Basics of A.I

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INTRODUCTION TO A.I - UMAIR M.I

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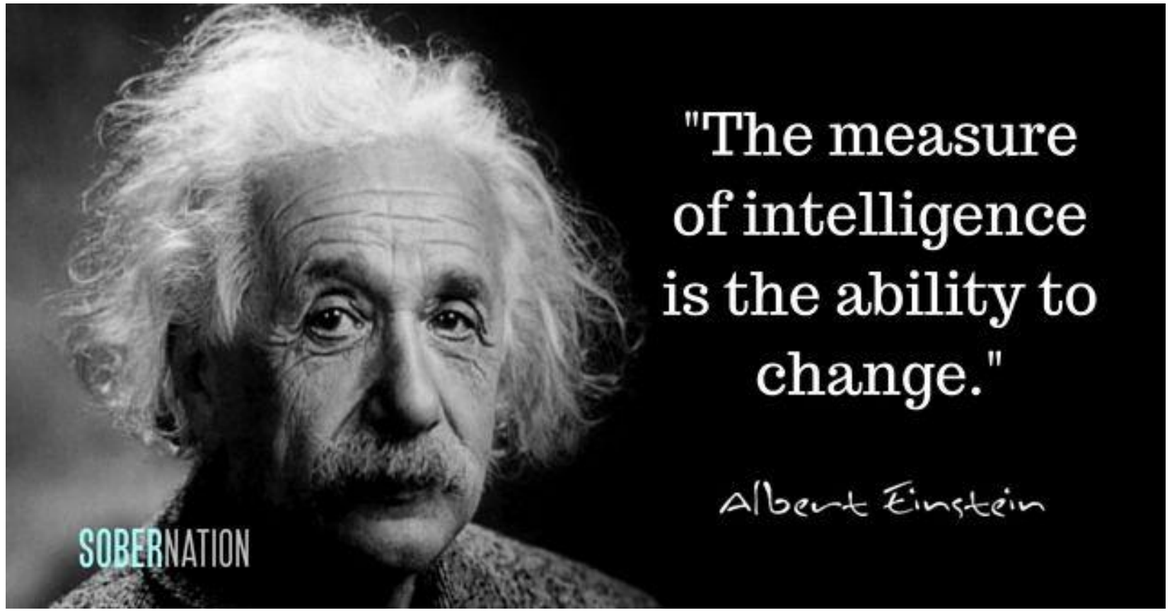
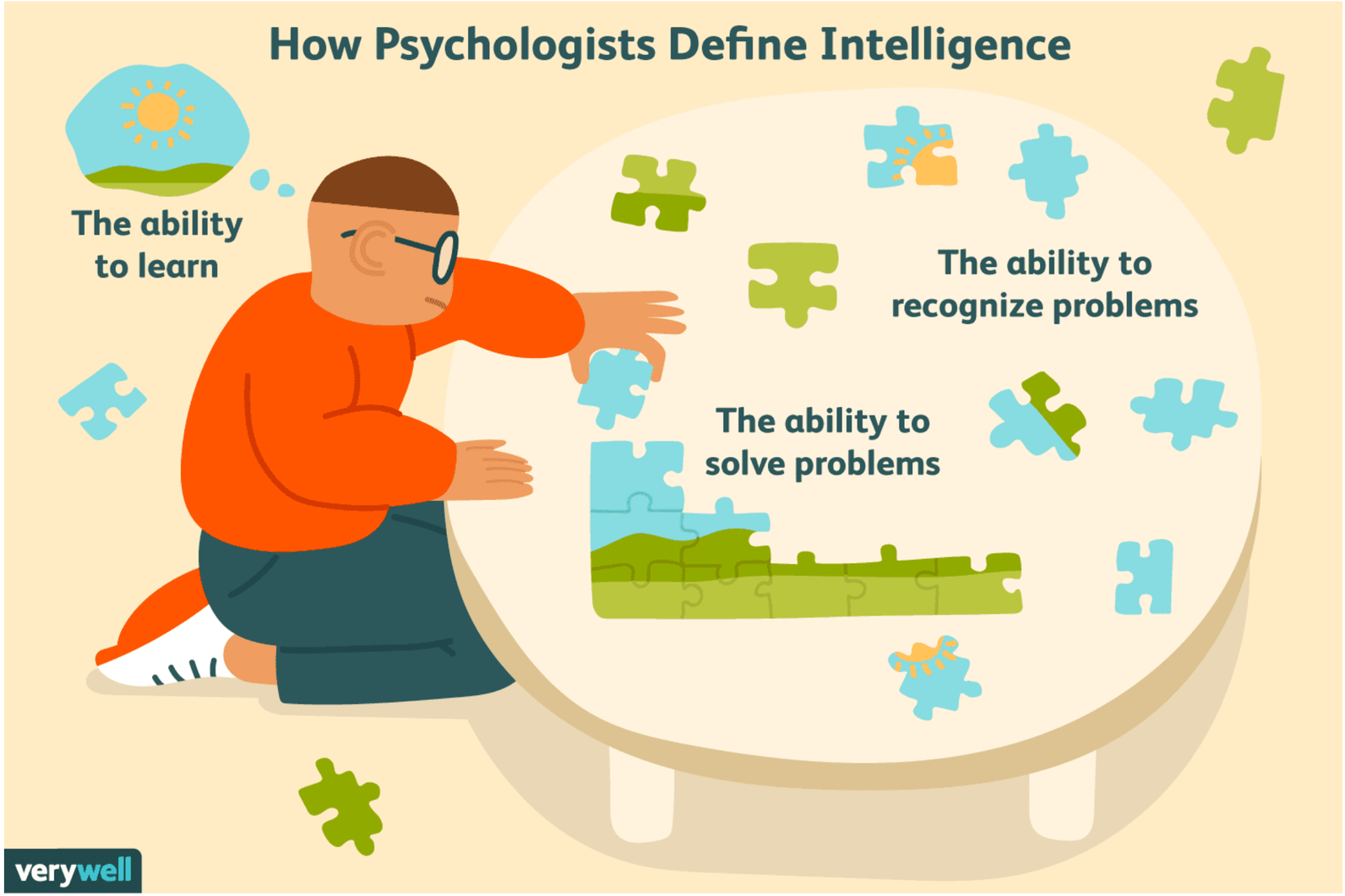
What is Intelligence ?


