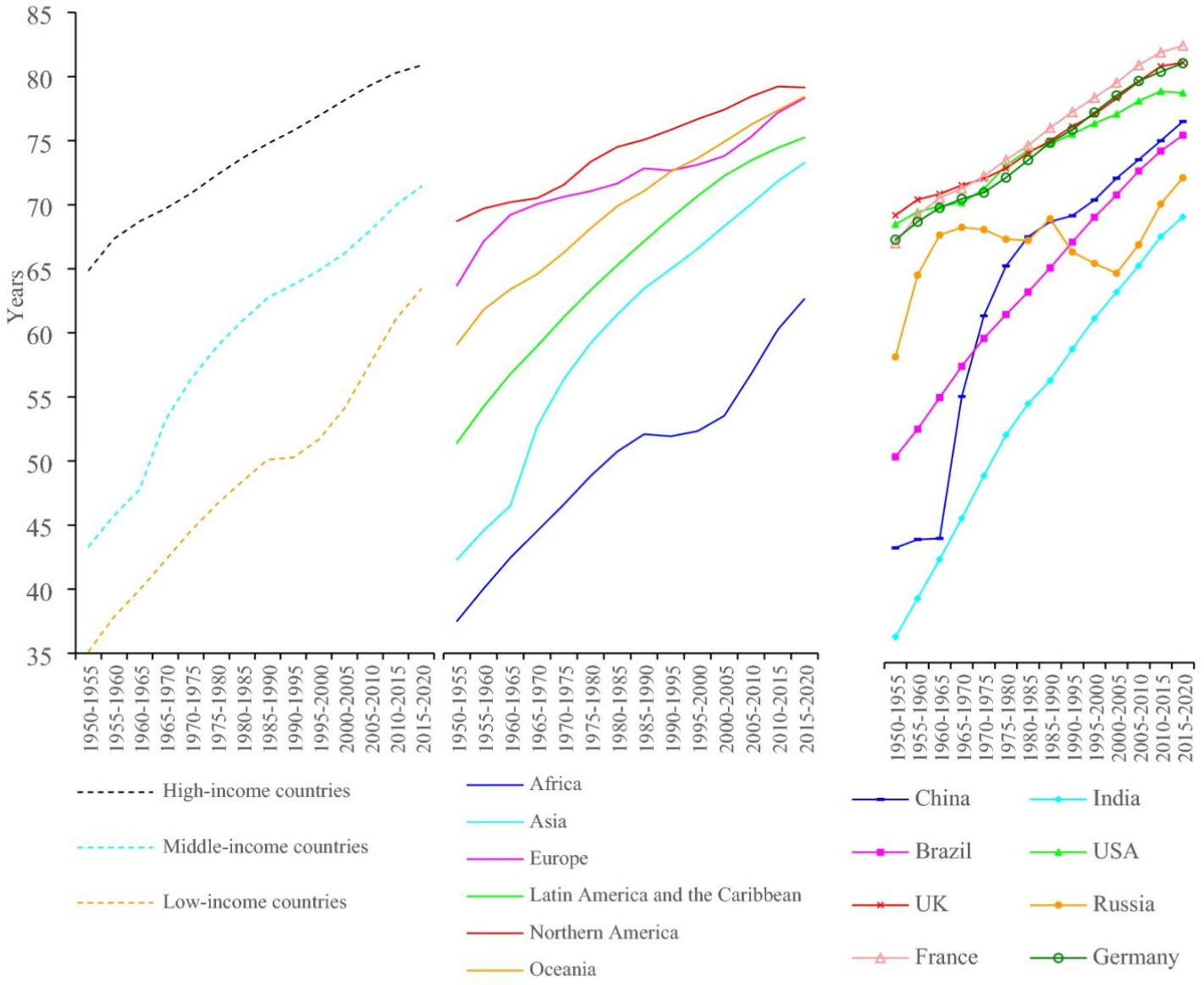
Figure 1

From: The effect of the COVID-19 pandemic on life expectancy in 27 countries



Changes in life expectancy worldwide and in major countries between 1980 and 2020. *Data Source*: World Population Prospects.

Exercise 1: How you graded the figure

Criterium	Median	Mean	Std
Figure-Ground separation	3	3	0.92
Pre-attentive attributes	4	4	1.20
Encoding effectiveness	3	3	1.00
Proximity and similarity	4	4	1.13
Color choice	4	4	1.11
Alignment	4	3	1.53

Exercise 1: Data Science students of HAW Kiel strongly disagree on design choices

Distribution of grades given to six different design criteria of figure 1 in Huang, Zimmermann, Liu et al. (2023)

