ACCADEMIA NAZIONALE DEI LINCEI
CENTRO LINCEO INTERDISCIPLINARE «BENIAMINO SEGRE»
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Università di Milano-Bicocca, Aula Magna

INTELLIGENZA ARTIFICIALE TRA MITO E REALTÀ:
QUANDO LA TECNOLOGIA DEMARCA IL CONFINE TRA UTOPIA E DISTOPIA

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ARTIFICIAL INTELLIGENCE

RED PILL Knowledge, freedom, uncertainty and the brutal truths of reality

BLUE PILL Security, happiness, beauty, and the ignorance of illusion

The red pill represented an uncertain future—it would free Neo from the enslaving control of the machine-generated dream world and allow him to escape into the real world, but living the "truth of reality" is harsher and more difficult.

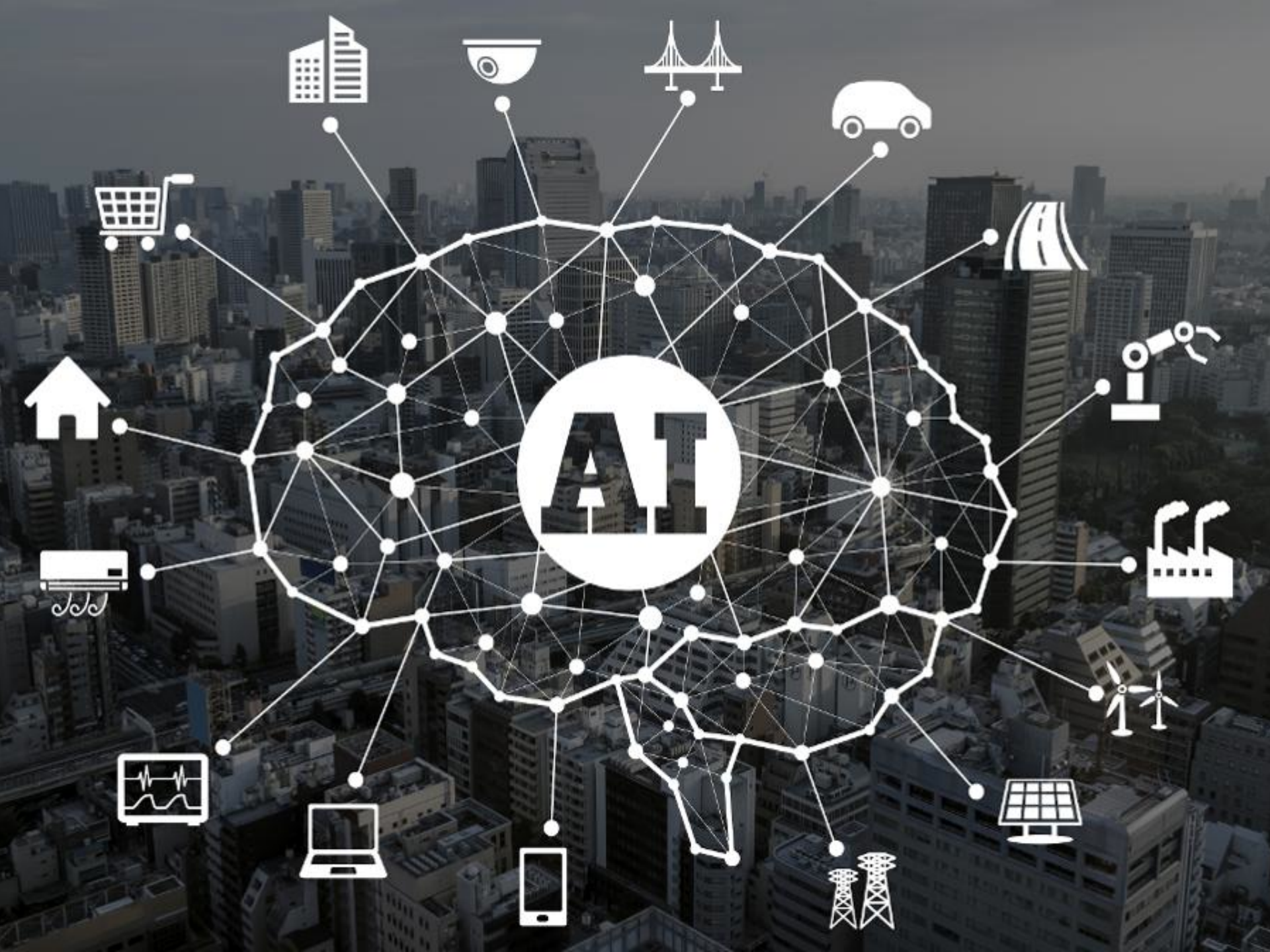
The blue pill represented a beautiful prison—it would lead Neo back to ignorance, living in confined comfort without want or fear within the simulated reality of the Matrix.

Dartmouth College Summer Research Project on Artificial Intelligence

Hanover (New Hampshire) - August 1956

John Mccarthy
Marvin Minsky
Allen Newell
Herbert Simon

"Lo studio procederà sulla base della congettura per cui, in linea di principio, ogni aspetto dell'apprendimento o una qualsiasi altra caratteristica dell'intelligenza possano essere descritte così precisamente da poter costruire una macchina che le simuli."


AI

“THINKING MACHINES”

Are there tasks which cannot easily be automated?

If so, what are the limitations?

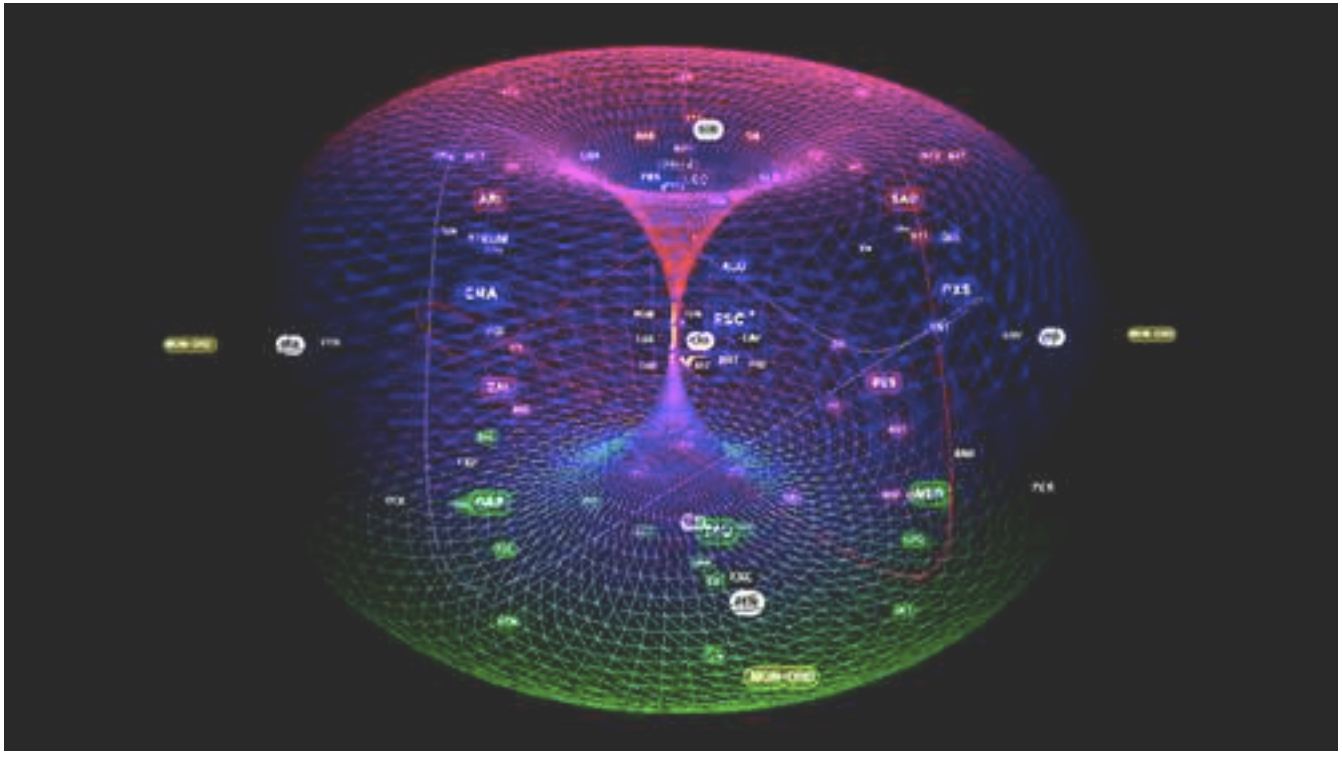
How do computers abilities compare to that of humans?