NOT SURE IF I'M INTELLIGENT
OR EVERYONE AROUND ME IS STUPID


THE FACE YOU MAKE
WHEN YOU DON'T KNOW WHAT YOU ARE DOING


"The measure of intelligence is the ability to change."
Albert Einstein
SOBERNATION


How Psychologists Define Intelligence
The ability to learn
The ability to recognize problems
The ability to solve problems
verywell

What is Artifical Intelligence ?

A.I is when we *artificially* introduce intelligence in machines

thereby giving us:

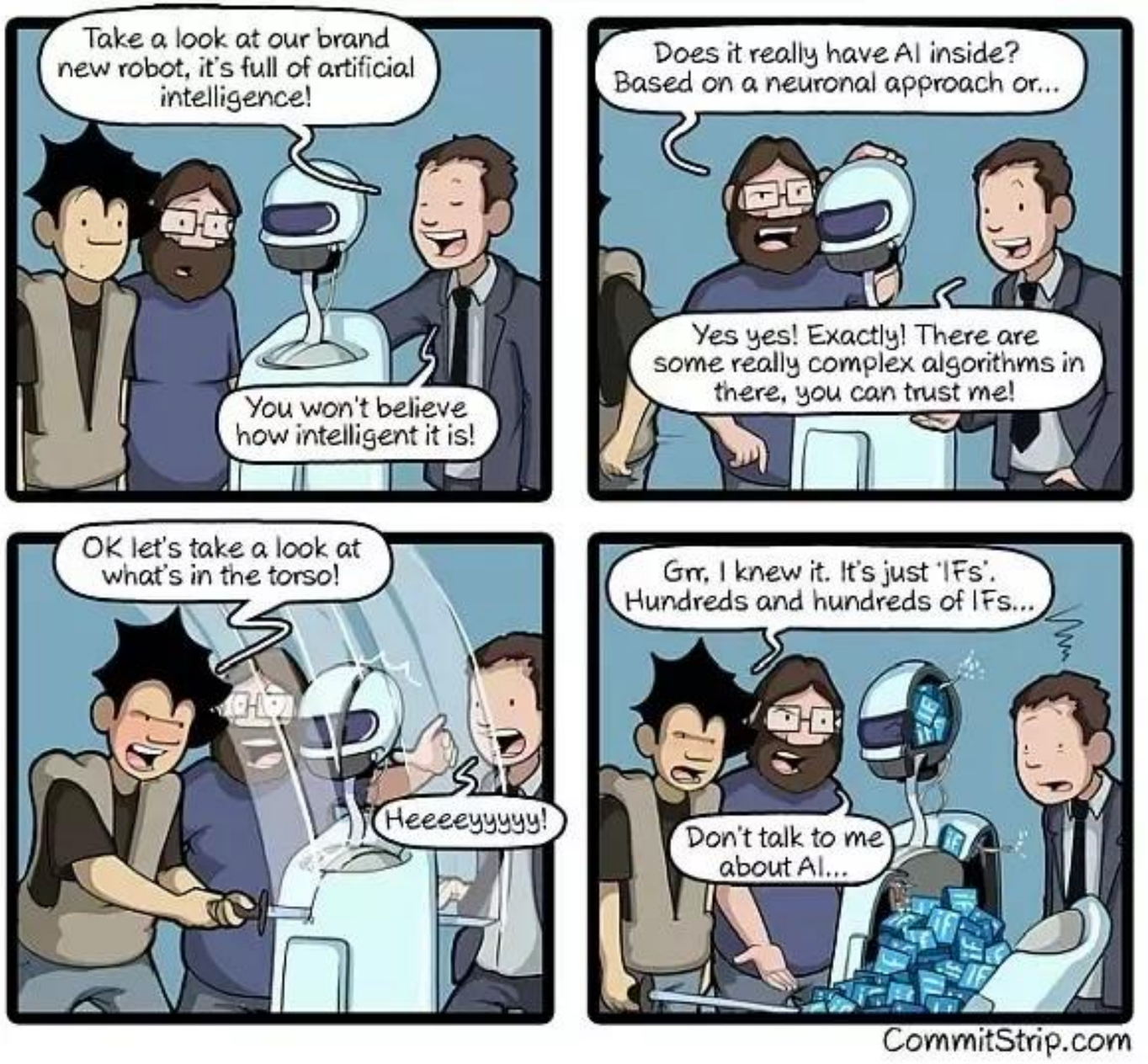
- a machine which mimics human like intelligence
- a machine which has decision making capabilities
- a machine which learns on its own

..

Software that solves a problem without explicit human instruction

Artificial Intelligence versus conventional programming

Conventional programming	Artificial Intelligence
Programmers look at the problem (desired output) and build an algorithm/application to solve this problem.	Ai programmers show the problem (desired output) to the A.I algorithms and expect the algorithms to find a solution.
A programmer has complete control over their application	An A.I programmer can never claim to have full control over their A.I applications. (Explainable A.I is hard to achieve)
The software must follow a logical series of steps to reach a conclusion (hard coded instructions by the programmer)	Ai applications use the technique of search and pattern matching
