Auditory attention

- Dichotic listening

  Each ear gets a separate channel

  Subjects typically can follow one but not the other

- But: Cocktail party effect

  Highly salient stimuli can get through the non-attended channel

  So where is the filter—early or late?

http://www.youtube.com/watch?v=vJG698U2Mvo

http://www.youtube.com/watch?v=FWSxSQsspiQ

Visual attention

- Cueing experiments

Left location
Cue location
Right location
O
+
O

Cue: “dot will be on the left”

(Variable inter-stimulus interval)

Visual attention

- Cueing experiments

  Subject never moves their eyes

  Cue is valid on 80% of trials, invalid on 20%

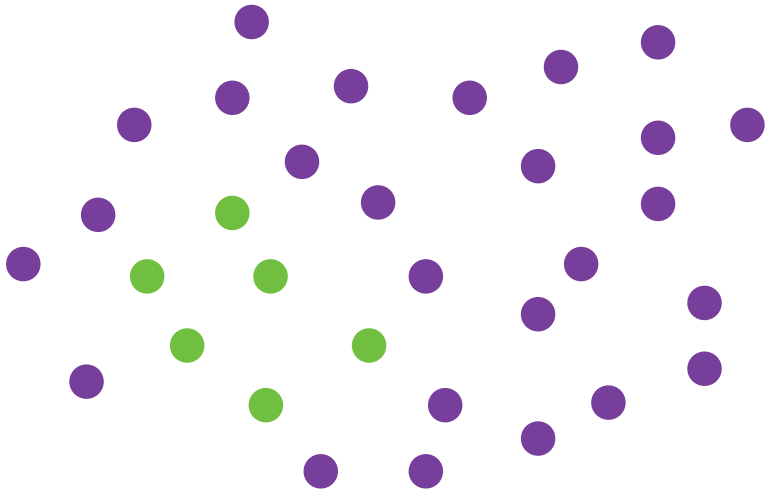
  Dot detection is faster in cued location.

- Attention at the cued location enhances performance
- Conclusion: Attention is like a spotlight that moves about the visual field, “enhancing” perception

Perception without attention

- Some visual features seem to be detected everywhere in parallel

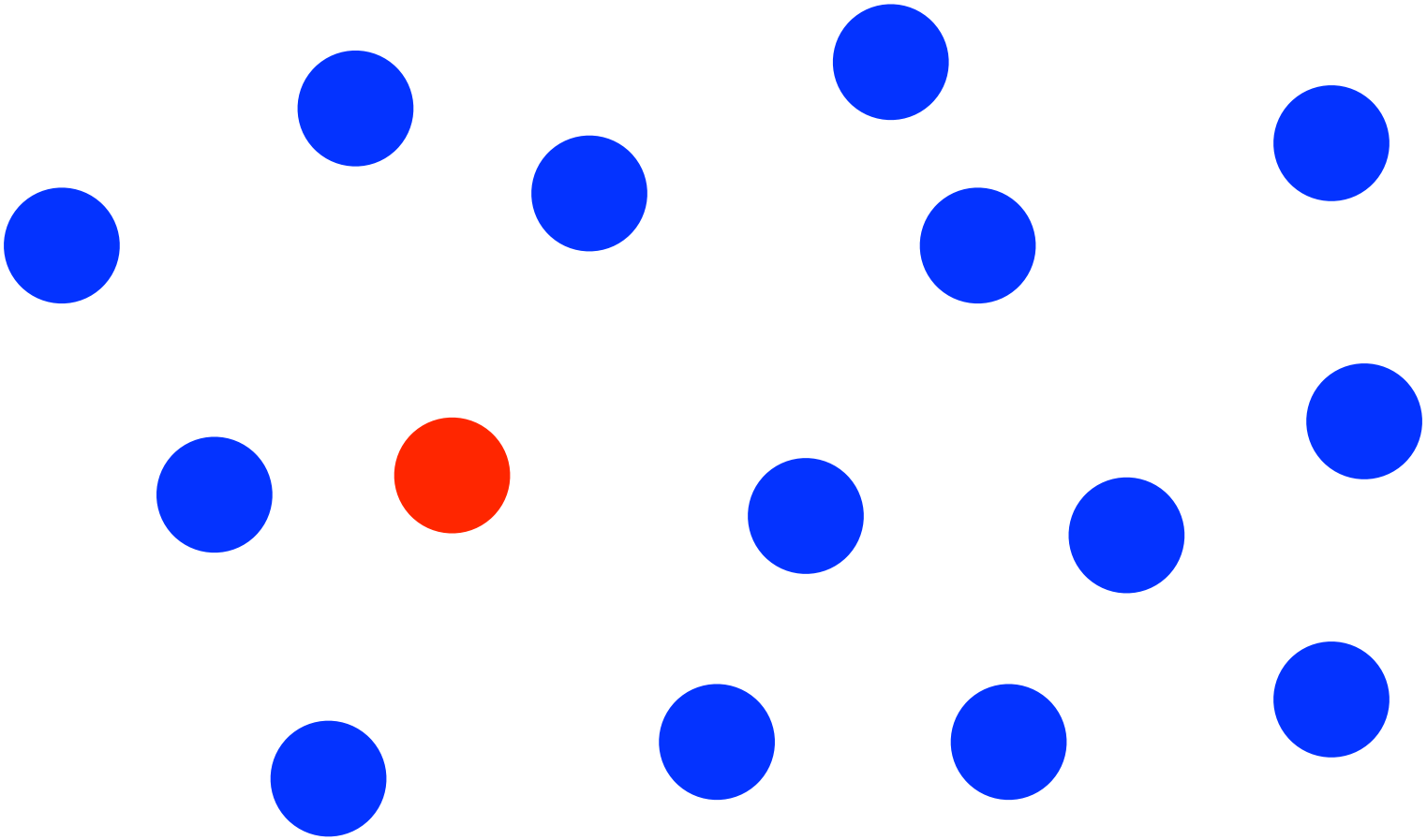
  Called "popout"



