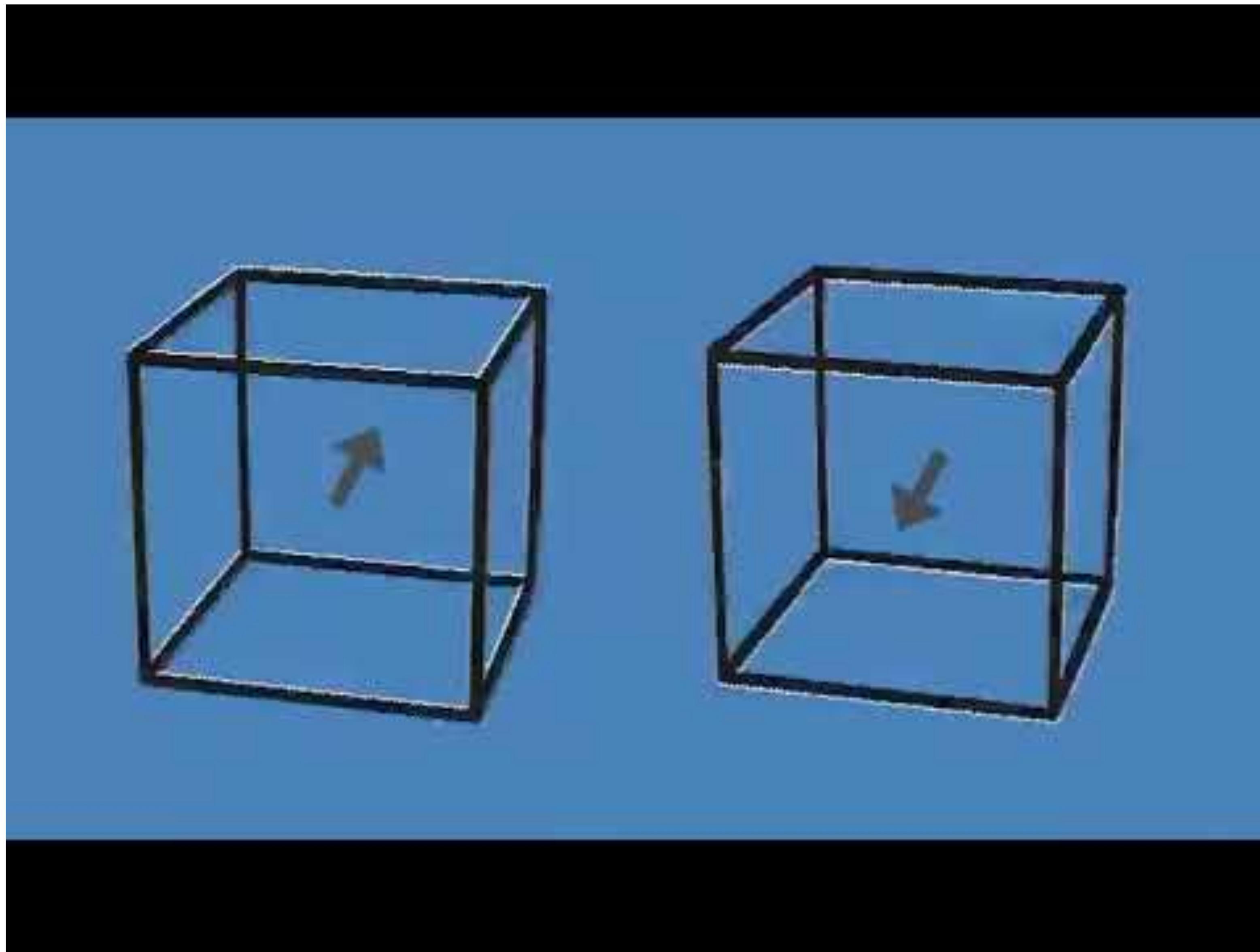

CSC4130

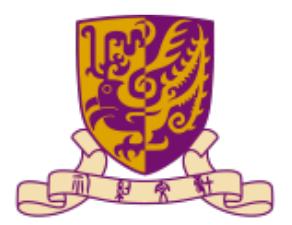
Introduction to Human-Computer Interaction

Lecture 10

Perception and Cognition

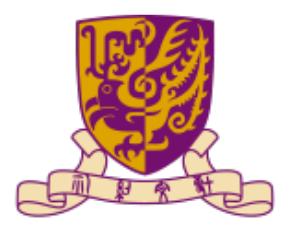






Outline

- Perception
- Cognition
- Gestalt principles
- Other design principles



Outline

- Perception
- Cognition
- Gestalt principles
- Other design principles

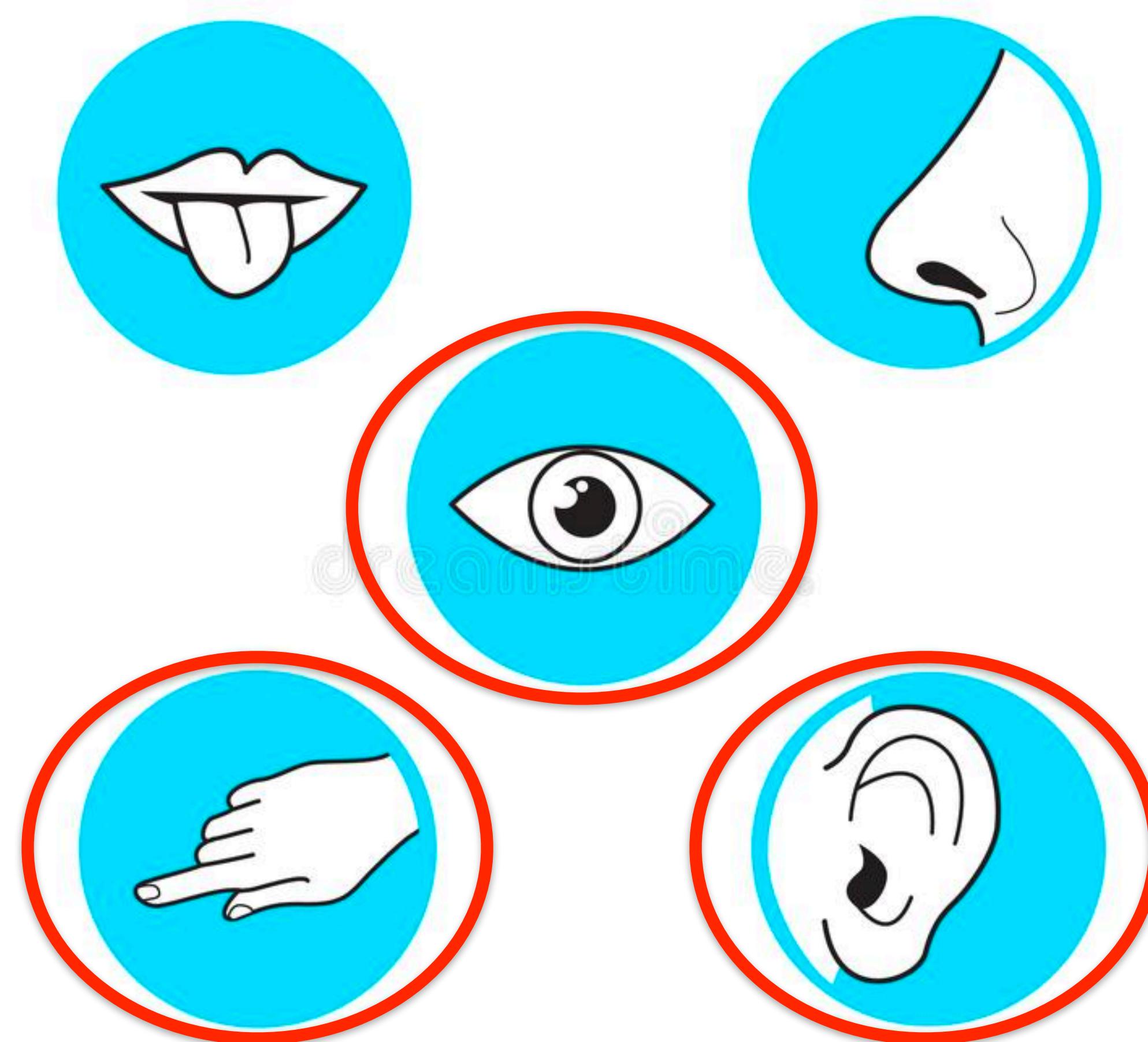
Perception

- The input signals



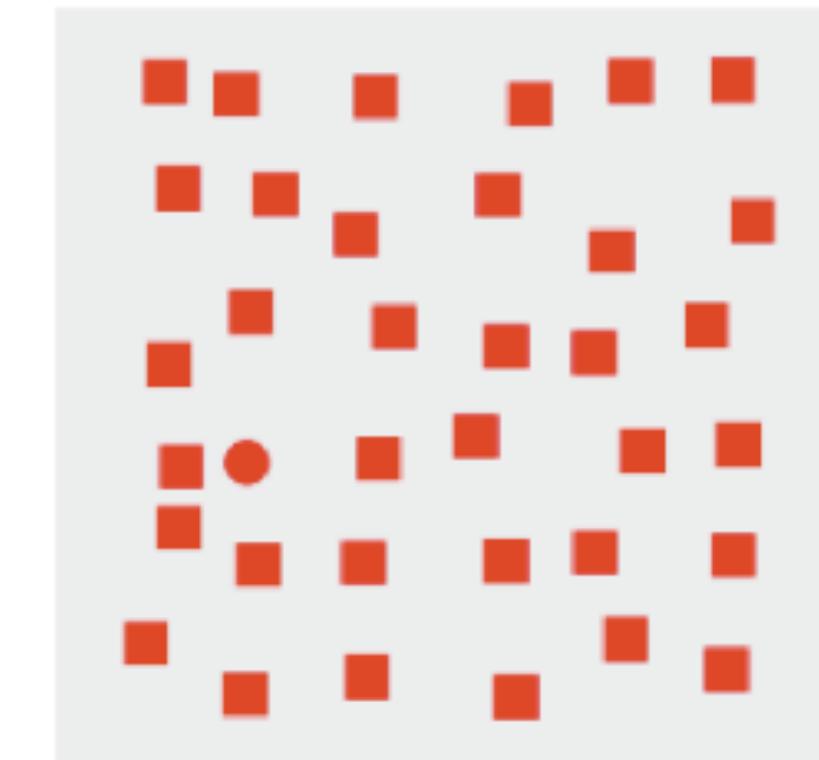
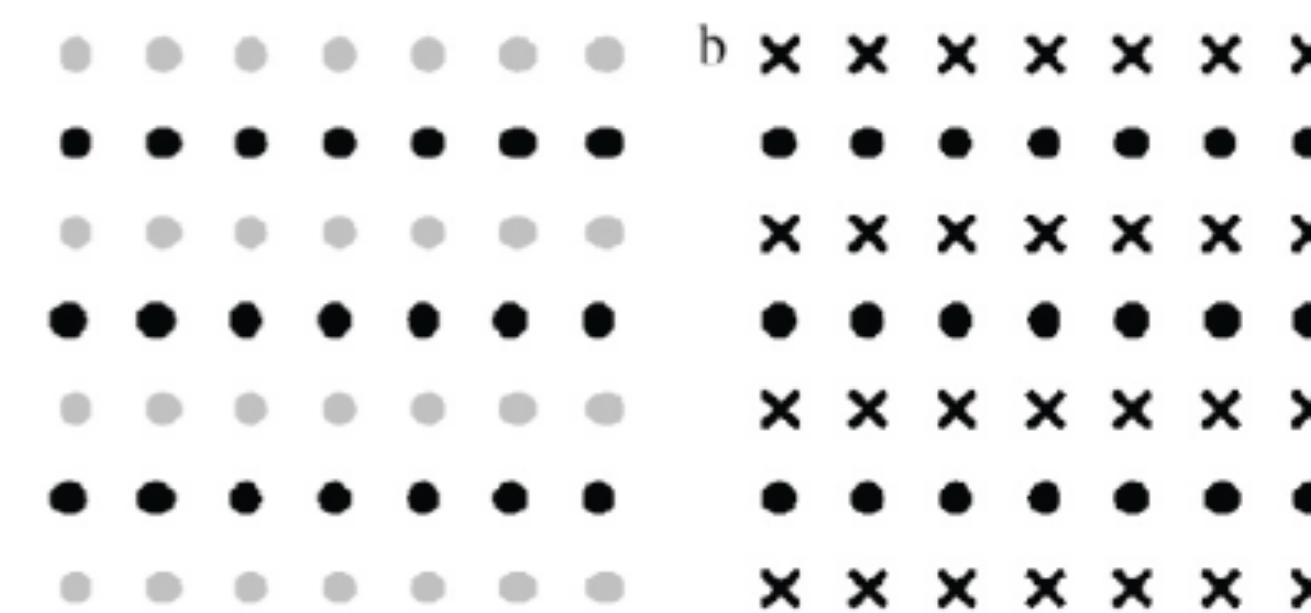
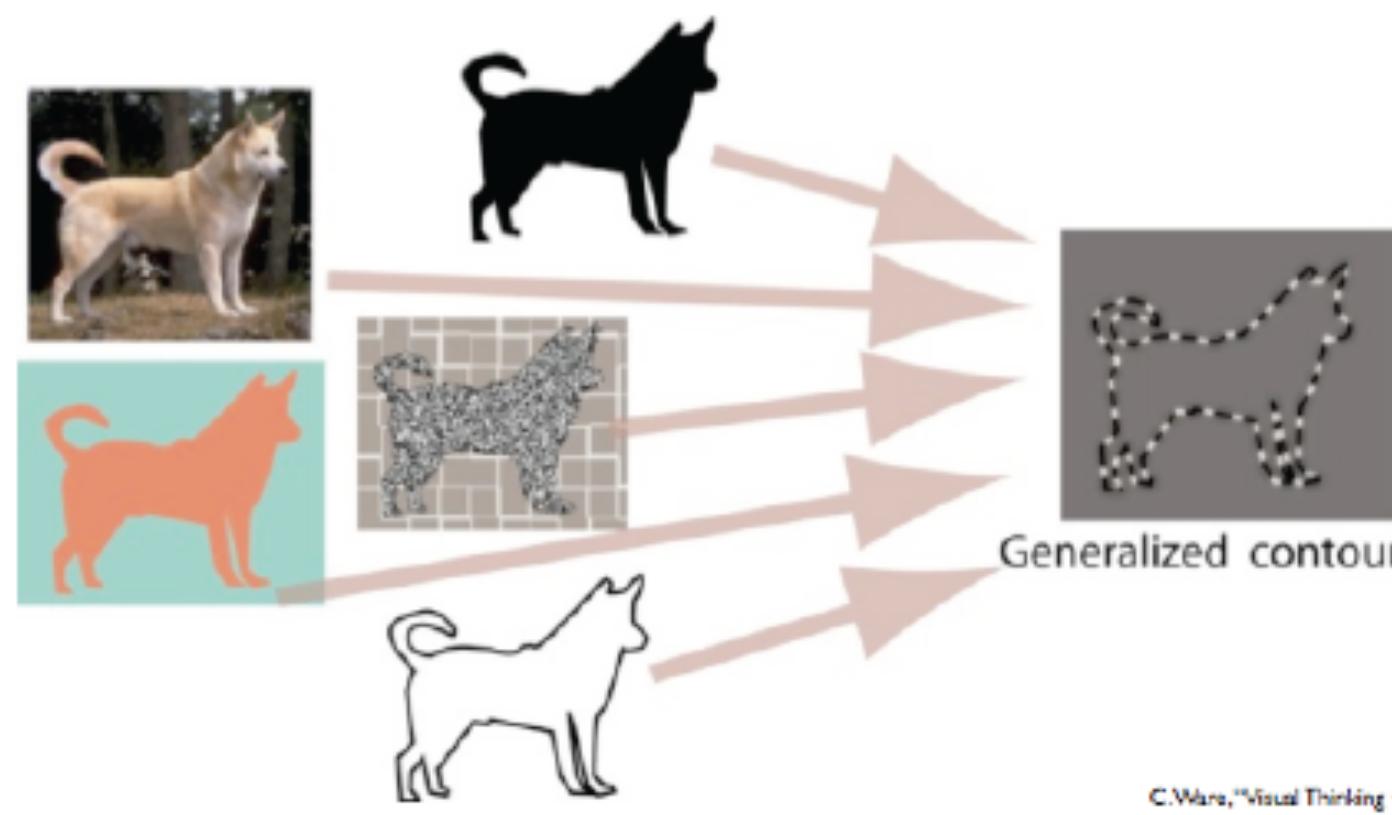
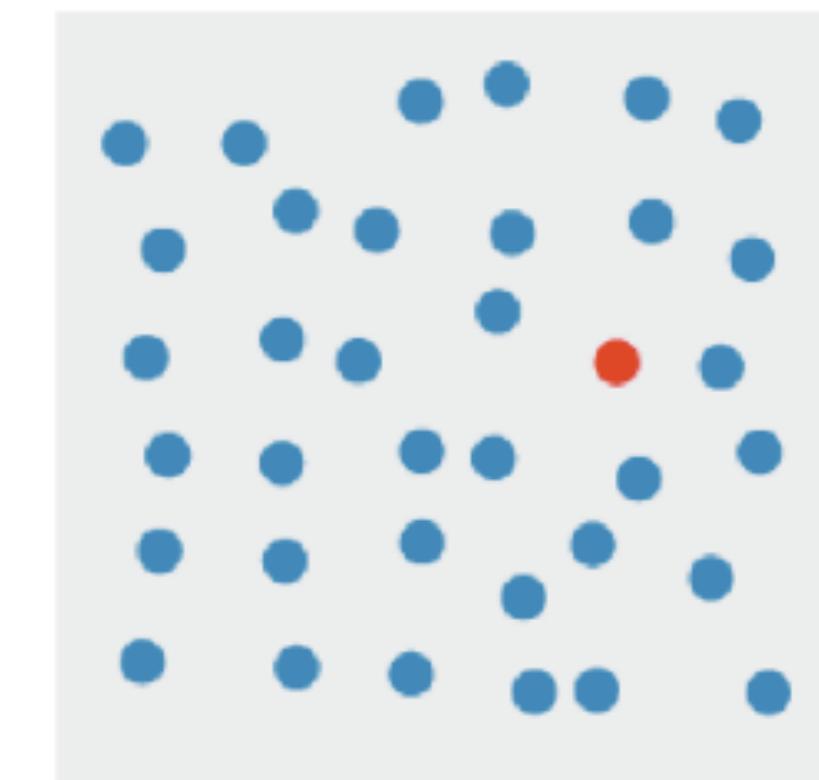
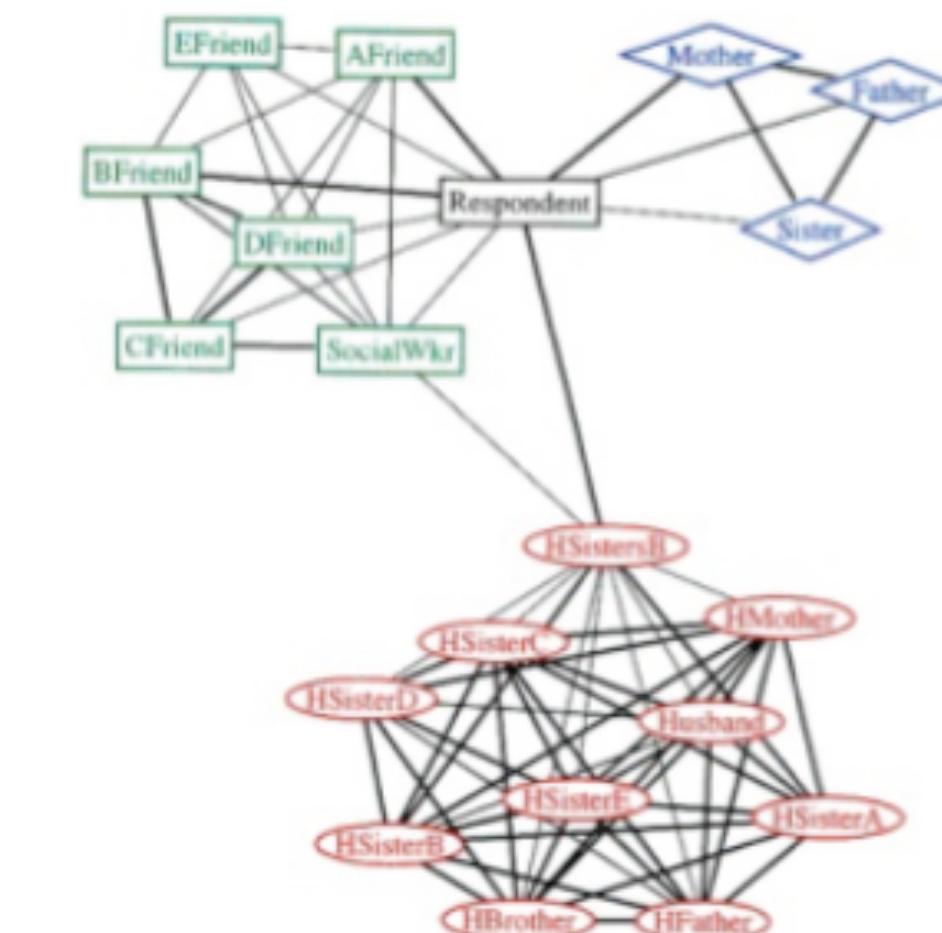
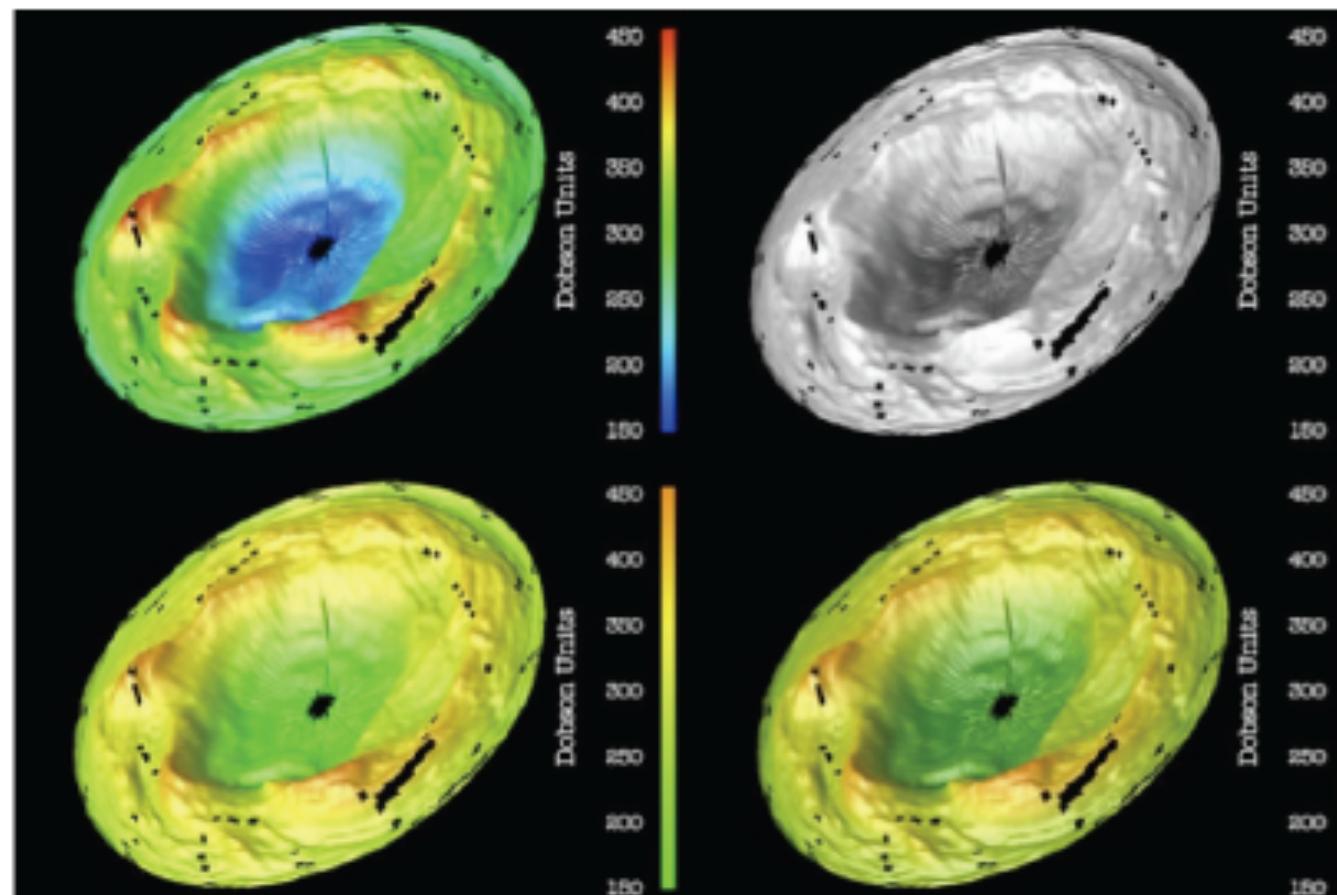
Perception

