

[http://huppenkothen.org/
data-visualization-tutorial/](http://huppenkothen.org/data-visualization-tutorial/)



Data Visualization

Daniela Huppenkothen

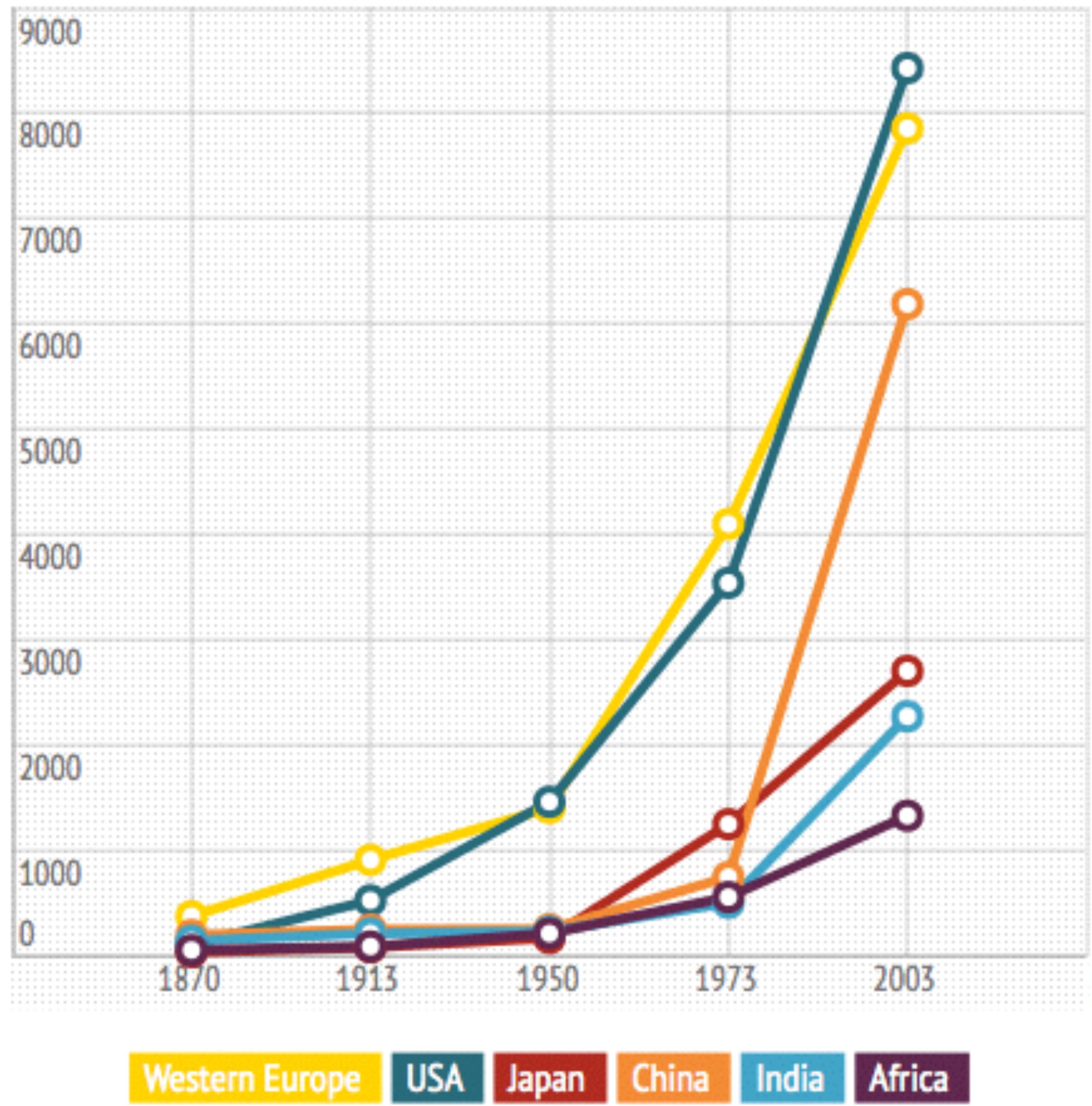
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1. Introduction
2. Exercise: Co-creating best practices
3. Accessibility in Data Visualization
4. Pre-Attentive Processing
5. Gestalt Principles
6. Data Visualization + Society
7. Exercise: Wireframing

Data visualization lets you see
things that would otherwise go
unnoticed.

	A	B	C	D	E	F
1	Past GDP	1870	1913	1950	1973	2003
2	Western Europe	367	902	1396	4096	7857
3	USA	98	517	1455	3536	8430
4	Japan	25	71	160	1242	2699
5	China	189	241	244	739	6187
6	India	134	204	222	494	2267
7	Africa	45	79	203	549	1322



“By visualizing information, we turn it into a landscape that you can explore with your eyes. A sort of information map. And when you’re lost in information, an information map is kind of useful.”

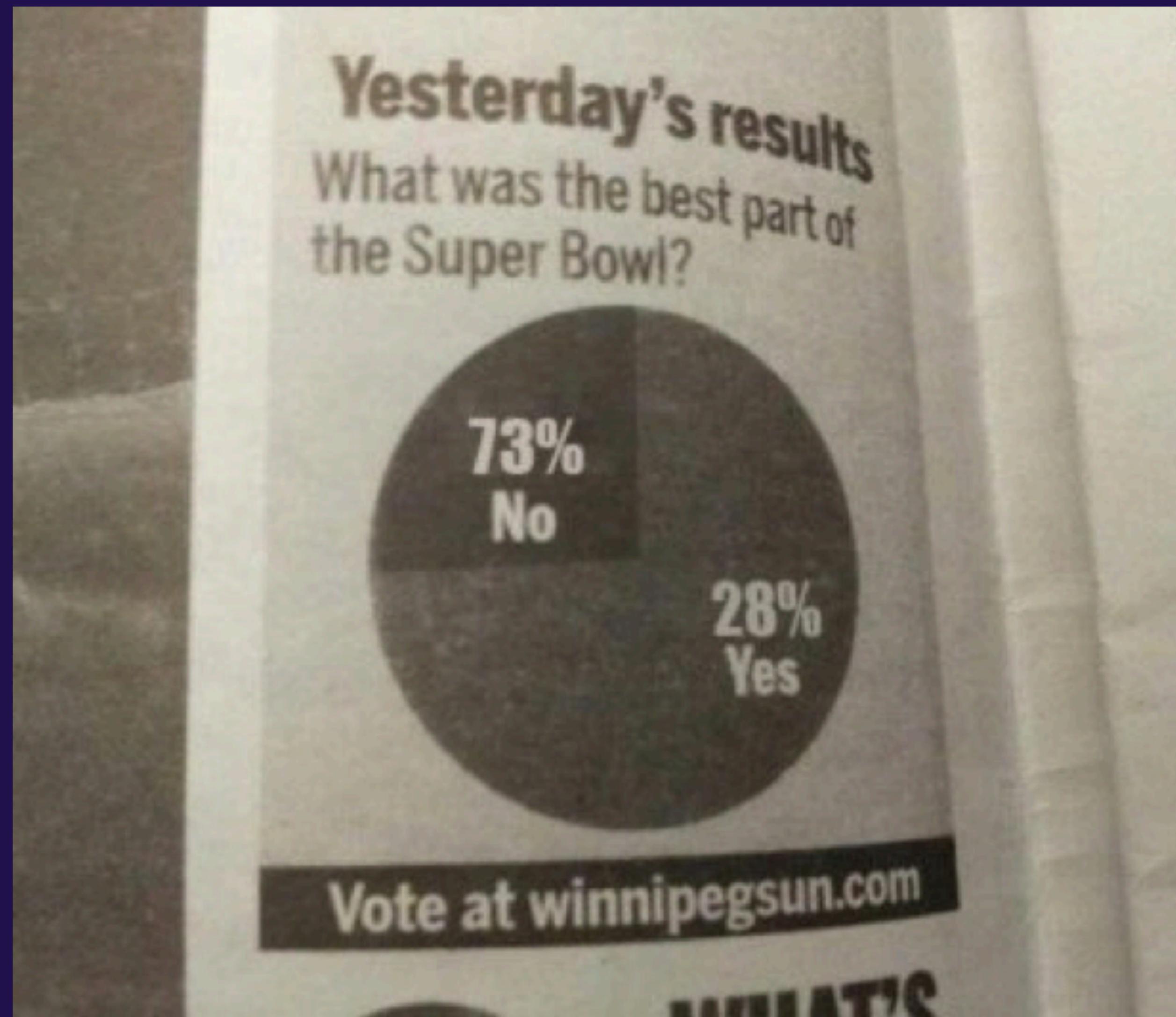
– David McCandless

Open Street Maps



Think of visualization as a new
set of **languages** you can use to
communicate

How **not** to do visualization ...



What makes a data visualization
effective at communicating
information?

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Exercise:

1. What do you think is the **main point** or piece of information this visualization is trying to convey?

2. What **elements** of the visualization help you understand the information that is being conveyed?

3. What **elements** would you **change** or **improve** in order to make the meaning clearer?

<http://huppenkothen.org/data-visualization-tutorial/02-bestpractices/index.html>

Structure

1. 5 minutes: by yourself
2. 10 minutes: find a partner + discuss your answers
3. 10 minutes: find another team of 2 and collect best practices:
<https://etherpad.wikimedia.org/p/ata-dataviz-exercise1>
4. 10 minutes: share with the group

<http://huppenkothen.org/data-visualization-tutorial/02-bestpractices/index.html>

Reminders

1. Share space and time!
2. Listen to one another!
3. Encourage one another!
4. Use positive and inclusive language!

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Exercise:

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Accessibility (n):
the quality of being
easily understood
or appreciated

Individuals

- with low Vision
 - with colour Blindness
 - with screen readers
 - on the autistic spectrum
 - with anxiety
 - with dyslexia
 - ...
-

Accessibility (n):
the quality of being
easily understood
or appreciated



<https://ukhomeoffice.github.io/accessibility-posters/>

Captions and Alt-Text

Markdown

```
![Bar graph of quantity Y for each of the categories A, B and C.](./fig/mybarchart.png)
```

Captions and Alt-Text

Markdown

```
![Bar graph of quantity Y for each of the categories A, B and C.](../fig/mybarchart.png)
```

HTML

```

```

Captions and Alt-Text

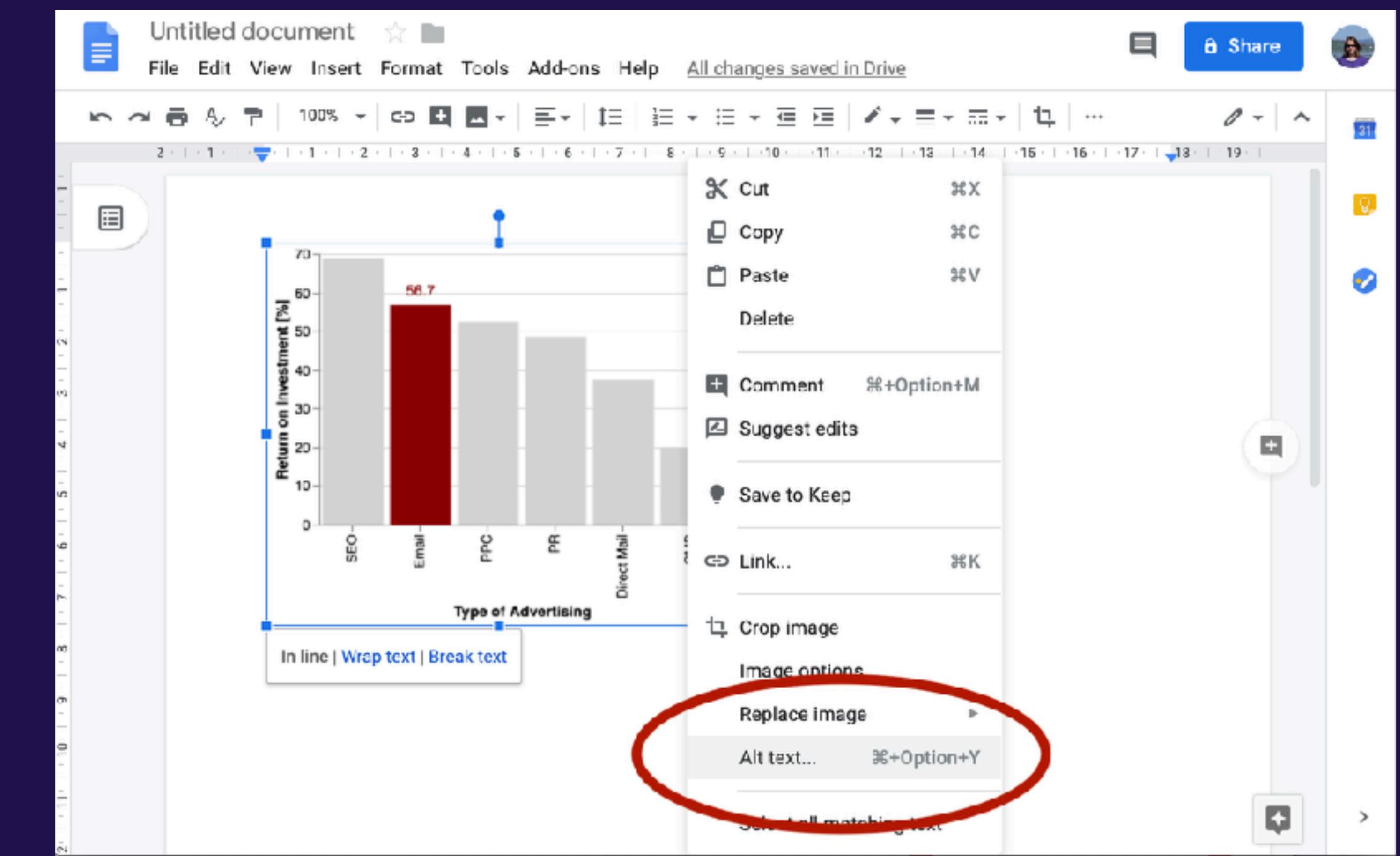
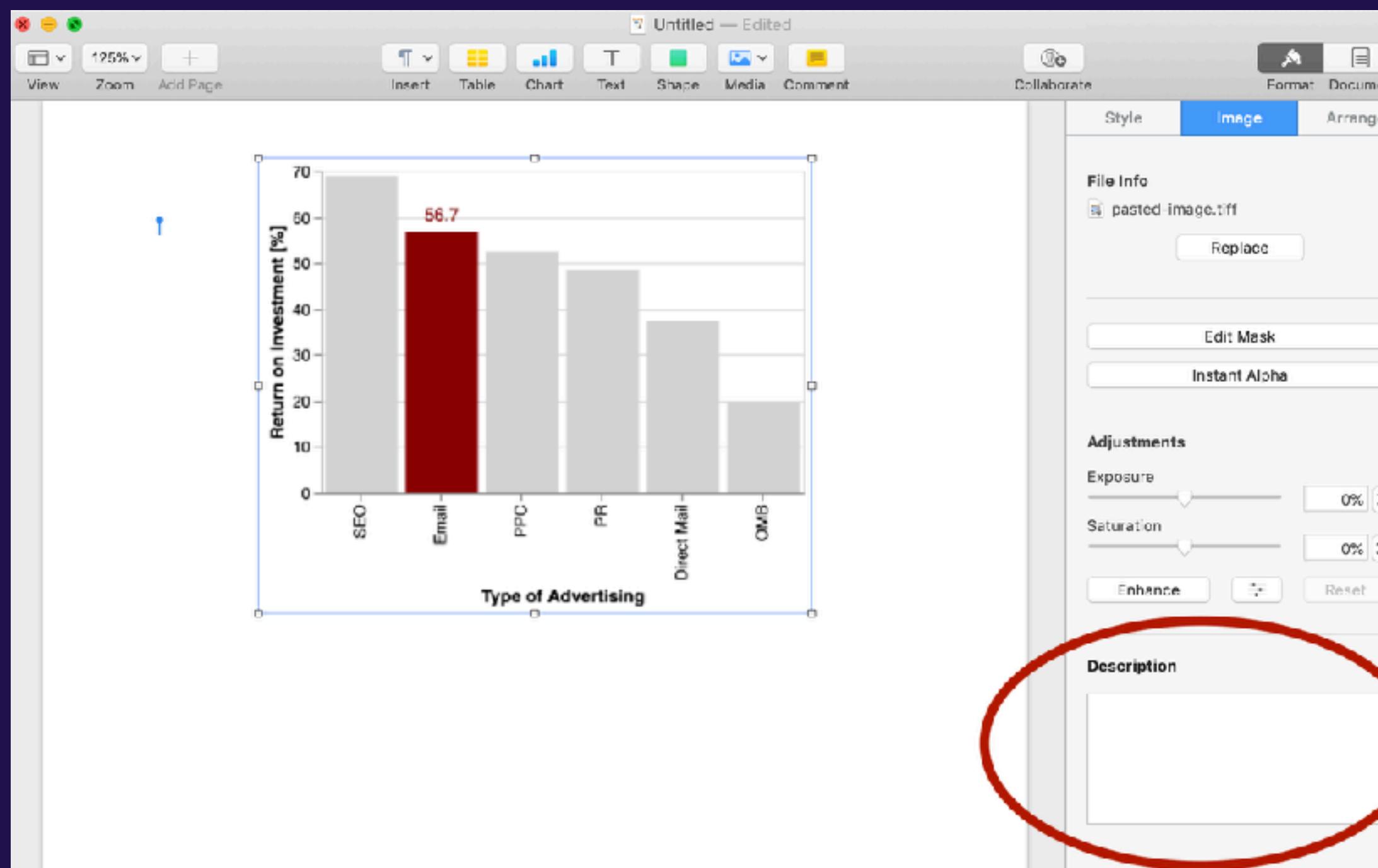
Markdown

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HTML

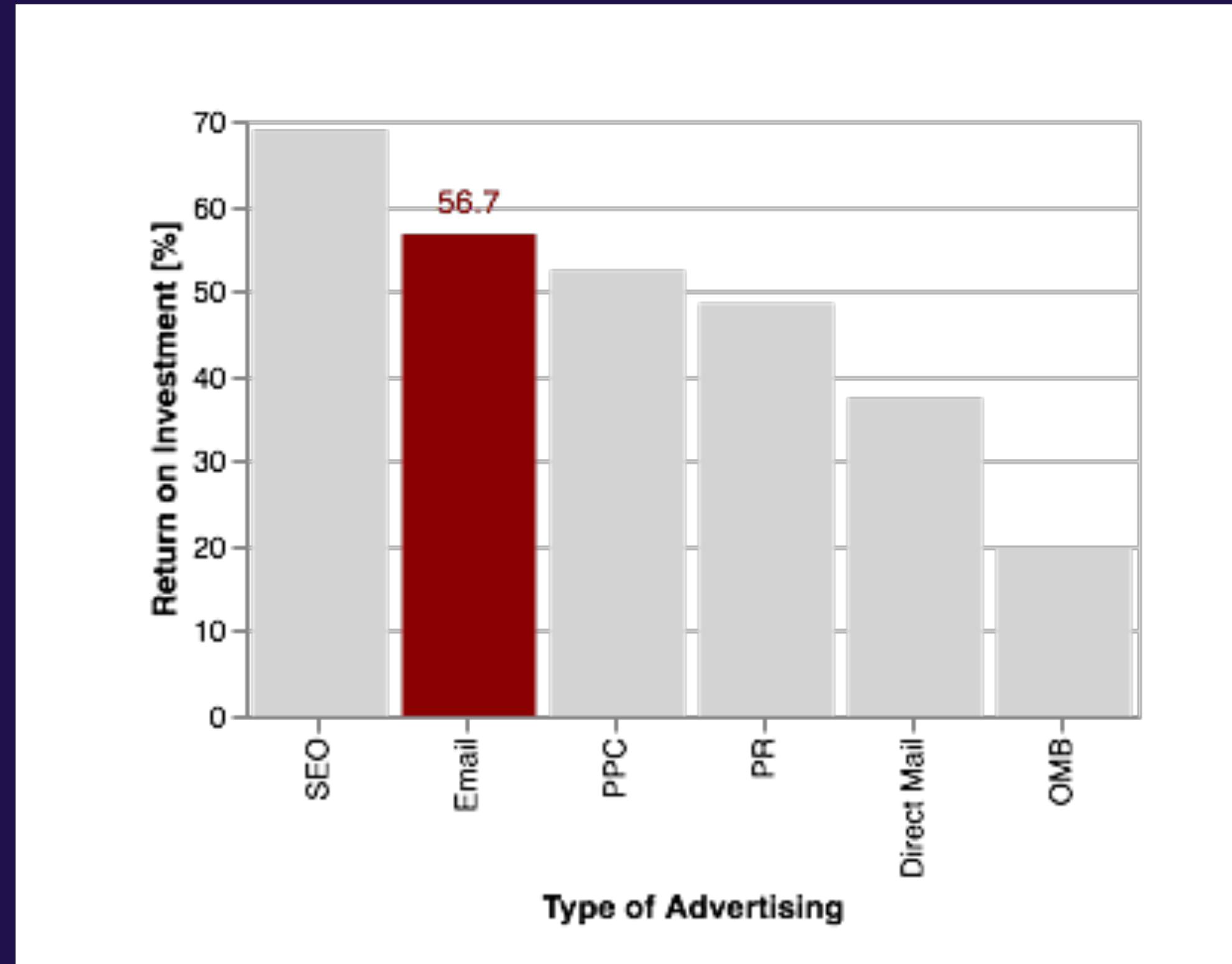
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Write Descriptive Figure Caption