Is the red target on the left or the right?

Target

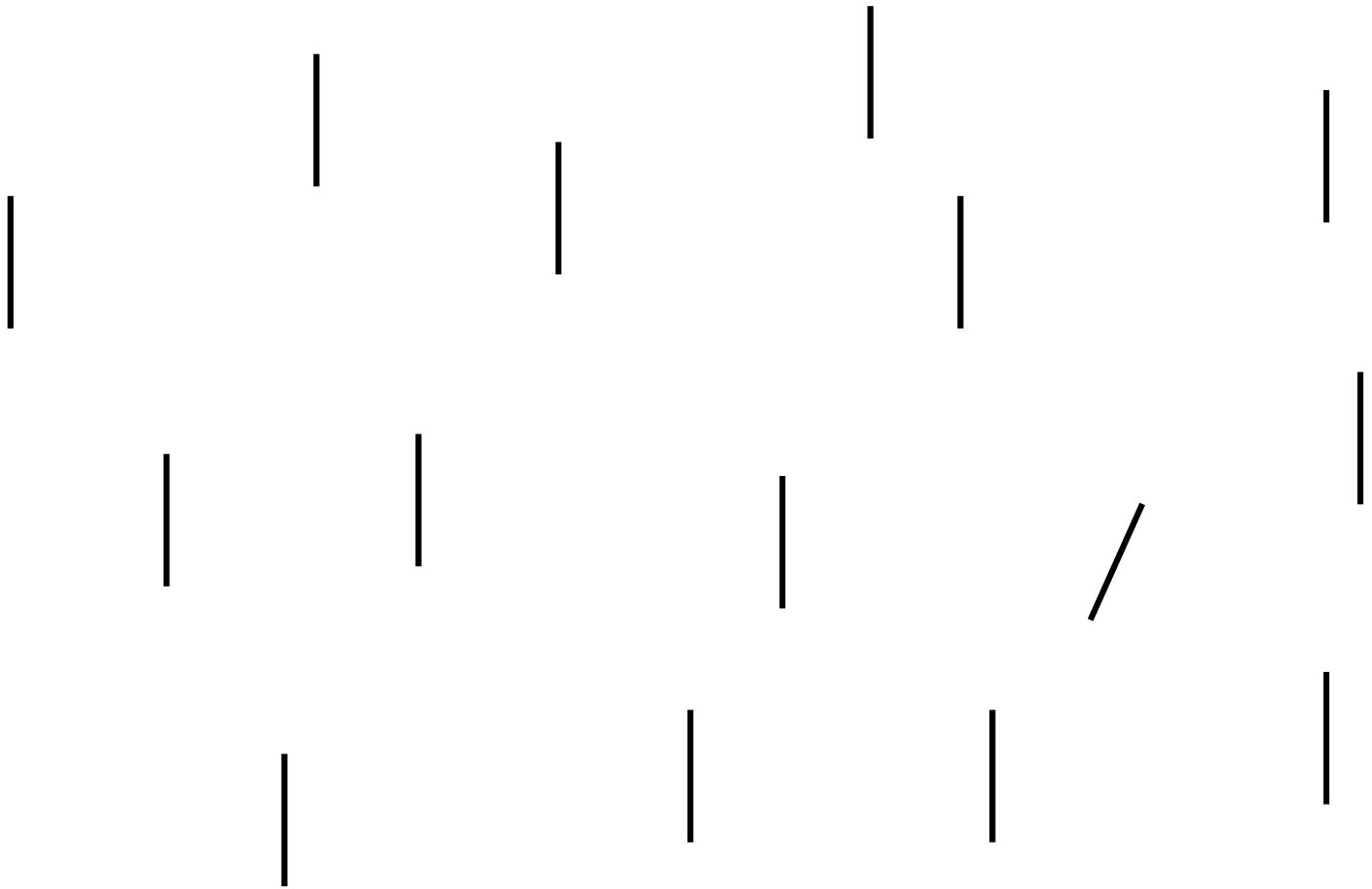
Distractors



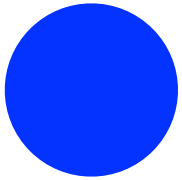
Is the slanted target on the left or the right?

