AI是什麼？可以吃嗎？ --
人工智慧的哲學思辯
Café Philo
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01:00 PM - 03:00 PM
Wework Times Square
1460 Broadway, New York NY 10036
MAY
SAT 20

What is AI and Why Should We Care?

Philosophical reflections on artificial intelligence

May 20th, 2017 @ Café Philo, NY

Ting-An Lin
PhD student, Philosophy, Rutgers University

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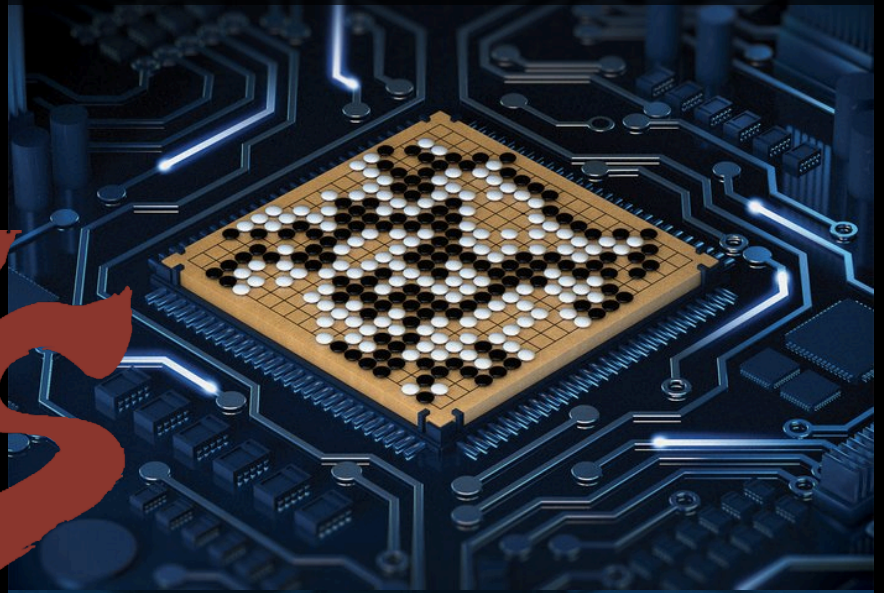
PhD student, Electrical Engineering and Neuroscience, Princeton University

March 8-15, 2016
Google DeepMind Challenge Match

VS

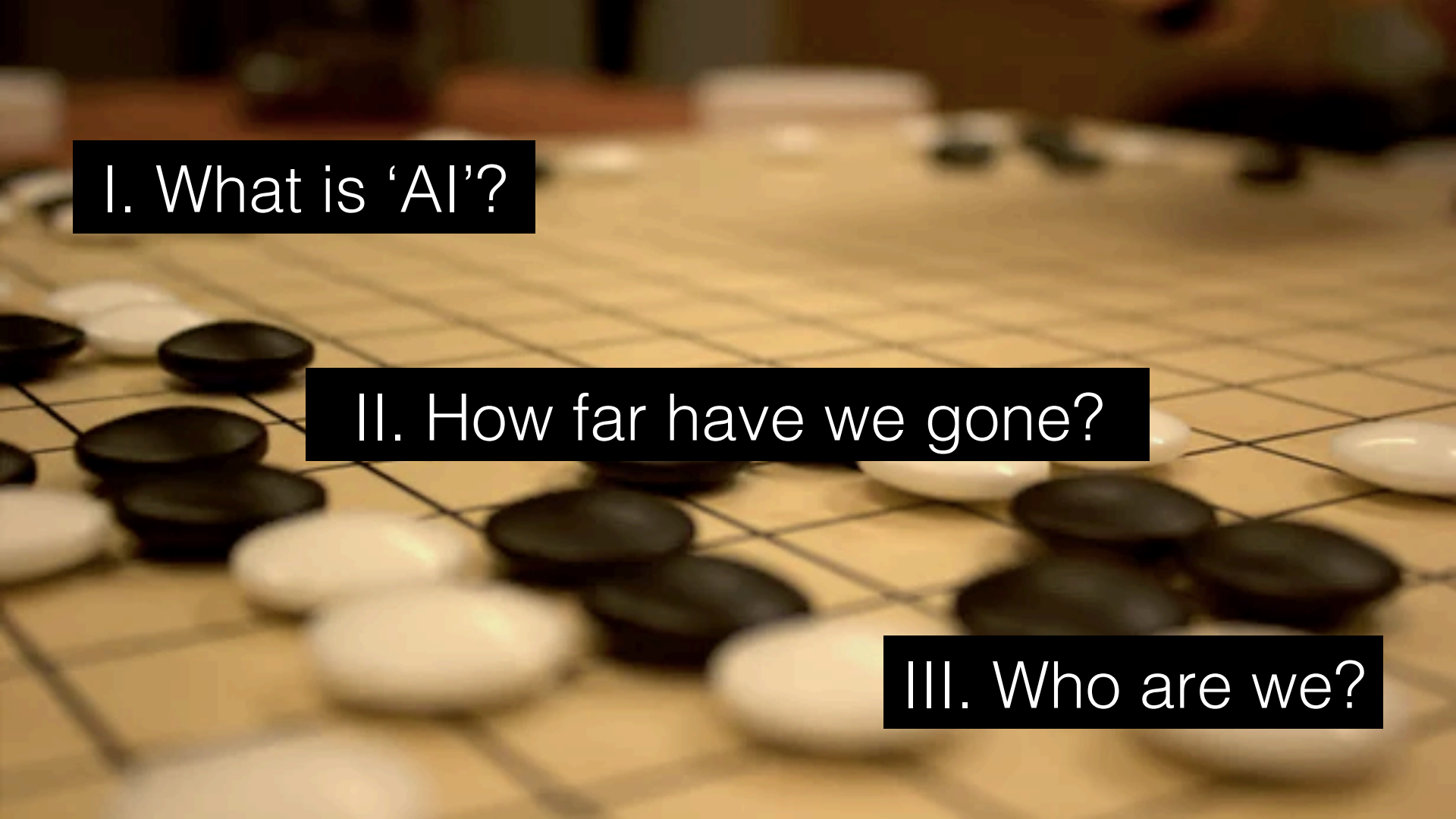


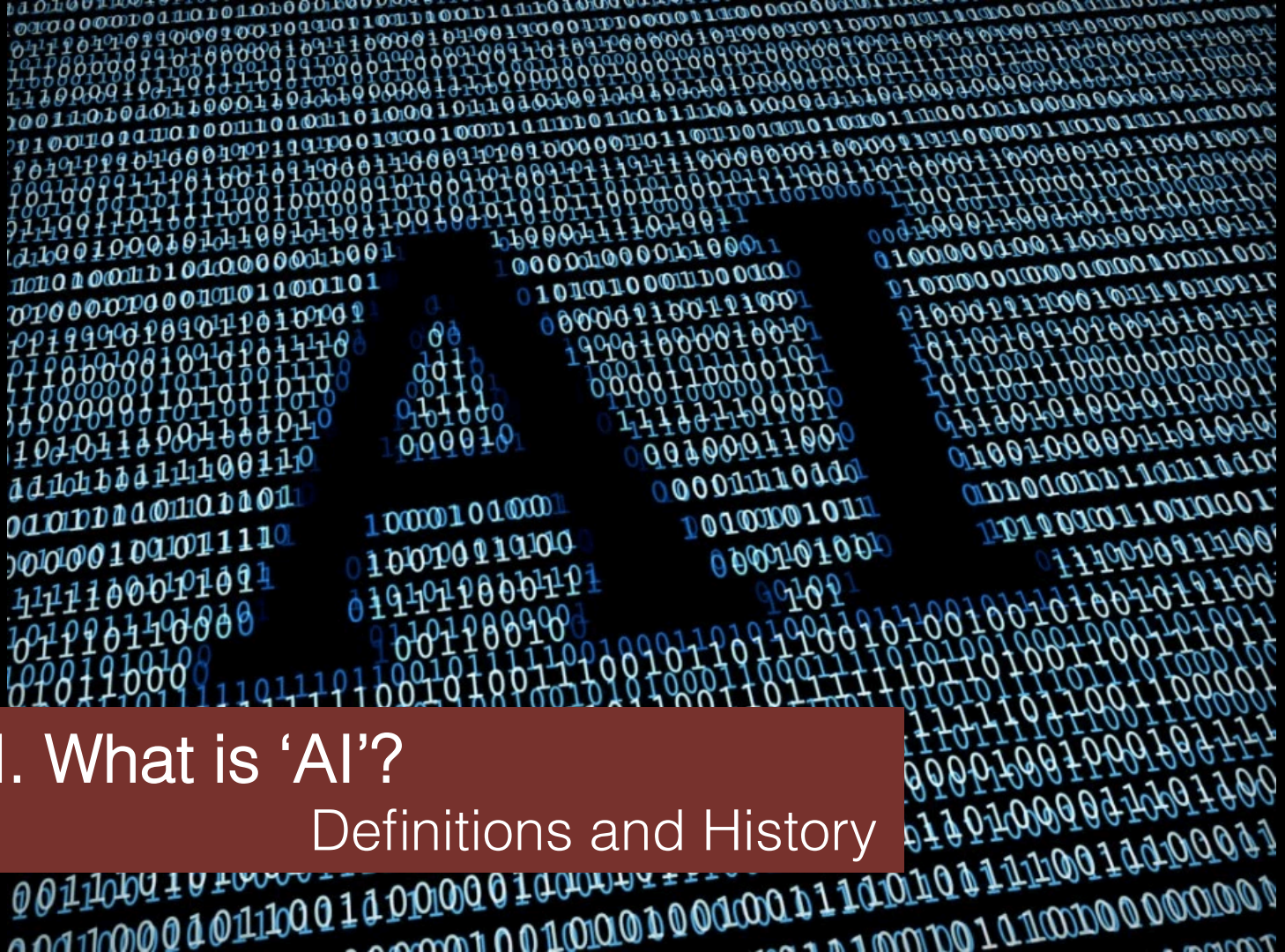
AlphaGo

Google DeepMind
Challenge Match
8 - 15 March 2016

FINAL SCORES

Match	Black	White	Result
1	Lee Sedol	AlphaGo	ALPHAGO WIN
2	AlphaGo	Lee Sedol	ALPHAGO WIN
3	Lee Sedol	AlphaGo	ALPHAGO WIN
4	AlphaGo	Lee Sedol	LEE SEDOL WIN
5	Lee Sedol	AlphaGo	ALPHAGO WIN

