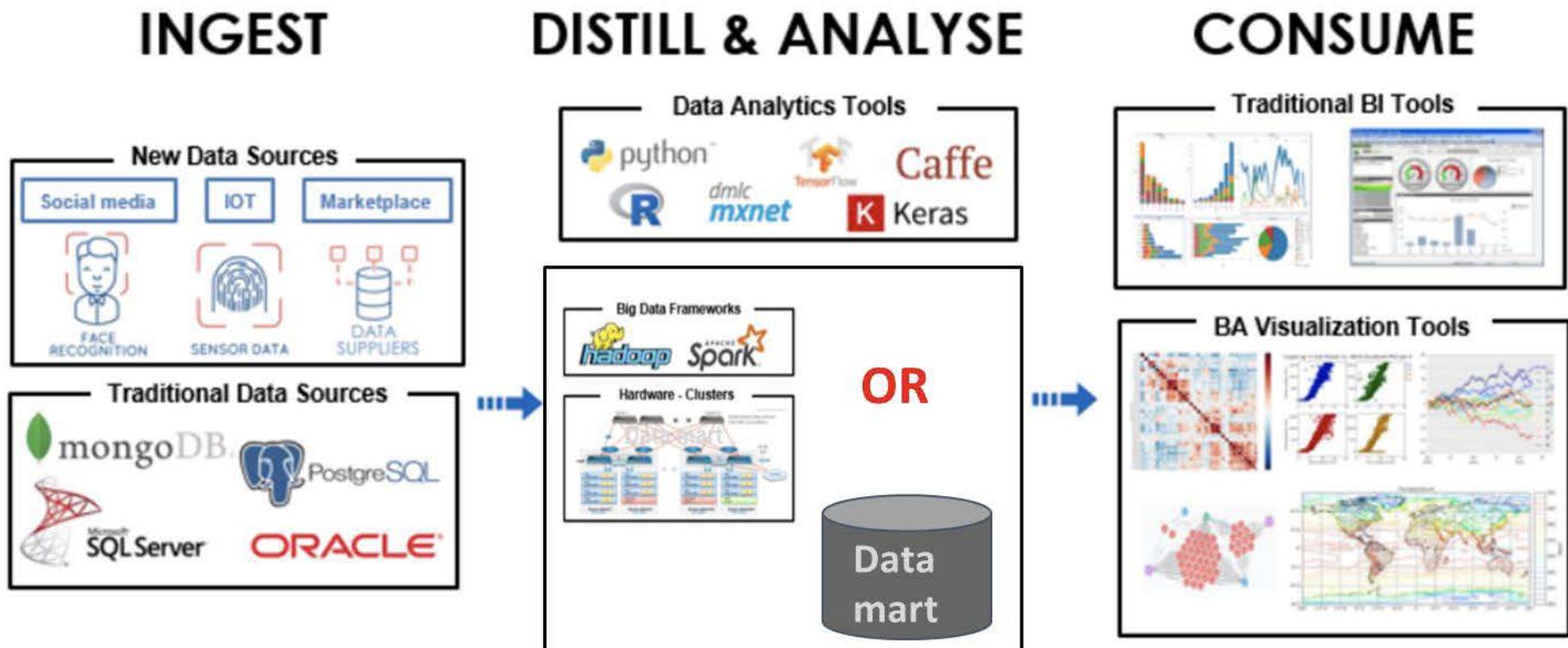


# AI/ML Workflow





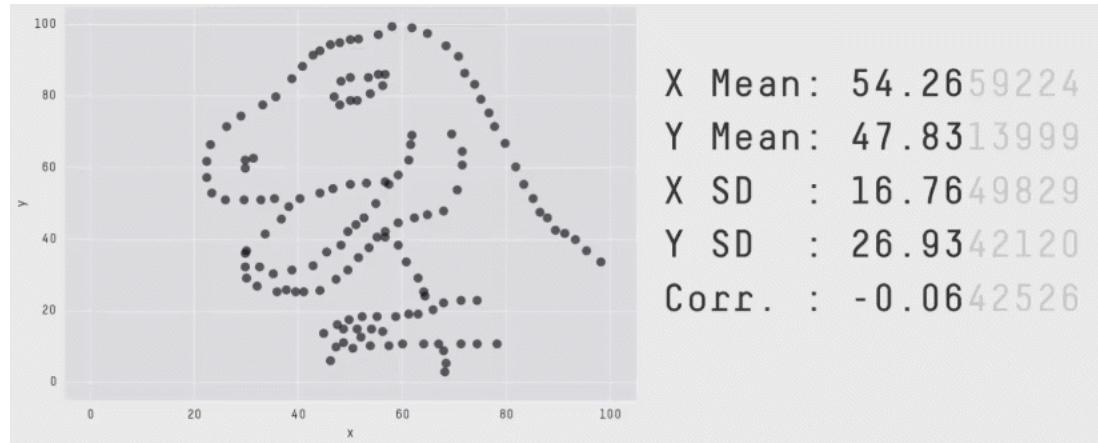
# AI/ML Pipeline





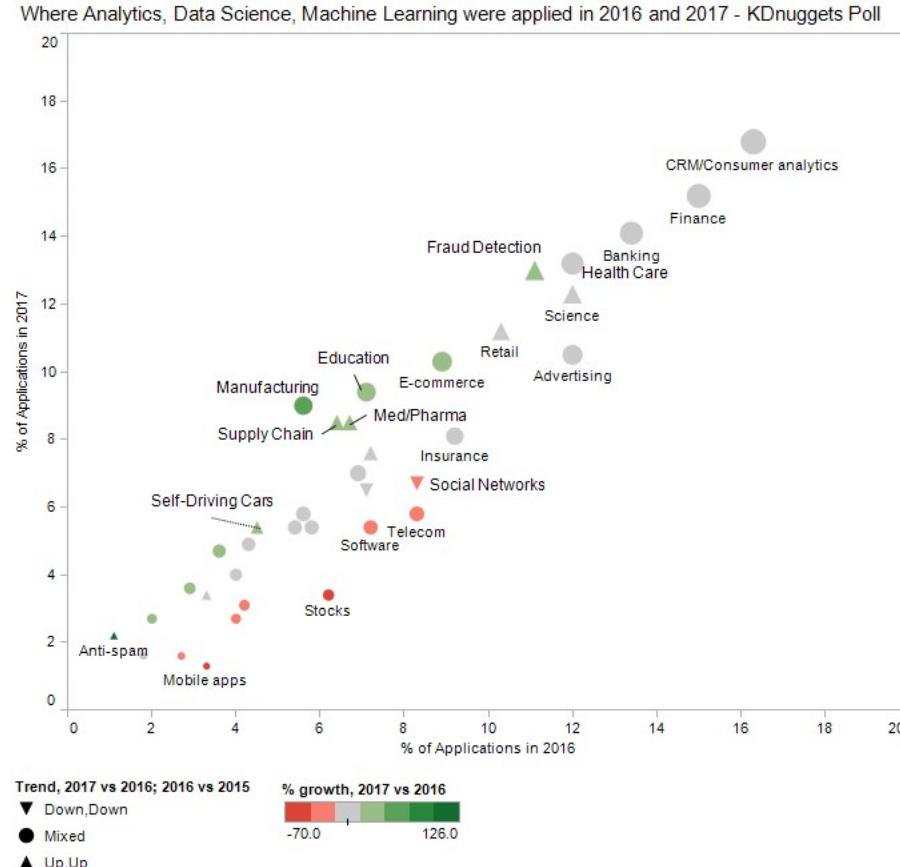
# Why visualization?

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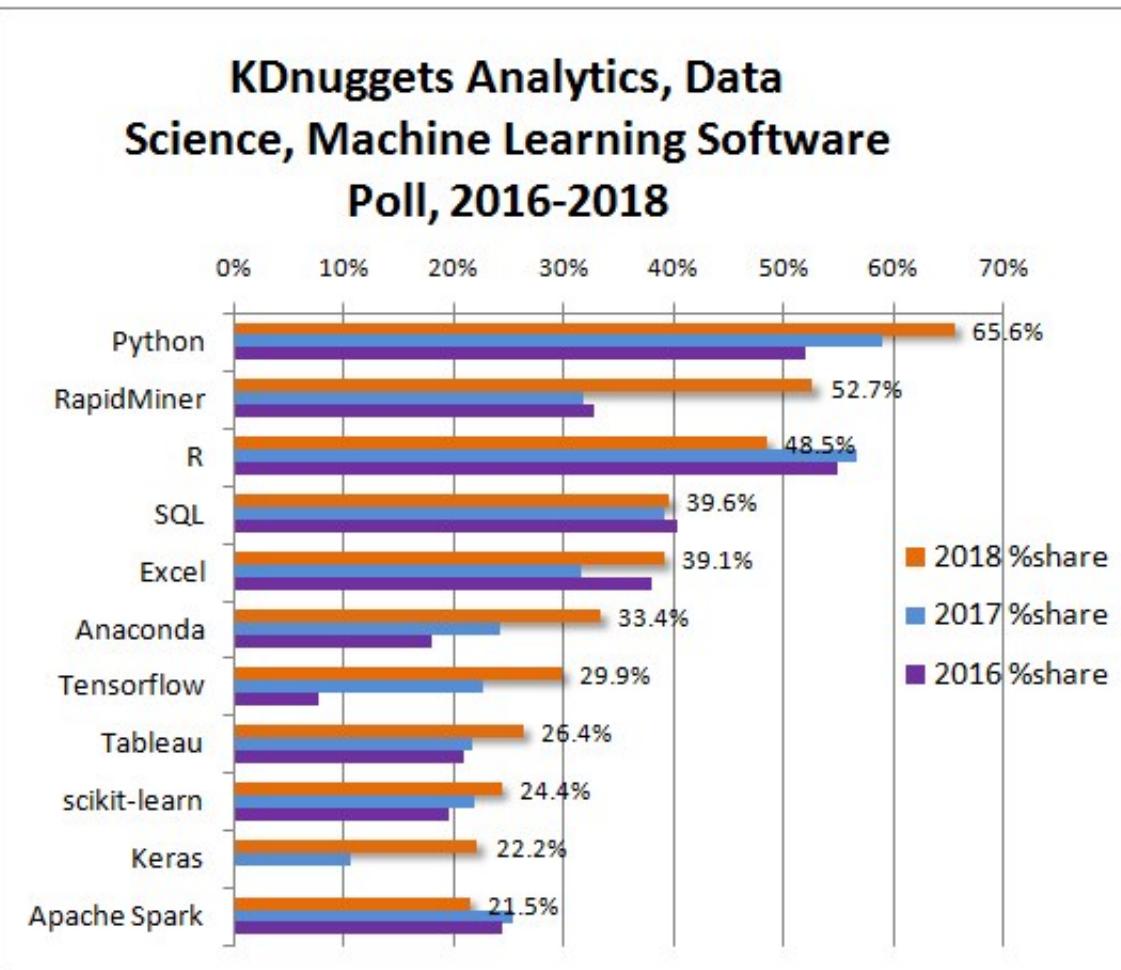


