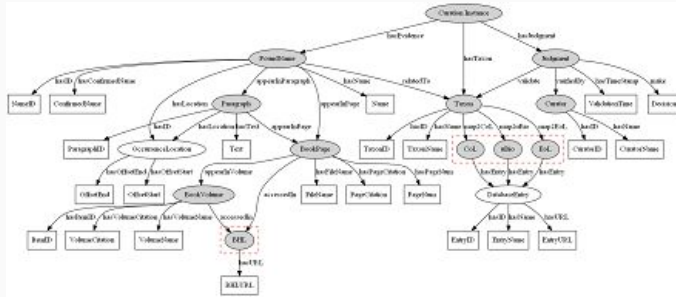# Creating "infant" AI: Natural thinking mimicking

The two waves of AI and the winter between them

Wave 1: knowledge base + production rules

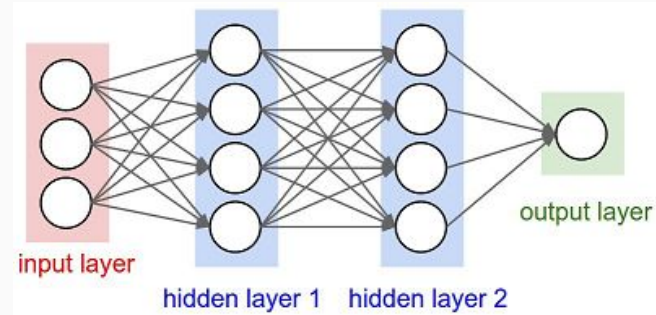😀 similar to the real brain machinery

🚫 no automatic learning from data and natural texts

🚫 knowledge processing is based on first order logic – unlike the natural brain

Wave 2: deep learning

😀 differentiability => automatic learning from data

🚫 fitting a curve through the backprop is pretty far from what the brain does – not able to implement real cognition

My approach: biologically plausible knowledge formation and processing

Main principles of an "AI infant" system:

1. Declarative (semantic) memory - analogous to LTM
2. Generalization mechanics
3. Stochastic reinforcement learning
4. Thinking by analogy mechanics

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Sensory input → Declarative memory → Grammar synthesizer → reply
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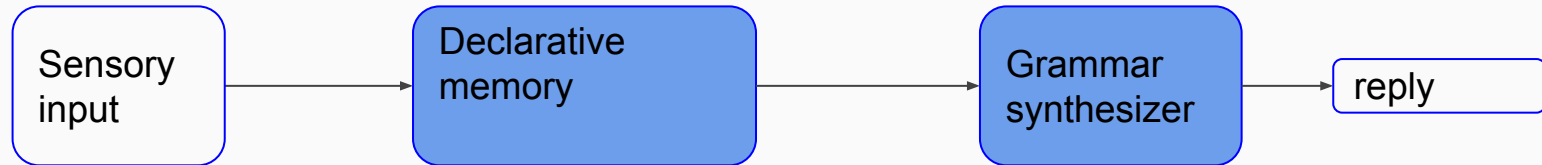
Declarative (semantic) memory

Knowledge is an **undirected cyclic graph of ensembles**

Basic entity ensembles are formed from "infant" sensory input, visual and audial
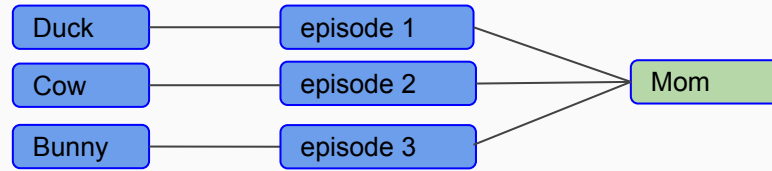
`v:duck a:duck`

