

# Perception

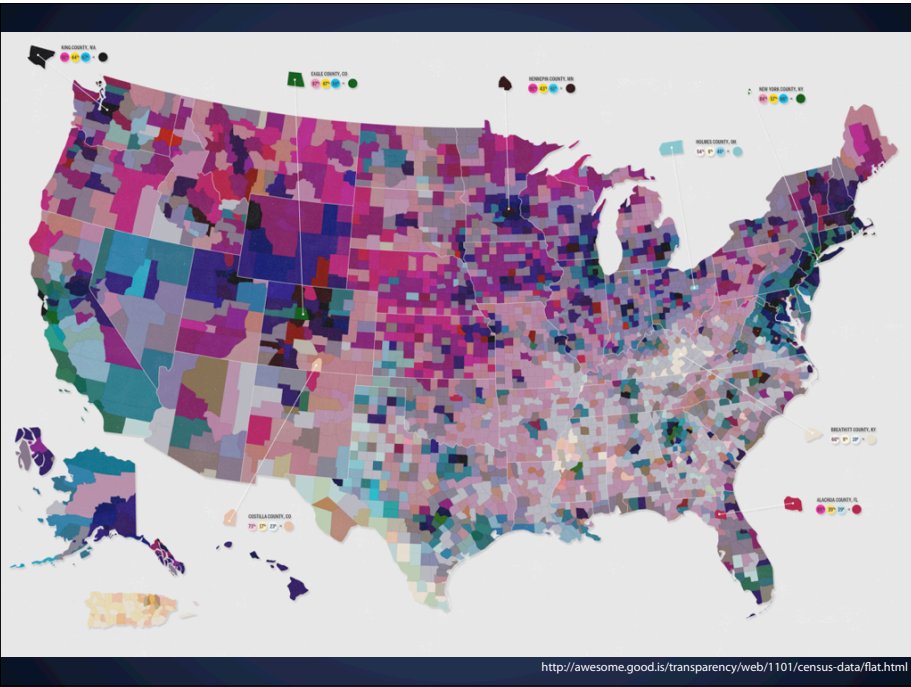
## Part I

Feb 7, 2012 – Michael Porath

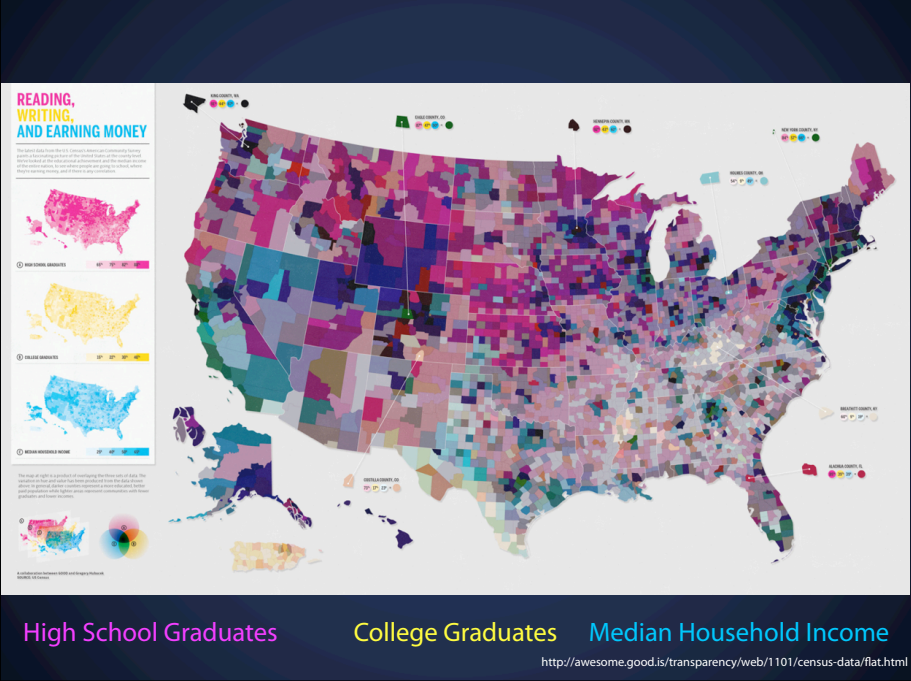
# Perception

## Part I

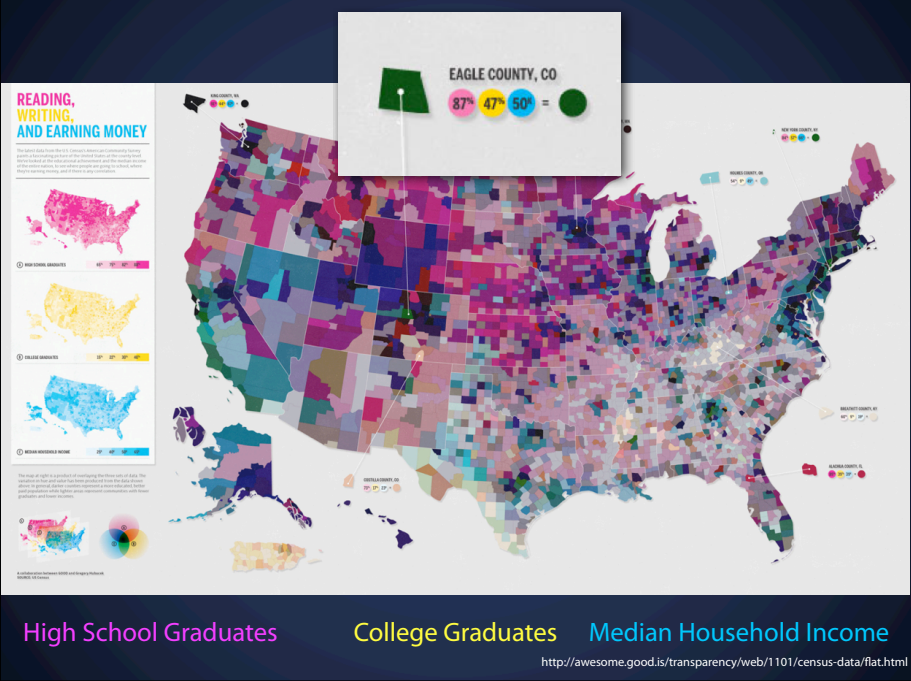
Feb 7, 2012 – Michael Porath



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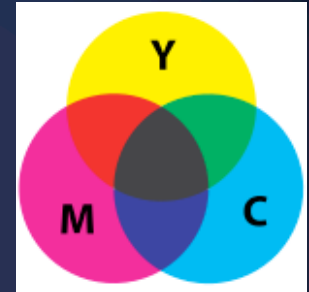
# Pre-attentive Attributes

vs Attentive Attributes

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## Pre-attentive vs Attentive

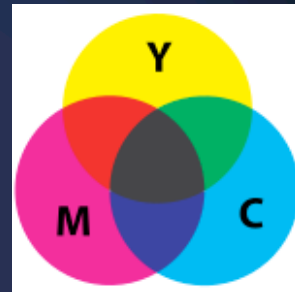
Example: Individual Colors vs Color Mixtures



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## Pre-attentive vs Attentive

Example: Individual Colors vs Color Mixtures



