

# JOURNEY OF MACHINE LEARNING AND HOW TO TAME IT

# Arthur Samuel



# Father of Machine learning

1956 – Trains computer to play checkers

1962 – Computer defeated the state champion

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

# Problem set

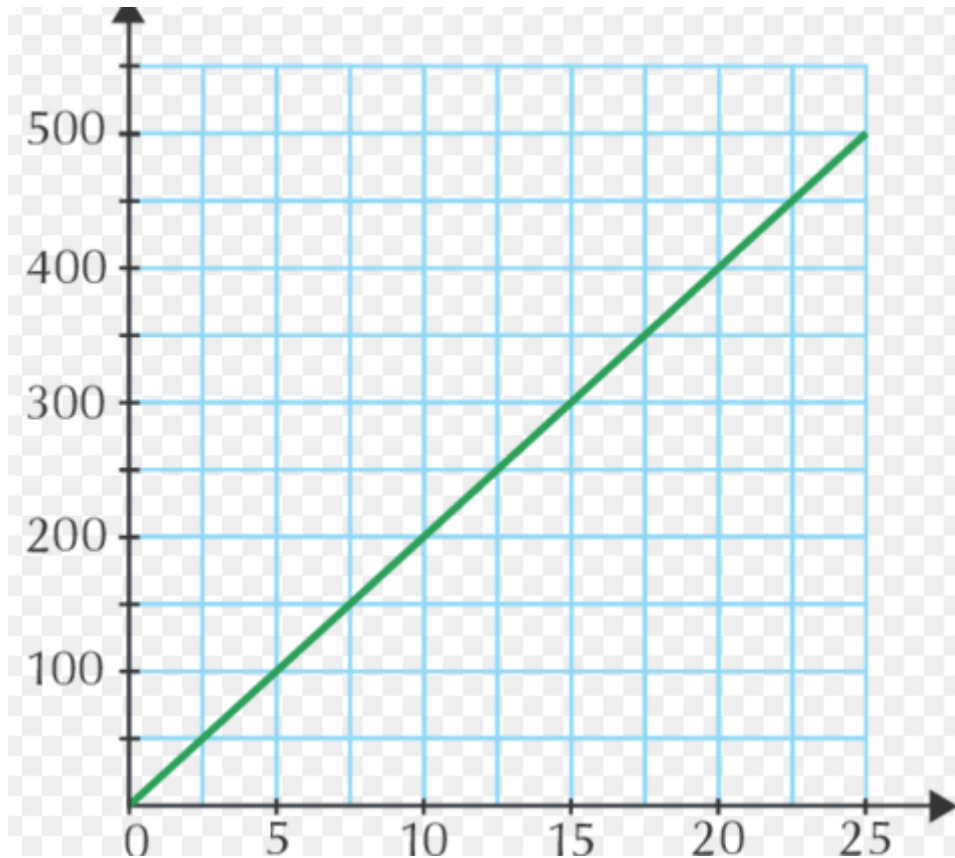
- A Specific metallic component is wearing out with use in an acidic environment
- How do we understand and use this component?

# 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

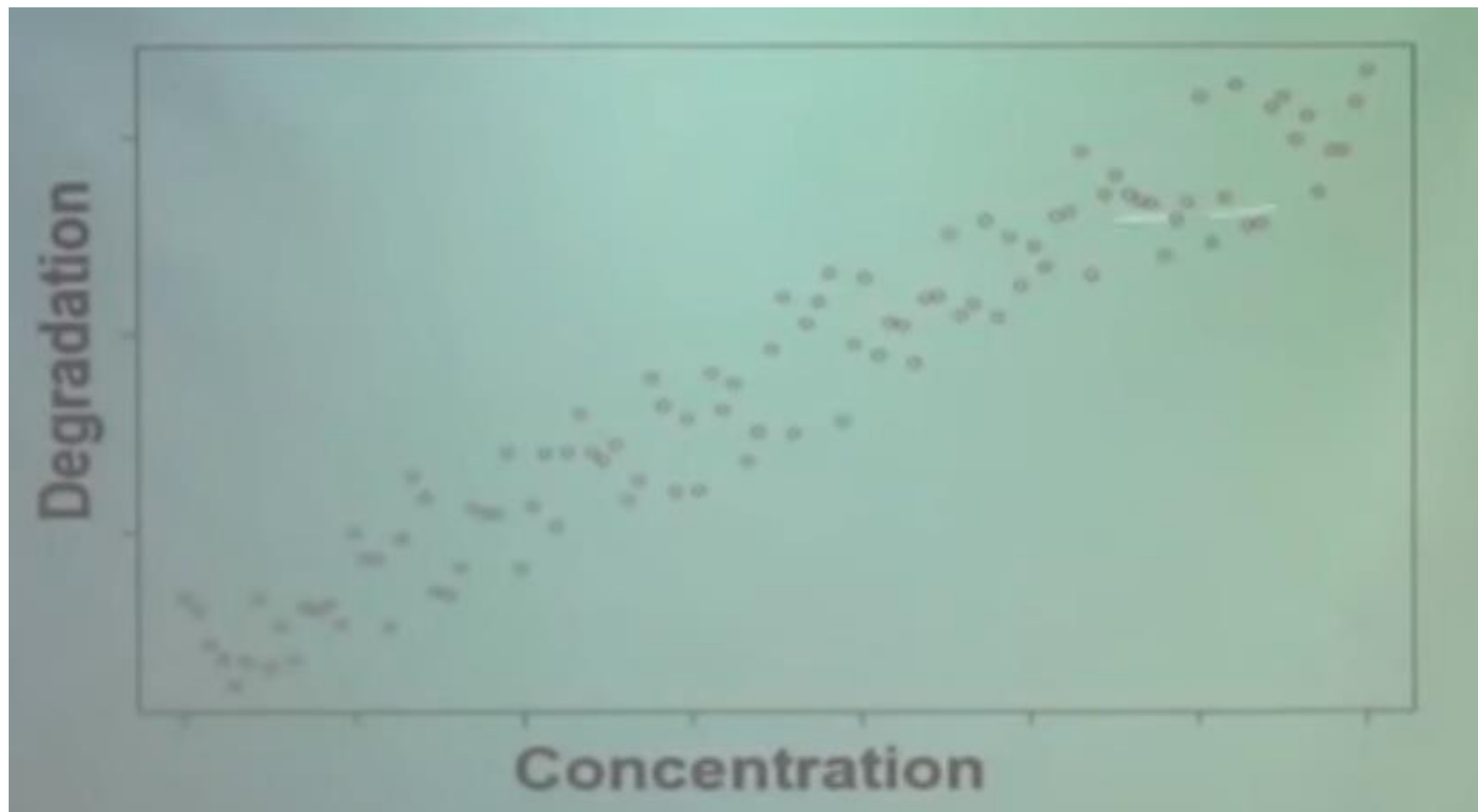
- A few hypothesis that cannot be proved
- Rest of science is developed by extending these using mathematics and experiments



# Inductive Learning

## Approach 2

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



# 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

A long, empty rectangular search bar with a thin blue border. On the right side of the bar is a small, multi-colored microphone icon.

Google Search

I'm Feeling Lucky

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[Edit your Facebook profile](#)Birthday:  
**June 10**Current City:  
Chicago, Illinois

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(in 3 weeks)[See gift suggestions](#)

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[See gift suggestions](#)

December 8

[See gift suggestions](#)

December 27

[See gift suggestions](#)

Janu

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## Popular Among Your Friends on Facebook

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★★★★★ (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

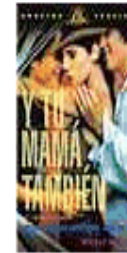
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[Add as Friend](#)

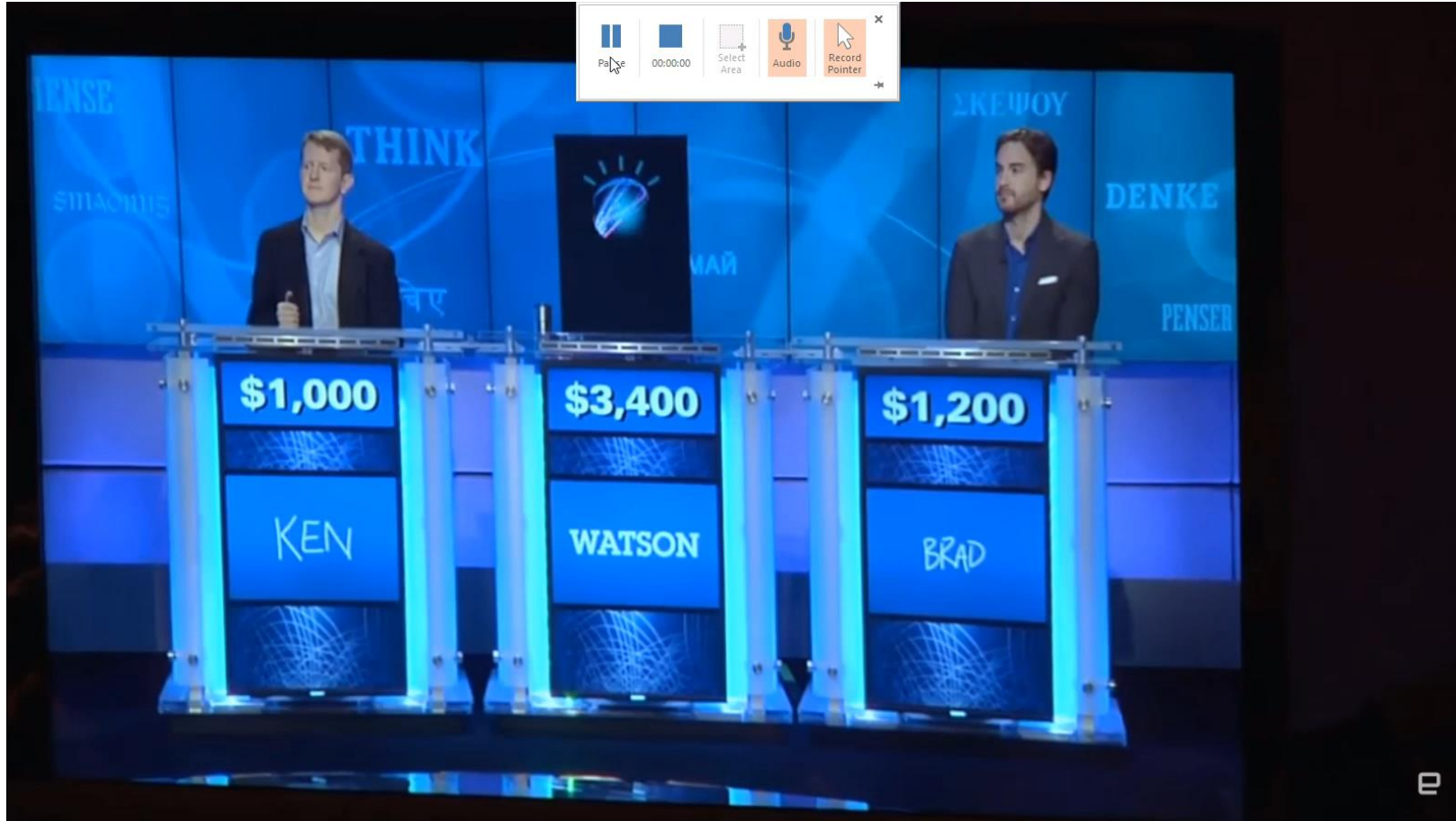
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Computers can Learn

