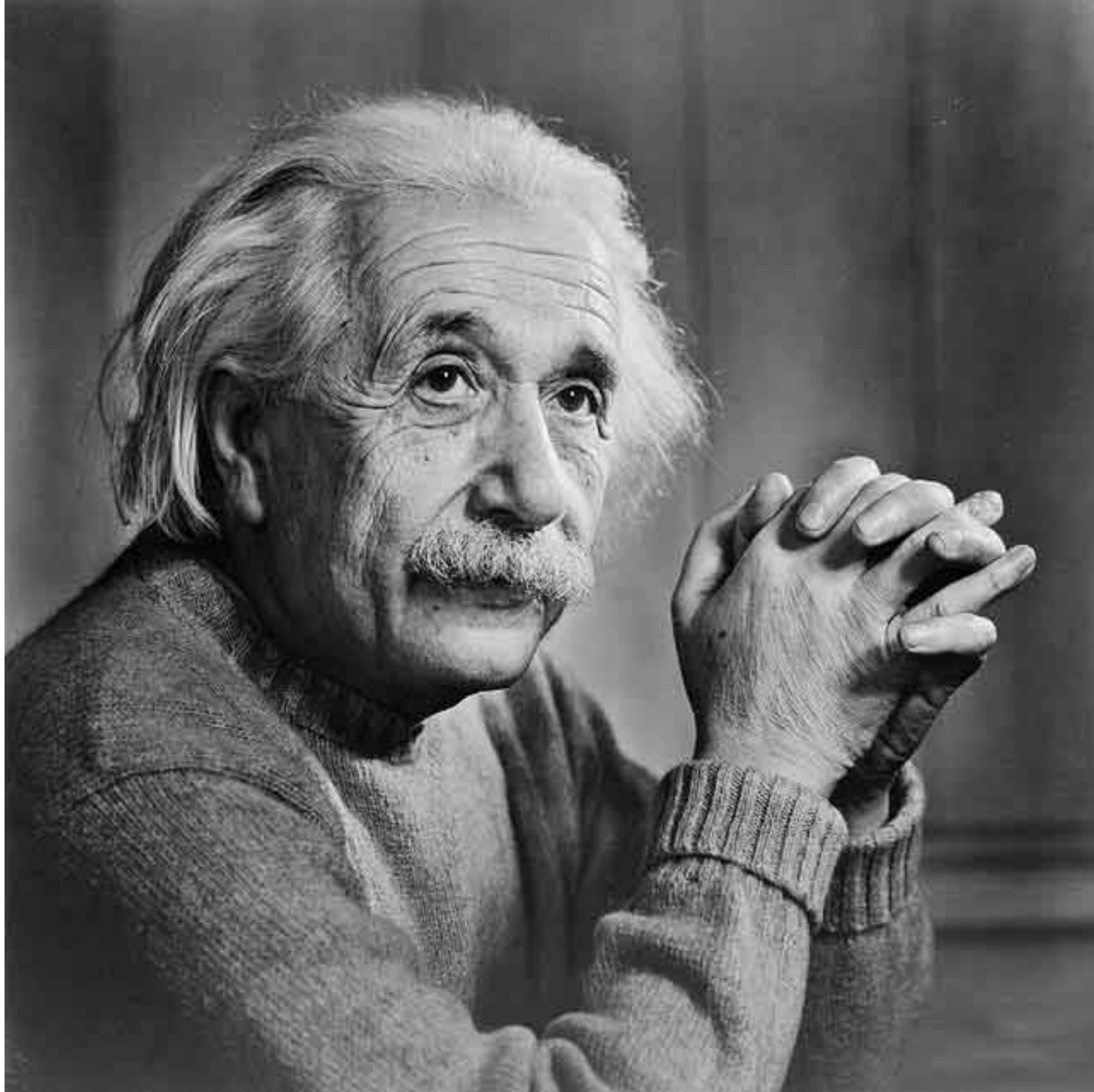
Artificial Intelligence

Daniel Borrajo

Outline

1. Introduction
2. Architecture of intelligent systems
3. Conclusions



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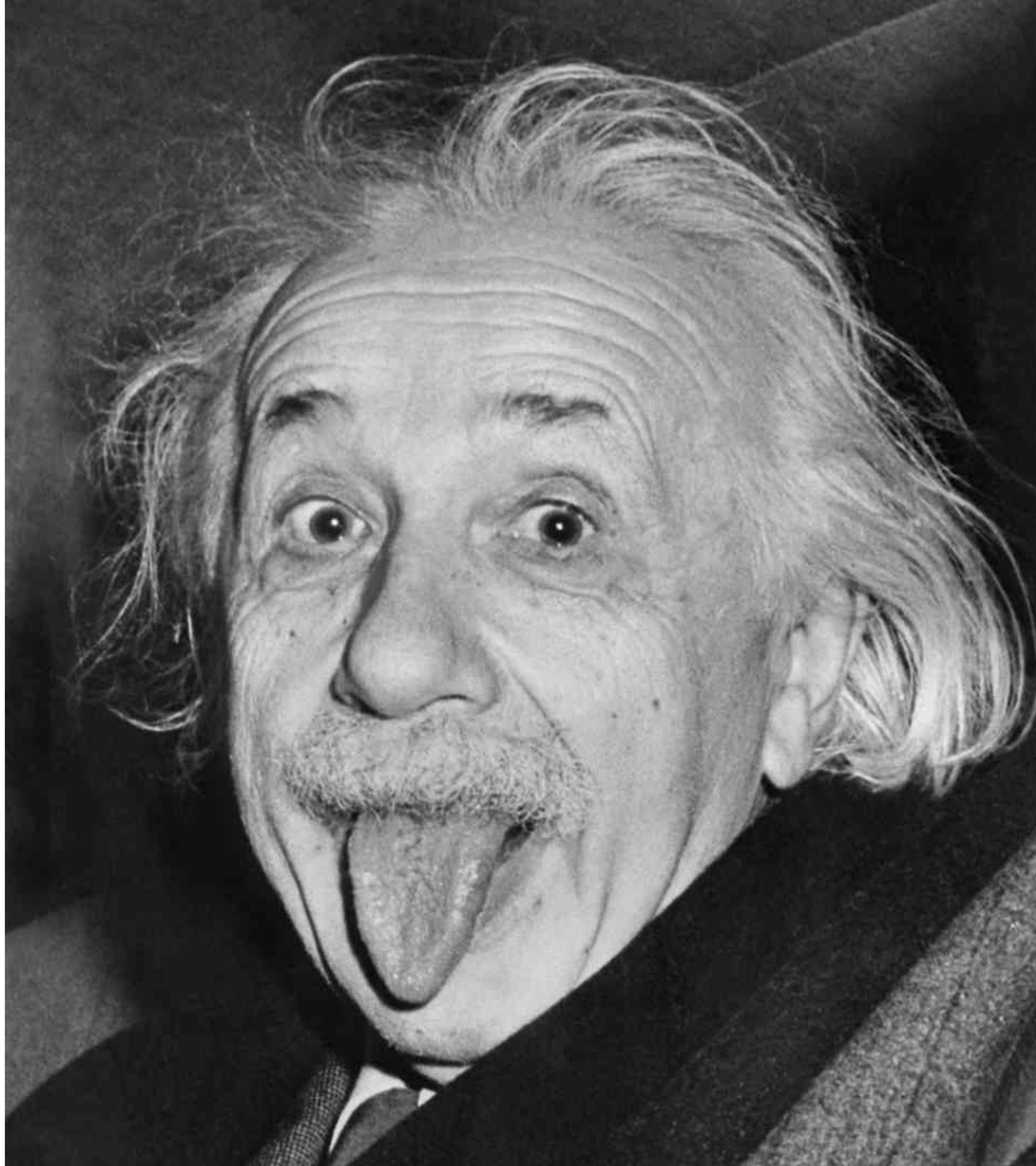
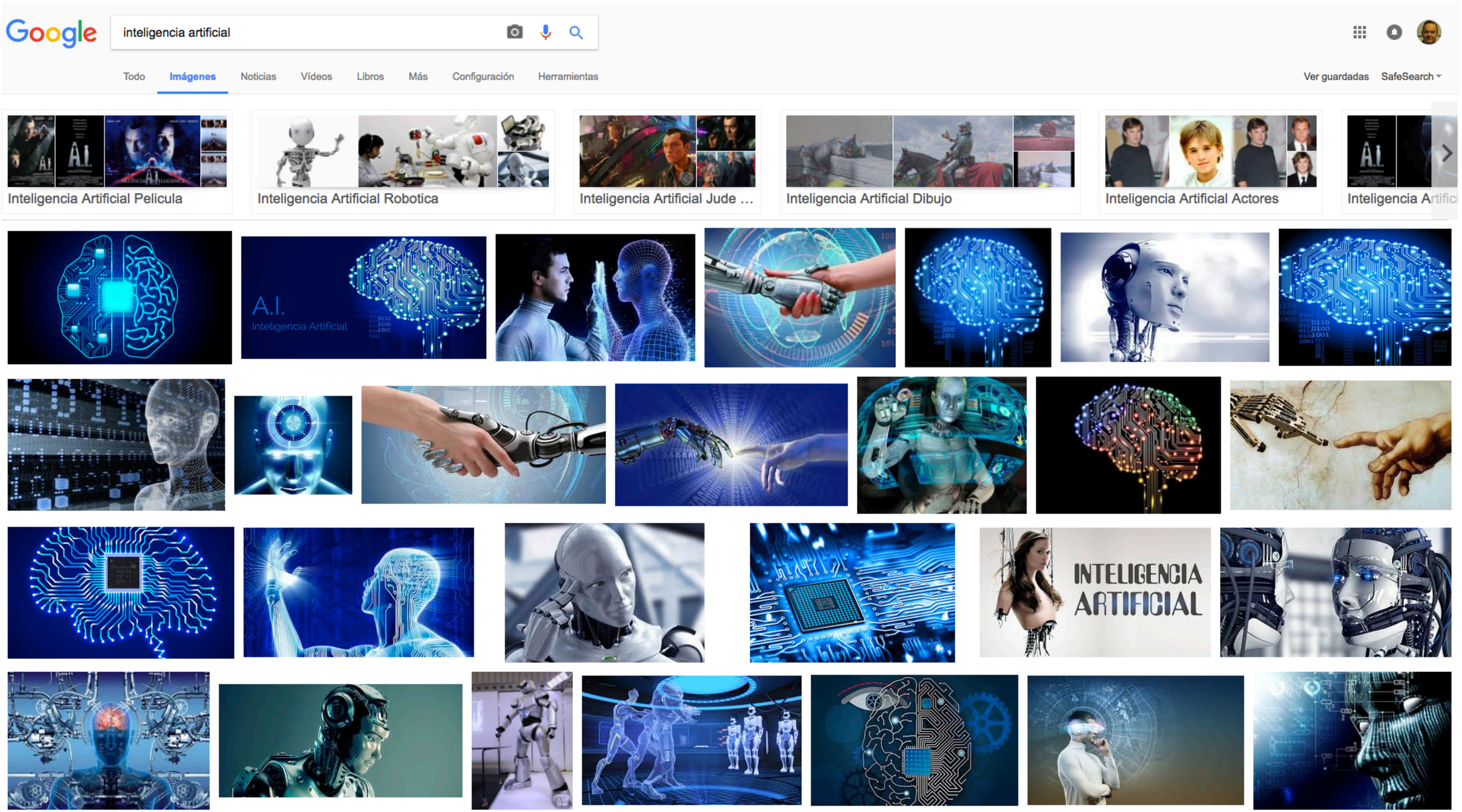
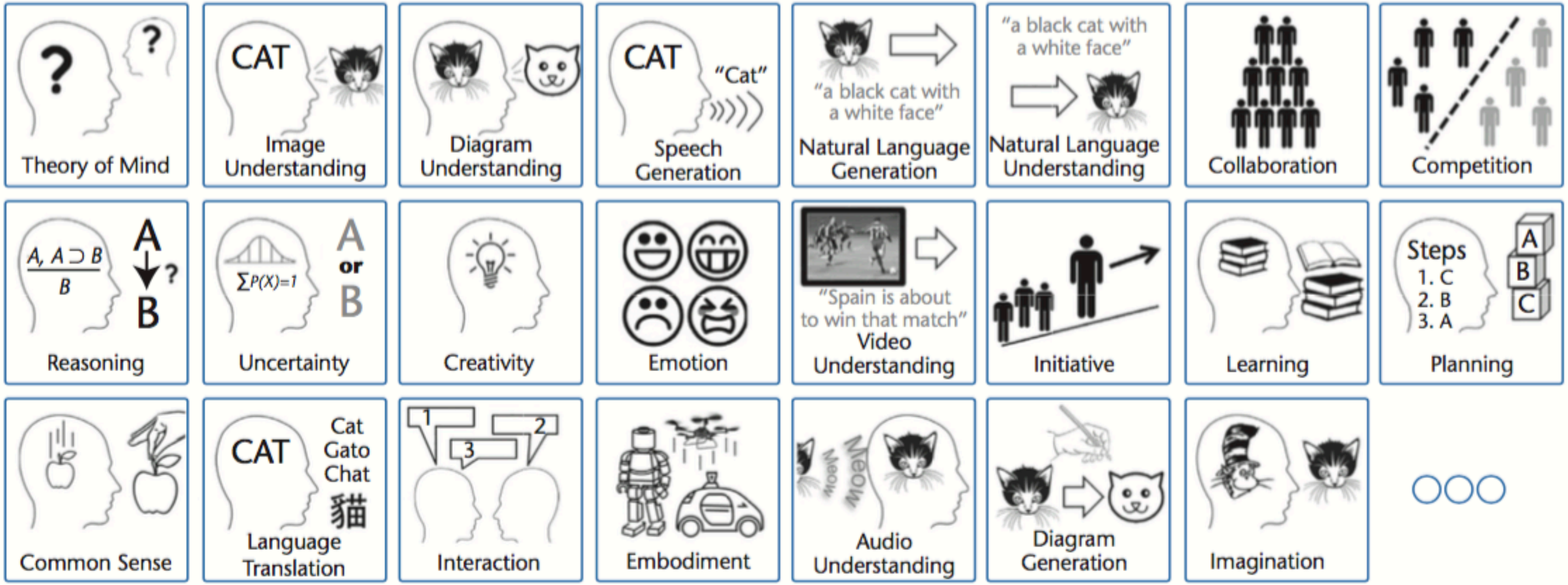


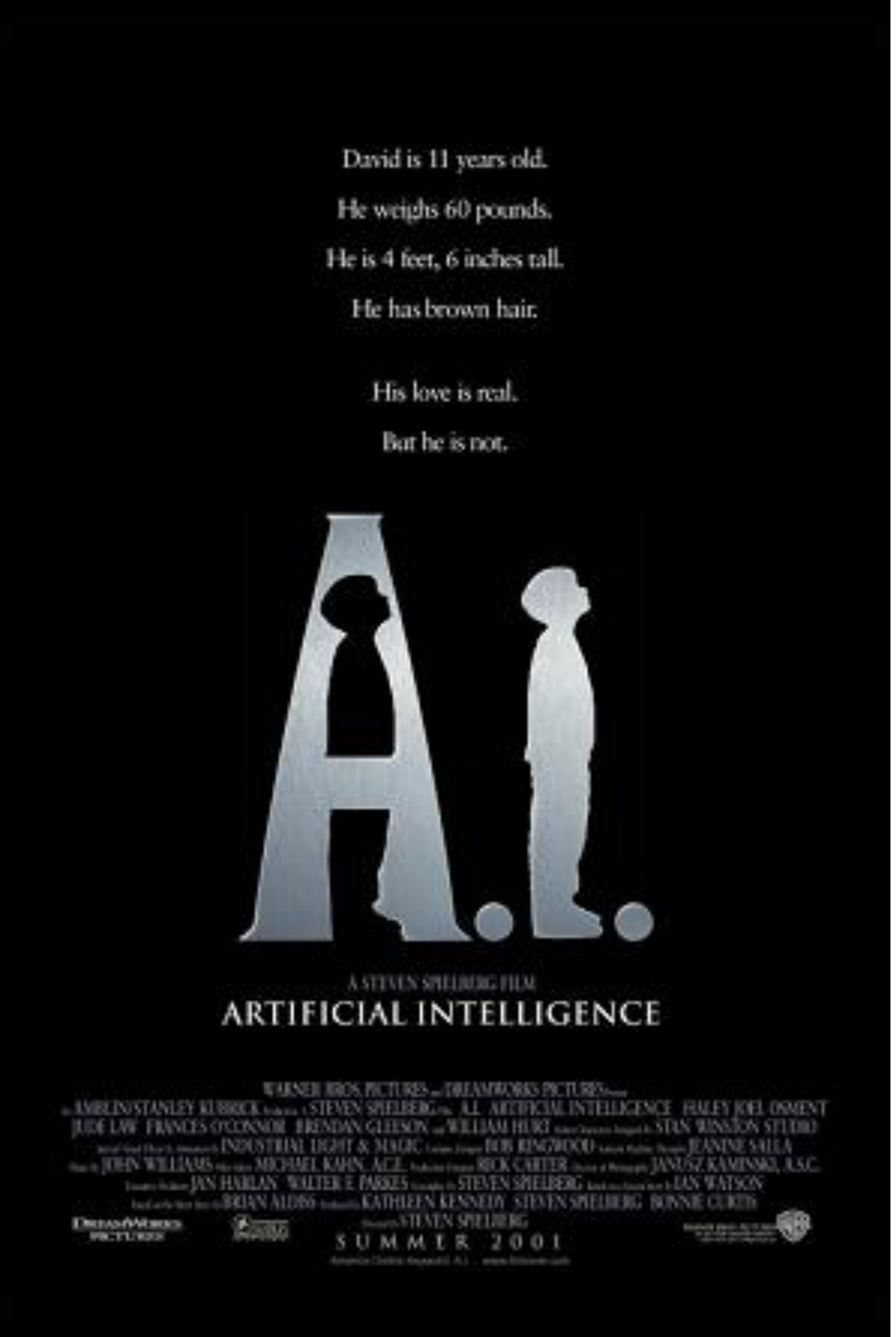


Source: Google Enero 2017

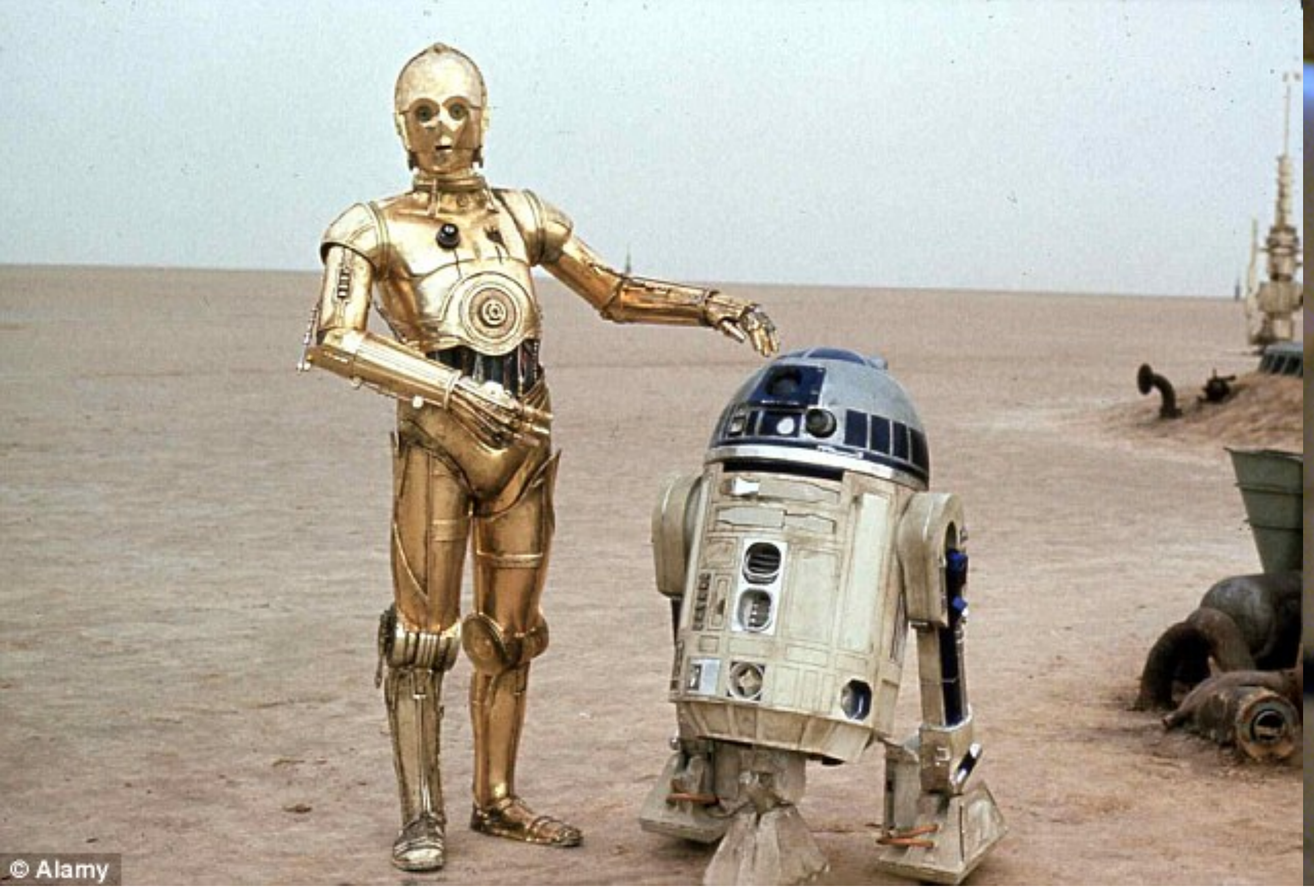
Source: dilbert.com Enero 2017



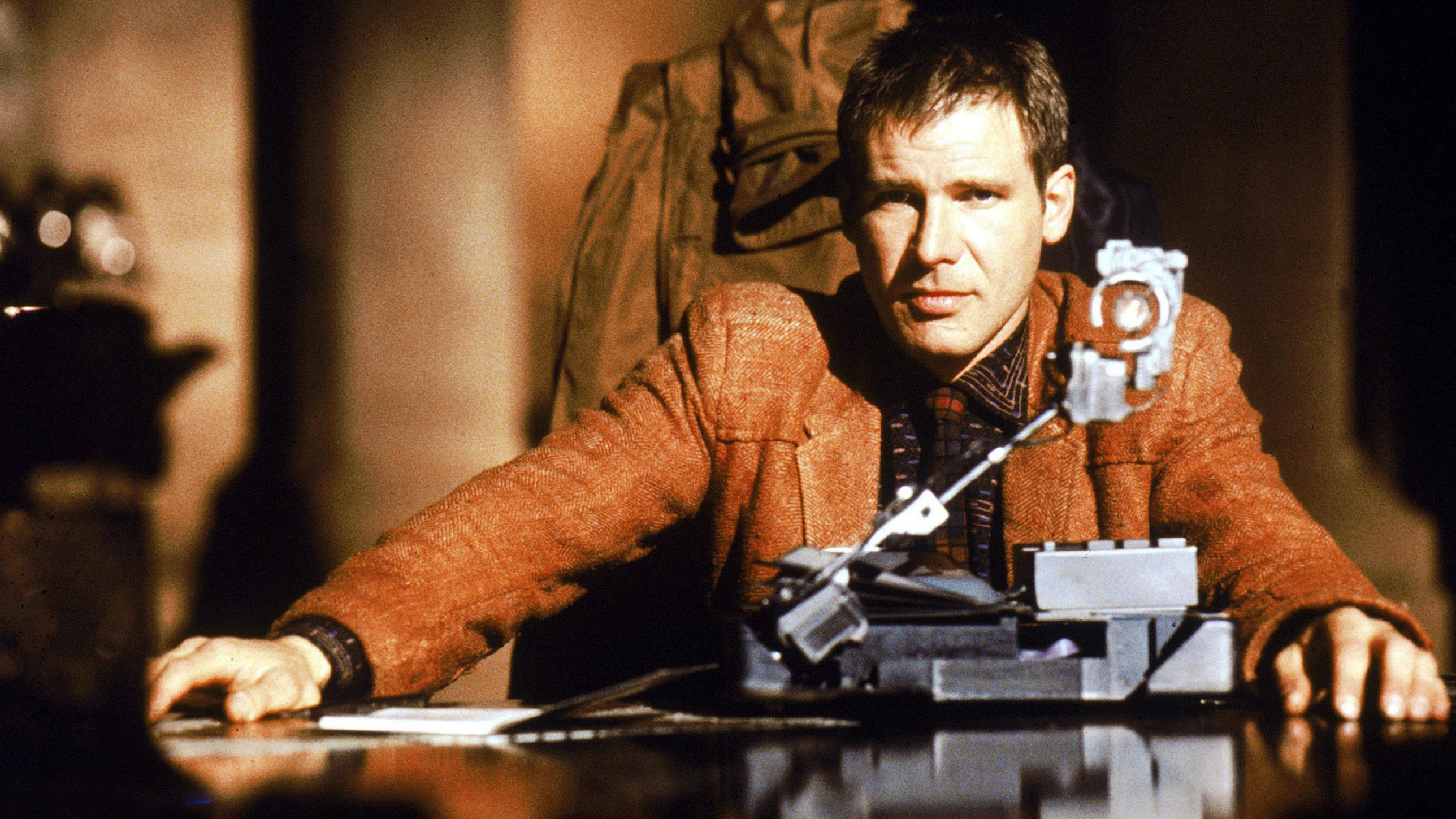
Source: [Adams et al., 2016]