$\leq 500\text{ms}$

Task

$> 500\text{ms}$

$\leq 10\text{ms}$

indiv. obj.

$> 10\text{ms}$

parallel processing

sequential processing

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# Where's Waldo?

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# How many 3s?

Ware, 2004

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# How many 3s?

1281768756138976546985604982826762  
9809858458224509856458940980943585  
9091030209905959595775050678904567  
8845789809821677654876360912949686

Ware, 2004

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# How many 3s?

Ware, 2004

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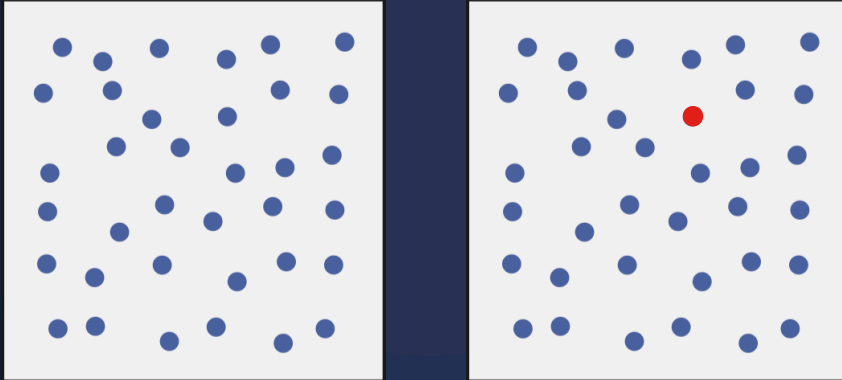
# How many 3s?