Target

Distractors

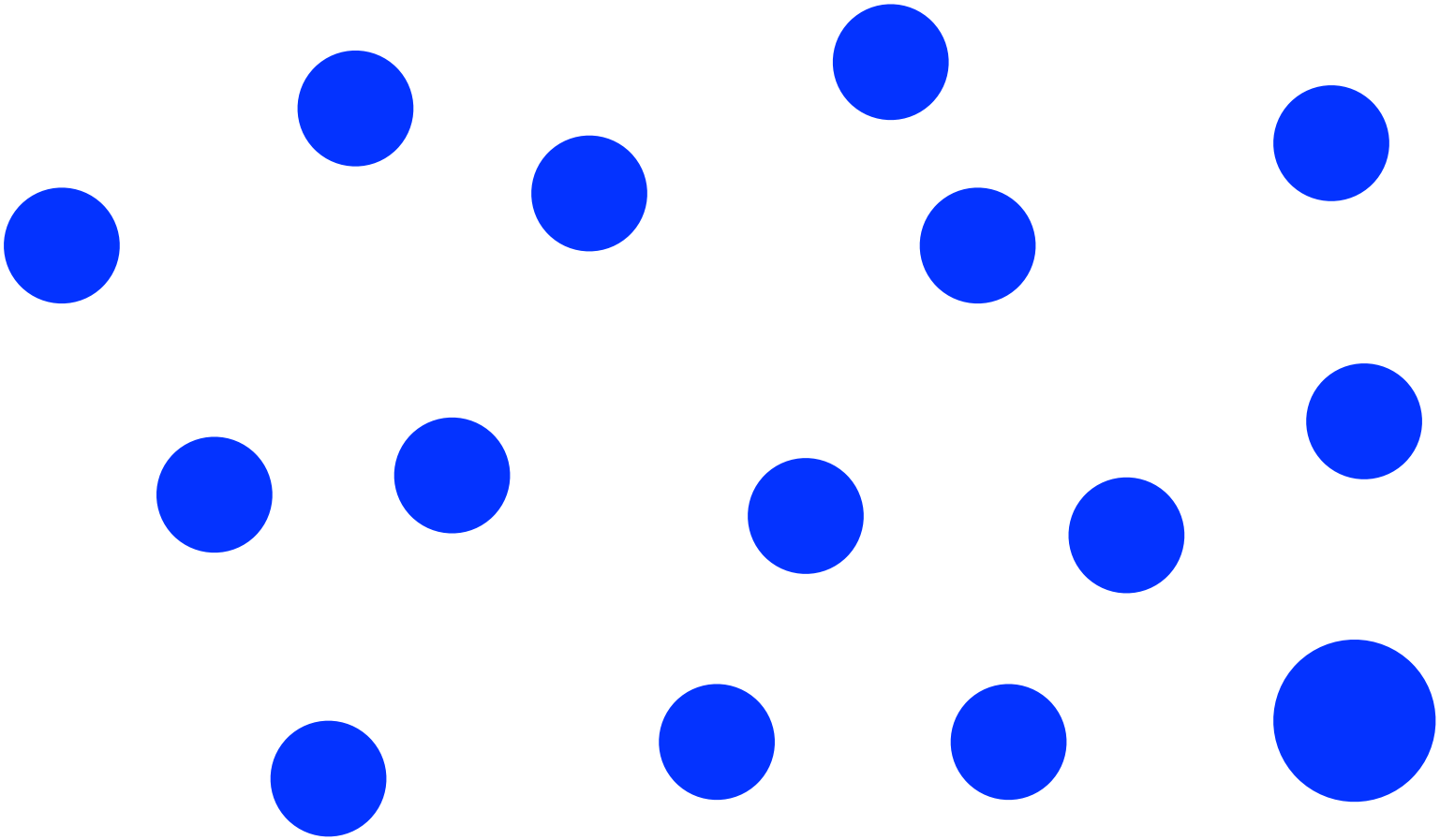


Is the big target on the left or the right?



Target

Distractors



Perception without attention

- Some visual features seem to be detected everywhere in parallel

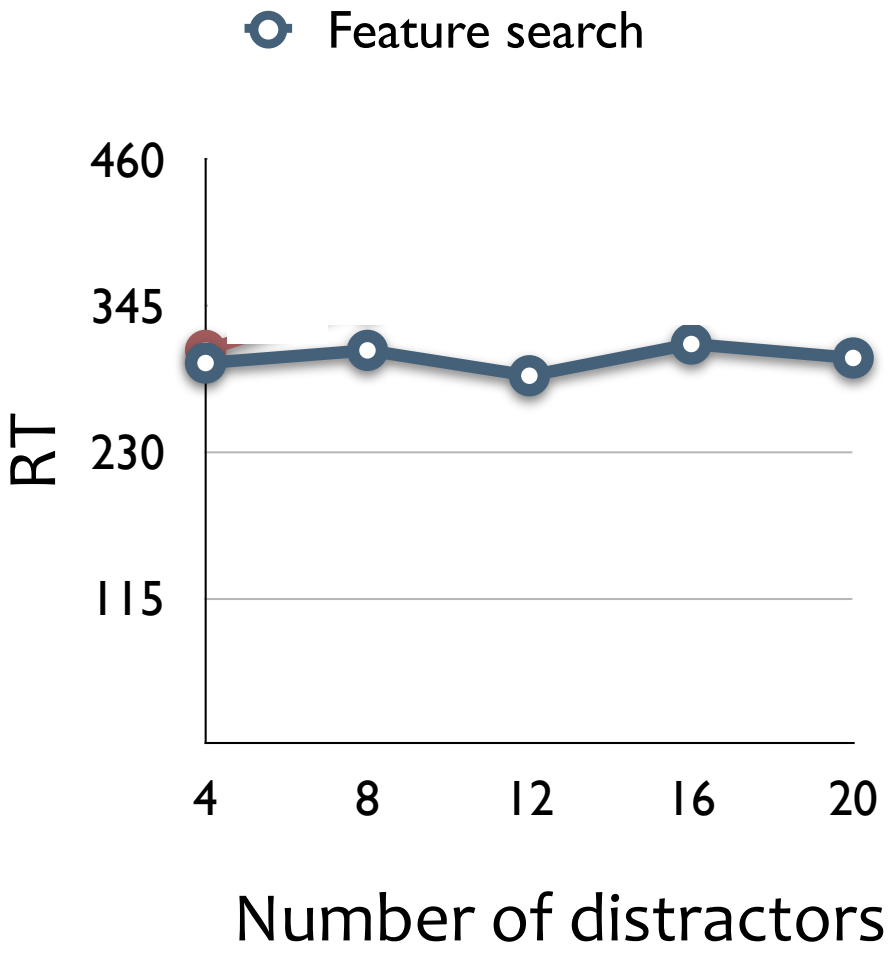
  Objects with the target feature “pop out” without apparent search