- Sight
- Sound
- Smell
- Touch
- Taste



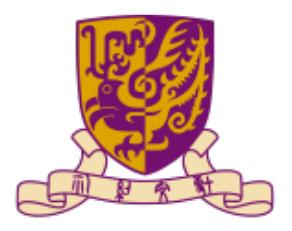
Visual perception

- The reflection in the brain from the visual signals



Visual perception



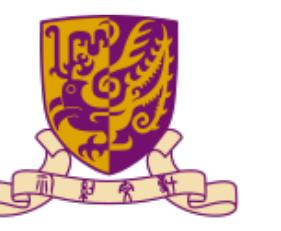


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Visual perception

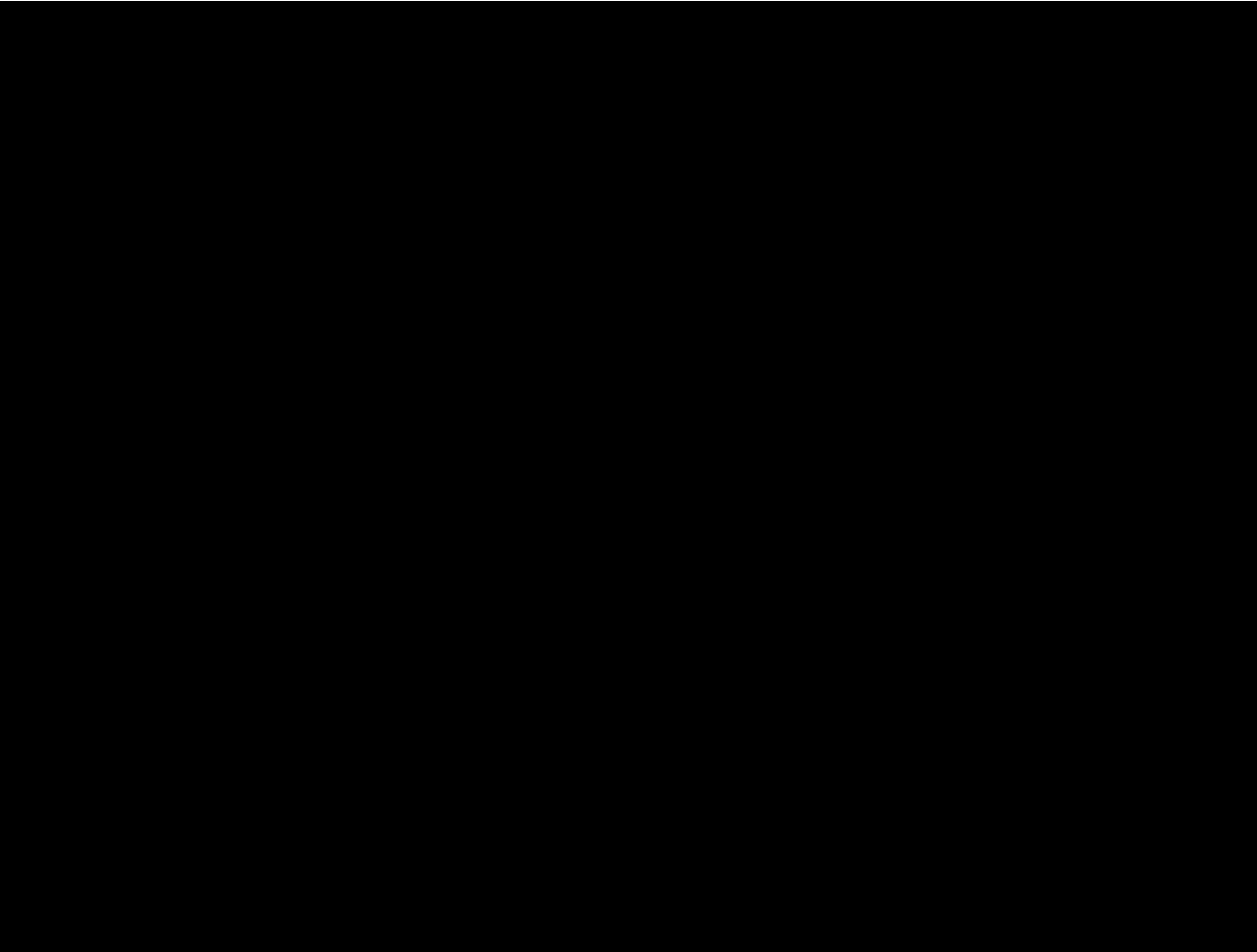
Memory plays an important role in perception and cognition;
however, the capacity is limited.

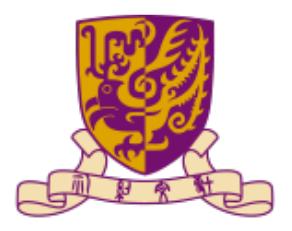


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Visual perception





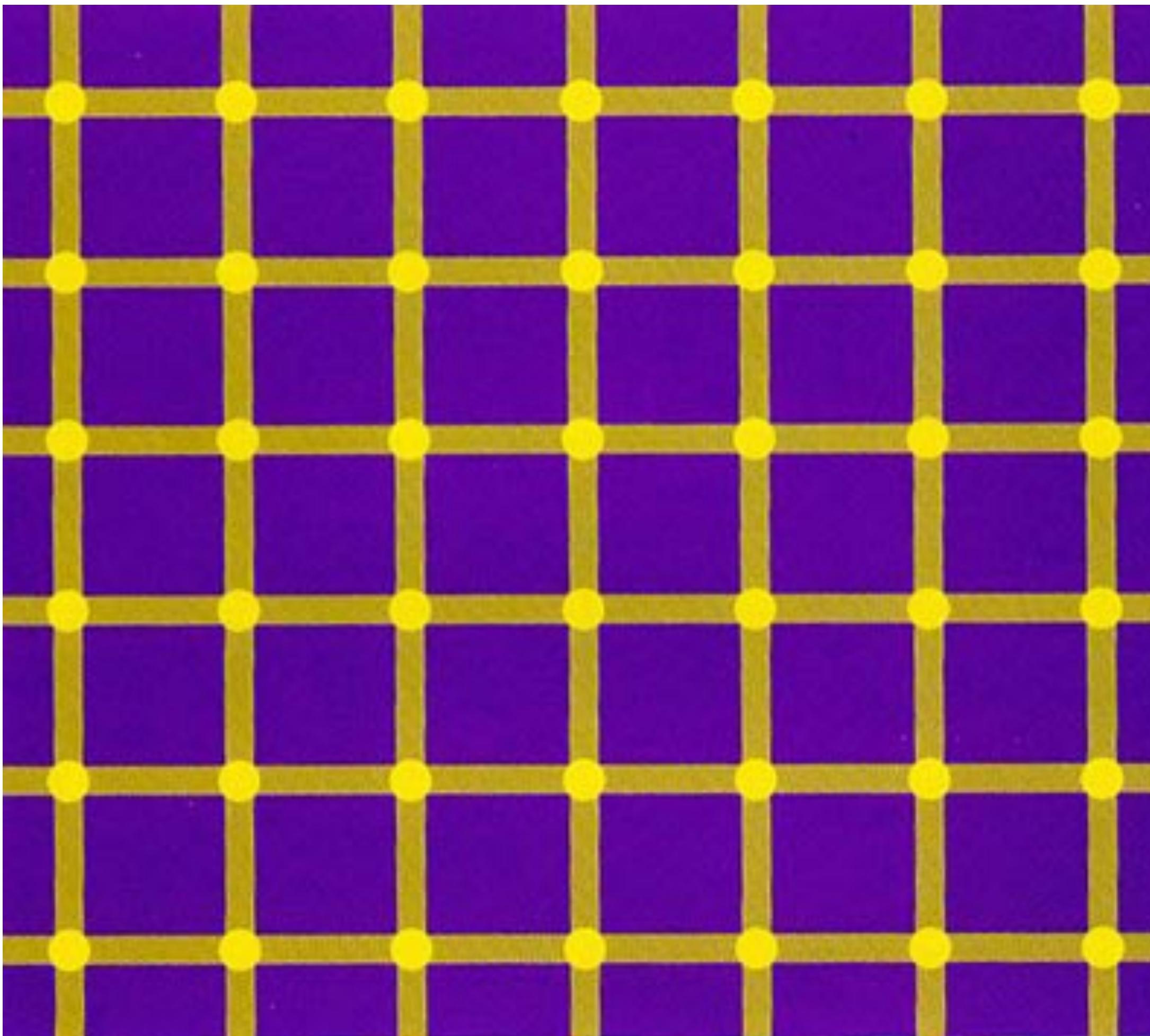
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Visual perception

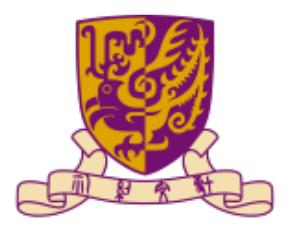
To find the change, we need to focus on.

Visual perception



Visual perception





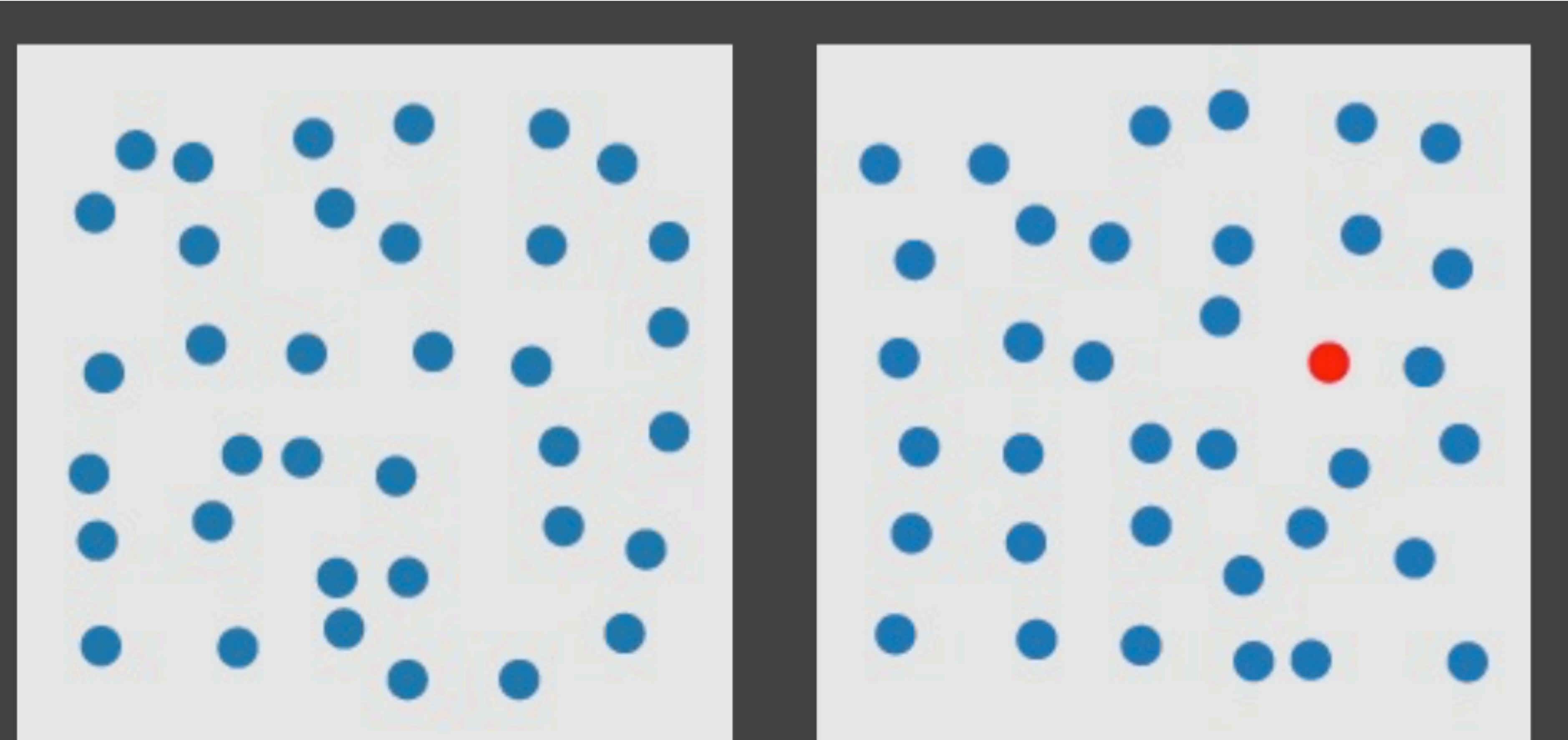
香港中文大學(深圳)

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Visual perception

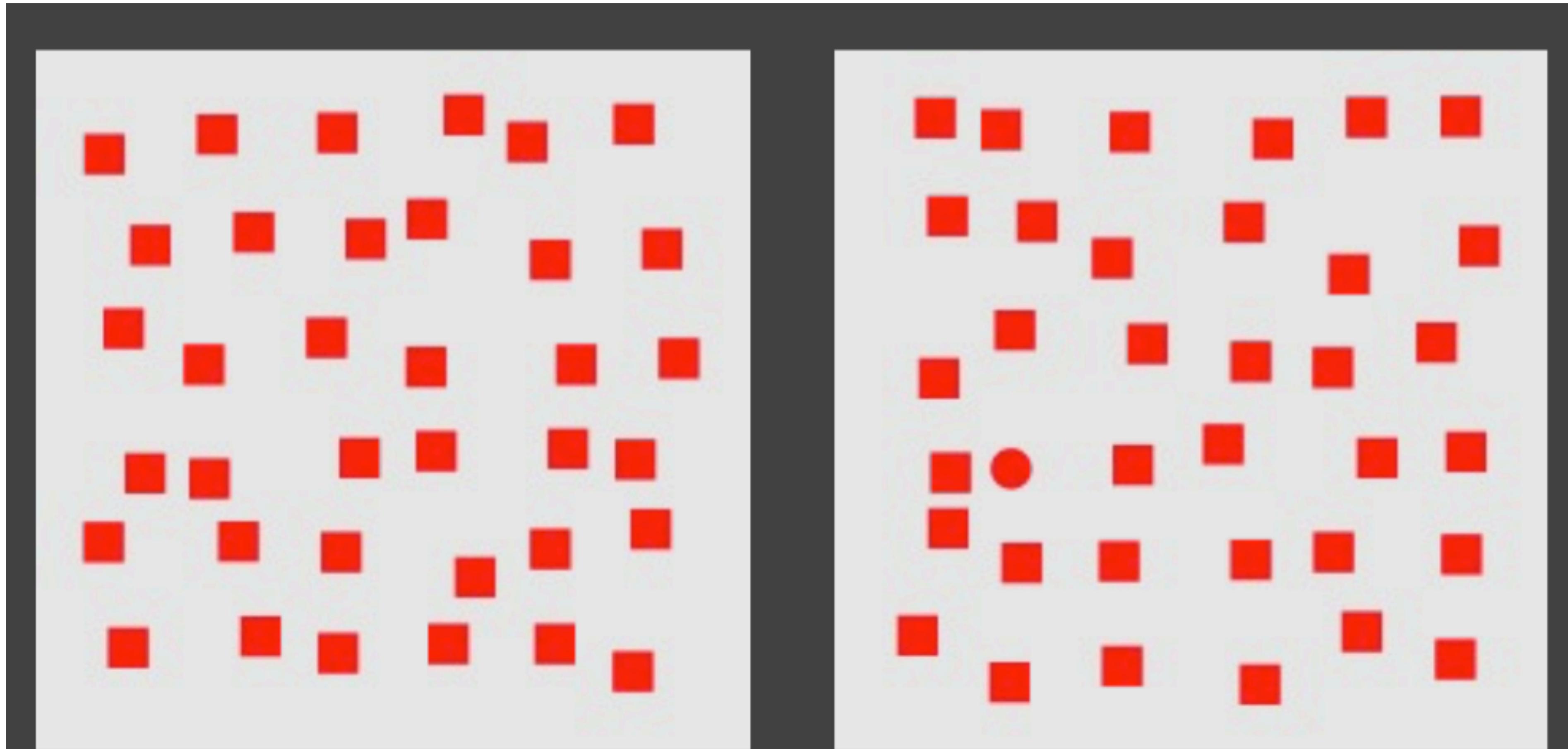
Our vision system observes the relative changes,
not the absolute changes.