5813120624510462757776443227882568  
8540085481532851714248582146284078  
1041710341052577585177276725911070  
4512525182715140123882064857804410

Ware, 2004

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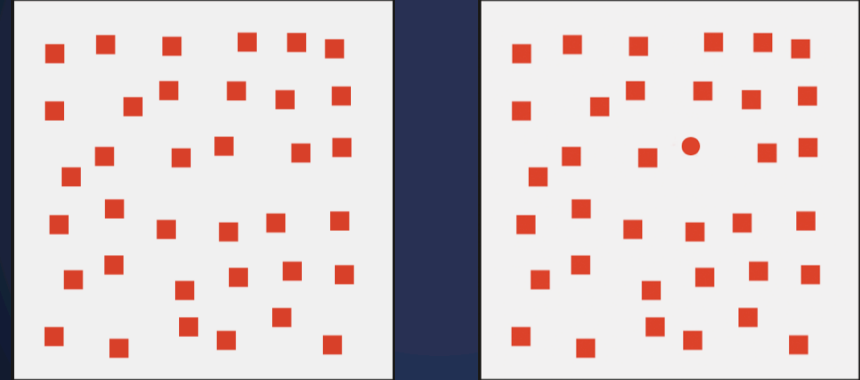
## Visual Pop-Out: Color



Healey (2011)

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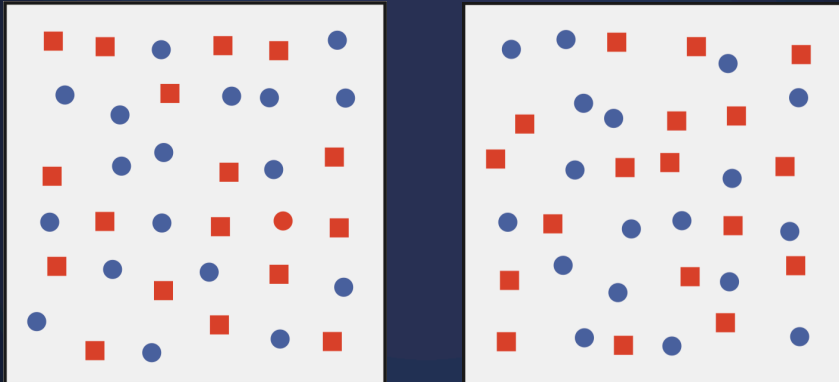
## Visual Pop-Out: Shape



Healey (2011)

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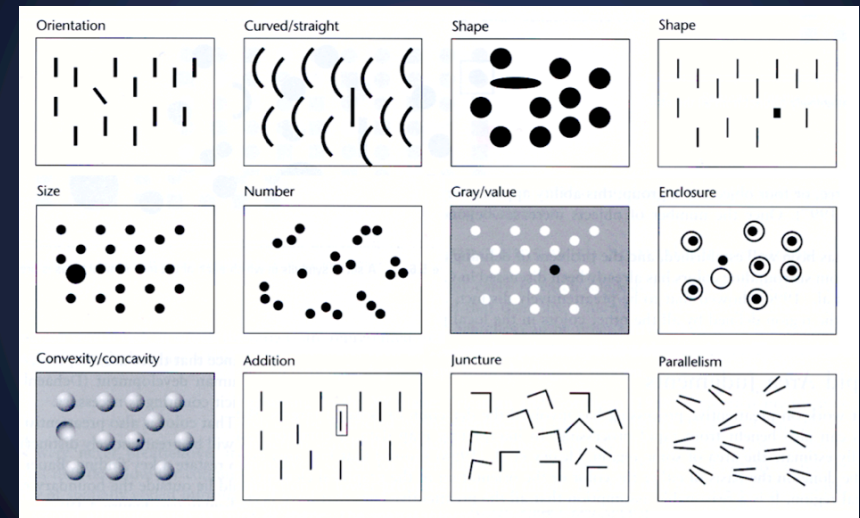
## Feature Conjunctions



Healey (2011)

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## Pre-attentive Features



Ware, 2004

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# More Pre-attentive Features

Line (blob) orientation  
Length  
Width  
Size  
Curvature  
Number  
Terminators  
Intersection  
Closure

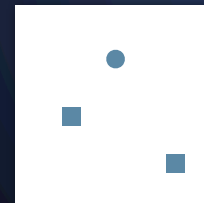
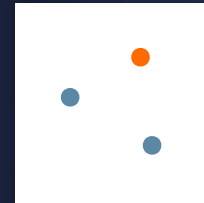
Color (hue)  
Intensity  
Flicker  
Direction of motion  
Binocular lustre  
Stereoscopic depth  
3-D depth cues  
Lighting direction

<http://www.csc.ncsu.edu/faculty/healey/PP/index.html>

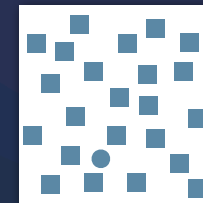
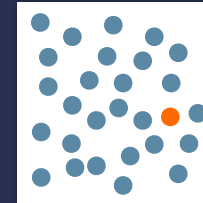
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# Distractors - Pre-attentive

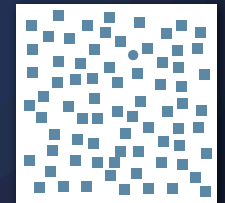
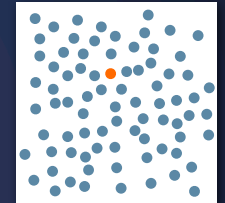
Few