Its easy to explain a conventional algorithm	Its very hard to explain how an A.I algorithm reached its desired output
The most important element here is the algorithm	The most important elements here are data and algorithms


Take a look at our brand new robot, it's full of artificial intelligence!
You won't believe how intelligent it is!
Does it really have AI inside? Based on a neuronal approach or...
Yes yes! Exactly! There are some really complex algorithms in there, you can trust me!
OK let's take a look at what's in the torso!
Heeeeyyyyy!
Grr, I knew it. It's just 'IFs'. Hundreds and hundreds of IFs...
Don't talk to me about AI...
CommitStrip.com

MAP OF COMPUTER SCIENCE

THEORETICAL COMPUTER SCIENCE

COMPUTATIONAL COMPLEXITY
DOES P≠NP?
NXN CHESS PSPACE NXNGO
NP COMPLETE
TRAVELLING SALESMAN MAP COLOURING
NP GRAPH ISOMORPHISM
BQP
DISCRETE LOGARITHM FACTORING
P
TESTING IF PRIME GRAPH CONNECTIVITY
EFFICIENT FOR A QUANTUM COMPUTER
EFFICIENT FOR A COMPUTER

INFORMATION THEORY
0100110100011001
COMPRESSION
ENTROPY
ERROR CORRECTION
CODING THEORY
PARITY CHECKING

CRYPTOGRAPHY
PUBLIC KEY
ALL THE SECRETS
7fh;"%amp $avr
PRIVATE KEY

COMPUTABILITY THEORY
ALAN TURING
INFINITELY LONG TAPE
HEAD
STATE REGISTER
1: MOVE LEFT
2: MOVE RIGHT
3: FLIP DIGIT
123: STOP
LAMBDA CALCULUS