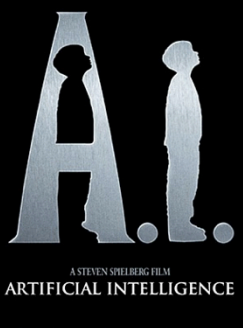

I. What is ‘AI’?
II. How far have we gone?
III. Who are we?



Part I. What is ‘AI’?

Definitions and History

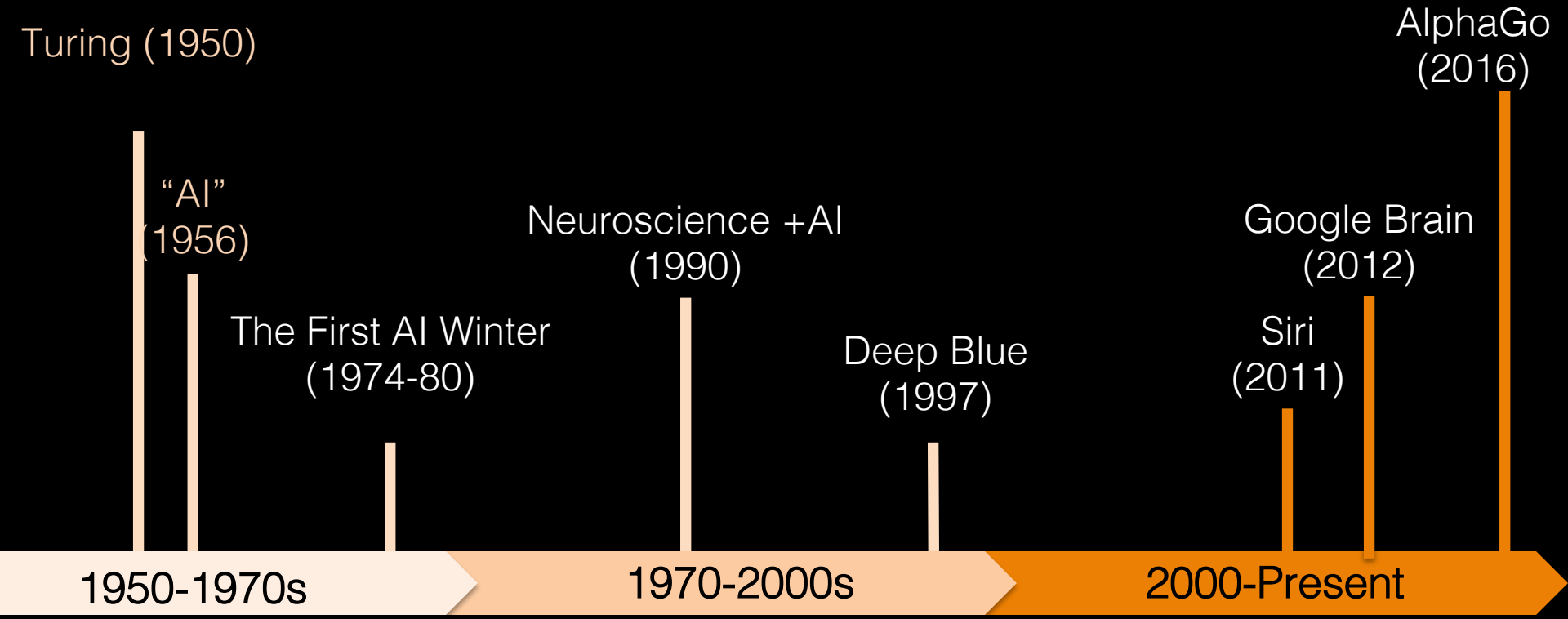
TERMINATOR
GENISYS



Artificial Intelligence (AI)

- the science devoted to developing programs that enable computers to display behavior that can be characterized as intelligent
- most research in AI is devoted to fairly narrow applications
- substantial interest remains in the long-range goal of building generally intelligent, autonomous agents

Source: Thomason, Richmond, "Logic and Artificial Intelligence", The Stanford Encyclopedia of Philosophy


Turing (1950)
"AI" (1956)
The First AI Winter (1974-80)
Neuroscience +AI (1990)
Deep Blue (1997)
Siri (2011)
Google Brain (2012)
AlphaGo (2016)
1950-1970s
1970-2000s
2000-Present

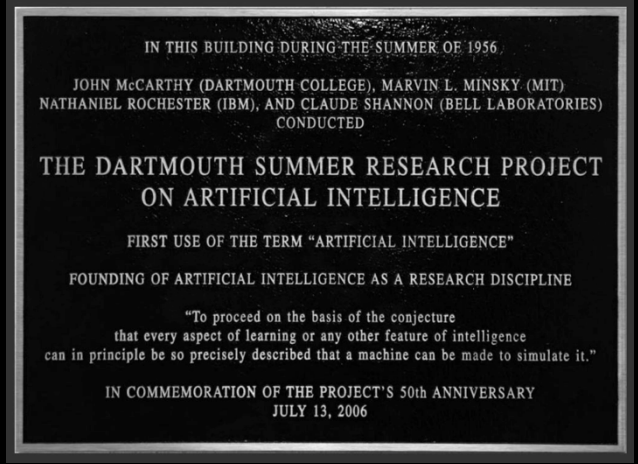
The birth of ‘AI’

Dartmouth Conference 1956, the birth of AI

John McCarthy:

“Every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it.

An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves.”



Q1: If many (or all) aspects of intelligence can be manifested by programmed machines, what does that tell us about intelligence, or human mind?

Strong AI

- human mind are essentially some programs
- suitably programmed machines can manifest mental capabilities
- An AI system can really think and have a mind

