



[https://bit.ly/aifep\\_2021](https://bit.ly/aifep_2021)

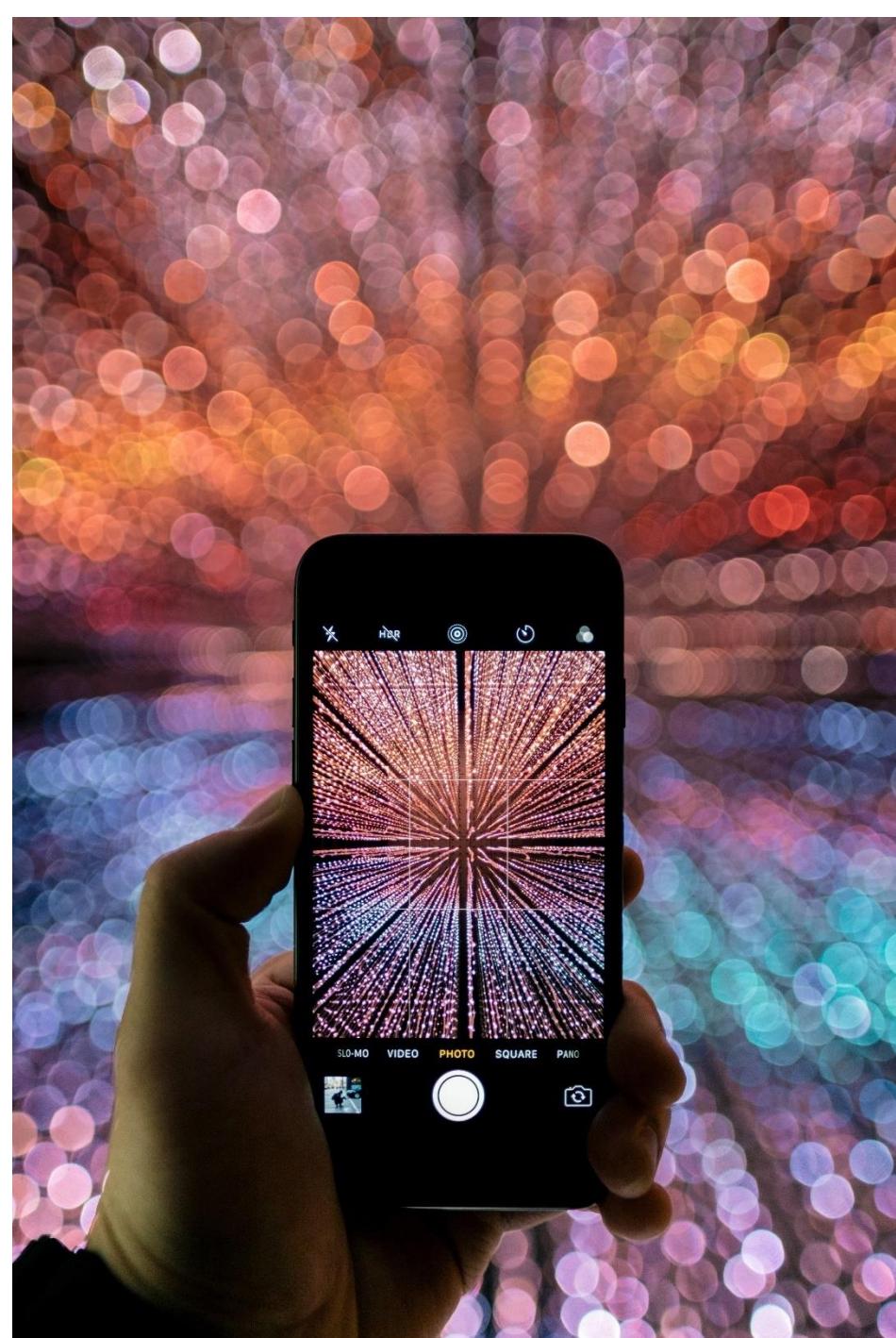


# Artificial Intelligence for Everyone

A Practical Experience

# Warm Up

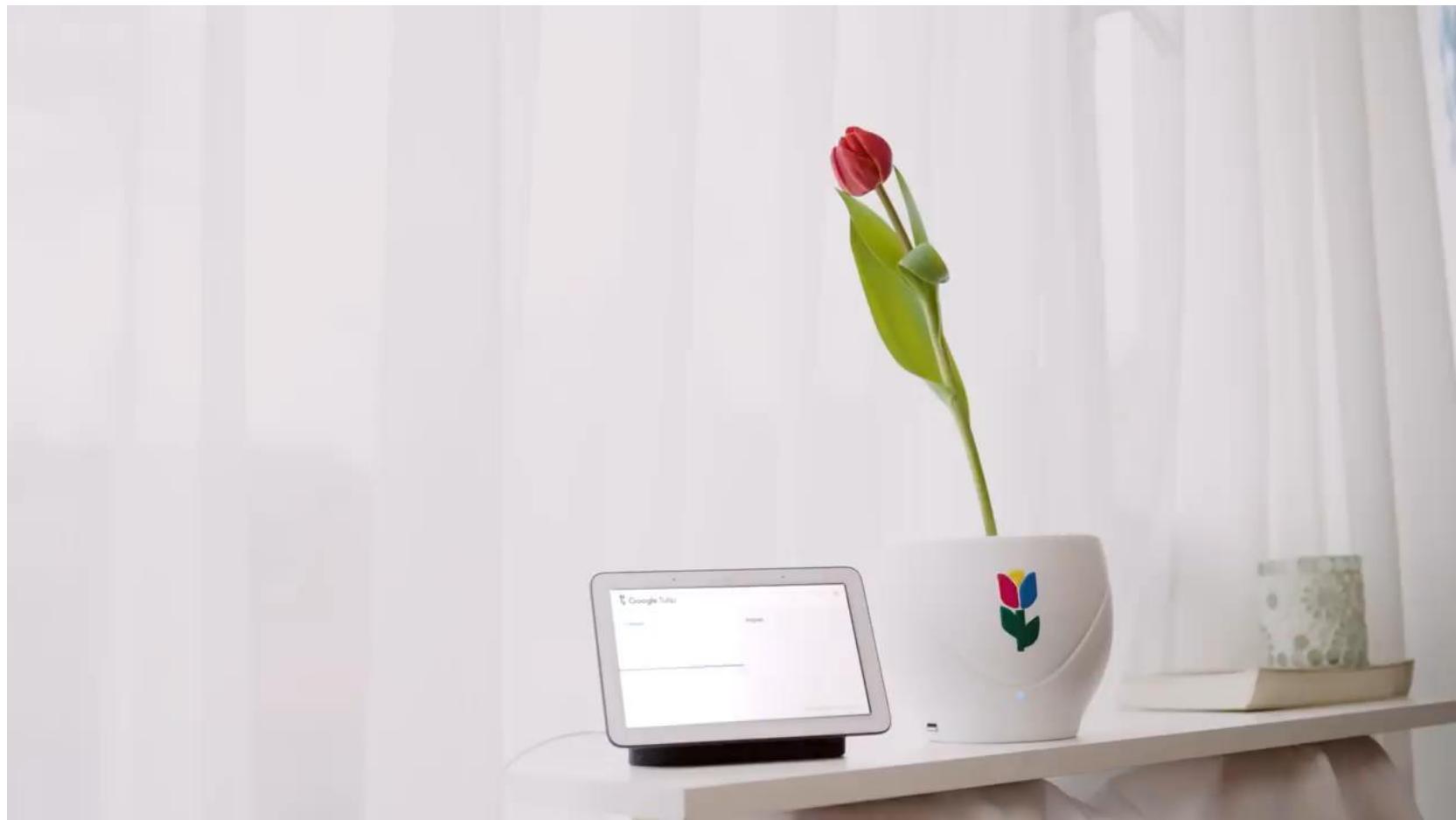
**What do you hope to gain  
from this workshop?**





# Talk to flower

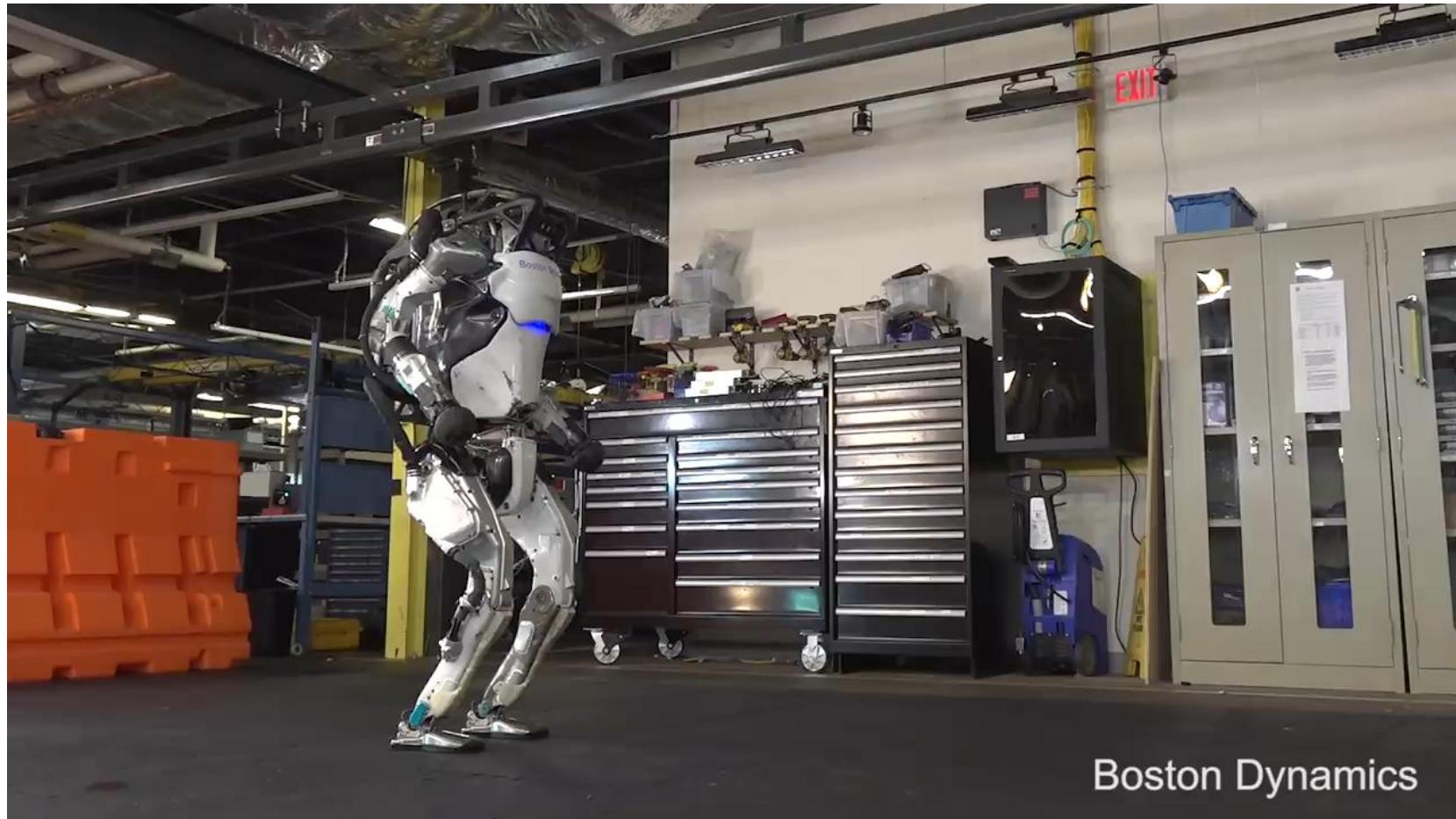
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[https://www.youtube.com/watch?v=nsPQvZm\\_rgM](https://www.youtube.com/watch?v=nsPQvZm_rgM)



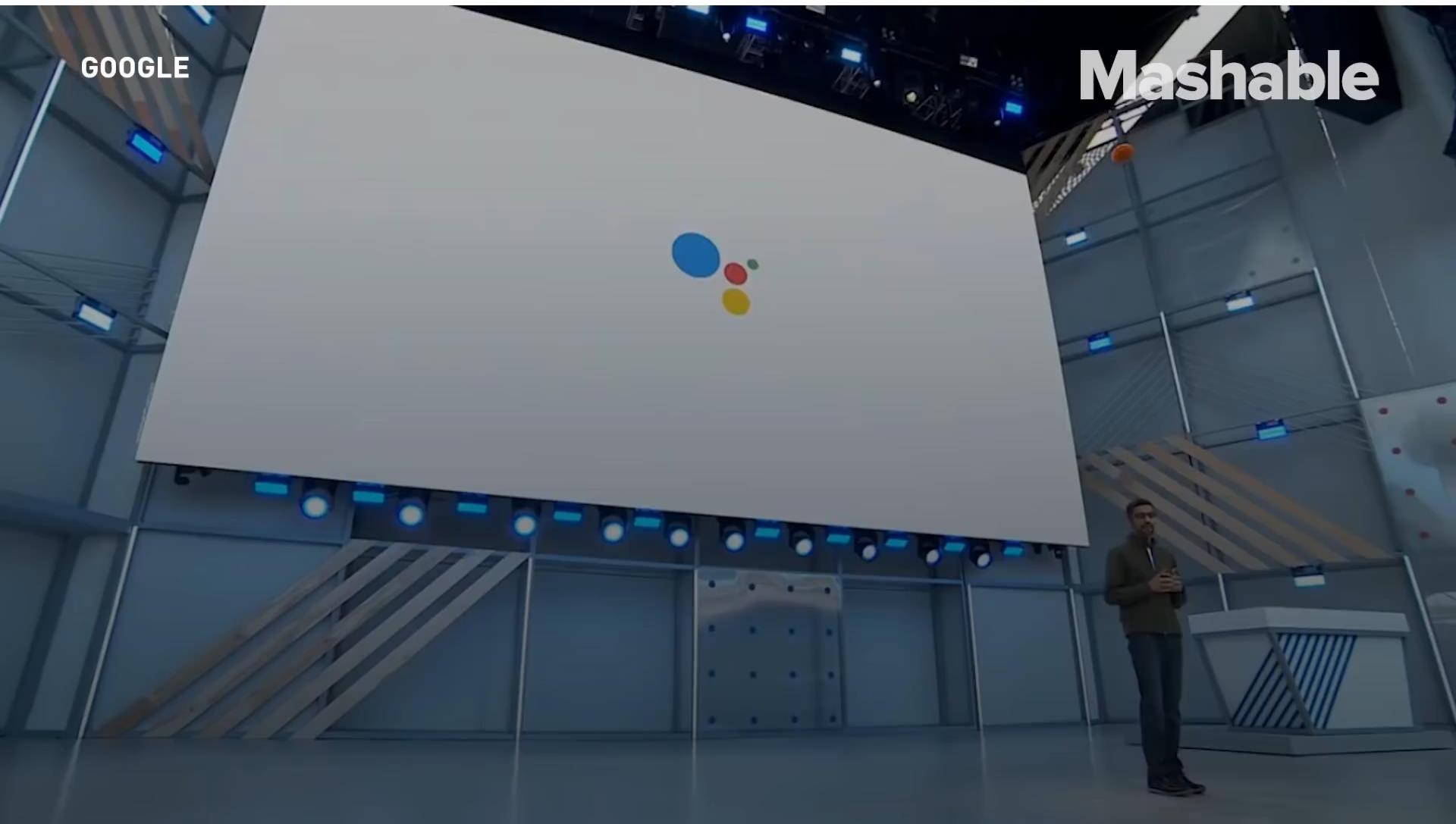
# Robotics



Boston Dynamics



# AI assistant make real phone call





# Programme

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



# Resources

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- Goto [bit.ly/aifep\\_2021](https://bit.ly/aifep_2021)
  - Download pdf (this presentation deck and activity sheets)
  - Download sample scripts
  - Links to other resources. Save you the typing!
- Goto [https://bit.ly/img\\_resources](https://bit.ly/img_resources)
  - Training and testing images for activity. Remember to unzip!
- You will need Telegram. Download and install on your phone/laptop. <https://desktop.telegram.org/>

# What is Artificial Intelligence?

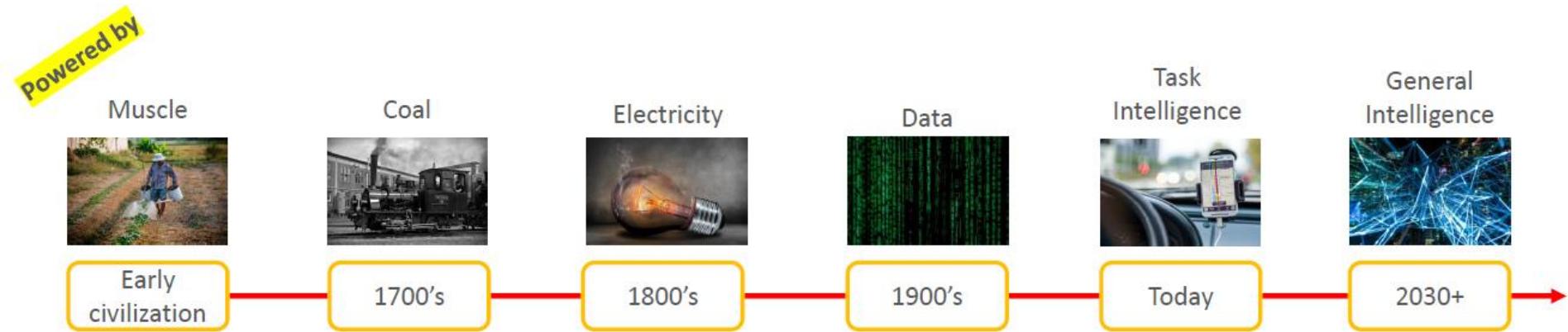
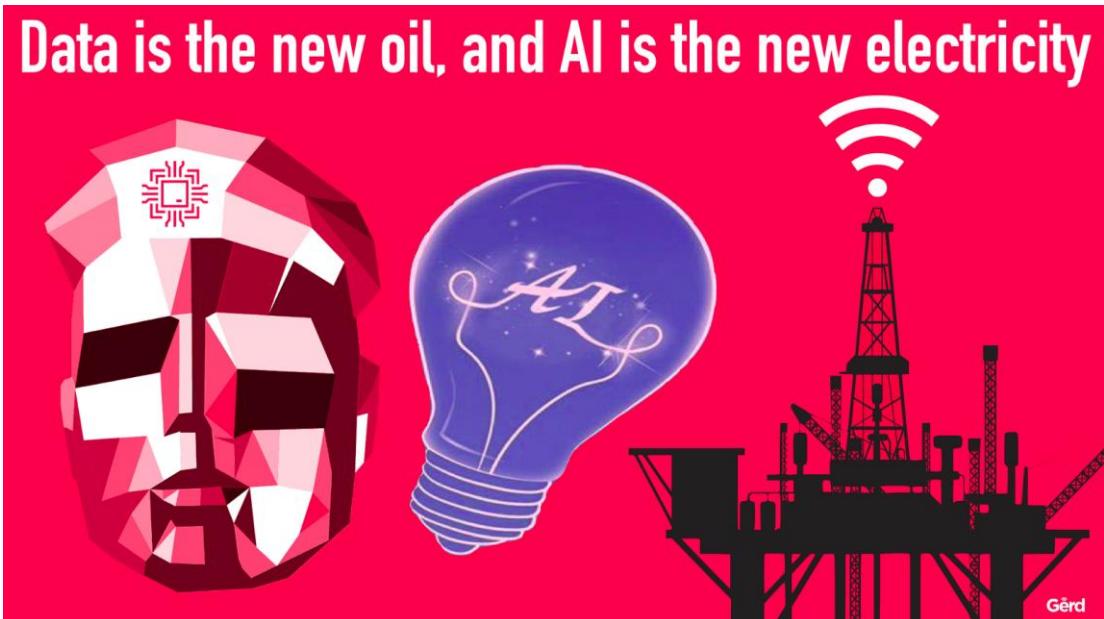
- The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision making, and translation between languages.” – Google



# 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





# 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**

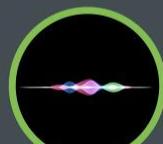
Sony launches first consumer robot pet dog AIBO (AI robot) with skills and personality that develop over time



