

Digital Humanities

Lecture 7

April 10

2026

Mario Verdicchio

A black and white photograph of a charred forest, likely after a fire. The trees are skeletal and blackened, with many trunks leaning at various angles. The ground is covered in ash and small rocks. A horizontal rainbow gradient bar is superimposed over the center of the image, containing the word "MEMORY" in large, bold, black, sans-serif capital letters.

MEMORY

01101010

11001110

MEMORY

11011011

10001011

0000

0	1	1	0	1	0	1	0
----------	----------	----------	----------	----------	----------	----------	----------

0001

1	1	0	0	1	1	1	0
----------	----------	----------	----------	----------	----------	----------	----------

0010

1	1	0	1	1	0	1	1
----------	----------	----------	----------	----------	----------	----------	----------

0011

1	0	0	0	1	0	1	1
----------	----------	----------	----------	----------	----------	----------	----------

0000	0	1	1	0	1	0	1	0
0001	1	1	0	0	1	1	1	0
0010	1	1	0	1	1	0	1	1
0011	1	0	0	0	1	0	1	1

Operands

Operators

0000

0 **1** **1** 0 1 0 1 0

0001

1 **1** 0 0 1 1 1 0

0010

1 **1** 0 1 1 0 1 1

0011

1 0 0 0 1 0 1 1

Addresses

0000

01101010

0001

11001110

0010

11011011

0011

10001011

0000

0 1 1 0 1 0 1 0

0001

1 1 1 0 1 0

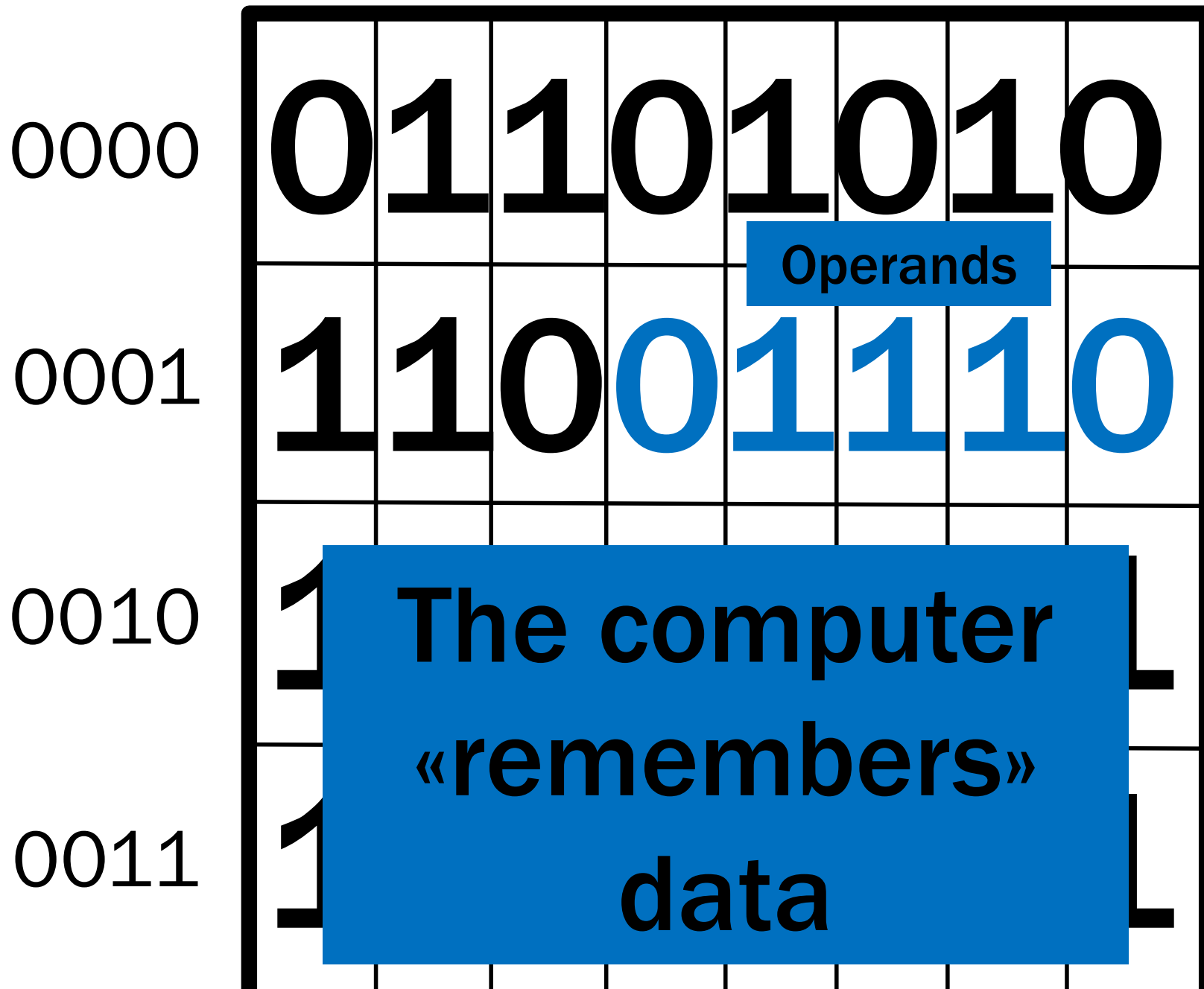
0010

1 1 1 1

0011

1 0 0 0 1 0 1 1





Operands

The computer «remembers» data

Operators

0000

0 **1** **1** 0 1 0 1 0

0001

1 1 0 0 1 1 1 0

0010

1 0 0 0 1 0 1 0

0011

1 0 0 0 1 0 1 0

**The computer
«remembers» what
to do with the data**

Addresses

0000

01101010

0001

11001110

0010

1

0011

10001011

The computer «remembers» where everything is



**DIGITAL
HUMANITIES**



**DIGITAL
HUMANITIES**

Home Insert Draw Design Layout References Mailings Review View Tell me

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FIND AND REPLACE

computer

digit cruncher

Replace All Replace

MATCHES: Result 1 of 14

When some 50 years ago **computer** science started to become a stand-alone discipline, independent from mathematics and physics from which it had originated in the first half of the 20th century, the question of defining its epistemological status emerged as well, because this discipline was and still is heavily dependent on mathematical, empirical, and engineering methods (Tedre 2015, Primiero 2020). A debate is still happening on whether to see **computer** science as a mathematical discipline, as a special kind of engineering, or as a scientific discipline (Angius et al. 2021).