Source: wikipedia Enero 2017



Source: dailynews.co.uk, tvline.com, © HBO Enero 2017



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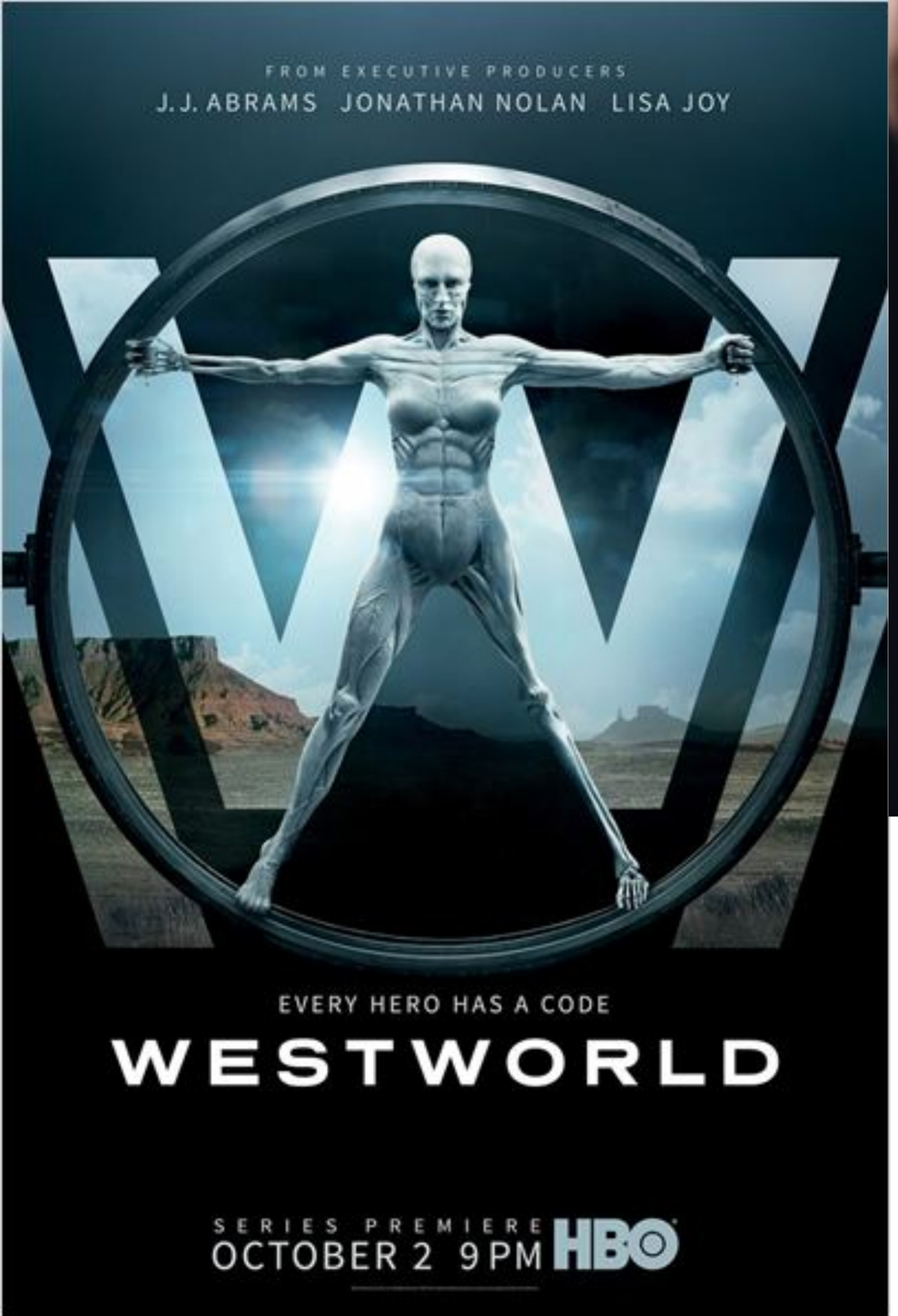

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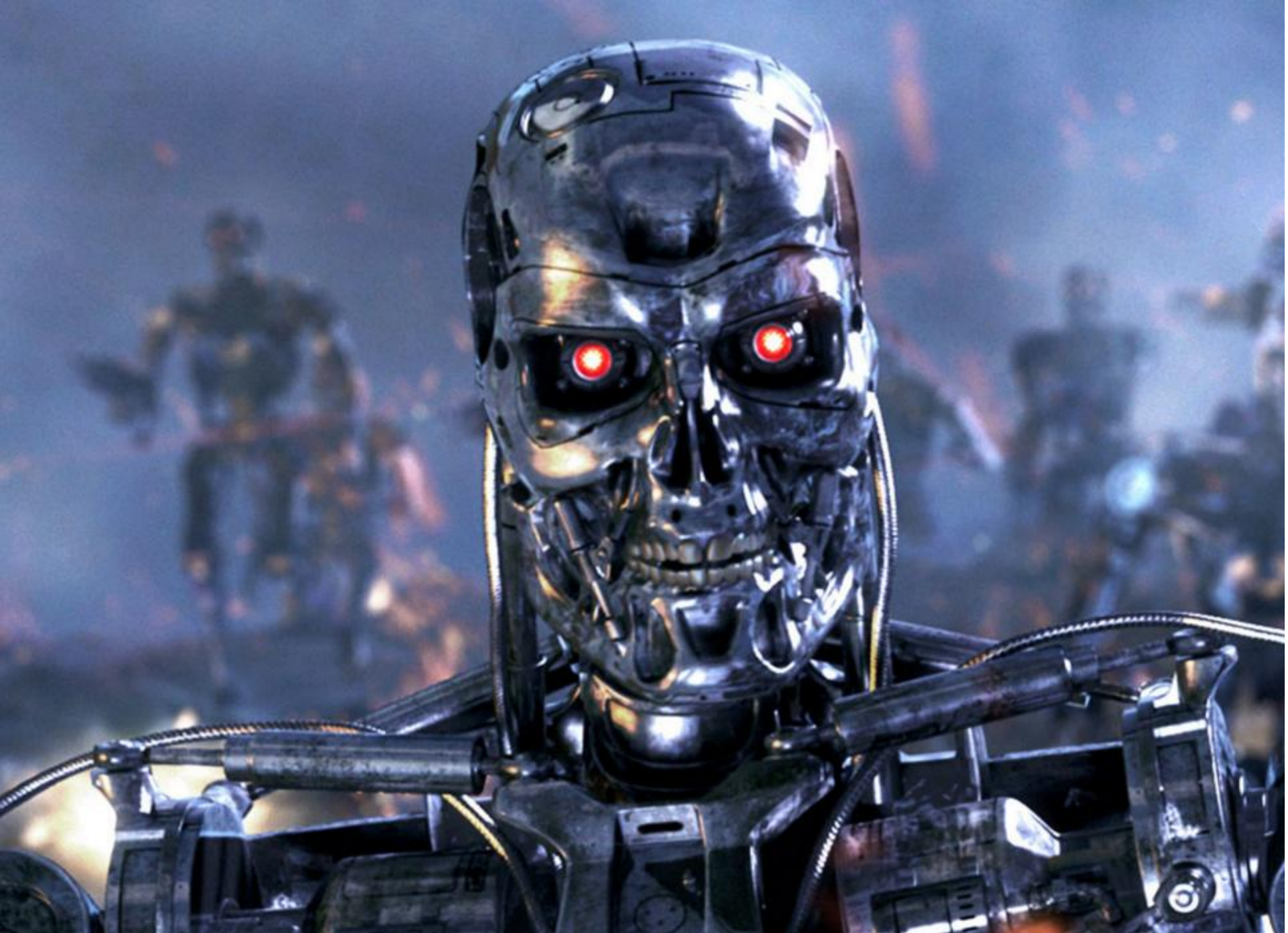
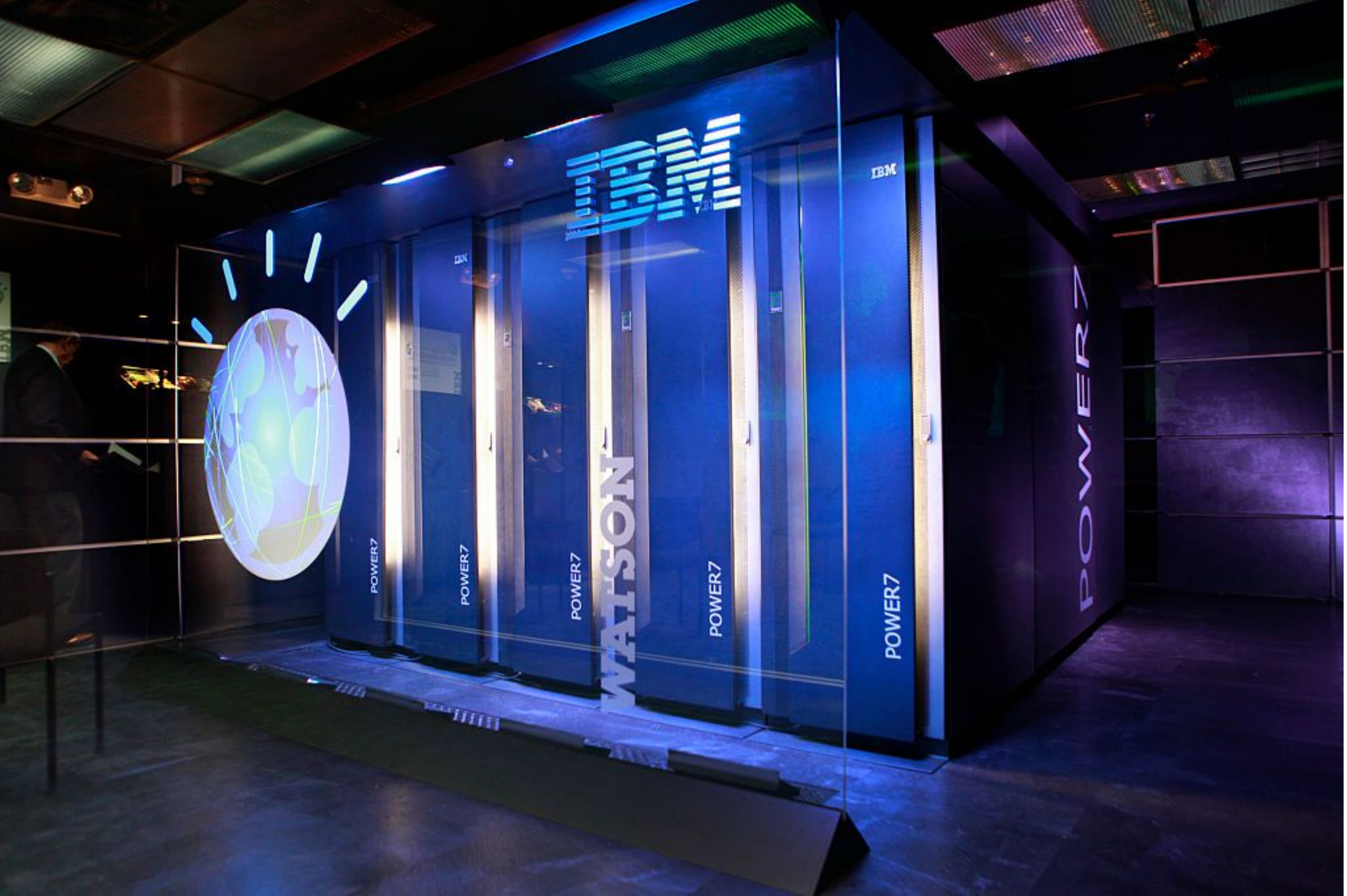


Source: forbes.com Enero 2017

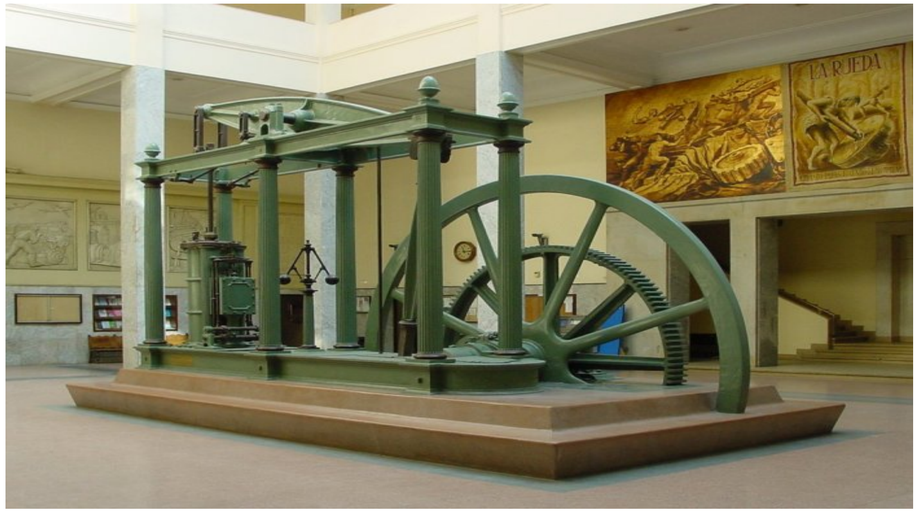
Source: www.wired.com y cbmm.mit.edu Enero 2017



Source: IBM

Source: Apple

Source: Google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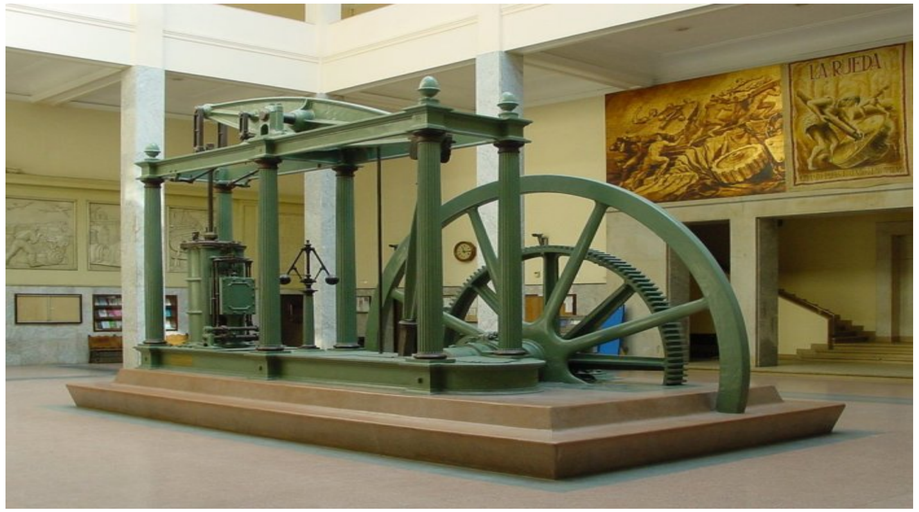
LA RUEDA

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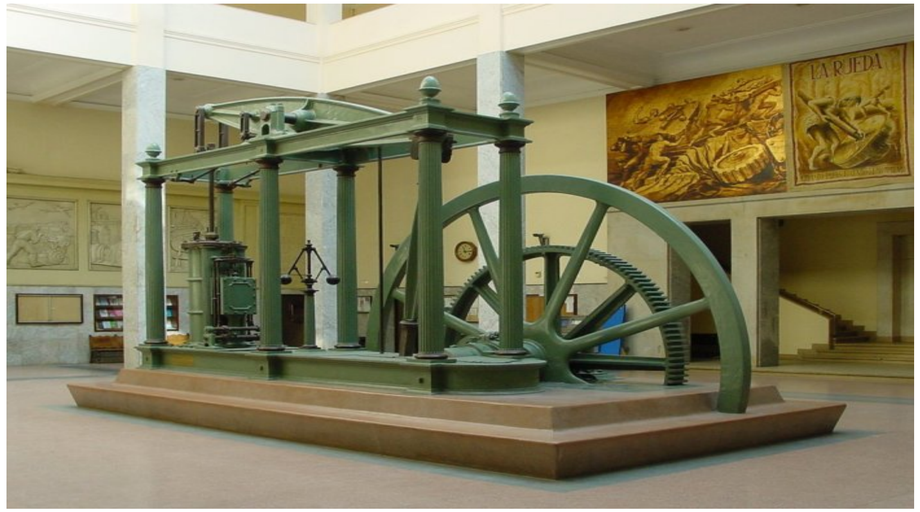
N900FJ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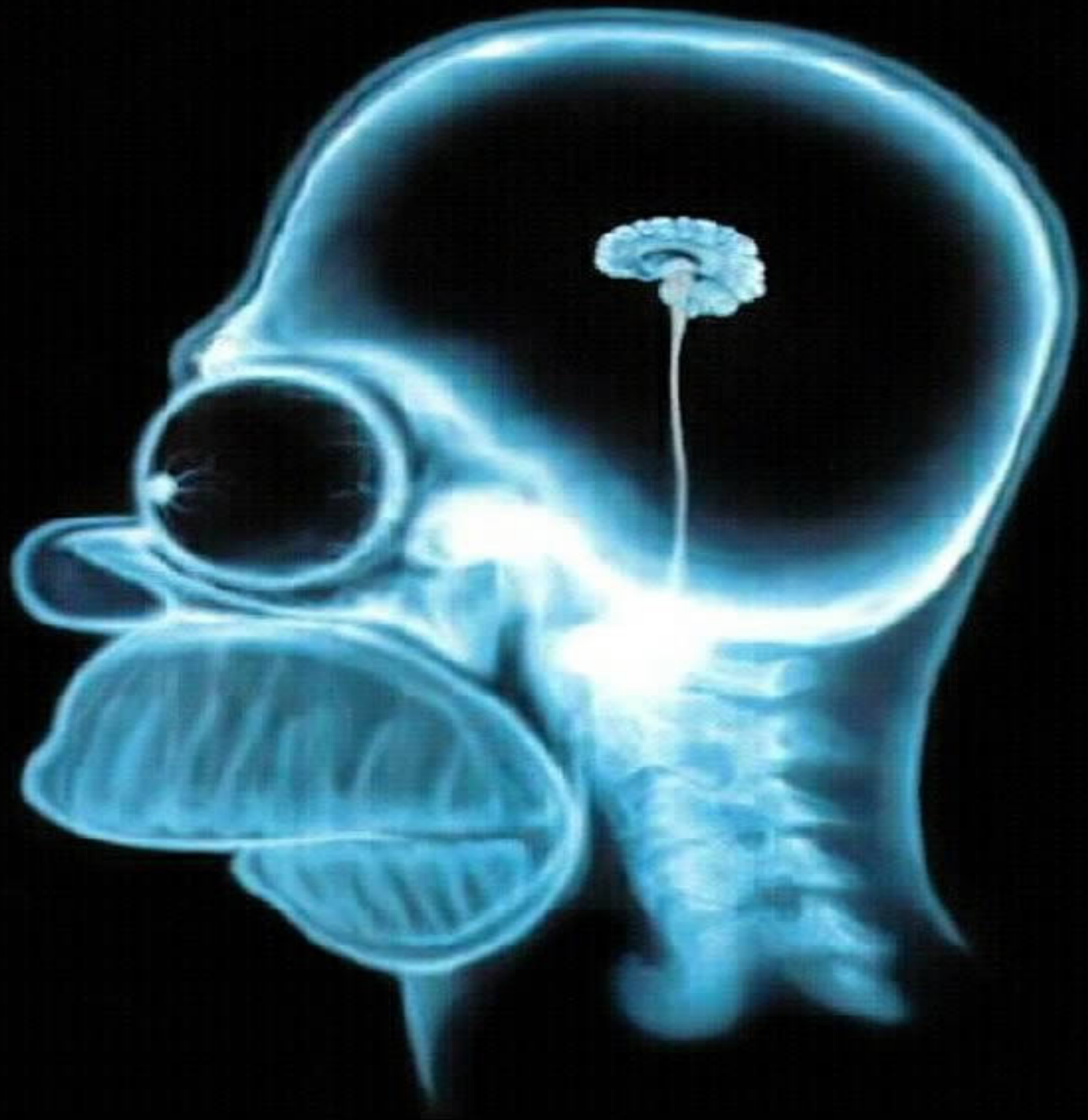

Source: iRobot, Domino's Pizza, Kiva

Source: Rethink Robotics, Microsoft

Turing Test

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ALEX GARLAND THE WRITER OF
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THERE IS NOTHING MORE HUMAN
THAN THE WILL TO SURVIVE
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Outline

1. Introduction
2. Architecture of intelligent systems
   - Architecture
   - Inputs
   - Representation
   - Reasoning
   - Machine learning
   - Output
3. Conclusions

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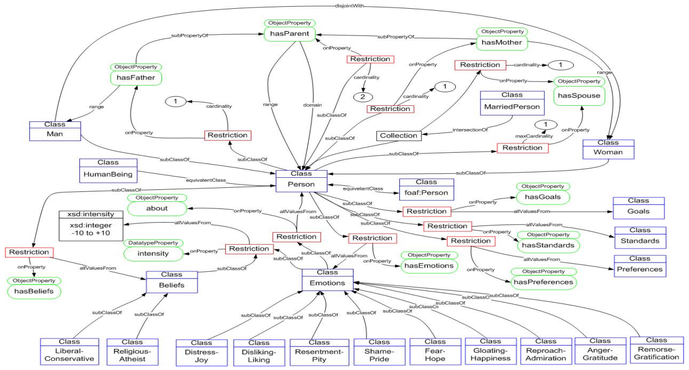
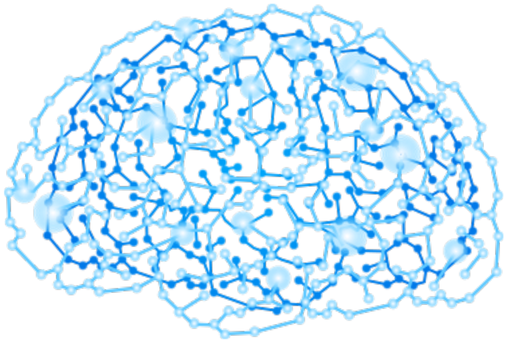
inputs



representation

learning



reasoning

outputs

Source: www.mcmfx.co.uk, cornell.edu, GizBot

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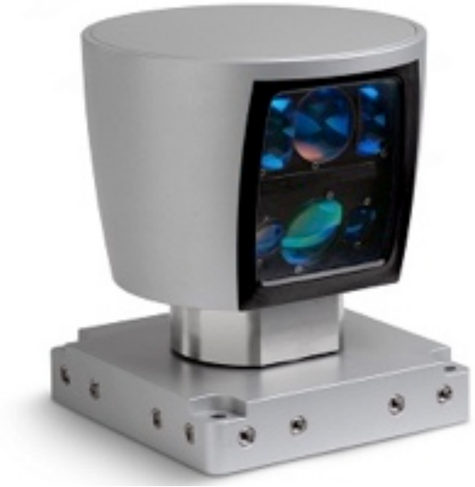
Sensors - Inputs

any suggestions?

esc
delete
tab
caps lock
return
shift
shift
control
alt
option
command ⌘
⌘ command
alt
option
control
fn
home
page up
delete
end
page down
clear
enter



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Megapixel

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A
HOME
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Wii MotionPlus INSIDE

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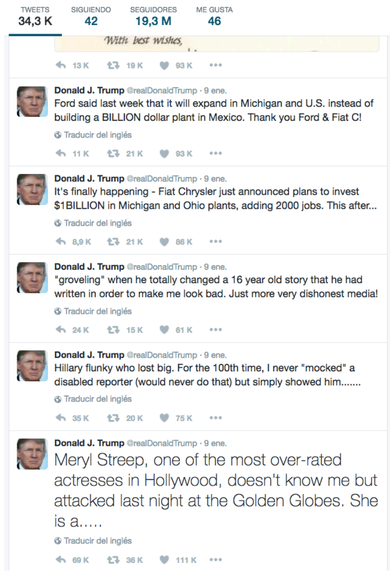
1'0"17"30
32
295K/H
POSITION
30/40

KINECT



Google

tripadvisor®

FOURSQUARE

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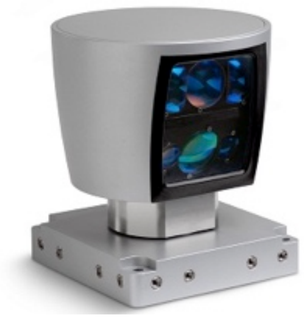

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Artículo Discusión

Inteligencia artificial

Las referencias de este artículo no tienen un **formato correcto**. Puedes colaborar editándolas como se indica en esta página.
También puedes avisar en su página de discusión a quien las añadió pegando: {{subst:Aviso formato de referencias|Inteligencia artificial}} ----

»IA« redirige aquí. Para otras acepciones, véase IA (desambiguación).

La **inteligencia artificial** (IA), o mejor llamada **inteligencia computacional**, es la inteligencia exhibida por máquinas. En ciencias de la computación, una máquina "inteligente" ic
percibe su entorno y lleva a cabo acciones que maximicen sus posibilidades de éxito en algún objetivo o tarea.[1][2][3][4] Coloquialmente el término "inteligencia artificial" se aplica cu
"cognitivas" que los humanos asocian con otras mentes humanas, como por ejemplo: "aprender" y "resolver problemas".[5] A medida de que las máquinas se vuelven cada vez m
se pensó que requeriría de inteligencia se elimina de la definición. Por ejemplo, el reconocimiento óptico de caracteres ya no se percibe como un ejemplo de la "inteligencia artificia
tecnología común.[6] Avances tecnológicos todavía clasificados como inteligencia artificial son los sistemas capaces de jugar ajedrez, GO y manejar por si mismos.

En 1956, John McCarthy acuñó la expresión «inteligencia artificial», y la definió como: "...la ciencia e ingenio de hacer máquinas inteligentes, especialmente programas de cómpu

Para Nilsson son cuatro los pilares básicos en los que se apoya la inteligencia artificial:

- Búsqueda del estado requerido en el conjunto de los estados producidos por las acciones posibles.
- Algoritmos genéticos (análogo al proceso de evolución de las cadenas de ADN).
- Redes neuronales artificiales (análogo al funcionamiento físico del cerebro de animales y humanos).
- Razonamiento mediante una lógica formal análogo al pensamiento abstracto humano.

También existen distintos tipos de percepciones y acciones, que pueden ser obtenidas y producidas, respectivamente, por sensores físicos y sensores mecánicos en máquinas, p
computadoras, tanto como por entradas y salidas de bits de un software y su entorno software.

Varios ejemplos se encuentran en el área de control de sistemas, planificación automática, la habilidad de responder a diagnósticos y a consultas de los consumidores, reconocin
habla y reconocimiento de patrones. Los sistemas de IA actualmente son parte de la rutina en campos como economía, medicina, ingeniería y la milicia, y se ha usado en gran va
juegos de estrategia, como ajedrez de computador, y otros videojuegos.

Índice [ocultar]

1 Categorías de la inteligencia artificial
2 Escuelas de pensamiento
2.1 Inteligencia artificial convencional
2.2 Inteligencia artificial computacional
3 Historia
4 La inteligencia artificial, la conciencia y los sentimientos
5 Críticas
6 Tecnologías de apoyo
7 Aplicaciones de la inteligencia artificial
8 Investigadores en el campo de la inteligencia artificial
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¿?