# Automatic drug discover

## Geoffrey Hinton

From Wikipedia, the free encyclopedia

**Geoffrey Everest Hinton** FRS<sup>[12]</sup> (born 6 December 1947) is a British-born Canadian<sup>[13]</sup> 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.<sup>[14]</sup> 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.<sup>[15][16][17]</sup>

### Contents [hide]

- Education
- Career
- Research
- Honours and awards
- Personal life
- References

## Education [edit]

Hinton was educated at King's College, Cambridge graduating in 1970, with a Bachelor of Arts in experimental psychology.<sup>[1]</sup> 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.<sup>[3][18]</sup>

## Career [edit]

After his PhD he worked at the University of Sussex, the University of California, San Diego, Carnegie Mellon University.<sup>[1]</sup> He was the founding director of the Gatsby Charitable Foundation Computational Neuroscience Unit at University College London,<sup>[1]</sup> and is currently<sup>[19]</sup> 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.<sup>[20]</sup> 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".<sup>[21]</sup>

Geoffrey Hinton



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

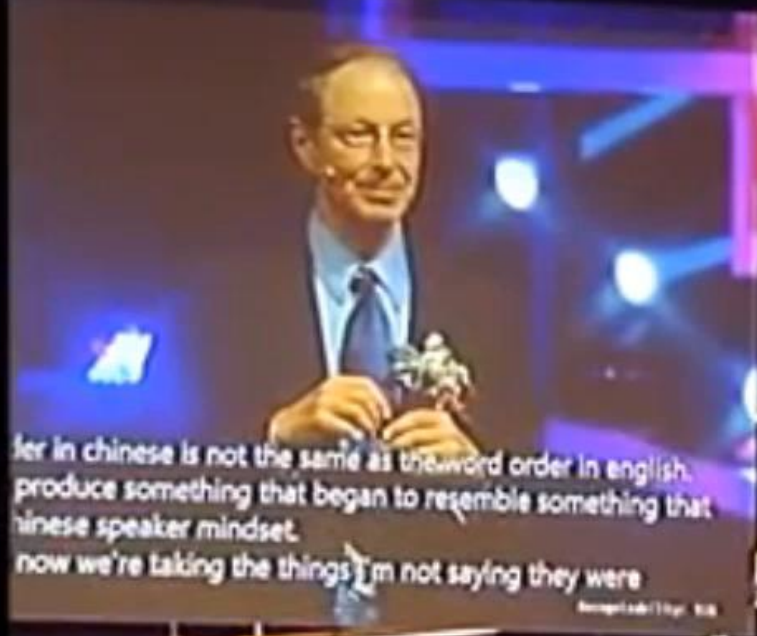


# Google DeepMind



Computers can listen and  
understand





...er 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 taking the things i'm not saying they were

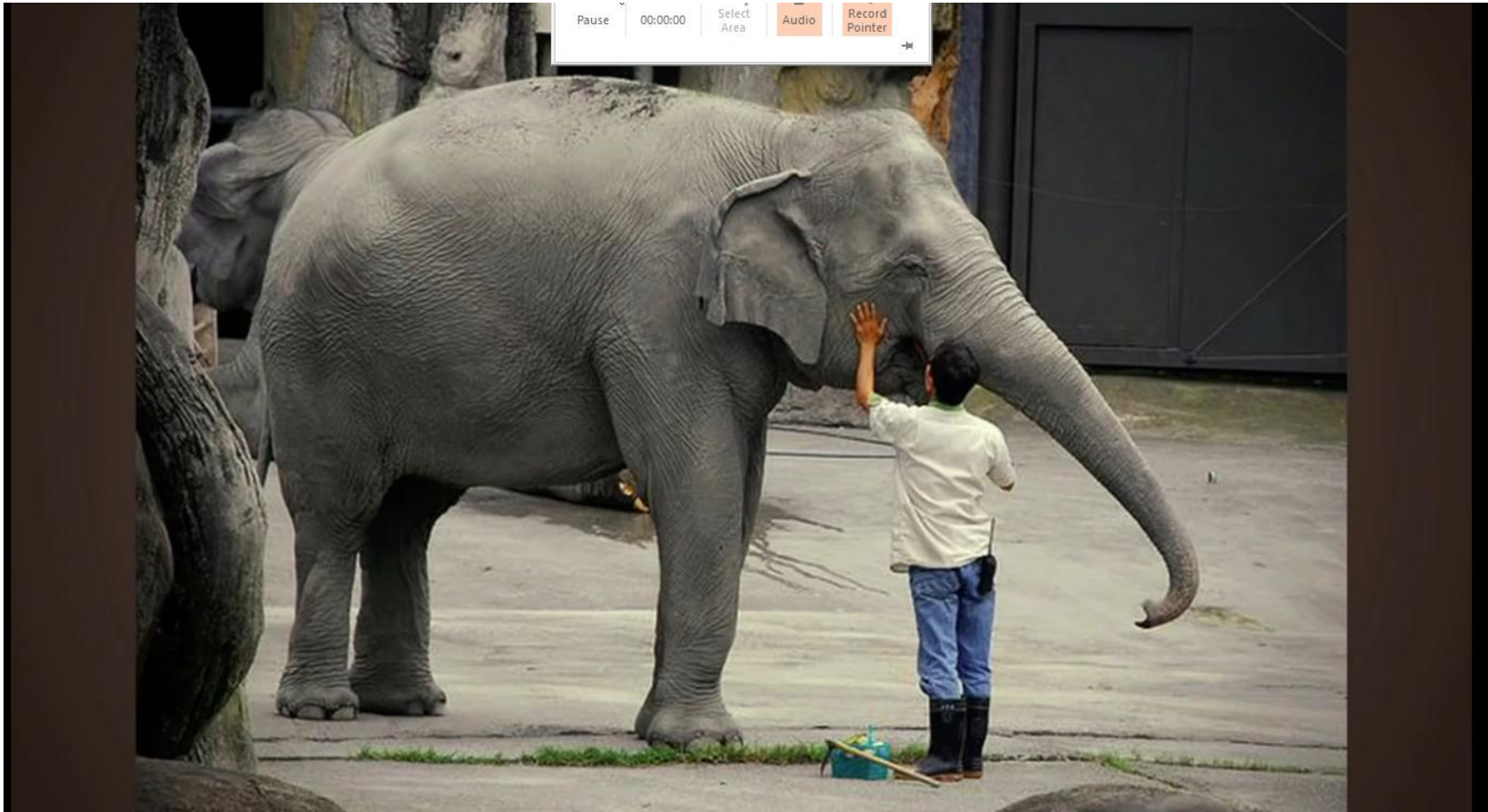
Source: [illegible] 1991, 1992

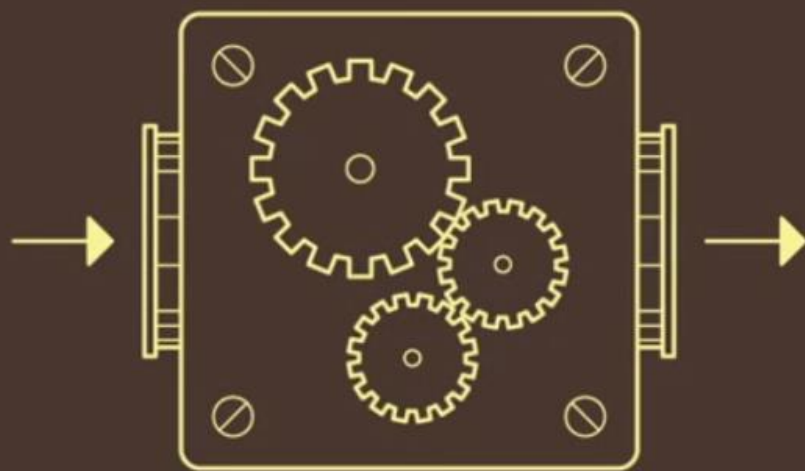
To produce something that  
began to  
resemble  
something that  
a / chinese / speaker  
mindset

