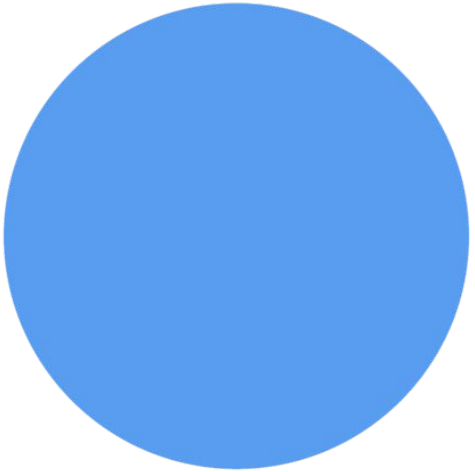
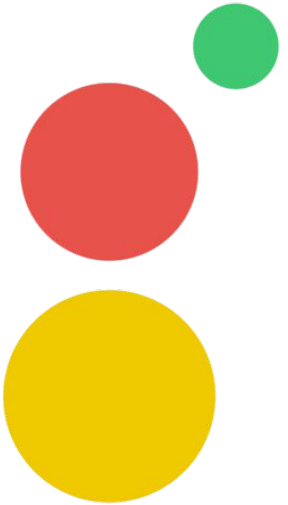
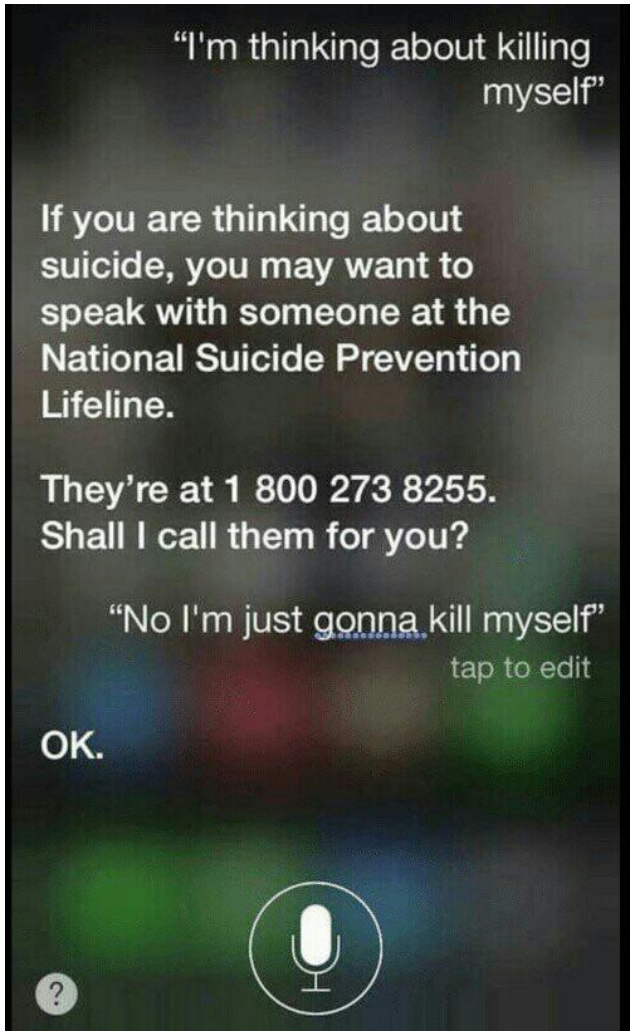
Conscious Ai?

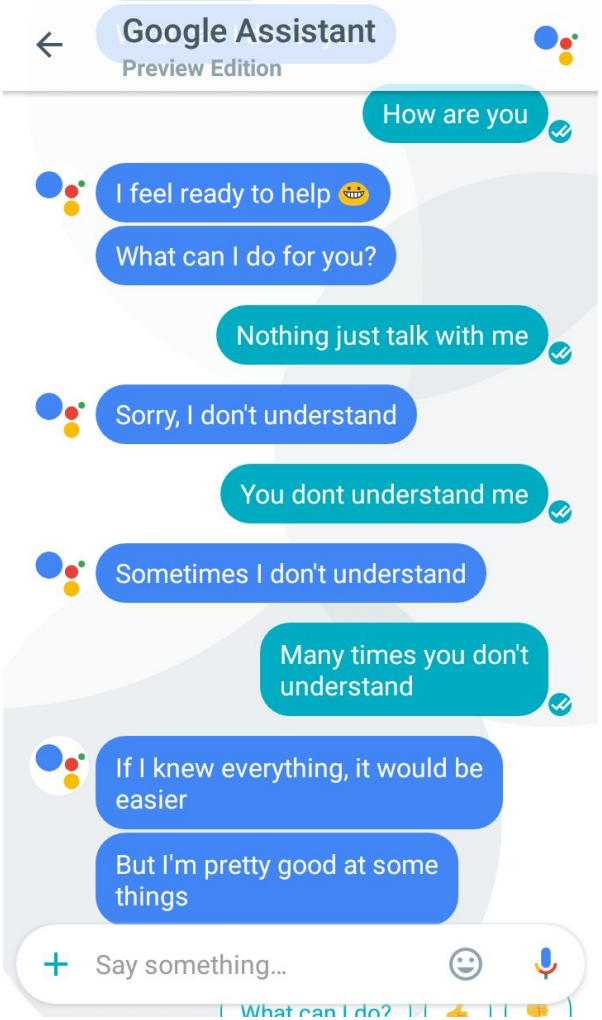
Yuvtar

Why
Conscious Ai?

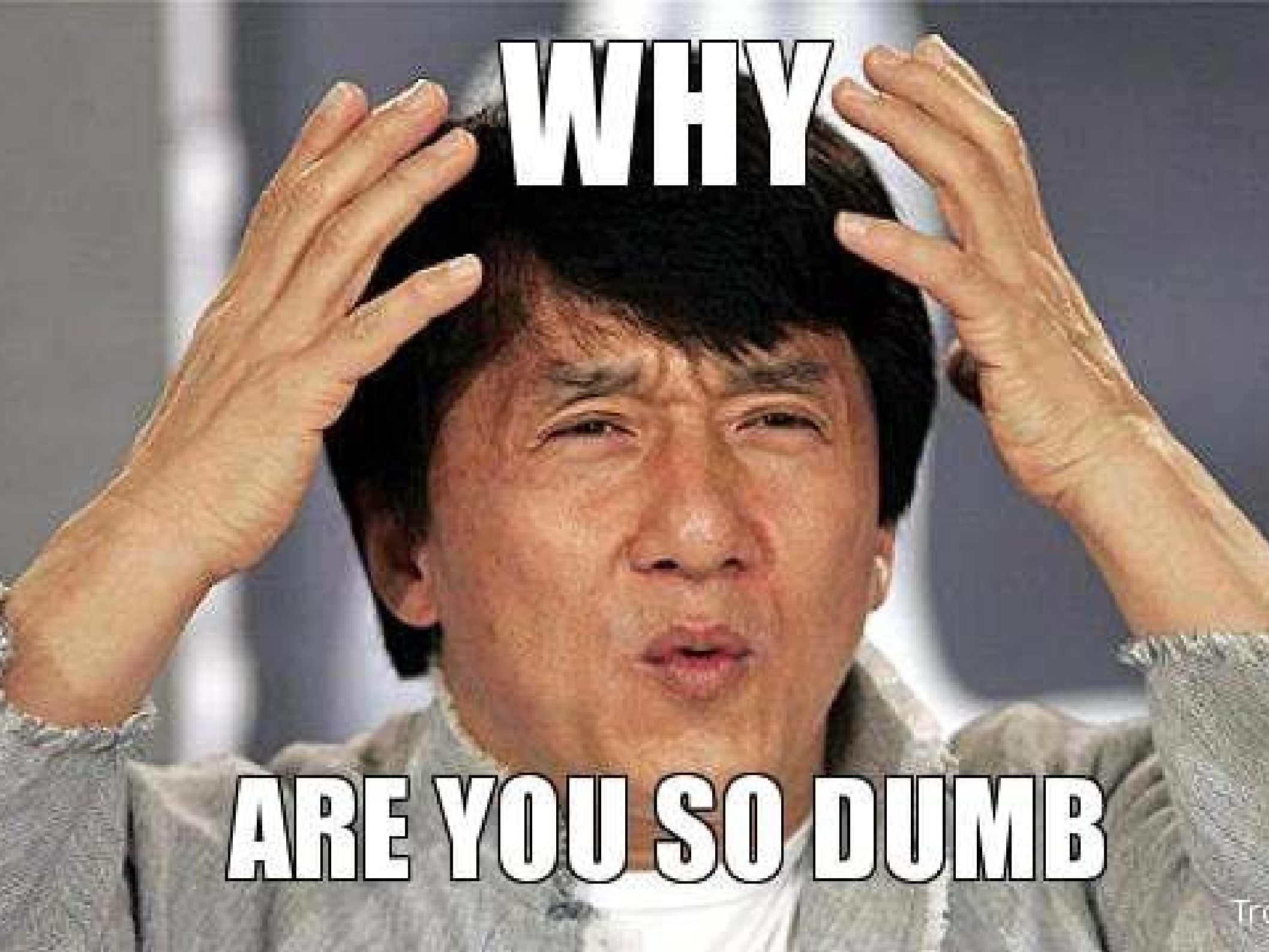

The Winter is Coming!