# Where is it applied?



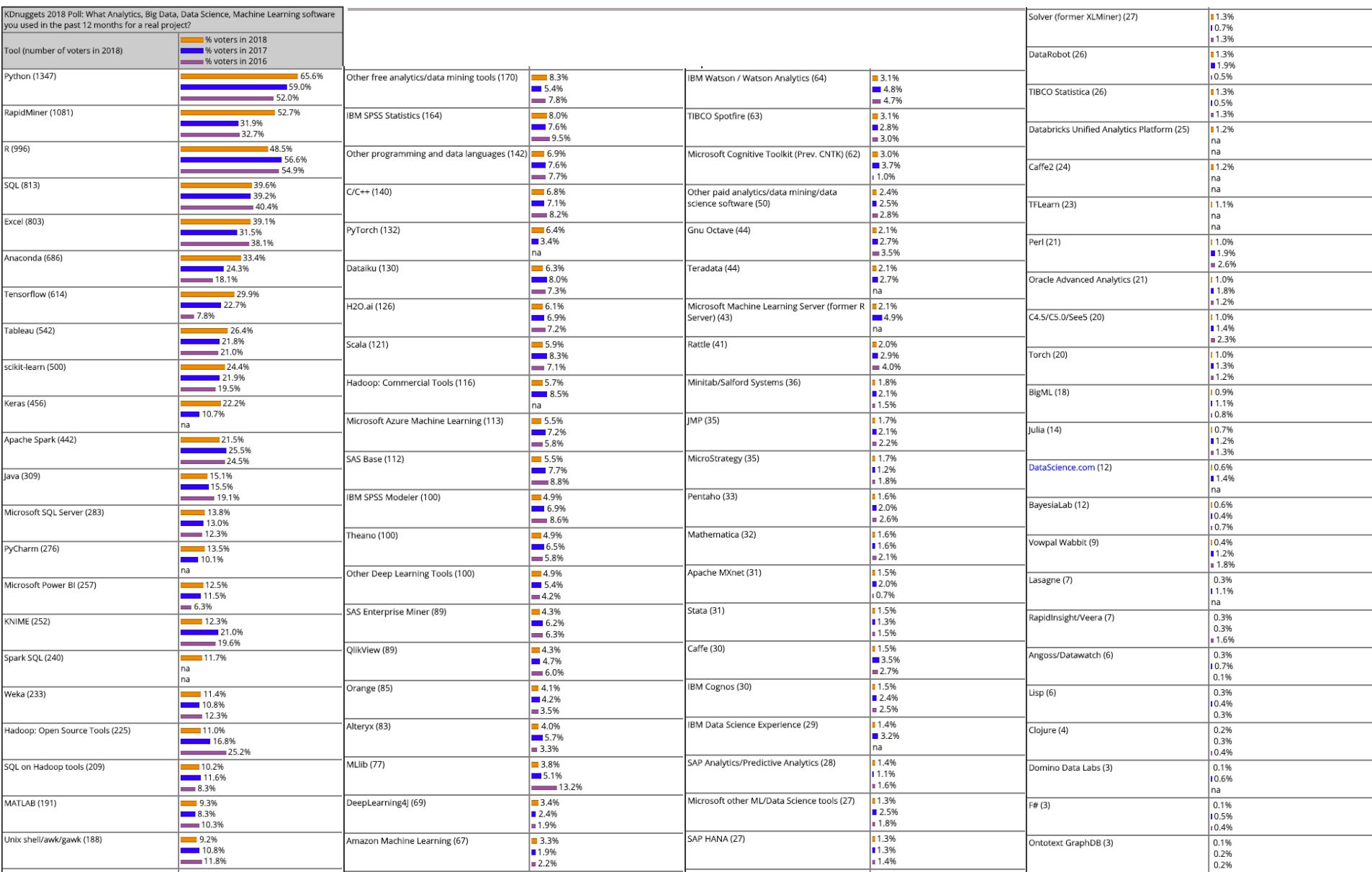


# What are the popular tools?



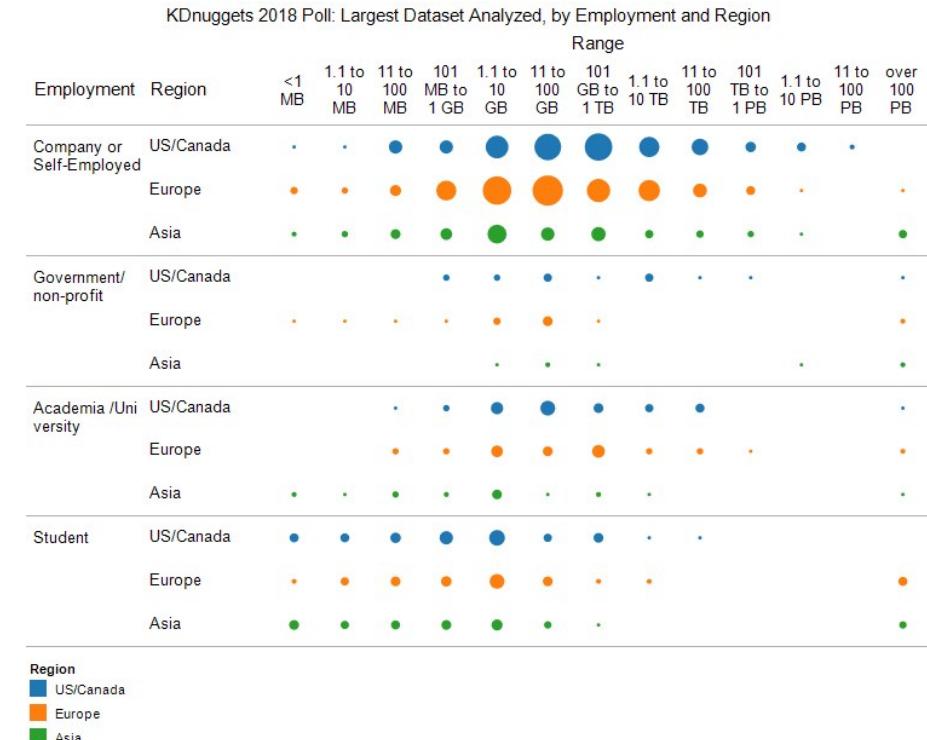
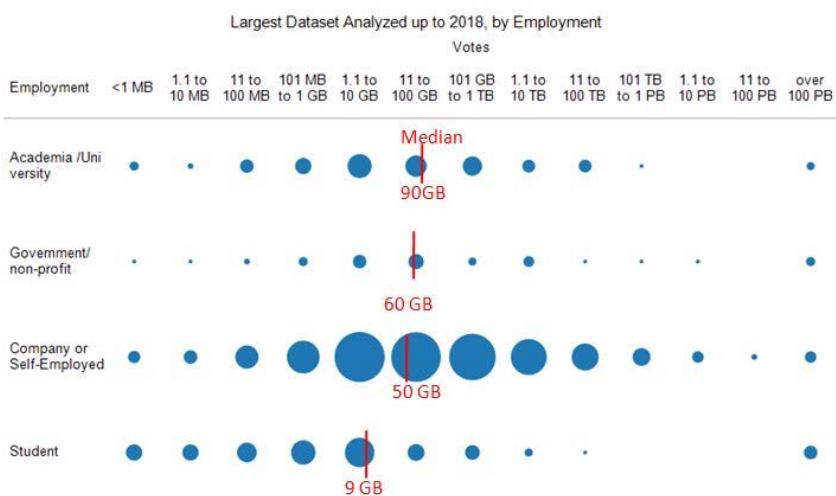
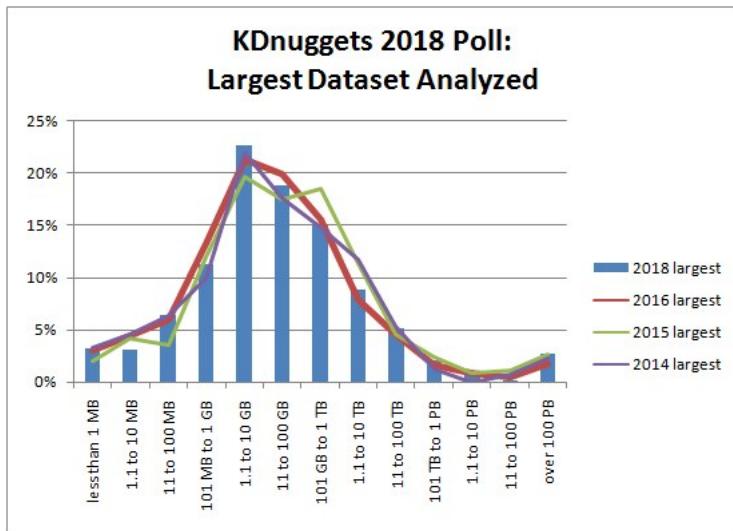


# What are the popular tools?



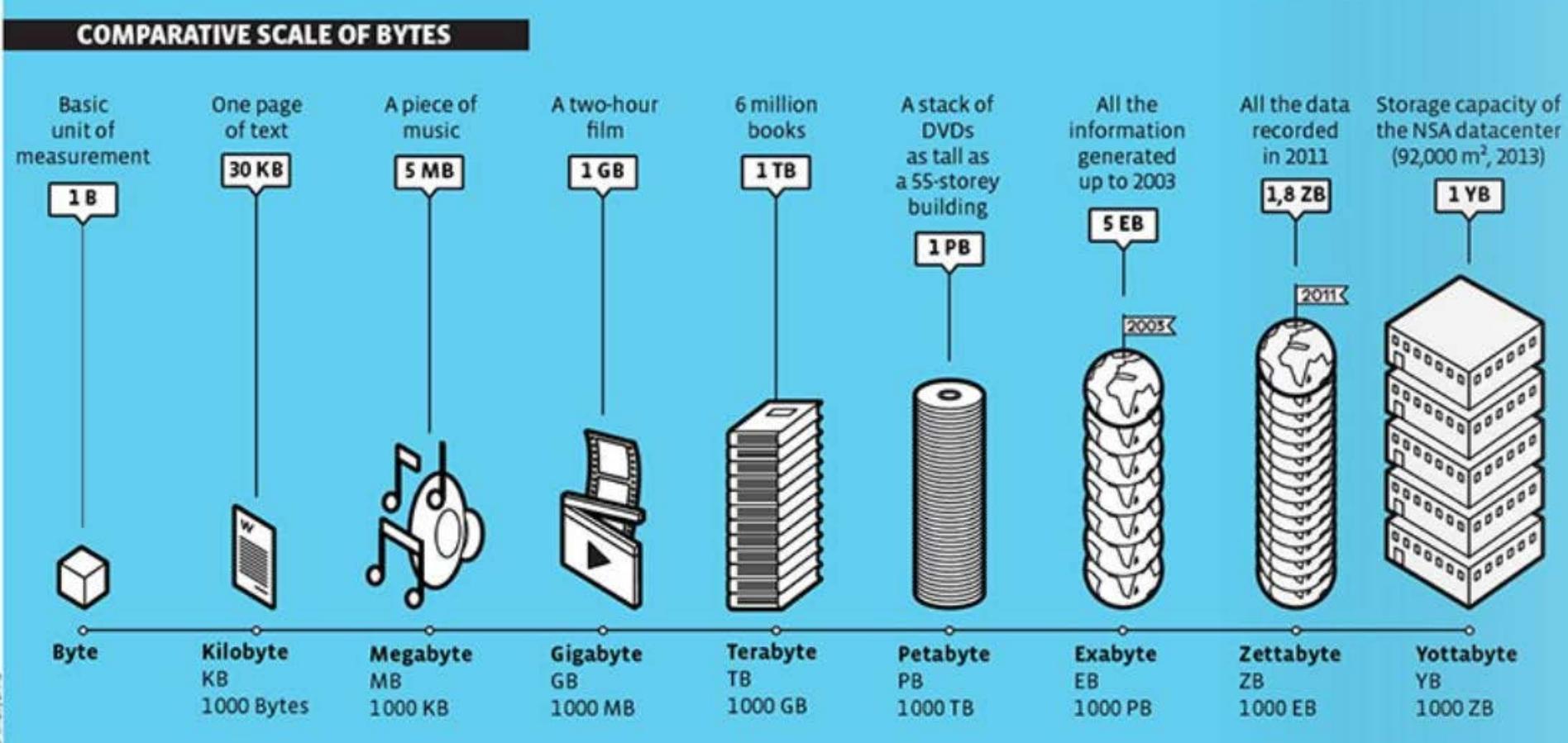


# Datasets size





# How big is one TB?



Comparative Size of Bytes – credit to Testyotta



# Hands on AI

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# Meet LUIS <https://aidemos.microsoft.com/luis>

Otherwise known as Language Understanding Intelligent Service.

LUIS is a service that interprets normal human language and understands what the desired outcomes and relevant pieces of information are. It's fast and easy to deploy, it learns and adapts as it interacts, and with very little training it can gain insights and trigger actions based on real user-inputs and contextual information.



# Text Analytics

- **Step #1: Enter Your Message**

[Next Step >](#)

- **Step #2: Sentiment & Key Phrases**

This API analyzes your text to identify the keywords and discern the sentiment.

