De las sangrías al estudio científico del aprendizaje: escapemos de los dogmas

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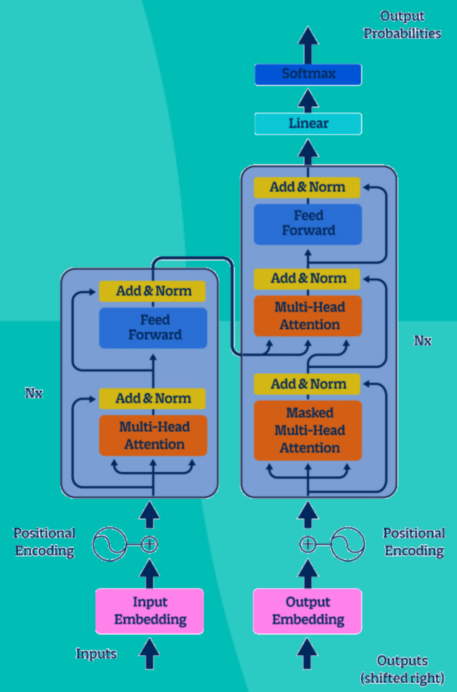
Coursera's Inaugural Innovation Instructor
Winner of McGraw Prize in Education (2023)
Senior Fellow, New Zealand Initiative
Distinguished Professor of Engineering
Oakland University, Rochester, Michigan



11 de octubre, 2025

Barb Oakley,
Professor of Engineering
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Rochester, Michigan

Terrence Sejnowski
Francis Crick Professor
The Salk Institute
Professor of Biological Sciences
University of California, San Diego

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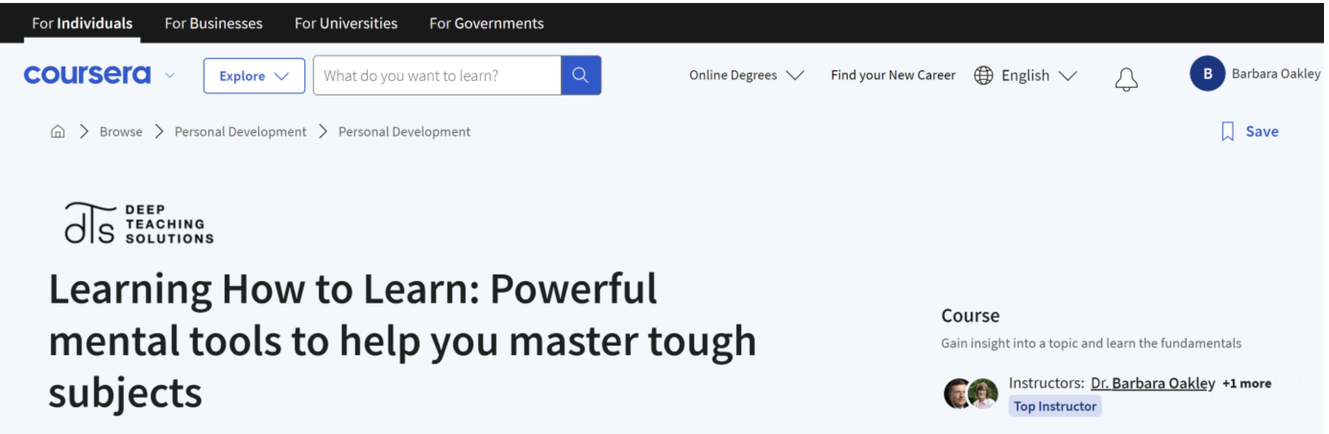
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The transformer

Attention Is All You Need

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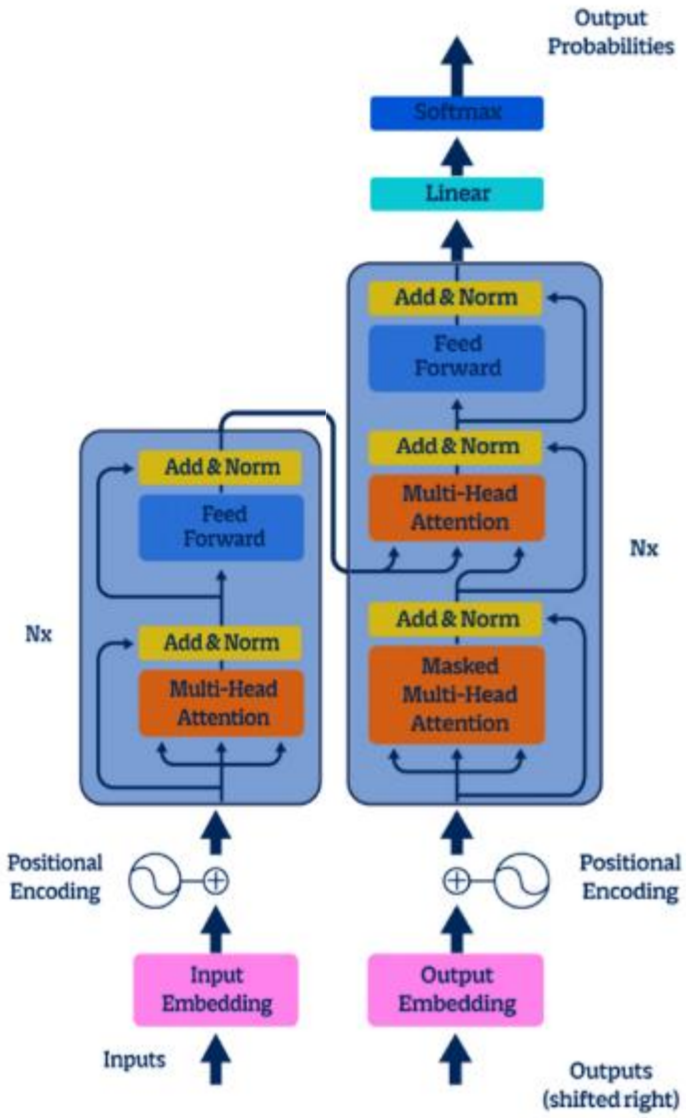
Abstract

The dominant sequence transduction models are based on complex recurrent or convolutional neural networks that include an encoder and a decoder. The best performing models also connect the encoder and decoder through an attention mechanism. We propose a new simple network architecture, the Transformer, based solely on attention mechanisms, dispensing with recurrence and convolutions entirely. Experiments on two machine translation tasks show these models to be superior in quality while being more parallelizable and requiring significantly less time to train. Our model achieves 28.4 BLEU on the WMT 2014 English-to-German translation task, improving over the existing best results, including ensembles, by over 2 BLEU. On the WMT 2014 English-to-French translation task, our model establishes a new single-model state-of-the-art BLEU score of 41.0 after training for 3.5 days on eight GPUs, a small fraction of the training costs of the best models from the literature.

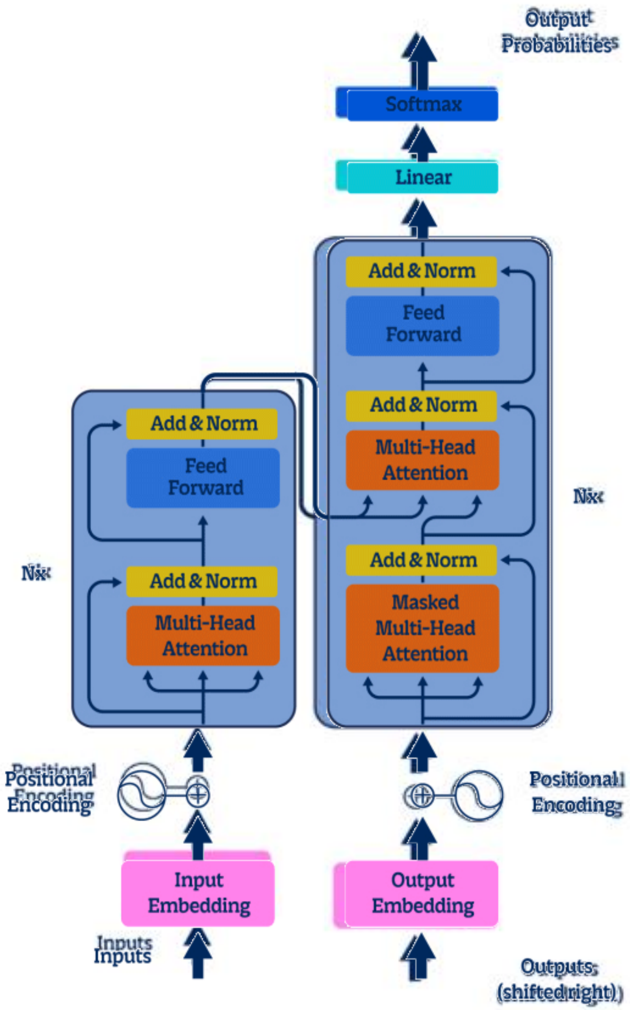
31st Conference on Neural Information Processing Systems (NIPS 2017), Long Beach, CA, USA.

Encoder

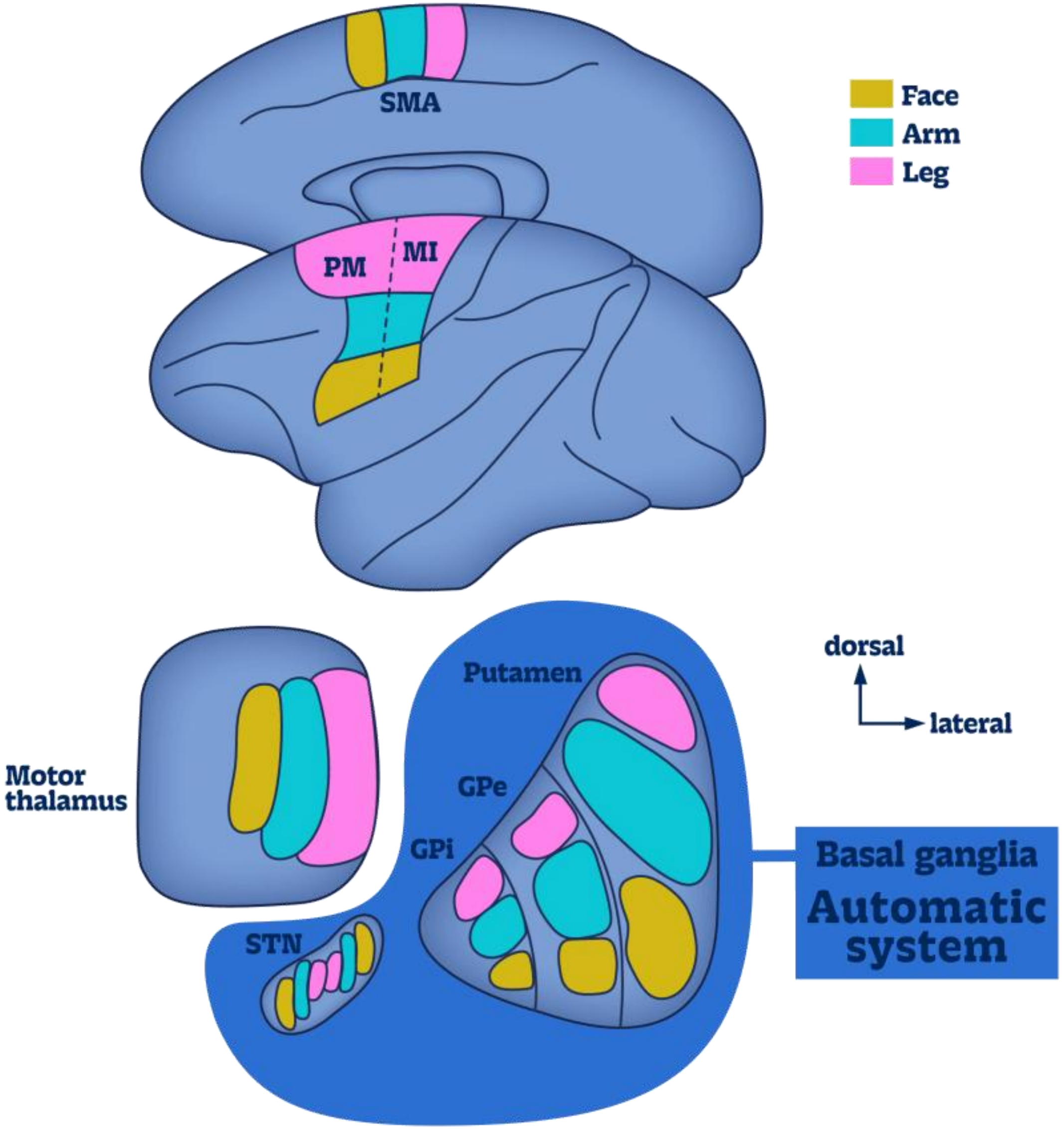


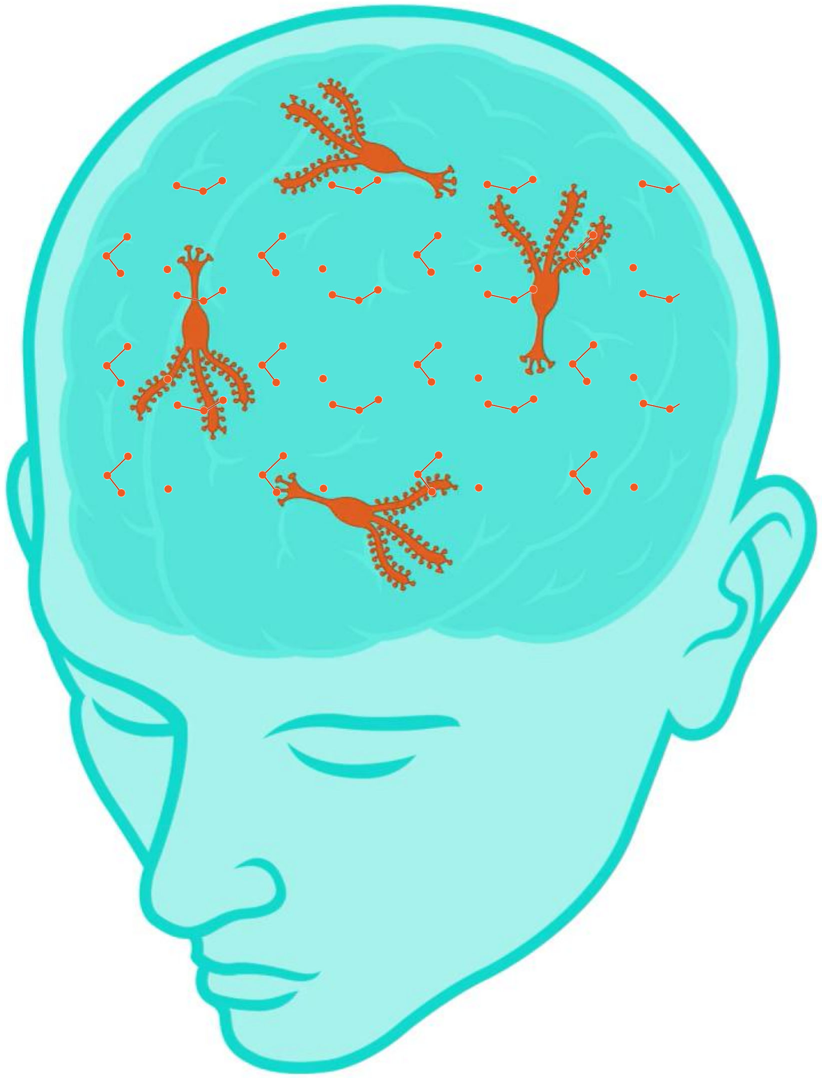
Decoder

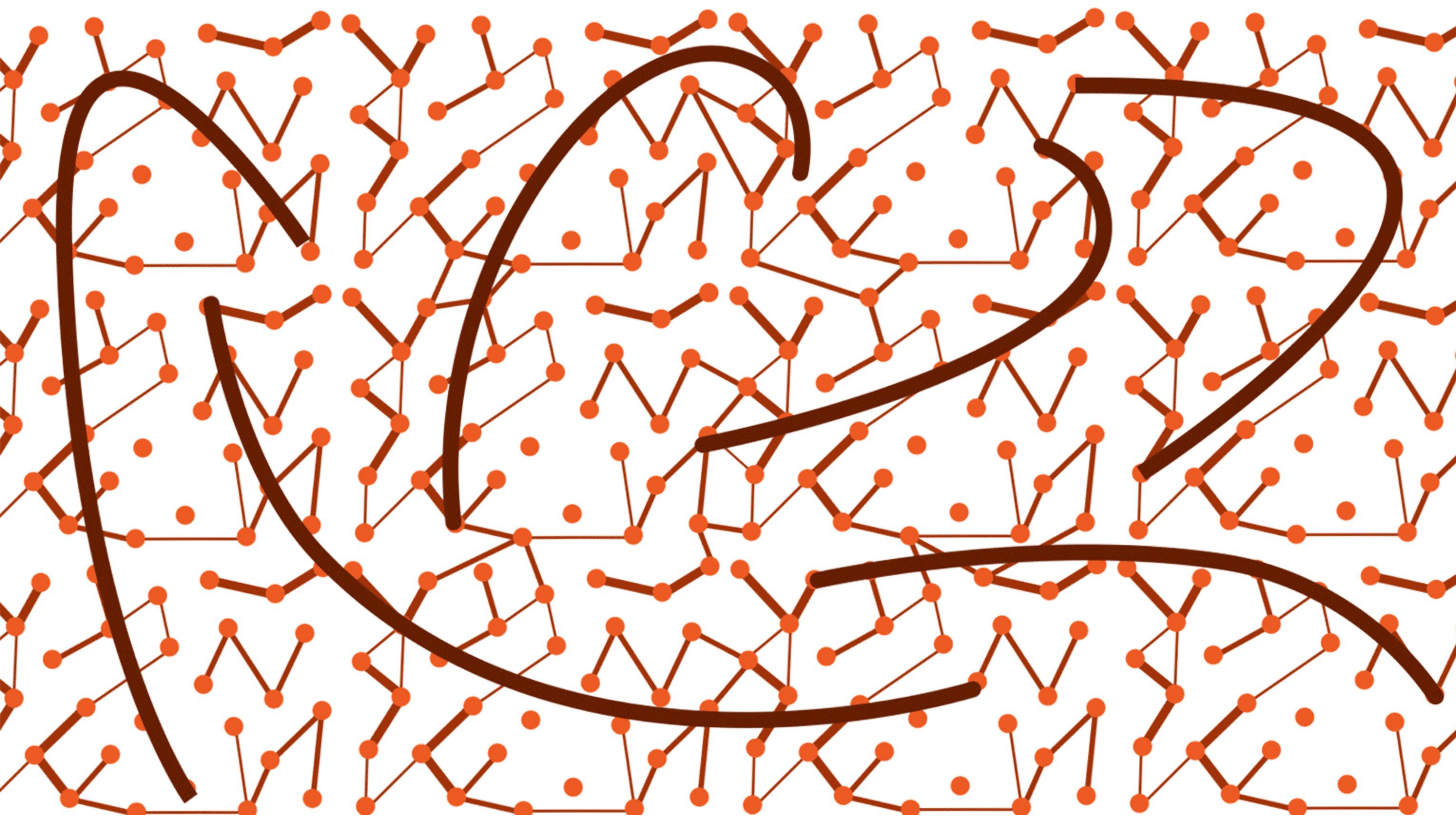
Flow of information through transformers in AI



