Demystifying Machine Learning

Presented by

F. Basheer Ahamed & A.Mohamed Noordeen

Some one said very profoundly :

You can buy a man’s time, you can buy a man’s physical presence at a given place; you can even buy a measured number of skilled muscular motions per hour or day.

But you cannot buy enthusiasm; you cannot buy initiative; you cannot buy loyalty; you cannot buy the devotion of hearts, minds and souls.

You have to earn those things

What Machine Learning is all about?

- **Humans can learn from past experience.**
- **Machines need to be told what to do (via program, instructions).**
- **Can machines learn from the past experience/data ?**
- **Lets discuss couple of use cases**

What Machine learning did in past and doing today and in future

? ? ?

Father of Machine learning

1956 – Trains computer to play checkers

1962 – Computer defeated the state champion

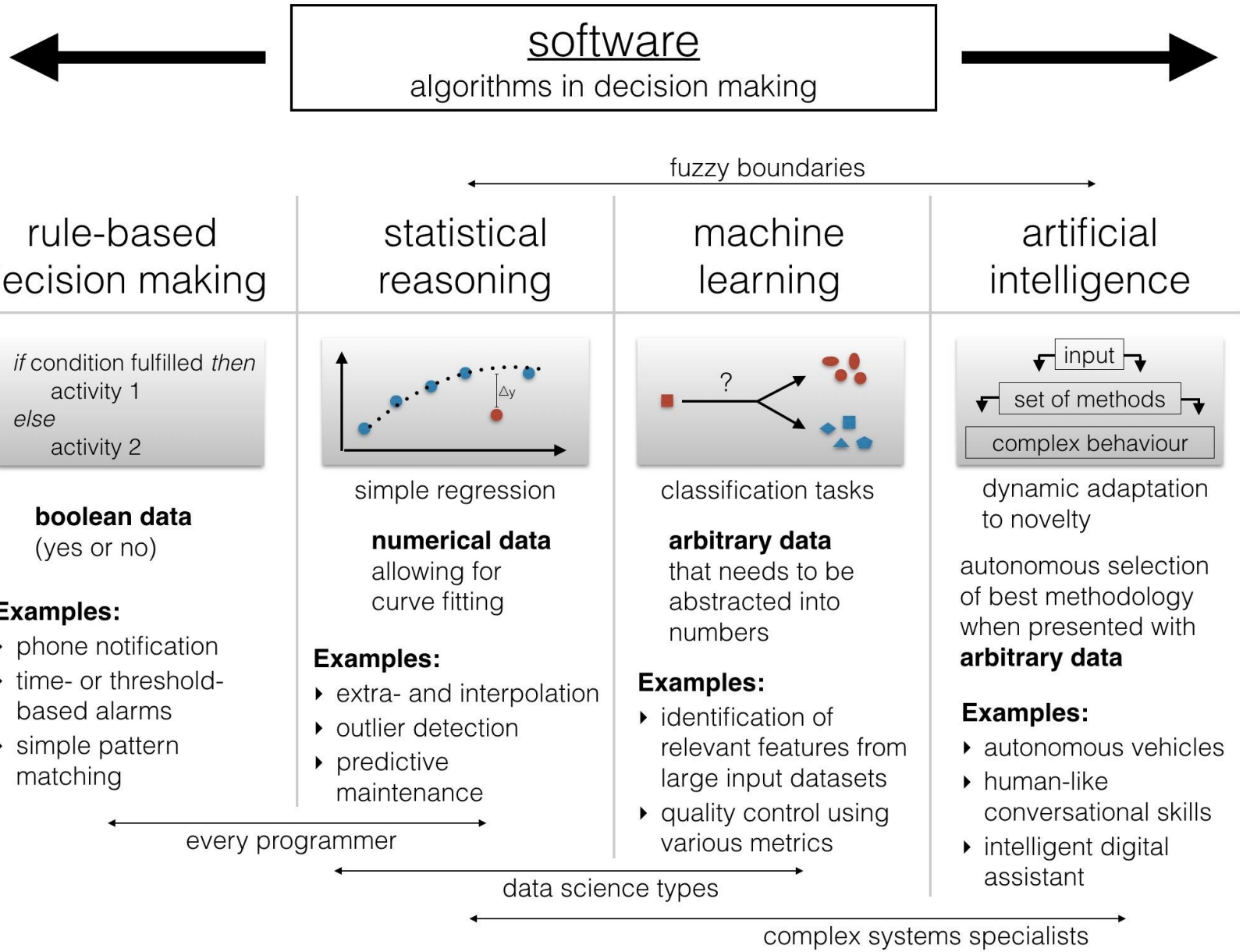
Machine Learning ..

- **As stated by Arthur Samuel : Machine learning is the subfield of computer science that gives computers the ability to learn without being explicitly programmed**

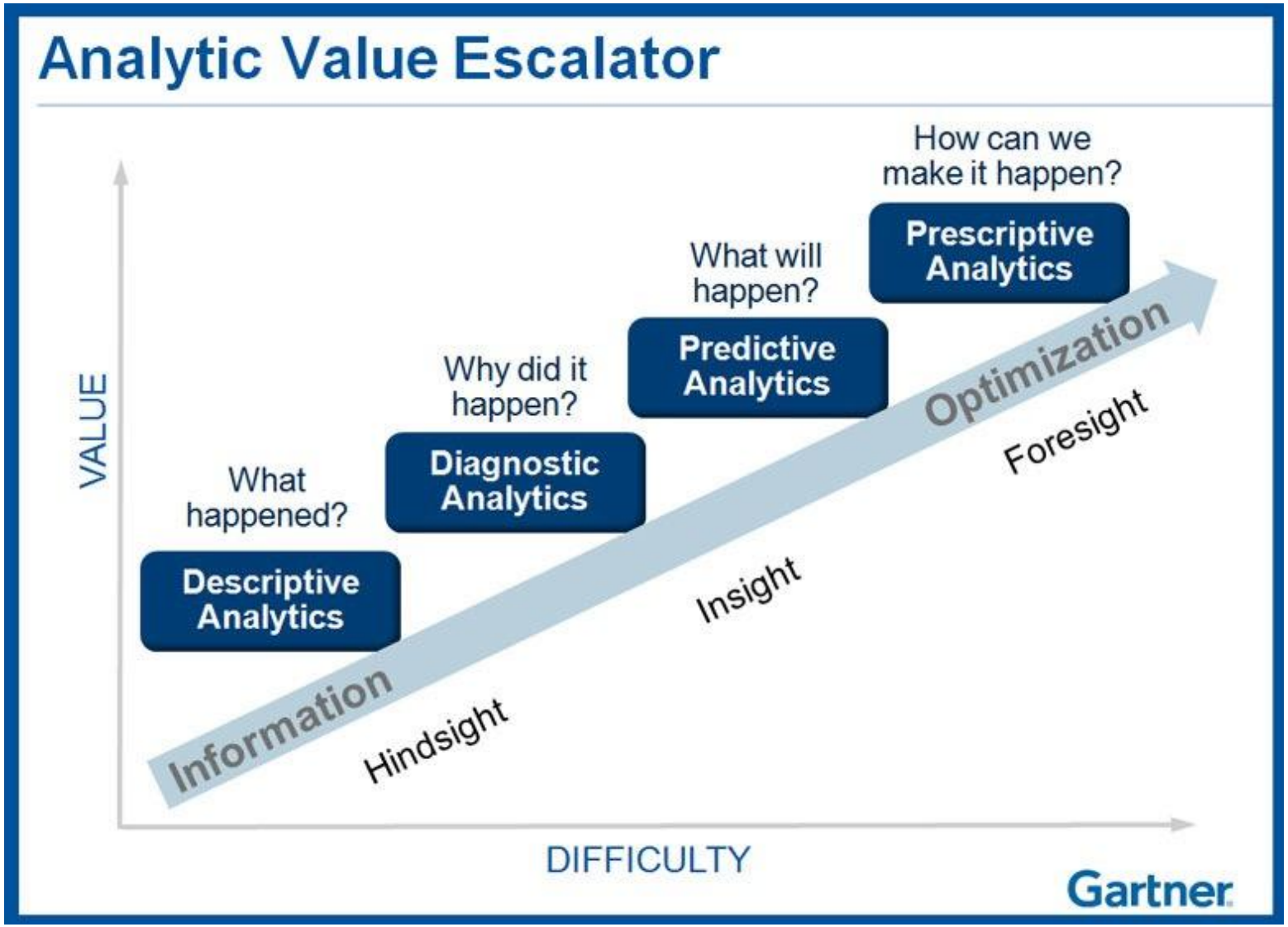
- **Machine learning and artificial intelligence have phenomenal potential to simplify, accelerate, and improve many aspects of our lives.**

- **Computers can ingest and process massive quantities of data and extract patterns and useful information at a rate exponentially faster than humans, and that potential is being explored and developed around the world.**

How Machine Learning is improving our life?



Trend of Analytics:



Real life usage of Machine Learning

- **Self driving cars - Tesla, capable of learning from other connected cars**
- **SIRI - Automatic speech recognition**
- **CORTANA - Virtual assistance**
- **Facebook Face Recognition Software**
- **Google Translator - Powered by (Guess)?:** However, without Google's substantial mountains of data (in every possible language) there's no way someone can compete with Google Translate. What makes Google so powerful? It's DATA. Google has a lot of data it can leverage, and all that data can be adapted and taught to perform specific tasks.

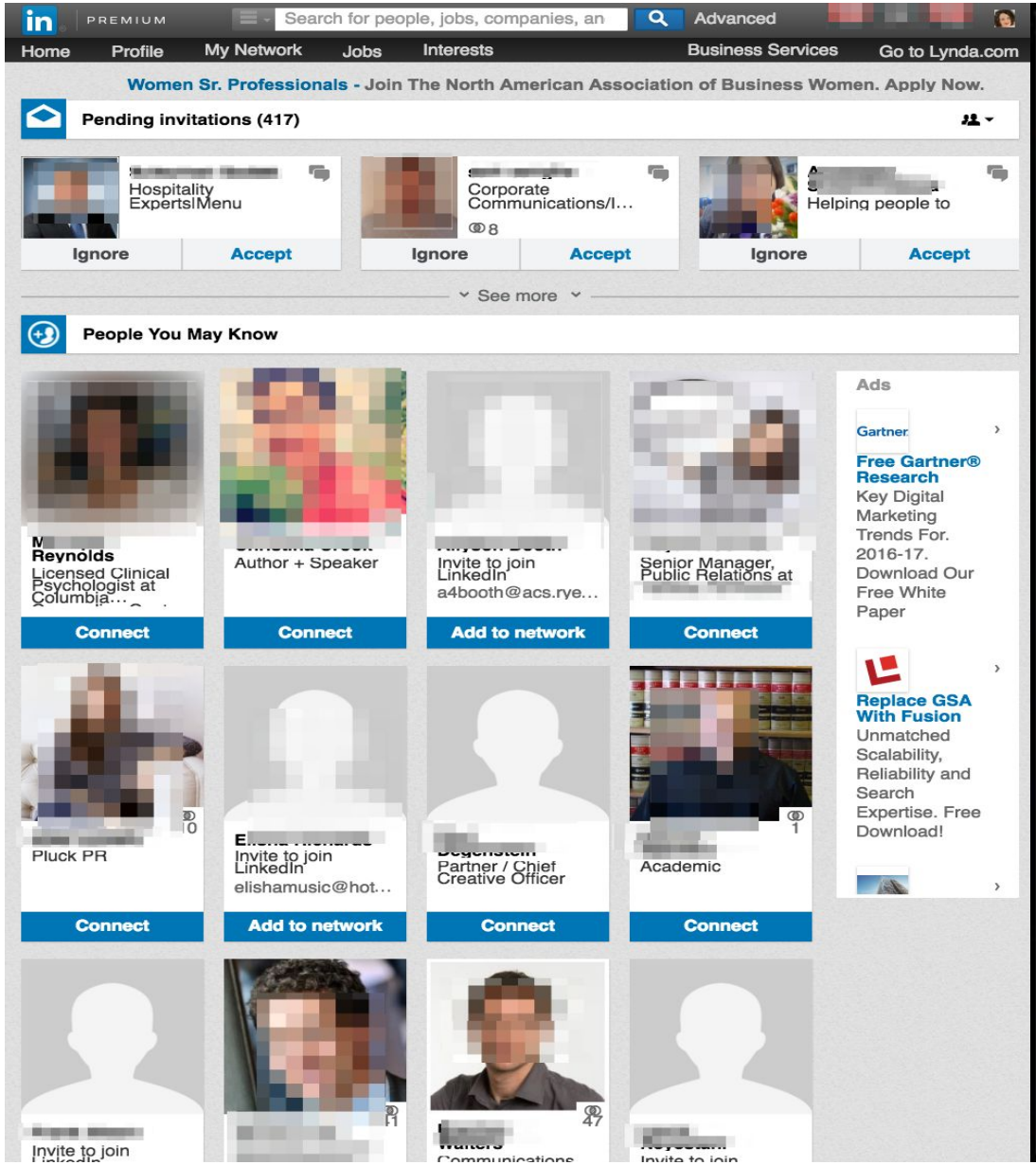
Real life usage of Machine Learning

- **Accurate Diagnosis of early stages of cancers**: A system designed by IBM correctly picked the cancerous lesions(damage) in the images with 95% accuracy where a doctor's accuracy is usually between 75% - 84% using manual methods. So, the computing approach will help the doctors make more informed decisions by increasing the efficiency to recognise melanoma and spot the cases where it is difficult for the doctors to identify.

- **Digit Recognition**: A model of this problem would allow a computer program to read and understand handwritten zip codes and sort envelops by geographic region.

- **Product Recommendation**: A model of this decision process would used the historical data and allow a program to make recommendations to a customer and motivate product purchases. Amazon has this capability. Also think of Facebook, GooglePlus and Facebook that recommend users to connect with you after you sign-up.

- **Credit Card Fraud Detection**: Given credit card transactions for a customer in a month, identify those transactions that were made by the customer and those that were not. A program with a model of this decision could refund those transactions that were fraudulent.