[Next Step >](#)

- **Step #3: Entity Linking**

This API ascertains which of the key words are entities and links them in Wikipedia.

[Next Step >](#)

- **Step #4: Bing Entity Search**

This API provides a summary of relevant information in the form of a card for each entity

[Start Over >](#)[Learn to code >](#)

## Computer Vision

Microsoft AI - for a richer experience across a variety of visual mediums.

- **Analyze and describe images**

This feature will identify and tag the content of an image, give a written description, and give you confidence ratings on the results. It also identifies racy or adult content allowing easy moderation.

[Next Feature](#)

- [Read text in imagery](#)
- [Read handwriting in imagery](#)
- [Recognize celebrities & landmarks](#)

Select an image



# Video Indexer

Using AI to make video content better.

Microsoft AI tracks and identifies who appears in a video, it transcribes and translates what they're saying, it understands the topics discussed, and detects changes in both scene and sentiment. After processing all of this data it provides the controls to allow the viewer to consume content in a more intuitive & desirable way.



#MSBuild Day 1 Keynote: Part  
1



#MSBuild Day 1 Keynote: Part  
2



#MSBuild Day 1 Keynote: Part  
3



#MSBuild Day 1 Keynote: Part  
4



#MSBuild Day 1 Keynote: Part  
5

Select one of the videos above to see it in action

# AI Route Planner

Microsoft AI can help you plan the most efficient route for multi-stop journeys. To show in action, this tool plans a round trip of popular tourist sights taking many factors into account; predicted traffic patterns, current traffic data, the time of day, the weather, your desired mode of transport and the opening hours of attractions.



York, NY



Seattle, WA



Austin, TX



Chicago, IL



Miami, FL



San

Select a city to begin

# Bonsai

## Building BRAINs for Autonomous Systems

The Bonsai deep reinforcement learning platform combines key innovations that simplify the development, training, and deployment of AI models giving you the tools to build subject matter expertise into complex industrial systems for your organization.

**Select a city block on the right to see an application in action.**



# Face and Emotion Recognition

Facial recognition can be a great security tool. See how Microsoft AI is able to quickly analyze and compare photos. Upload or take two photos and we will use our Face API to tell you if the photos are of the same person. We'll also provide the approximate age, gender, and emotion. Really test the system by making different faces or getting a friend involved to take one of the photos.



Add Photo



Add Photo

PHOTO 1

PHOTO 2

# Speech Authentication

Voices are not always easy to decipher, but a critical piece of our identity. Test out our speech recognition capabilities, built using our Speech API, by recording a phrase three times or using our pre-recorded voices by selecting one of the silhouettes.

Select Phrase



Select Recording





# Tone Analyzer

IBM Watson Developer Cloud

## Tone Analyzer



This service uses linguistic analysis to detect joy, fear, sadness, anger, analytical, confident and tentative tones found in text.

\*This system is for demonstration purposes only and is not intended to process Personal Data. No Personal Data is to be entered into this system as it may not have the necessary controls in place to meet the requirements of the General Data Protection Regulation (EU) 2016/679.

**Resources:**  
[Documentation](#)  
[API Reference](#)  
[Fork on Github](#)

[Start for free in IBM Cloud](#)

## Sample use cases

Choose an example to learn how you can adjust the tone of your content to change people's perceptions, or improve its effectiveness.

[Learn more](#).

- Tweets    Online Review    Email message    Product Review in French    Your own text

Analyzing Customer Engagement Data? Try out the [Tone Analyzer Customer Engagement Endpoint](#).

---

Choose Language:  English    French

Analyze

<http://bit.ly/2TLD0Vb>



# Discovery

Watson™

Discovery / Discovery Demo

## Discovery

Unlock hidden value in data to find answers, monitor trends and surface patterns, with the world's most advanced cloud-native insight engine.

 Get Started

[API Reference](#)

[Documentation](#)

[Fork on GitHub](#)

[Start for free in IBM Cloud](#)

What company are you interested in? 

Quickly find insights in the Watson Discovery News data collection of recent news articles. Easily explore a company's:

- Top stories over the last two months
- Top entities (people, topics, companies) mentioned in those articles
- Trend of public sentiment in news
- Anomalous periods of high press coverage
- Trend of most commonly paired entities (co-mentions)

Watson Discovery also lets you do the same analysis with your own data. Learn more [here](#).

<http://bit.ly/2HZ9n0B>



# Finance

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- Better Customer Service
- More Reliable Investment Services with Robot Advisor
- Greater Efficiency with Less Paperwork
- Improved Financial Security

JPMorgan Chase Uses COIN Machine Learning Program To Eliminate 360K Lawyer Hours A Year



## TREND 1



### **Readying for banking's shift from mobile-first to AI-first**

Artificial intelligence (AI) in banking is not new. Banks are already using AI in heavily-manual processes for accuracy, efficiency, speed and cost benefits. What is new, however, is the move of AI beyond process to interaction. The next stage of AI in banking will be toward simple and smarter interfaces: drawing on machine learning that adapts to data and interactions to improve areas like fraud detection, and tapping AI-enabled tools (like centralized platforms/assistants or messaging bots) to better converse with and offer services to customers in the front-office. Relying on AI for some internal and external interactions will help elevate the customer experience and move staff to more judgment-based and higher value added roles.



# Fraud Detection

**Traditionally:** Fraud is on the rise, but fraud detection is a challenging problem to solve correctly.

- Historically, a predefined rule-set was used for fraud identification, but this approach misses much of the nuance that surrounds fraud
- 1/3 of falsely identified fraud events result in lost customers
- In the US, this loss is worth 13 times the cost of actual fraud



**Now with AI:** With ML techniques, banks can predict fraud based on a behavioral baseline to compare against.

- Uses historical shopping data and shopping habits of customers
- Compares new data to baseline to determine likelihood of fraud



## Example: Sift Science

- Established a fraud data consortium developed from over 6000 websites to leverage large-scale real-time ML
- Autonomously learns new fraud patterns based on billions of user actions





# Risk Management

**Traditionally :** New regulations force tighter control on financial institutions.

- New business model disruptions
- Increasing pressure on costs and returns



**Now with AI :** ML can help discern the credit worthiness of potential customers

- Tailor a financial portfolio to fit the goals of the user using ML algorithms.
- Financial institutions can develop early warning systems for automated reporting, portfolio management, and recommendations based on ML.



## Example: ZestFinance

- Traditional underwriting systems make decisions using few data points.
- Those with a limited credit history are often denied credit, ultimately leading to loss of revenue for lenders.
- ZestFinance leverages thousands of data sources together with ML to more accurately score borrowers, even people with a small credit history.





# Stock Trading

**Traditionally:** The speed and volume of information is daunting.

- The market is reactionary.
- It's difficult to remain competitive while relying on traditional trading methods.
- Fundamental analysis is unable to show the entire financial picture.



**Now with AI:** Companies use massive datasets together with DL methods for better forecasting.

- Data pulled from financial, political, and social media
- Analyst reports combined.



**Example:** Sentient Technologies, and Learning Evolutionary Algorithm Framework (LEAF\*)

- Manages millions of data points to find trends and make successful stock trades.
- AI algorithms identify and combine successful trading patterns.
- Successful strategies are tested in the real world, evolving autonomously with LEAF.
- Sentient has received more funding than any other AI company.



# Travel

- Hotel Bookings by Voice Command
- AI Concierge Services
  - <https://techcrunch.com/2018/06/19/amazon-launches-an-alexa-system-for-hotels/>
- Travel Service Chatbots
- Check-in Through Facial Recognition
- Self-Driving Cars and Mobility as a Service
  - <https://www.economist.com/international/2016/09/29/it-starts-with-a-single-app>
- Other Robotic Tools





# Healthcare

- IBM Watson, Google Deepmind
- At-home testing and personalized health care
- Wearables
- Robot-Assisted Surgery
- Virtual Nursing Assistant
- Administrative Workflow assistance



# Healthcare

- Make quicker diagnoses, create better treatment plans and enable new approaches to insurance
- Identify public-health threats and the most at-risk patients
- help medical professionals diagnose disease and improve operations
- Insurers can devise new ways to encourage
- preventive care and incentivize providers
- Doctors will be able to tailor treatments—even drugs—to individual patients
- Virtual agents can serve as primary touchpoints for patients
- Several hurdles stand in the way, starting with data availability

## AI in health care: quicker diagnoses, better treatment plans, and improved health insurance



Machine learning program analyzes patients' health remotely via mobile device, compares it to medical records, and recommends a fitness routine or warns of possible disease

Autonomous diagnostic devices using machine learning and other AI technologies can conduct simple medical tests without human assistance, relieving doctors and nurses of routine activities



AI-powered diagnostic tools identify diseases faster and with greater accuracy, using historical medical data and patient records

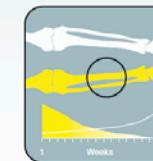
AI algorithms optimize hospital operations, staffing schedules, and inventory by using medical and environmental factors to forecast patient behavior and disease probabilities



AI tools analyze patients' medical histories and environmental factors to identify people at risk of an illness and steer them to preventive care programs



Virtual agents in the form of interactive kiosks register patients and refer them to appropriate doctors, improving their experience and reducing waiting time



AI insights from population health analyses give payers an opportunity to reduce hospitalization and treatment costs by encouraging care providers to manage patients' wellness



# Healthcare – Medical Diagnosis

**Traditionally:** Medical Diagnosis was a challenging process.

- Many symptoms are nonspecific
- Process of elimination was used to determine root cause (neither efficient nor exact)



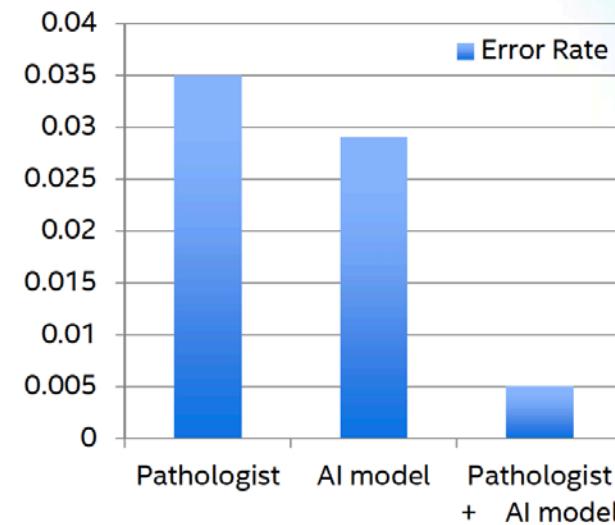
**Now with AI:** Doctors can provide diagnoses more efficiently and accurately, with the availability of:

- Large medical datasets
- Computer vision algorithms



**Example:** Breast Cancer, 2016, Harvard Medical School researchers

- Used DL to identify cancer in lymph node images
- Used Convolutional Neural Nets and custom hardware
- AI model combined with humans achieved lower error than either one individually





# Healthcare – Treatment Protocol

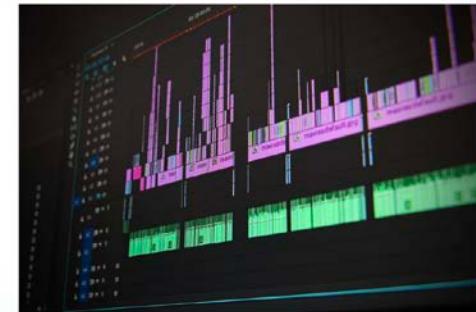
**Traditionally:** Doctors would diagnose a condition and recommend a treatment based on what historically worked for most people.

- Some considerations for population/demographics
- Difficult to create custom treatments without extensive research/cost



**Now with AI:** Doctors can tailor treatments to individual patients.

- Large medical datasets
- ML and DL algorithms
- Population/demographics analysis/simulations



**Example:** ICU Intervene, MIT Computer Science and Artificial Intelligence Laboratory.

- Uses ICU data, from vitals, labs, notes, to determine how to treat specific symptoms.
- Makes real-time predictions from DL models, to provide recommendations for patients.
- Forecasts predictions into the future (a few hours) compared to traditional methods (a few minutes).
- Predictions can be run on common GPU and CPU hardware.