COMPUTERS Vs HUMANS

Adding a thousand four-digit numbers

Drawing complex, 3D images

Store and retrieve massive amounts of data



HUMANS Vs COMPUTERS

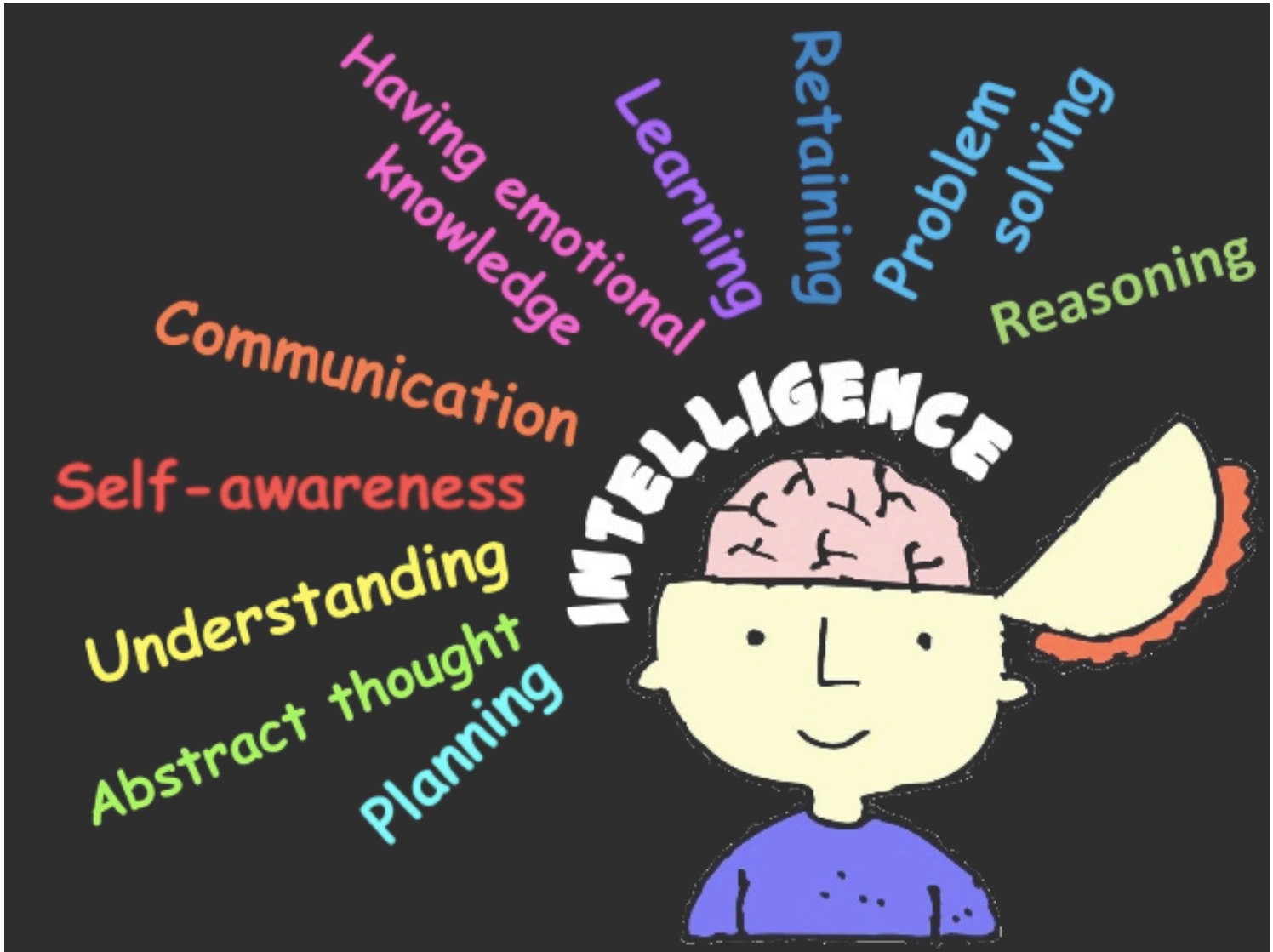
Handle a cat?

COMPUTER OR HUMAN?

Which of the following occupations could be performed by computers?

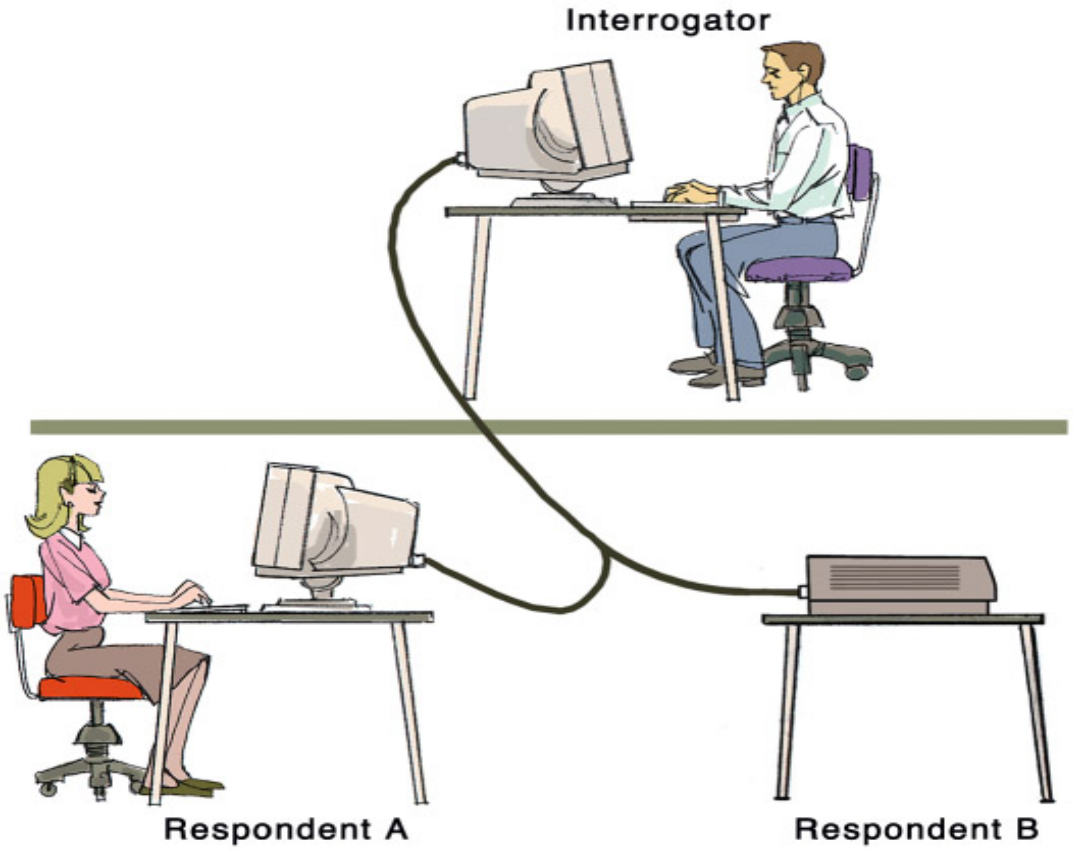
- Postman
- Bookstore clerk
- Librarian
- Doctor
- Lawyer
- Judge
- Professor