**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



# Why???



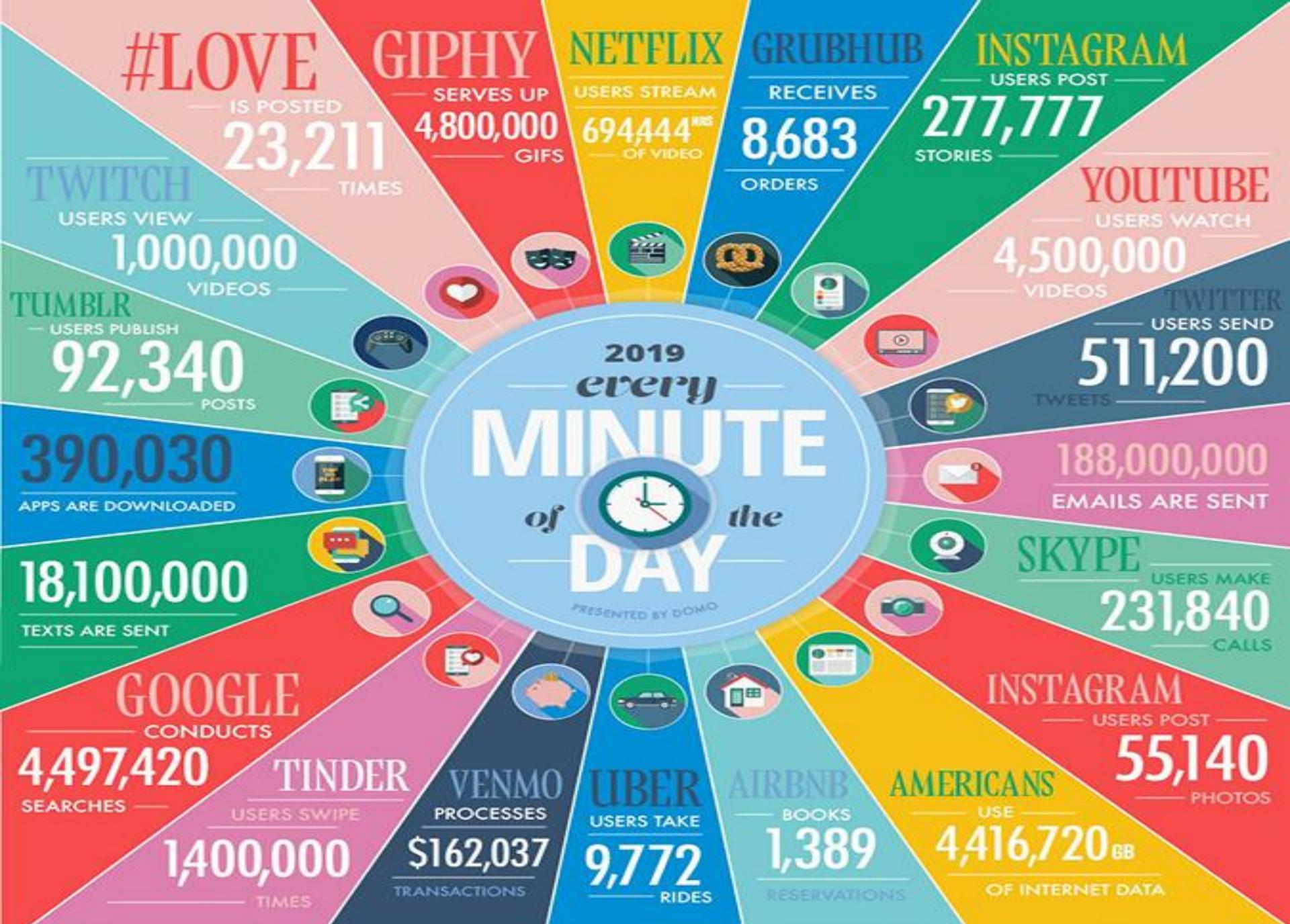


# Bigger Datasets

In 2020, it is expected that:

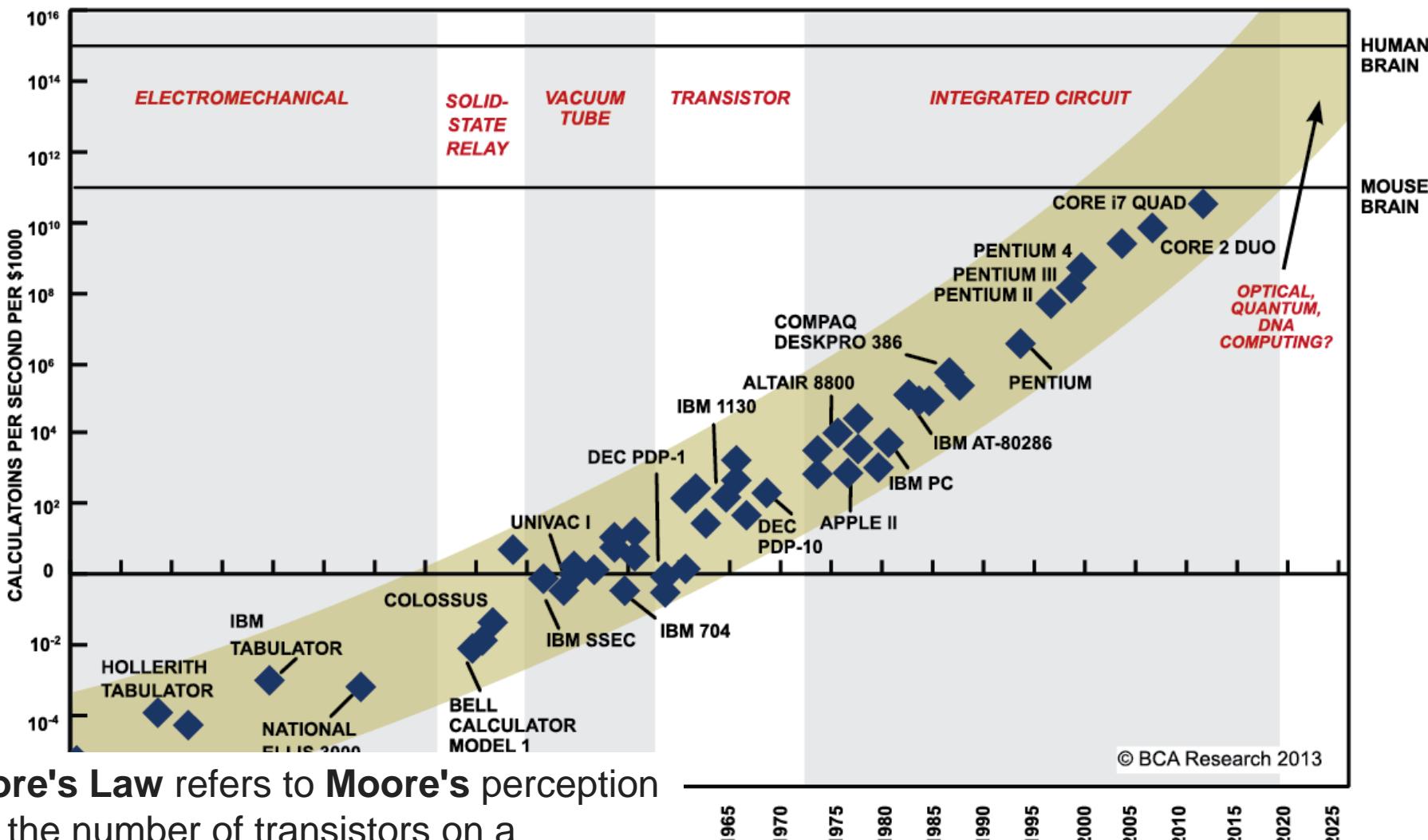
- The average internet user will generate ~1.5 GB of traffic per day.
- A smart hospital will generate 3,000 GB/day.
- Self-driving cars are each generating over 4,000 GB/day.
- Connected planes will generate 40,000 gigabytes per day.
- A connected factory will generate 1 million gigabytes per day.







# Moore's Law



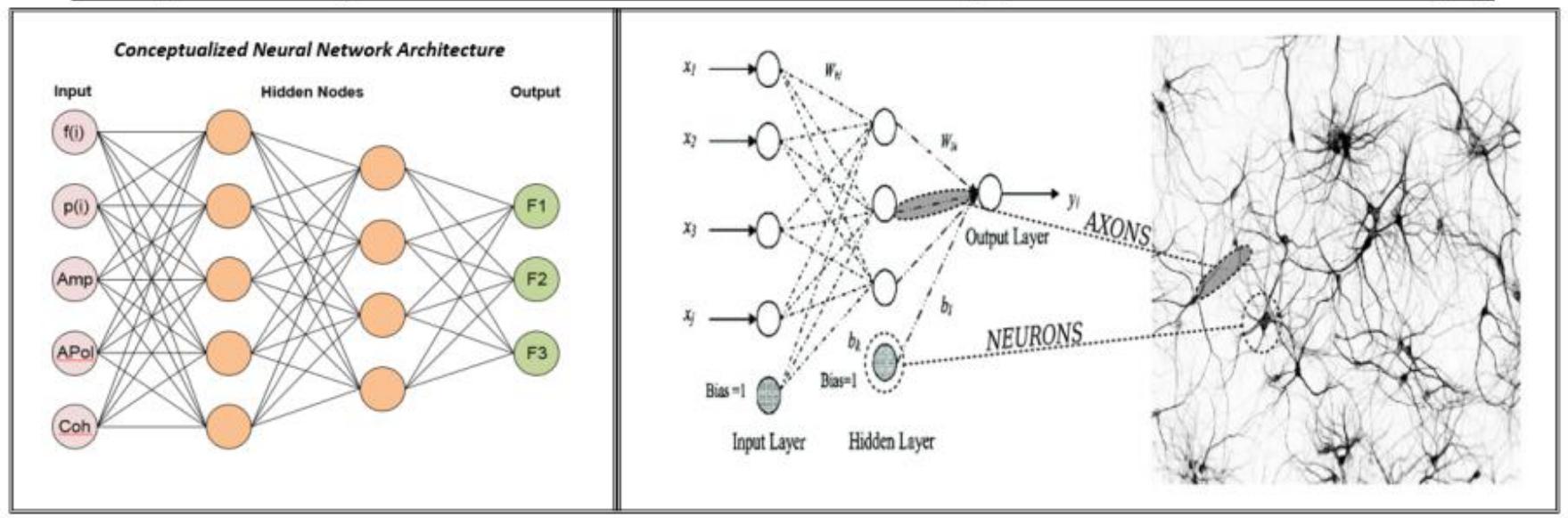
Moore's Law refers to Moore's perception that the number of transistors on a microchip doubles every two years, though the cost of computers is halved.

"ND BIOLOGY", P.67, THE VIKING PRESS, 2006. DATAPoints BETWEEN 2000 AND



# Neural Network

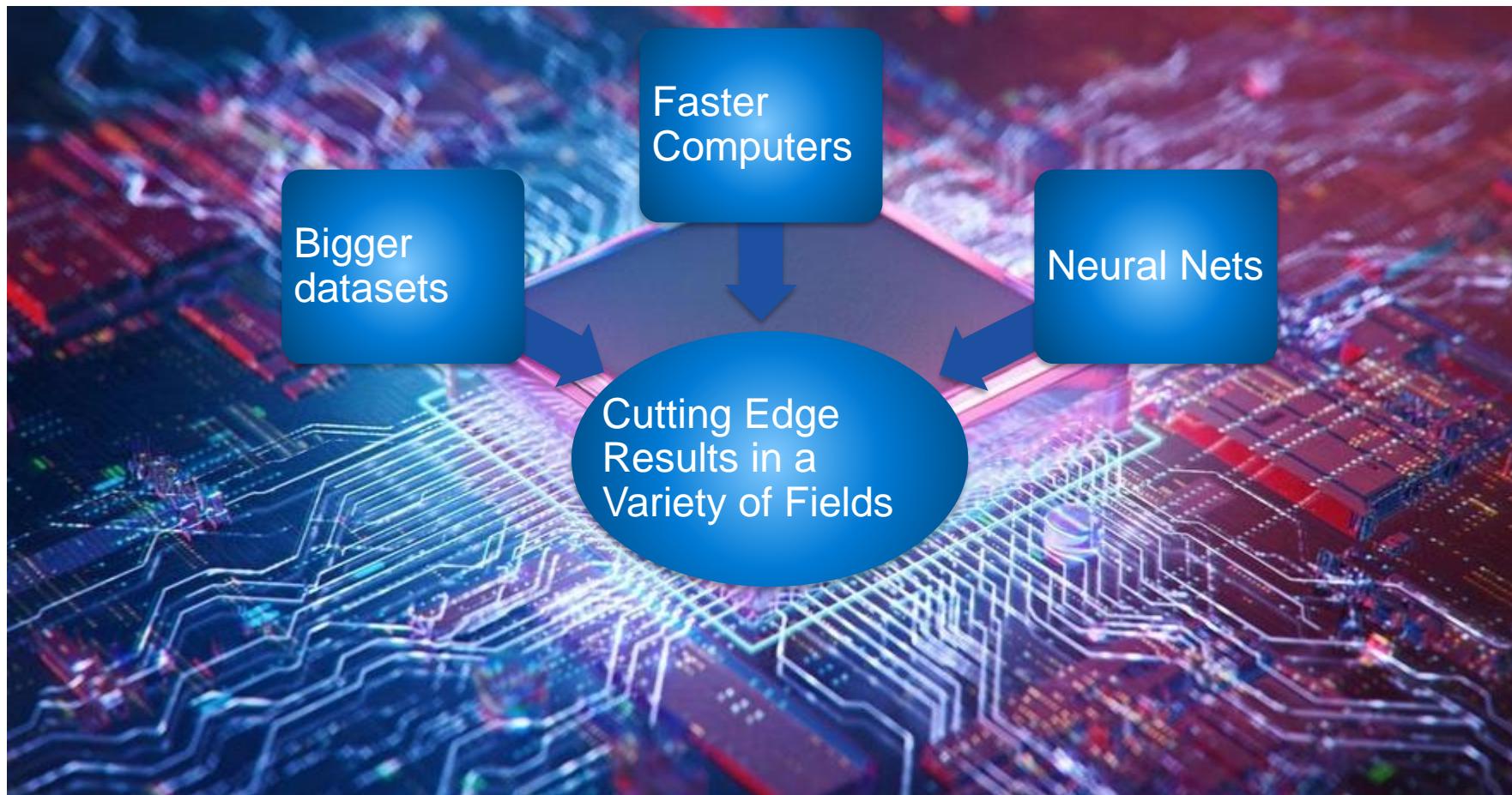
## ***Comparison of Neural Network Architecture (L) vs the Human Brain (R)***





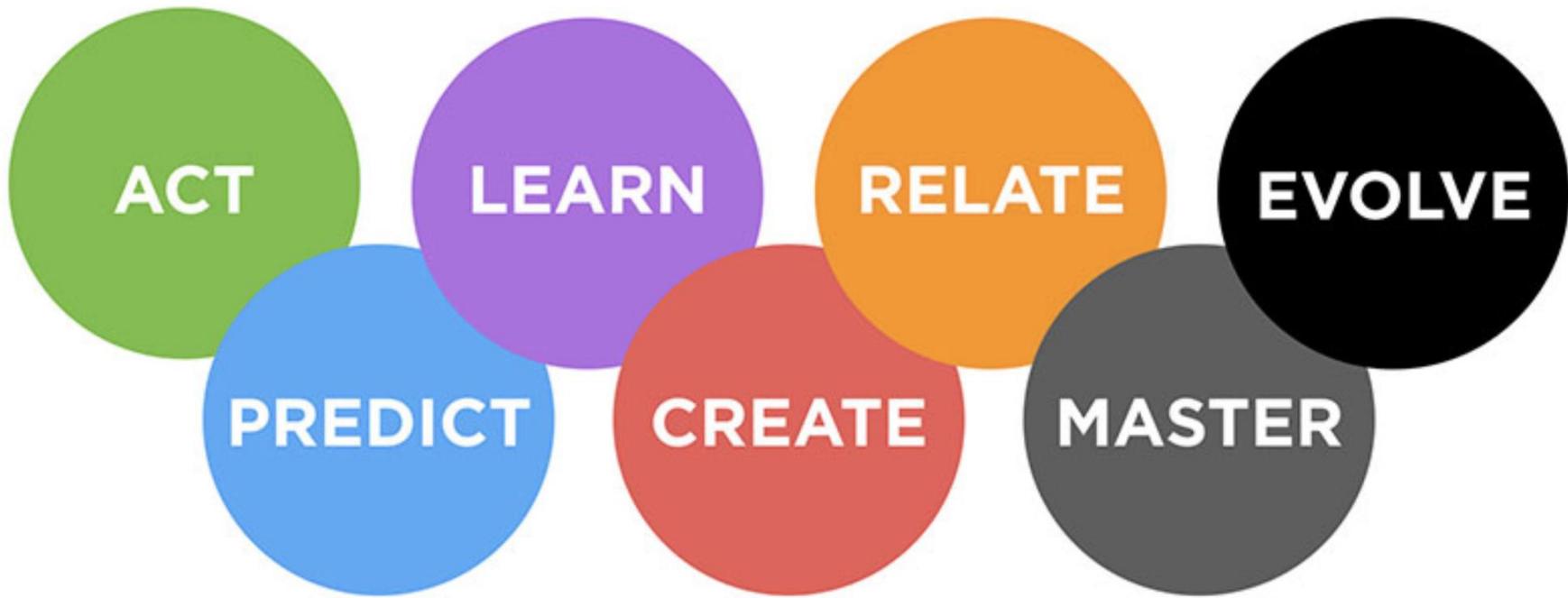
# AI Hardware

**Faster hardware** is one of the key areas driving the modern era of AI.





# 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





# Systems that Predicts

---

**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





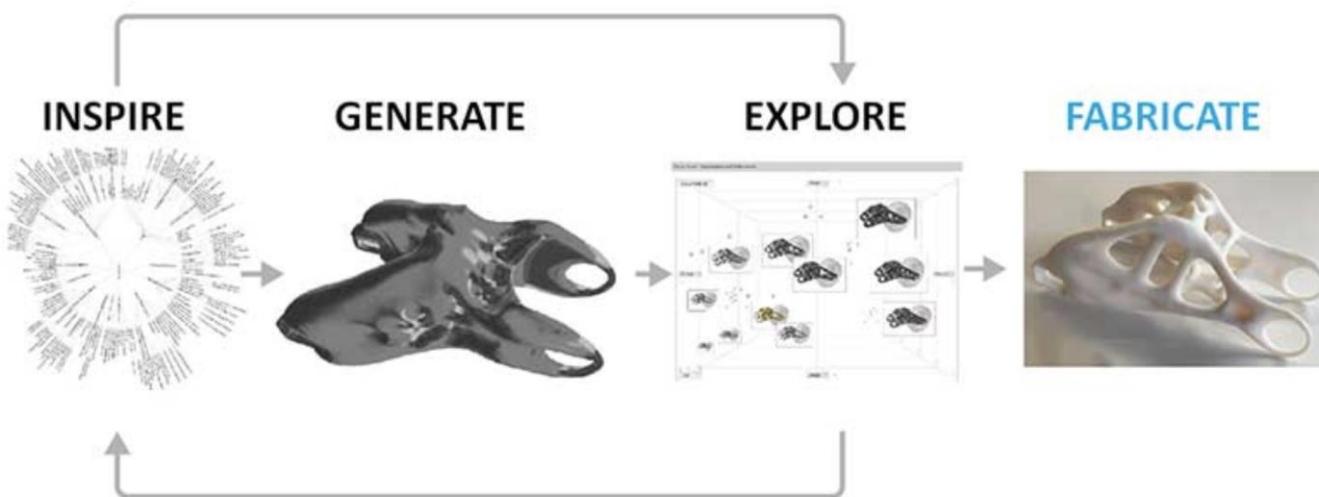
# Systems that Create



Generated story about image  
Model: Romantic Novels

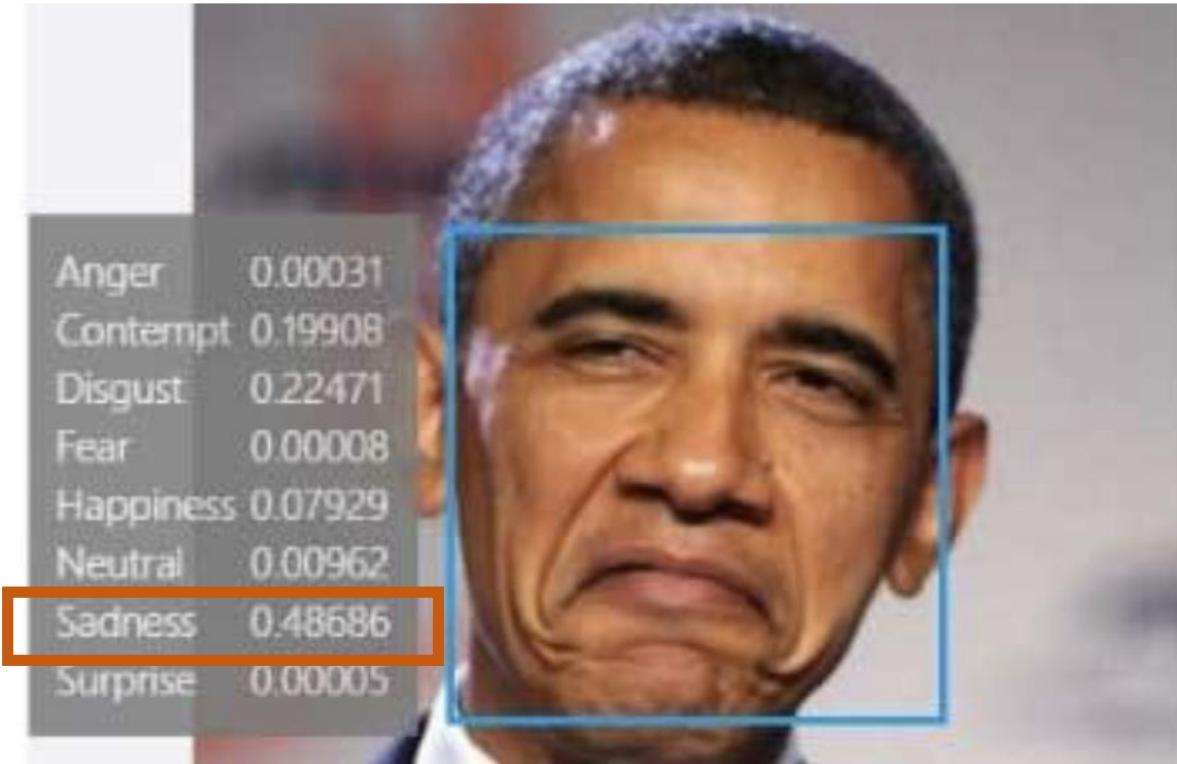
*"He was a shirtless man in the back of his mind, and I let out a curse as he leaned over to kiss me on the shoulder.*