More



A lot



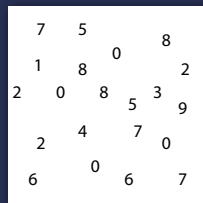
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# Distractors - Attentive

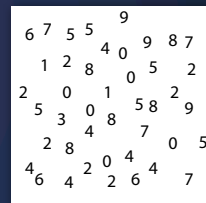
Few



More

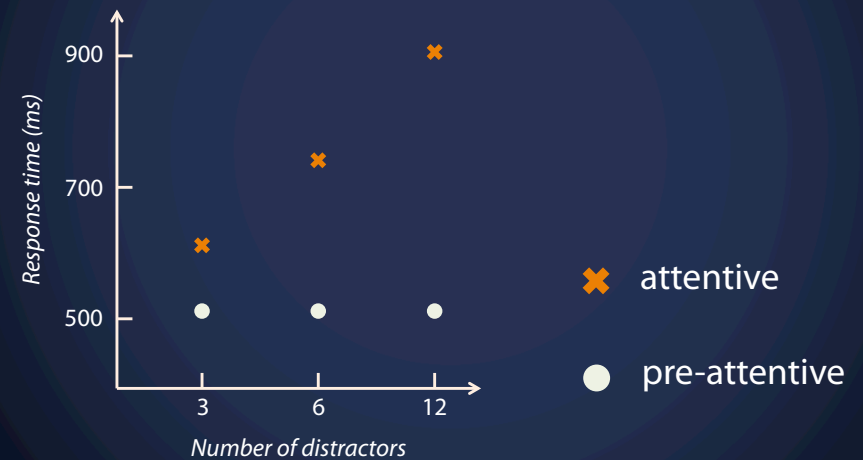


A lot



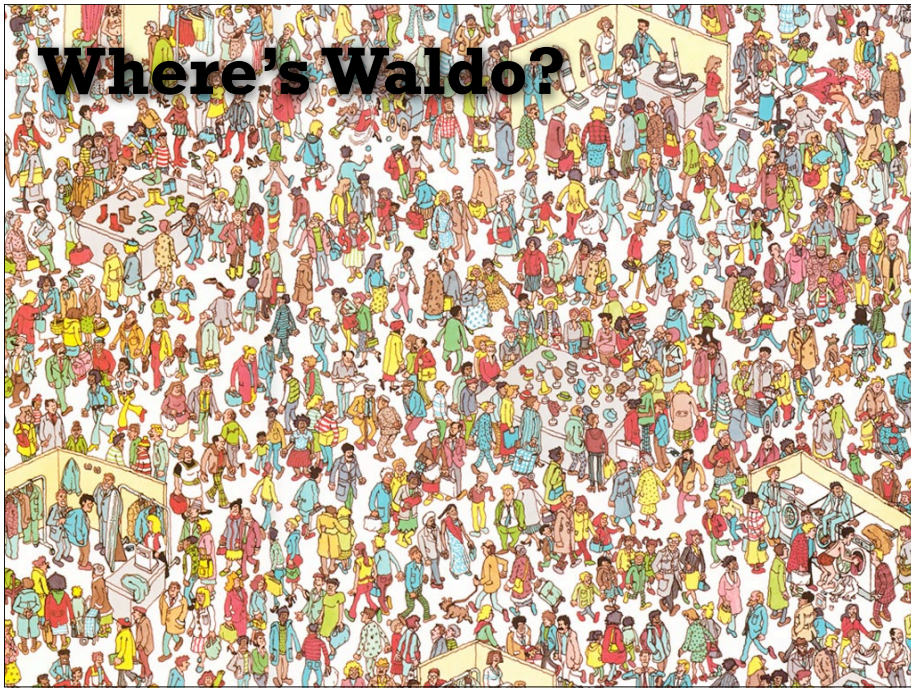
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# Distractors