INTELLIGENCE



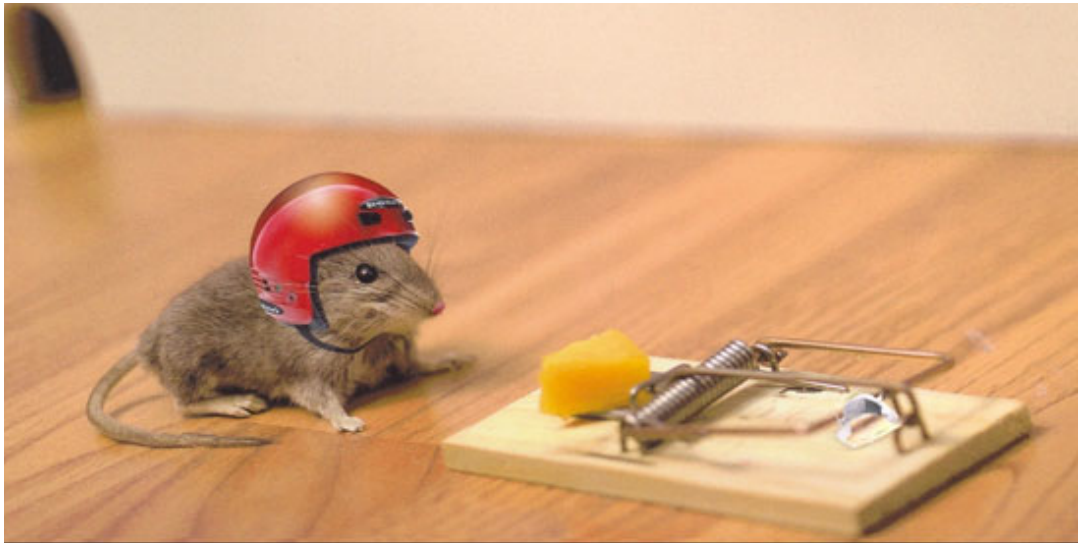
THE TURING TEST

The interrogator must determine which respondent is the computer and which is the human