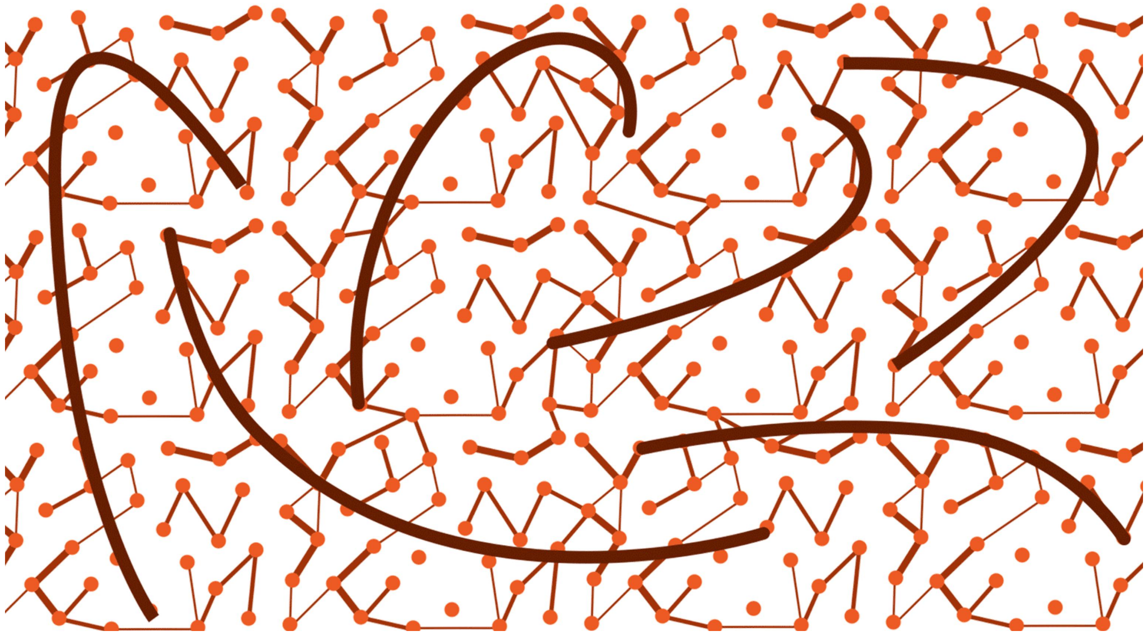
Flow of information in the brain



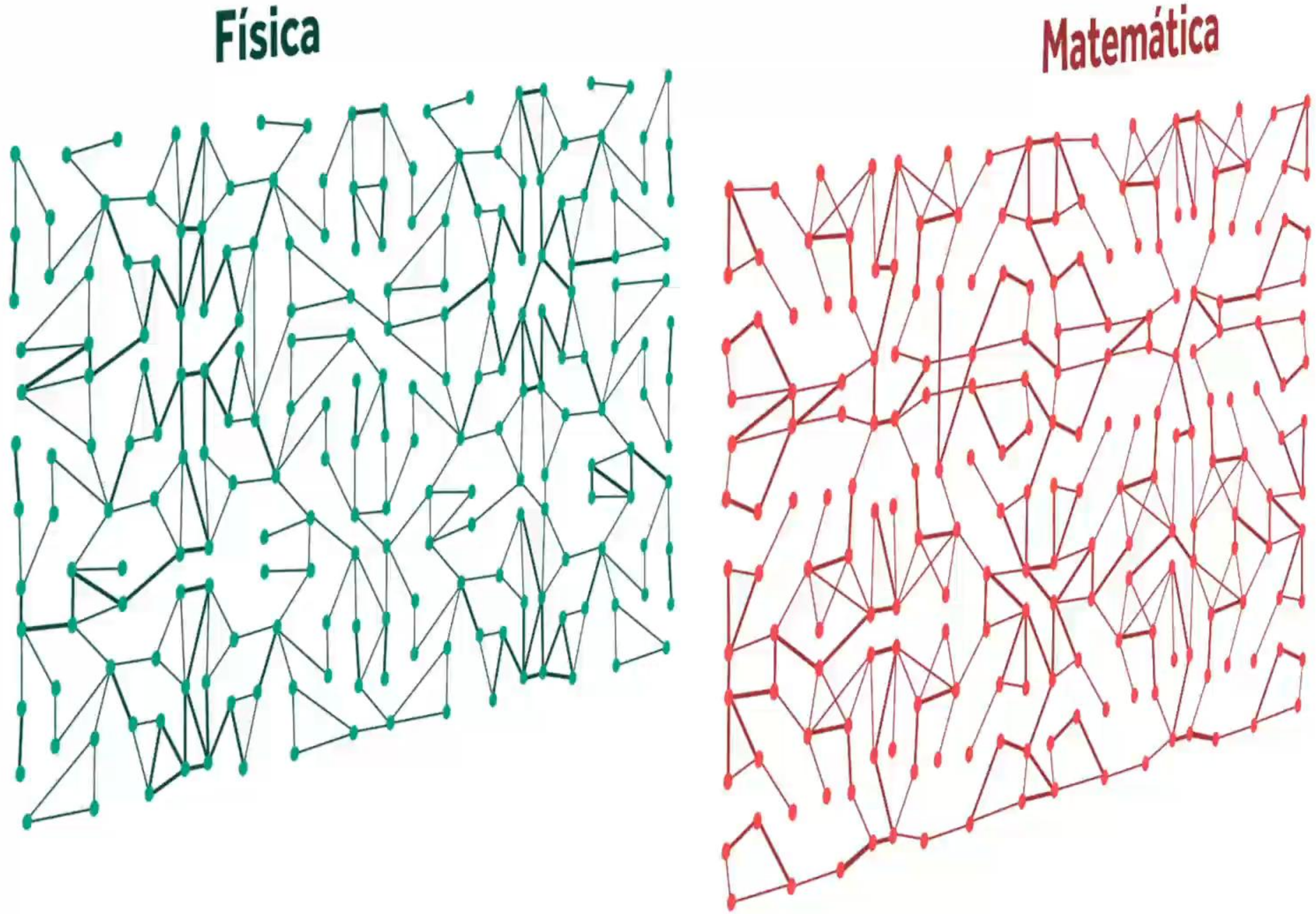




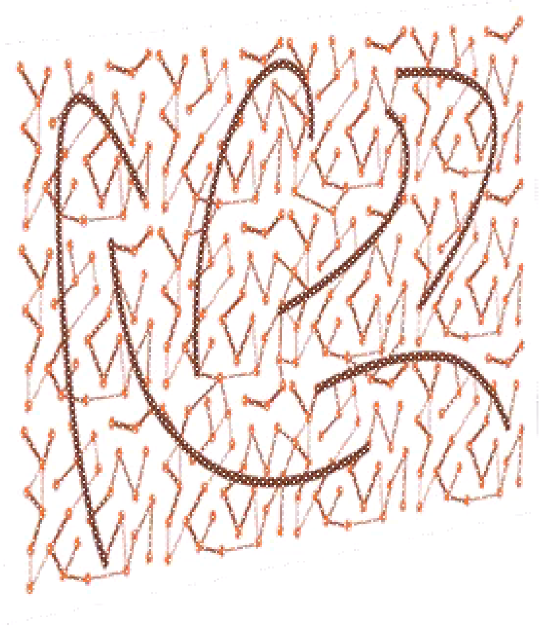
Esquemas



Esquemas


Física
Matemática

Esquema identitario

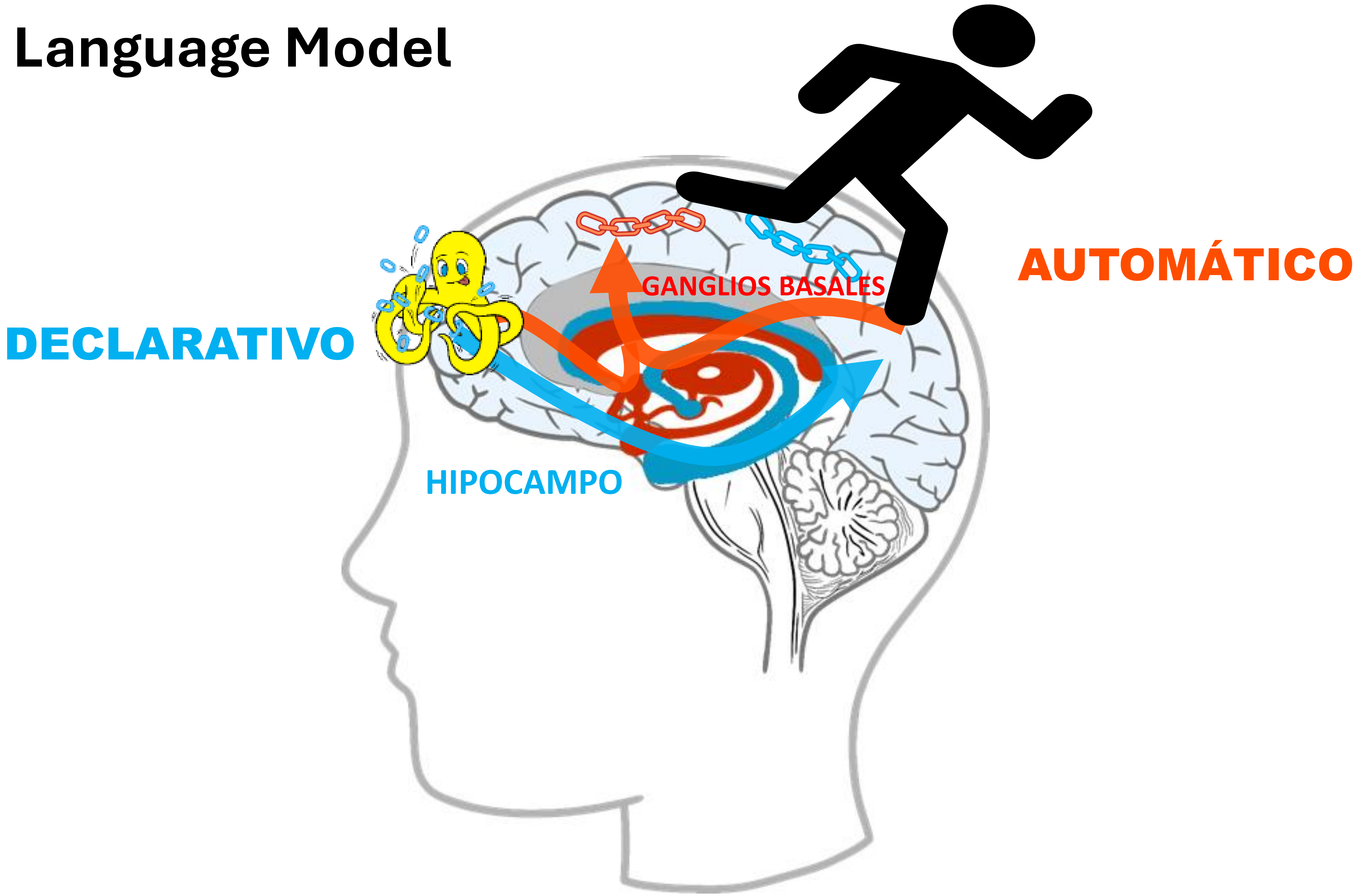


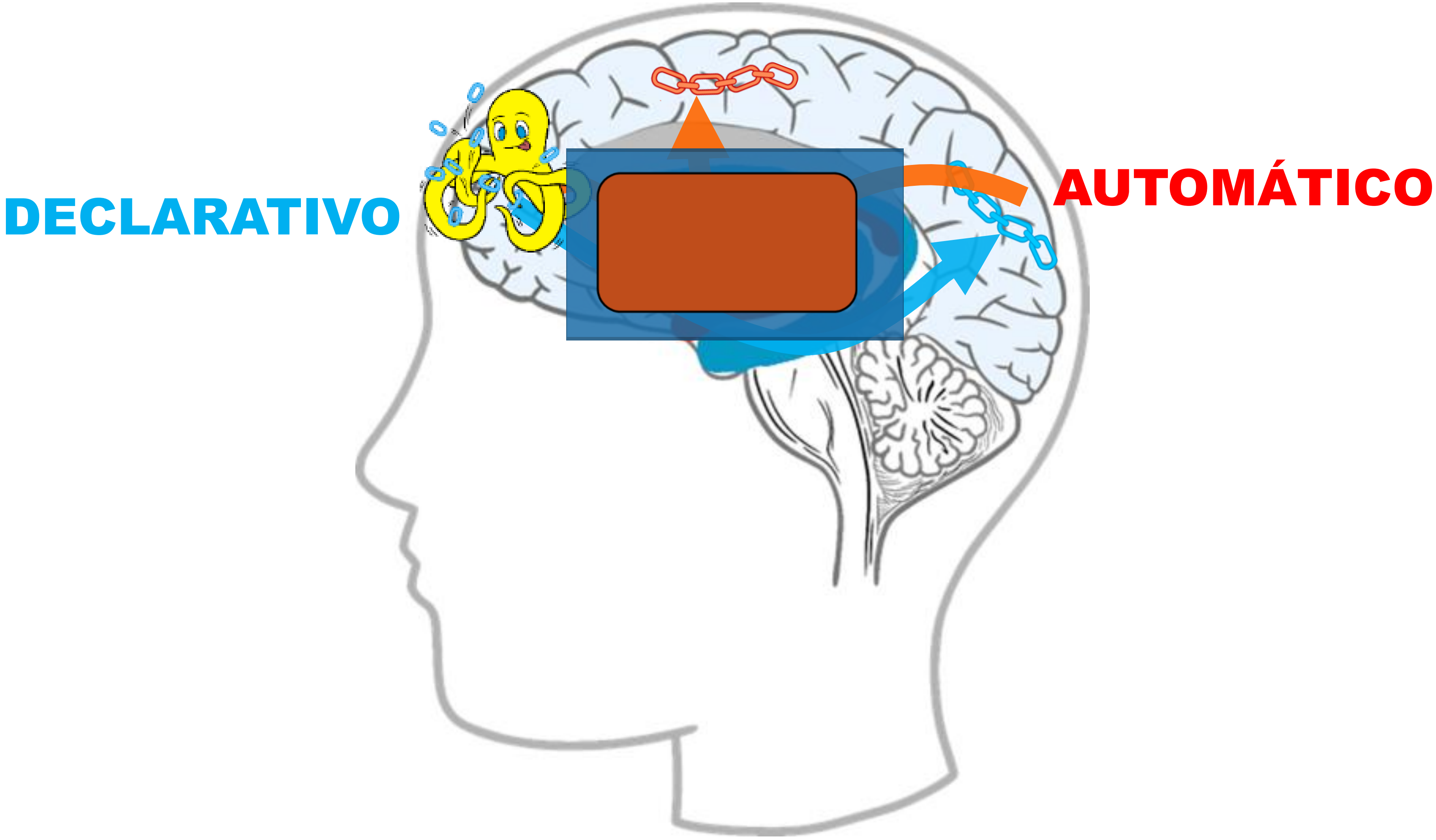
Sin conexiones en tu propio cerebro, no puedes pensar críticamente sobre IA generativa!

IA muestra

Pero yo soy quien realmente SABE!