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





# Systems that Relate





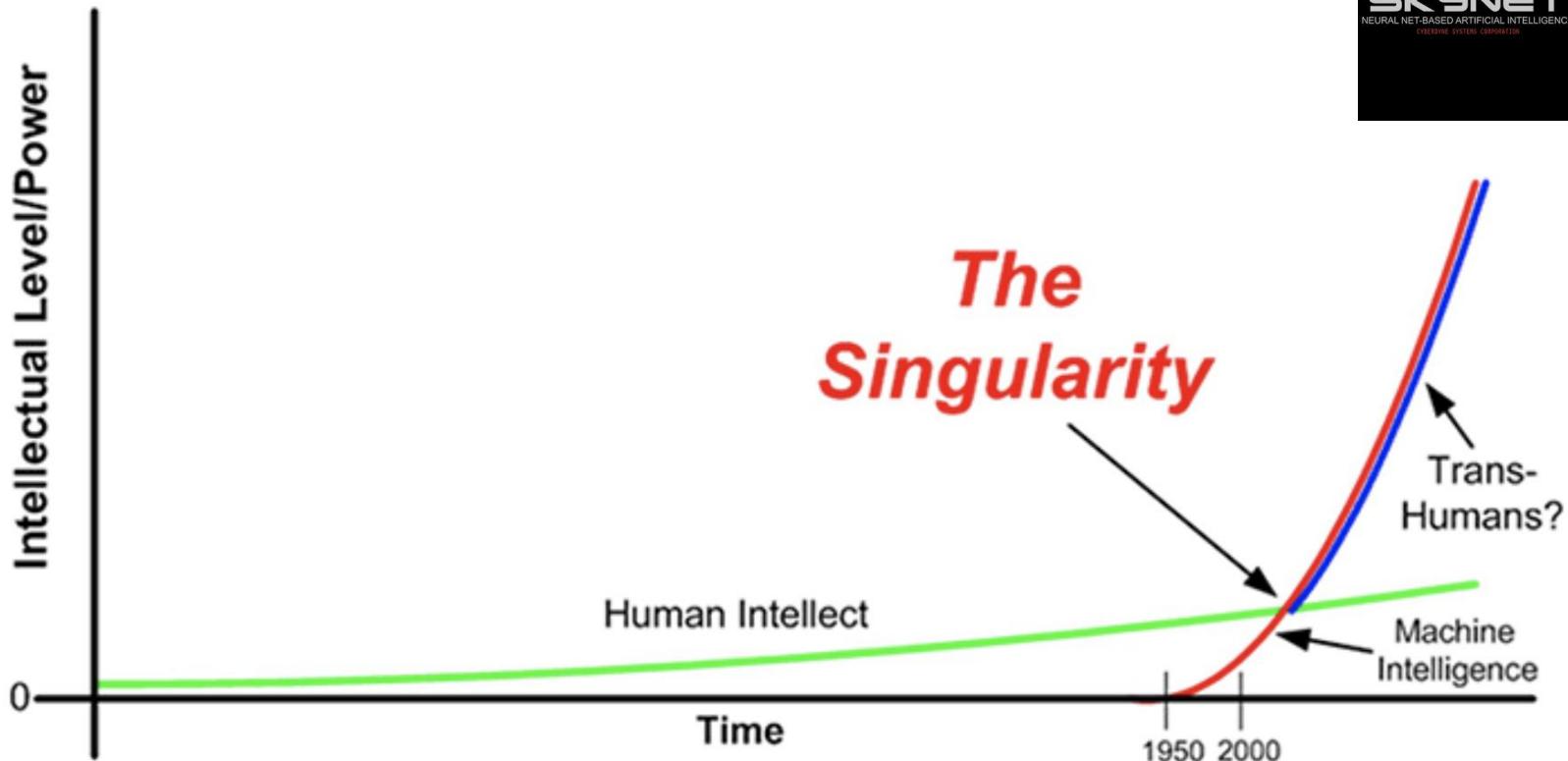
# Systems that Master

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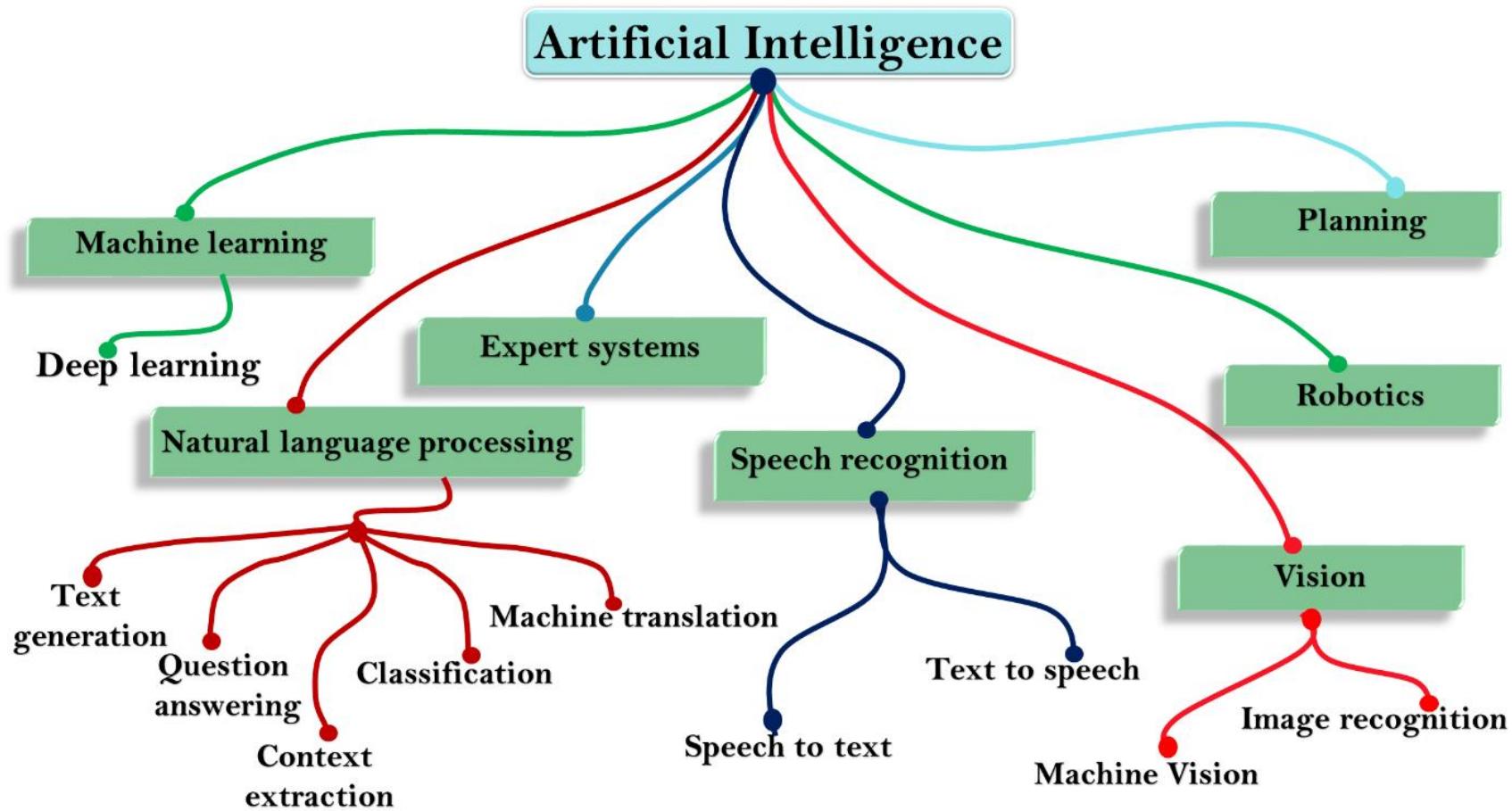


# Systems that Evolve



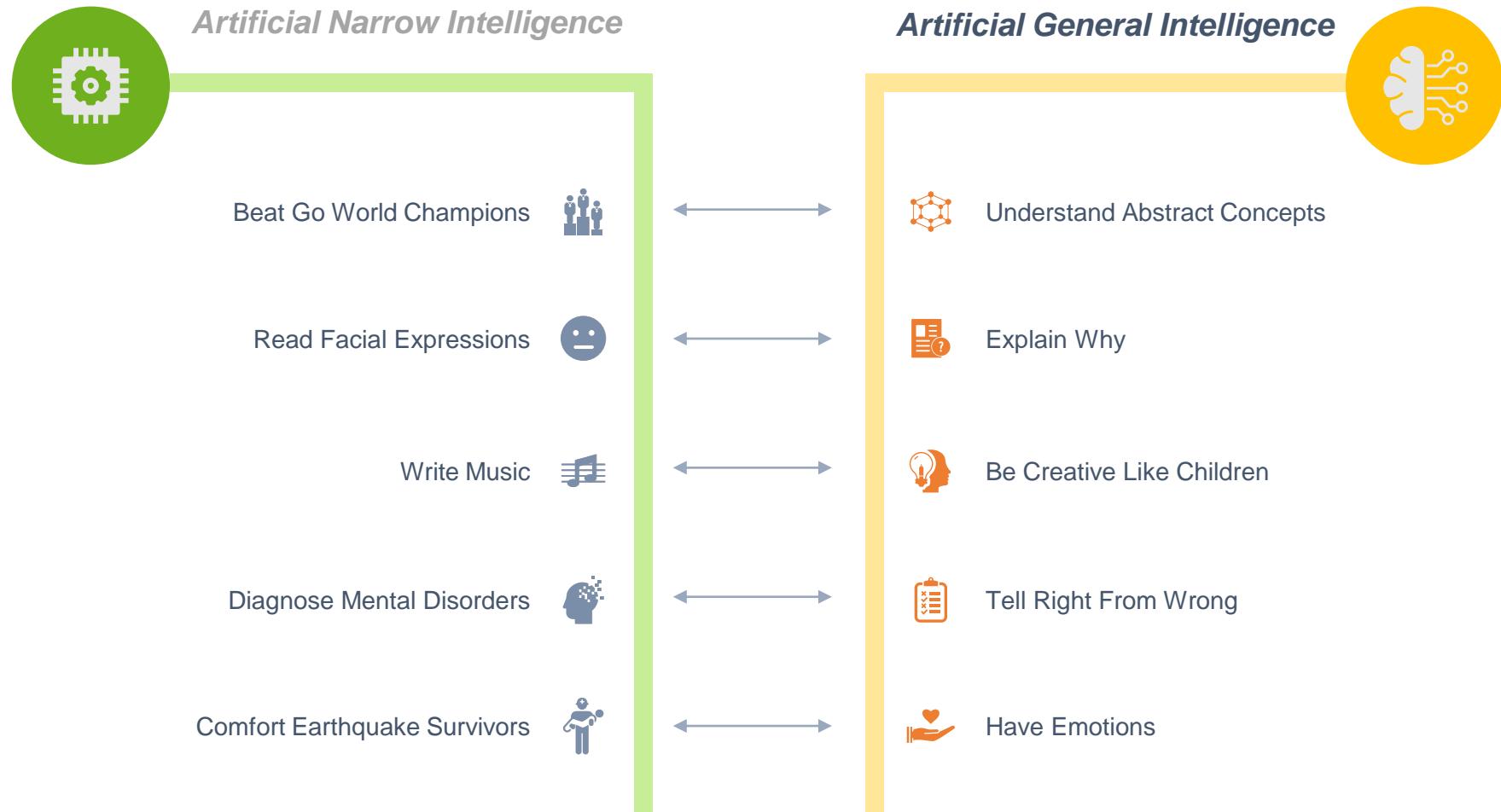


# Branches of Artificial Intelligence





# Artificial Narrow Intelligence vs Artificial General Intelligence





# Mapping Human Perceptions to AI-enabled Capabilities

Vision	Computer Vision	Conversational Interface RMIT Polytechnic Licensed to Seow Khee Wei
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	



The Kahoot! logo is centered on a dark purple background. The word "Kahoot!" is written in a bold, white, sans-serif font. A large, thin diagonal shadow of the same text is cast behind it, extending from the top-left towards the bottom-right. The exclamation mark at the end of the word has a small, dark purple star-like shape at its tip.

Kahoot!



# 15 Mins Break



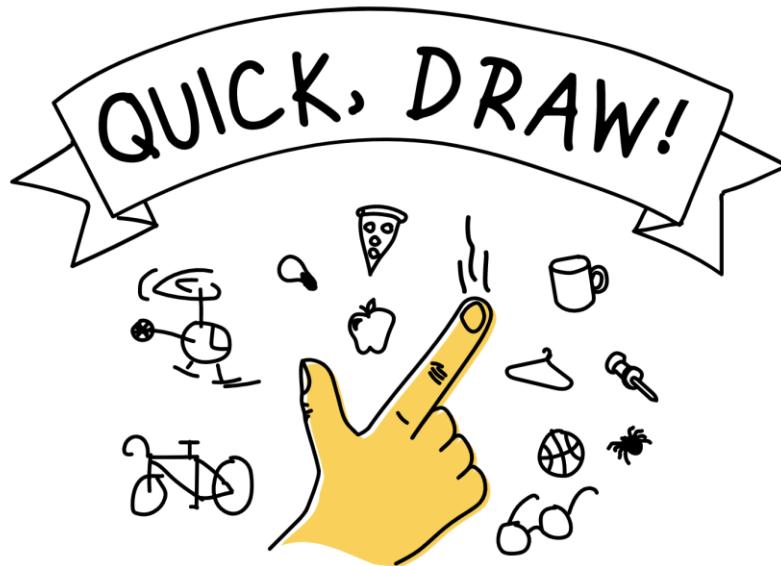
[bit.ly/top10\\_2020](https://bit.ly/top10_2020)





# Quickdraw Game

<https://quickdraw.withgoogle.com>



Can a neural network learn to recognize doodling?

Help teach it by adding your drawings to the [world's largest doodling data set](#), shared publicly to help with machine learning research.

Let's Draw!

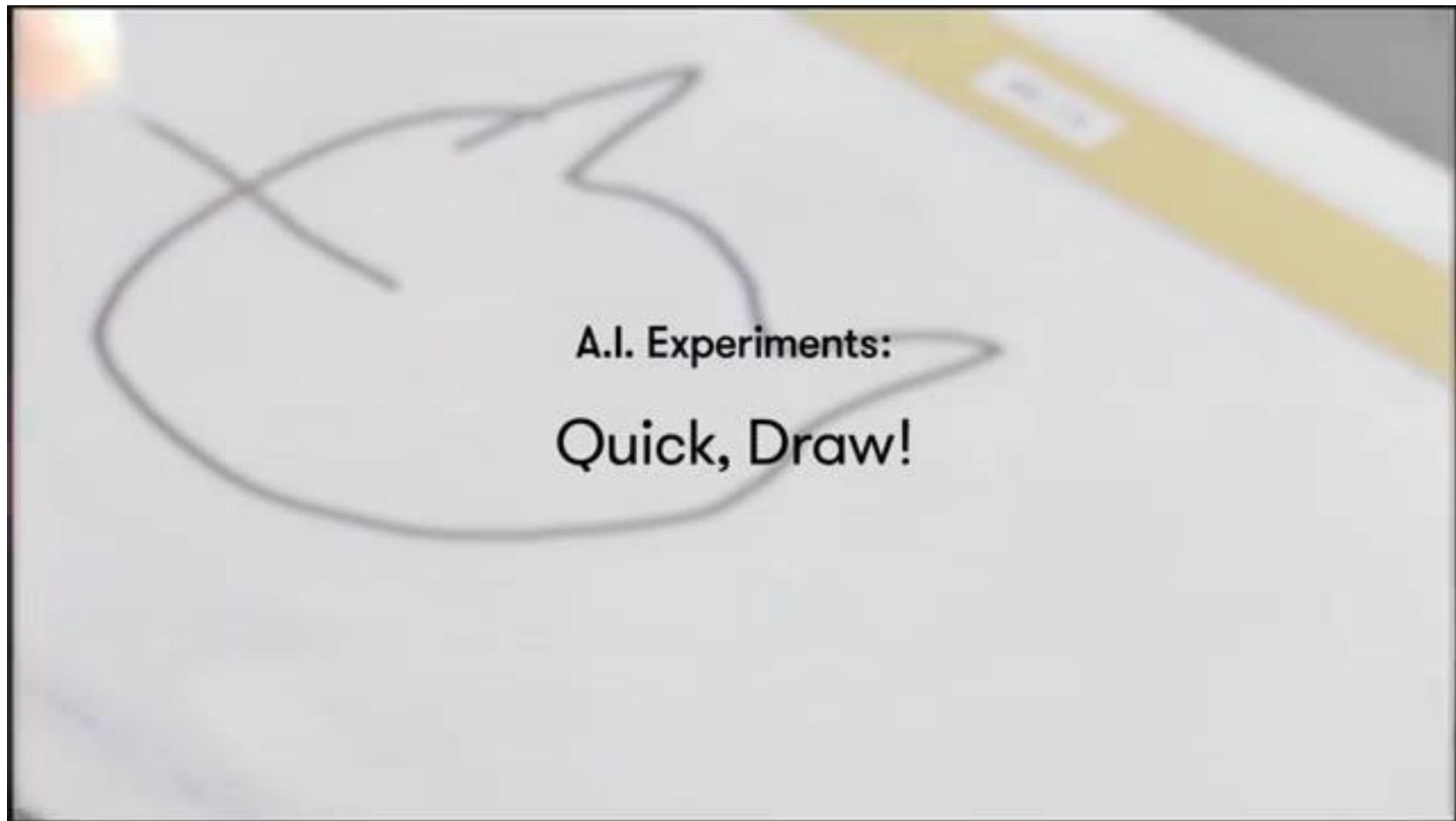


5 mins



# How does ML work in QuickDraw?

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# Teaching Computers to be Fair

Fairness comes from the source of data



What's in a title? When it co...  
theconversation.com



10 Myths About Doctors | Health Plus  
glenaeagles.com.sg



DA Virtual Clinic - Doctor Anywh...  
doctoranywhere.com



Singapore, say med school de...  
straitstimes.com



Home Doctor Singapore  
jaga-me.com



10 Myths About Doctors In...  
doctordentist.com



Doctor on Demand raised \$74 million ...  
techcrunch.com



your doctor to apologize ...  
theconversation.com



Online Doctors: 24/7 Telemedicine in ...  
homage.sg



Mendeley Careers  
mendeley.com



5 Signs You'll Make a Great Doctor ...  
topuniversities.com



60 Best Mother and Daugh...  
countryliving.com



some timeless Mother-Daughter ...  
amberrobertsimages.com



mother-daughter conflict ...  
ct.counseling.org



Mother And Daughters At The Beach ...  
dreamstime.com



35 Totally Relatable Mother Da...  
fairygodboss.com



25 Best Mother-Daughte...  
goodhousekeeping.com



Mother-Daughter Quotes : 101 Q...  
proflowers.com



60 Best Mother and Daughter Quotes ...  
countryliving.com



Mothers & Daughters | Houston Therapy ...  
houstontherapyforgirls.com



Group Strengthens Mother-Daug...  
npr.org



daughters mothers Vector Im...  
vectoartstock.com



Mother Daughter photo s...  
starupphoto.com

**Research search of keyword  
“doctor”**

**Fine tune of all possibilities**

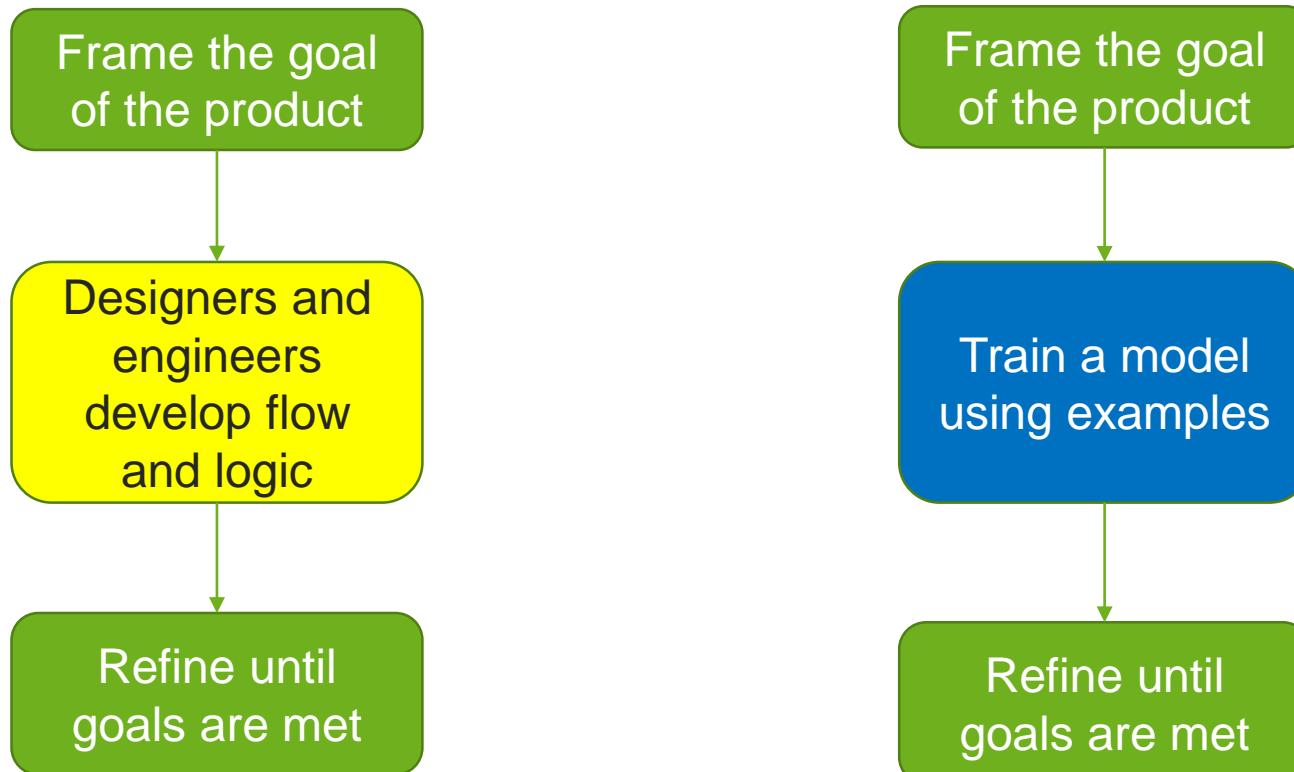
**Research search of keyword  
“mother & daughter”**

**Not yet, how much work will you  
do to make it less homogenous &  
Fair**



# Rule based Vs Machine Learning

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# Which approach to use?