PREMIUM
Search for people, jobs, companies, an
Advanced
Home
Profile
My Network
Jobs
Interests
Business Services
Go to Lynda.com
Women Sr. Professionals - Join The North American Association of Business Women. Apply Now.
Pending invitations (417)
Hospitality ExpertsIMenu
Ignore
Accept
Corporate Communications/I…
8
Ignore
Accept
Helping people to
Ignore
Accept
See more
People You May Know
Reynolds
Licensed Clinical Psychologist at Columbia…
Connect
Author + Speaker
Connect
Invite to join LinkedIn
a4booth@acs.rye…
Add to network
Senior Manager, Public Relations at
Connect
Pluck PR
0
Connect
Invite to join LinkedIn
elishamusic@hot…
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Partner / Chief Creative Officer
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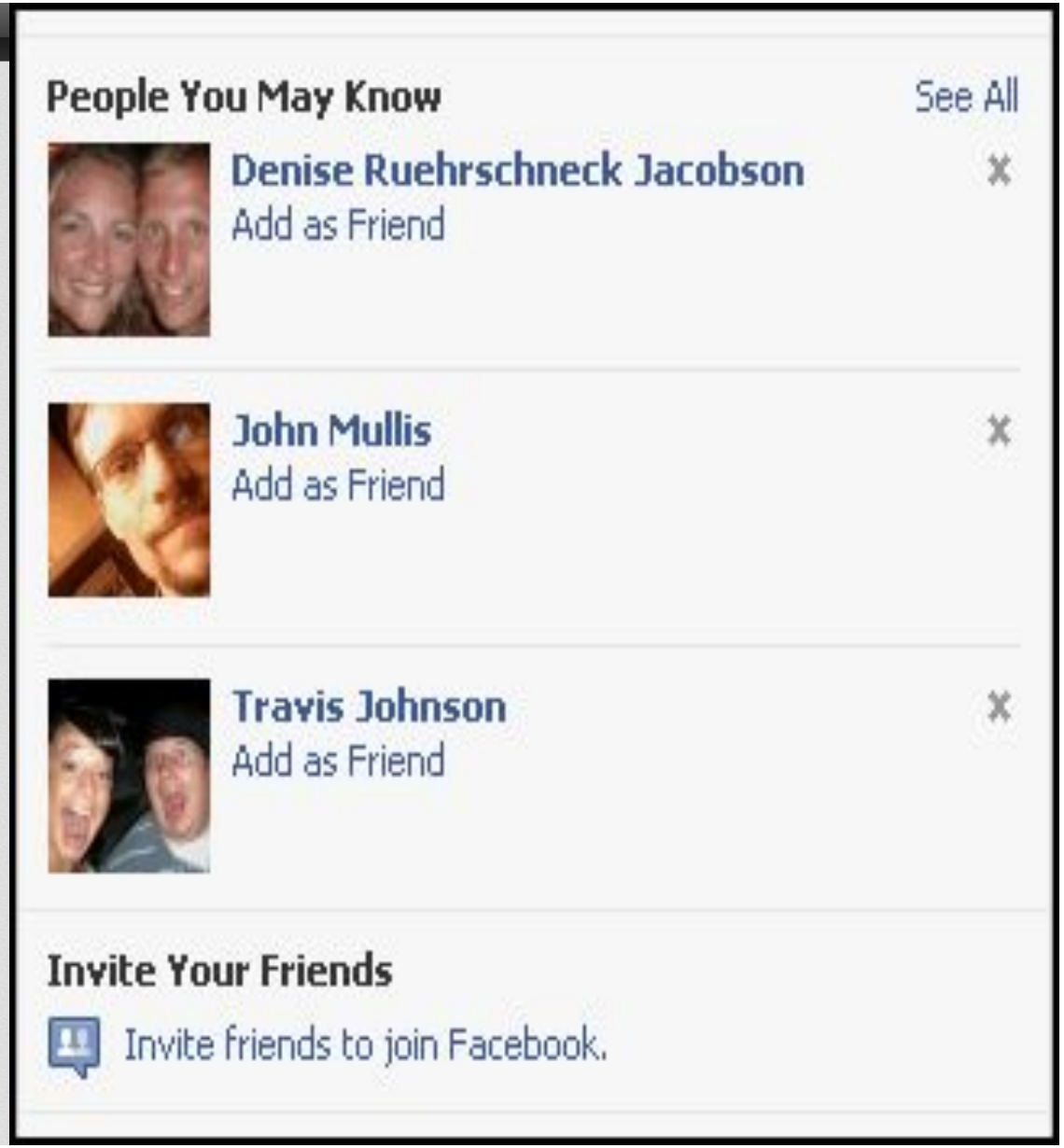
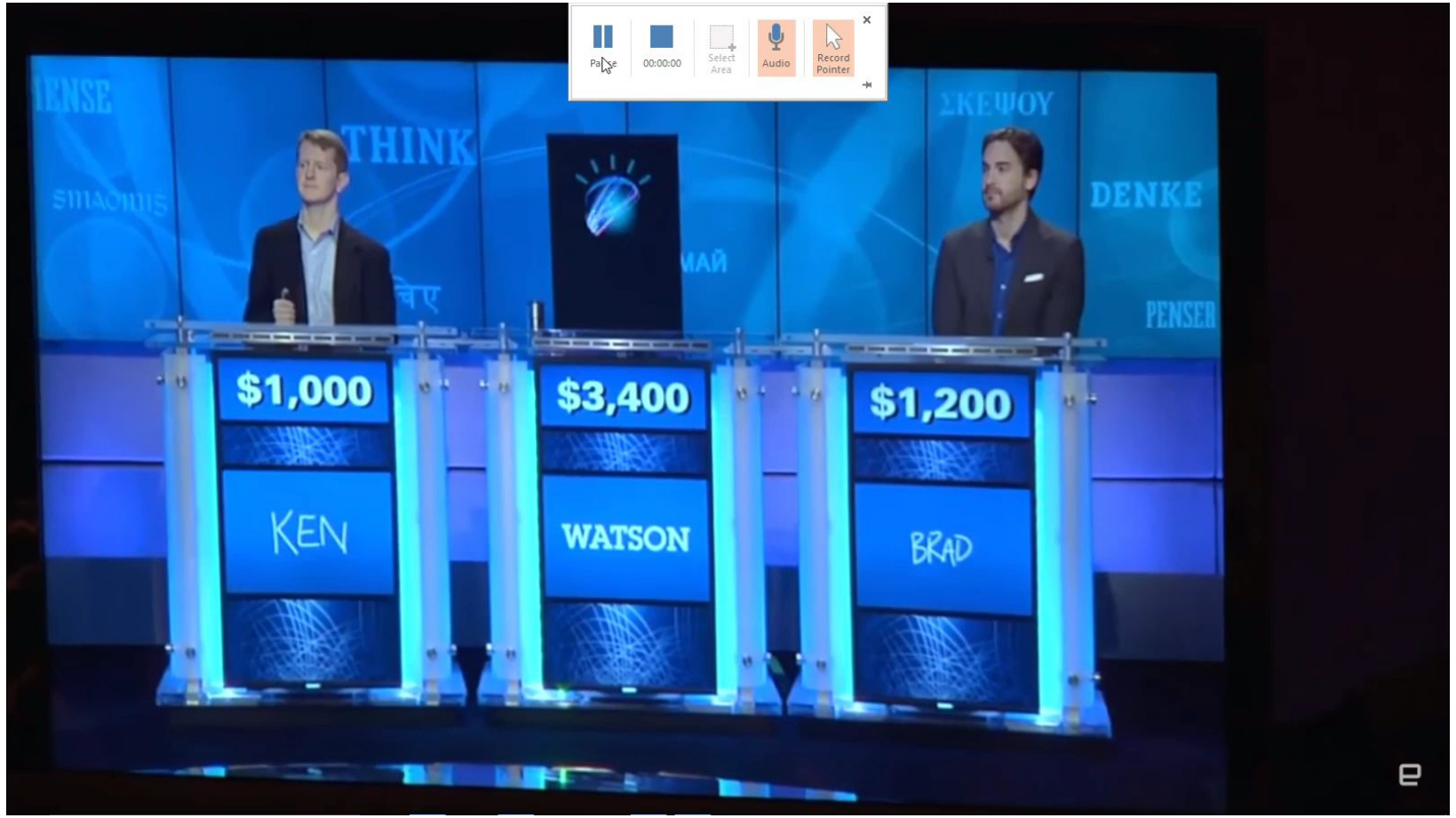

People You May Know
See All
Denise Ruehrschneck Jacobson
Add as Friend
John Mullis
Add as Friend
Travis Johnson
Add as Friend
Invite Your Friends
Invite friends to join Facebook.


PIENSE
THINK
ΣΚΕΨΟΥ
DENKE
PENSER
$24,000
Who is Stoker?
(I FOR ONE WELCOME OUR NEW COMPUTER OVERLORDS)
$1,000
$77,147
Who is Bram Stoker?
$ 17,973
$21,600
WHO IS BRAM STOKER?
$5600


Pause
00:00:00
Select Area
Audio
Record Pointer
THINK
DENKE
PENSER
$1,000
KEN
$3,400
WATSON
$1,200
BRAD


Google
self-driving car

Why Machine Learning is so easy now?

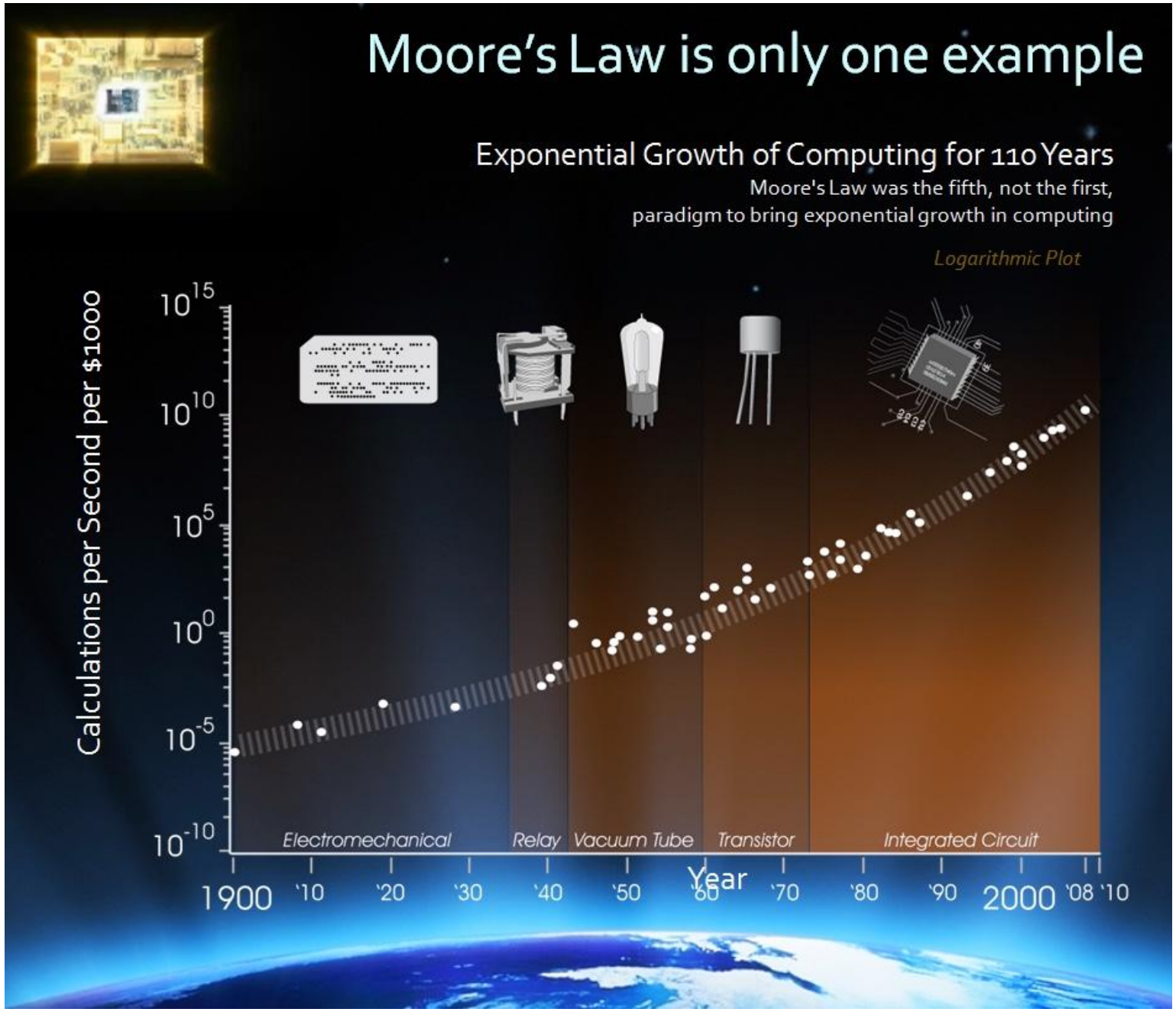
ML has been in the buzz from the 1970s, but why it suddenly started getting more weightage now?

Challenges so far:

Computation : The real challenge, instead, has been the computing horsepower. It takes a long time for machines to learn, to go through all these steps. But as our computers have gotten faster and bigger, machine learning that seemed impossible years ago is now becoming almost commonplace.

Data storage: We need tons of data to train the machines, with the evolution of High storage devices it has been possible now

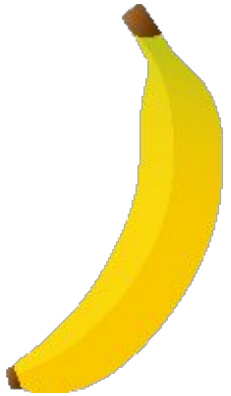
Data processing systems: With the help of Big Data and Distributed Processing systems, it has been possible now.

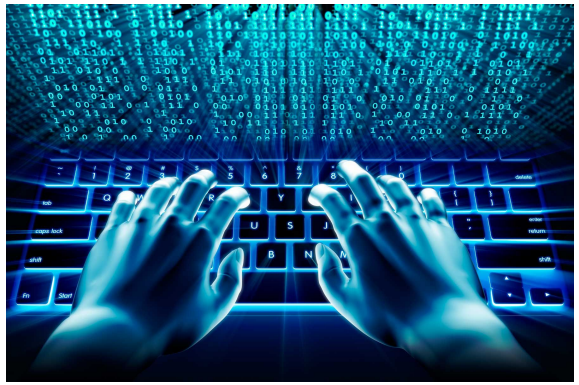

Moore's Law is only one example
Exponential Growth of Computing for 110 Years
Moore's Law was the fifth, not the first,
paradigm to bring exponential growth in computing
Logarithmic Plot
Calculations per Second per $1000
10^15
10^10
10^5
10^0
10^-5
10^-10
Electromechanical
Relay
Vacuum Tube
Transistor
Integrated Circuit
Year
1900
'10
'20
'30
'40
'50
'60
'70
'80
'90
2000
'08
'10

What is Machine Learning?

Baby Learning

?





Machine Learning

?

Traditional Programing Vs Machine Learning

"In God we trust.
All others must bring data."

- Dr. W. Edwards Deming

How do Machines Learn ?

Who does what?

