CPSC 100

Computational Thinking

Data Visualization
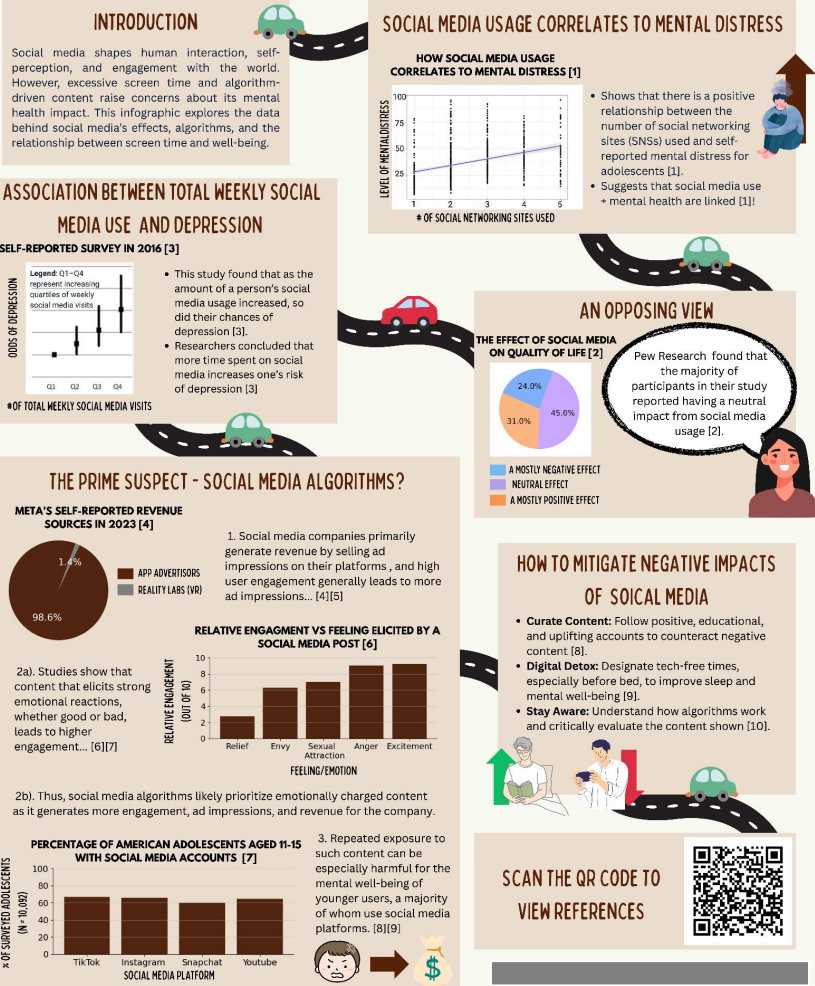
Instructor: Firas Moosvi
Department of Computer Science
University of British Columbia

Agenda

- Course Admin
    - Reminder about Milestone 3 & 4
    - Sample Digital Artifact
- Mini-activity on the importance of Data Visualizations
- Gestalt Principles (Part 1)

SOCIAL MEDIA & MENTAL HEALTH: THE ROLE OF SCREEN TIME AND ALGORITHMS

INTRODUCTION

Social media shapes human interaction, self-perception, and engagement with the world. However, excessive screen time and algorithm-driven content raise concerns about its mental health impact. This infographic explores the data behind social media's effects, algorithms, and the relationship between screen time and well-being.

ASSOCIATION BETWEEN TOTAL WEEKLY SOCIAL MEDIA USE AND DEPRESSION

SELF-REPORTED SURVEY IN 2016 [3]

Legend: Q1–Q4 represent increasing quartiles of weekly social media visits

ODDS OF DEPRESSION

Q1 Q2 Q3 Q4

#OF TOTAL WEEKLY SOCIAL MEDIA VISITS

- This study found that as the amount of a person's social media usage increased, so did their chances of depression [3].
- Researchers concluded that more time spent on social media increases one's risk of depression [3]

SOCIAL MEDIA USAGE CORRELATES TO MENTAL DISTRESS

HOW SOCIAL MEDIA USAGE CORRELATES TO MENTAL DISTRESS [1]

LEVEL OF MENTAL DISTRESS

100
75
50
25

1 2 3 4 5
OF SOCIAL NETWORKING SITES USED

- Shows that there is a positive relationship between the number of social networking sites (SNSs) used and self-reported mental distress for adolescents [1].
- Suggests that social media use + mental health are linked [1]!

AN OPPOSING VIEW

THE EFFECT OF SOCIAL MEDIA ON QUALITY OF LIFE [2]

24.0%
45.0%
31.0%

Pew Research found that the majority of participants in their study reported having a neutral impact from social media usage [2].

- A MOSTLY NEGATIVE EFFECT
- NEUTRAL EFFECT
- A MOSTLY POSITIVE EFFECT

THE PRIME SUSPECT - SOCIAL MEDIA ALGORITHMS?

META'S SELF-REPORTED REVENUE SOURCES IN 2023 [4]

1.4%
98.6%

- APP ADVERTISORS
- REALITY LABS (VR)

1. Social media companies primarily generate revenue by selling ad impressions on their platforms, and high user engagement generally leads to more ad impressions... [4][5]

2a). Studies show that content that elicits strong emotional reactions, whether good or bad, leads to higher engagement... [6][7]

RELATIVE ENGAGMENT VS FEELING ELICITED BY A SOCIAL MEDIA POST [6]

RELATIVE ENGAGEMENT (OUT OF 10)

10
8
6
4
2
0

Relief Envy Sexual Attraction Anger Excitement
FEELING/EMOTION

2b). Thus, social media algorithms likely prioritize emotionally charged content as it generates more engagement, ad impressions, and revenue for the company.

PERCENTAGE OF AMERICAN ADOLESCENTS AGED 11-15 WITH SOCIAL MEDIA ACCOUNTS [7]

OF SURVEYED ADOLESCENTS (N = 10,092)

100
80
60
40
20
0

TikTok Instagram Snapchat Youtube
SOCIAL MEDIA PLATFORM

3. Repeated exposure to such content can be especially harmful for the mental well-being of younger users, a majority of whom use social media platforms. [8][9]

HOW TO MITIGATE NEGATIVE IMPACTS OF SOICAL MEDIA

- **Curate Content:** Follow positive, educational, and uplifting accounts to counteract negative content [8].
- **Digital Detox:** Designate tech-free times, especially before bed, to improve sleep and mental well-being [9].
- **Stay Aware:** Understand how algorithms work and critically evaluate the content shown [10].