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Which three suppliers to get a quote from

Rule-based

Machine Learning



# Which approach to use?

---

Classifying an  
object in a photo

Rule-based

Machine Learning



# Which approach to use?

---

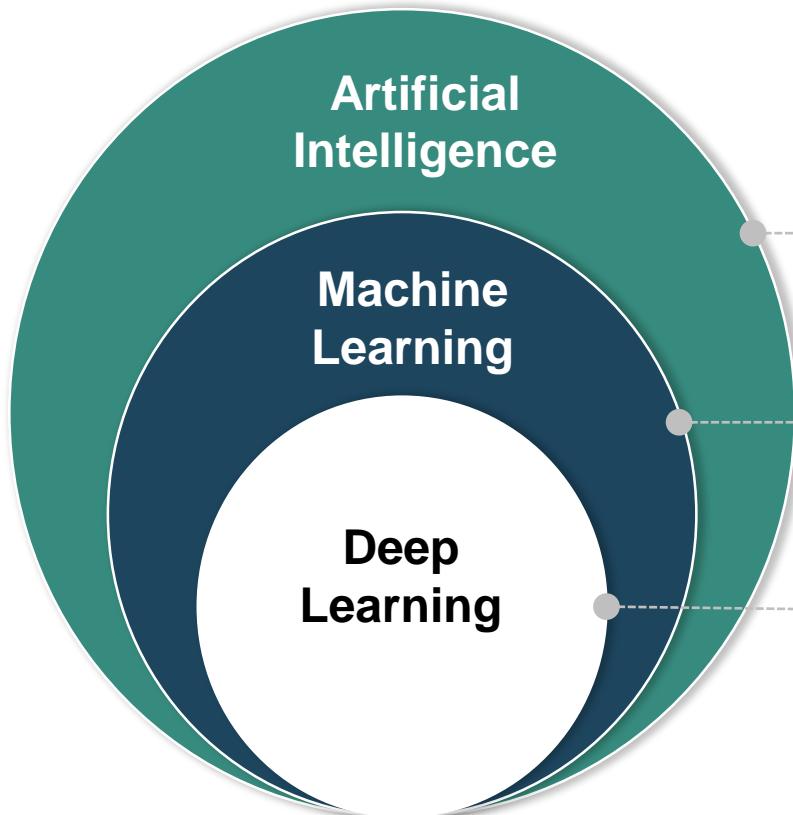
Search Engine

Rule-based

Machine Learning



# Definitions



## 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.

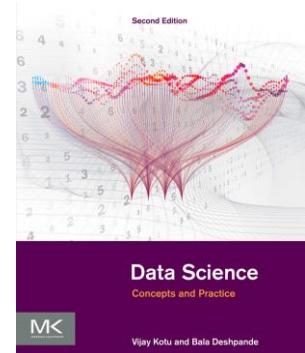
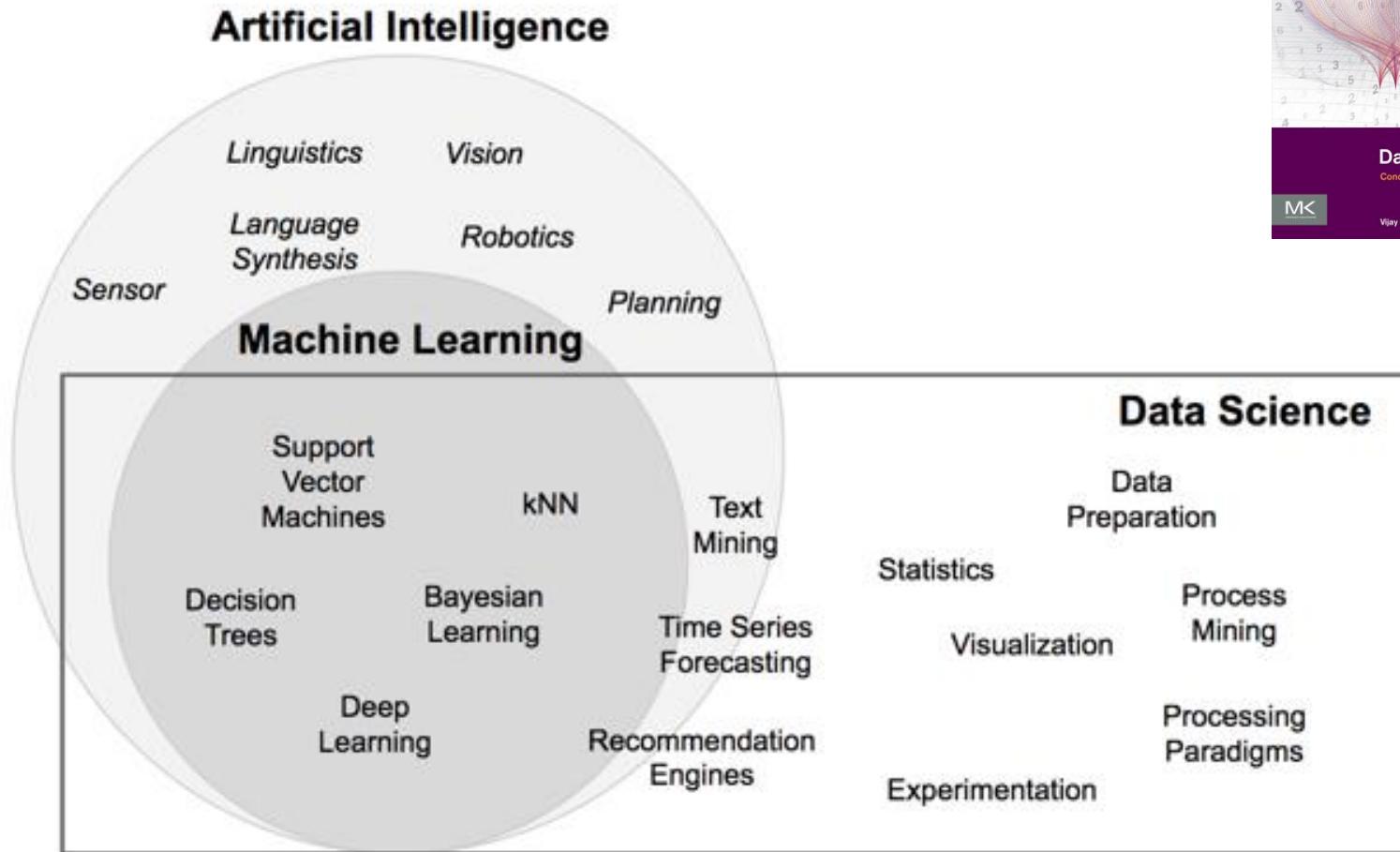


## Deep Learning

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

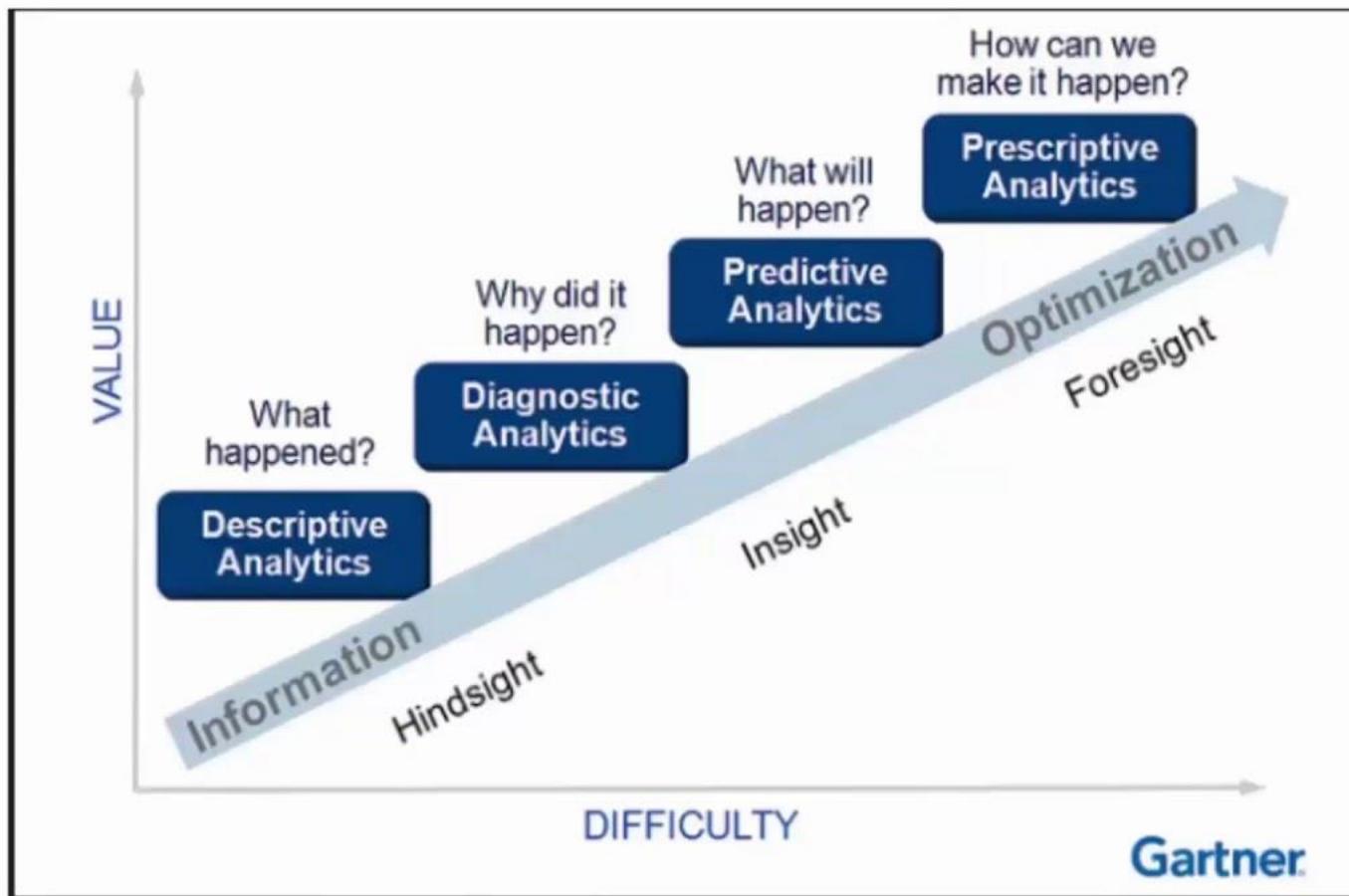


# AI vs ML vs DS





# Gartner Analytic Continuum





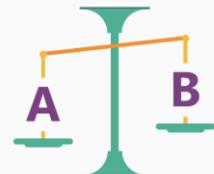
# 5 questions data science answers

**Is this weird?  
(Anomaly detection)**



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

**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?

**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?

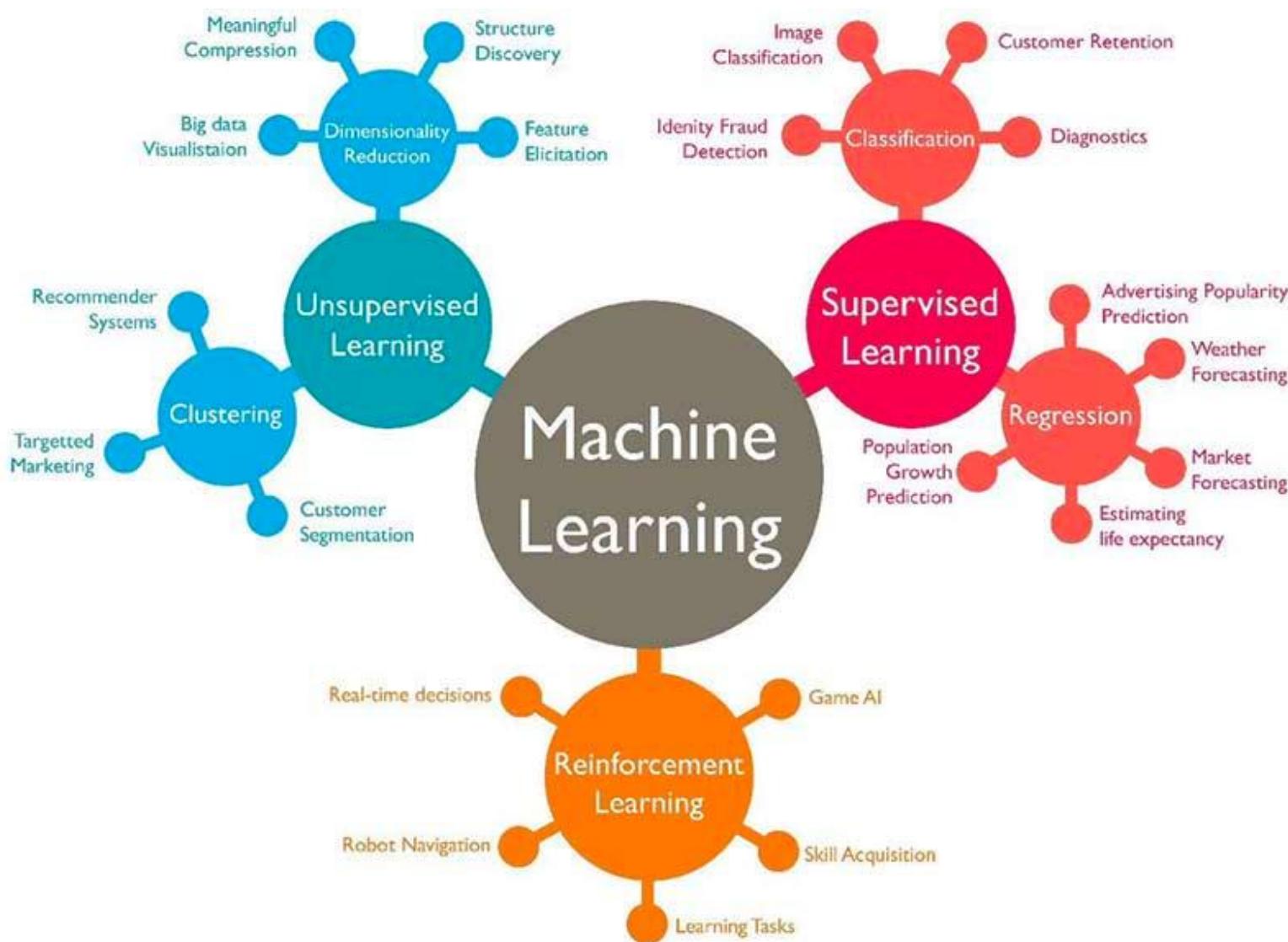
**What should I do?  
(Reinforce Learning)**



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?



# Types of Machine Learning



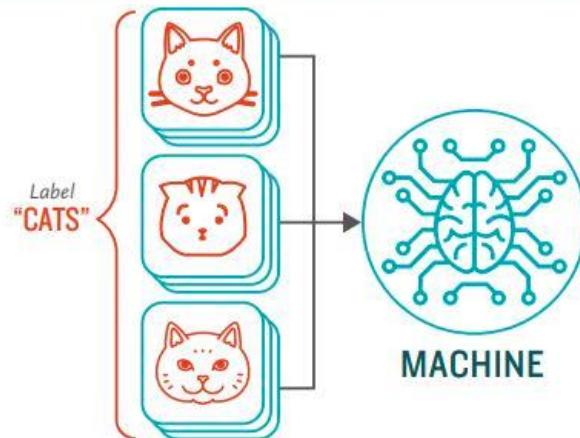


# Supervised Learning

## How **Supervised** Machine Learning Works

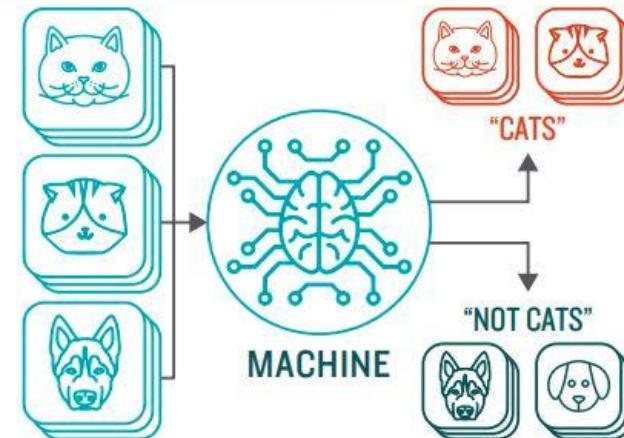
### STEP 1

Provide the machine learning algorithm categorized or "labeled" input and output data from to learn

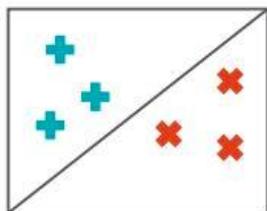


### STEP 2

Feed the machine new, unlabeled information to see if it tags new data appropriately. If not, continue refining the algorithm

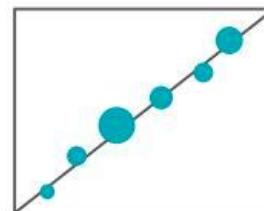


### TYPES OF PROBLEMS TO WHICH IT'S SUITED



#### CLASSIFICATION

Sorting items into categories



#### REGRESSION

Identifying real values (dollars, weight, etc.)

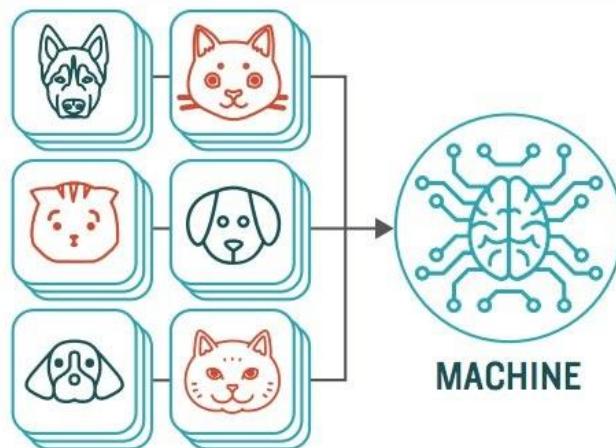


# Unsupervised Learning

## How **Unsupervised** Machine Learning Works

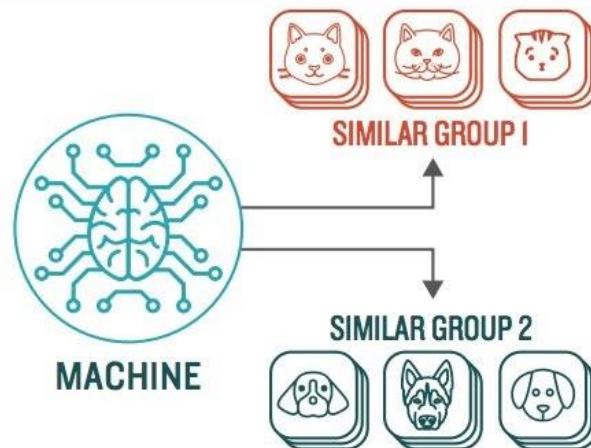
### STEP 1

Provide the machine learning algorithm uncategorized, unlabeled input data to see what patterns it finds

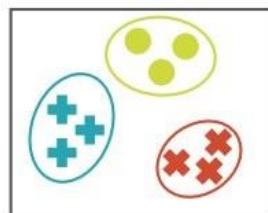


### STEP 2

Observe and learn from the patterns the machine identifies



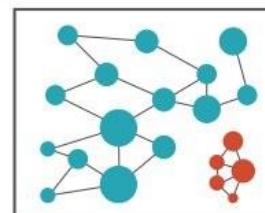
## TYPES OF PROBLEMS TO WHICH IT'S SUITED



### CLUSTERING

Identifying similarities in groups

*For Example:* Are there patterns in the data to indicate certain patients will respond better to this treatment than others?



### ANOMALY DETECTION

Identifying abnormalities in data

*For Example:* Is a hacker intruding in our network?



# Machine Learning Example

- 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*



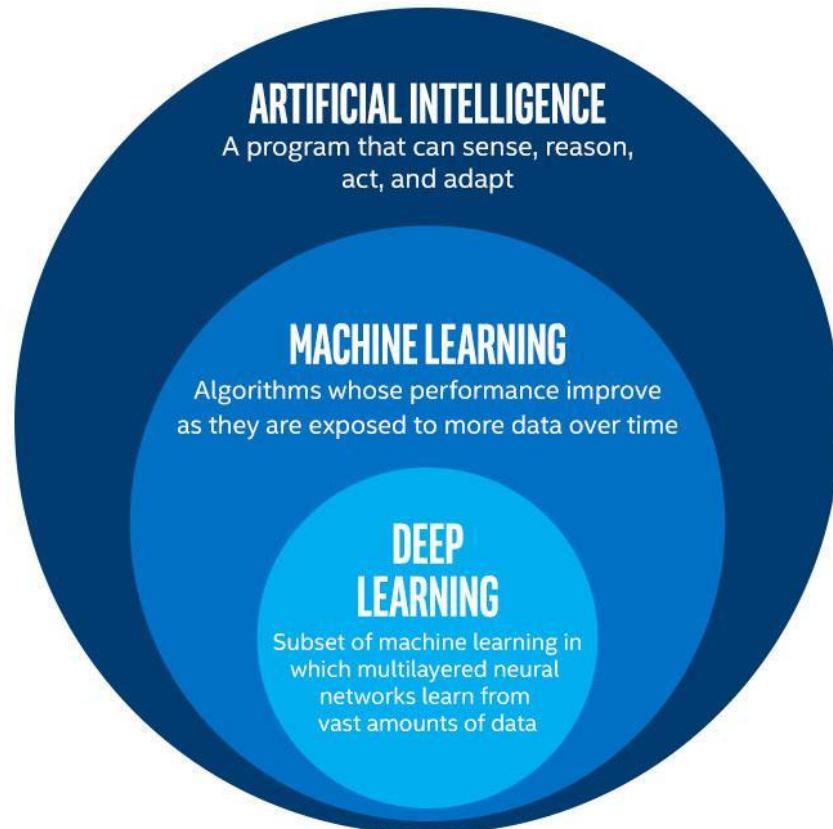
# What is deep learning?