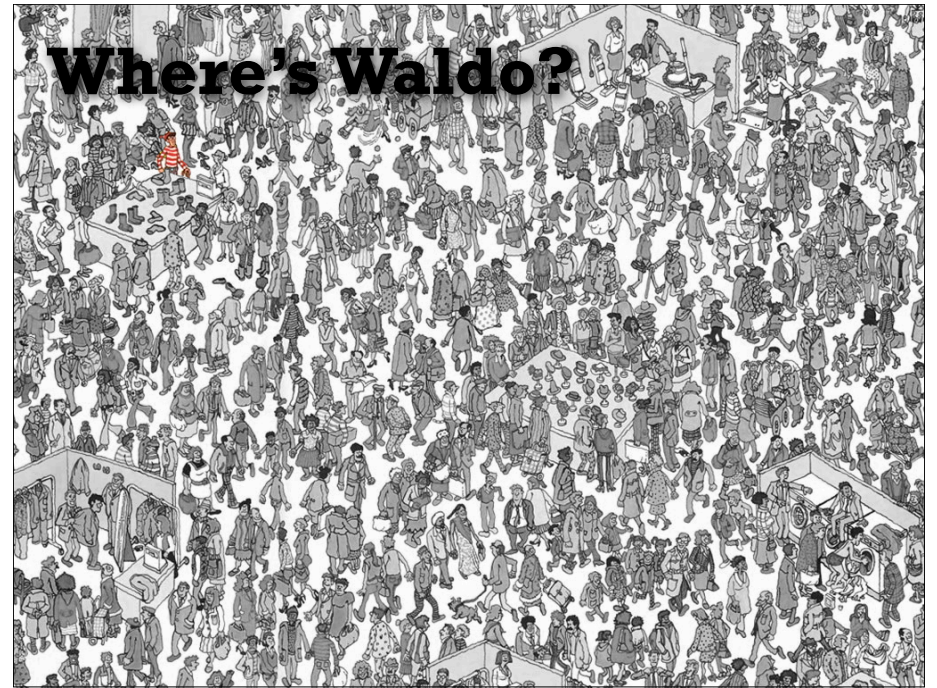


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Ware, 2004



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# Multiple Attributes

## Conjunctions

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# One-Dimensional

Lightness



White

Black

White

Black

Black

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# One-Dimensional

Shape

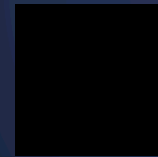


Circle  
Square  
Circle  
Square  
Square

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# Correlated Dimensions

Shape or lightness (Redundant encoding)

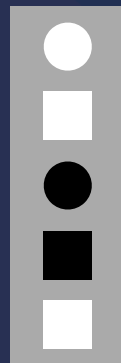


Circle  
Square  
Circle  
Square  
Square

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# Orthogonal Dimensions

Shape **and** lightness

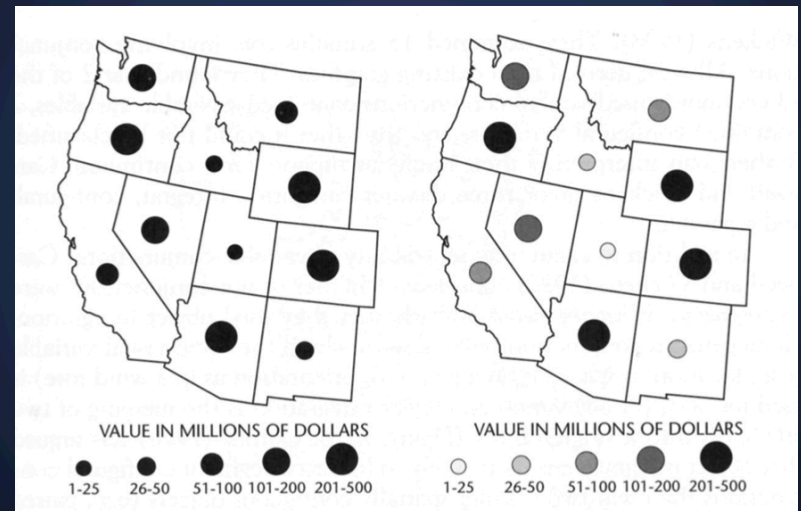


Circle  
Square  
Circle  
Square  
Square

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# Correlated Dimensions

Size and Value



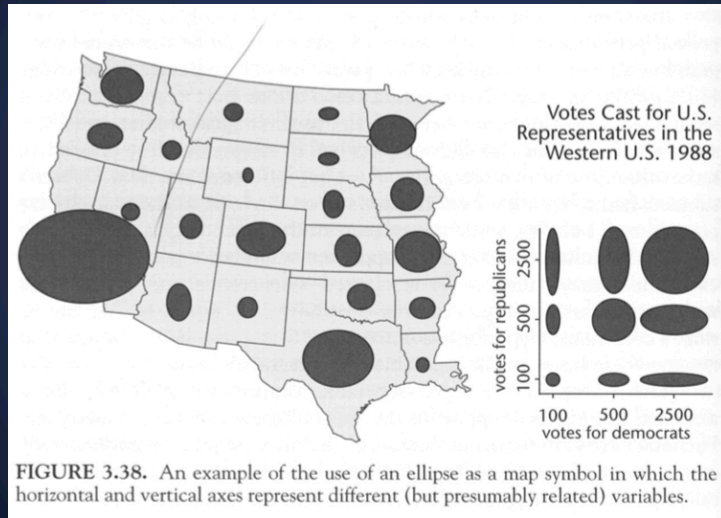
W. S. Dobson, Visual information processing and cartographic communication: The role of redundant stimulus dimensions, 1983 (reprinted in MacEachren, 1995)