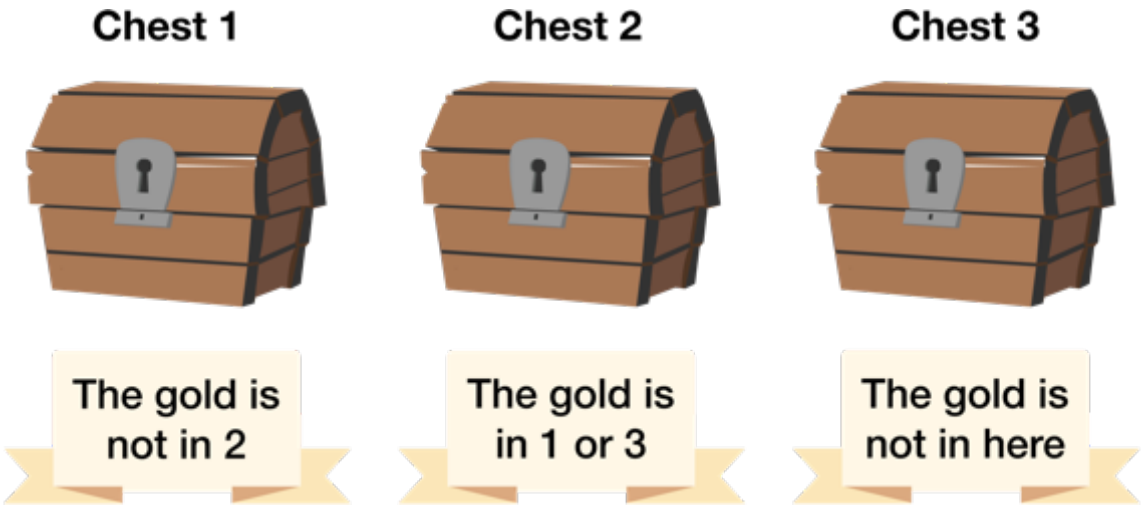
KNOWLEDGE

EXPERIENCE



KNOWLEDGE

INFERENCE



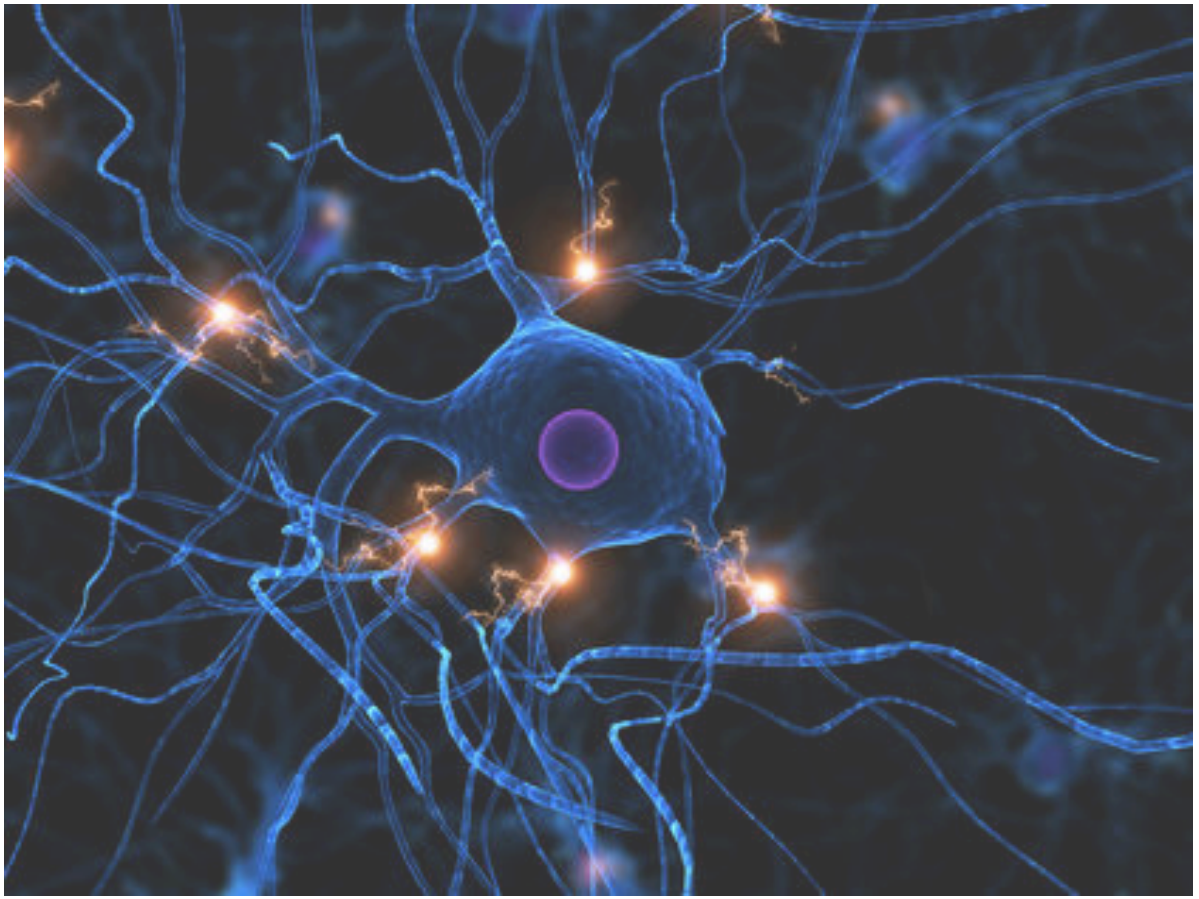
KNOWLEDGE

TRANSMISSION

KNOWLEDGE

ARTIFICIAL NEURAL NETWORKS: EXPERIENCE

A formal computer-based representation of knowledge, attempting to mimic animals/humans neural networks



NEURAL NETWORKS

A single cell conducts a chemically-based electric signal

Neuron conducts a strong signal (Excited state)

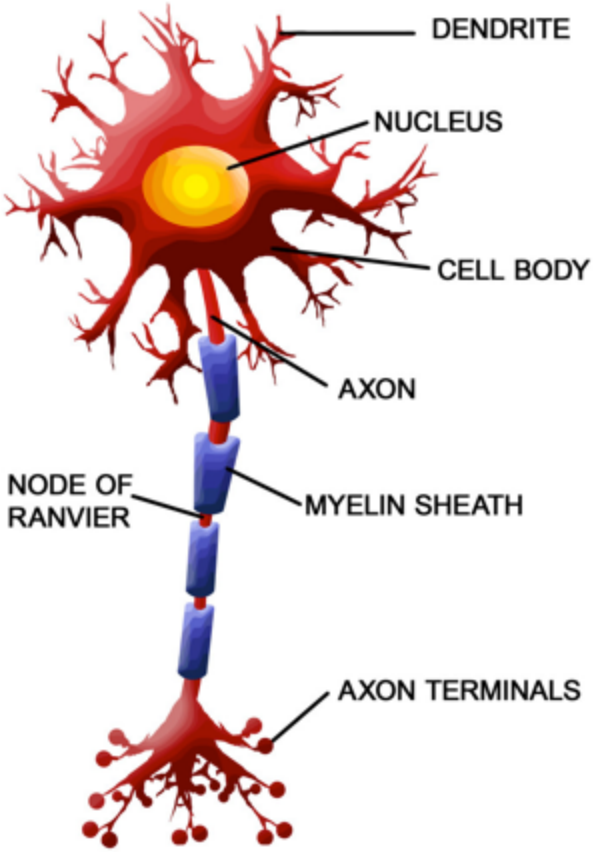
Neuron conducts a weak signal (Inhibited state)

A series of connected neurons forms a pathway

A series of excited neurons creates a strong pathway

A biological neuron has multiple input tentacles (dendrites) and one primary output tentacle (axon)

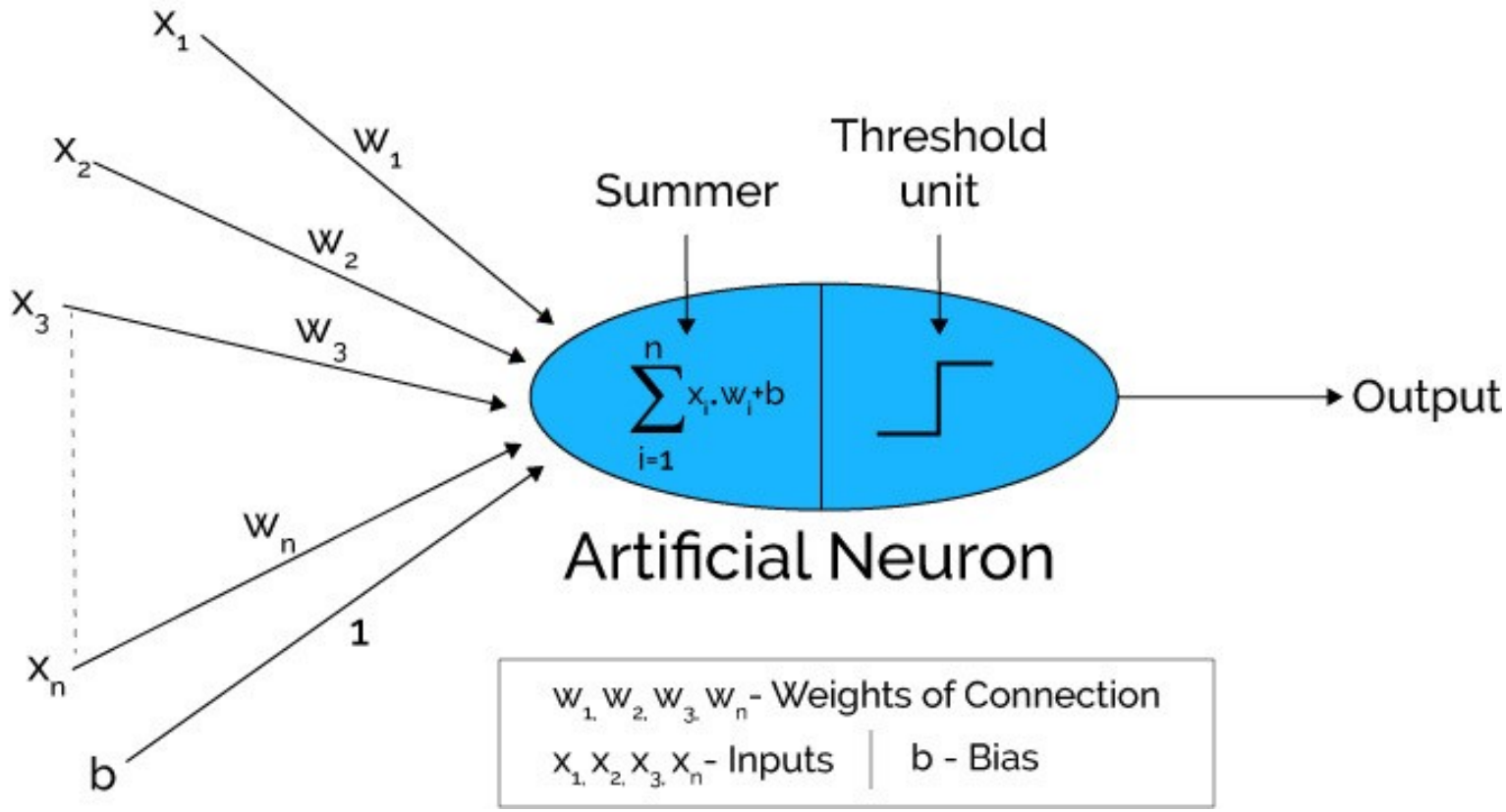
The gap between an axon and a dendrite is a synapse