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## Deep Learning

“Machine learning that involves using very complicated models called “deep neural networks”.”  
(Intel)

*Models* determine best representation of original data; in classic machine learning, humans must do this.

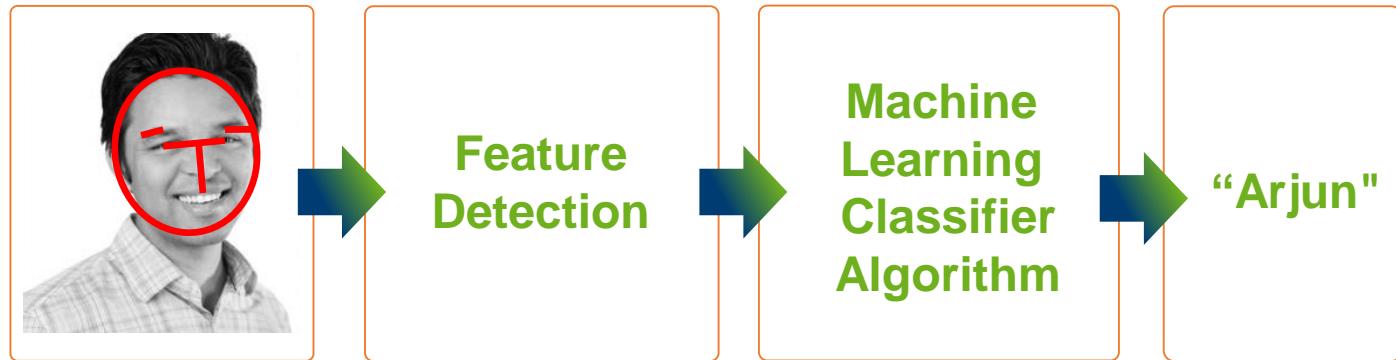




# Deep Learning Example

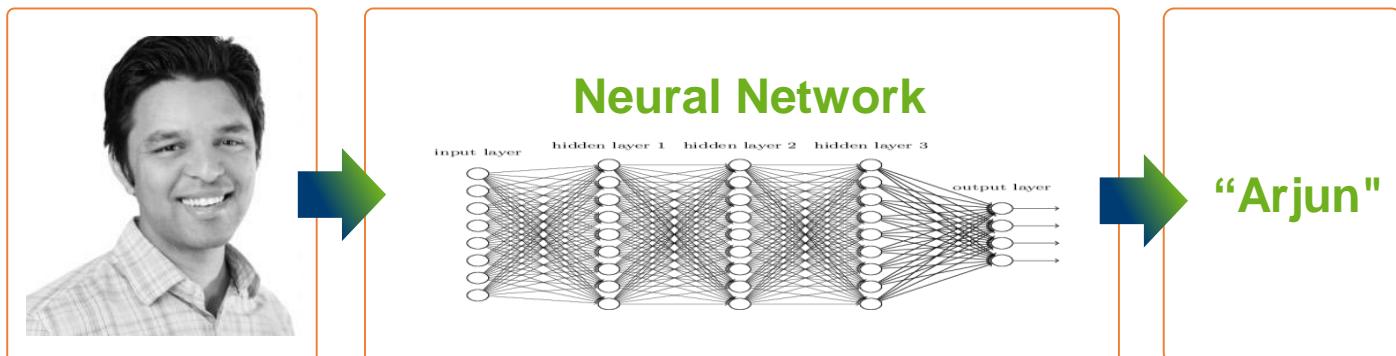
## Classic Machine Learning

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



## Deep Learning

Steps 1 and 2 are combined into 1 step.





# What is neural network?

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## Neural Networks



**EXPLAINED IN A MINUTE**



# Deep Learning in Action

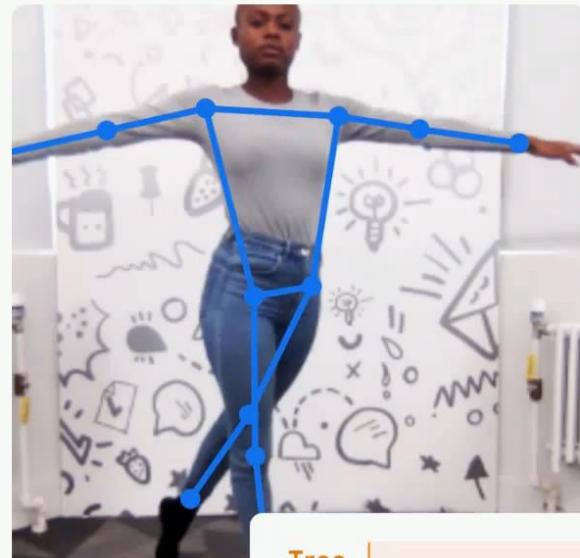
[bit.ly/google\\_teachable](https://bit.ly/google_teachable)

## Teachable Machine



Train a computer to recognize your own images, sounds, & poses.

A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.



[Get Started](#)





# Reinforcement Learning



Photo: ST



# Reinforcement Learning





# Reinforcement Learning

## Google DeepMind's Deep Q-learning

The algorithm will play Atari breakout.

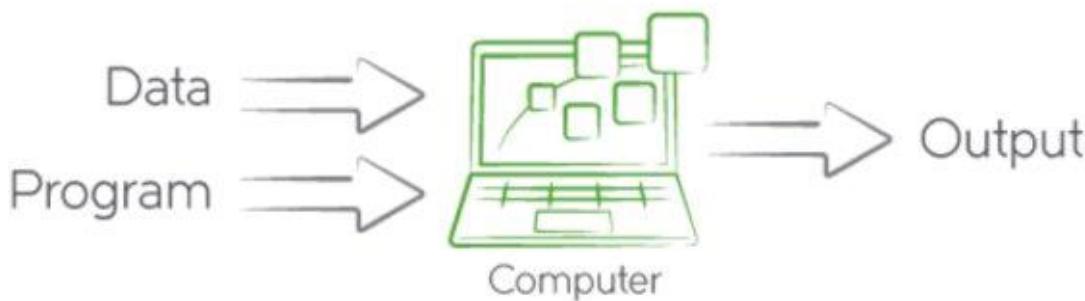
The most important thing to know is that all the agent is given is sensory input (what you see on the screen) and it was ordered to maximize the score on the screen.

No domain knowledge is involved! This means that the algorithm doesn't know the concept of a ball or what the controls exactly do.

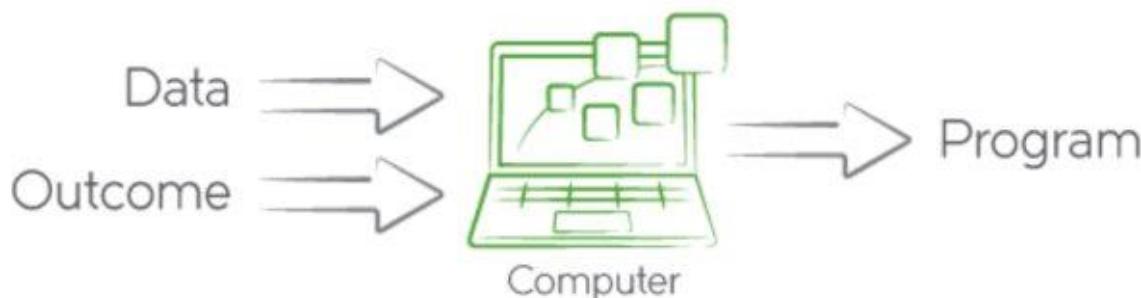


# Traditional Programming vs Machine Learning

## Traditional Programming

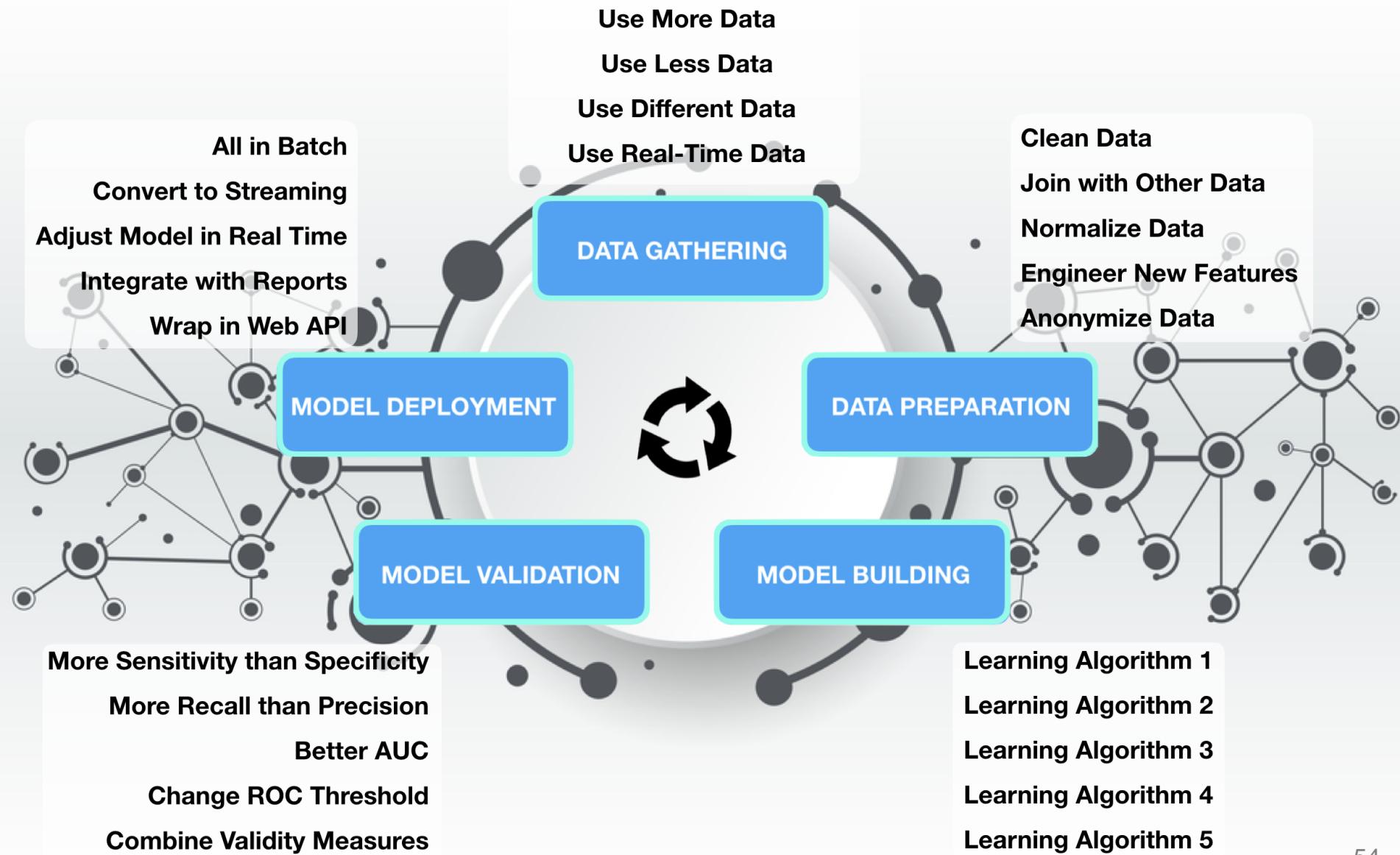


## Machine Learning





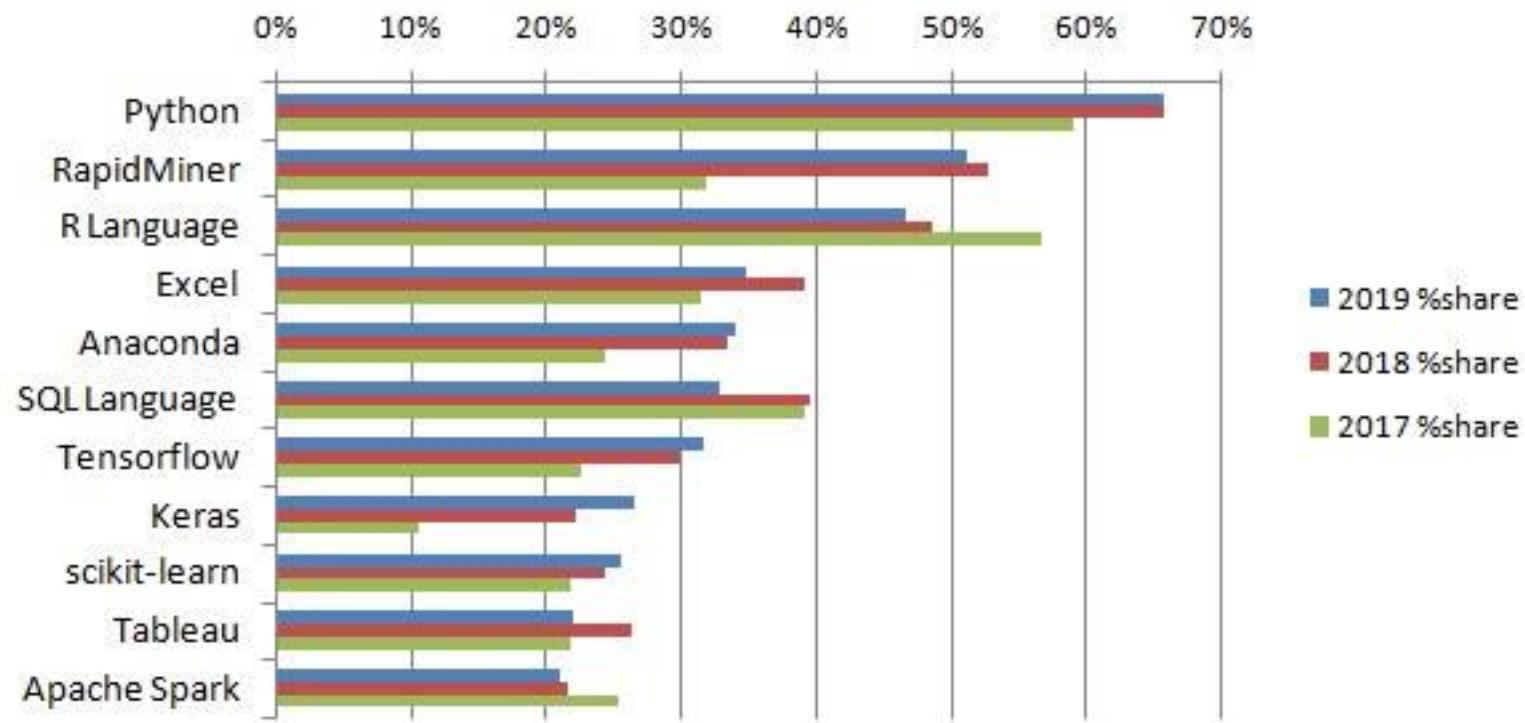
# AI/ML Workflow





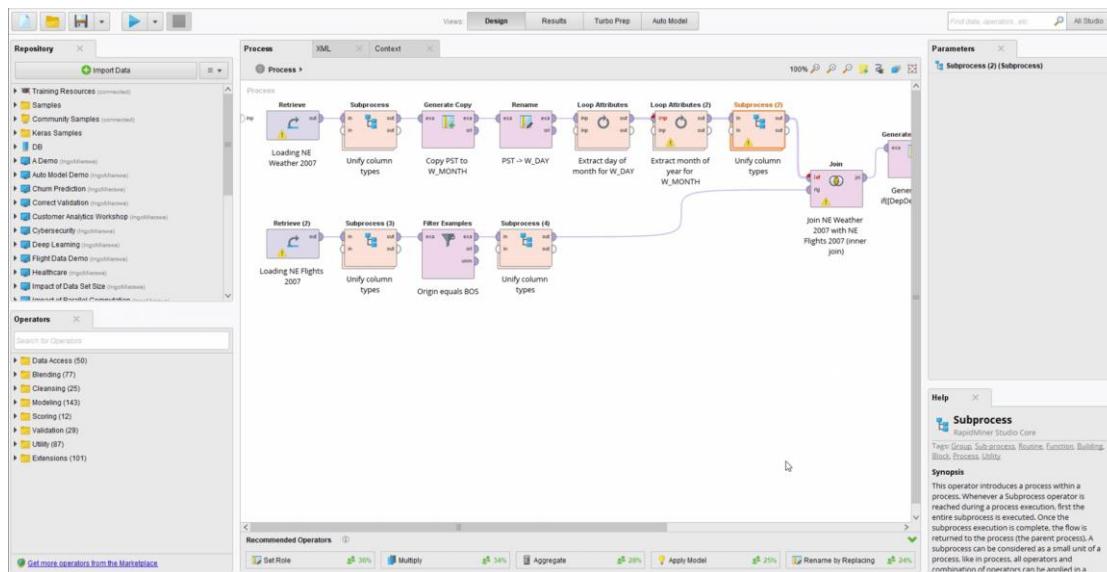
# What are the popular tools?