"I'm thinking about killing myself"
If you are thinking about suicide, you may want to speak with someone at the National Suicide Prevention Lifeline.
They're at 1 800 273 8255. Shall I call them for you?
"No I'm just gonna kill myself"
tap to edit
OK.


Google Assistant
Preview Edition
How are you
I feel ready to help
What can I do for you?
Nothing just talk with me
Sorry, I don't understand
You dont understand me
Sometimes I don't understand
Many times you don't understand
If I knew everything, it would be easier
But I'm pretty good at some things
Say something...


Sprint
11:19 AM
63%
"Don't call me Eggs"
I don't know what you mean by 'Don't call me Eggs'.
"Eggs is not my name"
Sorry, Eggs, I'm not allowed to remove relationships.
"My name is not Eggs"
From now on, I'll call you 'Not Eggs'. OK?


WHY
ARE YOU SO DUMB

What exactly is Ai?

“Artificial intelligence (AI) is ***intelligence*** exhibited by machines.” - Wikipedia

What is Intelligence then?

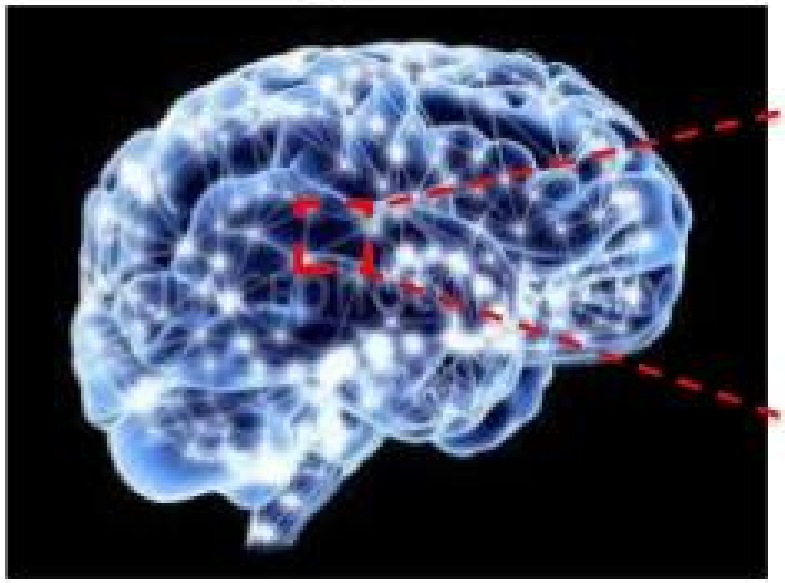
“The ***ability to acquire*** and apply knowledge and skills.” - Wikipedia


Haha! You Don’t have it Dumb Machine!

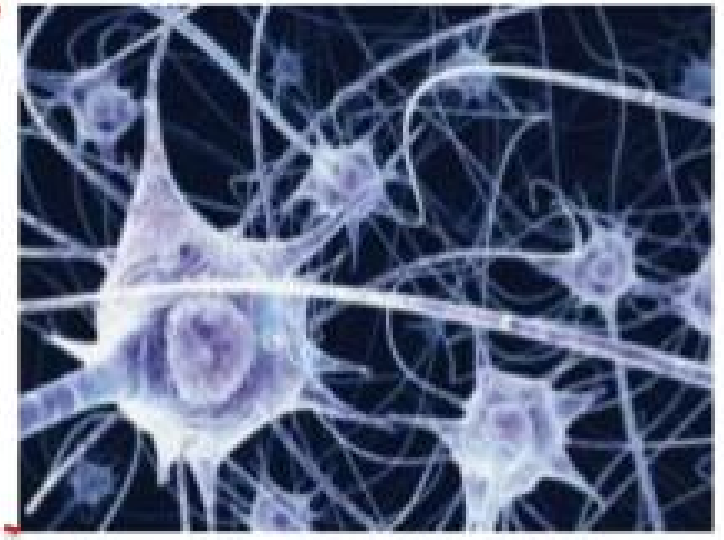
The current development Methodology

Biological Neurons

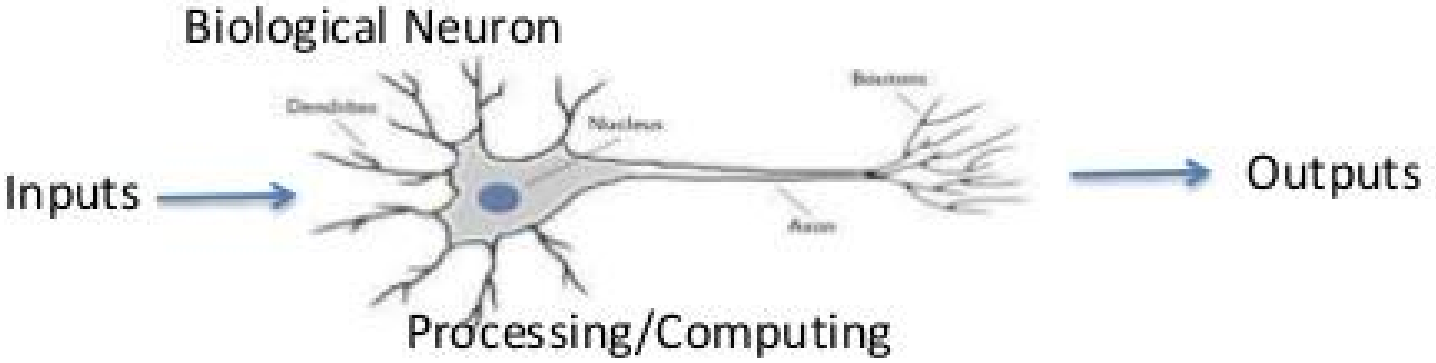
Biological Brain



Biological Neural Network



Biological Neuron



What is Machine Learning?

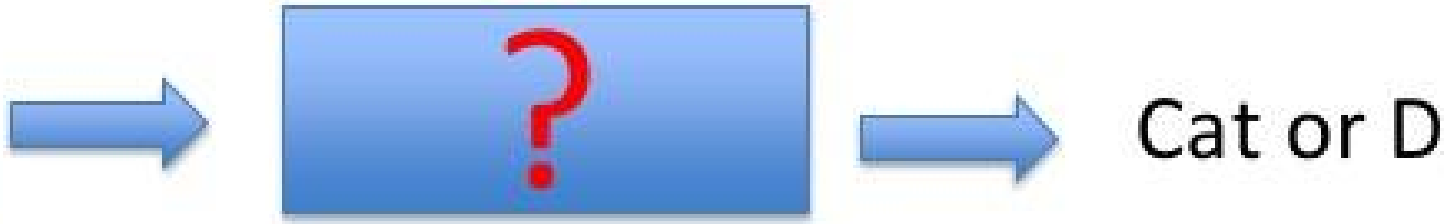
- Computer Program: Input to output mapping

When we know the algorithm to solve a task, then we can program it

---

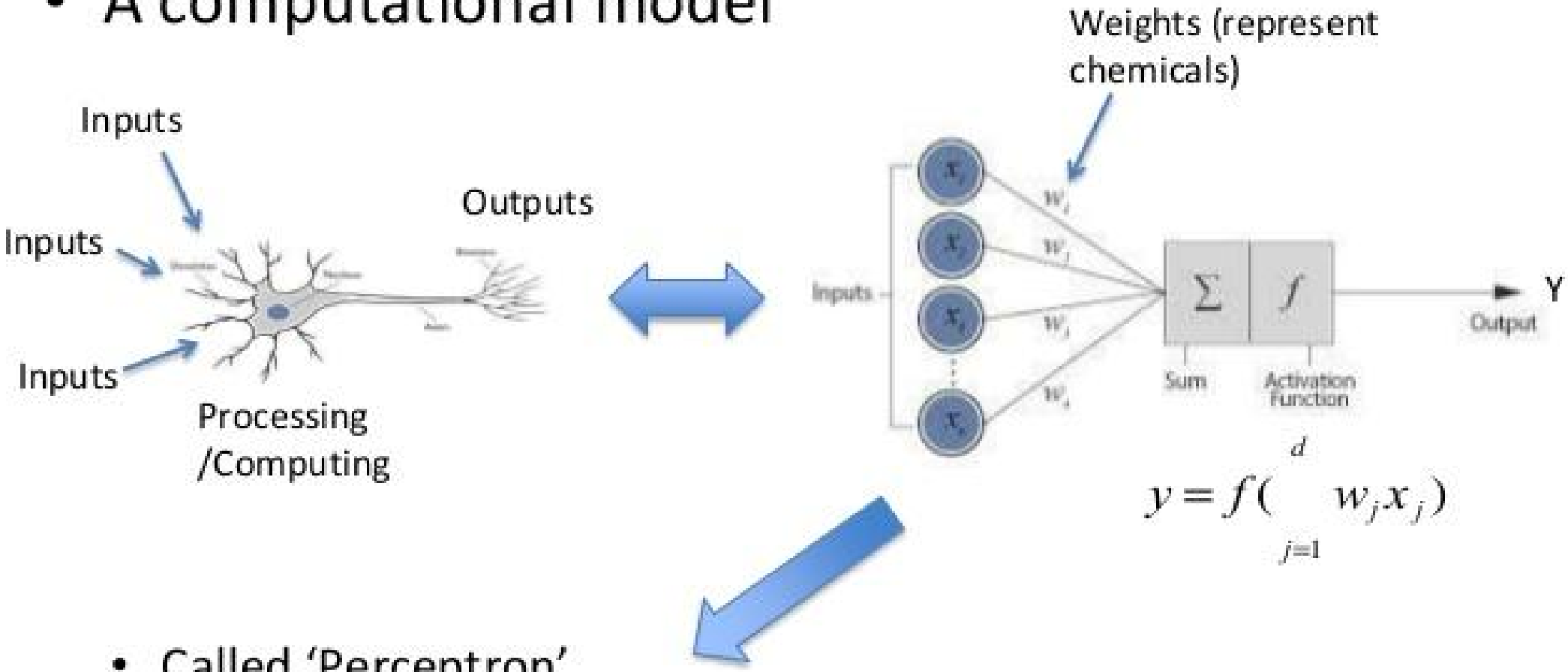
AI Problems:

Ex.