ARTIFICIAL NEURAL NETWORKS

An element accepts a certain number of input values (dendrites) and produces a single output value (axon) of either 0 or 1

Associated with each input value is a numeric weight (synapse)



ARTIFICIAL NEURAL NETWORKS

LEARNING BY TRAINING (adjusting the weights and threshold)

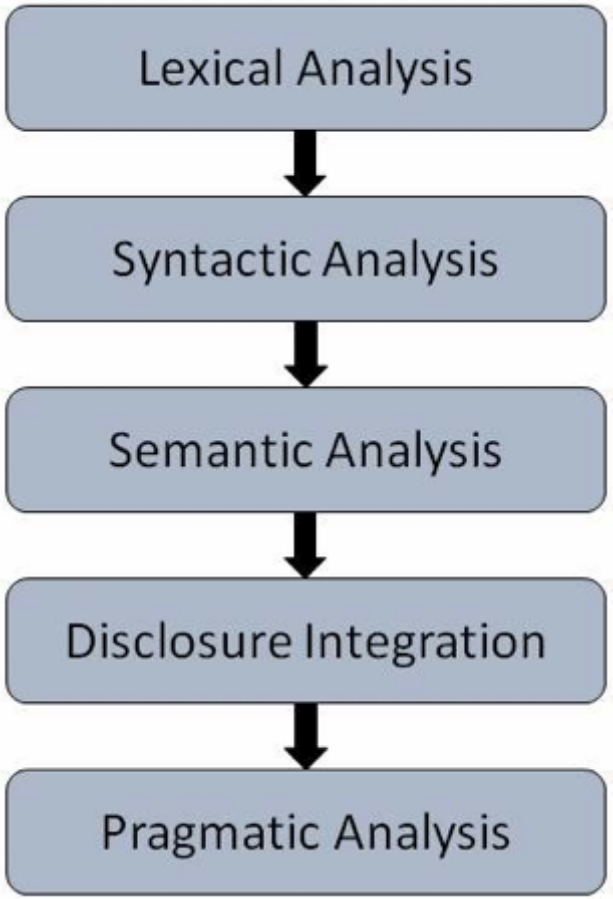
SYMBOLIC ARTIFICIAL INTELLIGENCE: INFERENCE

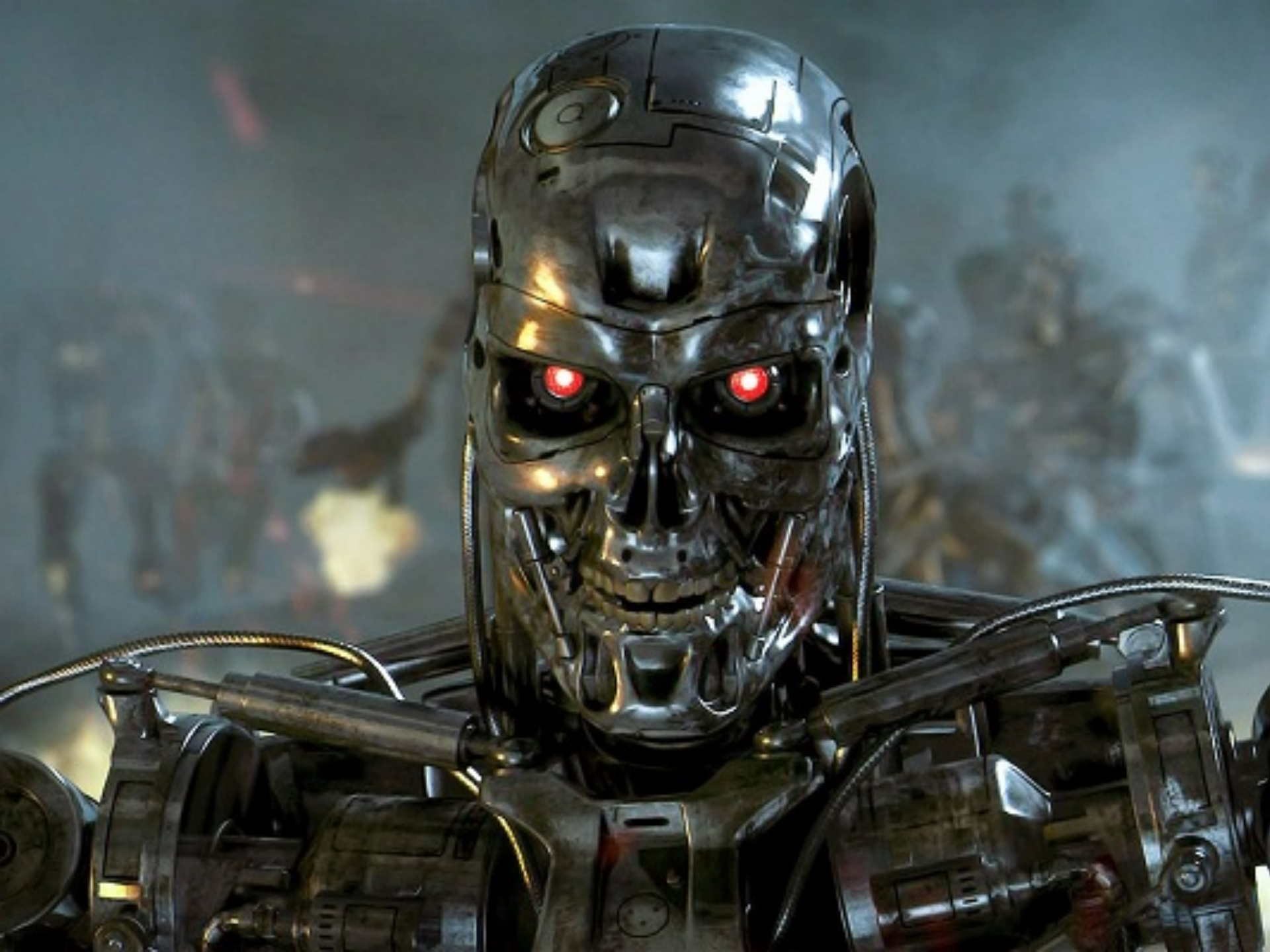
NATURAL LANGUAGE COMPREHENSION

LEXICAL AMBIGUITY
The ambiguity created when words have multiple meanings

SYNTACTIC AMBIGUITY
The ambiguity created when sentences can be constructed in various ways

REFERENTIAL AMBIGUITY
The ambiguity created when pronouns could be applied to multiple objects