## Top Analytics, Data Science, Machine Learning Software 2017-2019, KDnuggets Poll

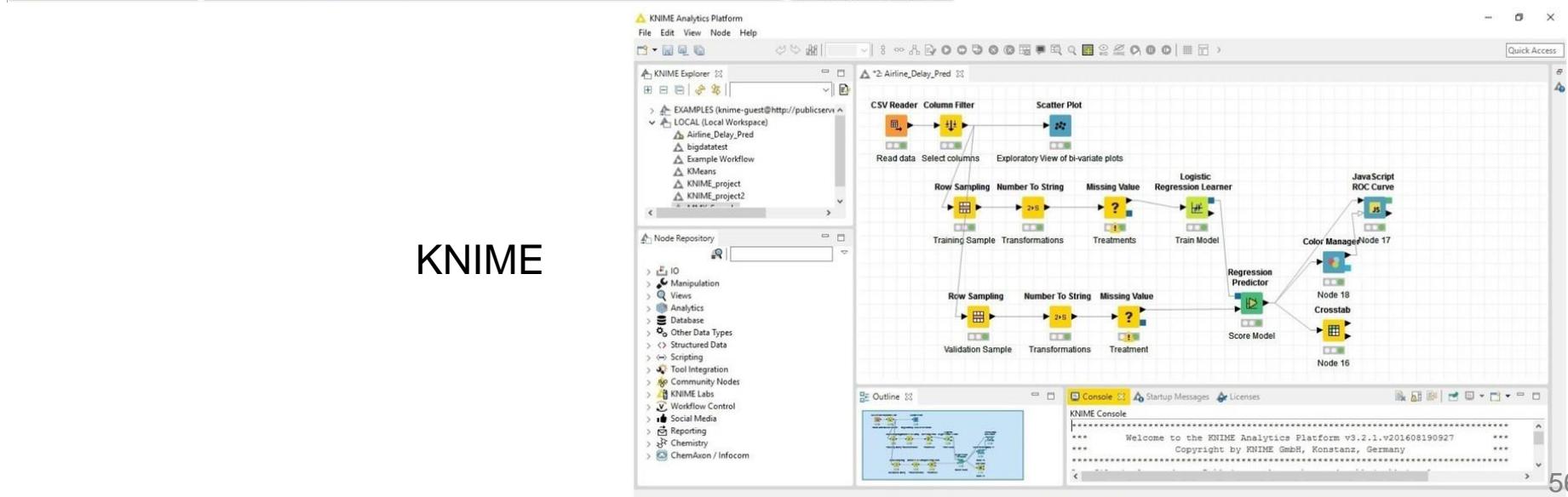




# Graphical Tools (ML/DS)



RapidMiner

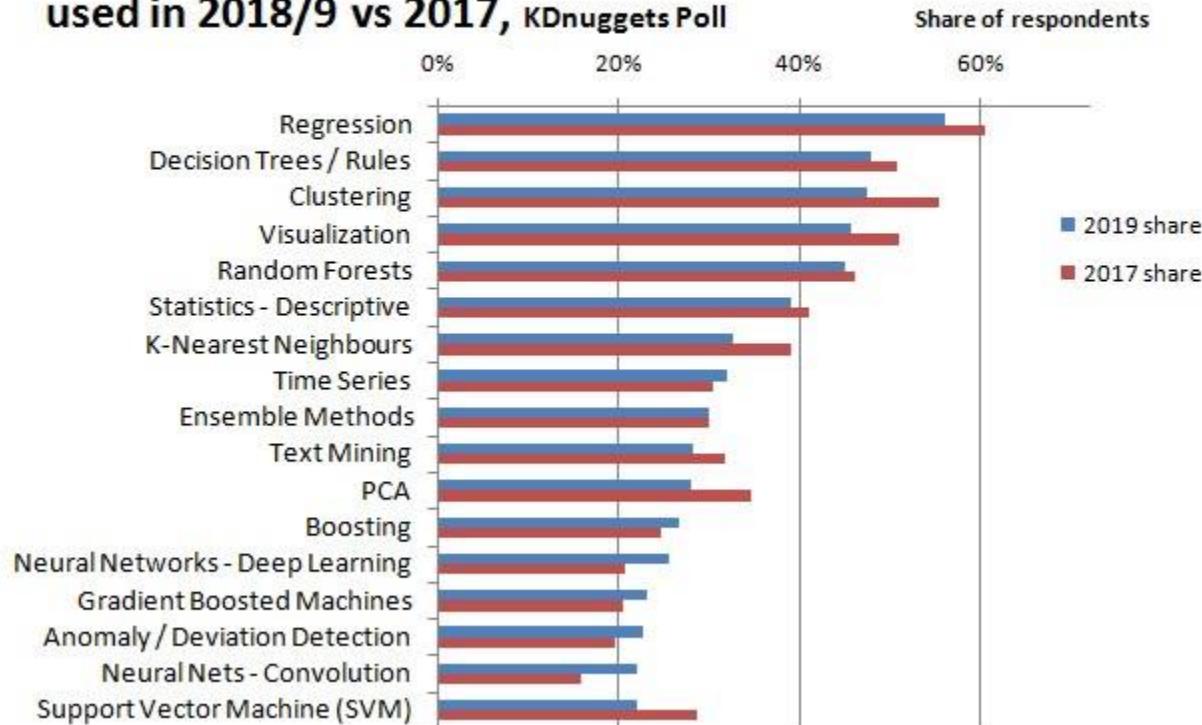


KNIME



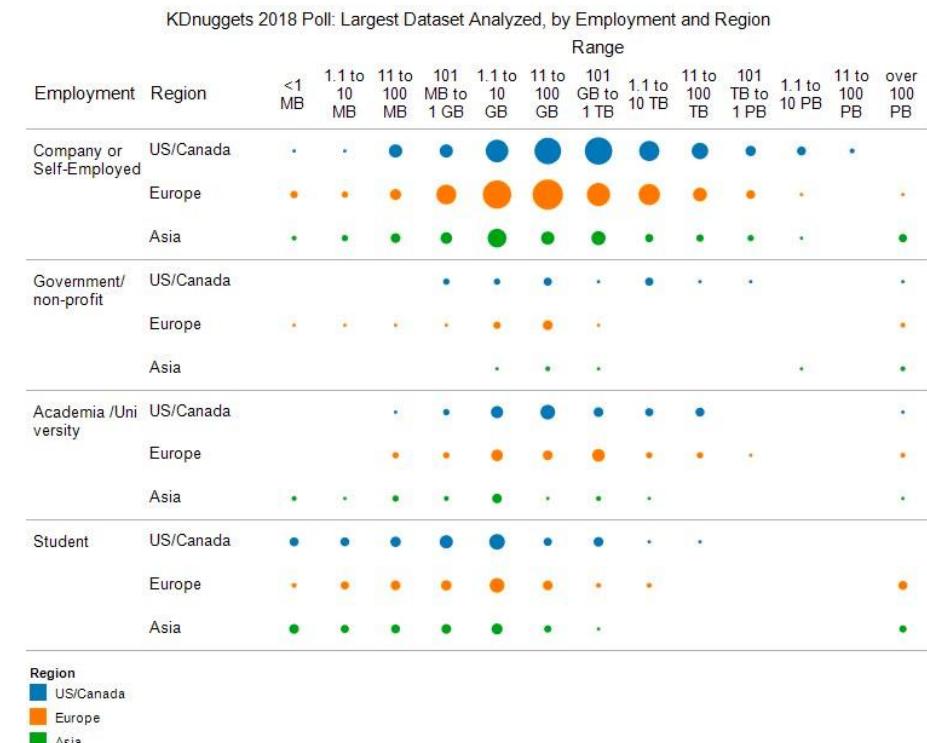
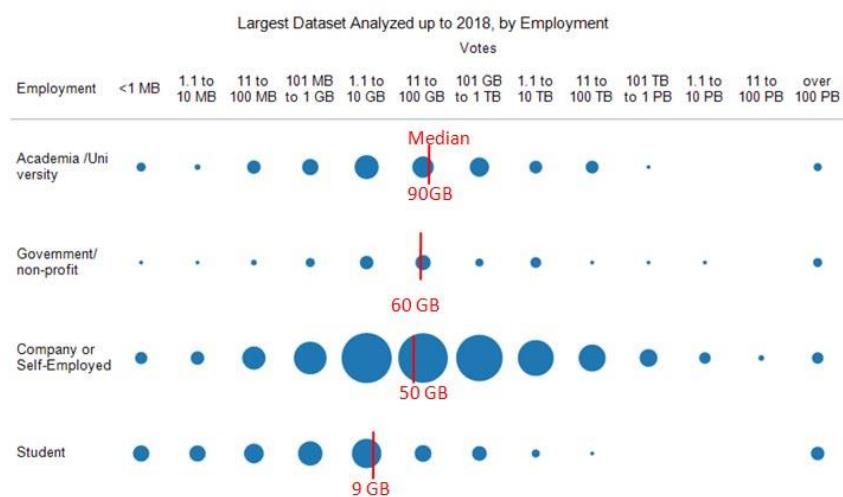
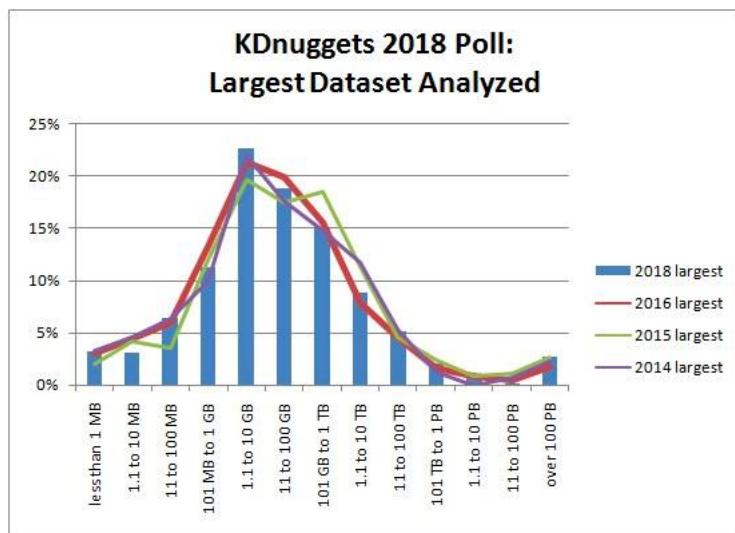
# Top Methods/algorithms

**Top Data Science, Machine Learning  
Methods, Algorithms  
used in 2018/9 vs 2017, KDnuggets Poll**





# Datasets size





The Kahoot! logo is centered on a dark purple background. The word "Kahoot!" is written in a bold, white, sans-serif font. A large, thin diagonal shadow of the same text is cast behind it, extending from the top-left towards the bottom-right. The exclamation mark at the end of the word has a small, dark purple star-like shape at its tip.

Kahoot!



# 60 mins Lunch Break

**Some interesting videos**

<https://www.youtube.com/watch?v=bmNaLtC6vkU>

[https://www.youtube.com/watch?v=Nnf8P5A\\_saE](https://www.youtube.com/watch?v=Nnf8P5A_saE)

LUNCH BREAK



# Hands on AI

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Come back at 2:10pm



20 mins

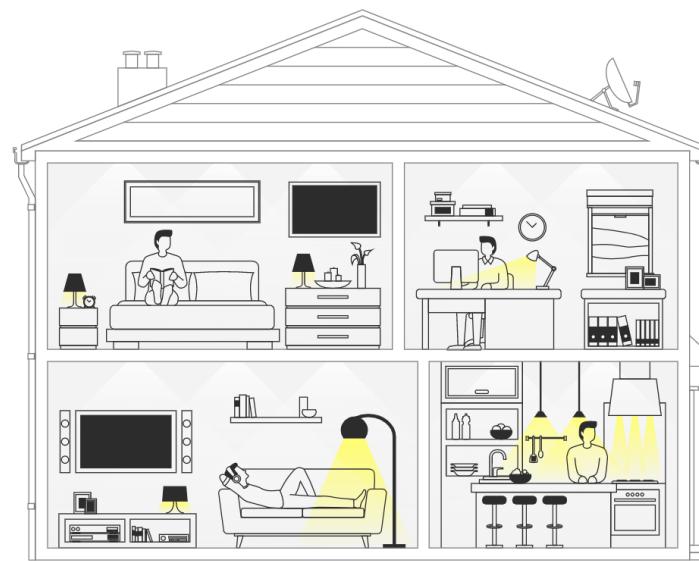


## Using AI to make video content better.

Otherwise known as Language Understanding Intelligent Service.

A machine learning-based service to build natural language into apps, bots, and IoT devices.

Quickly create enterprise-ready, custom models that continuously improve.





# Text Analytics

## Step #1: Enter Your Message

Saturn is the sixth planet from the Sun and the second-largest in the Solar System, after Jupiter. It is a gas giant with an average radius about nine times that of Earth.

[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 >](#)

<https://aidemos.microsoft.com/text-analytics>





# Computer Vision

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

## Analyze and describe images

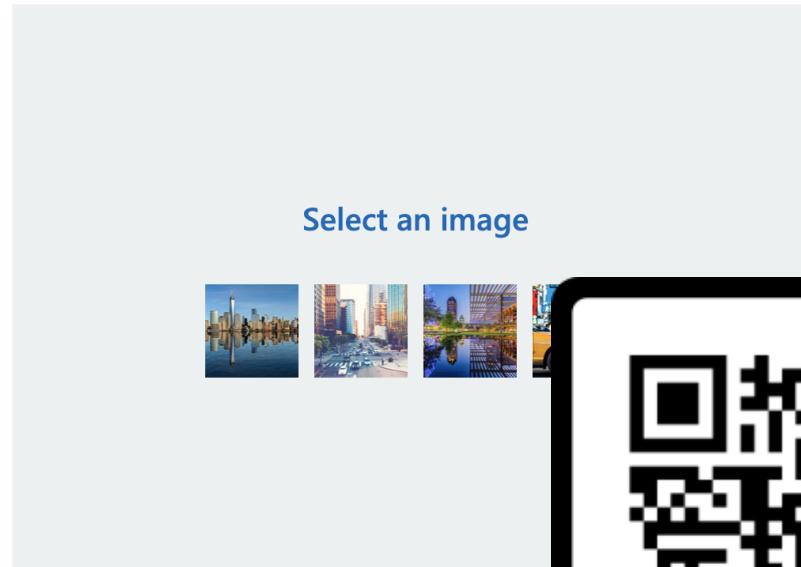
This feature will identify and tag the content of an image, give a written description, and give you confidence ratings on the results. It also identifies racy or adult content allowing easy moderation.

[Next Step](#)

## Read text in imagery

## Read handwriting in imagery

## Recognize celebrities & landmarks





## 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.



Select one of the videos above to see it in action





# how-old.net

How-Old.net  
How old do I look? #HowOldRobot

Search Faces...  🔍

➡️ Use this photo

📸 Use your own photo

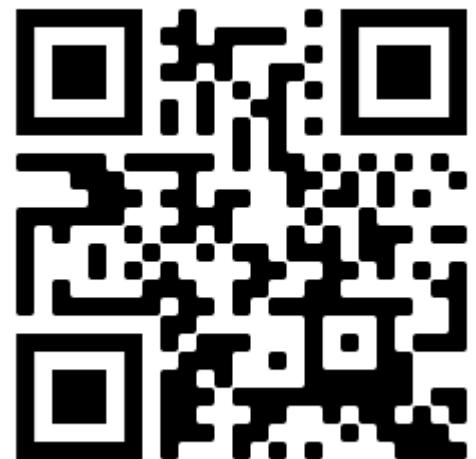
Microsoft

PS. We don't keep the photo

Share 21K Tweet

The magic behind How-Old.net

[Privacy & Cookies](#) | [Terms of Use](#)





# 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

IBM Watson Discovery Beta Demo

## Watson Discovery Query Demo

Let's see how Watson Discovery's results compare to a traditional keyword search across documents.

 Car Manuals

User guides, maintenance info, and recall data

 Student Loans

Now select a Natural Language Query and see what Discovery returns versus a corresponding keyword search

### Discovery search

 natural language query

### Traditional search

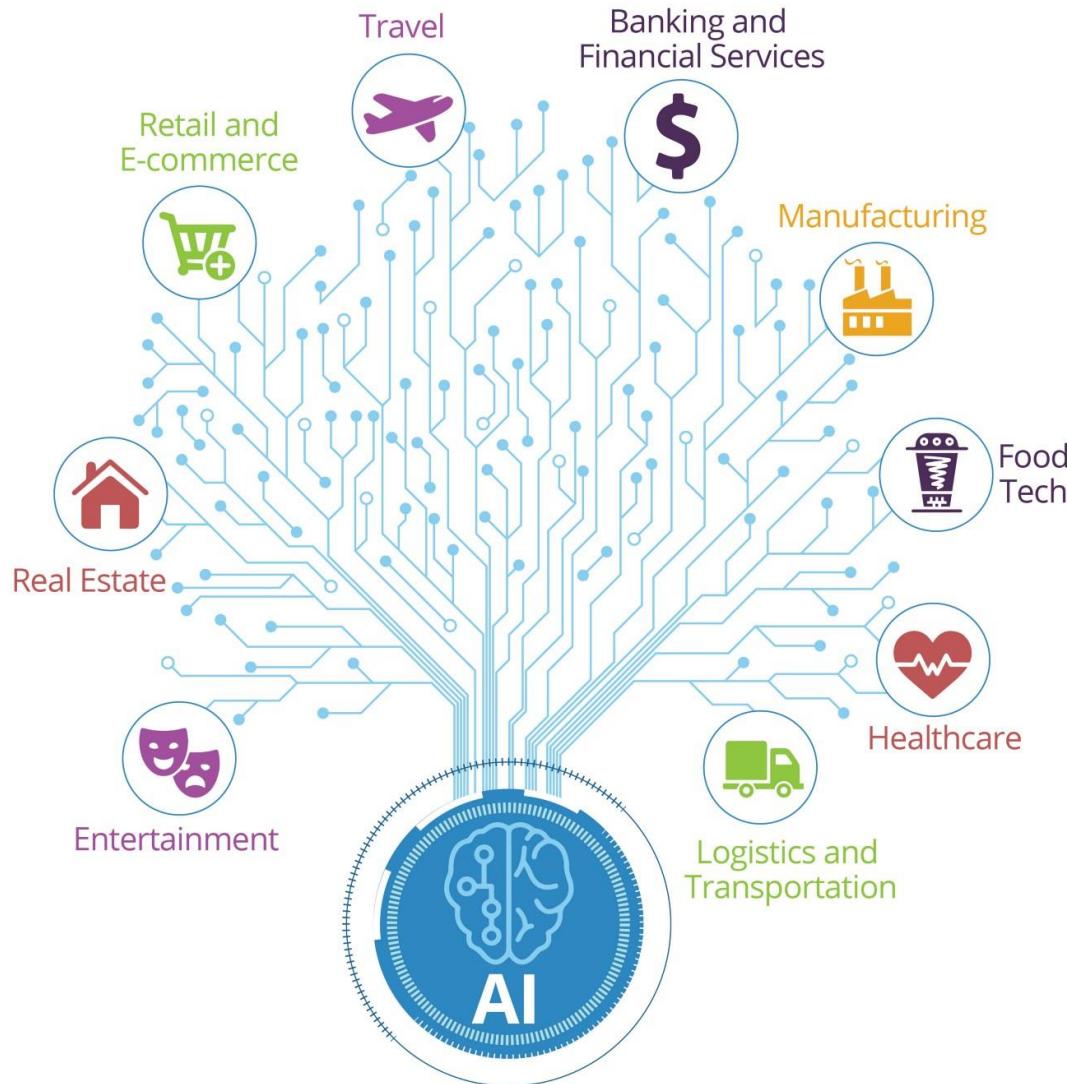
 corresponding keyword



<https://ibm.co/36SOnTN>

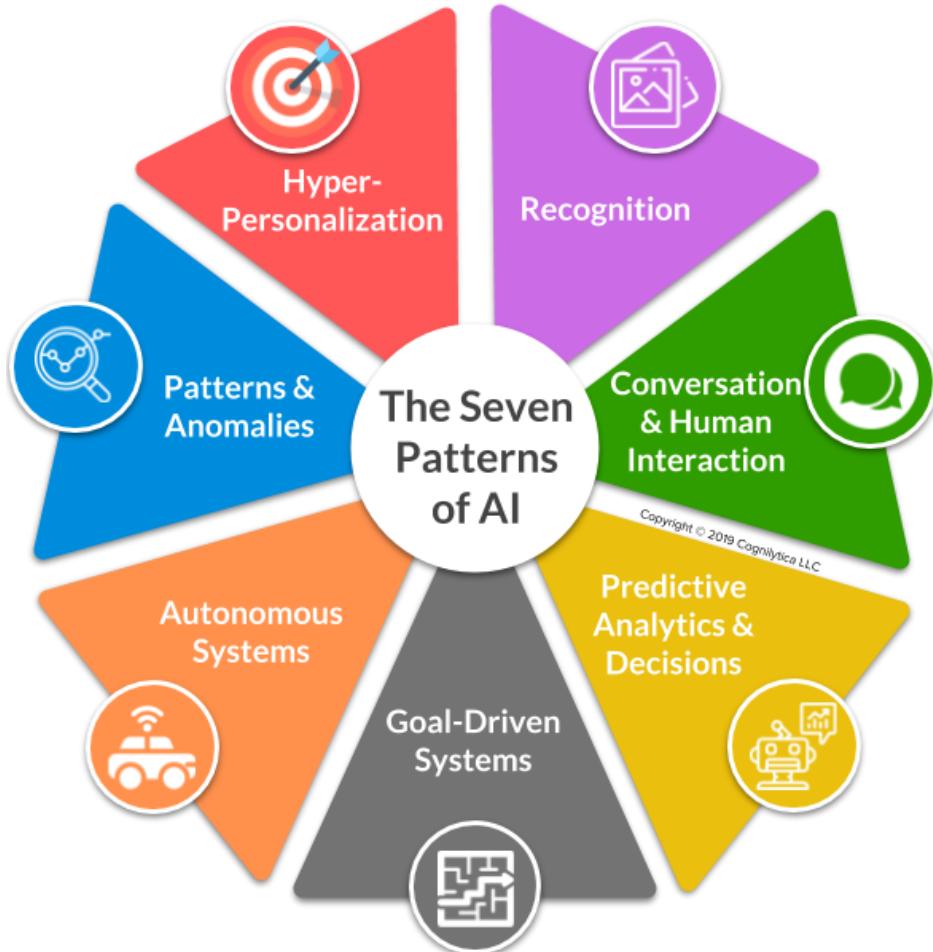


# AI Applications across Major Industries





# The Seven Patterns of AI



Any AI project or implementation falls within one or more of these 7 patterns that Cognilytica has identified (in no particular order).

## HYPERPERSONALIZATION

 Using ML to learn and build individual profiles for deep personalization.  
Example use cases: Personalized content, personalized recommendations, behavior profiling.

## AUTONOMOUS SYSTEMS

 Systems that are able to accomplish a task, achieve a goal, interact with surroundings with minimal or any human involvement.  
Example use cases: Autonomous vehicles, automatic knowledge generation, cobots, self-driving decisions.

## PREDICTIVE ANALYTICS & DECISION SUPPORT

 Helping humans make better decisions through models that help predict future data and behavior.  
Example use cases: Assisted search and retrieval, predicting a value, behavior, or failure, Guided assistance.

## CONVERSATIONAL/HUMAN INTERACTION

 Machines interacting with humans through natural conversation and interaction including voice, text, images, and written forms.  
Example use cases: Chatbots, voice assistants, content generation, sentiment analysis, machine translation.

## PATTERNS & ANOMALIES

 Using ML to identify patterns in data and learn higher-order connections between information to provide insight and spot outliers.  
Example use cases: Fraud & risk detection, discovering patterns among data, surfacing insights in data, automatic error detection / correction, predictive text.

## RECOGNITION

 Using ML to identify and understand images, sound, items, handwriting, faces, and gestures.  
Example use cases: Facial recognition, sound recognition, item detection, handwriting / text recognition.

## GOAL-DRIVEN SYSTEMS

 Find the optimal solution to a problem through trial and error.  
Example use cases: scenario simulation, game playing, bidding and real-time auctions



# Hyperpersonalization



PRODUCED BY COGNILYTICA  
REAL-WORLD, INDUSTRY & ADOPTION FOCUSED  
MARKET RESEARCH AND INTELLIGENCE ON AI

## THE HYPERPERSONALIZATION PATTERN OF AI

ONE OF THE SEVEN PATTERNS OF AI



### Hyperpersonalization



**Pattern:** Using machine learning to develop a unique profile of each individual that adapts over time for a wide variety of purposes, including displaying relevant content, recommend relevant products, or personalized recommendations and guidance.

**Objective:** Treating each individual as an individual.

## PATTERN USE CASES



### ENHANCED CUSTOMER PROFILING

Big data and AI are allowing companies to create more complete profiles of customers/users to deliver more personal messaging and content.



### CONTENT PERSONALIZATION

With AI-powered predictive analytics, advertisers are now able to get a comprehensive profile of target customers.



### RECOMMENDATION SYSTEMS

Use AI to analyze user behavior, preferences, feedback, and characteristics to predict behavior and deliver unique, personalized experiences.



### BEHAVIOR PROFILING

Through ML, learn how users behave through interactions.



### HYPERPERSONALIZED ADVERTISING

AI lets brands treat each customer as an individual instead of part of a bucket / group.



### HYPERPERSONALIZED MEDICINE

AI allows health professional to diagnose and treat each patient with individualized medicine and treatment options.



### HYPERPERSONALIZED FINANCE & INSURANCE

AI allows for additional factors to be examined when providing various insurance quotes or loan approvals.

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DOC ID: CG7G066



# Autonomous System



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MARKET RESEARCH AND INTELLIGENCE ON AI

## THE AUTONOMOUS SYSTEMS PATTERN OF AI

ONE OF THE SEVEN PATTERNS OF AI



Autonomous Systems

**Pattern:** Physical and virtual (software) systems that are able to accomplish a task, achieve a goal, interact with their surroundings, and perform their objective with minimal to no human involvement.