SCAN THE QR CODE TO VIEW REFERENCES

Sample Digital Artifact
x 3

This is an excellent infographic but a **very loose** example of something that MIGHT be suitable for an A+ in the course project if:

- Tied to 1 of 5 broad themes + course topics
- More **substantial…**
- More comprehensive (3x)
- Explanatory vs. Expository
- Overall, just **more…**

4

OpenAI

ChatGPT includes extra protections for teens

Hi Firas Moosvi,

Because your account shows you're under 18, we've adjusted a few settings to create a safer experience for you. Most of your ChatGPT experience will stay the same, though some sensitive topics and interactions may be limited.

OpenAI

ChatGPT includes extra protections for teens

Hi Firas Moosvi,

Because your account shows you're under 18, we've adjusted a few settings to create a safer experience for you. Most of your ChatGPT experience will stay the same, though some sensitive topics and interactions may be limited.

If you're 18 or older, you can verify your age to access all ChatGPT features. You'll just need to upload a photo of your government-issued ID and take a quick selfie—handled securely by our trusted verification partner, Persona.

I'm over 18

Mini-Activity

In groups of 3-4: Solve the Cholera Outbreak!

- It is **1854** (remember: no computers!) and the government has told you to find the source of the outbreak.

  – What would you do?

  – What kind of information would you want to collect?

  – What would you do with the information? Since there are no computers help organize information, how would you deal with the amount of information that you get?

A COURT FOR KING CHOLERA.
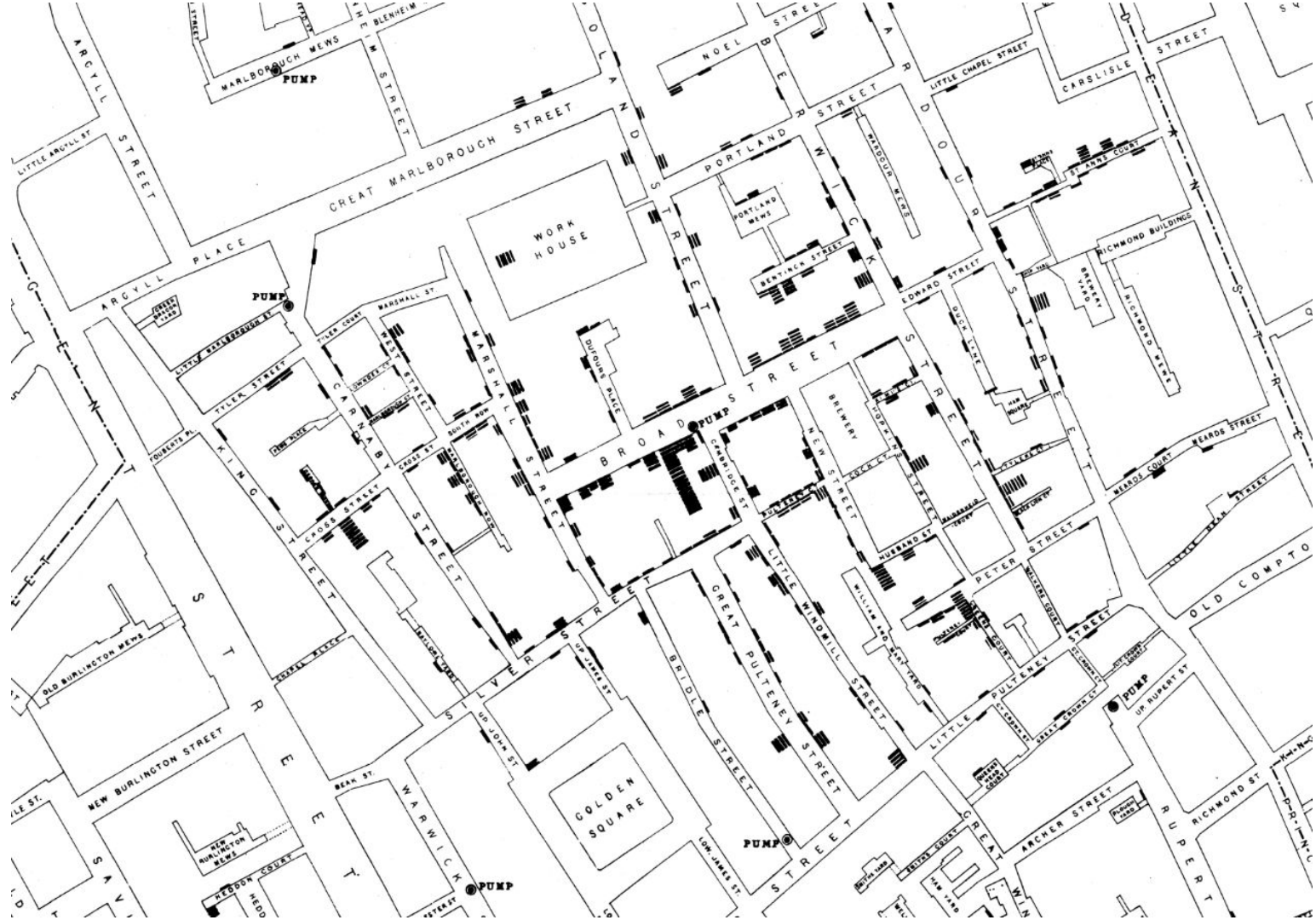
Learning Goals

Learning Goals

After this **today's lecture**, you should be able to:

- Understand, define, name Gestalt Principles and explain their role in visualization

  - Demonstrate how these principles appear in real life—such as recognizing how proximity is used in store displays or how logos use closure to create memorable designs.

- Explore how understanding these principles can inform better visual communication, whether for creating infographics, arranging elements on a webpage, or organizing a physical space.

Gestalt Principles

What are Gestalt Principles?

- "Gestalt" is German for "unified whole".

- German psychologists Max Wertheimer, Kurt Koffka, and Wolfgang Kohler created the **Gestalt Principles** in the 1920s.

- They wanted to understand **how people make sense of the confusing things they see and hear**. They identified a set of laws that address the natural compulsion to find order in disorder. According to this, the mind "informs" what the eye sees by perceiving a series of individual elements as a whole.

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What are Gestalt Principles?