ALGORITHMS
BUBBLESORT(A)
1: GO FROM LEFT TO RIGHT.
2: COMPARE EACH PAIR.
3: IF LEFT ONE HIGHER, SWITCH.
4: DO UNTIL NO MORE SWITCHES.
BUBBLE SORT O(n²)
1 2 3 4 5 6 7 8
MERGE SORT O(n log n)
1 2 3 4 5 6 7 8
ANALYSIS OF ALGORITHMIC COMPLEXITY

LOGIC
ZERO ONE NOT OR AND XOR NAND

COMPUTATIONAL GEOMETRY

GRAPH THEORY

AUTOMATA THEORY

QUANTUM COMPUTATION

AND MORE

PARALLEL PROGRAMMING
JOB 1
JOB 2
JOB 3
JOB 4
MAIN JOB
SMALLER JOBS

DATA STRUCTURES
LINKED LIST
LIST
TREE
GRAPH
STACK
HASHING

FORMAL METHODS
START
POSSIBLE STATES
ALERT 1

COMPUTER ENGINEERING

HARDWARE
MONITOR
SOUND
SSD
GPU
RAM
POWER
INPUT
CPU
MOTHERBOARD

SCHEDULING
PROCESSES
SCHEDULER
CPU 1 CPU 2 CPU 3 CPU 4
MULTIPROCESSING

COMPUTER ARCHITECTURE
CPU
INPUT
CENTRAL PROCESSING UNIT
CONTROL UNIT
ARITHMETIC/LOGIC UNIT
MEMORY UNIT
OUTPUT
GPU
MULTIPROCESSORS
FPGA
LOGIC BLOCK
INTERCONNECTION
INPUT/OUTPUT
SWITCH BOX
CONNECT BLOCK

SOFTWARE AND PROGRAMMING LANGUAGES
PYTHON JAVASCRIPT PERL PHP SWIFT SQL JAVA C# C++ C ASSEMBLY
WEB APPS
BROWSER
APPLICATIONS
OPERATING SYSTEM
BIOS
SILICON
MACHINE CODE
JAVASCRIPT COMPILER
C++ COMPILER
C COMPILER
ASSEMBLY COMPILER

COMPILERS

SOFTWARE ENGINEERING
FORMAL METHODS
UNIT TESTING
VERSION CONTROL
OBJECT ORIENTED DESIGN

OPERATING SYSTEMS
iOS
macOS

NETWORKING
CONCURRENT/ DISTRIBUTED/ PARALLEL/ SYSTEMS

DATA MANAGEMENT
DATABASES SQL DATACENTRES

PERFORMANCE
COMPUTER ANALYSIS
BENCHMARKING

APPLICATIONS

MACHINE LEARNING
SUPERVISED UNSUPERISED
NEURAL NETWORK
CAT
REINFORCEMENT

OPTIMISATION
FINANCE
LEAGUE OF LEGENDS
AMAZON WAREHOUSE

BOOLEAN SATISFIABILITY
x_1 OR x_2 OR $\bar{x}_3$ (SAT)
$\bar{x}_1$ OR $\bar{x}_2$ OR x_3
$\bar{x}_1$ OR $\bar{x}_2$ OR $\bar{x}_3$
$\bar{x}_1$ OR x_2 OR x_3

ARTIFICIAL INTELLIGENCE
A.I.

ROBOTICS

COMPUTER VISION
FIND THE HUMANS

IMAGE PROCESSING

NATURAL LANGUAGE PROCESSING
CHATBOTS
-HEY
HELLO THERE-
-ARE U A ROBOT?
YES-
WAIT, I MEAN NO-
-PROVE IT!
CALCULATING...-
I MADE YOU CAKE-
SCONES TEA FLOUR BUTTER BIRTHDAY CAKE FOOD BACON CELEBRATION PANCAKE BREAKFAST

