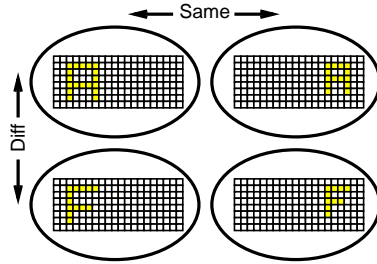


1

The Object Recognition Problem

Problem: Recognize object regardless of: location, size, rotation.

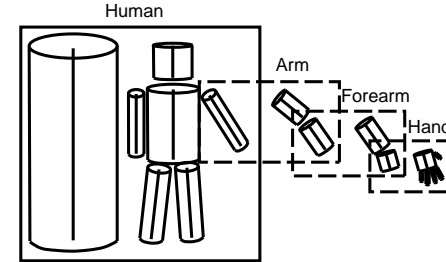


This is hard because different patterns in same location can overlap a lot, while the same patterns in different locations/sizes/rotations can not overlap at all!

2

Possible Solutions

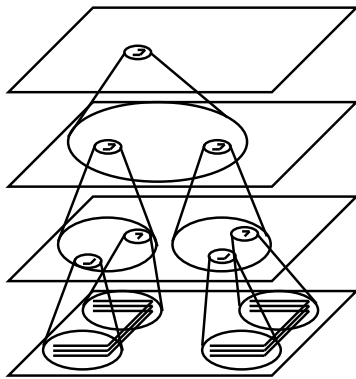
Solution: Canonicalize to 3-D model (Marr, Hinton):



Flaw: Underconstrained! Many 2-D projections map onto many 3-D structures, and search space is huge!

3

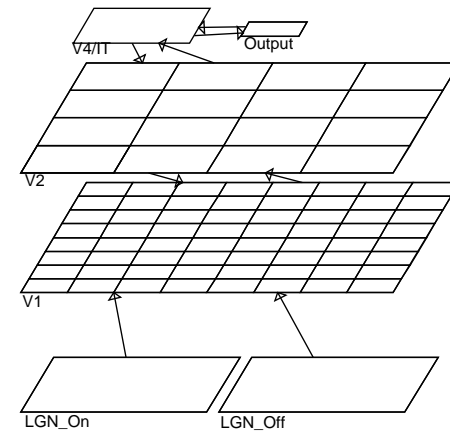
Gradual Invariance Transformations



Each layer produces incremental increase in invariance and featural complexity.

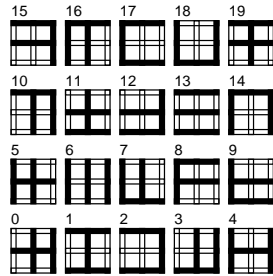
4

The Model



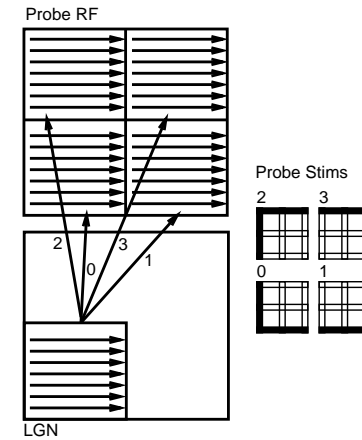
5

The Objects



6

Probing



7

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. How do we recognize objects (across locations, sizes, rotations with wildly different retinal images)? *Transformations: increasingly complex featural encodings, increasing levels of spatial invariance; Distributed representations.*
3. Why is visual system split into what/where pathways?
4. Why does parietal damage cause attention problems (neglect)?