17
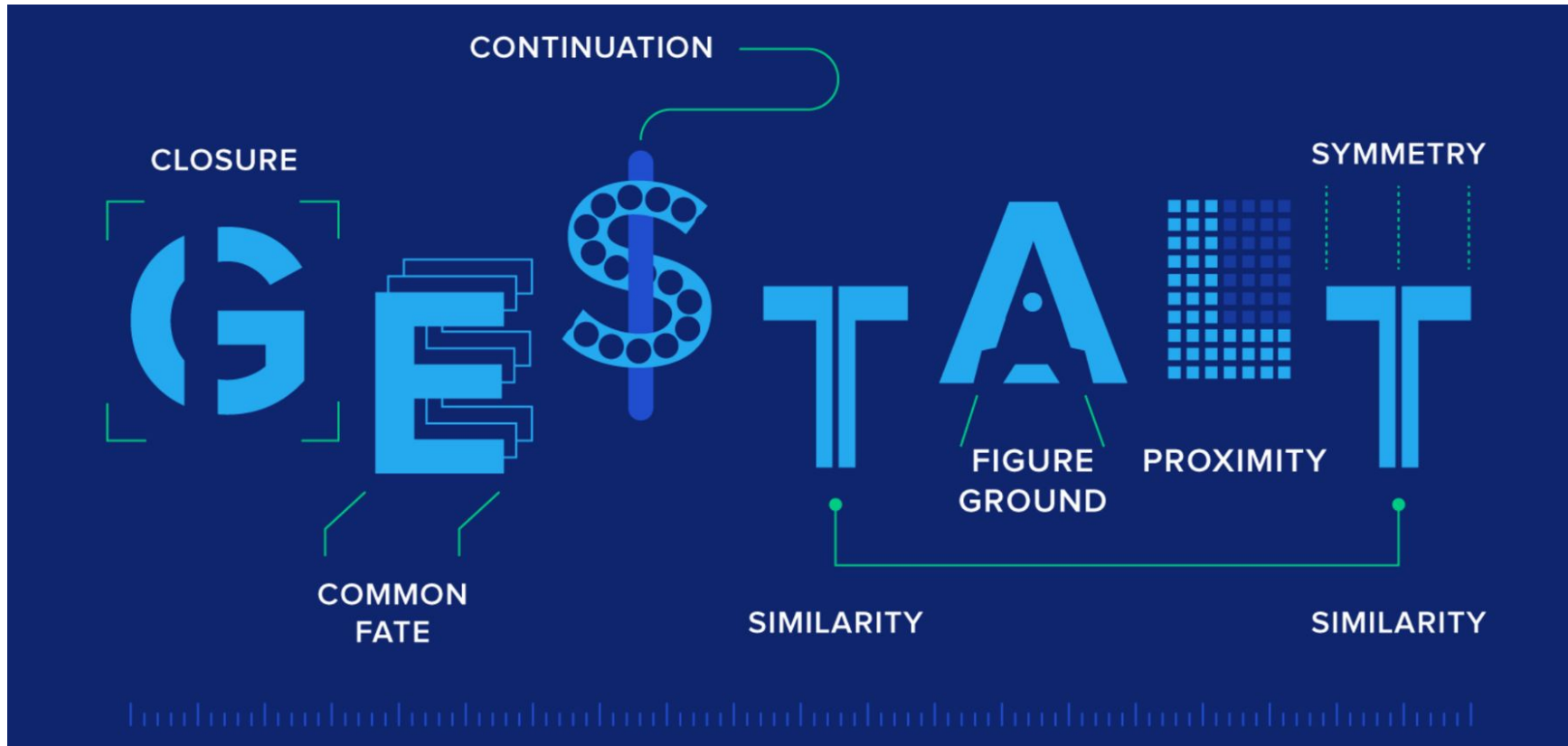
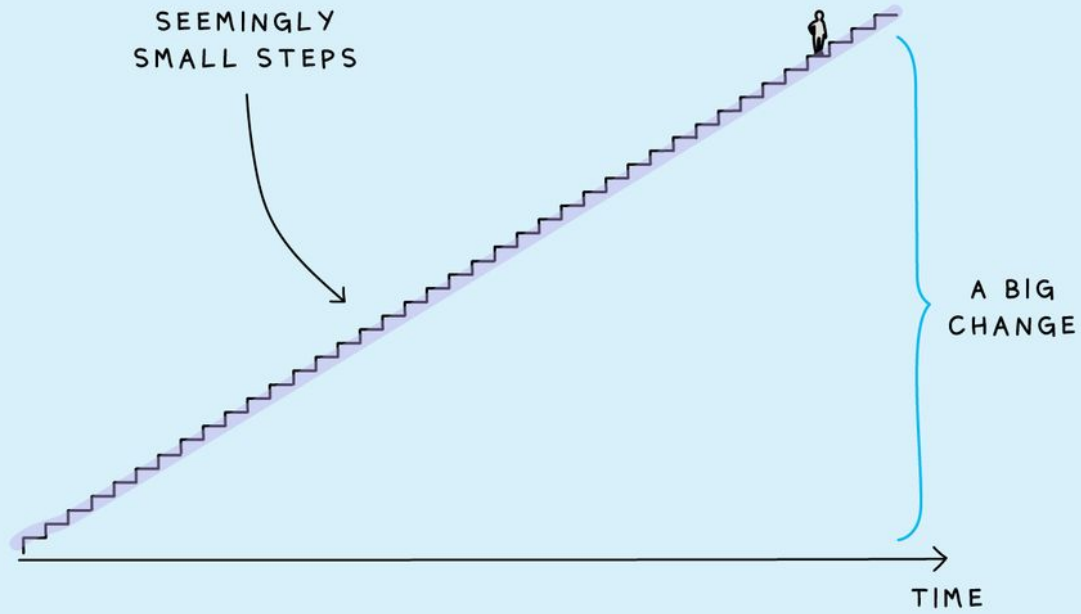# Gestalt Principles

1. Emergence

2. Closure (Reification)

3. Common Region

4. Continuity or Continuation

5. Proximity

6. Multistability

7. Figure/Ground

8. Invariance

9. Pragnanz

10. Similarity

11. Symmetry and Order

12. Common Fate

Today's Focus

1. Emergence

2. Closure (Reification)

3. Common Region

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12. Common Fate

Source: www.interaction-design.org

Emergence

Gestalt Rule: **Emergence**

Emergence

- A dog can immediately be identified, despite the picture not having all the details.

- Instead of building up our perception piece by piece, our minds tend to see the overall form all at once.

- We perceive the world without thinking too much about understanding every small thing around us.

Closure

23

Gestalt Rule: **Closure**
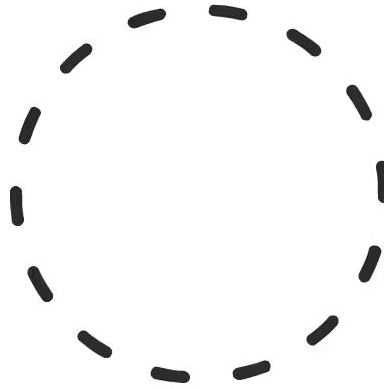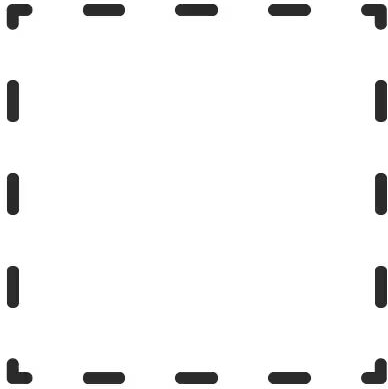
Closure

Sometimes known as "Reification"
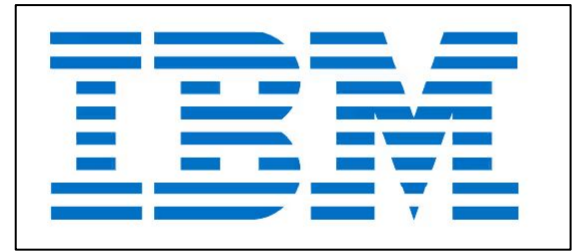
- The mind's tendency to fill in gaps in incomplete shapes or figures, effectively "closing" open boundaries to perceive a whole.