input

prediction

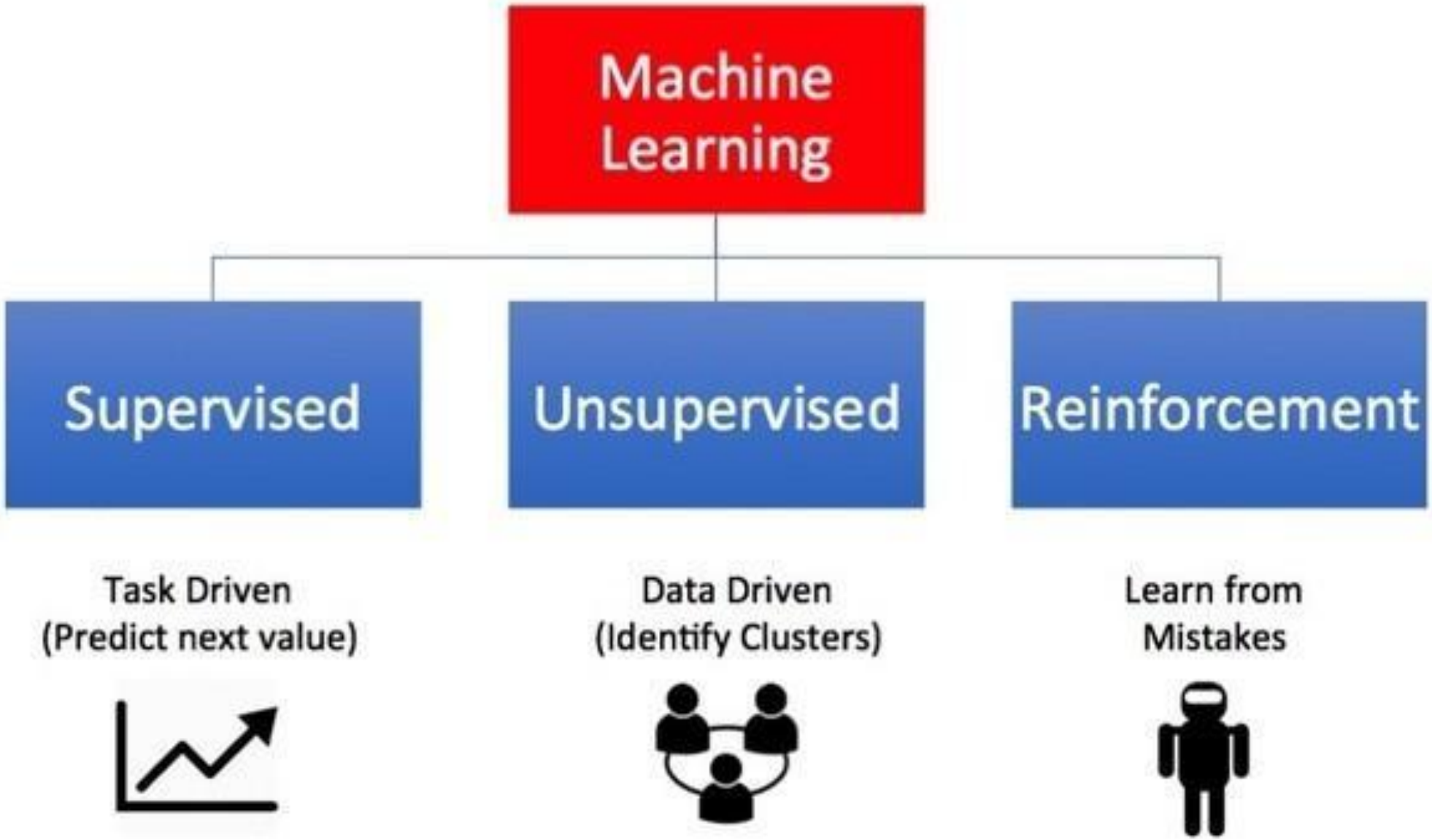
Parameters

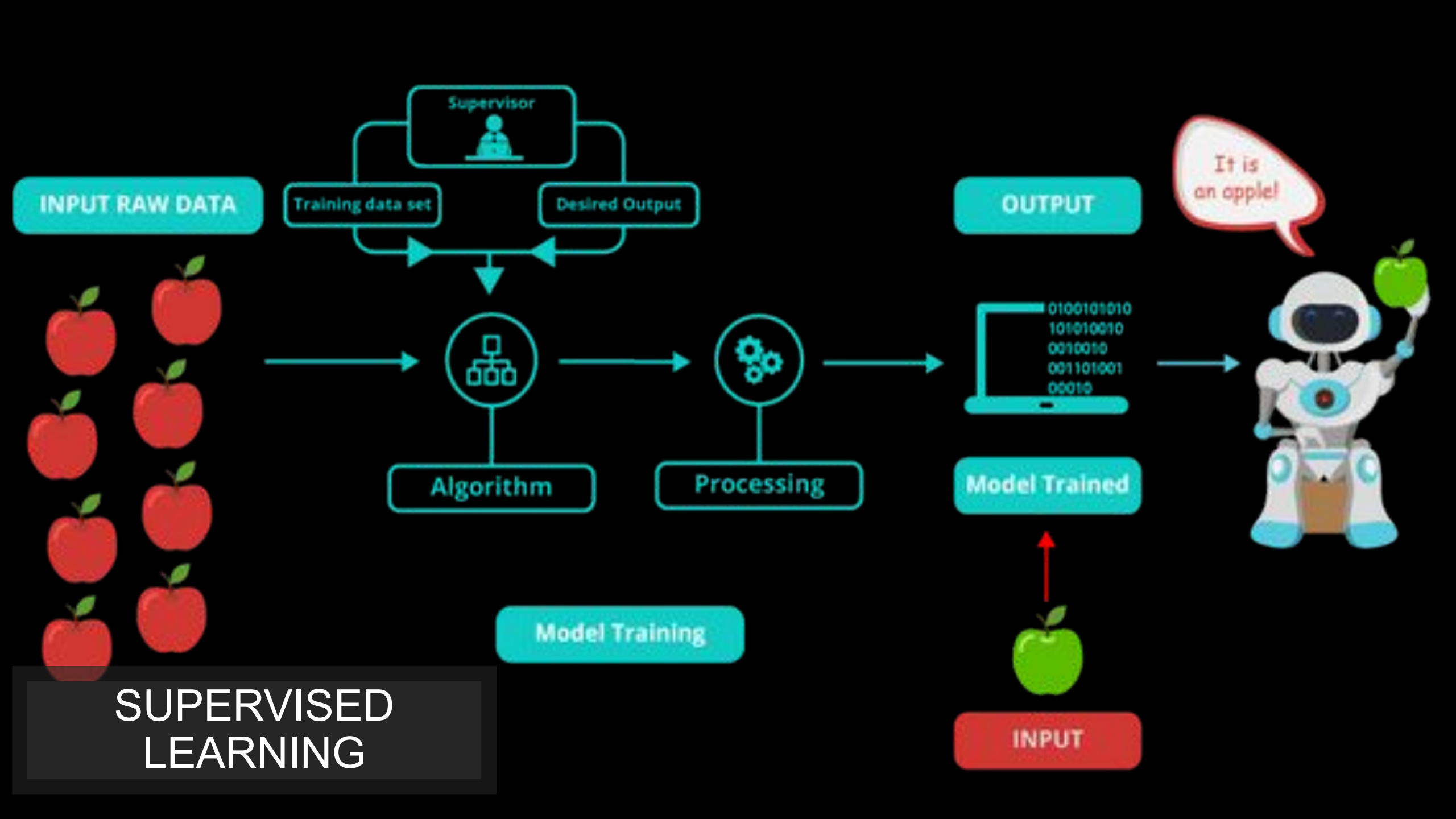
Learner

truth

Research at Google

Types of Machine Learning




Supervisor
INPUT RAW DATA
Training data set
Desired Output
OUTPUT
It is an apple!
0100101010
101010010
0010010
001101001
00010
Algorithm
Processing
Model Trained
Model Training
INPUT
SUPERVISED LEARNING

SUPERVISED LEARNING

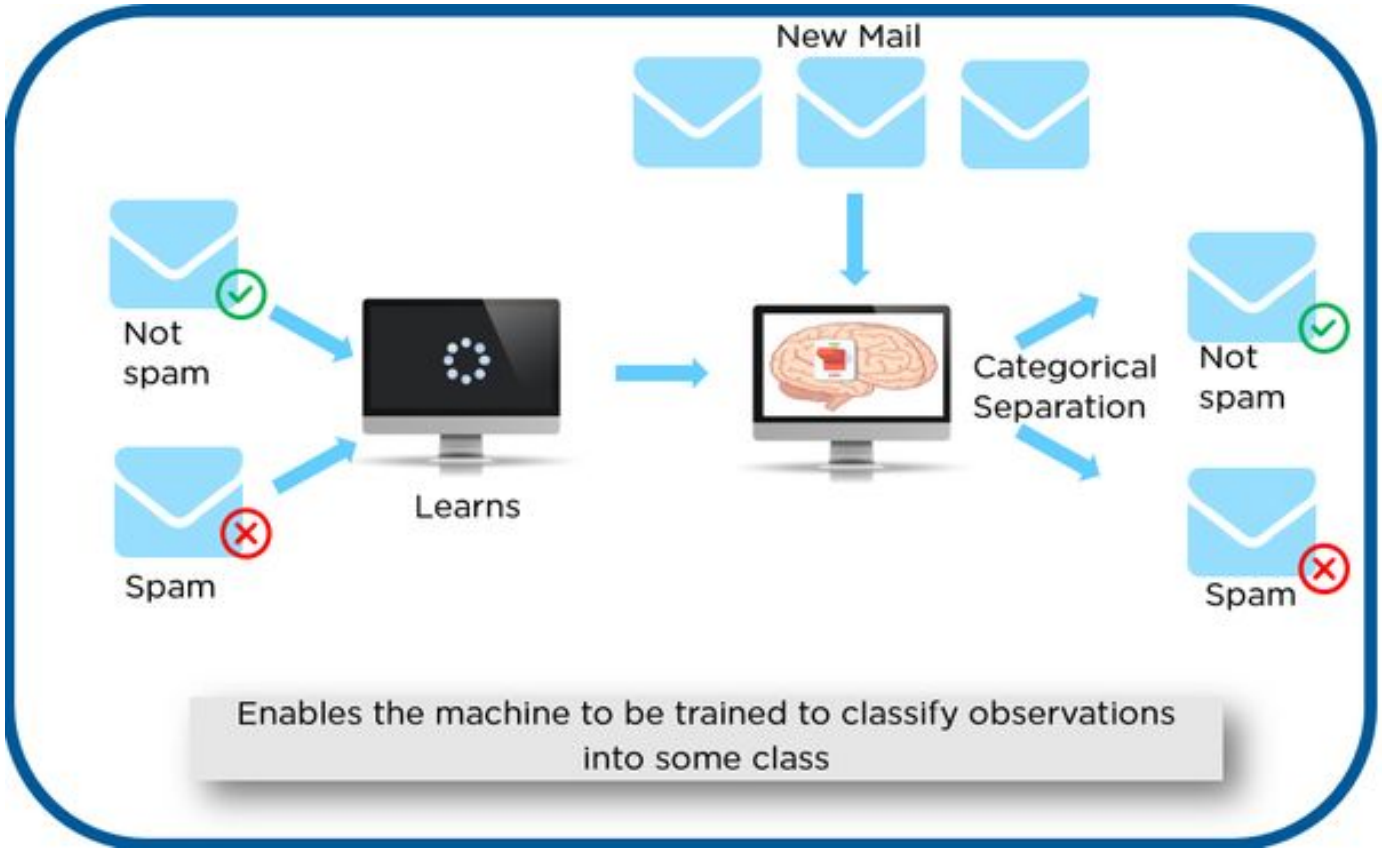
It is the easiest to understand and the simplest to implement. It is very similar to teaching a child with the use of flash cards.

Real life examples of supervised learning

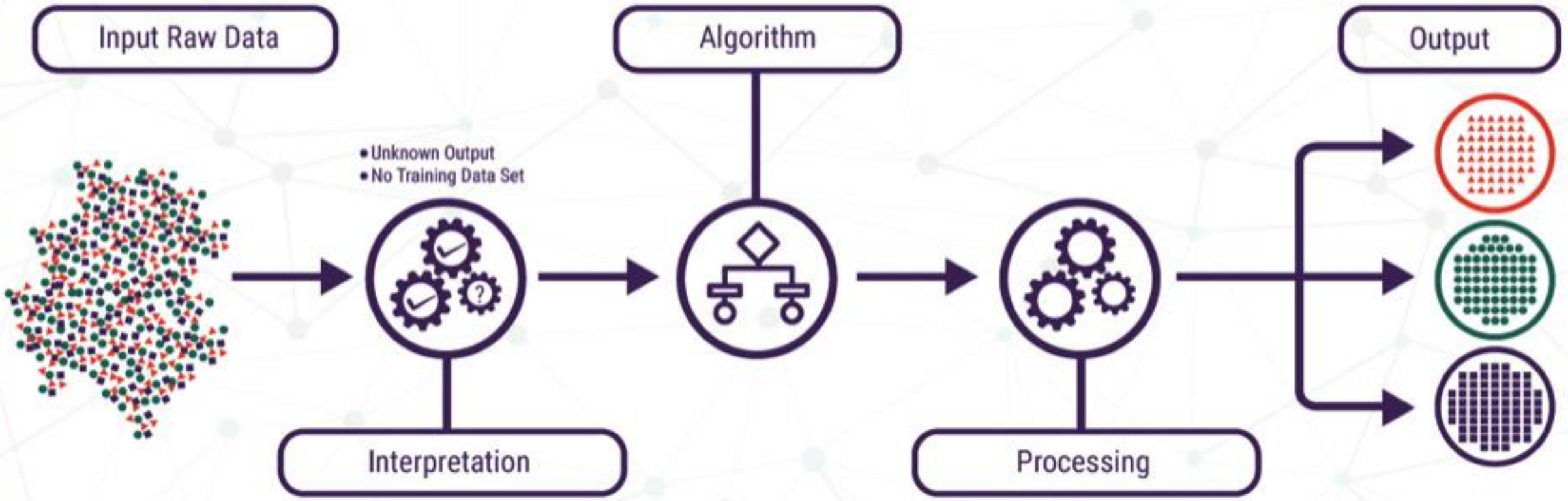
That spam filter is a supervised learning system.

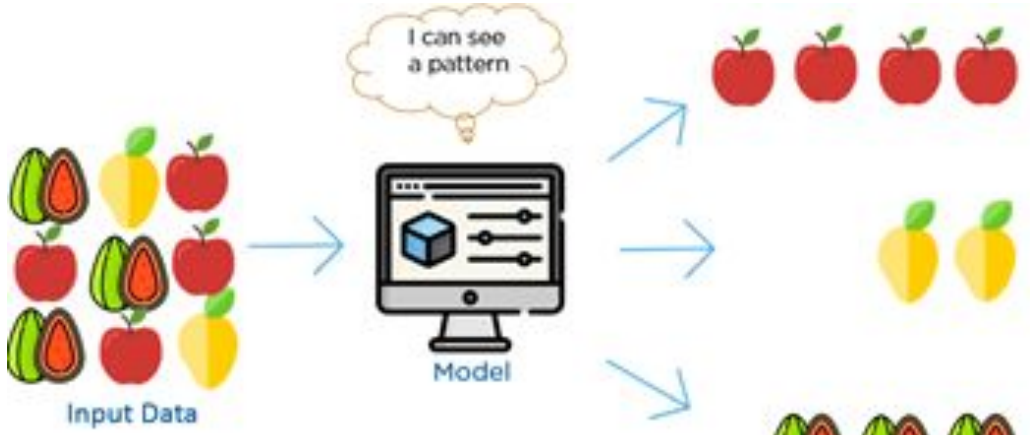
Fed email examples and labels (spam/not spam), these systems learn how to preemptively filter out malicious emails so that their user is not harassed by them.

Many of these also behave in such a way that a user can provide new labels to the system and it can learn user preference.



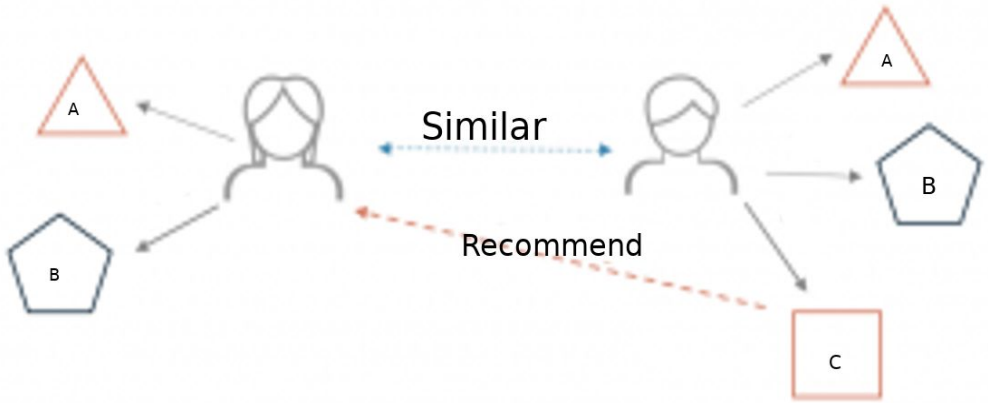
UNSUPERVISED LEARNING





Un-Supervised Learning

- Unsupervised learning is very much the opposite of supervised learning.
- It features no labels.
- Our algorithm would be fed a lot of data and from there, it can learn to group, cluster, and/or organize the data in a way such that a human (or other intelligent algorithm) can come in and make sense of the newly organized data.