The debate on **computer** science as a scientific discipline is part of a larger discussion regarding the intersection between **computer** science and science, which can be addressed from a conceptual and methodological perspective along two different directions of knowledge flow. In the analysis of **computer** science as a science, the flow goes from science to **computer** science, with a particular focus on how the experimental scientific method can inform **computer** scientists so that they can make their methodologies more precise and rigorous from the point of view of traditional science. Recommendations for code sharing to increase repeatability of experiments in **computer** science are an example of this kind of effort (Collberg and Proebsting 2016). In the other direction of knowledge flow, **computer** science is intended as “infra-science”, that is, a tool for scientific disciplines in terms of technological support provided to traditional methodologies of scientific discovery and knowledge creation (Amigoni and Schiaffonati 2014). The applications of computational techniques to scientific disciplines are numerous and varied, but one case in particular, namely Machine Learning (ML) in Radiology, is interesting from an epistemological perspective.

**Open that file, find
and replace every
occurrence of
«computer» with
«digit cruncher».**

Operands / Data

Open that **file**, find
and replace every
occurrence of
«computer» with
«digit cruncher».

Open that file, **find**
and **replace** every
occurrence of
«computer» with
«digit cruncher».

Open **that** file, find
and replace every
occurrence of
«computer» with
«digit cruncher».

Addresses / References

0000

0**1****1**0**1**0**1**0

000**1**

1**1**0**0****1****1****1**0

00**1**0

1**1**0**1****1**0**1****1**

00**1****1**

1000**1**0**1****1**

**Open that file, find
and replace every
occurrence of
«computer» with
«digit cruncher».**

Home Insert Draw Design Layout References Mailings Review View Tell me

Times New... 12 A^ A^ Aa abc A

Paste B I U ab x₂ x² A A

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- 1. Go to the first character at the beginning of the file.**
- 2. If that character starts a sequence that forms the word «computer», replace that sequence with «digit cruncher», otherwise leave the characters the way they are.**
- 3. Go to the next character.**
- 4. Repeat 2 and 3 until you have reached the end of the file.**

1. Go to the to the first character at the beginning of the file.
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3. Go to the next character.
4. Repeat 2 and 3 until you have reached the end of the file.





REPEAT



RePEAT



RePEAT

ReMEMBER

**Repetition requires
memory.**

**The computer can repeat
only what it «remembers».**



RePEAT

ReMEMBER



RePEAT

ReMEMBER

ReTRIEVE

Repetition requires memory.

The computer can repeat only what it «remembers».

Remembering is based on being able to retrieve the needed data stored in the memory.

**Repetition requires
memory.**

**A working memory requires
an addressing system to
support retrieval.**

**Repetition requires
memory.**

**A working memory requires
an addressing system to
support retrieval.**

4. Repeat 2 and 3 until you have reached the end of the file.

**Repetition requires
memory.**

**A memory requires
reference.**



RePEAT

ReMEMBER

ReTRIEVE

ReREFERENCE

4. Repeat 2 and 3 until you have reached the **end** of the file.

Re **REFERENCE**

1110001010101
10111010101010
10101110101010
01110101010101
10111000101010
10101110101011
01101110000111
101010111101

Where is the end?

MEMORY

0 1 1 0 1 0 1 0

1 1 0 0 1 1 1 0

1 1 0 1 1 0 1 1

1 0 0 0 1 0 1 1

MEMORY

A memory stores data.

A memory stores instructions.

The address system of a memory enables repetition (also known as ITERATION).

10001011

ITERATION



- 1. Go to the to the first character at the beginning of the file.**
- 2. If that character starts a sequence that forms the word «computer», replace that sequence with «digit cruncher», otherwise leave the characters the way they are.**
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- 3. Go to the next character.**
- 4. Repeat 2 and 3 until you have reached the end of the file.**





THE FILE IS BIG



- 1. Go to the to the first character at the beginning of the file.**
- 2. If that character starts a sequence that forms the word «computer», replace that sequence with «digit cruncher», otherwise leave the characters the way they are.**
- 3. Go to the next character.**
- 4. Repeat 2 and 3 until you have reached the end of the file.**