# Healthcare – Drug Discovery

**Traditionally:** Each new drug approval costs over a billion dollars in Research and Development.

- The cost has been doubling every 9 years since 1970
- The drug discovery process can take decades
- 9 out of 10 drug approval attempts fail
- There are currently only 1,500 approved drugs



**Now With AI:** Companies are leveraging structured and unstructured data with AI, to establish a pipeline of new drug discovery.

- There are  $10^{20}$  possible drug-like molecules
- Massive space for potential discovery



**Example:** HetioNet drug discovery model, 2016, UCSF, Himmelstein and Baranzini.

- Developed a graph network to encode millions of biomedical reports.
- Used ML to predict probability of treatment efficacy for ~209,000 compound-disease pairs.
- Provided clear pharmacological insights for epilepsy drug discovery and treatment.





# Healthcare – Surgery

**Traditionally:** Every type of surgery poses possible risks to the patient.

- Adverse anesthesia effects
- Operational complications



**Now with AI:** Semi-intelligent computer systems predict surgical steps, identify complications, and warn surgeons about pending challenges.

- Computer “vision” leverages data from laparoscopic and arthroscopic cameras
- Smart systems automate dictation by generating notes during the surgery
- Surgeons can send point-of-view live feeds of the operative site to experts anywhere in the world for real-time advice.

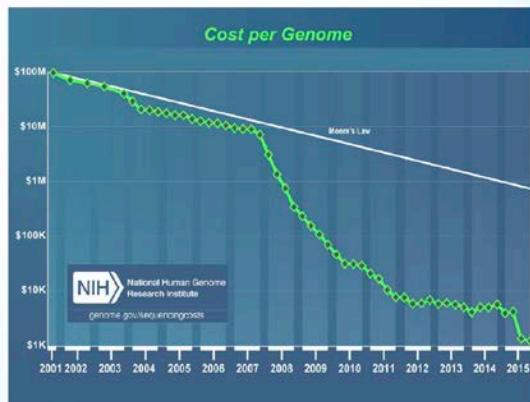




# Healthcare – Genome Sequencing

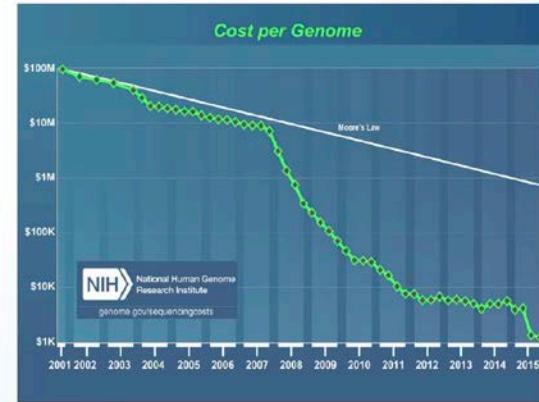
In 2001: Full human sequencing cost \$100 million.

- The first genome sequencing took ~13 years



**Now with AI:** Sequence companies are employing AI techniques to reduce cost and increase accuracy.

- Illumina claims that within the near future sequencing will only take 1 hour and cost only \$100



**Example:** Google's DeepVariant\* sequencing:

- Leverages massive data sets together with DL to identify all variants
- Accuracy on genome classification: 99.958 %
- DeepVariant\* is computationally expensive, but the framework can run on GPU hardware, allowing for a faster learning process
- Availability as open source code promises to revolutionize the industry





# Transportation Industry

- Hyperloop
- High-Speed Tunnel Networks
- Self-Driving Cars
- Self-Flying Aircraft





# Autonomous Car

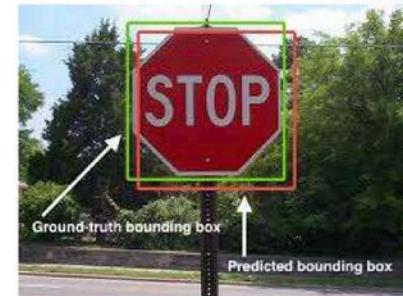
**Traditionally:** Despite having safer cars, the number of deadly car accidents have been on the rise the last few years.

- The leading cause of automobile accidents is human error
- One of the primary sources of traffic jams is each driver acting out of self-interest, that prevents traffic flow
- Part of the population who can't drive: children, the elderly, and the disabled



**Now with AI:** Self-driving cars are enabled by the latest AI breakthroughs in computer vision.

- Cars identify stop signs, lane lines, and other landmarks via DL tools
- Mapping technology can use computer vision to detect addresses
- Cars triangulate and can use other 3D-sensing technologies, such as LIDAR and RADAR



**Example:** Waymo, the autonomous vehicle division of Alphabet Inc.

- Waymo has been operating self-driving minivans without a safety driver since October 2017
- Waymo's Carcraft\* software accelerated the car's development, with 2.5 billion simulated miles driven in 2016
- The system used DL together with massive data sets collected from self-driving cars on public roads





# Automated Trucking

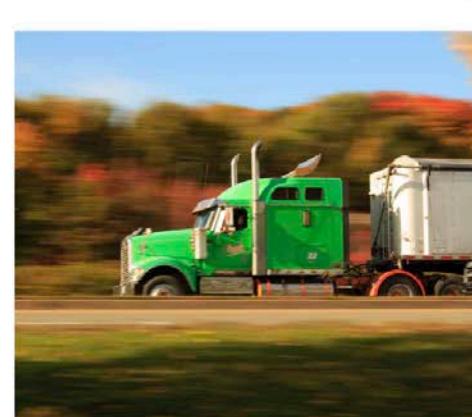
**Traditionally:** There is a shortage of 48,000 drivers nationwide.

- Driver turnover rates at some companies reach 300%
- Truck drivers are twice as likely as other workers to be obese and/or have diabetes
- Truckers are half as likely to have health insurance
- The number of accidents and fatalities have increased in recent years



**Now with AI:** Autonomous trucks can coordinate movements with other trucks.

- Save on fuel, and reduce wind-drag and the chance of a collision
- Video, LIDAR, and accelerometers are used to collect detailed data about the truck's surroundings
- Guidance algorithms provide feedback for braking, steering, and throttling commands, based on incoming and historical data





# Retail Industry

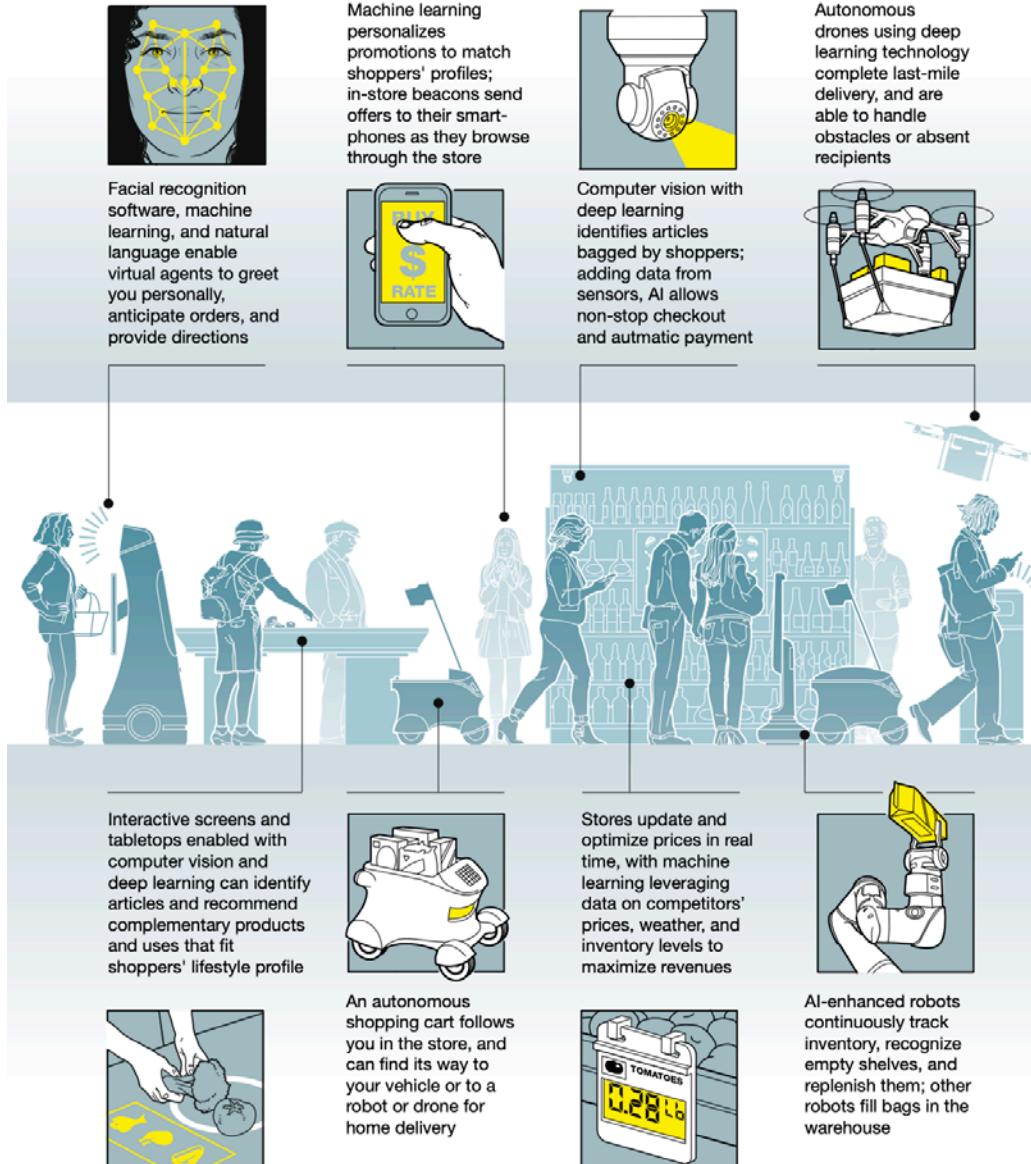
- Intelligent Shopping Systems
- Robots
- Biometric technologies
- Facial recognition



# Retail Industry

- Artificial Intelligence: The Next Digital Frontier
  - 20 percent stock reduction by using deep learning to predict e-commerce purchases.
  - 2 million fewer product returns per year.
  - 30 percent reduction of stocking time by using autonomous vehicles in warehouses.
  - 50 percent improvement in assortment efficiency.
  - 4-6 percent sales increase using geospatial modeling to improve micro market attractiveness.
  - 30 percent online sales increases from the use of dynamic pricing and personalization.

**Retailers can know more about what shoppers want—sometimes before shoppers themselves**





# Customer Experience

**Traditionally:** Americans are shifting their spending from material goods to experiences.

- The “Amazon effect”: there have been nine major retail bankruptcies in 2017
- Retailers need to become competitive or risk obsolescence
- Balancing “out-of-stock” with “over-stock” trade-off requires great finesse



**Now with AI:** Companies bring experience and optimization to retail shopping.

- AI-powered gift concierge learns your preferences as you engage, and can help predict the appropriate gift to buy
- Leveraging ML-trained agents, companies are providing recommendations via natural language
- Companies using AI via Watson\* to monitor factors from weather to consumer behavior, to optimize consumption rate predictions



**Example:** The North Face and Watson\* are combining massive datasets and AI, to bring the brick-and-mortar experience to e-commerce.

- The North Face, with Fluid and IBM Watson\*, has launched XPS\* - an AI-enabled digital expert that uses a natural language interface to help shoppers.
- XPS curates and filters the available options, so shoppers are more likely to make a purchase

The screenshot shows a mobile application interface for The North Face XPS. It features a grid of five jackets, each with a 'MATCH' label indicating a recommended item based on user input. The jackets are: 'WOMEN'S PRISM WIND JACKET \$99.00', 'WOMEN'S APE ELEVATION JACKET \$199.00', 'MEN'S DRYZZLE JA' \$199.00', 'WOMEN'S REFELX JACKET \$99.00', and 'MEN'S VENTURE JACKET \$99.00'. At the bottom, a horizontal slider asks 'HOW COLD DO YOU EXPECT IT TO BE? (°F)'. The app is powered by FLUIDXPS and IBM Watson. The North Face logo is at the bottom left, and the Intel logo is at the bottom right.