**Objective:** Minimizing human labor.

## PATTERN USE CASES



### AUTONOMOUS VEHICLES

AI allows for autonomous vehicles of all sorts including cars, trucks, boats, trains, warehouse bots, lawnmowers, and more.



### COLLABORATIVE ROBOTS

Cobots operate in conjunction with, & close proximity to humans.



### AUTONOMOUS BUSINESS PROCESS

Allow systems to autonomously discover processes and increase workflow optimization on its own.



### DOCUMENTATION / KNOWLEDGE GENERATION

Automatically extract information from various systems to generate documents and increase operational efficiencies.



### AUTONOMOUS DECISIONS

Processes and actions where there is no human involvement such as autonomous routing of internal tickets or routing documents to departments.



### AUTONOMOUS LOGISTICS

Autonomously plan and execute logistics tasks such as routing of goods, accurate tracking of shipments, or inventory forecasting.



### AUTONOMOUS RETAIL

The customer experience and business operations of brick and mortar stores are completely automatized.

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DOC ID: CGIG062



# Predictive Analytics



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MARKET RESEARCH AND INTELLIGENCE ON AI

## THE PREDICTIVE ANALYTICS & DECISION SUPPORT PATTERN OF AI

ONE OF THE SEVEN PATTERNS OF AI



Predictive Analytics & Decisions



**Pattern:** Use ML to understand past / existing behavior and predict future outcomes or help humans make decisions about future outcomes using insight learned from past behavior / interactions / data.

**Objective:** Helping humans make better decisions

## PATTERN USE CASES



### FORECASTING & PREDICTION

Use previous data, past behavior and interactions to help humans predict future outcomes.



### DECISION SUPPORT

Analyzes business data and presents it so that users can make business decisions more easily.



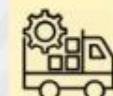
### ASSISTED SEARCH

Use AI to find info needles in data haystacks through voice or text search.



### SITUATIONAL AWARENESS

Collect data from your situation / environment and make decisions based on that data.



### LOGISTICS & SUPPLY CHAIN

AI algorithms optimize supply chain to optimize staffing, inventory control, energy consumption, more accurate tracking of shipments, and more.



### BANKING & FINANCE

AI is being used to determine creditworthiness, help with financial trading and investing.



### ENERGY

Analytics is helping the energy industry reduce unexpected equipment failures by predicting when a component might fail, or predict when customers might get a high bill and send out alerts.

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DOC ID: CGI-G062



# Conversation & Human interaction



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MARKET RESEARCH AND INTELLIGENCE ON AI

## THE CONVERSATION & HUMAN INTERACTION AI PATTERN

ONE OF THE SEVEN  
PATTERNS OF AI



Conversation  
& Human Interaction

**Definition:** Machines and humans interacting with each other using natural language, conversational forms of interaction through voice, text, and written, and image forms.



**Objective:** Machines interacting with humans the way humans interact with each other.

## PATTERN USE CASES



### NATURAL LANGUAGE PROCESSING (NLP)

Give machines ability to understand and generate natural language.



### AI ENABLED CHATBOTS

Conversational agents that can engage directly with humans for customer support & engagement, conversational commerce, personal assistants, and more.



### VOICE ASSISTANTS

Voice-based hardware devices that interact with users to provide a wide range of capabilities.



### SENTIMENT, MOOD, INTENT ANALYSIS

Identify and categorize opinions expressed in text to gain a more complete picture of the voice of the customer.



### CONTENT SUMMARIZATION

Extract key information from documents and create shorter / more concise versions of text.



### MACHINE TRANSLATION

Machines provide translation between different languages giving access to written or spoken information in another language.



### CONTENT INTELLIGENCE

Machines are able to automatically understand text and data such as charts within a document.



### CONTENT GENERATION

Machine creates content in human understandable format such as generating text, images, or audio.

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DOC ID: CGIG3060



# Pattern & Anomaly Detection



## THE PATTERN & ANOMALY PATTERN OF AI

ONE OF THE SEVEN PATTERNS OF AI



Patterns & Anomalies



**Pattern:** Use ML to identify patterns in data and learn higher-order connections between information to provide insight into whether a given piece of data fits an existing pattern or is an outlier.

**Objective:** Find which one of these things is like the other and which is not

## PATTERN USE CASES

### FRAUD & RISK DETECTION



Use ML to find which one of these things is like the other and which is not. Used heavily for financial transactions such as credit card purchases.



### UNCOVERING INSIGHTS IN DATA

Machines look at data to find insights, patterns, and groupings in the data.



### AUTOMATIC ERROR DETECTION & CORRECTION

AI systems can learn what's "normal" behavior and spot mistakes or errors and make adjustments as needed.



### INTELLIGENT MONITORING

AI can monitor of various systems (hardware and software) to determine when errors or breakdowns will occur to help predict maintenance cycles of machinery, formulate predictions regarding asset malfunction, and allow for reductions in unplanned downtime.



### DATA AUGMENTATION & DISCOVERY

Using unstructured learning to find and group information that might be relevant from data.



### PREDICTIVE TYPING / PREDICTIVE TEXT

AI can provide text suggestions that learn over time allowing the software to build custom dictionaries.



### CYBERSECURITY APPLICATIONS

AI can help with cybersecurity by learning and adapting to changing threats, identify and spot malware, phishing attacks, and more.



### CANDIDATE MATCHING

AI can sort through thousands of potential candidates to find best matches, screen candidates, and help suggest best candidates for position.

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# Recognition Pattern



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## THE RECOGNITION PATTERN OF AI

ONE OF THE SEVEN PATTERNS OF AI



Recognition



**Pattern:** Using ML to identify and understand images, sound, items, handwriting, faces, and gestures

**Objective:** Have machines identify and understand the real world and unstructured data.

## PATTERN USE CASES



### OBJECT RECOGNITION, CLASSIFICATION, & ANALYSIS

Deep Learning has made it possible to train and recognize any image.



### SOUND & AUDIO RECOGNITION

Using machines to recognize and understand different sound input such as bird songs or genres of music.



### HANDWRITING / TEXT RECOGNITION

Computers understand and interpret handwritten content from documents and digital sources such as checks.



### GESTURE RECOGNITION

Computers interpret human gestures as commands to enhanced video game interaction, interpret sign language, or help surgeons virtually grasp and move objects.



### CONTENT SUMMARIZATION

Extract key information from documents and create shorter / more concise versions of text.



### MEDICAL IMAGING

AI is augmenting radiologists by being a "second set of eyes" on images and x-rays.



### INSURANCE CLAIMS APPLICATIONS

AI helping with real-time assessment of car or storm damage.



### COUNTERFEIT DETECTION

AI helping find counterfeit goods such as purses, watches, or drugs.

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DOC ID: CGIG061



# Goal-Driven System



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## THE GOAL-DRIVEN SYSTEMS PATTERN OF AI

### ONE OF THE SEVEN PATTERNS OF AI

**Pattern:** Using Reinforcement Learning for real-world games.



**Objective:** Find the optimal solution to a problem through trial and error

## PATTERN USE CASES

### GAME PLAYING



First checkers, then chess, and now more complicated games like Go, AI systems play games and learn through trial and error.



### SCENARIO SIMULATION

Using AI to create scenarios and figure out best outcomes for things such as resource optimization of money, equipment, time, or other resources.



### TRAFFIC LIGHT CONTROL

AI systems can figure out optimal solution to solve congestion.



### ROBOTS

AI powered robots can figure out how to run, jump, and move in various environments.



### BIDDING AND ADVERTISING

Multi-agent smart bidding solution finds the optimal price and time points.



### ROBOADVISING

Automated, algorithm-driven financial planning services that run through thousands of scenarios and automatically invest client assets.



### PHARMA / LIFE SCIENCES

AI can run through thousands of sequences to help with protein folding.

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DOC ID: CGIG065

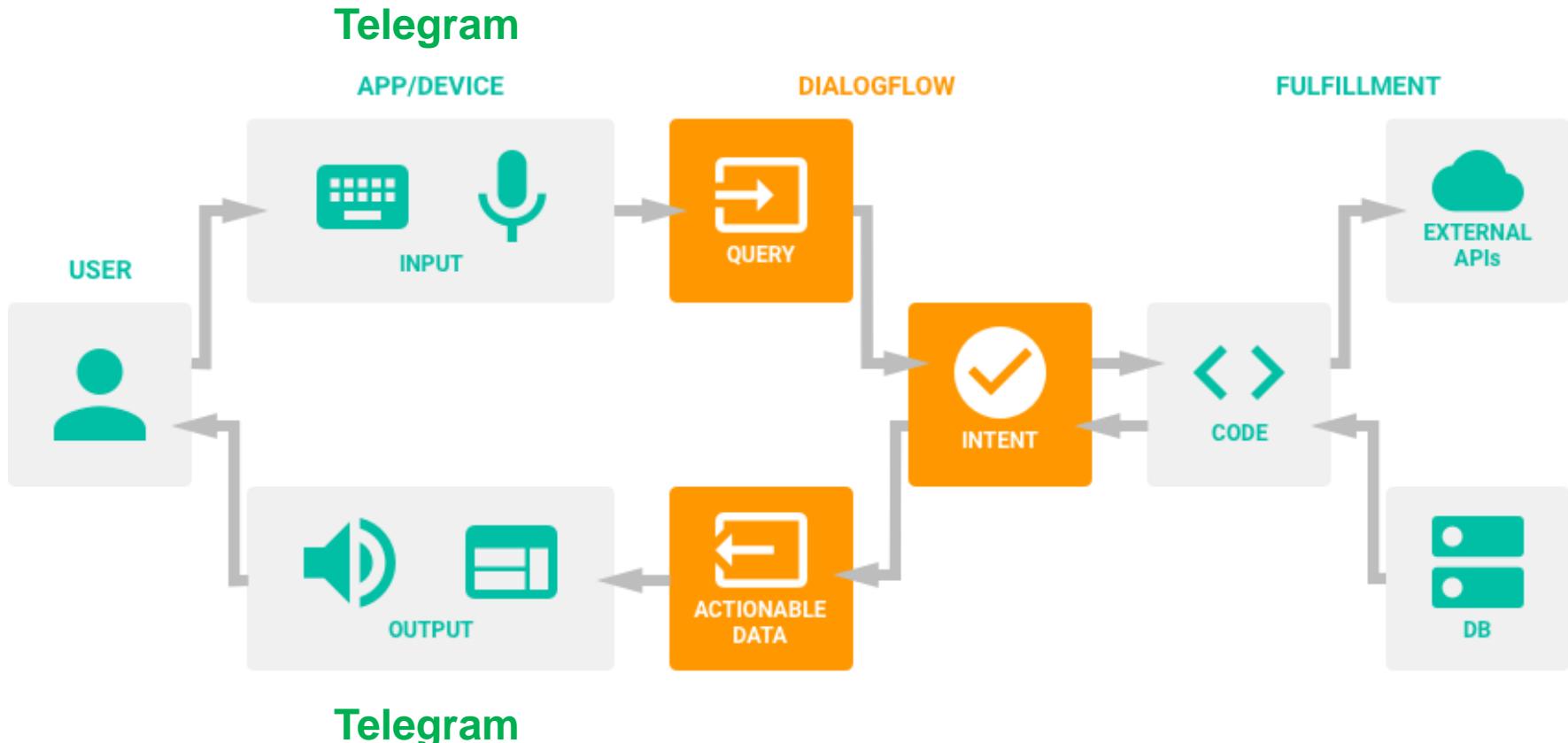


# Solving Rubiks Cube





# Hands on - Chatbot





# Building a QnA Chatbot

## ***QnA Chatbot***



### **QnA Source**

- <https://www.comm100.com/blog/top-10-chatbot-faqs.html>
- <https://cloud.google.com/compute/docs/faq>

- 01 ***Setup***  
Create DialogFlow account  
Prepare your questions and answers
- 02 ***Create QnA Knowledge Base***  
Gather training and validation images from internet or other sources.  
Add personality
- 03 ***Train the Knowledge Base***  
Allow the KB to build up database.
- 04 ***Publish the Knowledge Base***  
Once tested, allow your KB to be used by the bots
- 05 ***Create a QnA Bot***  
Connect your KB to a Bot
- 06 ***Connect your bot to agent***  
Use popular apps like Telegram and Messenger to chat with your bot



**15 Mins  
Break  
We will start  
Hands-on**

[bit.ly/google\\_duplex2019](http://bit.ly/google_duplex2019)





# Training an image classifier

## *Training an image classifier*

**We will start 2<sup>nd</sup> Hands-on on 3:45pm**



## **Fruits Classifier**

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

### **Setup**

Create Clarifai account

### **Prepare images**

Gather training and validation images from internet or other sources

### **Train the classifier**

Allow the classifier to know what constitutes a given class.

### **Evaluate the classifier**

Check for accuracy, recall and probability threshold.

### **Test your model**

Use unseen data to test your classifier.

### **Improve your classifier**

Use various techniques to improve your classifier.

# Many Examples of how AI is applied

---



# 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.

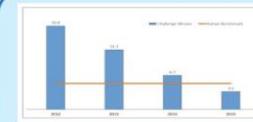
## Object detection



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



# Finance

- 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



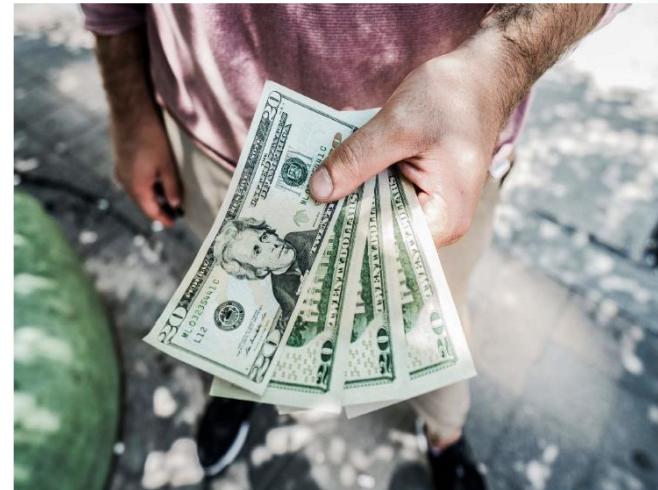
**Now with AI :** ML can help discern the credit worthiness of potential customers

- 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



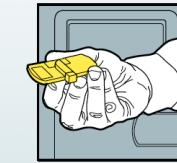
# Healthcare

- 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

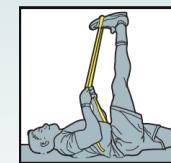
AI algorithms optimize hospital operations, staffing schedules, and inventory by using medical and environmental factors to forecast patient behavior and disease probabilities



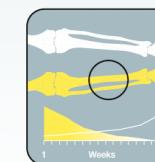
AI tools analyze patients' medical histories and environmental factors to identify people at risk of an illness and steer them to preventive care programs



Personalized treatment plans designed by machine learning tools improve therapy efficiency by tailoring treatment to specific patients' needs and medical



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)



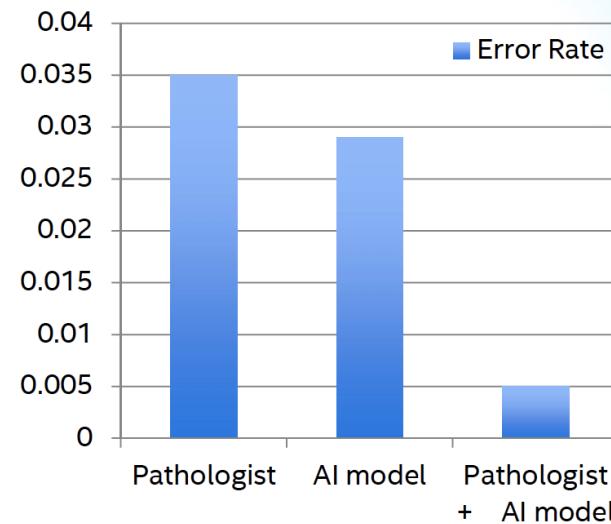
**Now with AI :** Doctors can provide diagnoses more efficiently and accurately, with the availability of:

- 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

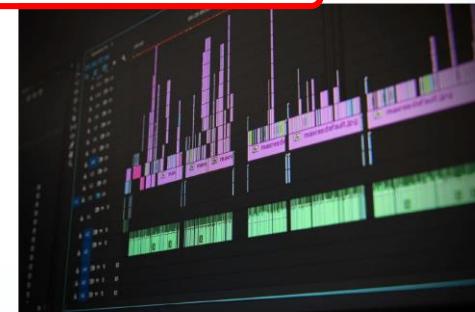
**Traditionally :** Doctors would diagnose a condition and recommend a treatment based on what historically worked for most people.

- 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.





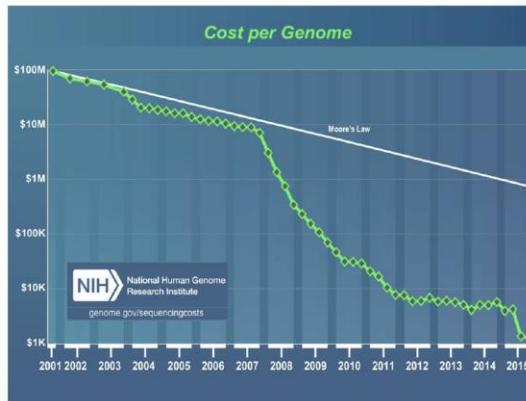
# Robot Surgery



# Healthcare – Genome Sequencing

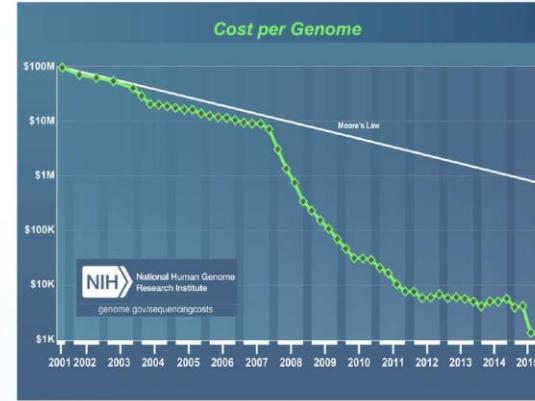
**In 2001:** Full human sequencing cost \$100 million.

- 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

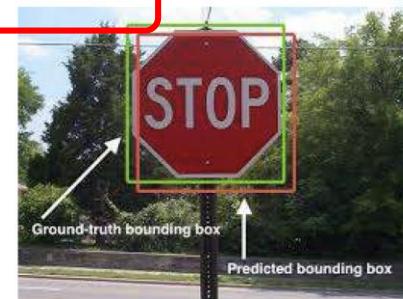
**Traditionally:** Despite having safer cars, the number of deadly car accidents have been on the rise the last few years.

