

# Introducción á Intelixencia Artificial e perspectiva histórica

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Senén Barro Ameneiro, CiTIUS

@SenenBarro

# Que é a IA?

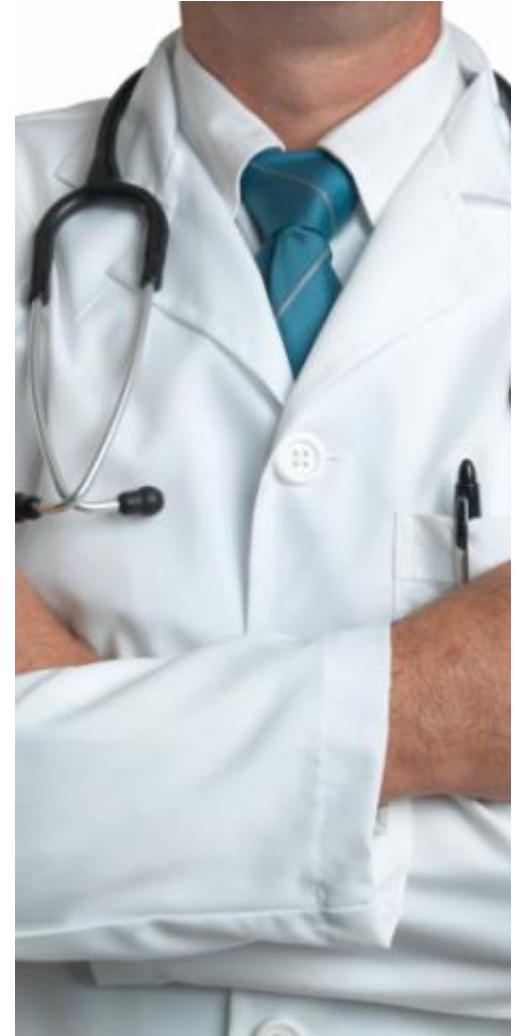
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*“Artificial intelligence (AI) refers to systems that display intelligent behaviour by **analysing their environment** and **taking actions** – with some degree of **autonomy** – to achieve specific **goals**.*

*AI-based systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications).”*

“A definition of AI: Main capabilities and scientific disciplines”,  
High-Level Expert Group on Artificial Intelligence, European Commission, April 2019

# Introducción á IA



¿Teñen intelixencia?

# Que é a IA?

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*Un Sistema terá un certo grao de intelixencia cando teña unha **autonomía** significativa e unha riqueza de comportamento en dominios ou contornas dinámicas e complexas, sexa capaz de **aprender** da súa experiencia e/ou presente un alto grao de competencia en áreas especializadas do **coñecemento** humano*

1958 New York  
Times...

## NEW NAVY DEVICE LEARNS BY DOING

Psychologist Shows Embryo  
of Computer Designed to  
Read and Grow Wiser

WASHINGTON, July. 7 (UPI)  
—The Navy revealed the embryo of an electronic computer today that it expects will be able to walk, talk, see, write, reproduce itself and be conscious of its existence.

The embryo—the Weather Bureau's \$2,000,000 "704" computer—learned to differentiate between right and left after fifty attempts in the Navy's demonstration for newsmen.

The service said it would use this principle to build the first of its Perceptron thinking machines that will be able to read and write. It is expected to be finished in about a year at a cost of \$100,000.

Dr. Frank Rosenblatt, designer of the Perceptron, conducted the demonstration. He said the machine would be the first device to think as the human brain. As do human beings,

Perceptron will make mistakes at first, but will grow wiser as it gains experience, he said.

Dr. Rosenblatt, a research psychologist at the Cornell Aeronautical Laboratory, Buffalo, said Perceptrons might be fired to the planets as mechanical space explorers.

### Without Human Controls

The Navy said the perceptron would be the first non-living mechanism "capable of receiving, recognizing and identifying its surroundings without any human training or control."

The "brain" is designed to remember images and information it has perceived itself. Ordinary computers remember only what is fed into them on punch cards or magnetic tape.

Later Perceptrons will be able to recognize people and call out their names and instantly translate speech in one language to speech or writing in another language, it was predicted.

Mr. Rosenblatt said in principle it would be possible to build brains that could reproduce themselves on an assembly line and which would be conscious of their existence.