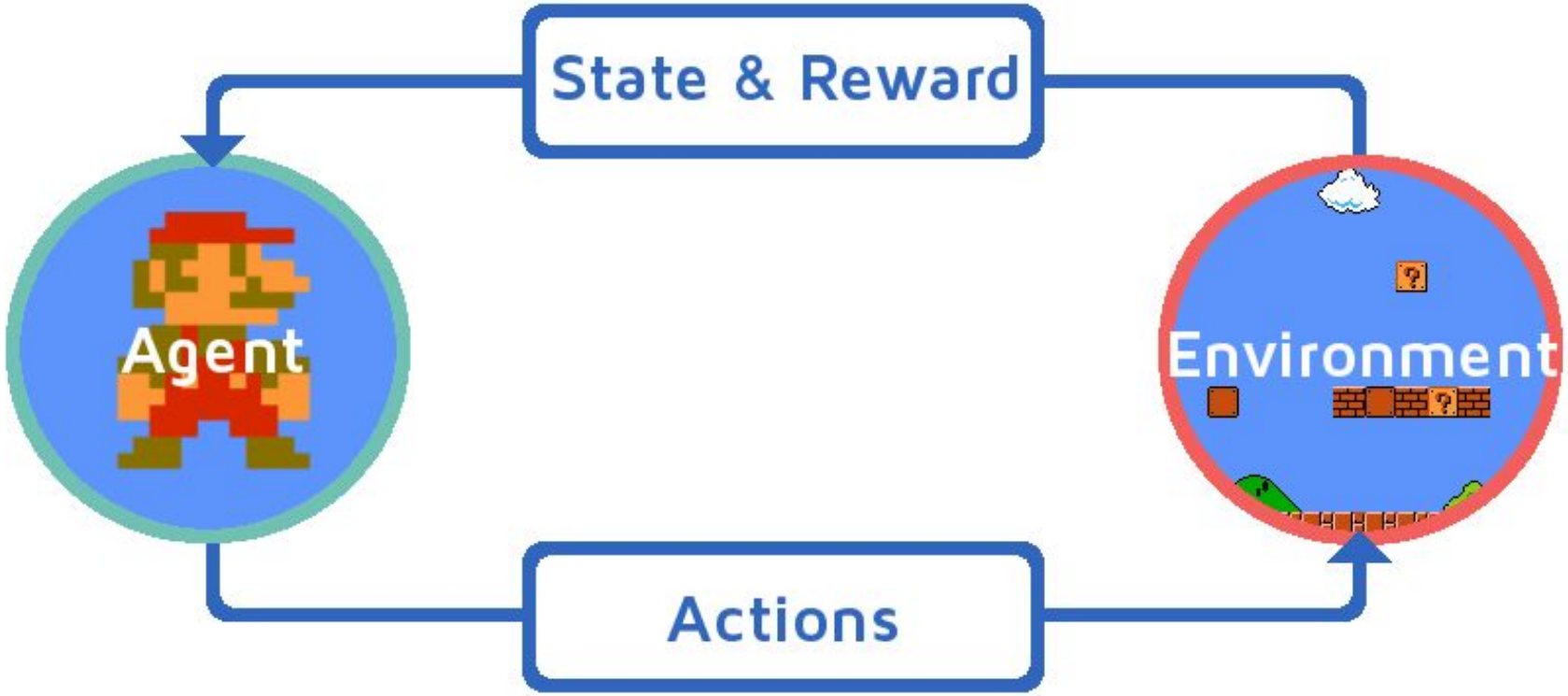
Real life examples of un-supervised learning

Recommender Systems

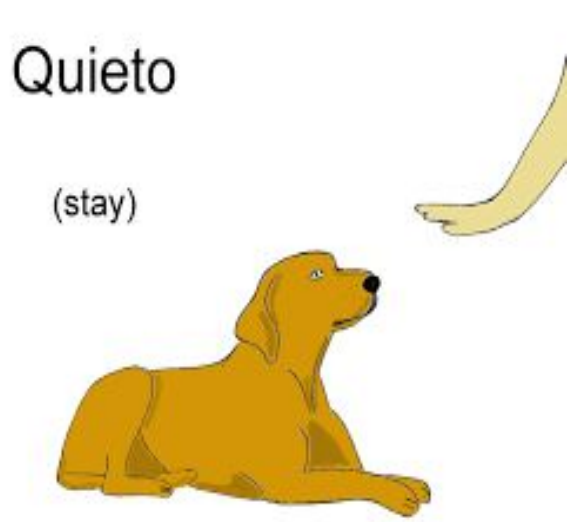
- If you've ever used YouTube or Netflix, you've most likely encountered a video recommendation system.
- Taking into account users that have watched similar videos as you and then enjoyed other videos that you have yet to see, a recommender system can see this relationship in the data and prompt you with such a suggestion.

Reinforcement learning

Action and reward-based learning



Reinforcement Learning



Machine learning systems are made up of three major parts:

- **Model**: the system that makes predictions or identifications.

- **Parameters**: the signals or factors used by the model to form its decisions.

- **Learner**: the system that adjusts the parameters — and in turn the model — by looking at differences in predictions versus actual outcome.

Secret of Learning

Gradient Descent or Gradient Learning:

It means that the system makes those little adjustments over and over, until it gets things right. If you likened it to climbing down a steep mountain. You don't want to jump or run, because that's dangerous. You'll more likely make a mistake and fall. Instead, you inch your way down, carefully, a little at a time.

Example:

https://martechtoday.com/how-machine-learning-works-150366

- The learner will again and again adjust the parameters, to reshape the model. Another set of test data will be inputted. A comparison will happen again, and the learner will again adjust the model.

- The cycle will keep repeating until there's a high degree of confidence in the ultimate model, that it really is predicting the outcome of scores based on hours of study. Nearly all successful system uses it, works for 2 parameters or 2 billion

Problem set

- A Specific metallic component is wearing out with use in an acidic environment

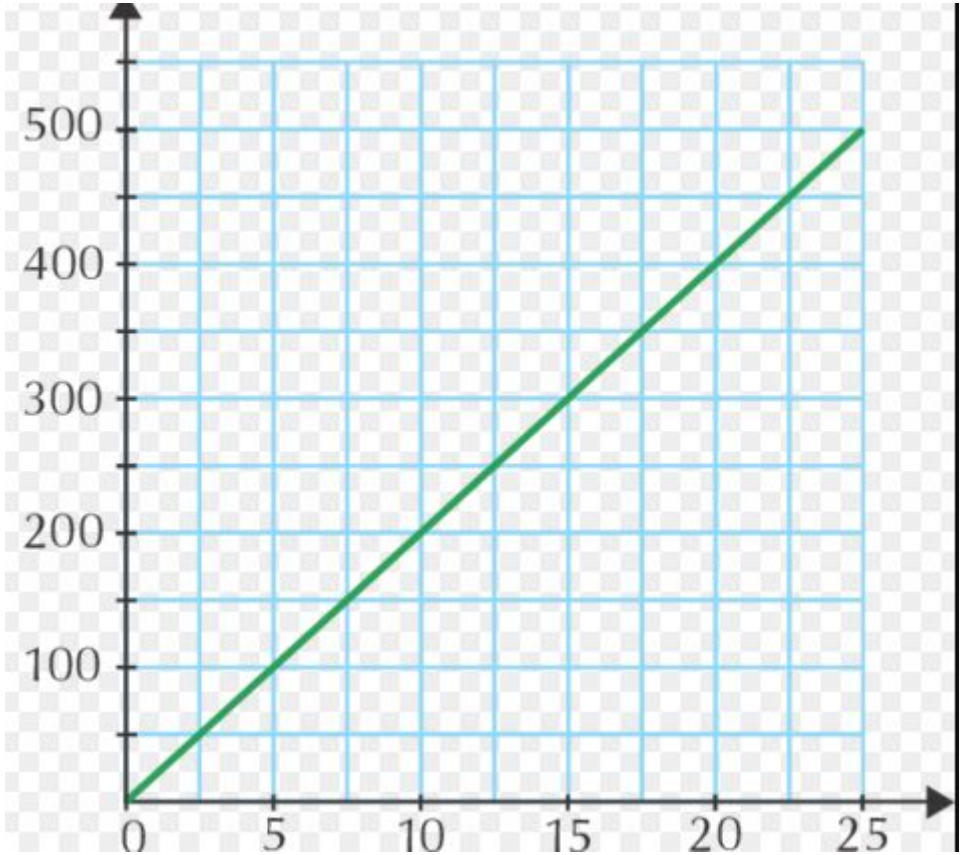
- How do we understand and use this component?

Approach 1…… Science

- A chemist studies what happens to the material in acid and understands that the metal is reacting with the hydrogen in the acid to form a vapor.

- Comes up with a equation and science behind

Approach 2…….Engineering



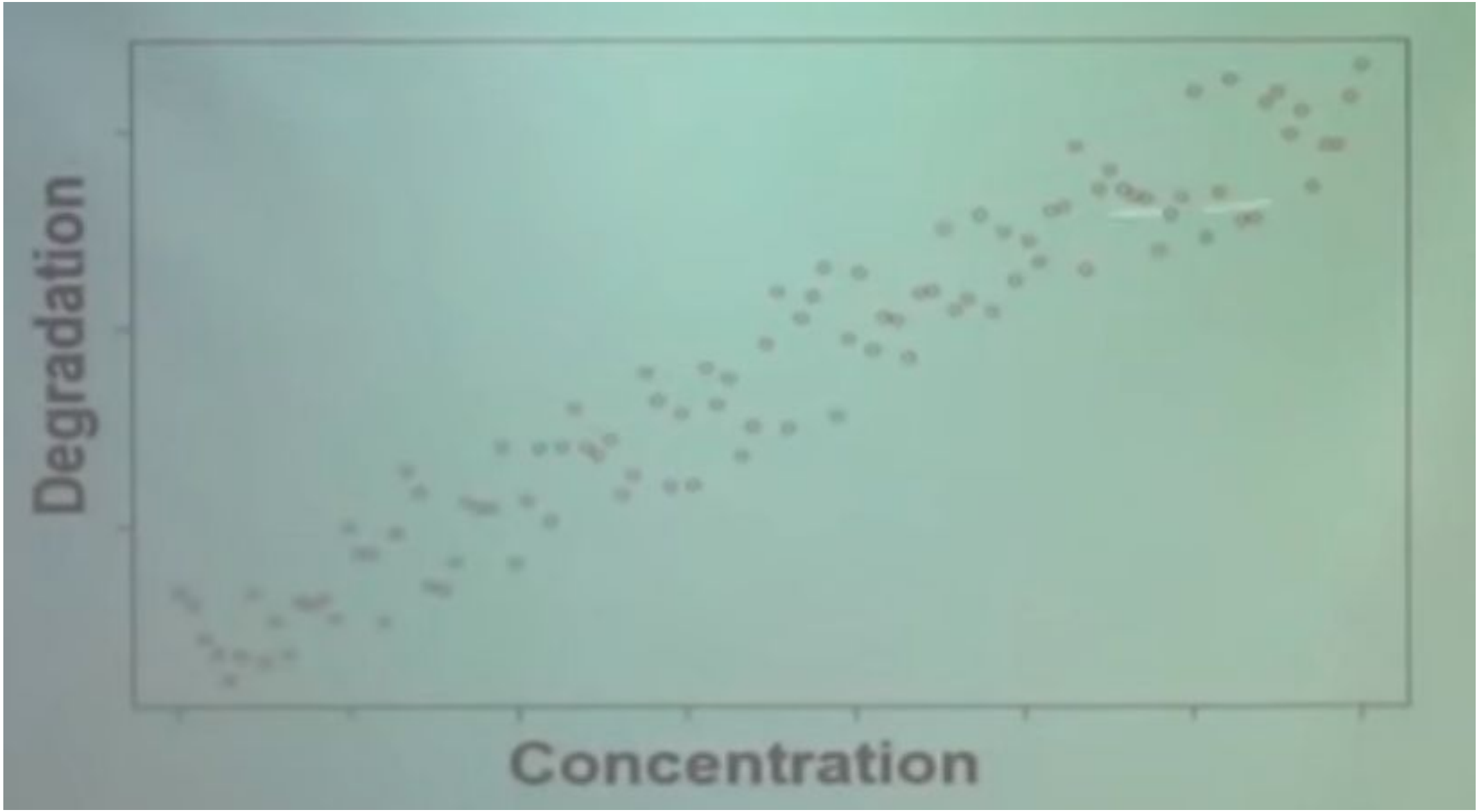
- An engineer tests the degradation in a few concentrations and temperature, plots the degradation, validate the theory and comes up with the thumbs up rule

Deductive learning

- A few hypothesis that cannot be proved
- Rest of science is developed by extending these using mathematics and experiments

Inductive Learning
Approach 2

- Measure the degradations in hundreds of conditions (temperatures and concentrations for various times)


Degradation
Concentration

Result is same but

- Do not know the reasons(causations are not known and only correlations are identified)
- Walmart example(does not tell how to act)
- Marketing customer(does not tell the reason)

Where it does not work

- Fails when randomness prevails
- Need a lot of data to come to the correct conclusions

"In God we trust.
All others must bring data."

- Dr. W. Edwards Deming

Machine learning wonders at past


Google
Google Search
I'm Feeling Lucky

amazon.com

Hello, Gil Starkey. We have recommendations for you. (Not Gil?)

Gil's Amazon.com | Today's Deals | Gifts & Wish Lists | Gift Cards

Shop All Departments | Search All Departments

Your Amazon.com › Your Amazon Facebook Page

Facebook Profile Info

Edit your Facebook profile

Birthday:
June 10

Current City:
Chicago, Illinois

You don't have any information about favorite books, music, or movies on Facebook. Edit your Facebook profile and add your favorites to get personalized recommendations on this page.

Birthday and Gift Suggestions for Your Friends on Facebook

November 1
(in 3 weeks)
See gift suggestions

November 23
See gift suggestions

December 8
See gift suggestions

December 27
See gift suggestions

Janu
See

› See all friends on Facebook and their birthdays

Popular Among Your Friends on Facebook

The Godfather DVD Collection... DVD ~ Marlon Brando

(630) $41.49

2 friends like this:

› See more

Back in Black ~ AC/DC

(677) $9.99

2 friends like this:

› See more

Goldfinger DVD ~ Sean Connery

(239) $12.49

1 friend likes this:

› See more

The Beatles Stereo Box Set ~ The Beatles

(383) $188.00

2 friends like this:

› See more

As a Man Thinketh by James Allen

(261) $3.50

1 friend likes this:

› See more

Close

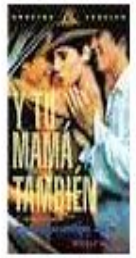
Other Movies You Might Enjoy

Amelie

Add

Not Interested

Y Tu Mama Tambien



Add

Not Interested

Eiken has been added to your Queue at position 2.

This movie is available now.

Move To Top Of My Queue

< Continue Browsing

Visit your Queue >

Guys and Balls

Add

Not Interested

Mostly Martha

Add

Not Interested

Only Human

Add

Not Interested

Russian Dolls

Add

Not Interested

Close

Computers can Learn

Automatic drug discover

Geoffrey Hinton

From Wikipedia, the free encyclopedia

Geoffrey Everest Hinton FRS[12] (born 6 December 1947) is a British-born Canadian[13] cognitive psychologist and computer scientist, most noted for his work on artificial neural networks. As of 2015 he divides his time working for Google and University of Toronto.[14] He was one of the first researchers who demonstrated the use of generalized backpropagation algorithm for training multi-layer neural nets and is an important figure in the deep learning community.[15][16][17]

Contents [hide]

Education [edit]

Hinton was educated at King's College, Cambridge graduating in 1970, with a Bachelor of Arts in experimental psychology.[1] He continued his study at the University of Edinburgh where he was awarded a PhD in artificial intelligence in 1977 for research supervised by Christopher Longuet-Higgins.[3][18]

Career [edit]

After his PhD he worked at the University of Sussex, the University of California, San Diego, Carnegie Mellon University.[1] He was the founding director of the Gatsby Charitable Foundation Computational Neuroscience Unit at University College London,[1] and is currently[19] a professor in the computer science department at the University of Toronto. He holds a Canada Research Chair in Machine Learning. He is the director of the program on "Neural Computation and Adaptive Perception" which is funded by the Canadian Institute for Advanced Research. Hinton taught a free online course on Neural Networks on the education platform Coursera in 2012.[20] Hinton joined Google in March 2013 when his company, DNNresearch Inc, was acquired. He is planning to "divide his time between his university research and his work at Google".[21]

Geoffrey Hinton

Born	Geoffrey Everest Hinton 6 December 1947 (age 69)[1] Wimbledon, London
Residence	Canada
Fields	Machine learning Neural networks Artificial intelligence Cognitive science Object recognition[2]
Institutions	University of Toronto Google