- Visual search paradigm:

  Response Time (RT) to detect the target as a function of the number of distractors

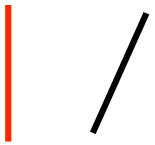
Visual search

- Feature search:
  Target has feature X
  Distractors don't
  No effect of #distractors
  → Parallel search
- Conjunction search



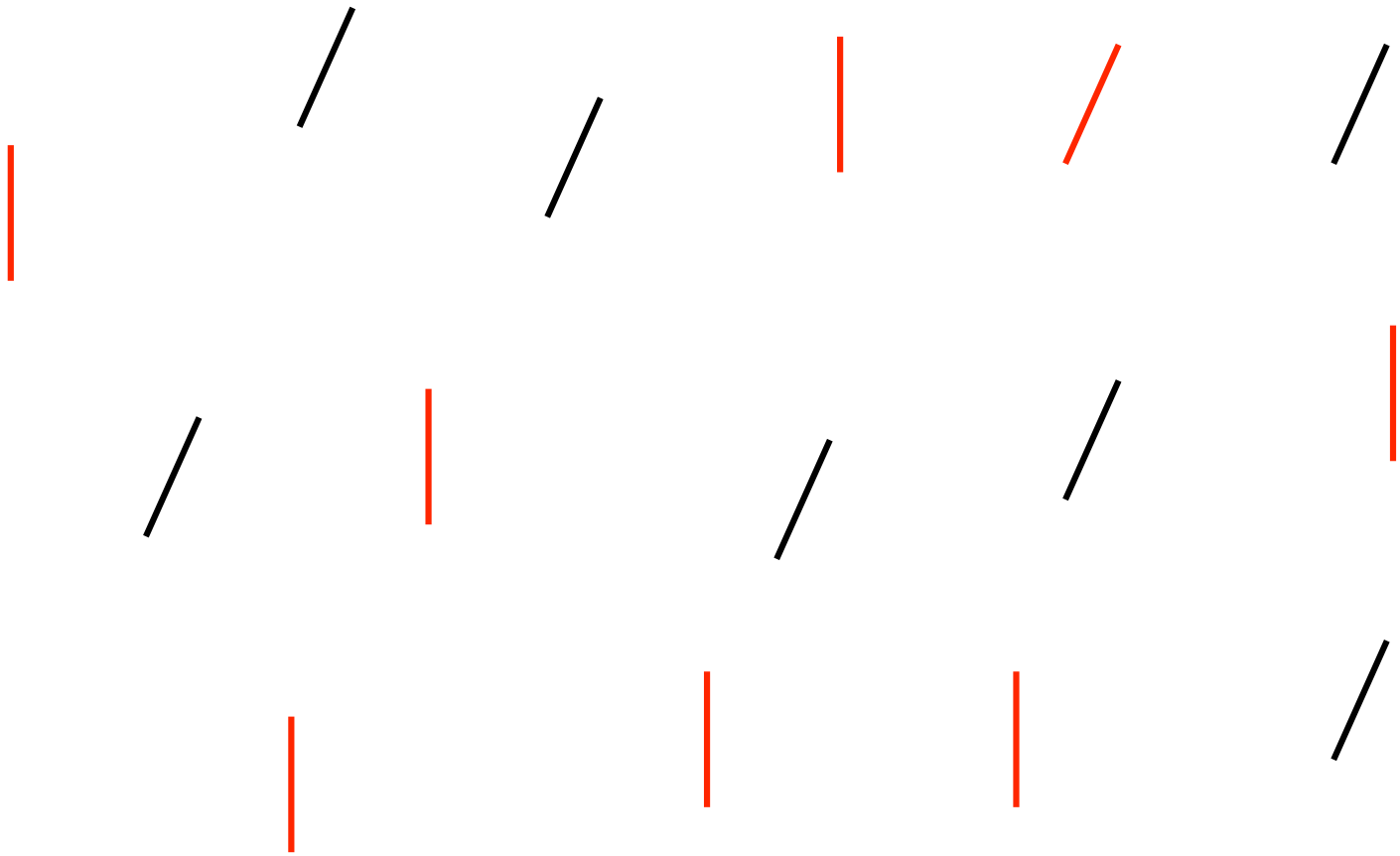
Is the slanted, red target on the left or the right?