Alan Turing: Father of CS and AI

VOL. LIX. No. 236.] [October, 1950

MIND

A QUARTERLY REVIEW

OF

PSYCHOLOGY AND PHILOSOPHY

I.—COMPUTING MACHINERY AND INTELLIGENCE

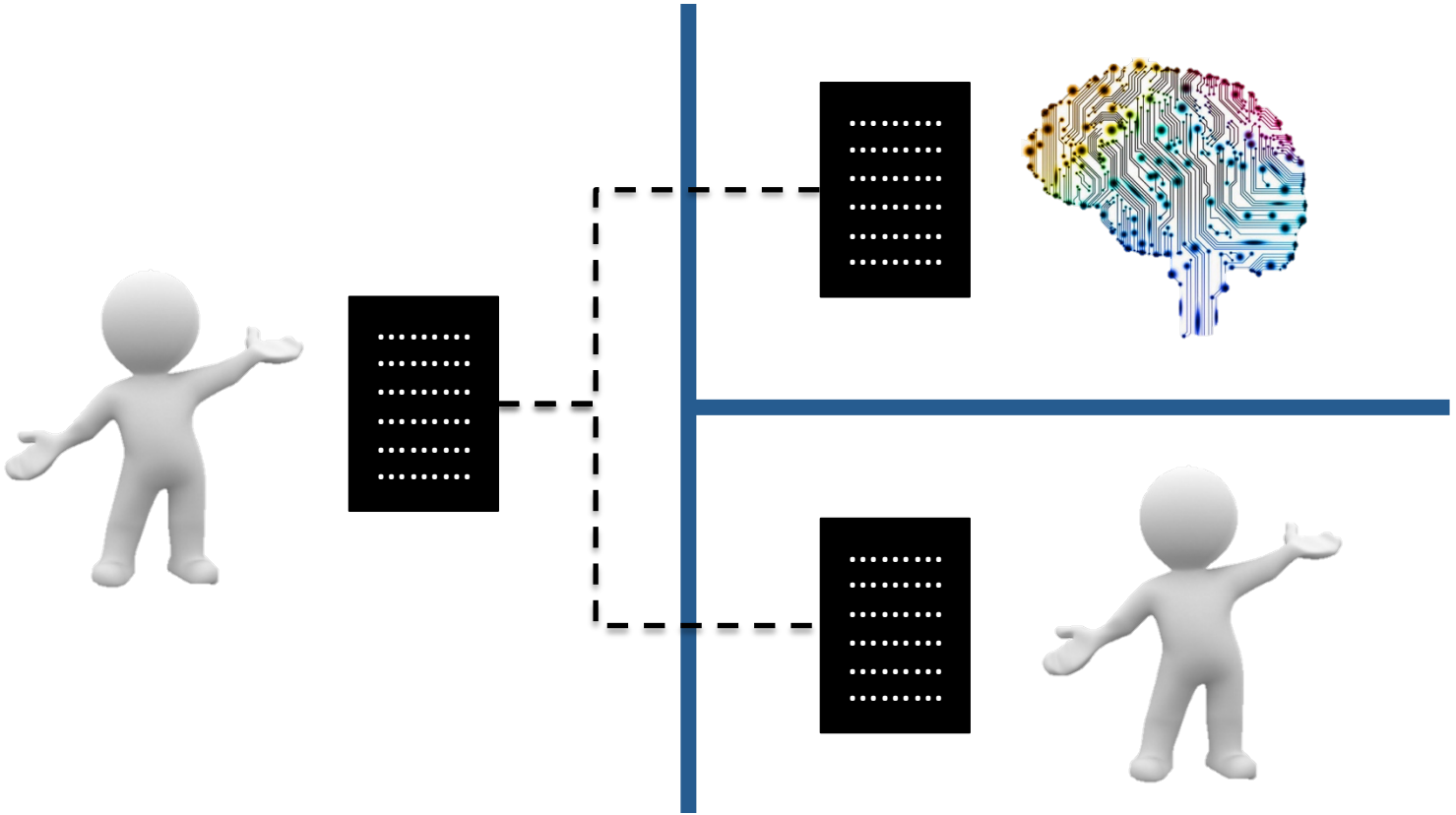
BY A. M. TURING

1. *The Imitation Game.*

I PROPOSE to consider the question, 'Can machines think?' This should begin with definitions of the meaning of the terms 'machine' and 'think'. The definitions might be framed so as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words 'machine' and 'think' are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, 'Can machines think?' is to be sought in a statistical survey such as a Gallup poll. But this is absurd. Instead of attempting such a definition I shall replace the question by another, which is closely related to it and is expressed in relatively unambiguous words.

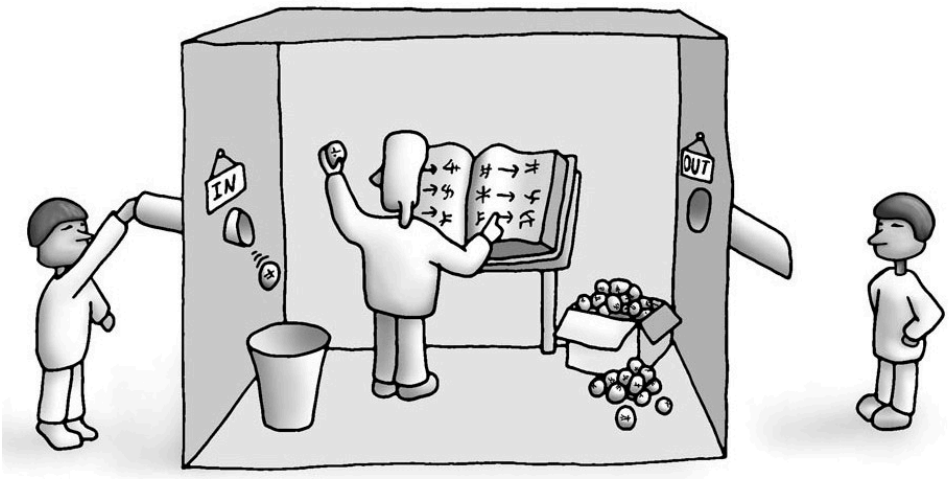
Turing Test

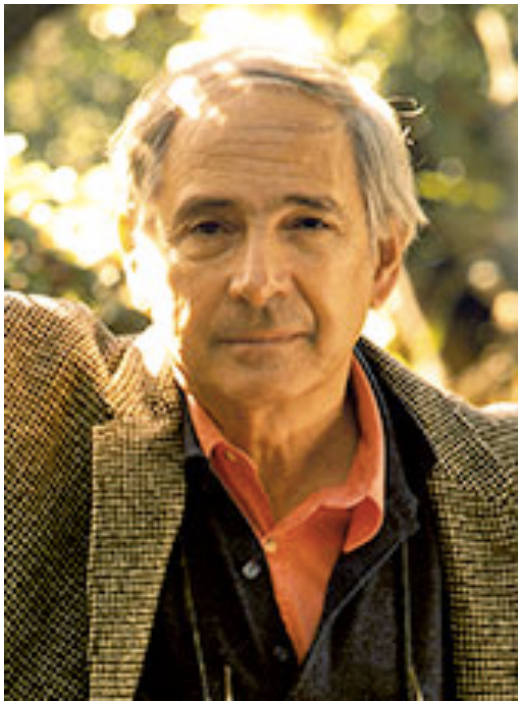
Alan Turing



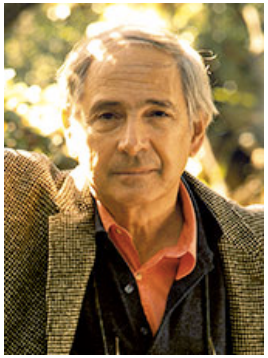
Source: Turing, Alan M. "Computing machinery and intelligence." Mind 59.236 (1950): 433-460.

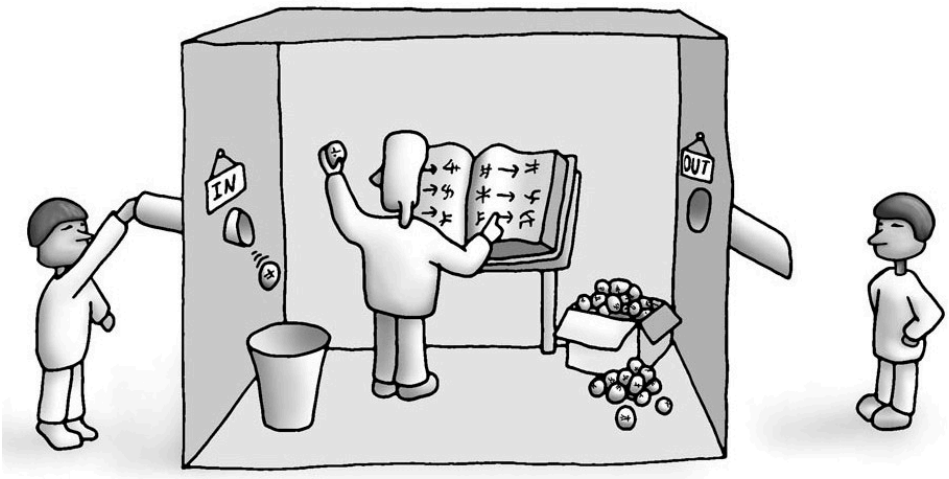
John Searle:
Chinese Room Argument





Reference: Wikipedia. Philosophy of artificial intelligence
Cole, David, "The Chinese Room Argument", *The Stanford Encyclopedia of Philosophy* (Winter 2015 Edition), Edward N. Zalta (ed.)