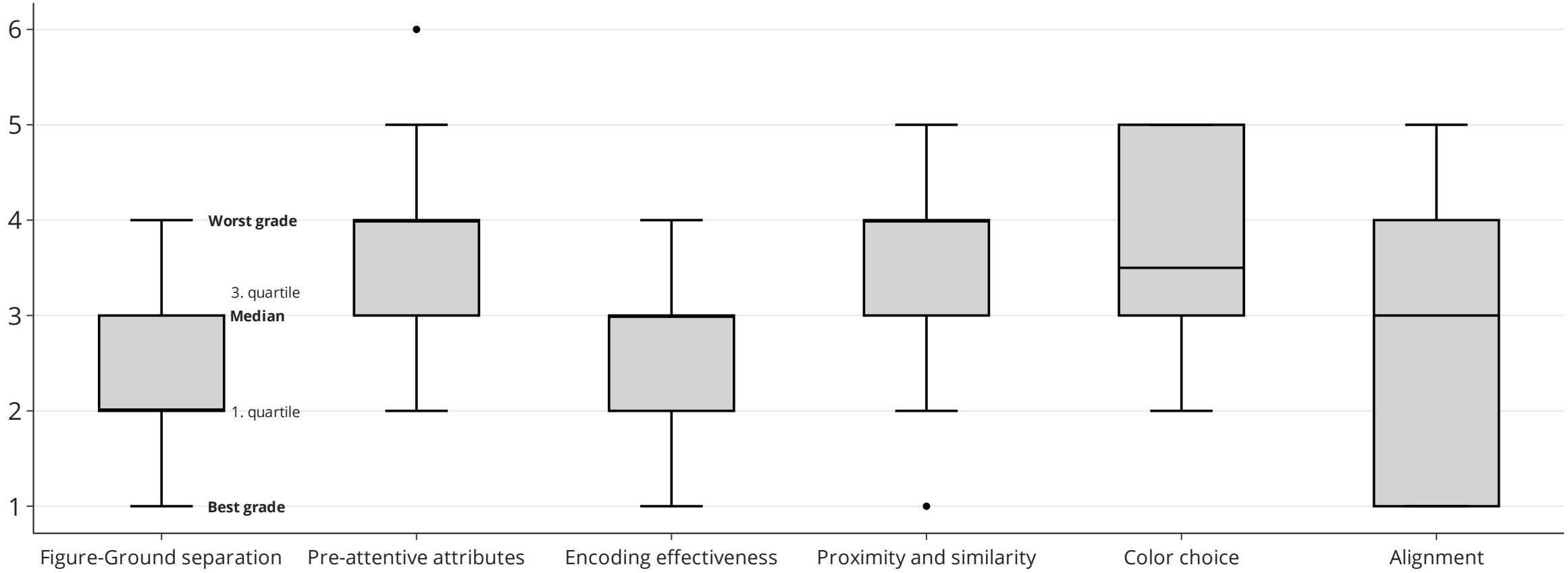


Figure-Ground Separation

Pros:

- Lines are easily visible
- Good contrast with background

Cons:

- Lines are too thin
- Visual occlusion: too much information

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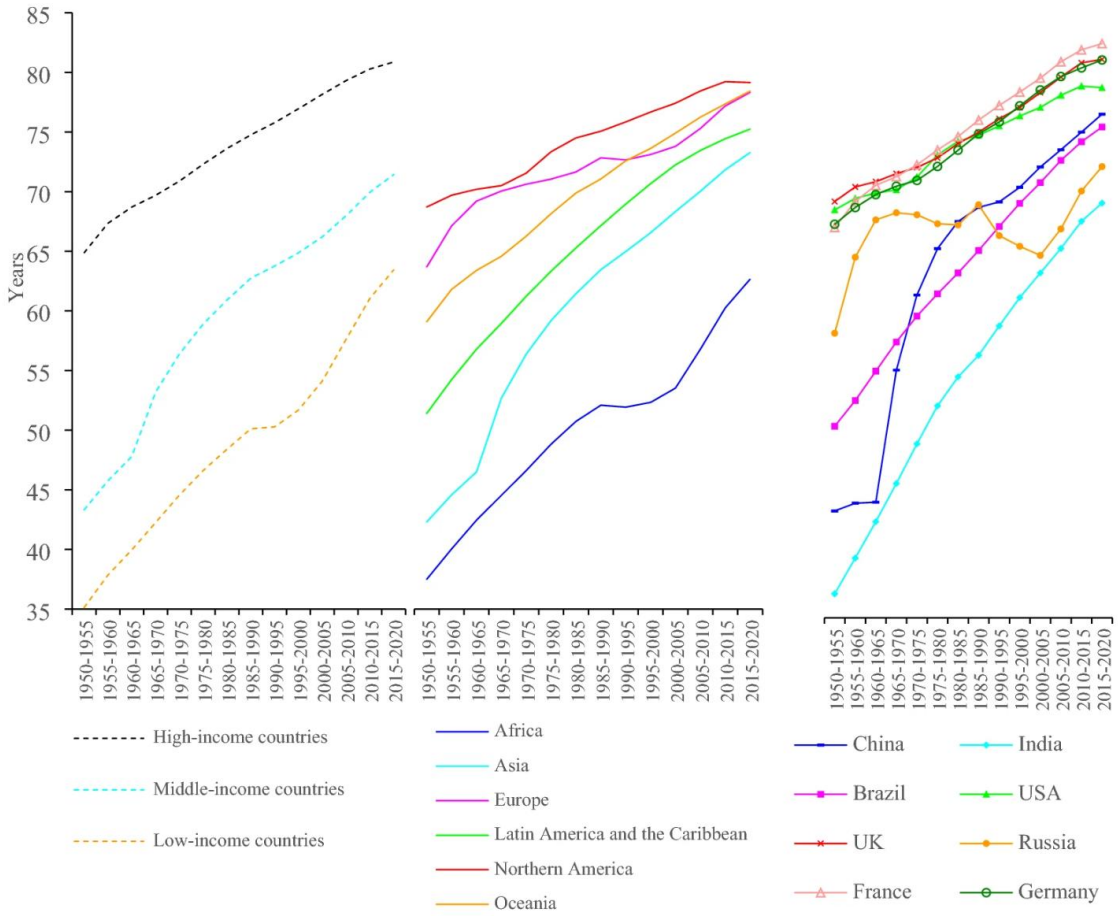

Changes in life expectancy worldwide and in major countries between 1980 and 2020. *Data Source*: World Population Prospects.