Target: red ∧ slanted



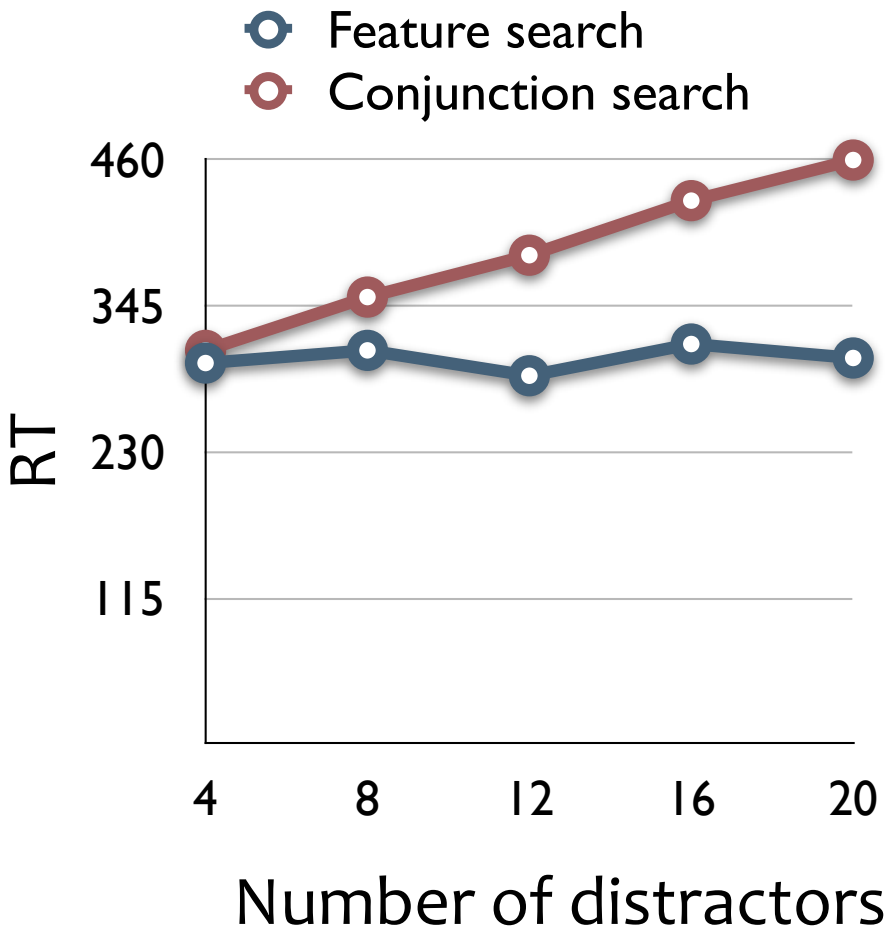
Distractors: ~(red ∧ slanted)

