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Perception and Attention

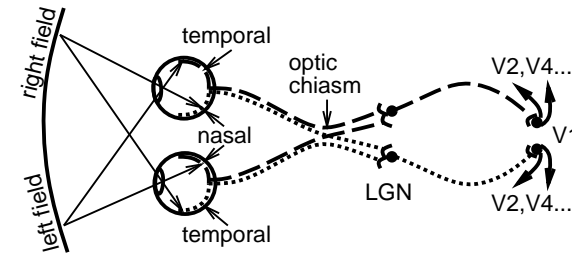
Familiar (boring?) but...:

1. Why does primary visual cortex encode oriented bars of light?
2. Why is visual system split into what/where pathways?
3. Why does parietal damage cause attention problems (neglect)?
4. How do we recognize objects (across locations, sizes, rotations with wildly different retinal images)?

2

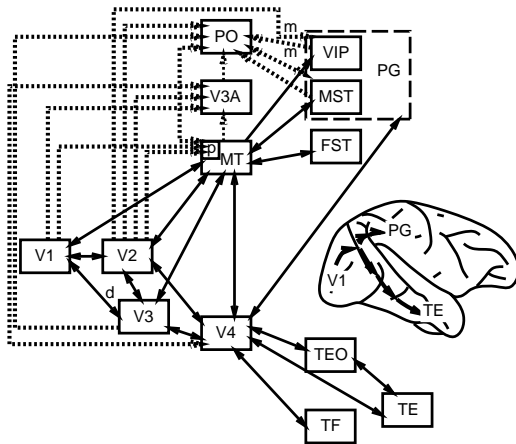
Overview of the Visual System

Hierarchies of specialized visual pathways, starting in retina, to LGN (thalamus), to V1 & up:



3

Two Streams: Ventral "what", Dorsal "where"

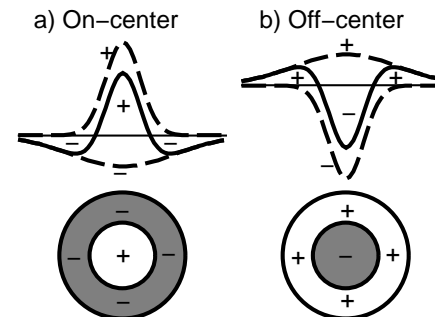


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The Retina

Retina is *not* a passive "camera"

Key principle: *contrast enhancement* that emphasizes *changes* over space & time.



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LGN of the Thalamus

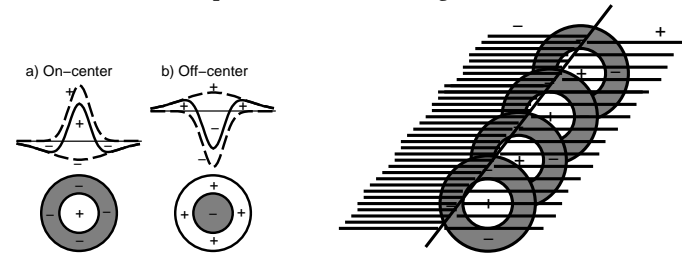
A "relay station", but so much more!

- Organizes different types of information into different layers.
- Performs *dynamic* processing: magnocellular motion processing cells, attentional processing.

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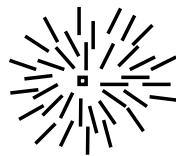
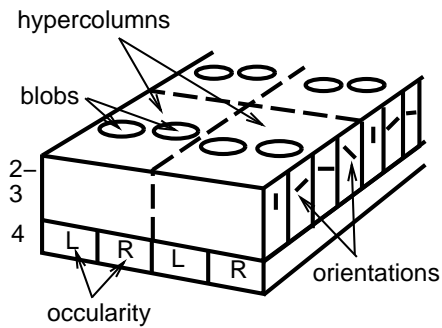
Primary Visual Cortex (V1): Edge Detectors

V1 combines LGN inputs into oriented *edge detectors*:



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Primary Visual Cortex (V1): Topography



Pinwheel

8

A Question

What makes visual cortex visual cortex? Why does it represent what it does?

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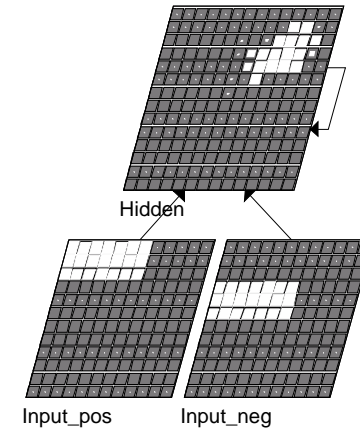
Primary Visual Representations

What makes visual cortex visual cortex? Why does it represent what it does?: Inputs and Hebbian correlational learning.



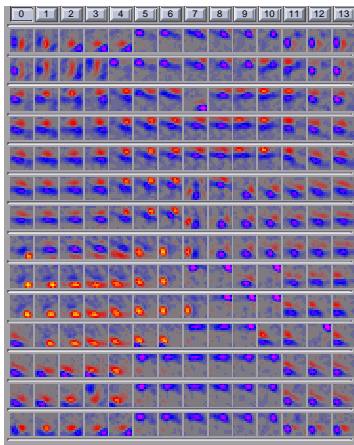
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The Model



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The Receptive Fields



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Perception and Attention

Familiar (boring?) but...:

1. Why does primary visual cortex encode oriented bars of light?
Correlational learning based on natural visual scenes.
2. Why is visual system split into what/where pathways?
3. Why does parietal damage cause attention problems (neglect)?
4. How do we recognize objects (across locations, sizes, rotations with wildly different retinal images)?