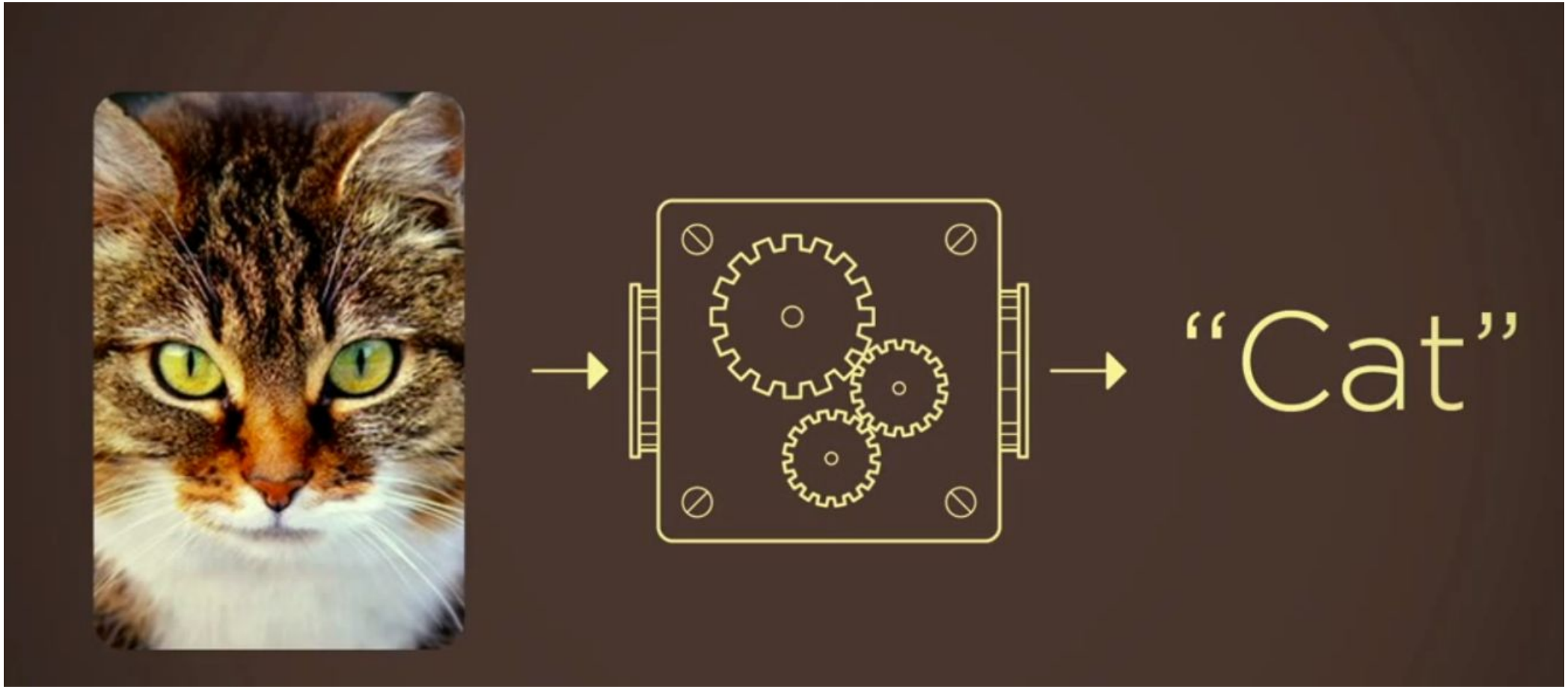
Google DeepMind

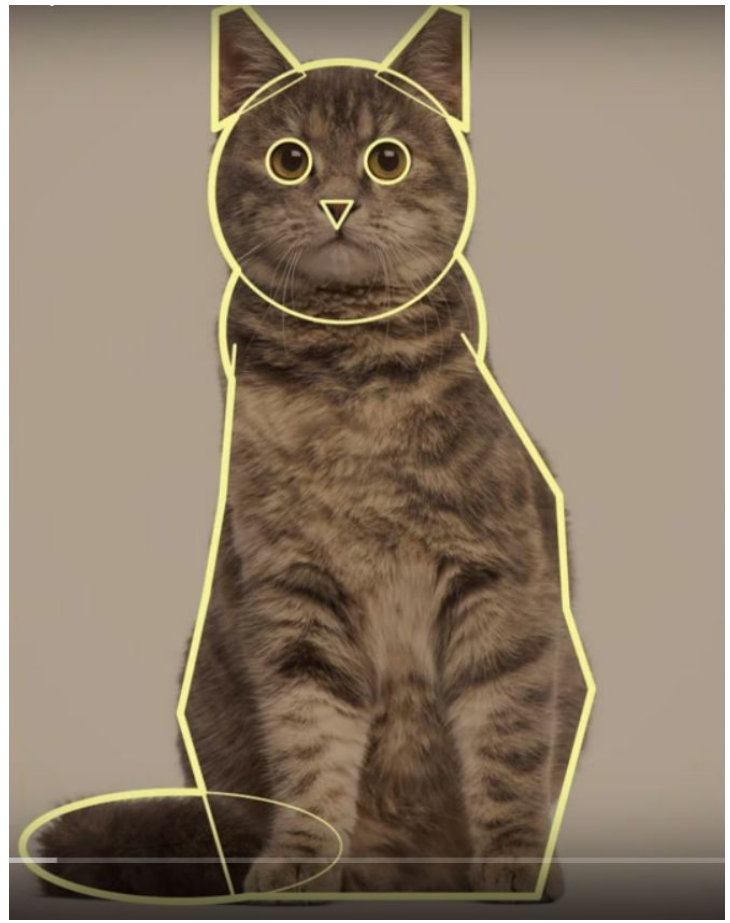
Computers can listen and understand

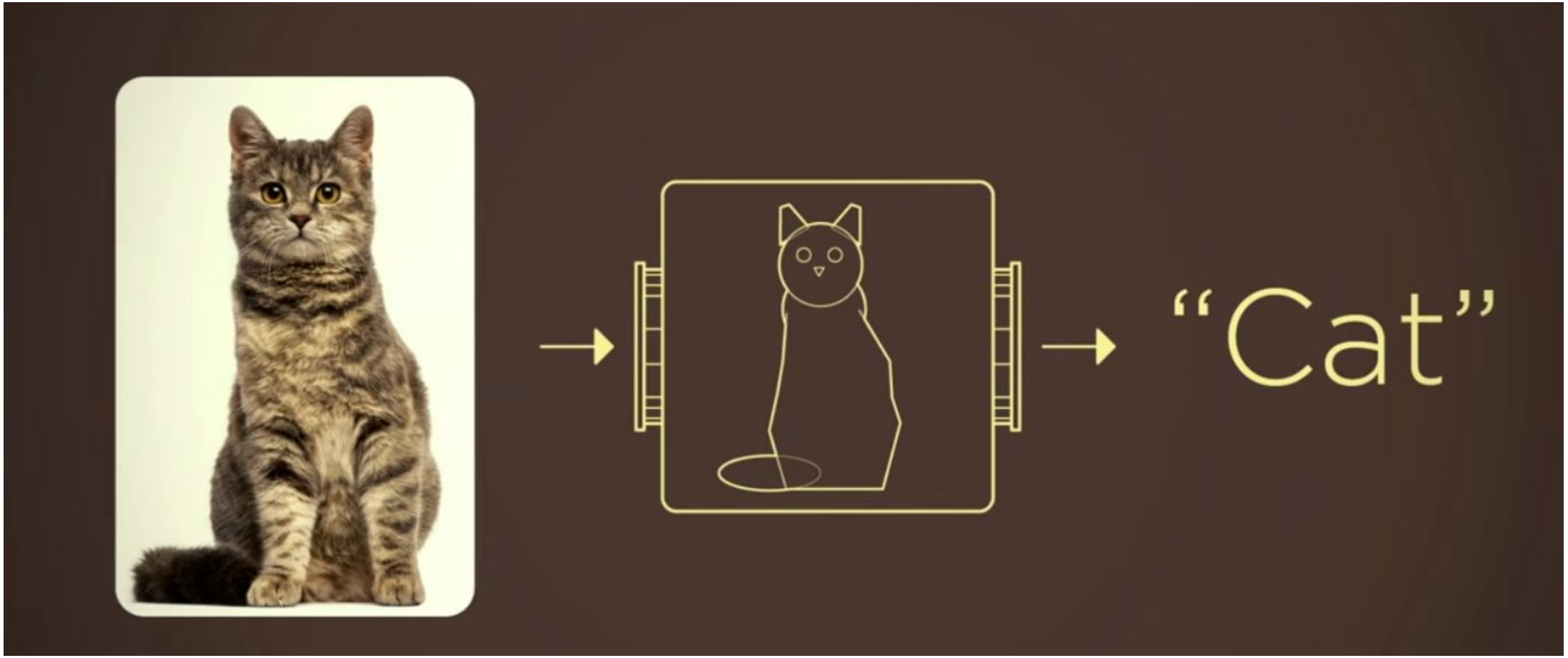

ler in chinese is not the same as the word order in english.
produce something that began to resemble something that
hinese speaker mindset.
now we're talking the things I'm not saying they were
本进行重新排序。
一种产品开始像说中文的人心态的东西。

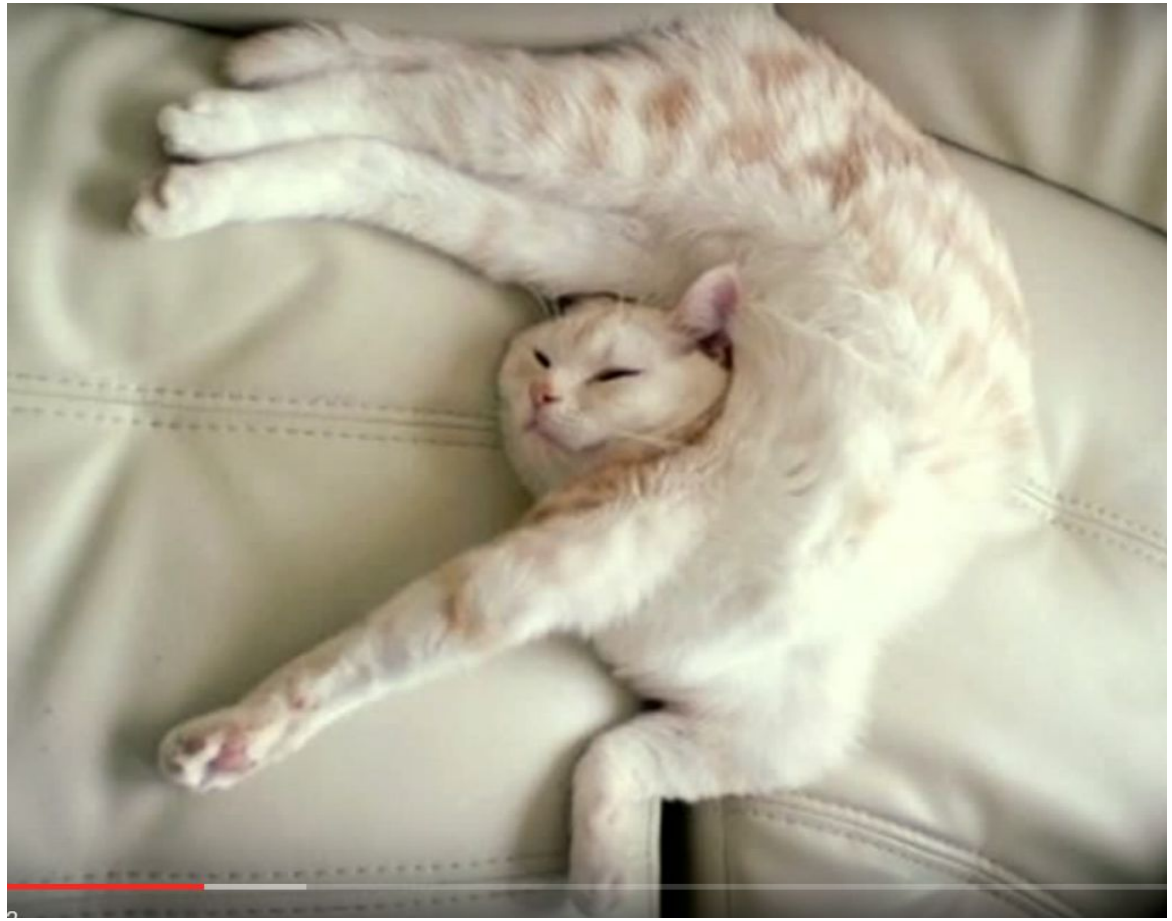
Computers can see

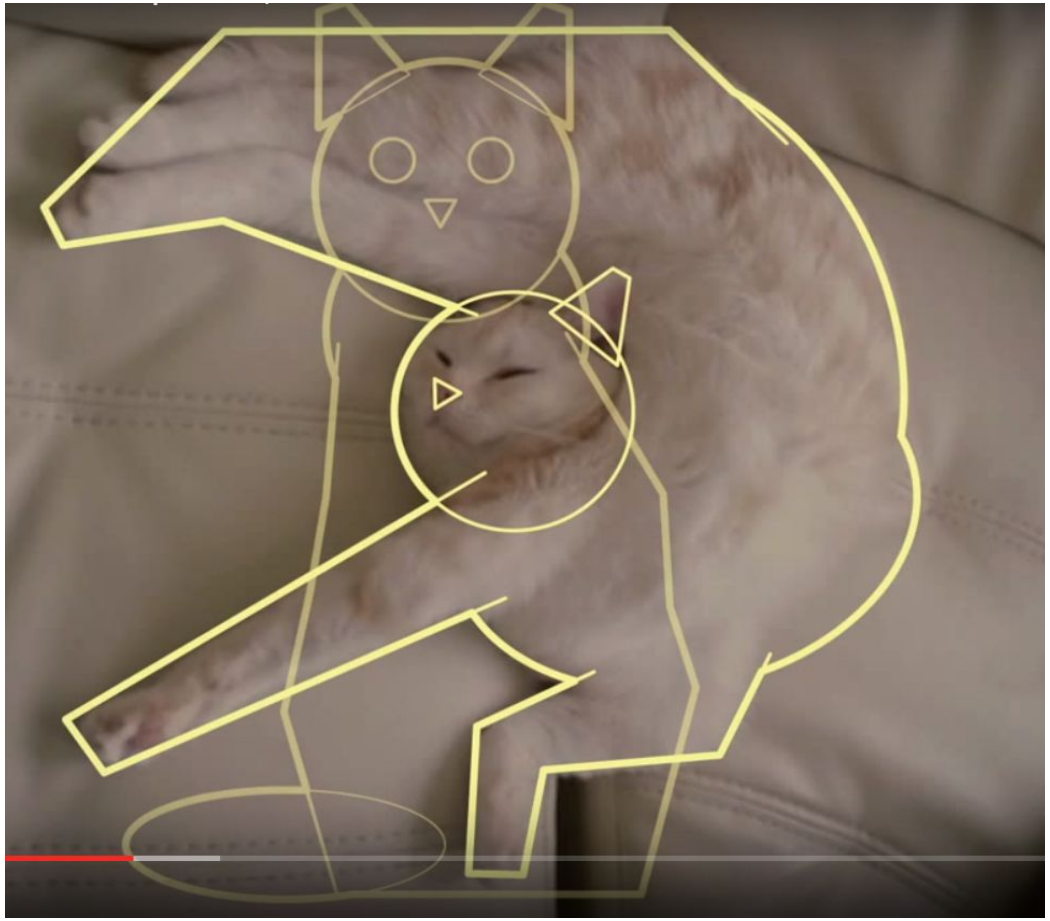

Pause
00:00:00
Select Area
Audio
Record Pointer

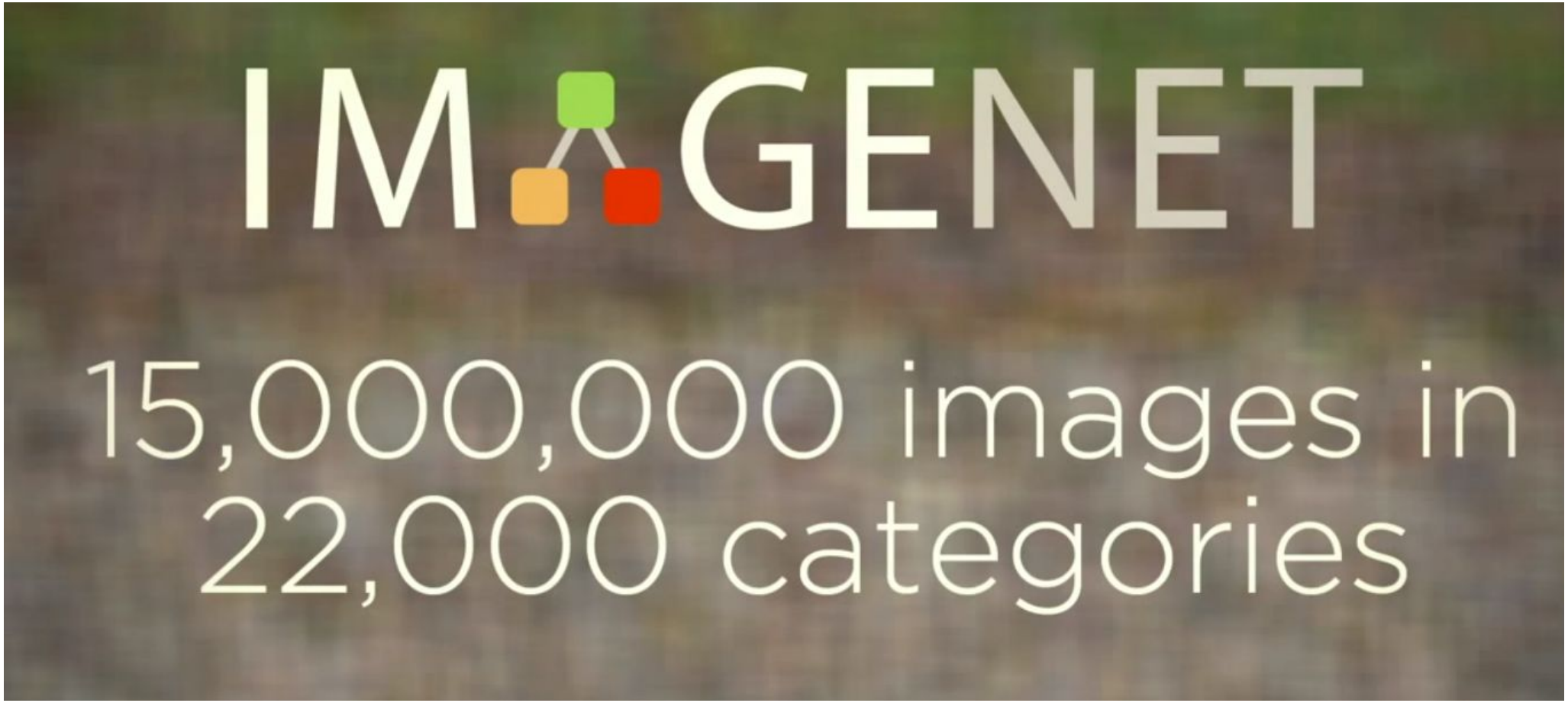

"Cat"