= ~red ∨ ~slanted



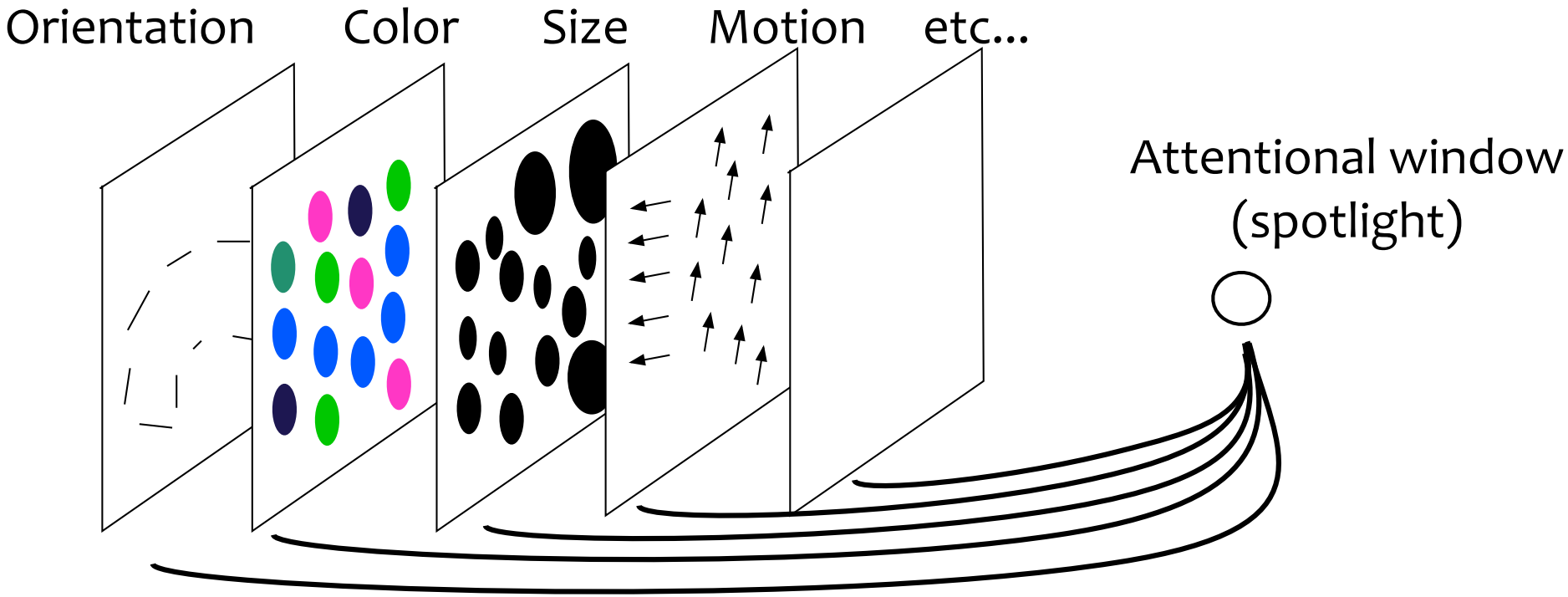
Visual search

- Feature search:
  - Target has feature X
  - Distractors don't
  - No effect of #distractors
  - → Parallel search
- Conjunction search
  - Target: feature conjunction
  - Linear effect of #distractors
  - → Serial search

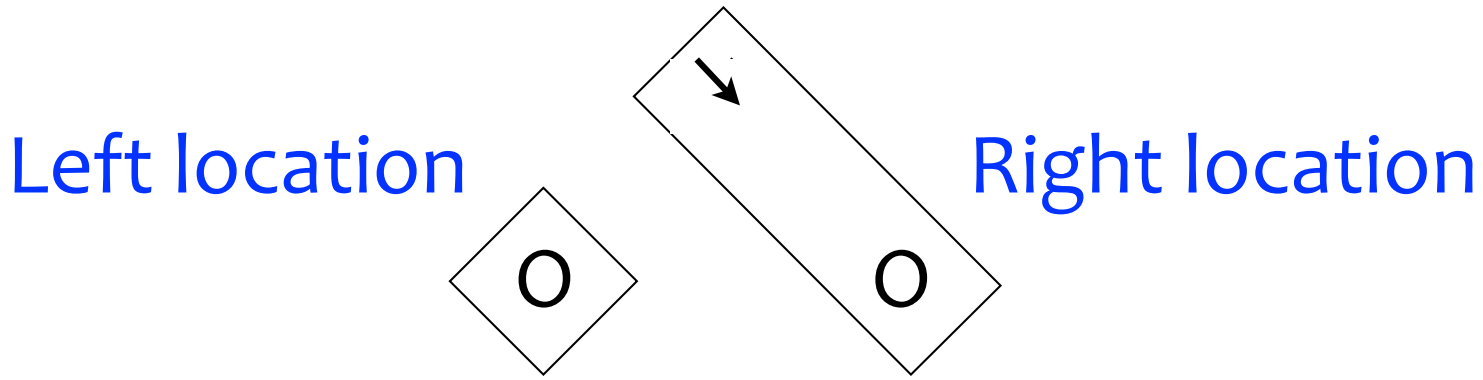


Feature binding requires attention

- Primitive feature maps are parallel
- Combining features at each location requires attention
- → Complex objects are only perceived within the spotlight of attention!