Pre-Attentive Attributes

Where is the viewer drawn to, and does that make sense

Pros:

- We immediately see that everything goes up

Cons:

- The viewers are visually drawn to the lines → we see that the lines go up, but the exact message does not become clear
- Too many attributes (color, symbol, line type) → nothing is pre-attentive / nothing stands out → interpretation is not intuitively clear
- Right-most plot stands out

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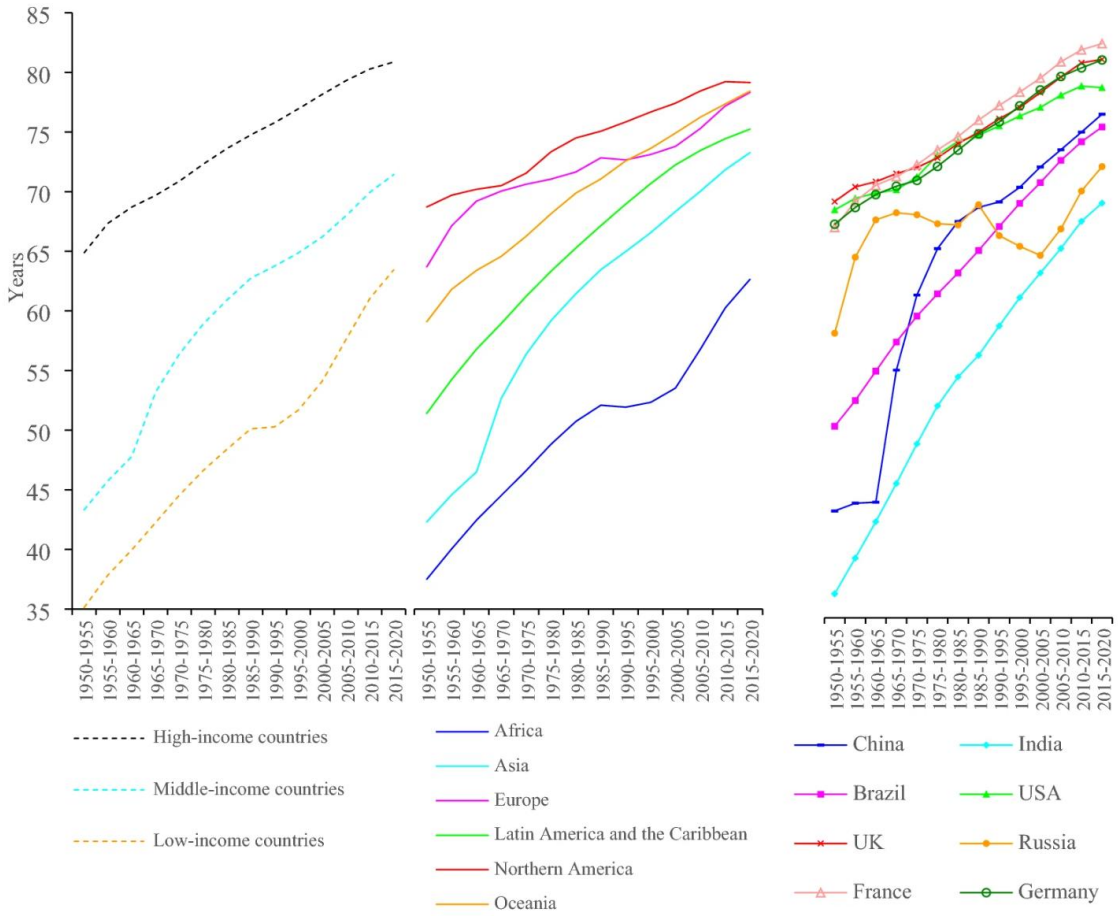

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Encoding Effectiveness

What is the encoding?

How the data is visually shown?

- Time → x
- Life Expectancy → y
- Income-levels → color
- Continent → color
- Countries → color + symbol

Pro:

- Line chart with time on x, LE on y is a good choice

Cons:

- Color and symbol encoding is too much
- Having three different color encodings is too much → causes confusion which legend relates to which subplot

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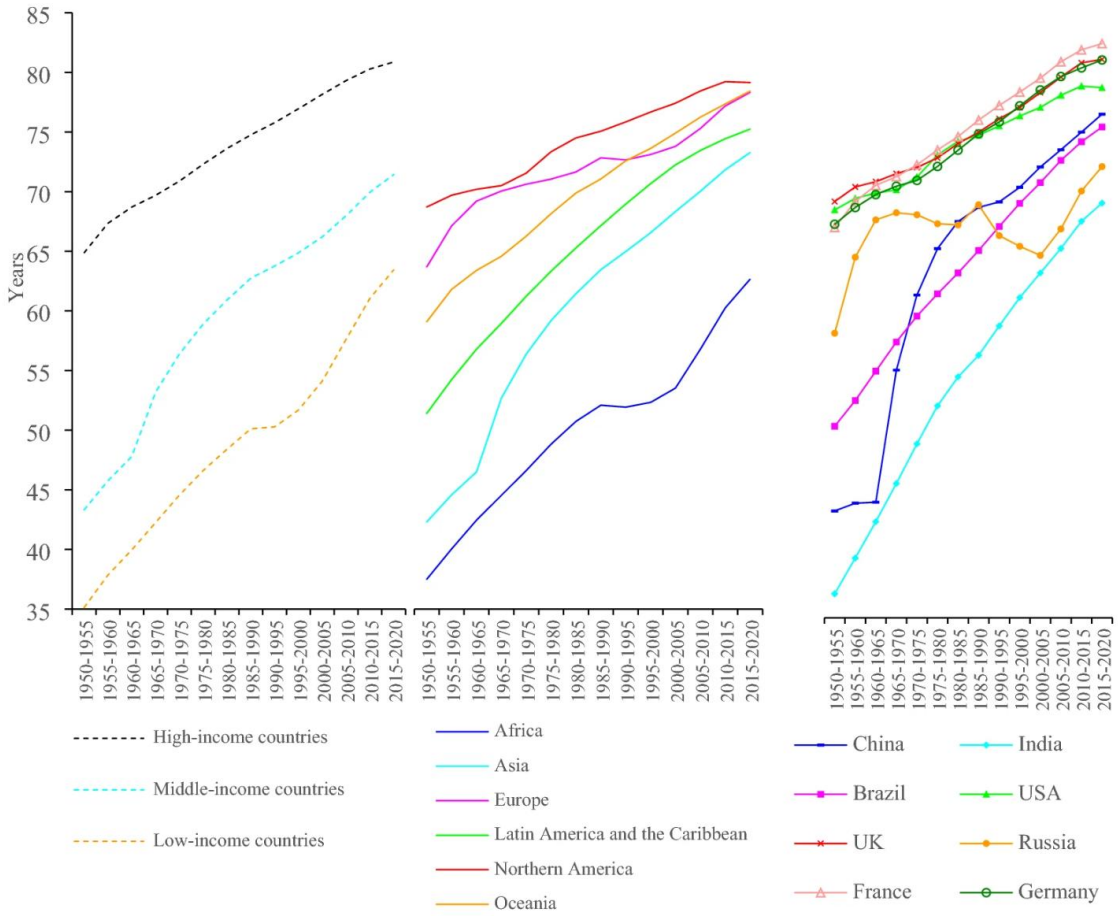