- Lets us quickly recognize objects even when parts are missing.

- Used in logos and artwork to hint at forms and engage the viewer's imagination.

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Common Region

Gestalt Rule: **Common Region**
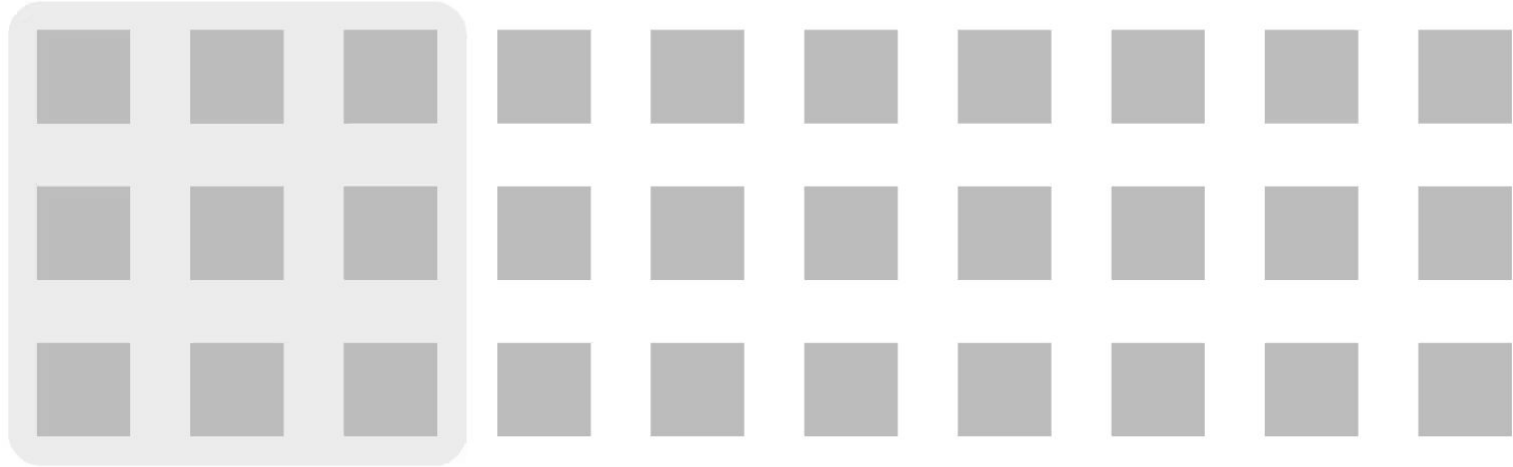
Common Region

- Elements located within the same clearly defined area or boundary are perceived to belong together.

- Helps us group items based on shared space.

- Influences how we arrange or label items so they appear unified (like sections on an infographic or webpage).

- In a living room, a rug can create a sense of a "zone" or common elements are on facebook posted

Today's Focus

1. **Emergence**

2. **Closure (Reification)**

3. **Common Region**

4. Continuity or Continuation

5. Proximity

6. Multistability

7. Figure/Ground

8. Invariance

9. Pragnanz

10. Similarity

11. Symmetry and Order

12. Common Fate

Continuity

Gestalt Rule: **Continuity**
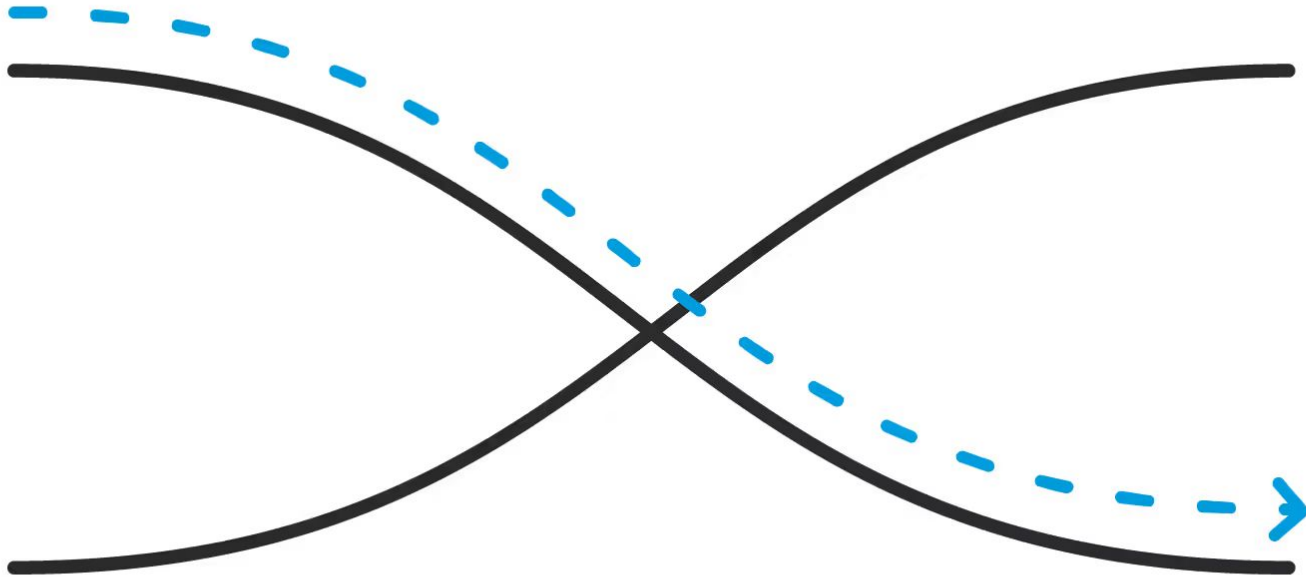
Continuity

- Our eyes prefer continuous, unbroken lines and curves. When lines or shapes follow a smooth path, we assume they are connected, rather than separate elements.

- Makes complicated or intersecting shapes **easier** to interpret.

- Encourages design that "**flows**," guiding your attention **naturally**.