ITERATION ENABLES AUTOMATION





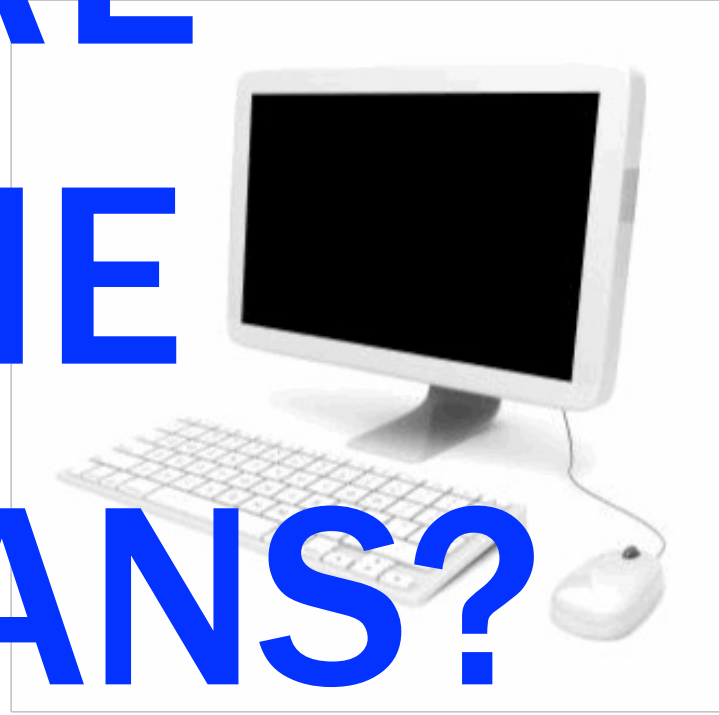
**WHERE
ARE
THE
HUMANS?**





Image from «Wall-E» (directed by Andrew Stanton, 2008, Walt Disney Pictures).

**WHERE
ARE
THE
HUMANS?**



WHERE

ARE

THE

HUMANS?



EVERYWHERE

1. Go to the to the first character at the beginning of the file.

Provided by
humans.

2. If that character starts a sequence that forms the word «computer», replace that sequence with «digit cruncher», otherwise leave the characters the way they are.

Provided by
humans.

3. Go to the next character.

Provided by
humans.

4. Repeat 2 and 3 until you have reached the end of the file.

1. Go to the to the first character at the beginning of the file.

Provided by
humans.

2. If that character starts a sequence that forms the word «computer», replace that sequence with «digit cruncher», otherwise leave the characters the way they are.

Provided by
humans.

3. Go to the next character.

Provided by
humans.

4. Repeat 2 and 3 until you have reached the end of the file.

Provided by
humans.

Provided by
the computer.









What do the results mean?



What do the results mean?

What does «mean» mean?

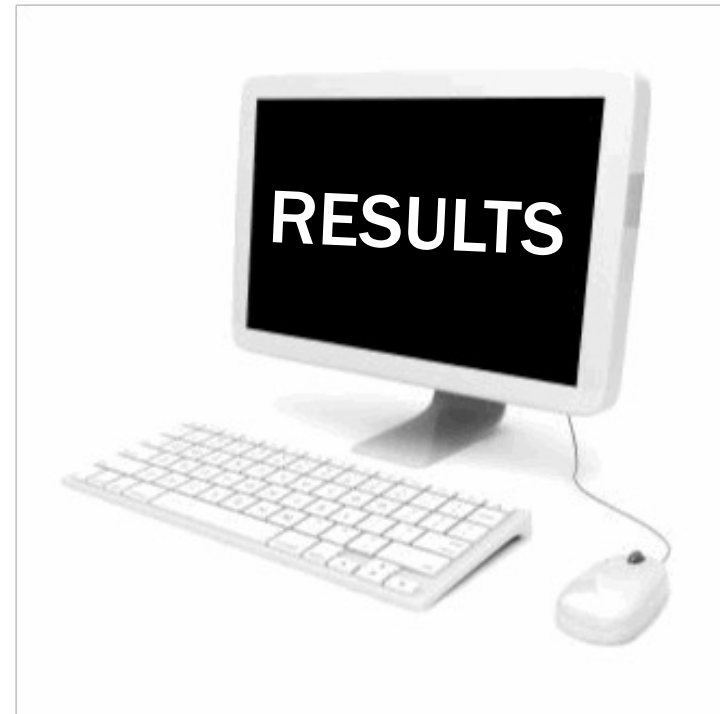




Cat.



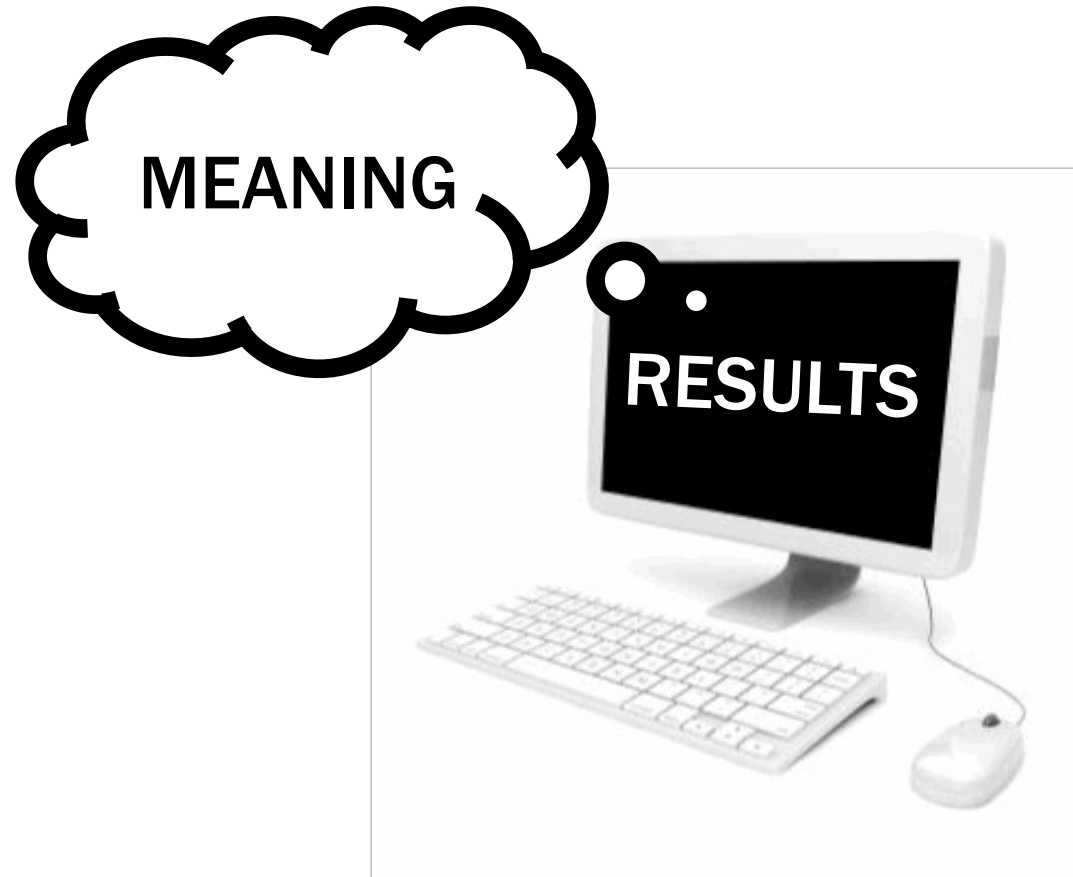
What do the results mean?