Visual attention



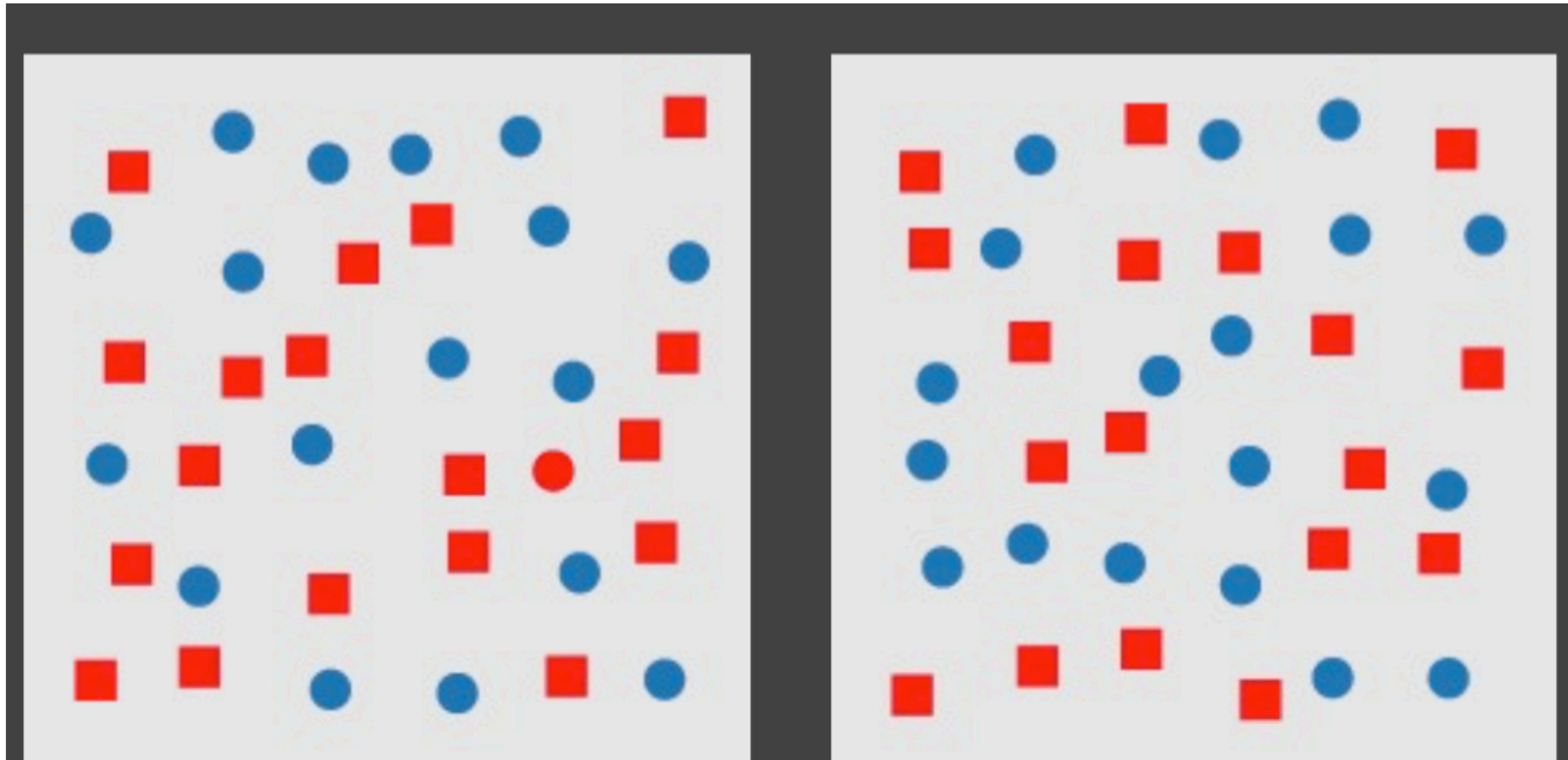
<http://www.csc.ncsu.edu/faculty/healey/PP/index.html>

Visual attention



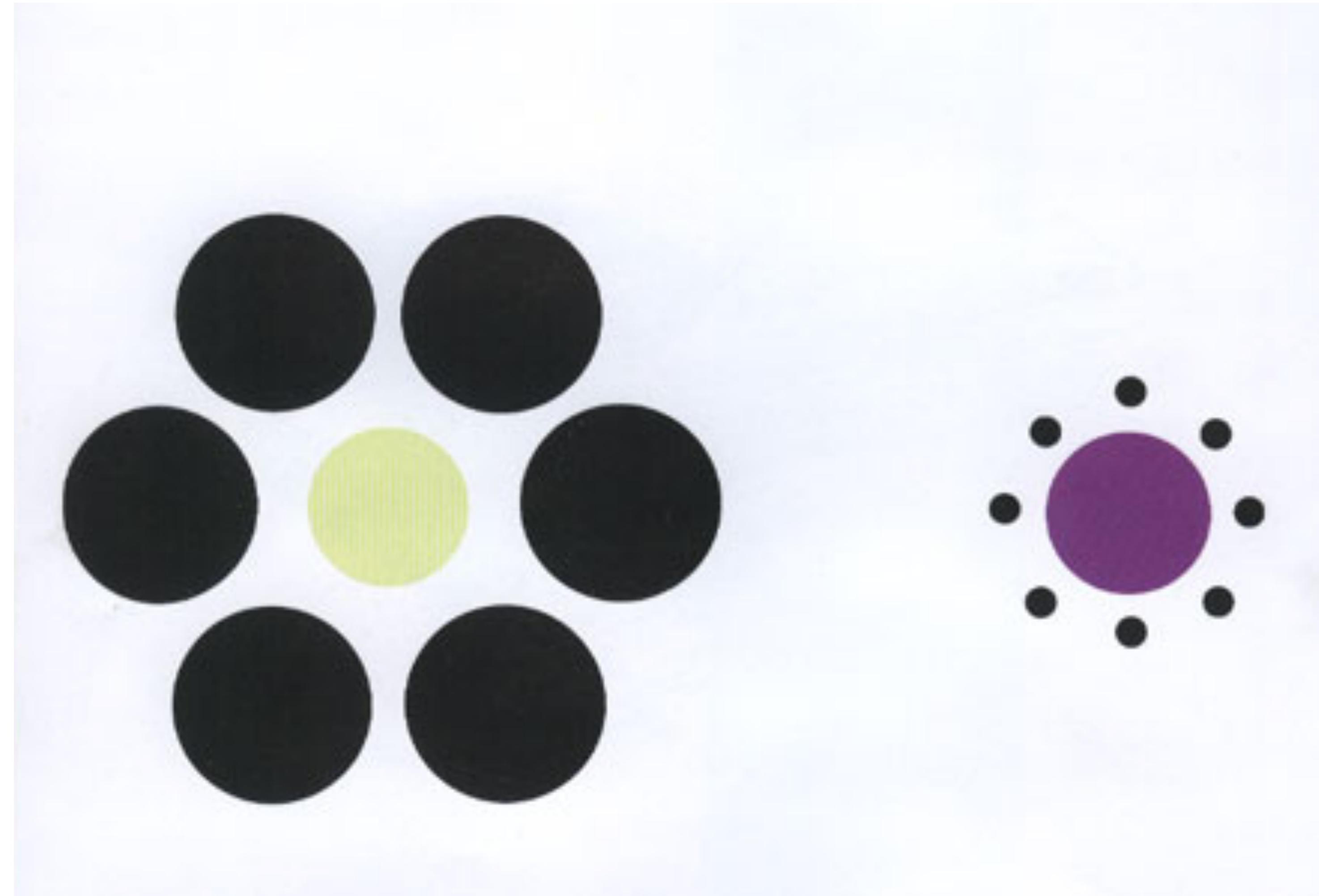
<http://www.csc.ncsu.edu/faculty/healey/PP/index.html>

Visual attention

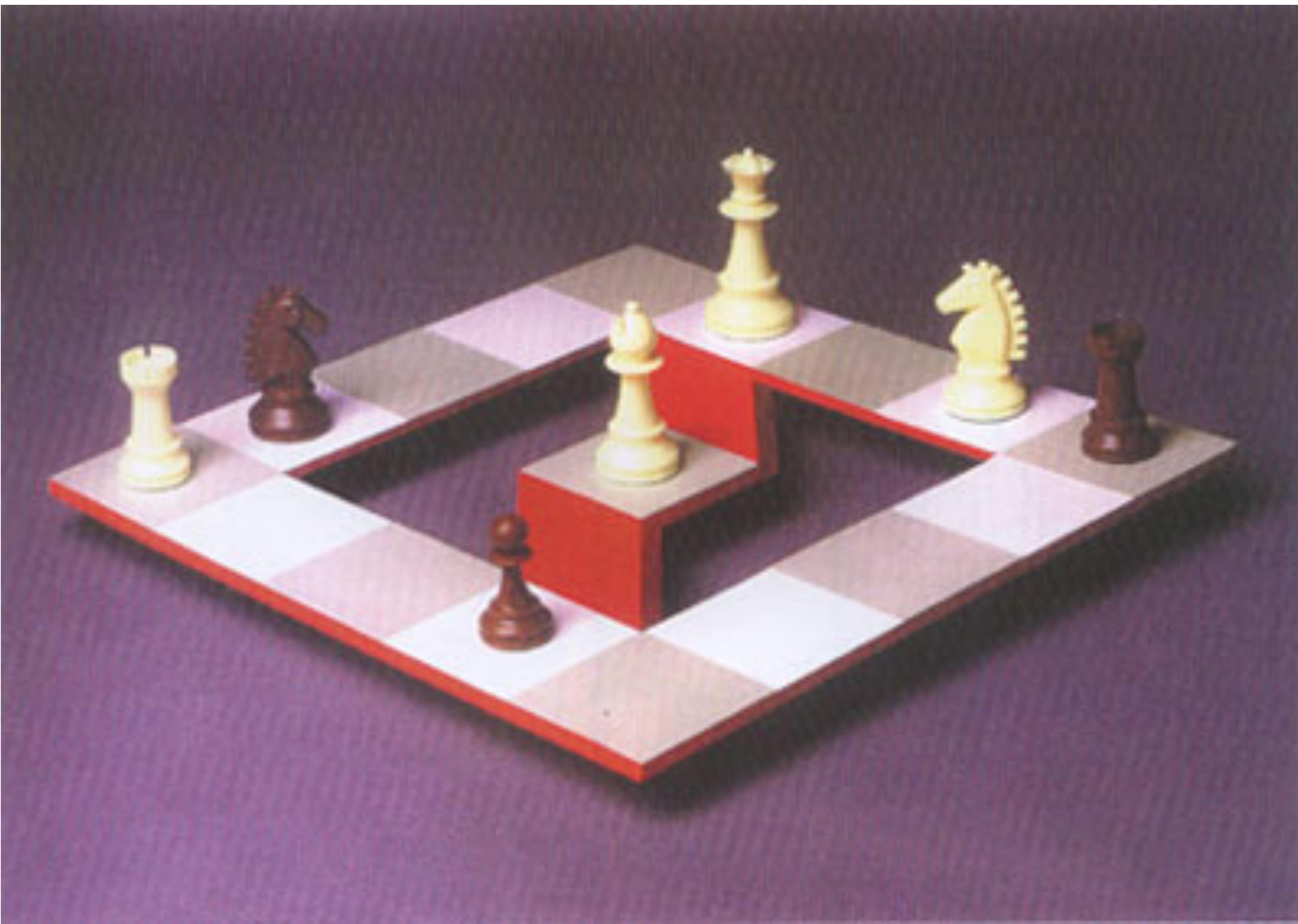


<http://www.csc.ncsu.edu/faculty/healey/PP/index.html>

Visual illusion



Visual illusion

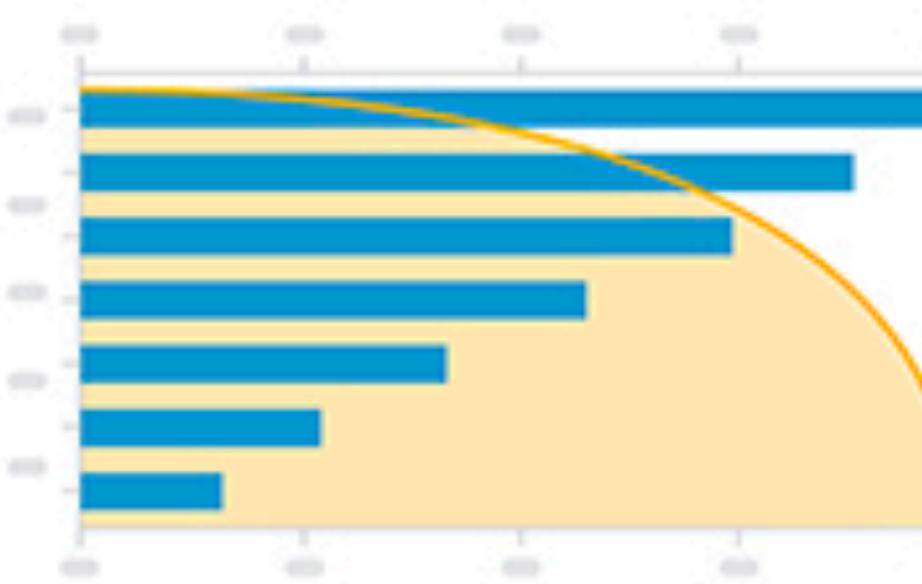
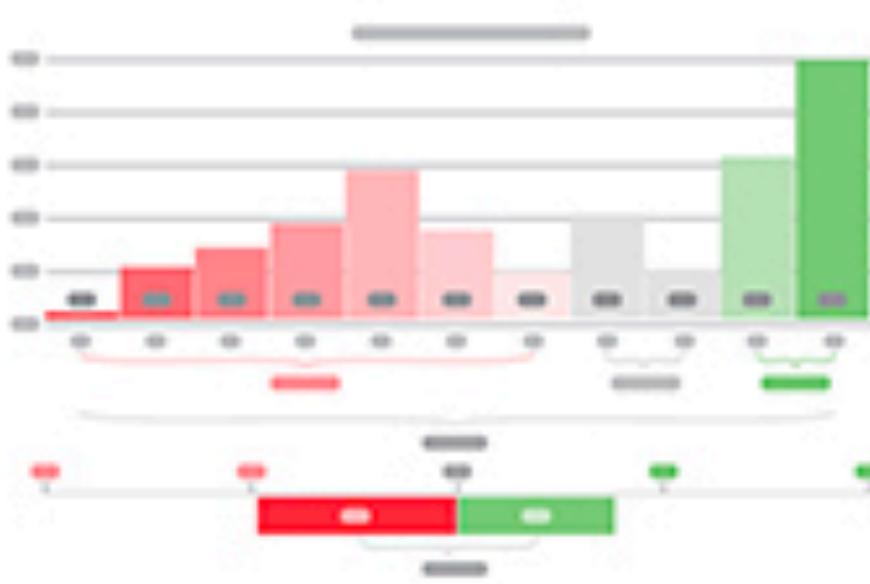
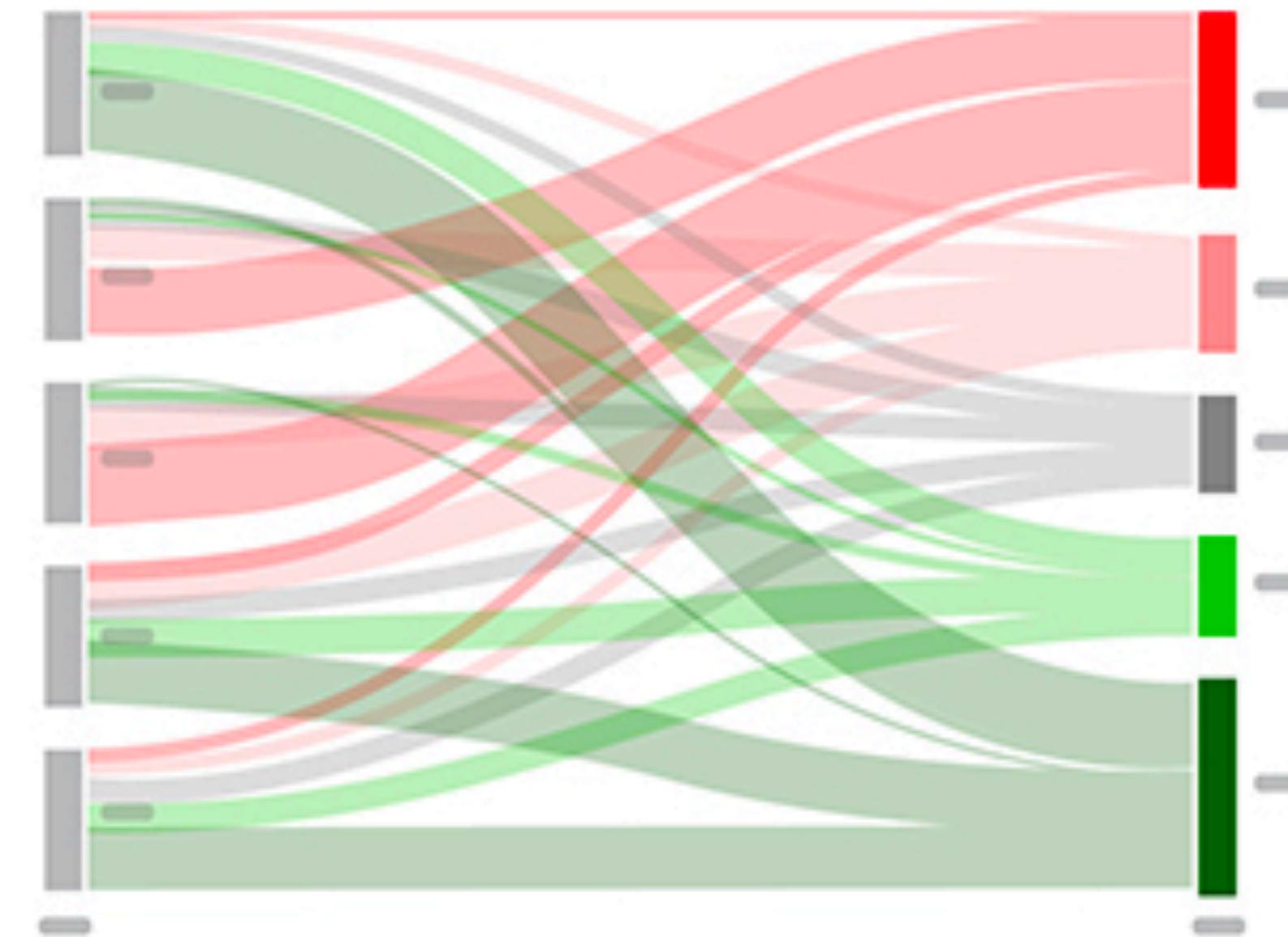
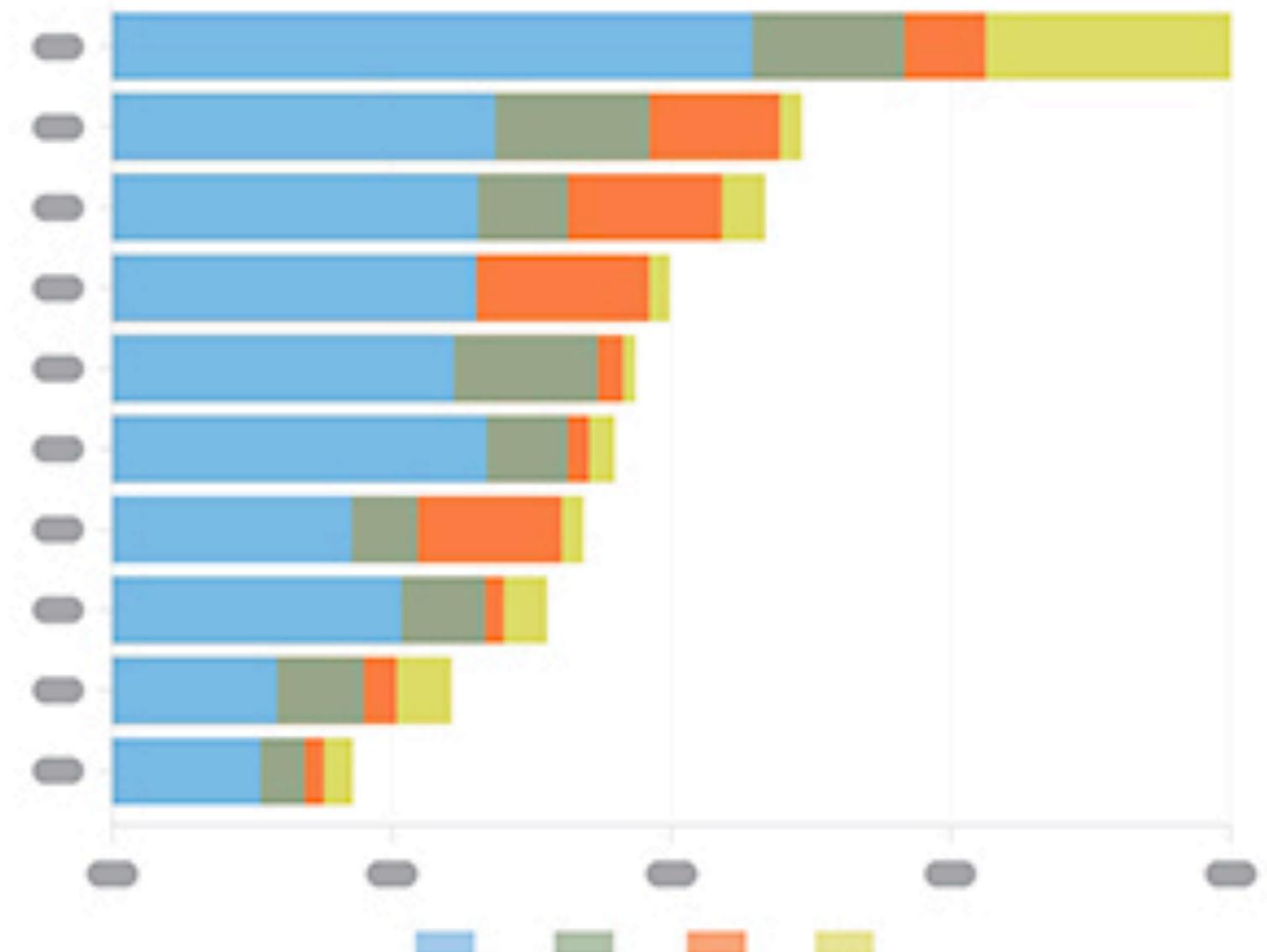