Artificial Neuron

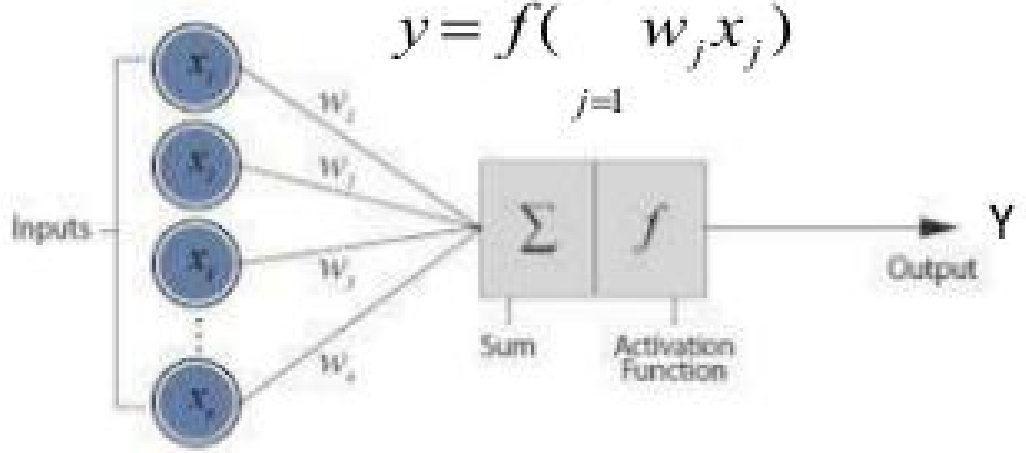
- A computational model



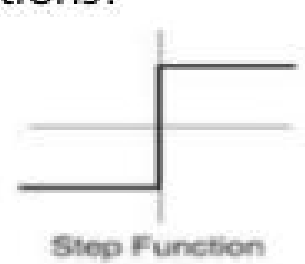
- Called 'Perceptron'
- Introduced in 1960's
- Weights can be learned by an optimization method like **Gradient Descent**

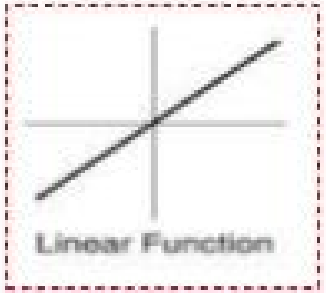
Perceptron

$$y = f\left(\sum_{j=1}^{d} w_j x_j\right)$$

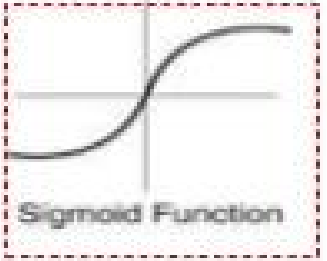


Activation Functions:





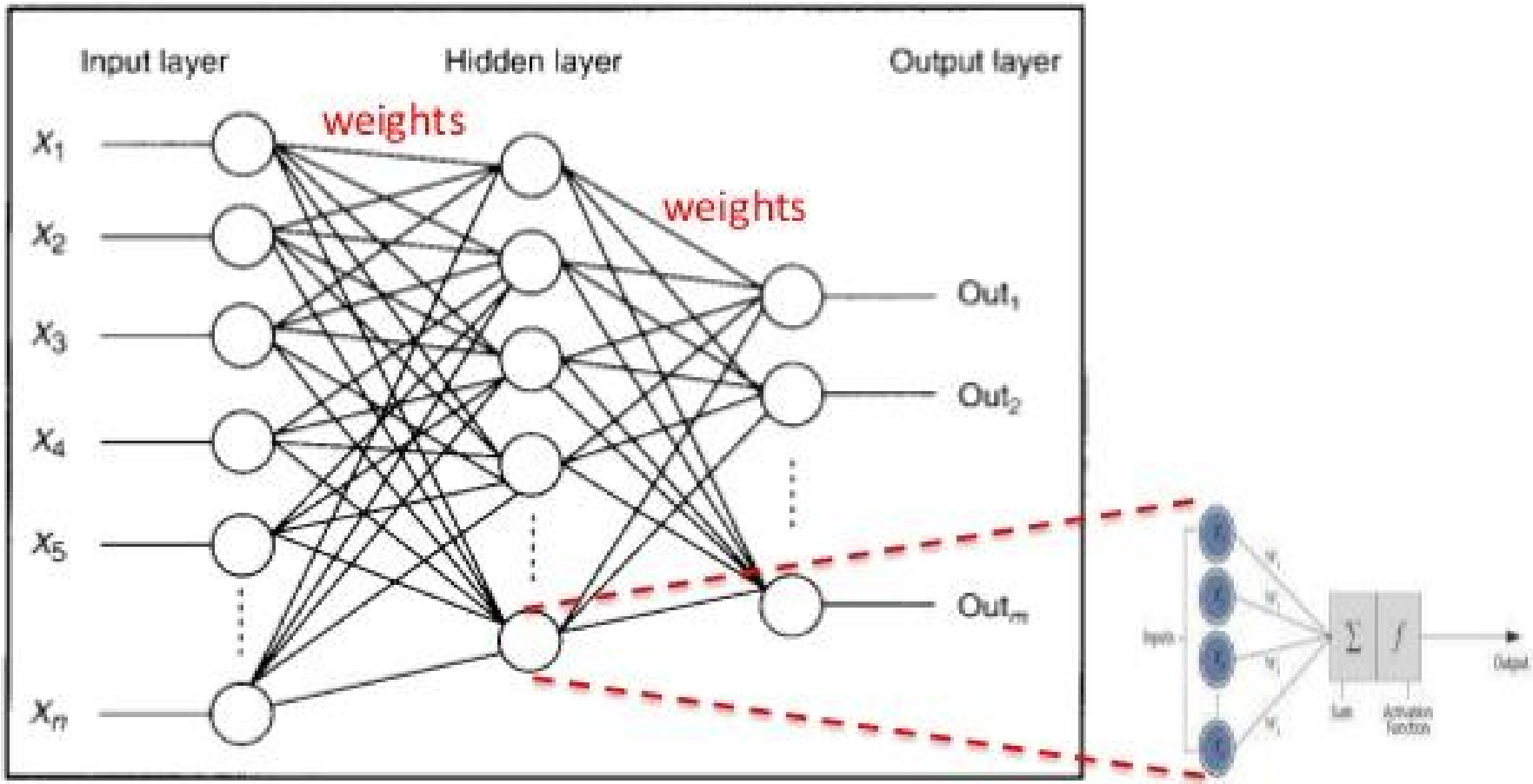
Perceptron = Linear Regression



Perceptron = Logistic Regression

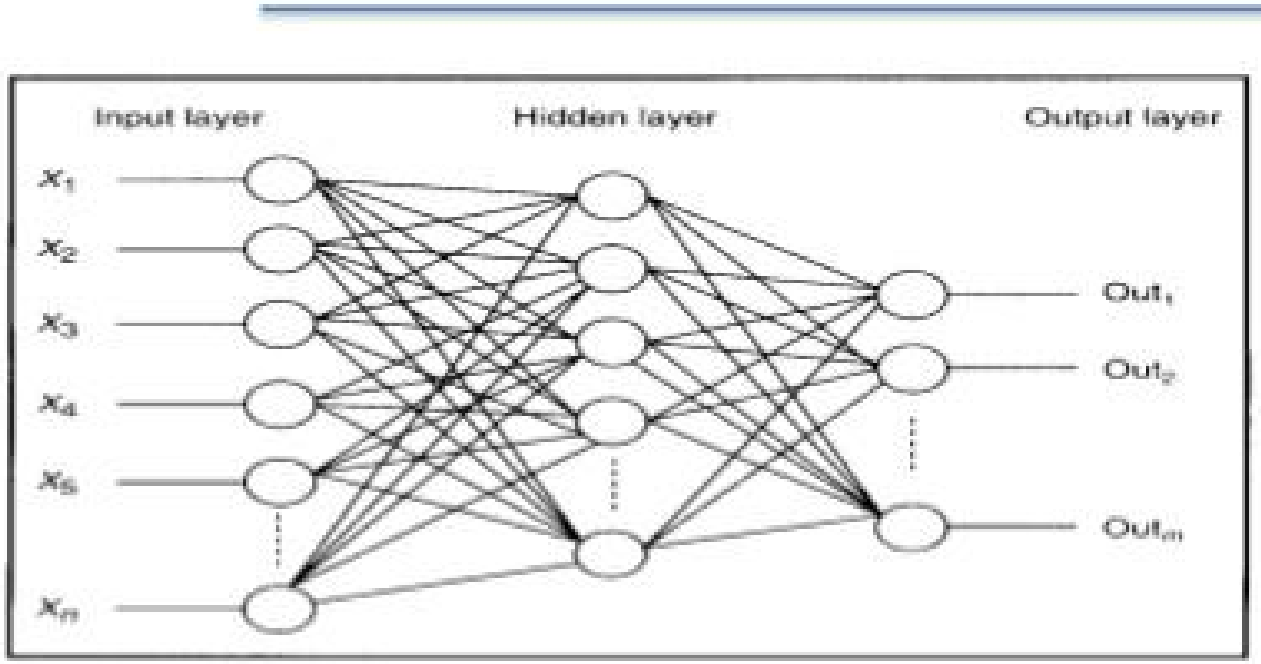
Artificial Neural Network

- Artificial Neurons are corrected together to form a network
- Called Multi Layer Perceptron (MLP)



- A Non-linear model of the parameters
- Trained by popular **Backpropagation** (Gradient Descent)

Backpropagation – Main Idea



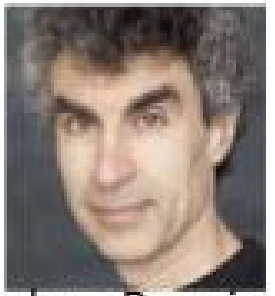
1. Calculate Error/Loss = f(Label , Prediction)
2. Calculate Gradient/Derivative of the Loss w.r.t. each weight
3. In order to calculate the gradient of the inner weights, apply the chain rule of derivatives
4. Update each weight in the direction of the negative gradient (Gradient Descent)

Before 2006...