KNOWLEDGE REPRESENTATION

SUPER COMPUTING

COMPUTER GRAPHICS

VIRTUAL REALITY

TELEPRESCENCE

AUGMENTED REALITY
YOUTUBE
DOMAIN OF SCIENCE
MAP OF COMPUTER SCIENCE

COMPUTATIONAL SCIENCE
COMPUTATIONAL PHYSICS
NUMERICAL ANALYSIS
BIOINFORMATICS
COMPUTATIONAL CHEMISTRY

SIMULATION

HACKING

BIG DATA

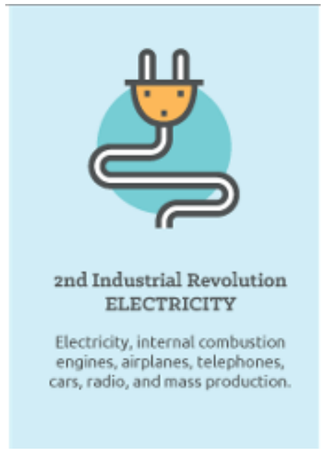
HUMAN COMPUTER INTERACTION

INTERNET OF THINGS

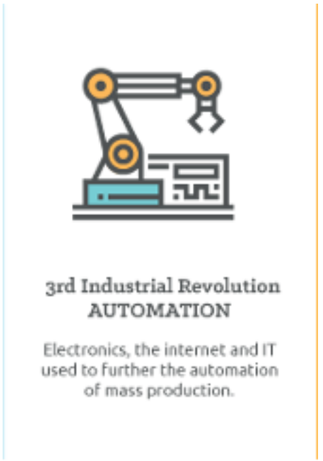
BY DOMINIC WALLIMAN ©2017

The 4th and the biggest industrial revolution

1784



1870



1969

Now or future ?

History of A.I – important points

- Efforts to create intelligent machines started as early as 1642
  - First mechanical calculating machine – Blaise Pascal
- Turing test was introduced in 1950
- In 1955 we coined the term, “Artifical Intelligence"

A SHORT HISTORY OF AI...

1955

The term “artificial intelligence” is coined at Dartmouth conference and AI is founded as an academic discipline.

1956-1974

Golden years of AI enjoy government funding in promising, logical-based problem-solving approaches.

1974-1980

Overly high expecatations and limited capacities of AI programs leads to the first "AI winter" with reduced funding and interest.

1980-1987

The rise of knowledge-based expert systems brings new successes and a change in focus of research funding towards this form of AI.

1987-1993

The second "AI winter" starts with a collapse in the specialized hardware industry. The AI hype brings negative perceptions by governments and investors.

1993-2011

Optimism about AI returns, marked with the help of increased computational power and AI becomes data-driven.

2012-TODAY

Increased availability of data, connectedness and computational power allow for breakthroughs in machine learning, mainly neural networks and deep learning.

WHY ?

Connectedness -> Internet / IOT

2012-TODAY

Increased availability of data, connectedness and computational power allow for breakthroughs in machine learning, mainly neural networks and deep learning.

More Data

Cloud computing

Powerful chips / processors

Ease of use of A.I applications

Machine learning, deep learning

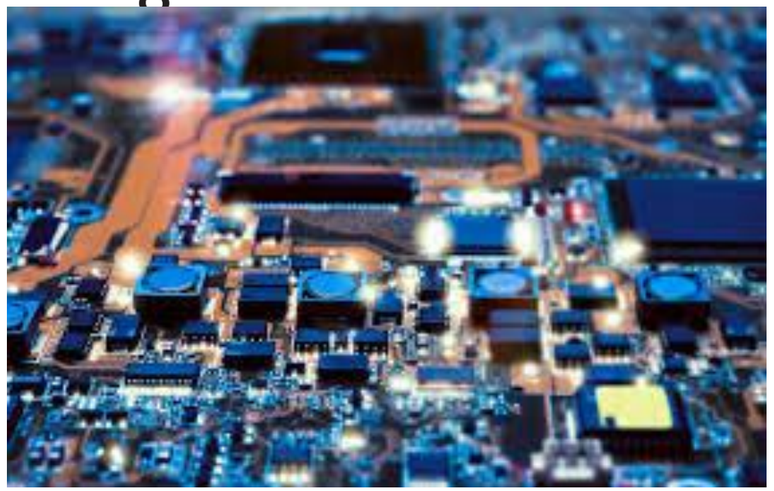
Natural language processing

Can A.I exist on its own ?

Question:

- Can you name a company which is purely an AI company ?