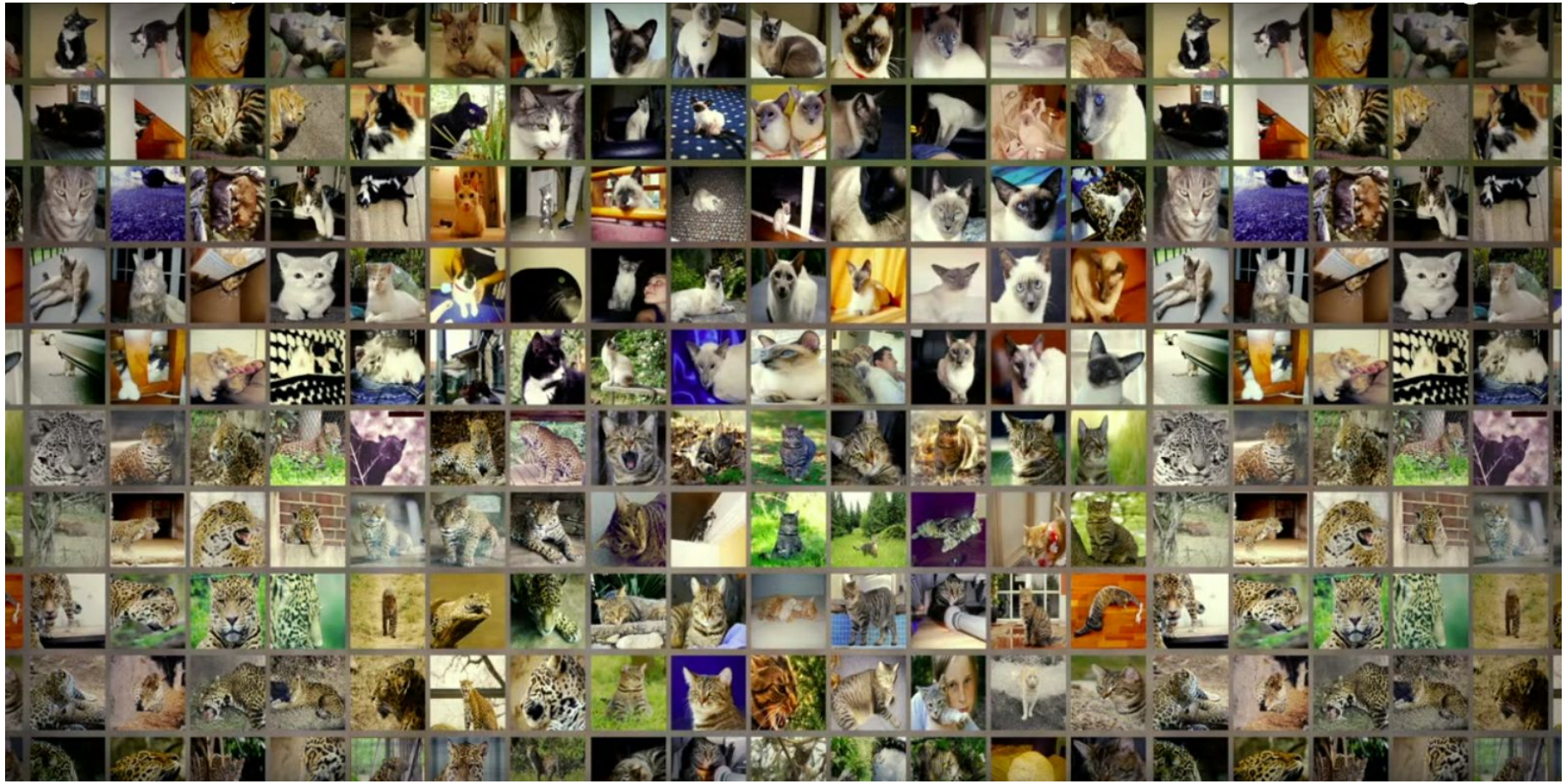


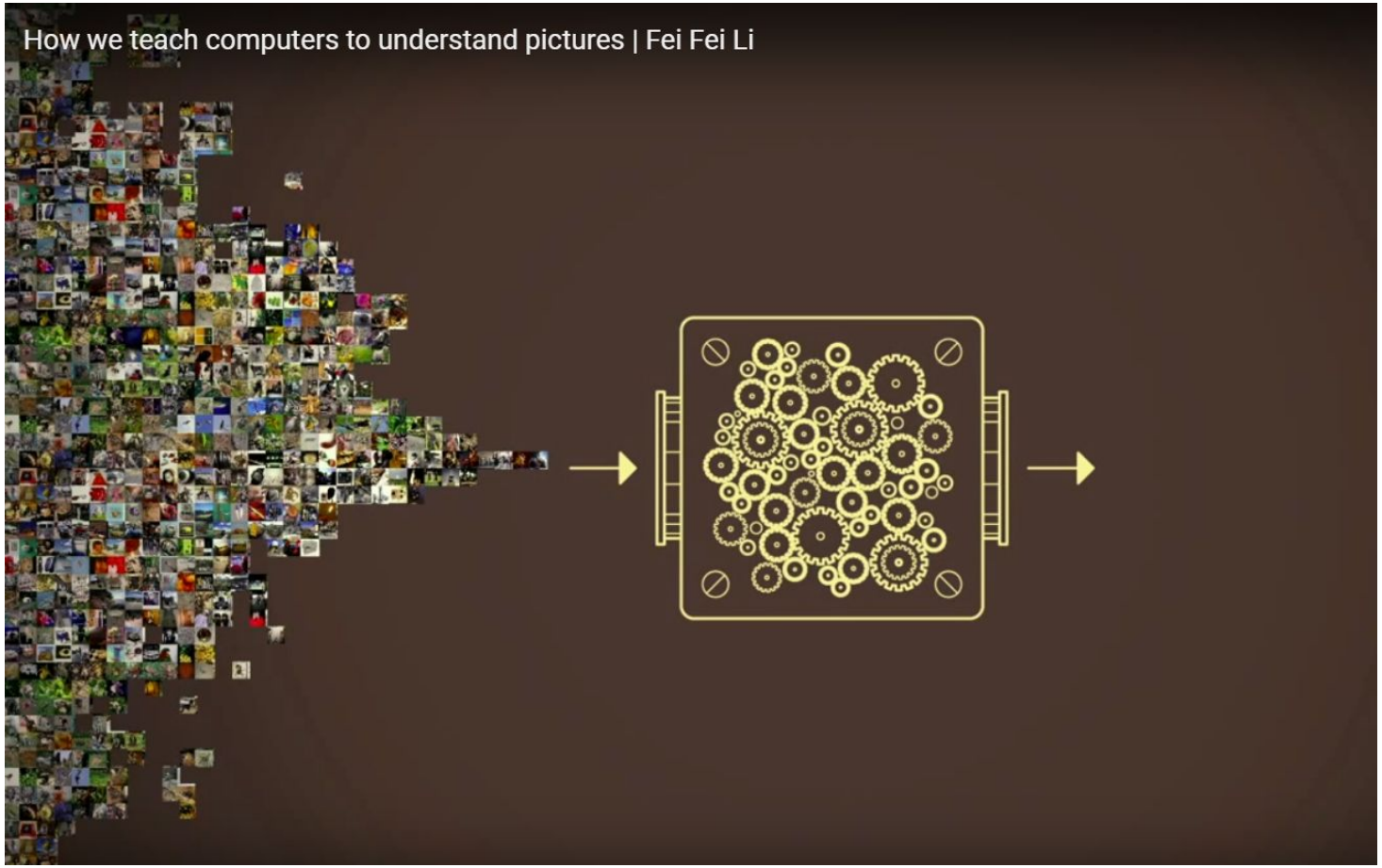

“Cat”

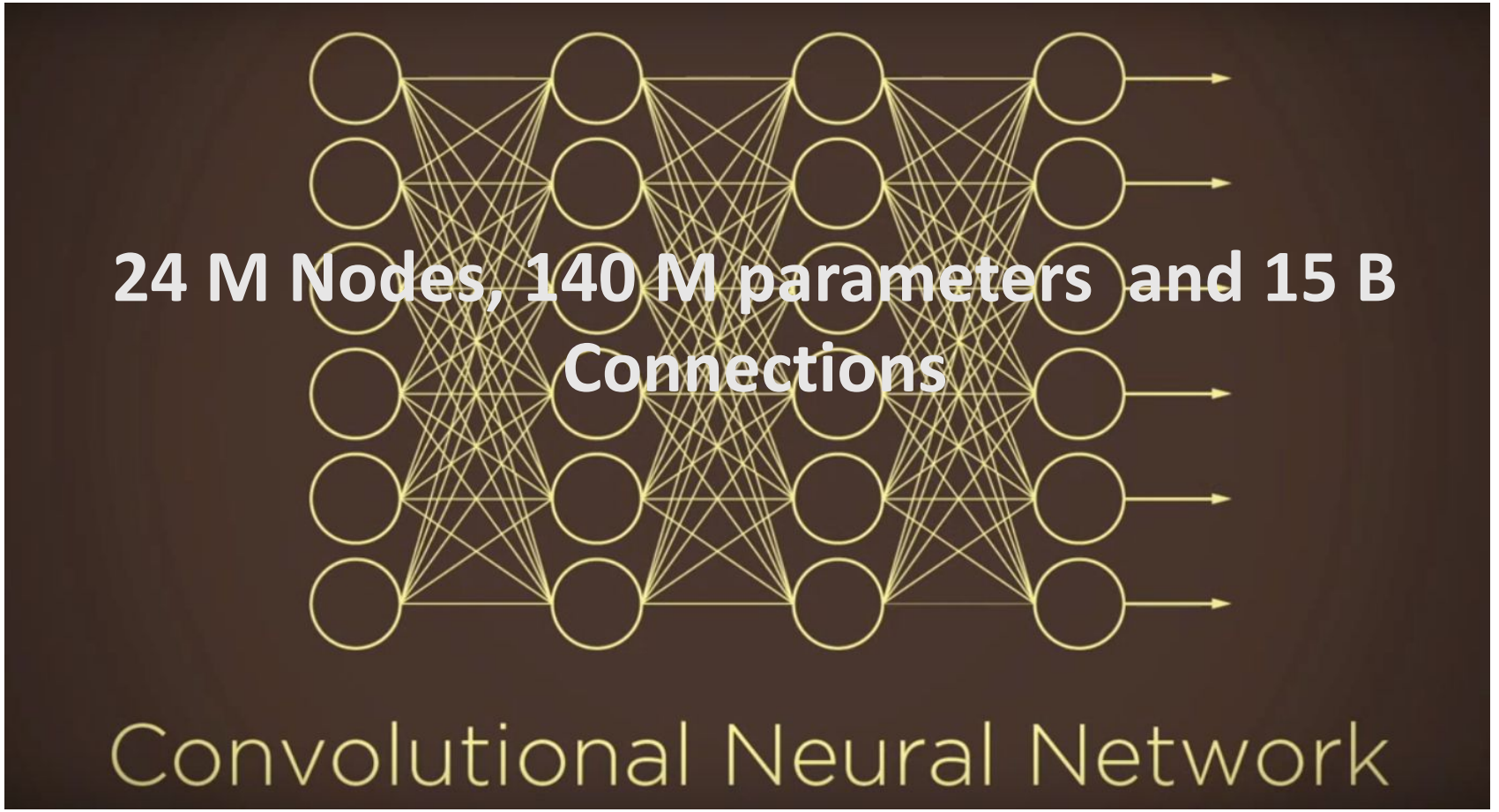





IMAGENET
15,000,000 images in
22,000 categories




How we teach computers to understand pictures | Fei Fei Li


24 M Nodes, 140 M parameters and 15 B Connections
Convolutional Neural Network

Some Interesting things around AI

- Artificial Intelligence created its own Movie

https://arstechnica.com/gaming/2016/06/an-ai-wrote-this-movie-and-its-strangely-moving/

- Artificial Intelligence created its own Music
- https://www.youtube.com/watch?v=3OEmzI52stk
- Artificial Intelligence created its own Art
- https://www.youtube.com/watch?v=Sbd4NX95Ysc