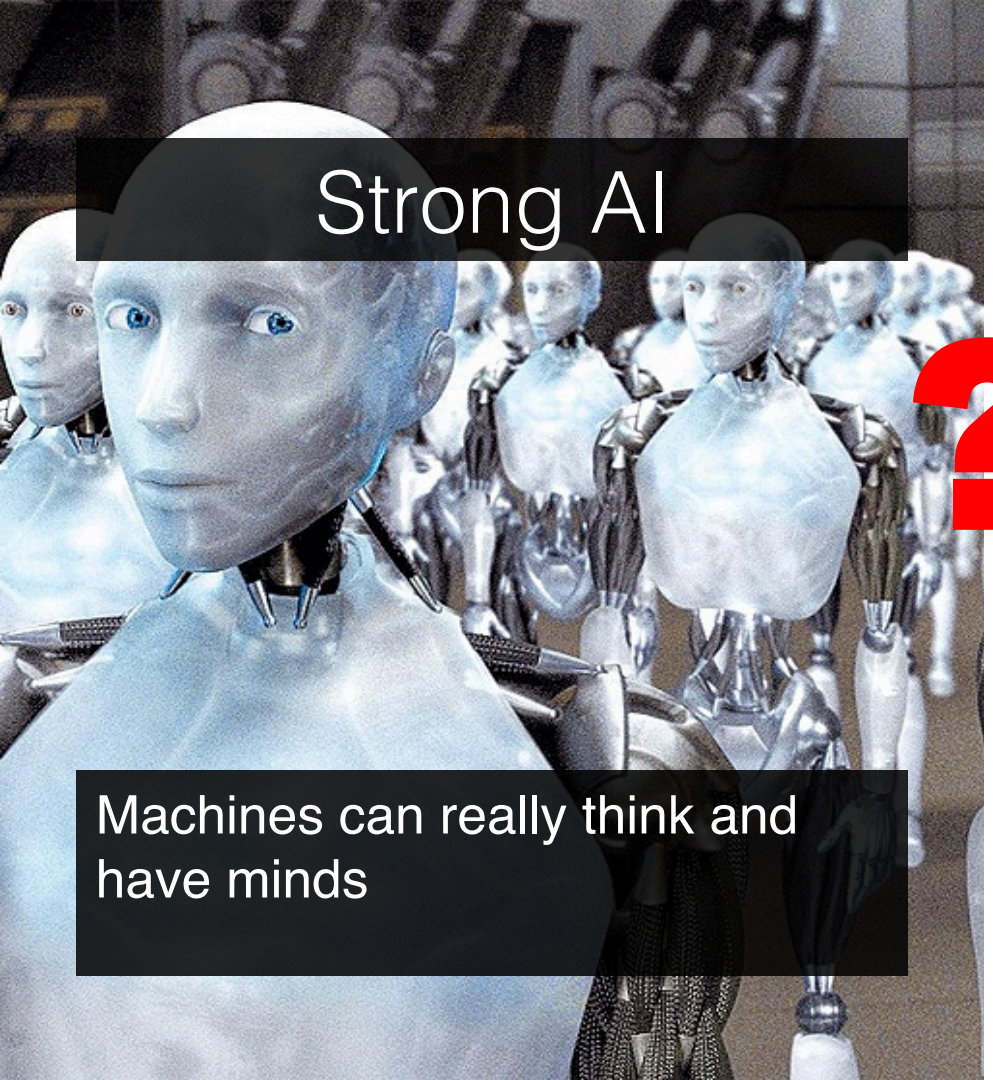


Weak AI

- human minds are not essentially some programs
- suitably programmed machines can only simulate mental capabilities
- machines do not think, understand, or have a mind

Reference: Wikipedia. Philosophy of artificial intelligence
Cole, David, "The Chinese Room Argument", *The Stanford Encyclopedia of Philosophy* (Winter 2015 E

Strong AI



Machines can really think and have minds

?

Weak AI

Machines can only simulate human minds and act like they are thinking

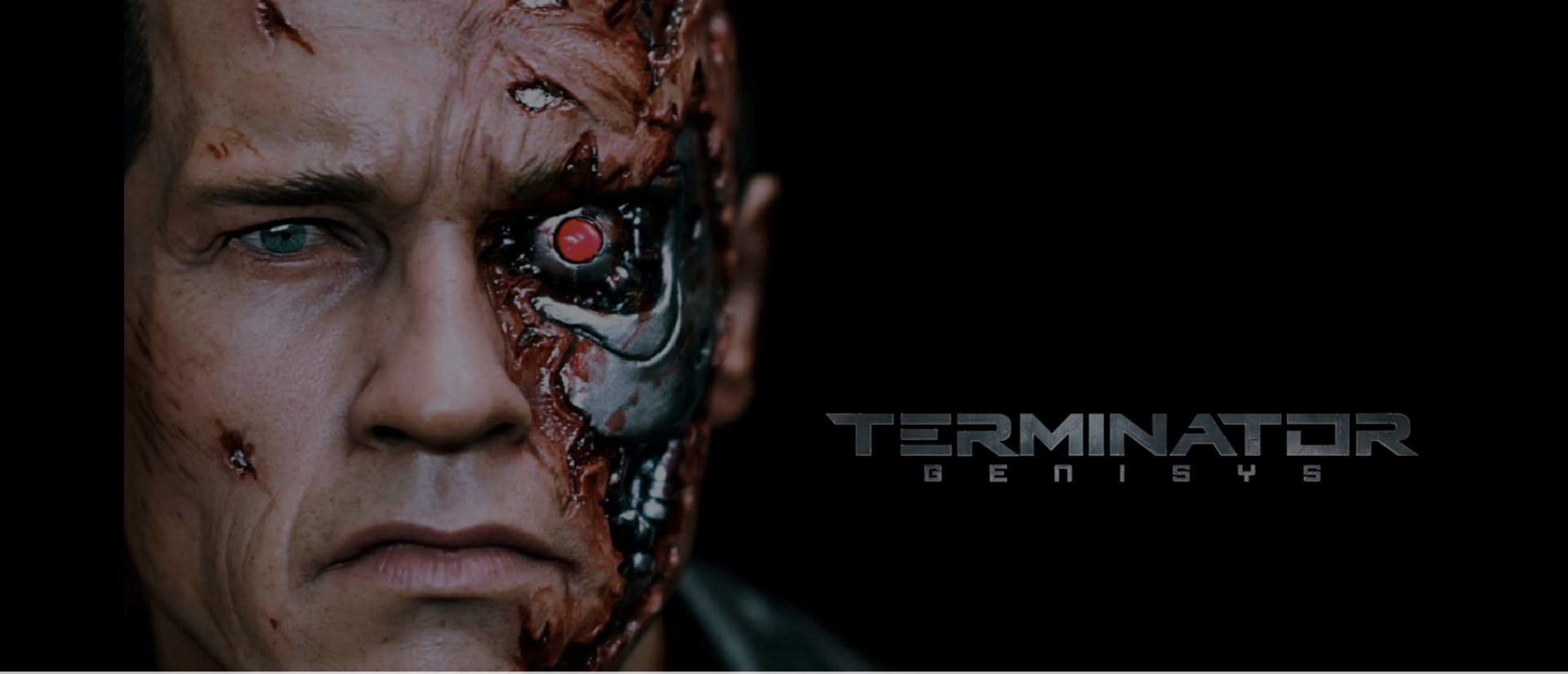
Q1: If many (or all) aspects of intelligence can be manifested by programmed machines, what does that tell us about intelligence, or human mind?

Q2: Is that true that all aspects of intelligence can in principle be manifested by programmed machines?

Part II. How far have we gone?

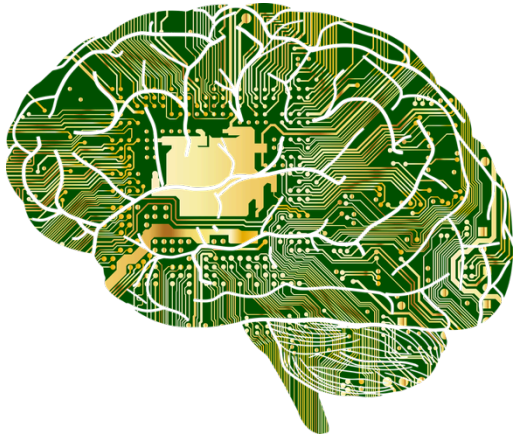
Movements in AI research, current advancement

TERMINATOR
GENISYS



This is far from happening!!

Input



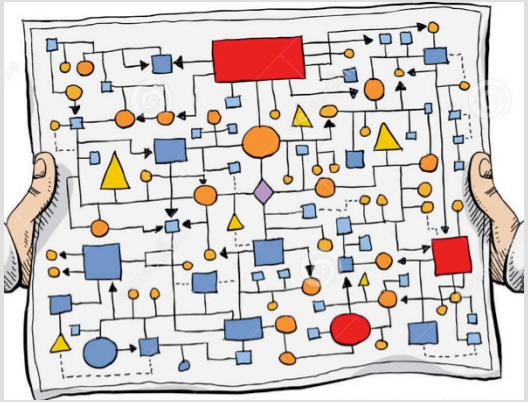
Output

Cat

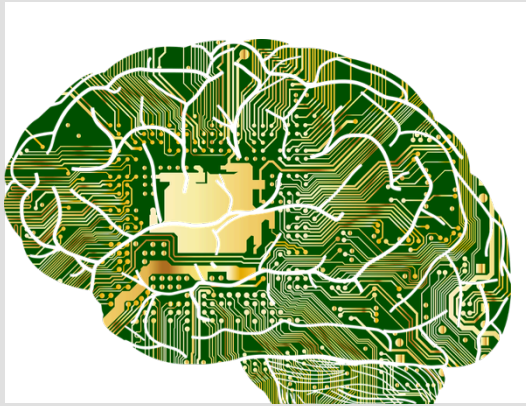
Dog

Traditional and modern approach to AI

Handcrafted Knowledge



Machine Learning



Handcrafted Knowledge

Input

Output

Cat

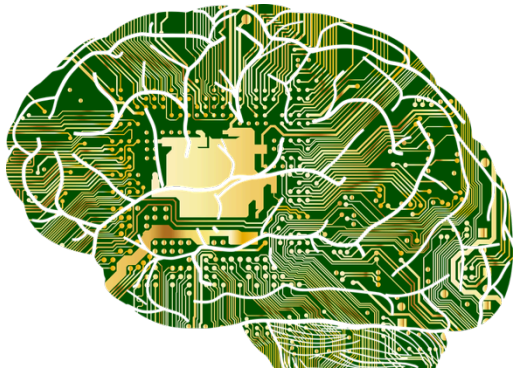
Dog

What is Machine Learning?

Machine learning gives computers the ability to learn without being explicitly programmed.