# Food Supply Chain

**Traditionally:** Restaurants use historical data or "gut-feeling" approach to supply chain.

- This can result in excessive waste or food unavailability



**Now with AI:** Many companies have started to leverage sophisticated algorithms to forecast demand.

- Agents can adjust orders with trading partners in real time, as required for business need



**Example:** Vivanda's FlavorPrint\* program.

- Based on recipes and consumer-provided data, Vivanda maps data to create "digital-taste" identifiers for each consumer
- Providing ML-based recommendations to customers may influence demand
- Shares data with food industry customers, enabling them to improve demand forecasts



# Education Industry

- Personalized Learning Platforms
- Individualized Artificial Intelligence Tutors
- Personalized Games
- Crafting a more enjoyable learning experience

Example: Adaptive learning systems, and grading.

- Learning analytics track student performance and provide tailored educational programs.
- Using natural language processing and ML models, AI programs can be used for long answer and essay grading.





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# Agriculture Industry

- Agricultural Drones
- Autonomous Tractors
- Vertical Farms

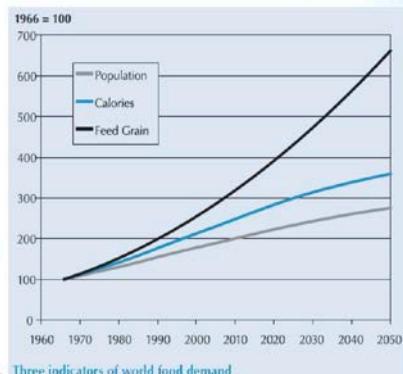




# AgTech

**Traditionally:** The world population is estimated to reach 9 billion by 2050.

- Food production will have to increase by 70% to meet the projected demand.
- Most land suitable for farming is already being used, hence the needed increase must come from higher yields.
- Agriculture must feed the world while not over-straining Earth's resources.



source: www.card.iastate.edu

**Now with AI:** Autonomous robots use computer vision and a produce vacuum system for produce harvest.

- DL-enabled robots are being used to identify and kill weeds.
- Companies have shown 90% herbicide reduction due to "targeted" spray application.
- AI-driven genome sequencing advancements enables crop "genome" editing.



## Example: TellusLabs yield predictions.

- Uses ML together with weather and other historical data to forecast yields.
- Leverages cloud-based GPUs for DL on satellite images.
- TellusLab's predictions have shown to be consistently more accurate than the USDA.
- Came within 1% of predicting corn and soybean yields in 2017.





# Entertainment Industry



<https://youtu.be/9IXgVmLxVtQ>

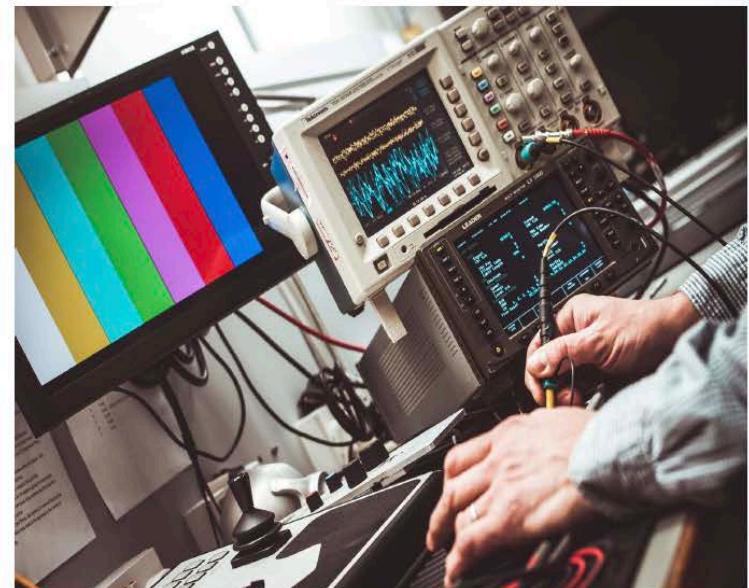




# AI for Music Generation

**Example:** “I AM AI”, first album released in 2017 to be generated by AI – with professional musicians and DL technology.

- Music generation is possible due to special DL algorithms that are designed for sequential data.
- The models learn musical patterns based on learning from large musical datasets.
- Raw music files can be processed on cloud-based computer power, making DL on these datasets possible.

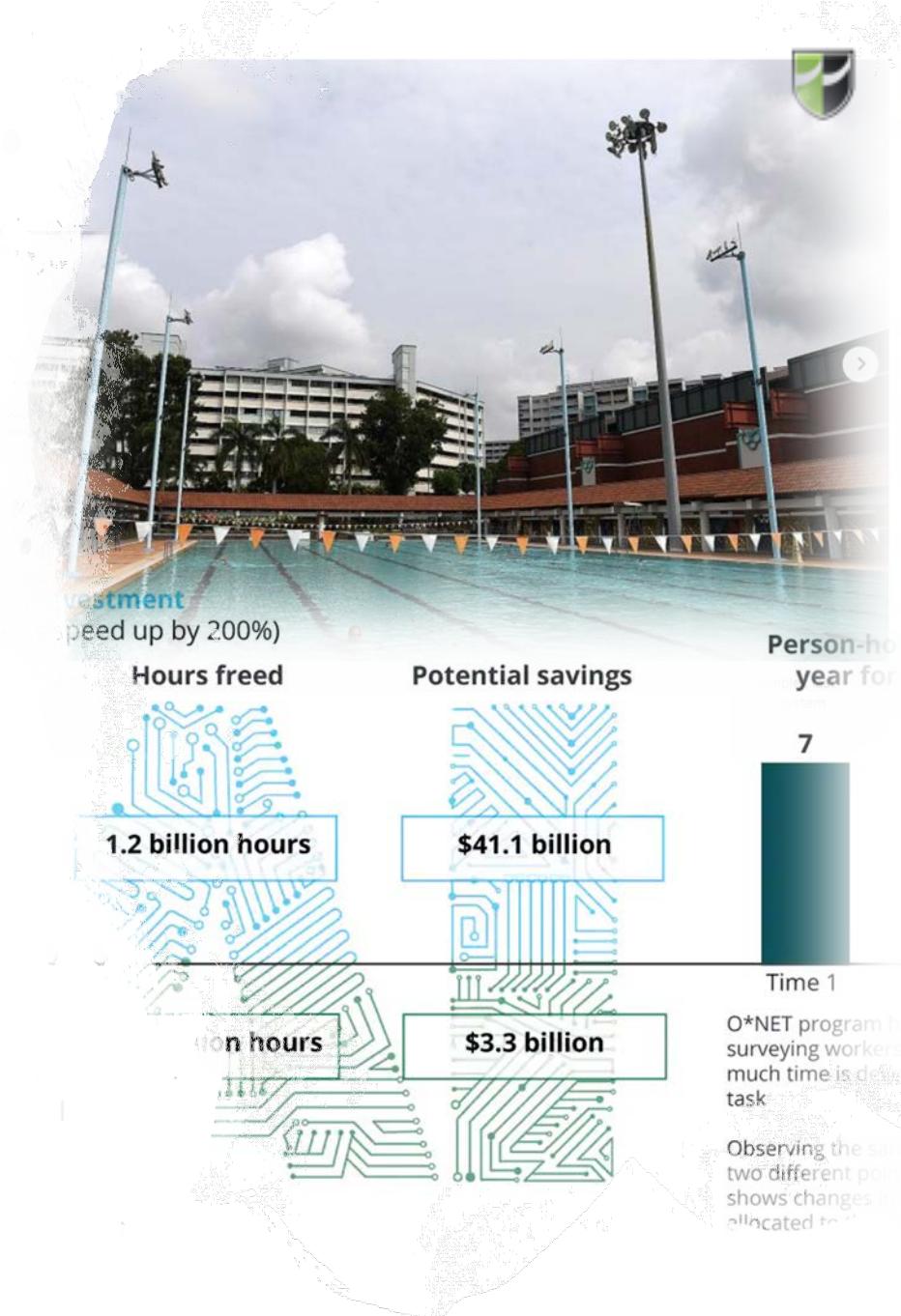


The instrumentation was composed with artificial intelligence, lyrics and vocal melodies written by Taryn. Let us know what you think in the comments!



# Governments

- Public Safety and security
- Bureaucratic Efficiency





# Smart Cities

**Traditionally:** As of 2008, for the first time in history, half of the world's population resides in cities.

- There are heightened demands on scarce resources.
- Simultaneously, a large part of existing infrastructure is underutilized or not being used efficiently.



**Now with AI:** AI techniques are used to analyze photo and video data to perform studies of pedestrian and traffic trends.

- Adaptive signal control: allows traffic lights to tailor their timing based on real-time data.
- With license plate recognition, and DL technology, cities can not only optimize parking but can also track criminals.



## Example: AT&T reimagines smart cities

- AT&T developed a framework to help cities integrate Internet of Things (IoT) sensors with AI.
- Remotely monitor the condition of roads, bridges, buildings.
- Assist with public safety.
- Notify police if gunfire has gone off, by using sound detection.





# Cybersecurity

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## Example: Deep Instinct

- Uses GPU-based neural network to achieve 99% detection rates for even the most advanced cyber attacks.
- DeepInstinct's DL models have the ability to detect patterns - mostly designed by humans - enabling the prediction of pending cyber attack.





# Oil and Gas

**Traditionally:** Shrinking oil reserves force companies to operate in remote and possibly hostile areas.

- Price has fallen dramatically in recent years.
- Forcing company layoffs and drastic budget cuts.
- Ultimately, companies are in great need of optimizing operations and cost.



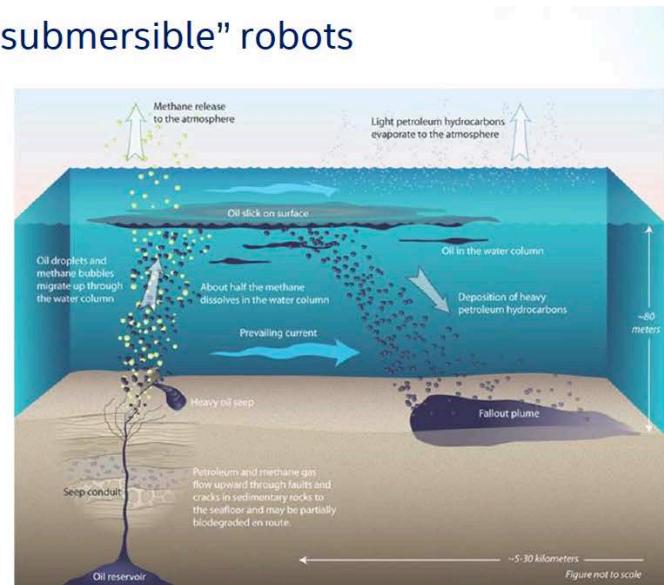
**Now with AI:** AI uses economic, political and weather data to forecast optimum production locations.

- Drilling is still an expensive and risk-prone endeavor.
- ML, with seismic, thermal and strata data, can help optimize the drilling process.



**Example:** ExxonMobile and MIT developing “submersible” robots for exploration.

- AI robots are used in ocean exploration to detect “natural seep”.
- Robots are trained via DL techniques and learn from their mistakes.
- Simultaneously protect the ecosystem and detect new energy resources.





# Preventive Maintenance

**Traditionally:** Relied on historical data to provide basis for preventative maintenance schedule.

- Conservative approach: parts were replaced well before failure, and thus financially inefficient.
- Flawed due to inability to predict new failure modes.



**Now with AI:** Internet of Things (IoT) sensors help to optimize maintenance scheduling.

- Part replacement schedule is optimized by assessing anomalies and failure patterns.
- Safety and productivity can increase exponentially.