In today's demonstration, the "704" was fed two cards, one with squares marked on the left side and the other with squares on the right side.

### Learns by Doing

In the first fifty trials, the machine made no distinction between them. It then started registering a "Q" for the left squares and "O" for the right squares.

Dr. Rosenblatt said he could explain why the machine learned only in highly technical terms. But he said the computer had undergone a "self-induced change in the wiring diagram."

The first Perceptron will have about 1,000 electronic "association cells" receiving electrical impulses from an eye-like scanning device with 400 photo-cells. The human brain has 10,000,000,000 responsive cells, including 100,000,000 connections with the eyes.

Walk?

Talk?

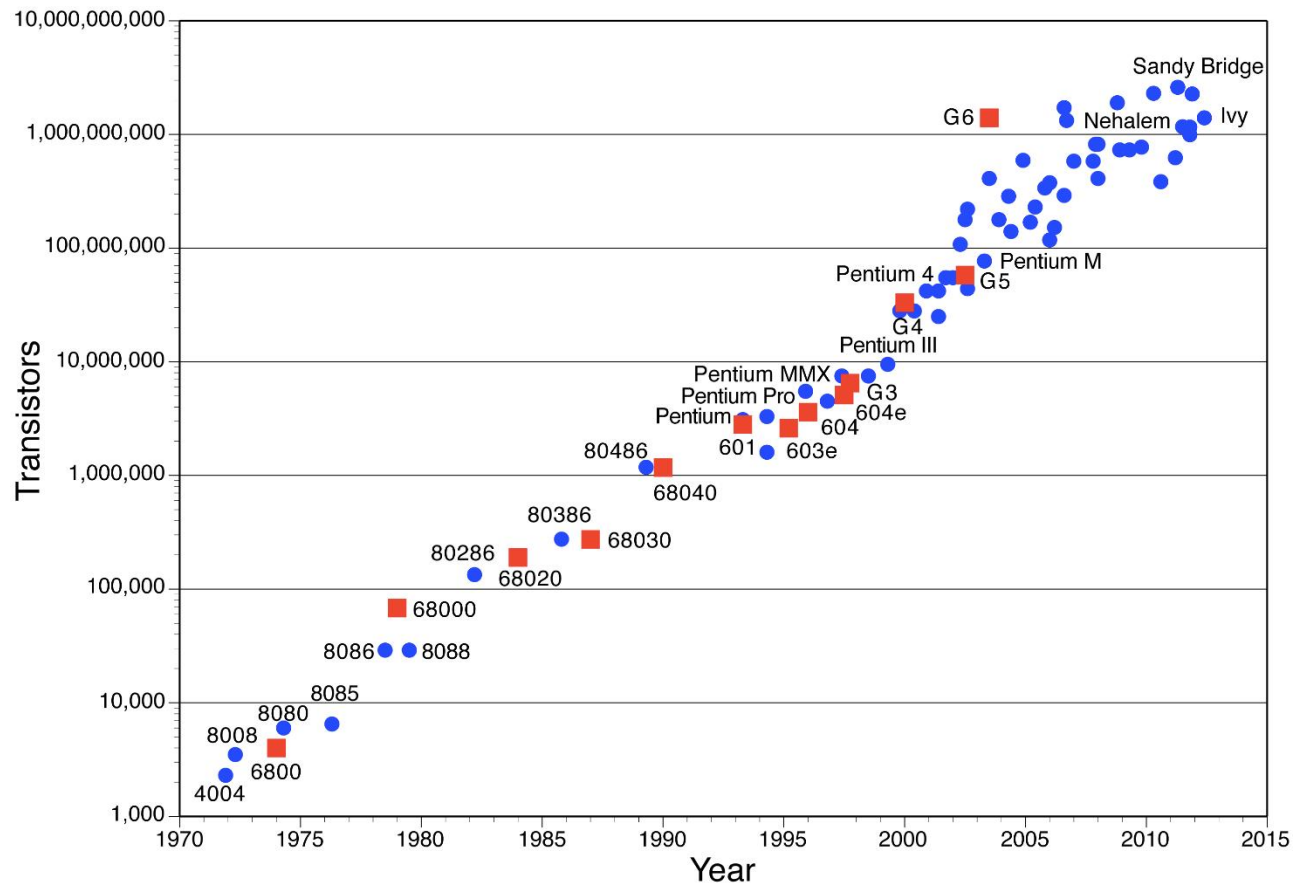
See?

