Preattentive Vision & Salience

Ru Qi Yu

Anne Treisman (1935-2018)

-faculty member at UBC in the 1980s

-feature integration theory

-ensemble perception

Defining preattentive vision

-What are preattentive processes

-What is attention?

Attention

Hard to define

-Cognition

-Neuroscience

-Day-to-day language

Concept of attention

Before scientific research

Origin?

Taking time and resources to focus on a target

Pre-attention

-Quick

-No specific target

Topics

-Visual search

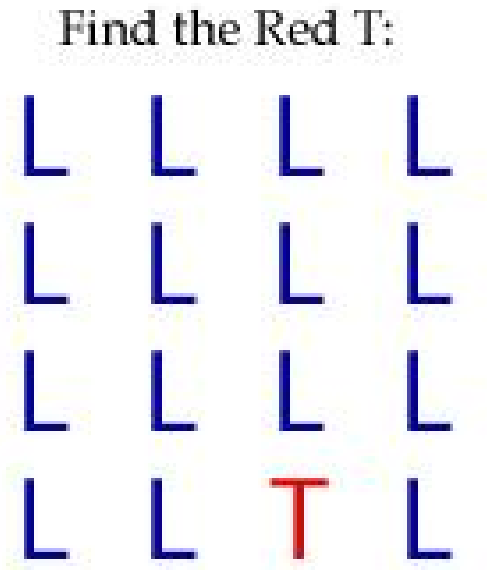
-Salience

-Application and caveats

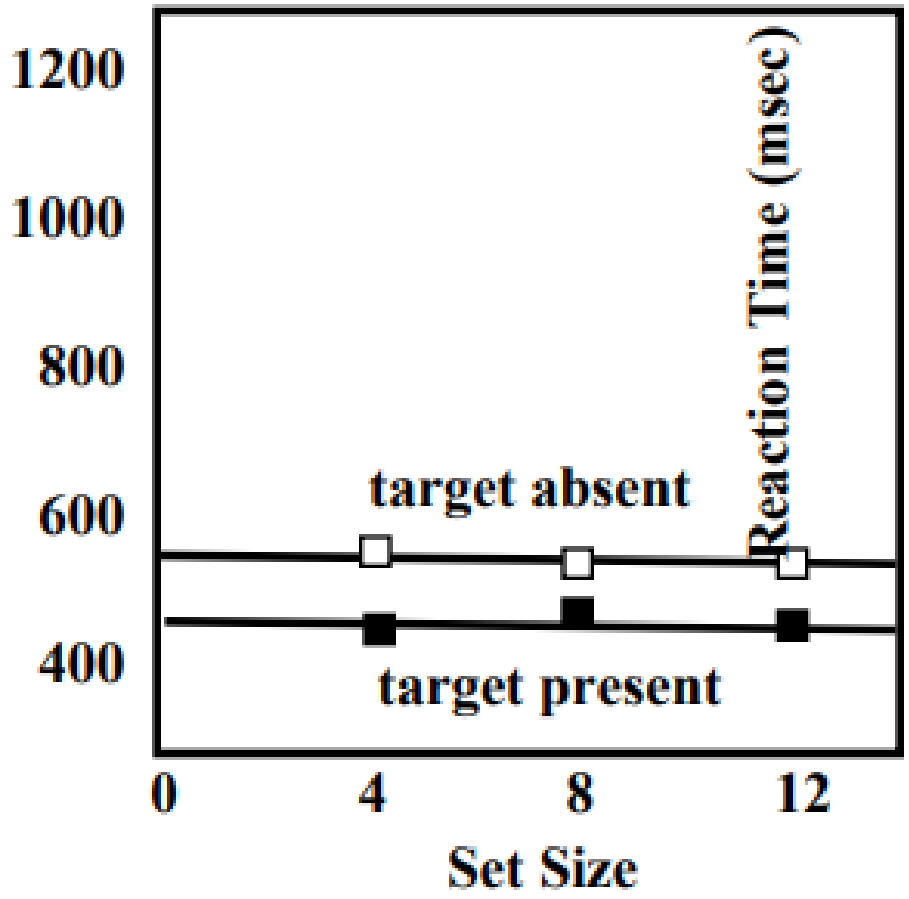
-Ensemble encoding

Visual search

Preattentive: quick and not focused



Pop-out effect



Wolfe, 2000

Salient features

When the target differs from the distractors in one feature

They “guide” attention

More complicated scenes

Salience map

Obtained from: http://www.oulu.fi/infotech/annual_report/2011/cmv

Can salience be determined so easily?

