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What does it mean to “know” something?

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Networks

1. Biology: The cortex
2. Excitation:
 - Unidirectional
 - Bidirectional
3. Inhibition
4. Constraint Satisfaction: Putting it all together.

3

Constraint Satisfaction

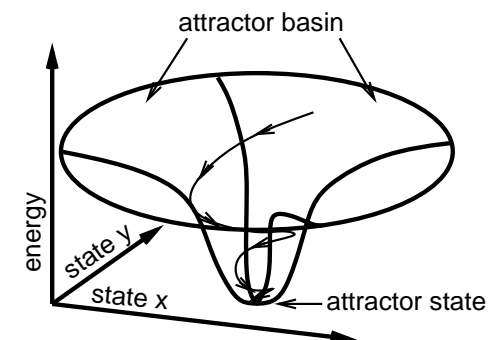
Process of trying to satisfy various constraints (from environment, connection weights, activations).

1. Attractor Dynamics.
2. Energy/harmony.
3. Noise.

4

Attractor Dynamics

A network will *settle* into a *stable state* over time: the *attractor*.



Maximize harmony given inputs and weights.

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Energy, Harmony

Energy: $E = -\frac{1}{2} \sum_j \sum_i a_i w_{ij} a_j$

or the flip side:

Harmony: $H = \frac{1}{2} \sum_j \sum_i a_i w_{ij} a_j$

Harmony biggest when activations consistent with the weights!

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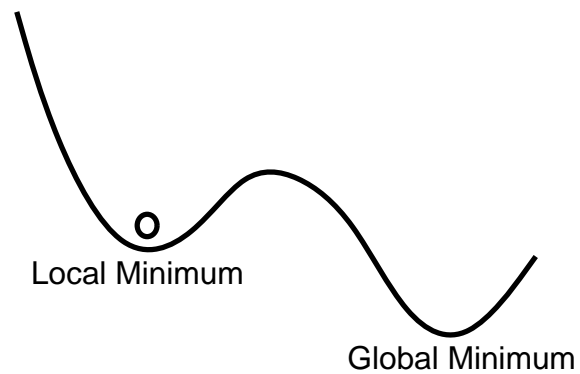
Constraint Satisfaction

1. Attractor Dynamics.
2. Energy/harmony (sims).
3. Noise.

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The Role of Noise

How might noise be useful in your brain?



Sims.

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Networks

1. Biology: The cortex
2. Excitation:
 - Unidirectional (transformations)
 - Bidirectional (top-down processing, pattern completion, amplification)
3. Inhibition: Controls bidirectional excitation (feedforward, feedback, set point, kWTA approximation)
4. Constraint Satisfaction: Putting it all together.