Write?

Reproduce itself?

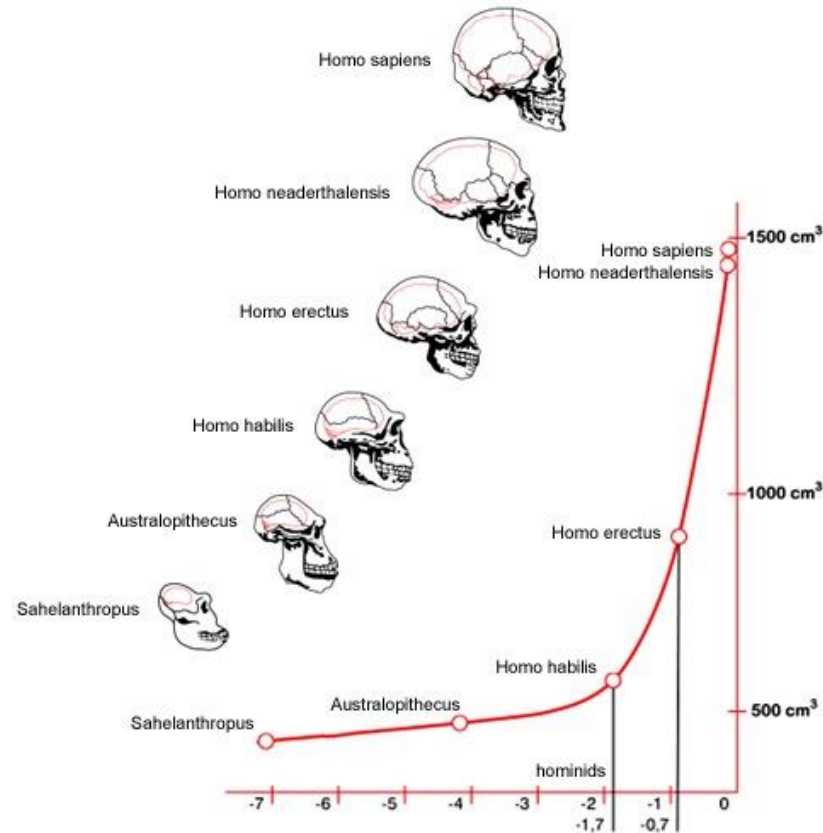
Be conscious of  
its existence?

# Introducción á IA



Evolución dos microprocesadores

# Introducción á IA



Evolución do tamaño do cerebro en homínidos



# Introducción á IA

Elemento de comparación	Cerebro	Computador
Tamaño	Aproximadamente 1.500 cc	720 m <sup>2</sup> de superficie ocupada e máis de 100 toneladas de peso (2)
Consumo de enerxía	20 watts (1)	17,6 MW -24 MW se se inclúe a unidade de refrixeración- (2)
Capacidade de almacenamento / memoria	3.500 terabytes (1)	1 petabyte de memoria asociada aos procesadores e 12,4 petabytes de capacidade de almacenamento total (2)
Capacidade de procesamento	2.200 teraflops (1)	33,86 petaflops (2)
Aprendizaxe	Enorme capacidade de aprendizaxe	Aprendizaxe en máquina implementadas vía software
Evolución	Poucos cambios nos últimos 100.000 anos	Moi rápida, sobre todo en potencia de cálculo e capacidade de almacenamento
Cálculos matemáticos	Moi lento	Moi rápido
Problemas lóxicos – formalizables alorítmicamente-	Moi lento	Moi rápido
Percepción e acción sobre a contorna	Moi rápido	Moi lento
Razoamento de sentido común	Moi rápido	Moi lento

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Comparación *wetware* vs hardware



# Introducción á IA

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IA	Como persoas	Racionalmente
<b>Pensamento</b>	Modelado cognitivo	Leis do pensamento lógico
<b>Comportamento</b>	Test de Turing	Axentes racionais

The diagram includes two horizontal arrows pointing from 'Modelado cognitivo' to 'Leis do pensamento lógico' and from 'Test de Turing' to 'Axentes racionais'. Additionally, a diagonal arrow points from 'Leis do pensamento lógico' down to 'Axentes racionais'.