Visual search and salience

Pre-attentive basic features

Salience is more complicated

Applying salience to visualization

From research, we can know salient features that grab people's attention

Individual differences can also affect attention

-arousal level

-scarcity of resources

-previous experience and interests

Applying visually salient features

Test the specific audience first

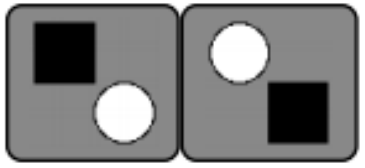
Other applications of visual search

-the paradigm is still very widely used

-does it tell us something other than salience

Other applications of visual search

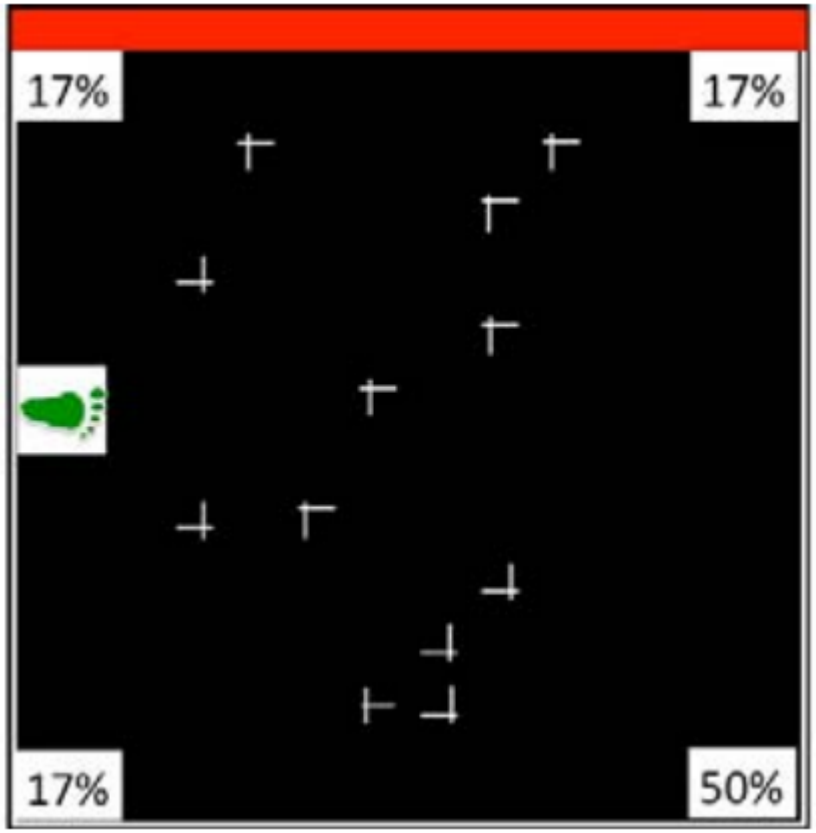
Which visual processes are fast?

Condition	Targets	Distractors	Rate (ms/item) Present	Absent
1A (Mosaic)			7	8
1B (Occlusion)			36	66