一种产品  
开始  
像  
说中文的人  
的心态

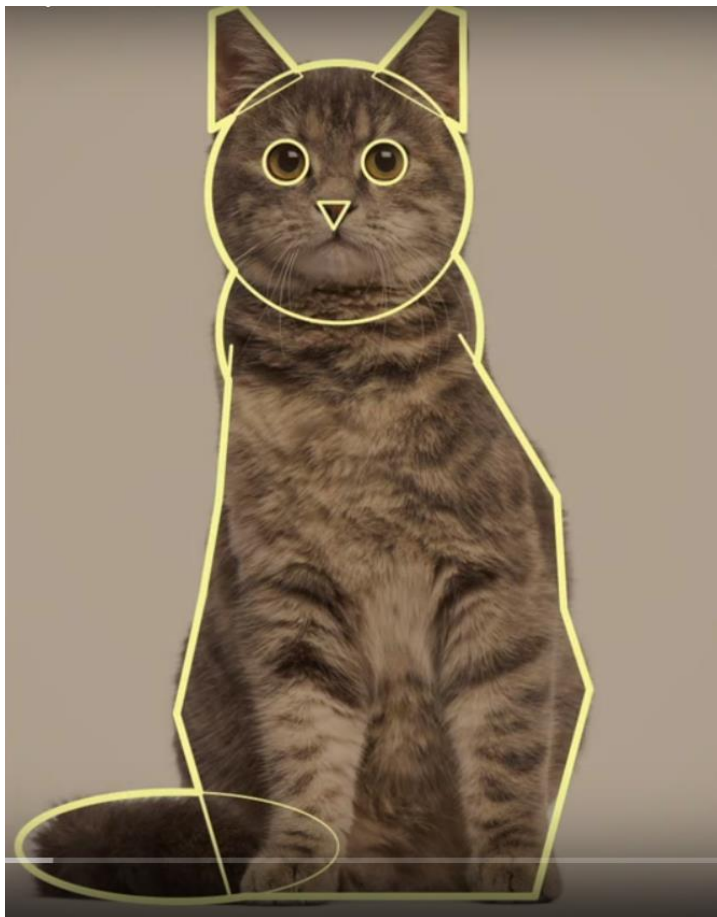
本进行重新排序。  
一种产品开始像说中文的人心态的东西。

Computers can see





“Cat”

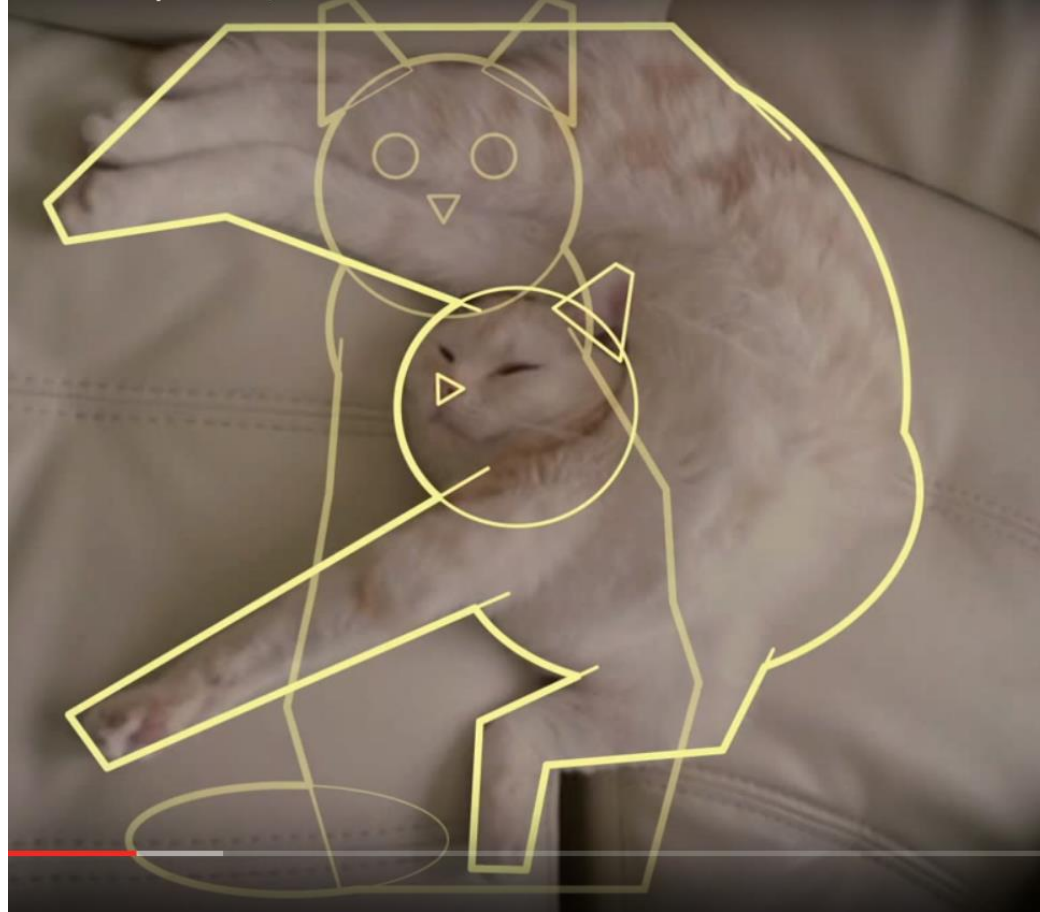




“Cat”