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Proximity

Proximity

Pros:

- Hierarchy from Income-level → Continent → Country all next to each other from left to right

Cons:

- Legends are not close to the lines and in wrong order
- Multiple legends for the three subplots which viewers will confuse with each other

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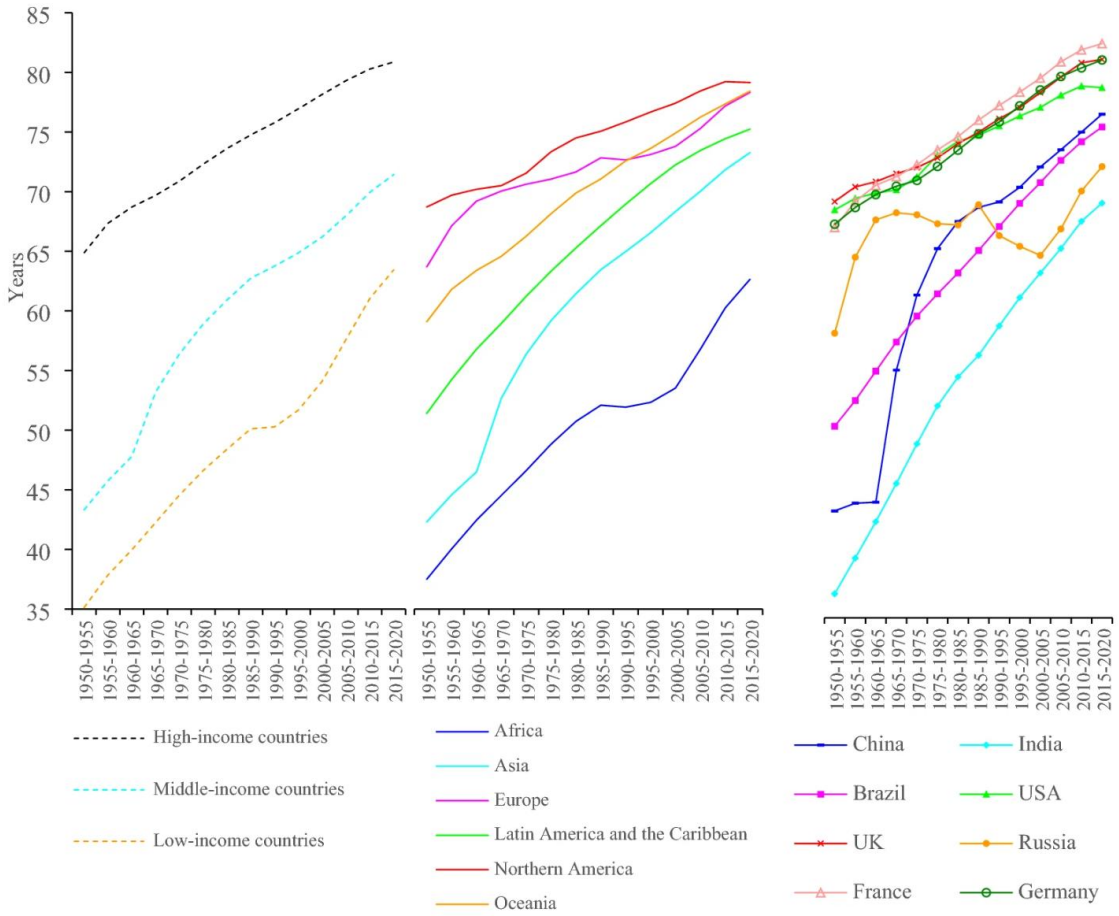

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Similarity

Use the same colors, shapes, sizes to highlight group membership

→ If things have the same color, viewers think that it represents the same entity

Pros:

Cons

- **This principle is violated**
- Light blue means three different things on the the three subplots