ROBOTICS: INFERENCE AND EXPERIENCE

MOBILE ROBOTICS

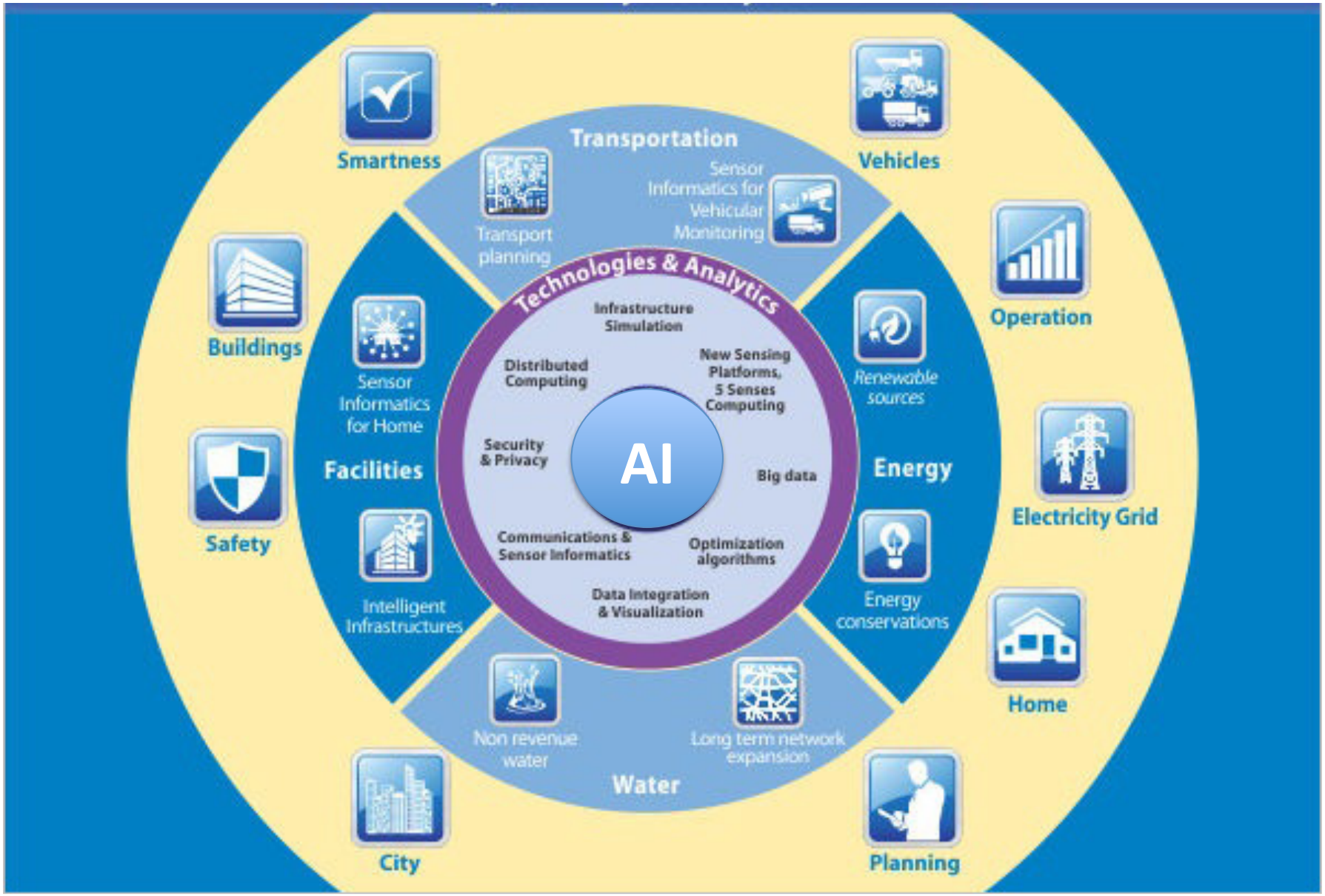
The study of robots that move relative to their environment, while exhibiting a degree of autonomy

SENSE-PLAN-ACT (SPA) PARADIGM

The world of the robot is represented in a complex semantic net in which the sensors on the robot are used to capture the data to build up the net


KNOWLEDGE TRANSMISSION


UTOPIA



"un assetto politico, sociale e religioso che non trova riscontro nella realtà, ma che viene proposto come ideale e come modello"

“un’immaginaria società o comunità altamente indesiderabile o spaventosa nella quale alcune tendenze sociali, politiche e tecnologiche percepite come negative o pericolose sono portate al loro limite estremo”


RESTRमहानि

ARTIFICIAL INTELLIGENCE MEETS CYBERNETICS

CYBERPHYSICAL SYSTEMS

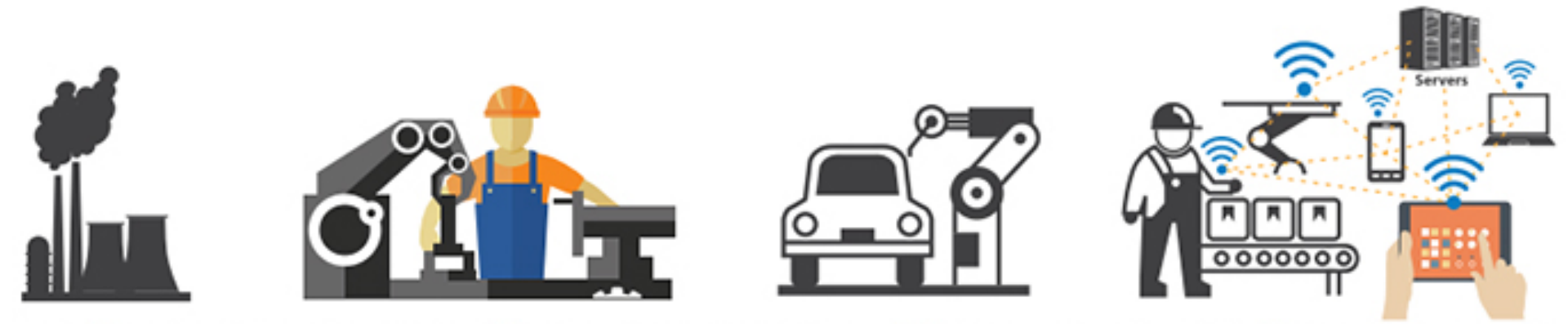

CYBER
Securely
Safely
Reliably
Cyber-Physical Systems
Autonomously
Real-Time
Physical
Data centers
Networks
Terminals & devices

SOCIOTECHNICAL SYSTEMS

SOCIOTECHNICAL SYSTEMS

the social and conceptual framework for

INDUSTRY 4.0



18th Century

Industry 1.0

Mechanical production. Equipment powered by steam and water

19th Century

Industry 2.0

Mass production assembly lines requiring labor and electrical energy

20th Century

Industry 3.0

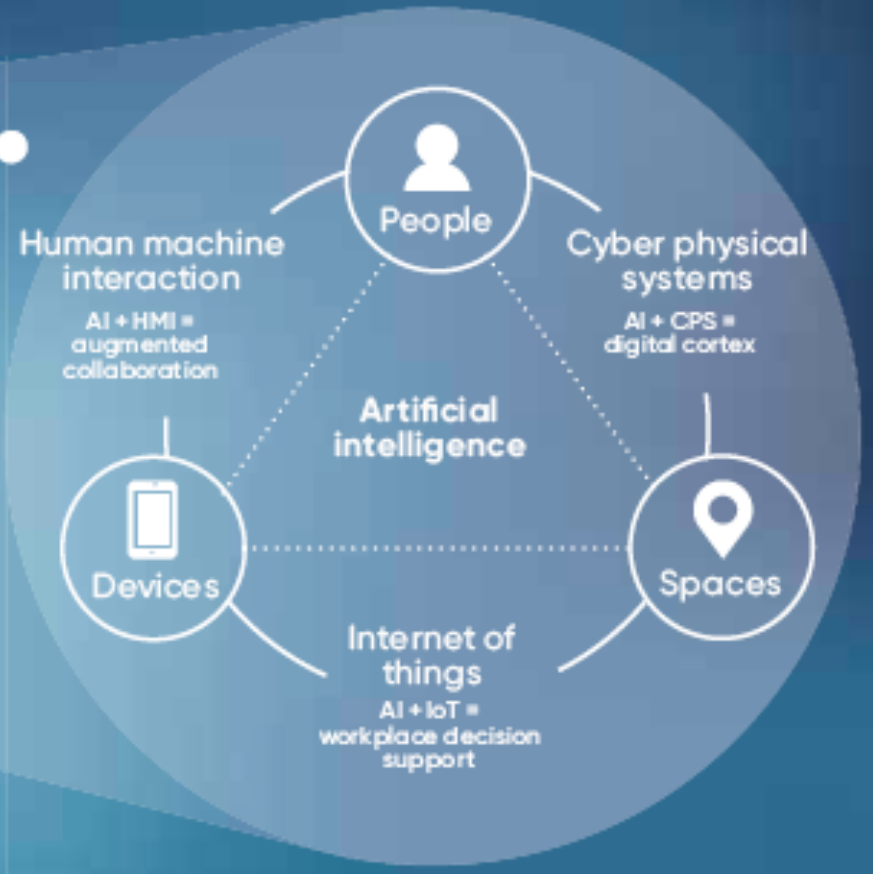
Automated production using electronics and IT