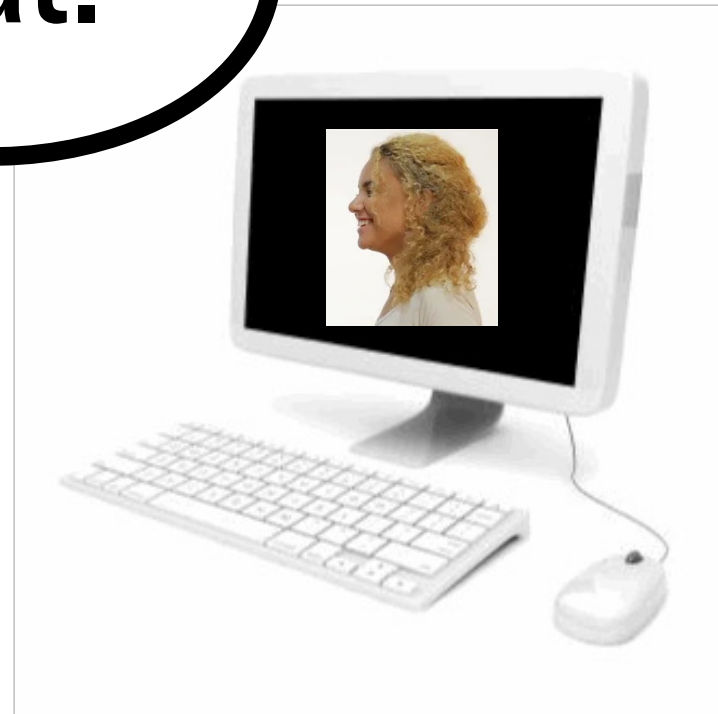
What do the results mean?



What does «**meaning**» mean?



Cat.





Cat.