Visual illusion



Vision in the interfaces

- Charts
 - Data patterns and trends



Which Types of Charts are Right for Your Data Story?

Vision in the interfaces

- Buttons
 - Specific actions



Vision in the interfaces

- Images and videos
 - Animations

Matrix Multiplication

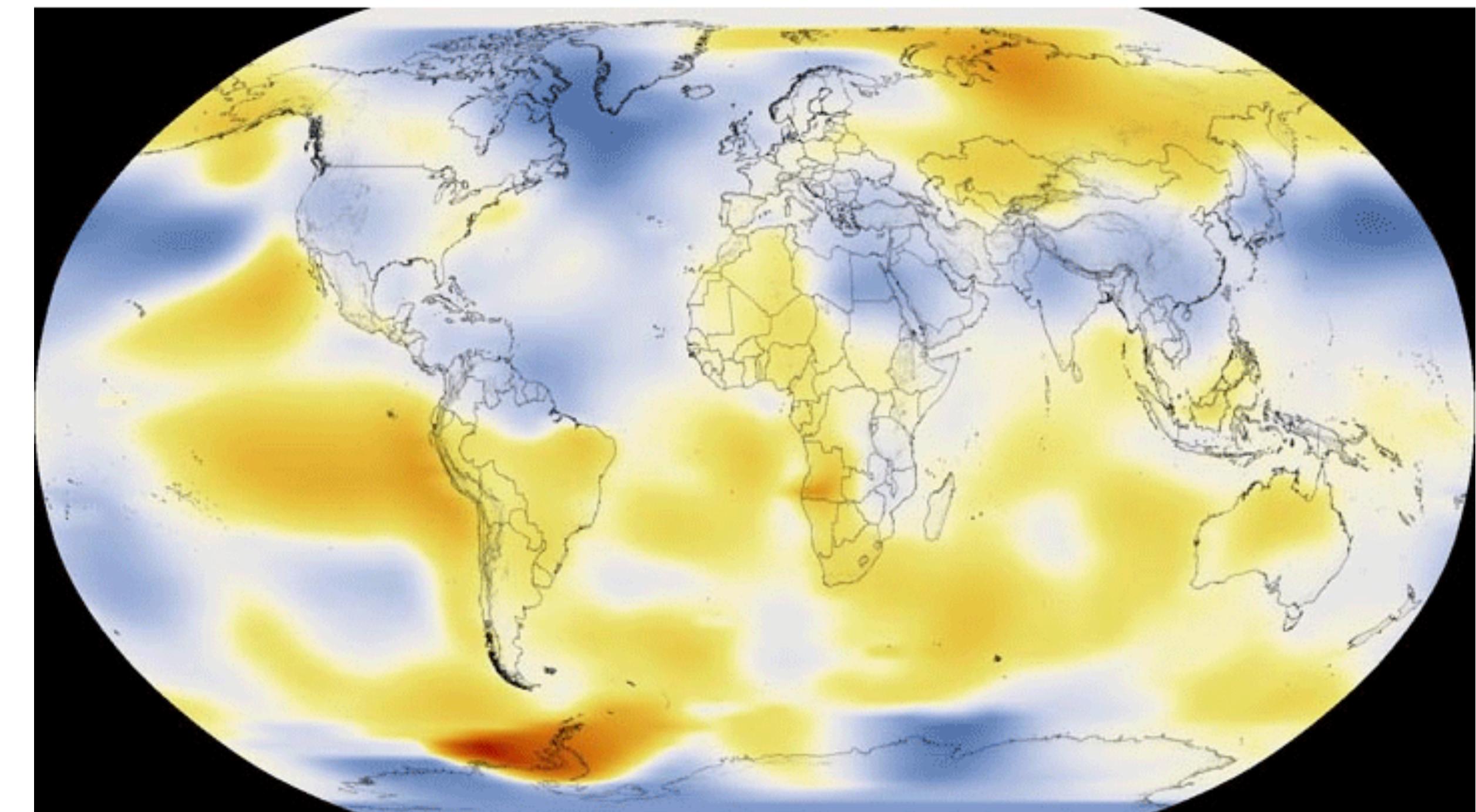
$$\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 0 \\ 2 & 3 & 4 \end{bmatrix} \times \begin{bmatrix} 2 & 5 \\ 6 & 7 \\ 1 & 8 \end{bmatrix}$$

[-] [+] [-] [+]

▶ Multiply

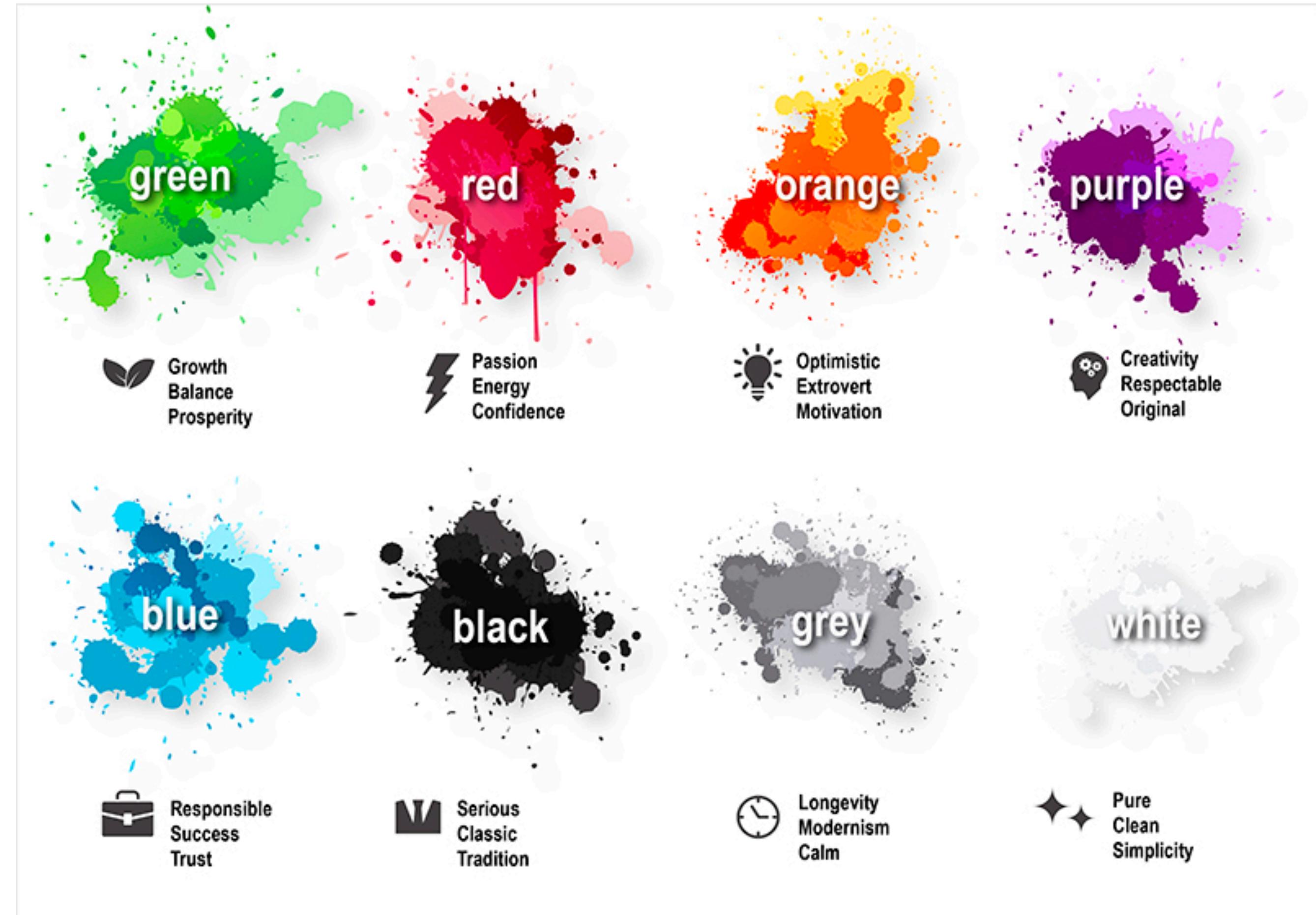
Data source: NASA/GISS
Credit: NASA Scientific Visualization Studio

1986



Vision in the interfaces

- Colors
 - Attentions and moods

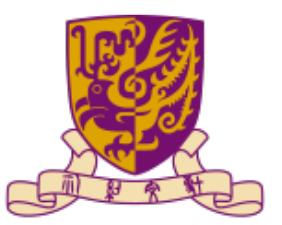


Sound

- Second sense
 - Particularly important for speech
- Less used in user interfaces
 - Partly because annoying for others
 - Because less directional more diffuse

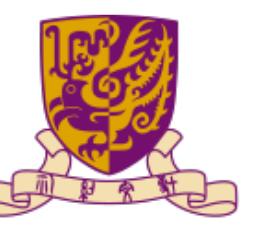
Sounds in the interface

- Simple sounds (beep, ring, and buzz)
 - Attention grabbing and feedback
- Ecological (thump and gurgle)
 - What is happening
- Speech and music
 - Recorded
 - Live
 - Interactive



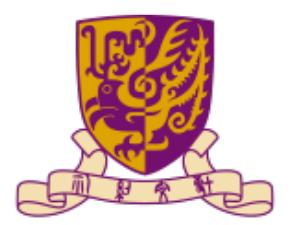
Touch

- Third sense
 - Important for interaction
- Mostly used in touch screen (e.g., smart phone)
 - Require specific hardwares
 - Cause inconvenient
 - Depend on materials