Large Language Model

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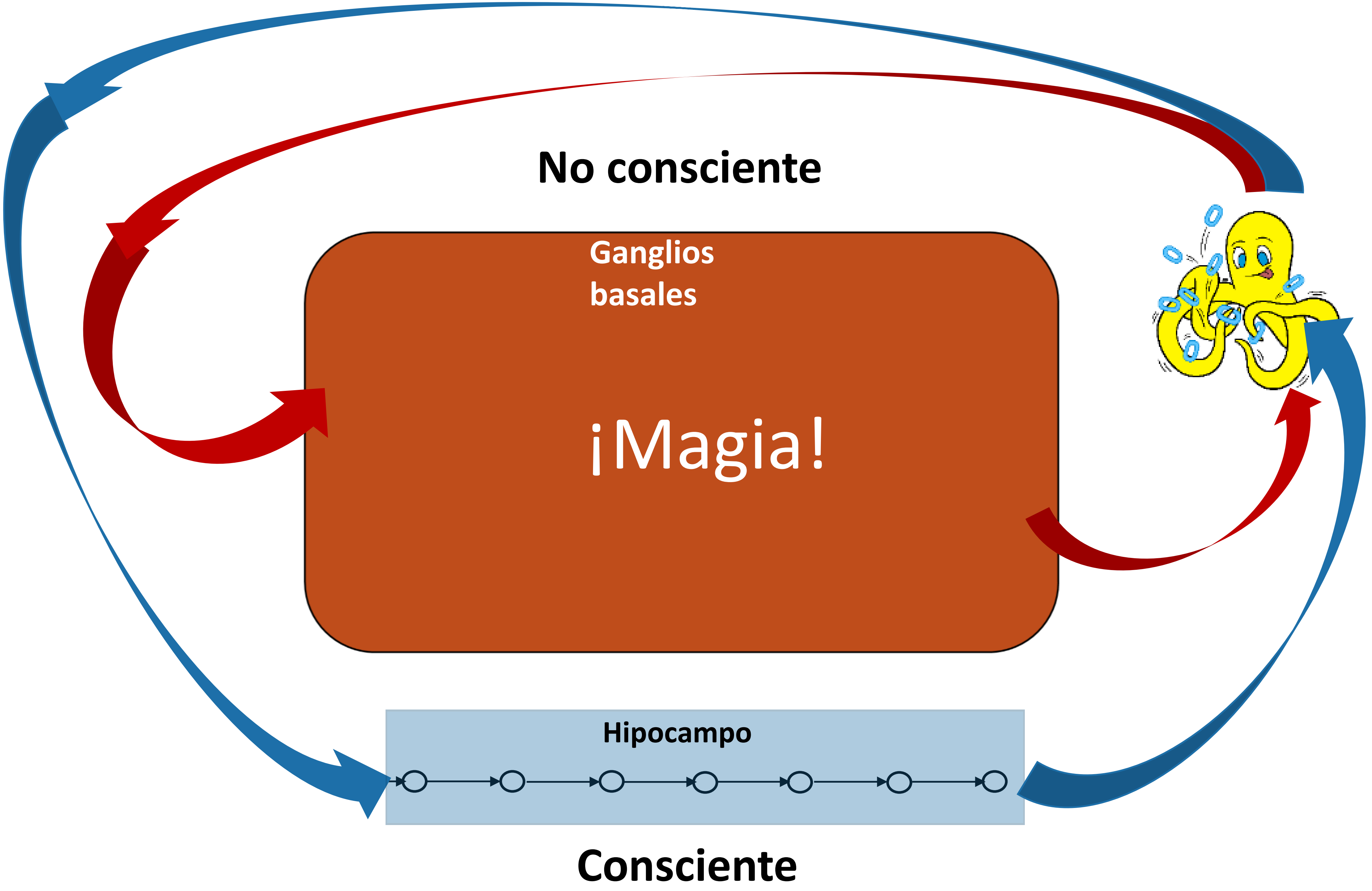
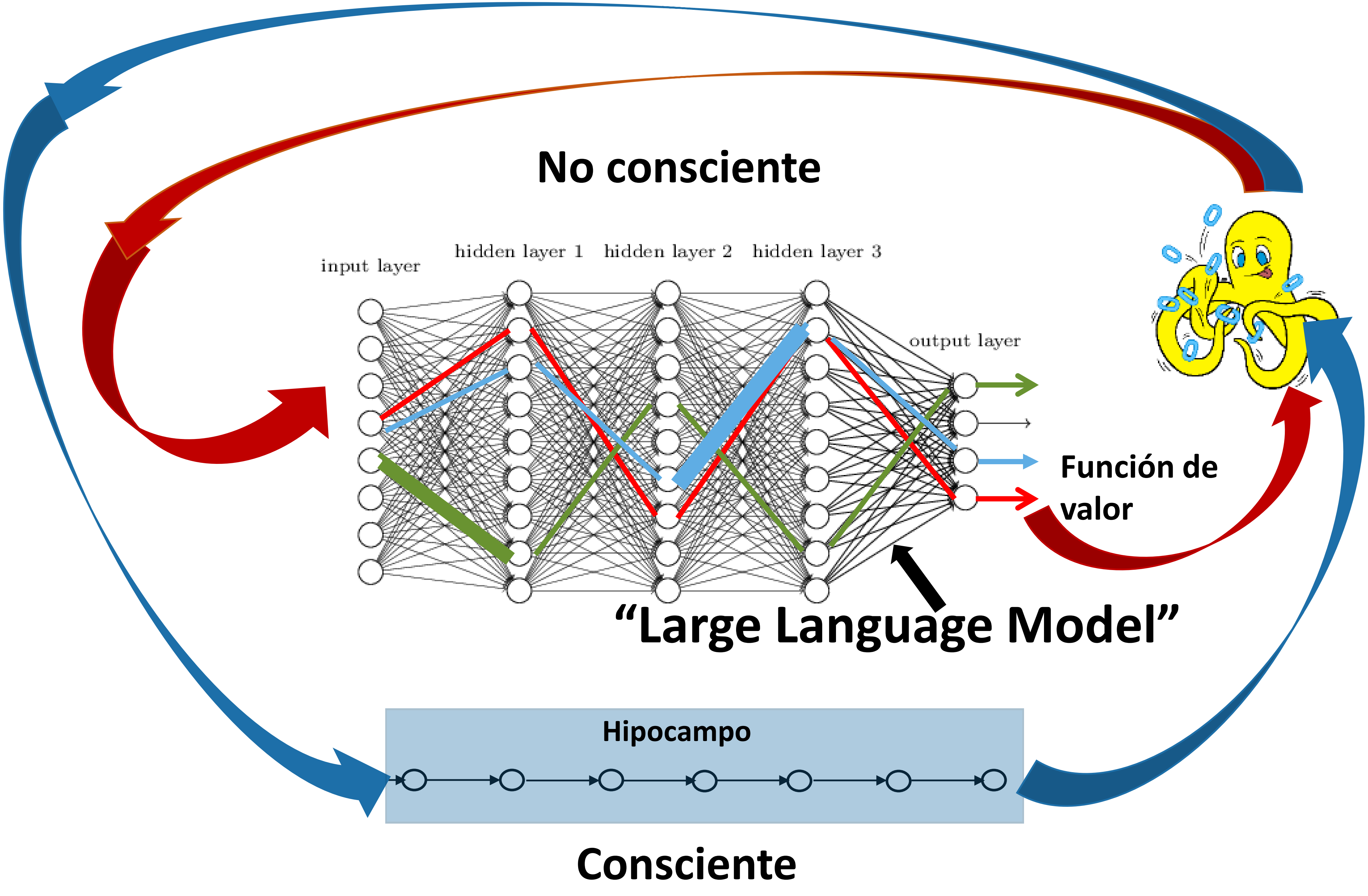
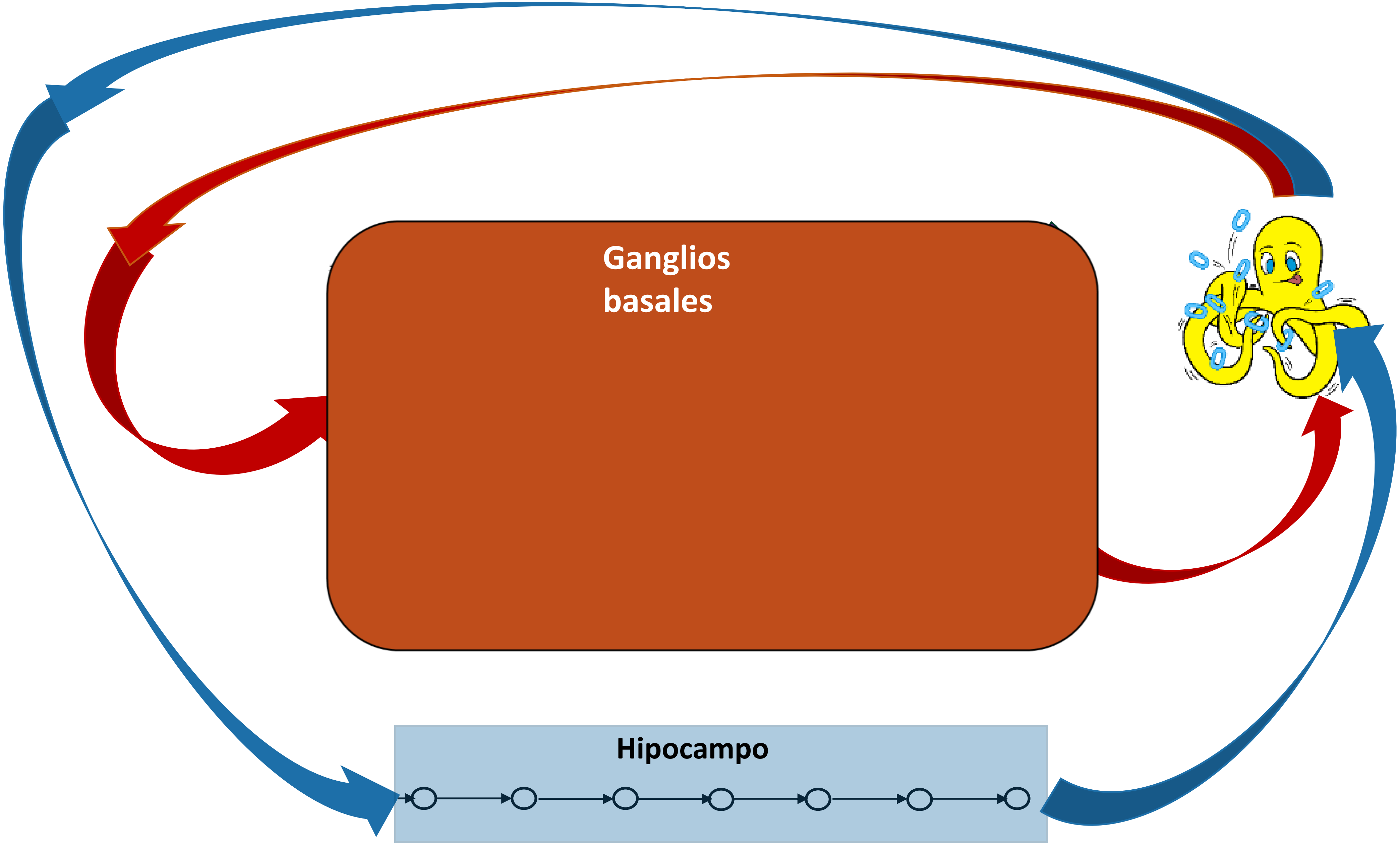
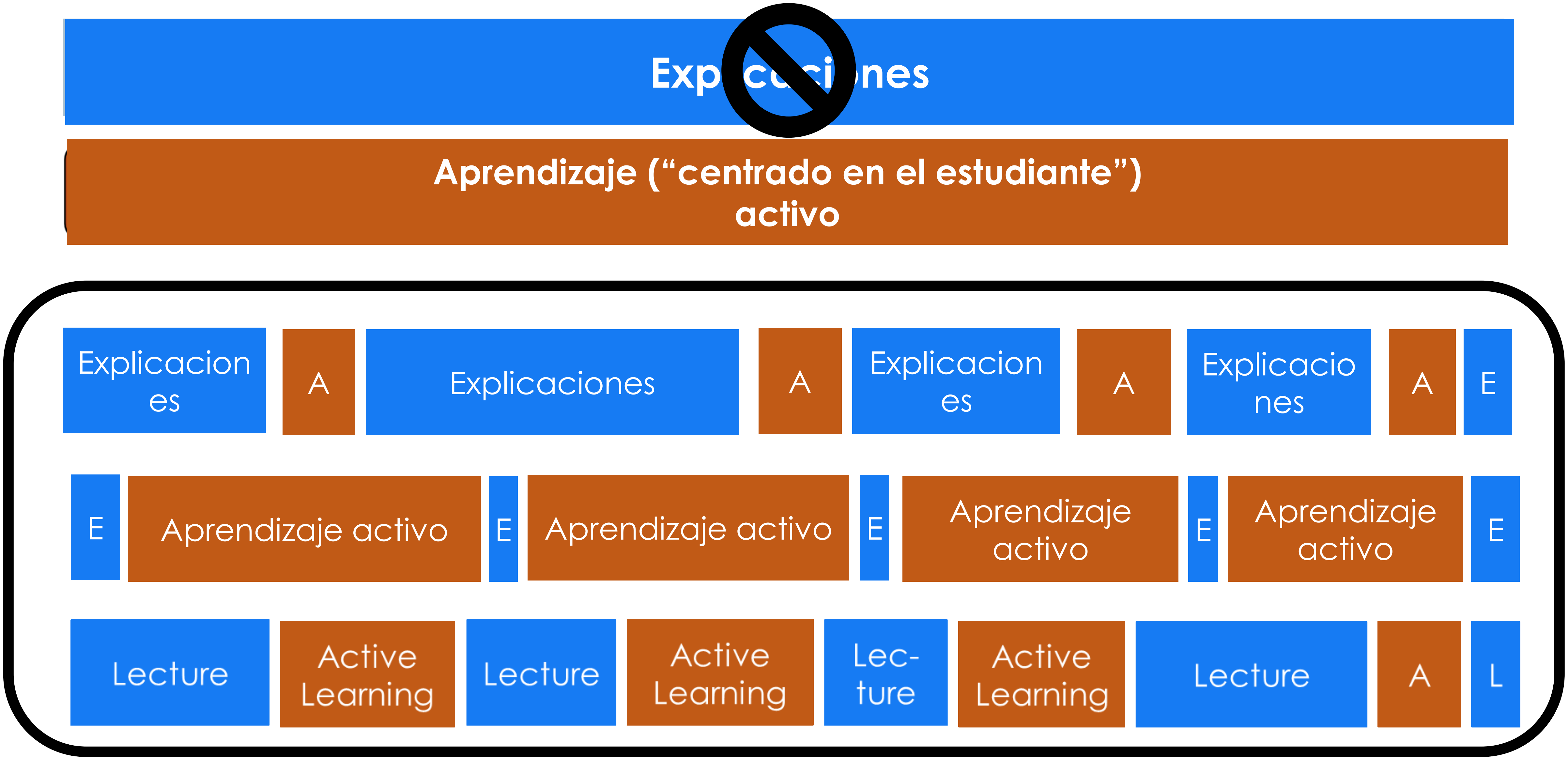

No consciente
Ganglios basales
¡Magia!
Hipocampo
Consciente

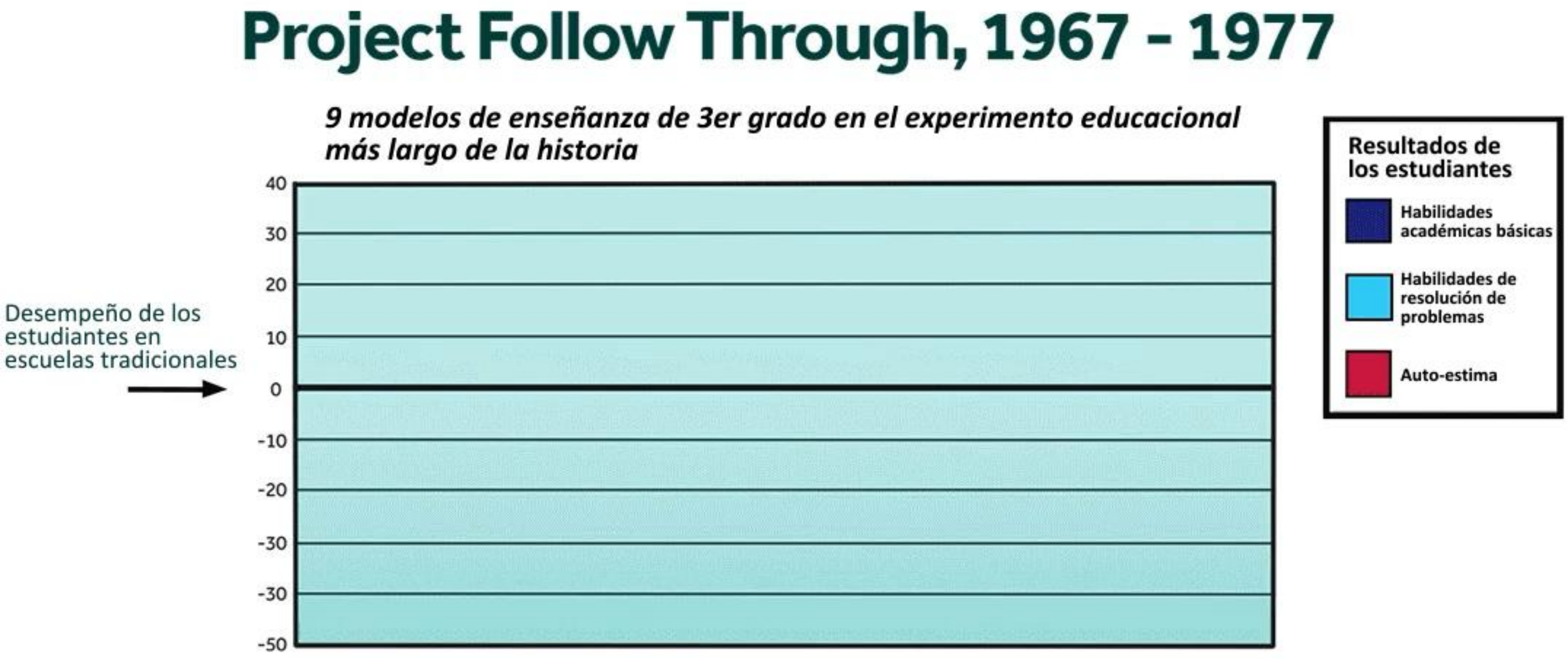

No consciente
input layer
hidden layer 1
hidden layer 2
hidden layer 3
output layer
Función de valor
"Large Language Model"
Hipocampo
Consciente