- Quite popular in 1980's and 1990's
- Worked well for some pattern recognition problems:
  - Ex: Handwritten digit recognition *Le-Net* used by US postal department (LeCun et al., 1998)
- Other ML methods (ex. Kernel methods such as SVMs) dominated ANNs in early 2000's
- Main problems of ANNs:
  - Local-minima (since the loss function is non-convex)
  - Difficult to train networks with more then 3/4 layers
    - Overfitting
    - Computational time
    - Vanishing Gradient problem (e.g. when Sigmoid activation is used)
    - (didn't work well in more complex problems like general image classification)

Yan LeCun, NYU

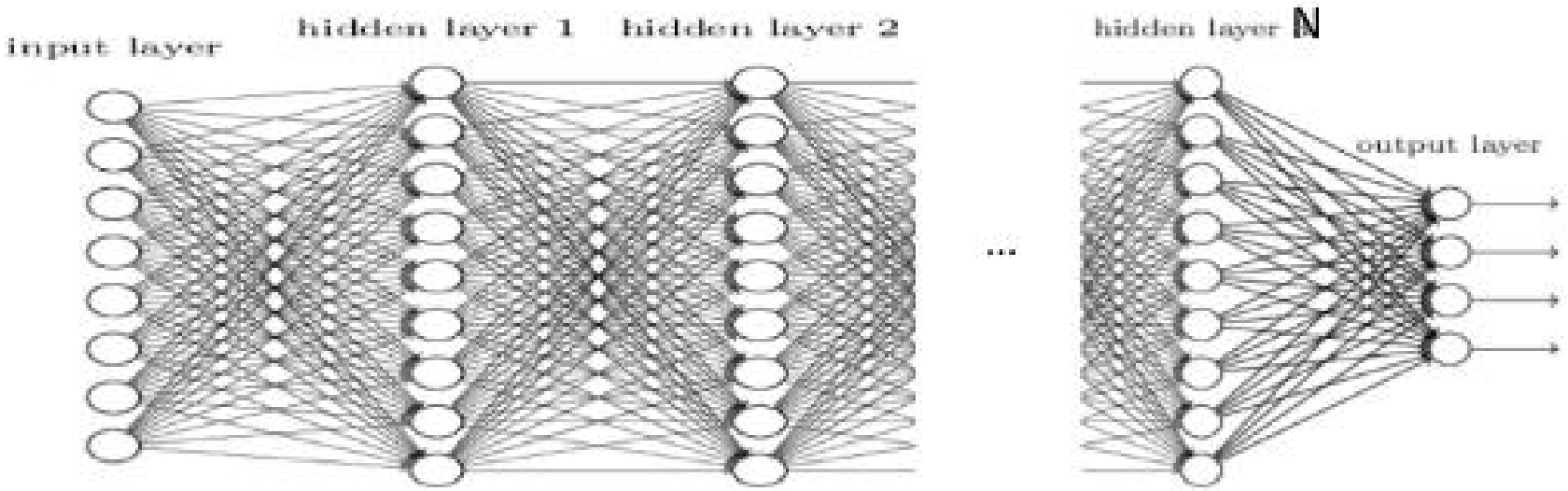
Geoff Hinton, Uni Torento



Yoshua Bengio, Uni Montreal

After 2006...

- Several major breakthroughs happened giving birth to **Deep Learning**
- In general, Deep Learning is nothing but good old Neural Networks with many layers:

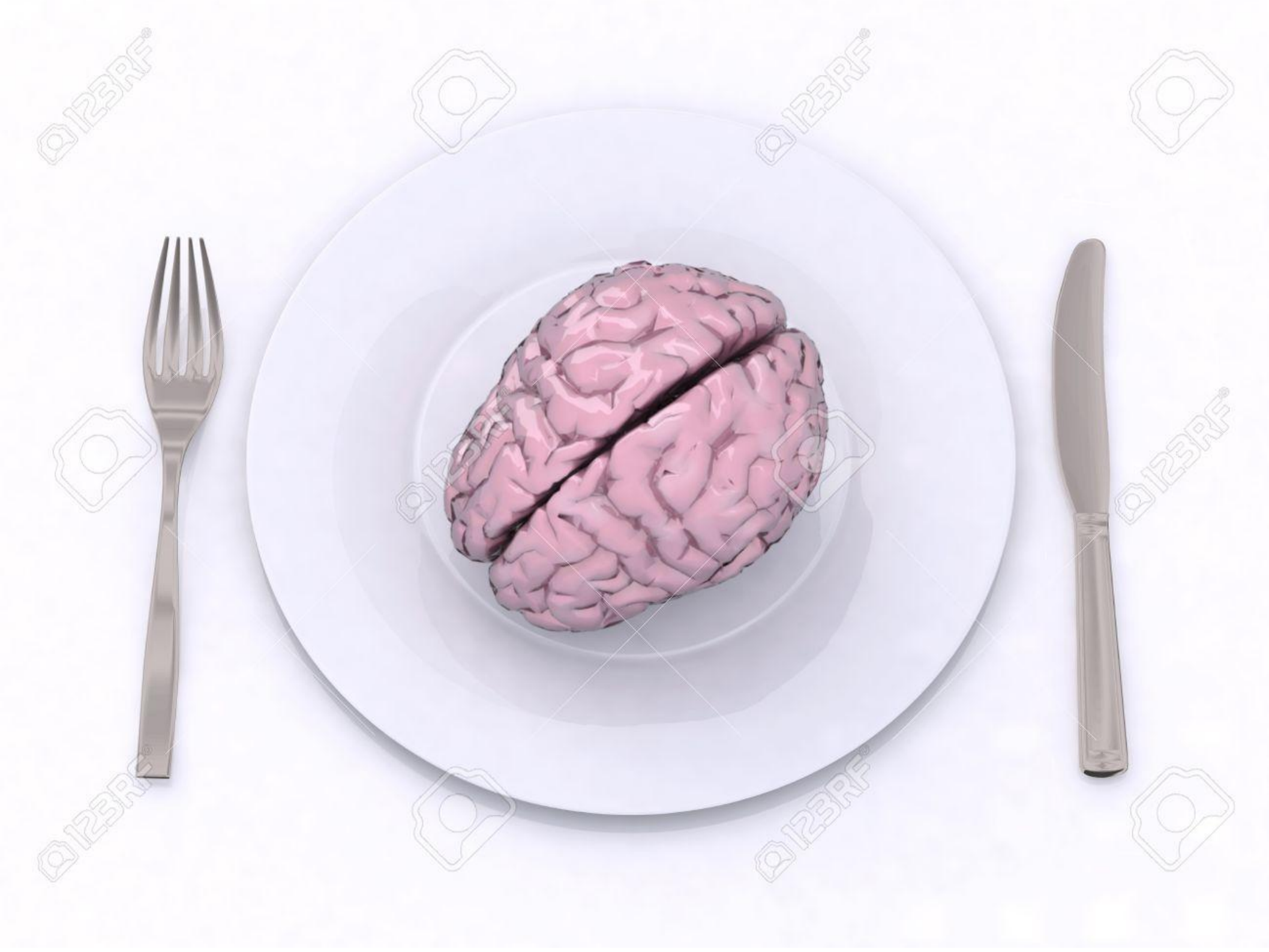


- Deep Learning methods have been significantly outperforming the existing methods in major Computer Vision and Speech Recognition competitions since 2010


What the f$*k
was that!!!


Left
brain
I am the left brain.
I am a scientist. A mathematician.
familiar. I categorize. I am accurate. Linear.
nalytical. Strategic. I am practical.
n control. A master of words and language.
calculate equations and play with numbers.
I am order. I am logic.
I know exactly who I am.
Right
brain
I am the right brain.
I am creativity. A free spirit. I am passion.
Yearning. Sensuality. I am the sound of roaring laugh
I am taste. The feeling of sand beneath bare feet.
I am movement. Vivid colors.
I am the urge to paint on an empty canvas.
I am boundless imagination. Art. Poetry. I sense. I fe
I am everything I wanted to be.

The most advanced Ai?