Touch in the interface

- Click
- Draw
- Drag
- Zoom in and out
- Rotate

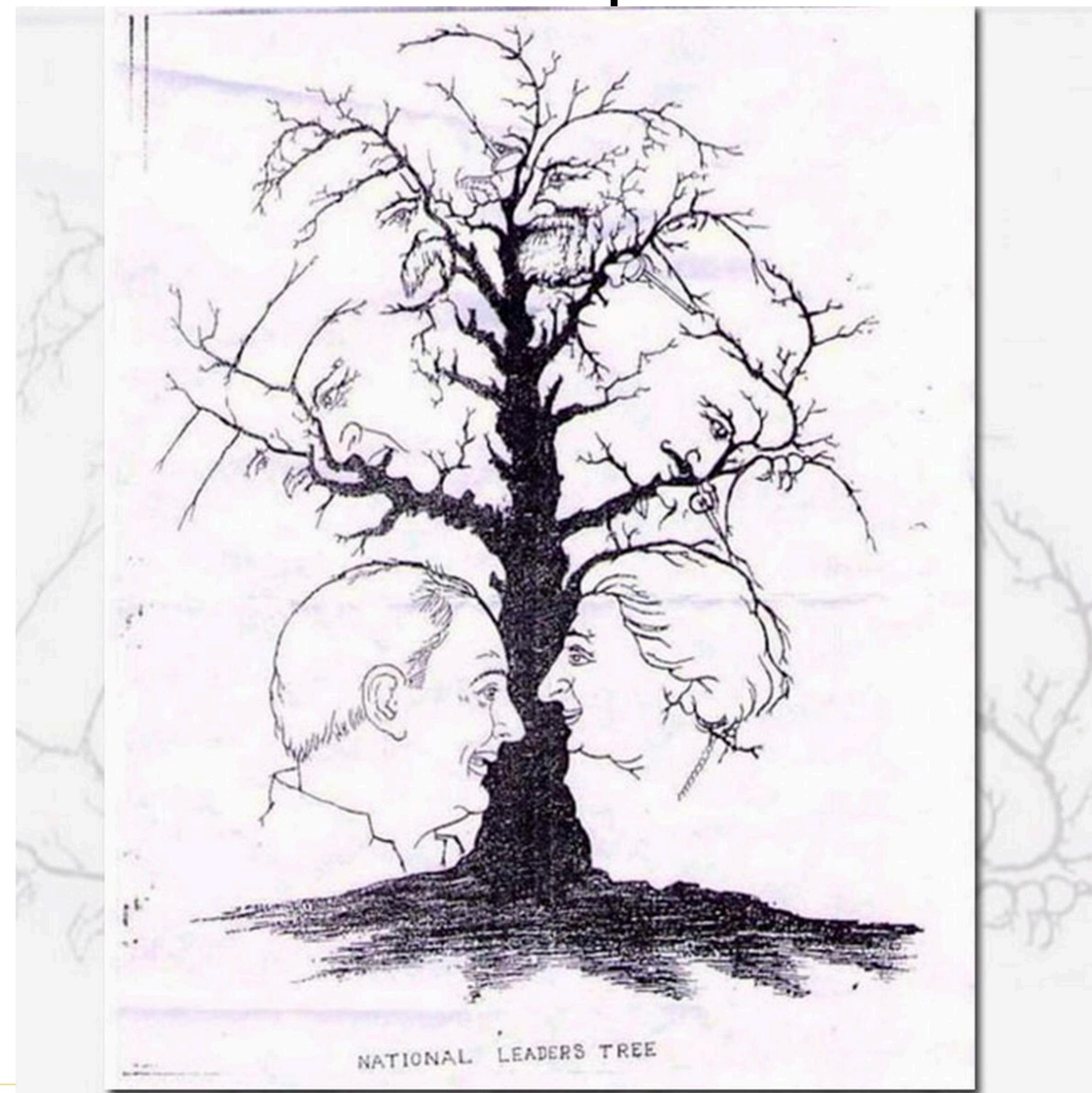


Outline

- Perception
- Cognition
- Gestalt principles
- Other design principles

Cognition

- How human understands and explains from the input signals



Cognition

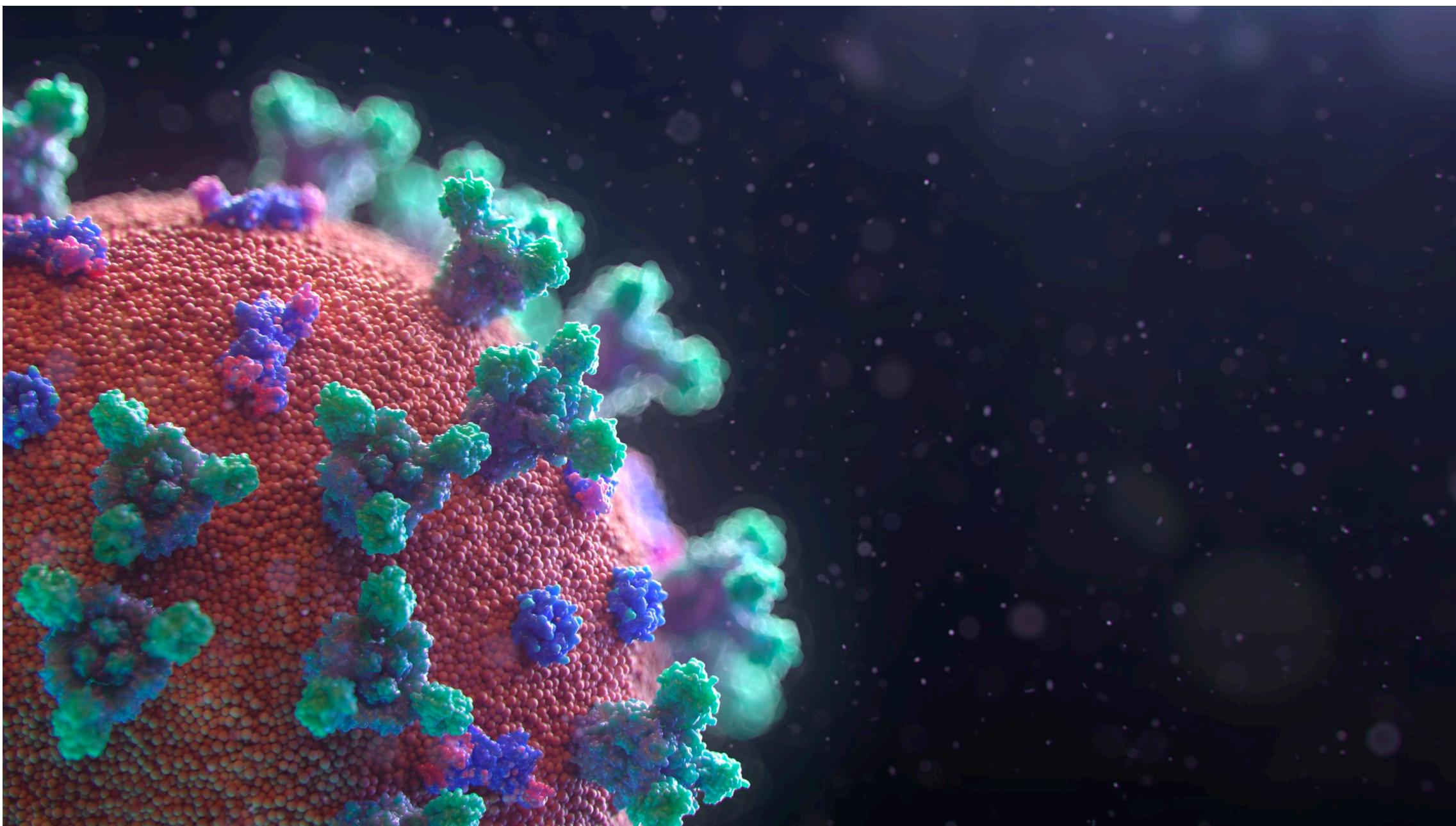


Cognition

- How to interpret will impact how to remember

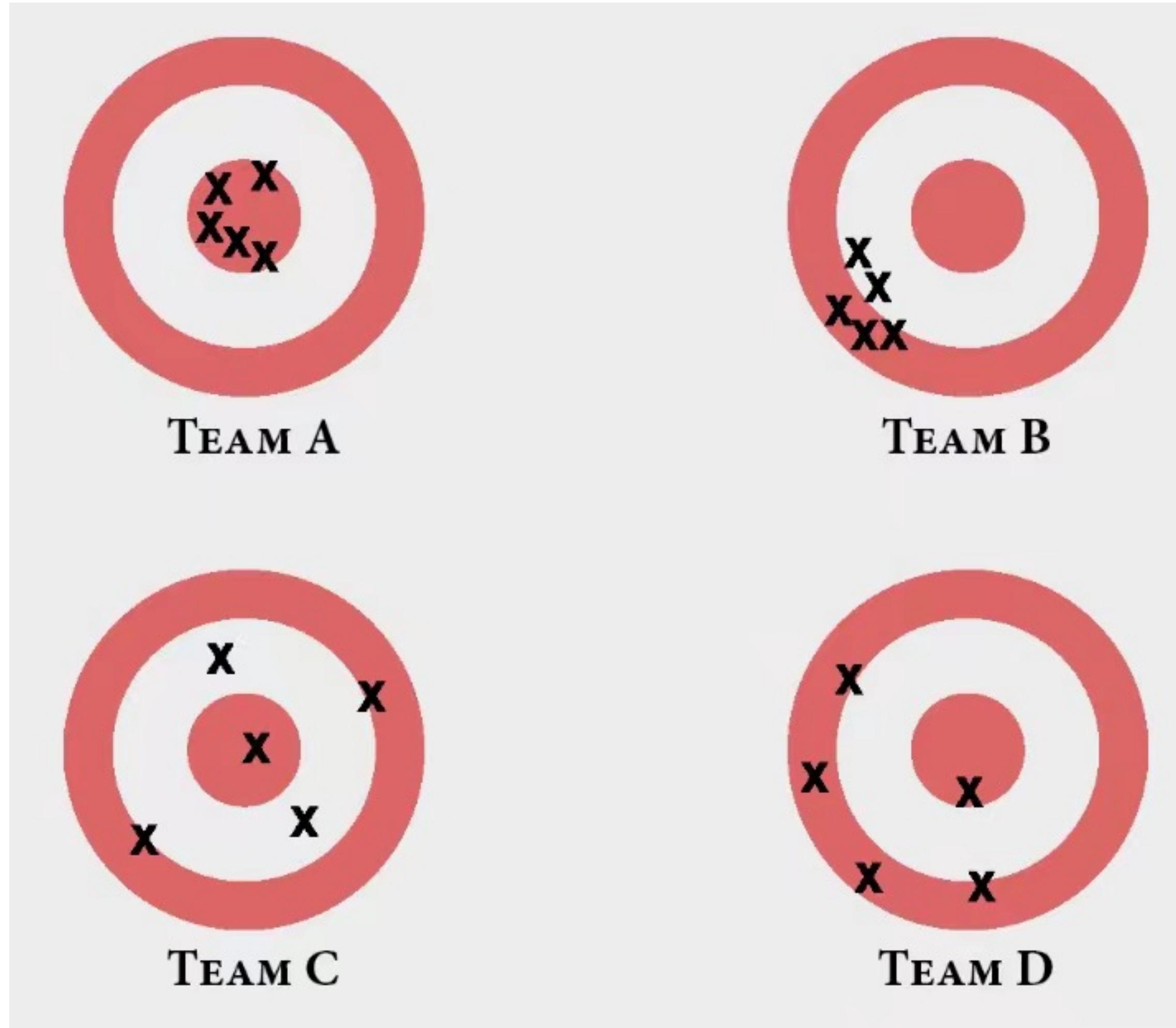
Oct 1

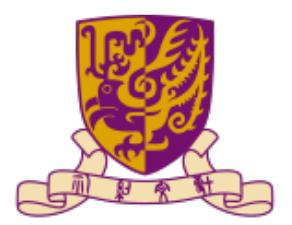
Jul 4



Cognition

- Influence the understanding and judgement

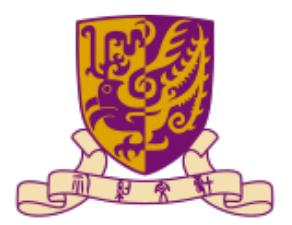




Cognition

Ming is 30 years old. He is very smart and has no imagination. He does not like playing sports and has obsessive-compulsive disorder. He is very good at math but poor at liberal arts. In the following two statements, which one is more likely to be true?

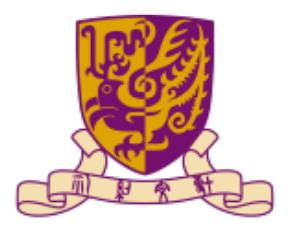
- A. Ming's hobby is to play jazz music.
- B. Ming is an accountant and Ming's hobby is to play jazz music.



Cognition

- Smart
- Perseverant
- Cunning
- Unprincipled

How to judge a person if ...

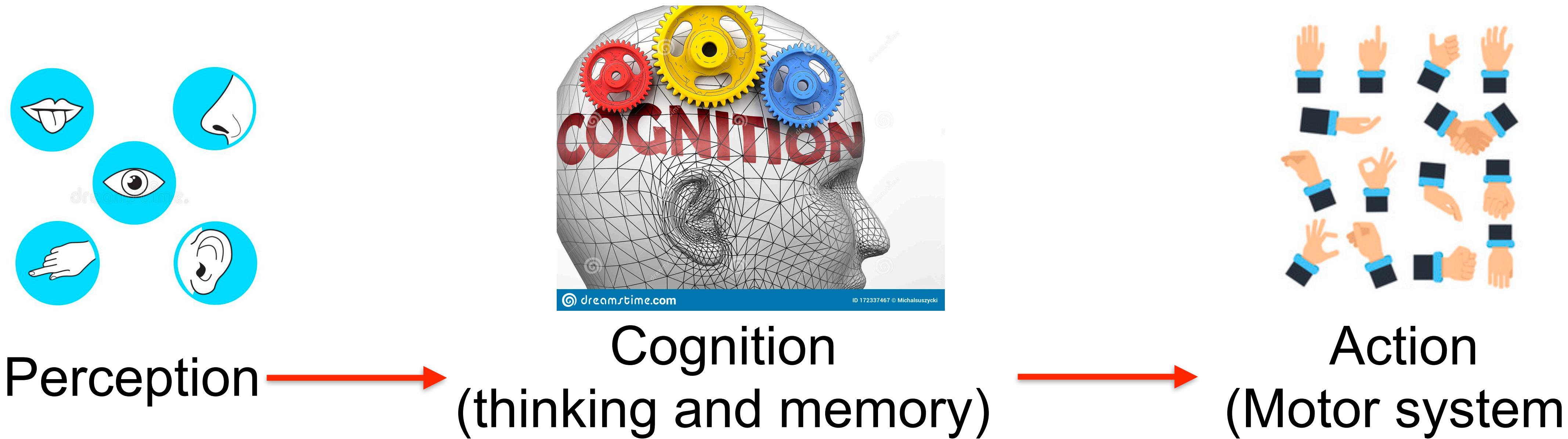


Cognition

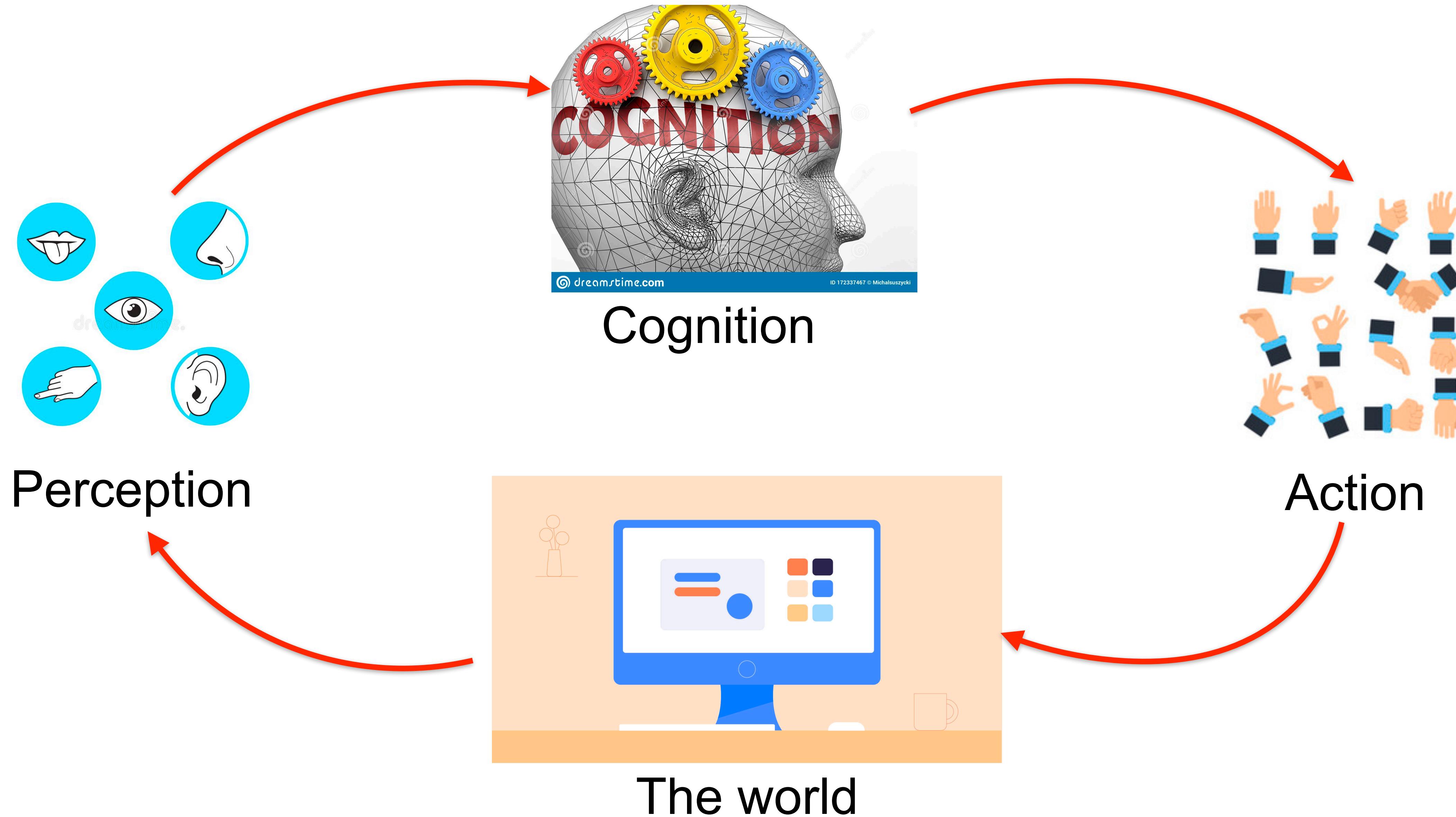
- Mechanical prediction
- Common frame of reference
- Delphi method
- Structure judgement

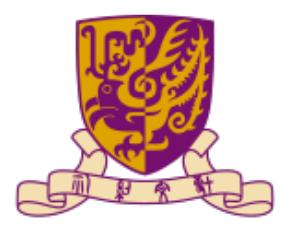
Computation analogy

Input → Processing → Output



A cycle of interaction



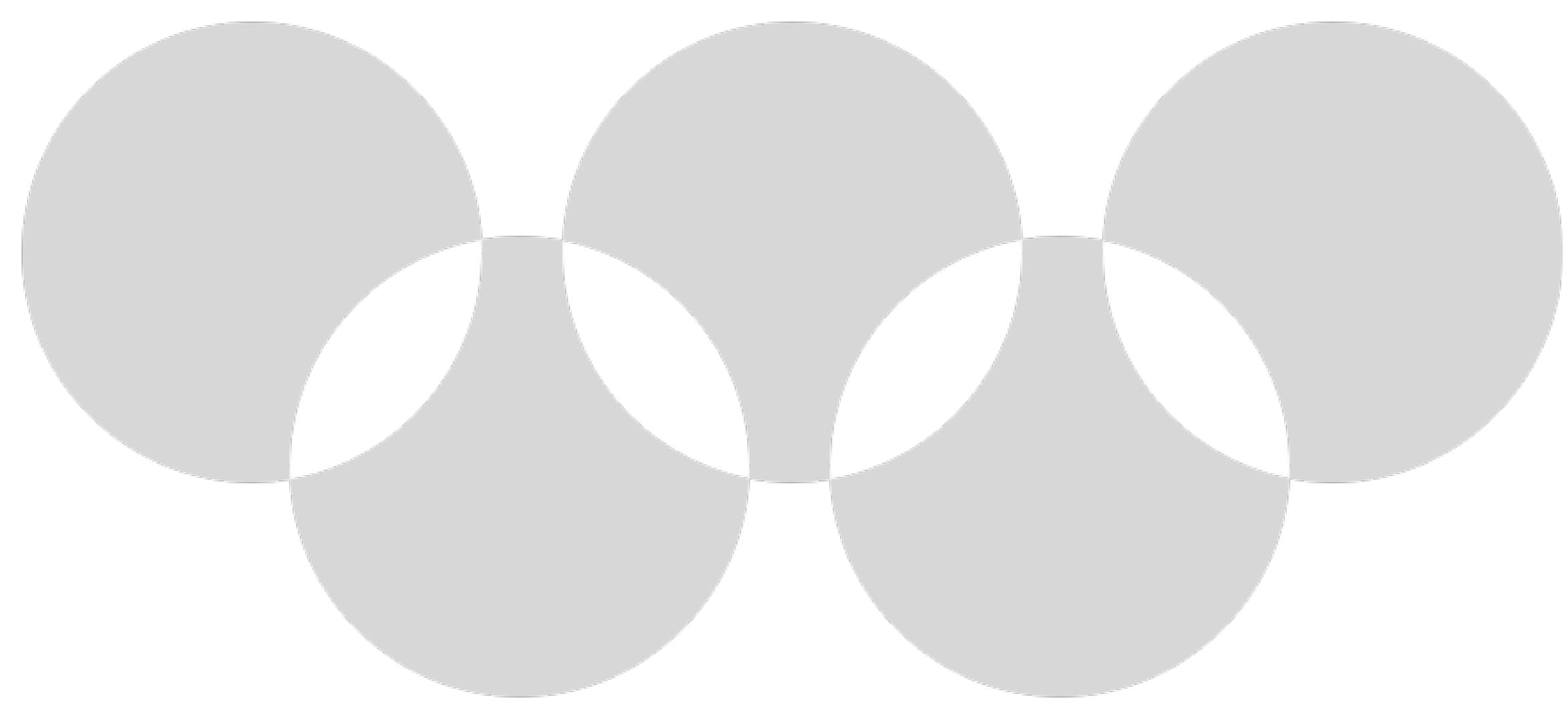
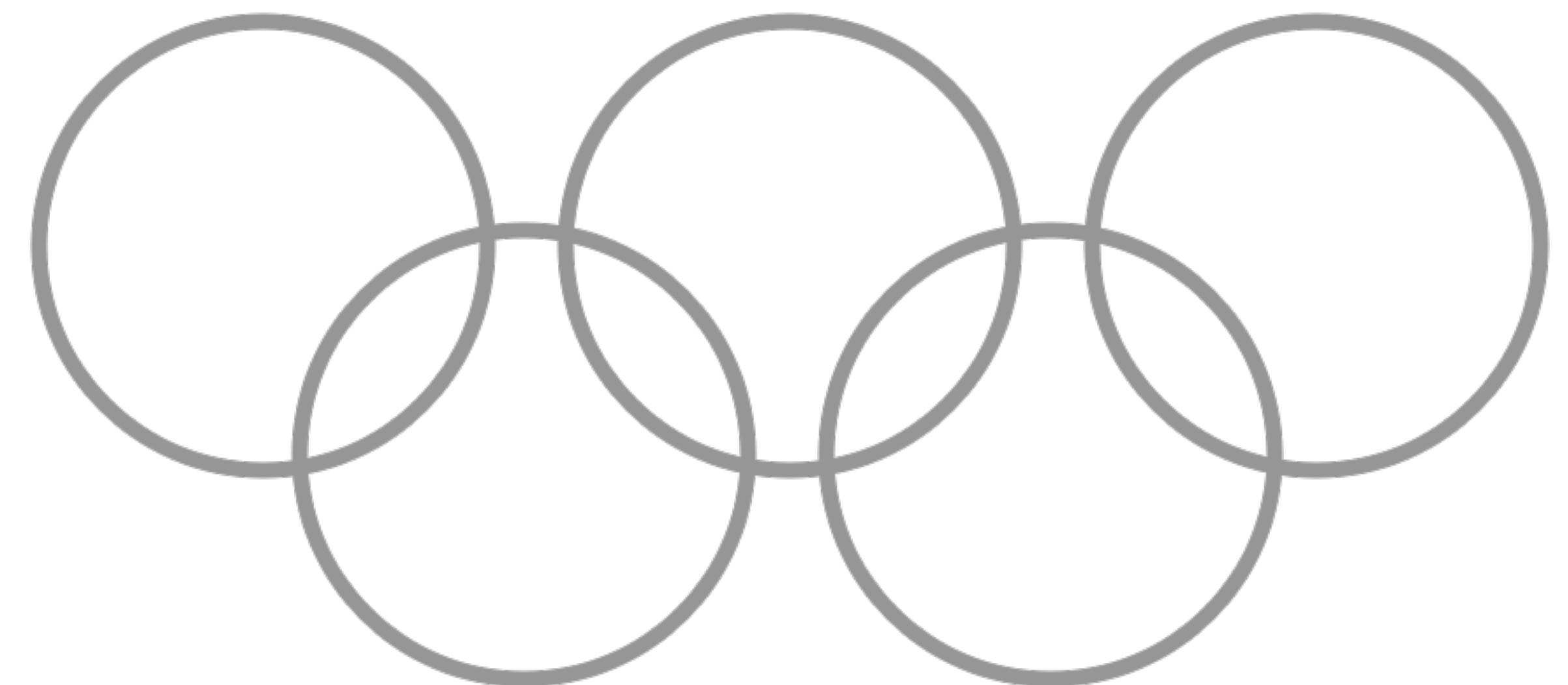


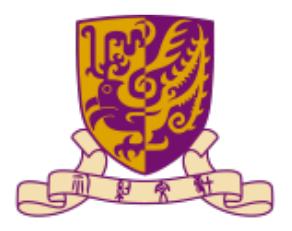
Outline

- Perception
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Gestalt principles

- Gestalt (form, shape in German) is a group of visual perception principles developed by German psychologists in 1920s
- The whole is other than the sum of the parts
- People interpret ambiguous or complex images as the simplest form(s) possible