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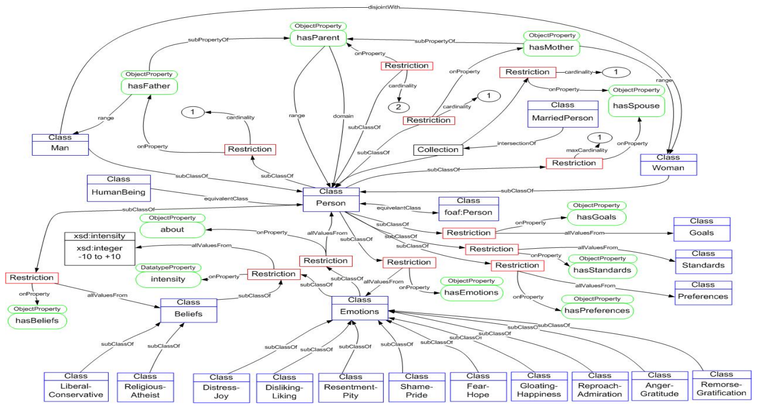

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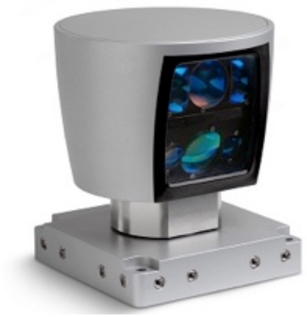
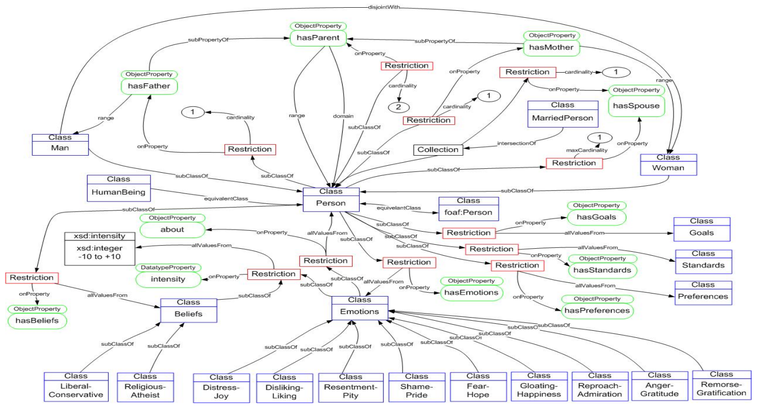


Inteligencia artificial

Machine learning



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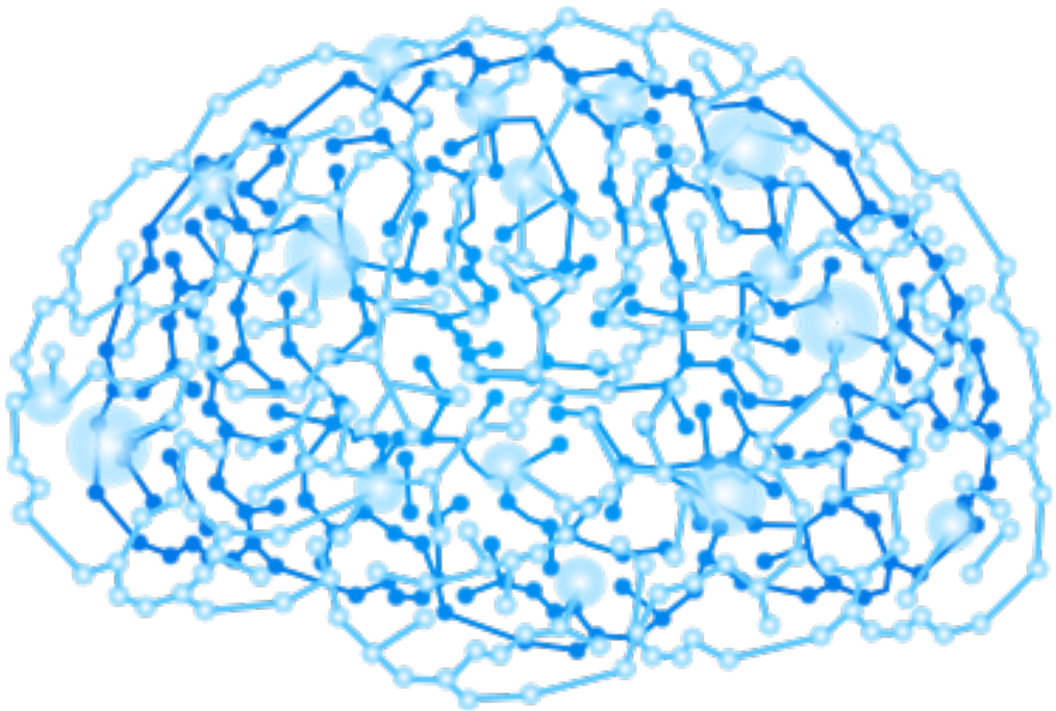
Reasoning

1. Production systems
2. Heuristic search
3. Automated planning
4. Reasoning under uncertainty
5. Bio-inspired techniques
6. Social reasoning
7. Creativity



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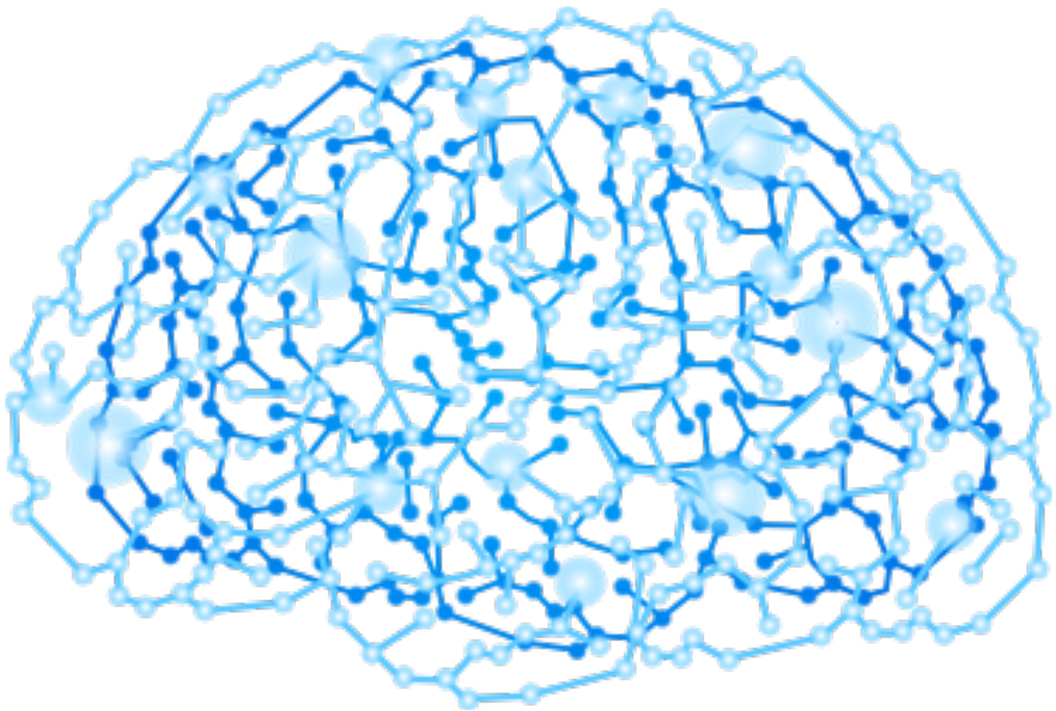

MYCIN

IF identity of organism is not known AND
stain of organism is gramneg AND
morphology of organism is rod AND
aerobicity of organims is aerobic
THEN there is strongly suggestive evidence
(0.8) that class of organism is
enterobacteriaceae

…

Business rules

IF average-5-purchases ≥ 300,0 AND
average-time-3-purchases ≤ 35
THEN client=VIP

IF average-4-purchases ≤ 300,0 AND
average-time-3-purchases ≤ 12
THEN client=VIP

IF average-5-purchases ≤ 200,0 AND
average-time-3-purchases ≥ 12
THEN client=Standard

…

Computing project costs for ESA

IF number new classes ≥ 20 AND
team experience = low AND
programming language = C++
THEN risk is high
…

Funds management. Unión Fenosa

```
(RULE invest
    :LHS ((account :id =id :amount =a
                   :predicted-output =o (label =acc))
          (investment :risk =r :interest-rate =i
                      :min-amount =m (label =inv)))
          (check (> =a =m)))
    :RHS (($modify =acc :amount (- =a =m))))
…
```

Reasoning

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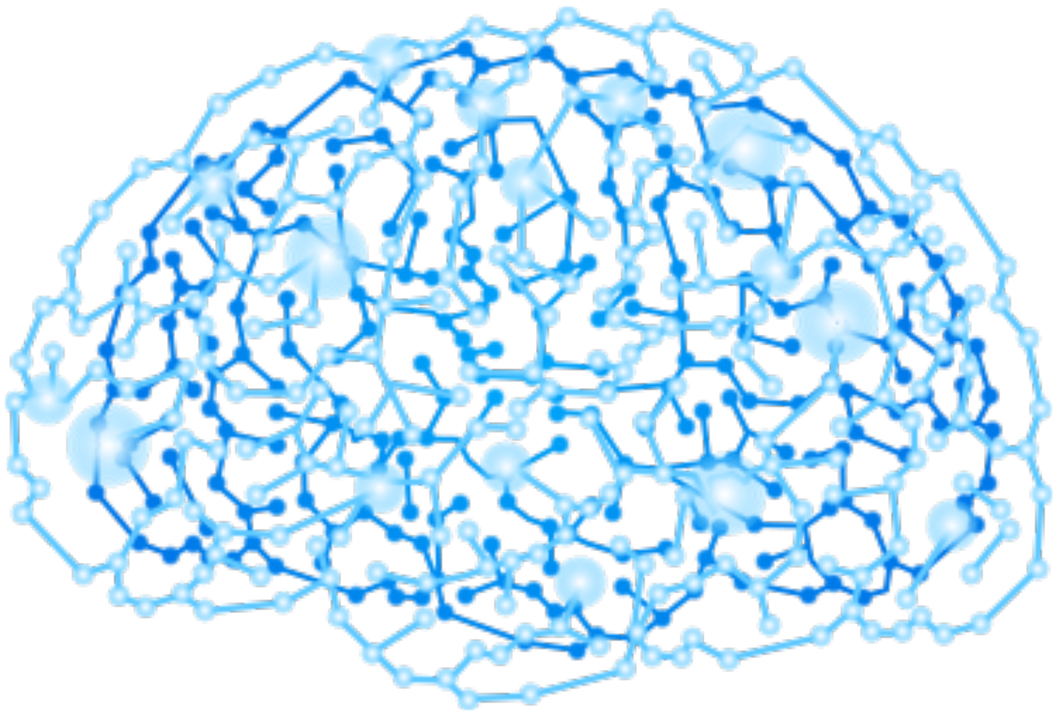
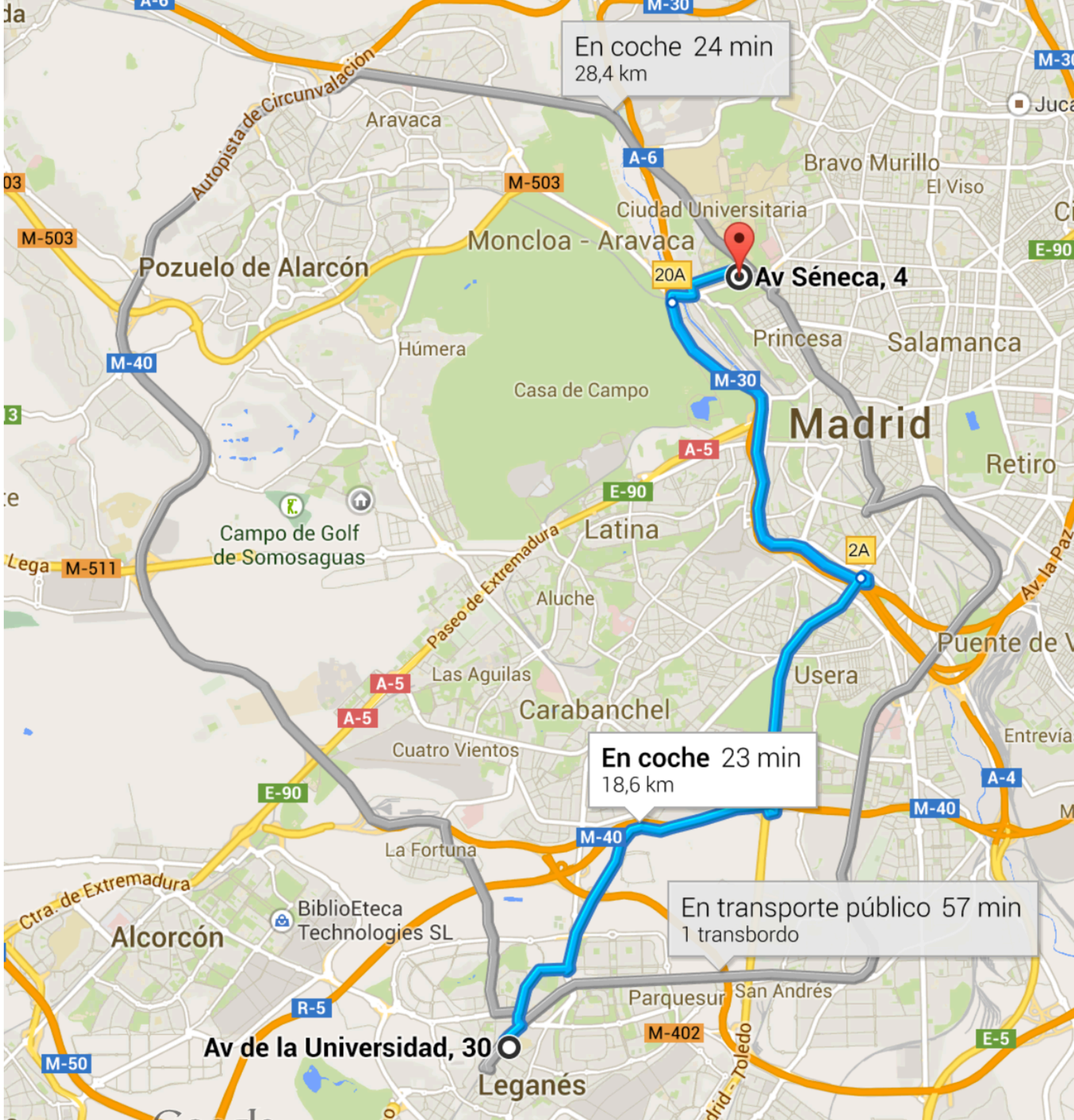
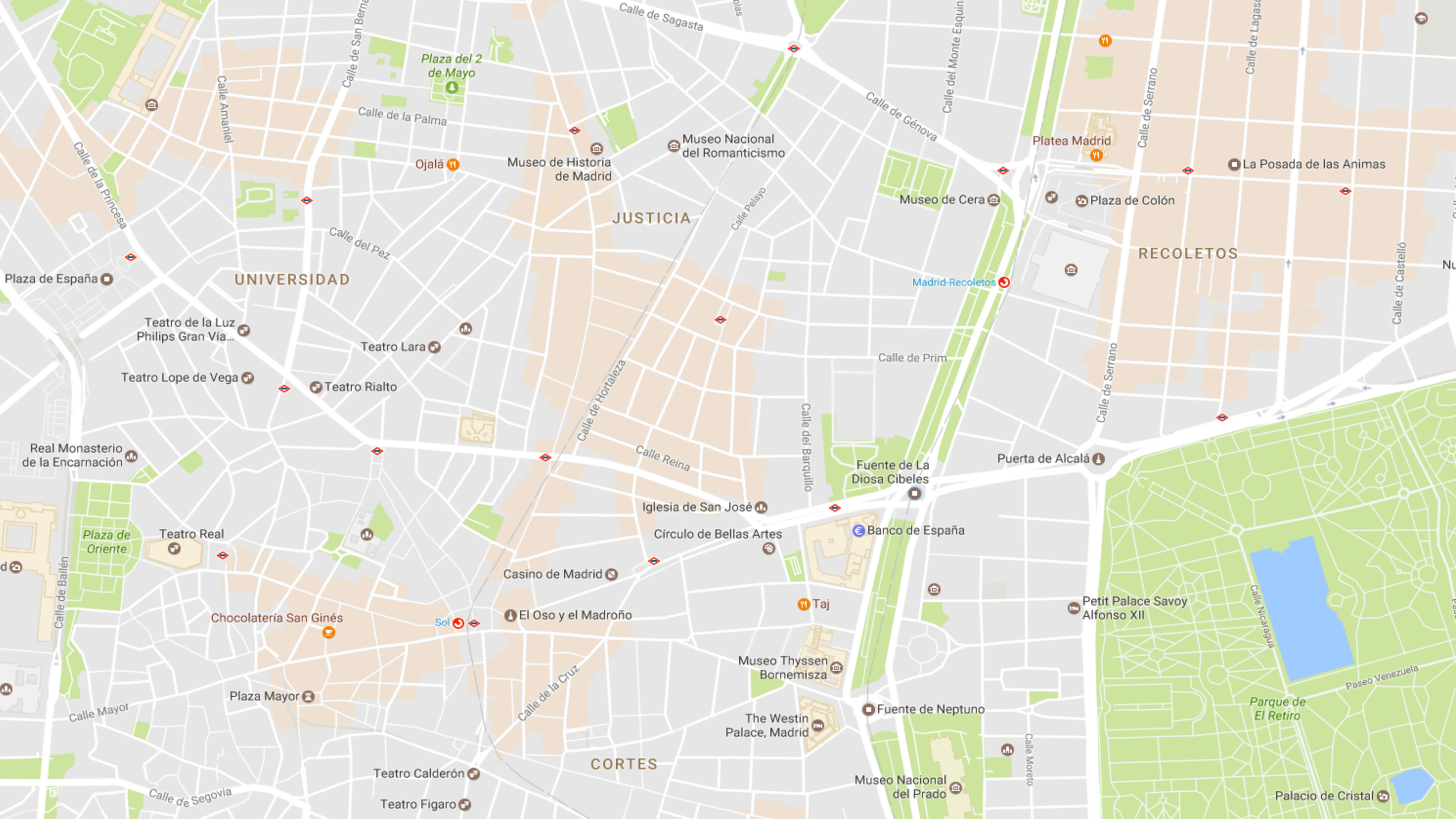


Heuristic search

Problem space
- states
- operators (actions)