**Example:** AI with General Electric.

- GE is the industry leader for Internet of Things (IoT) sensor installations on engines and turbines, and plans to have 60,000 engines connected to the internet by 2020.
- Computer vision cameras and reinforcement learning algorithms find tiny cracks or damage.
- Sensor data and AI allows GE to track performance and optimize part replacement.





# Fault Detection

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**Example:** Computer vision for fault detection on solar panels.

- DL algorithm trained on labelled data of correctly manufactured vs. flawed panels
- Reduced the need for human inspection by 66% compared to historical need





# Automate Garment Industry

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**Example:** SoftWear Automation's "sewbots".

- Computer vision is used to track fabric at the thread level.
- Eliminates need for human seamstress / seamster.
- Allows designers to create garments that were previously thought to be too complicated or specialized to construct.





# AI and Customer Service

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**Example:** Bot assistants and customer service agents

- AI Augmented messaging.
- AI for sorting and routing inquiries.
- AI enhanced customer phone calls.
- Some companies have used AI to fully automate customer service.





# AI and Next Gen Gaming

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**Now with AI:** Forza 5 Motorsport\* uses its “Drivatar” AI system to learn how to drive in the style of other players in the game.

- Neural networks are used to train characters to walk and run realistically.
- Reinforcement Learning (RL) is a technique used throughout gaming.





# AI and Next Gen Gaming

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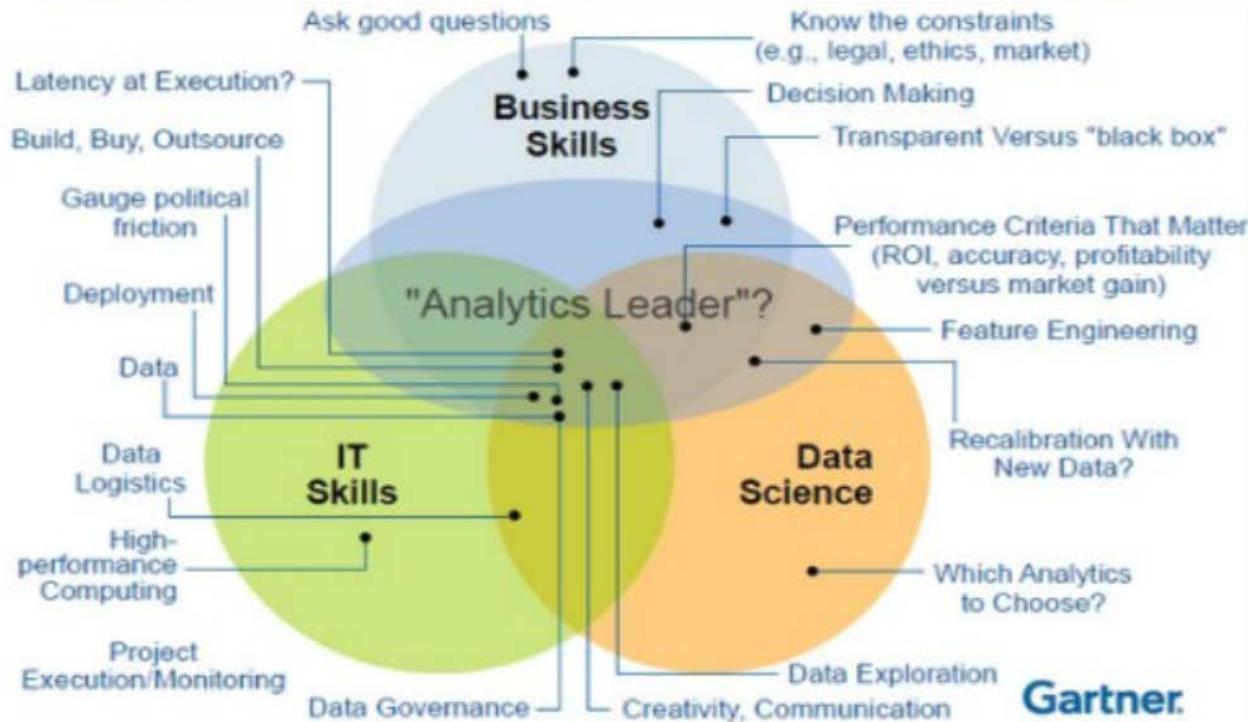
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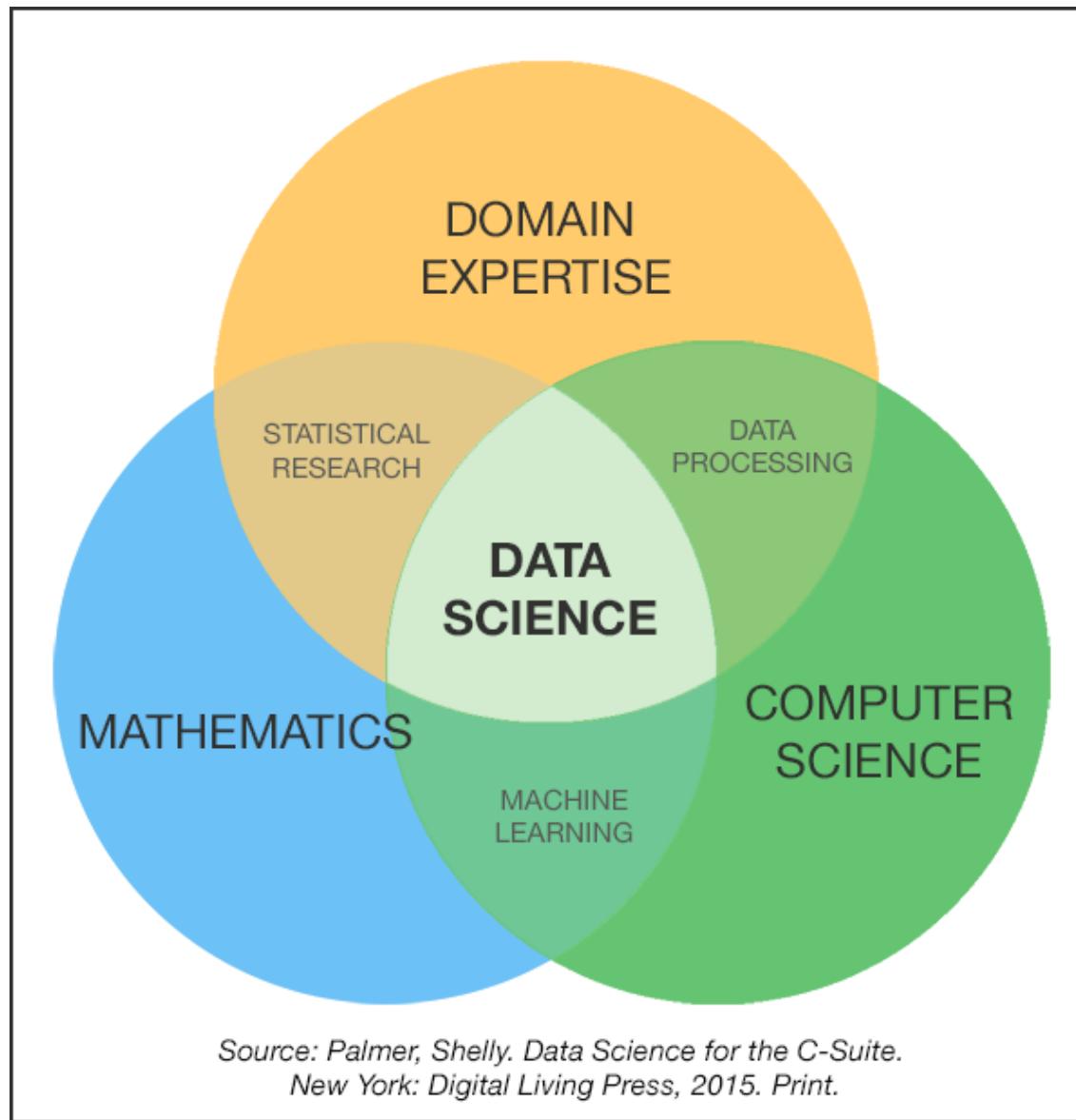
## Driving the Success of Data Science Solutions: Skills, Roles and Responsibilities ...



**Gartner.**



# Data Science Venn Diagram



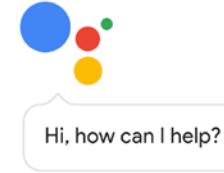
# AI Services



- Google Search
  - Google Assistant ([hands on](#))
  - Google Photo (image recognition)
  - Speech Recognition
- 
- Google's AI Services for Companies
    - <https://experiments.withgoogle.com/collection/ai>
  - Google's cloud-based AI Tools
    - <https://ai.google>
  - Google's AI Experiments:
    - <https://experiments.withgoogle.com/ai>
  - Do-it-Yourself AI:
    - <https://aiyprojects.withgoogle.com/voice/>

**Voice Kit**  
Do-it-yourself intelligent speaker. Experiment with voice recognition and the Google Assistant.

**Vision Kit**  
Do-it-yourself intelligent camera. Experiment with image recognition using neural networks.



Meet your Google Assistant.

Ask it questions. Tell it to do things. It's your own personal Google, always ready to help.

**Beware – Google's AI is so smart it just taught itself to walk without any human help**

Jimmy Naubuga Monday 17 Jul 2017 6:31 pm

f t d <



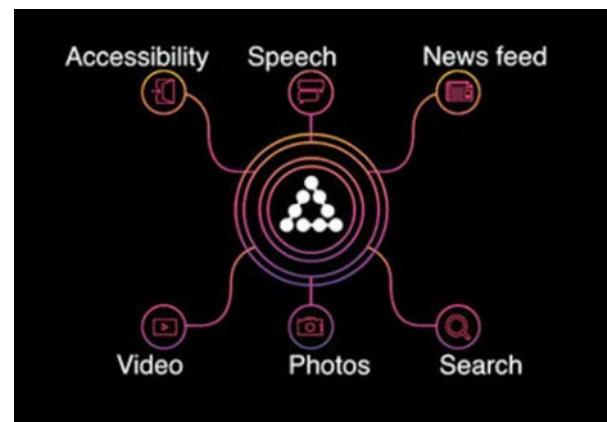


# Google Duplex



# AI Services

- Facebook Photo search
- FB Learner Flow (<https://code.fb.com/ml-applications/introducing-fblearner-flow-facebook-s-ai-backbone/>)
- Text Analytics (Deep Text)
- Pattern Recognition to Prevent Suicides
- Improving 360 Degree Photos
- Computer Vision
- Facebook Personal Assistant M (experiment)
- Facebook Messenger Platform Chatbot
- Facebook's AI research Activities
  - <https://research.fb.com/category/facebook-ai-research/>



TECHNOLOGY NEWS NOVEMBER 28, 2017 / 12:05 AM / A YEAR AGO

Facebook will use AI to help correct skewed 360-degree photos

The company has a technique for dealing with big file sizes, too.

**Facebook to expand artificial intelligence to help prevent suicide**

David Ingram

3 MIN READ





# AI Services

- Amazon Recommended Products
- Alexa Personal Assistant
- Cloud Storage
- Amazon's AI platform:
  - Amazon Lex
  - Amazon Polly
  - Amazon Recognition

**LEARNING TOOLS**

### Get deep with machine learning

**AWS DeepRacer**

AWS DeepRacer is a fully autonomous 1/18th-scale race car designed to help you learn about reinforcement learning through autonomous driving.