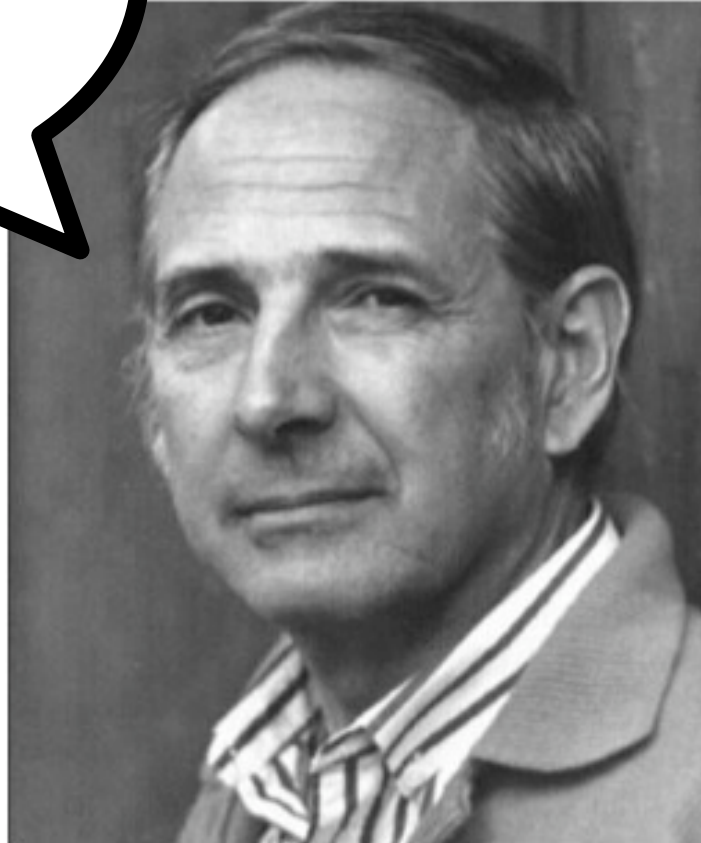


**Can a computer entertain
meaning?**

MEANING



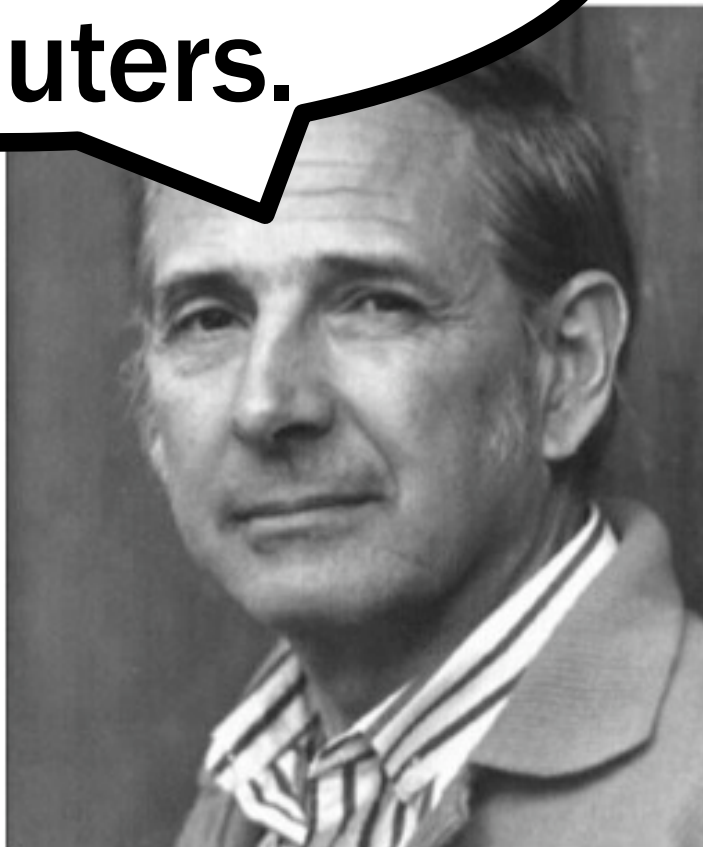
No.



John Searle (1932 -)

American philosopher widely known for his contributions to the philosophy of language, philosophy of mind, and social philosophy.

**Meaning is
inaccessible to
computers.**



The Chinese Room

**The
Chinese
Room
is
a
thought
experiment**

It is **not** a scientific experiment in the classical sense of the term, in which devices have been used in a laboratory to test a theory.



Rather, it is a way to illustrate an imaginary but theoretically feasible situation to prove a thesis.



**Meaning is
inaccessible to
computers.**



Searle proposed the Chinese Room experiment in 1980 in the article “Minds, brains and programs”, published in the journal “Behavioral and Brain Sciences”.

The Chinese Room



The Chinese Room works as follows.

Imagine having a closed room, with a person inside (e.g. John Searle himself) who has everything necessary for survival (food, water, air, etc.), and who does not know the Chinese language.

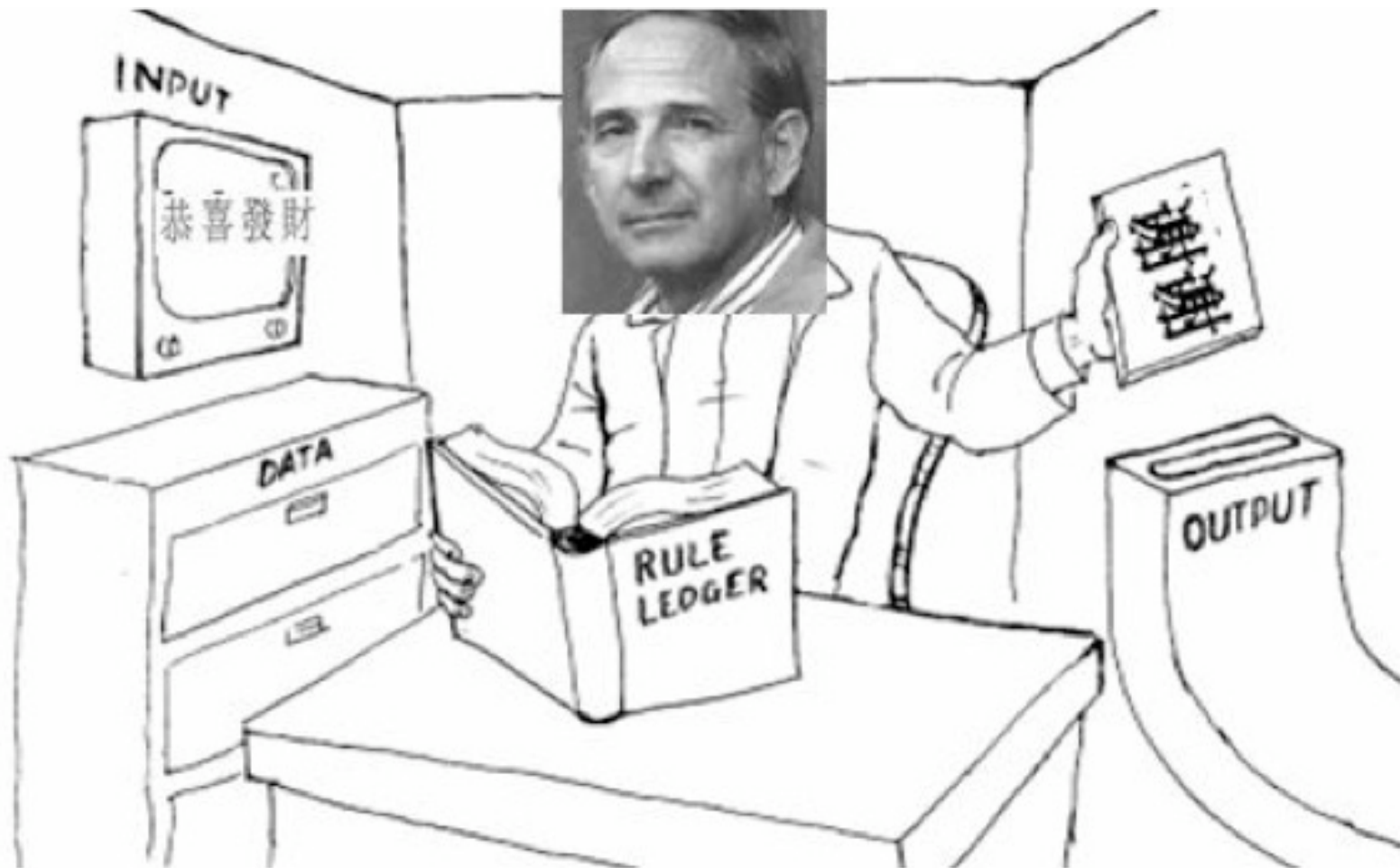
From the outside, the room looks like a large cube, with only a Chinese keyboard on one wall, and a slot on the opposite wall, from which printed pages can come out.