Today

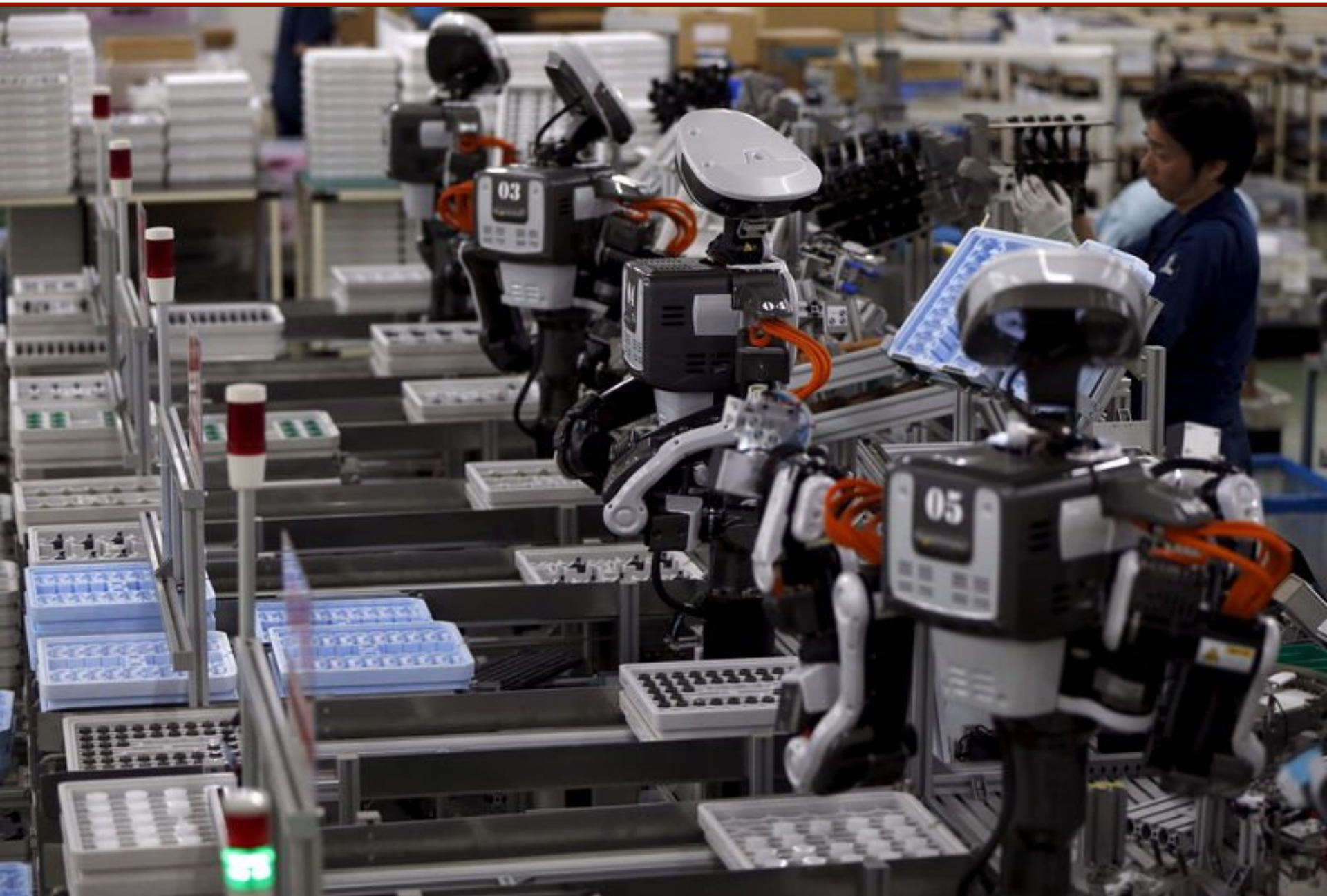
Industry 4.0

Intelligent production incorporated with IoT, cloud technology and big data

Digital cortex and the workplace of the future



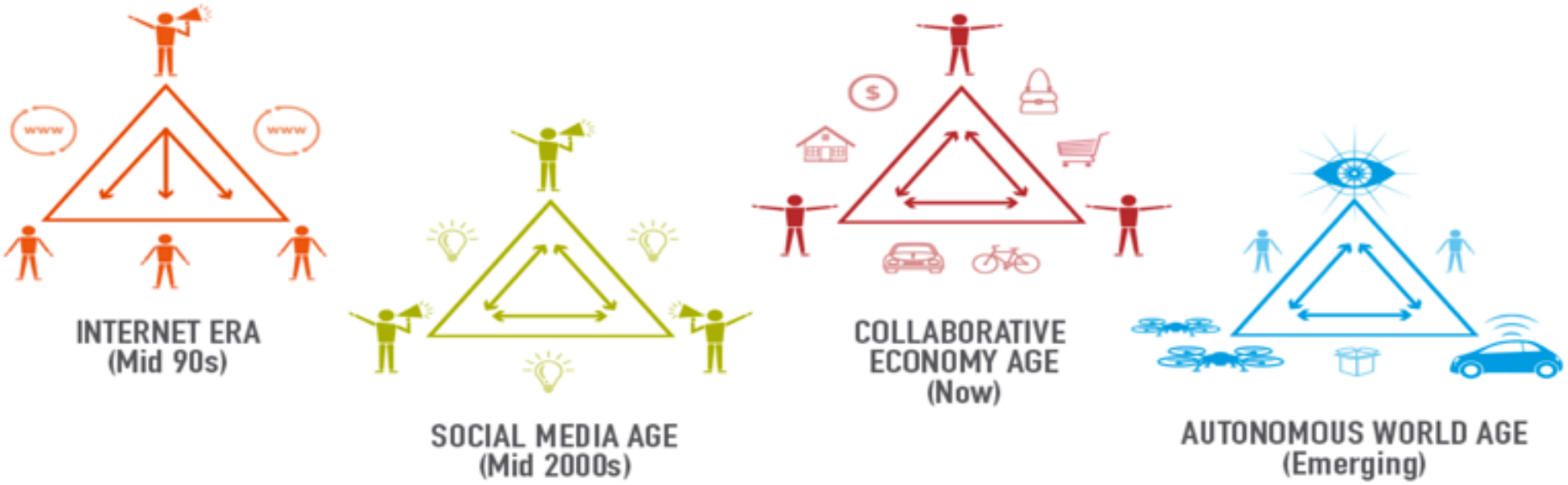
The workplace of the future is composed of the network of people, devices and spaces that, when combined, create a digital cortex. This can be seen as a mix of tree-like structures, characteristic of the current cloud architecture and snowflake structures that characterise the local centralised architecture