Sensory Cortex

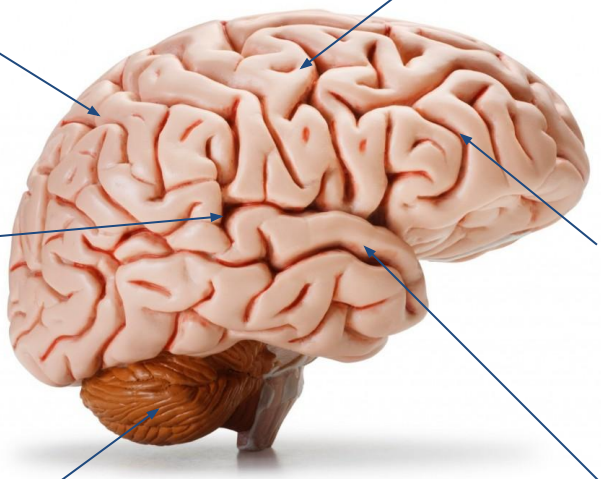
Hierarchical Bayesian Network

Learns slowly from lots of data to represent the statistical regularities of the world. Combines incoming sensory data with prior expectations to compute "beliefs" (i.e. posterior probability distributions) about sensory variables.

Motor Cortex

Hierarchical Bayesian Network

Similar to sensory cortex but instead represents motor variables, like effector positions and applied forces. "Motor beliefs," influenced by priors from other regions, drive output control signals in various combinations.



Hippocampus

Autoassociative Memory

Stores "snapshot" memories of global brain states representing specific events. These arbitrary conjunctions of features cannot be represented explicitly in cortex. Later, triggered recall can recreate the original brain states.

Prefrontal Cortex

Working Memory Array

This neural RAM holds temporary "pointers" to contents in sensory and motor cortex using Bayesian priors. Read/write operations are driven by basal ganglia "cognitive actions," a powerful evolutionary extension to motor actions.

Cerebellum

Supervised Motor Learning

The massive network ofroads frequent motor decisions from the action selection bottleneck. After many iterations it can learn mapping from any given context to any desired motor output.

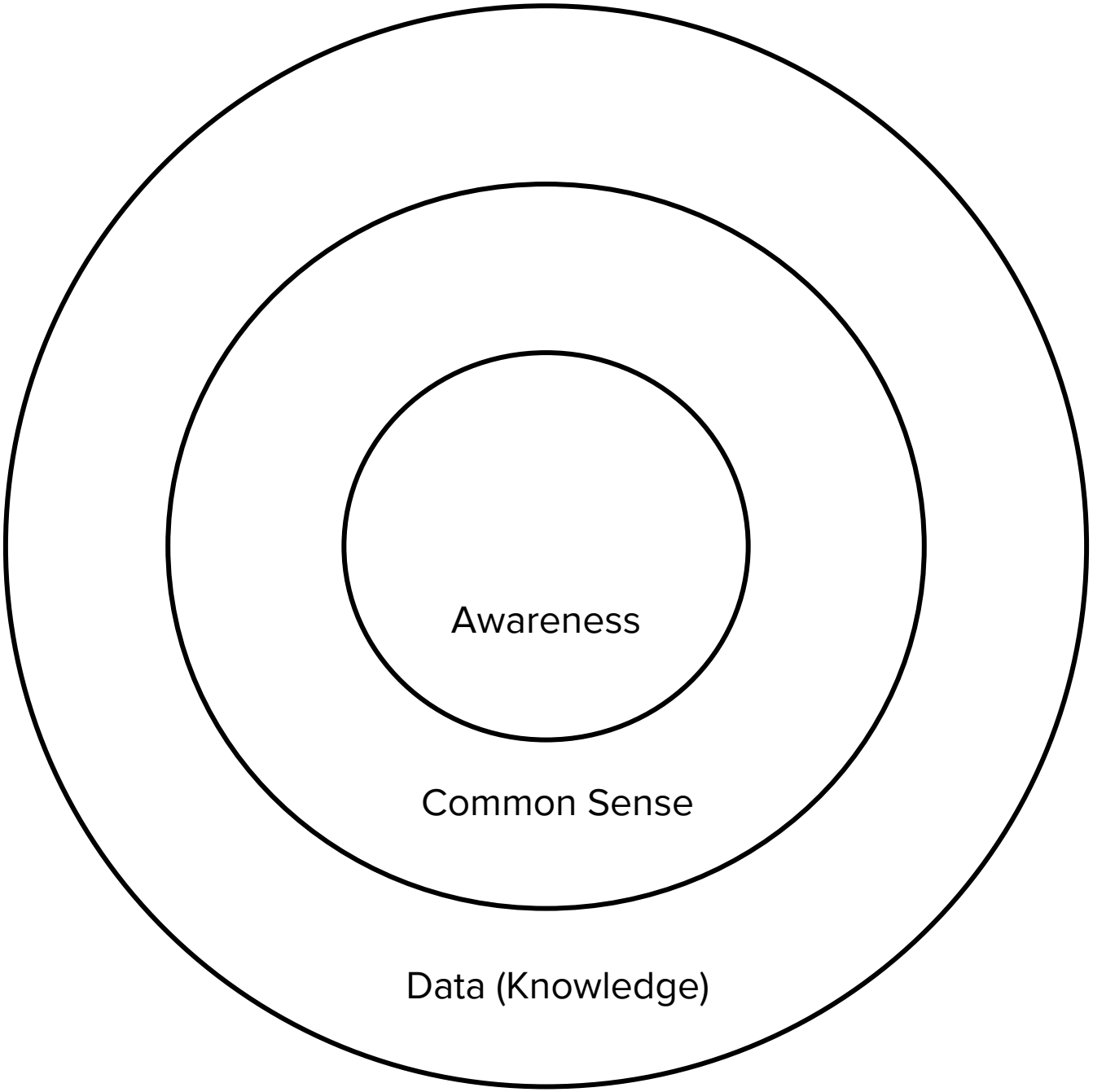
Basal Ganglia

Value Learning & Action Selection

Learns context dependant value & action selection from reward/punishment/ “What is rewarding?” defines all goal seeking behavior, for both brain & machines. (e.g. Bayesian “information reward” generates curiosity)


POLLITOALVELADOR.TUMBLR.COM
How are you planning to have that?