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Continuity

- https://youtu.be/gVIUI1832CE?si=IMhrru9UyeWmVJQi

34
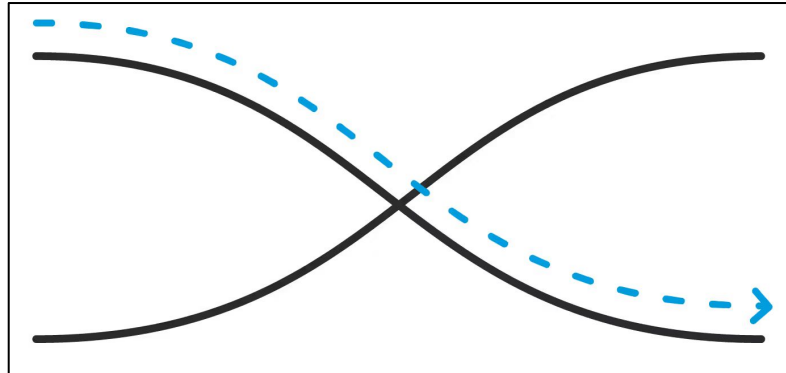
Proximity

Gestalt Rule: **Proximity**

Proximity

- Objects that are physically close to one another are seen as related or forming a group.

- Helps with quick organization of information.

- Influences how we arrange items to signal relationships (e.g., grouped shelves in a grocery store).

girl scouts

Multistability

Gestalt Rule: **Multistability**
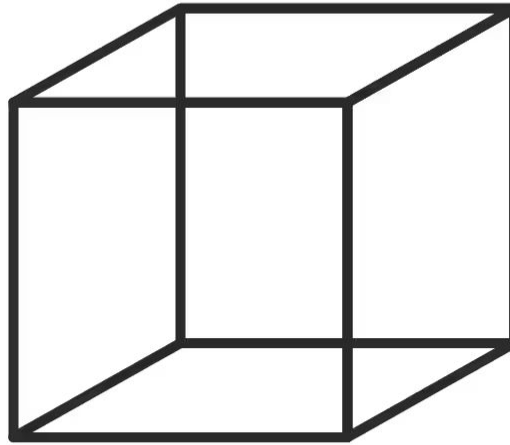
Necker Cube

Multistability

- Phenomenon where an ambiguous image can switch between different interpretations in your mind.

- Demonstrates how our brains can hold multiple interpretations of the same visual.

- Highlights the importance of context and focus in shaping what we perceive first.

40

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"My wife and my mother-in-law" from 1915 by W. E. Hill

42

"My wife and my mother-in-law" from 1915 by W. E. Hill

43

"My wife and my mother-in-law" from 1915 by W. E. Hill

44

Gestalt Principles (Part 1)

1. **Emergence**

2. **Closure (Reification)**

3. **Common Region**

4. **Continuity or Continuation**

5. **Proximity**

6. **Multistability**

7. Figure/Ground

8. Invariance

9. Pragnanz

10. Similarity

11. Symmetry and Order

12. Common Fate

45

SEEMINGLY SMALL STEPS

A BIG CHANGE

TIME

LIZ FOSSLIEN

47

Wrap up

Preview for next class...

Q: Which Gestalt Principles is most applicable to this logo?

A. Emergence

B. Closure

C. Common Region

D. Continuity

E. Multistability

Q: Which Gestalt Principles is most applicable to this logo?

A. Emergence

B. **Closure**

C. Common Region

D. Continuity

E. Multistability

Q: Which Gestalt Principles is most applicable to this logo?

A. Emergence

B. Closure

C. Common Region

D. Continuity

E. Multistability

amazon

Q: Which Gestalt Principles is most applicable to this logo?

A. Emergence

B. Closure

C. Common Region

D. **Continuity**

E. Multistability

amazon

53

Q: Which Gestalt Principles is most applicable to this image?

A. Emergence

B. Closure

C. Common Region

D. Continuity

E. Multistability

Q: Which Gestalt Principles is most applicable to this image?