- Experience the thrill of the race in the real world when you deploy your RL model onto AWS DeepRacer
- Build models with Amazon SageMaker and then train, test, and iterate on the track using the AWS DeepRacer 3D racing simulator
- Starting in 2019, compete in the world's first global autonomous racing league, to race for prizes and a chance to advance to win the coveted AWS DeepRacer Cup

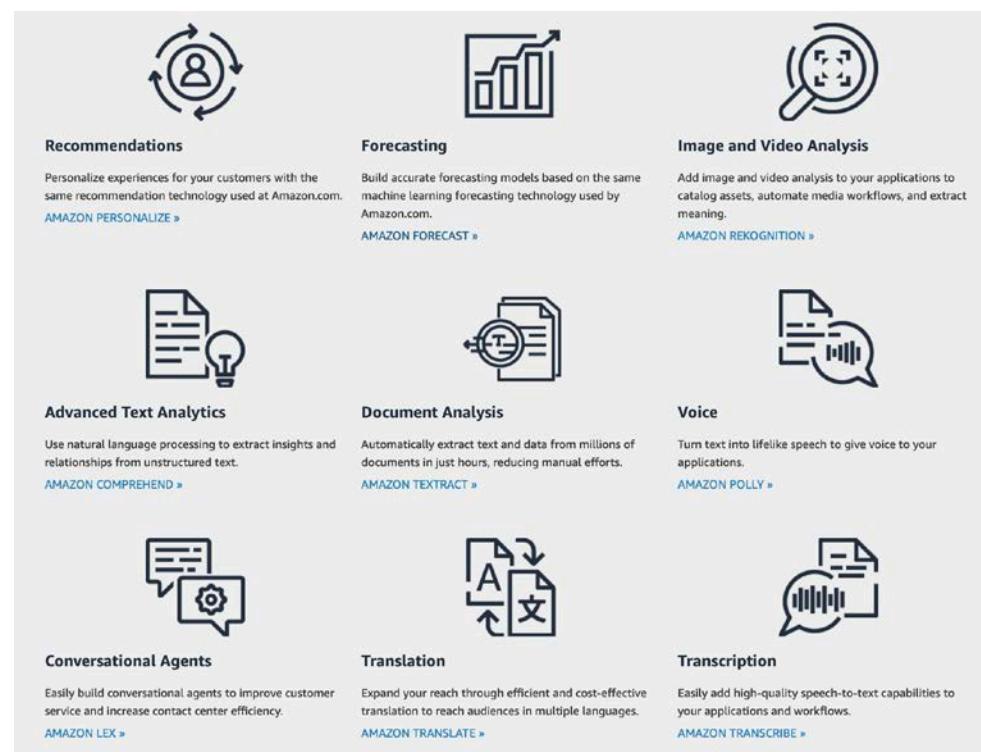
[Learn more »](#)

**AWS DeepLens**

AWS DeepLens is the world's first deep learning-enabled video camera for developers. Integrated with Amazon SageMaker and many other AWS services, it allows you to get started with deep learning in less than 10 minutes through sample projects with practical, hands-on examples.

- Choose your deep learning model from the AWS DeepLens pre-trained model library, or your own models trained with Amazon SageMaker.
- Deploy your model to the device with a single click.
- Watch the results in real time in the AWS Management Console.

[Learn more »](#)



 <b>Recommendations</b> Personalize experiences for your customers with the same recommendation technology used at Amazon.com. <a href="#">AMAZON PERSONALIZE »</a>	 <b>Forecasting</b> Build accurate forecasting models based on the same machine learning forecasting technology used by Amazon.com. <a href="#">AMAZON FORECAST »</a>	 <b>Image and Video Analysis</b> Add image and video analysis to your applications to catalog assets, automate media workflows, and extract meaning. <a href="#">AMAZON REKOGNITION »</a>
 <b>Advanced Text Analytics</b> Use natural language processing to extract insights and relationships from unstructured text. <a href="#">AMAZON COMPREHEND »</a>	 <b>Document Analysis</b> Automatically extract text and data from millions of documents in just hours, reducing manual efforts. <a href="#">AMAZON Textract »</a>	 <b>Voice</b> Turn text into lifelike speech to give voice to your applications. <a href="#">AMAZON POLLY »</a>
 <b>Conversational Agents</b> Easily build conversational agents to improve customer service and increase contact center efficiency. <a href="#">AMAZON LEX »</a>	 <b>Translation</b> Expand your reach through efficient and cost-effective translation to reach audiences in multiple languages. <a href="#">AMAZON TRANSLATE »</a>	 <b>Transcription</b> Easily add high-quality speech-to-text capabilities to your applications and workflows. <a href="#">AMAZON TRANSCRIBE »</a>



# AI Services

- Cortana - <https://www.microsoft.com/en-us/windows/cortana>
- Presentation Translator -  
<https://translator.microsoft.com/help/presentation-translator>
- HoloLens
- InnerEye - <https://www.microsoft.com/en-us/research/project/medical-image-analysis/>
- Azure Microsoft Cloud Service –
- AI for Earth -  
<https://www.microsoft.com/en-us/ai/ai-for-earth>
- AI Language Translator -  
<https://www.microsoft.com/en-us/translator/>  
<https://www.bing.com/translator> (demo)



Microsoft | AI Products & Services Approach More All Microsoft Sign in

**AI for Earth**

AI for Earth puts Microsoft cloud and AI tools in the hands of those working to solve global environmental challenges.

▷ Play AI for Earth video

**Areas of focus**

AI for Earth awards grants to projects that use artificial intelligence to address four critical areas that are vital for building a sustainable future.

Learn about AI for Earth grants >



# Presentation Translator

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<https://youtu.be/9IXgVmLxVtQ>



# InnerEye Research Project

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<https://youtu.be/9IXgVmLxVtQ>



# AI Services

IBM

- Cognos Analytice - <https://www.ibm.com/sg-en/products/cognos-analytics>
- Tone Analyzer - <https://tone-analyzer-demo.ng.bluemix.net> (demo)
- Discovery - <https://discovery-news-demo.ng.bluemix.net>
- Visual Recognition -  
<https://www.ibm.com/watson/services/visual-recognition/demo/#demo>
- Text to Speech - <https://text-to-speech-demo.ng.bluemix.net/> (audio streaming does not work on mobile browser)

IBM Watson Developer Cloud

### Tone Analyzer

This service uses linguistic analysis to detect joy, fear, sadness, anger, analytical, confident and tentative tones found in text.

\*This system is for demonstration purposes only and is not intended to process Personal Data. No Personal Data is to be entered into this system as it may not have the necessary controls in place to meet the requirements of the General Data Protection Regulation (EU) 2016/679.

Resources: Documentation API Reference Fork on GitHub Start for free in IBM Cloud

#### Sample use cases

Choose an example to learn how you can adjust the tone of your content to change people's perceptions, or improve its effectiveness.  
Learn more...

Tweets  Online Review  Email message  Product Review in French  Your own text

Analyzing Customer Engagement Data? Try out the [Tone Analyzer Customer Engagement Endpoint](#).

I hate these new features. On #ThisPhone after the update.  
I hate #ThisPhone Company products, you'd have to torture me to use #ThisPhone.  
This emoji in #ThisPhone are stupid.  
#ThisPhone is a useless, stupid waste of money.  
#ThisPhone is the worst phone I've ever had - ever. 😡  
#ThisPhone another ripoff, lost all respect SHAME.  
I'm worried my #ThisPhone is going to overheat like my brother's did.

Analyze

### Insurance (Custom Classifier)

Custom Classifier trained on insurance images

vandalism	0.64
flat_tire	0.53
broken_windshield	0.11
motorcycle_accident	0.86

International vehicle glass repair company Belron uses Custom Models to automatically generate estimates of repair costs based on customer-submitted images of car damage.

Select an image on the left to evaluate how this Custom Model analyzes different images





# AI Services

- Speech Recognition on Siri
- QuickType
- A11 Bionic Chip – Core ML
- Apple Music
- Apple HomePod
- Apple Photos



**Apple acquires AI tech that seeks to understand your photos**

Regaind can tell good pics from bad ones, and interpret what's going on.

**Apple has new self-driving car hardware covered with iPod-style white plastic**

Kif Leswing, Business Insider US

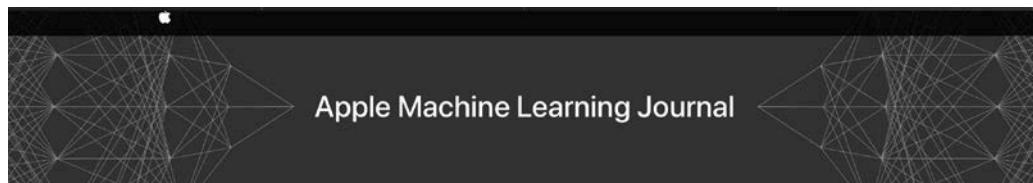
October 18, 2017

71,188 views | Dec 26, 2016, 07:05am

**Apple Publishes Its First Artificial Intelligence Paper**



Aaron Tilley Forbes Staff



Optimizing Siri on HomePod in Far-Field Settings

Vol. 1, Issue 12 • December 2018  
by Audio Software Engineering and Siri Speech Team



# AI Services

Robots Run the Warehouses ([link](#))

Innovation

## Alibaba lets AI, robots and drones do the heavy lifting on Singles' Day

This year's November 11 shopping ritual will engage a recommendation algorithm, robots, and chatbots capable of understanding human emotion

Topic | Singles' Day (11.11)

### SMART CUSTOMER SERVICE

Ali Assistant is a chatbot that handles both spoken and written queries, acting as customer-service rep and personal shopping assistant. It is capable of handling up to

**95%**

of customer service enquiries



Intelligent Machines

## Alibaba's AI Fashion Consultant Helps Achieve Record-Setting Sales

AI will blur the line between online and offline retail.

### BIG DATA

With nearly

**500 million**

active users across its websites and apps, Alibaba has a vast repository of consumer data that can be processed and analyzed by AI programs continuously in real time, leading to increasingly accurate predictions and a better shopping experience.



### COMPUTING POWER

Alibaba has built up one of the world's largest networks of interconnected computer servers to run its e-commerce empire, backed by an operating system that can process more than

**175,000**  
transactions per second.



# Hands-on Training an image classifier

## *Training an image classifier*

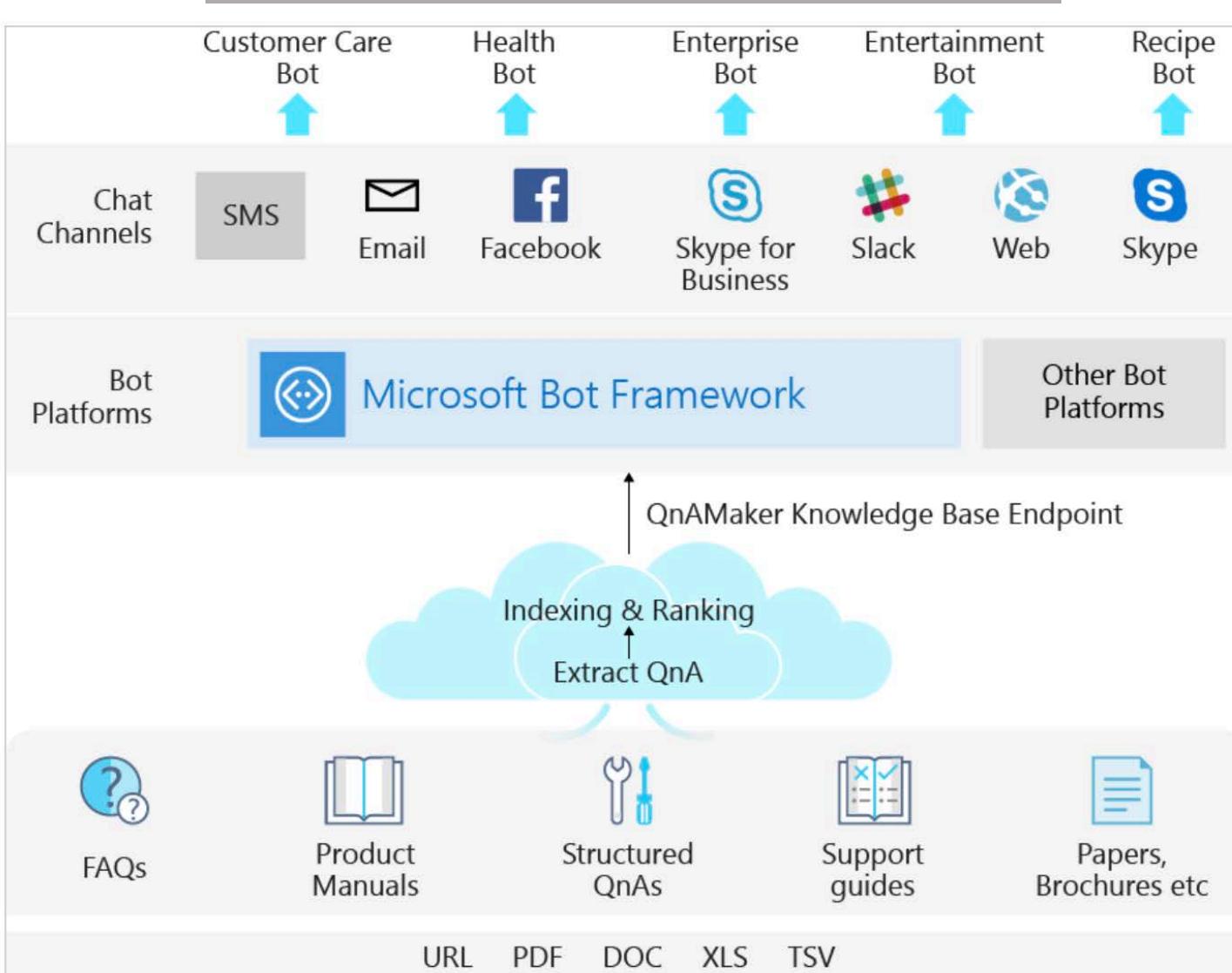


- 01 **Setup**  
Create Azure account  
Create Custom Vision resources
- 02 **Prepare images**  
Gather training and validation images from internet or other sources
- 03 **Train the classifier**  
Allow the classifier to know what constitutes a given class.
- 04 **Evaluate the classifier**  
Check for accuracy, recall and probability threshold.
- 05 **Test your model**  
Use unseen data to test your classifier.
- 06 **Improve your classifier**  
Use various techniques to improve your classifier.