Rensink & Enns, 1997

Other applications of visual search

Where do people pay attention to



Jiang & Swallow, 2014

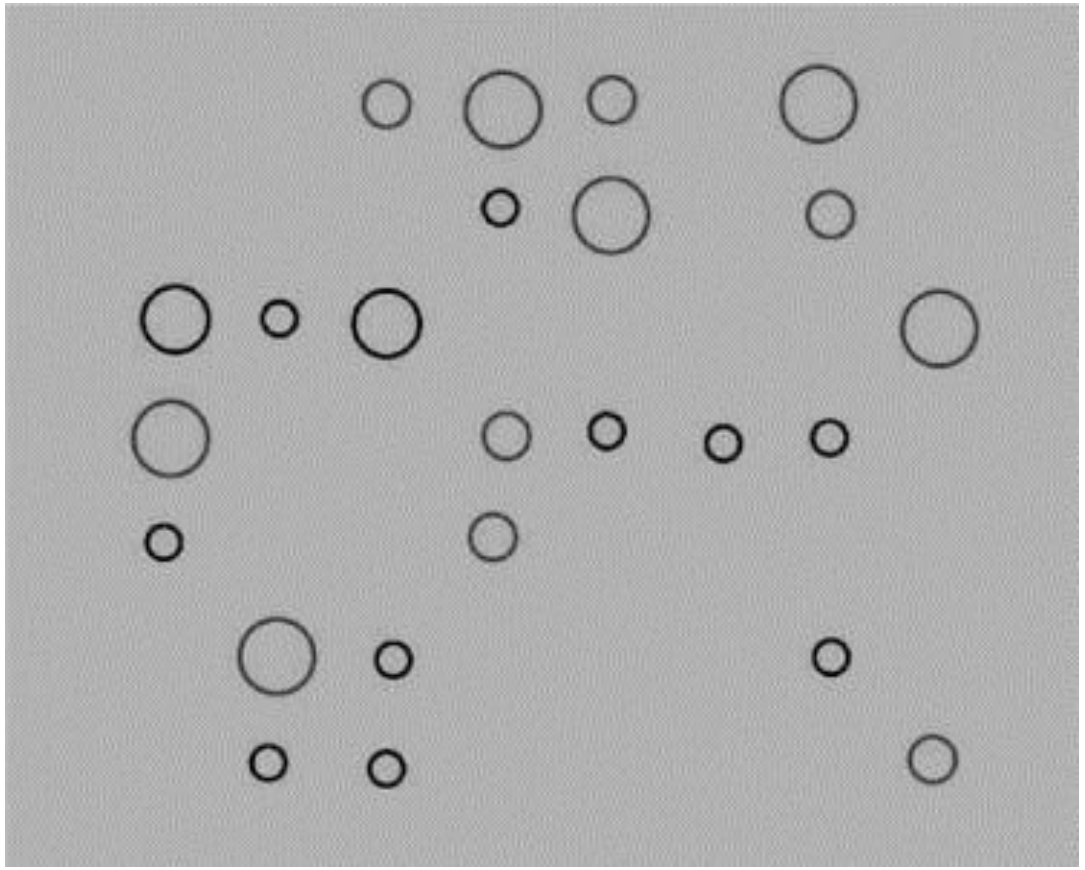
Ensemble perception

-Extraction of summary statistics

-Also quick

-May also be considered as pre-attentive -> before attention

Example



Chong & Treisman, 2005

How do we extract such information

-Density and numerosity?

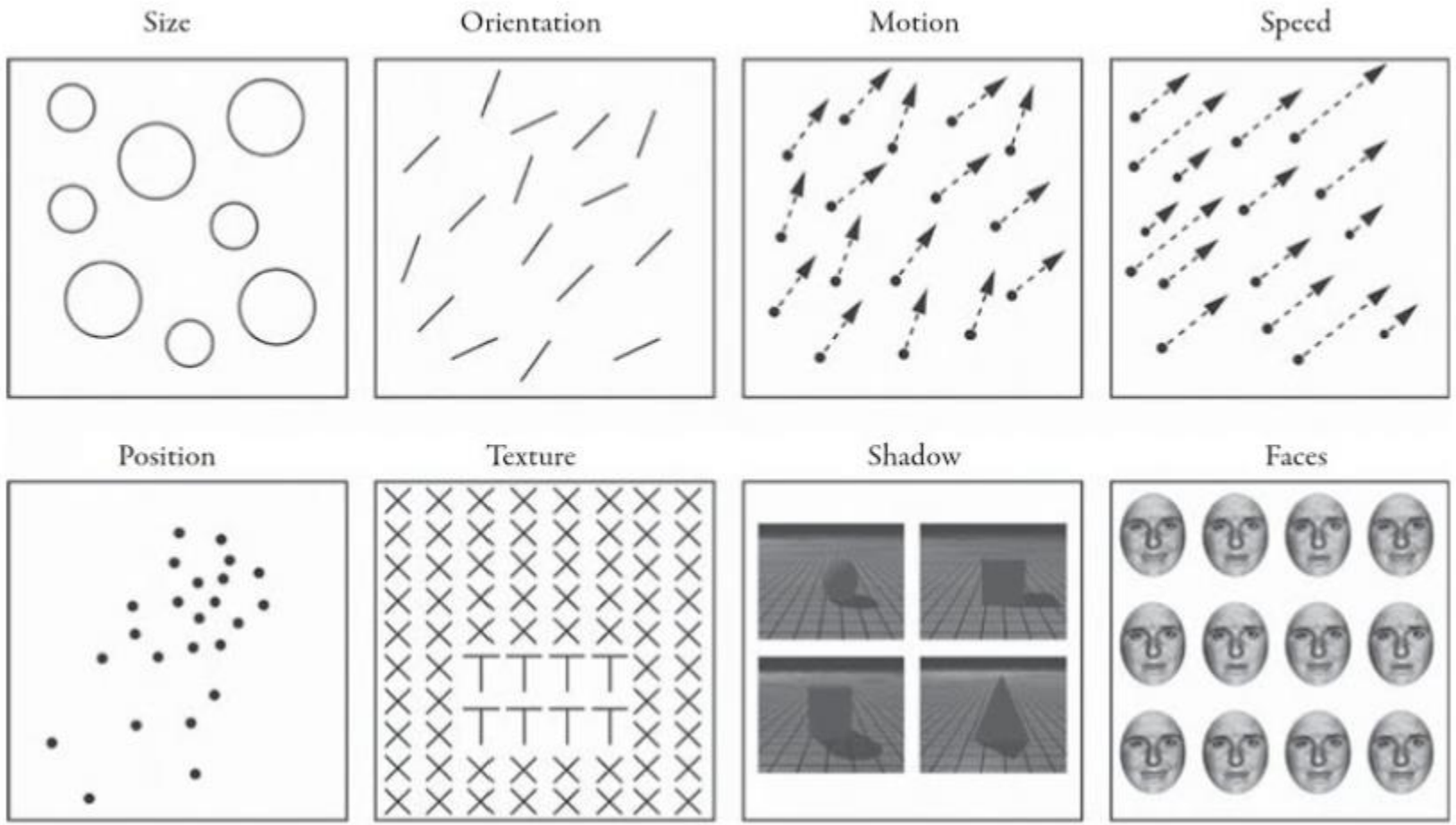
-Ensemble perception is fast and is minimally affected by other factors (Chong & Treisman, 2005)