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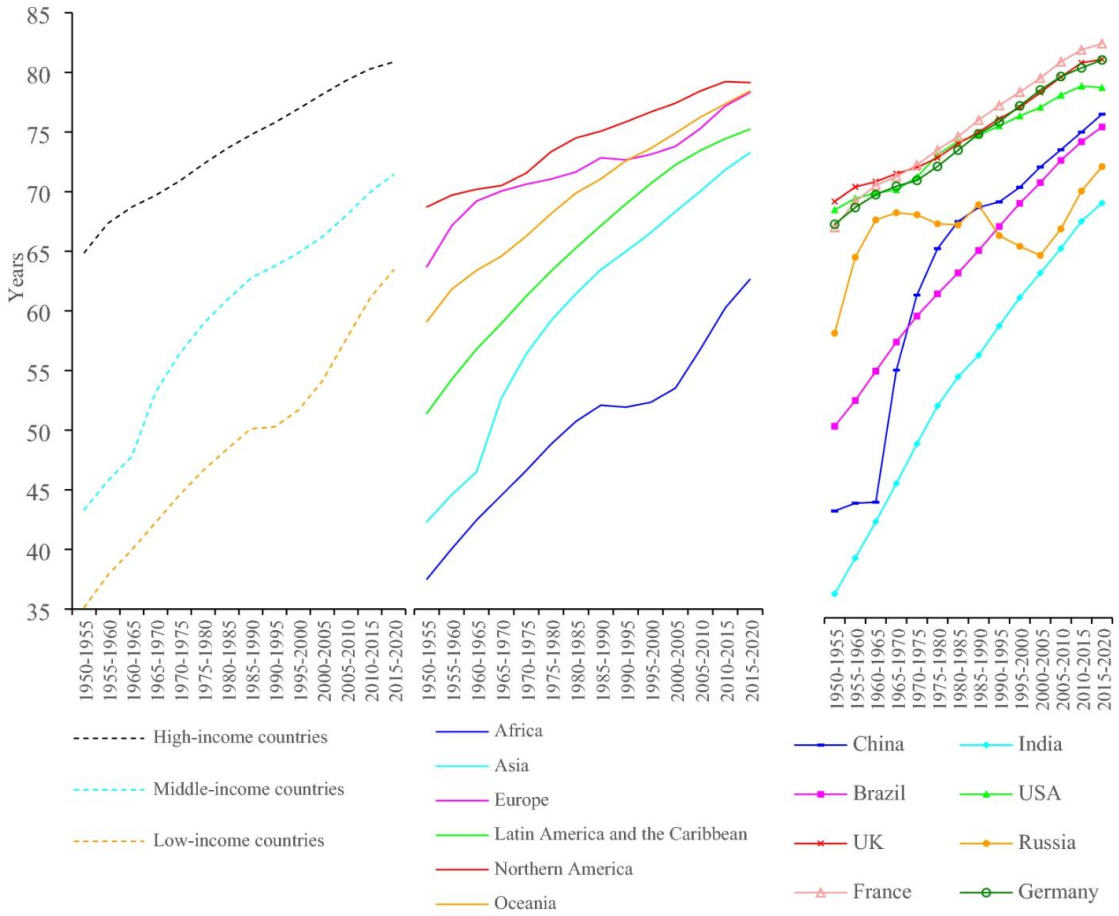

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Color choices

- Color blindness is ok, apart from the green and red line
- Light green and dark green → suggests that it is related (which is not the case)

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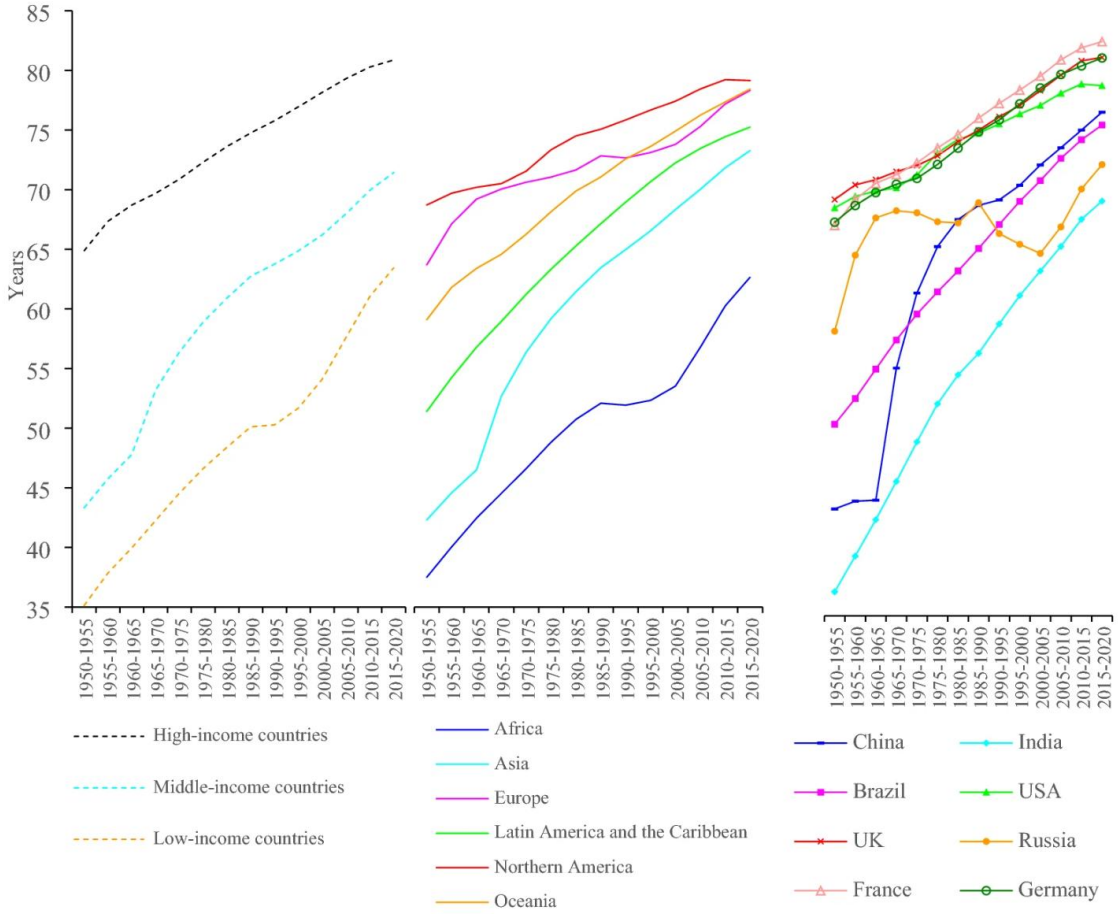

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Alignment

Cons:

- Third subplot: not aligned with first two, and is more compressed; legend is not aligned with subplot
- Placement of legend
- Legend spacing is not aligned
- No space between „Years“ and y-axis labels
- Vertical x-axis labels are perceptually bad