- describe what's **shown** in the figure
- describe the **main point** to take away from it



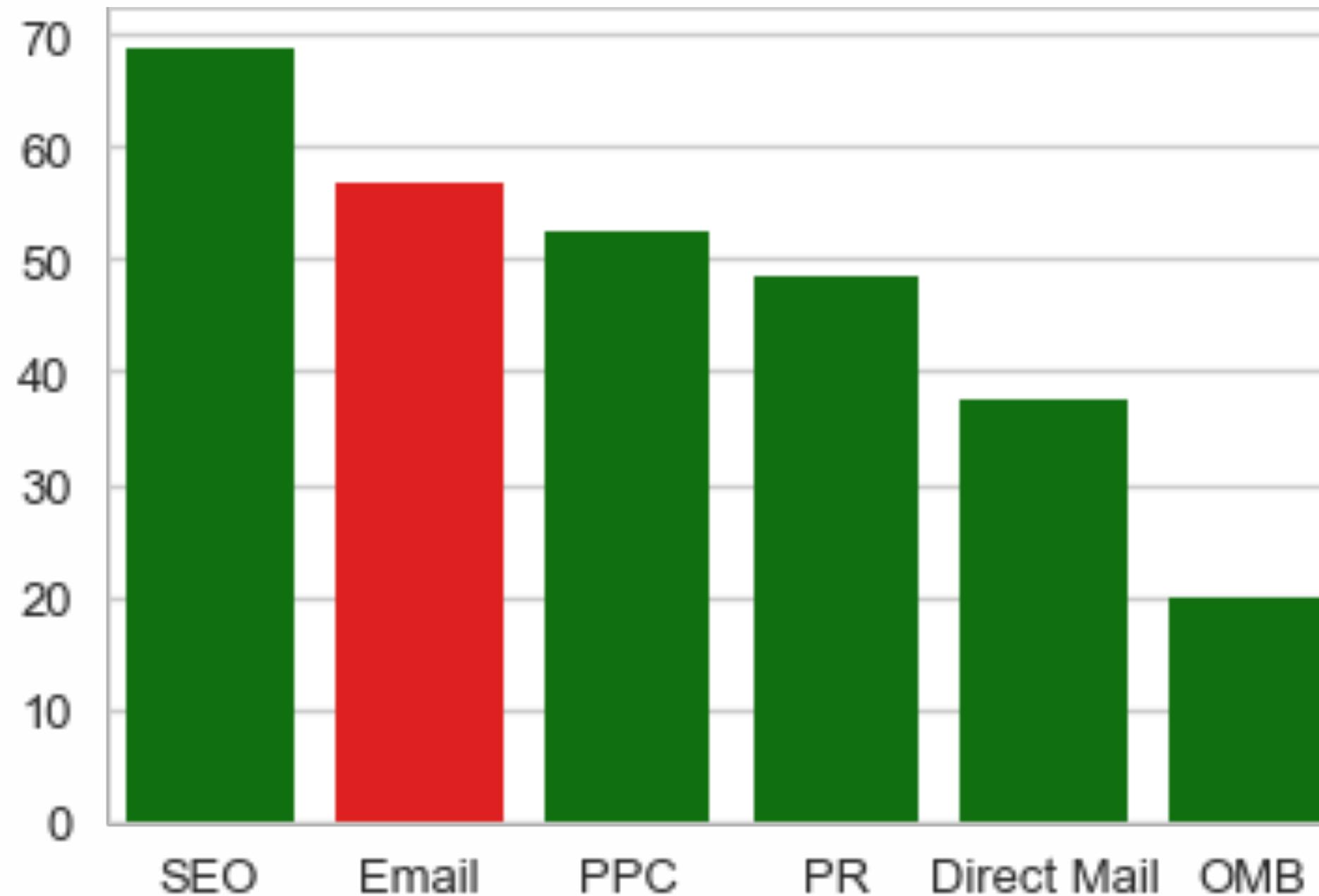
"In this figure, we show the Return of Investment in percent as a function of the type of advertisement for SEO, E-mail, PPC, PR, Direct Mail and OMB. Our results show that E-mail is the second-most effective advertising tool behind SEO, with a 56.7% ROI."

Contrast

<https://webaim.org/resources/contrastchecker/>

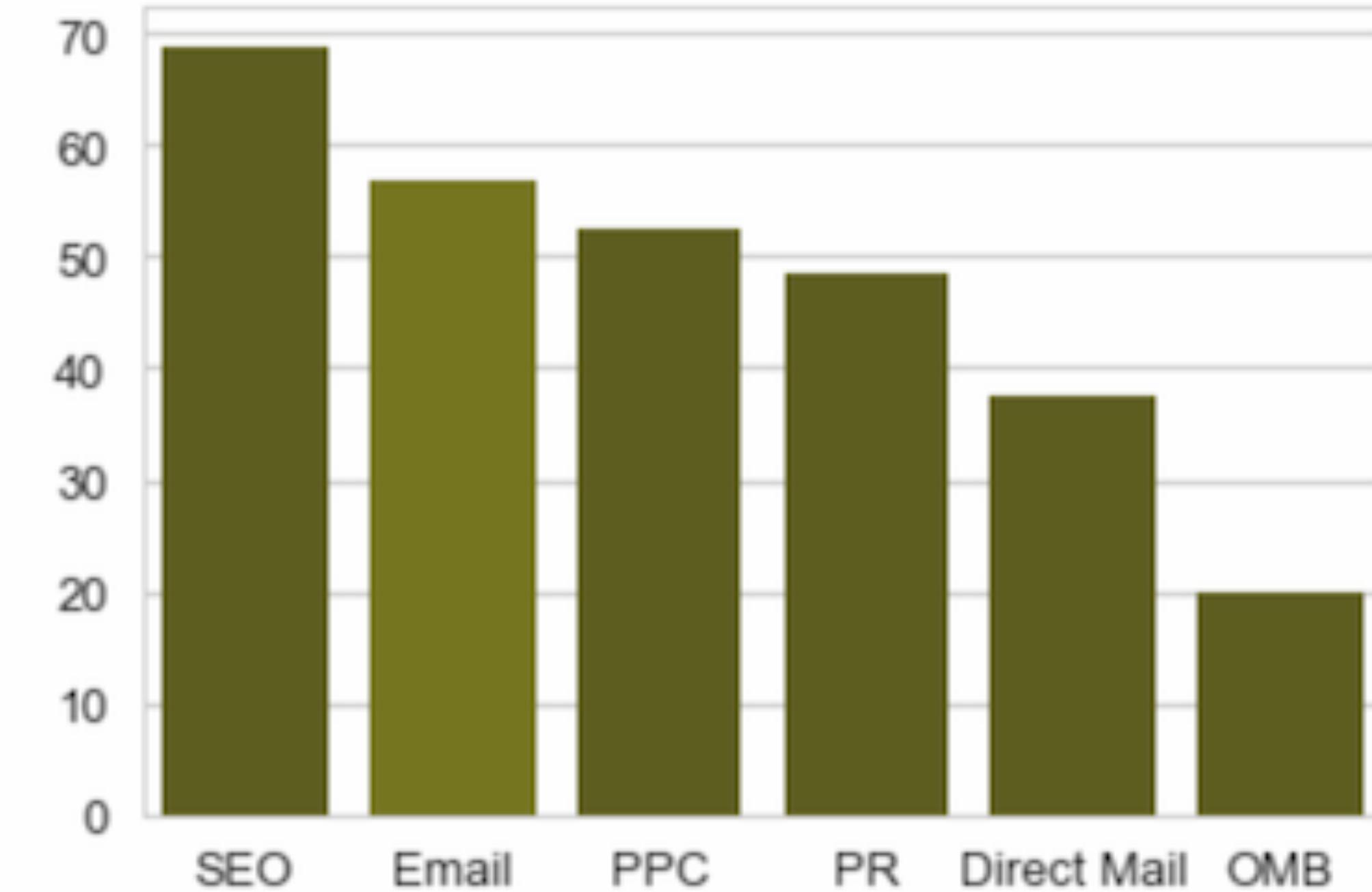
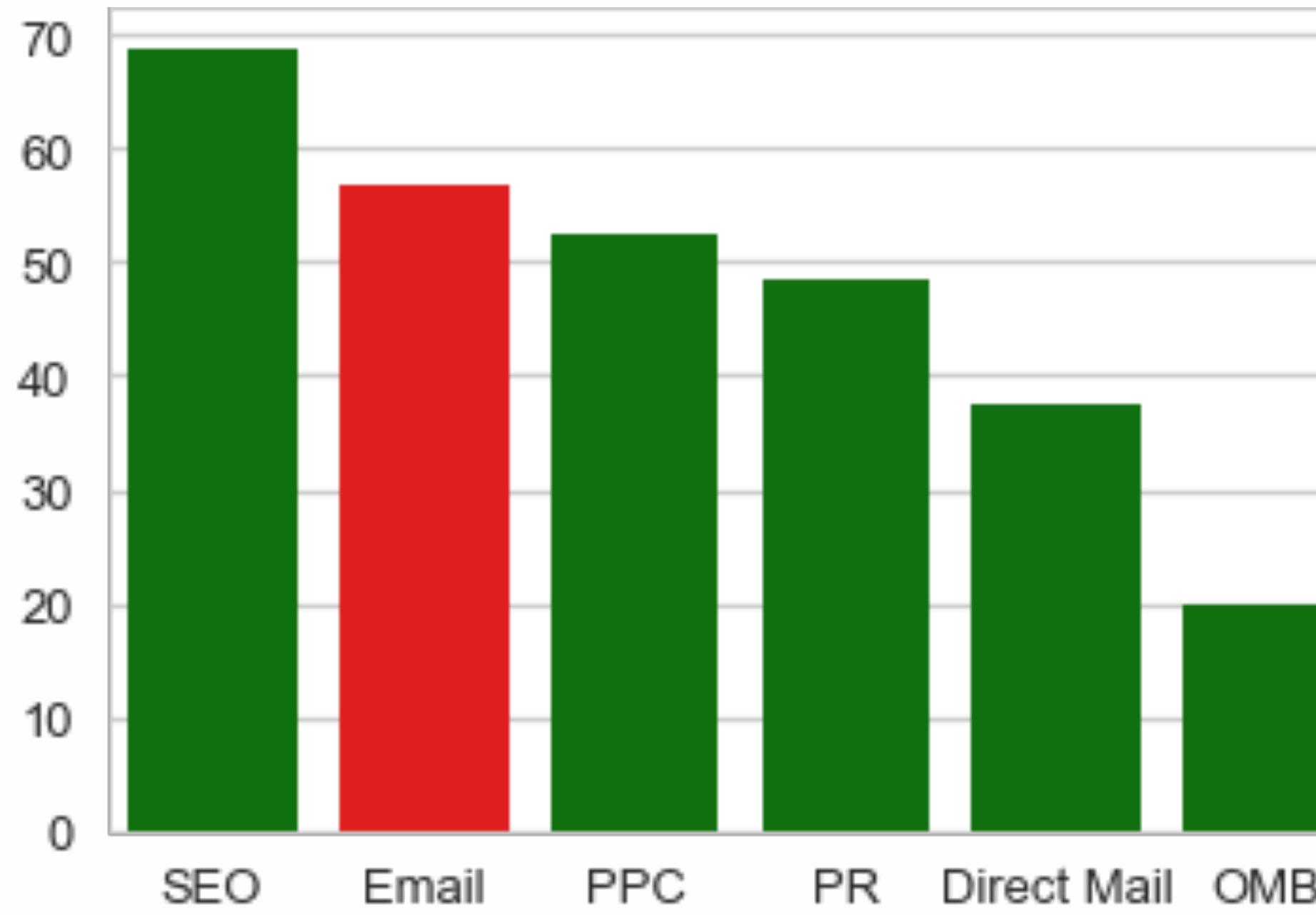
Colour Blindness

Can you spot the bar that has a different colour?



Colour Blindness

Can you spot the bar that has a different colour?





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Visualization is about managing
the viewer's attention*.

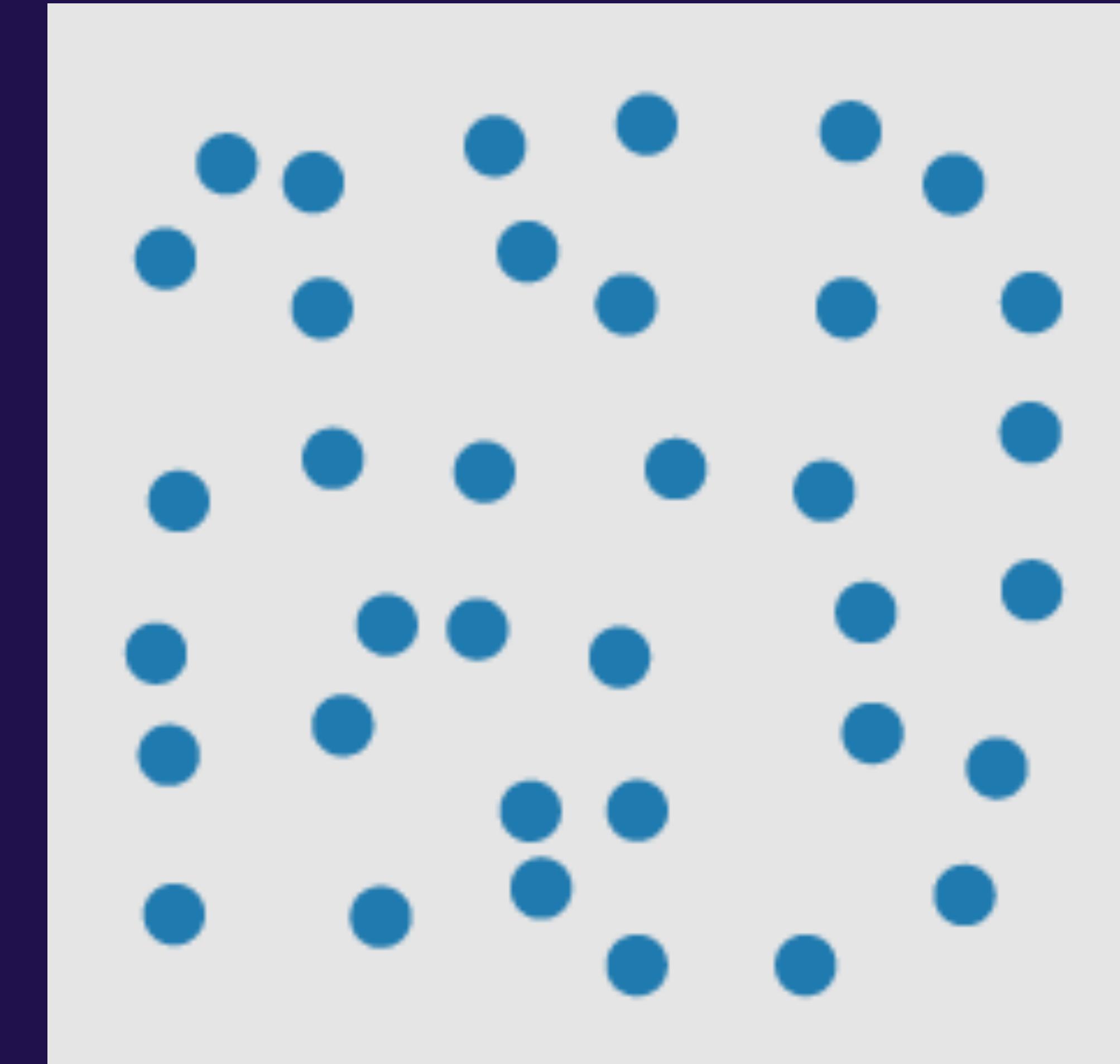
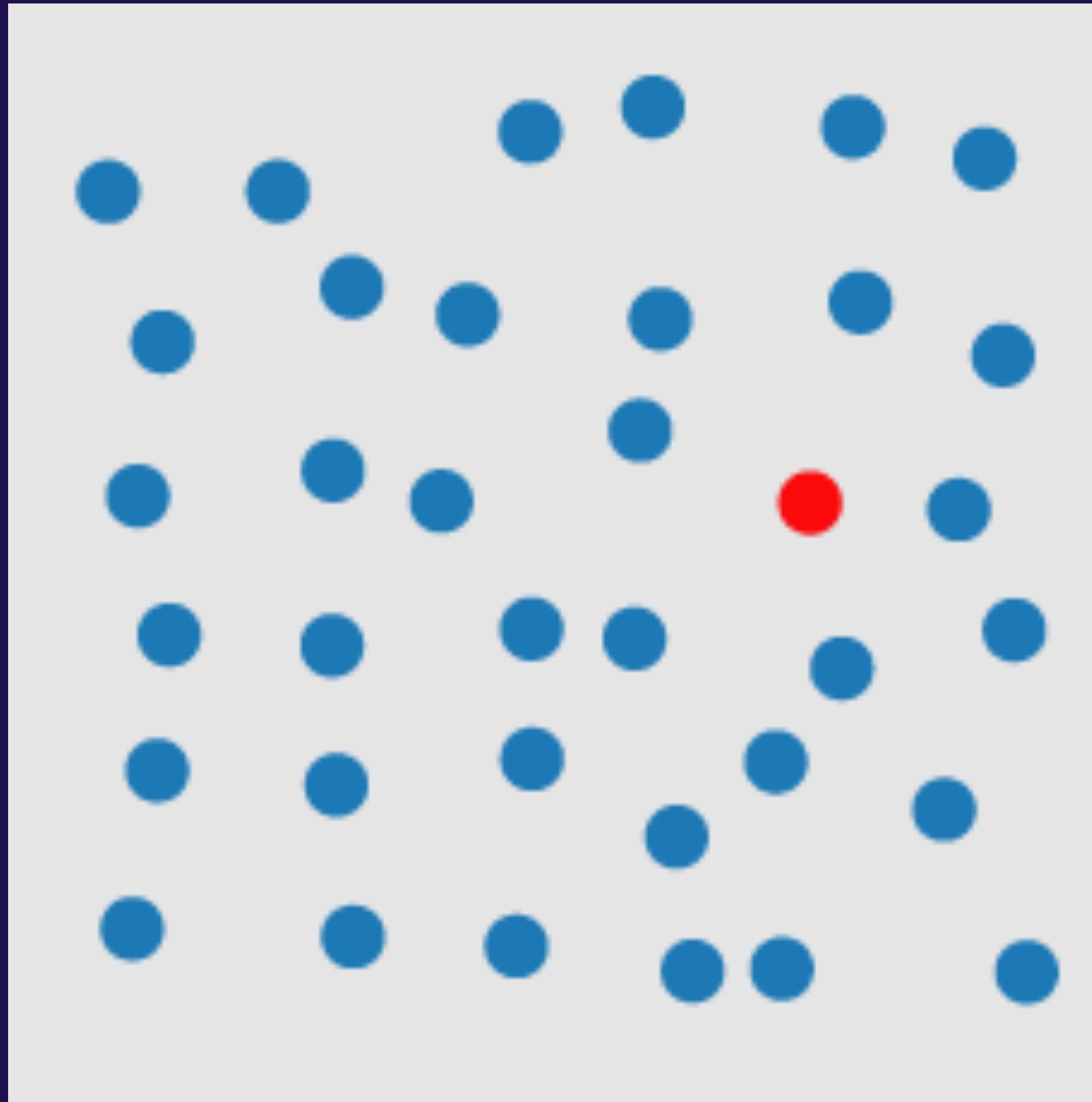
*Side note: research tells us that there is no vision without attention