A. Emergence

B. Closure

C. Common Region

D. Continuity

E. Multistability

Review

Gestalt Rule: **Emergence**

Gestalt Rule: **Closure**

Gestalt Rule: **Common Region**

Gestalt Rule: **Continuity**

Source: www.interaction-design.org
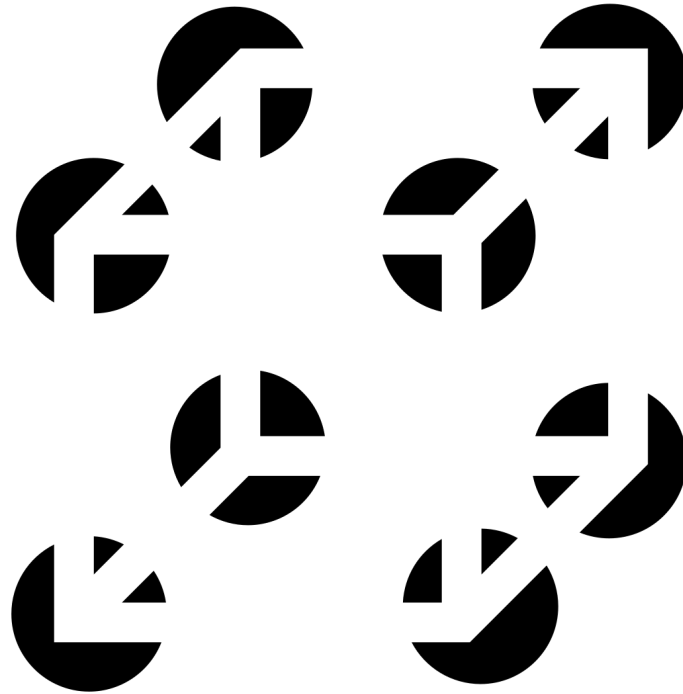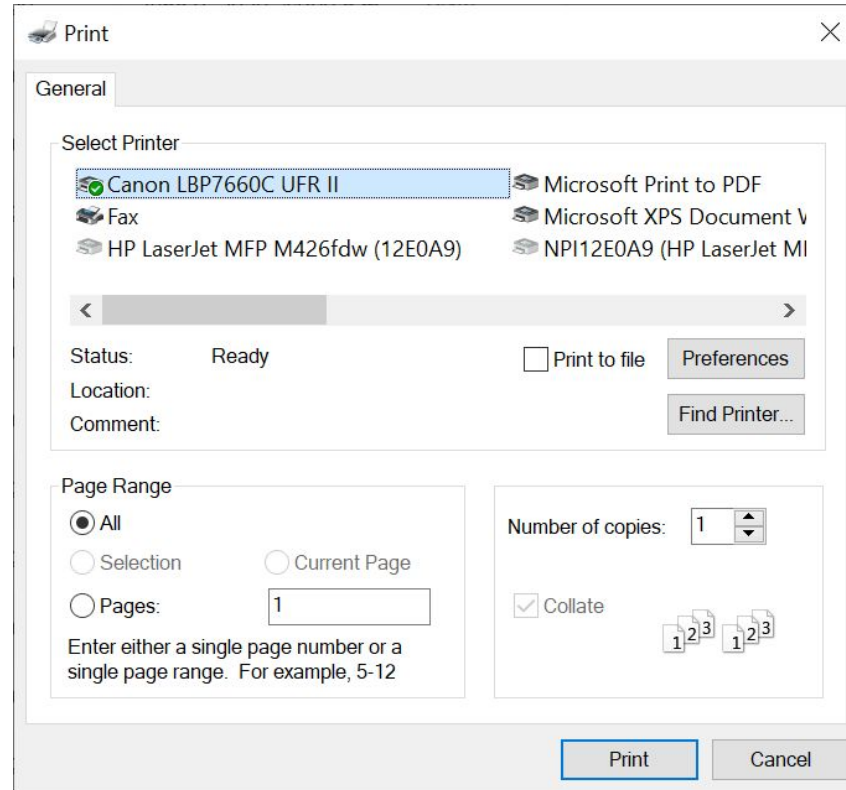
Gestalt Rule: **Proximity**
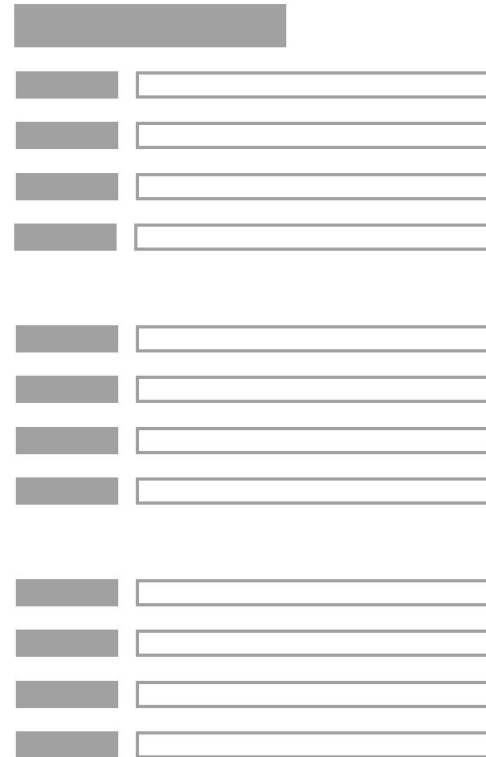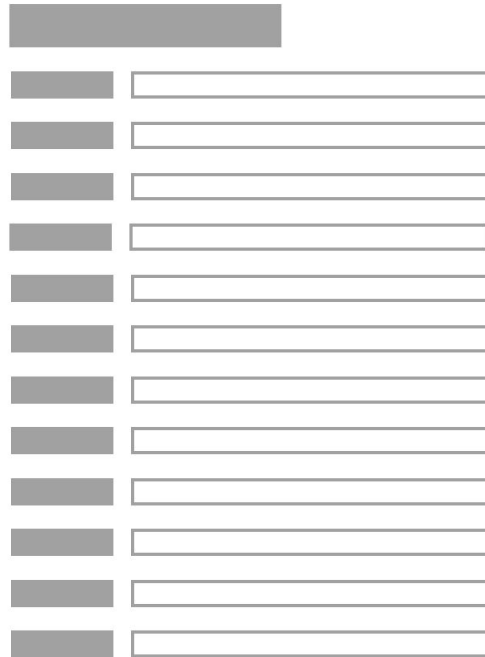
Gestalt Rule: **Multistability**

Gestalt Principles (Part 2)

1. Emergence

2. Closure (Reification)

3. Common Region

4. Continuity or Continuation

5. Proximity

6. Multistability

7. Figure/Ground

8. Invariance

9. Pragnanz

10. Similarity

11. Symmetry and Order

12. Common Fate

Source: www.interaction-design.org

Figure/Ground

Gestalt Rule: **Figure/Ground**

Rubin's Vase

Figure/Ground

- We naturally separate visual elements into a "**figure**" (the main object) and a "**ground**" (the background). **Which element is figure can flip**, as in the vase-faces illusion.

  - Vital for understanding **how we pick out objects in a busy environment** (e.g., spotting a friend in a crowd).

  - Used in designs to create emphasis or visual interest. (e.g. infographics)

- E.g. When you read text on a page, the words are the figure and the white page is the ground. You focus on the figure (text) and let the ground (white background) fade away.

Invariance

Gestalt Rule: **Invariance**
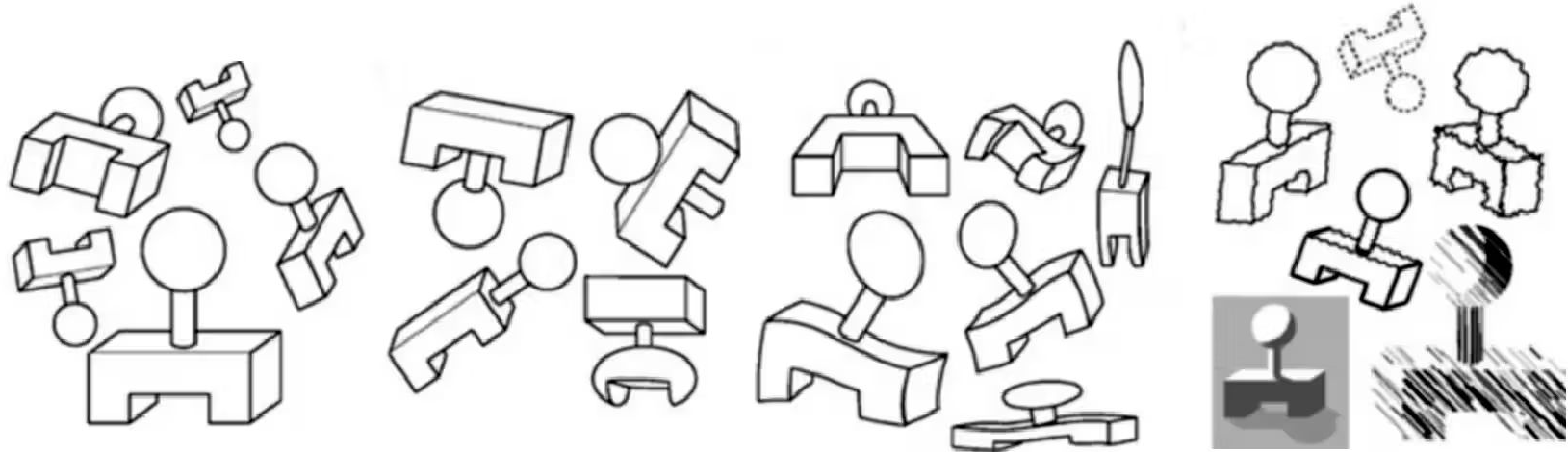
Invariance

- We can **recognize simple shapes regardless of rotation, scale, or slight distortions.** A circle is still seen as a circle even if it's tilted or partially covered.