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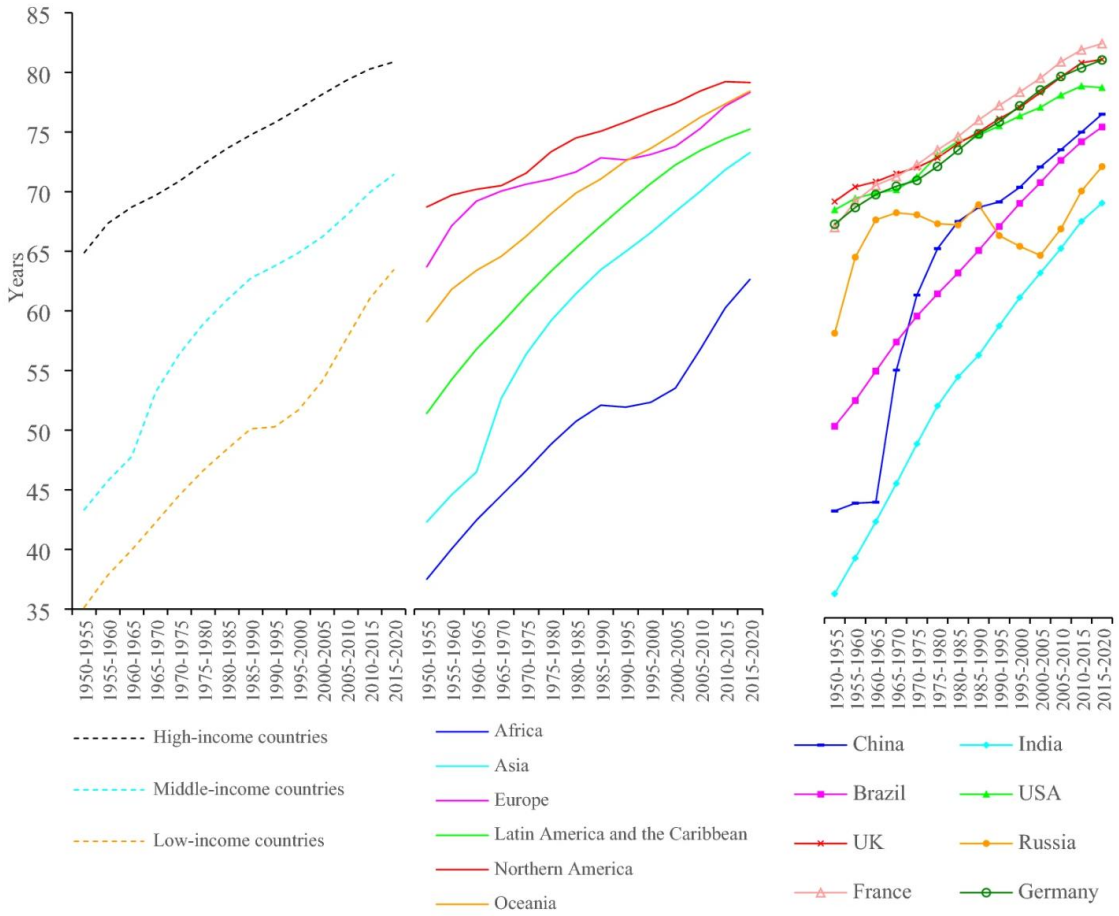

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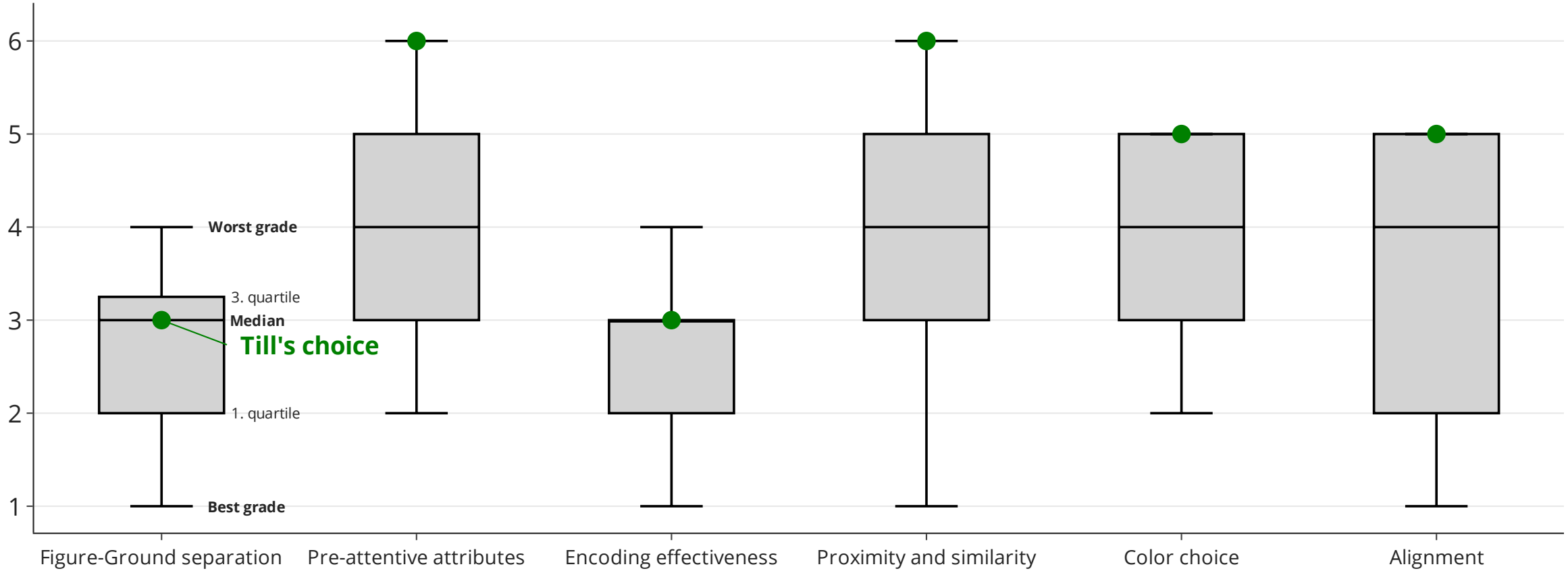
Exercise 1: Data Science students like design much more than their DataViz professor