Problem
- initial state
- goals

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El Oso y el Madroño
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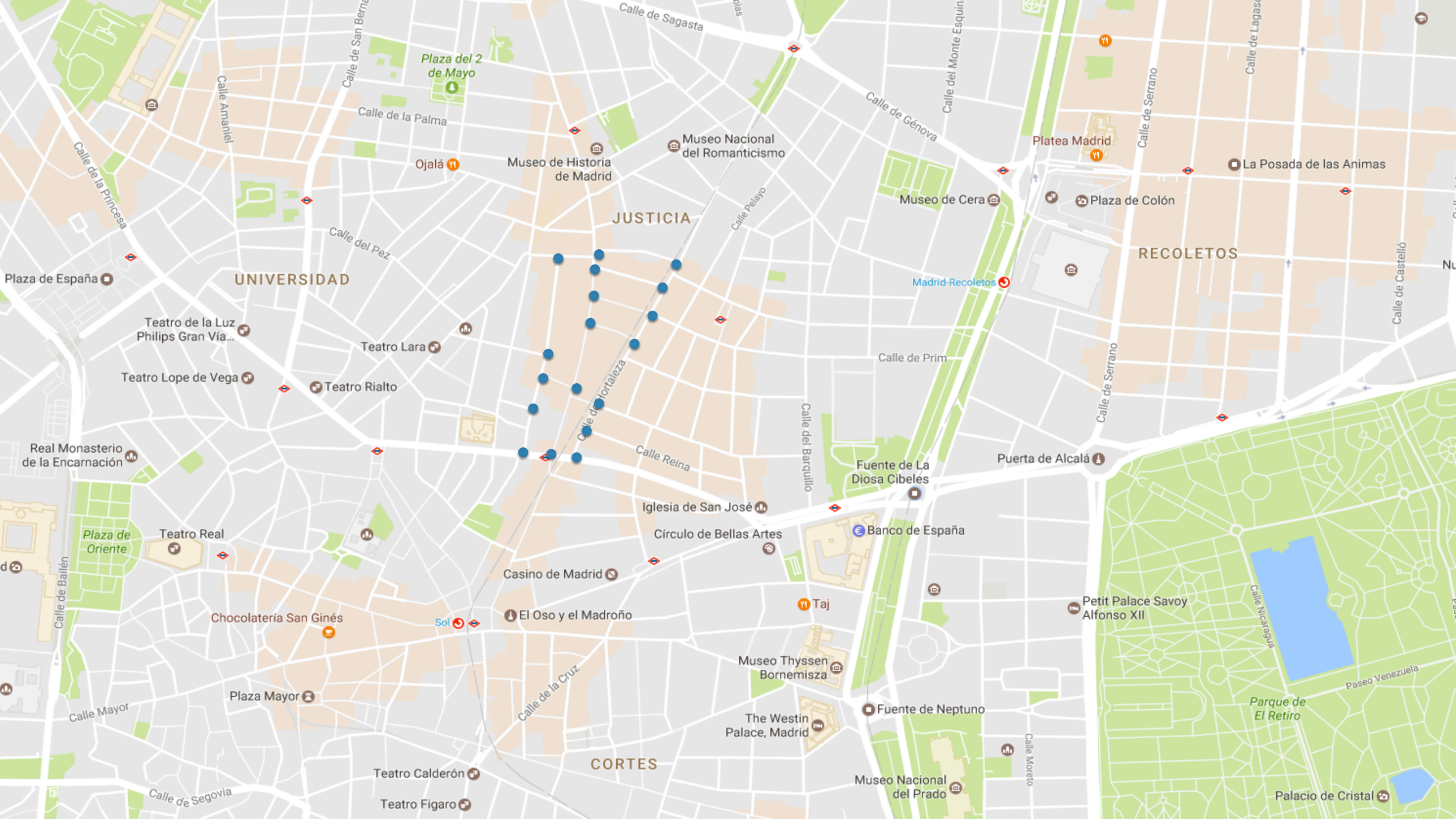
Paseo Venezuela
Parque de El Retiro
Palacio de Cristal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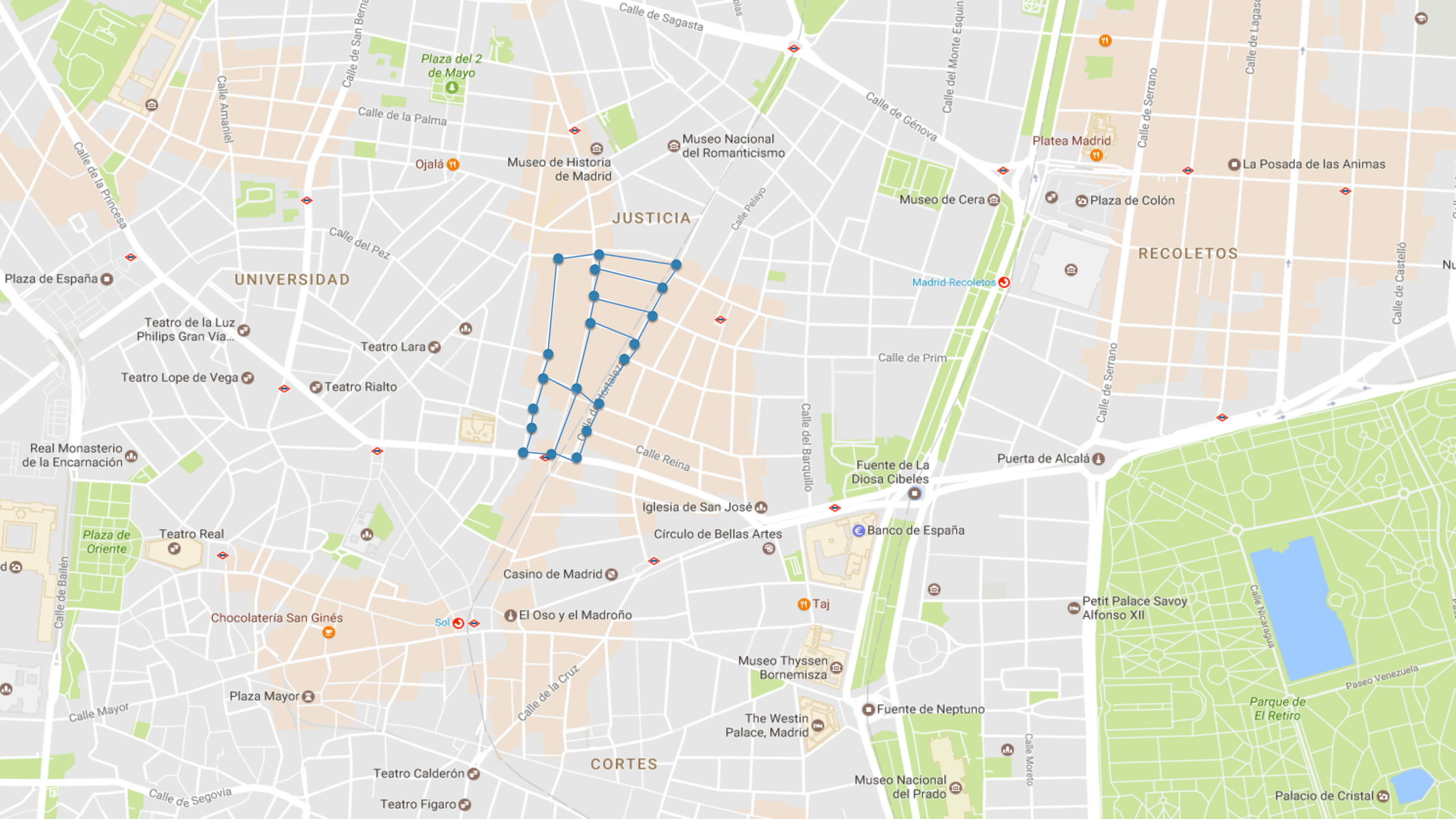
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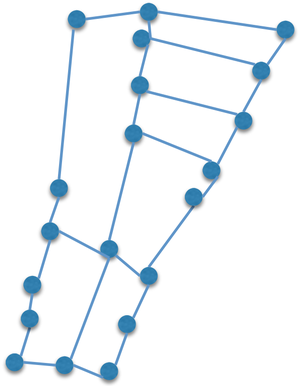
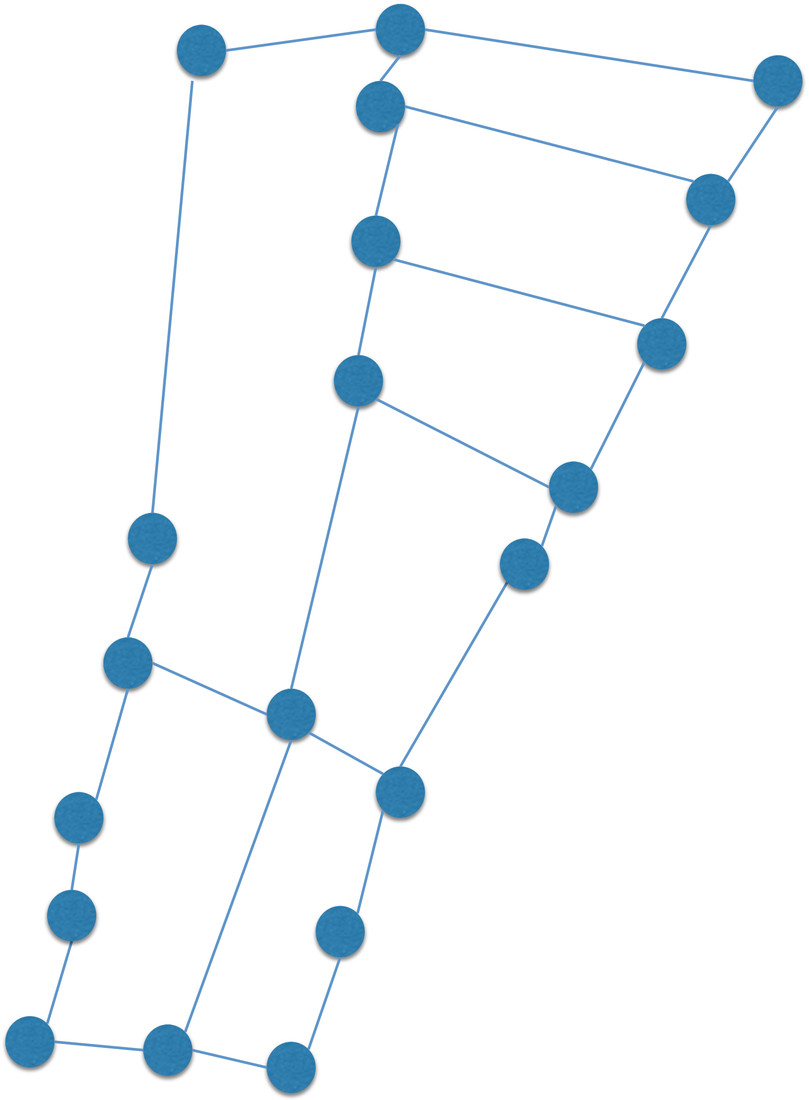
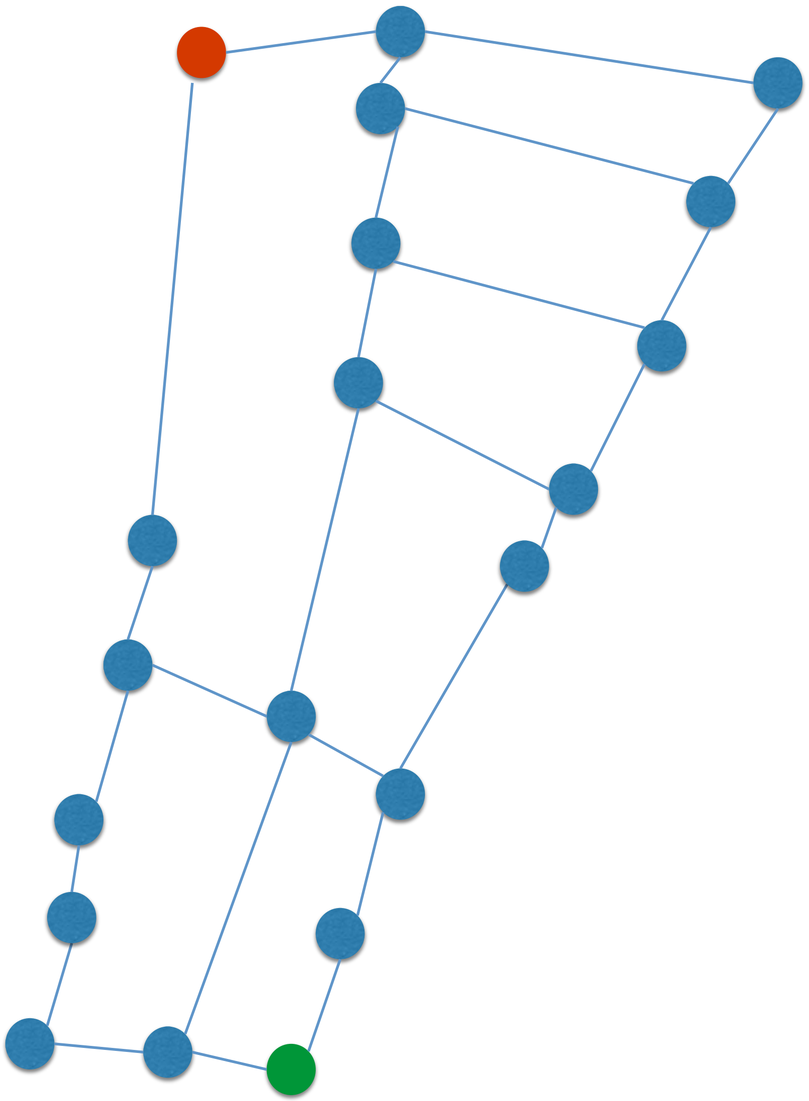
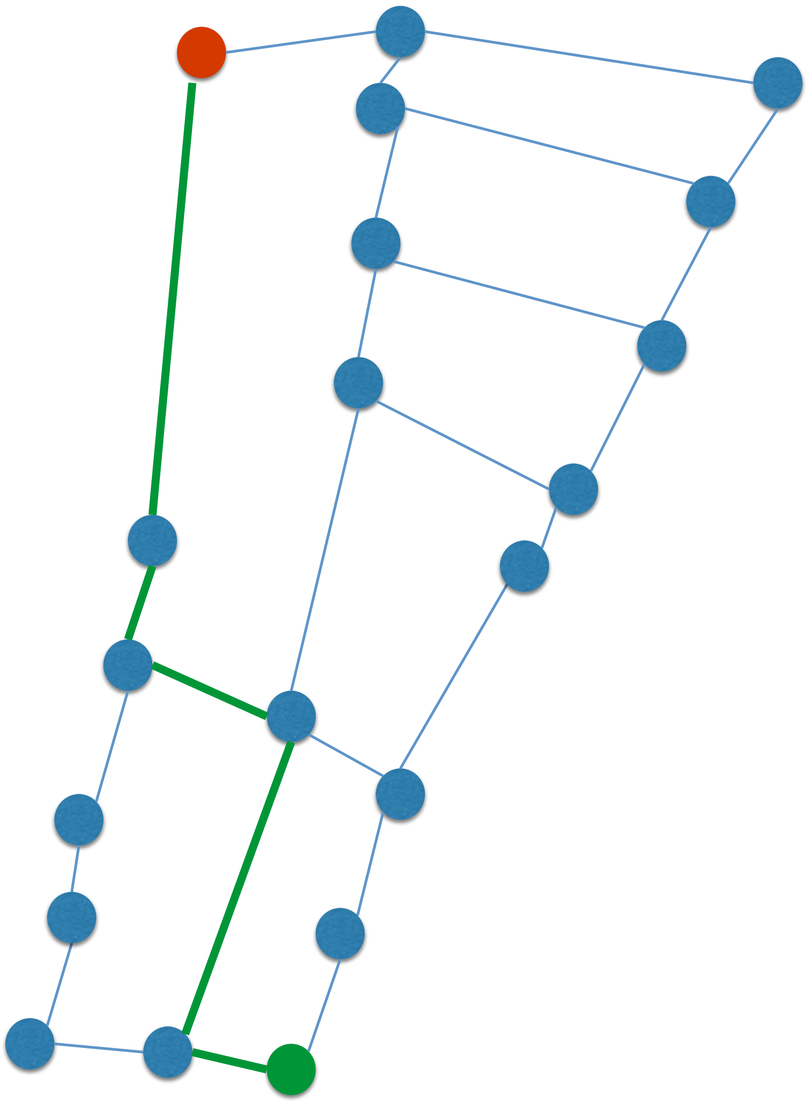
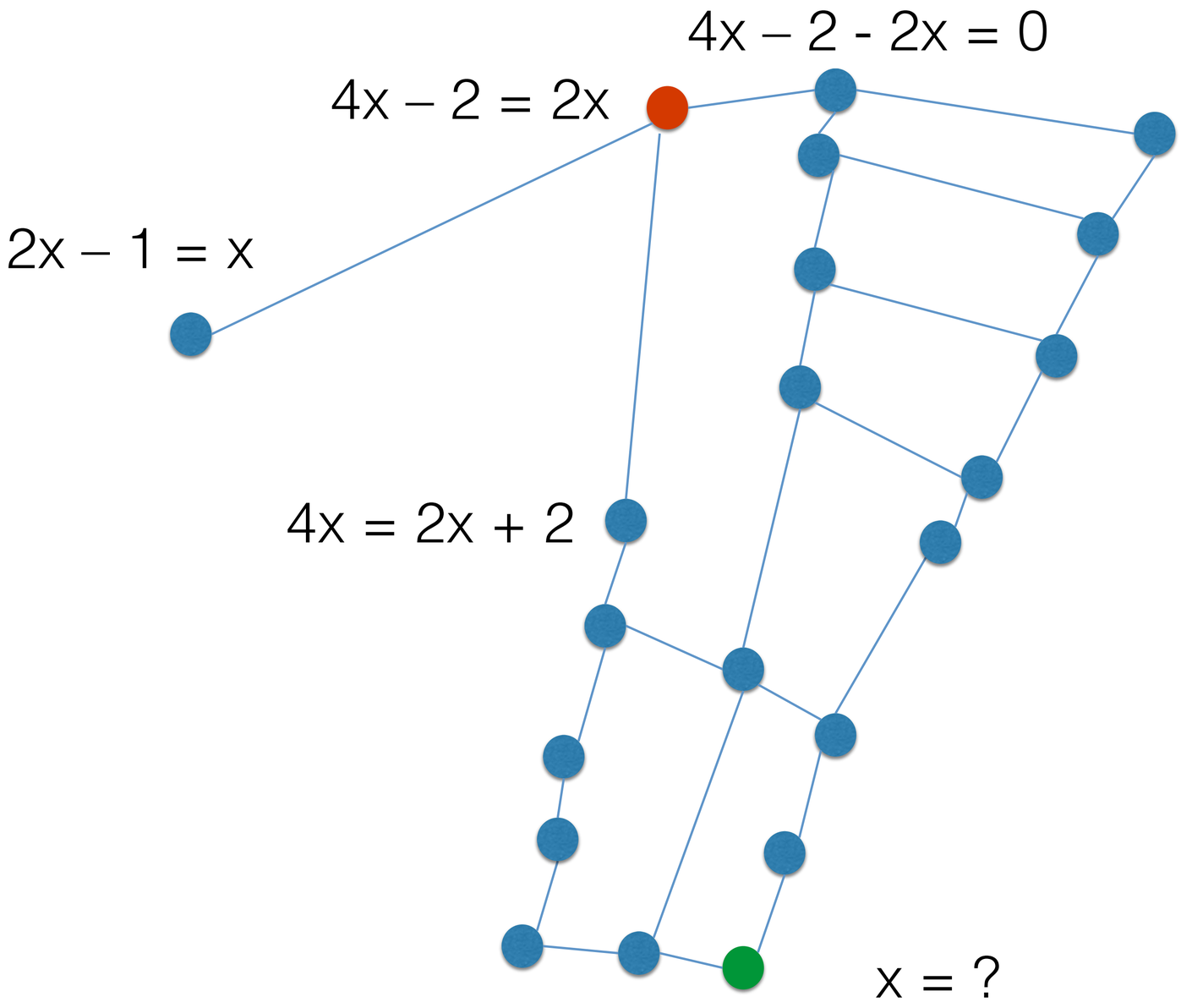
Calle de la Cruz
Fuente de Neptuno
Parque de El Retiro
The Westin Palace, Madrid
Calle Moreto
CORTES
Teatro Calderón
Museo Nacional del Prado
Calle de Segovia
Teatro Figaro
Palacio de Cristal

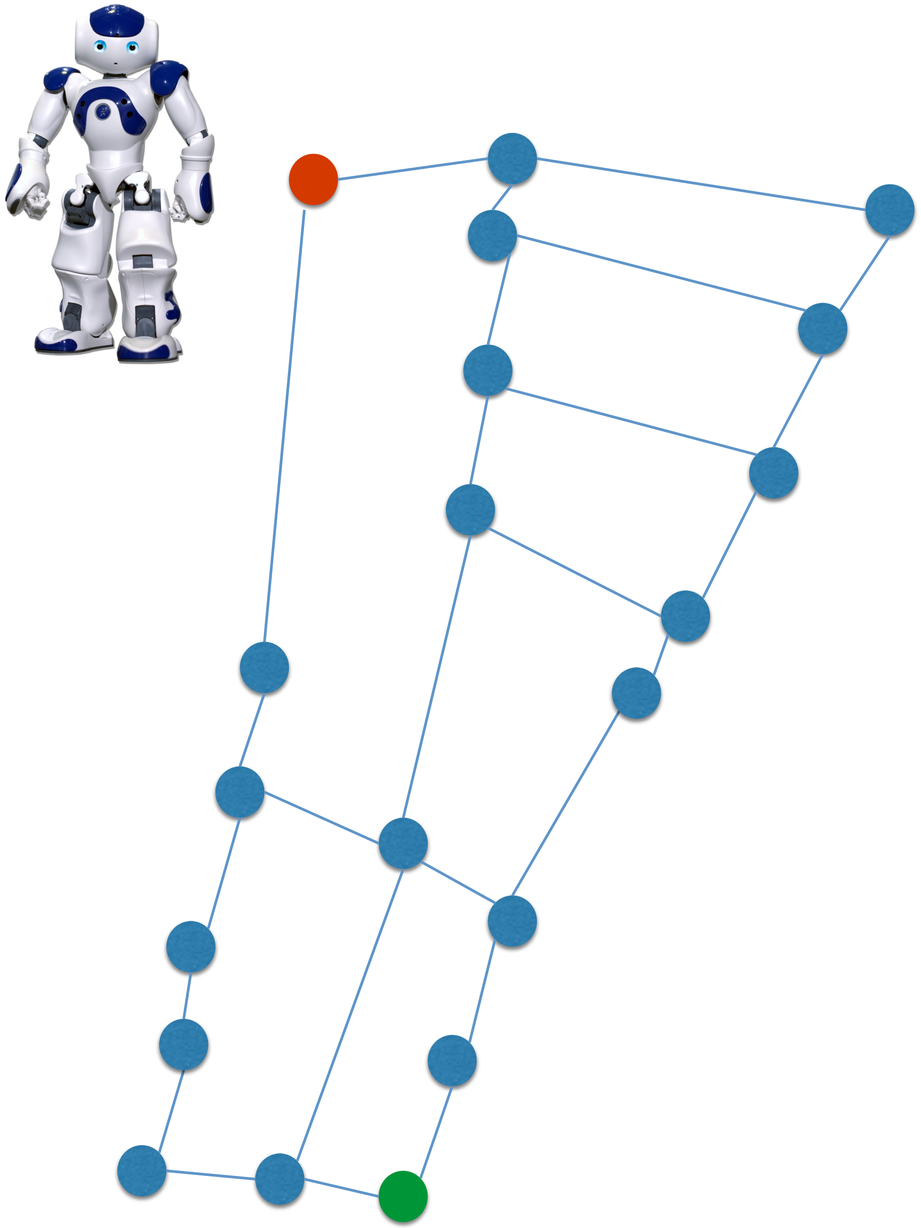


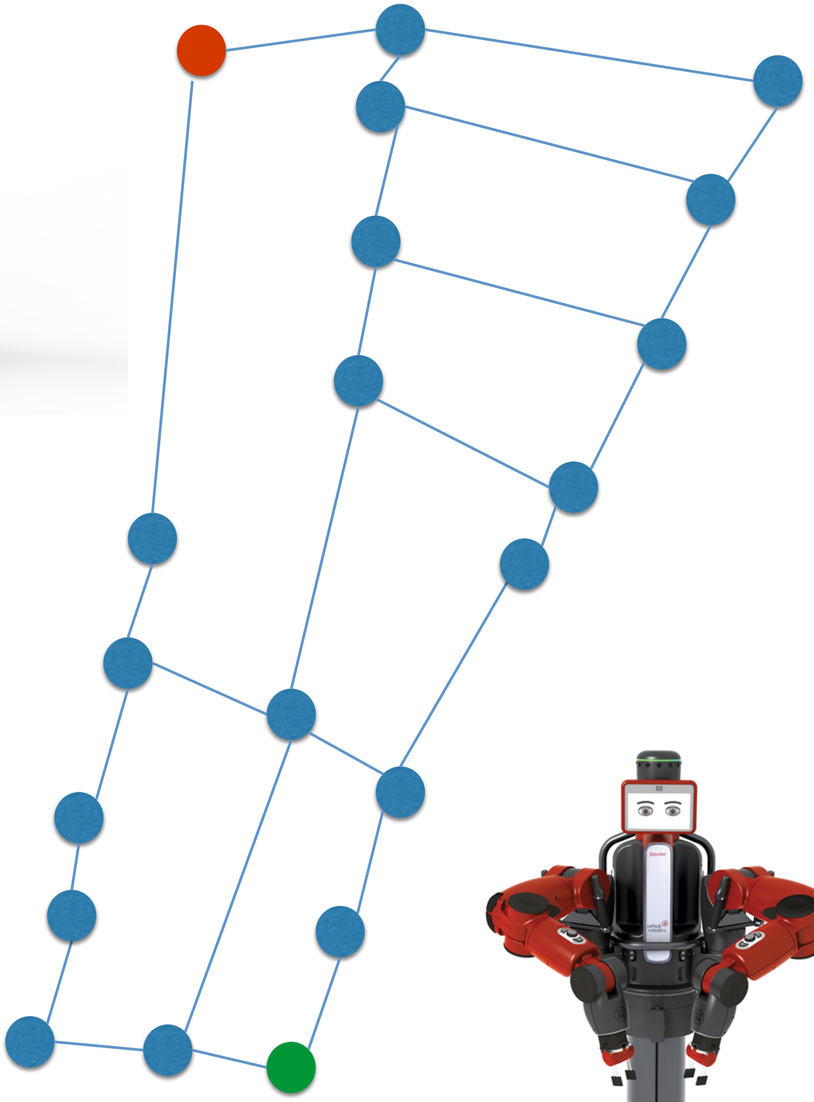


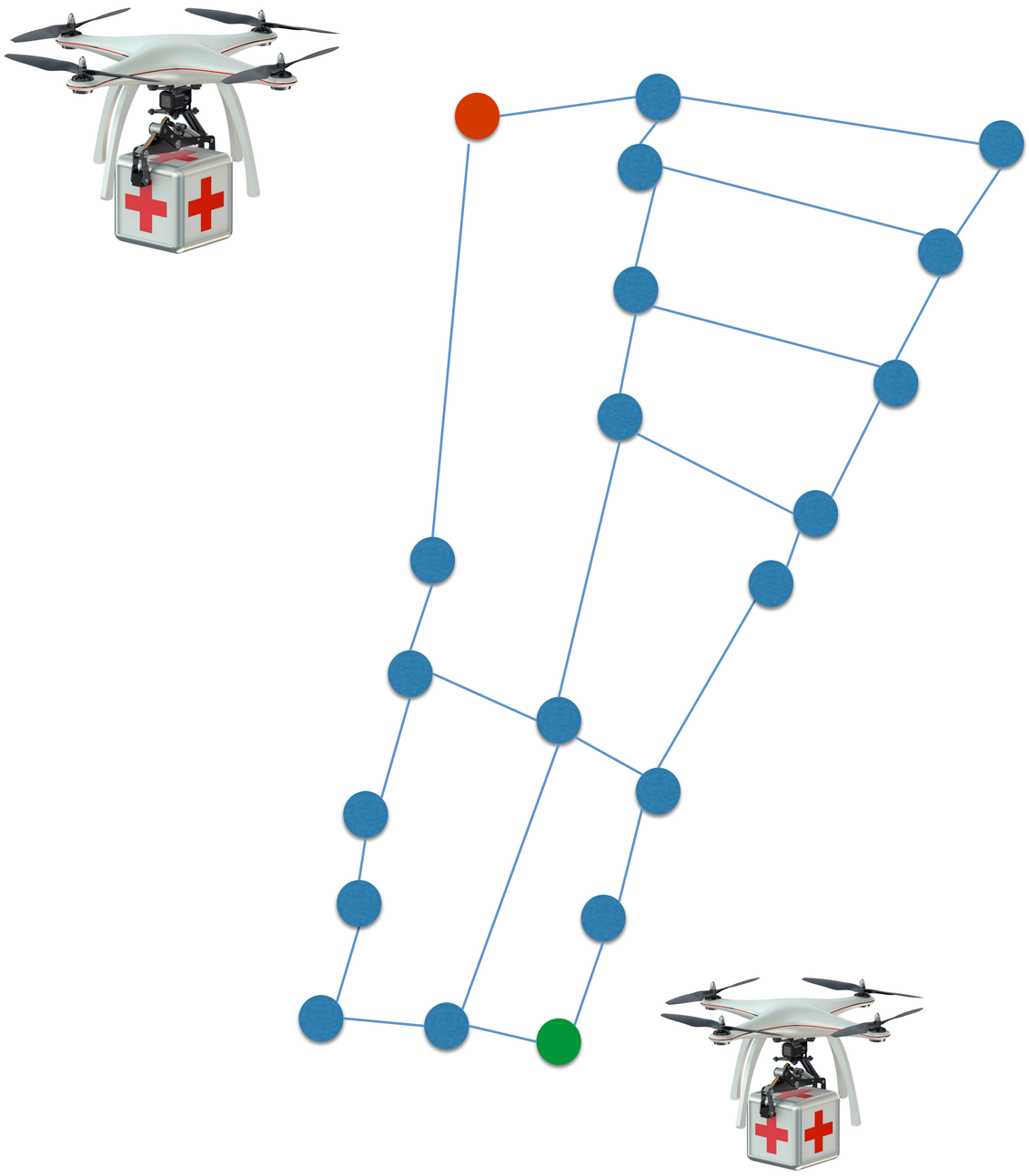





4x – 2 - 2x = 0
4x – 2 = 2x
2x – 1 = x
4x = 2x + 2
x = ?

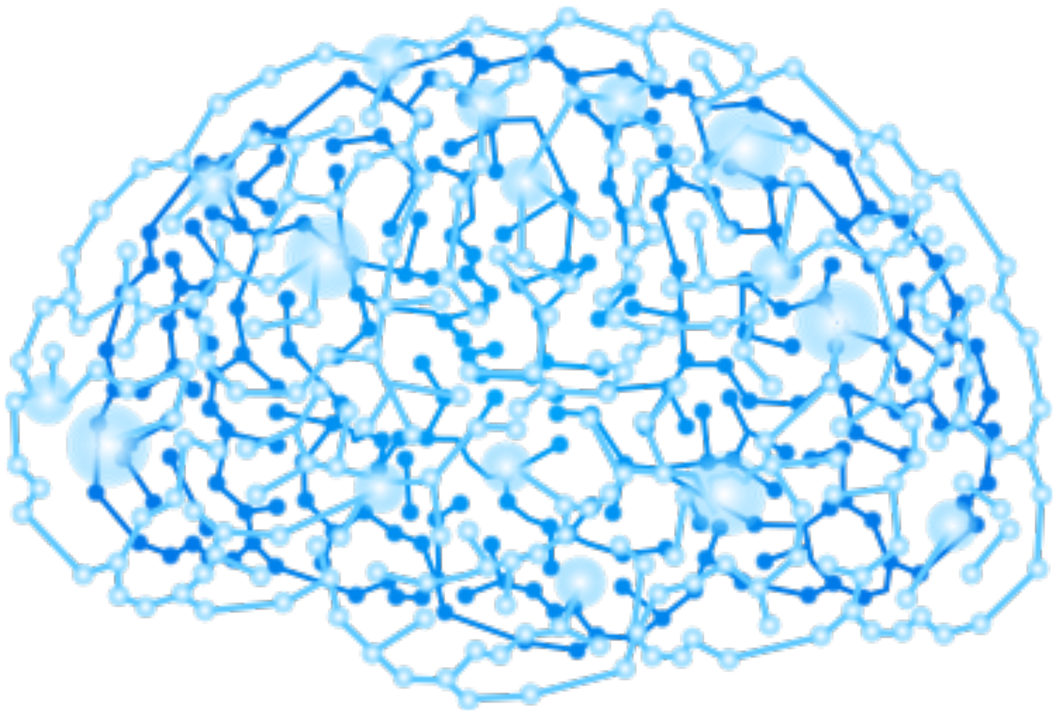


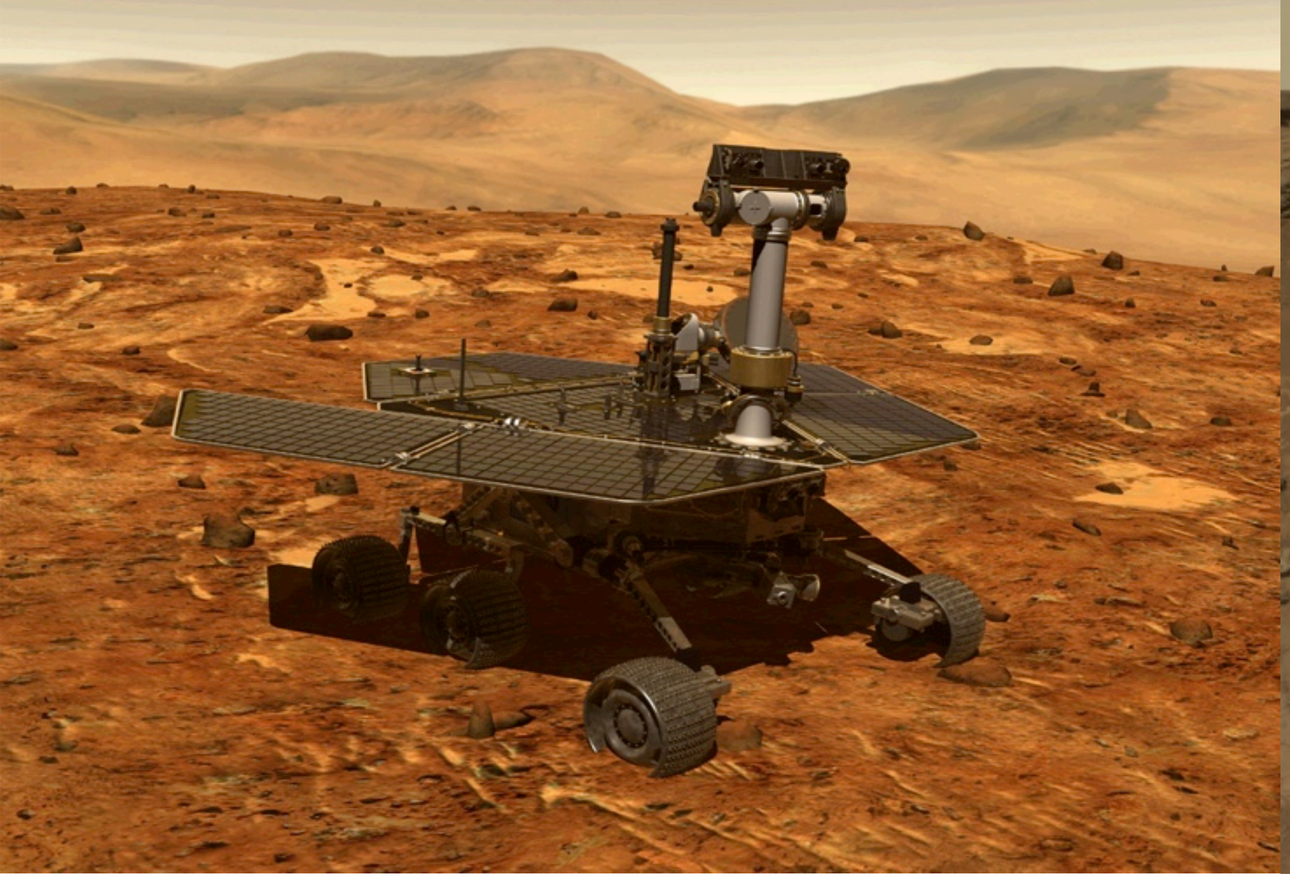


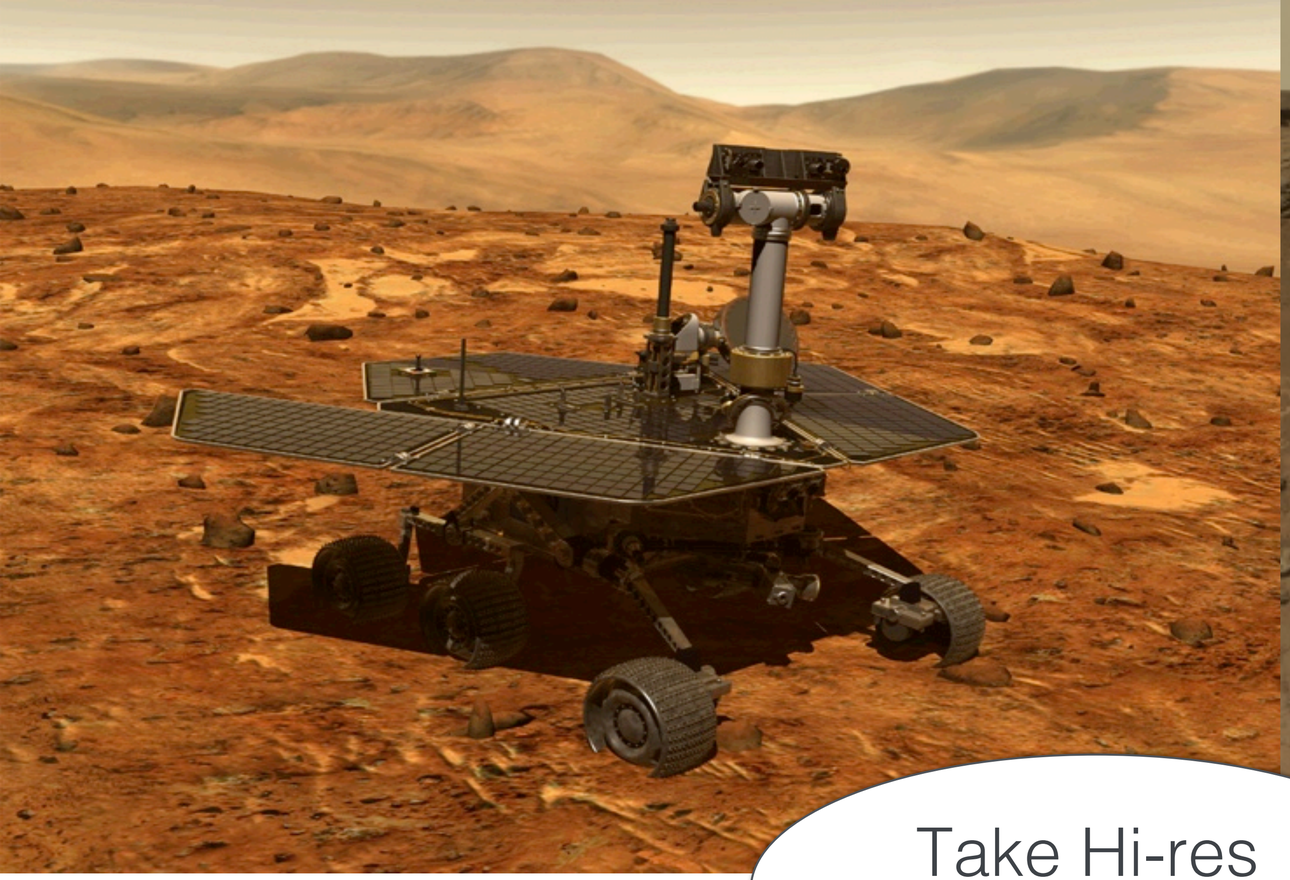


Reasoning

1. Production systems
2. Heuristic search
3. Automated planning
4. Reasoning under uncertainty
5. Bio-inspired techniques
6. Social reasoning
7. Creativity