Ganglios basales
Hipocampo



Enseñanza directa

Nota: algunas formas de enseñanza causan retrocesos en los estudiantes



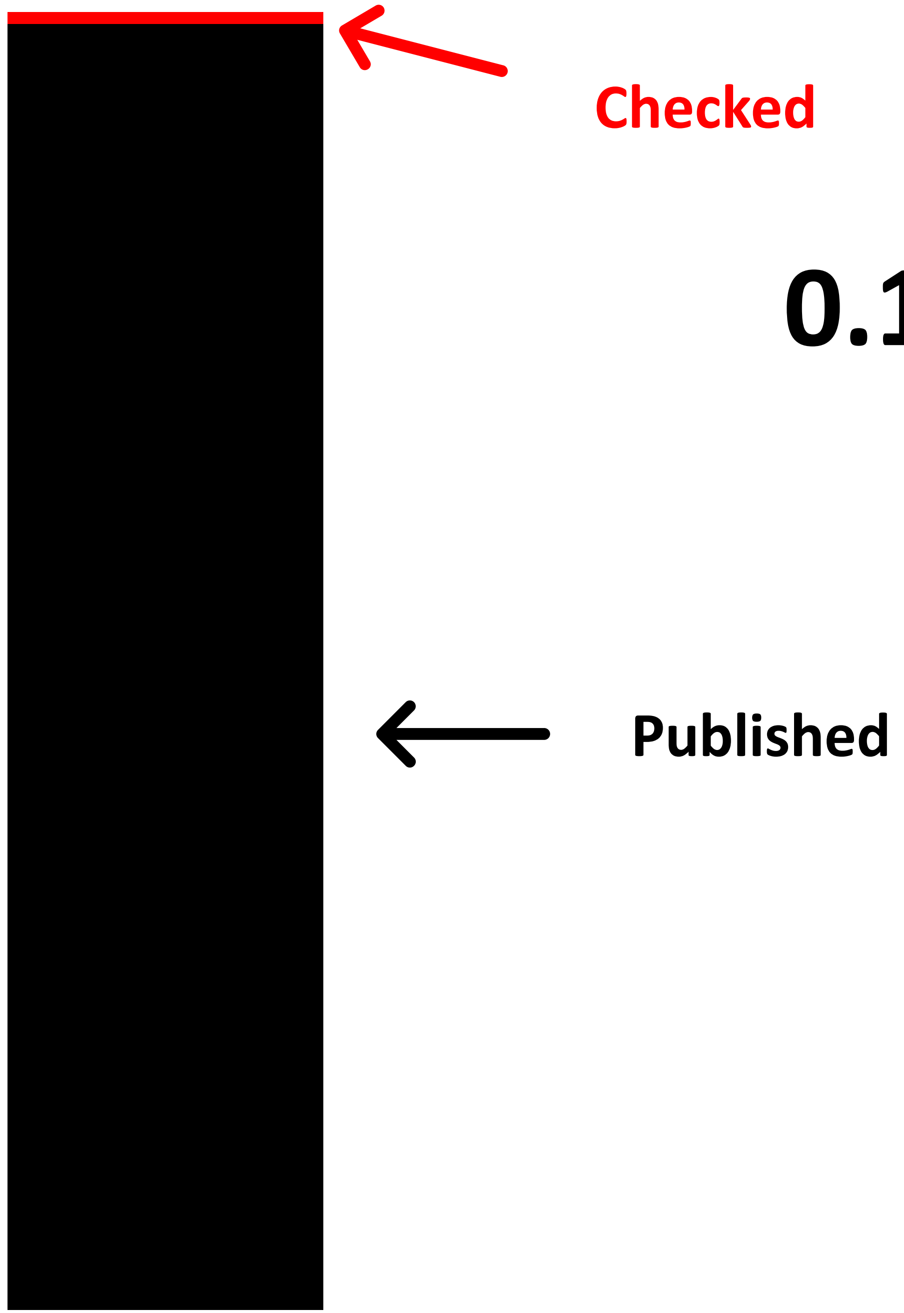
Facts Are More Important Than Novelty: Replication in the Education Sciences

FEATURE ARTICLE

Matthew C. Makel[1] and Jonathan A. Plucker[2]

Educational Researcher, 2014, Vol 43, Issue 6, pages 304-316

Despite increased attention to methodological rigor in education research, the field has focused heavily on experimental design and not on the merit of replicating important results. The present study analyzed the complete publication history of the current top 100 education journals ranked by 5-year impact factor and found that only 0.13% of education articles were replications replications. Contrary to previous findings in medicine, but similar to psychology, the majority of education replications successfully replicated the original studies. However, replications were significantly less likely to be successful when there was no overlap in authorship between the original and replicating articles. The results emphasize the importance of third-party, direct replications in helping education research improve its ability to shape education policy and practice.

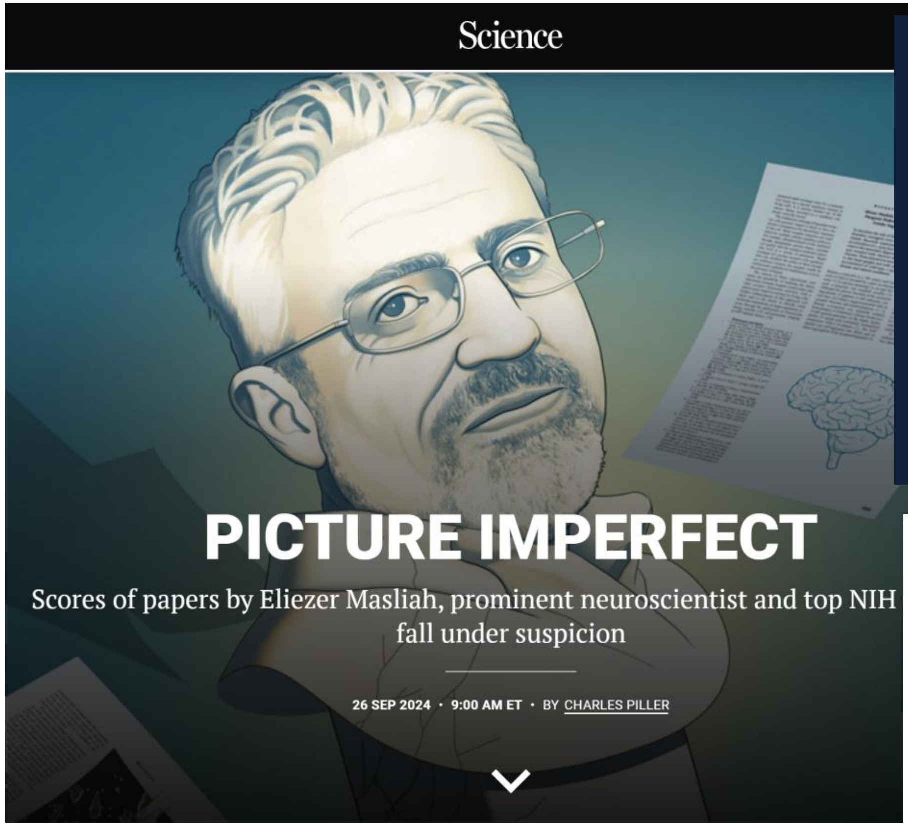


0.13% of education articles were replications

Sangrías y sanguijuelas

El pensamiento grupal puede bloquear campos y disciplinas completos.

“Paradigm Cartel”



NBC NEWS

Allegations of fabricated research undermine key Alzheimer's theory

A six-month investigation by Science magazine uncovered evidence that images in the much-cited study, published 16 years ago in the journal Nature, may have been doctored.

2022-07-26|

GENE ONLINE

Billions of Research Dollars May Have Been Wasted Due to Fraudulent Alzheimer's Study

by Reed Slater

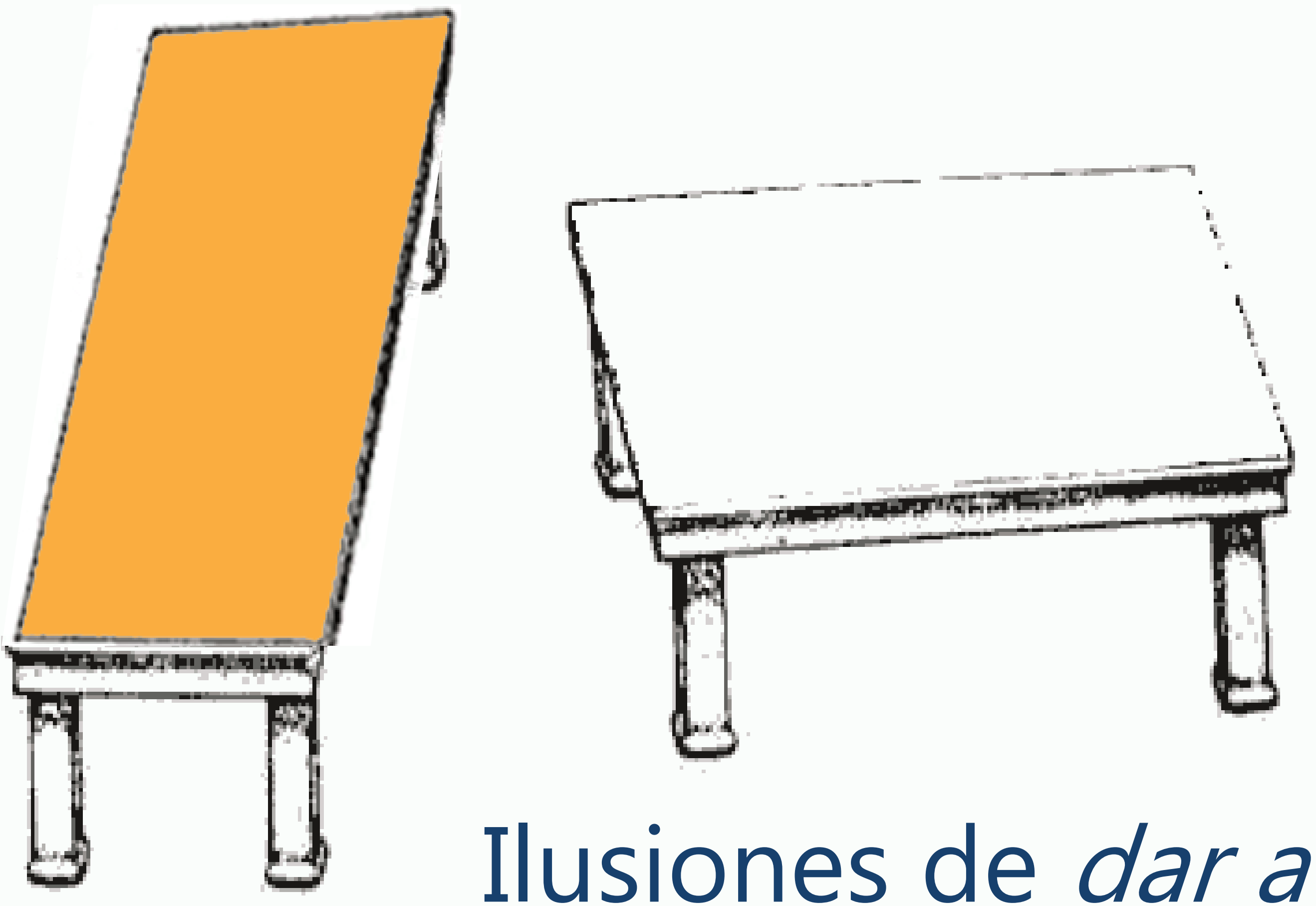
Share To

Minnesota Reformer "Paradigm Cartel"

Alzheimer's researcher alleged to have doctored images is leaving UMN

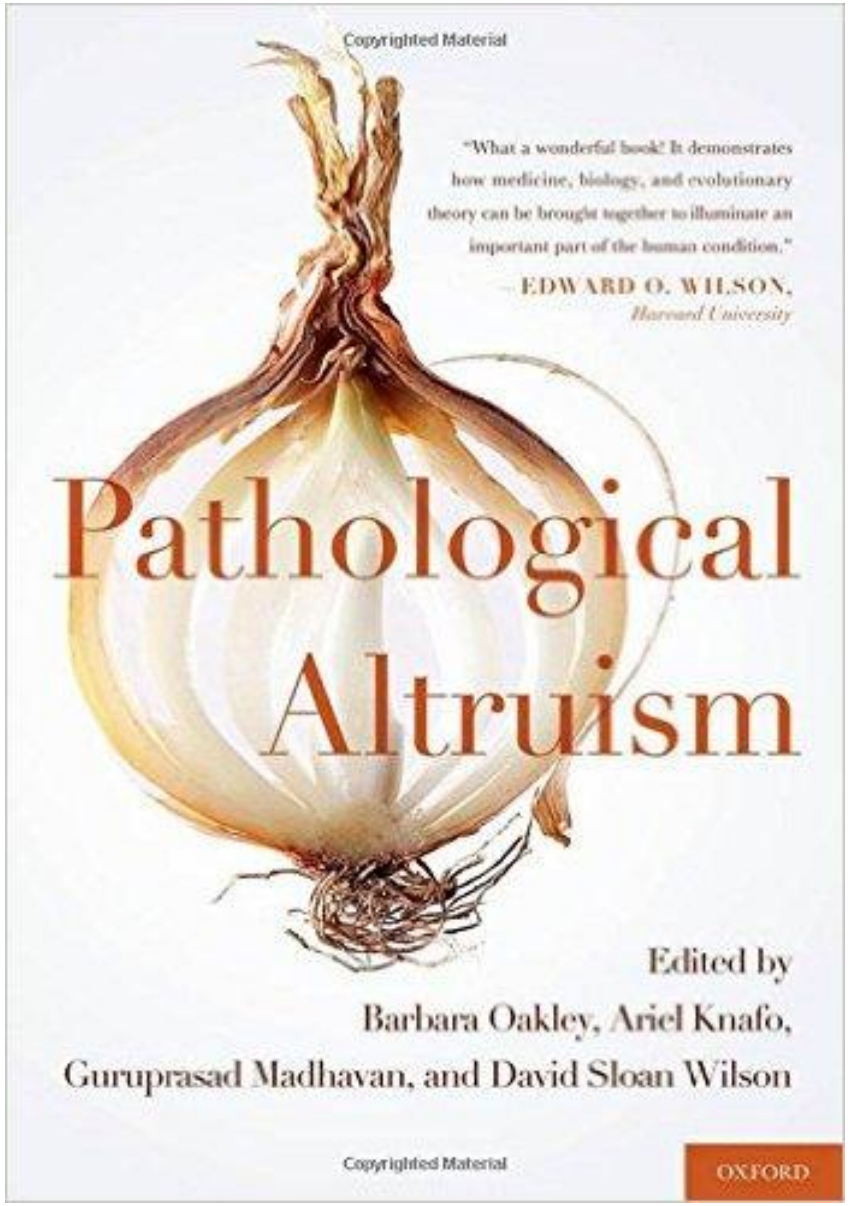
BY: **CHRISTOPHER INGRAHAM** - FEBRUARY 7, 2025 1:08 PM

Ilusiones ópticas



Ilusiones de *dar ayuda*

Optical illusion by Roger Shepard (“Turning the Tables”)



The New York Times

The Pathological Altruist Gives Till Someone Hurts

Basics
By NATALIE ANGIER OCT. 3, 2011

"un volumen muy académico, pero sorprevisamente ágil"

Proceedings of the National Academy of Sciences of the United States of America

Concepts and implications of altruism bias and pathological altruism

Barbara A. Oakley[1]

THE WALL STREET JOURNAL.

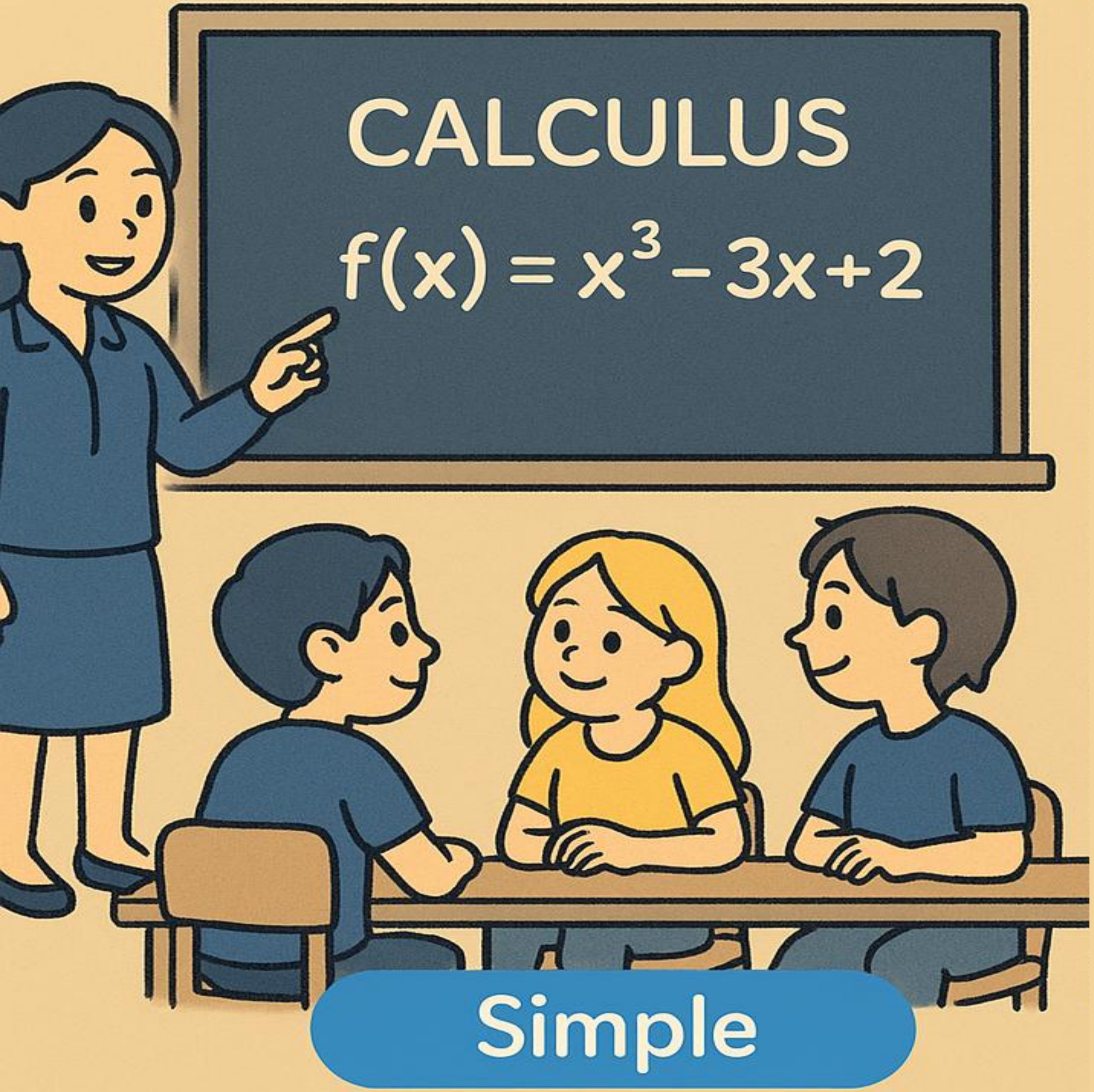
BEST OF THE WEB

Pathological Altruism

A simple concept that could revolutionize scientific and social thought.