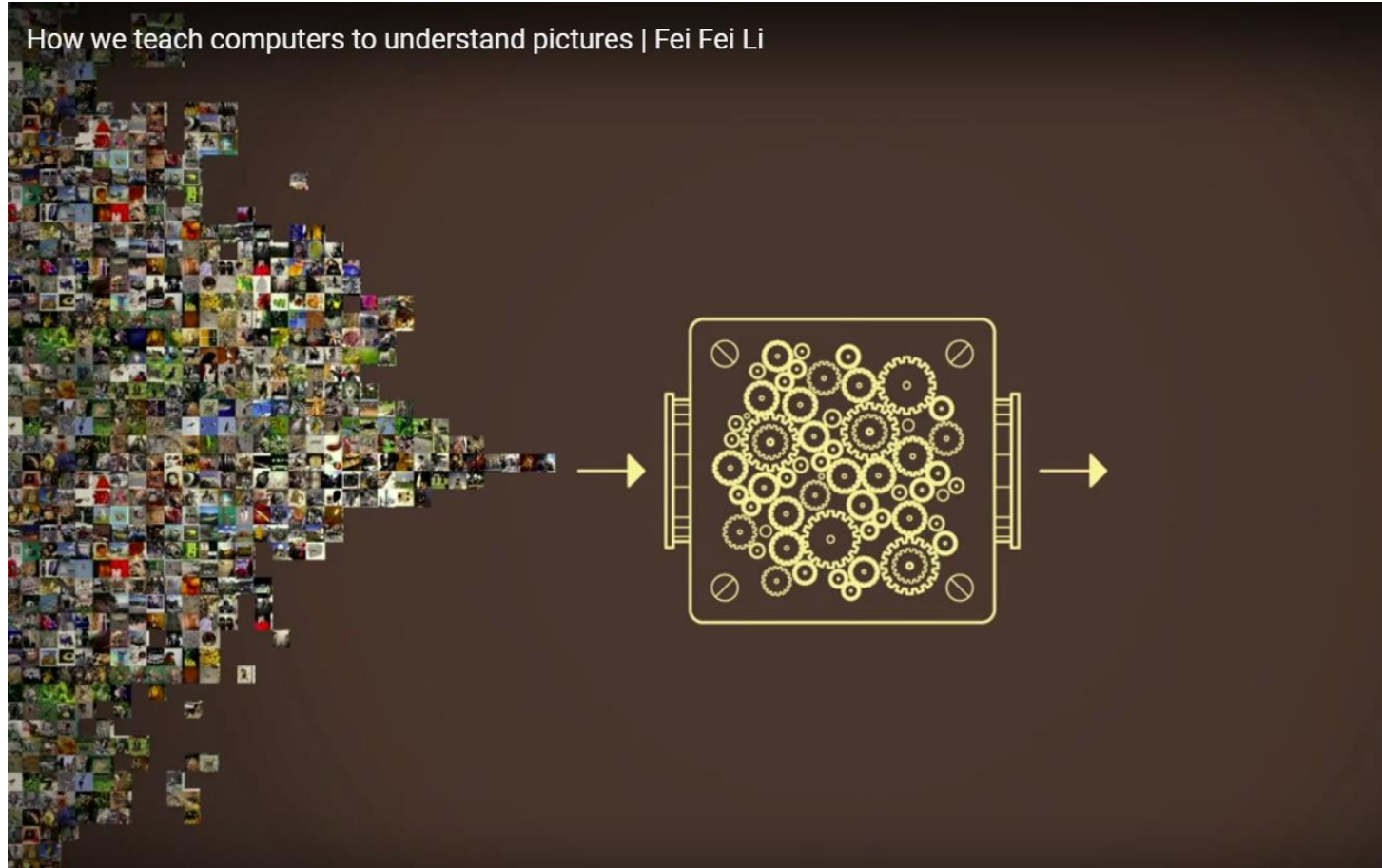
# IMAGENET

15,000,000 images in  
22,000 categories





How we teach computers to understand pictures | Fei Fei Li





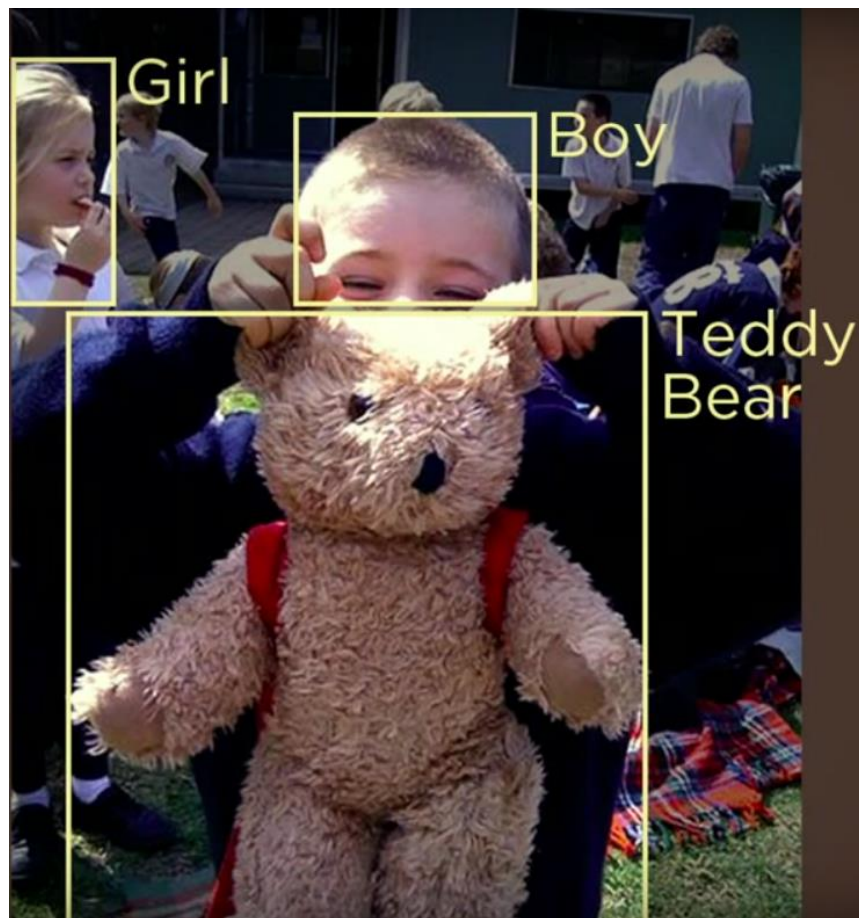


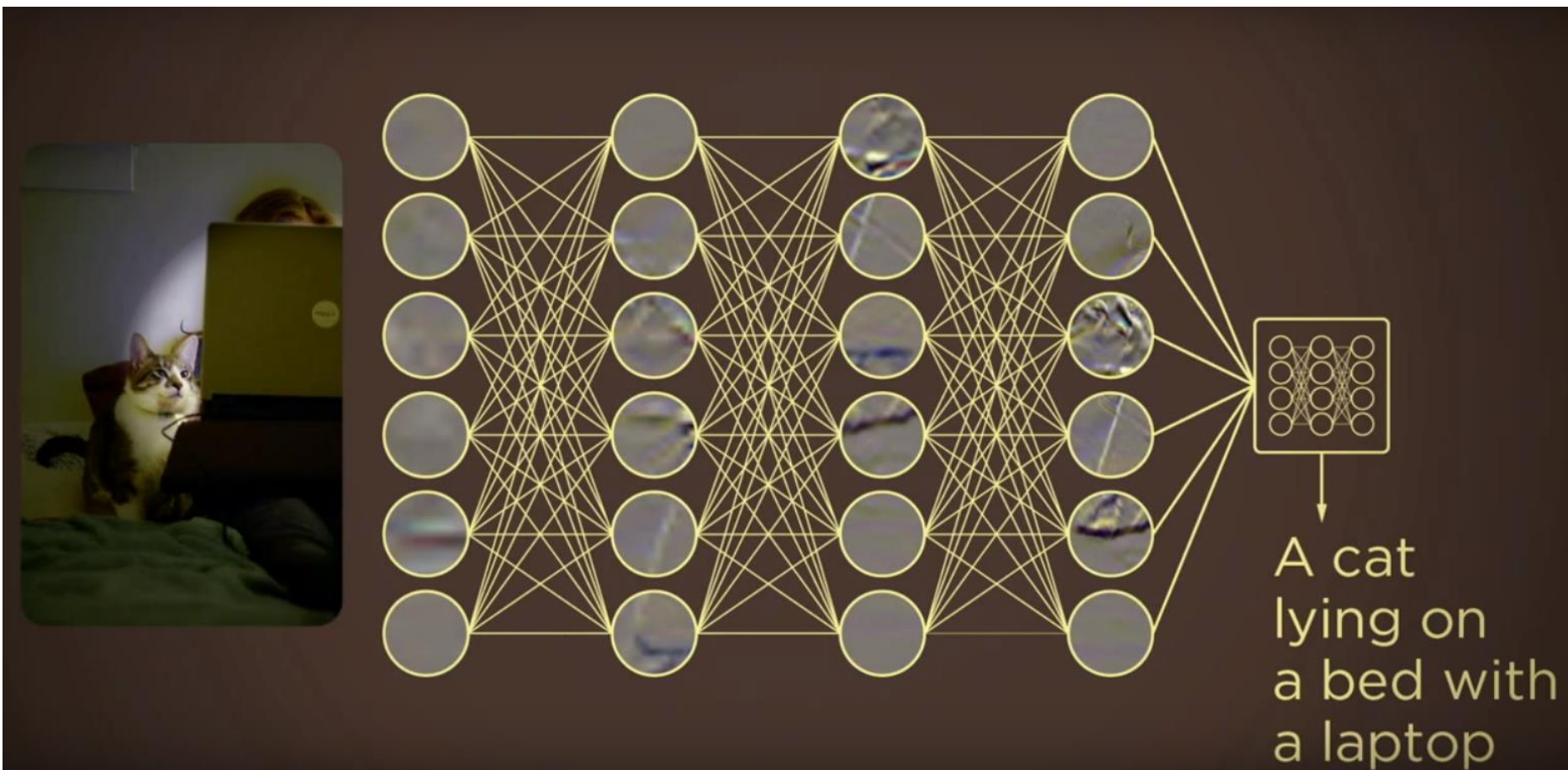
**24 M Nodes, 140 M parameters and 15 B  
Connections**

Convolutional Neural Network

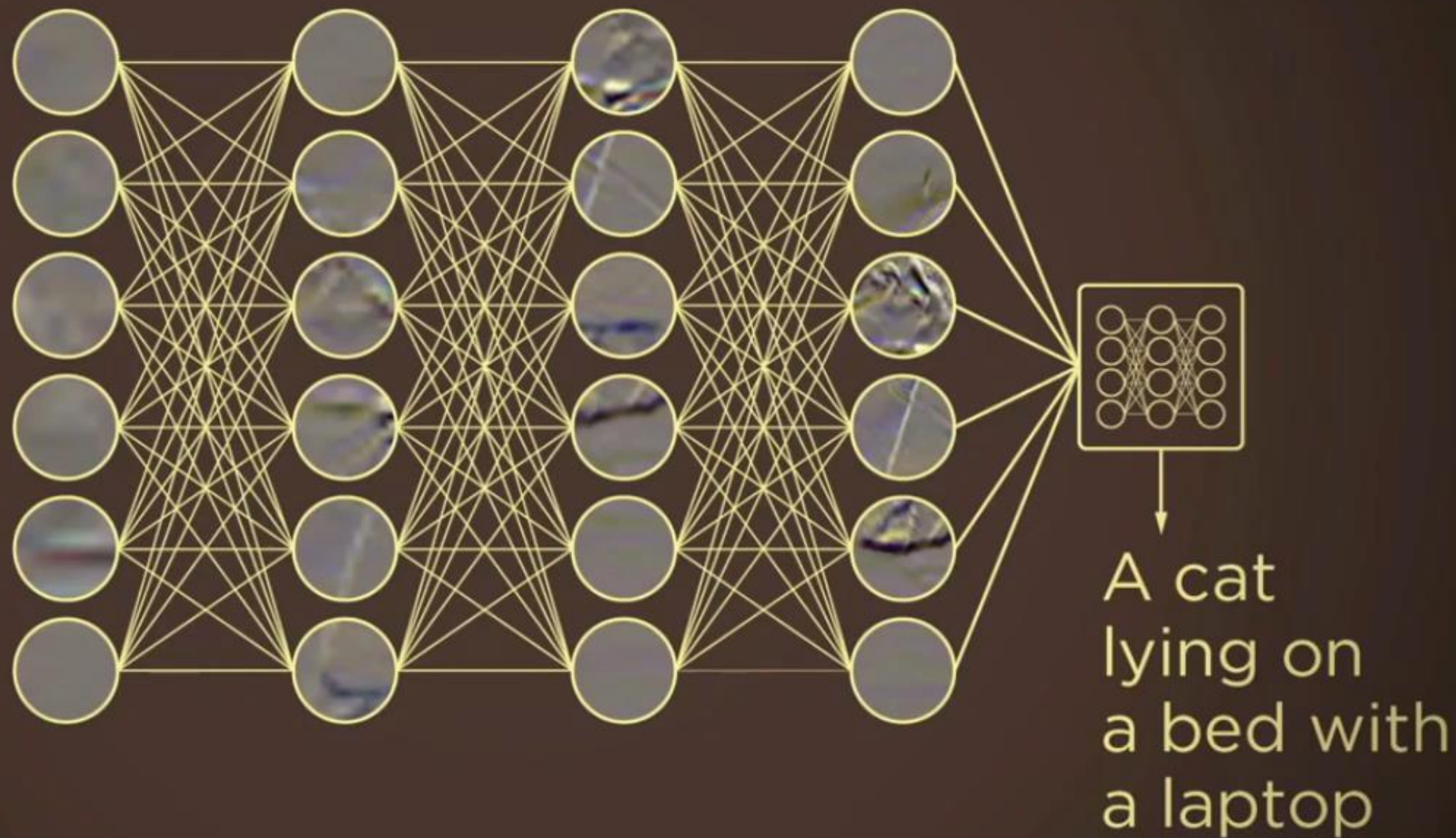
Cat











# 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=3OEmzl52stk>
- Artificial Intelligence created its own Art
- <https://www.youtube.com/watch?v=Sbd4NX95Ysc>