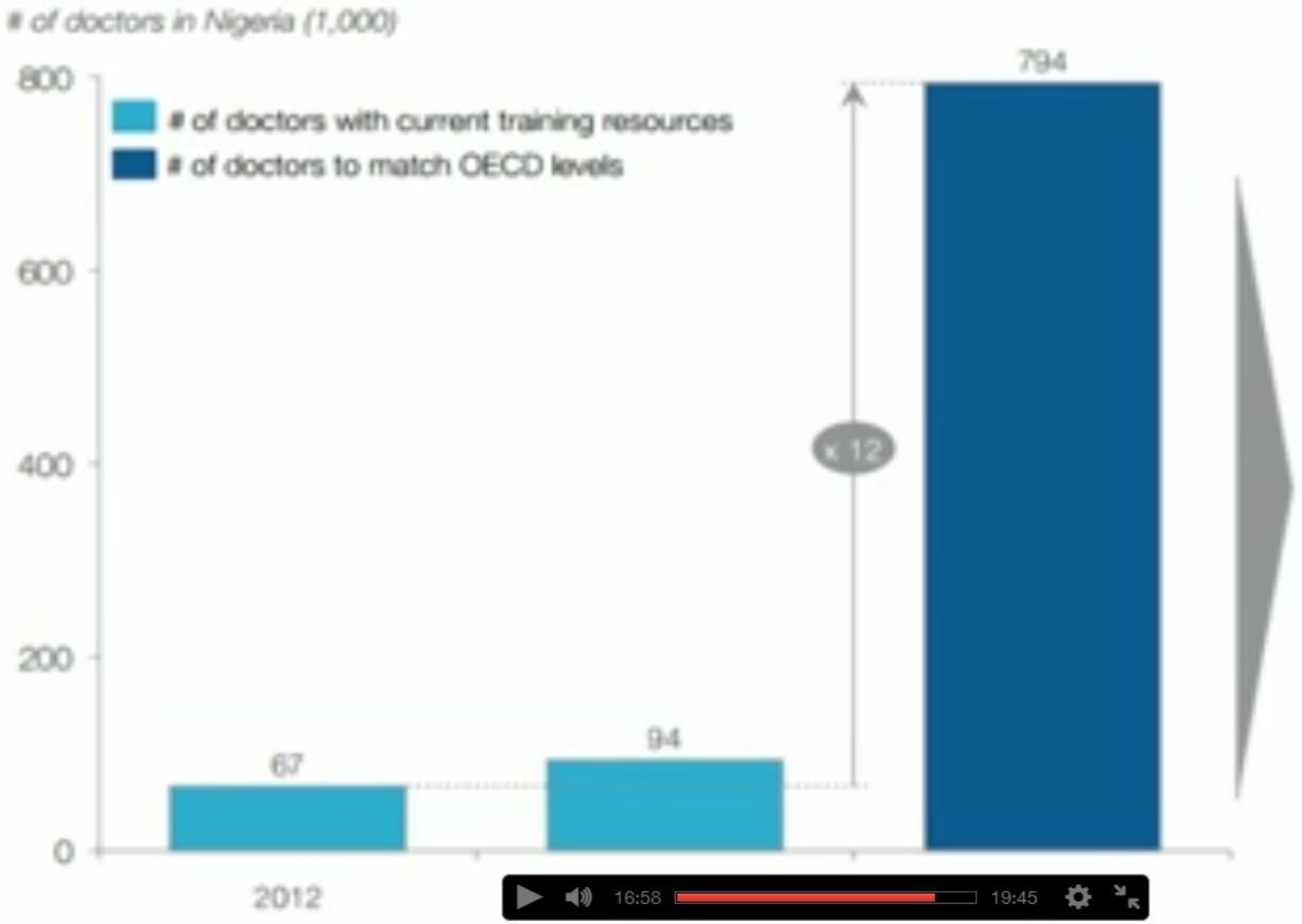
For Future

Exhibit 1: Imitating Traditional Development Paths Is Impossible for Emerging Economies
Nigeria would need over 700,000 additional doctors to reach OECD levels by 2030

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

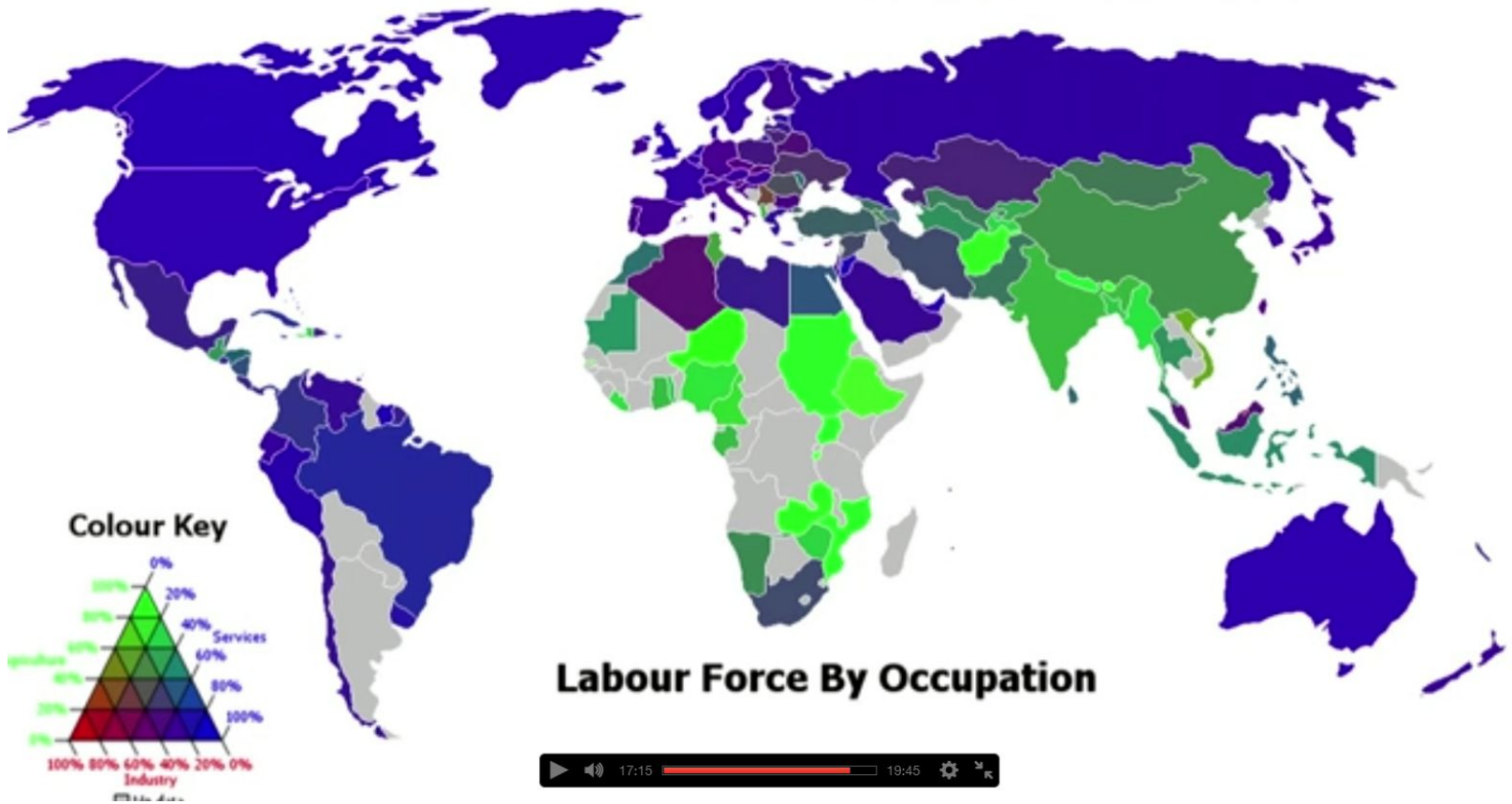
Sources: World Bank, WHO, Africa Health Workforce Observatory, BMI, IFC, BCG



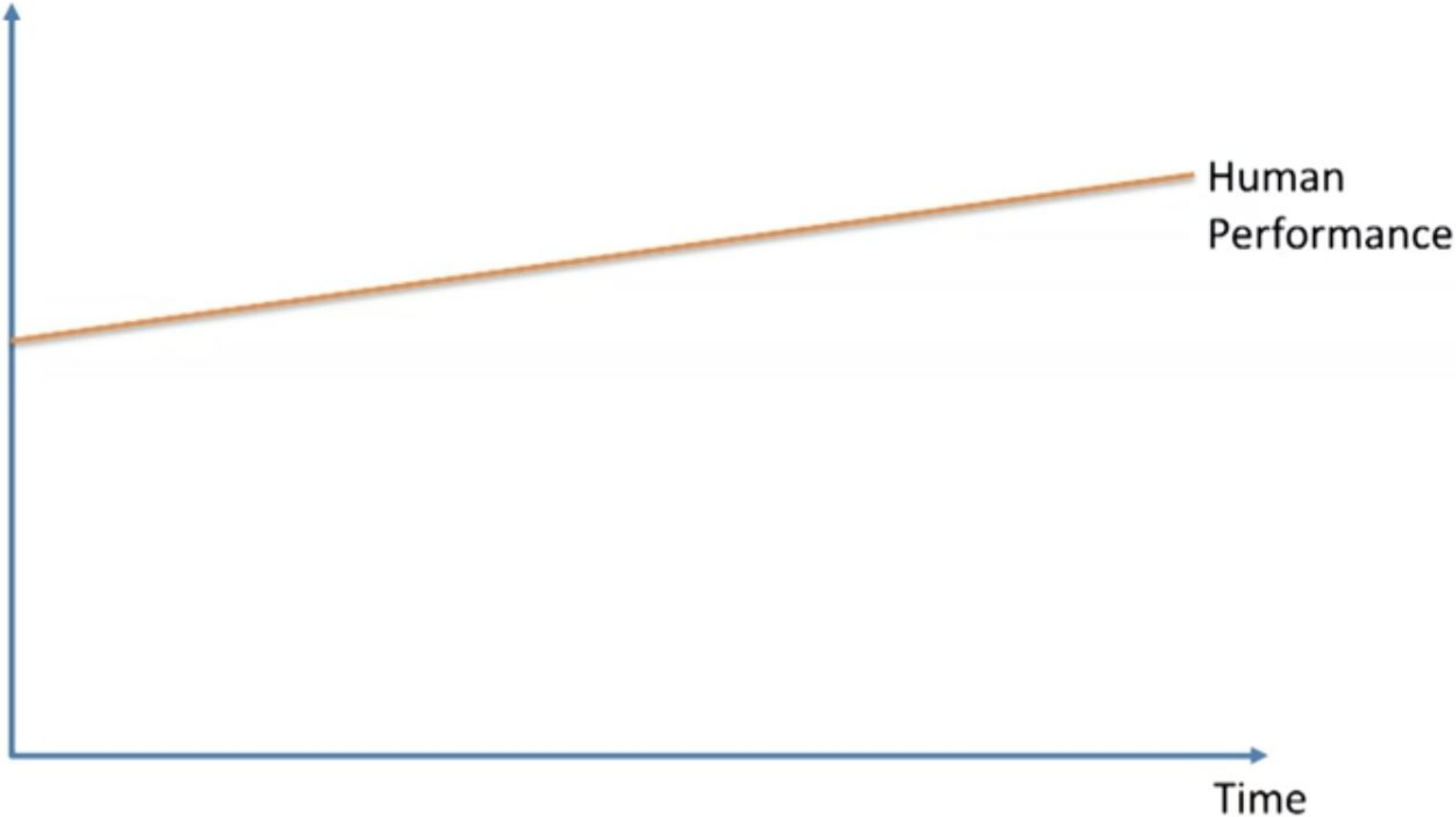
Cost:
US$ 51 billion, equalling 20% of GDP (2012) or 10 times public health expenditure (2012)

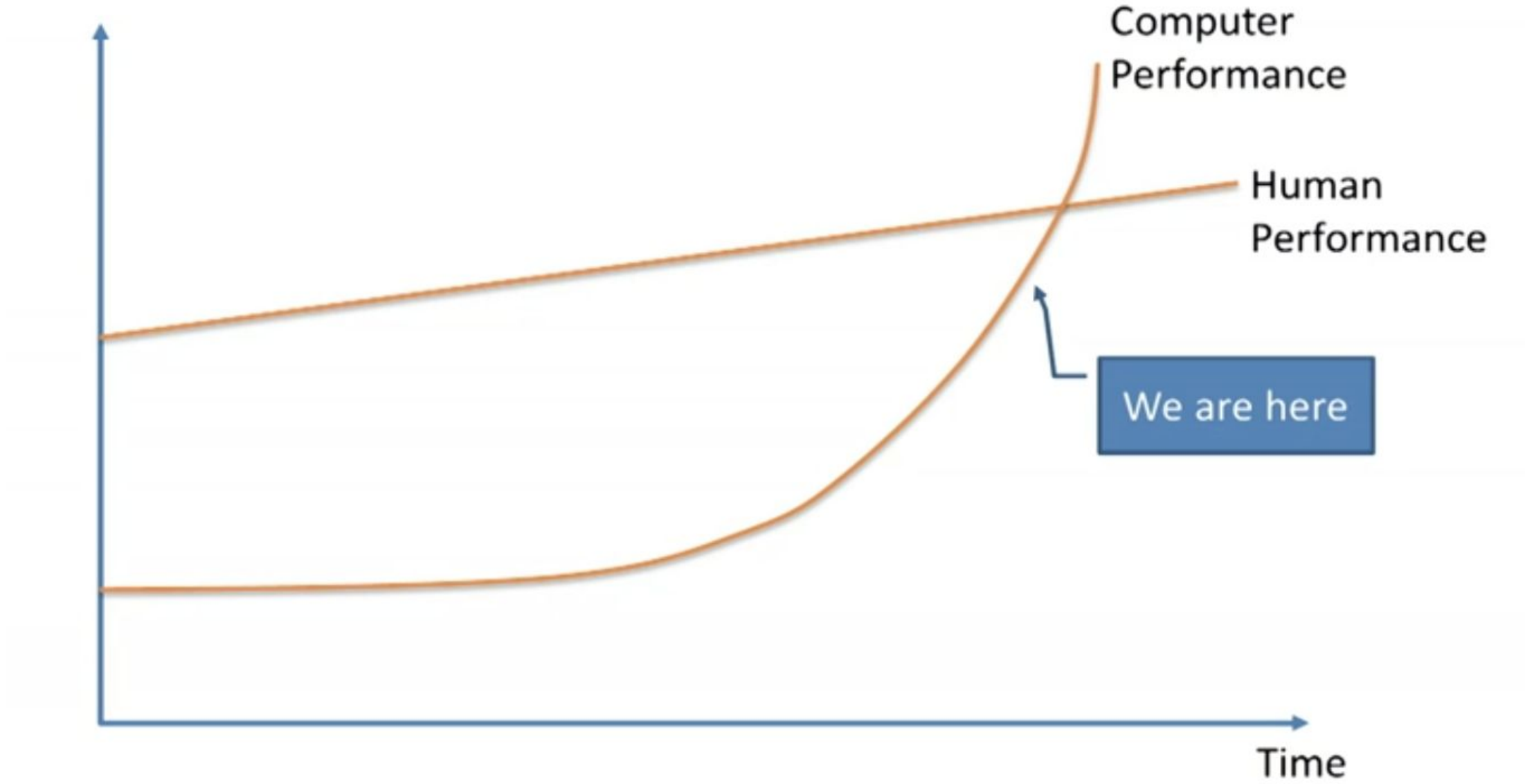
Duration:
300 years with existing training infrastructure

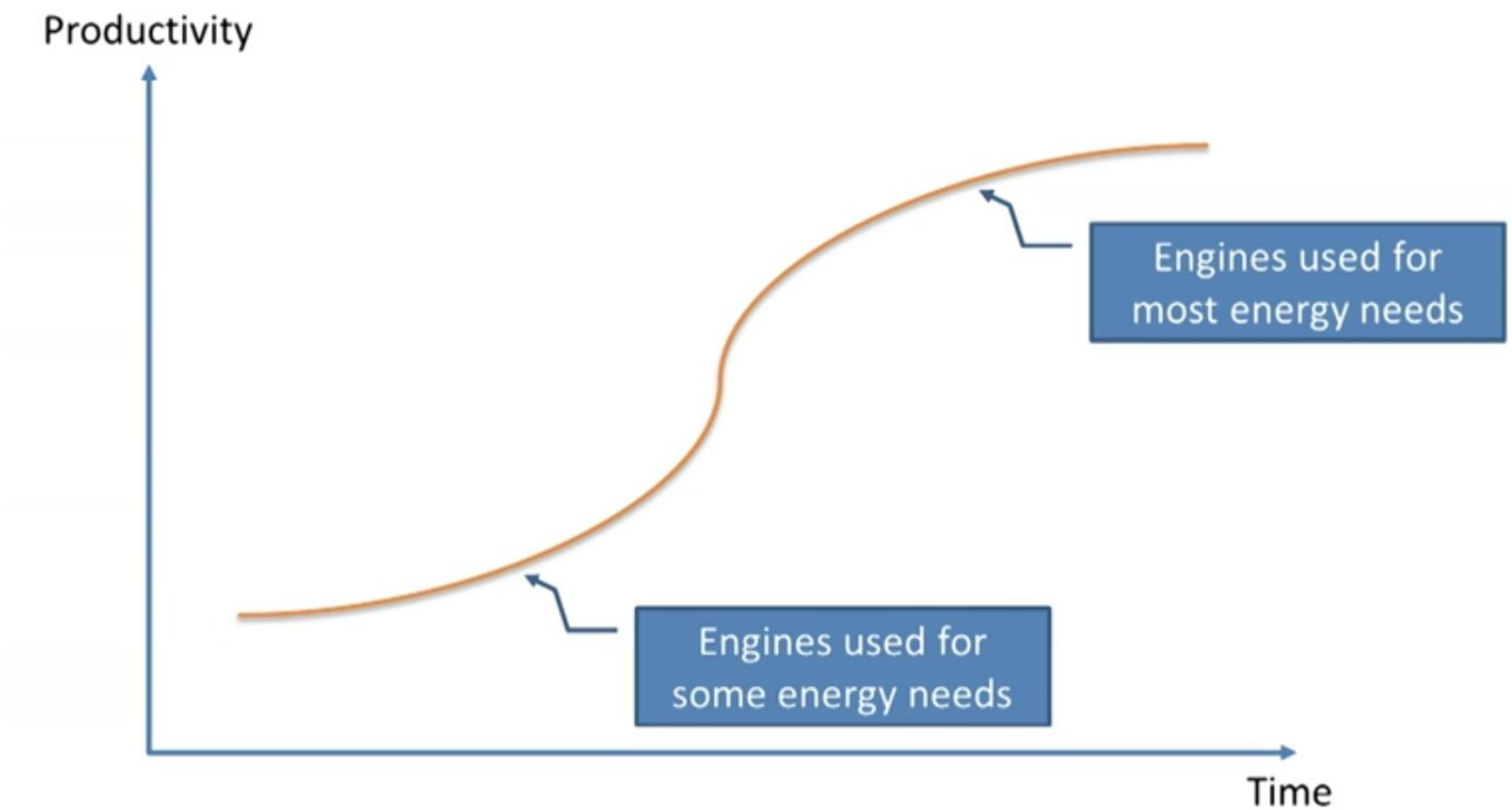
GDP Composition By Sector and Labour Force By Occupation, produced using data from the CIA World Factbook 2006 (Wikimedia Commons)