Distintos enfoques da IA

# Introducción á IA

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- Alan Turing publicou en 1950 na revista *Mind*: “Computing Machinery and Intelligence”, que comeza así: “I propose to consider the question, **Can machines think?**”



# Introducción á IA

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Test de Turing

# Introducción á IA

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Máquina enigma

# Introducción á IA



Período	Descripción
1940 - 1955	Primeiros pasos prometedores
1956 - 1973	Arranque moi optimista
1974 - 1980	Declive –primeiro “inverno”-
1981 - 1987	Recuperación
1988 - 1993	Estancamento –segundo “inverno”-
1994 - 2010	Relanzamento
2010 -	Ambición e realismo

?

Períodos na evolución da IA





Dartmouth Summer  
Research Project on AI, 1956

Unde venis, AI?



Photographer: Joe Mehling

Figure 1. Trenchard More, John McCarthy, Marvin Minsky, Oliver Selfridge, and Ray Solomonoff.

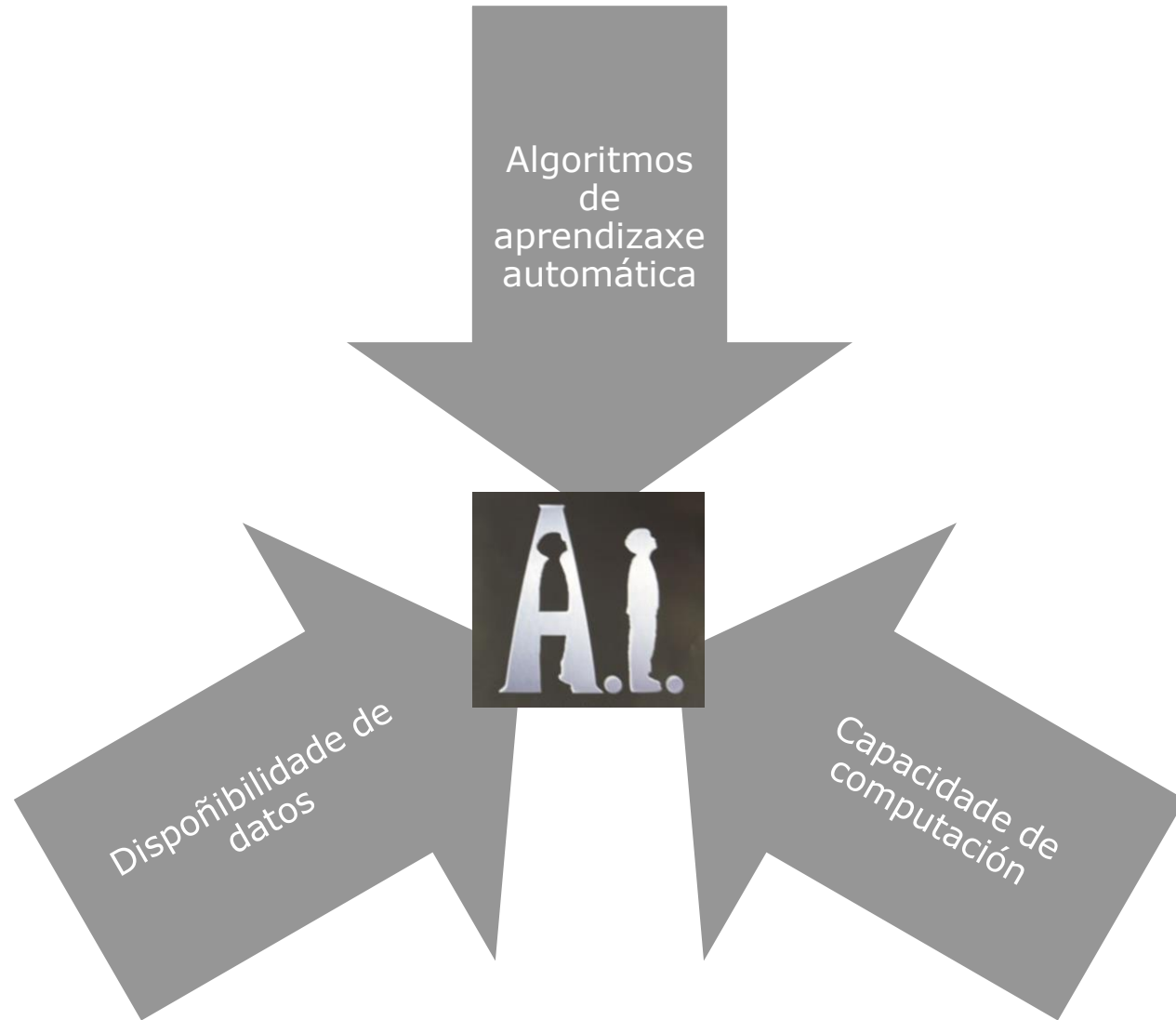
# Quo vadis, AI?