For Future

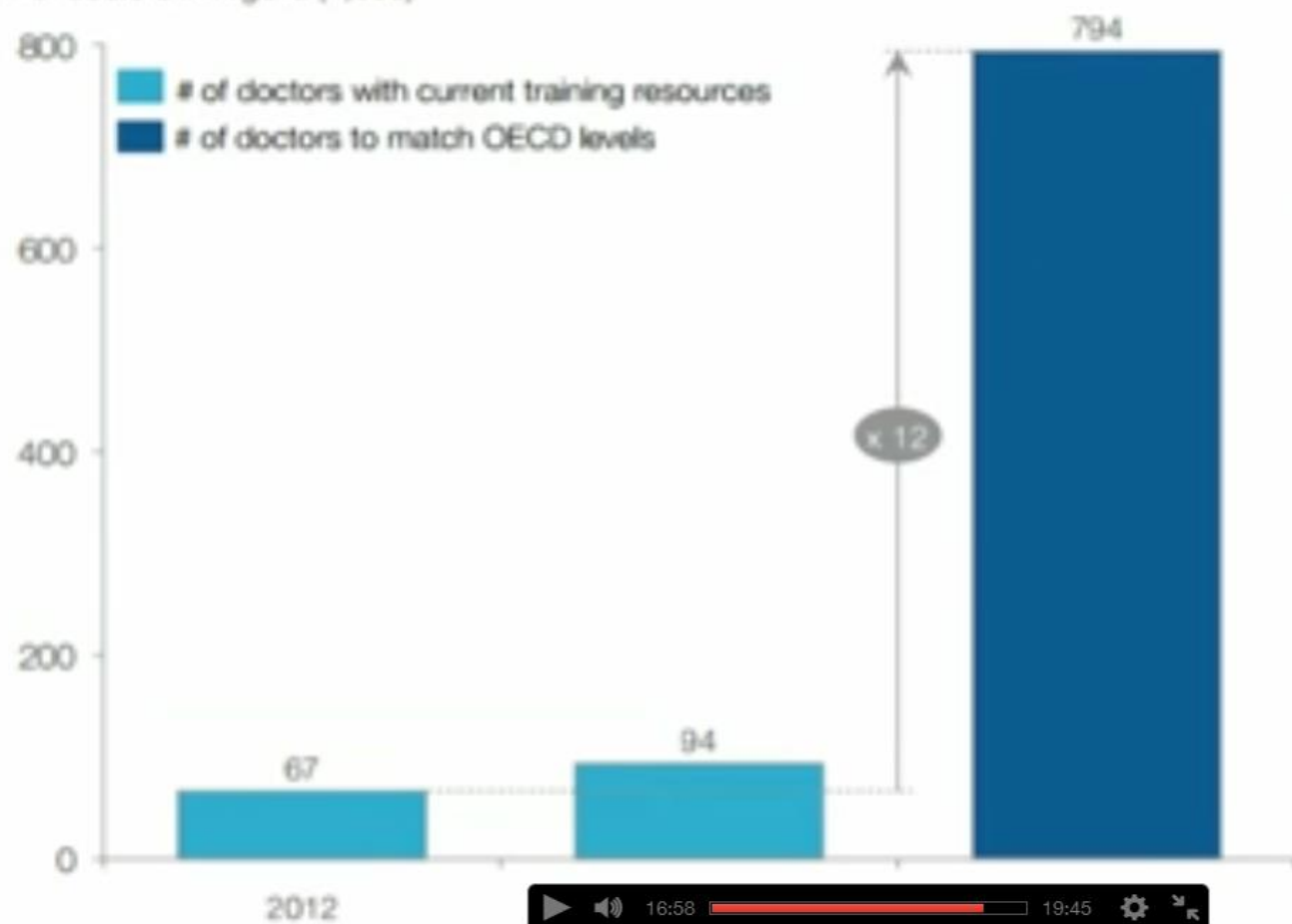
## Exhibit 1: Imitating Traditional Development Paths Is Impossible for Emerging Economies

Nigeria would need over 700,000 additional doctors to reach OECD levels by 2030

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



# of doctors in Nigeria (1,000)



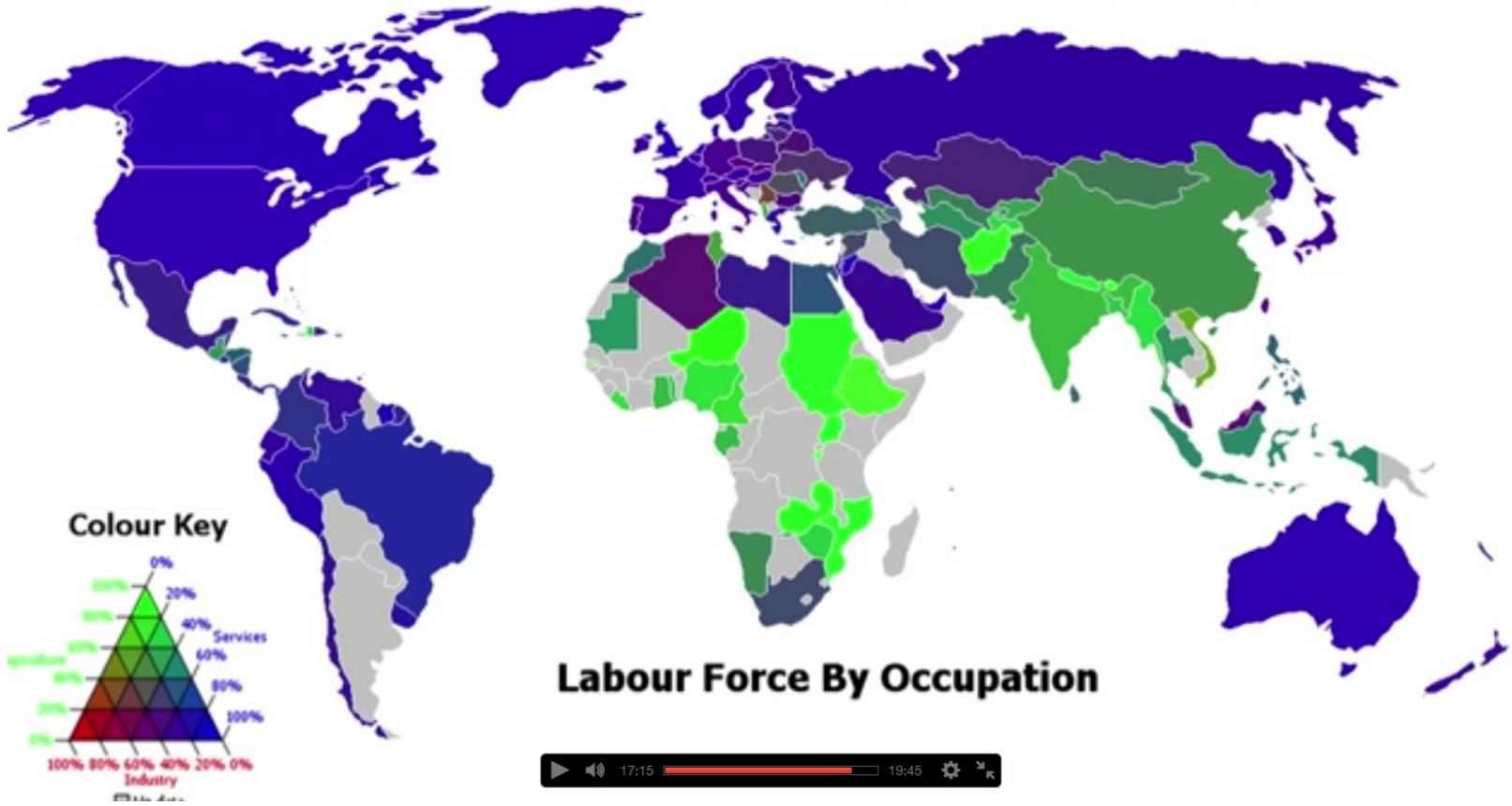
### Cost:

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)*





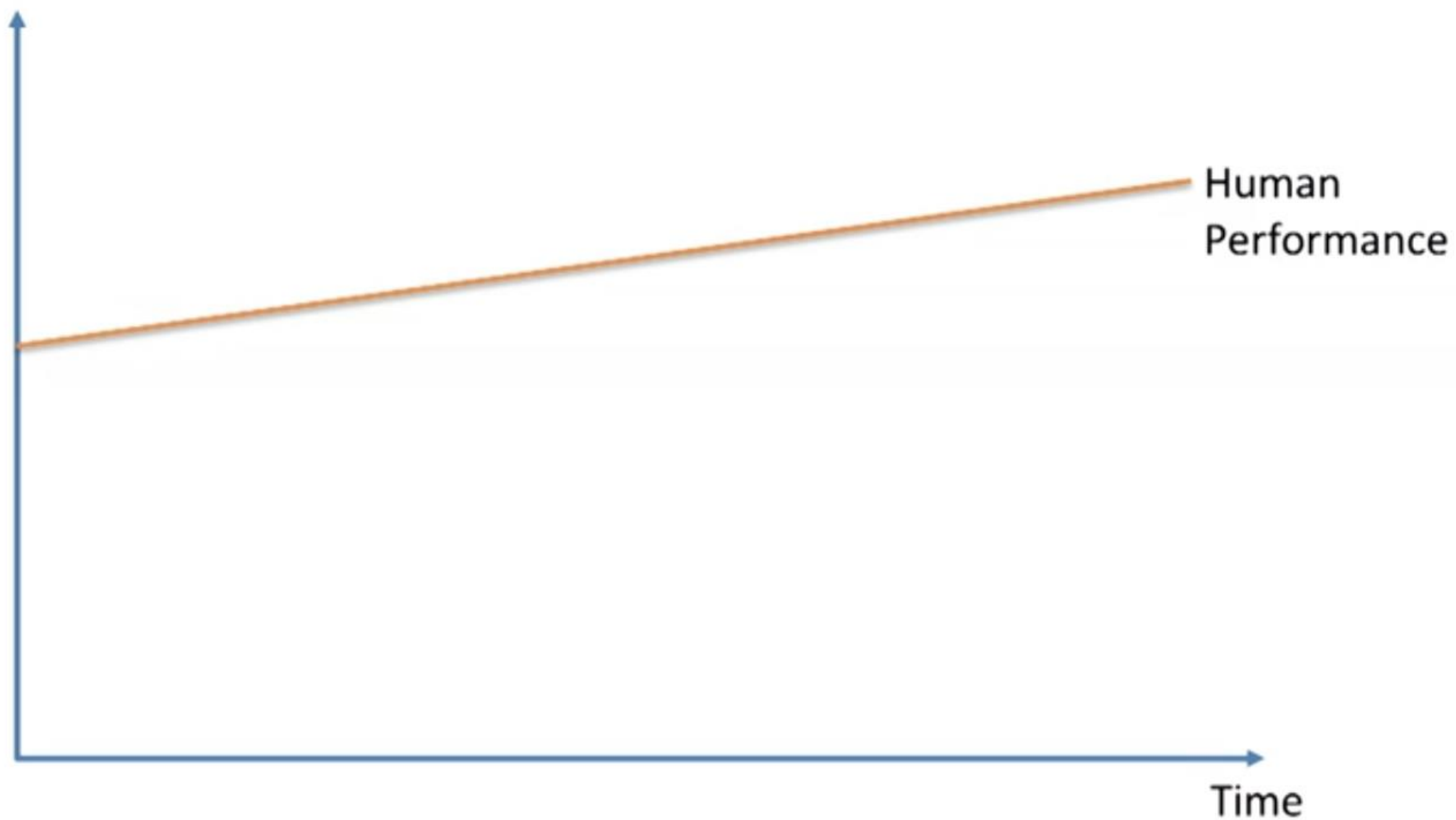
Reading &  
Writing

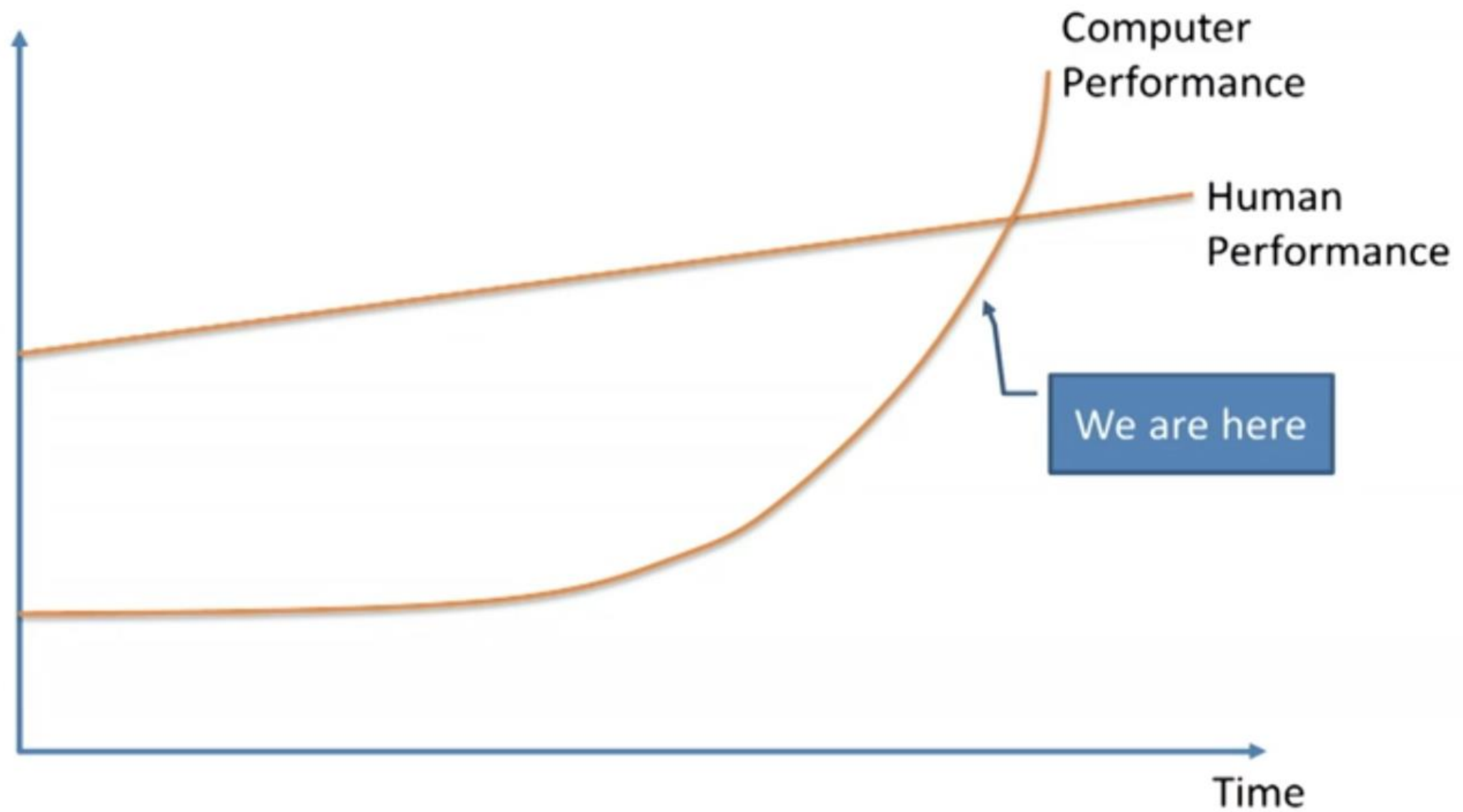
Speaking &  
Listening

Looking at  
things

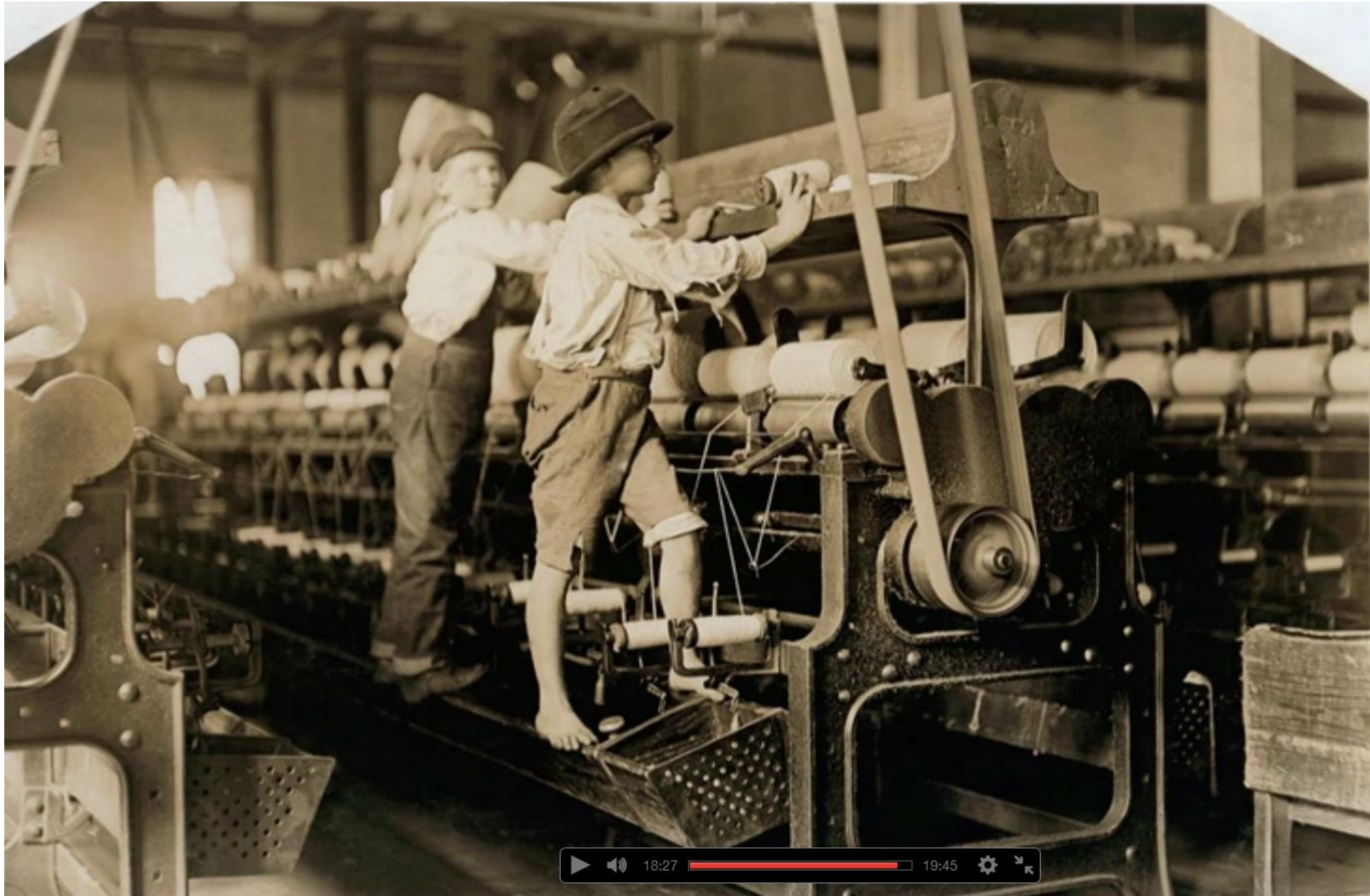
Integrating  
knowledge

- Driving cars
- Preparing food
- Diagnosing disease
- Finding legal precedents
- ...