Take Hi-res image

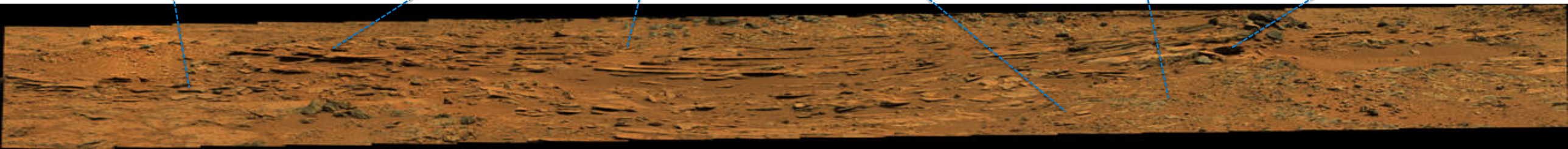
Take Low-res image

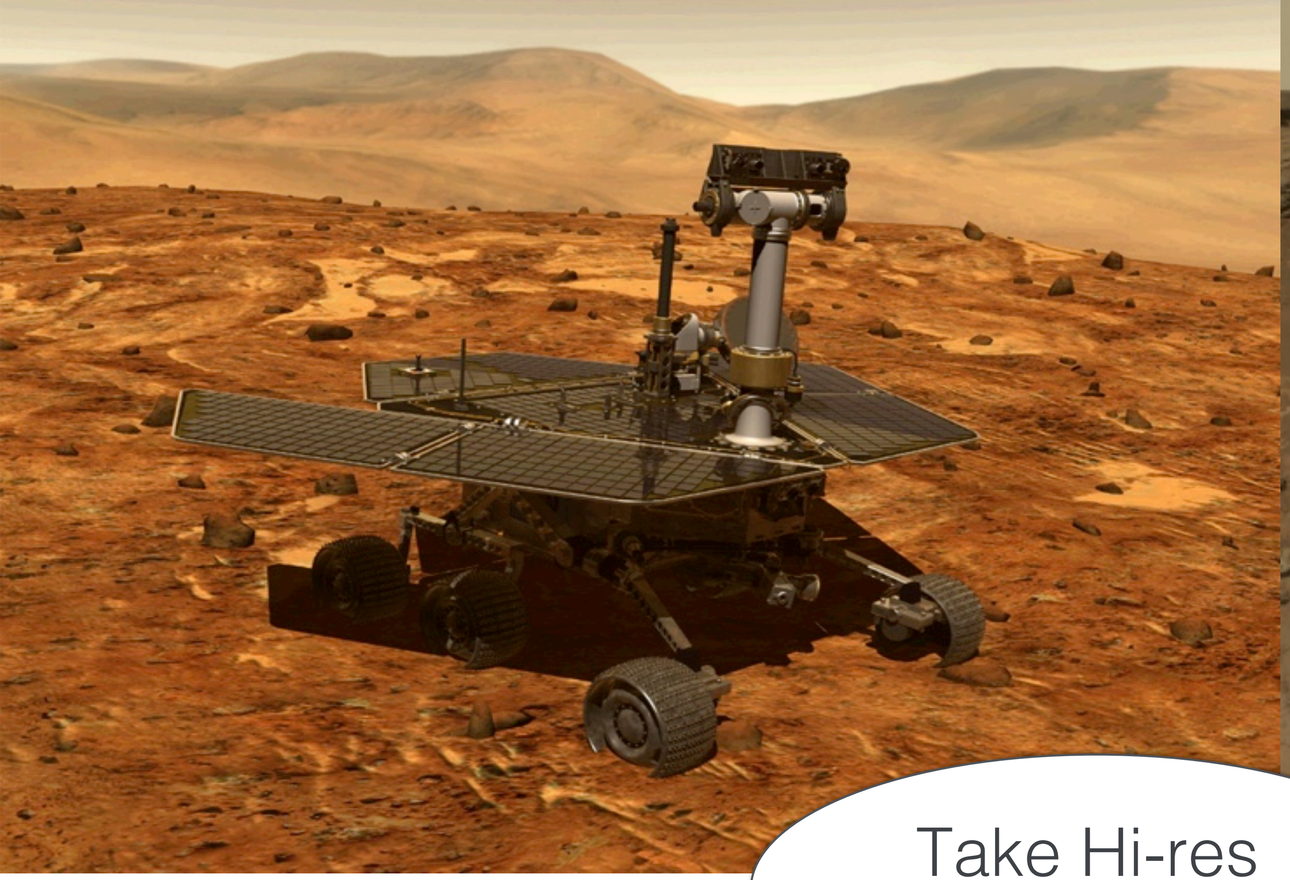
Soil analysis

Rock analysis

Soil analysis

Rock analysis





Take Hi-res image

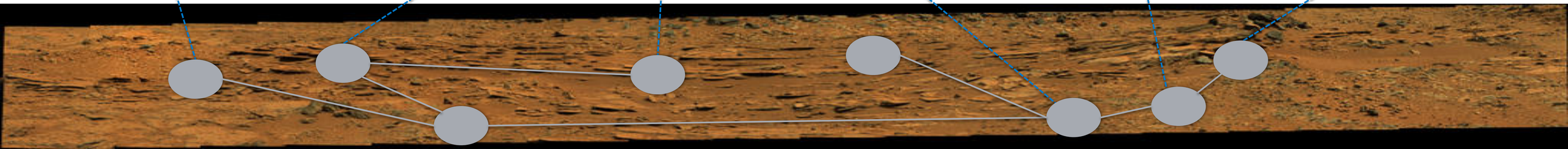
Take Low-res image

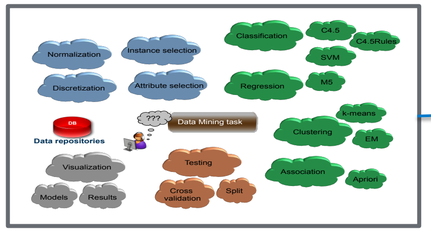
Soil analysis

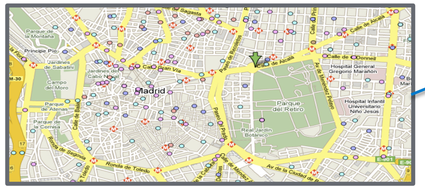
Rock analysis

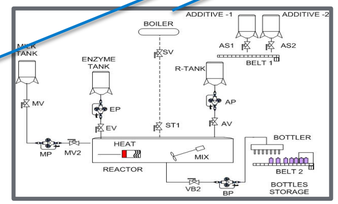
Soil analysis

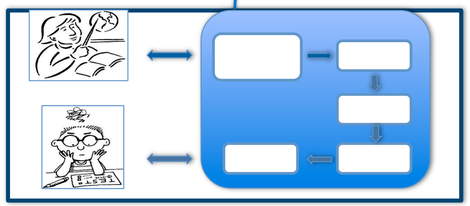
Rock analysis





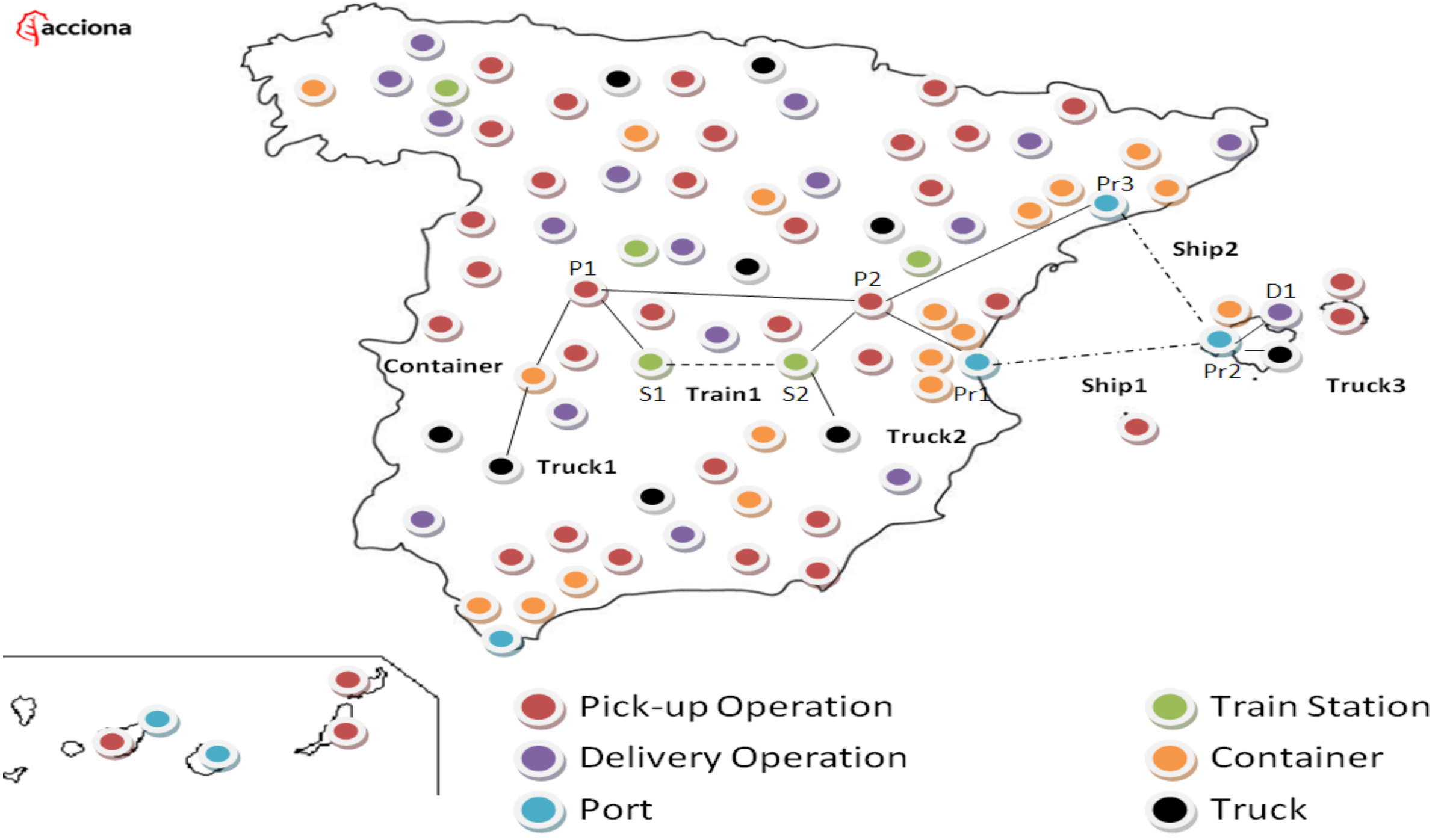






Planner

Plan


acciona
Pr3
Ship2
P1
P2
D1
Container
S1
Train1
S2
Pr1
Ship1
Pr2
Truck3
Truck2
Truck1
Pick-up Operation
Delivery Operation
Port
Train Station
Container
Truck

Reasoning

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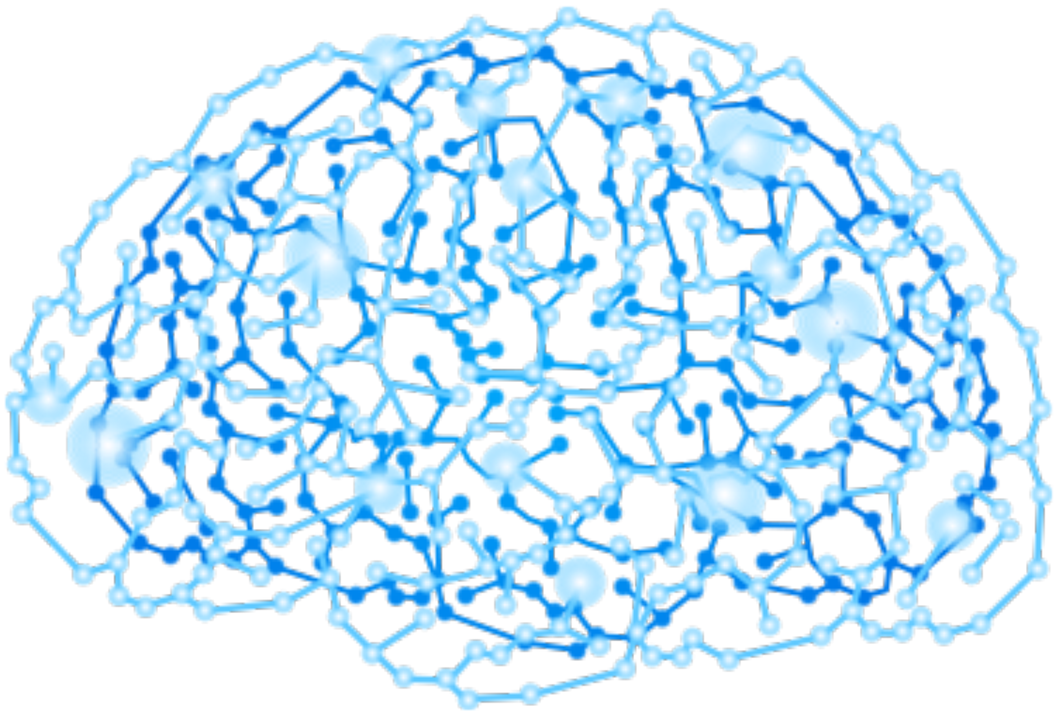
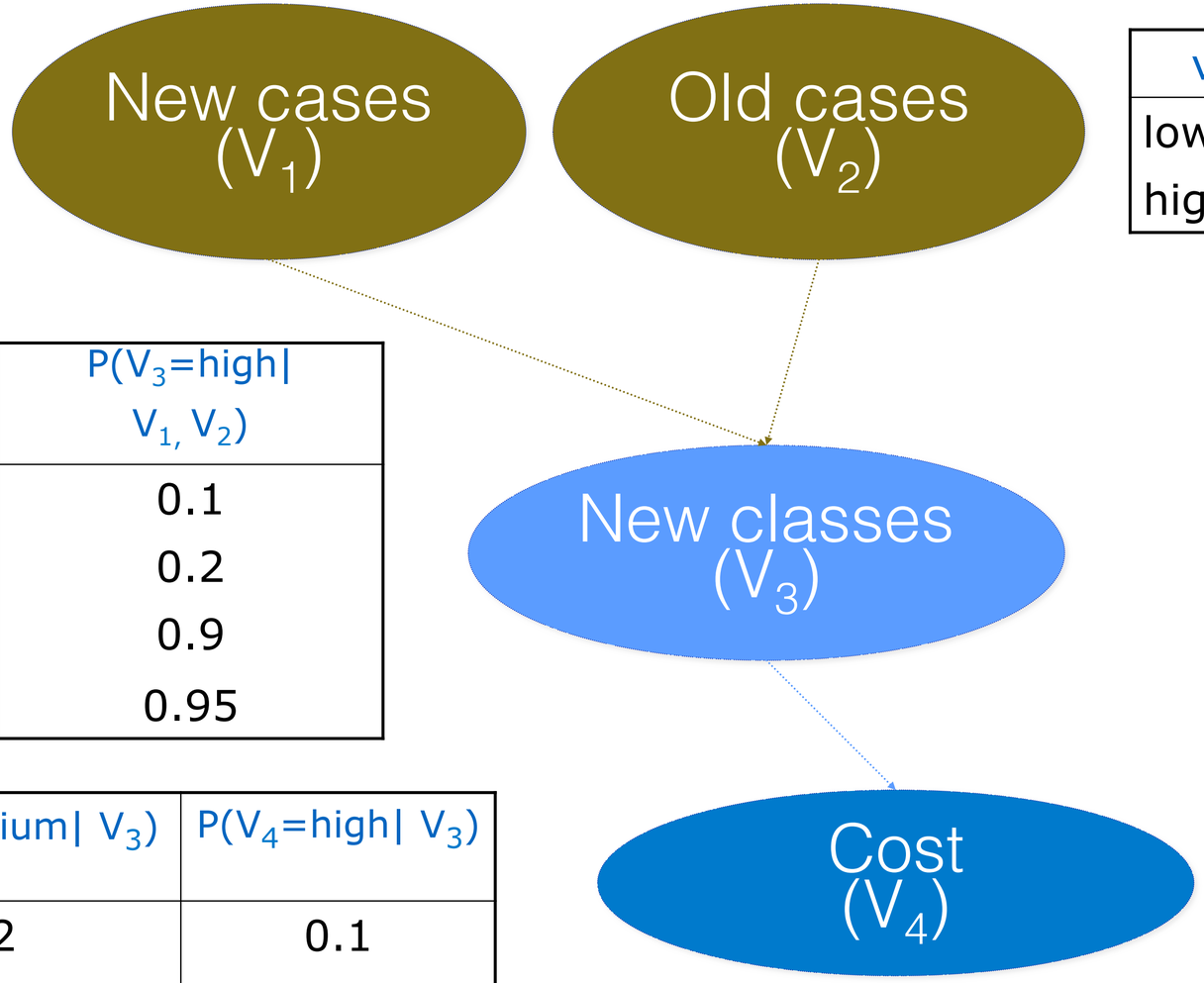


Bayesian networks

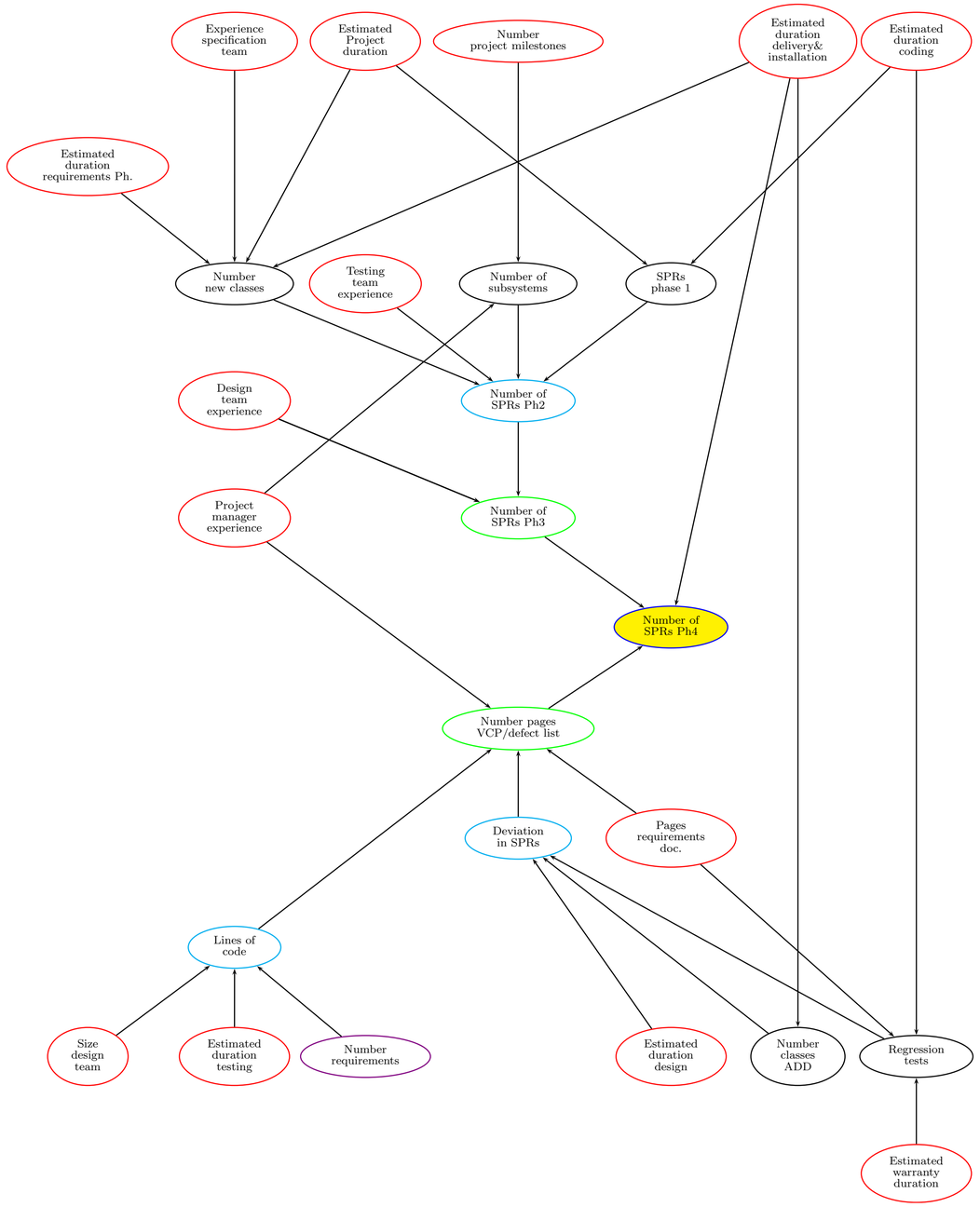
Value	$P(V_1=value)$
low	0.7
high	0.3



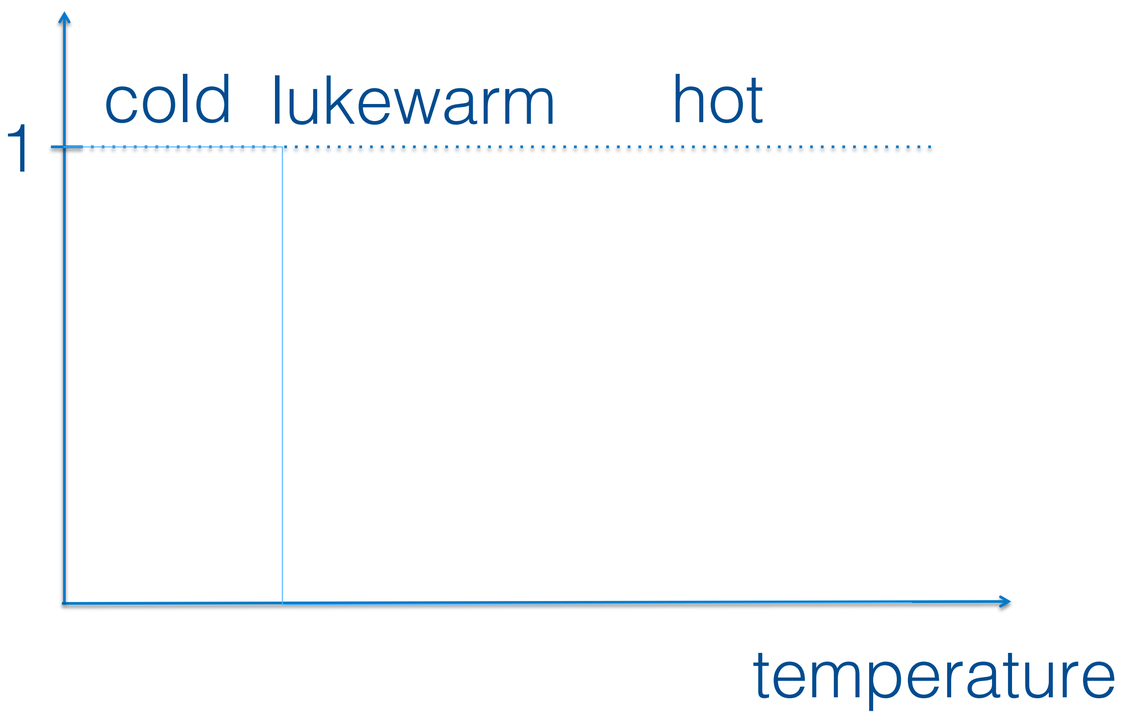
valor	$P(V_2=valor)$
low	0.3
high	0.7

V_1	V_2	$P(V_3=low \mid V_1, V_2)$	$P(V_3=high \mid V_1, V_2)$
low	low	0.9	0.1
low	high	0.8	0.2
high	low	0.1	0.9
high	high	0.05	0.95