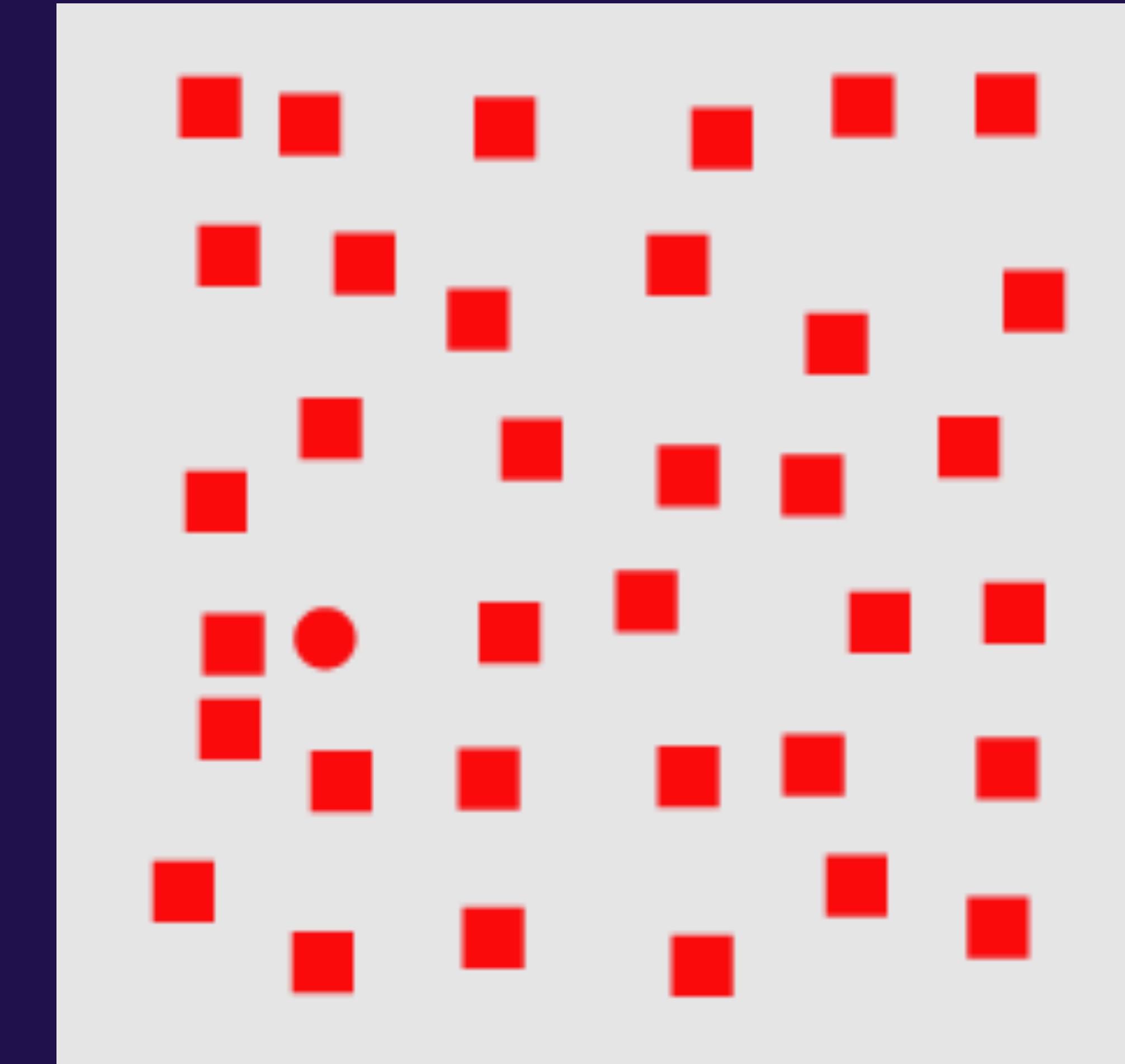
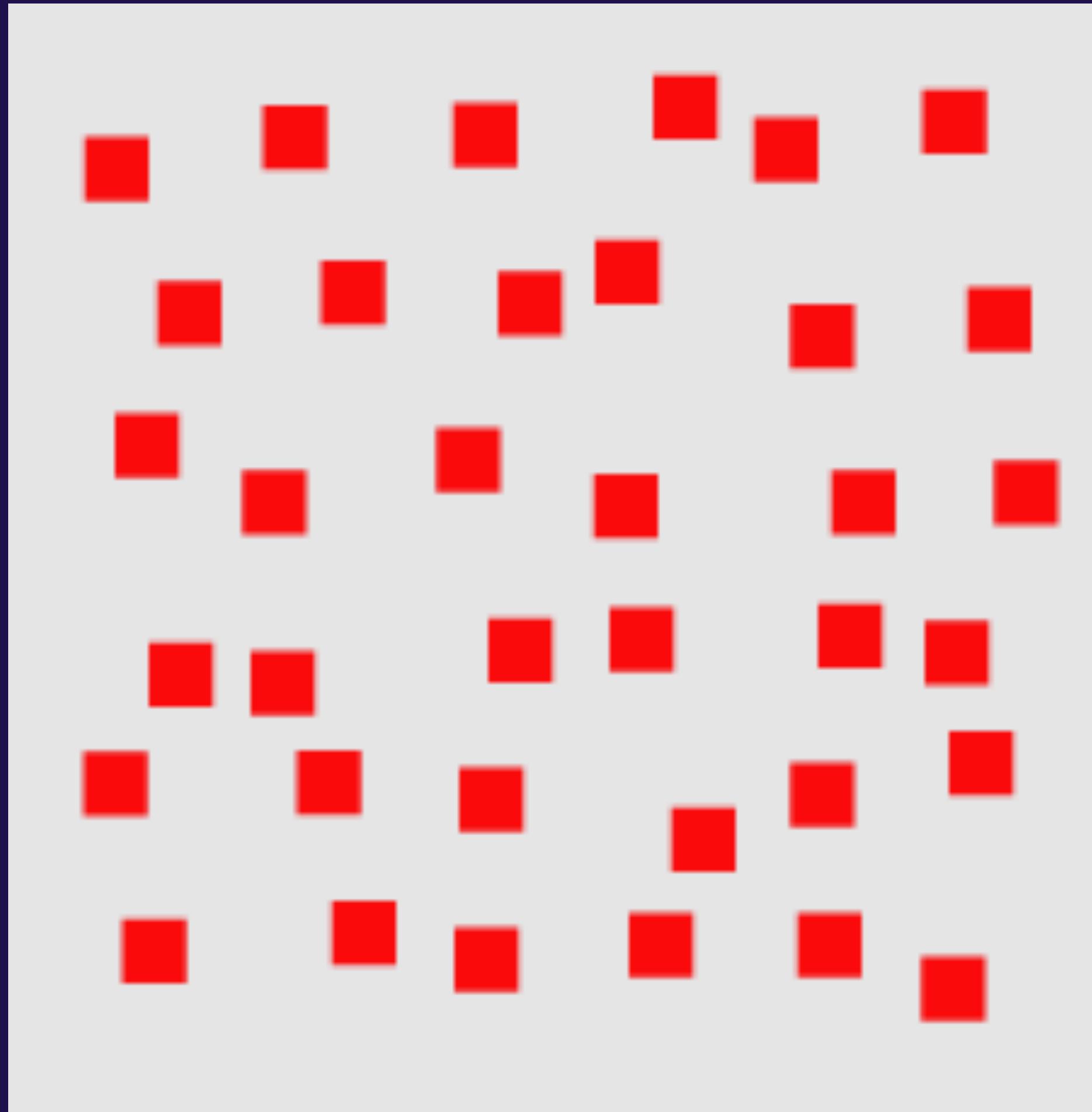


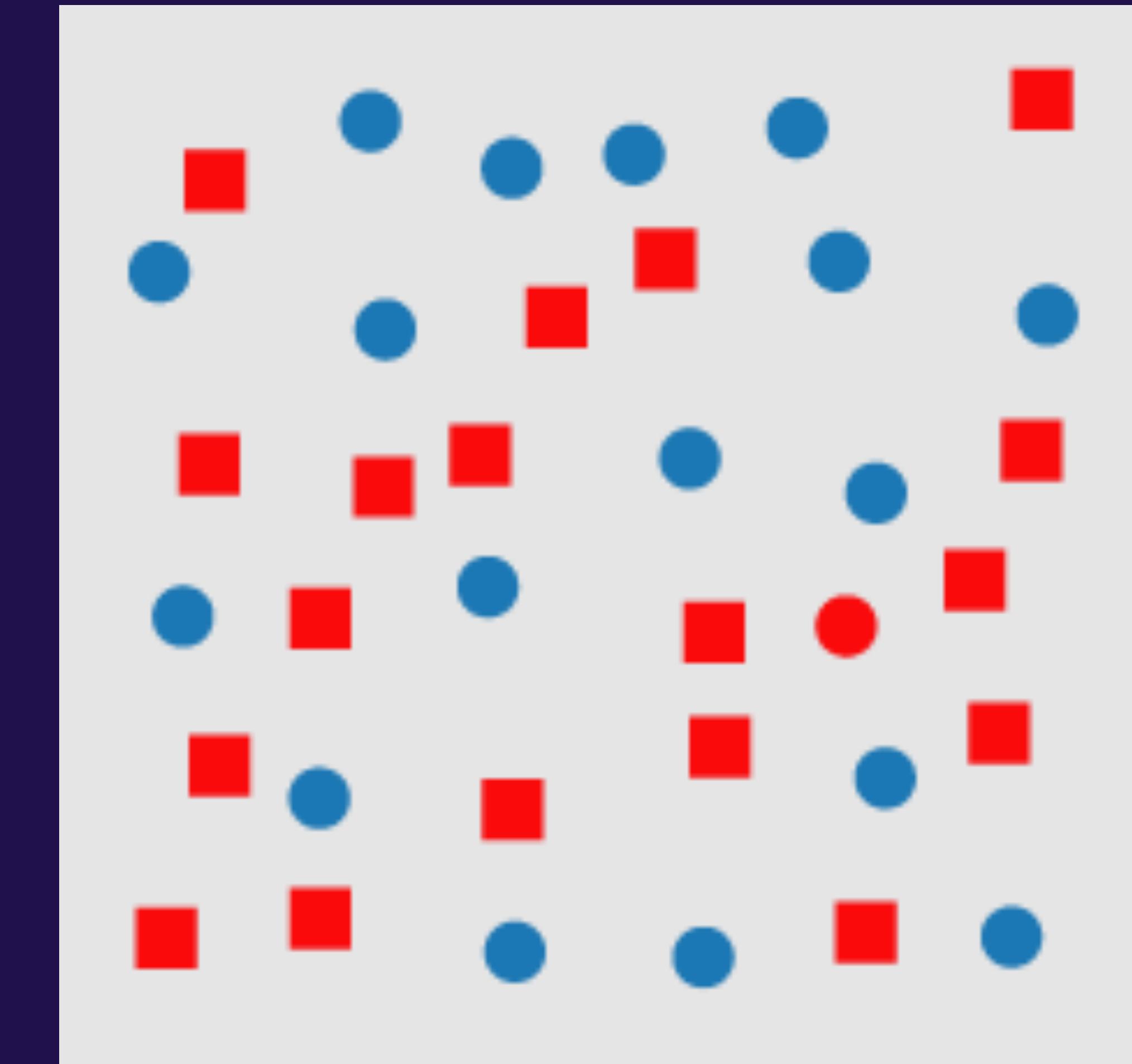
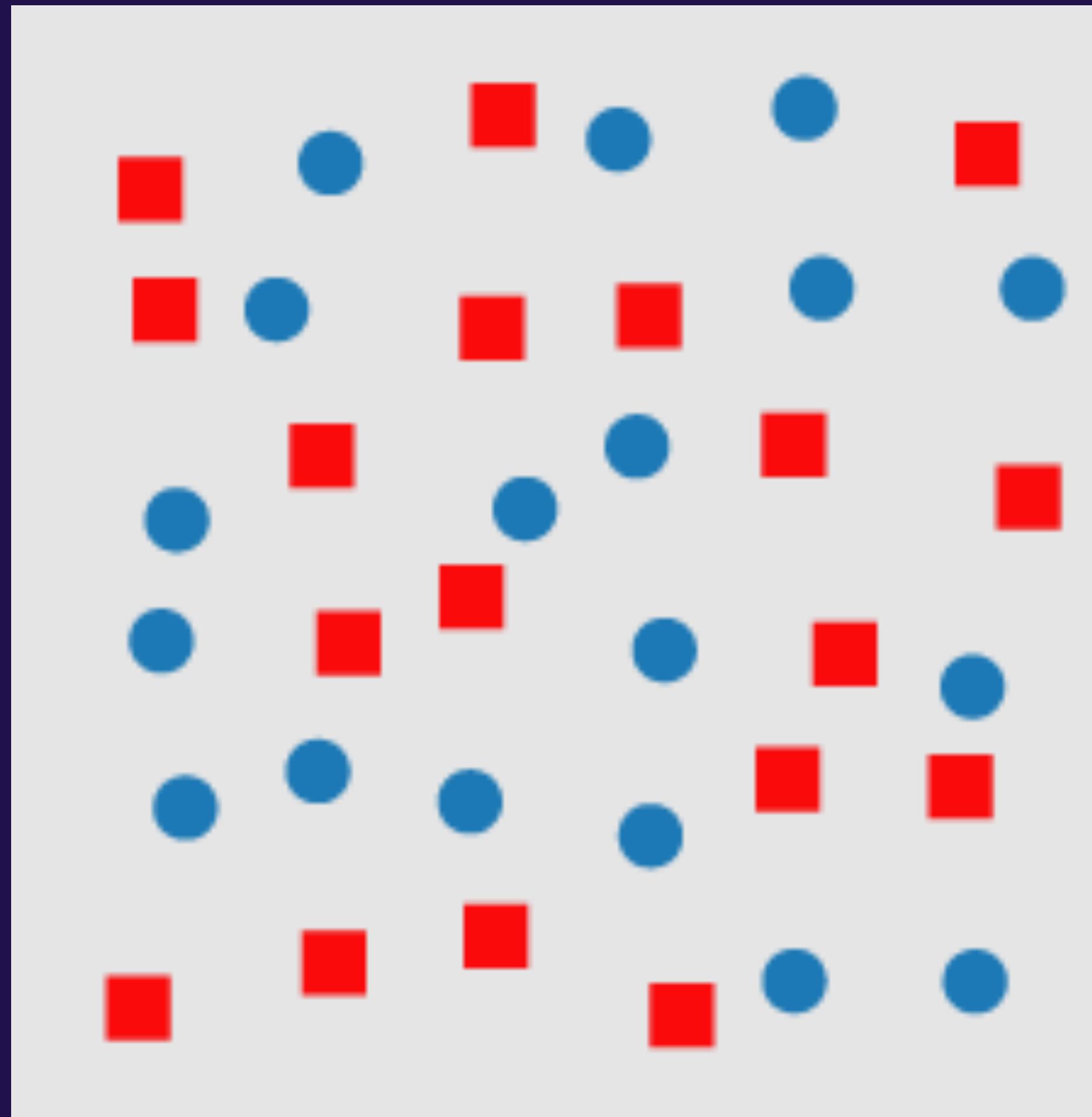
pre-attentive processing

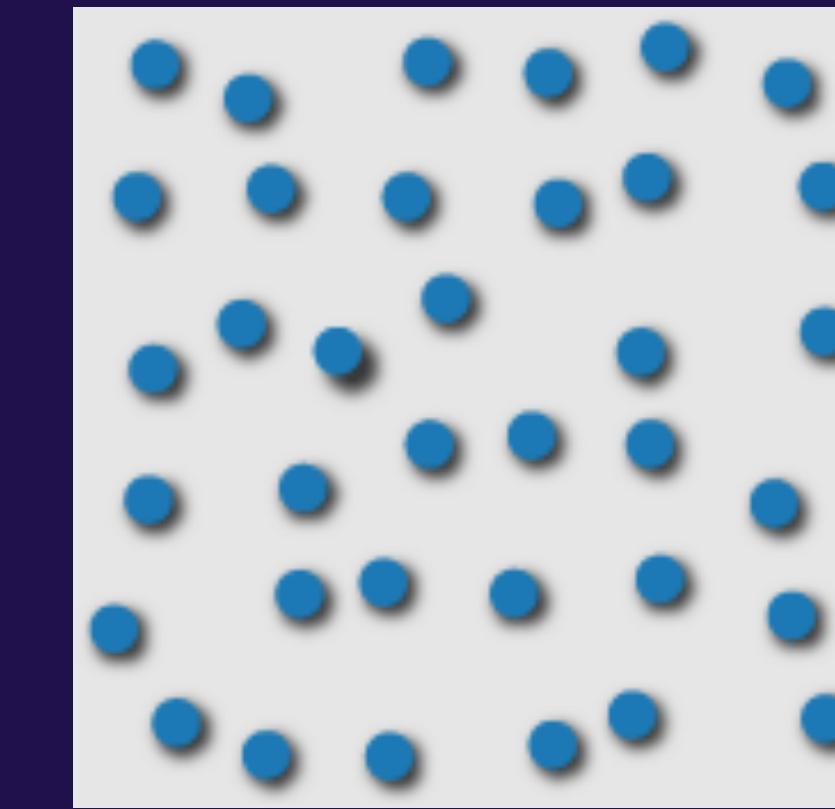
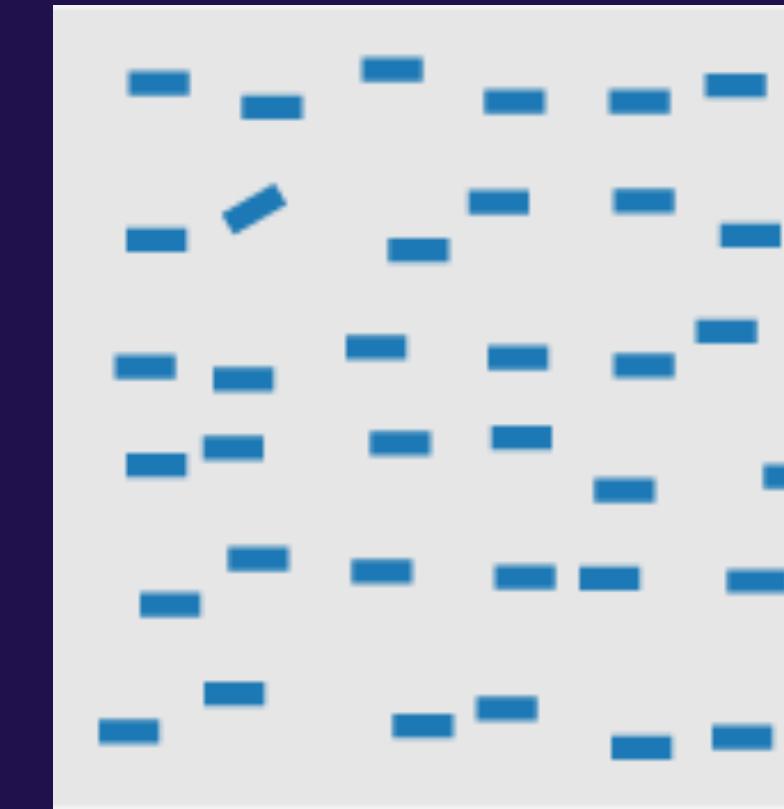
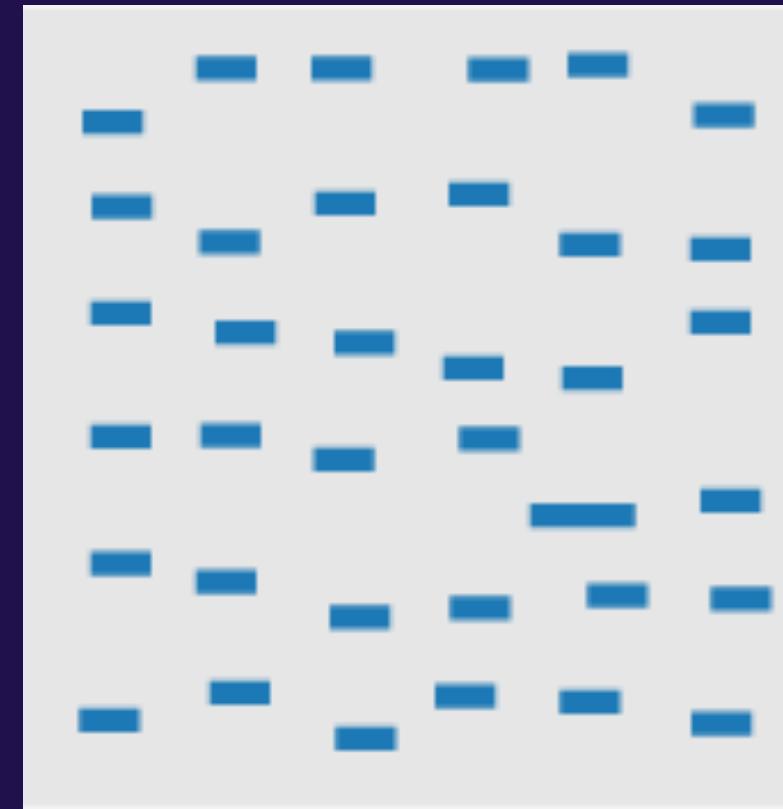
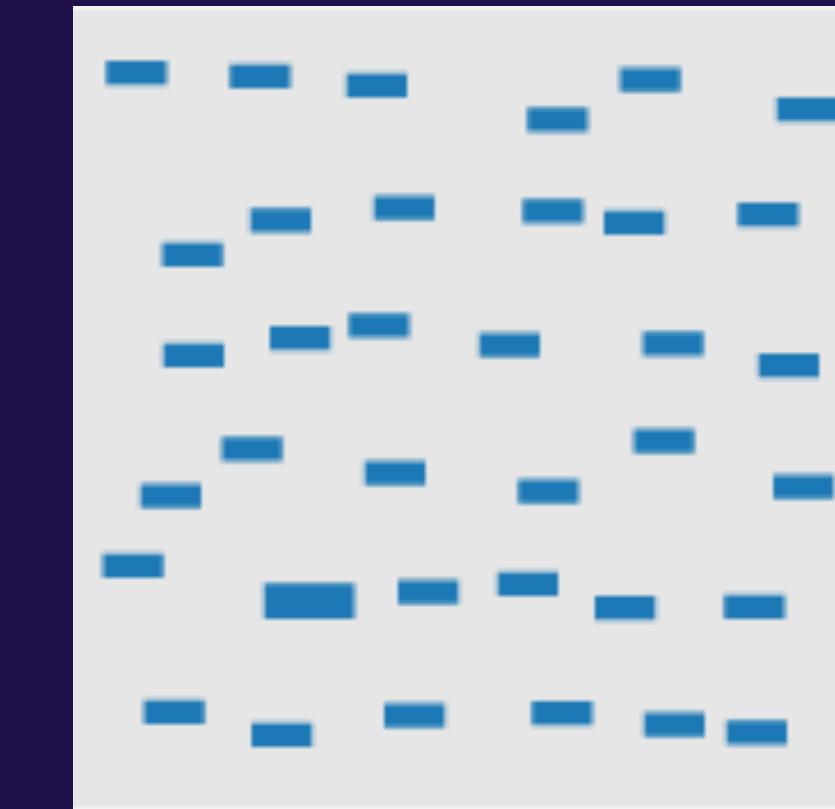
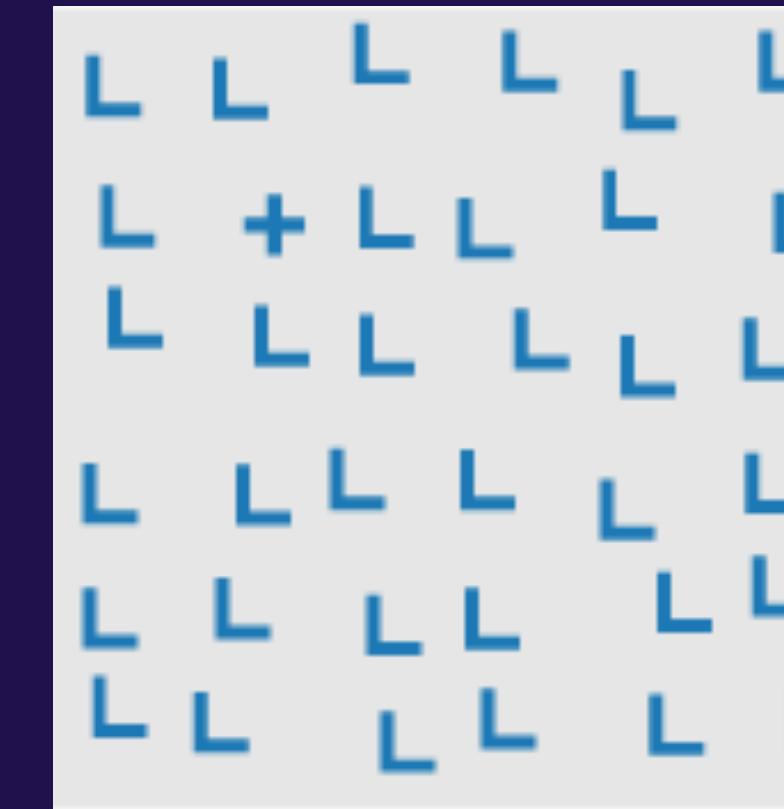
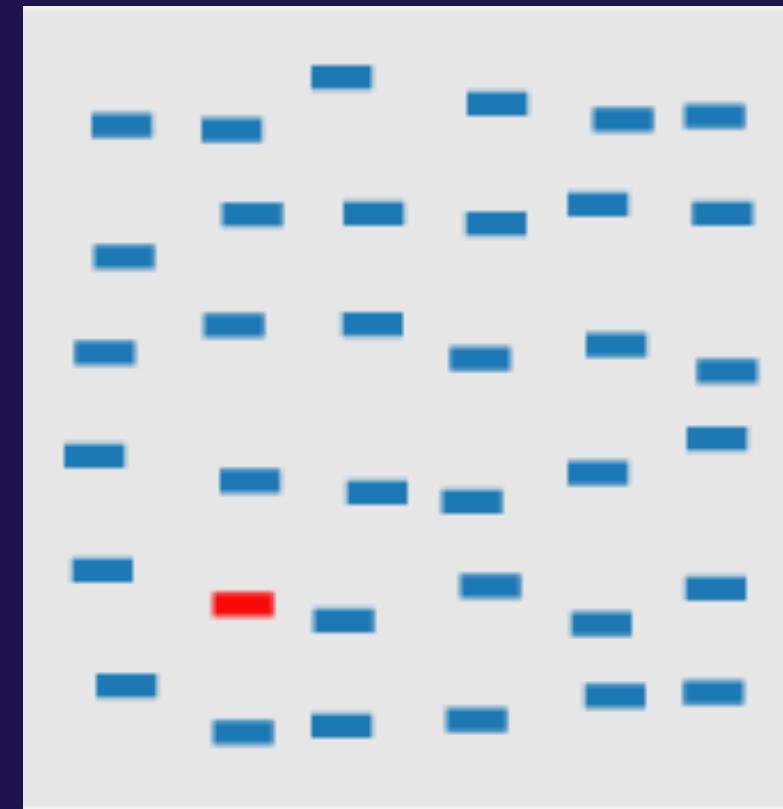
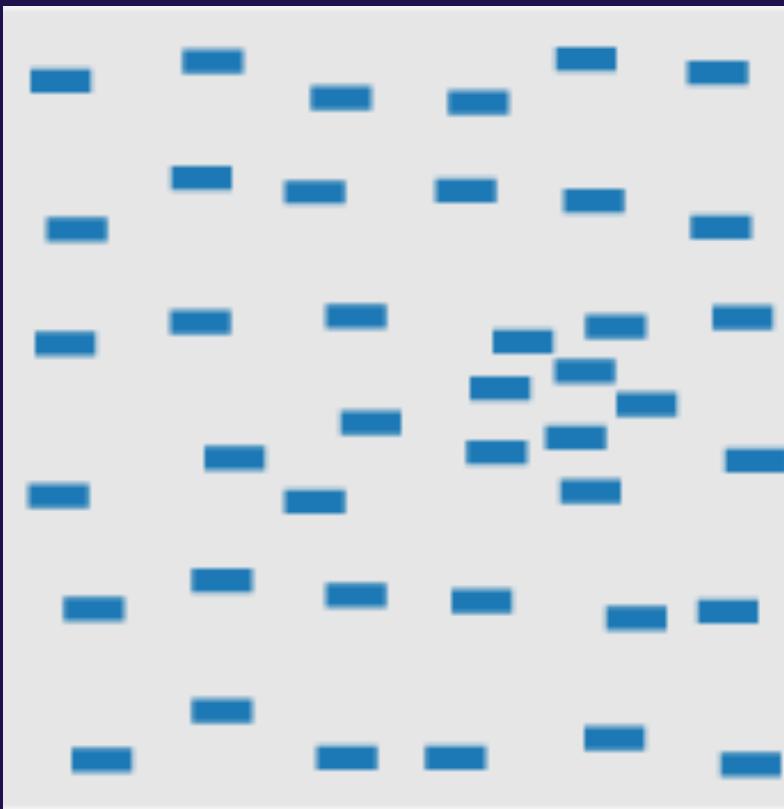
Let's do another experiment ...