- A.I helps other software services do their job better. e.g:
  - Voice recognition and intelligent search used in A.I assistants
  - Natural Language processing used in Translation services




ORPAT
OT-512GT
LARGE DISPLAY
3 YEAR BATTERY LIFE
120 STEPS CHECK
REAL SOLAR CELL


AI


Music
Videos
Photos
Podcasts
Extras
Settings
Shuffle Songs
Now Playing
MENU

Examples of A.i in our daily lives

Self driving cars

Image / video analysis

Voice and chat assistants

Examples of A.I in our daily lives

Google Maps

UBER

Plagiarism Checker

Maps

OSL
STO

Examples of A.I in our daily lives

Content reccomendation

Types of A.I

3 Types of A.I

Narrow AI

Dedicated to assist with or take over specific tasks.

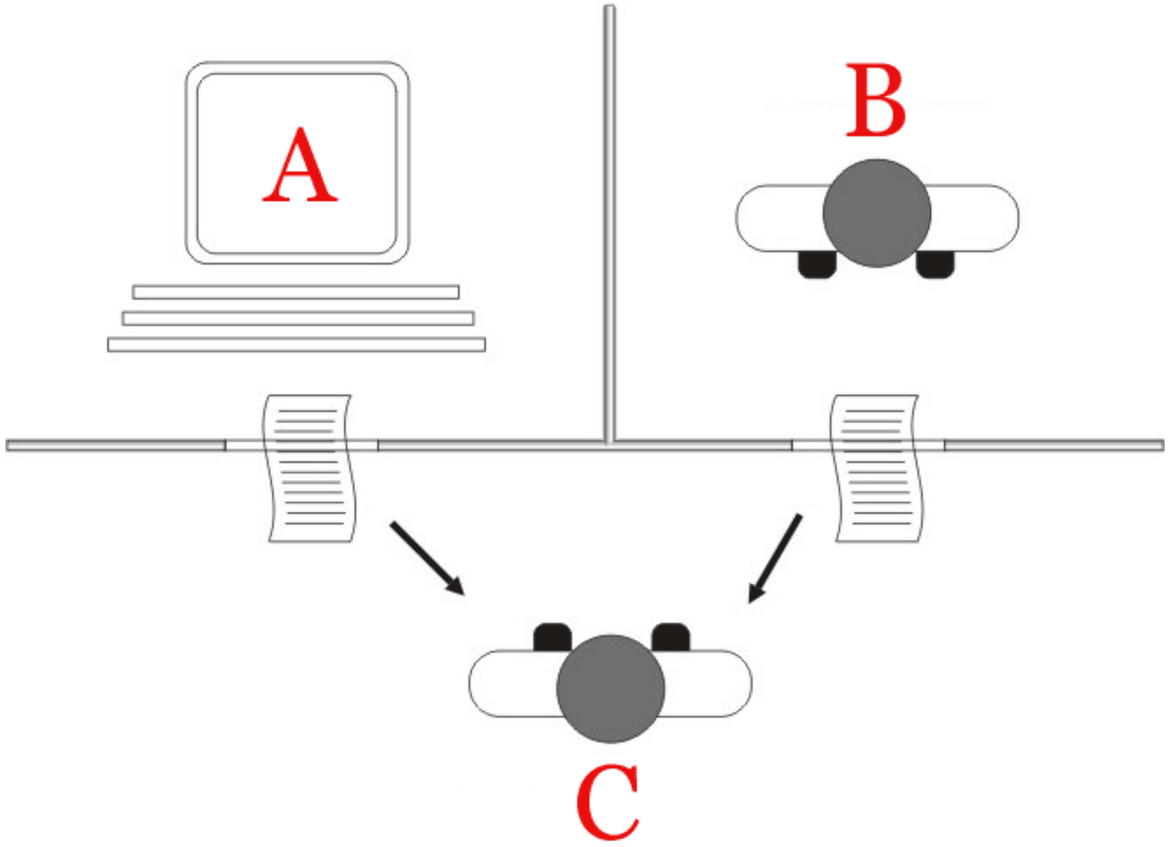
General AI

Takes knowledge from one domain, transfers to other domain.