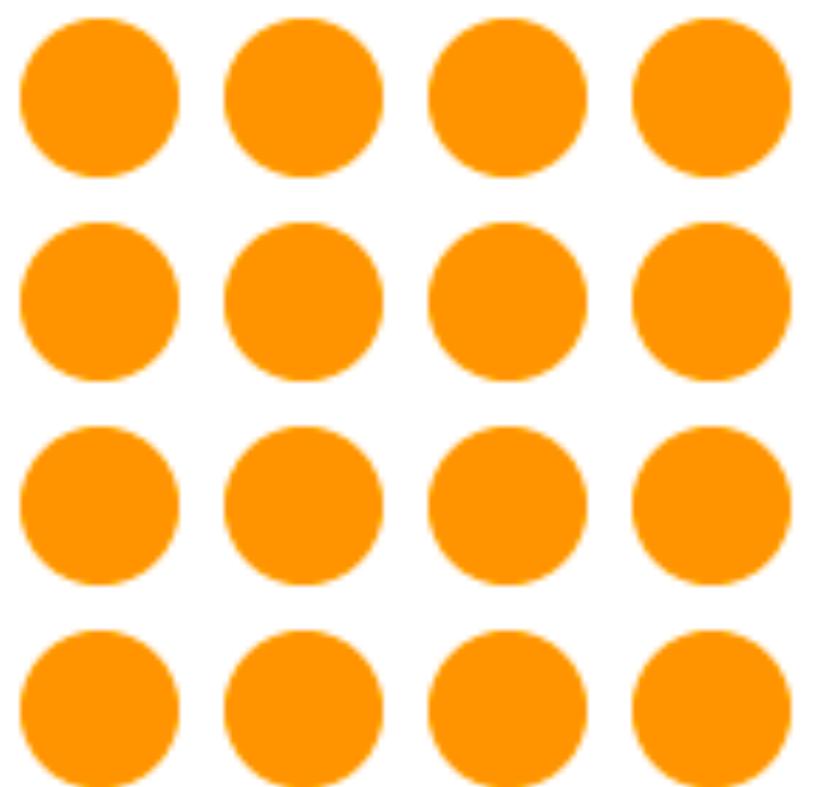
Gestalt principles

- Principle of proximity
- Principle of closure
- Principle of similarity
- Principle of continuity
- Principles of figure-ground
- Principle of common region
- Principle of focal point

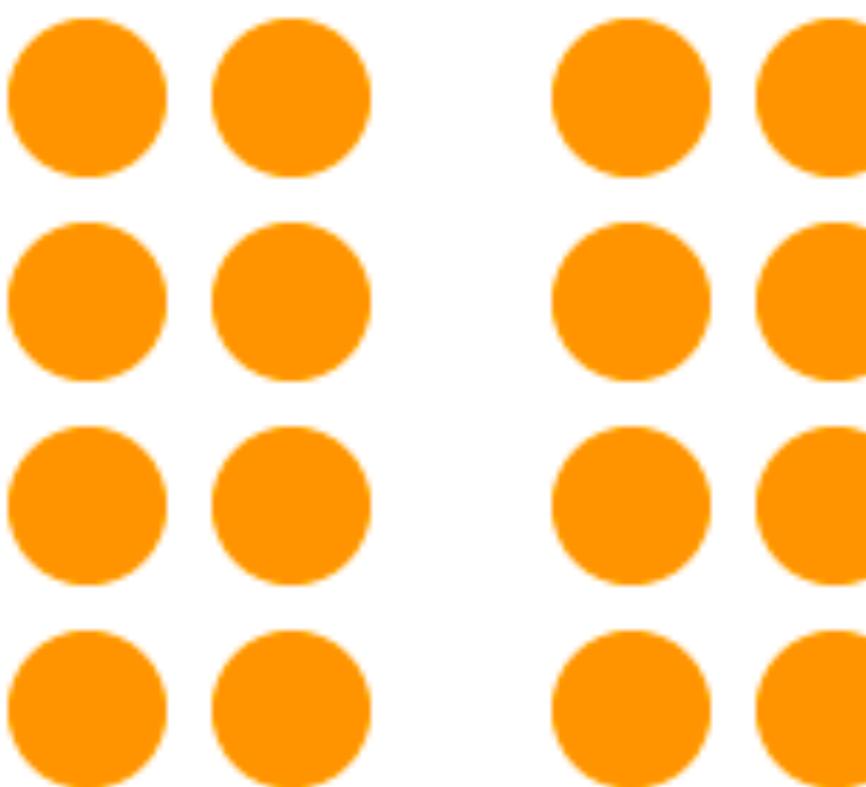
Gestalt principles of proximity

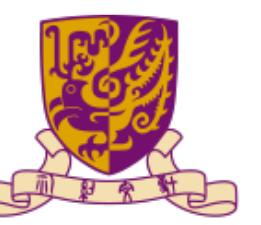
- Things that are close together appear to be more related than things that are spaced farther apart

This is perceived to be one group and the components somehow related to each other.



We perceive two groups here, and understand that there are differences between them.





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Gestalt principles of proximity

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- Biden signs historic \$1.9 trillion Covid-19 relief law
- Biden's relief bill probably won't matter that much in the midterms
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Rain 51°F

Today	Fri	Sat	Sun	Mon
51°F 46°F	60°F 52°F	67°F 56°F	62°F 43°F	63°F 39°F

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Fact check

Biden did not cancel ICE operation targeting sex traffickers

AFP Factcheck

No, the price of gas isn't up 50 cents, price of food isn't up 10% under Biden

PolitiFact

A viral misfire: A White House video feed ended but Biden took questions

Washington Post

Were Hundreds of COVID-Positive Immigrants 'Recklessly Released' in Texas?

Snopes.com

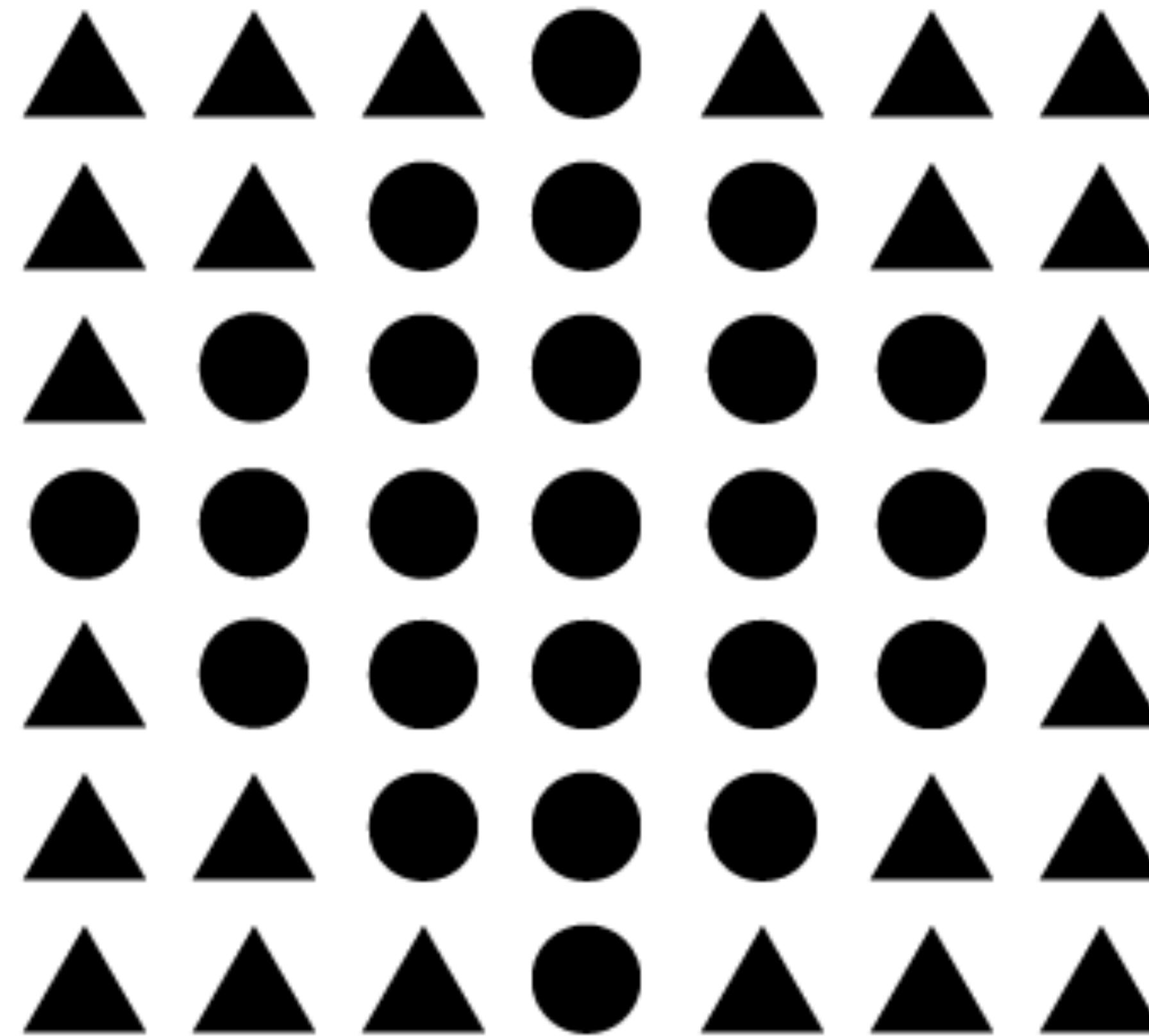
Gestalt principles of closure

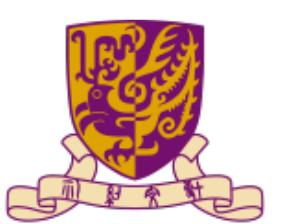
- When we look at a complex arrangement of visual elements, we tend to look for a single, recognizable pattern



Gestalt principles of similarity

- When things appear to be similar to each other, we group them together. And we also tend to think they have the same function.





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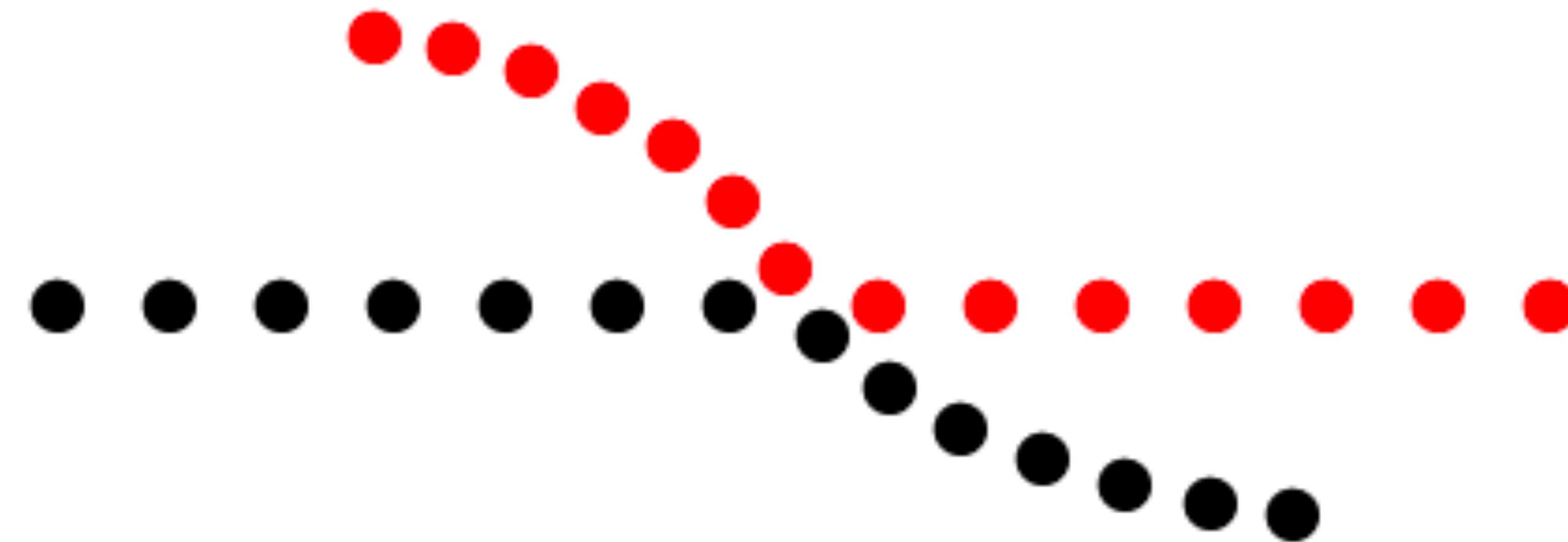
The Chinese University of Hong Kong, Shenzhen

Gestalt principles of similarity

The screenshot shows the GitHub sign-up page. At the top, there is a navigation bar with the GitHub logo, a search bar labeled "Search GitHub", and links for "Explore", "Features", "Enterprise", and "Pricing". On the right side of the bar are "Sign up" and "Sign in" buttons. The main content area features a large, bold title "Where software is built" followed by a description of GitHub's features: "Powerful collaboration, code review, and code management for open source and private projects. Public projects are always free. Private plans start at \$7/mo." To the right of this text is a sign-up form with three input fields: "Pick a username", "Your email", and "Create a password". Below the password field is a note: "Use at least one lowercase letter, one numeral, and seven characters." A large green "Sign up for GitHub" button is centered below the password field. A small note at the bottom of the sign-up form states: "By clicking 'Sign up for GitHub', you agree to our [terms of service](#) and [privacy policy](#). We will send you account related emails occasionally." At the bottom of the page, a blue banner asks, "Want to use GitHub on your servers?" with a blue "Get started" button.

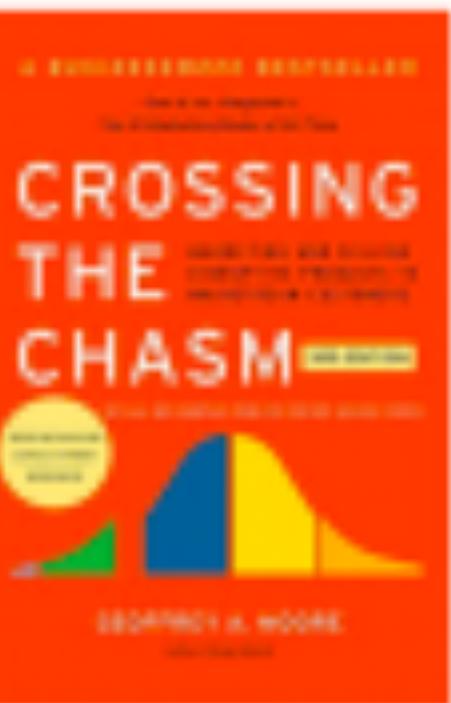
Gestalt principles of continuity

- Elements that are arranged on a line or curve are perceived to be more related than elements not on the line or curve



Gestalt principles of continuity

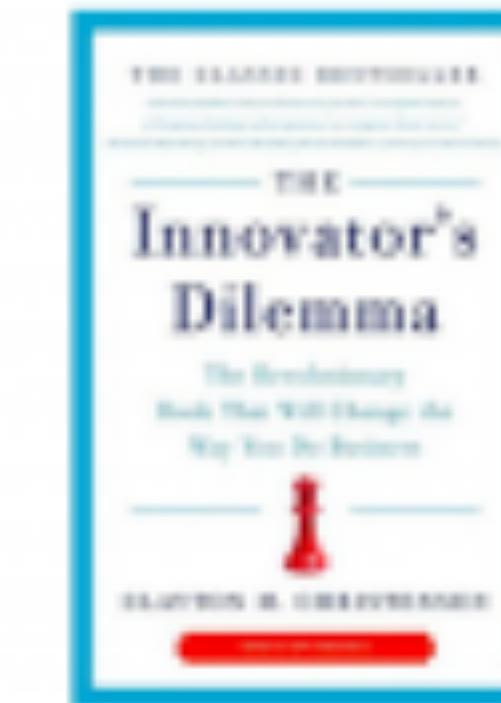
Customers Who Bought This Item Also Bought



Crossing the Chasm, 3rd Edition: Marketing and Selling Disruptive Products
by Geoffrey A. Moore
 72
Paperback
\$12.35 



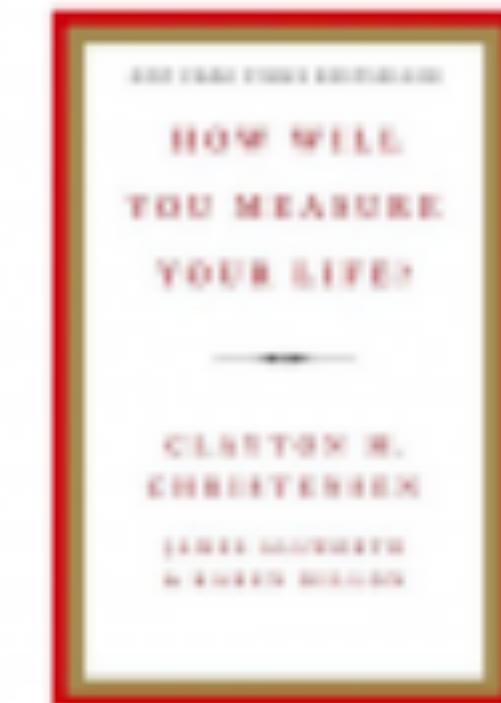
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 1,062
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The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business
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 209
#1 Best Seller in Industrial Management...
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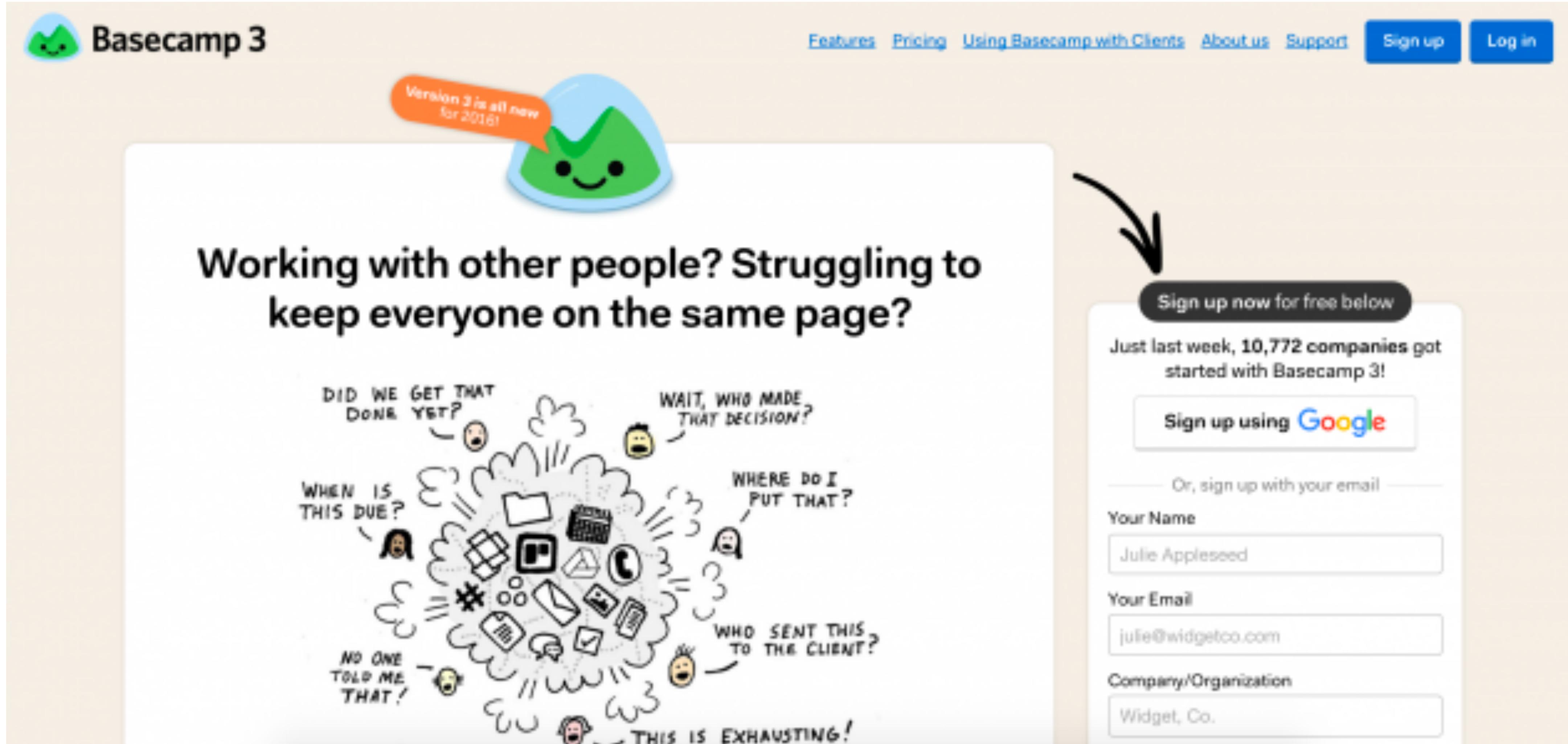
How Will You Measure Your Life?
by Clayton M. Christensen
 583
Hardcover
\$15.86 

Gestalt principles of figure-ground

- People instinctively perceive objects as either being in the foreground or the background. They either stand out prominently in the front (the figure) or recede into the back (the ground)



Gestalt principles of figure-ground



The screenshot shows the homepage of Basecamp 3. At the top left is the logo "Basecamp 3" with a green mountain icon. The top right features a navigation bar with links: Features, Pricing, Using Basecamp with Clients, About us, Support, Sign up (in a blue button), and Log in (in a blue button). A large orange speech bubble in the upper left corner says "Version 3 is all new for 2016!". Below it is a smiling green mountain icon.