**Hotdog/Not-Hotdog  
- HBO's Silicon Valley**



# Hands on - Chatbot





# QnA Source

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The table below summarizes the types of content and file formats that are supported by QnA Maker.

Source Type	Content Type	Examples
URL	FAQs (Flat, with sections or with a topics homepage) Support pages (Single page how-to articles, troubleshooting articles etc.)	<a href="#">Plain FAQ</a> , <a href="#">FAQ with links</a> , <a href="#">FAQ with topics homepage</a> <a href="#">Support article</a>
PDF / DOC	FAQs, Product Manual, Brochures, Paper, Flyer Policy, Support guide, Structured QnA, etc.	<a href="#">Structured QnA.doc</a> , <a href="#">Sample Product Manual.pdf</a> , <a href="#">Sample semi-structured.doc</a> , <a href="#">Sample white paper.pdf</a>
Excel	Structured QnA file (including RTF, HTML support)	<a href="#">Sample QnA FAQ.xls</a>
TXT/TSV	Structured QnA file	<a href="#">Sample chit-chat.tsv</a>



# Hands-on Building a QnA Chatbot

## ***QnA Chatbot***



- 01
- 02
- 03
- 04
- 05
- 06

### ***Setup***

Create Azure account  
Prepare your questions and answers

### ***Create QnA Knowledge Base***

Gather training and validation images from internet or other sources.  
Add personality

### ***Train the Knowledge Base***

Allow the KB to build up database.

### ***Publish the Knowledge Base***

Once tested, allow your KB to be used by the bots

### ***Create a QnA Bot***

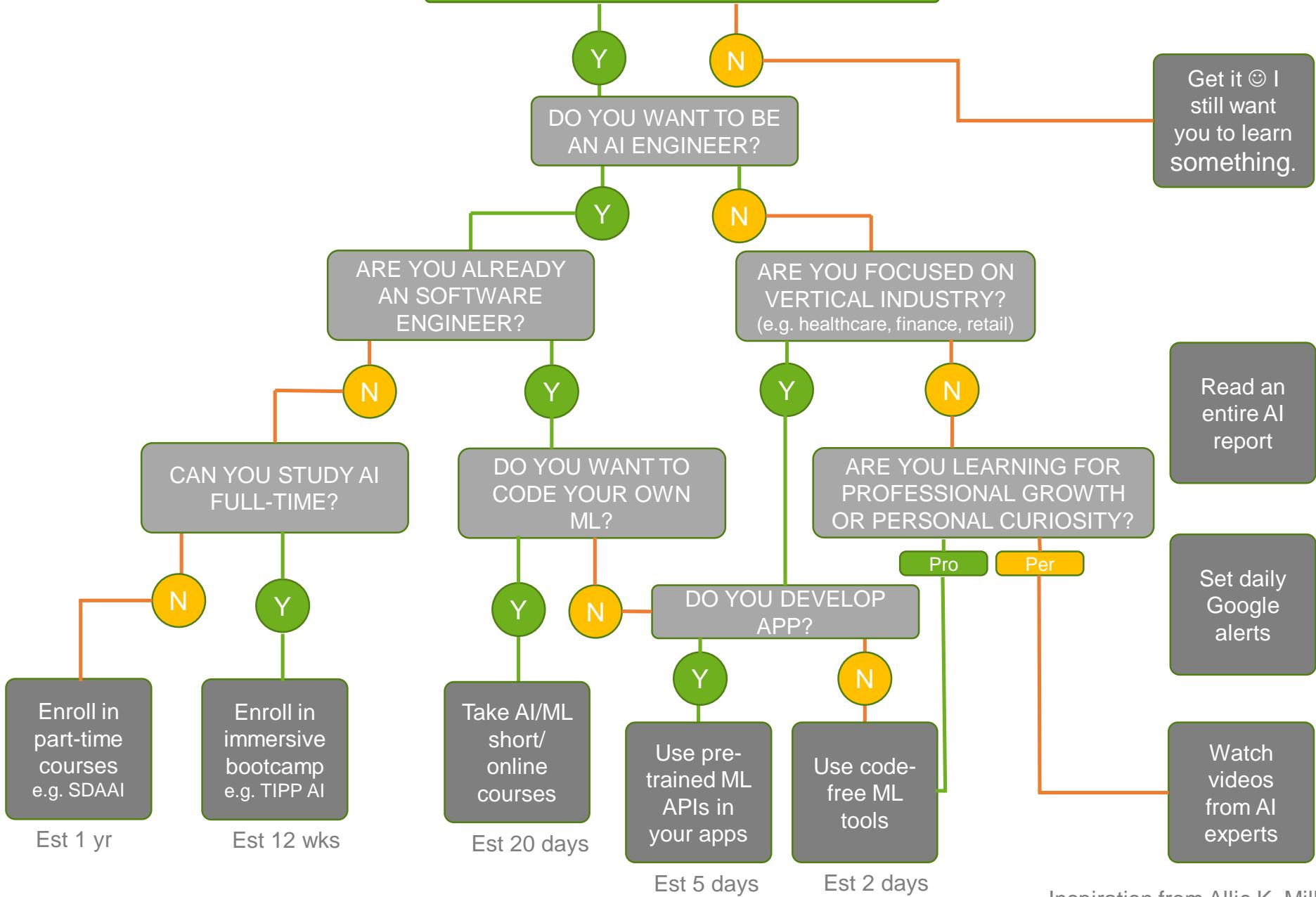
Connect your KB to a Bot

### ***Connect your bot to channels***

Use popular apps like Telegram and Messenger to chat with your bot



# DO YOU WANT TO LEARN AI?



## Inspiration from Allie K. Miller



# Where to go from here?

MOOC:  
DataCamp  
<https://www.datacamp.com/>

The screenshot shows the DataCamp website with a search bar for "python". A promotional banner at the top says "Subscribe now. Save 50% on DataCamp and skill up. Offer ends in: 04 days 04 hrs 56 mins 51 secs." Below the search bar, it says "57 results for 'python'". There are six course cards displayed:

- Intro to Python for Data Science**: Master the basics of data analysis in Python. Expand your skill set by learning scientific computing with numpy. 4 hours. Instructor: FILIP SCHOUWENAARS.
- Intermediate Python for Data Science**: Level up your data science skills by creating visualizations using matplotlib and manipulating data frames with Pandas. 4 hours. Instructor: FILIP SCHOUWENAARS.
- Python Data Science Toolbox (Part 1)**: Learn the art of writing your own functions in Python, as well as key concepts like scoping and error handling. 3 hours. Instructor: HUGO BOWNE-ANDERSON.
- Deep Learning in Python**: Learn the fundamentals of neural networks and how to build deep learning models using Keras 2.0. 4 hours.
- Supervised Learning with scikit-learn**: Learn how to build and tune predictive models and evaluate how well they will perform on unseen data. 4 hours.
- pandas Foundations**: Learn how to use the industry-standard pandas library to import, load, and manipulate DataFrames. 4 hours.

Edx  
<https://www.edx.org/>

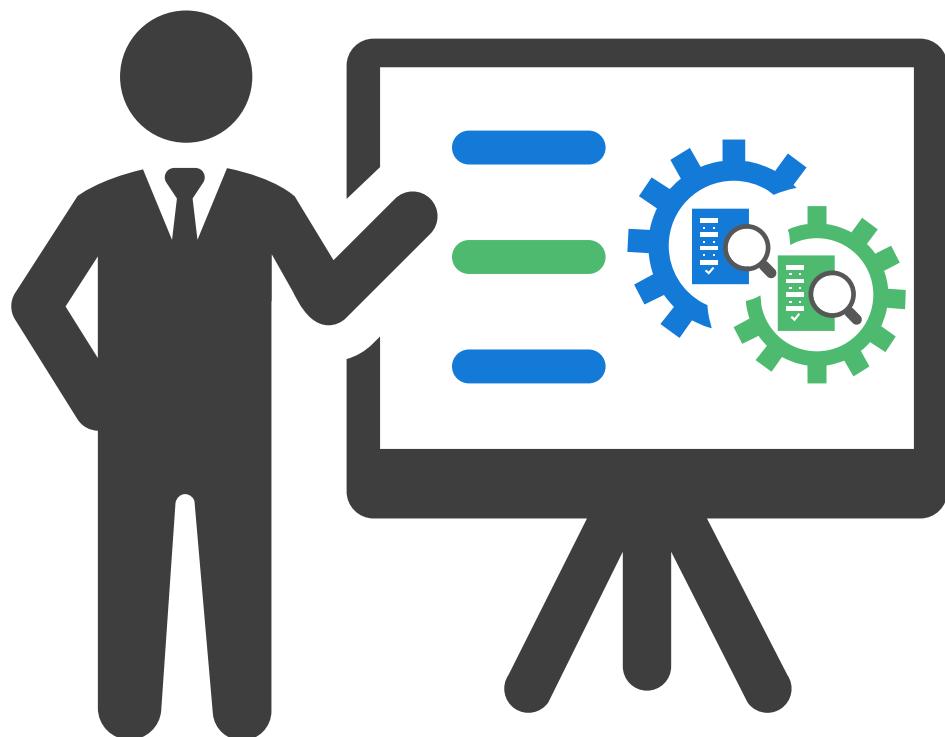
Udemy (freemium course)  
<https://t.me/freecourse>

RP/SOI AI4E Telegram Channel  
<http://bit.ly/2FFWsPl>

The screenshot shows the edX homepage. At the top, there is a banner with the text "Accelerate your future. Learn anytime, anywhere." and a "Find courses" button. To the right, there is a photo of a woman looking at a tablet. Below this, there is a search bar with the placeholder "What do you want to learn?". Further down, there are logos for several partner institutions: MIT, Massachusetts Institute of Technology, HARVARD UNIVERSITY, Berkeley, THE UNIVERSITY OF TEXAS SYSTEM, THE HONG KONG POLYTECHNIC UNIVERSITY, and THE UNIVERSITY OF BRITISH COLUMBIA. At the bottom, there is a large "CYBER MONDAY" graphic with the text "THE COUNTDOWN IS ON! Get 15% off your purchase." and a "Start Exploring" button.



# Summary



Email  
[seow\\_khee\\_wei@rp.edu.sg](mailto:seow_khee_wei@rp.edu.sg)

Telegram  
[@kwseow](https://t.me/kwseow)

Source code:



# Thank you