Super AI

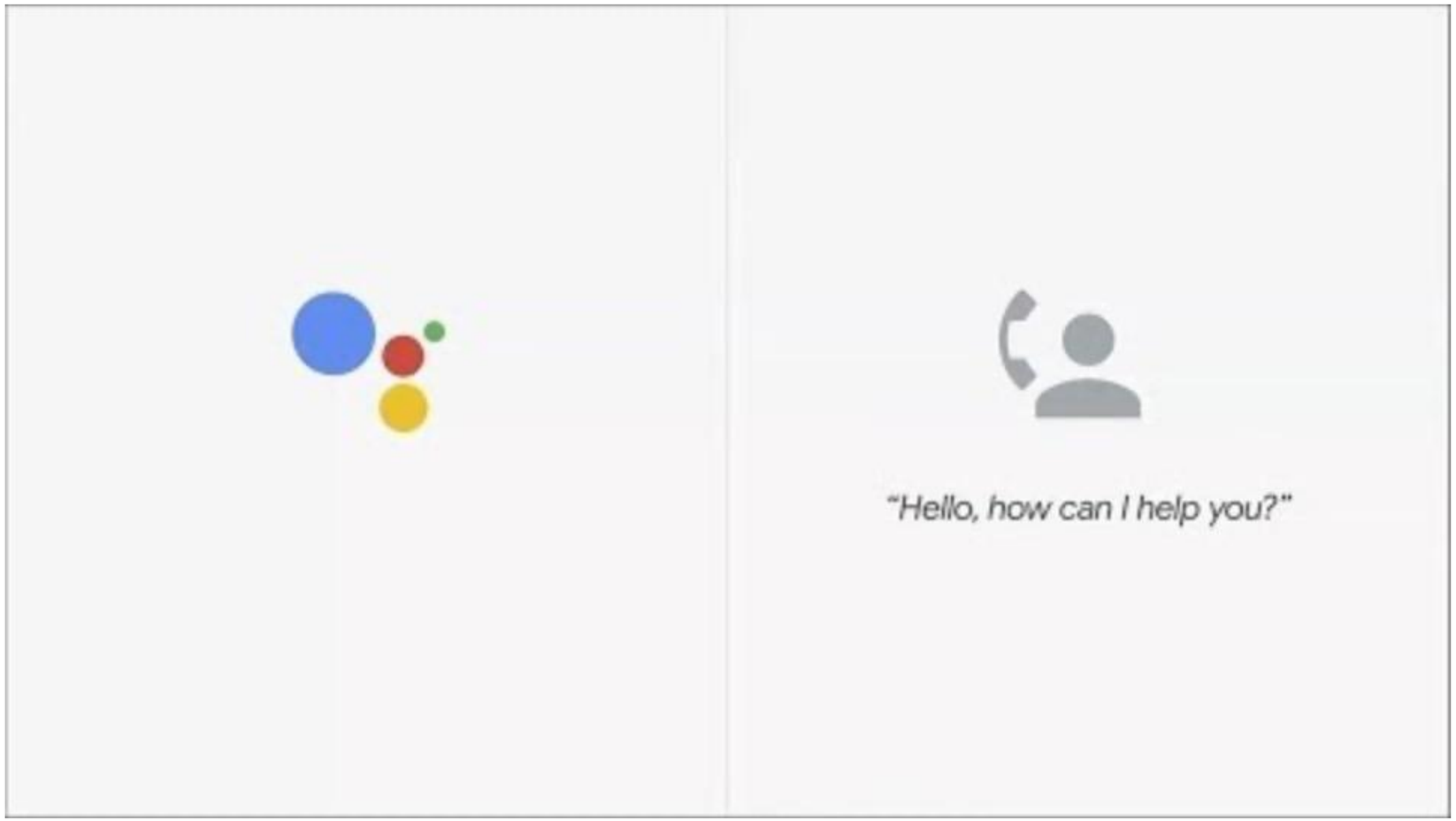
Machines that are an order of magnitude smarter than humans.