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# Orthogonal Dimensions

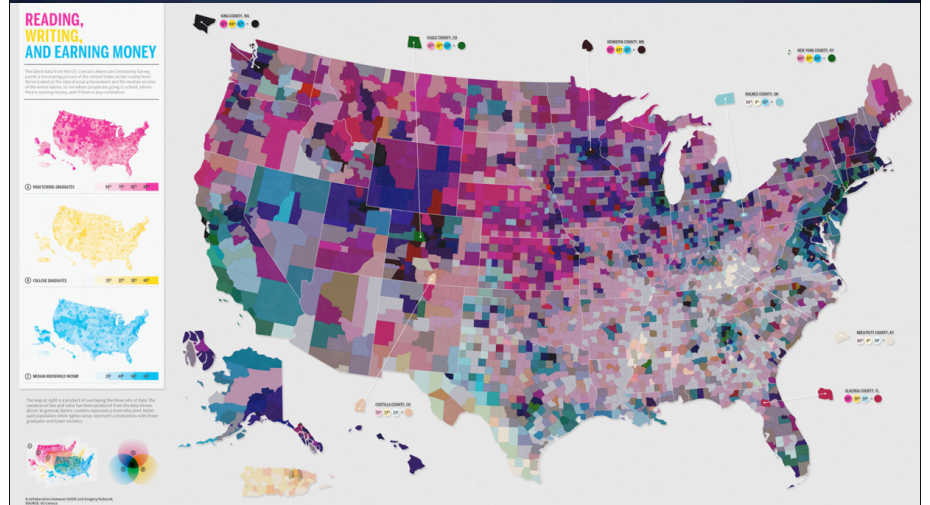
Aspect Ratio: Size and Size



MacEachren, 1995

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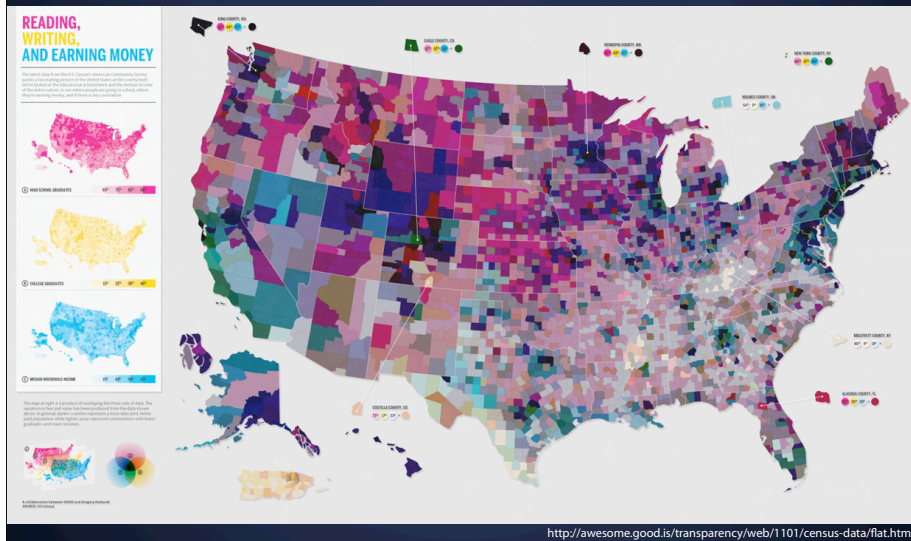
Color and Color and Color



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# Orthogonal Dimensions

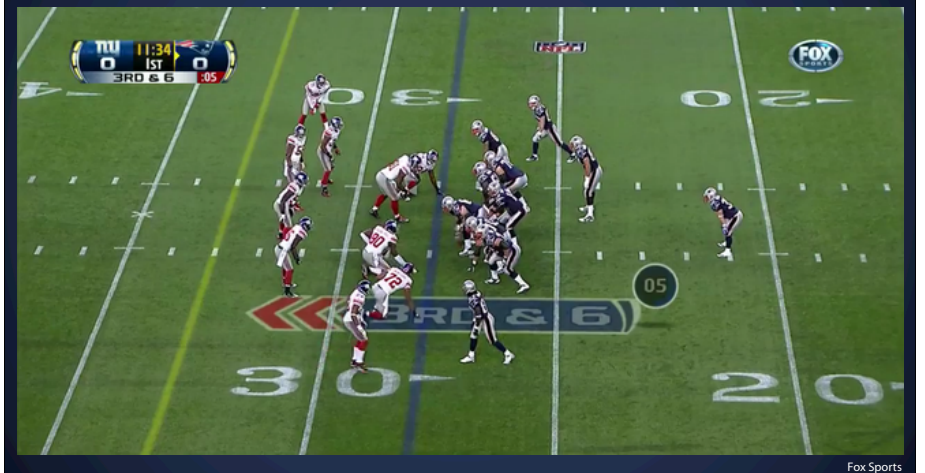
Color and Color and Color



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# Super Bowl

Orthogonal? Correlated?