Duck (visual) — Duck

Duck (audial) — Duck
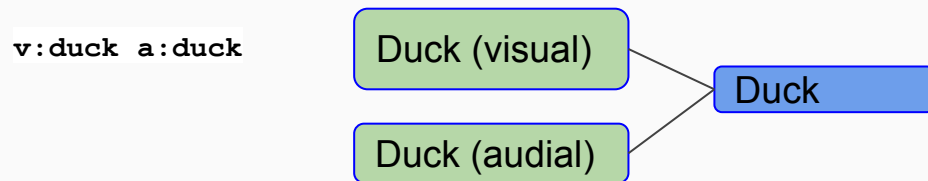
Episodes in the life of the "infant" form ensembles, connected with entities

`v:Mom a:duck v:duck` – Mom is showing a Duck toy saying "Duck"

Duck (visual) — Duck — episode — Mom
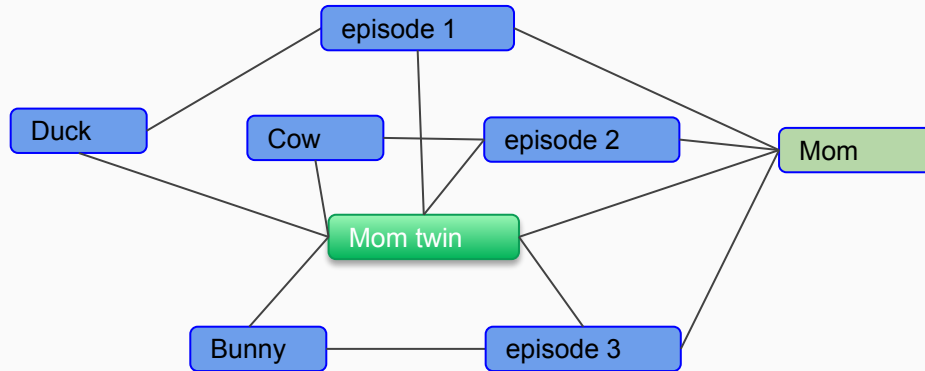
Duck (audio) — Duck
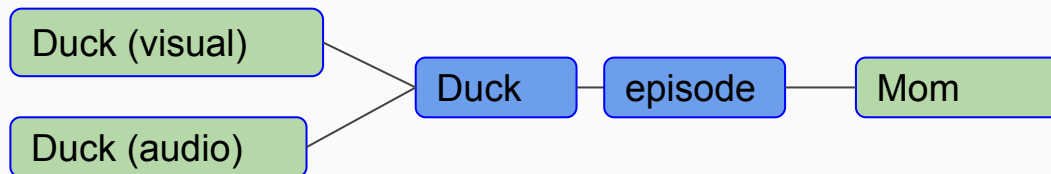
Generalization mechanism

Generalization is based on Hebbian learning with frequent patterns

Frequently activated ensembles capture adjacent neurons and form "twin" ensembles. They reconnect with the same ensembles becoming a "hub ensemble"
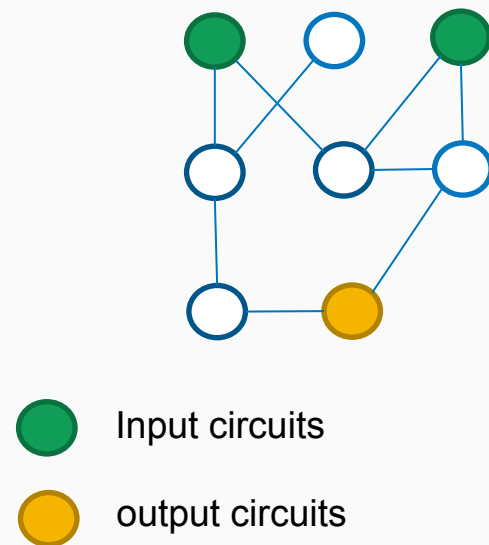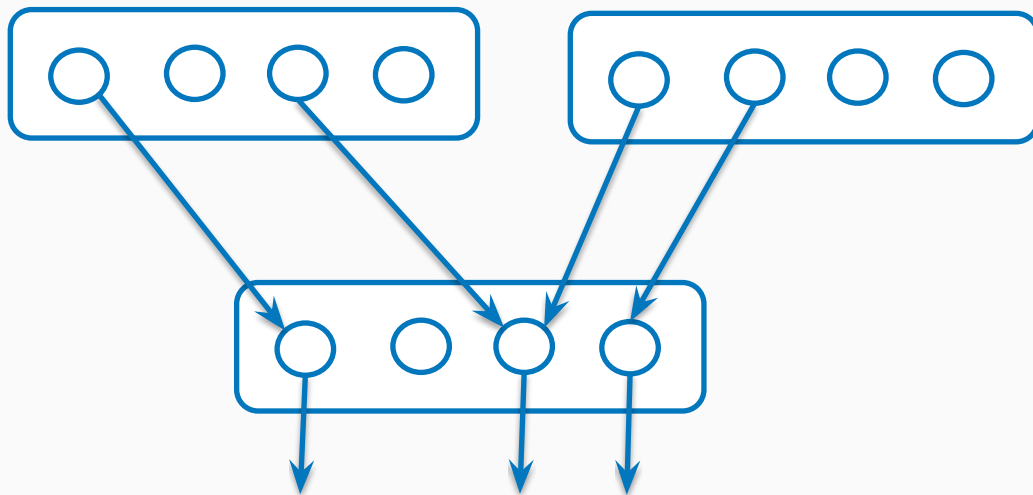
Stochastic reinforcement learning