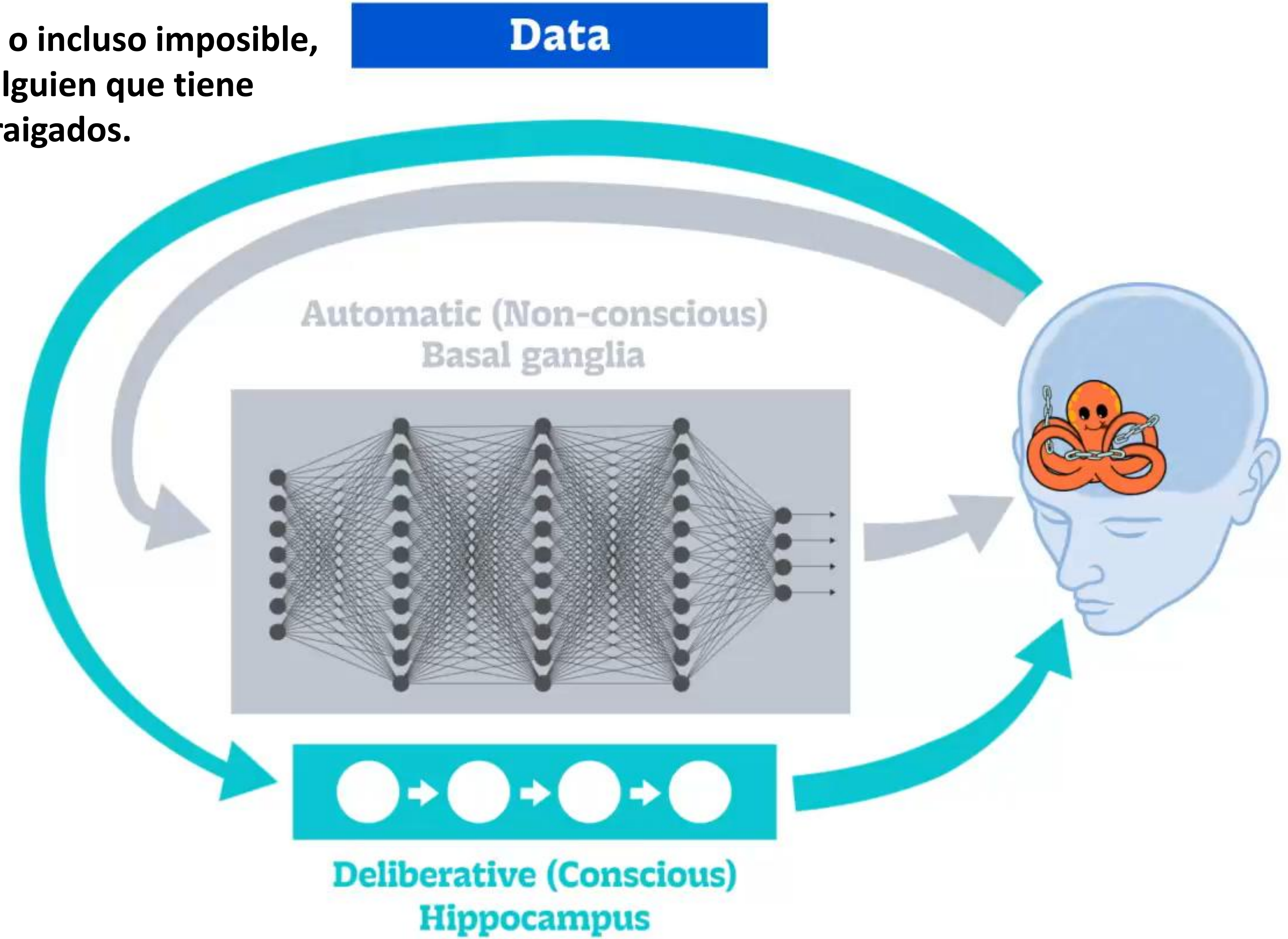
By *James Taranto*
June 14, 2013

Student-Centered



Por eso puede resultar difícil, o incluso imposible, discutir de forma lógica con alguien que tiene prejuicios profundamente arraigados.

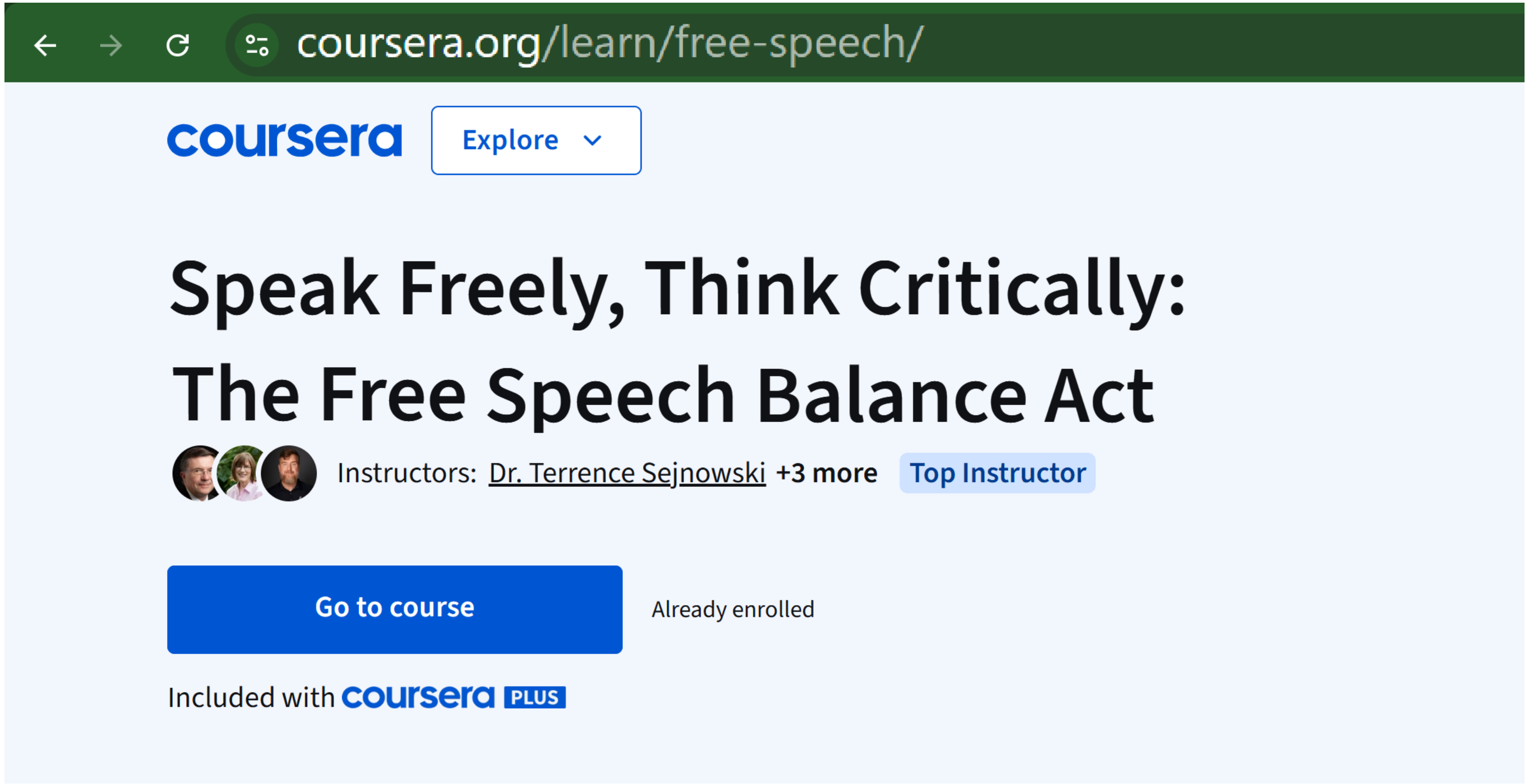
Esto también *te* incluye.



“Los espacios seguros” no son seguros

- Las universidades no pueden formar pensadores críticos y las empresas no pueden innovar cuando el desacuerdo se considera un peligro.

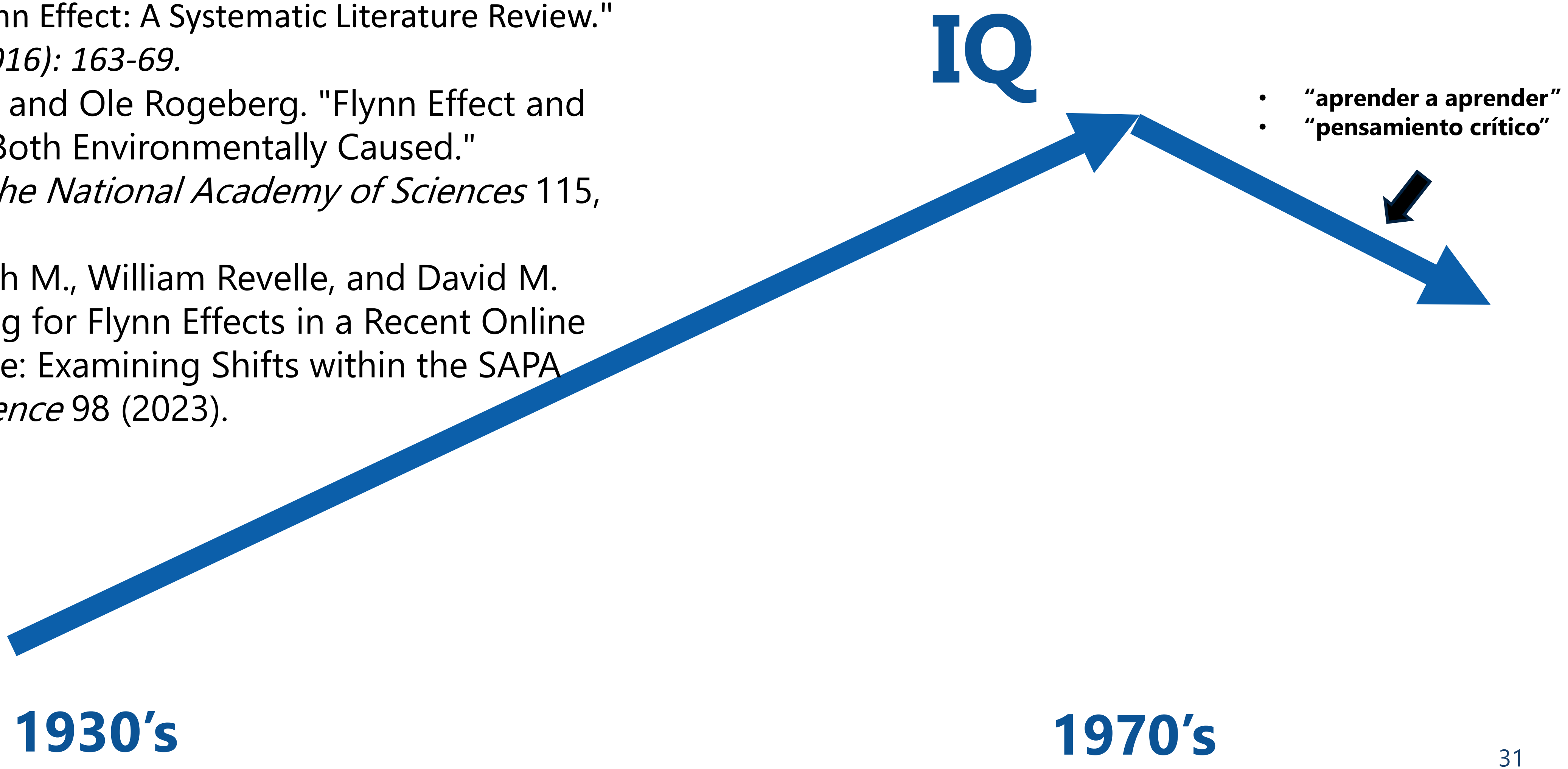
  - https://tinyurl.com/speak-freely-think-critically



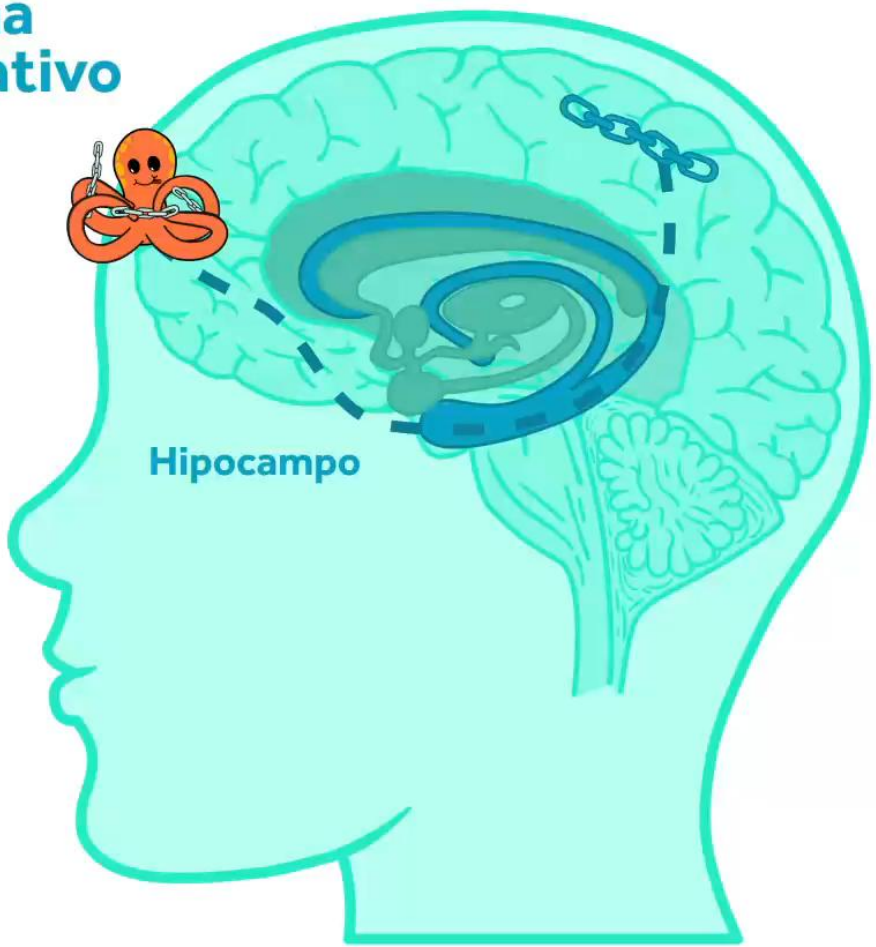
The Flynn Effect

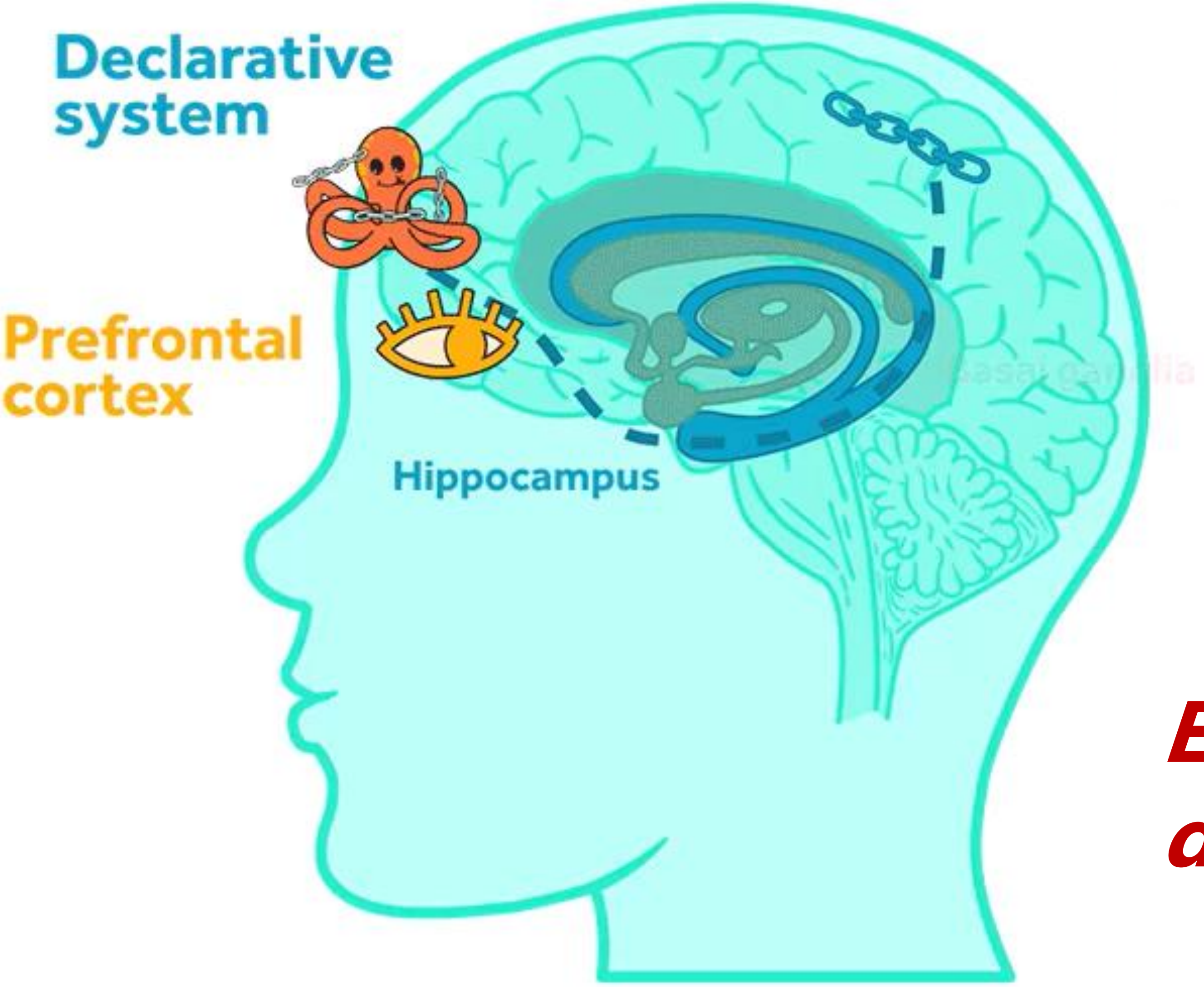
Flynn, James R. "The Mean IQ of Americans: Massive Gains 1932 to 1978." *Psychological Bulletin 95, no. 1 (1984): 29.*