Machine Learning Approach

Input

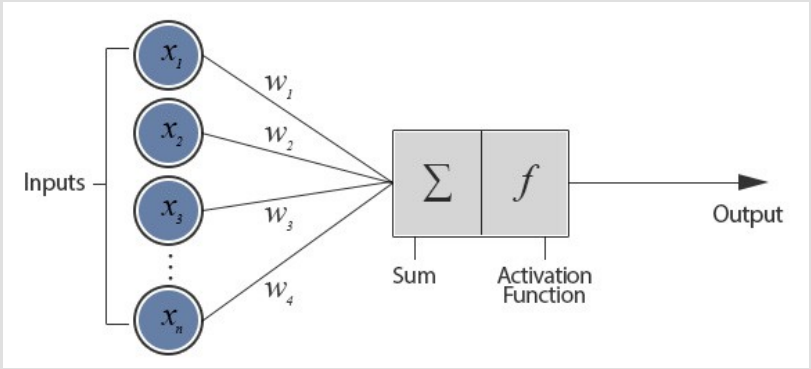


Output

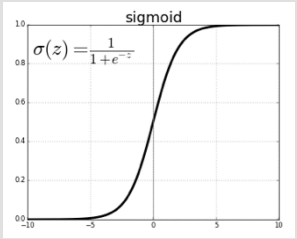
Cat

Dog

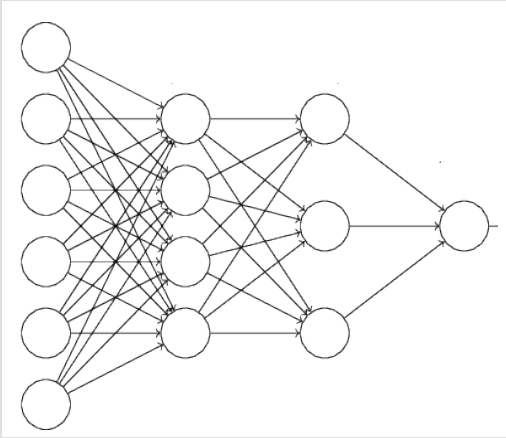
Deep learning is a prominent approach in machine learning



Artificial Neuron



Activation

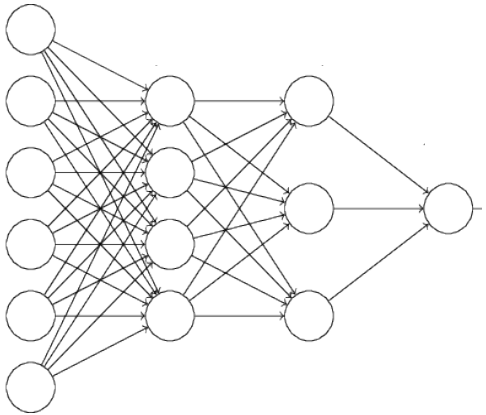


Neural Network

Source: https://medium.com/technologymadeeasy/for-dummies-the-introduction-to-neural-networks-we-all-need-c50f6012d5eb
https://medium.com/dbrs-innovation-labs/machine-learning-for-artists-7a3689a34e9e

Supervised Learning

Input



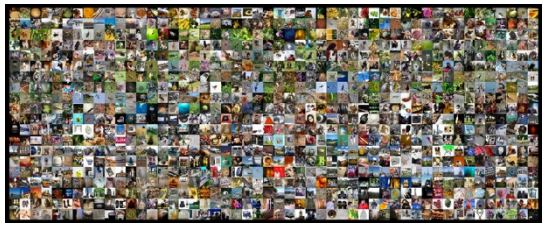
Output

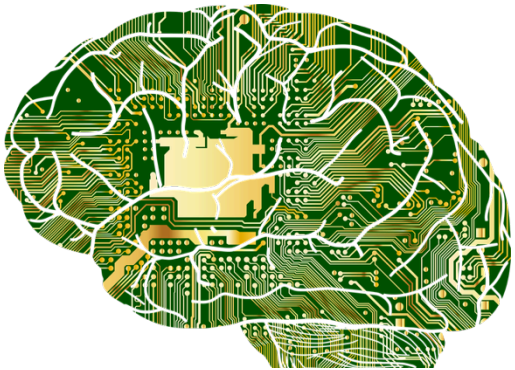
Cat

Dog

millions of images and thousands of labels

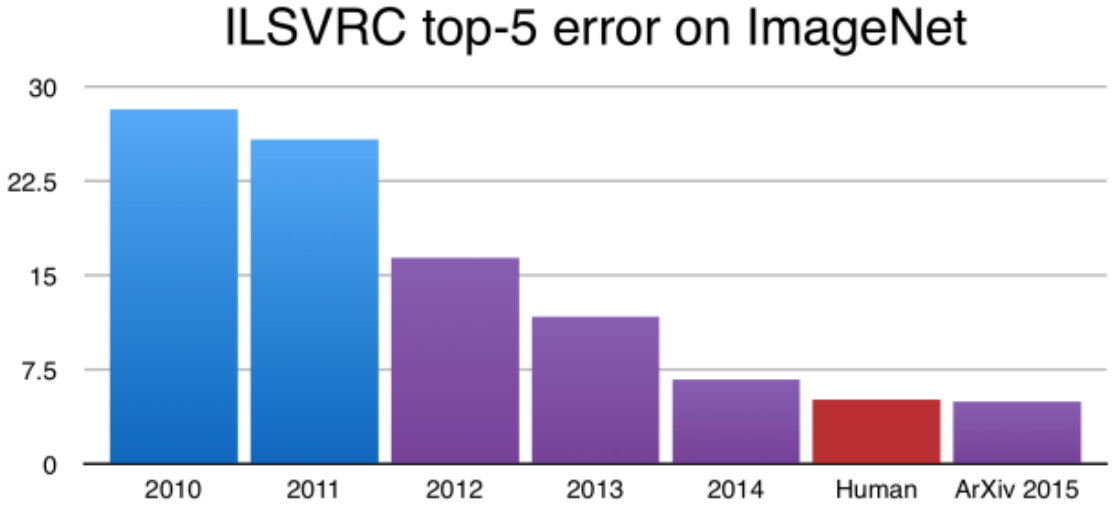
Input





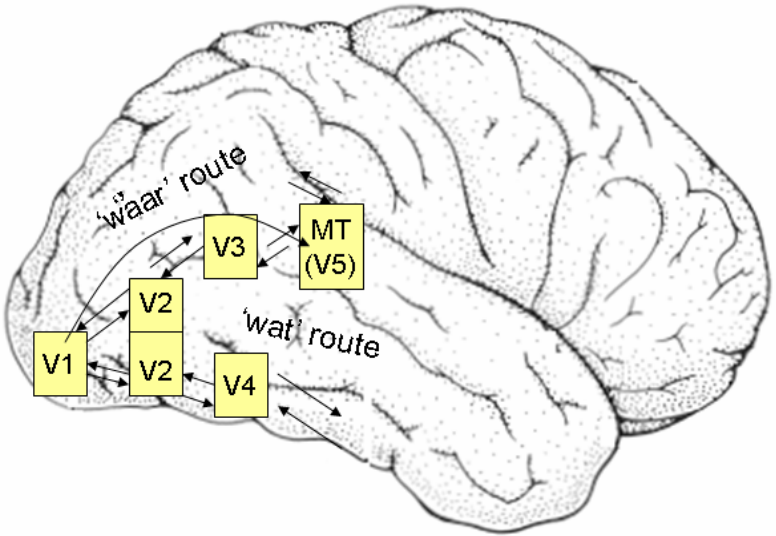
Output

1000 labels



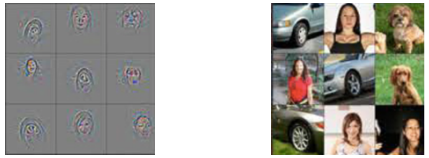
Source: https://srconstantin.wordpress.com/2017/01/28/performance-trends-in-ai/

Human Brain

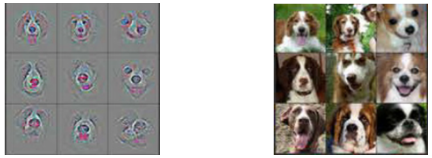


Neural Network

Layer 5

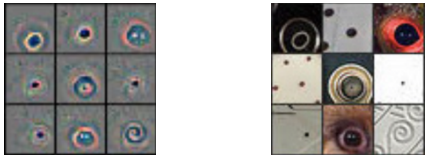


Layer 4

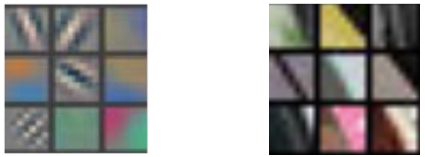


Layer 3

Layer 2

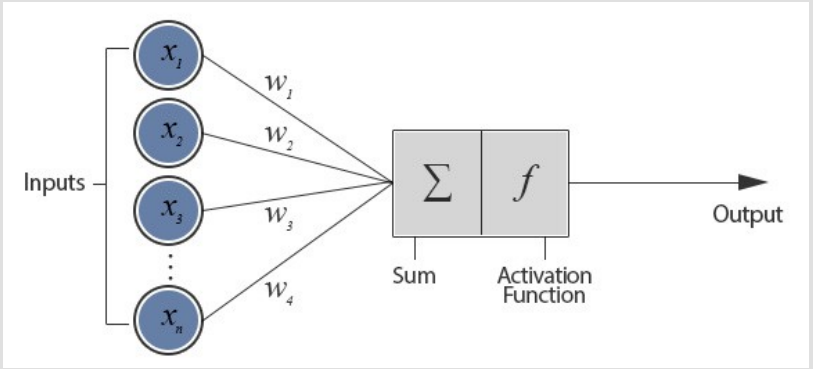


Layer 1

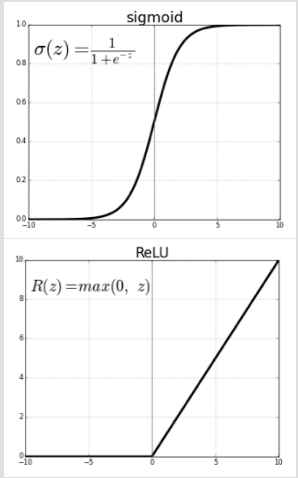


Source : MLA Zeiler, "Visualizing and understanding convolutional networks." ECCV, 2014.