Knowledge is just a pile of chaotic ensembles until you ask the "infant" **questions**

A question ignites an urge to be satisfied by a dopamine injection (**hedonistic synapse learning**)

Ensebles consist of many circuts – each **circut** corresponds to a combination of input ensembles and an output ensemble
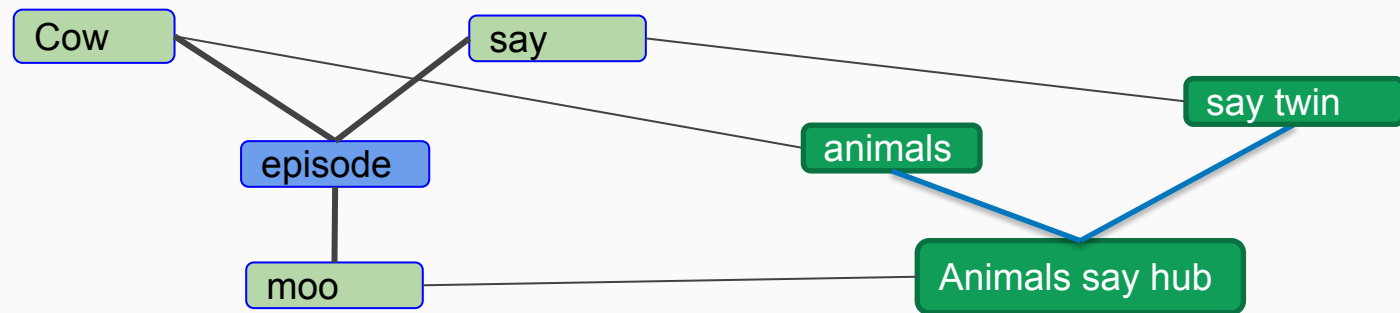
The goal is to find and engrave the optimal **pathway** from input circuits to output circuits – the way to dopamine

Input circuits

output circuits

Thinking by analogy

While being reinforce trained not only entity circuits learn the right pathway
Their "hub" counterparts are ignited along the way and engrave the right path on "abstract" level

Reinforcement learning on episodes "Cow say moo", "Duck say quack", "Cat say miau" turns into the 'Animal say animal sound" **engram**

Which will produce a correct answer for "What dog say?" if "Dog" is correctly attached to the "Animals" hub ensemble

Where is it all going?

Basic milestones of developement:

1) Ability to answer any complex question
2) Ability to gain knowledge from real texts, say from Wikipedia. Tons of algorithms needed
3) Ability to solve math tasks.
4) ….
5) AGI

Thanks!

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https://github.com/BelowzeroA/
conversational-ai