03
04
05

ARTIFICIAL INTELLIGENCE AND BUSINESS

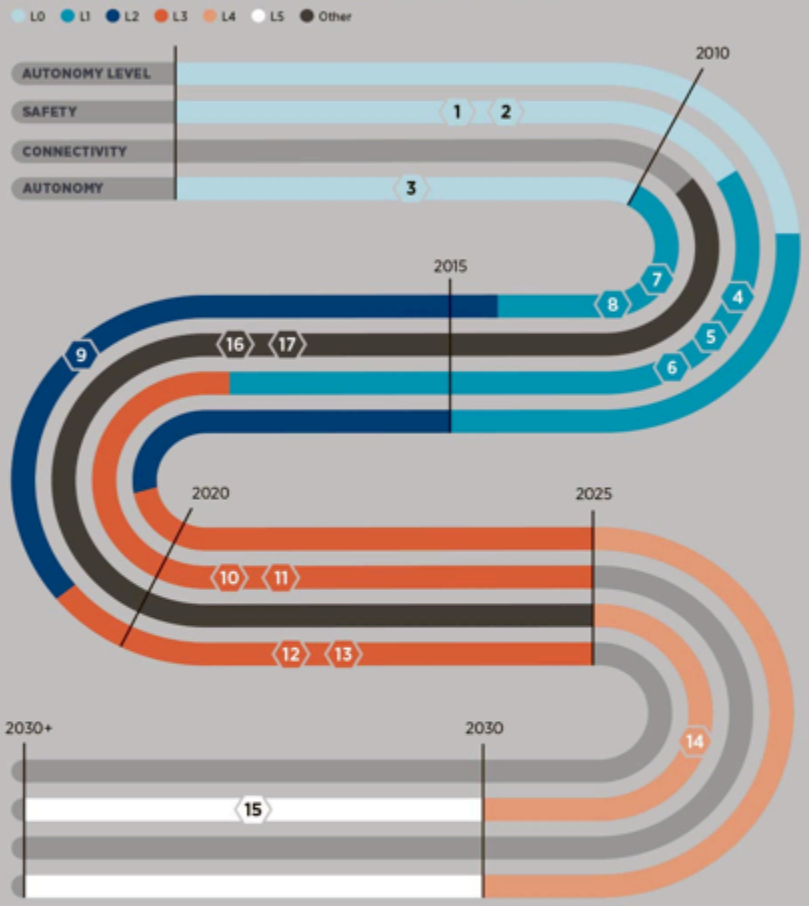
ARTIFICIAL INTELLIGENCE & NEAR FUTURE

Autonomous Vehicles, Bioacoustic Sensing, Biochips, Brain-Computer Interface, Digital Dexterity, Human Augmentation, Machine Learning, Neurobusiness, People-Literate Technology, Quantum Computing, Smart Advisors, Smart Dust, Smart Robots, Virtual Personal Assistants, Virtual Reality, Volumetric and Holographic Displays



Driving the future: connected and autonomous cars

CONNECTED AND AUTONOMOUS VEHICLE TECHNOLOGY ROAD MAP



TYPE OF TECHNOLOGY

1. Blind spot monitoring
2. Lane departure warning
3. Cruise control
4. Intelligent speed adaption
5. Lane keep assist
6. Autonomous emergency braking
7. Adaptive cruise control
8. Park assist (steering only)
9. Traffic jam assist
10. Intersection pilot
11. Emergency driver assistant
12. Highway autopilot
13. Valet park assist
14. Certain driving situations, for example remote parking and urban automated driving
15. Full end-to-end journey
16. 3D cloud-based navigation
17. Vehicle-to-vehicle, vehicle-to-device and vehicle-to-infrastructure communication

Source: KPMG 2015

LEVELS OF AUTOMATION

Level	Driver	Automation		Example
L0	Driver only	Driver continuously in control of speed and direction	No intervening vehicle system active	N/A
L1	Assisted	Driver continuously performs the longitudinal or lateral dynamic driving task	The other driving task is performed by the system	Park assist
L2	Partial automation	Driver must monitor the dynamic driving task and the driving environment at all times	System performs longitudinal and lateral driving task in a defined use case	Traffic jam assist
L3	Conditional automation	Driver does not need to monitor at all times, but must always be in a position to resume control	System performs driving task in a defined use case. May request driver to resume the driving task with sufficient time margin	Highway patrol
L4	High automation	Driver is not required during defined use case	System performs longitudinal and lateral driving task in a defined use case	Urban automated driving
L5	Full automation	System performs the lateral and longitudinal dynamic driving task in all situations encountered during the entire journey. No driver required		Full end-to-end journey

Source: KPMG 2015

IMPACT OF HIGH-TECH VEHICLES

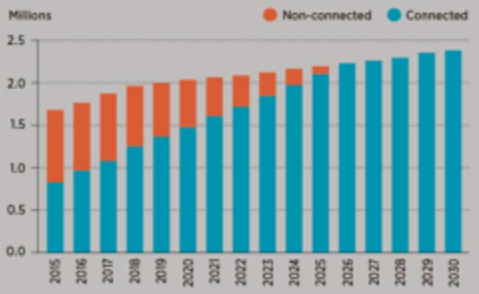
235hrs
are spent on the roads by the average driver in England
Source: Department for Transport 2015

94%
of road deaths and injuries involve human error
Source: Department for Transport 2015

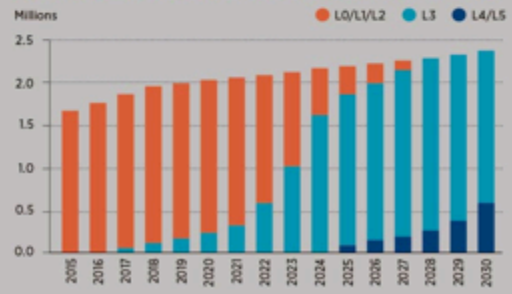
25,000+
serious accidents will be prevented by connected and autonomous cars between 2014 and 2030
Source: KPMG

£51bn
estimated economic benefit of connected and autonomous cars by 2030
Source: KPMG

FORECAST UK PRODUCTION OF CONNECTED CARS

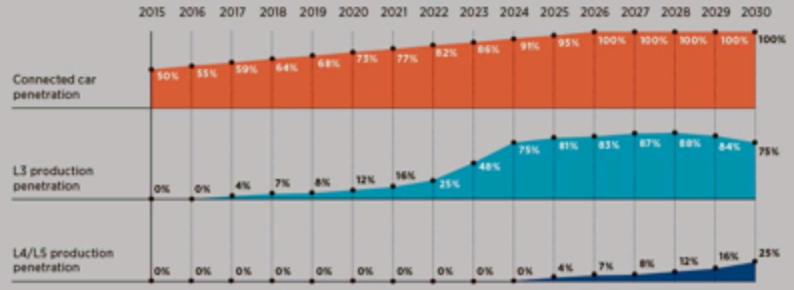


FORECAST UK PRODUCTION OF AUTONOMOUS VEHICLES



Source: KPMG 2015

PENETRATION OF CONNECTED AND AUTONOMOUS CARS



Source: KMPG 2015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Thank You