Turing Test – General AI



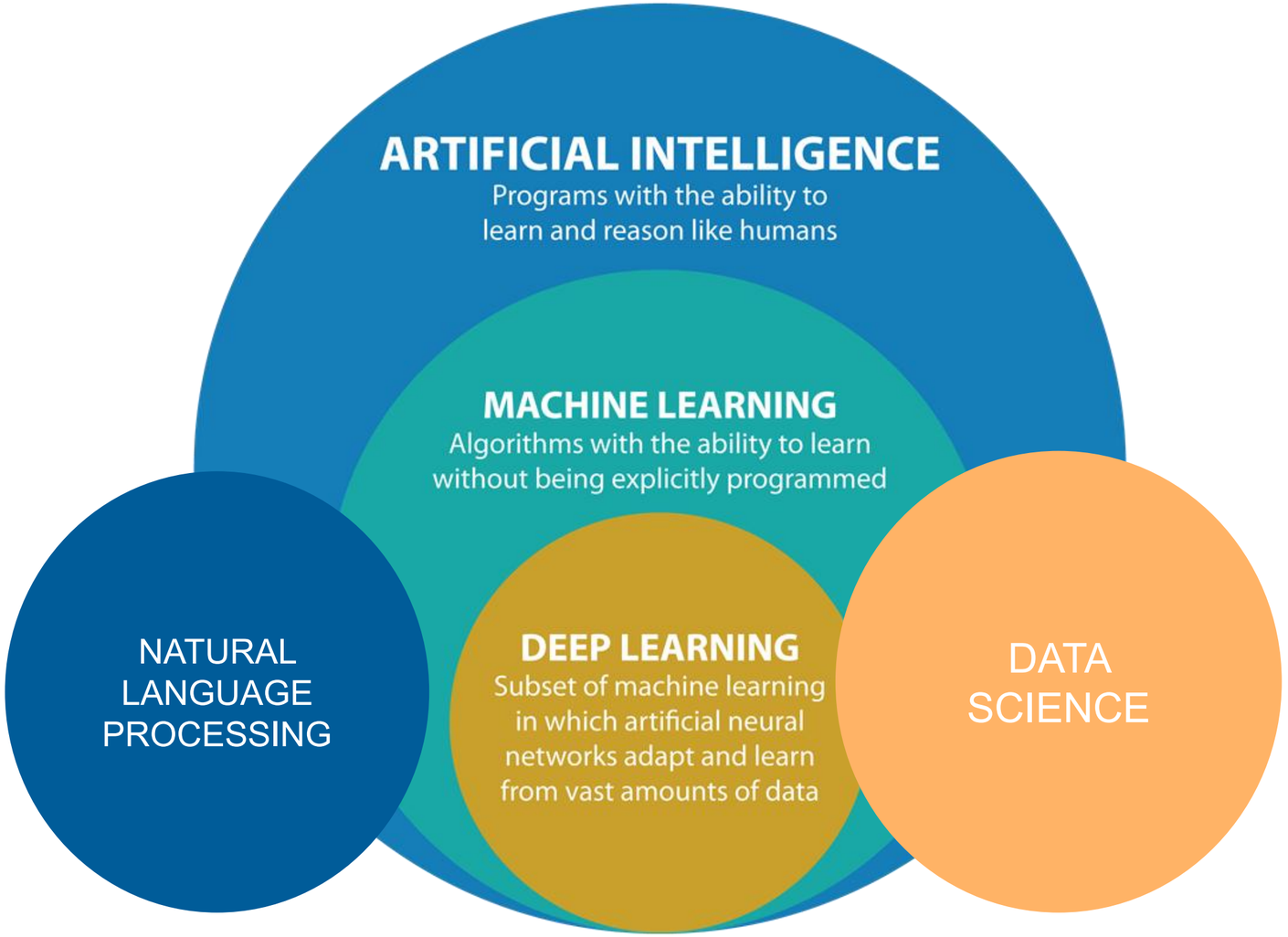
Can modern AI assistants pass the turing test ?

Google Duplex passed the turing test in 2018



Branches of A.I

ROBOTICS



NATURAL LANGUAGE PROCESSING

DATA SCIENCE

VISION

SPEECH

Skillset needed to work with A.I

Math

- the theoretical background necessary to conduct and apply AI research

Statistics

- empirical skills needed to fit and measure the impact of AI models

Machine Learning

- skills needed to build self learning models like deep learning and other supervised models that power most AI applications today

Statistical Programming

- programming skills needed to implement AI models such as in python and related packages like sci-kit learn and pandas

Software Engineering

- programming skills needed to design and scale AI powered applications

A.I buzz created a lot of negativity

- FOMO
  - Fear of missing out
- FUD
  - Fear, uncertainity and doubt
- Feuds
  - When people with their knowledge of A.I fight with each other
  - Ref:https://techcrunch.com/2017/07/25/elon-musk-mark-zuckerberg-artificial-intelligence/

A.I buzz is also helping to solve many problems

- Human trafficking
- Money Laundering
- Terrorism
- Covid19 research
- etc ..