The main headline reads: "Working with other people? Struggling to keep everyone on the same page?"

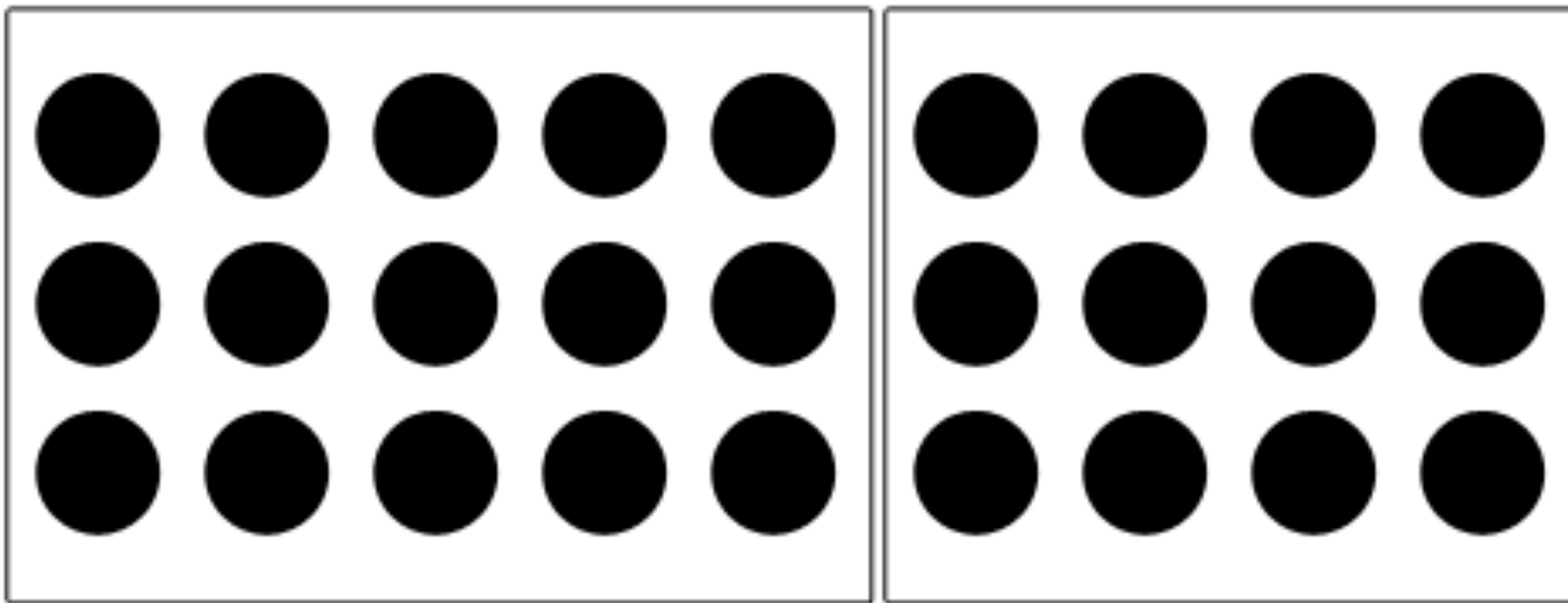
Below the headline is a cartoon illustration of a brain with various thought bubbles and icons, representing confusion and exhaustion. The thought bubbles contain questions like:

- DID WE GET THAT DONE YET?
- WAIT, WHO MADE THAT DECISION?
- WHERE DO I PUT THAT?
- WHO SENT THIS TO THE CLIENT?
- NO ONE TOLD ME THAT!
- THIS IS EXHAUSTING!
- WHEN IS THIS DUE?

To the right of the illustration is a sign-up form with a large black arrow pointing to the "Sign up now for free below" button. The form includes fields for "Your Name" (Julie Appleseed), "Your Email" (julie@widgetco.com), and "Company/Organization" (Widget, Co.).

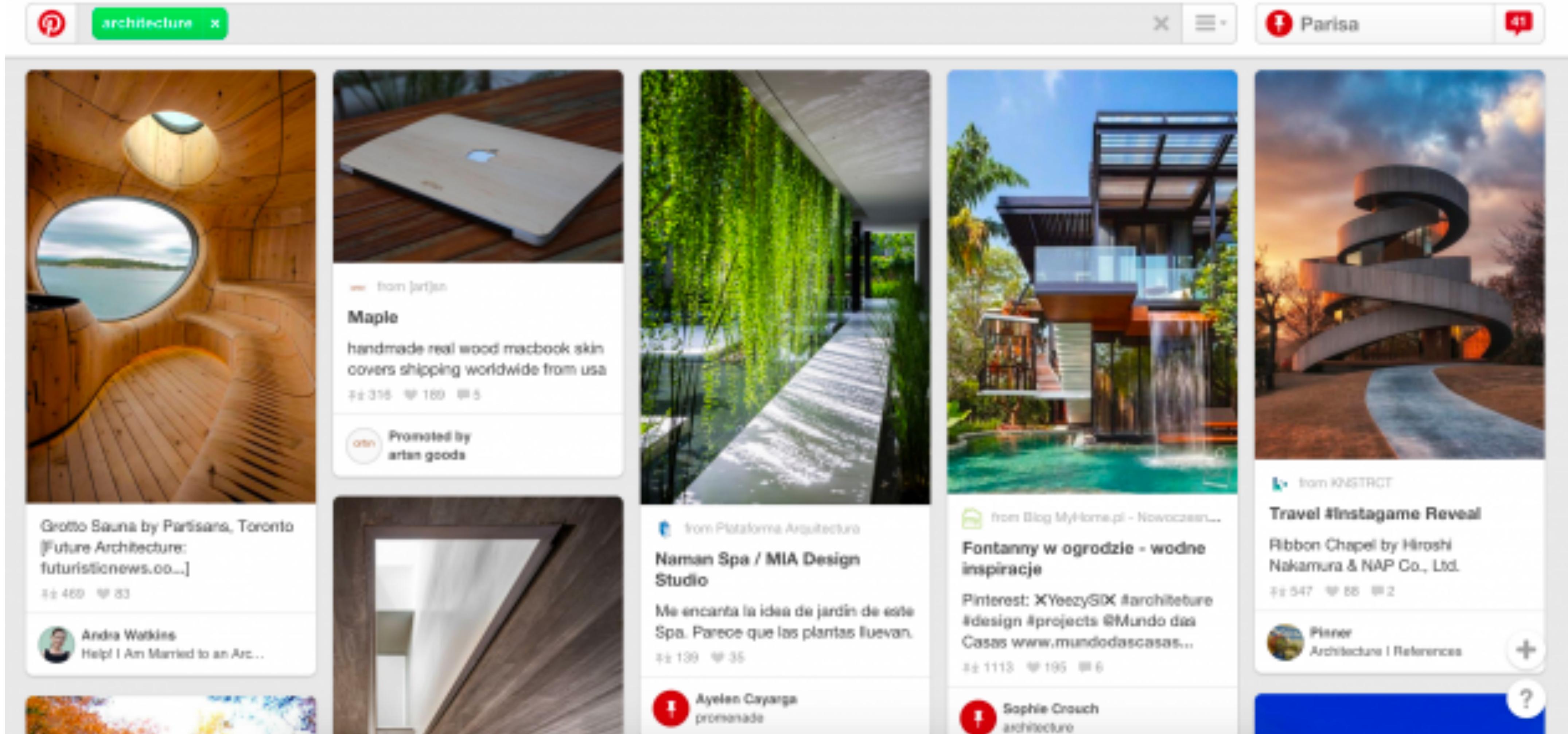
Gestalt principles of common region

- When objects are located within the same closed region, we perceive them as being grouped together



Gestalt principles of common region

P architecture X Parisa 41



Grotto Sauna by Partisans, Toronto [Future Architecture: futuristiconnews.co...]

from artan goods

Maple
handmade real wood macbook skin covers shipping worldwide from usa

from artan goods

Naman Spa / MIA Design Studio

Me encanta la idea de jardín de este Spa. Parece que las plantas lluevan.

Ayelen Cayarga

Fontannny w ogrodzie - wodne inspiracje

Pinterest: XYeezyGDX #architecture #design #projects @Mundo das Casas www.mundodascasas...

Sophie Crouch architecture

Ribbon Chapel by Hiroshi Nakamura & NAP Co., Ltd.

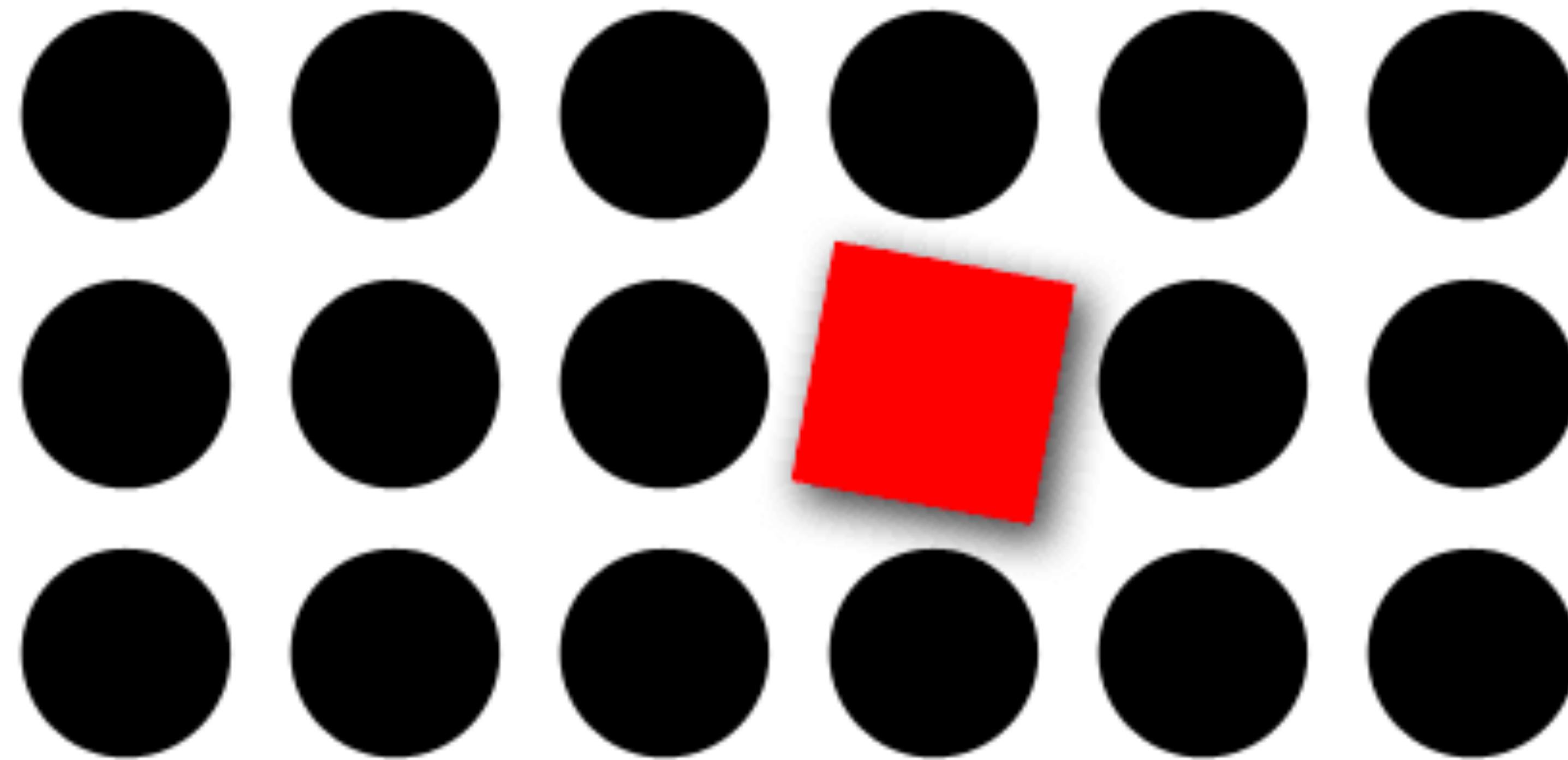
from KNSTRCT

Travel #Instagame Reveal

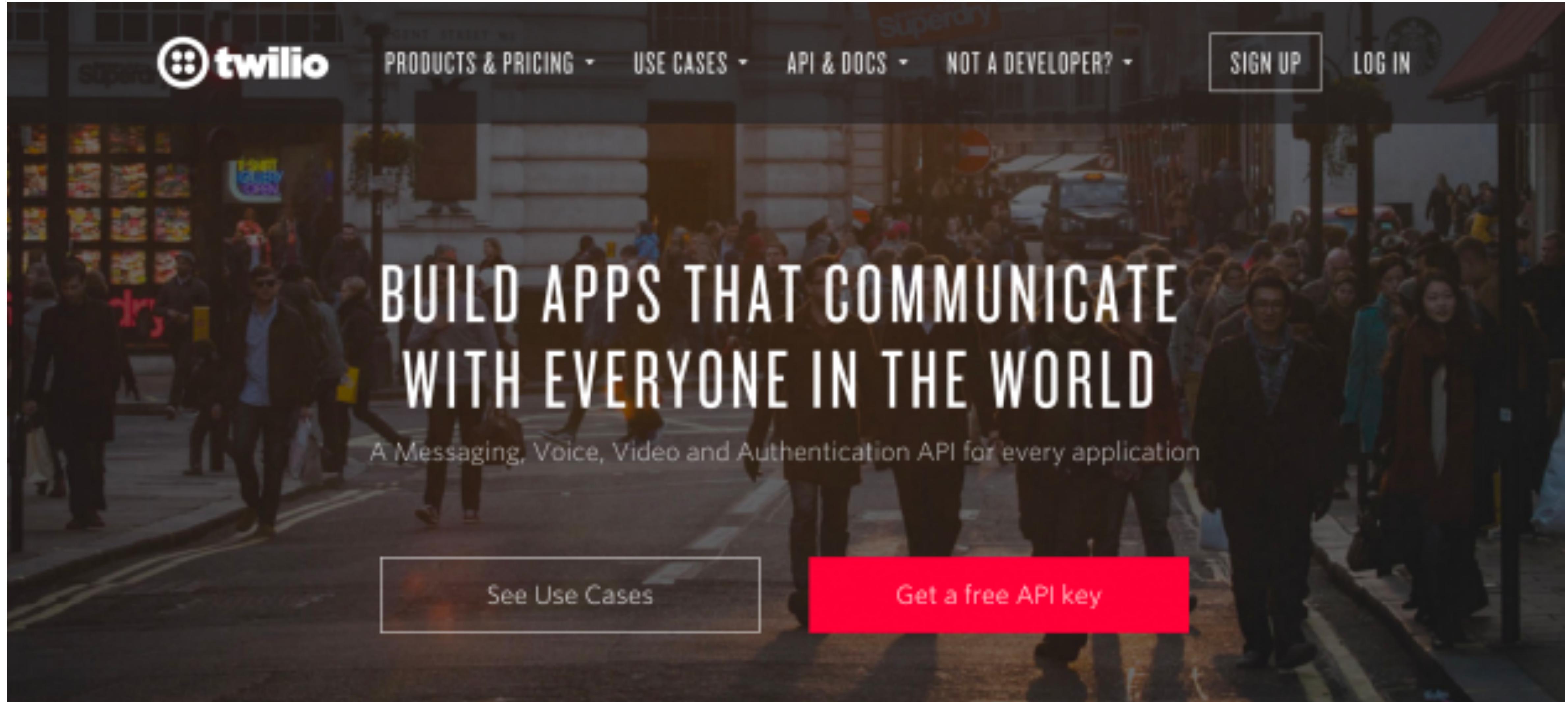
Pin for Architecture I References

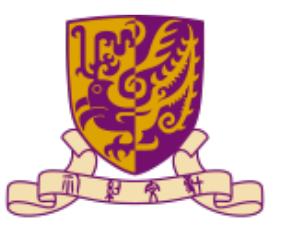
Gestalt principles of focal point

- Whatever stands out visually will capture and hold the viewer's attention first



Gestalt principles of focal point





Outline

- Perception
- Cognition
- Gestalt principles
- Other design principles

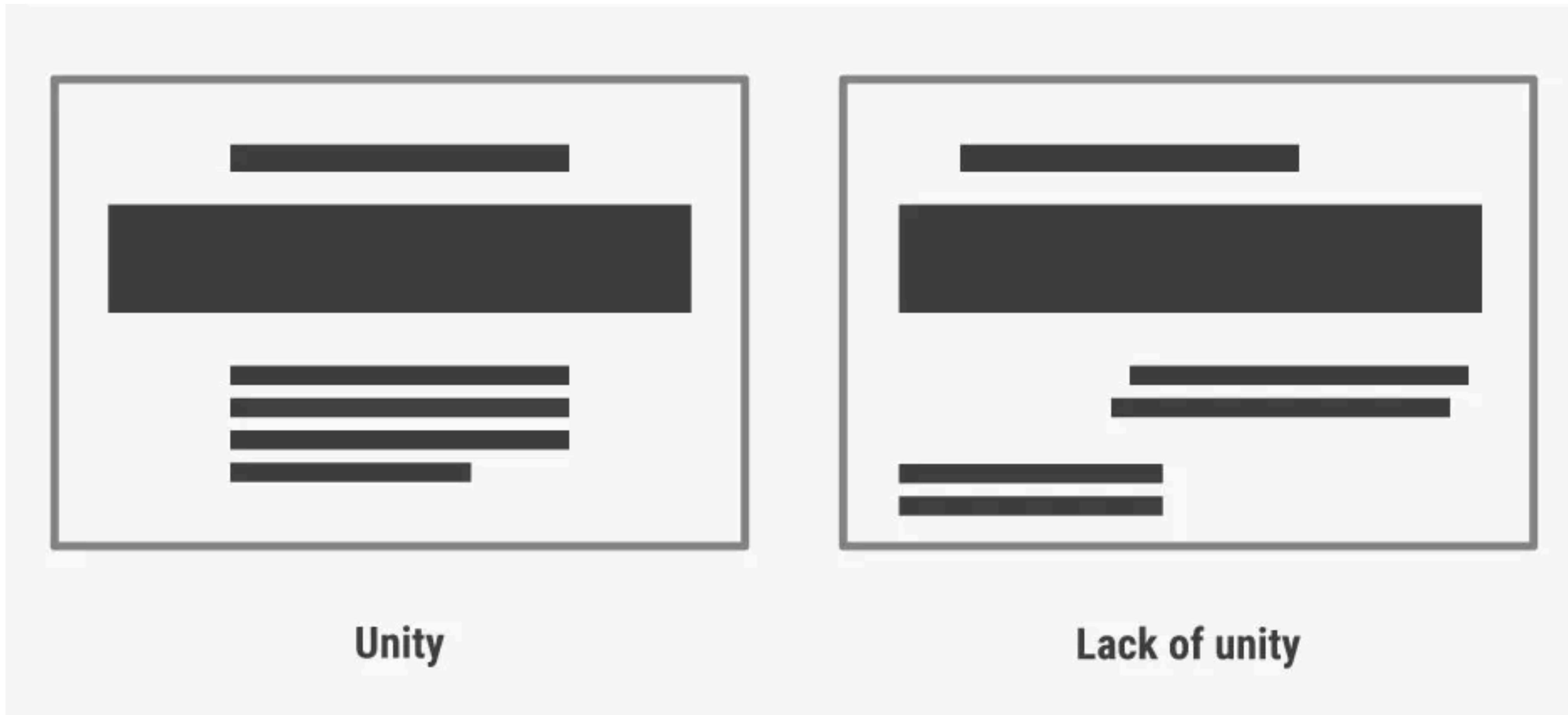
Weber's law

- The observation that the ability to perceive changes in magnitudes of stimuli is proportional to the magnitude