- 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



JUST WALK OUT  
TECHNOLOGY

# 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





# 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.



# Food Supply Chain

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

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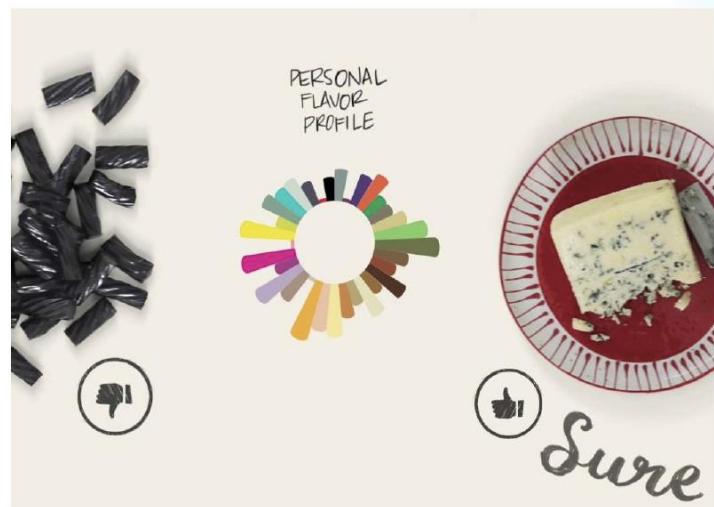
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# Agriculture Industry

- Agricultural Drones
- Autonomous Tractors
- Vertical Farms

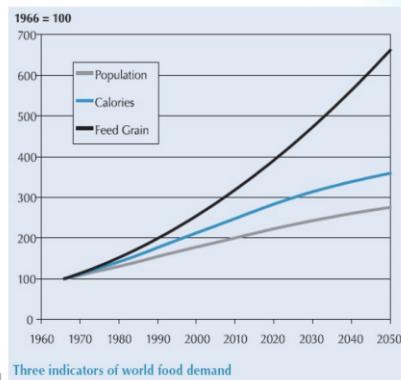




# AgTech

**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.



**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.





# I AM AI

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I am AI (Variation)

AIVA (Artificial Intelligence Virtual Artist)

00:00



Aiva Technologies

[www.aiva.ai](http://www.aiva.ai)

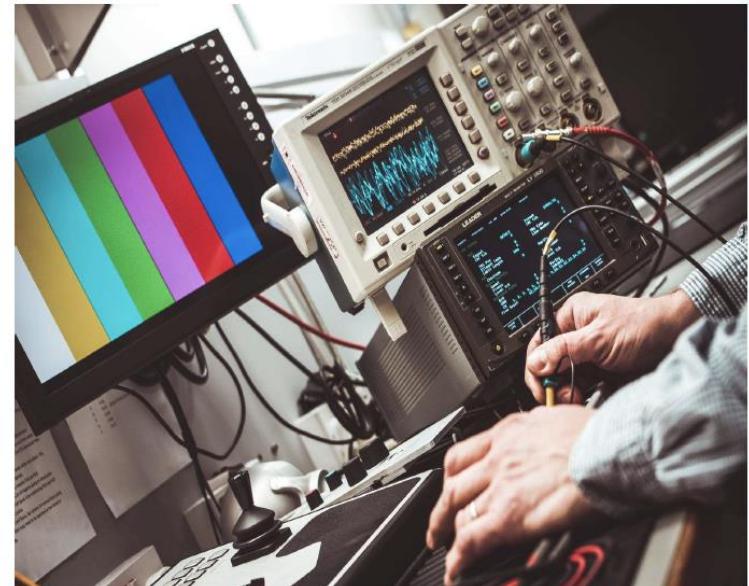
[https://www.youtube.com/watch?v=gzGkC\\_o9hXQ](https://www.youtube.com/watch?v=gzGkC_o9hXQ)



# 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.

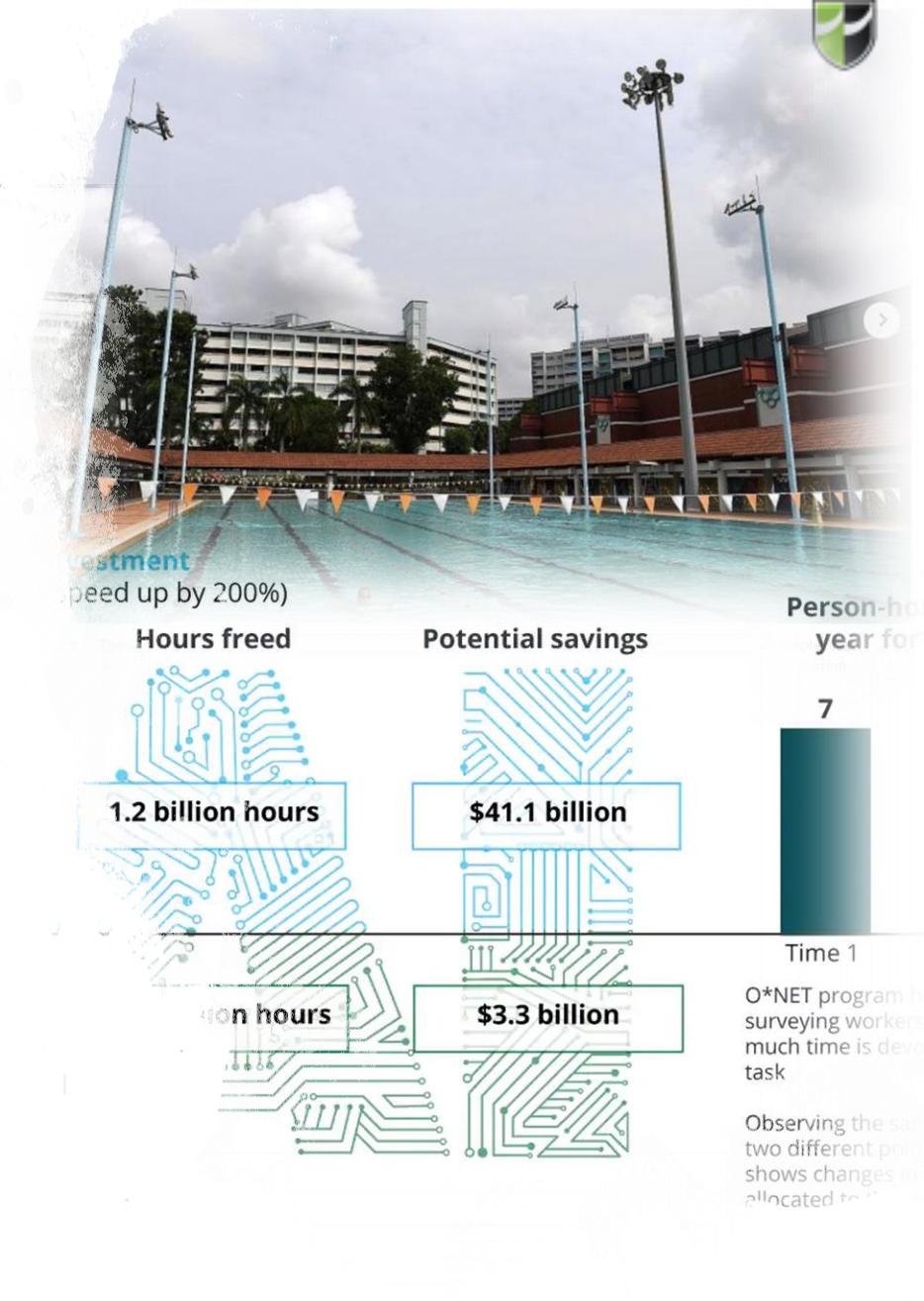


The instrumentation was composed with artificial intelligence, lyrics and vocal melodies written by Taryn. Let us know what you think in the comments!



# 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

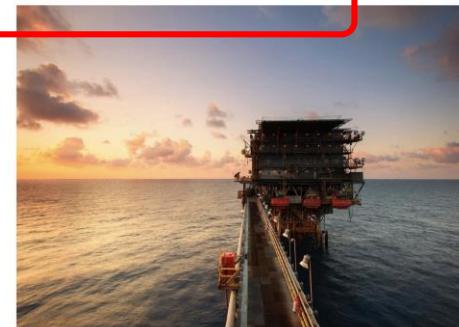
**Traditionally:** Shrinking oil reserves force companies to operate in remote and possibly hostile areas.

- 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.



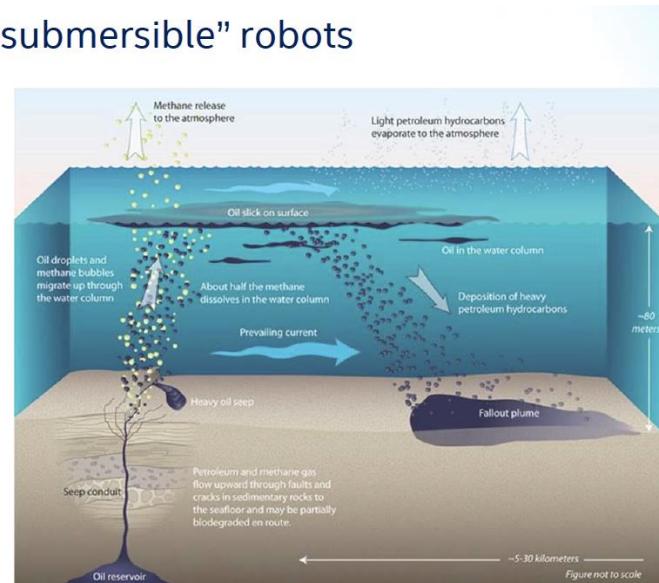
**Now with AI:** AI uses economic, political and weather data to forecast optimum production locations.

- 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.

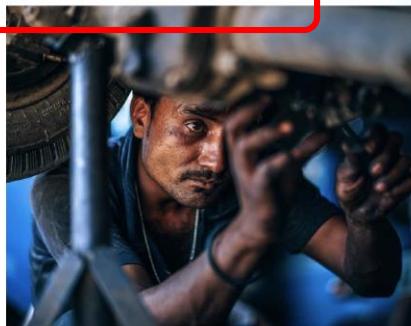




# Preventive Maintenance

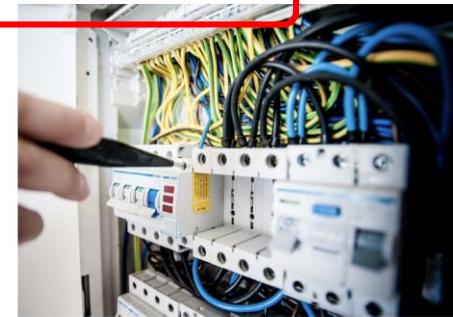
**Traditionally:** Relied on historical data to provide basis for preventative maintenance schedule.

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



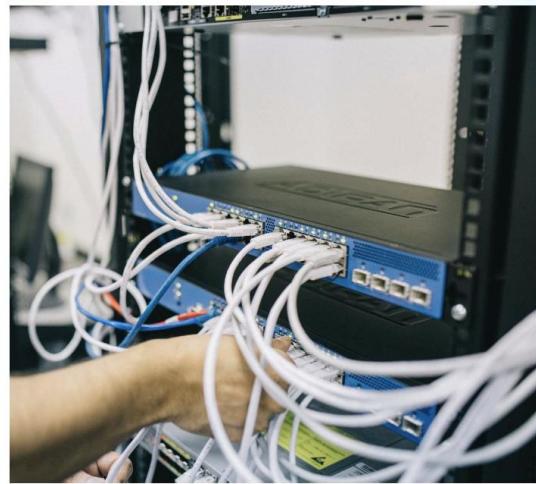
**Now with AI:** Internet of Things (IoT) sensors help to optimize maintenance scheduling.

- 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.

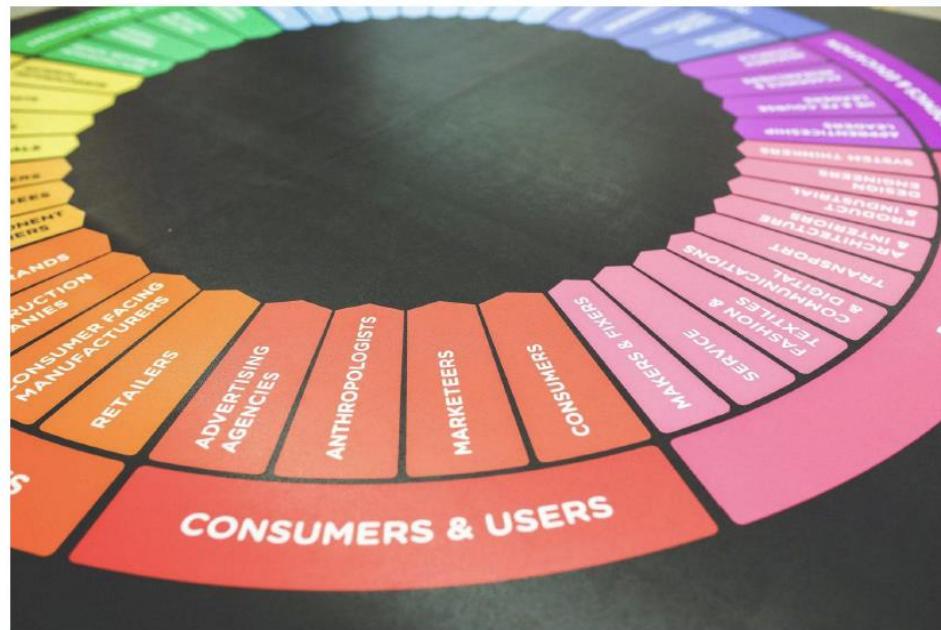




# AI and Customer Service

**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

---

**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.

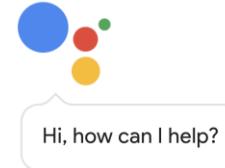
- Neural networks are used to train characters to walk and run realistically.
- Reinforcement Learning (RL) is a technique used throughout gaming.



# AI 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/>

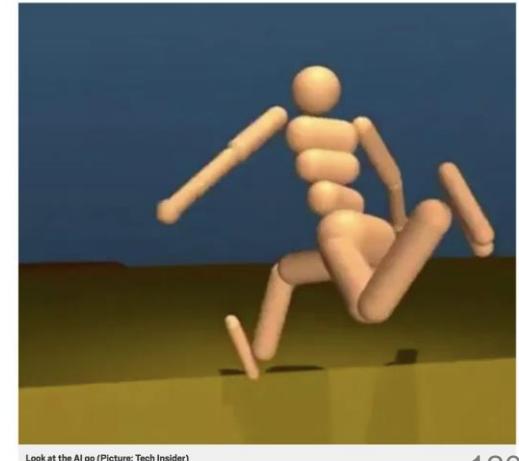
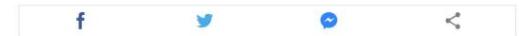


Meet your Google Assistant.

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 Nsubuga Monday 17 Jul 2017 6:31 pm



**Voice Kit**

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



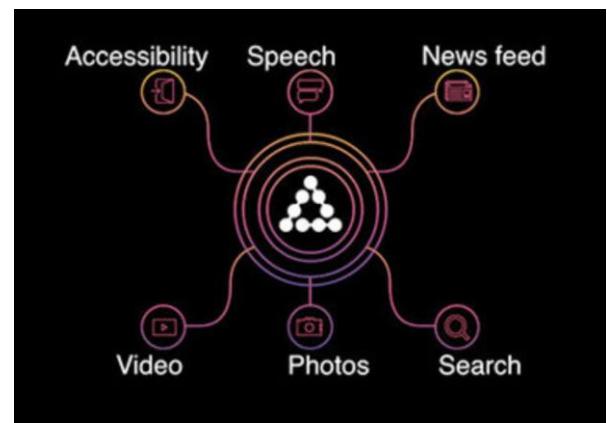
**Vision Kit**

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



# 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.
- Integrate 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 »](#)





**Recommendations**

Personalize experiences for your customers with the same recommendation technology used at Amazon.com.

[AMAZON PERSONALIZE »](#)



**Forecasting**

Build accurate forecasting models based on the same machine learning forecasting technology used by Amazon.com.

[AMAZON FORECAST »](#)



**Image and Video Analysis**

Add image and video analysis to your applications to catalog assets, automate media workflows, and extract meaning.

[AMAZON REKOGNITION »](#)



**Advanced Text Analytics**

Use natural language processing to extract insights and relationships from unstructured text.

[AMAZON COMPREHEND »](#)



**Document Analysis**

Automatically extract text and data from millions of documents in just hours, reducing manual efforts.

[AMAZON Textract »](#)



**Voice**

Turn text into lifelike speech to give voice to your applications.

[AMAZON POLLY »](#)



**Conversational Agents**

Easily build conversational agents to improve customer service and increase contact center efficiency.

[AMAZON LEX »](#)



**Translation**

Expand your reach through efficient and cost-effective translation to reach audiences in multiple languages.

[AMAZON TRANSLATE »](#)



**Transcription**

Easily add high-quality speech-to-text capabilities to your applications and workflows.

[AMAZON TRANSCRIBE »](#)



# Amazon Rekognition

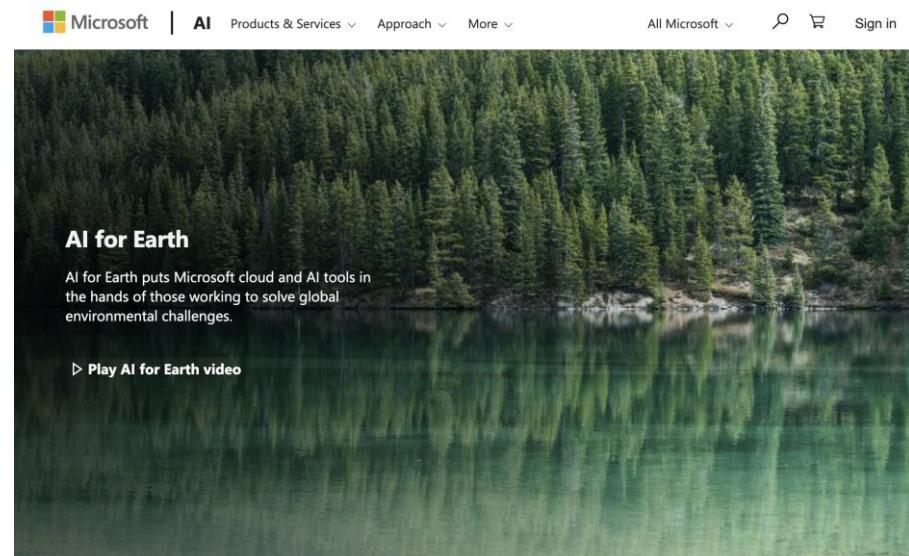
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Amazon Rekognition Video をご紹介します。



# 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)



The screenshot shows the Microsoft AI for Earth landing page. At the top, there's a navigation bar with the Microsoft logo, a search icon, and links for "AI", "Products & Services", "Approach", "More", "All Microsoft", and "Sign in". Below the navigation is a large, scenic image of a forest reflected in a lake. Overlaid on this image is the "AI for Earth" heading and a brief description: "AI for Earth puts Microsoft cloud and AI tools in the hands of those working to solve global environmental challenges." A "Play AI for Earth video" button is also visible.

## 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 >](#)



# AI Services

- Cognos Analytic - <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 get me to use #ThisPhone.  
The 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	0.06

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

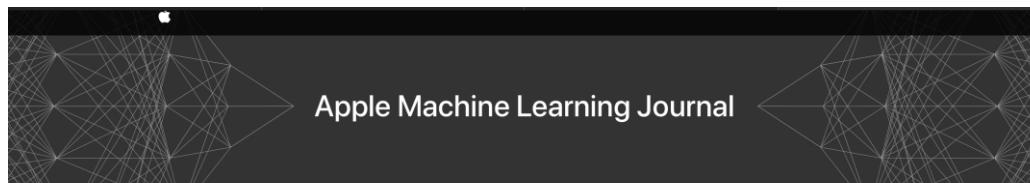
October 18, 2017

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.



# Function specific AI services

Sales	Outreach.io
Virtual Human	<a href="https://www.quantumcapture.com/ctrl-human">https://www.quantumcapture.com/ctrl-human</a>
HR Services	<a href="https://leena.ai/HR-FAQ">https://leena.ai/HR-FAQ</a>
Scheduling	<a href="https://x.ai/how-it-works/">https://x.ai/how-it-works/</a>
Enterprise support functions	<a href="https://www.soapbox.ai/">https://www.soapbox.ai/</a>
Sales Bots	<a href="https://octaneai.com/">https://octaneai.com/</a>
AI-Powered Transcription	<a href="http://capiro.ai/index.html">http://capiro.ai/index.html</a>
Hiring	<a href="https://hiringsolved.com/product">https://hiringsolved.com/product</a>
Programming	<a href="https://www.codota.com/enterprise">https://www.codota.com/enterprise</a> <a href="https://kite.com/">https://kite.com/</a>

# What's Next



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

› Edx  
<https://www.edx.org/>

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

› 1-4 days short courses

- AI
- Data Analytics
- IT Security
- DevOps
- Software Development
- New/Digital Media

<https://www.rp.edu.sg/soi/life-long-learning>

› Specialist Diplomas

- Applied Artificial Intelligence
- Business Analytics

<https://www.rp.edu.sg/soi/life-long-learning>

# Lifelong Learning



Scan me



- <https://www.rp.edu.sg/soi/lifelong-learning>

## Short Courses



SOI offers an extensive variety of short, industry-relevant courses for ICT skills upgrading and skills acquisition. Our courses are categorized under different areas, ranging from Artificial Intelligence (AI), Business Intelligence / Business Analytics (BI/BA), Business Processes (BP), Unmanned Aerial Vehicle (UAV), IT Security, New/ Digital Media, Software Development to the Internet of Things (IoT). To view our short course offerings, click on the relevant tab below.

[AI](#) [Data Analytics](#) [IT Security](#) [DevOps](#) [Software Development](#) [New/ Digital Media](#) [UAV](#) [RPA](#)

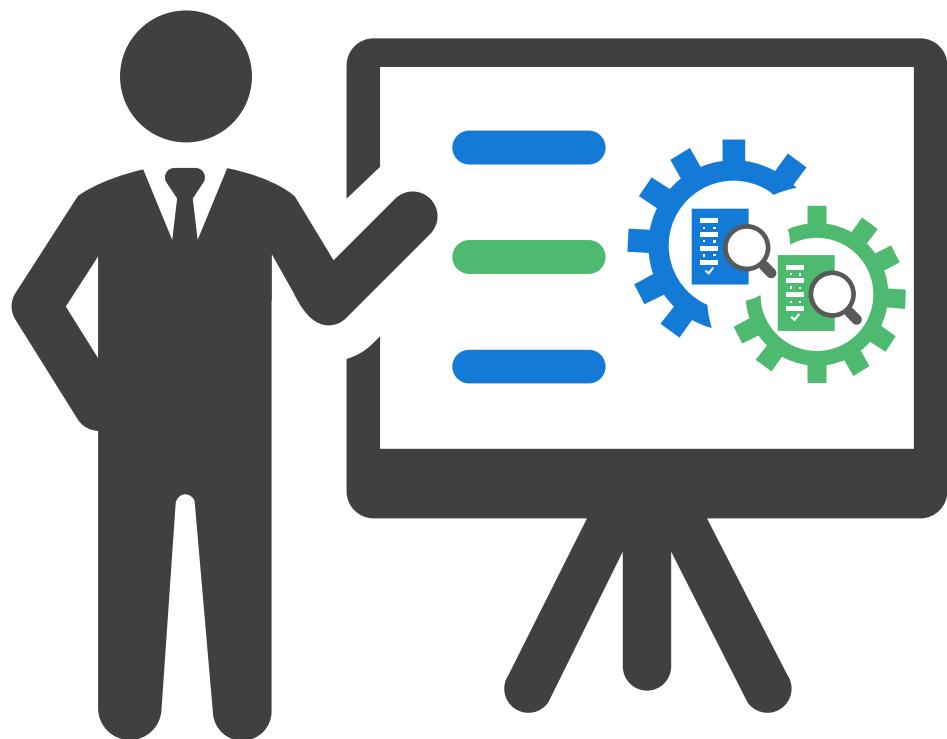
+ [Artificial Intelligence for Everyone - A Practical Experience \(1 day Beginner\)](#)

+ [Artificial Intelligence for Techies - A Hands-On Approach \(1 day Beginner\)](#)

+ [An Introduction to Code-Free Machine Learning \(1 day Beginner\)](#)



# Summary



Email  
[Jane\\_zhang@rp.edu.sg](mailto:Jane_zhang@rp.edu.sg)

Telegram  
[@jane\\_rp](https://t.me/jane_rp)

Source code:

131



# Thank you