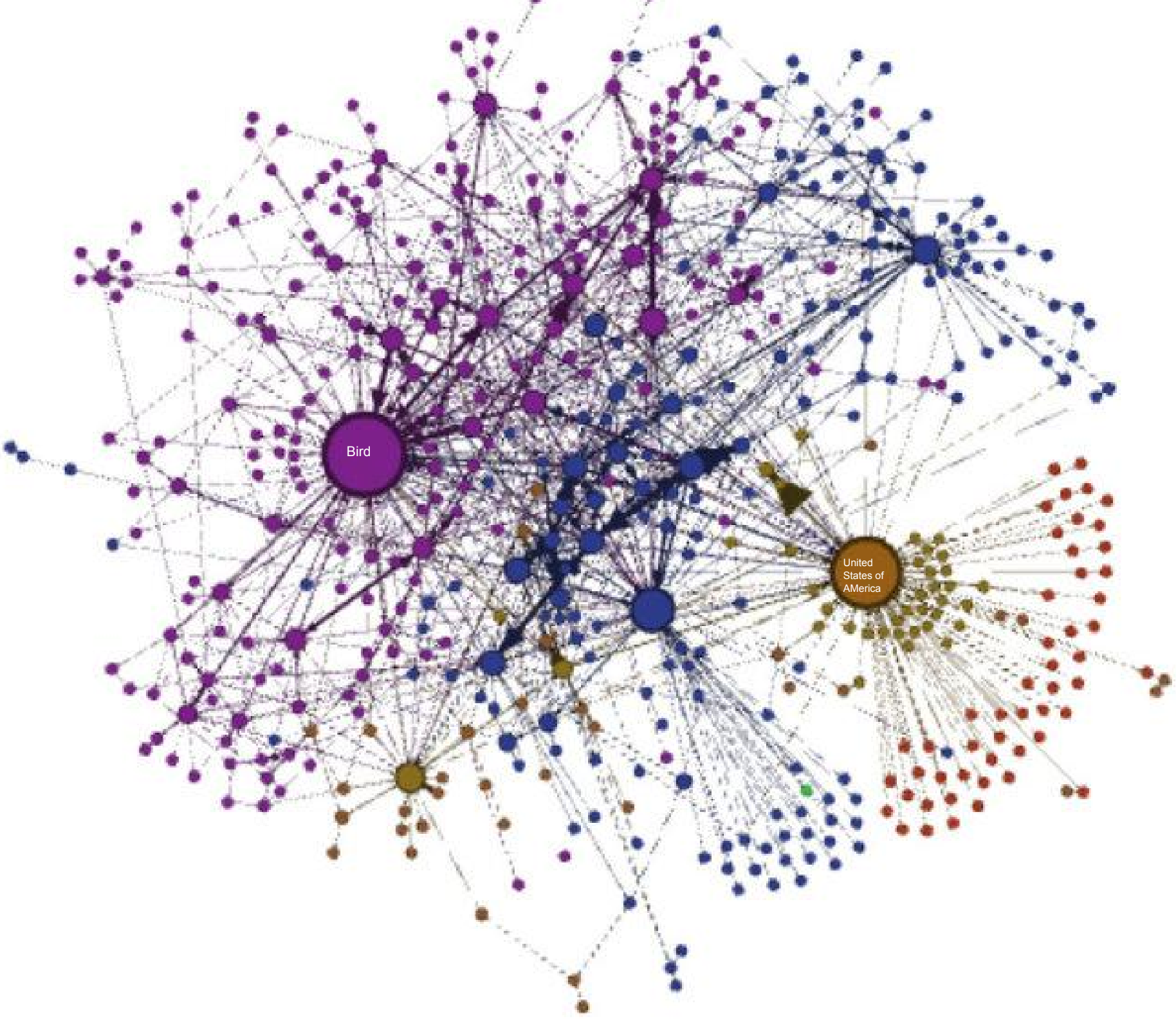
Three Steps for G.A.I

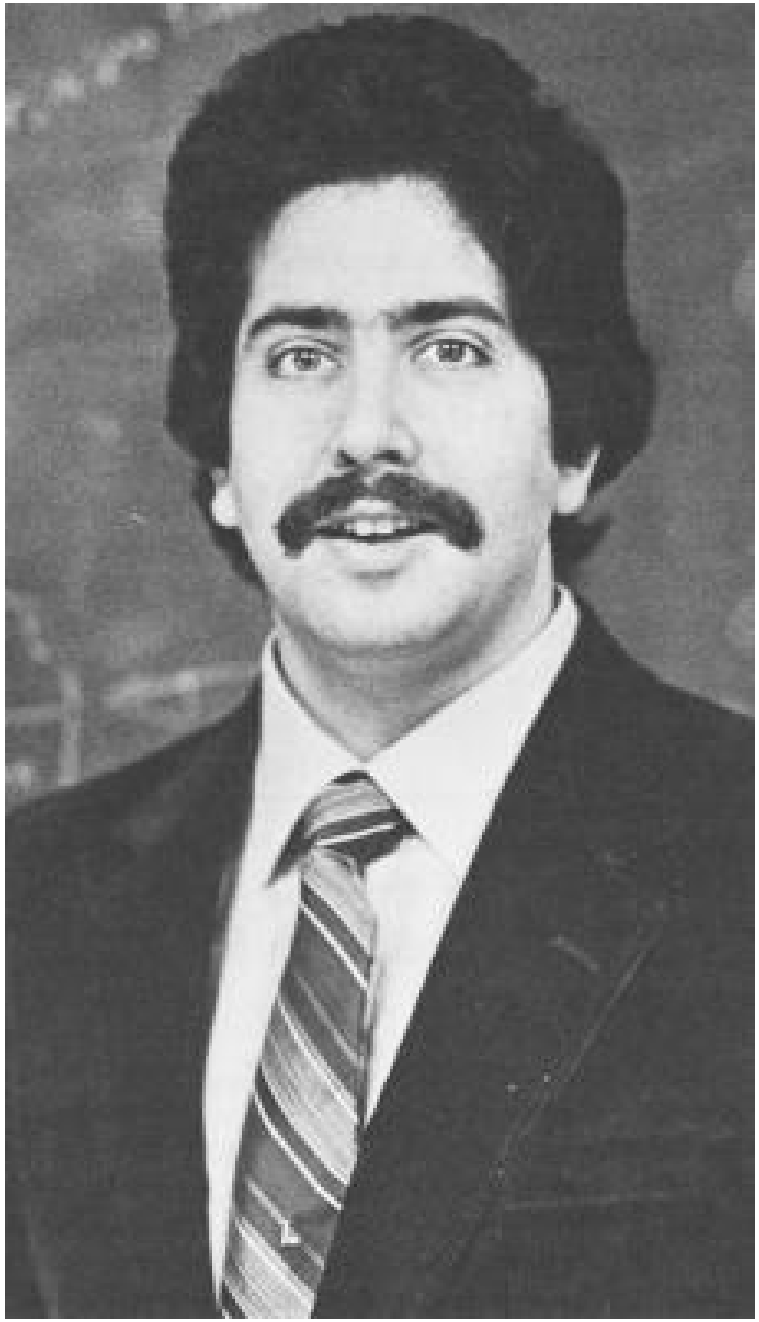

Awareness
Common Sense
Data (Knowledge)

Common Sense

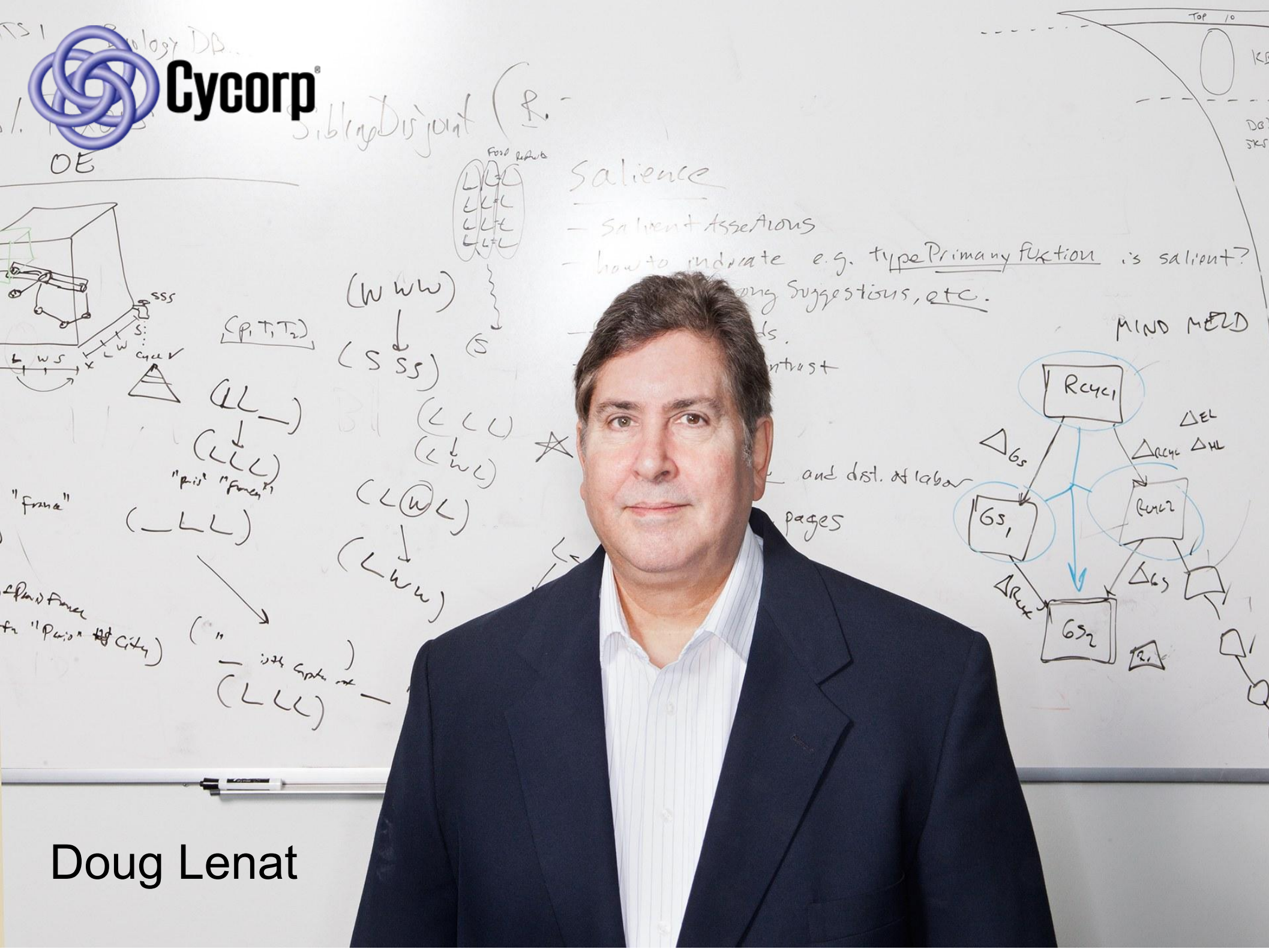
“The **Bird** is *flying* like a **airplane** *over* the **United States of America**.”

"The **Bird** is *flying* like a **airplane** *over* the **United States of America**."


Bird
United States of AMerica



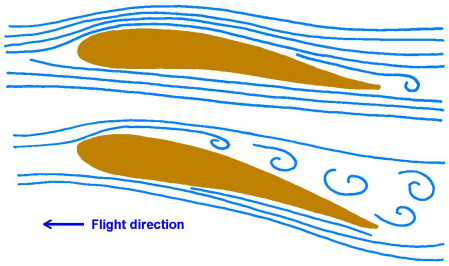
Doug Lenat
1984


Cycorp
Salience
MIND MELD
Doug Lenat

“The **Bird** is *flying* like a **airplane** *over* the **United States of America**.”