Unity

- Create a sense of harmony between all elements

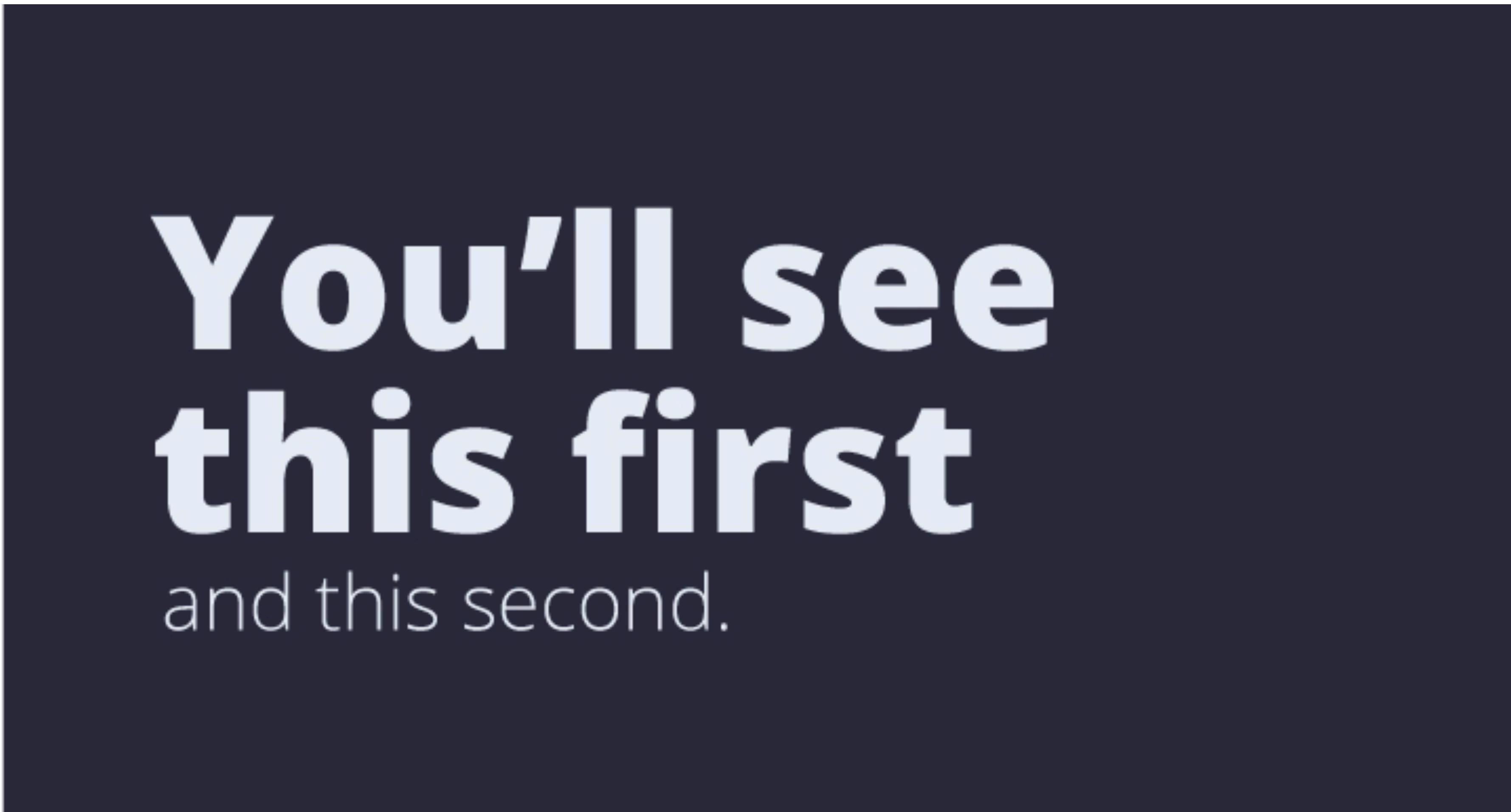


Unity

Lack of unity

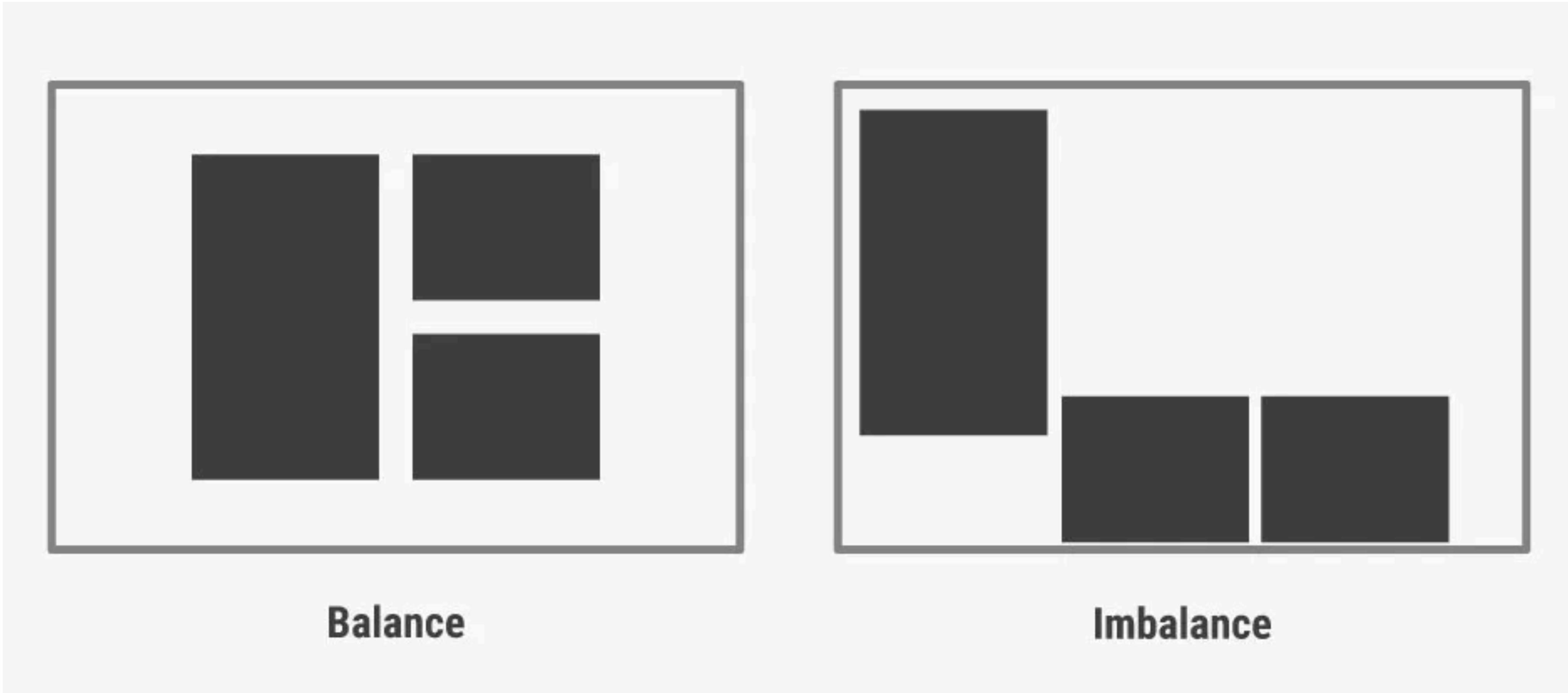
Hierarchy

- Show the difference in importance of the elements in a design



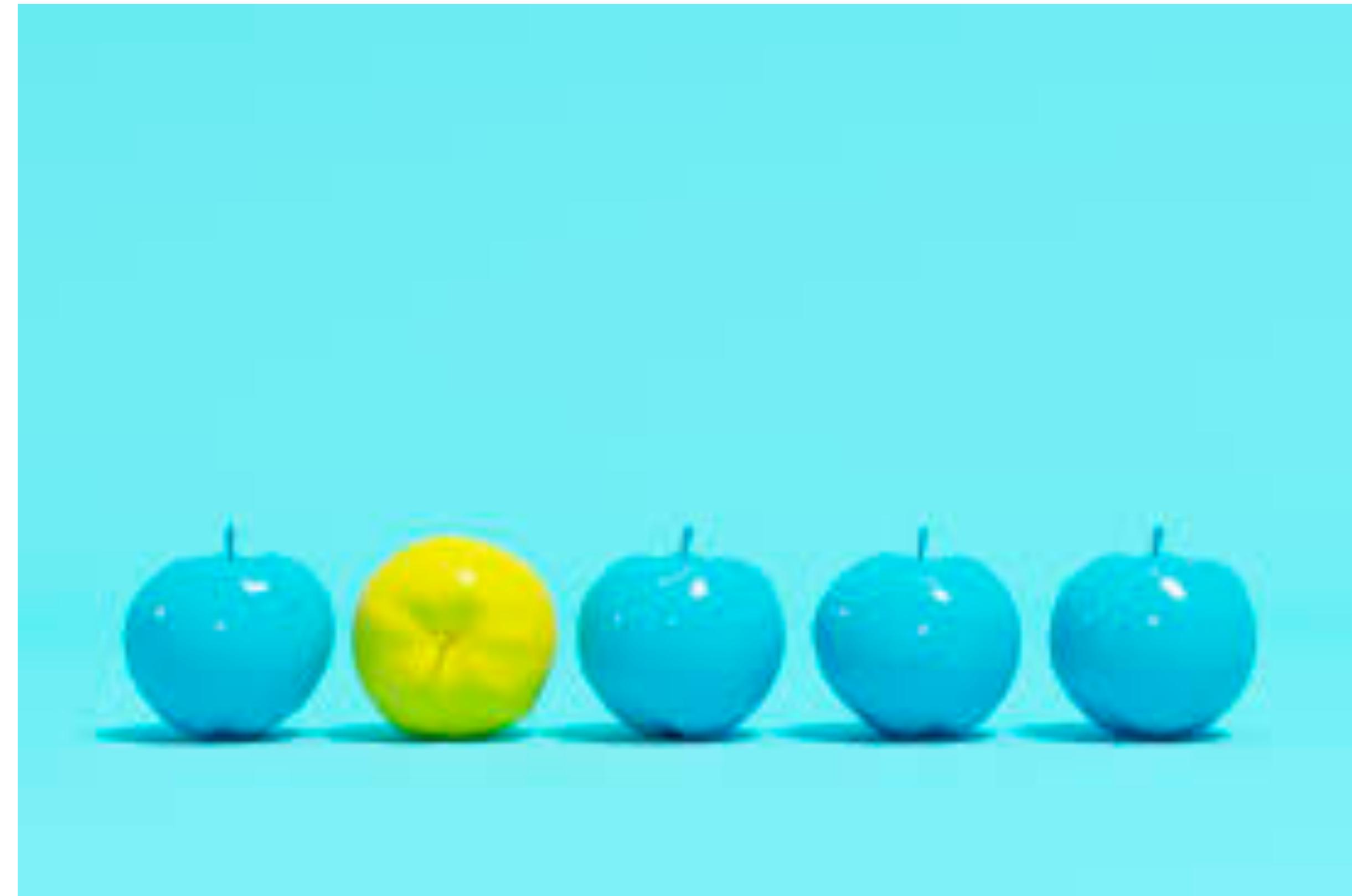
Balance

- Govern how we distribute the elements of a design *evenly*



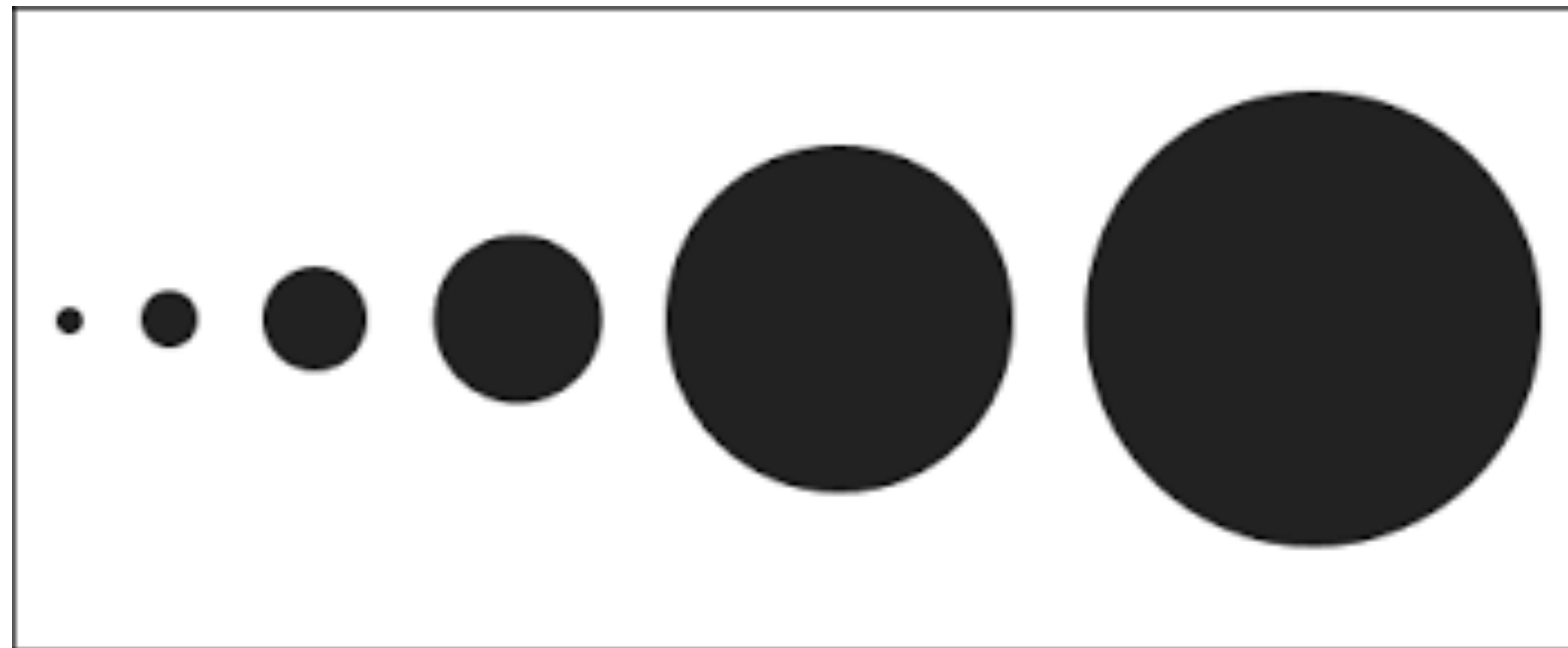
Contrast

- Make an element stand out through the use of color, value and size



Scale

- Describe the relative sizes of the elements in a design

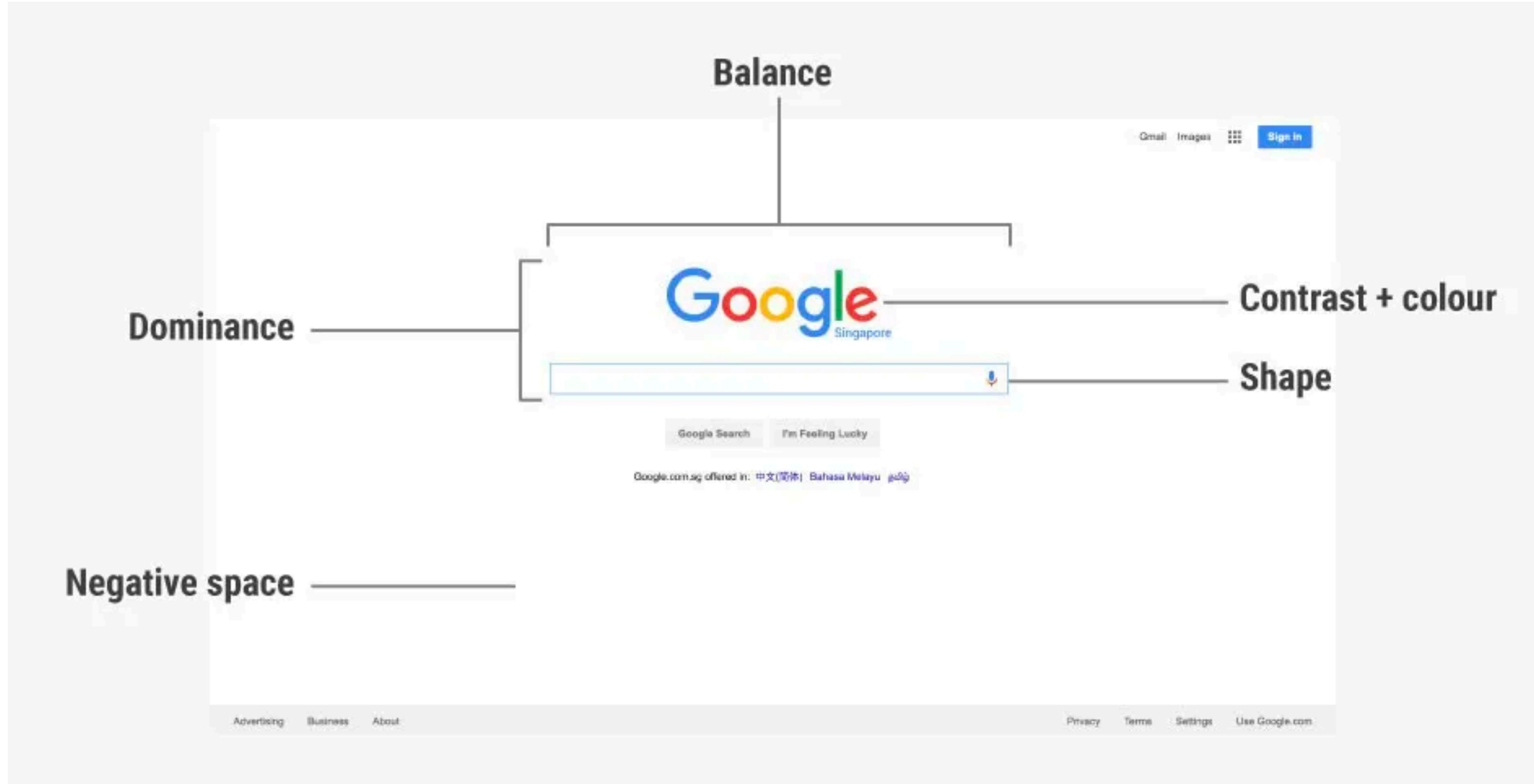


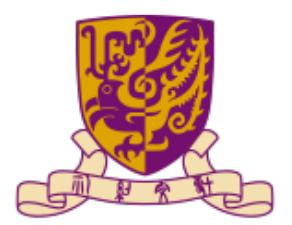
Dominance

- Create focus on a single element



Case study





香港中文大學(深圳)

The Chinese University of Hong Kong, Shenzhen

Thank Prof. Siming Chen and Prof. Alan Dix for many of the slides!