The keyboard allows a person outside the room who knows Chinese to enter sentences in the language.

The keyboard is connected to a monitor inside the room that displays the ideograms typed on the keyboard.

Although Searle does not know Chinese, he has at his disposal a manual which indicates to him, for each sequence of ideograms on the monitor, another sequence of ideograms that he must take from a filing cabinet and send to the outside of the room through the slot.

Even if he doesn't understand Chinese, by following the manual Searle is able to respond to the sentences on the monitor, and if the manual is well written, the person outside the room will have the impression that the room can speak Chinese. It is a Chinese Room.



What does Searle want to prove with the Chinese room experiment?

Searle wants to show us that it is possible to create an automatic system that works in a certain language without understanding the words of that language. Indeed, the person inside the room does not understand Chinese and relies on the manual. Being the only living being inside the room, if he does not understand Chinese, surely nothing else in the room can.

With his thought experiment, Searle wants to suggest that computers are machines built to work with signs (the same signs that are shown on the monitor in the Chinese Room or on your laptop's monitor) without any understanding of their meaning.

Signs.

What is it like to work with signs whose meaning is unknown?

What is it like to be inside the Chinese Room?

犬 赤 道

Welcome to the Chinese Room.

犬 赤 道

What do these signs **mean**?

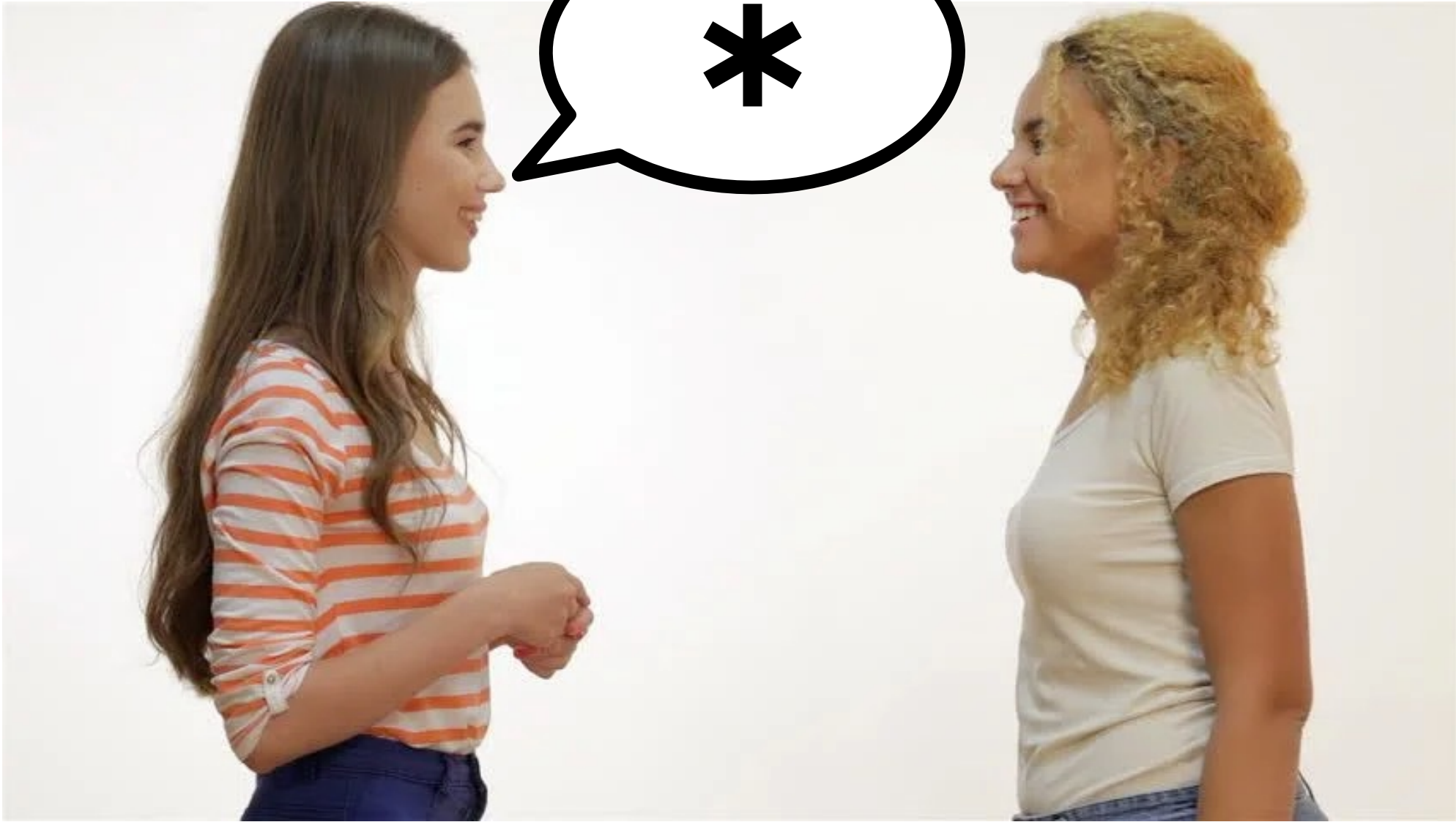


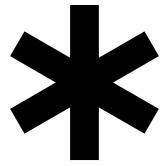
Wrong.



犬。







Today is Jack's birthday.

Penny and Janet went to the store.

They were going to get presents.

Janet decided to get a kite.

“Don't do that,” said Penny.

**“Jack has a kite. He will make you
take it back.”**

The meaning of the short story is clear to us.
However, try and check how many things we have taken for granted and which are not explicitly said in the text.