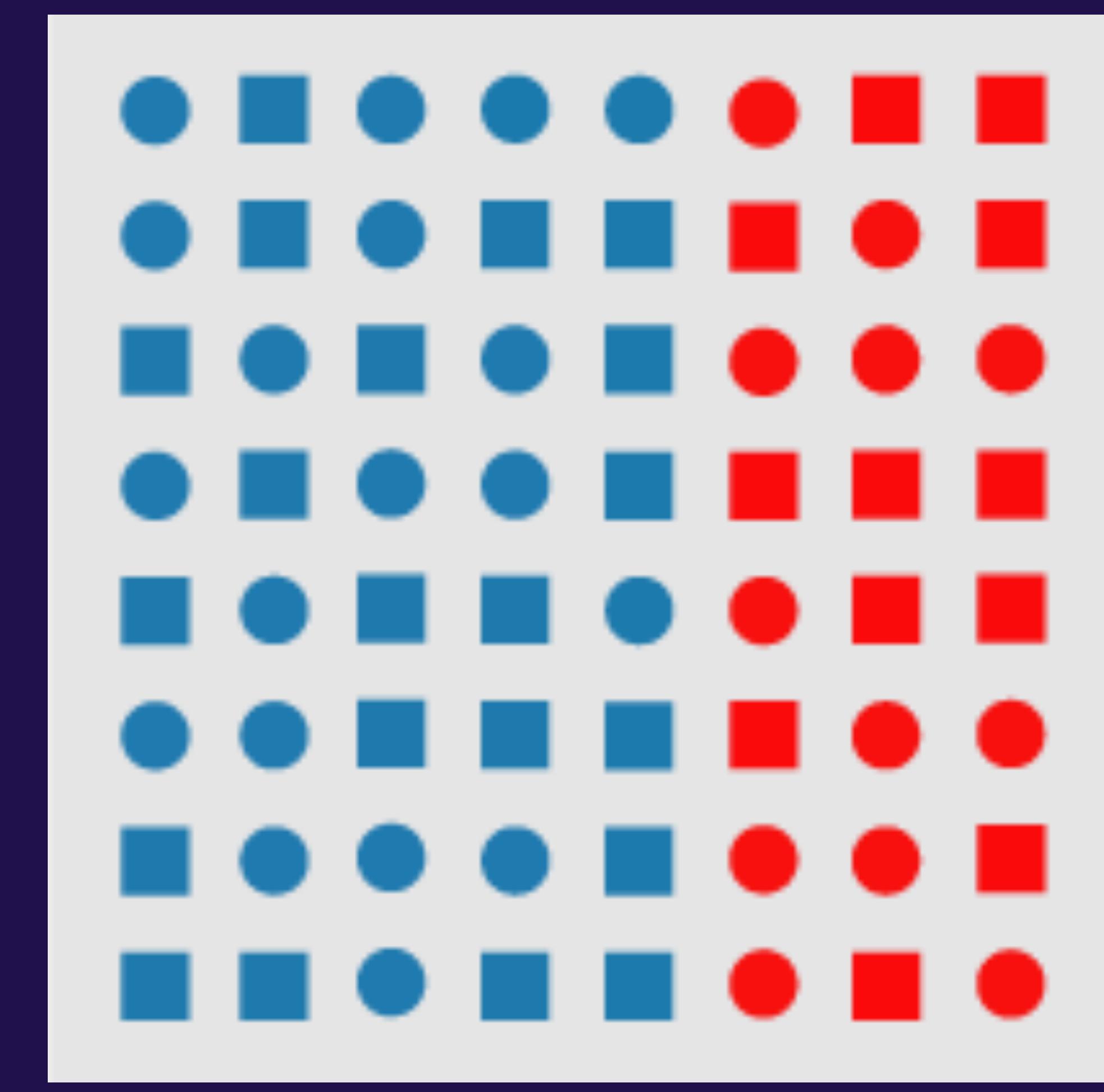
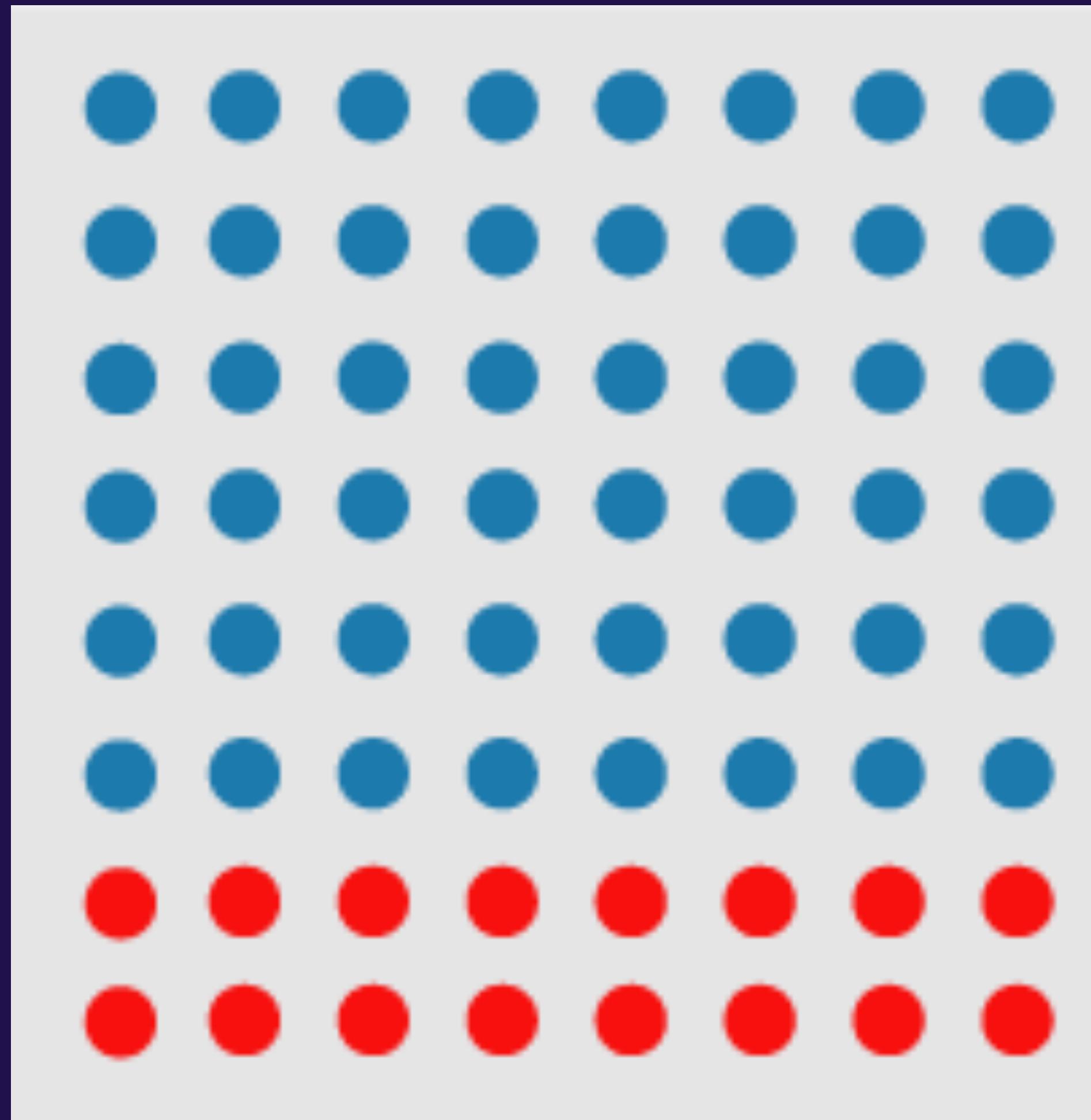
<https://www.csc2.ncsu.edu/faculty/healey/PP/>

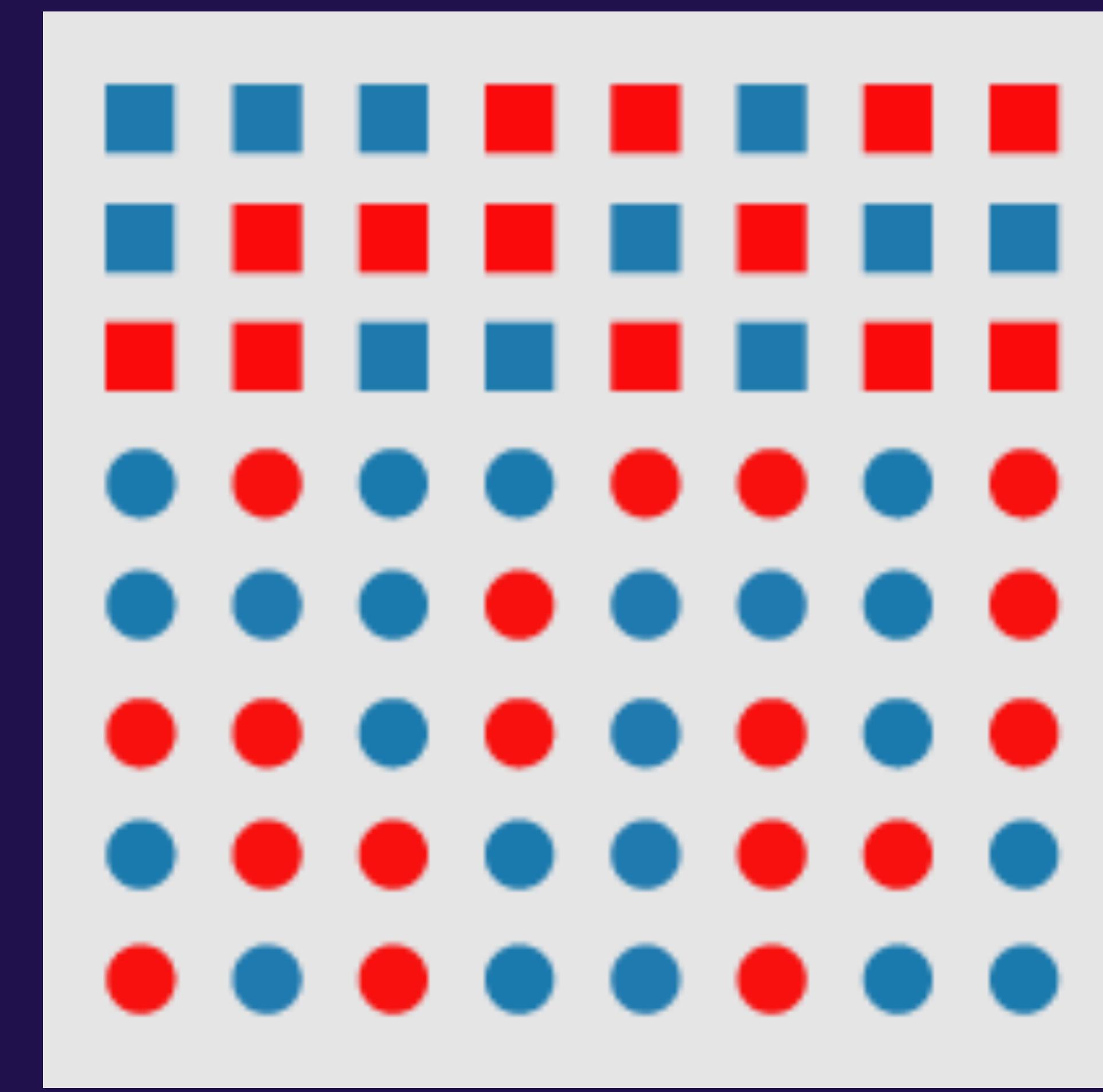
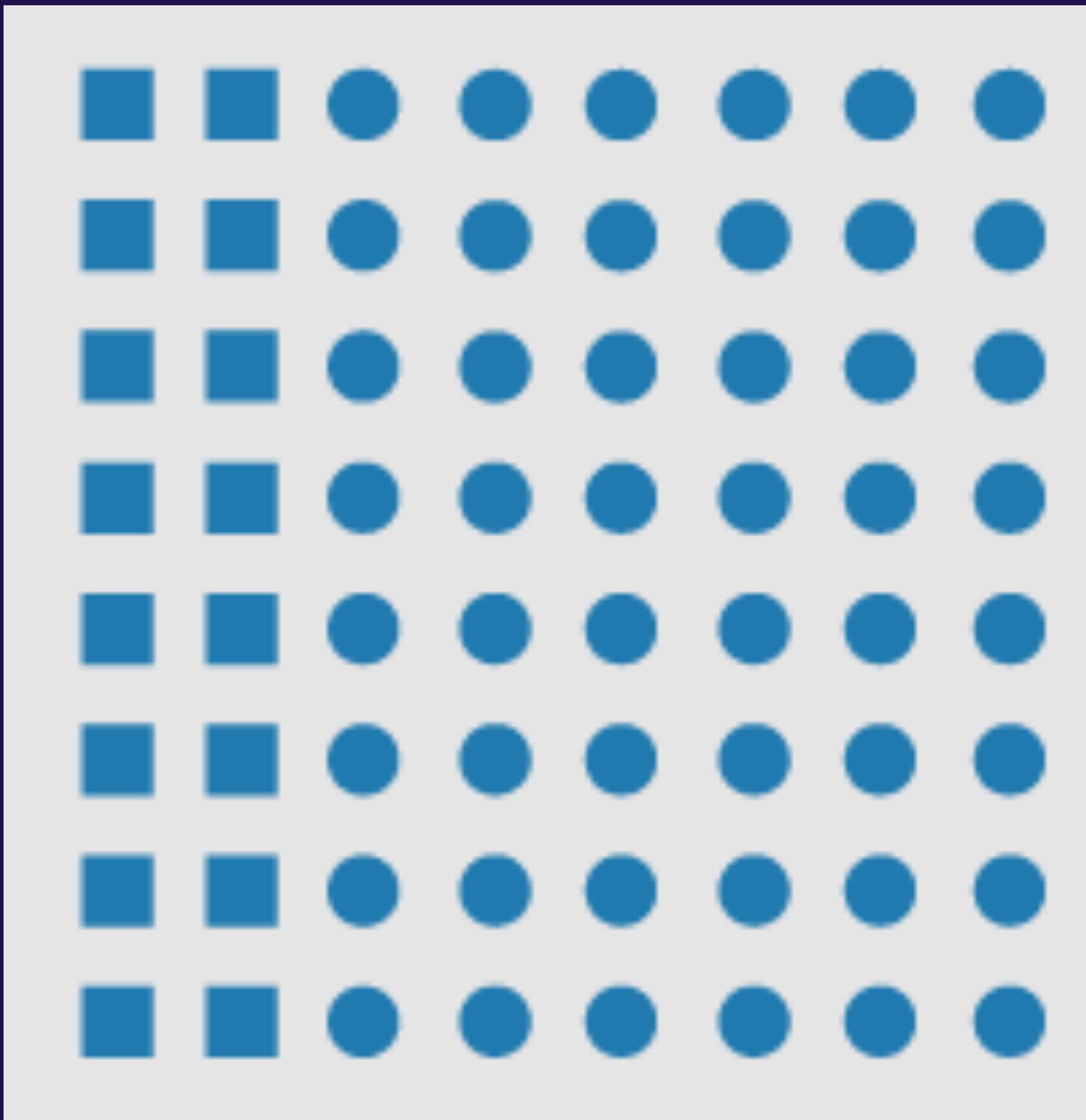