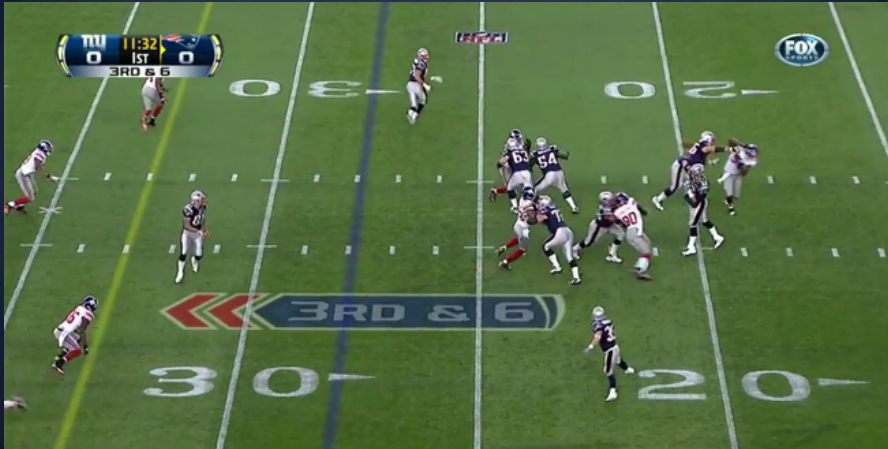


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# Super Bowl

Orthogonal? Correlated?



Fox Sports

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# Recap

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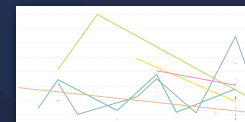
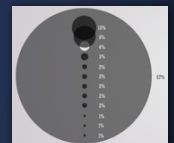
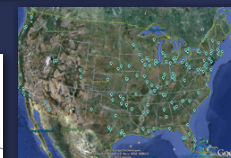
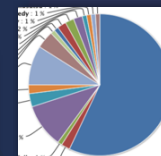
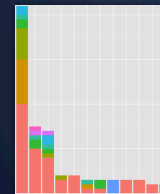
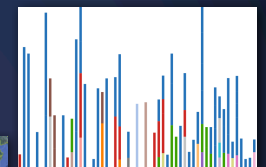
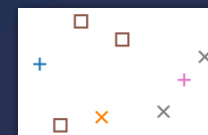
# Lab

Assignment 1 Design Critique

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# Feedback Assignment 1

Different types of graphs

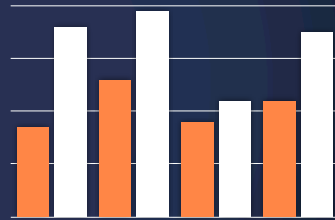


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# Feedback Assignment 1

Common Pitfalls

- No Labels
- No Axis
- No Title
- No Caption (if inline)
- Too many different colors
- Distracting decorations

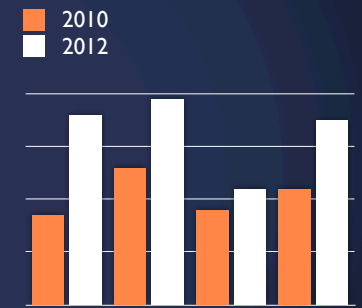


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# Feedback Assignment 1

Common Pitfalls

- No Labels / Legend
- No Axis
- No Title
- No Caption (if inline)
- Too many different colors
- Distracting decorations

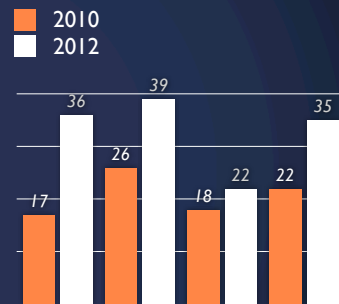


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# Feedback Assignment 1

Common Pitfalls

- No Labels / Legend
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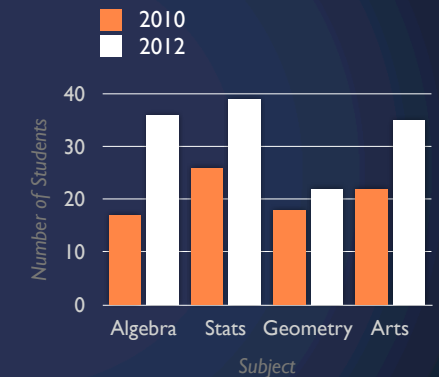