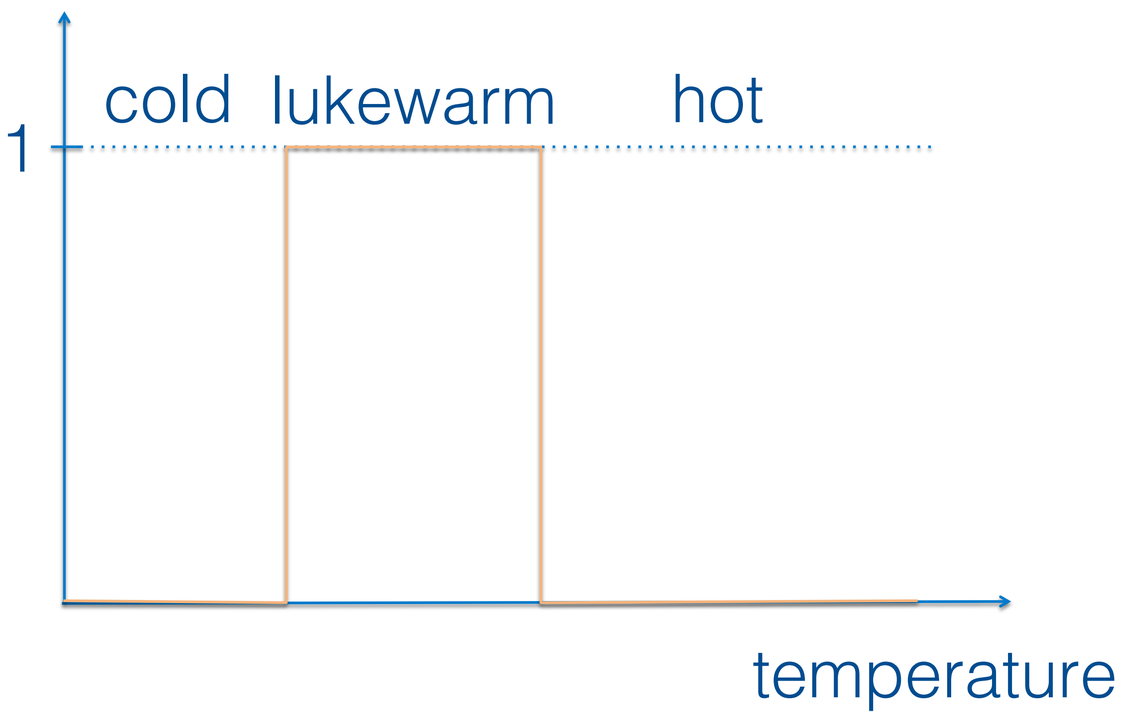
V_3	$P(V_4=low \mid V_3)$	$P(V_4=medium \mid V_3)$	$P(V_4=high \mid V_3)$
low	0.7	0.2	0.1
high	0.1	0.2	0.7


Experience specification team
Estimated Project duration
Number project milestones
Estimated duration delivery& installation
Estimated duration coding
Estimated duration requirements Ph.
Number new classes
Testing team experience
Number of subsystems
SPRs phase 1
Design team experience
Number of SPRs Ph2
Project manager experience
Number of SPRs Ph3
Number of SPRs Ph4
Number pages VCP/defect list
Deviation in SPRs
Pages requirements doc.
Lines of code
Size design team
Estimated duration testing
Number requirements
Estimated duration design
Number classes ADD
Regression tests
Estimated warranty duration

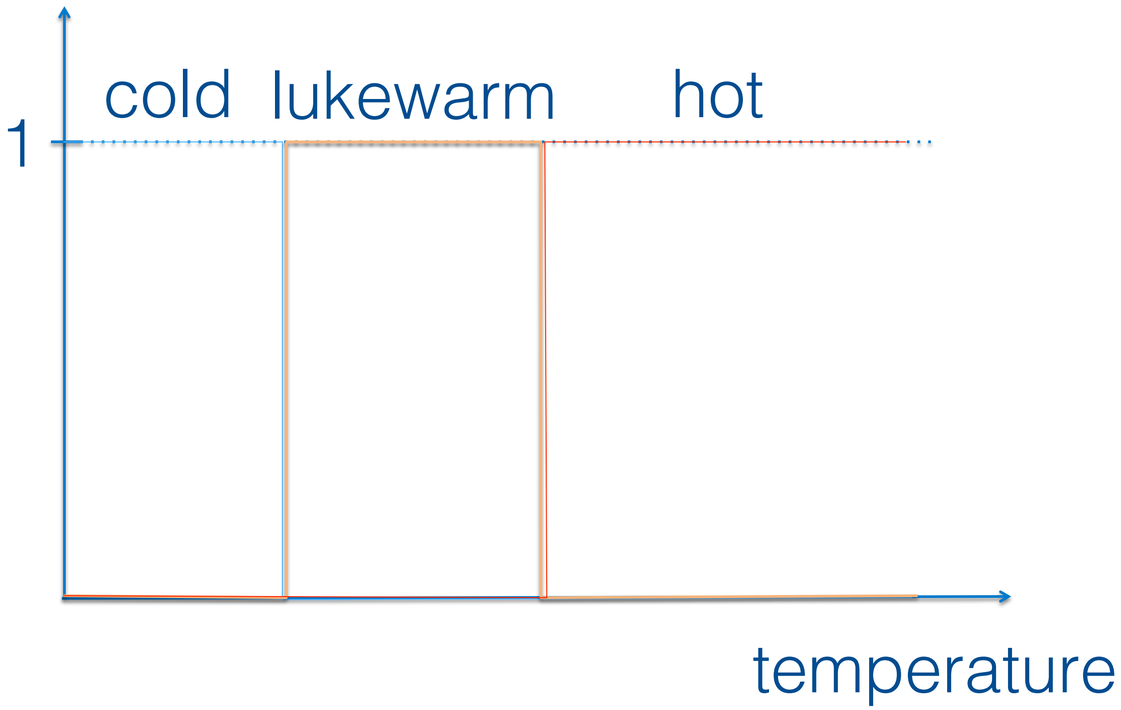
Classic logic

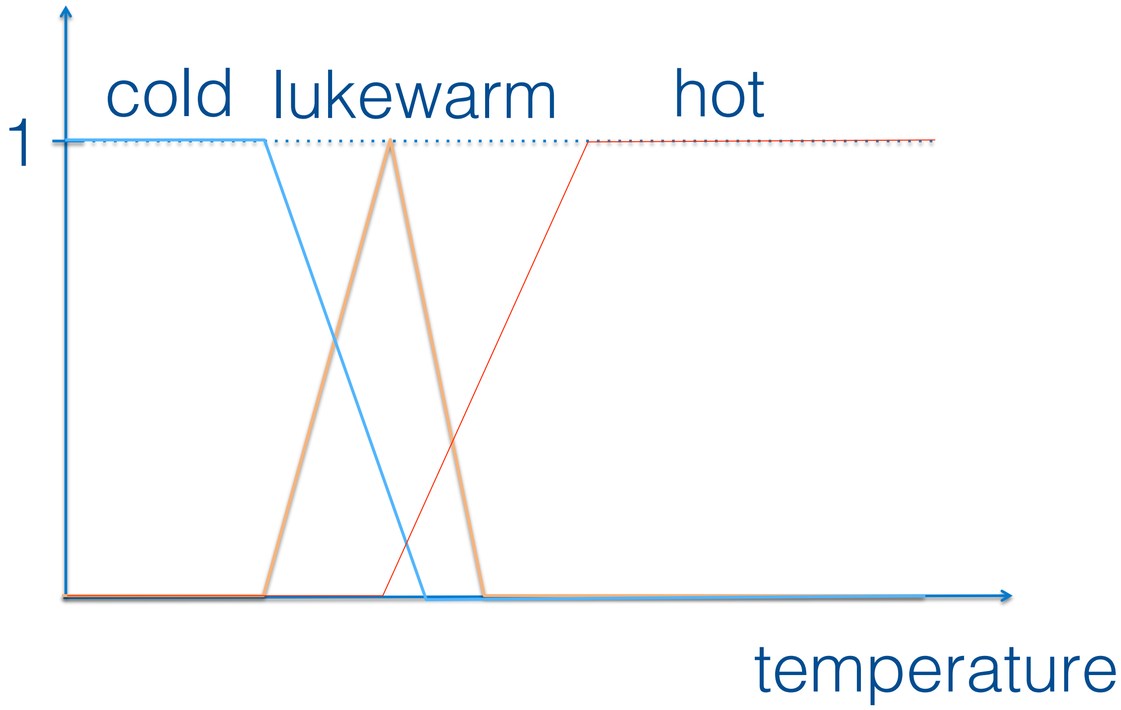


Classic logic

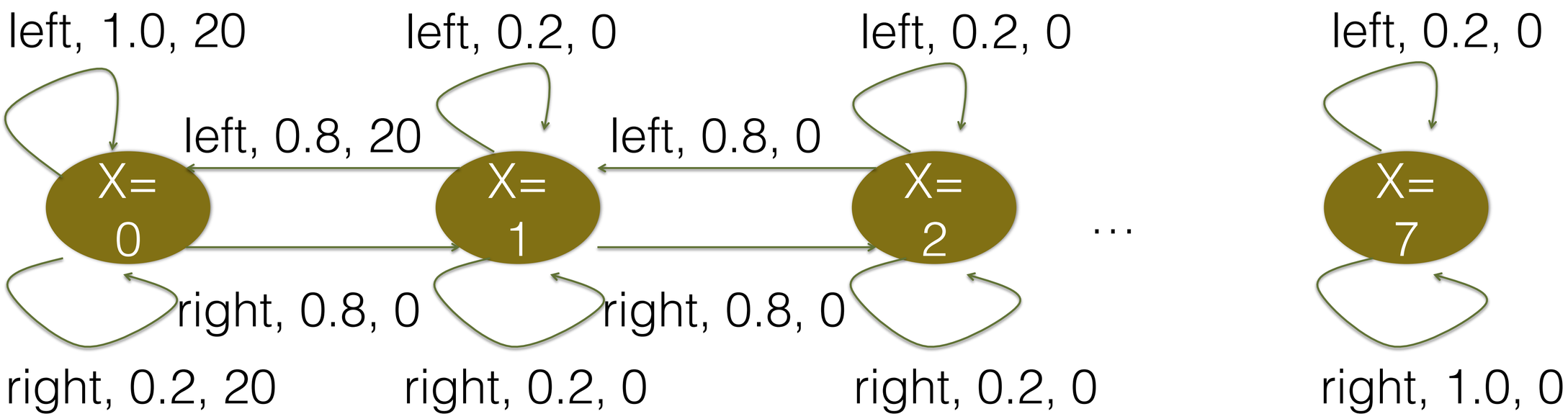


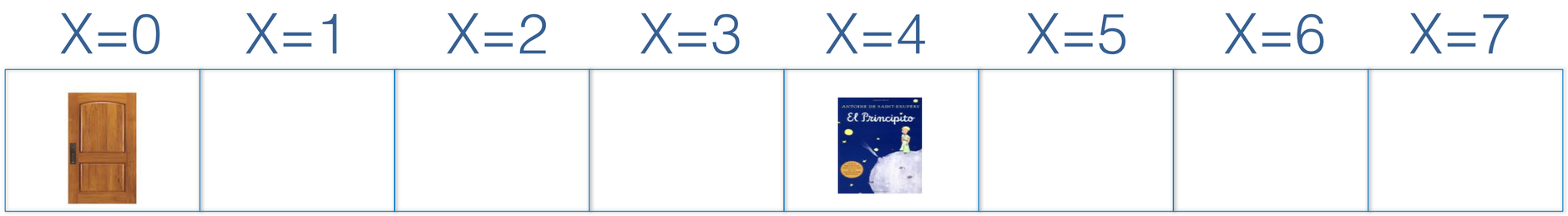
Fuzzy logic


cold
lukewarm
hot
1
temperature


cold
lukewarm
hot
1
temperature

Markov Decision Processes





Reasoning

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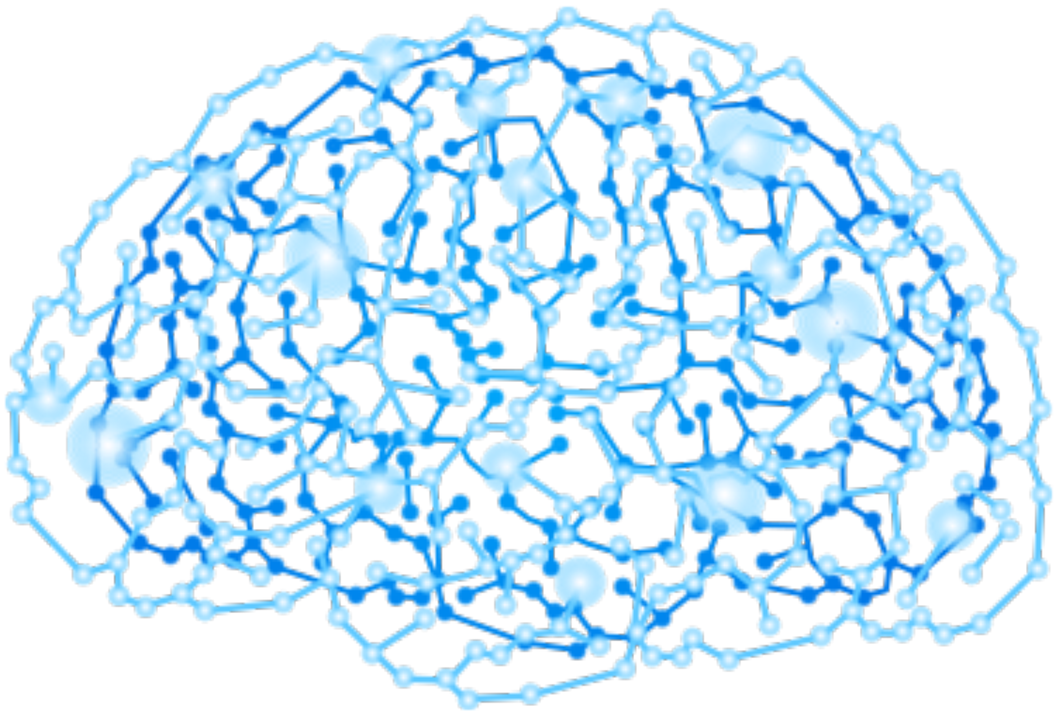
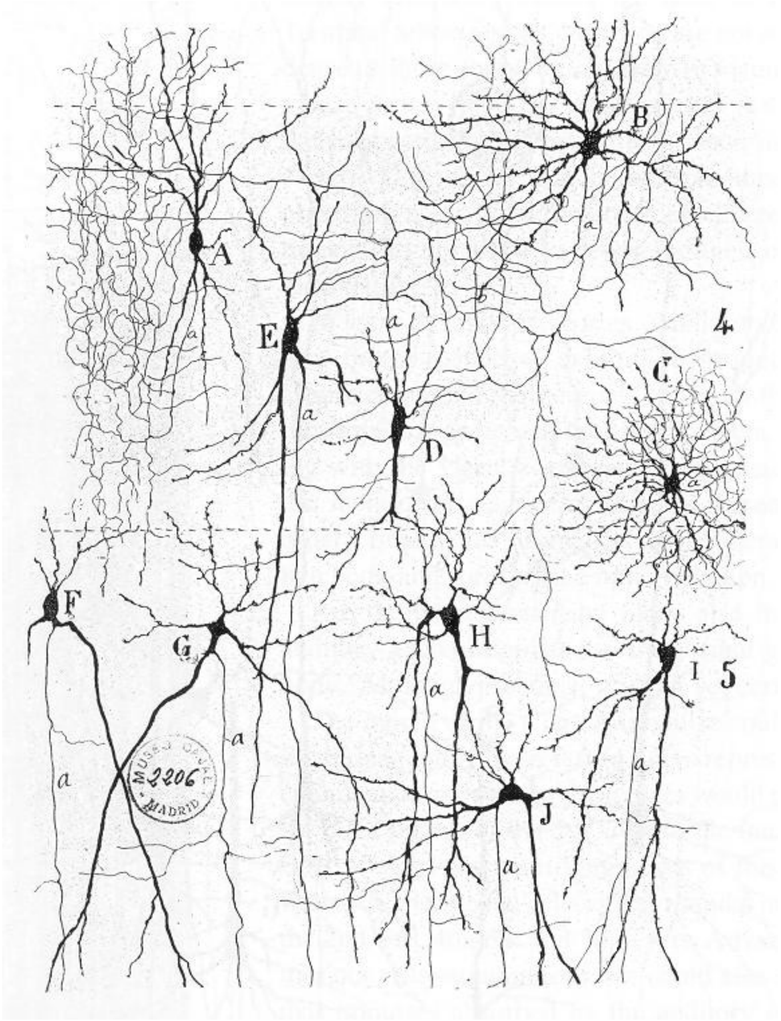
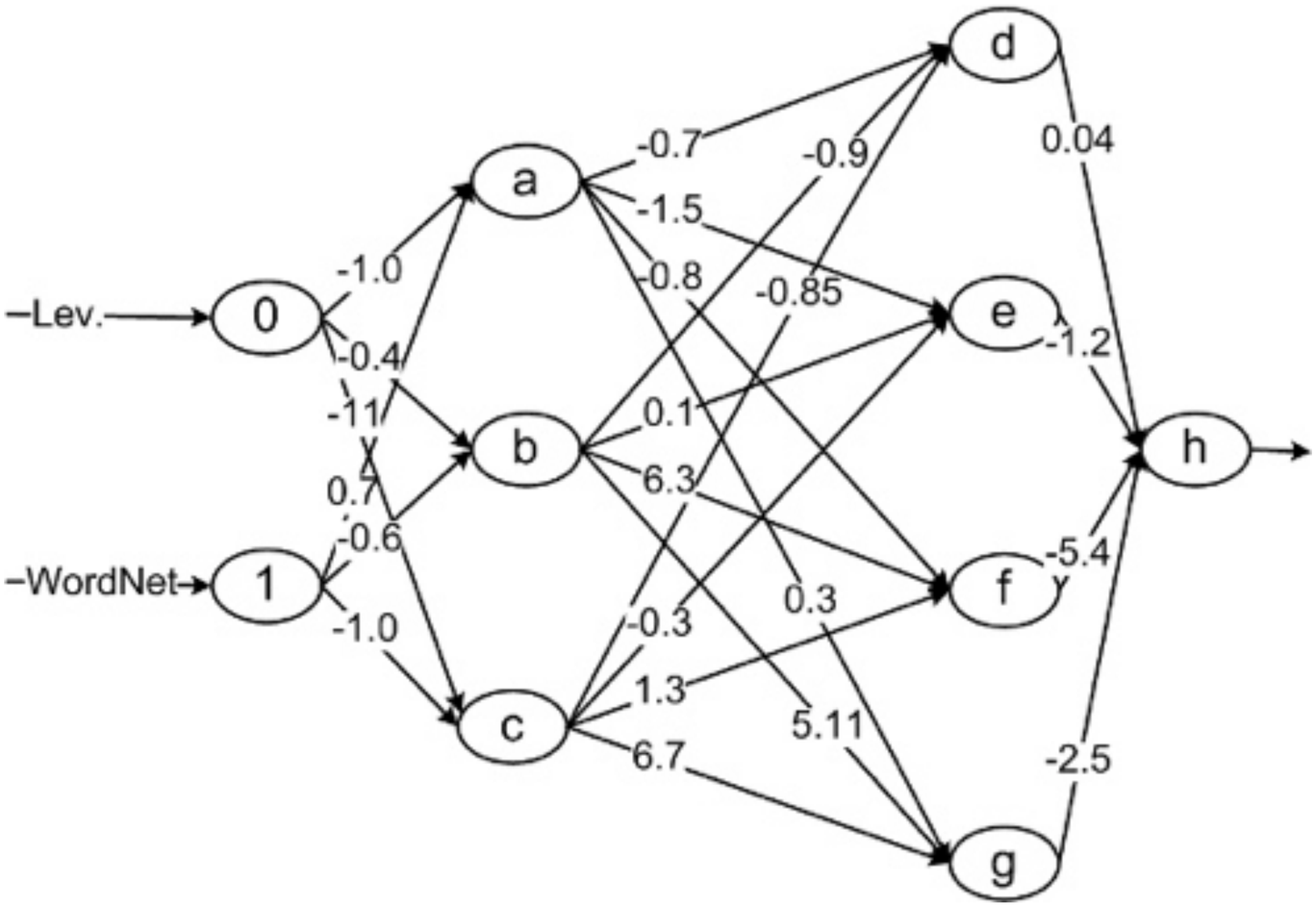


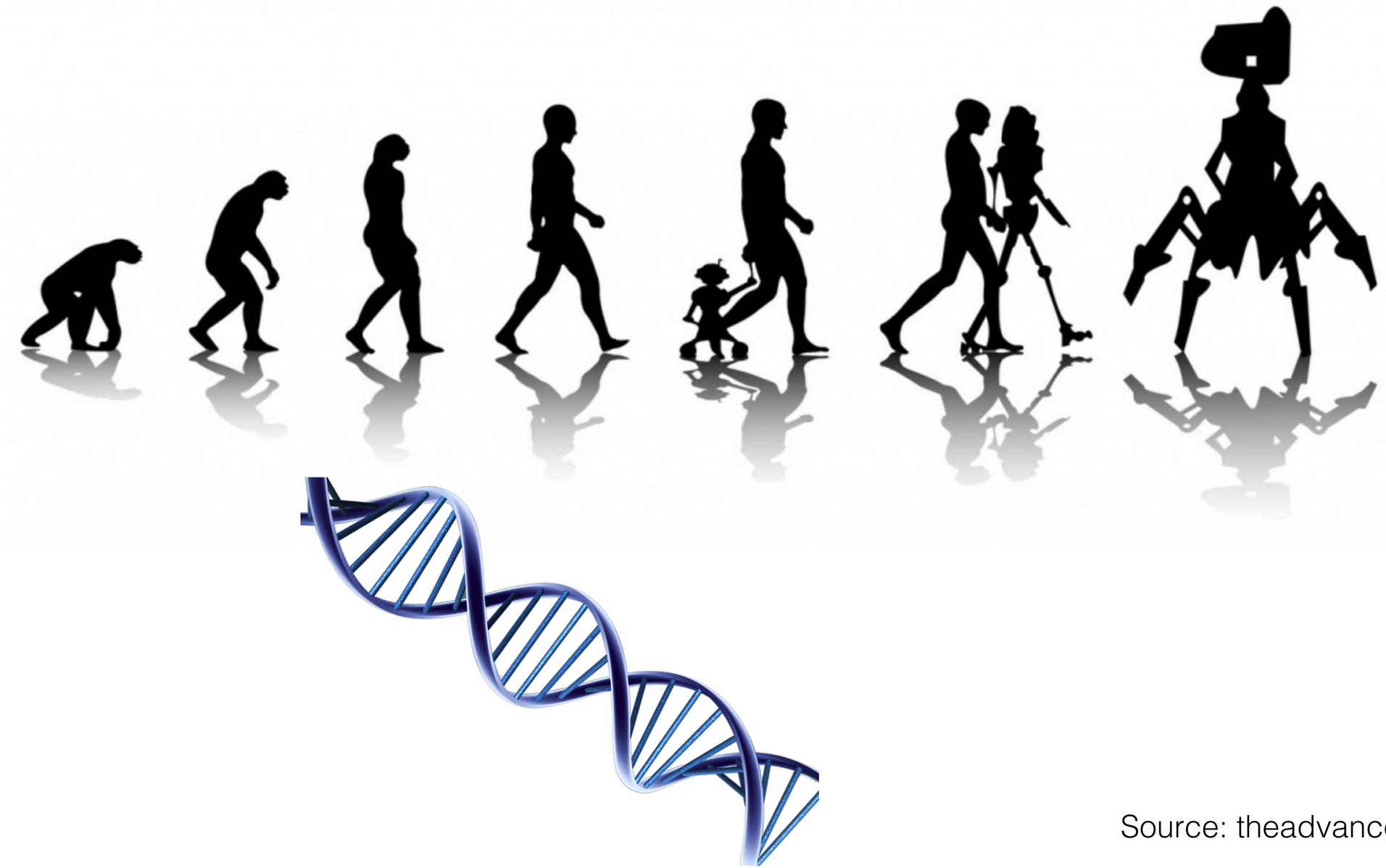
Neural networks





Source: Texture of the Nervous System of Man and the Vertebrates, Santiago Ramón y Cajal