The Dartmouth College Artificial Intelligence Conference: The Next Fifty Years; James Moor, AI Magazine Volume 27 Number 4 (2006)

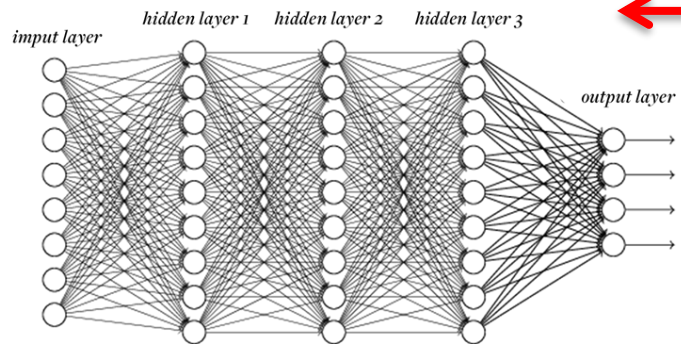
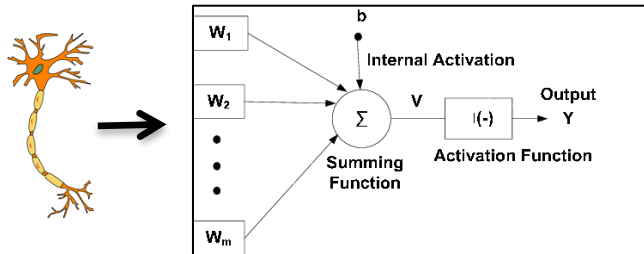


# Uvi es, AI?

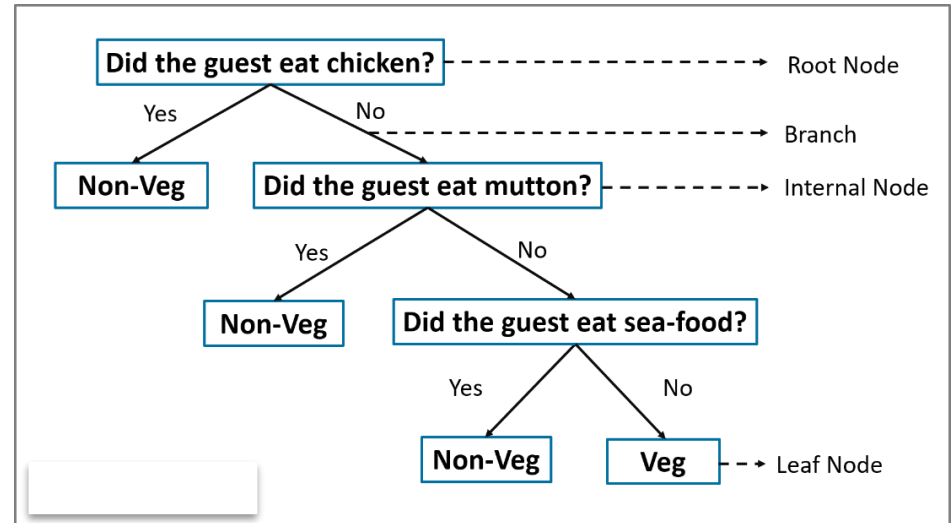
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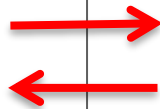
# Diferentes aproximacións no tempo