- Dutton, Edward, Dimitri van der Linden, and Richard Lynn. "The Negative Flynn Effect: A Systematic Literature Review." *Intelligence 59 (2016): 163-69.*
- Bratsberg, Bernt, and Ole Rogeberg. "Flynn Effect and Its Reversal Are Both Environmentally Caused." *Proceedings of the National Academy of Sciences* 115, no. 26 (2018):
- Dworak, Elizabeth M., William Revelle, and David M. Condon. "Looking for Flynn Effects in a Recent Online U.S. Adult Sample: Examining Shifts within the SAPA Project." *Intelligence* 98 (2023).



Sistema declarativo





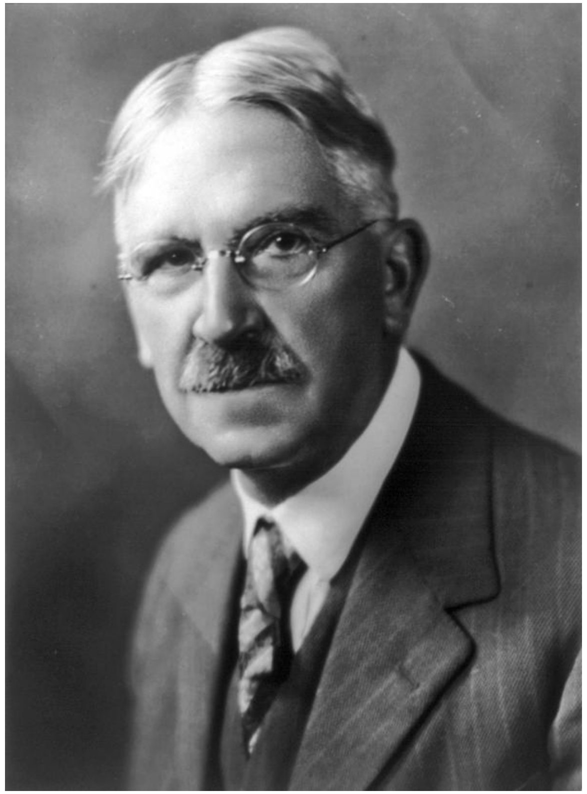
Sistema automático

¿Dónde va el conocimiento?

¿Dónde están las habilidades?

El cerebro no hace la distinción

Jean Piaget
1896 - 1980



John Dewey
1859–1952

Maria Montessori
1870–1952

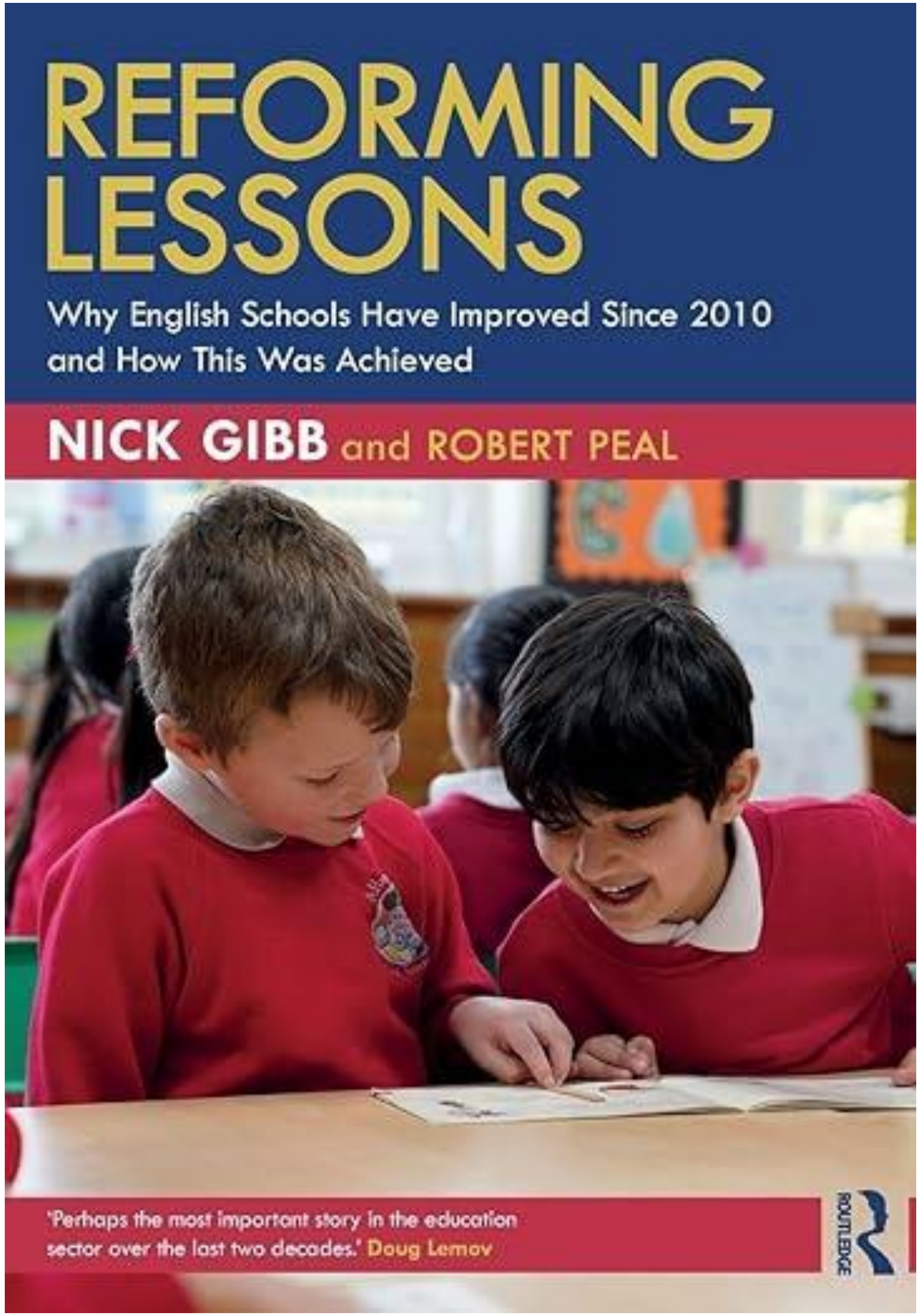
Lev Vygotsky
1896–1934

Sentiment Analysis of "Rote" Over Time

¿Qué pasaría si enseñáramos otras asignaturas de la misma manera que enseñamos la «neurociencia» en educación?

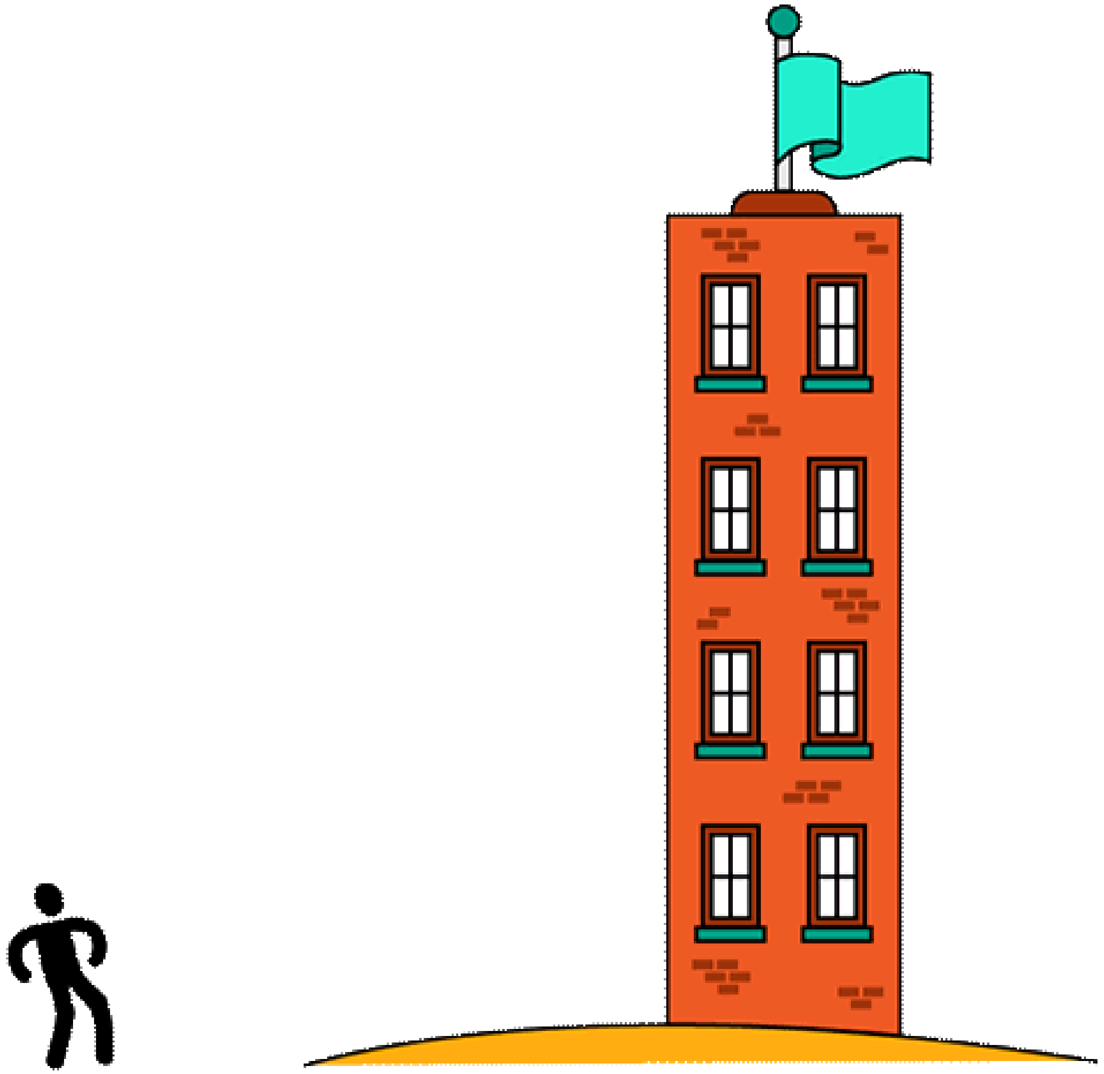
- **“Mitos de las matemáticas”**
- **“Mitos de la historia”**
- **“Mitos de la biología”**

¡Enseñar solo “neuromitos” no es enseñar neurociencias!



¡Hay esperanza para el futuro de la educación!

Ratones con sistemas dopaminérgicos inactivos *no pueden aprender nada nuevo.*



nature COMMUNICATIONS

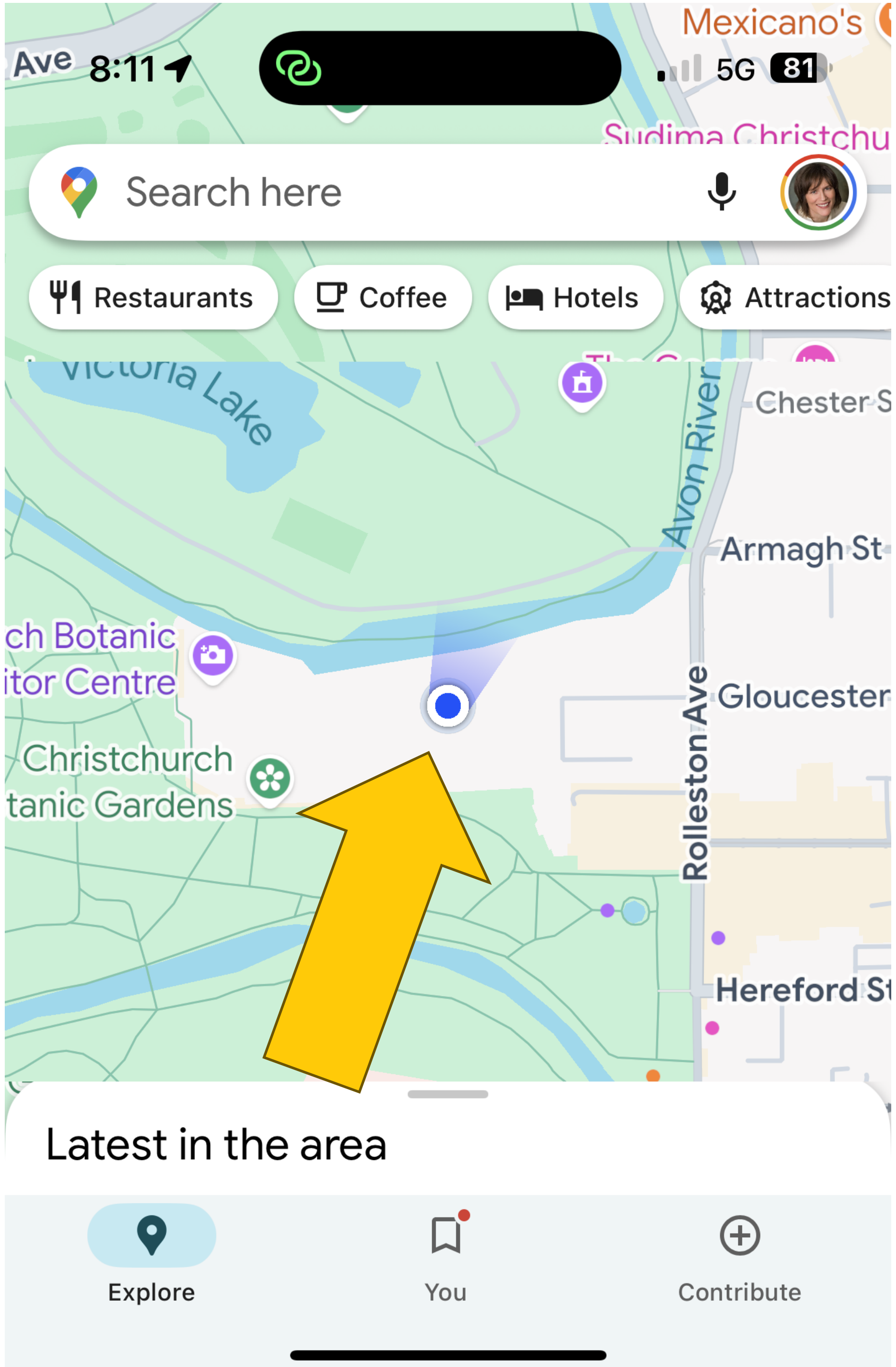
(2019)10:4646

https://doi.org/10.1038/s41467-019-12552-4 OPEN

The Eighty Five Percent Rule for optimal learning

Robert C. Wilson[1,2*], Amitai Shenhav[3,4], Mark Straccia[5] & Jonathan D. Cohen[6]

Researchers and educators have long wrestled with the question of how best to teach their clients be they humans, non-human animals or machines. Here, we examine the role of a single variable, the difficulty of training, on the rate of learning. In many situations we find that there is a sweet spot in which training is neither too easy nor too hard, and where learning progresses most quickly. We derive conditions for this sweet spot for a broad class of learning algorithms in the context of binary classification tasks. For all of these stochastic gradient-descent based learning algorithms, we find that the optimal error rate for training is around 15.87% or, conversely, that the optimal training accuracy is about 85%. We demonstrate the efficacy of this 'Eighty Five Percent Rule' for artificial neural networks used in AI and biologically plausible neural networks thought to describe animal learning.