Object-based attention



Dot detection is faster at right location than left location

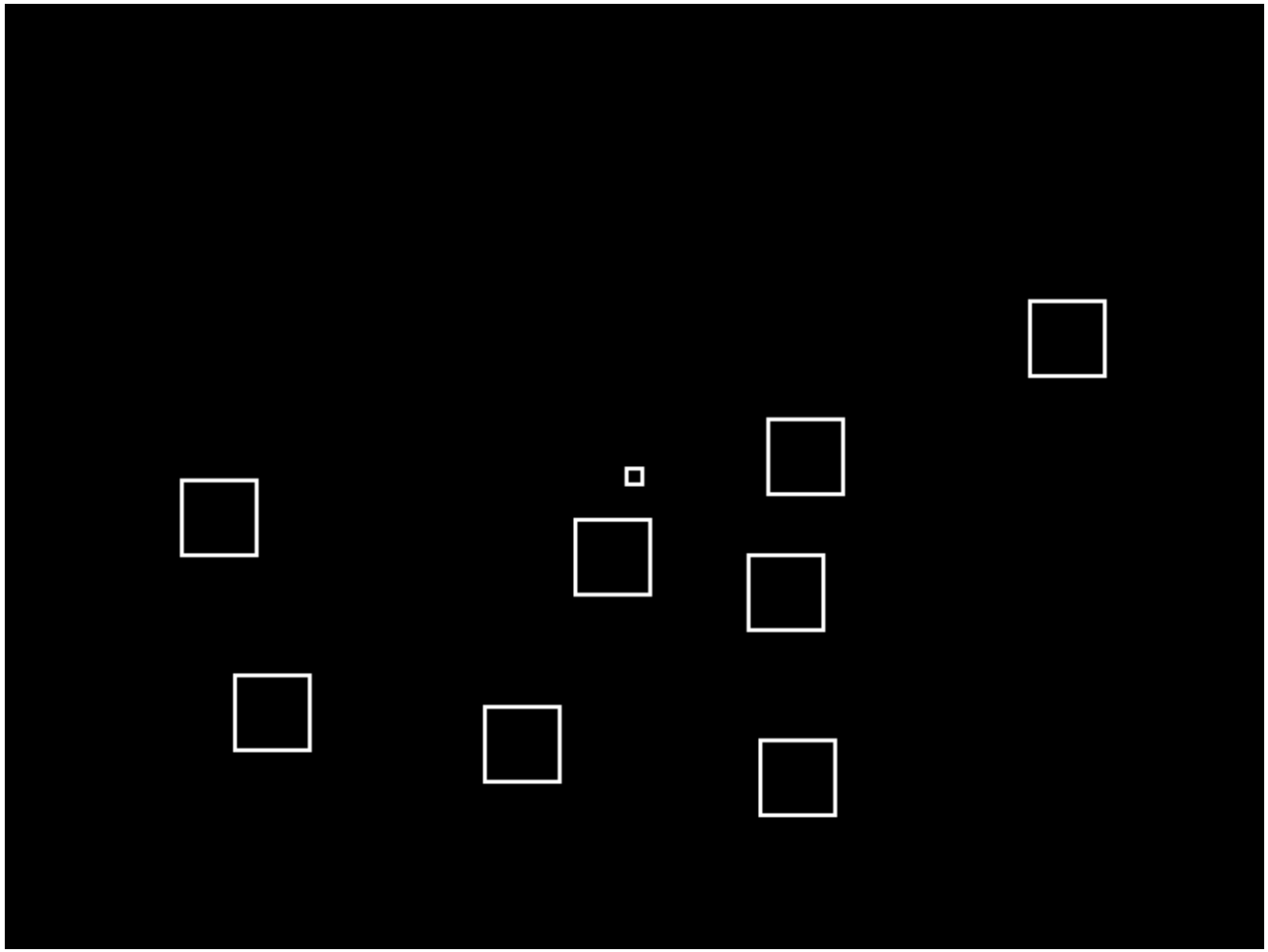
Object-based attention

- Attention seems to jump between objects but spread within objects
- Attention seems to select objects, not locations
- Multiple object tracking

  We can attend about 4 locations (objects) at once

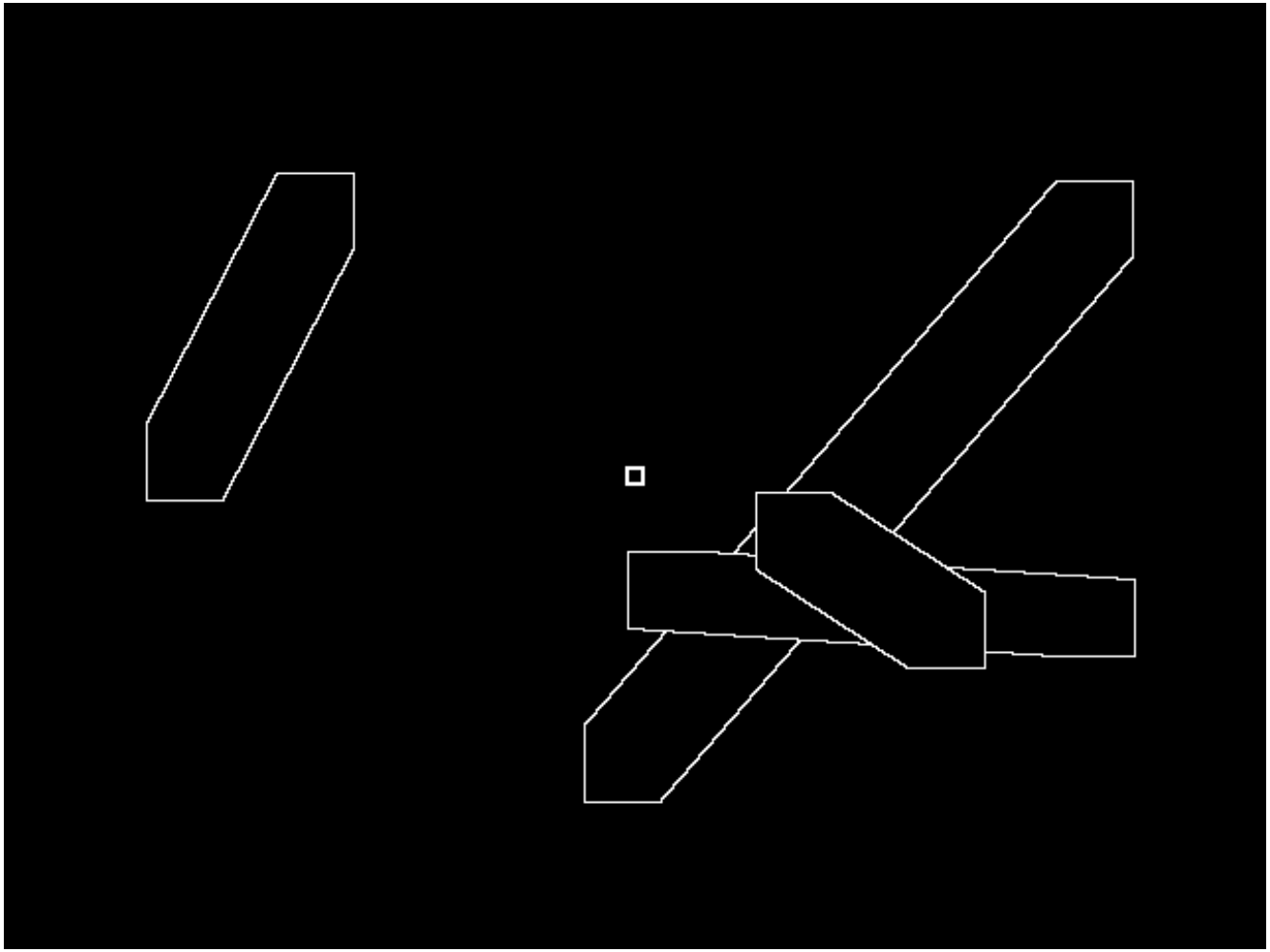
  But we track distinct objects, not locations.
- Subitizing