Ensemble perception – low level processing?

-fast and relatively accurate

-do the early visual processes automatically extract the summary statistics?

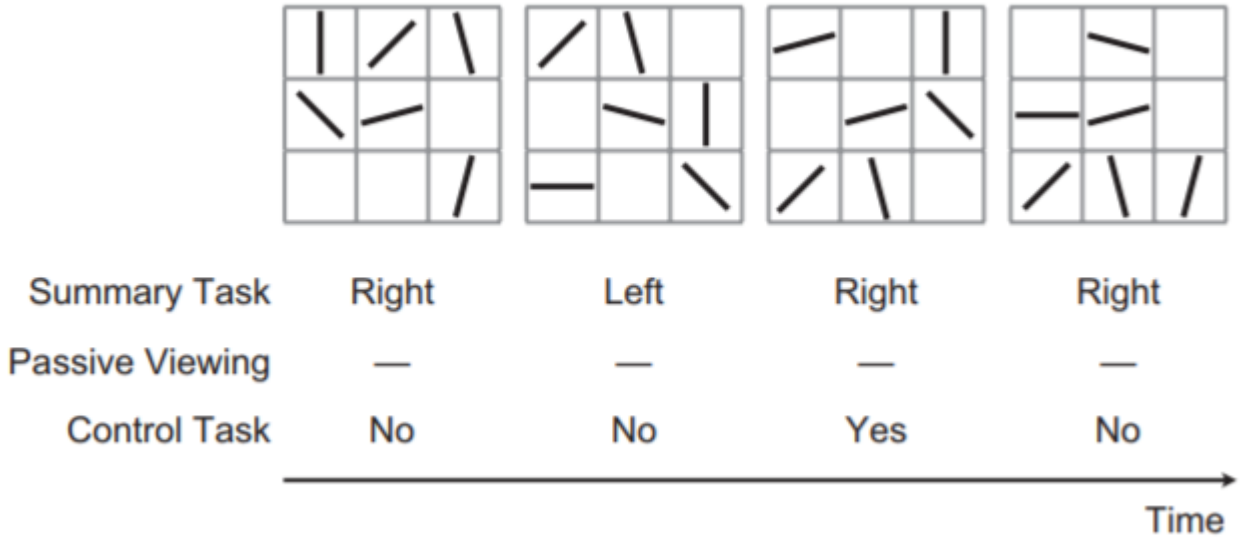
Ensemble perception – low level processing?



Haberman & Whitney, 2012

Ensemble perception – low level processing?