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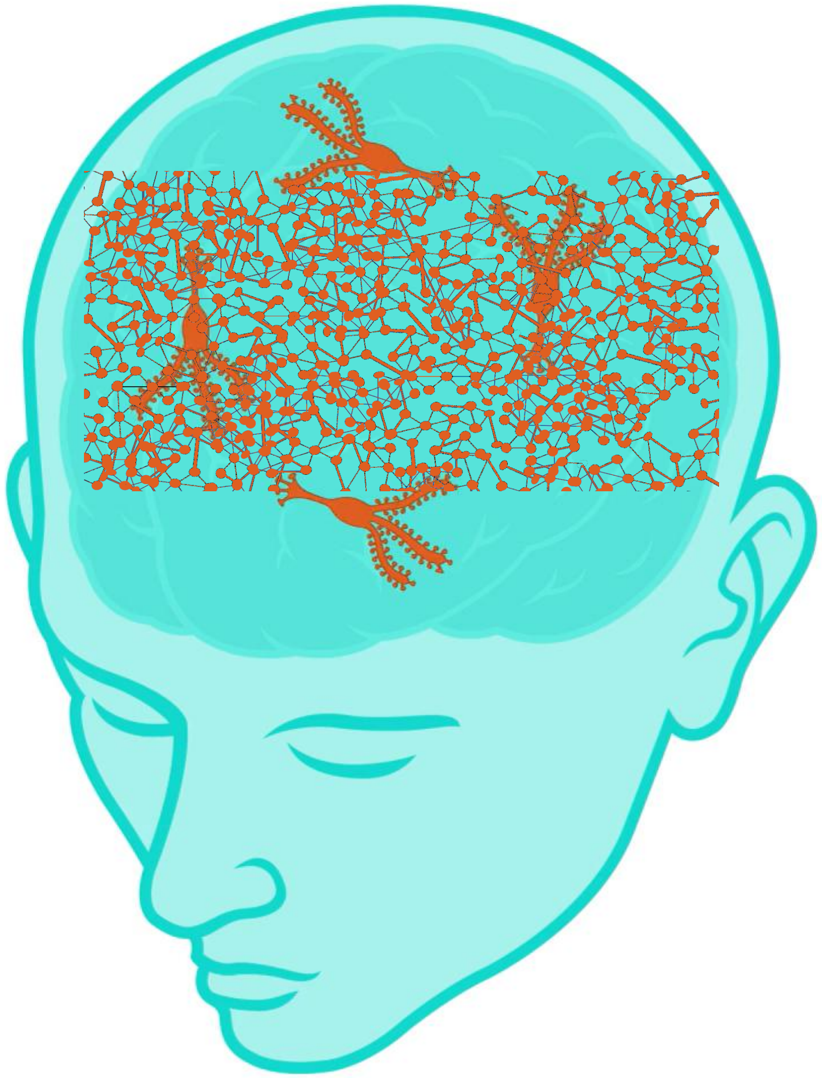
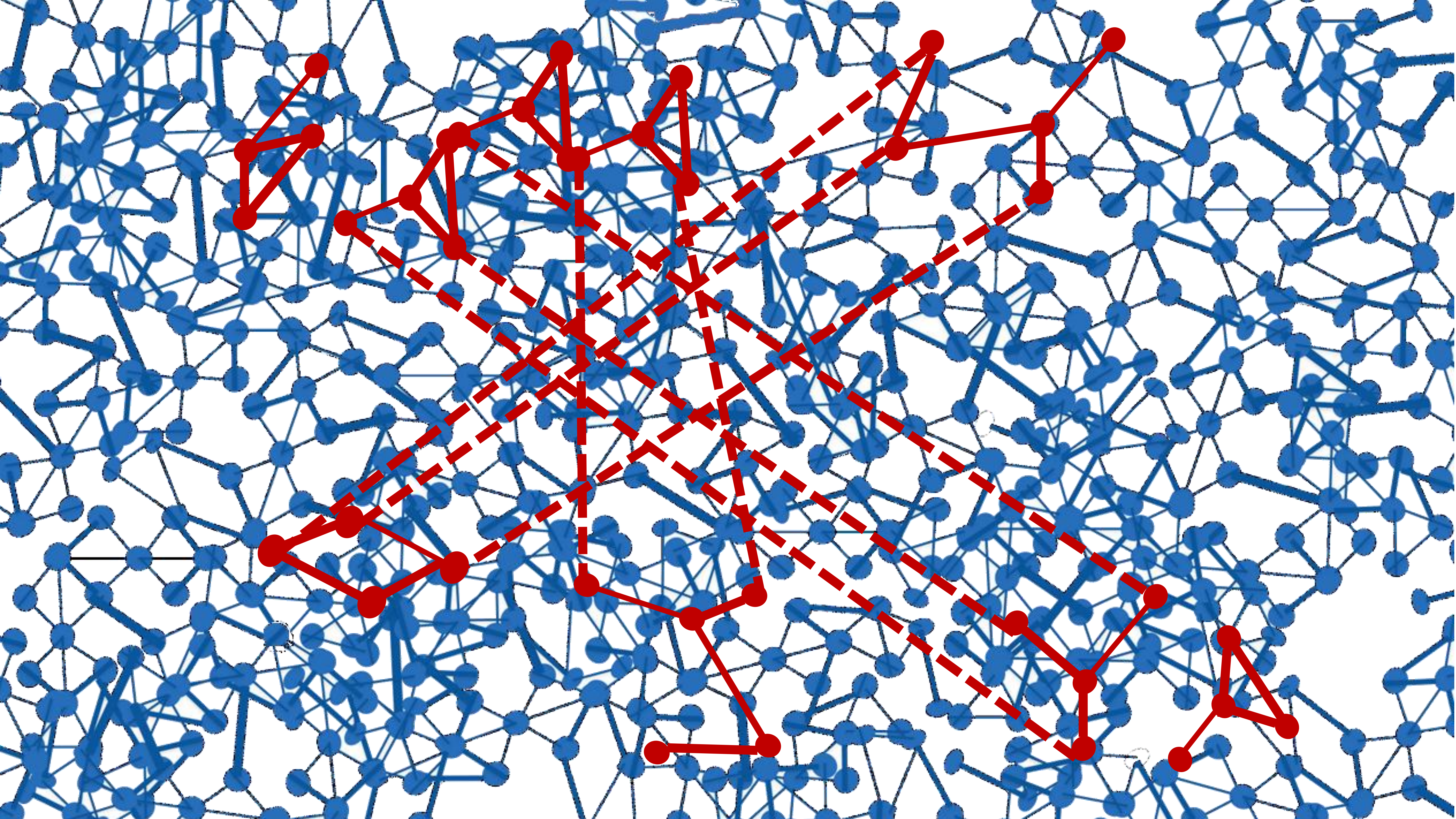
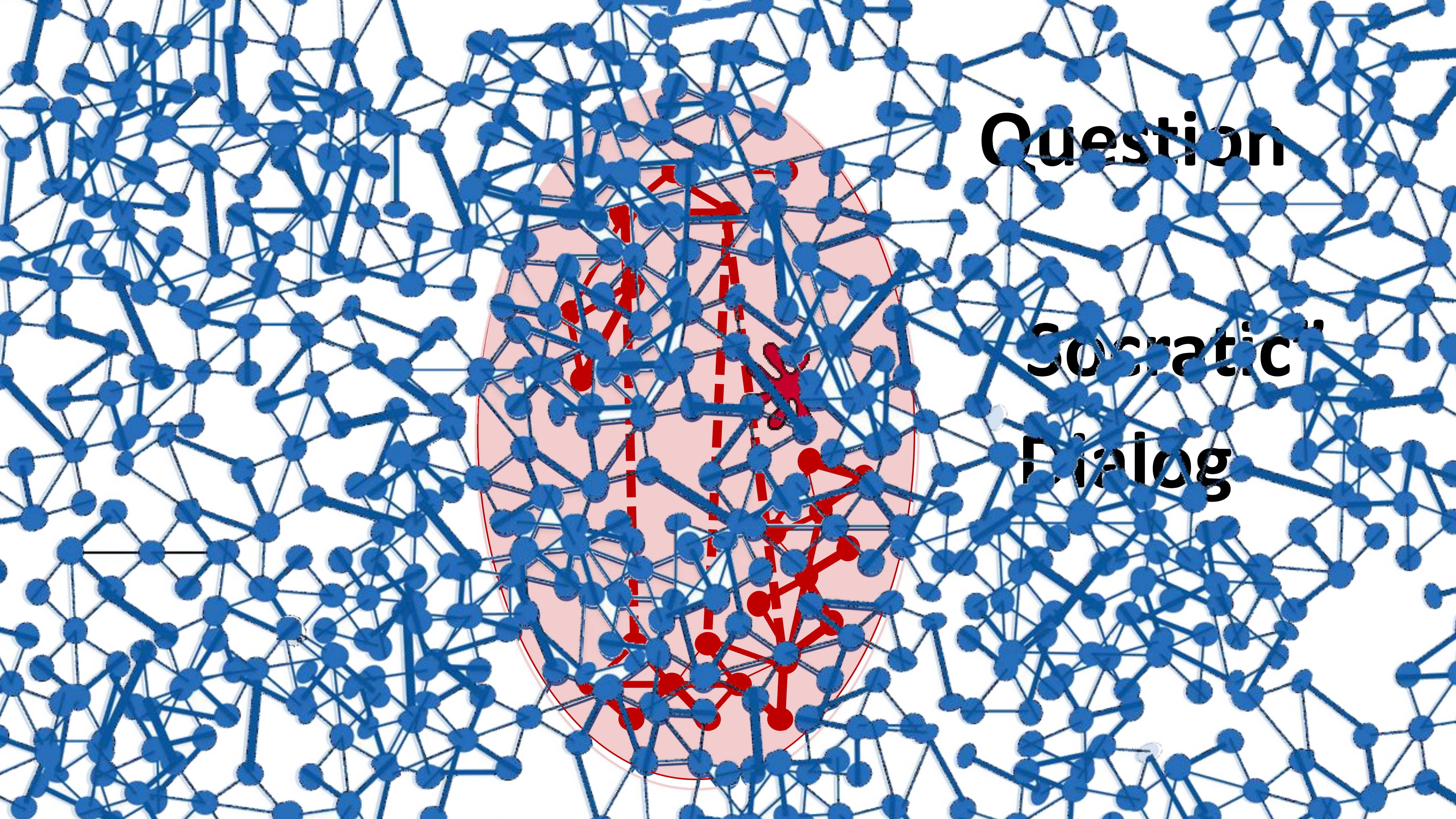
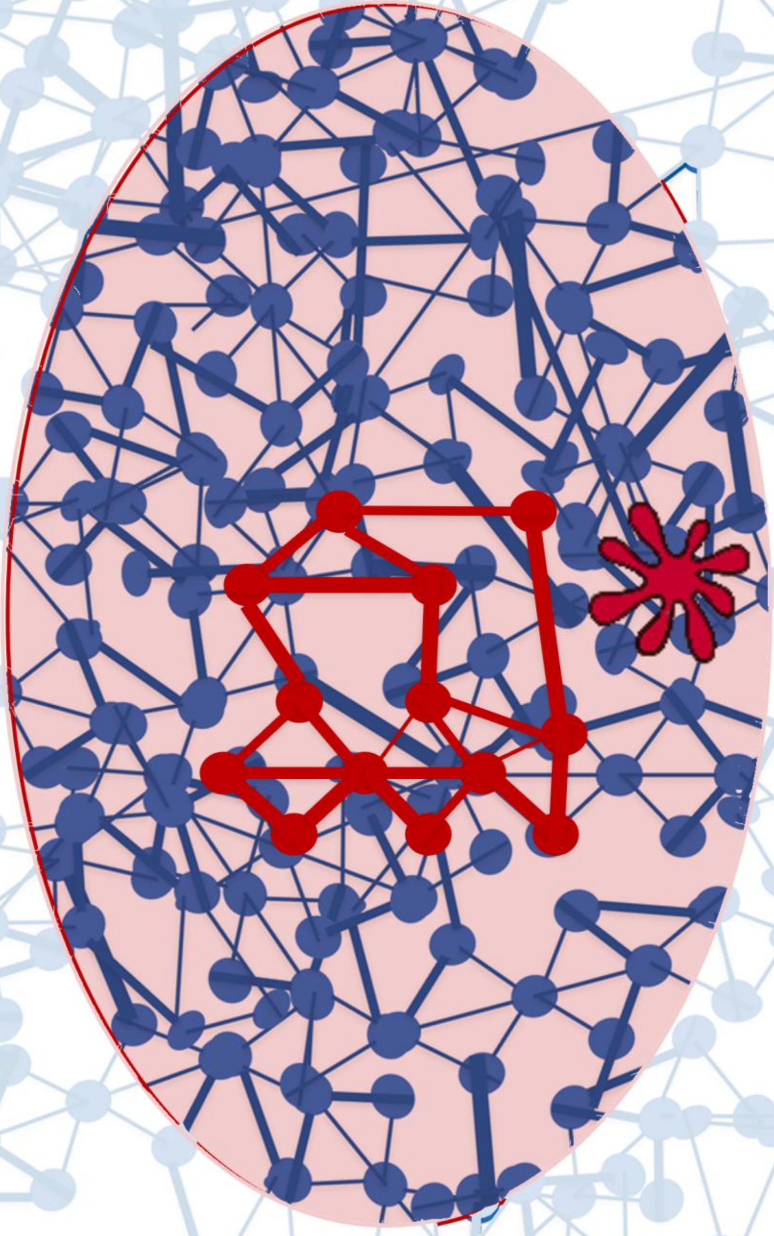
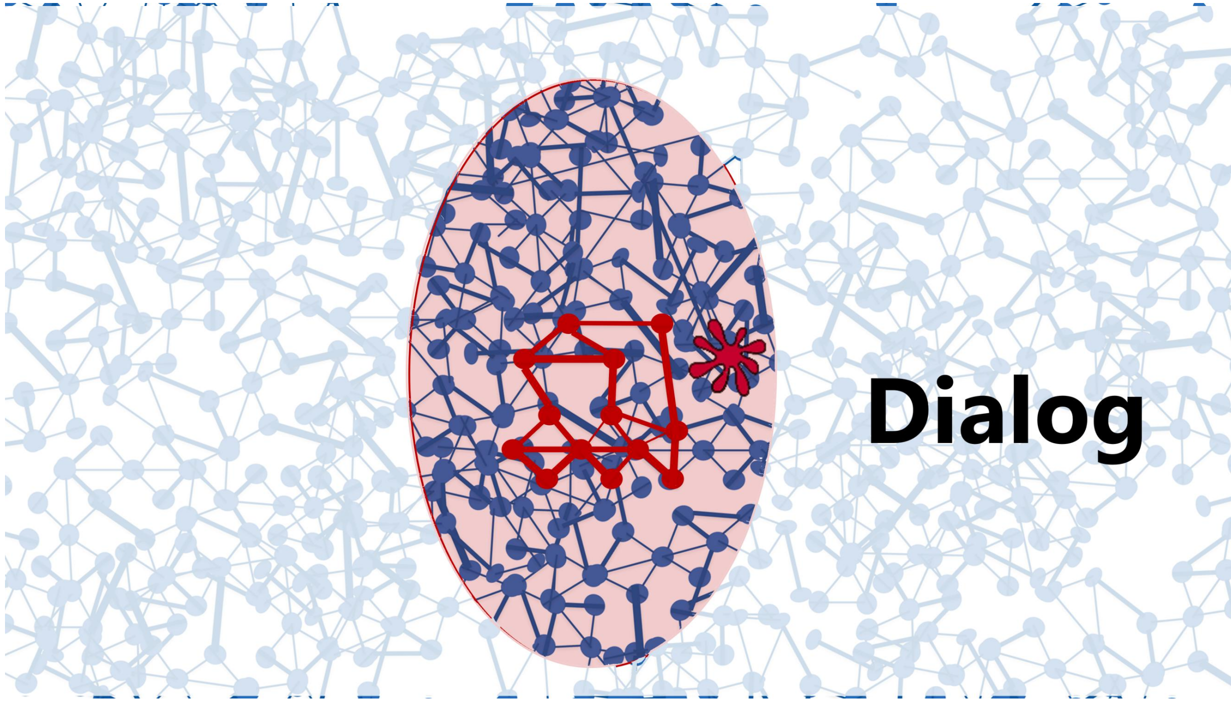