  - Explains how we recognize letters in d**if**f**e**r**e**n**t** f**o**n**t**s or everyday objects from various angles.

  - Helps us see objects as the "same" despite minor variations.

- E.g. Whether you see a coffee cup right-side up, upside-down, or at an angle, you still know it's a coffee cup. The shape and handle are recognizable enough.

Pragnanz

Gestalt Rule: **Pragnanz**
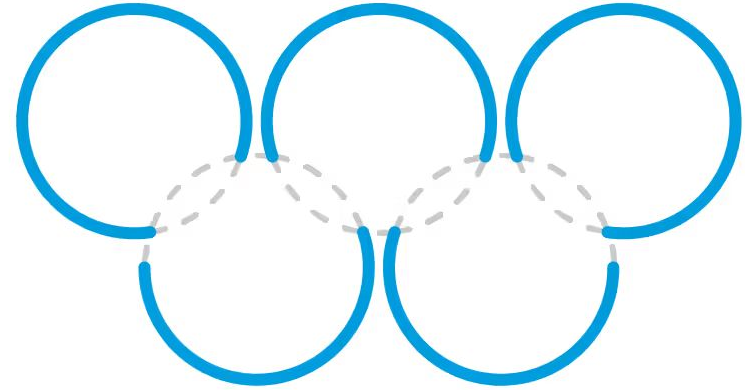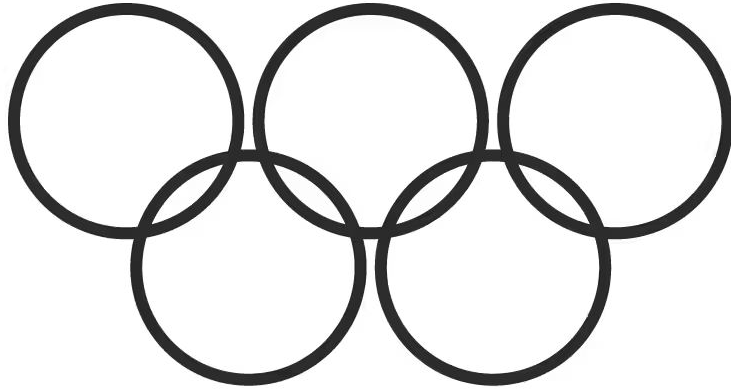
Pragnanz (German for "good figure")

- We perceive/interpret visuals in the **simplest way possible**. Our brains automatically favor the **most stable, straightforward interpretation.**

  - Reflects our preference for symmetry, simple forms, & clear organization.

  - Guides designers to minimize visual complexity for easy understanding.

- E.g. Given a messy arrangement of coloured blocks on a table, your mind looks for basic shapes or clean lines first, rather than complex or "zigzag" patterns.

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Pragnanz
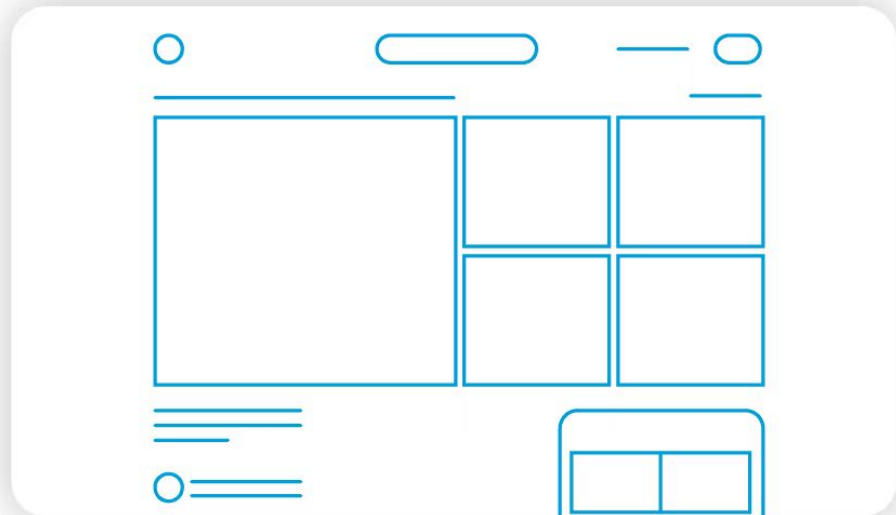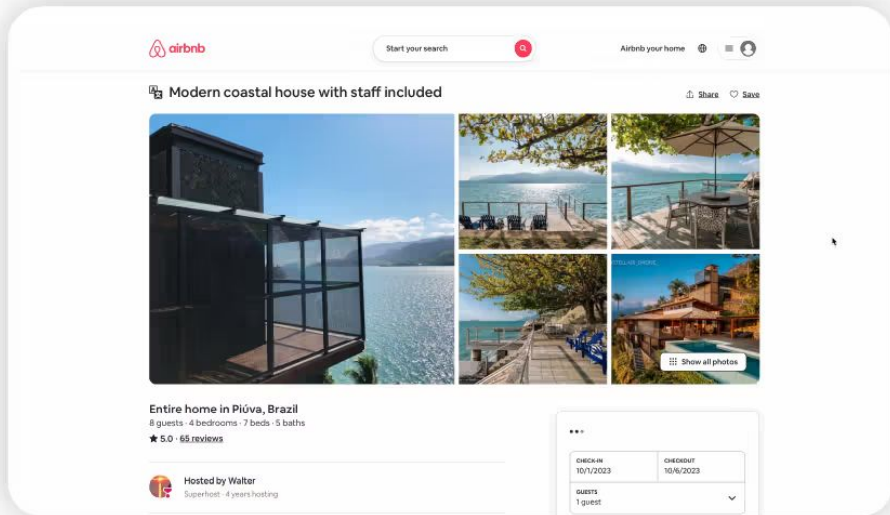
Similarity