Subsimbólica



Simbólica



# Orientación científico-tecnolóxica

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IA de propósito específico



IA baseada en aprendizaxe  
[profunda] automática



Non temos un modelo de  
intelixencia nin de aprendizaxe  
xeral



# Introducción á IA

Deep Blue vs Kasparov





# Introducción á IA

AlphaGo vs Lee Sedol



Boston Dynamics

# Introducción á IA

Boston Dynamics

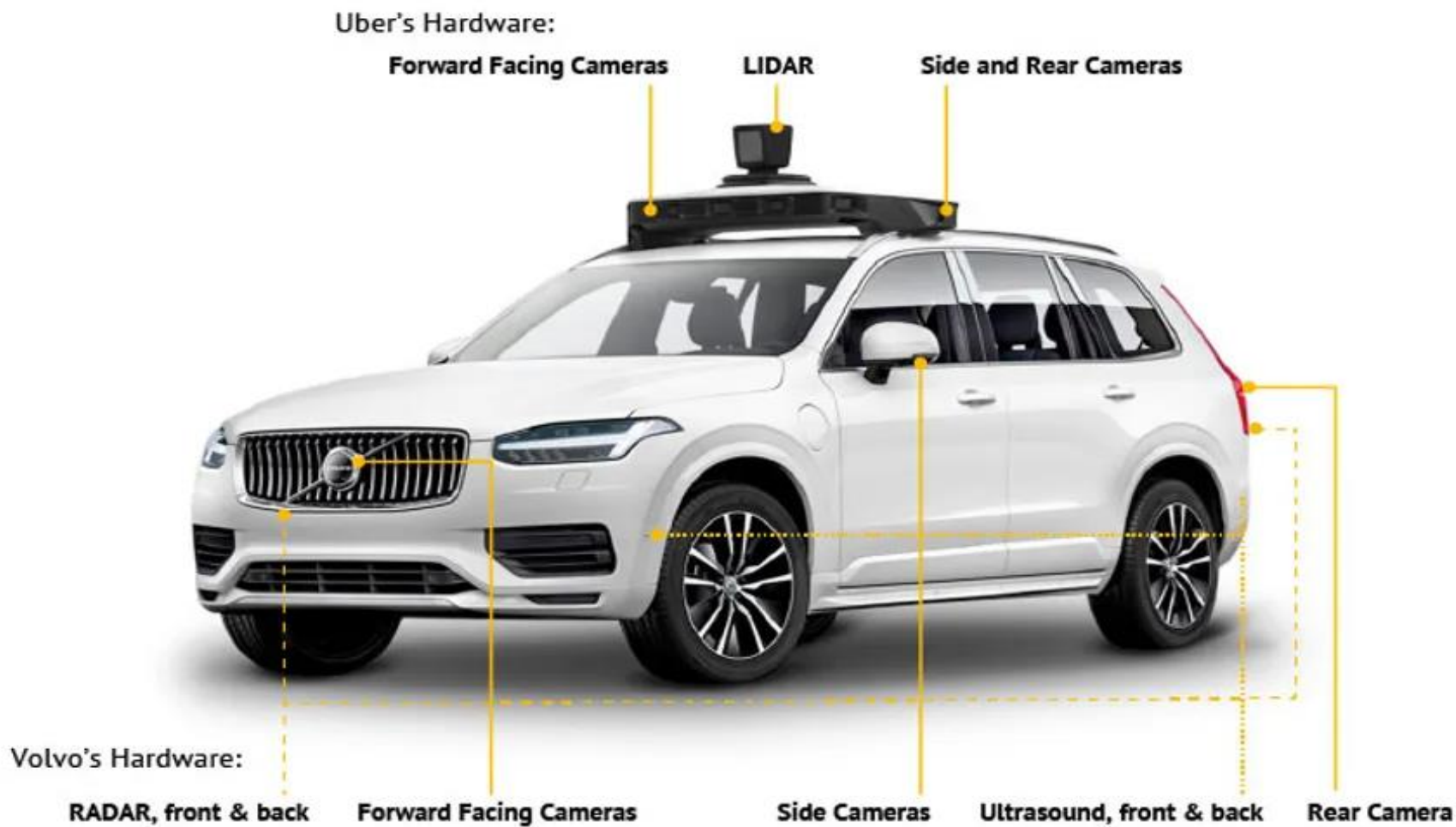




# Introducción á IA

Sandstorm, DARPA Challenge





# Introducción á IA

Coche autónomo



# Introducción á IA

Eleccións en EE.UU. 2016

# ¿Una tormenta en un vaso de agua?



MIGUEL-ANXO MURADO (/FIRMAS/MIGUEL-ANXO-MURADO)