Evolutionary computation



Source: theadvancedapes.com

Nature-based optimization

Reasoning

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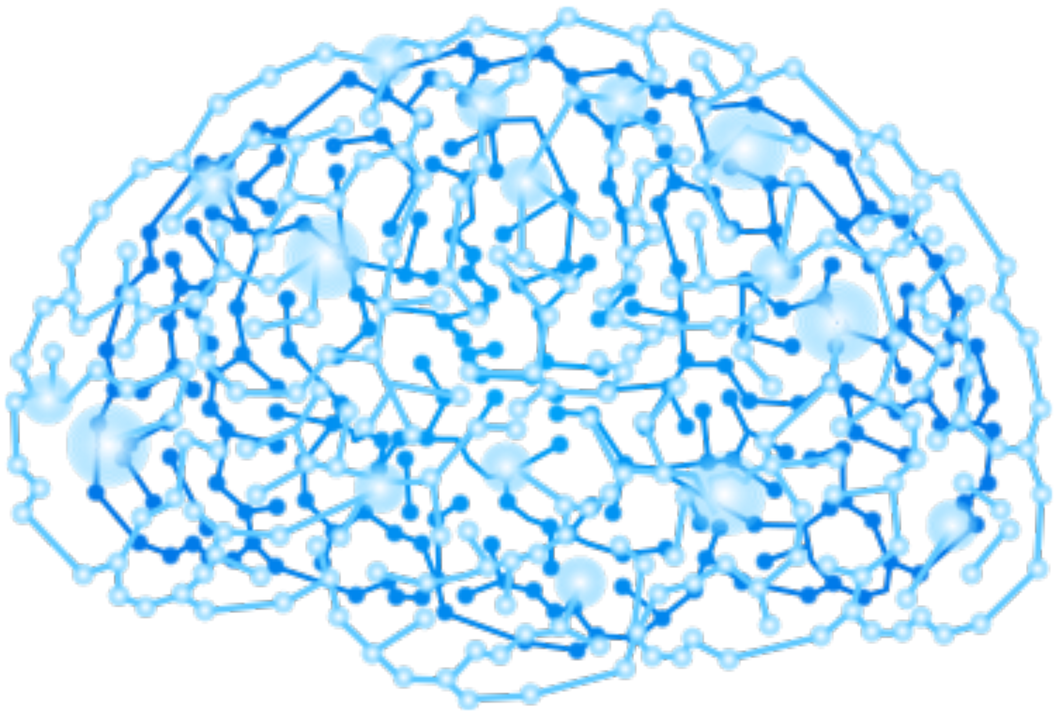
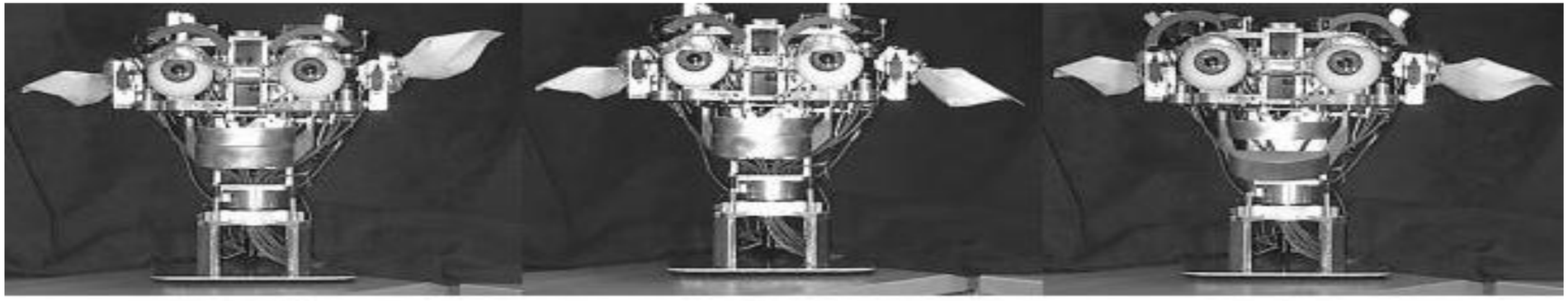
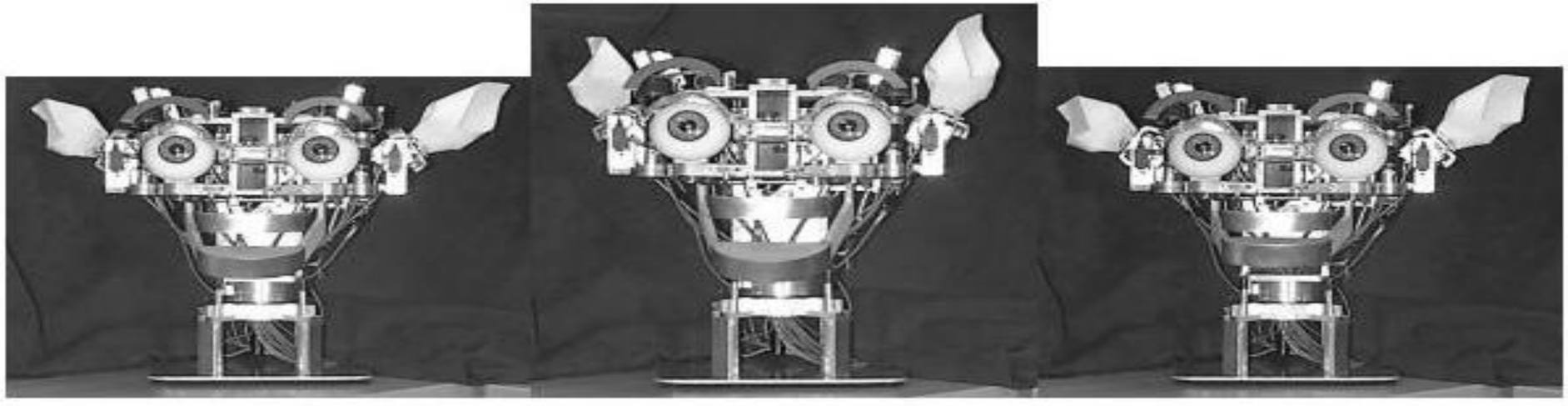
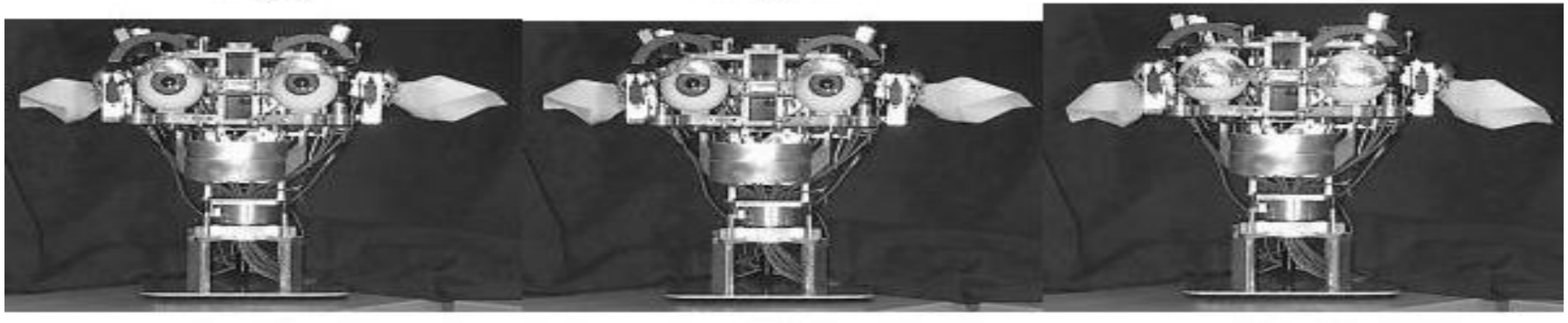




Disgust Angry Fear



Happy Surprise Interest



Sad Tired Sleep

Reasoning

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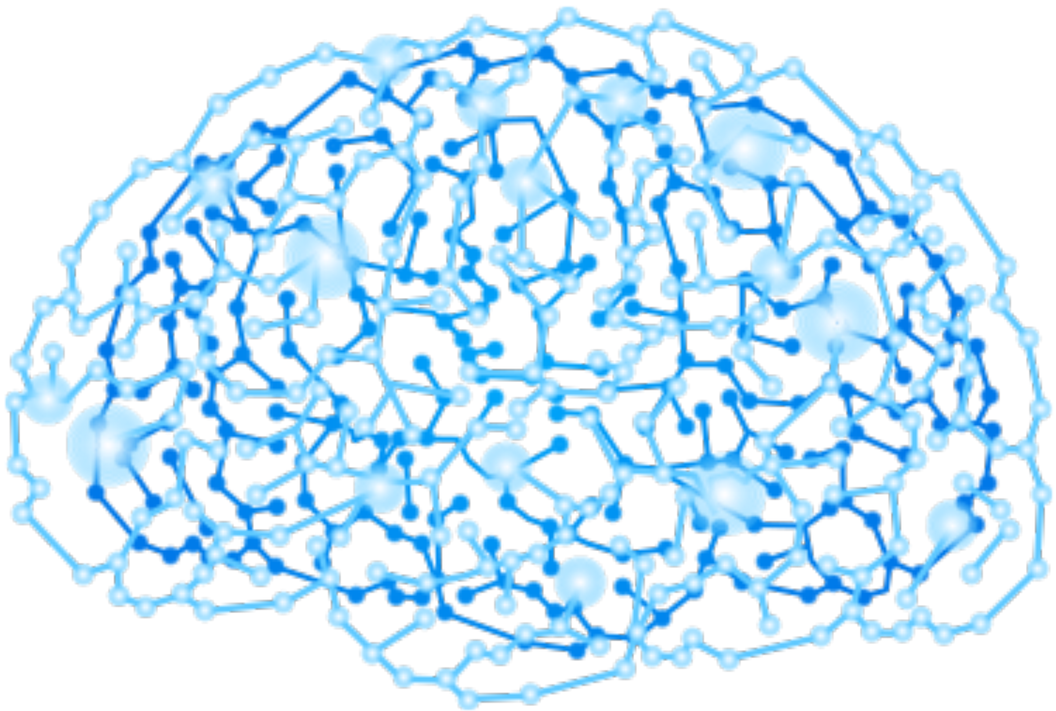


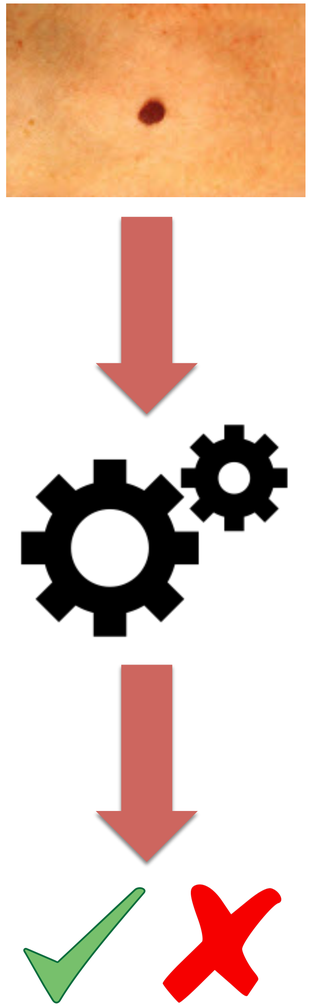
melomics

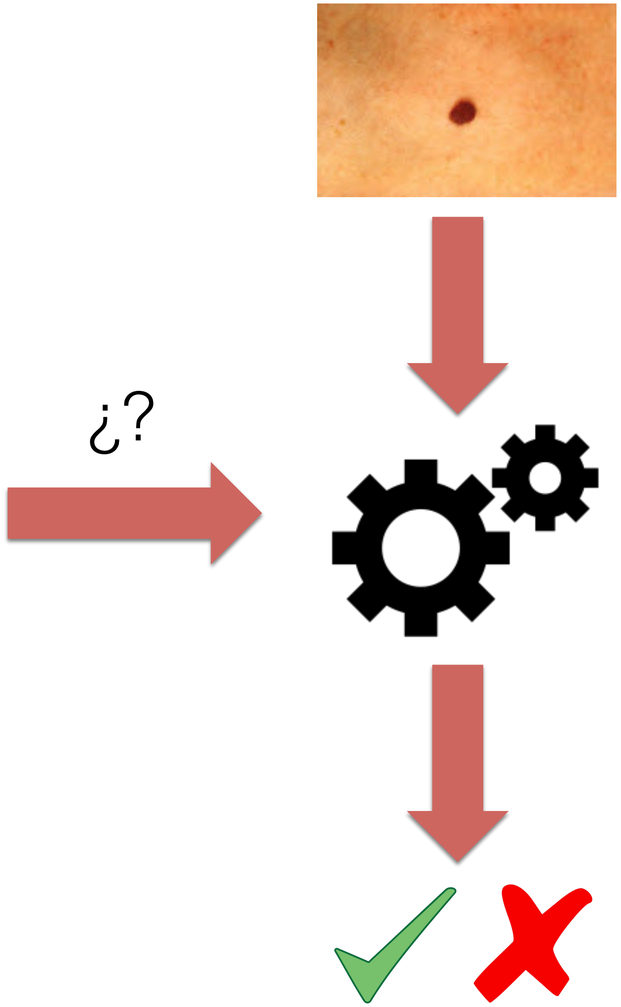
ai AUTOMATED INSIGHTS

NarrativeScience

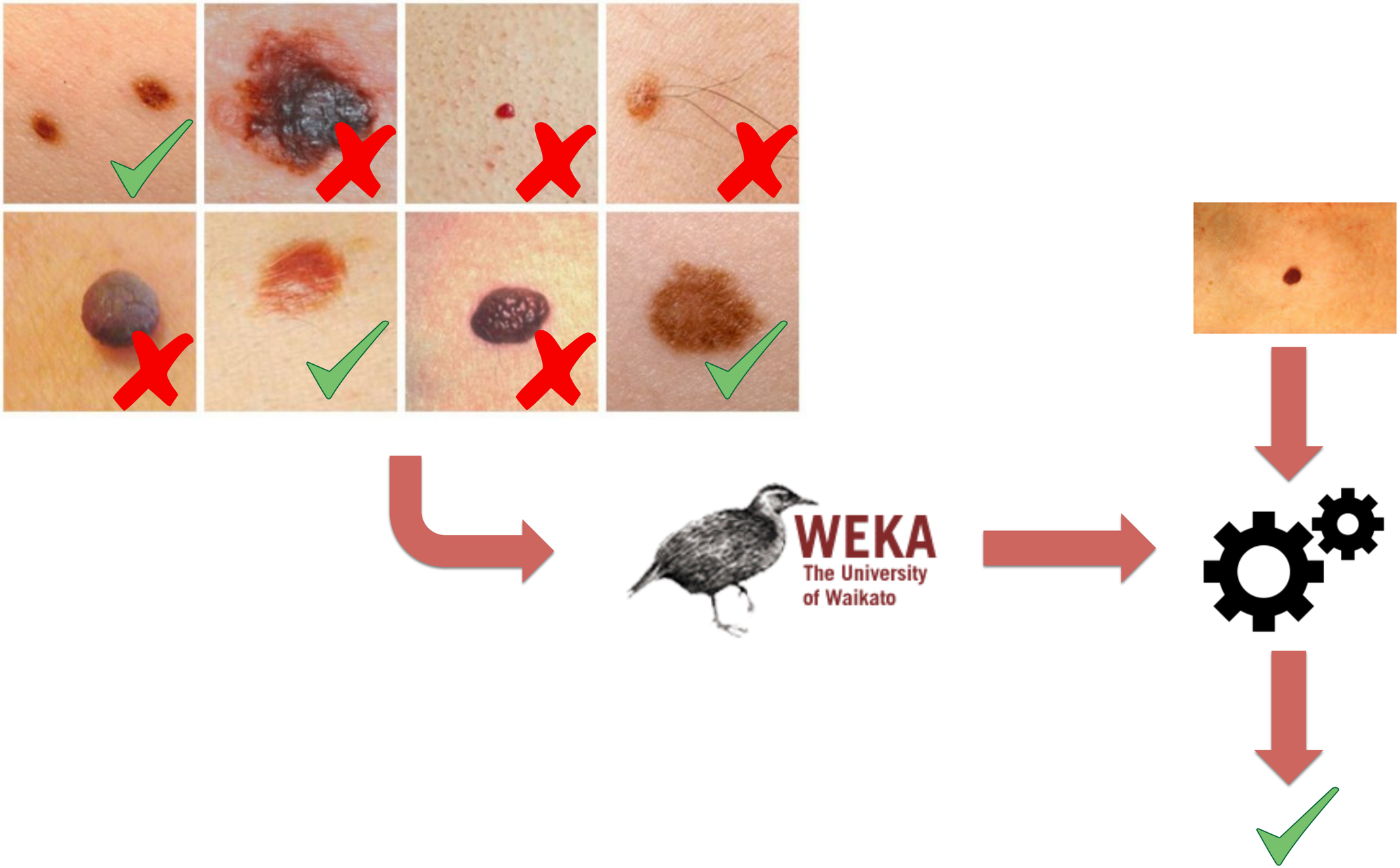
Outline

1. Introduction
2. Architecture of intelligent systems
   - Architecture
   - Inputs
   - Representation
   - Reasoning
   - Machine learning
   - Output
3. Conclusions



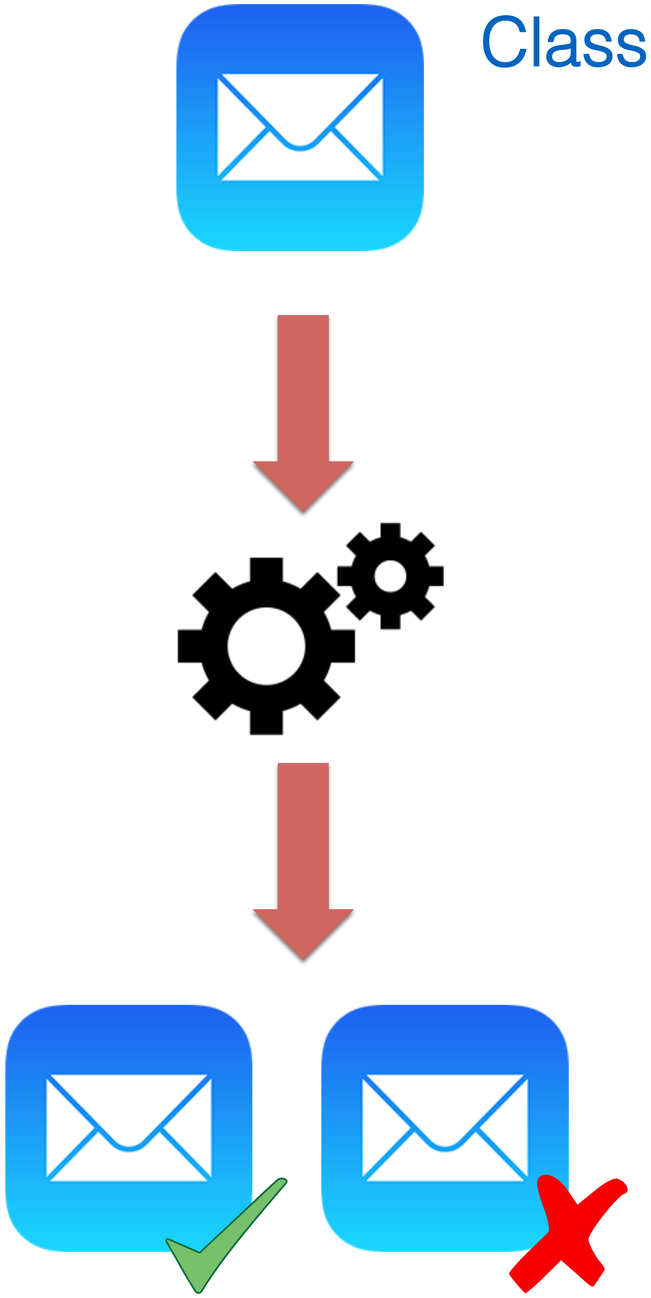


WEKA
The University of Waikato

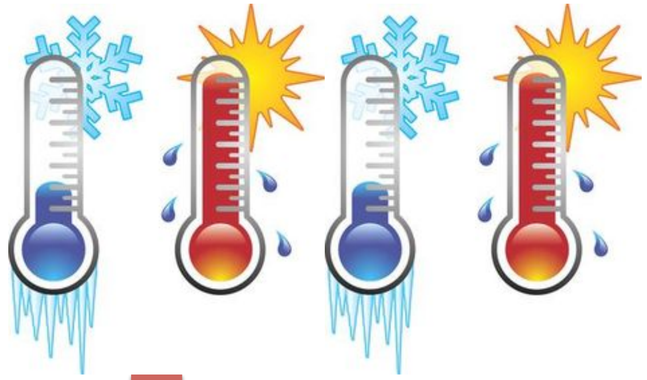

WEKA
The University
of Waikato

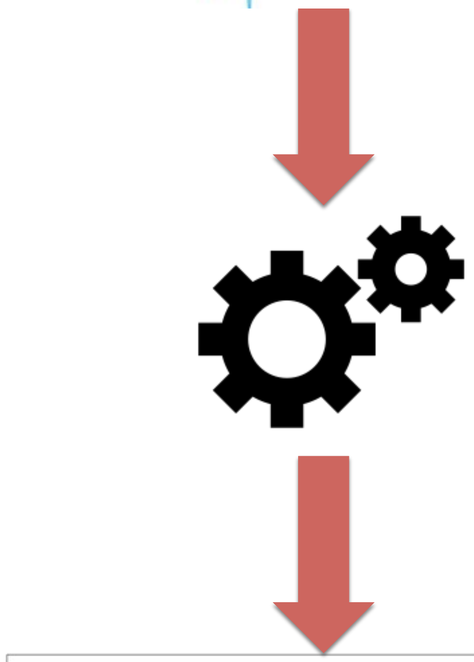
WEKA
The University of Waikato

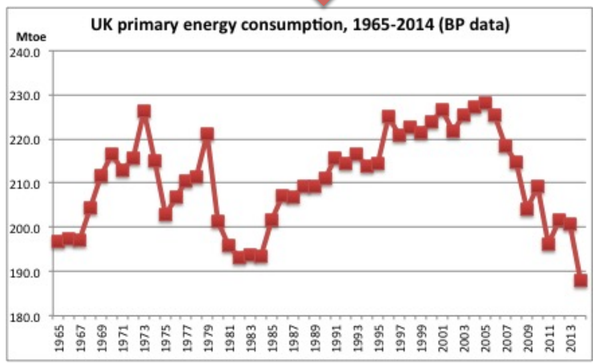
Classification



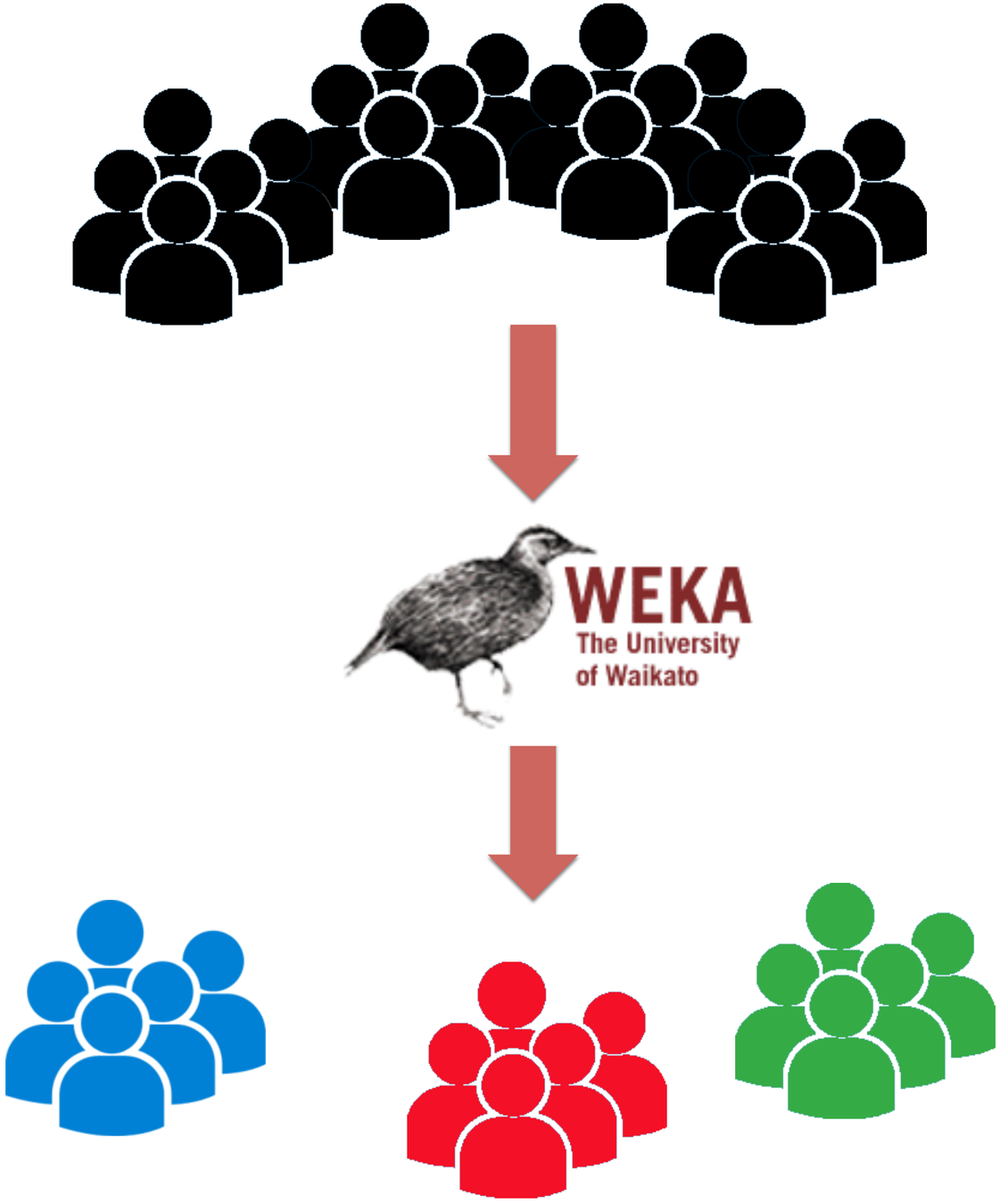
Regression







Clustering



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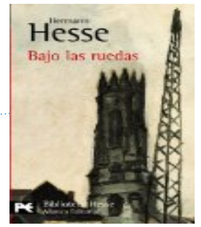