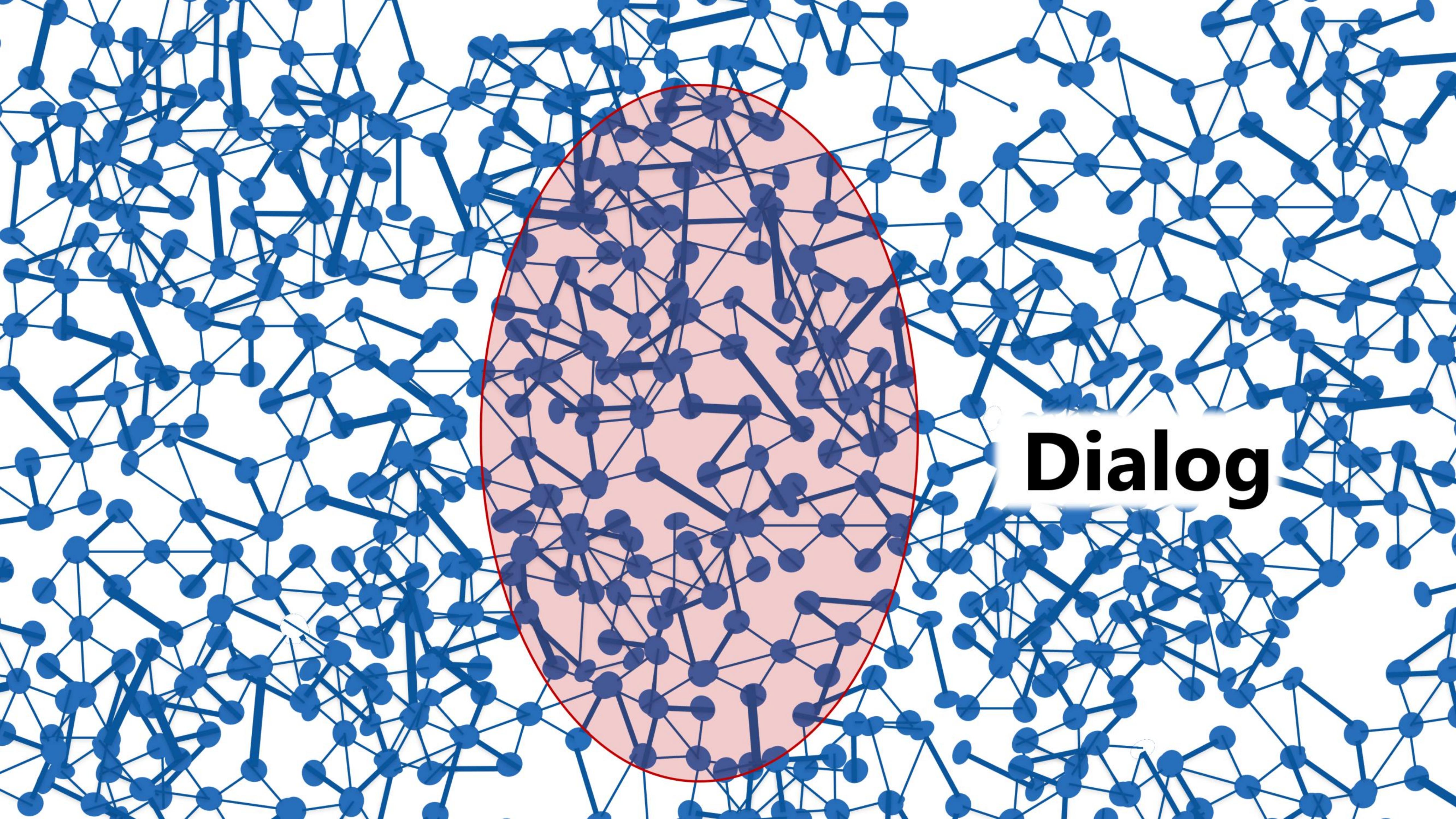



Question
Socratic
Dialog



Dialog


Dialog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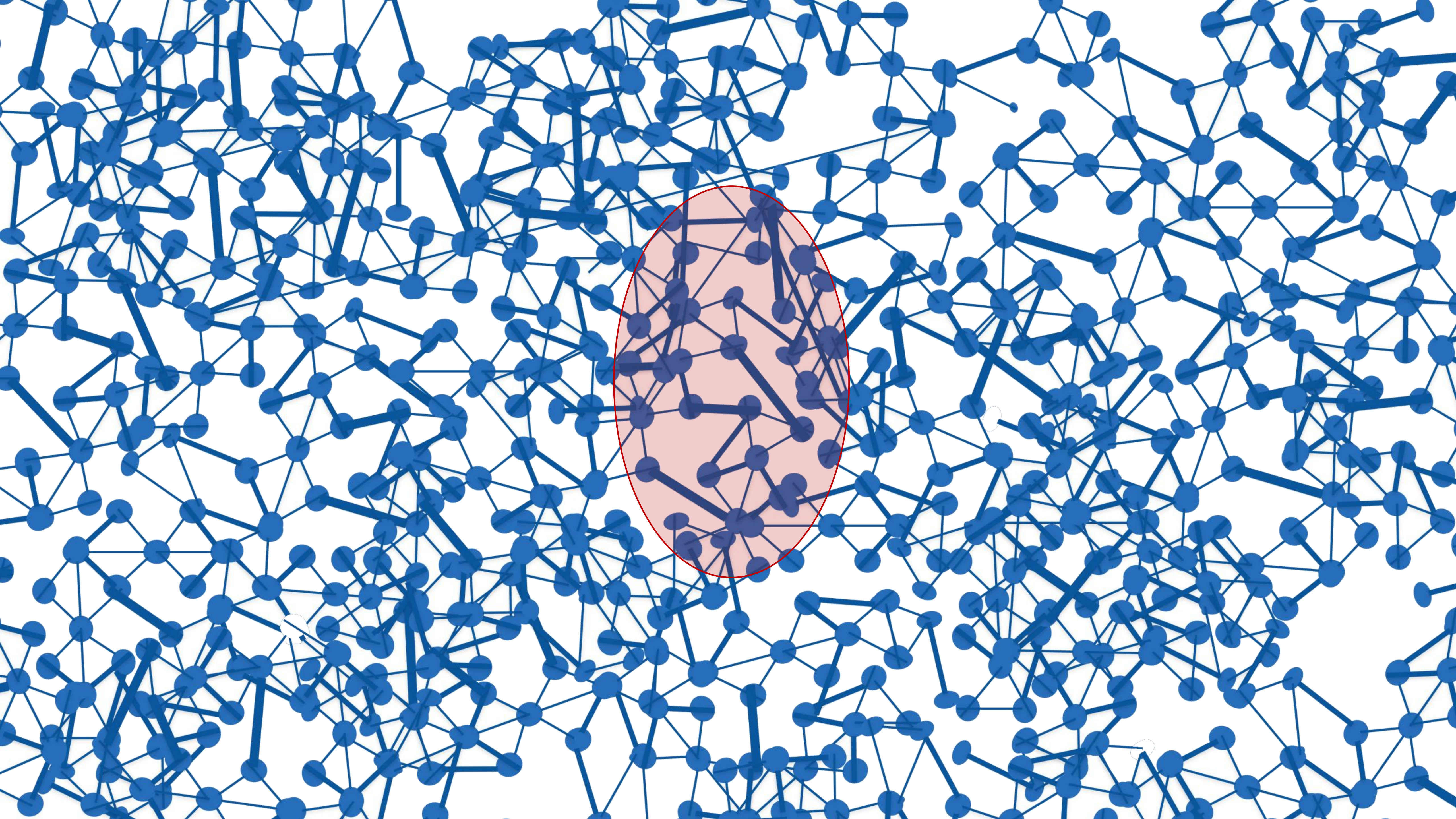

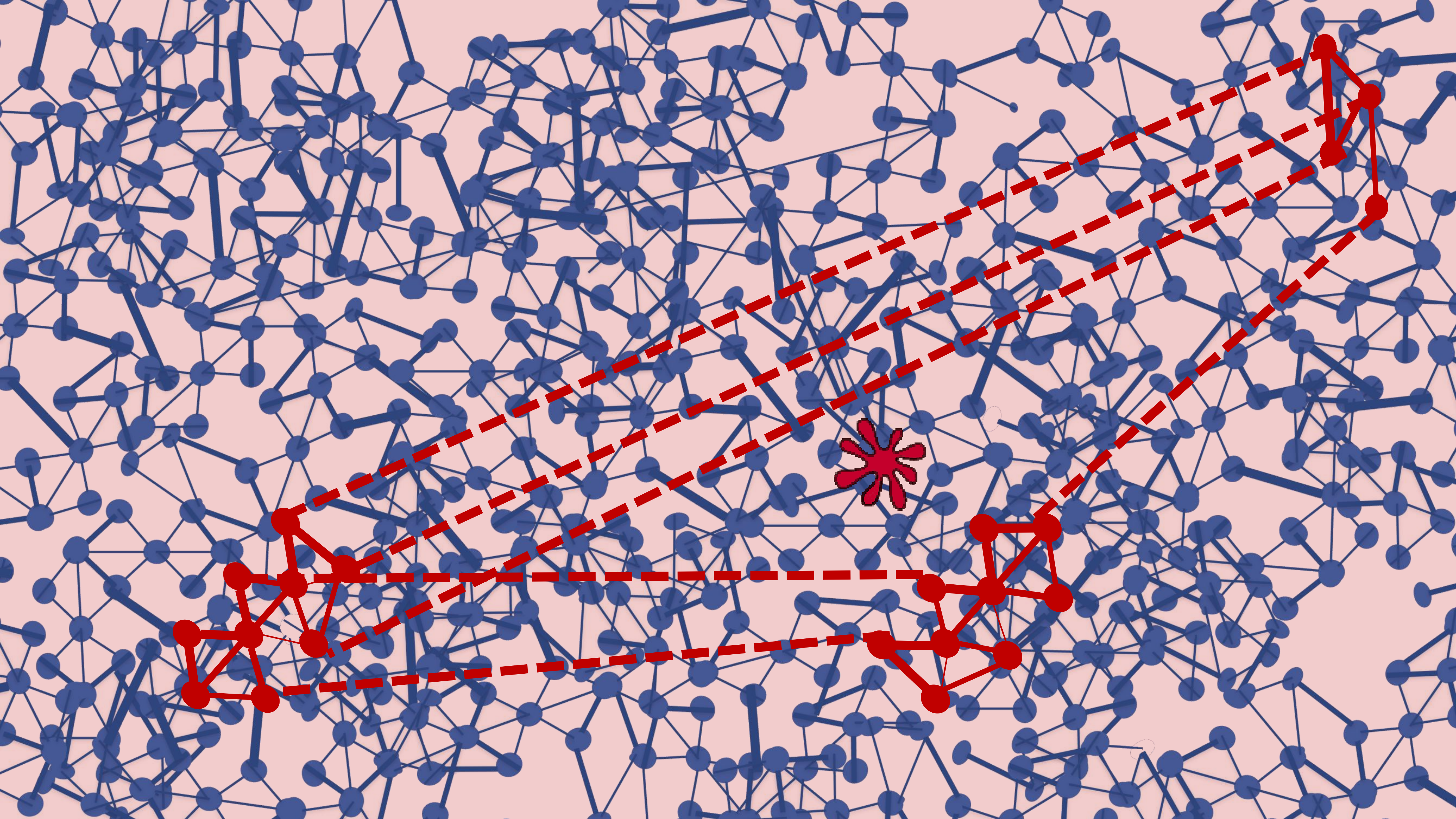

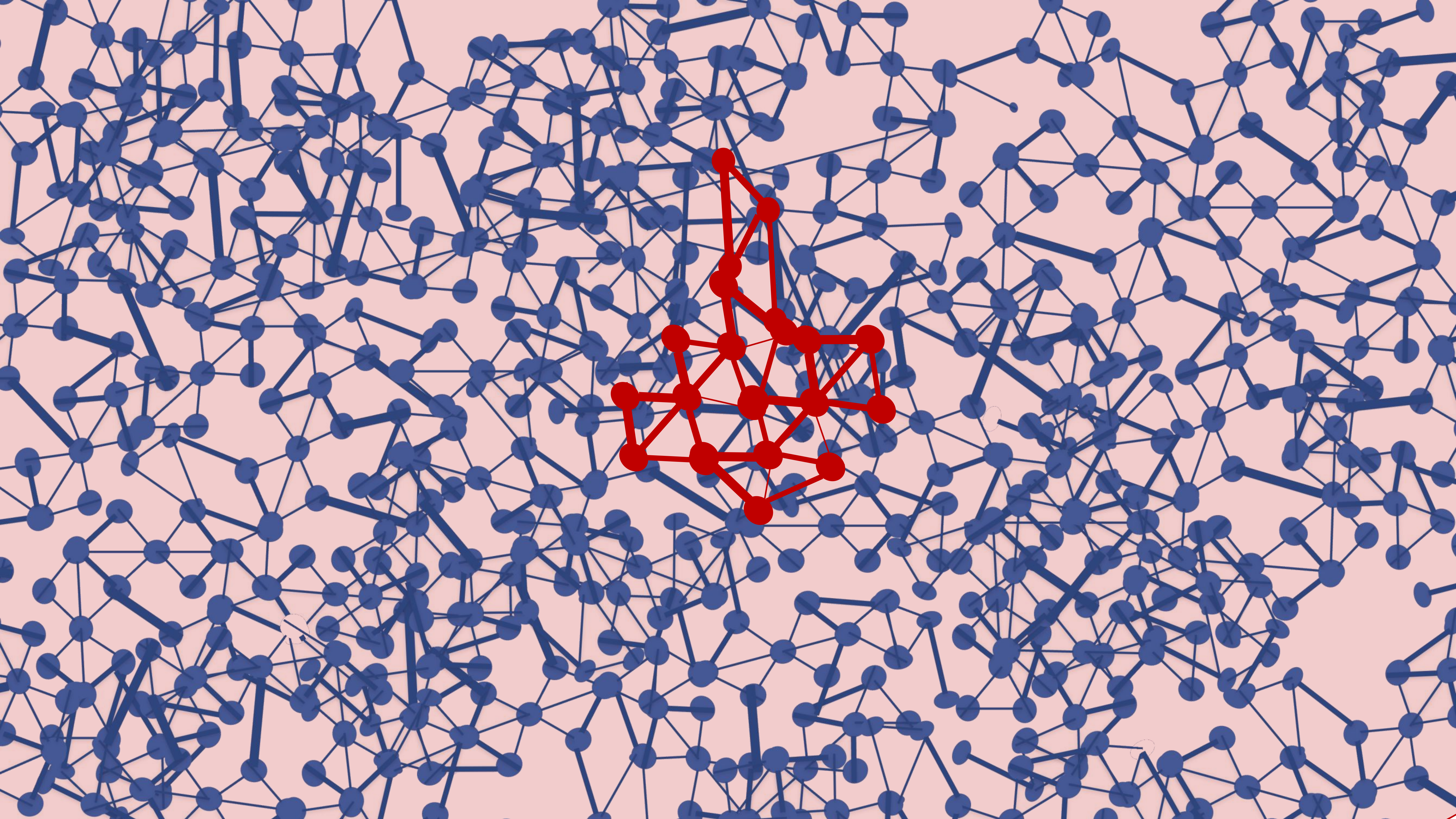

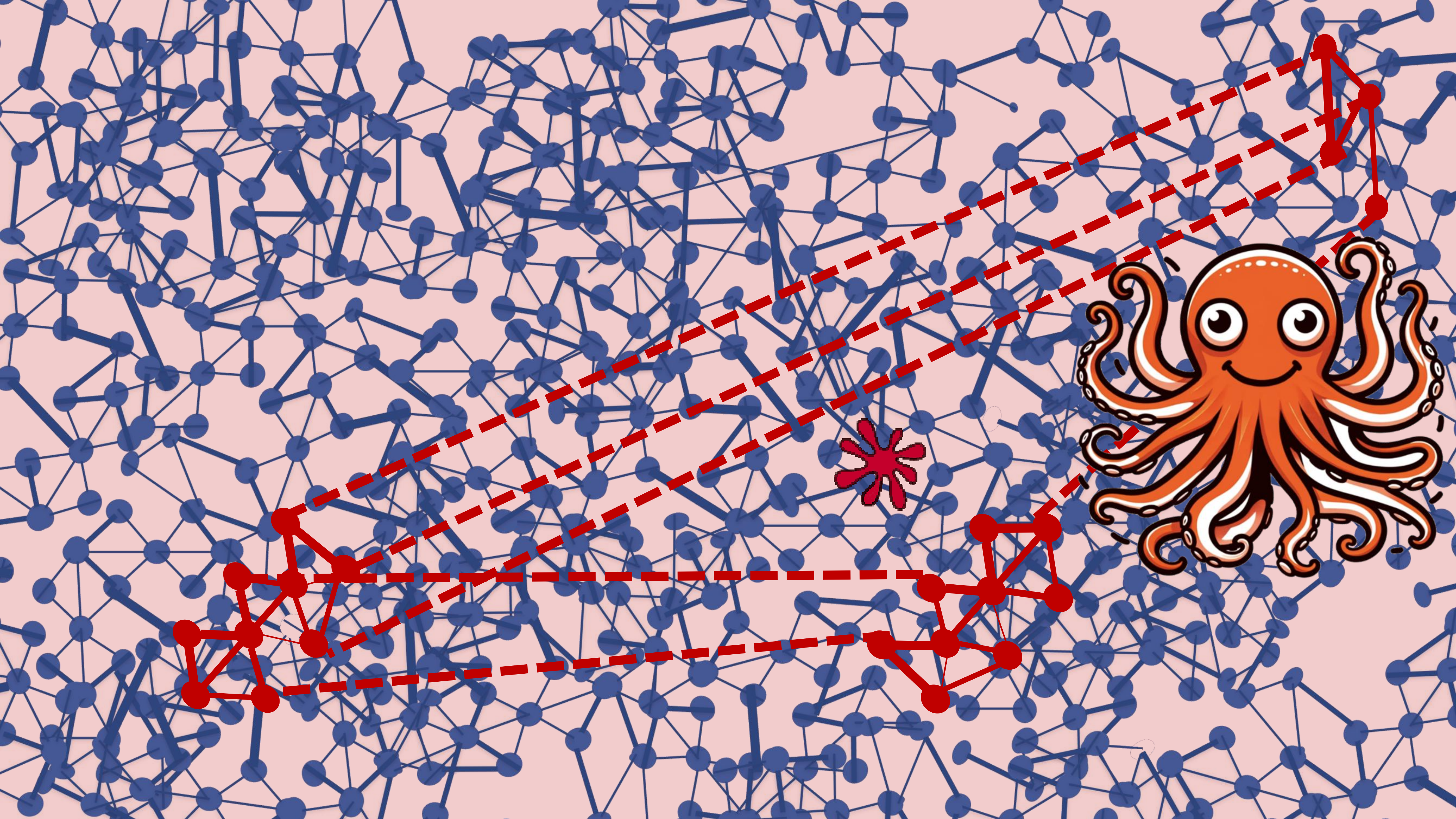

La IA muestra

Pero yo soy quien realmente SABE!

Links to:

- This PowerPoint
- Our (readable!) research paper on the dangers of cognitive offloading
- (“The Memory Paradox”)
- Related further online courses
- Survey

https://forms.gle/pDxiyRw3ZYzHBaQ29