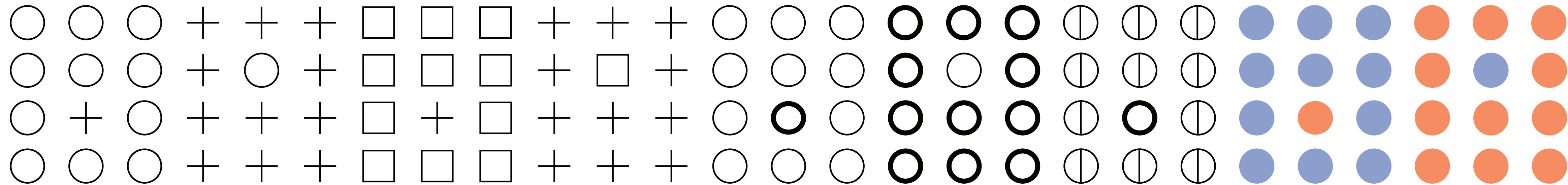




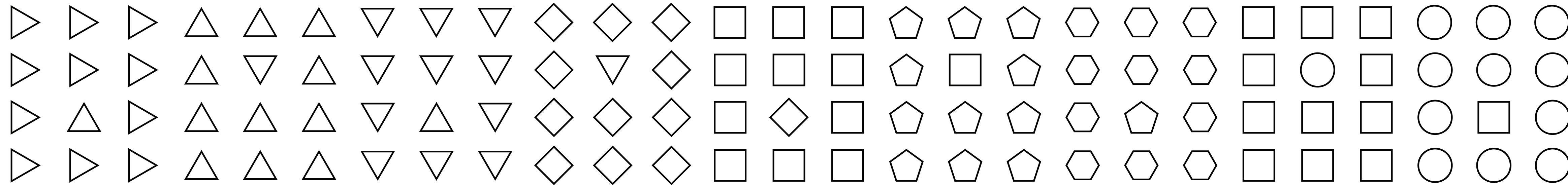


Choose strong visual boundaries

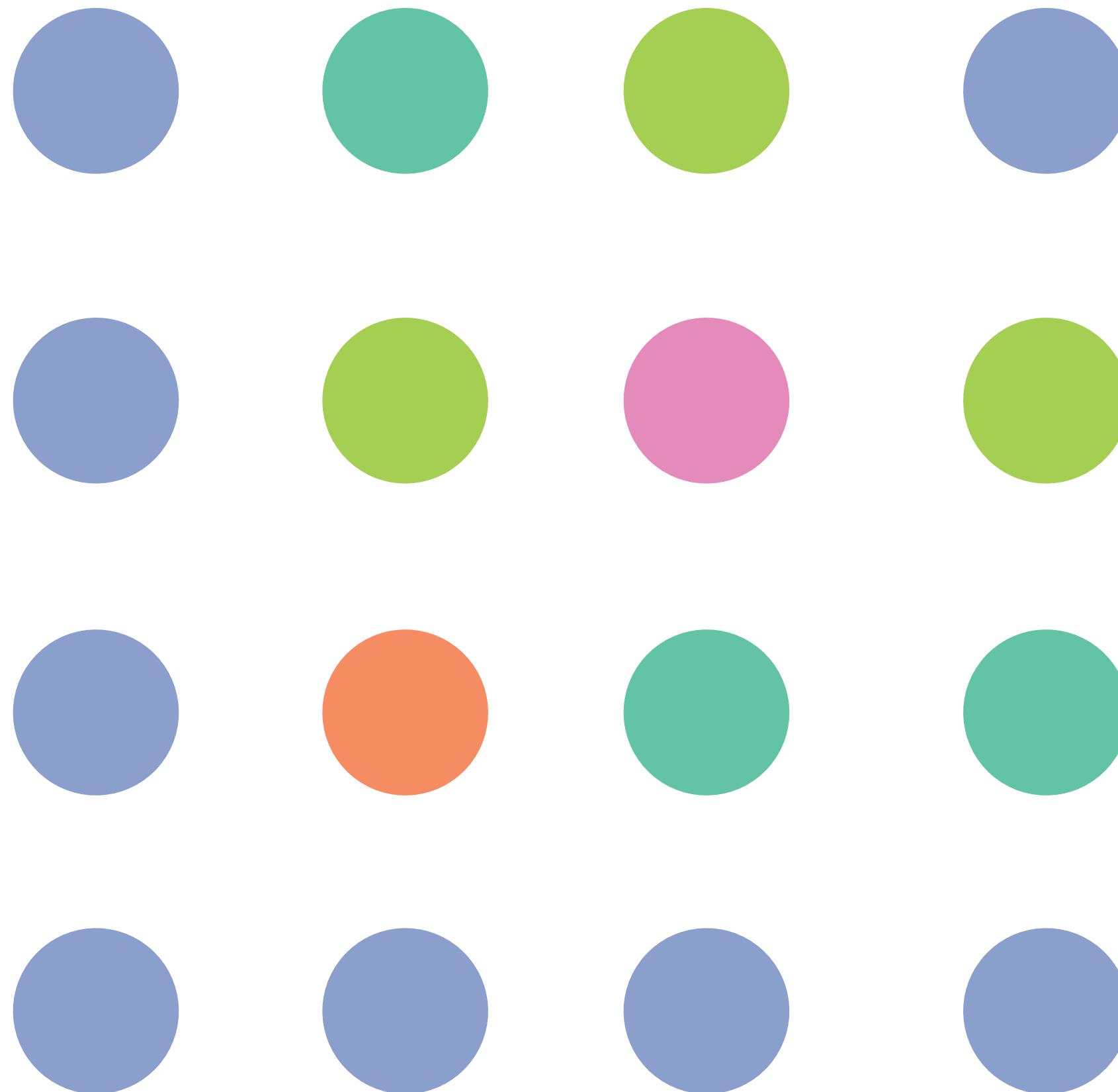
Strong visual boundaries



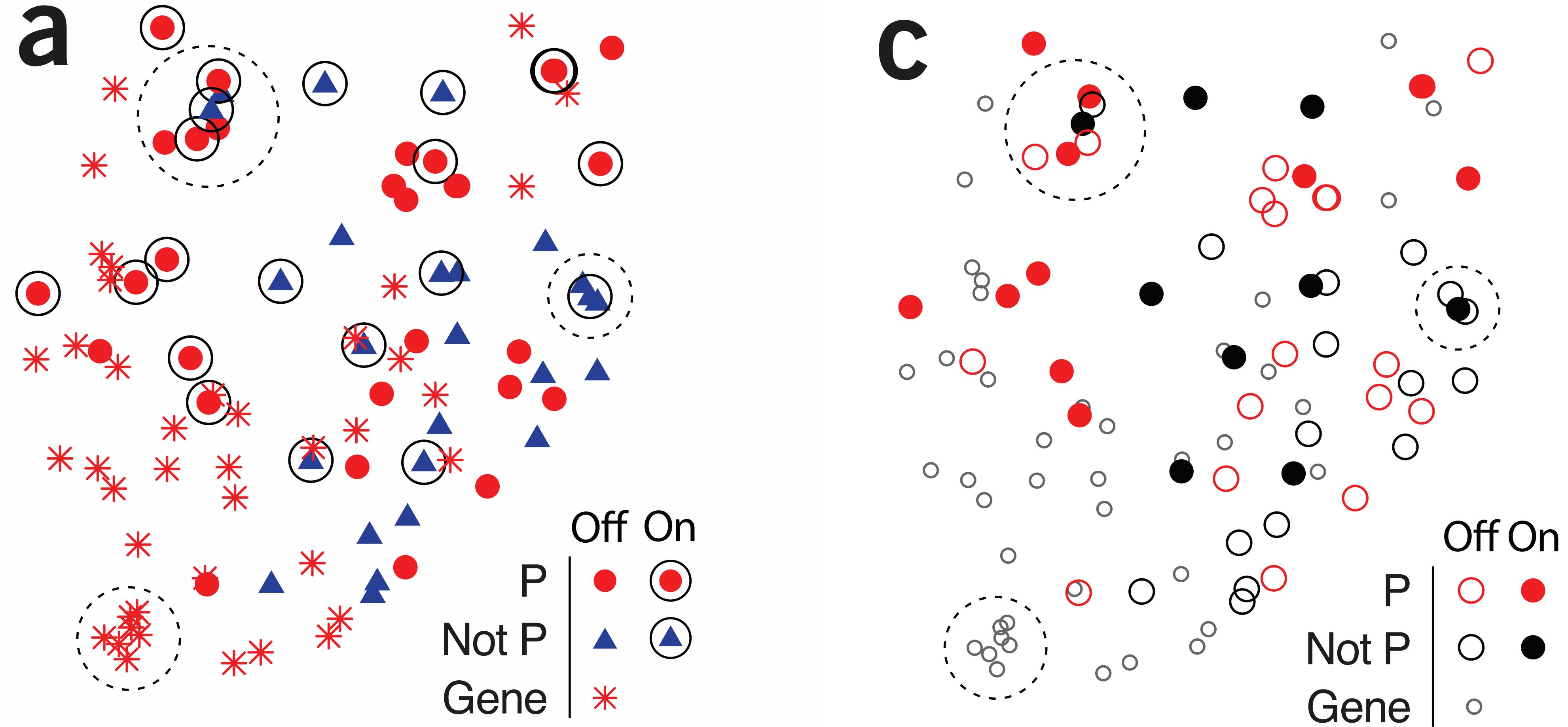
Weak visual boundaries



Use Colour Judiciously



Represent Data Hierarchies

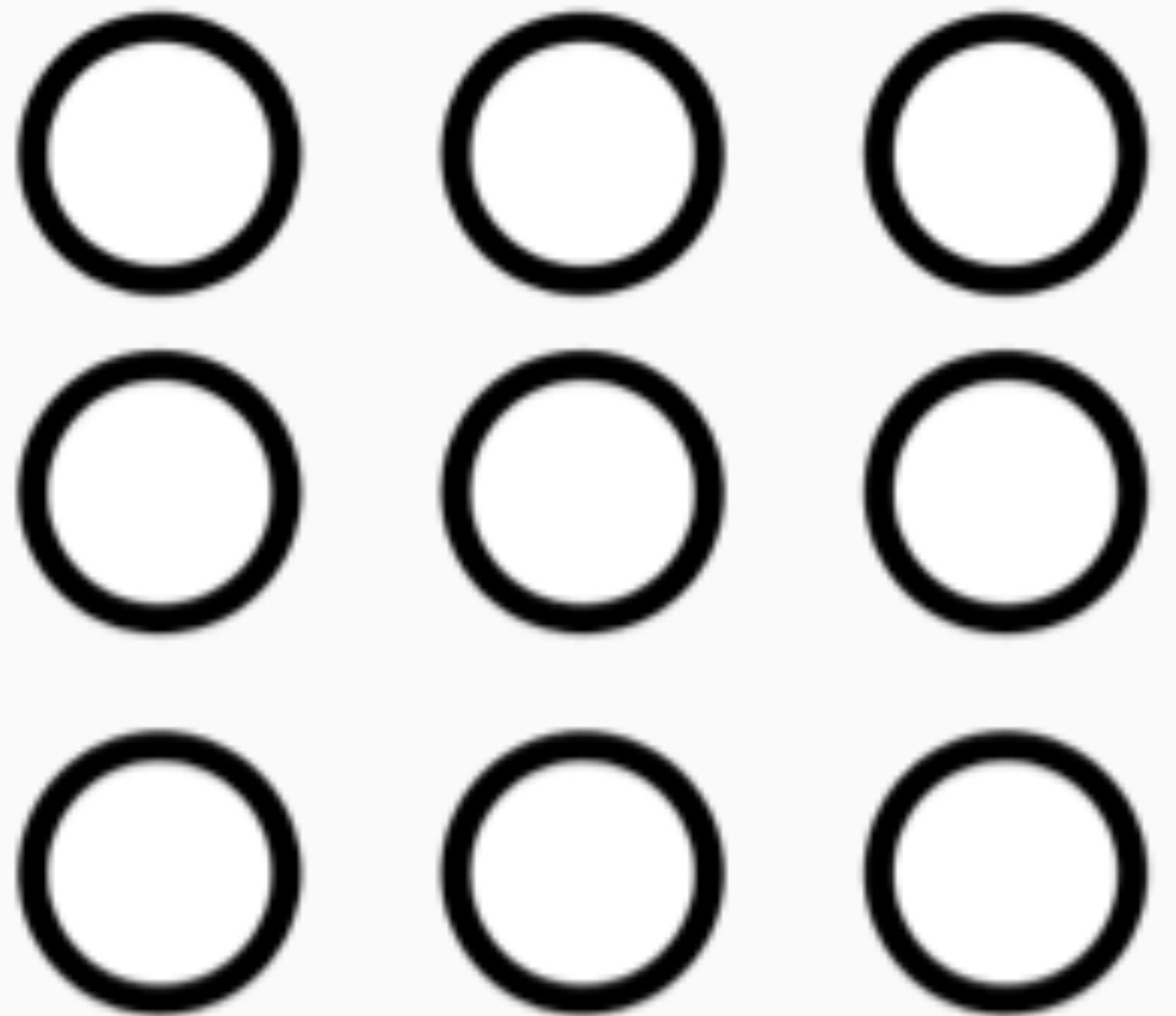


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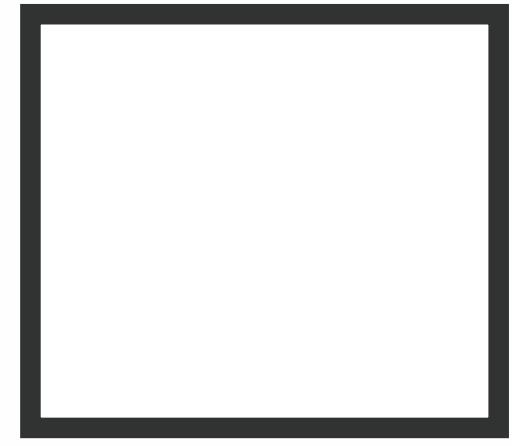
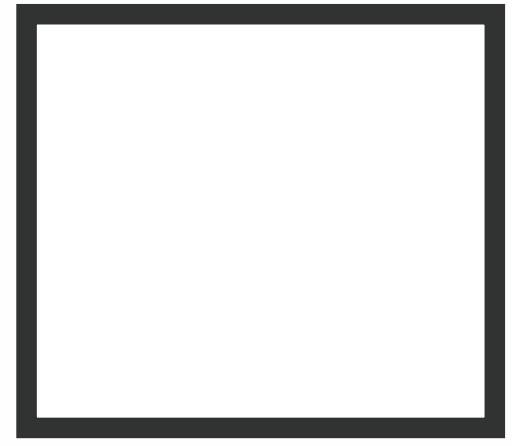
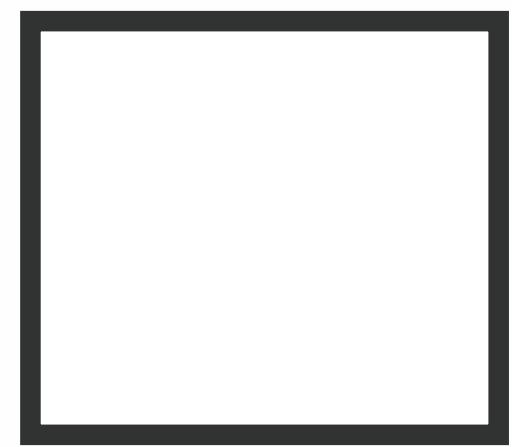
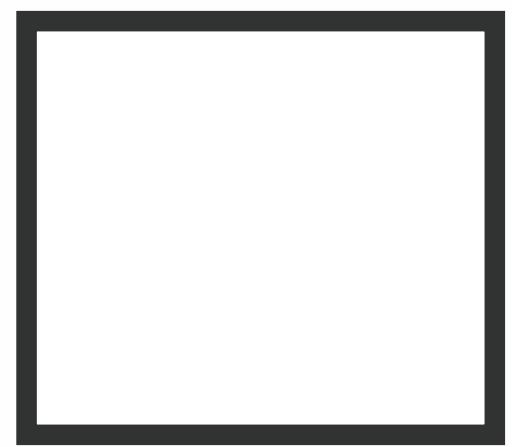
Gestalt Principles



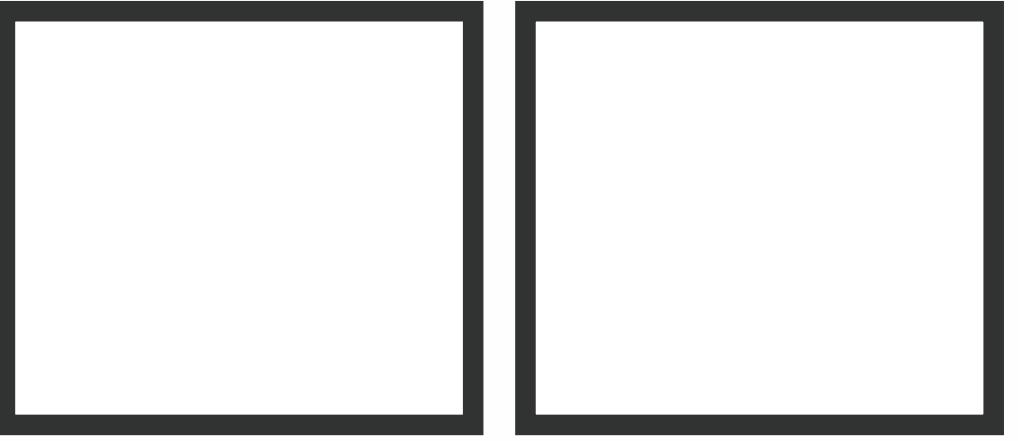
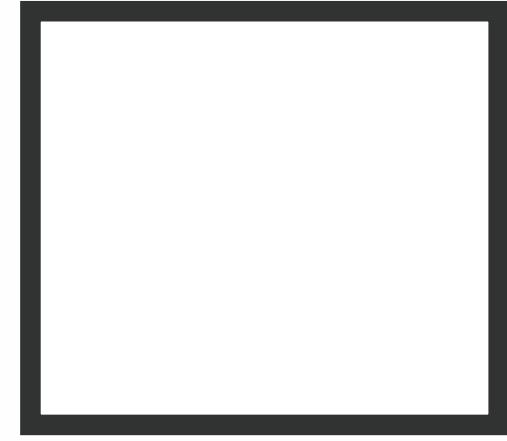
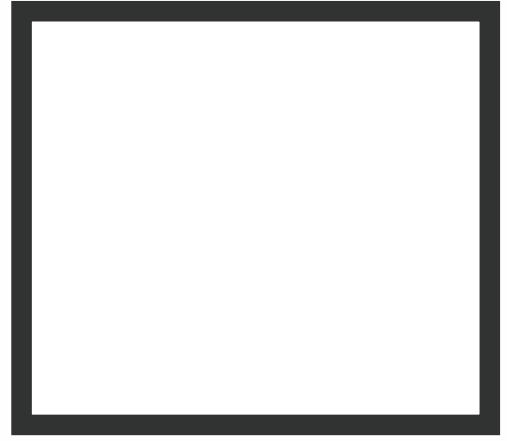
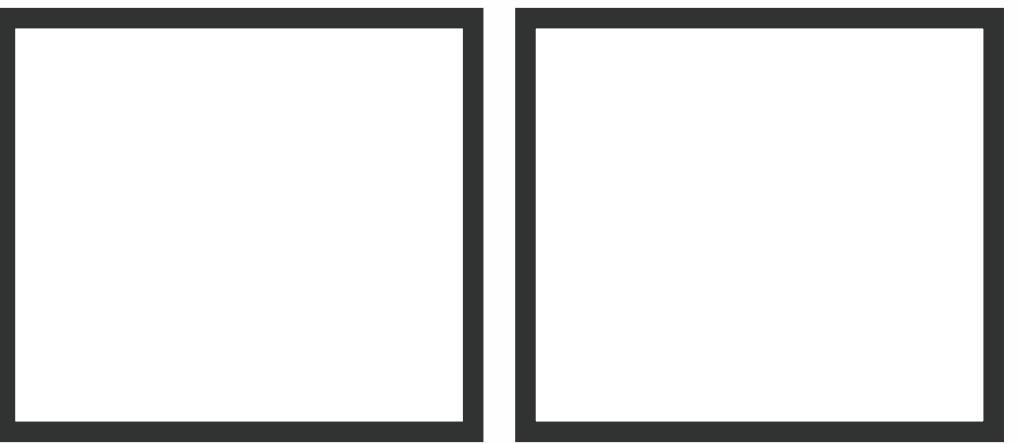
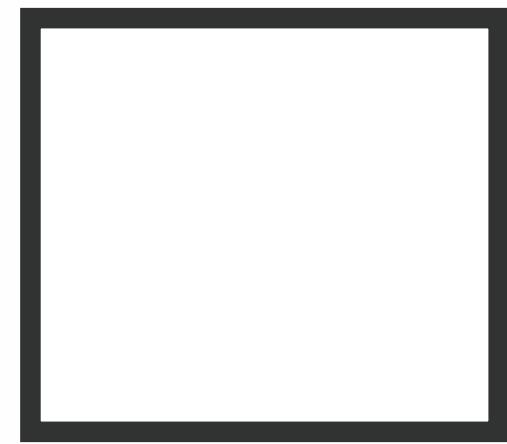
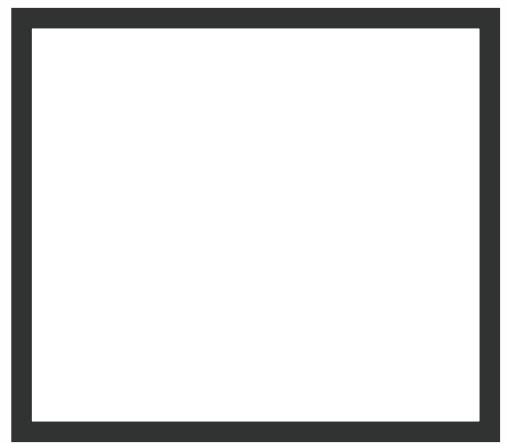
Proximity