30/10/2016 05:00

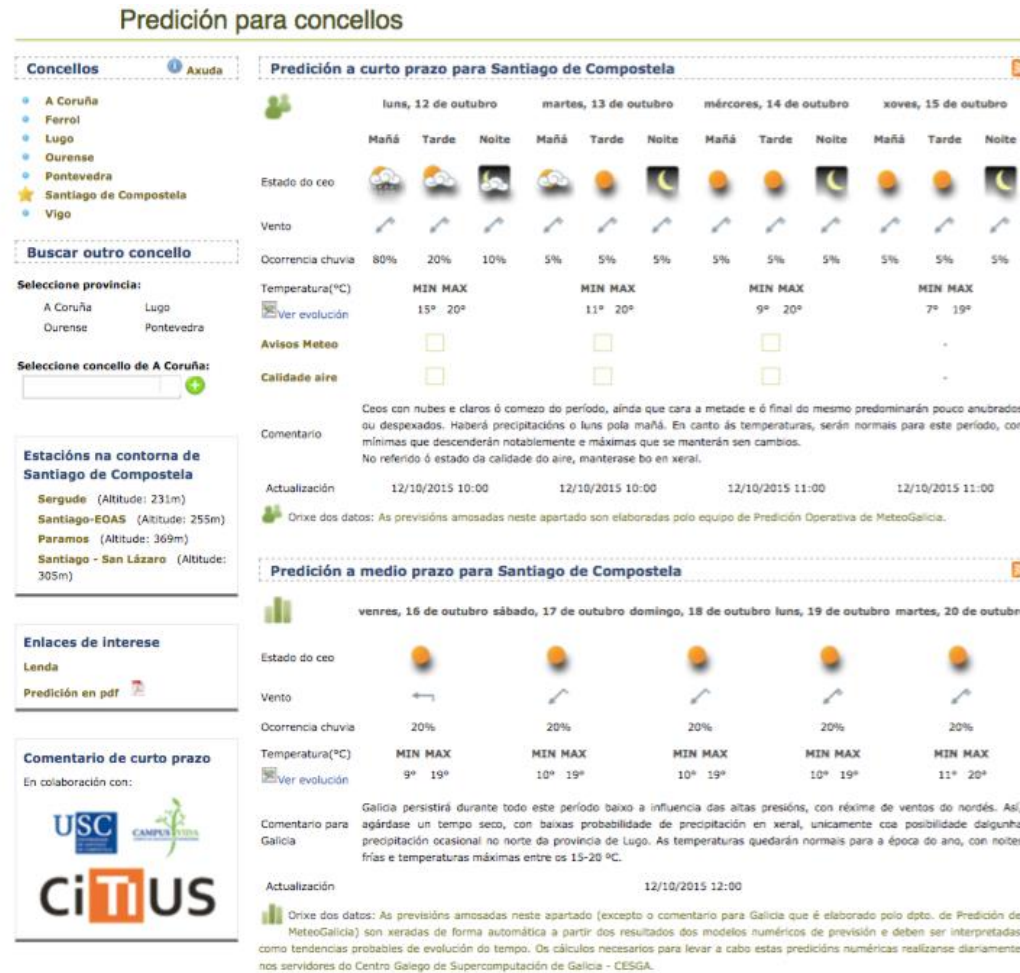
Por increíble que parezca, existe una forma de inteligencia en el planeta que dice que Donald Trump ganará las elecciones estadounidenses. Por suerte, se trata de la inteligencia artificial, que no suele acertar demasiado en esas cosas. Un programa informático desarrollado en la India y que se basa en los datos que proporcionan las búsquedas de Internet y las opiniones reflejadas en las redes sociales, coloca al magnate por delante de la senadora Clinton. Lo que quizás nos dice más sobre Internet que sobre la política norteamericana.

Afortunadamente para Clinton, Internet no es la realidad, pero, por otra parte, la realidad misma se le ha complicado a ella con la aparición de un nuevo lote de correos electrónicos comprometedores. Lo de los correos privados de Hillary era un asunto que parecía ya cerrado. Su vuelta a la actualidad, a poco más de una semana de las elecciones, no podía ser más inoportuna para ella. Sus partidarios dicen que no es más que una tormenta en un vaso de agua. Y tienen razón, pero cuando el vaso de agua es una campaña presidencial norteamericana, cualquier tormenta importa.

## Introducción á IA

Eleccións en EE.UU. 2016

# Introducción á IA



GALiWeather: o tempo en palabras





Víctor, Cristina e Adrián