Gestalt Rule: **Similarity**
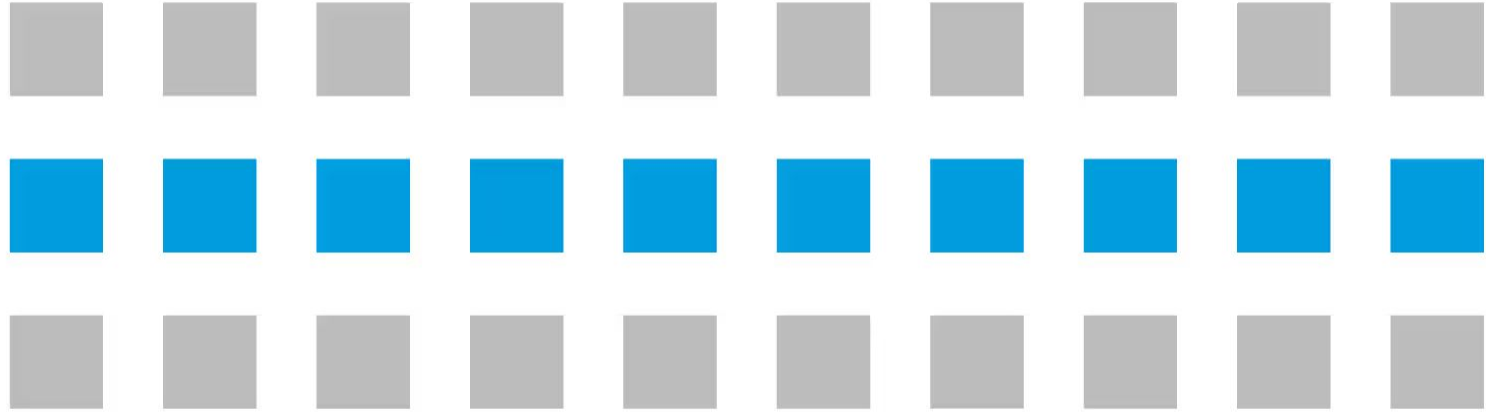
Similarity

- Elements sharing **similar characteristics** (colour, shape, size) are **mentally grouped together**.

  - Enables quick categorization based on shared features.

  - Helps you pick out familiar faces or patterns in a crowd—people wearing similar uniforms, for instance.

- A set of matching red chairs in a conference room stands out as a single group, separate from any green chairs, even if they're all arranged together in one space.

iPhone 16 Pro

Built for Apple Intelligence.

Learn more   Buy

iPhone 16

Built for Apple Intelligence.

Learn more   Buy

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Symmetry and Order

Gestalt Rule: **Symmetry**
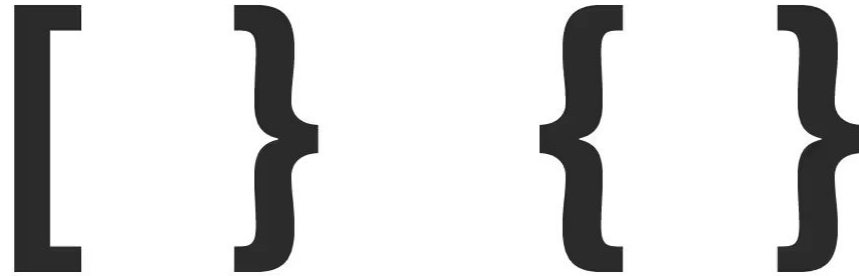
Symmetry and Order

- Symmetrical arrangements appear **more orderly & cohesive**. **Our brains love balance** & see symmetrical patterns as a unified whole.

    – Symmetry is often associated with beauty, harmony, and reliability.

    – Guides how we arrange items in a room or how we judge certain designs (e.g. infographics) to be aesthetically pleasing.

- A heart shape ❤️, mirrored from left to right, looks balanced and complete. You see it as a single symbol rather than two separate halves. 💔
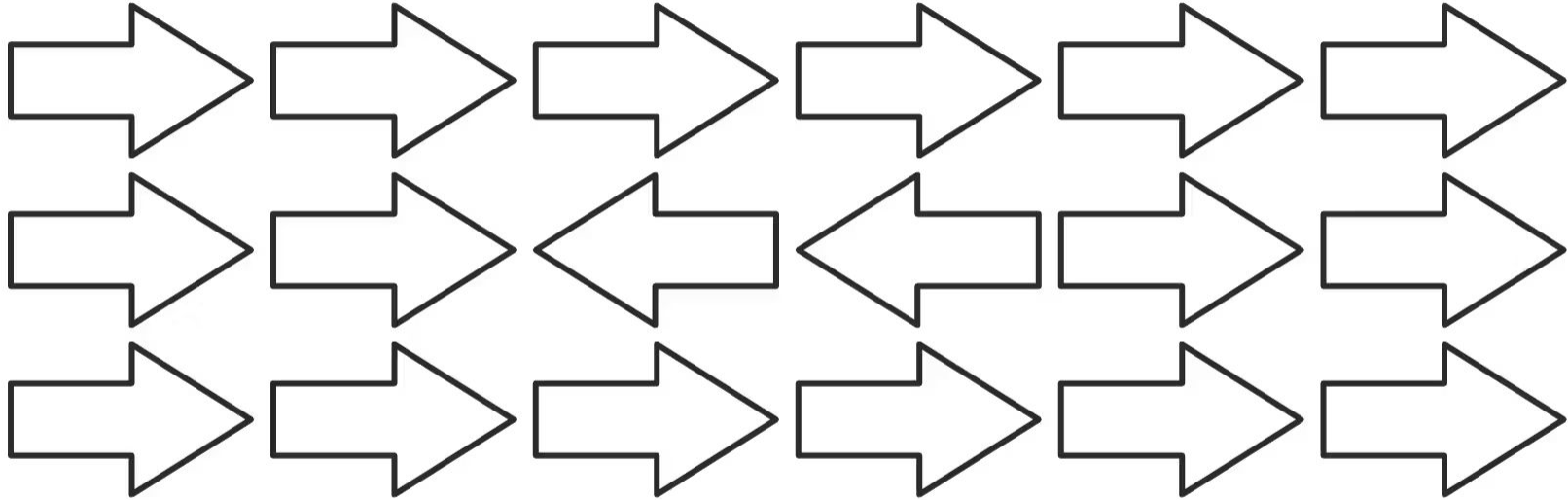
Source: www.interaction-design.org

Symmetry and Order

Common Fate

Gestalt Rule: **Common Fate**

Common Fate

- Elements moving in the **same direction** or showing the same change over time are perceived as **belonging together**.

  - Helps interpret motion and group dynamics in busy environments.

  - Applies to everything from following a parade to understanding traffic flows (people heading in the same direction are likely together).

- A flock of birds all heading south in formation is seen as a single group, even if they sometimes shift positions within that formation.

Common Fate

Source: www.interaction-design.org

Q: Which Gestalt Principles is most applicable to this image?

A. Figure/Ground

B. Invariance

C. Pragnanz

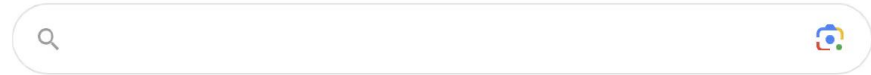D. Similarity

E. Symmetry and Order

following   finding

Type the two words:

following finding   **Send**

Q: Which Gestalt Principles is most applicable to this image?

iClicker

A. Figure/Ground

B. **Invariance**

C. Pragnanz

D. Similarity

E. Symmetry and Order

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Q: Which Gestalt Principles is most applicable to this image?

A. Invariance

B. Pragnanz

C. Closure

D. Symmetry and Order

E. Common Fate

Q: Which Gestalt Principles is most applicable to this image?

A. Invariance

B. Pragnanz

C. Closure

D. **Symmetry and Order**

E. Common Fate