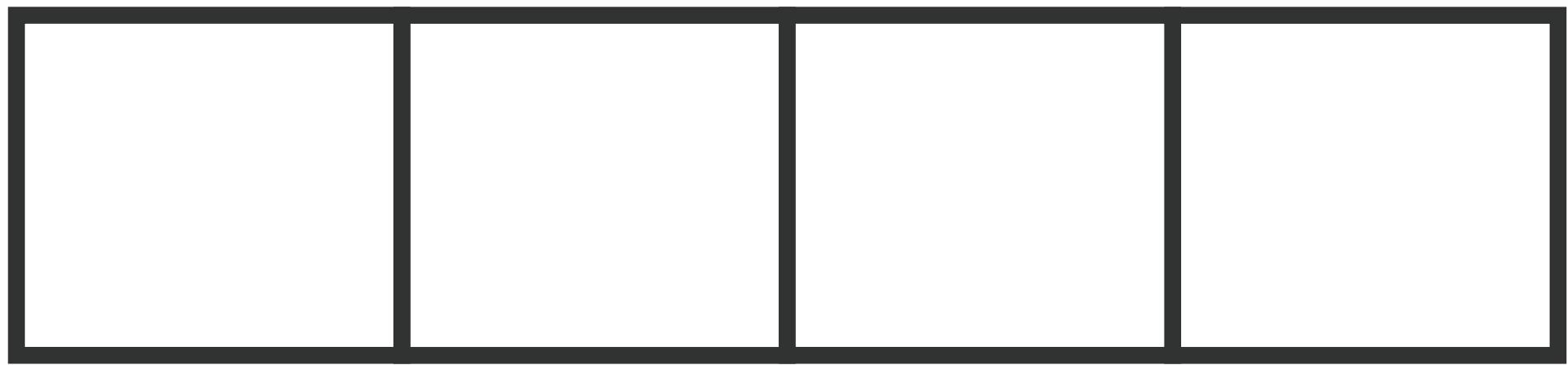
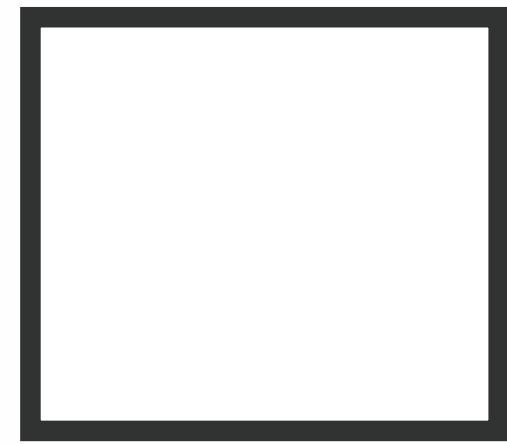
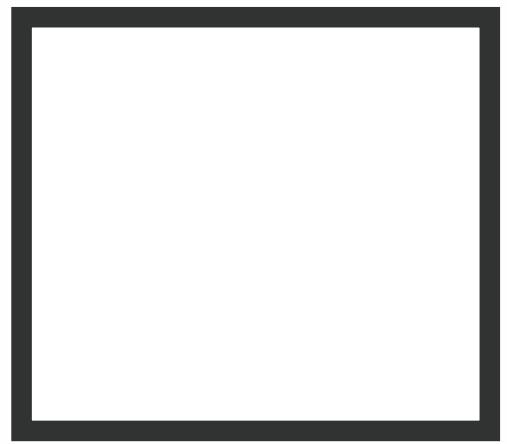
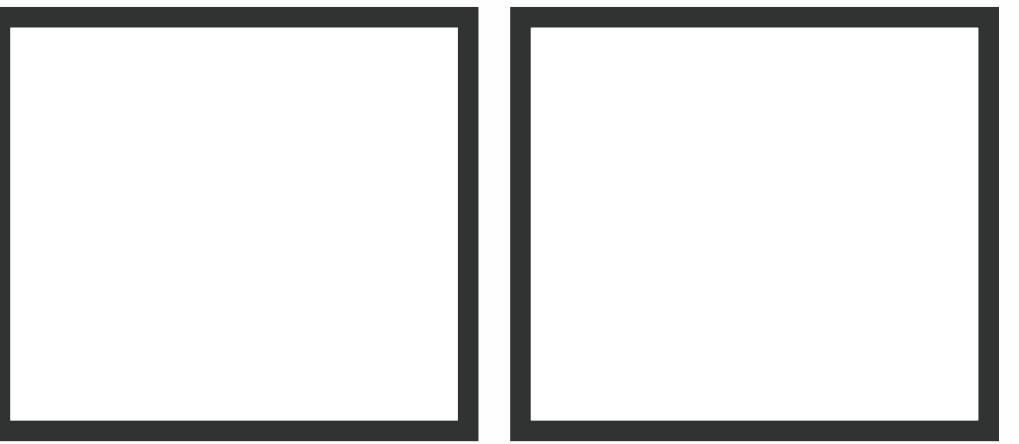
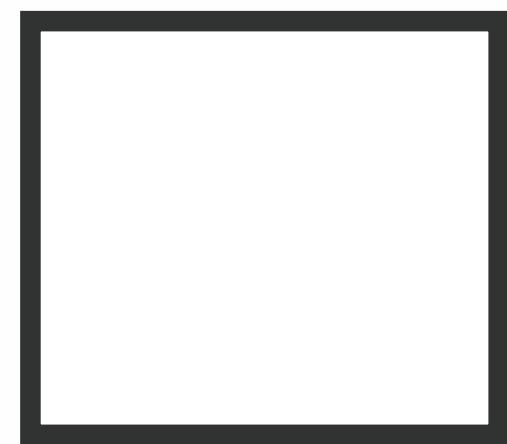
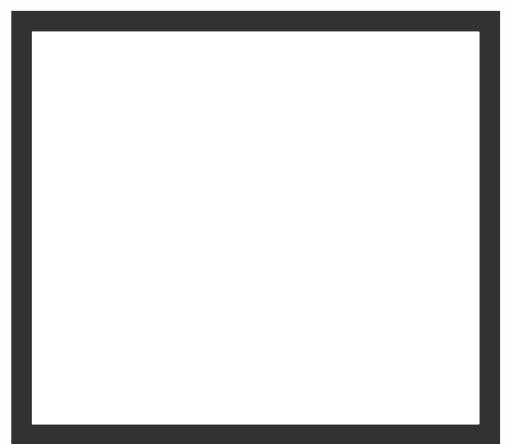
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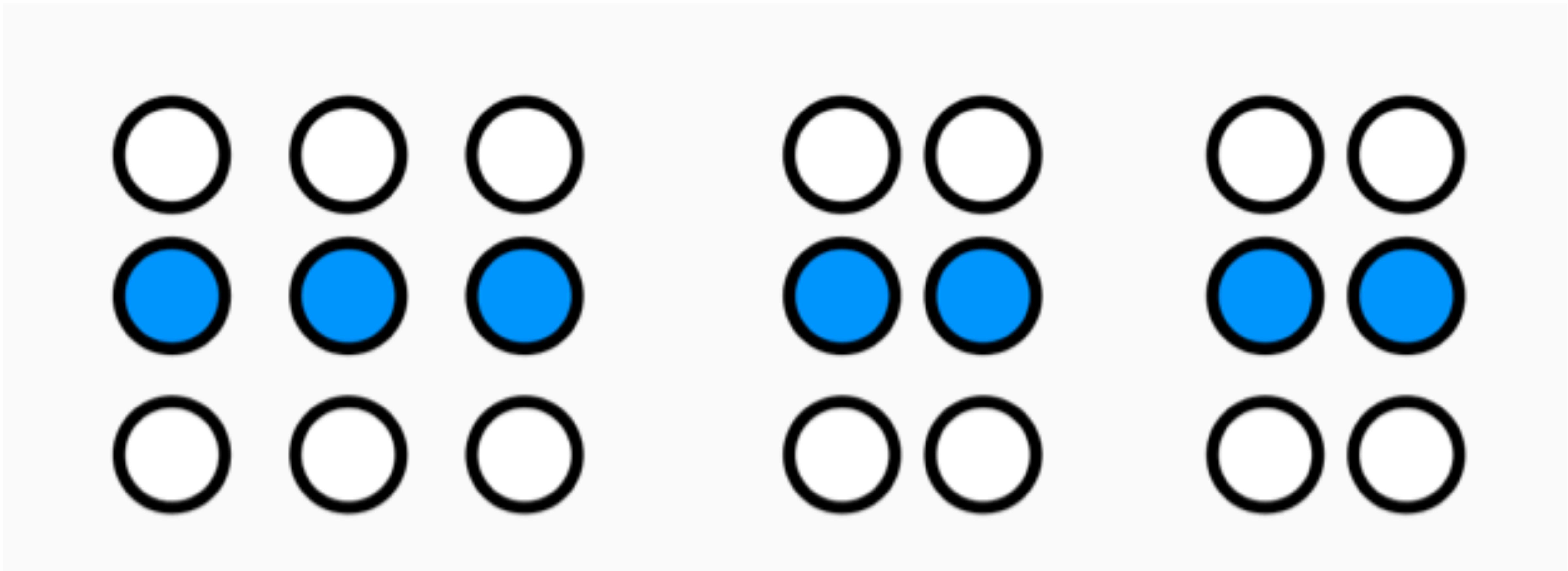
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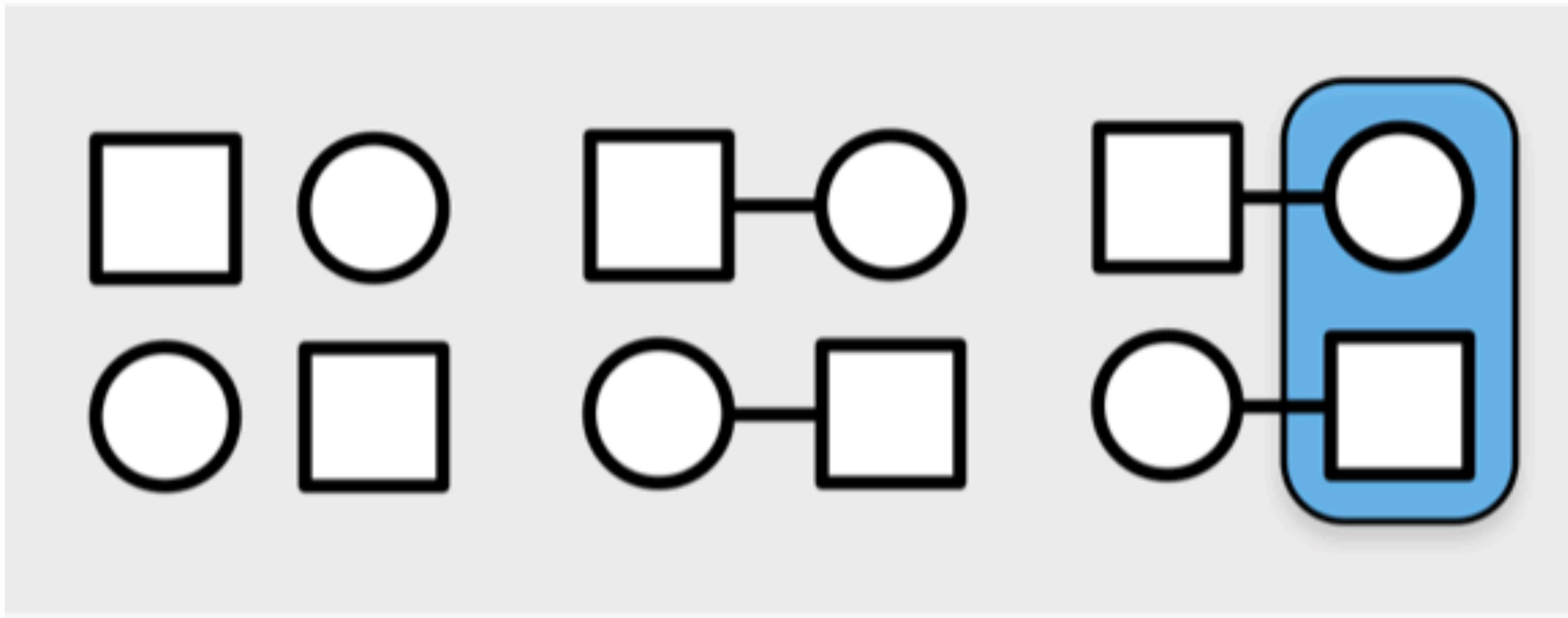
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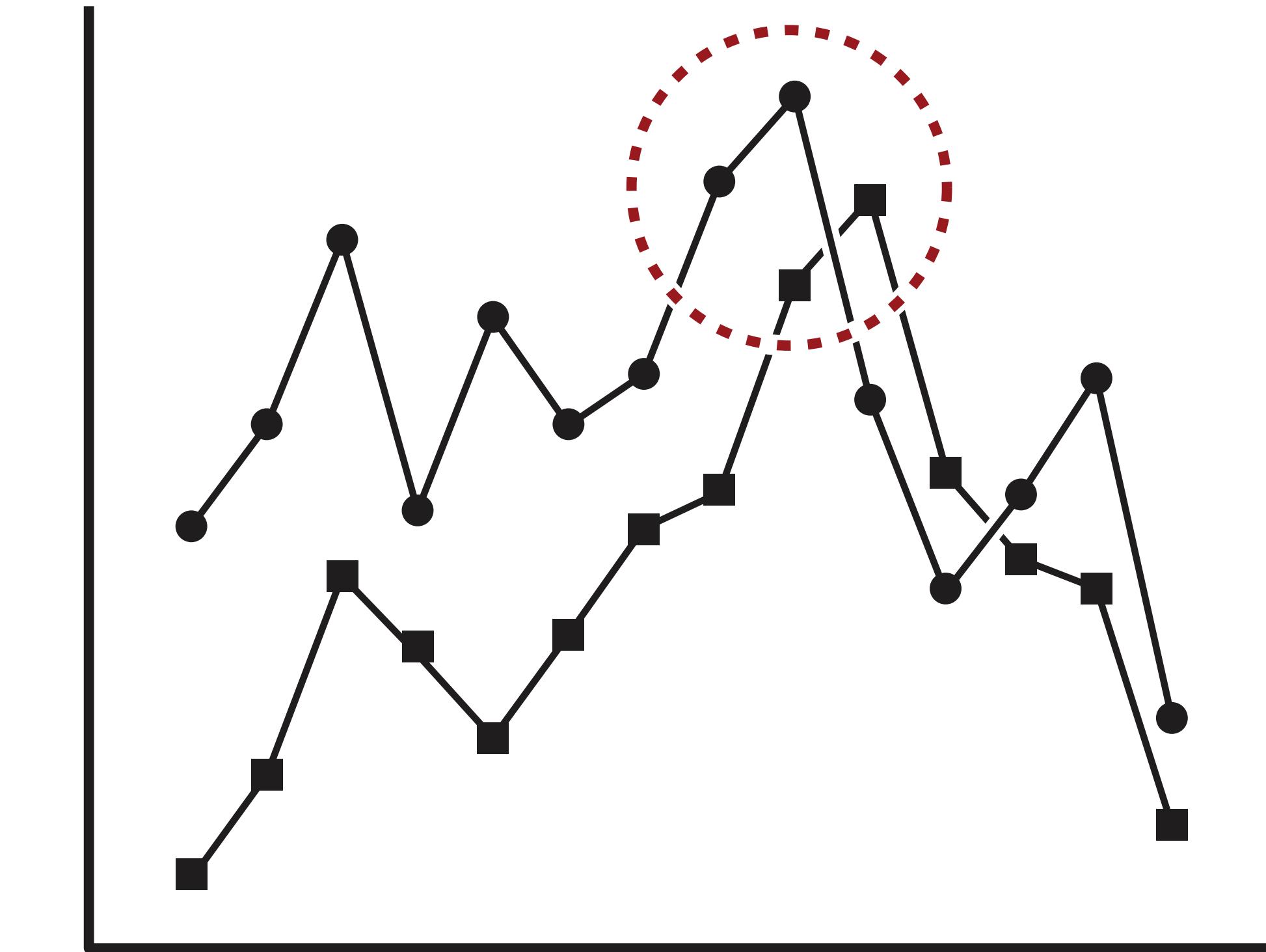
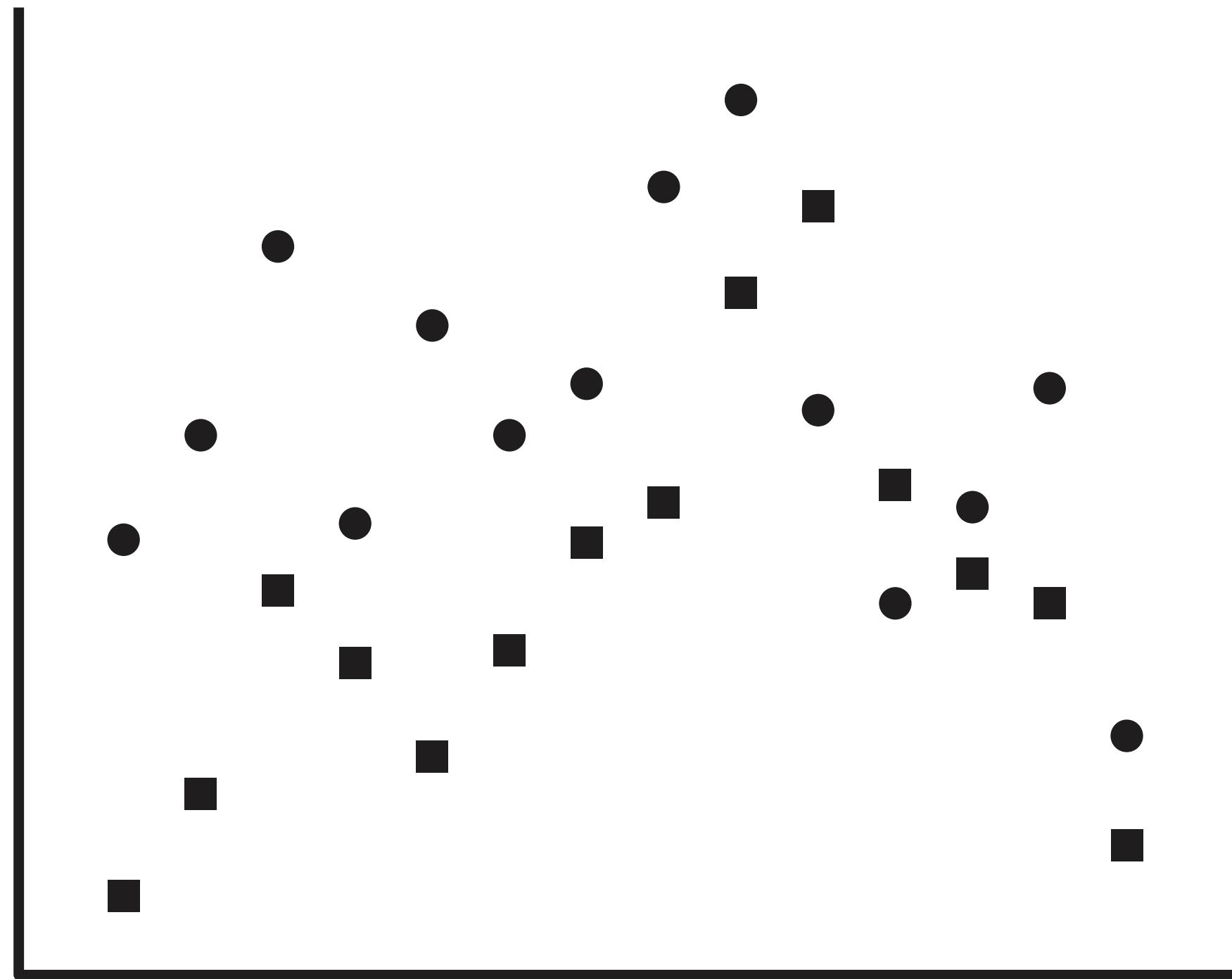
Similarity