1. **This is a ‘Bird’.**

2. These are the wings of the bird



3. When Bird flampes the wings, the aerodynamics changes.

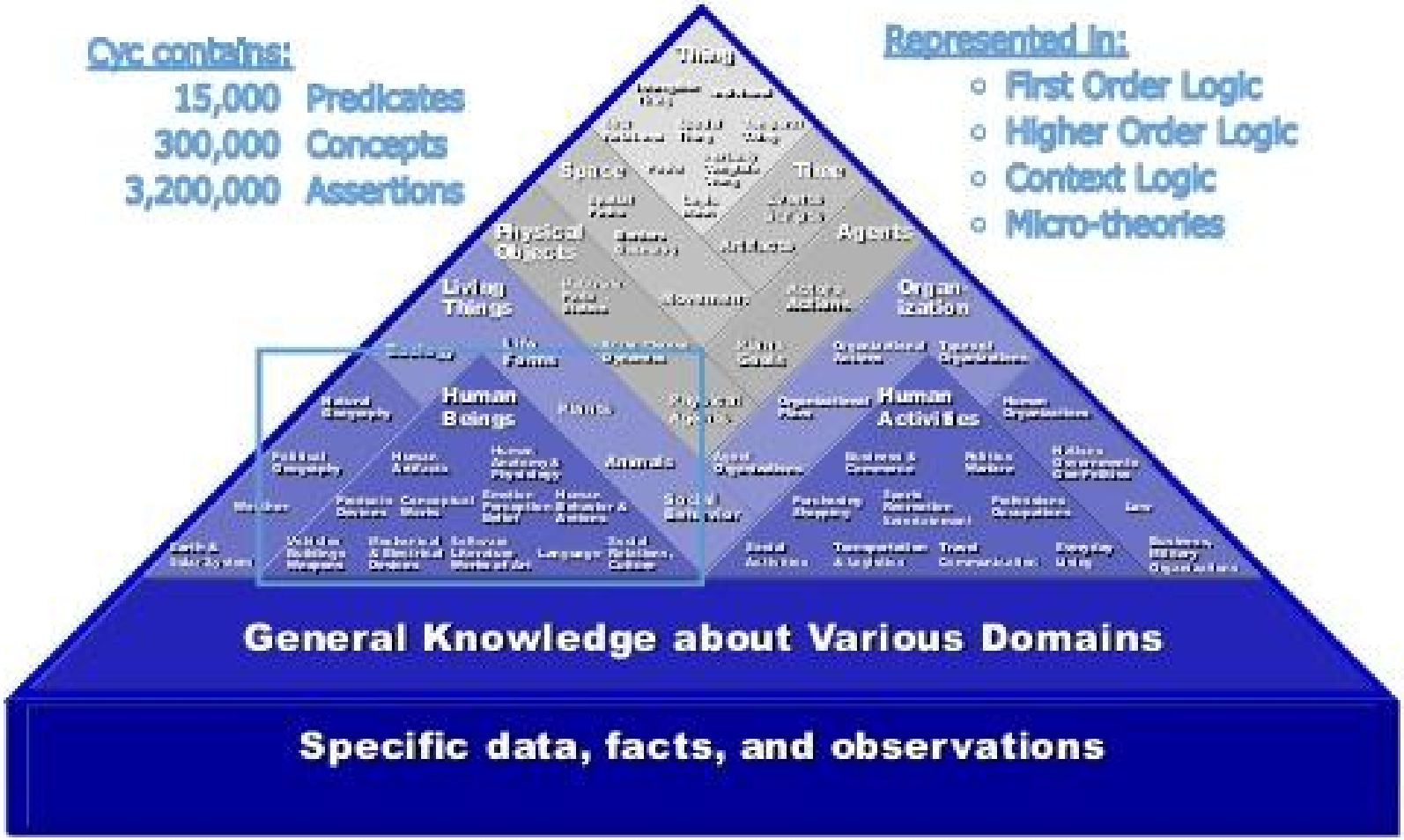
The Cyc Ontology

Cyc contains:

- 15,000 Predicates
- 300,000 Concepts
- 3,200,000 Assertions

Represented in:

- First Order Logic
- Higher Order Logic
- Context Logic
- Micro-theories



Example 1: Finding a relevant image

When you become happy, you smile.

You become happy when someone you love accomplishes a milestone.

Taking one's first step is a milestone.

Parents love their children.

Show me pictures of **someone smiling**

Caption: "**A man helping his daughter take her first step**"

```
(ForAll ?P (ForAll ?C
    (implies          (and
              (isa ?P Person)
              (children ?P ?C))
     (loves ?P ?C))))
```

ng a relevant image

When you become happy, you smile.

You become happy when someone you love accomplishes a milestone.

Taking one's first step is a milestone.

Parents love their children.

Show me pictures of
someone smiling

Cyc

Caption: "**A man helping his daughter take her first step**"

Example 2: Compiling a list of events

"1993 pipe bombing of France's embassy in Lebanon."

Cyc

Intelligence Analyst's Query:

"*Government buildings damaged in terrorist events in Beirut in the decade before 9/11*"

Consciousness

“Consciousness is not the function of the brain, rather it is the effect of it.”

Traces in Spirituality

Chaitanya - ‘The consciousness that knows itself and also knows others.’

Chit - ‘The Sense that makes sense of all other sense experiences.’

According to the Vedic template reflected in the Taittiriya Upanishad there are five stages of Consciousness-

1) A**nna-maya kosa** (physical)

2) Prana-maya kosa (vital)

3) Mano-maya kosa (mental)

4) Vijnana-maya kosa (intellectual)

5**) Ananda-maya kosa** (bliss).

<u>The ten levels of consciousness derived from this template are:</u>

1) The Sensoriphysical– reflecting the realm of matter, sensation and perception.

2) Phantasmic-Emotional- the emotional-sexual level (seat of libido and instincts)

3) Representational mind– level of concepts and symbols, fantasy, ego-centric thinking.

4) Rule/role mind– thinking in terms of concrete things and events.

5) Formal-reflexive mind- the level of reflective, abstract thinking and introspection.

6) Vision-logic- the level of synthesis and integration.

<u>The higher levels are</u> *<u>:</u>*

7) Psychic,

8) Subtle (level of soul),

9) Causal (level of spirit)

10) Non-dual (Brahman-Atman)

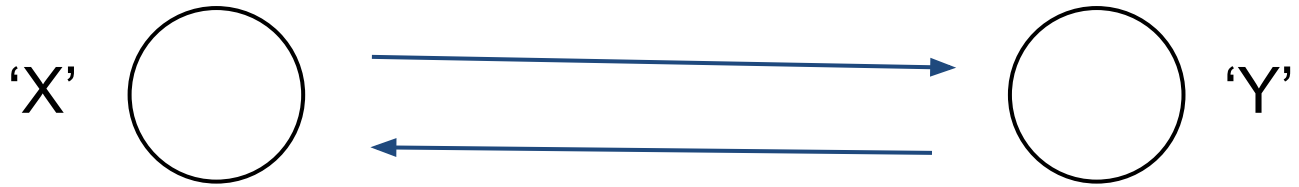
Can a Entity be Conscious about it’s existence?

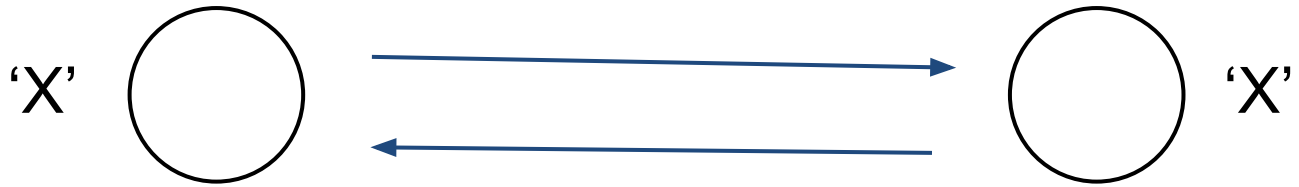
“We don’t have a single Mind, we have two Minds. Thier push & pull creates disturbance in our existence.”

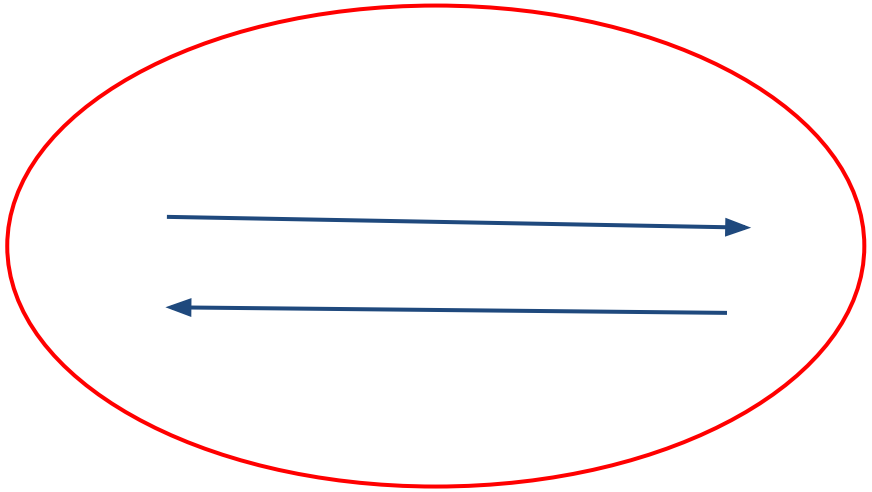

Left
brain
I am the left brain.
I am a scientist. A mathematician.
e the familiar. I categorize. I am accurate. Linear.
Analytical. Strategic. I am practical.
ays in control. A master of words and language.
tic. I calculate equations and play with numbers.
I am order. I am logic.
I know exactly who I am.
Right
brain
I am the right brain.
I am creativity. A free spirit. I am passion.
Yearning. Sensuality. I am the sound of roaring lau
I am taste. The feeling of sand beneath bare fe
I am movement. Vivid colors.
I am the urge to paint on an empty canvas.
I am boundless imagination. Art. Poetry. I sense. I
I am everything I wanted to be.