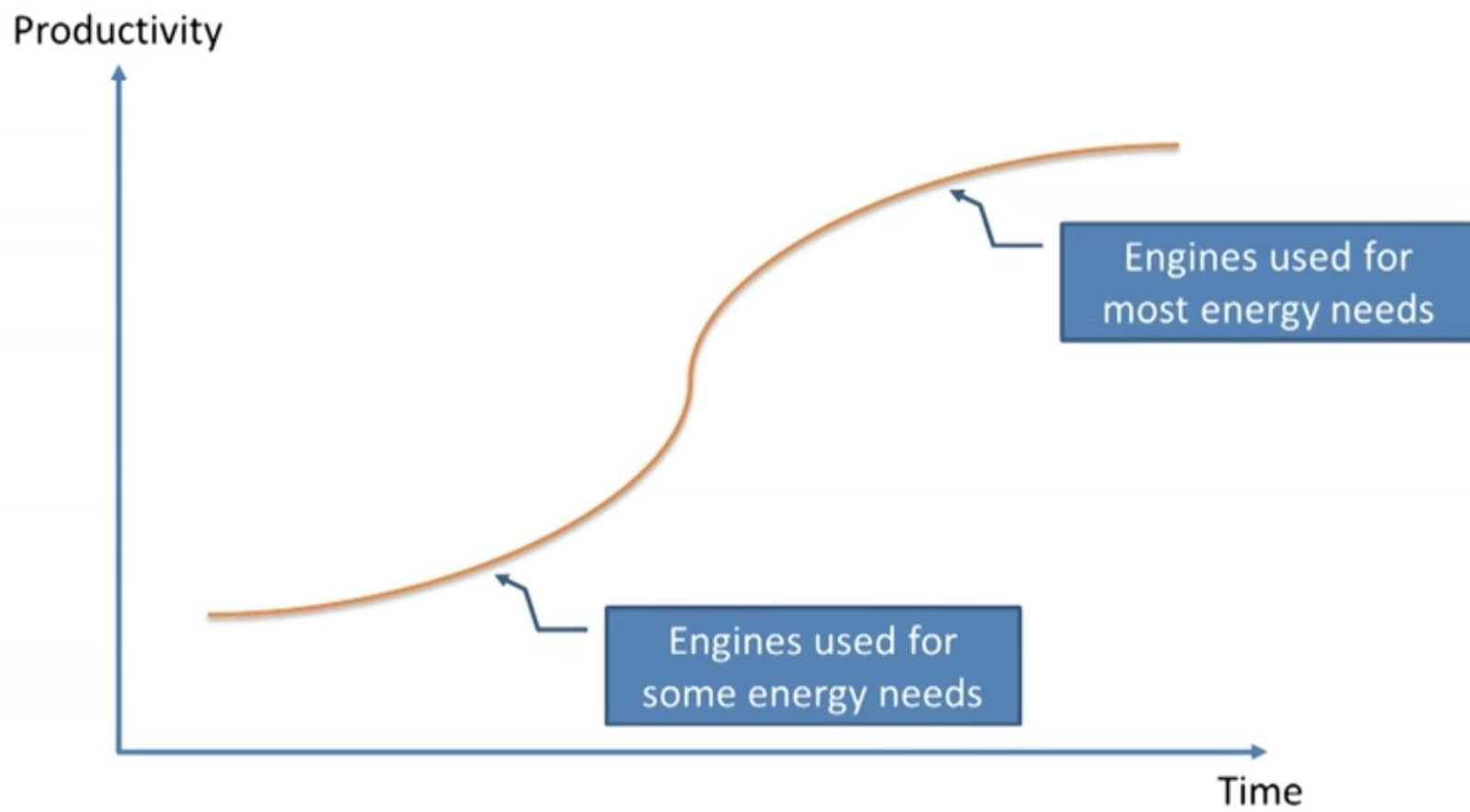


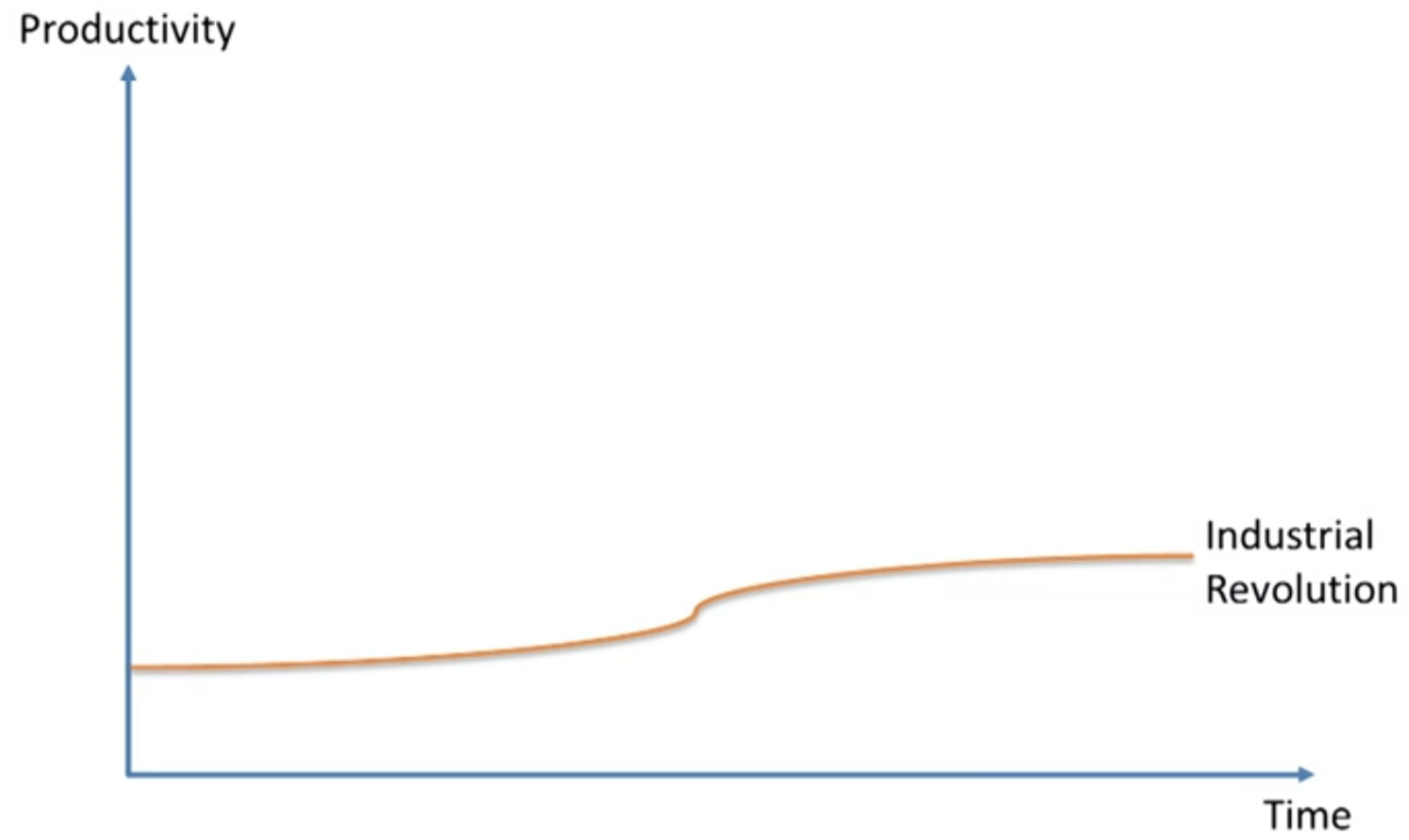


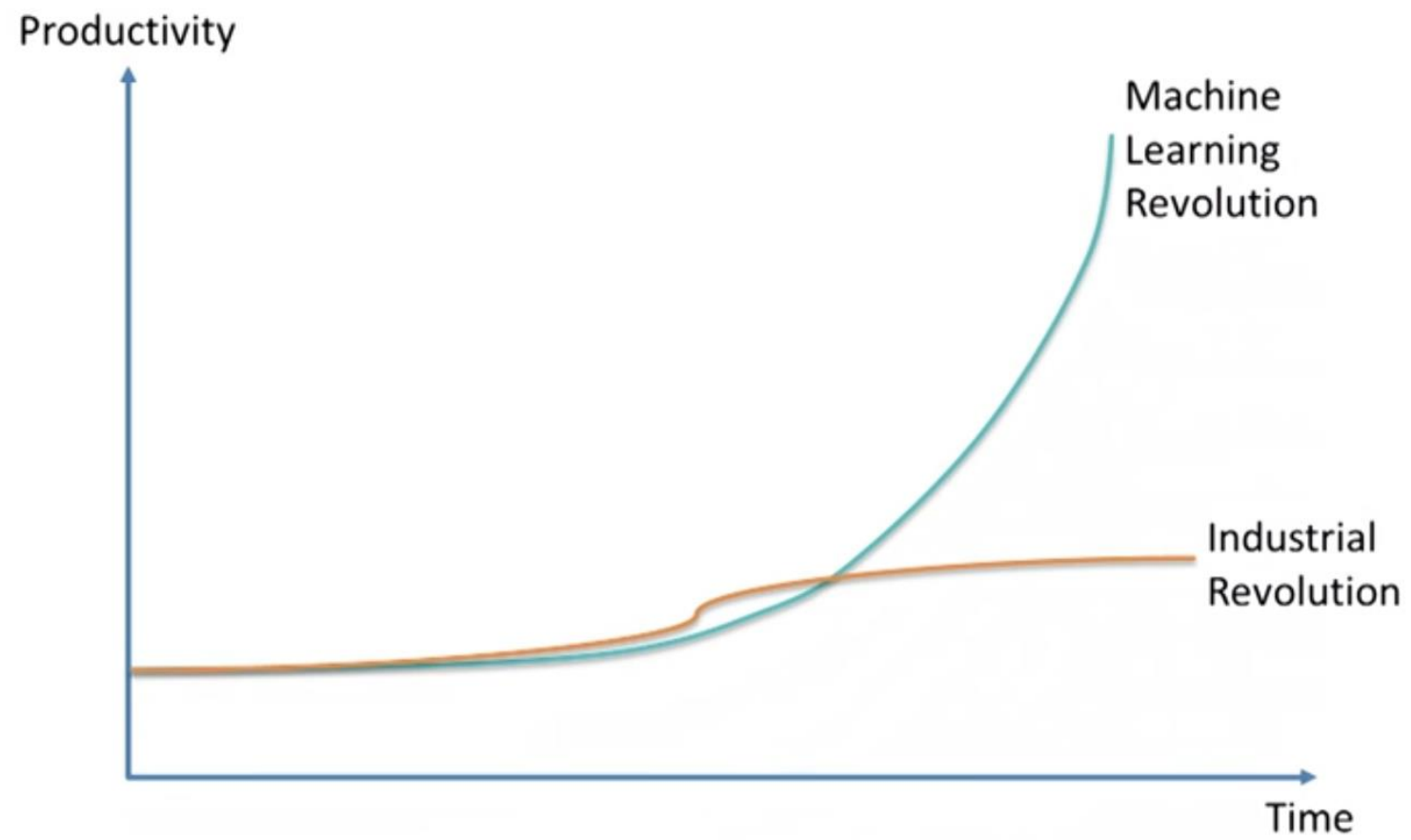


Children  
working in a  
mill in Macon,  
Georgia, 1909

*United States Library  
of Congress's Prints  
and Photographs  
division [nclc.01581](#)*





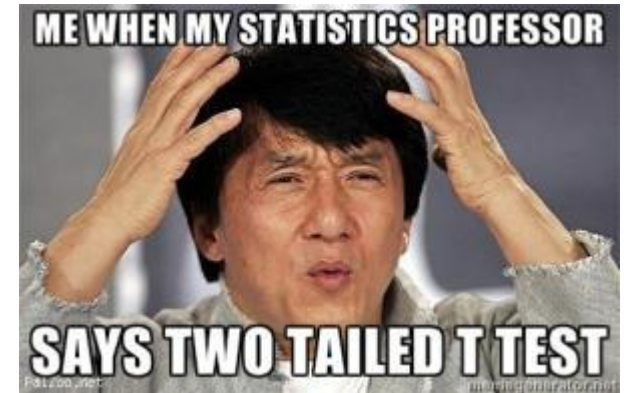
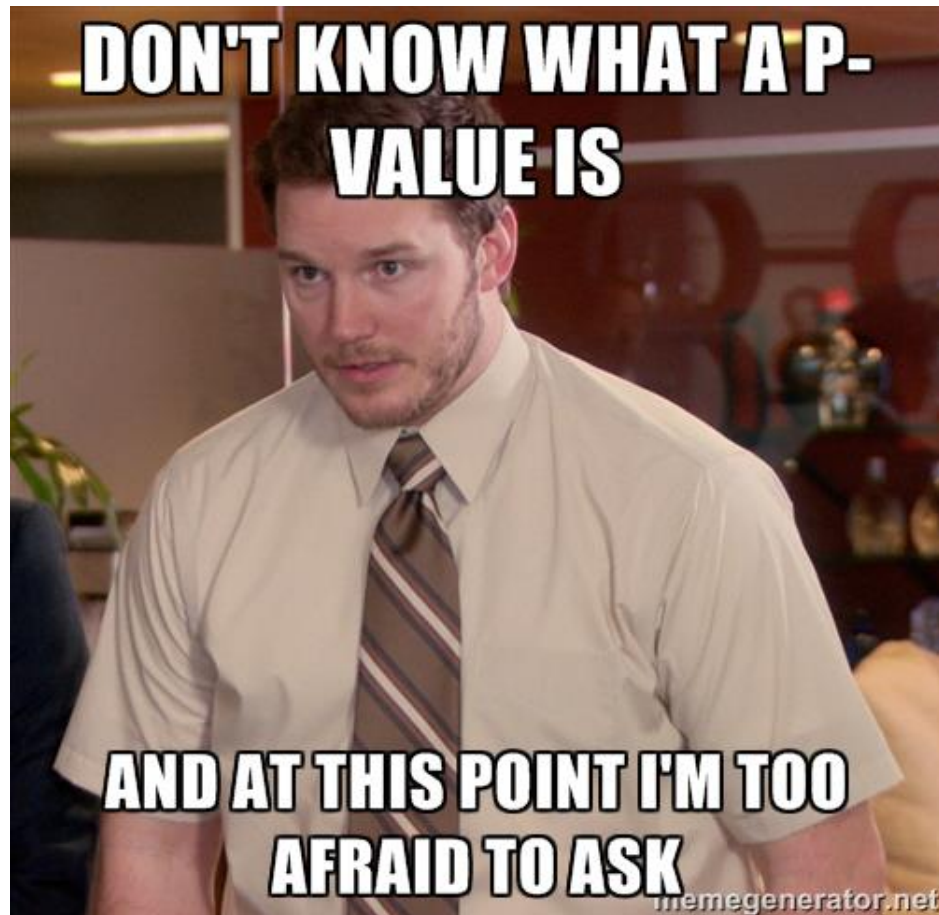


# Future Jobs - Michio Kaku - Physicst

- 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





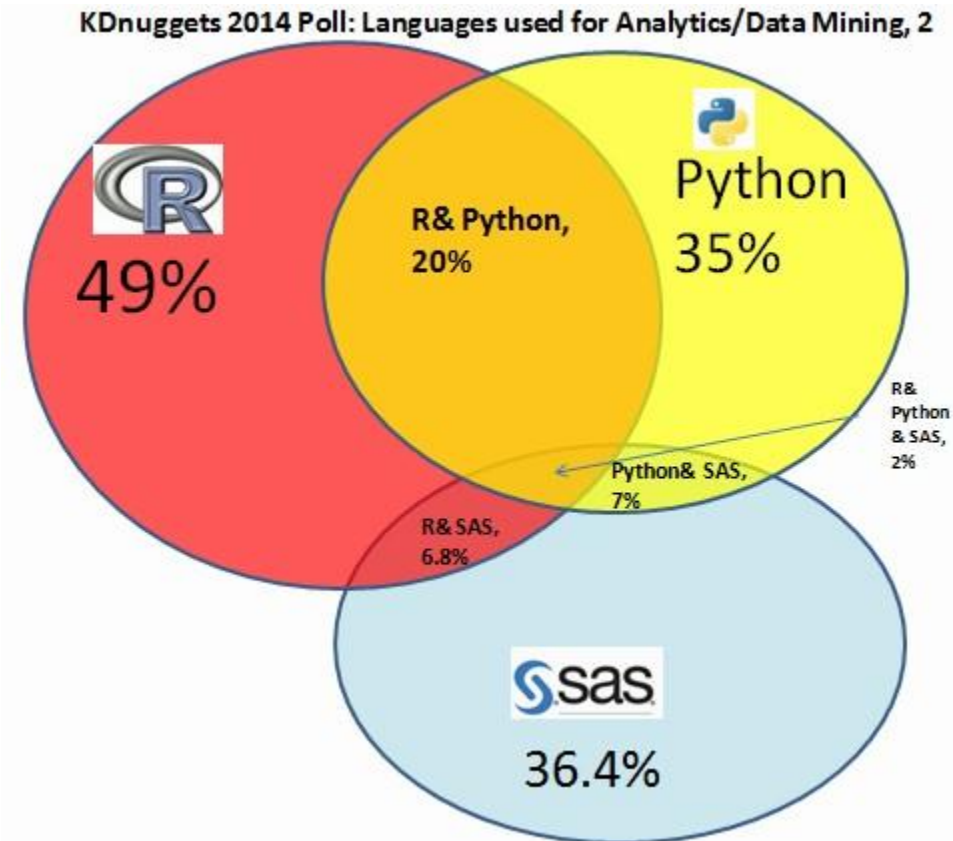
Learn algorithm how it works rather  
concentrating on output



**HOW IT  
WORKS**



# Learn and practice a programming language



```
208 limit_val = a;  
209 $("#limit_val").a(a);  
210 update_slider();  
211 function(limit_val);  
212 $("#word-list-out").e(" ");  
213 var b = k();  
214 h();  
215 var c = l(), a = "-", d = parseInt(  
    arseInt($("#slider_shuffle_num  
216 function("LIMIT_total:" + d);  
217 function("rand:" + f);  
    f = d, function("check re
```



Practice all algorithm with each use case



Make use of Kaggle and Analytics vidhya



Contribute your work to Opensource





# Write a blog





# References

- [https://www.ted.com/playlists/310/talks on artificial intelligen](https://www.ted.com/playlists/310/talks_on_artificial_intelligen)
- <http://www.kdnuggets.com/>
- <https://www.youtube.com>
- <https://www.cubs100.org/GetImage.aspx?IDMF=ea11fbcd-1eb1-4829-9276-41f91b5bd75a&w=900&h=600&src=mc>
- <https://securityledger.com/wp-content/uploads/2016/05/IBM-Watson.jpg>

Thank You