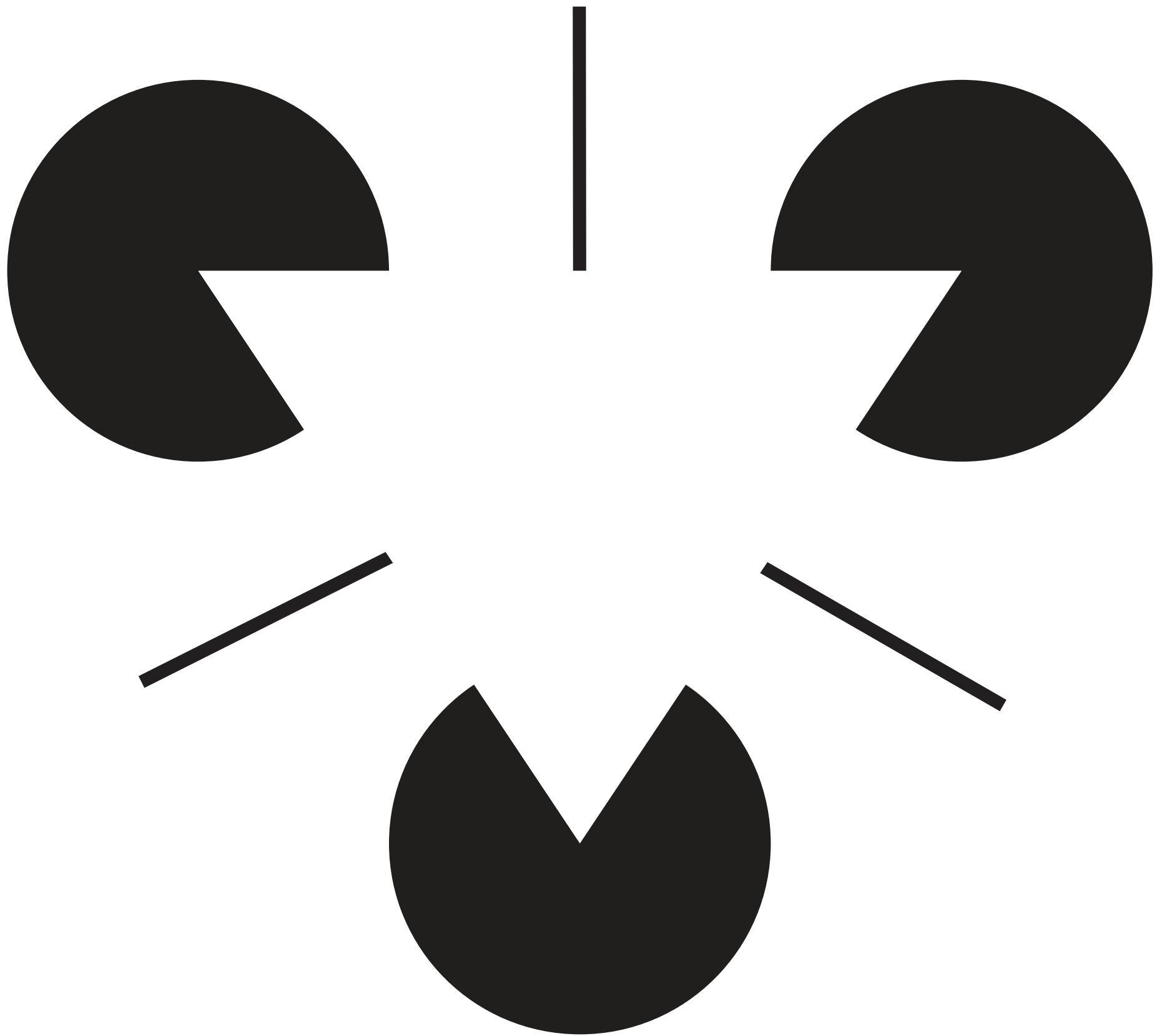
Connectedness and Enclosure



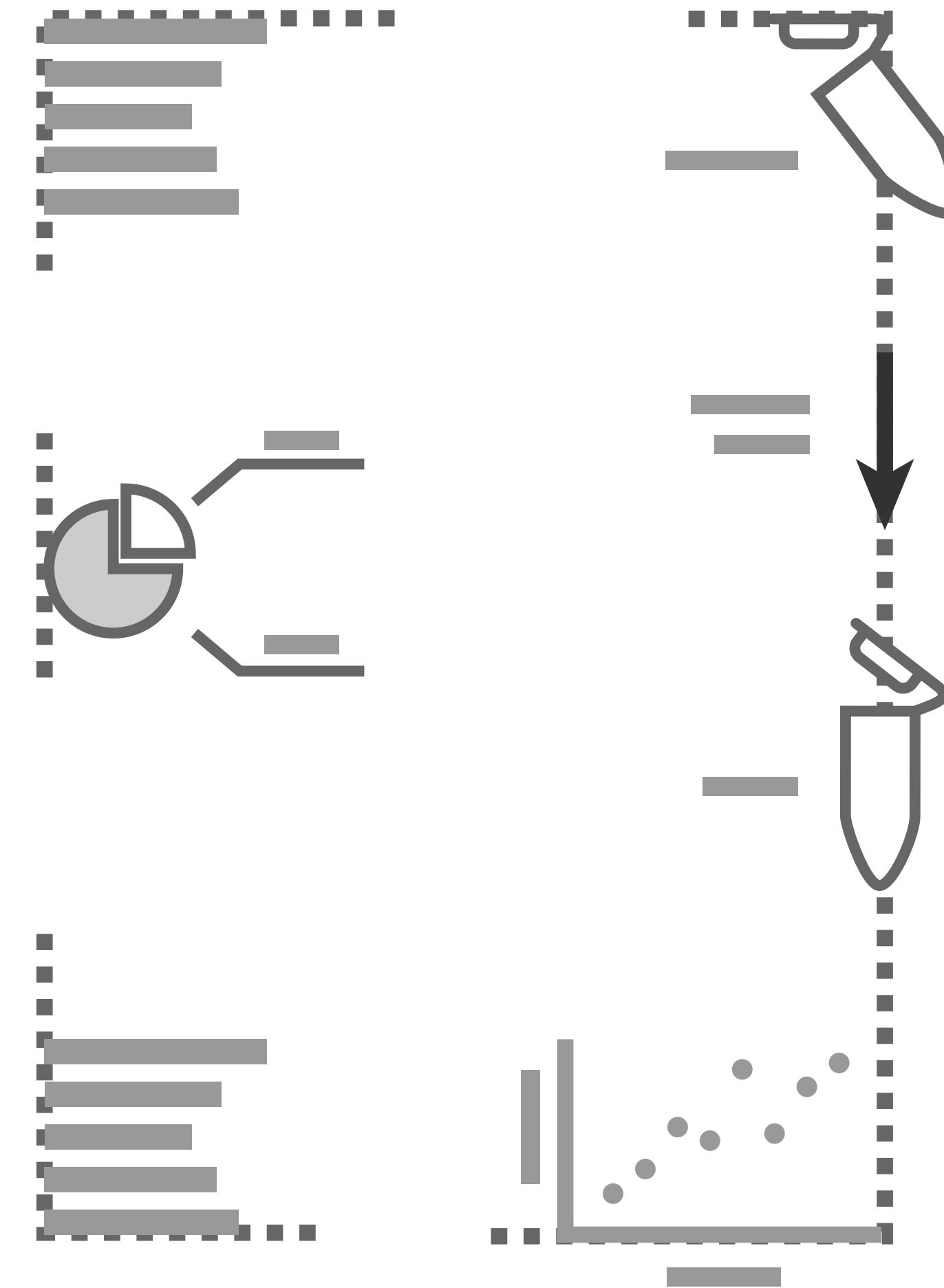
Connectedness and Enclosure



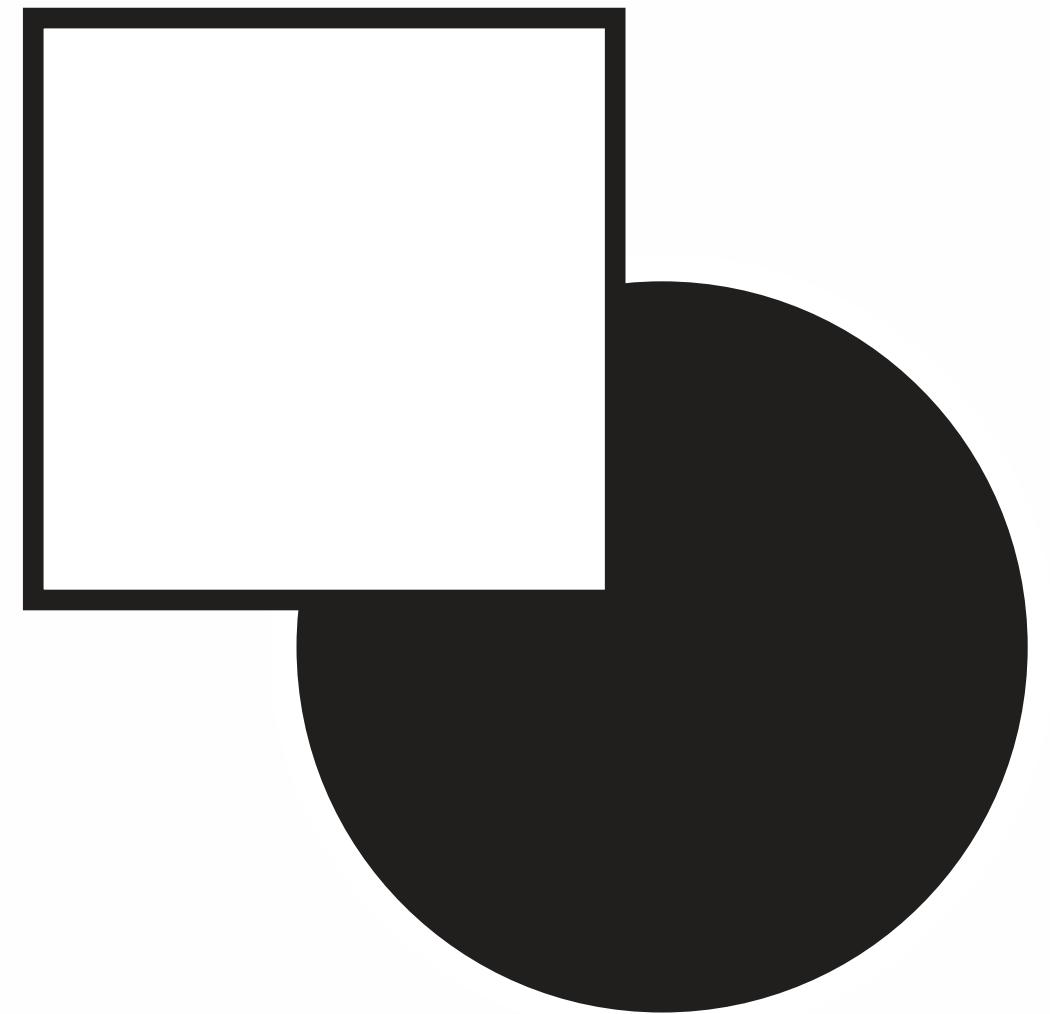
Visual Interpolation



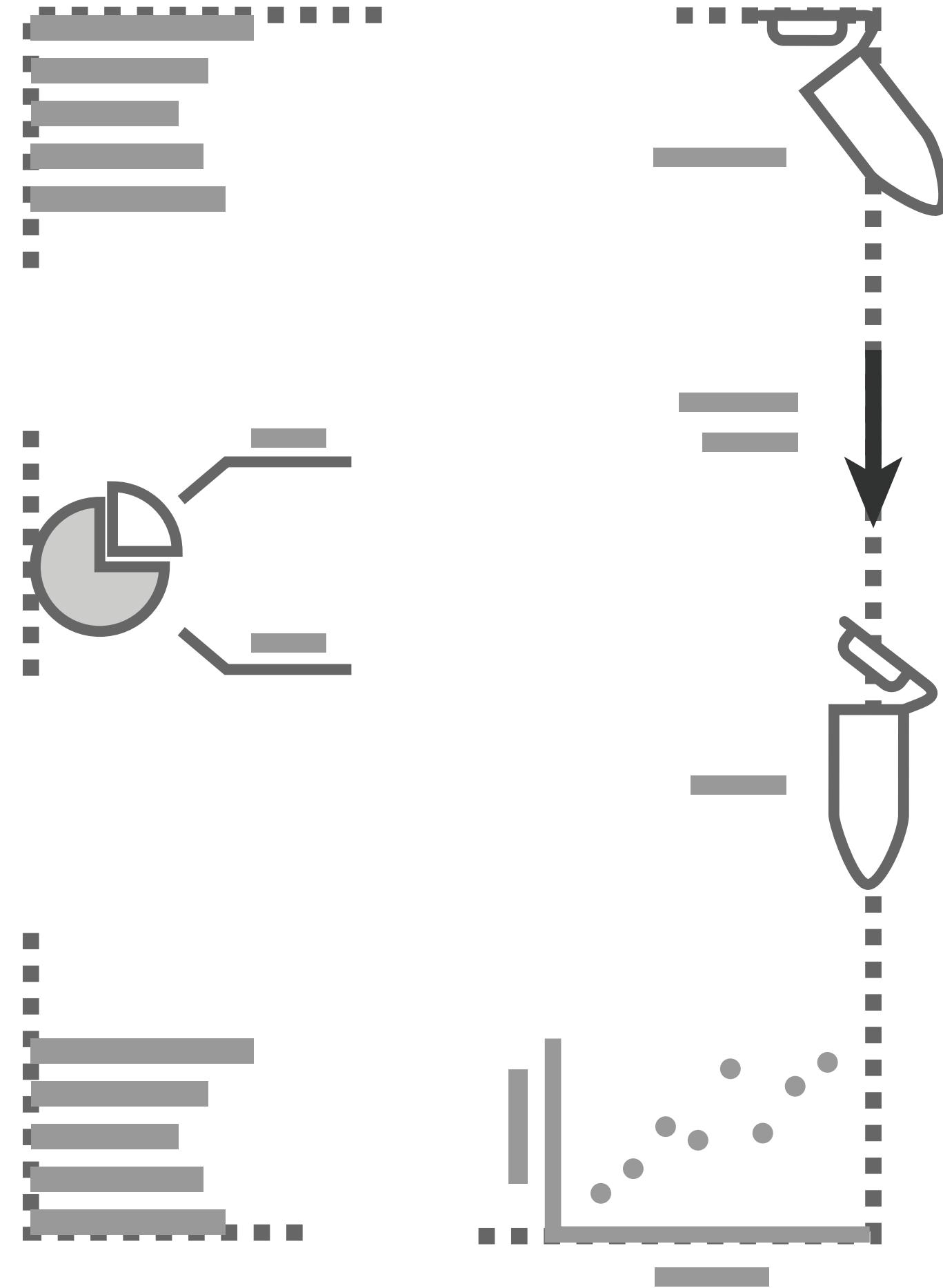
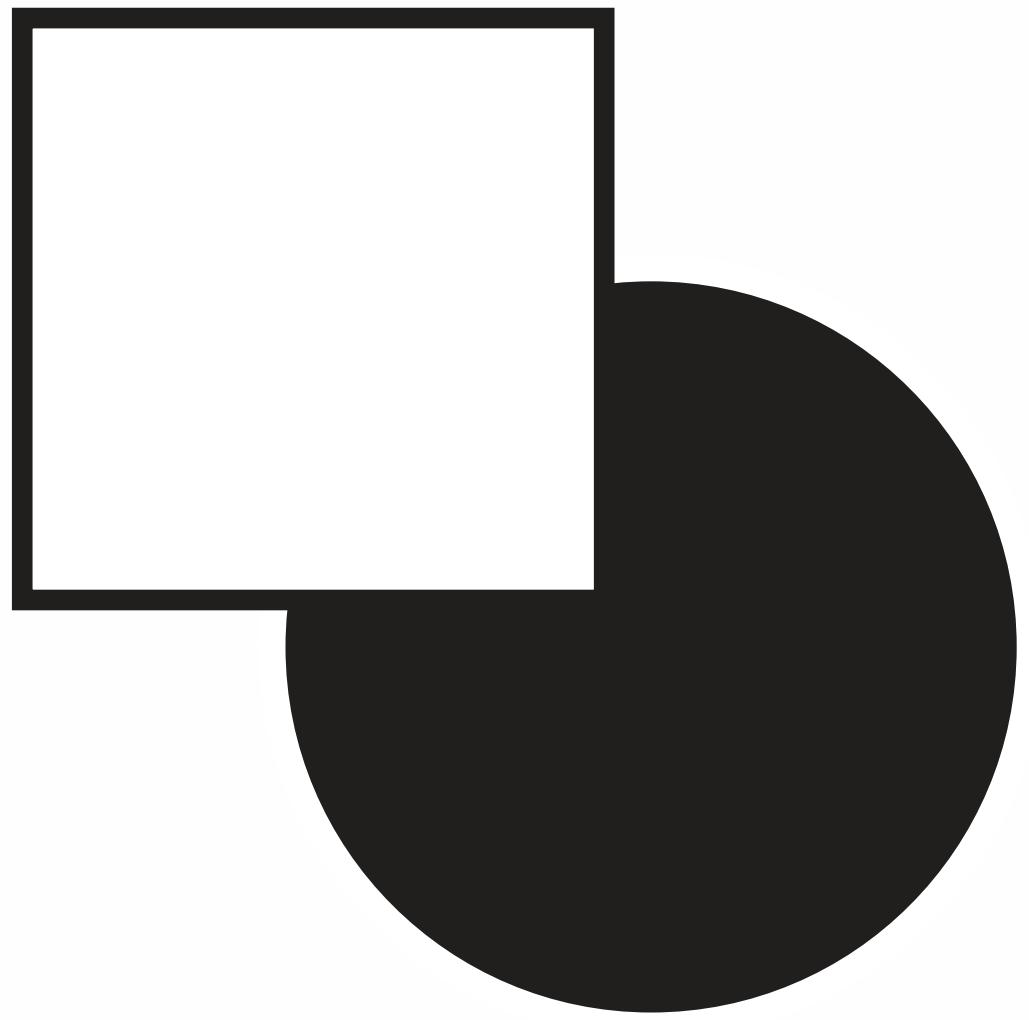
Visual Interpolation



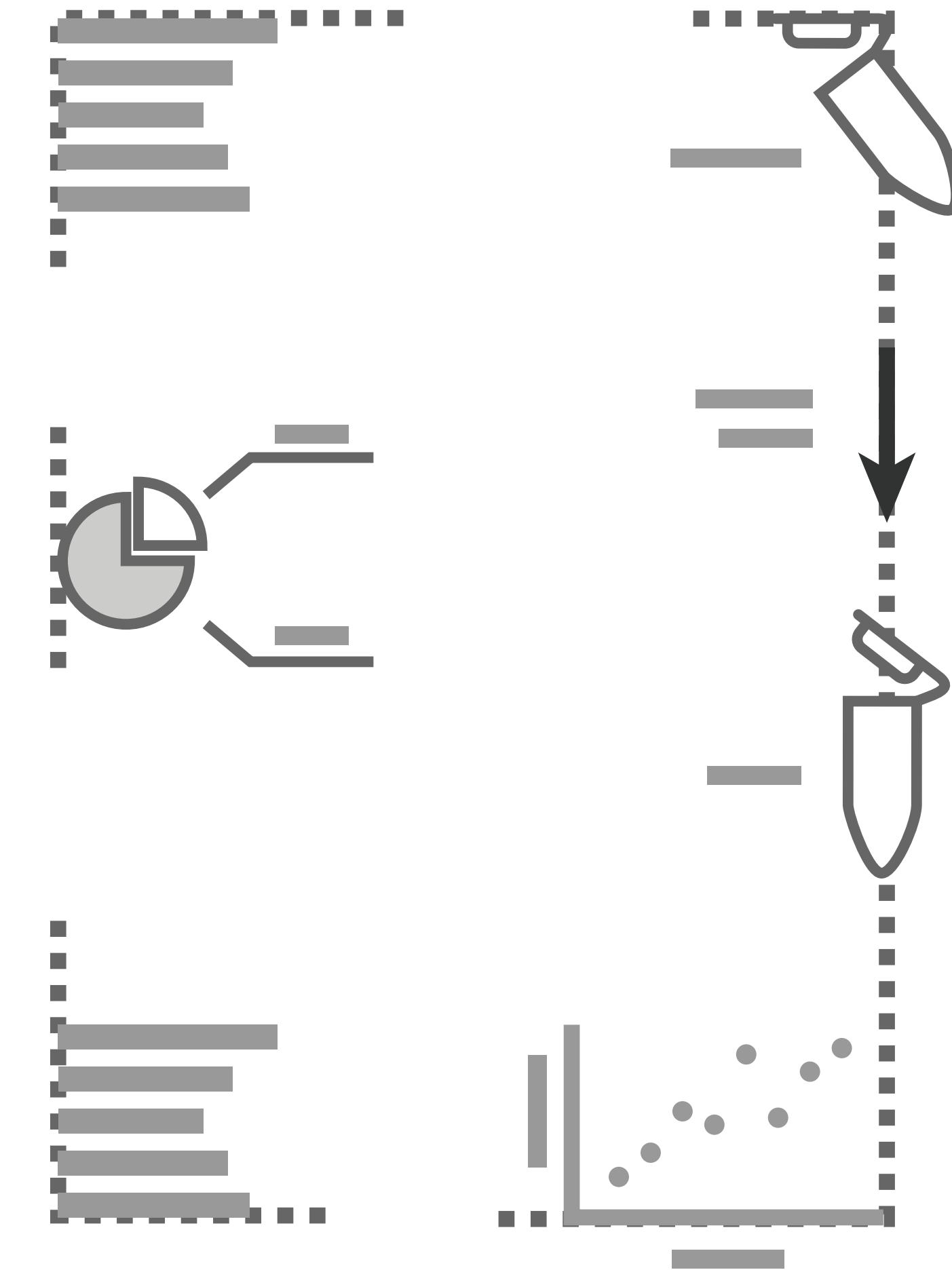
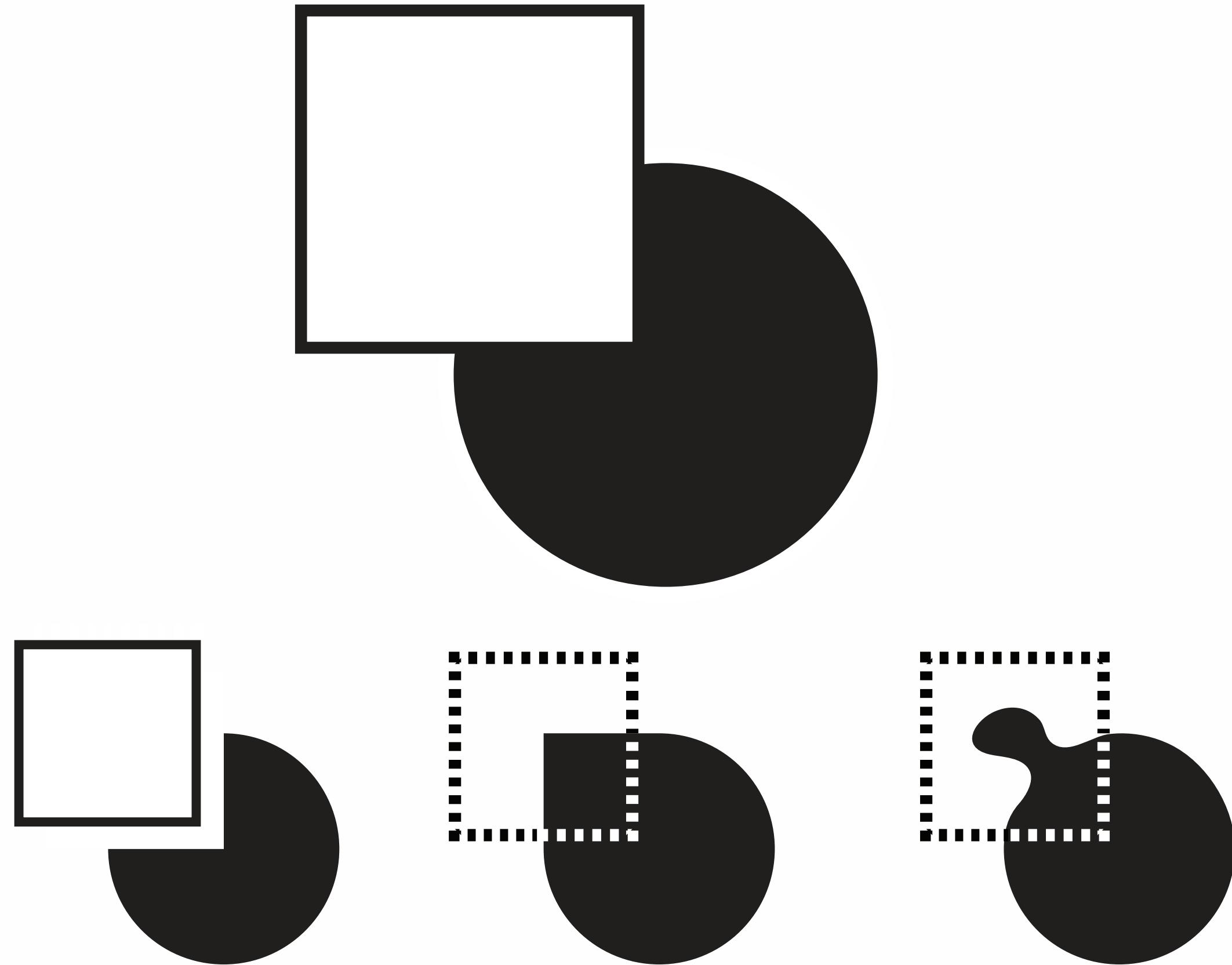
Visual Completion