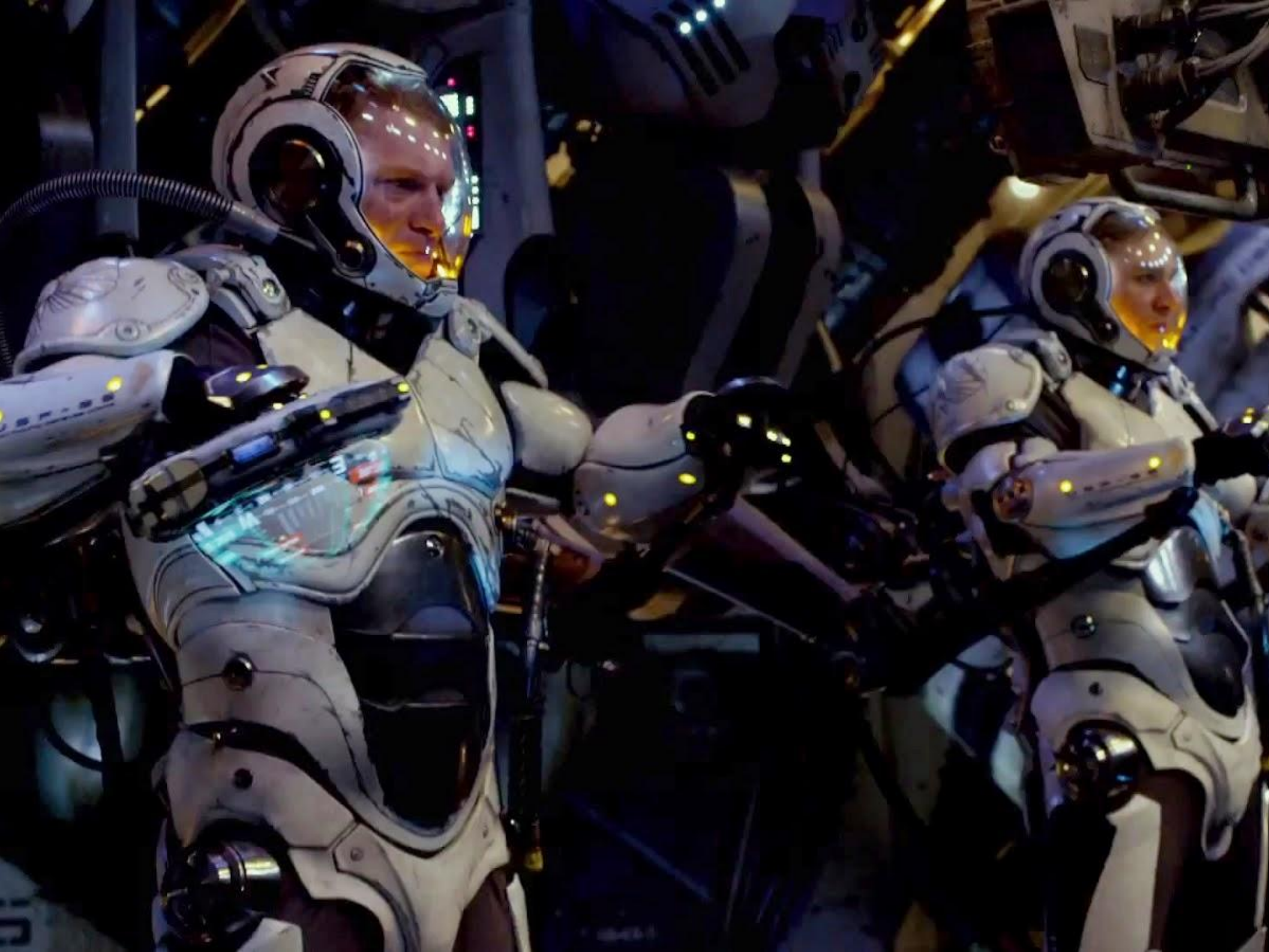
“Consciousness is nothing but our two hemispheres, the left & right with their different functionalities constantly looking and synchronizing with each other.”

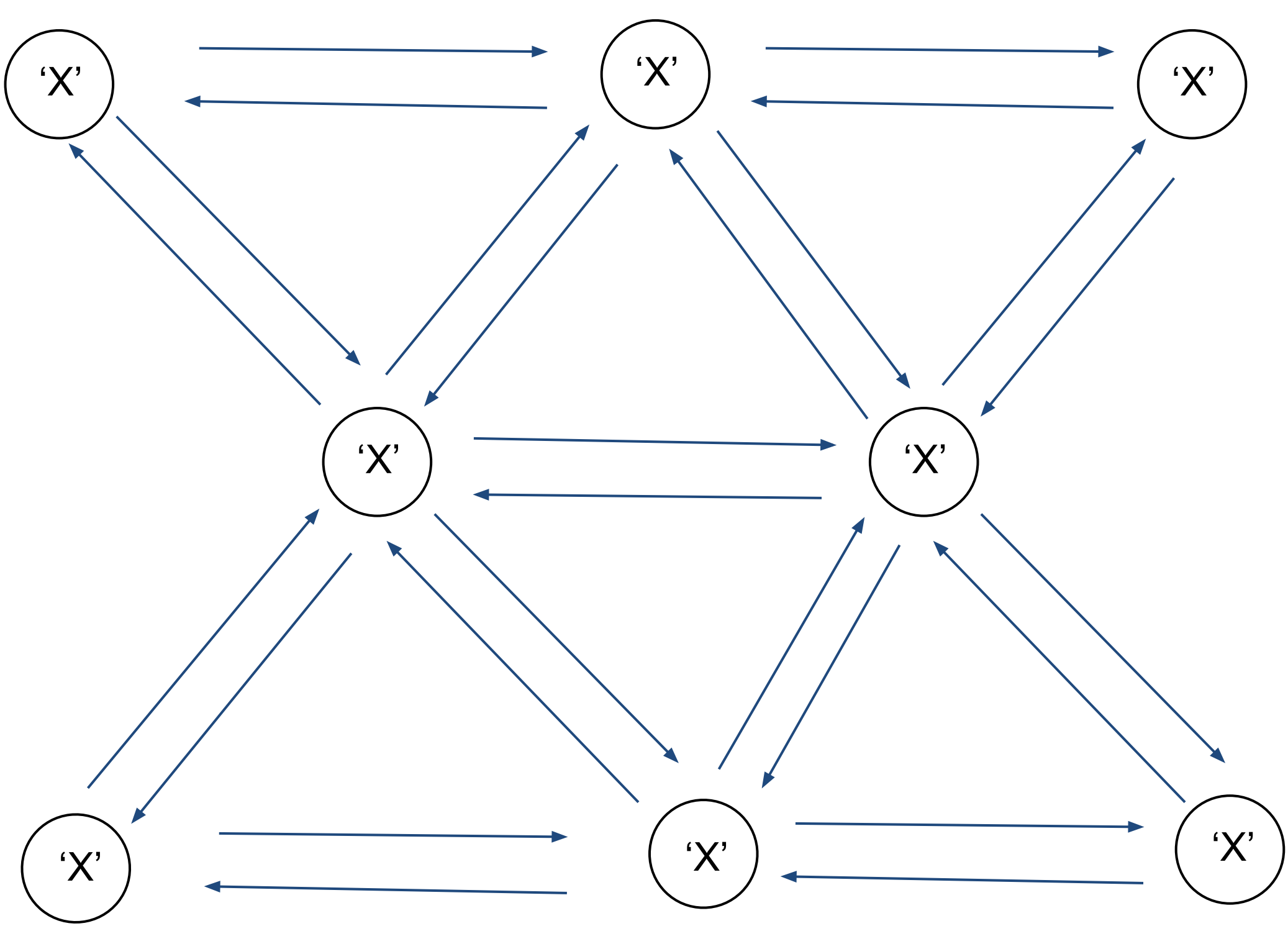

facebook


‘X’
‘Y’


‘X’
‘X’






‘X’
‘X’
‘X’
‘X’
‘X’
‘X’
‘X’

Interesting Papers

1. 1. Peck, C.C., Streeter, T., & Kozloski, J. 2007. An Integrated Cerebro-Cerebellar Model Demonstrating Associative Learning and Motor Control. In Proceedings of the 10th Tamagawa-Riken Dynamic Brain Forum. [**pdf** |

2. Streeter, T., Oliver, J., & Sannier, A. 2006. Verve: A General Purpose Open Source Reinforcement Learning Toolkit. In Proceedings of the ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. [**pdf** |

3. Streeter, T. 2006. Curiosity-Driven Exploration with Planning Trajectories. In Proceedings of theTwenty-First National Conference on Artificial Intelligence. [**pdf**

4. Christof Koch 2012. Automated High-Throughput Characterization of Single Neurons by Means of Simplified Spiking Models

5. Christof Koch 2013. Framework for Consciousness.

Interesting GitHub Projects

1. A TensorFlow implementation of DeepMind's WaveNet paper -https://github.com/ibab/tensorflow-wavenet

2. Numenta Platform for Intelligent Computing is an implementation of Hierarchical Temporal Memory (HTM), a theory of intelligence based strictly on the neuroscience of the neocortex. - https://github.com/numenta/nupic

3. OpenAI Baselines: high-quality implementations of reinforcement learning algorithms - https://github.com/openai/baselines

4. Open-source software for robot simulation, integrated with OpenAI Gym. - https://github.com/openai/roboschool

5. A living collection of deep learning problems - https://github.com/openai/requests-for-research

6. Code for "Learning to Generate Reviews and Discovering Sentiment" - https://github.com/openai/generating-reviews-discovering-sentiment

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