1) Gifts are bought in stores.

2) Birthdays are celebrated with gifts.

3) Janet and Penny want to buy a gift for Jack.

4) Jack doesn't want to have two kites.

5) Jack will bring back the new kite, not the old one.

6) The kite will be taken back to the shop where it was purchased.

7) Neither Penny nor Janet is a cat. Or a dog. Or a computer.

**Common sense is
inaccessible to
computers.**



Hubert Dreyfus (1929-2017)

from "What Computers Still Can't Do", H. Dreyfus, MIT Press, 1992.

Common sense is
inaccessible to
computers. **even us?**





Searle's thought experiment is aimed to demonstrating that a computer processes signs without understanding the meaning of those signs.

犬

This is a sign.



This is its meaning.



Actually, this is a digital image.

But you know what I mean.

犬

Signs.



Meanings.

犬



Signs.

Meanings.

Actually, these are signs
with meaning.

犬

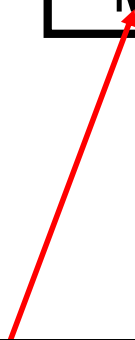
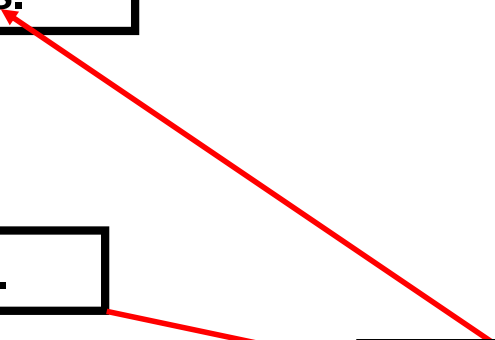


Signs.

Meanings.

And so are these.

Actually, these are signs with meaning.



犬

Signs.



Meanings.

犬

Syntax



Semantics



Searle's thought experiment is aimed to demonstrating that a computer processes signs in a purely syntactic way, and not in a semantic way.

chip



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Integrated Circuit

An integrated circuit or monolithic integrated circuit is ...



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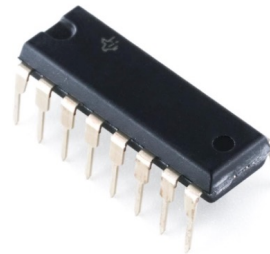


CHIP

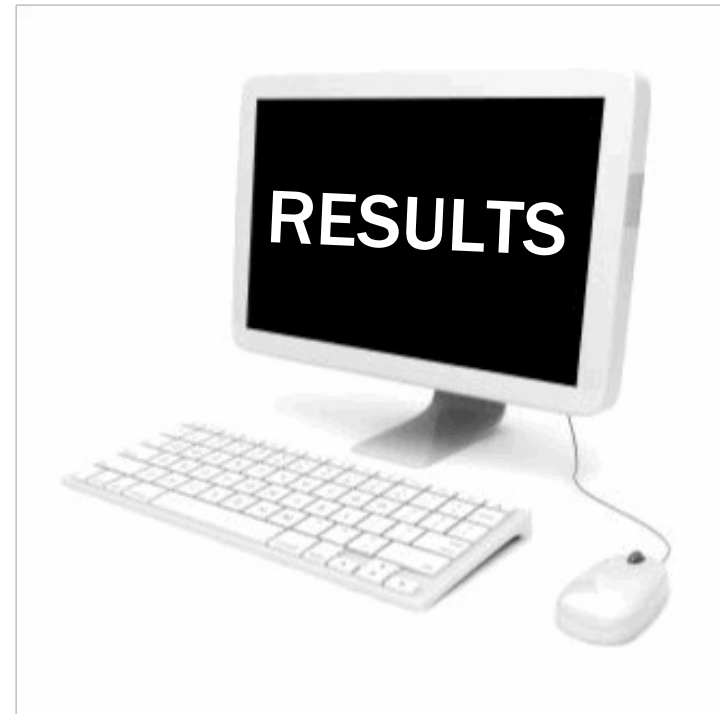
One sign.



Four meanings.
(At least)



What do the results **mean**?





chip



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chip



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Integrated Circuit

An integrated circuit or monolithic integrated circuit is ...

https://www.getc

This "Chip" is a link.

Chip | the s

Chip automatica

download **Chip**

This "Chip" is in bold type.

Full FAQs here.

Chip

Chip

**This is what we see
in the browser.**

```
<a href="https://www.getchip.uk/">  
  <h3>Chip</h3>  
</a>
```

```
<em>Chip</em>
```

**This is what Google
sends to the
browser.**

Present "Chip" as an anchor (a) link with a reference (href) to <https://www.getchip.uk/>

```
<a href="https://www.getchip.uk/">  
  <h3>Chip</h3>  
</a>
```

Present "Chip" as a header of category 3 (h3)

```
<em>Chip</em>
```

Present "Chip" with emphasis (em)

This is data.

`Chip`

This is data on
how to present
data in the
browser.

It is data
about
data.

It is **meta**data.

`Chip`

The standard all browsers must agree upon for the Web to work with these metadata is called HTML:
HyperText Markup Language

The HTML language is maintained by the W3C: the World Wide Web Consortium. They define themselves as “an international community that develops open standards to ensure the long-term growth of the Web.”

Hypertext

Hyper**text**



What is so “hyper” about it?

It’s links.

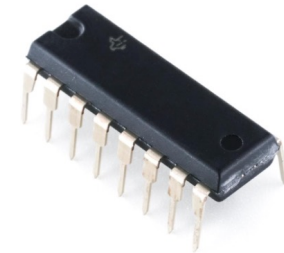
A text becomes “hyper” because of links.