Multiple object tracking

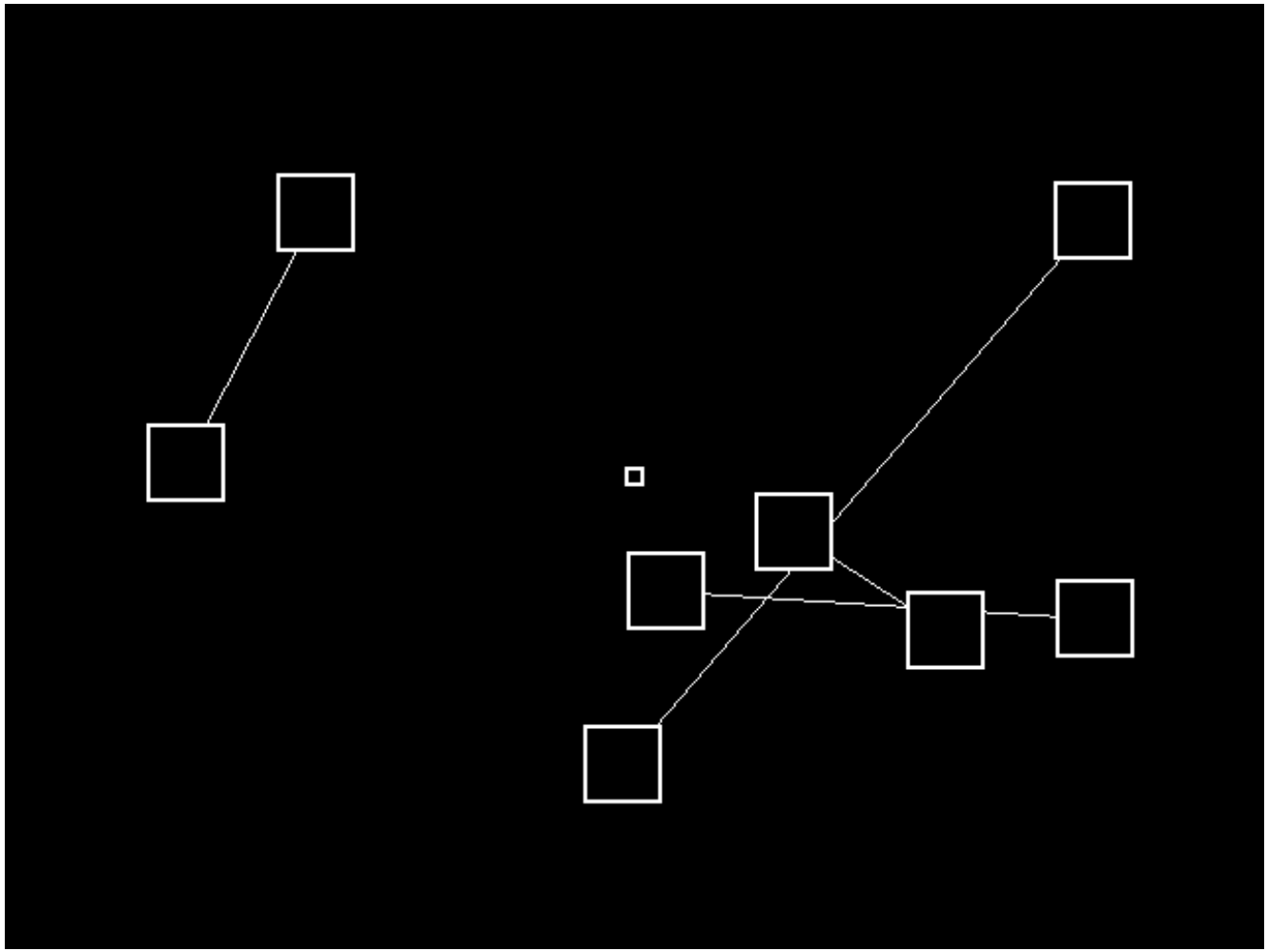


Tracking 4 objects among 8

http://perception.yale.edu/Brian/demos/MOT-Basics.html



When targets and distractors are “merged”, targets can’t be separately tracked



Even when only a thin line “merges” them, it still makes the task much more difficult