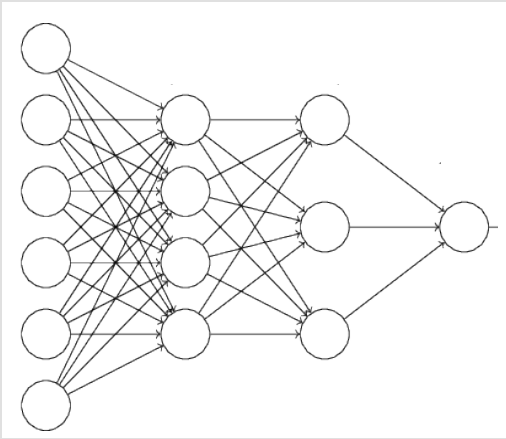
Universal Approximation Theorem



Perceptron



Activation



Neural Network

<u>Universal Approximation Theorem</u>

Neural network can approximate ANY given (nice) function

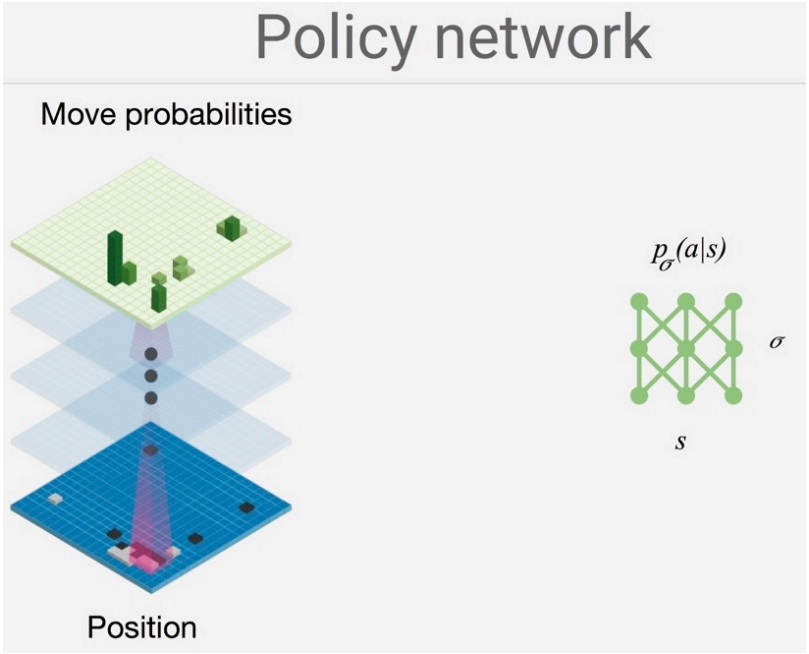
Source: K. Hornik et al. "Multilayer feedforward networks are universal approximators." Neural networks,1989
G. Cybenko "Approximation by superpositions of a sigmoidal function." Mathematics of Control, Signals, and Systems,1989

