1

Grand Finale!

How does the brain secrete the mind? Or, how do neurons create our thoughts, behaviors, emotions, etc.?

2

Fundamentals

- Neurons: detectors, excitation/inhibition/leak, threshold fire
- Networks: transformations, pattern completion, amplification, attractor dynamics, constraint satisfaction
- Learning: model and task
- Perception/Attention: transformations, object/spatial paths
- Memory: weights vs. acts, cortex, hippo, prefrontal cortex
- Language: transformations, interacting orthographic, semantic, and phonological pathways
- Higher level cognition: activation-based processing, gating

3

Understanding How Brain Secretes Mind

- Models help us to understand phenomena. oriented bars of light and V1, specialized memory systems, divisions of labor in reading, effects of lesions.
- Models deal with complexity. object recognition, semantics.
- Models are explicit, deconstruct psychological constructs. disengage/inhibition vs. activation, mechanisms of memory.
- Models allow control.
- Models provide a unified framework.

4

Remaining/Recurring Issues: Specific

- Wiring.
- Control/timing.
- Missing brain areas.
- Scaling.
- Error signals.

5

Remaining/Recurring Issues: General

- Models are too simple.
- Models are too complex.
- Models can do anything.
- Models are reductionistic.

6

What next?

- What do these models say about nature vs. nurture?
- How would these models capture individual differences?
- Would an ideal model be just like the brain?
- Could we predict behaviors w/full knowledge?
- Is there room for free will?
- Can these models capture emotions? Subjective experience? Consciousness?
- Are these models getting rid of God?