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# Feedback Assignment 1

Common Pitfalls

- No Labels / Legend
- No Axis / Axis Titles
- No Title
- No Caption (if inline)
- Too many different colors
- Distracting decorations

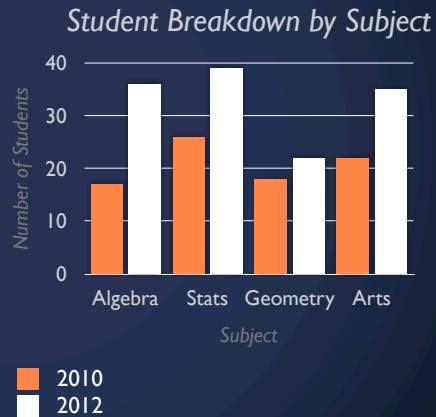


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# Feedback Assignment 1

## Common Pitfalls

- No Labels / Legend
- No Axis / Axis Titles
- **No Title**
- No Caption (if inline)
- Too many different colors
- Distracting decorations

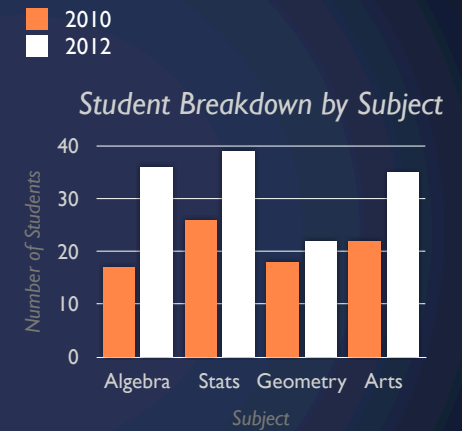


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# Feedback Assignment 1

## Common Pitfalls

- No Labels / Legend
- No Axis / Axis Titles
- No Title
- **No Caption (if inline)**
- Too many different colors
- Distracting decorations



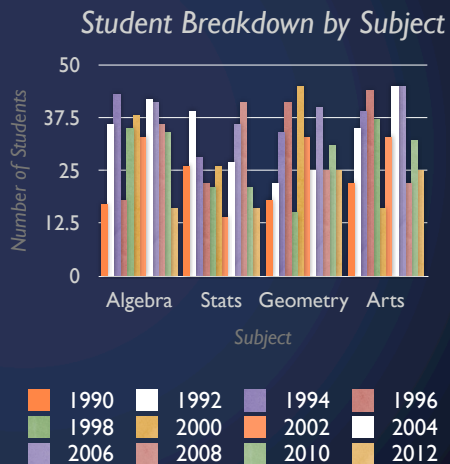
**Graph 1** – The number of students have increased from 2010 to 2012. This is true across the board, independent of the subject.

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# Feedback Assignment 1

## Common Pitfalls

- No Labels / Legend
- No Axis / Axis Titles
- No Title
- No Caption (if inline)
- **Too many different colors / categories**
- Distracting decorations

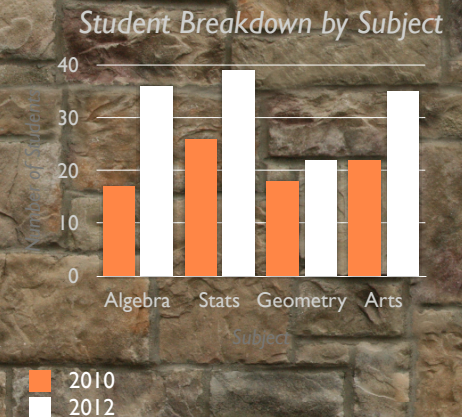


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# Feedback Assignment 1

## Common Pitfalls

- No Labels / Legend
- No Axis / Axis Titles
- No Title
- No Caption (if inline)
- Too many different colors
- **Distracting decorations**

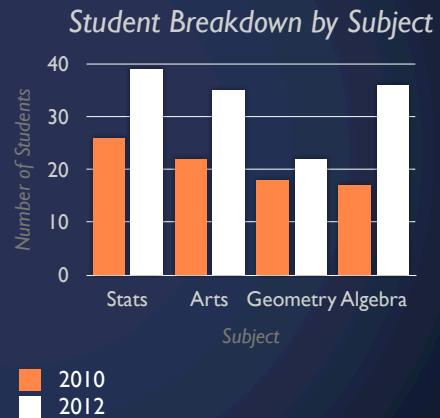


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# Feedback Assignment 1

Improvements

- Filter Data
- Arrange / Sort By Data
- Ask For Feedback



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# Critiquing Visualizations

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## Critiquing Visualizations

*Critique the design, not the designer*

**DO**

Listen before speaking.

Suggest alternatives.

Avoid statements that refer to absolutes.

Point out good aspects.

**DON'T**

Be overly nice

"That's interesting"

"That's stupid"

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