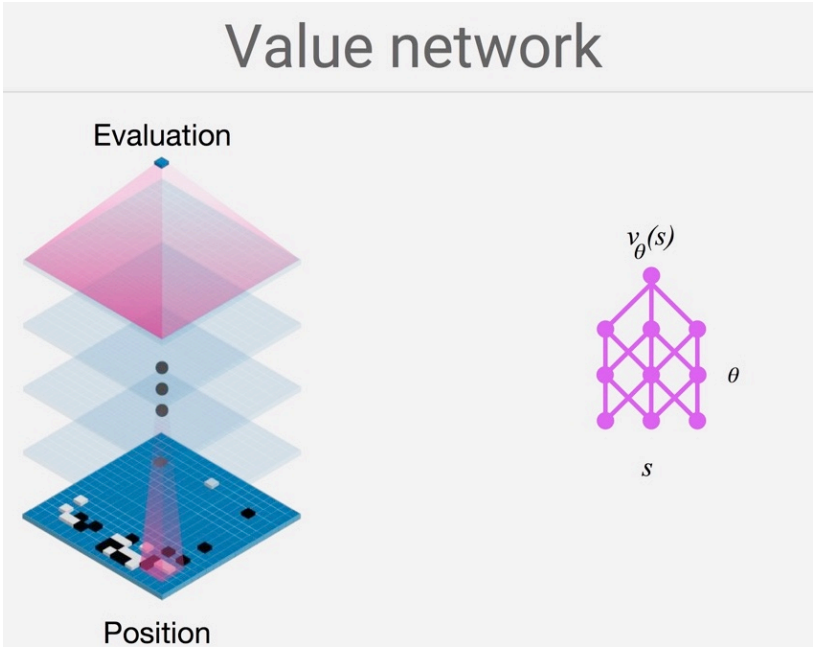
Nature AlphaGo

Seoul AlphaGo

Source: David Silver IJCAI 2016 Invited Talk: AlphaGo

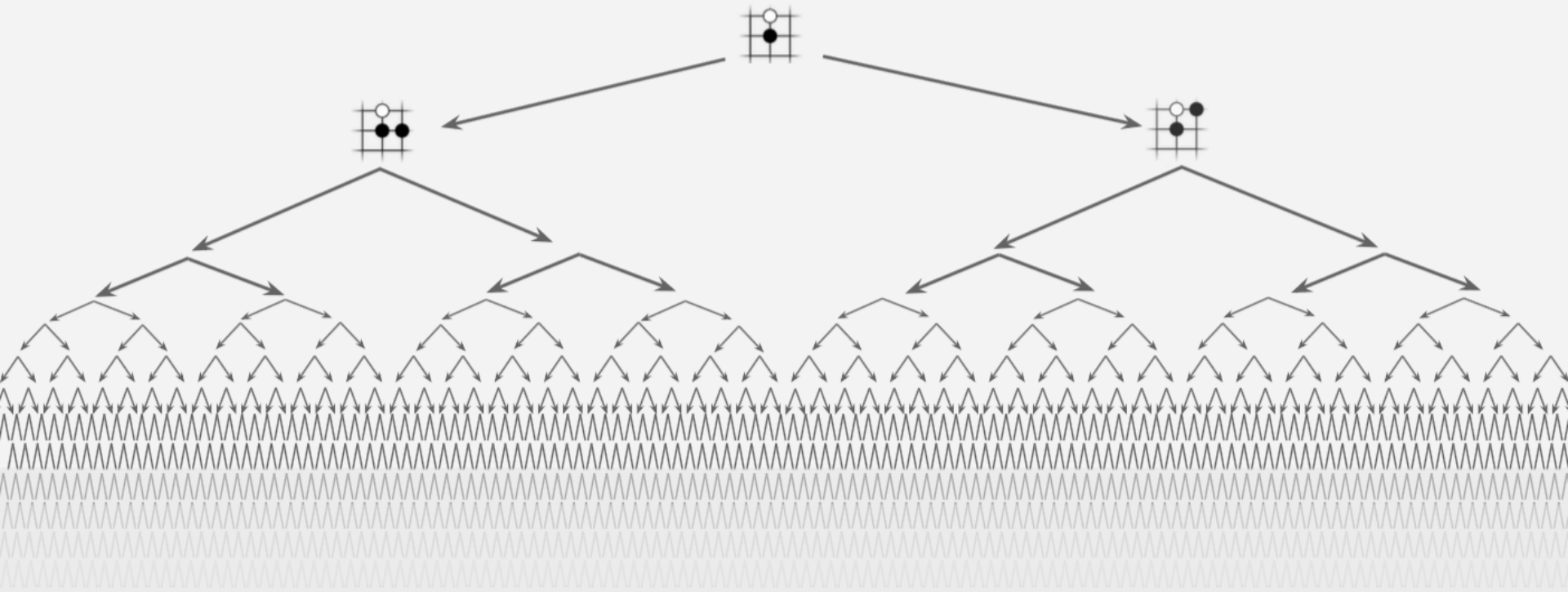
Two key components of AlphaGo





Source: David Silver IJCAI 2016 Invited Talk: AlphaGo

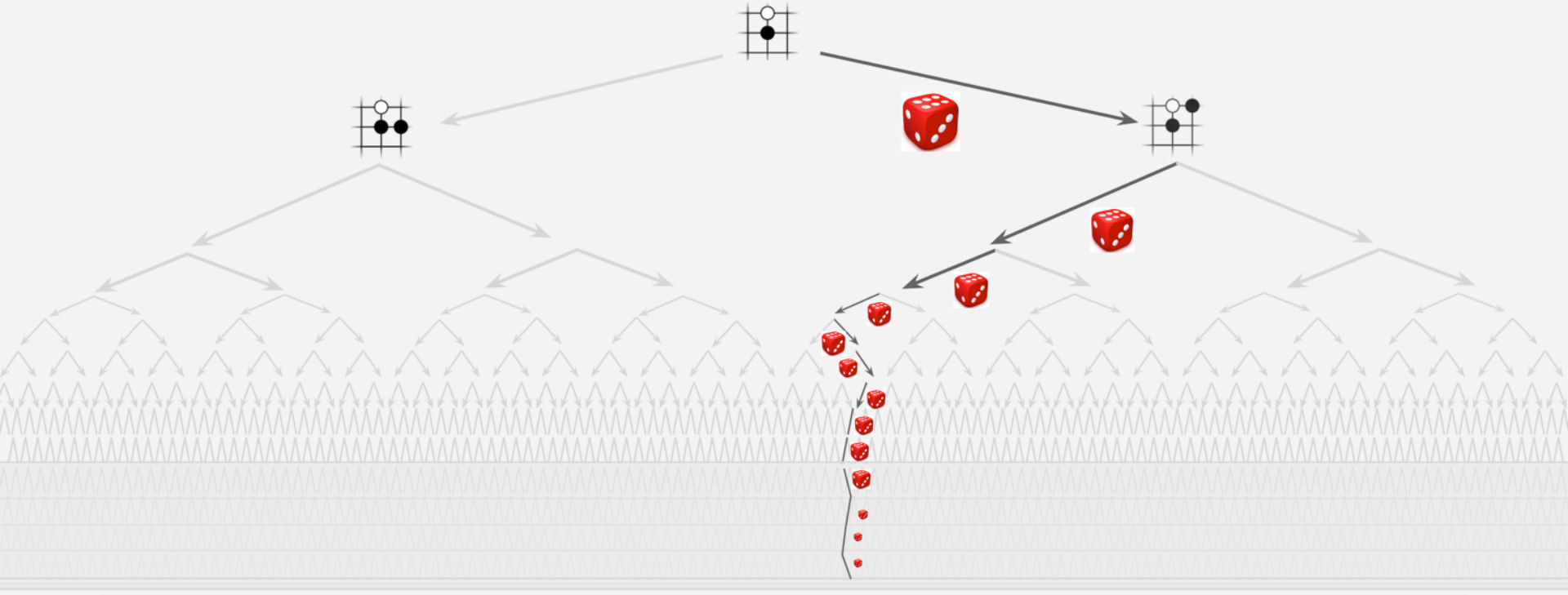
Exhaustive search



Google DeepMind

Source: David Silver IJCAI 2016 Invited Talk: AlphaGo

Monte-Carlo rollouts



Google DeepMind

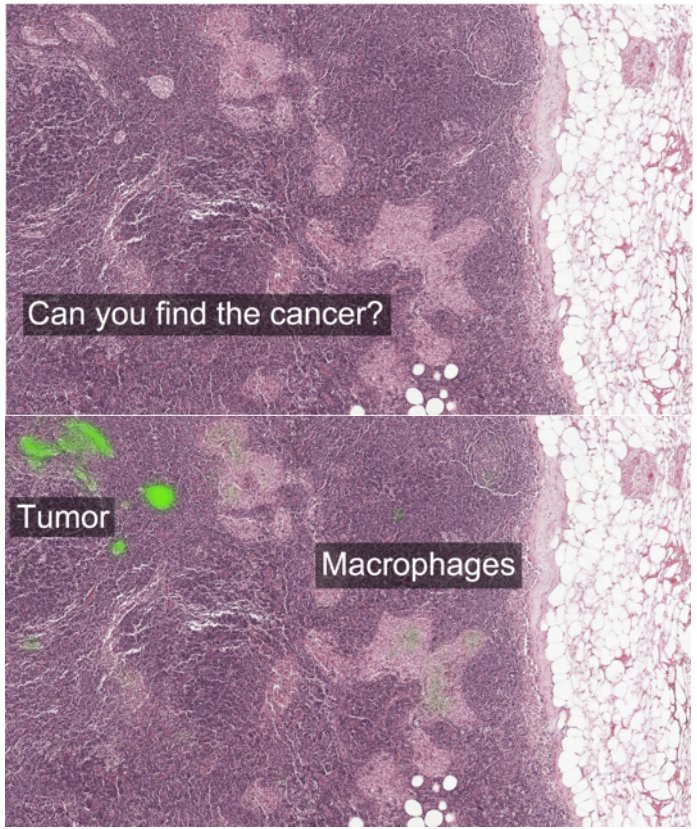
Source: David Silver IJCAI 2016 Invited Talk: AlphaGo

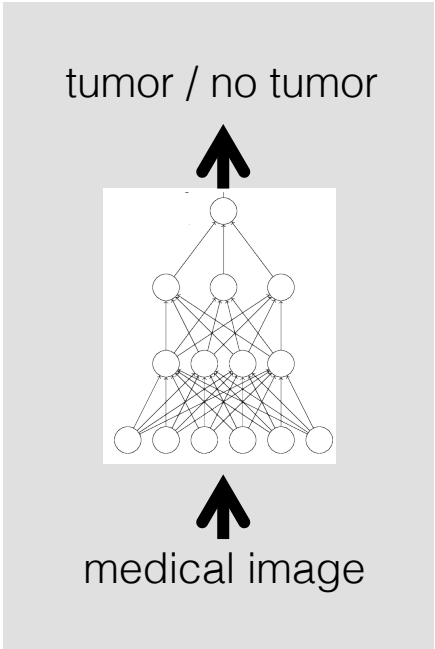
The same technique in other applications

Medical Diagnosis

Self-Driving Car

Computer-aided diagnosis





Source: https://research.google.com/teams/brain/healthcare/

Rethinking the Inception Architecture for Computer Vision

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Sergey Ioffe
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Jonathon Shlens
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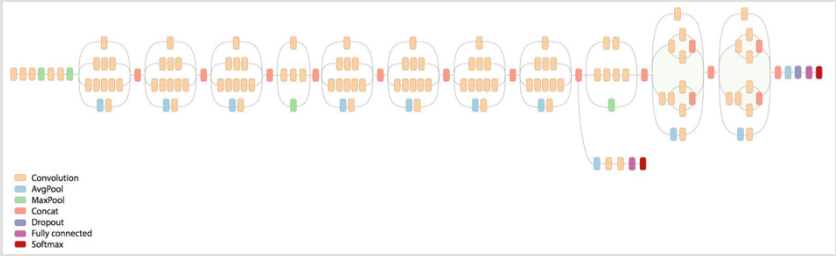


JAMA | Original Investigation | INNOVATIONS IN HEALTH CARE DELIVERY

Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs

Varun Gulshan, PhD; Lily Peng, MD, PhD; Marc Coram, PhD; Martin C. Stumpe, PhD; Derek Wu, BS; Arunachalam Narayanaswamy, PhD; Subhashini Venugopalan, MS; Kasumi Widner, MS; Tom Madams, MEng; Jorge Cuadros, OD, PhD; Ramasamy Kim, OD, DNB; Rajiv Raman, MS, DNB; Philip C. Nelson, BS; Jessica L. Mega, MD, MPH; Dale R. Webster, PhD

LETTER

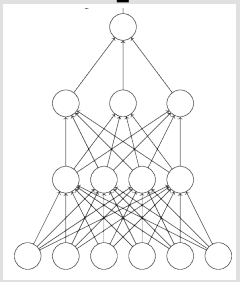
doi:10.1038/nature21056

Dermatologist-level classification of skin cancer with deep neural networks

Andre Esteva[1]*, Brett Kuprel[1]*, Roberto A. Novoa[2,3], Justin Ko[2], Susan M. Swetter[2,4], Helen M. Blau[5] & Sebastian Thrun[6]

Self-driving Car

wheel and pedal control



sensor input

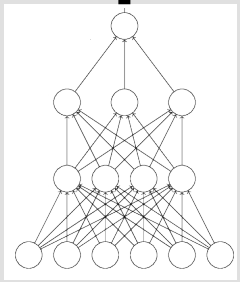
Source: https://bits.blogs.nytimes.com/2014/05/13/a-trip-in-a-self-driving-car-now-seems-routine/

https://www.youtube.com/watch?v=VG68SKoG7vE&t=5s

Universal approx. theorem can be used in many applications

Face Detection

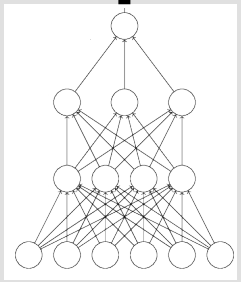
face / no face



image

Loan Approval

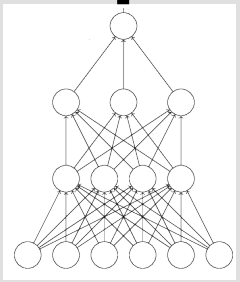
repay / no repay



personal information

Translation

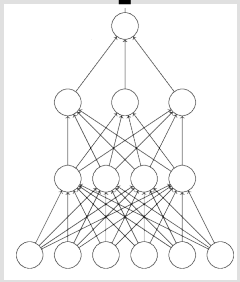
Mandarin sentence



English sentence

Speech Recognition

transcript



audio clip

While doing those specific tasks, is there any essential difference between human and computer?