Distribution of grades given to six different design criteria of Figure 1 in Huang, Zimmermann, Liu et al. (2023)



Additional issues

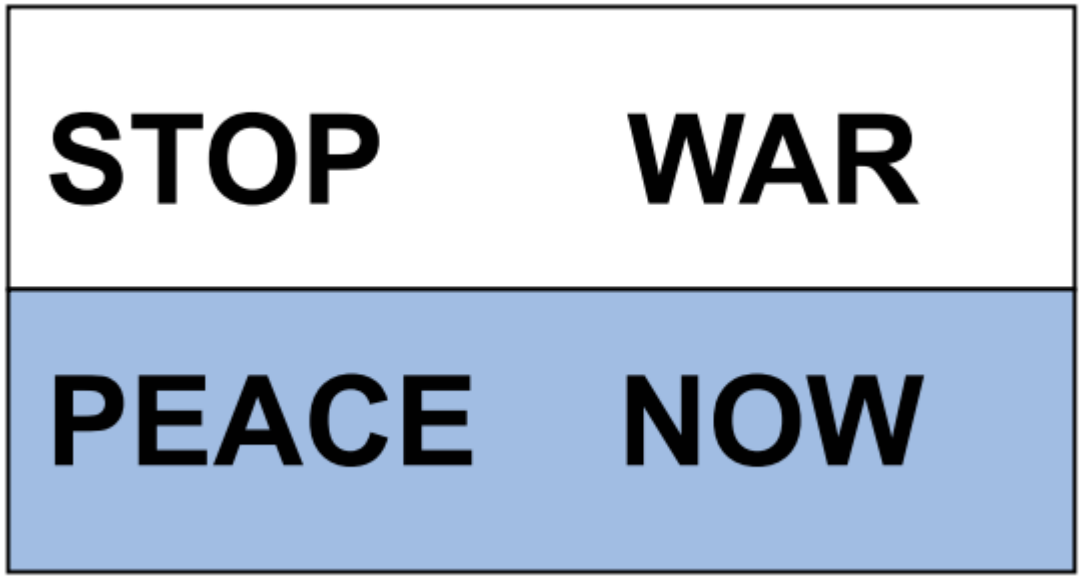
- Subtitle does not fit
- Message not clear
- Emphasize on side-by-side comparison not helpful
- Dense x-axis labeling
- Oversized legend
- Incoherent color scheme
- Information density too high
- Different font sizes for no clear reason
- Subtitle contradicts axis information
- No Titles for subplots

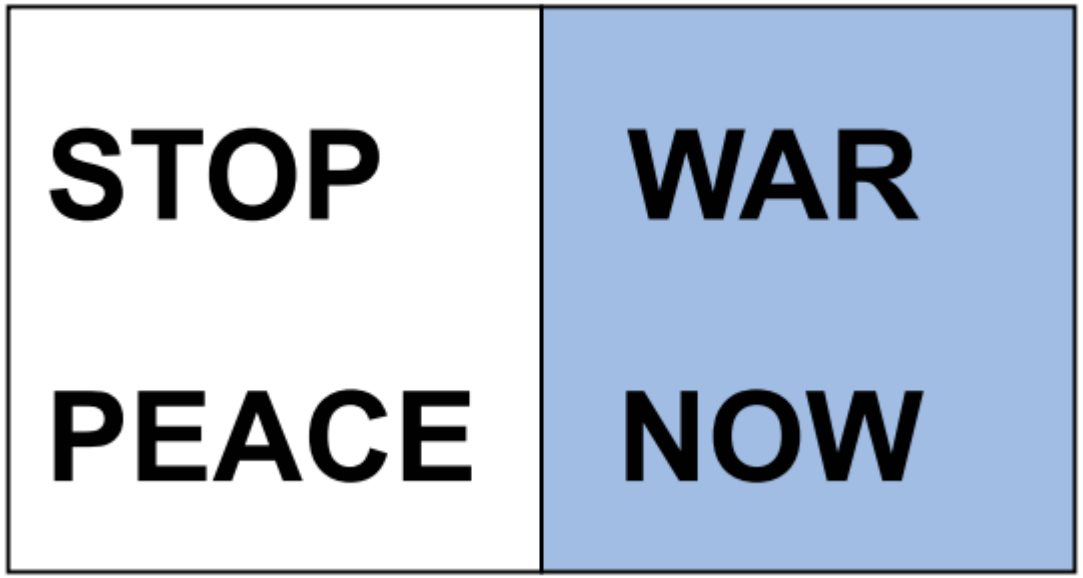
Preattentive feature: saturation

Count the 3s!