"Attention" may be involved

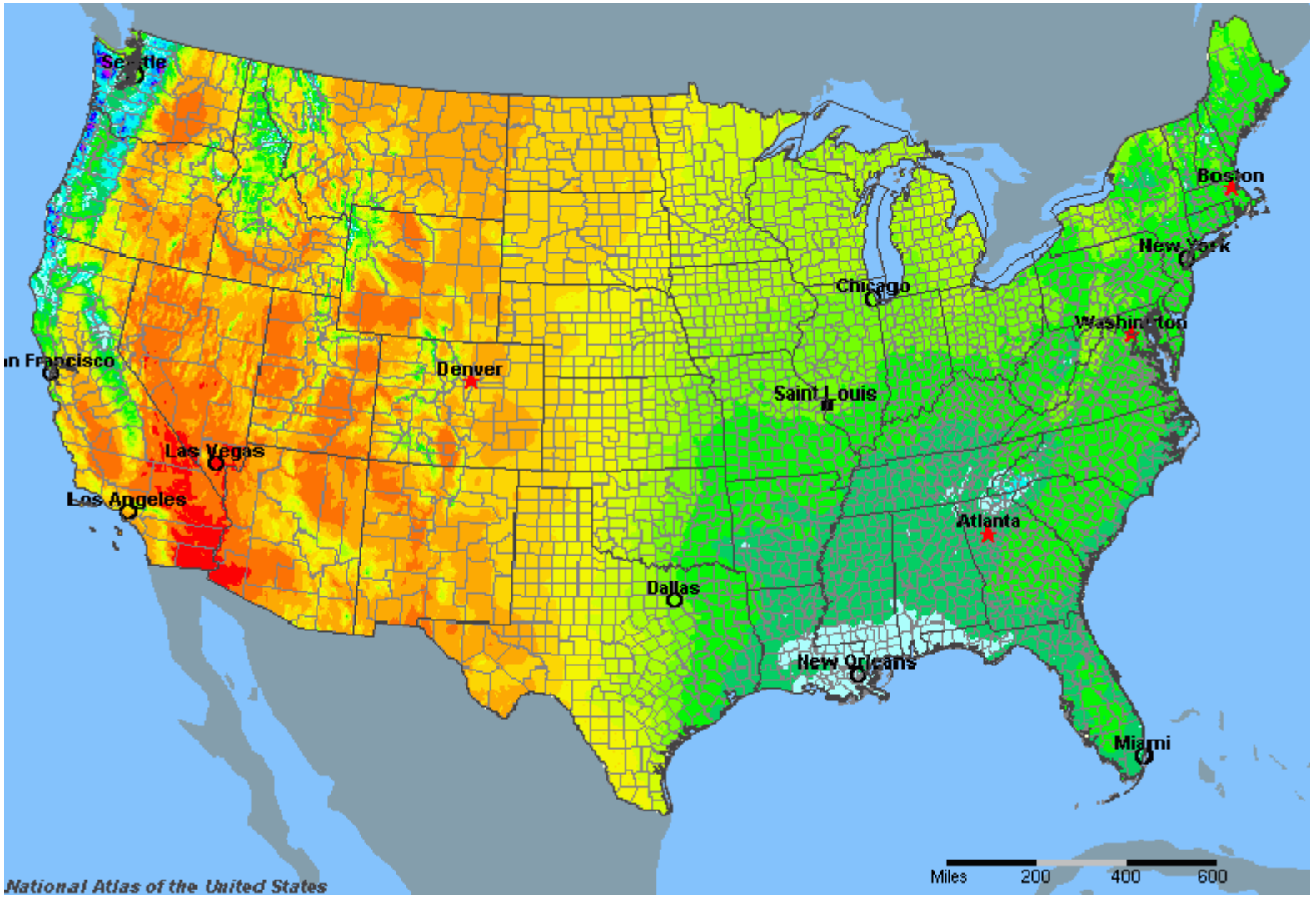


Zhao et al., 2011

Ensemble perception

-It’s quick and incidental, but “distributed attention” may be needed

-When we visualize information, don’t simply assume people can see the average


Seattle
Boston
New York
Chicago
Washington
San Francisco
Denver
Saint Louis
Las Vegas
Los Angeles
Atlanta
Dallas
New Orleans
Miami
National Atlas of the United States
Miles
200
400
600

Take-home messages

-The visual system extracts some information quickly

-We can use these results to predict salience

-The visual system needs to be “ready” to quickly extract certain information (i.e., summary statistics)