WIRED

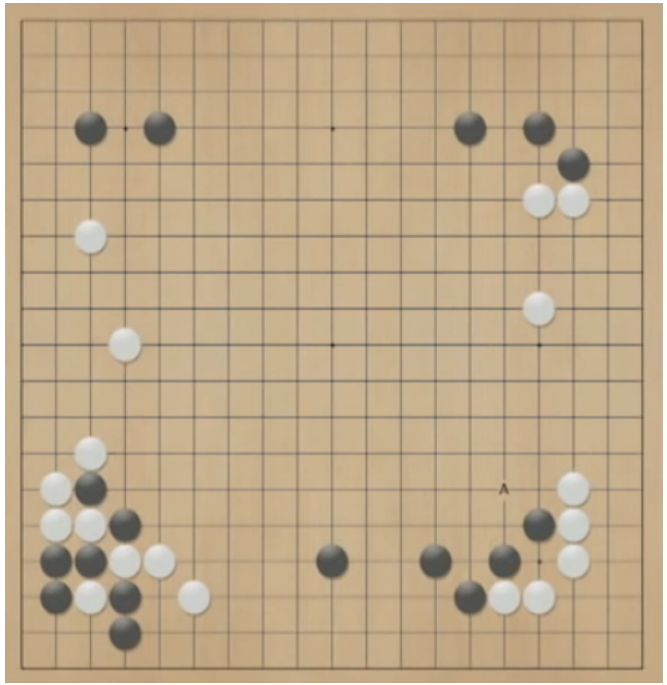
CADE METZ BUSINESS 03.16.16 7:00 AM

IN TWO MOVES, ALPHAGO AND LEE SEDOL REDEFINED THE FUTURE

AlphaGo's 37th move in game 2

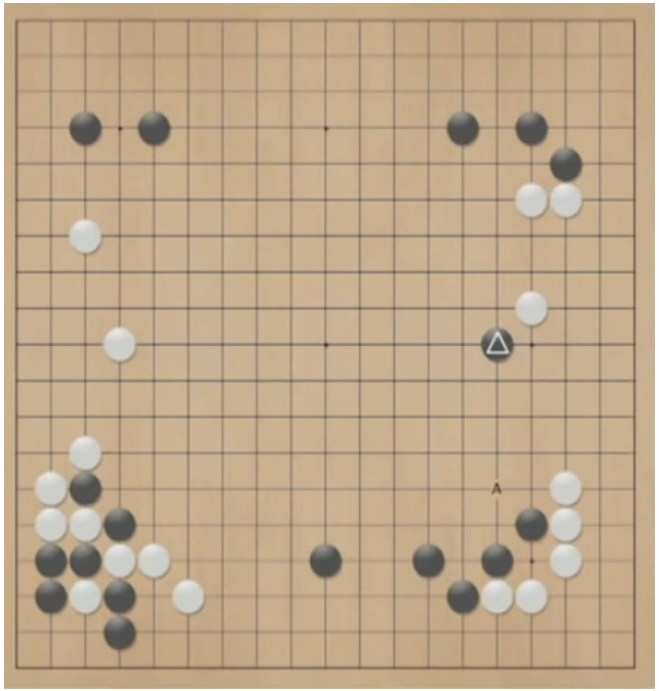
Lee Sedol's 78th move in game 4

AlphaGo’s Astounding Move 37 in Game 2



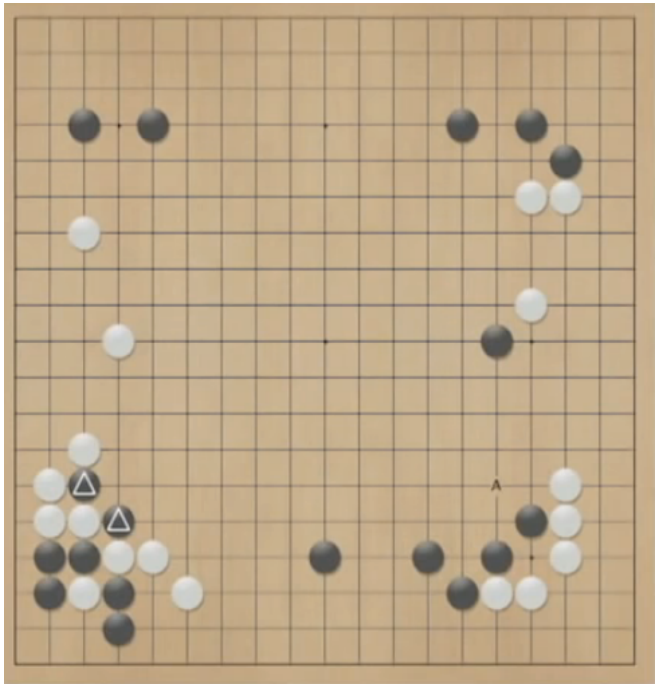
Source: Demis Hassabis, "Artificial Intelligence (AI) invents new knowledge and teaches human new theories"

AlphaGo’s Astounding Move 37 in Game 2



Source: Demis Hassabis, "Artificial Intelligence (AI) invents new knowledge and teaches human new theories"

AlphaGo’s Astounding Move 37 in Game 2



Source: Demis Hassabis, "Artificial Intelligence (AI) invents new knowledge and teaches human new theories"

Medical Diagnosis

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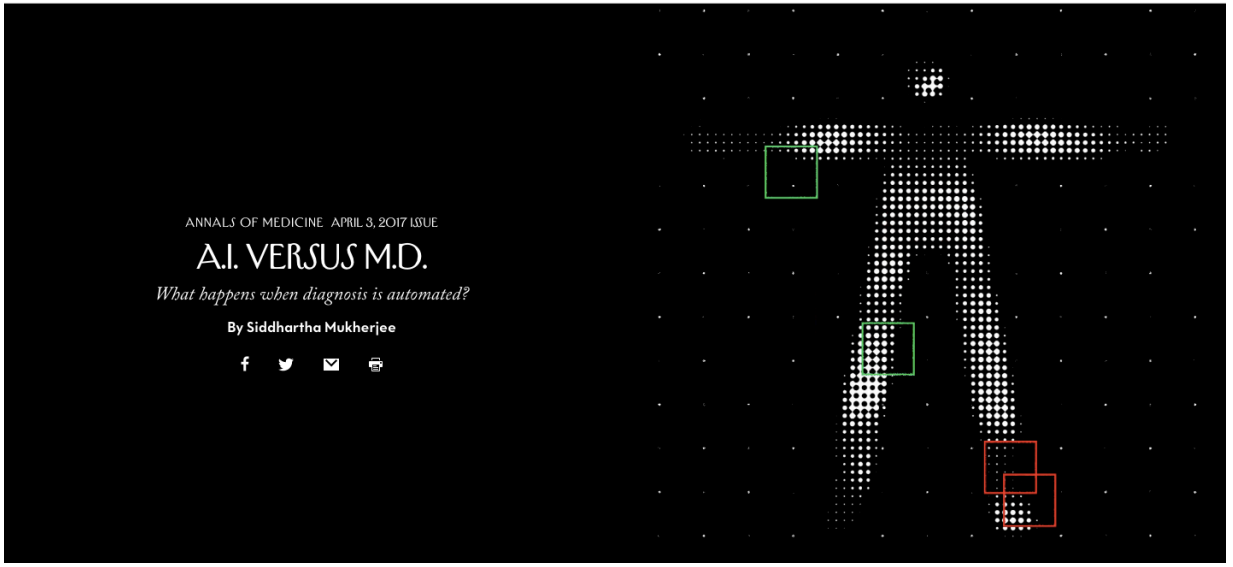
ANNALS OF MEDICINE APRIL 3, 2017 ISSUE

A.I. VERSUS M.D.

What happens when diagnosis is automated?

By Siddhartha Mukherjee



Q1: If many (or all) aspects of intelligence can be manifested by programmed machines, what does that tell us about intelligence, human mind, or us?

Q2: Is that true that all aspects of intelligence can in principle be manifested by programmed machines?

Part III. Who are We?

Are there essential differences between humans and machines?

Medical Diagnosis

Driving

Court Ruling

Perception
Action
Reasoning
Language

Perception
Action
Consciousness
Emotion
Reasoning
Language

Perception
Action
Meaning Creation & Value Attribution
Goal, Dream
Self-Realization
Imagination
Morality
Care, regards, love
Identity
Community
Consciousness
Emotion
Reasoning
Language

Better understanding of “AI”

AI is around us!

How are we different from machines?