`Chip`

Marking up text with HTML enables computers to show the same data in many different ways, but it is always about the way data look on screen, or whether they are a link to other webpages.



`Chip`



Can there be a way to convey the meaning of data by means of these markups?

Can the Web go from syntactic searches of C-H-I-P to semantics searches of the meaning of "chip"?



This is Tim Berners-Lee, who is universally recognized as the inventor of the Web (not the Internet, which is the telecommunication infrastructure connecting computers, but the Web: the whole set of hypertexts that travel through the Internet).

A computer only processes signs syntactically.

We want a computer to handle semantics as well.

There must be a way to express semantics syntactically, to express meaning with signs.

Wait...doesn't this happen all the time?

sur·prise (sər prɪz') *vt.* **-prised'**, **-pris'ing** [*<* OFr *sur-* (see SUR-¹) + *prendre*, to take] **1** to come upon suddenly or unexpectedly; take unawares **2** to attack without warning **3** to amaze; astonish —*n.* **1** a being surprised **2** something that surprises

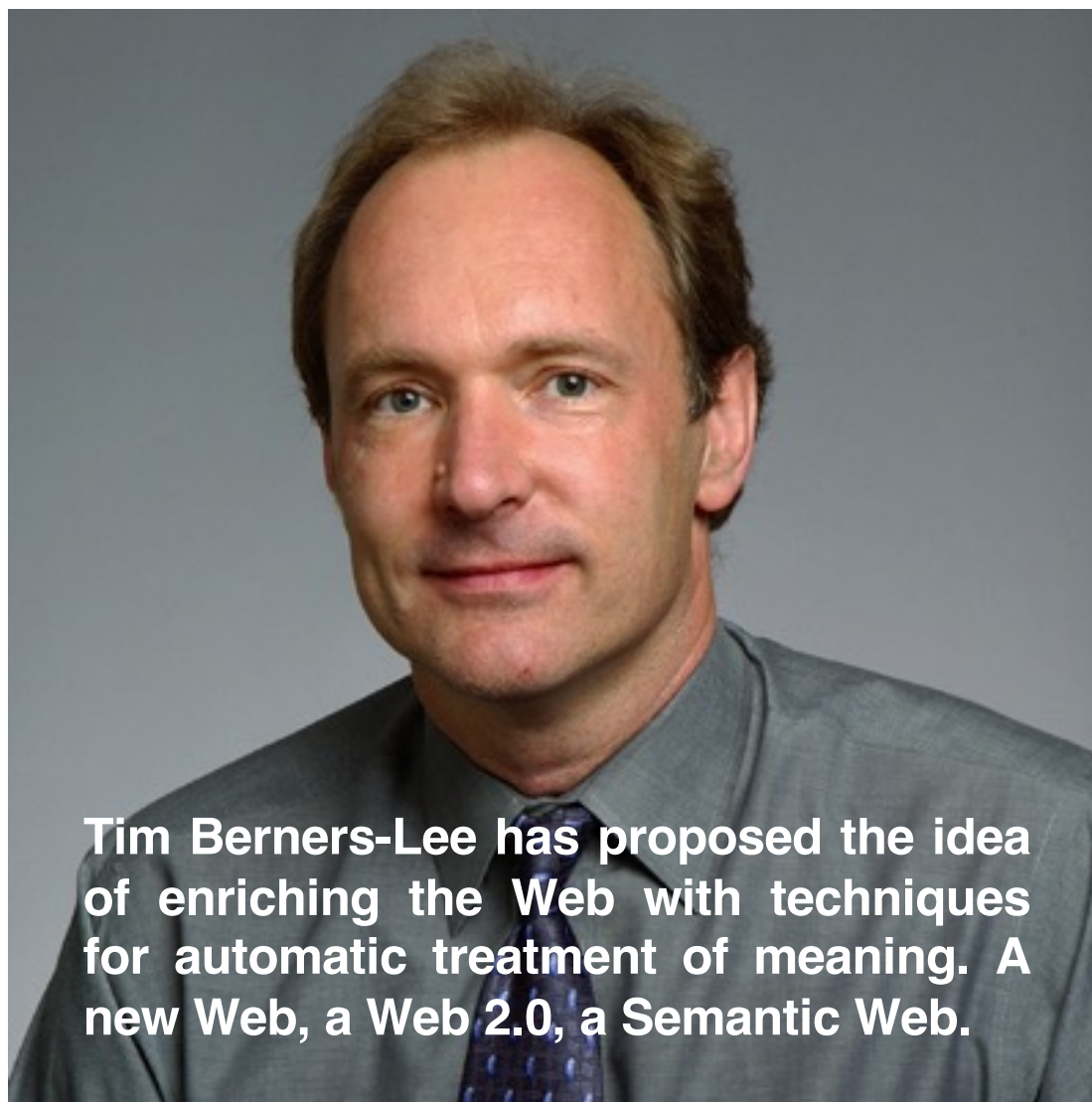
sur·re·al (sər rē'əl, sə-; -rēl') *adj.* **1** surrealistic **2** bizarre; fantastic

sur·re'al·ism' (-iz'əm) *n.* [*see* SUR-¹ & REAL] a modern movement in the arts trying to depict the workings of the unconscious mind —**sur·re'al·is'tic** *adj.* —**sur·re'al·ist** *adj., n.*

sur·ren·der (sə ren'dər) *vt.* [*<* Fr *sur-*, up + *rendre*, render] **1** to give up possession of; yield to another on compulsion **2** to give up or abandon —*vi.* to give oneself up, esp. as a prisoner —*n.* the act of surren-

A dictionary: where the meaning of signs is given by other signs.

[*<* L *sub-*, under, etc. in a stealthy



Tim Berners-Lee has proposed the idea of enriching the Web with techniques for automatic treatment of meaning. A new Web, a Web 2.0, a Semantic Web.