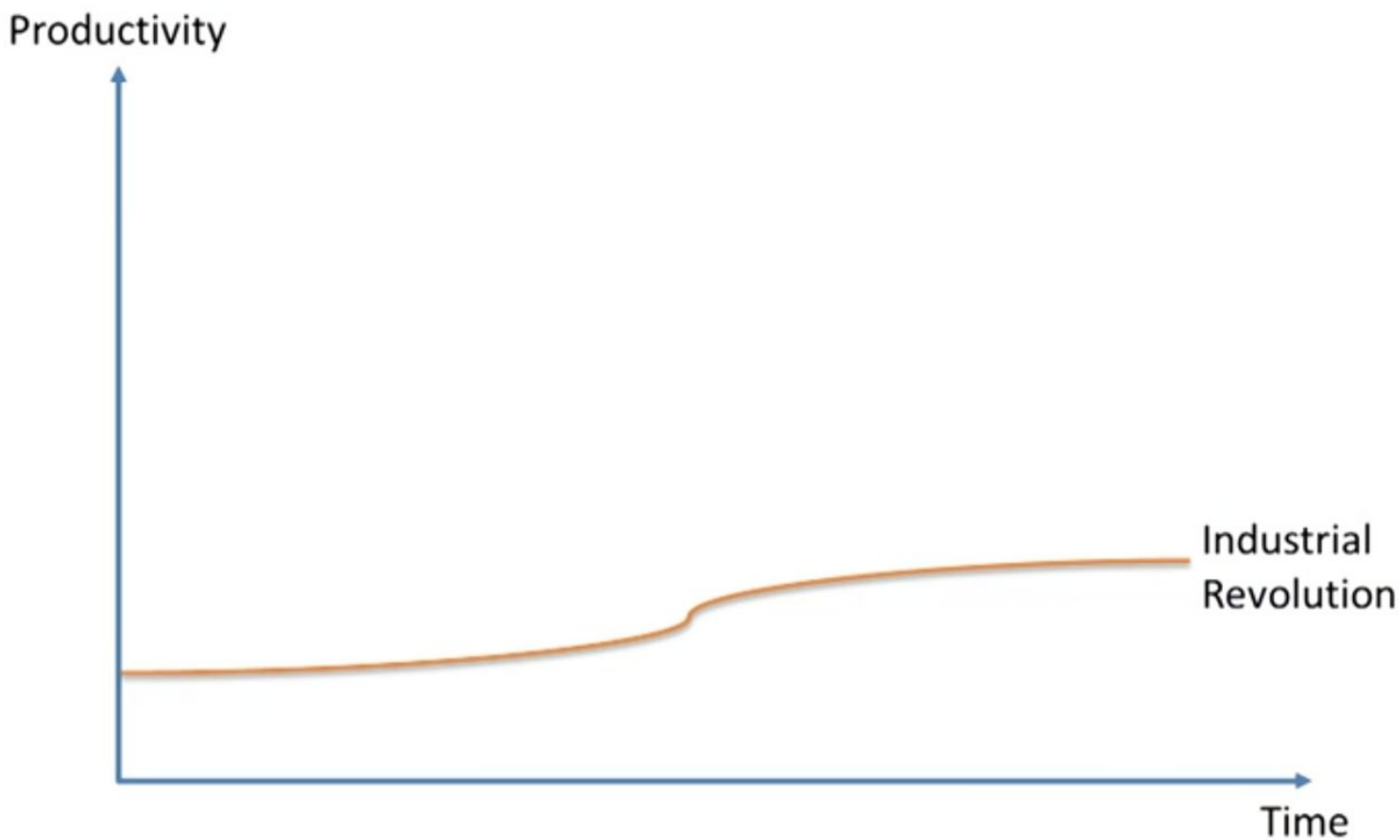


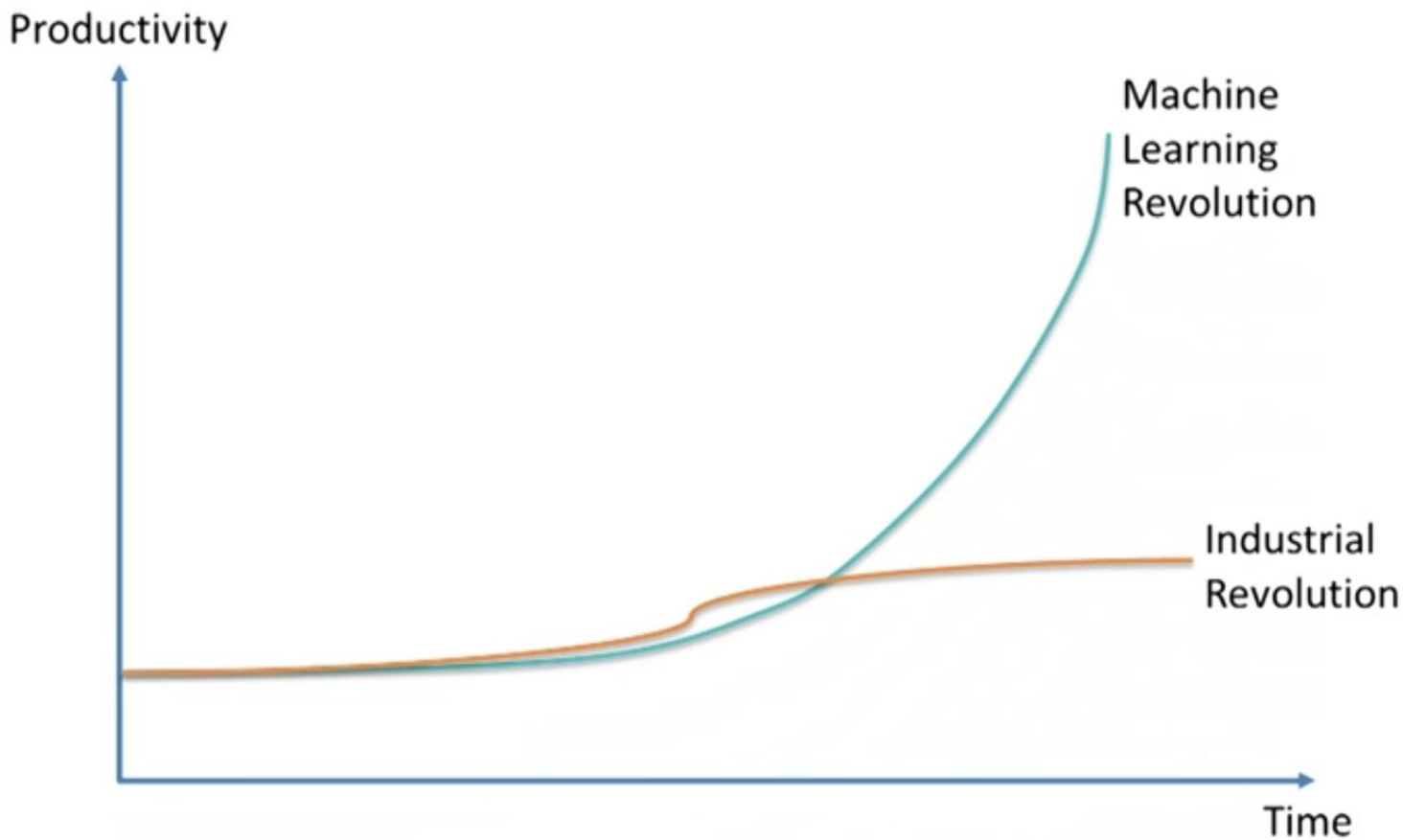

Reading & Writing
Speaking & Listening
Looking at things
Integrating knowledge
• Driving cars
• Preparing food
• Diagnosing disease
• Finding legal precedents
• …


Human
Performance
Time


Computer
Performance
Human
Performance
We are here
Time


Productivity
Engines used for most energy needs
Engines used for some energy needs
Time


Productivity
Industrial
Revolution
Time


Productivity
Machine
Learning
Revolution
Industrial
Revolution
Time

Lets Discuss Pros and Cons of ML

Pros & Cons

Advantages of ML?
- Speed, Accuracy, upgradations etc

Disadvantages or limitations of ML
- Can only learn from huge amount of data, for new things, it needs to be educated.

Will it take our job ?

Perception makes the difference :

How long will you have to work to buy BMW?

Doctor: I think I can buy one in 6-8 months of my practice.

MBA: I need about 11-12 months of hard work.

Engineer: At least 2-3 years of very hard work.

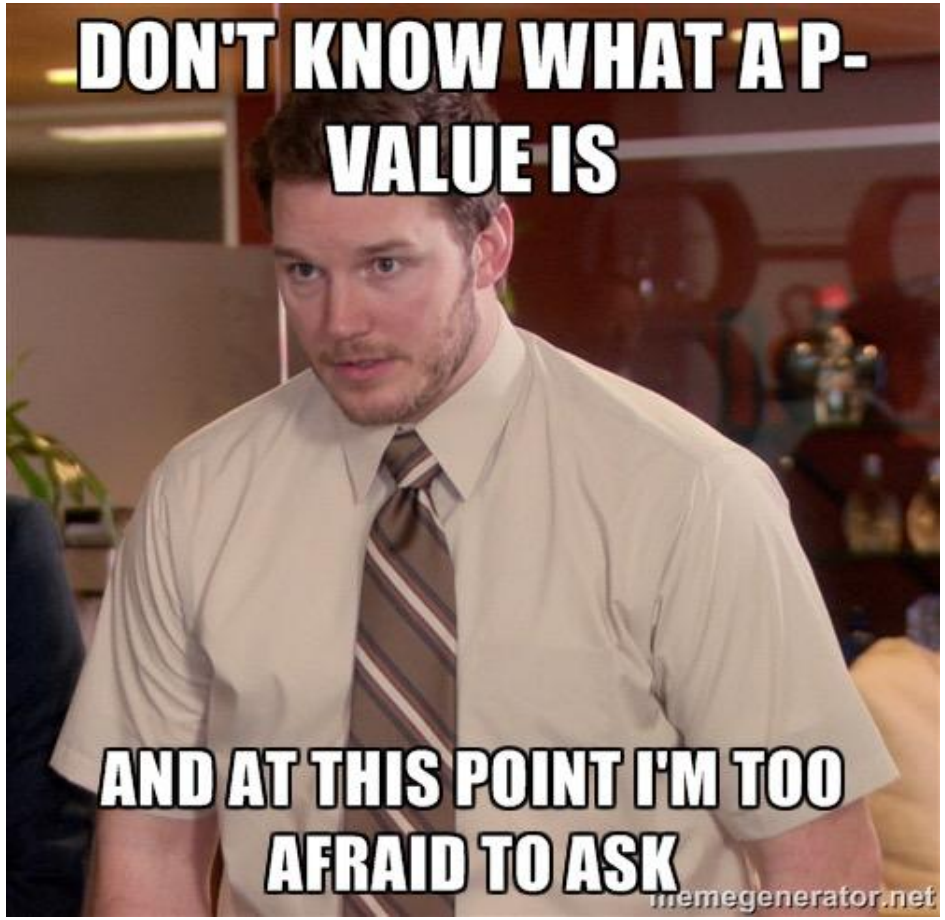
Future Jobs - Michio Kaku - Physicst

- Those of Artificial intelligence can’t do
- Pattern recognition and common sense are big problem of AI
- Repetitive jobs will be wiped off

- Jobs involved in intellectual capitalism will shine like
- Leadership
- Creativity
- Analysis
- Imagination
- Telling joke
- Writing a story, script

How to tame it?

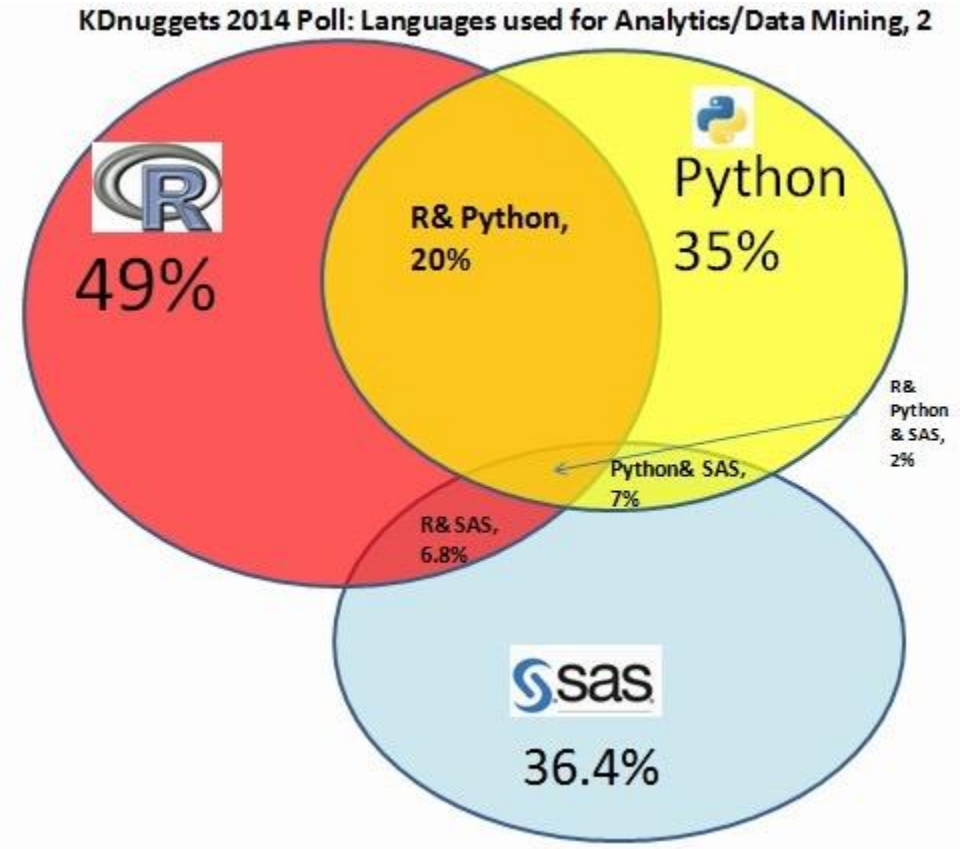
Revise Statistics and Probability



Learn algorithm how it works rather concentrating on output

HOW IT WORKS

Learn and practice a programming language



Big data and Data science are happily married

Practice all algorithm with each use case

Make use of Kaggle and Analytics vidhya

Contribute your work to Opensource

Write a blog


blog
blogs
content
posts
online
MABs
blogging
interactive
particular
subject
comments
readers
function
bloggers
Web
individual
many
single
also
1990s
post
leave
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- https://securityledger.com/wp-content/uploads/2016/05/IBM-Watson.jpg

Q & A

Thank you for your active participation

We have plans to meet you all again with few interesting things !

Stay tuned…..