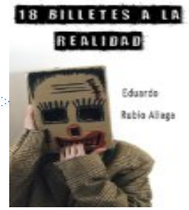

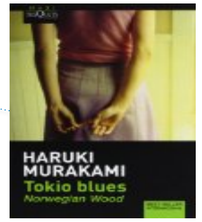

Outline

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DELL

Google
Say "Ok Google"
Google
Create
Play
Play Store

Google

Outline

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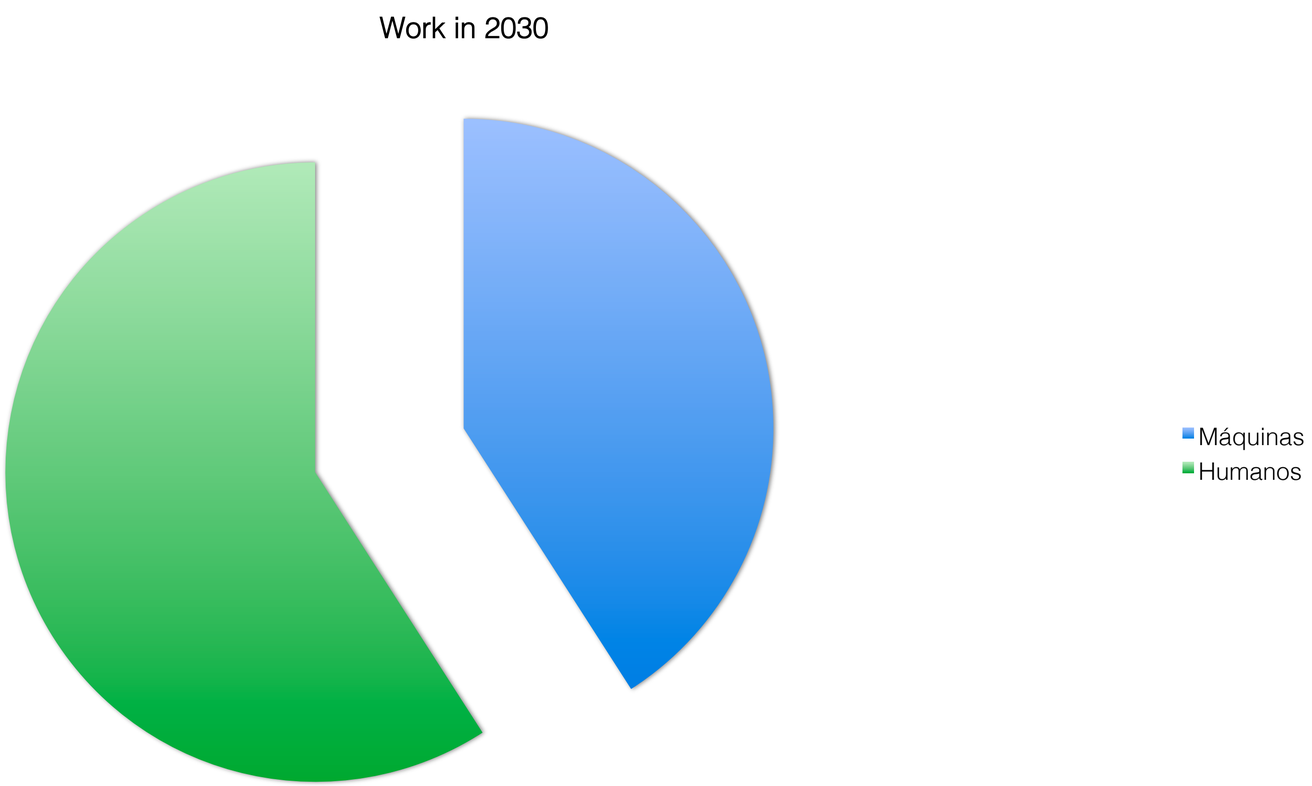
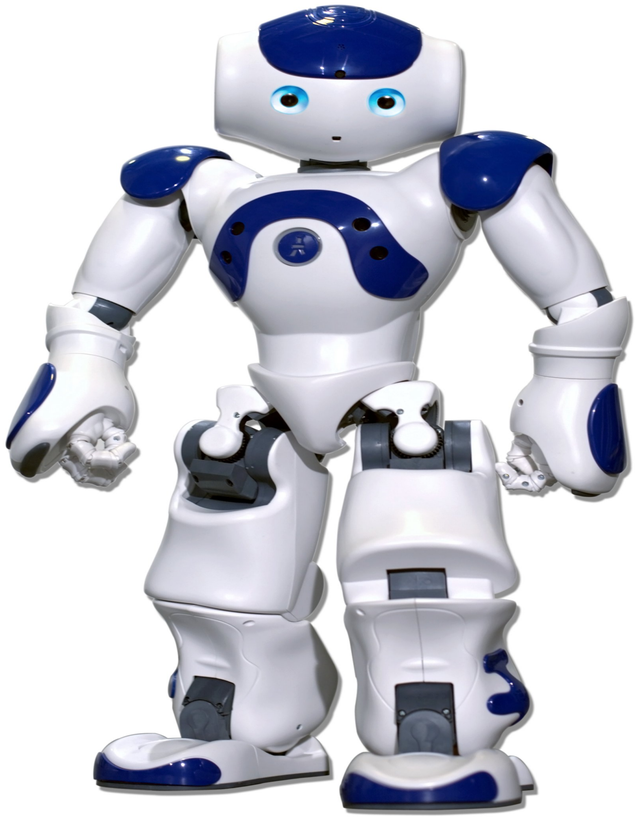
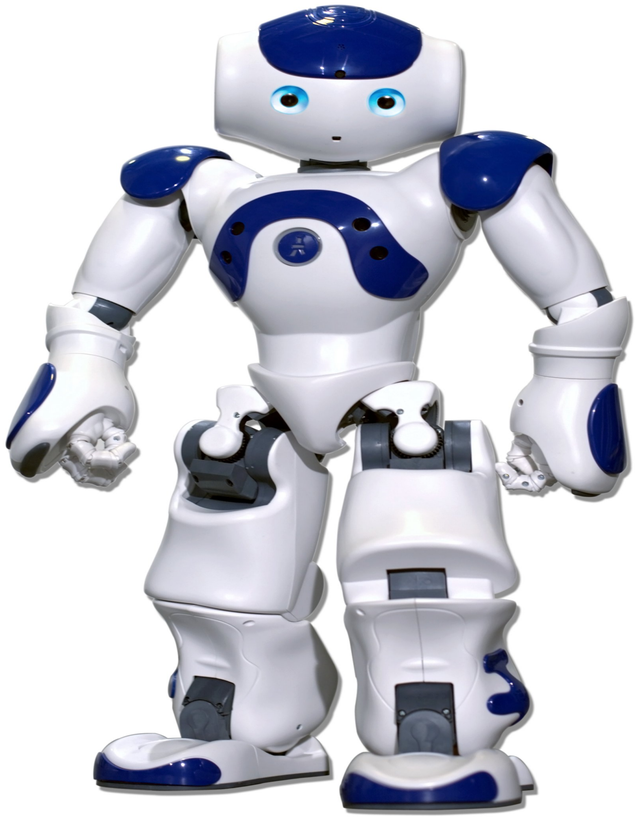
2. Architecture of intelligent systems
3. Conclusions

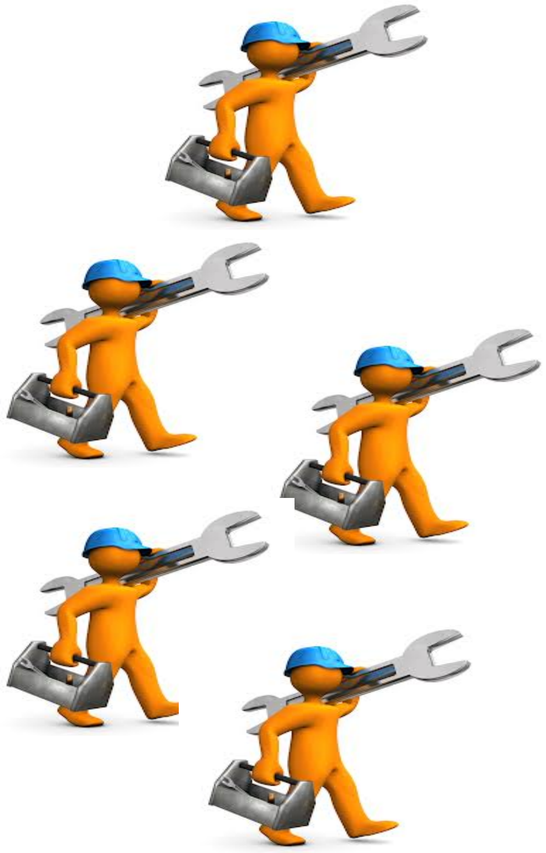

Work in 2030
Máquinas
Humanos

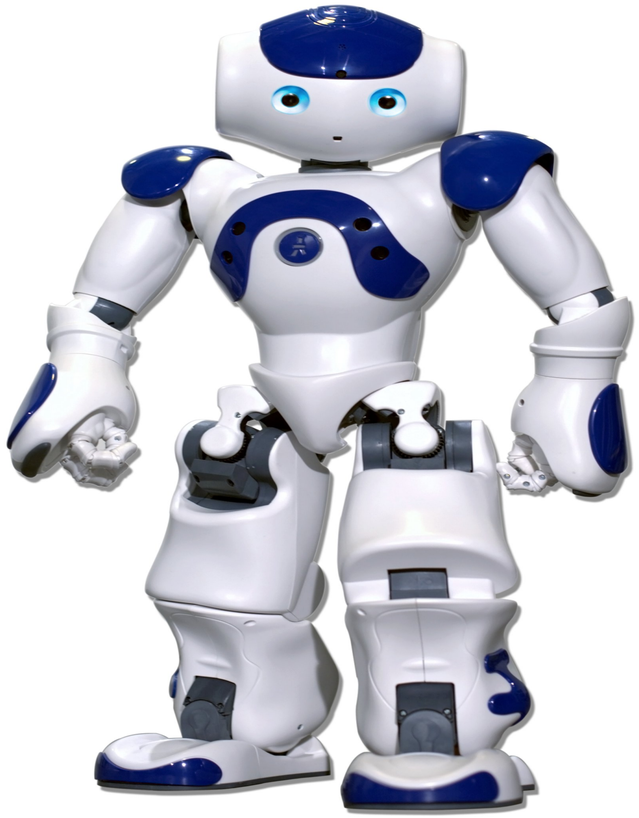
Bankomat
AT&T

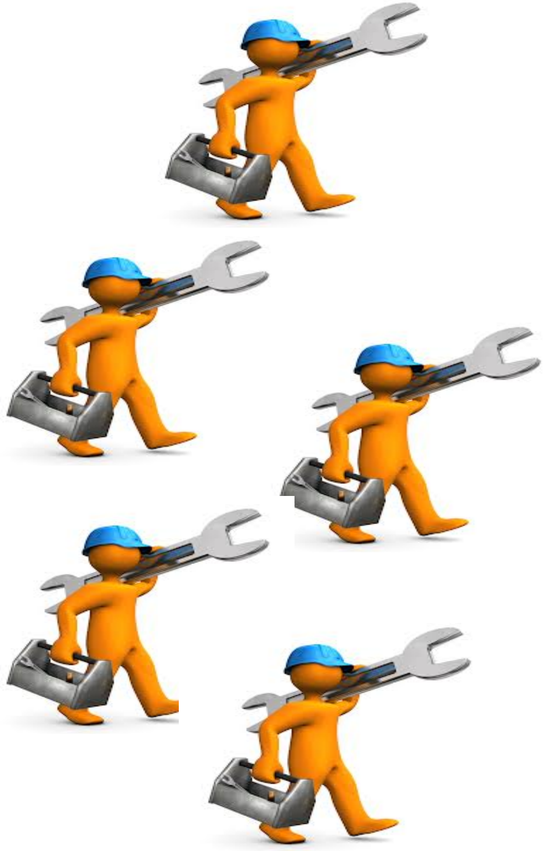
ROYAL
ROYAL

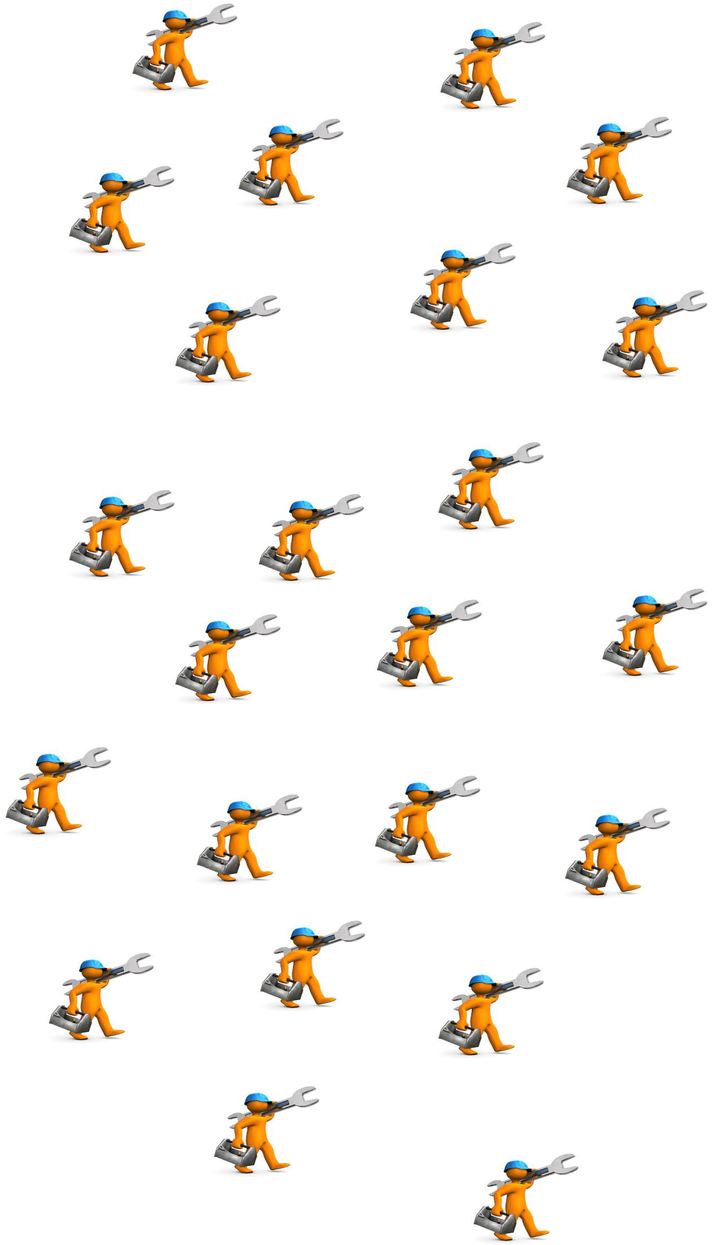












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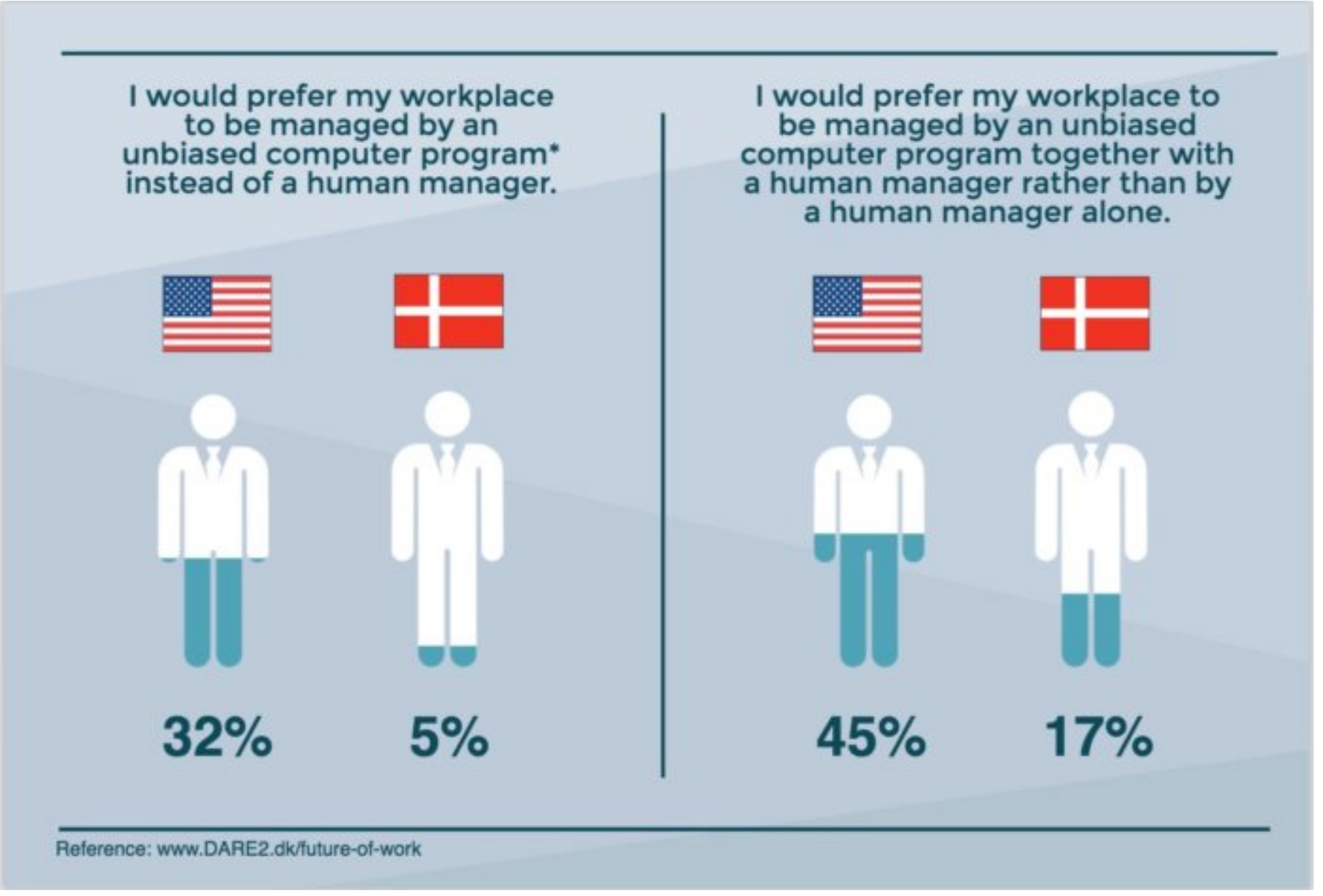
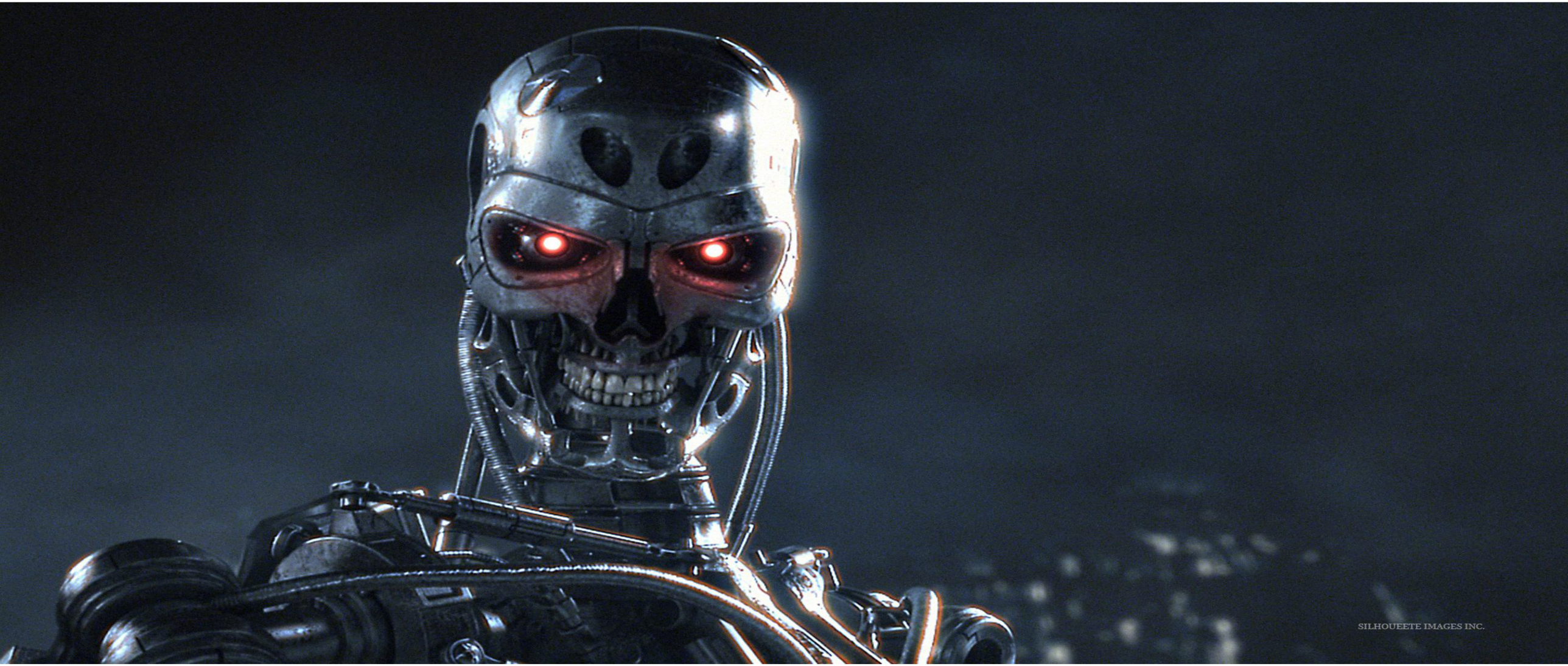

I would prefer my workplace to be managed by an unbiased computer program* instead of a human manager.
32%
5%
I would prefer my workplace to be managed by an unbiased computer program together with a human manager rather than by a human manager alone.
45%
17%
Reference: www.DARE2.dk/future-of-work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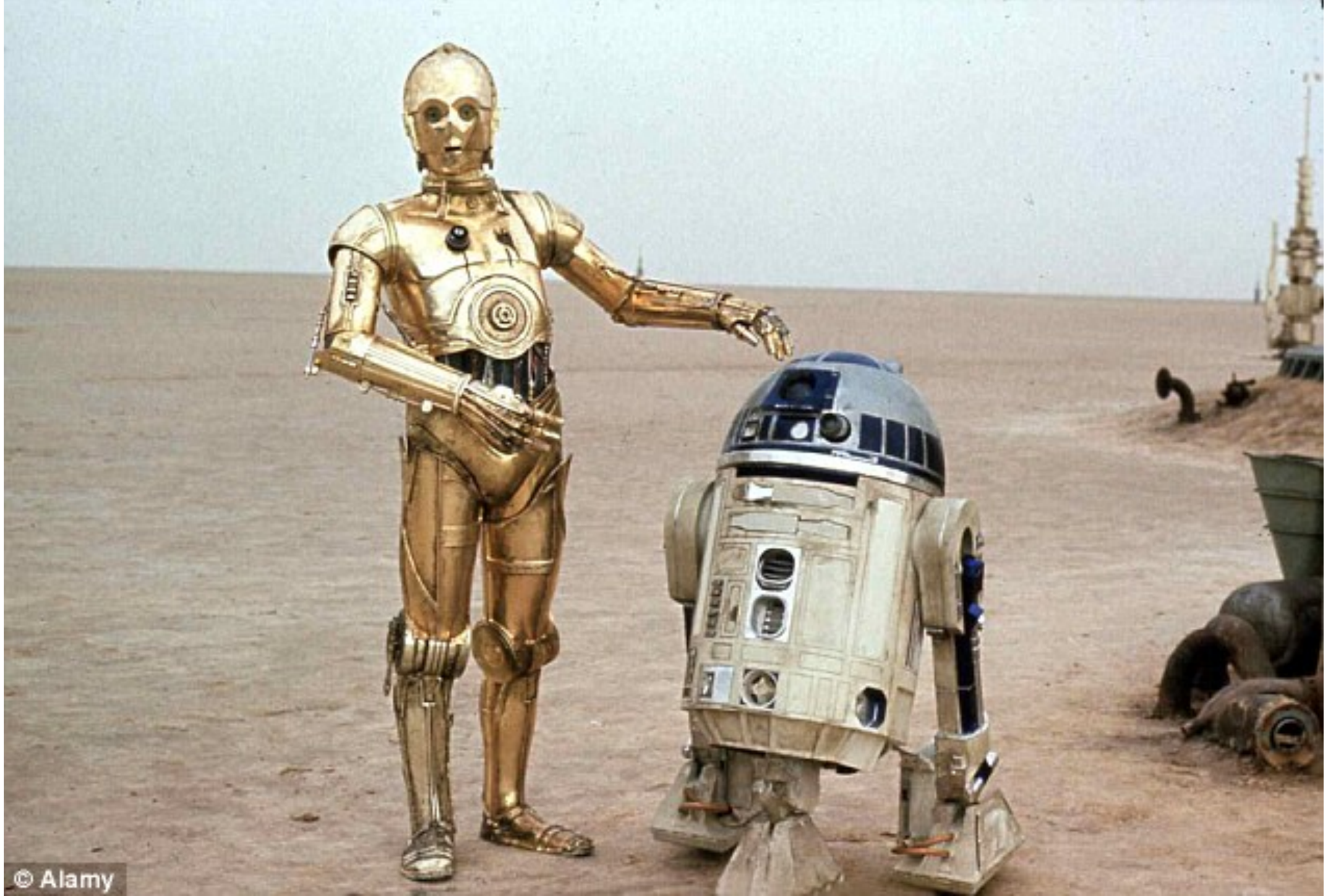
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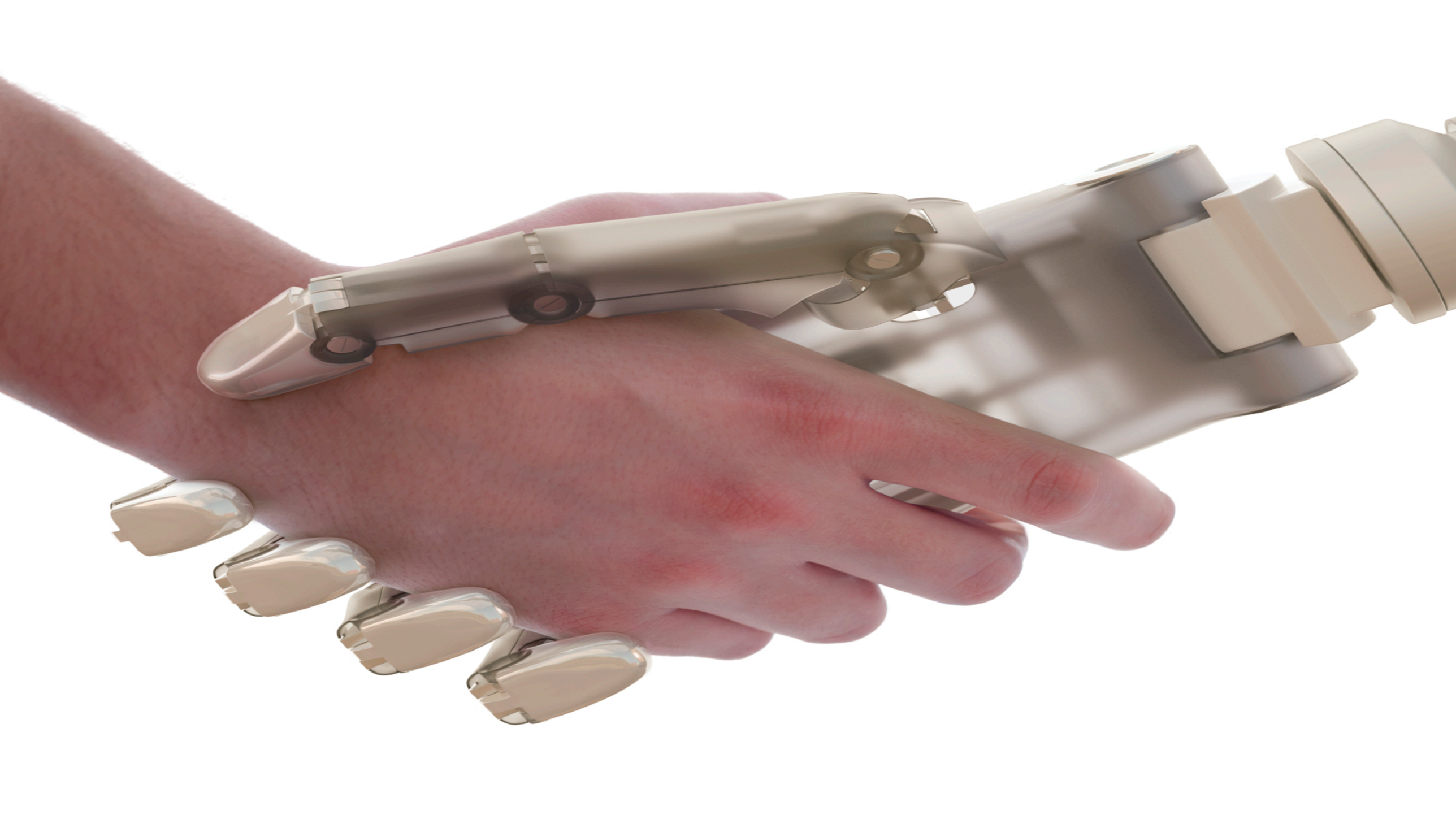

References

Sam S. Adams, Guruduth Banavar, and Murray Campbell.
I-athlon: Toward a multidimensional turing test.
AI Magazine, Spring:78–84, 2016.