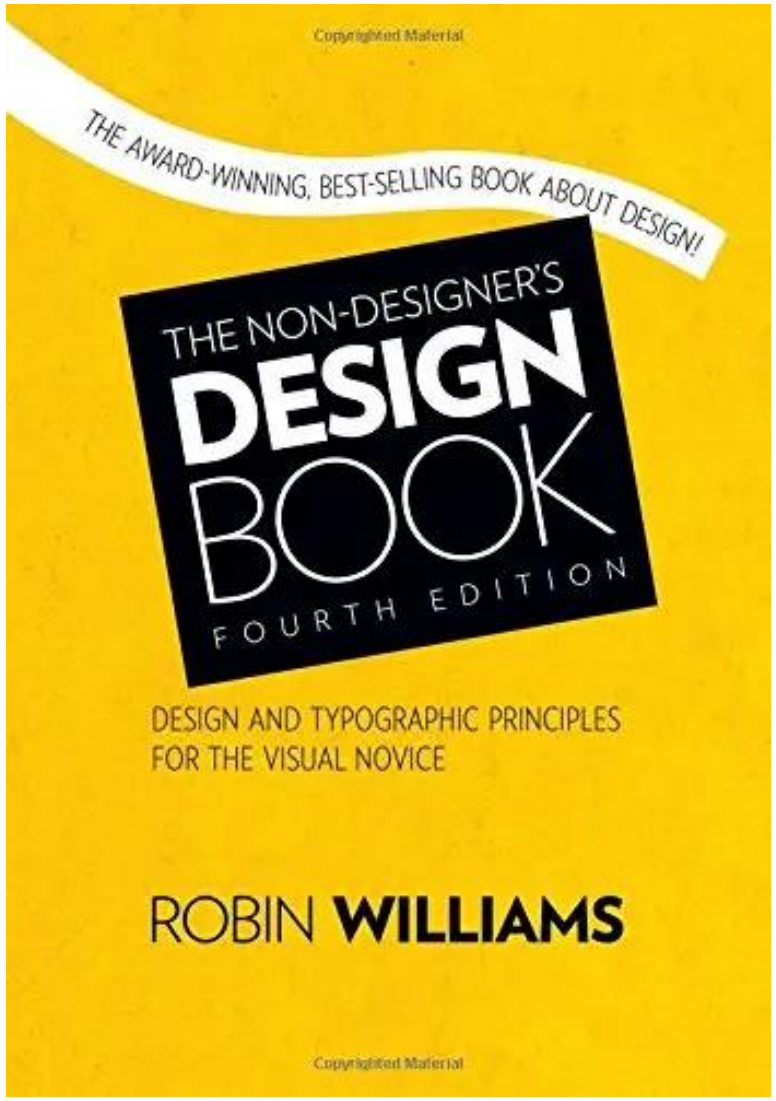
Phase 2: Pattern Perception

- Occurs after basic feature detection
- Also, takes little time
- Basic features are grouped into patterns: clusters, shapes, figure-ground distinction
- We perceive structure, but don‘t yet interpret meaning





CRAP Design Principles



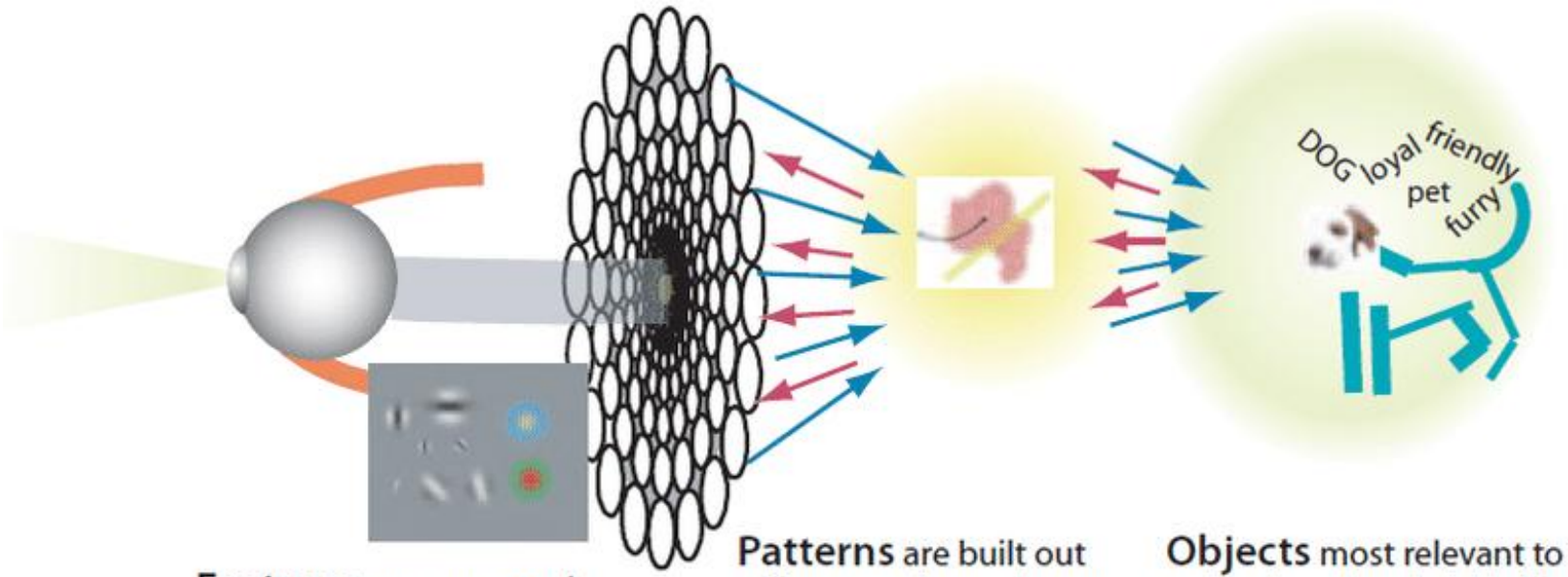
Contrast: avoid elements that are merely similar. If the elements (type, color, size, line thickness, shape, space, etc.) are not the same, then make them very different.

Repeat visual elements (colors, shapes, line thicknesses, fonts, sizes, etc.) throughout the piece

Align: Nothing should be placed on the page arbitrarily. Every element should have some visual connection with other elements.

Proximity: When several items are in close proximity to each other, they become one visual unit rather than several separate units.

How our brain processes visual information



Features are processed in parallel from every part of the visual field. Millions of features are processed simultaneously.

Patterns are built out of features depending on attentional demands. Attentional tuning reinforces those most relevant.

Objects most relevant to the task at hand are held in Visual Working Memory. Only between one and three are held at any instant. Objects have both non-visual and visual attributes.

1. Preattentive processing **2. Pattern Perception** **3. Cognitive Processing**

Bottom-up

Top-down