Visual Completion

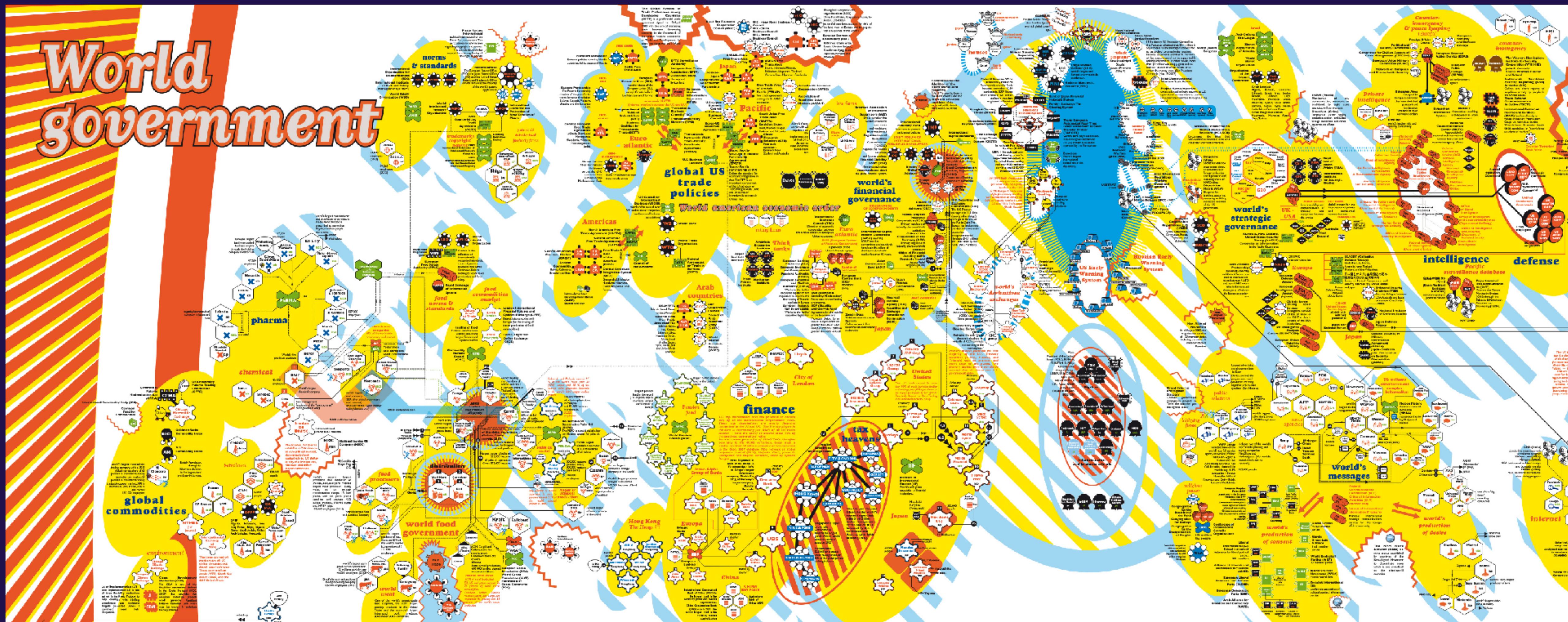


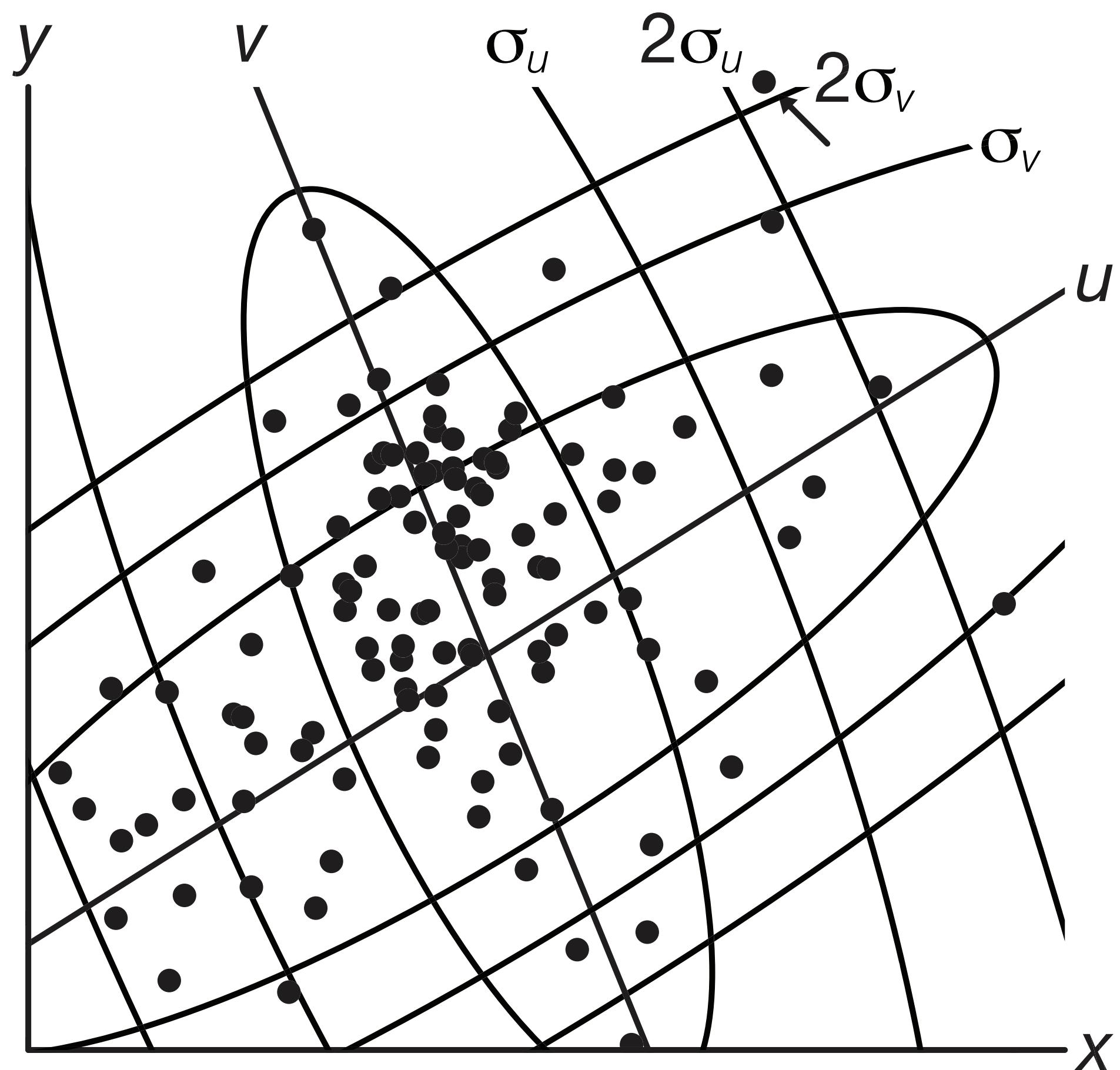
Visual Completion

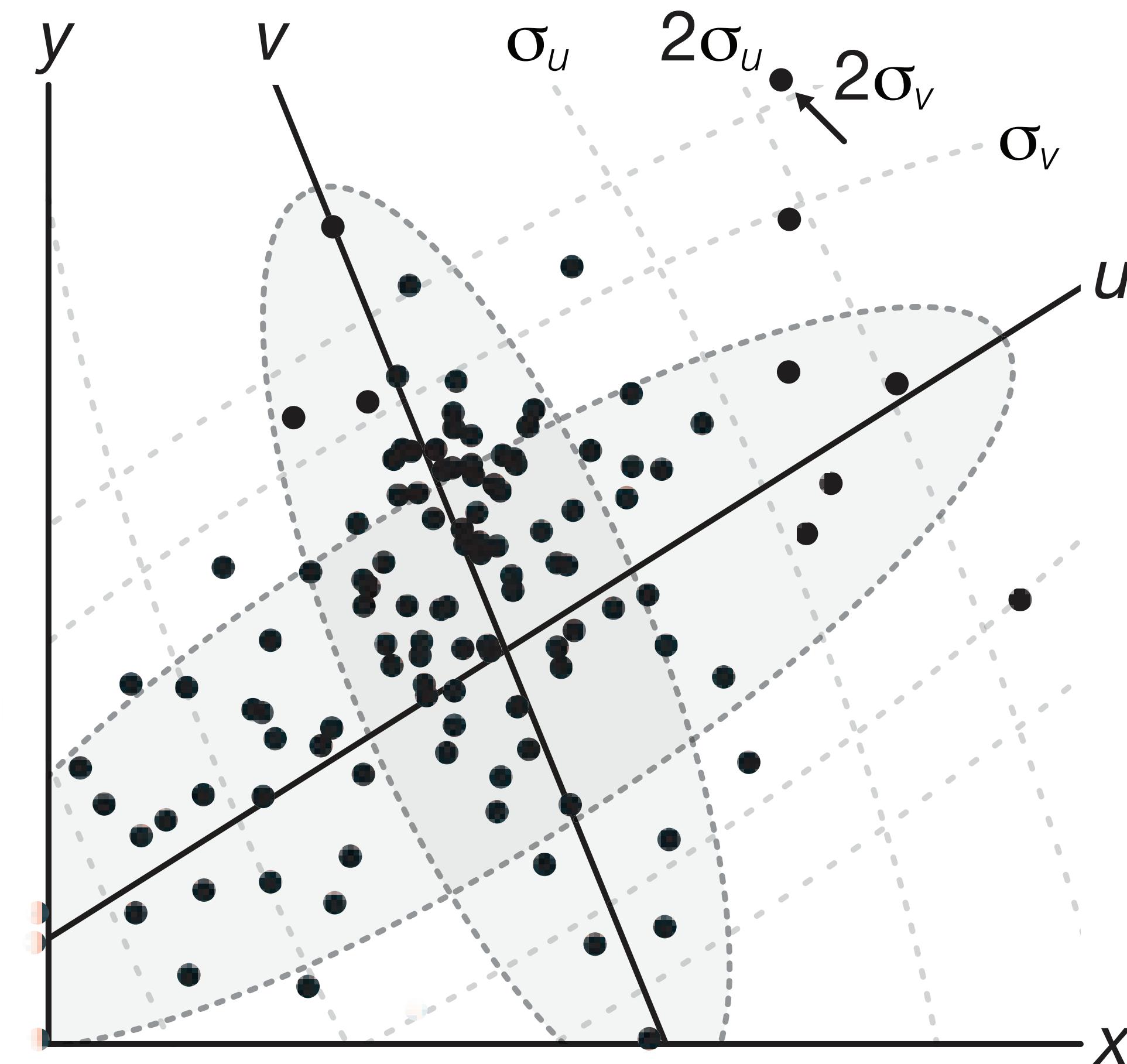
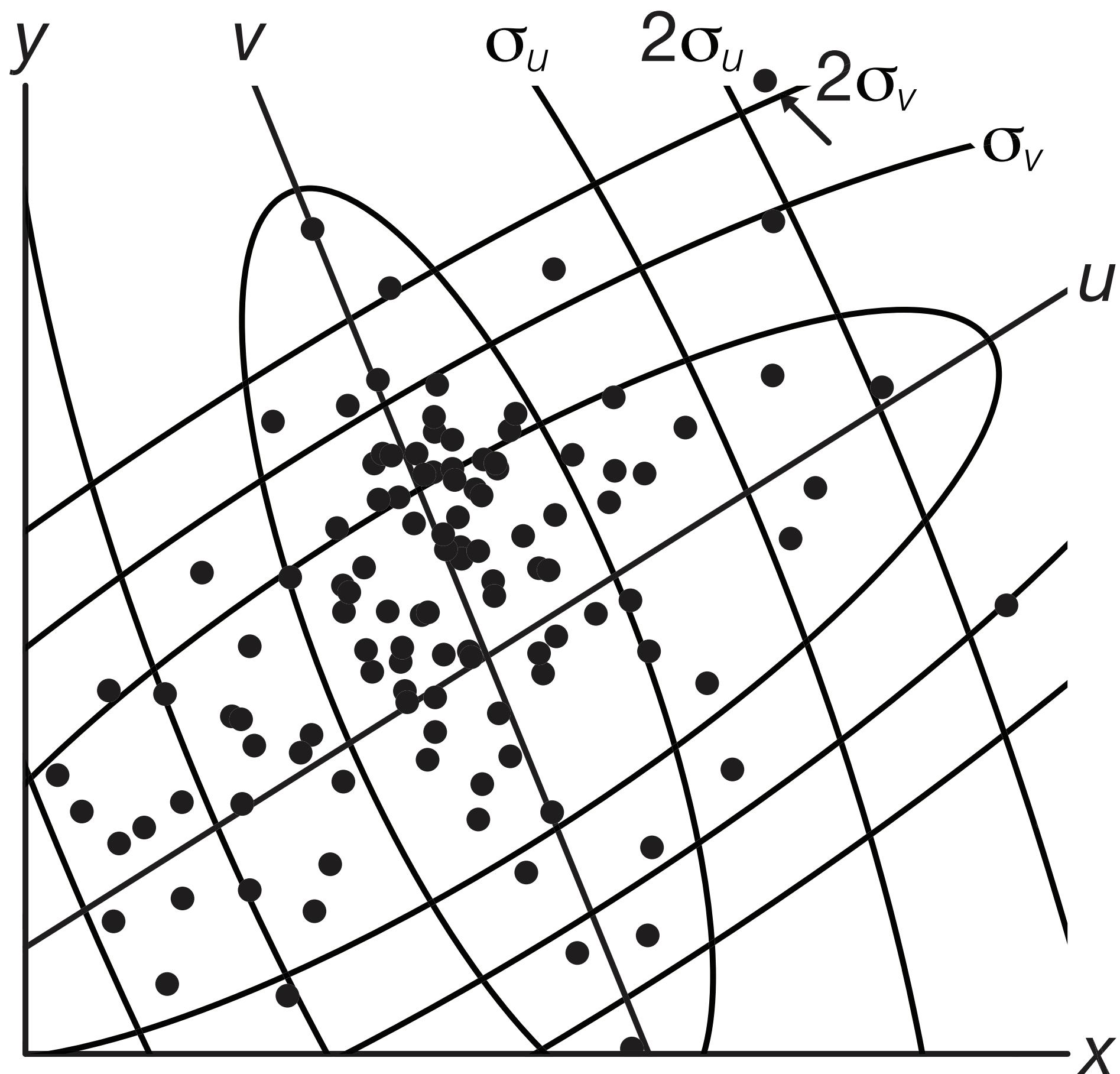


in practice

World government







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data and algorithms are social constructs

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... are created by humans

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... encode biases

data and algorithms are social constructs

... are created by humans

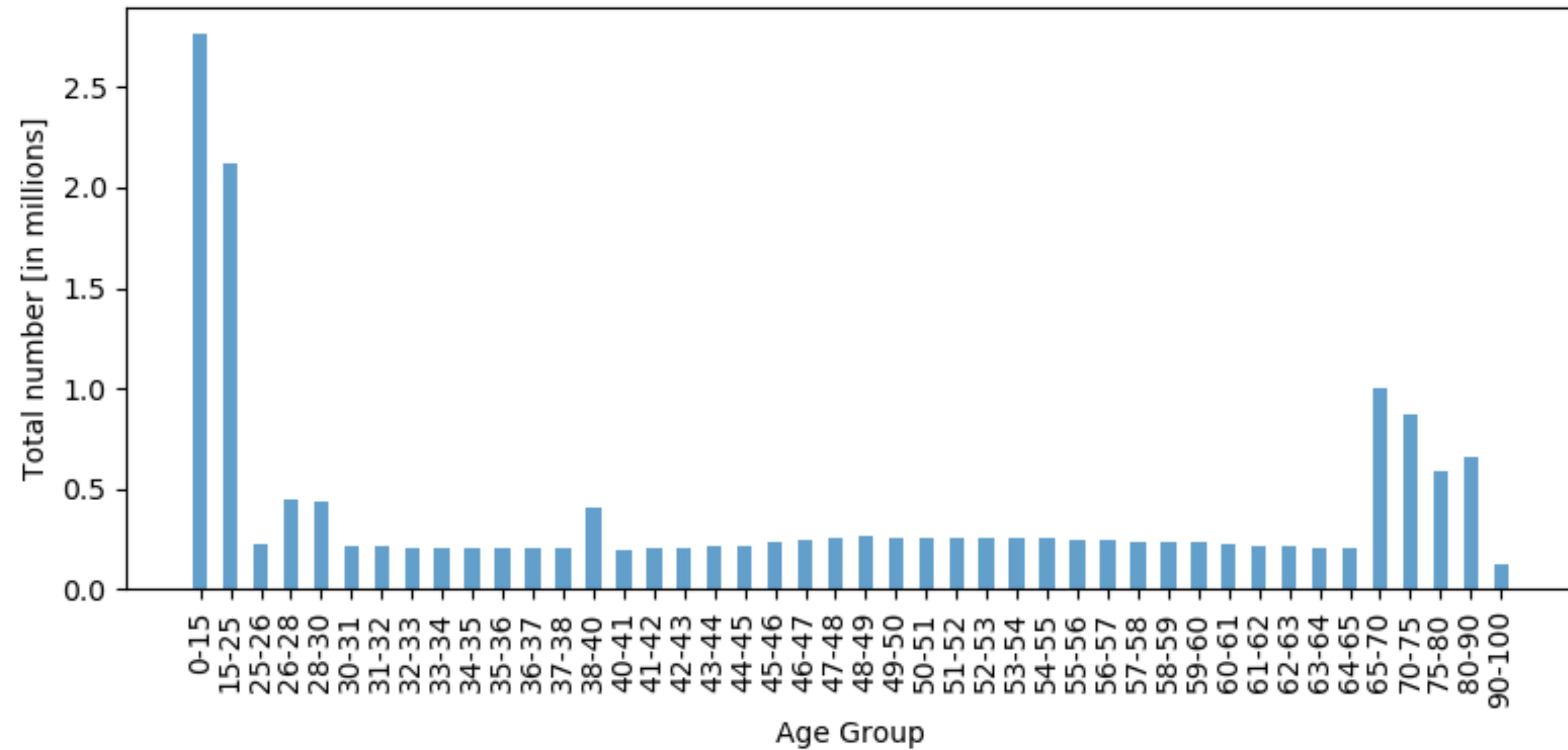
... encode biases

... can be (mis-)used

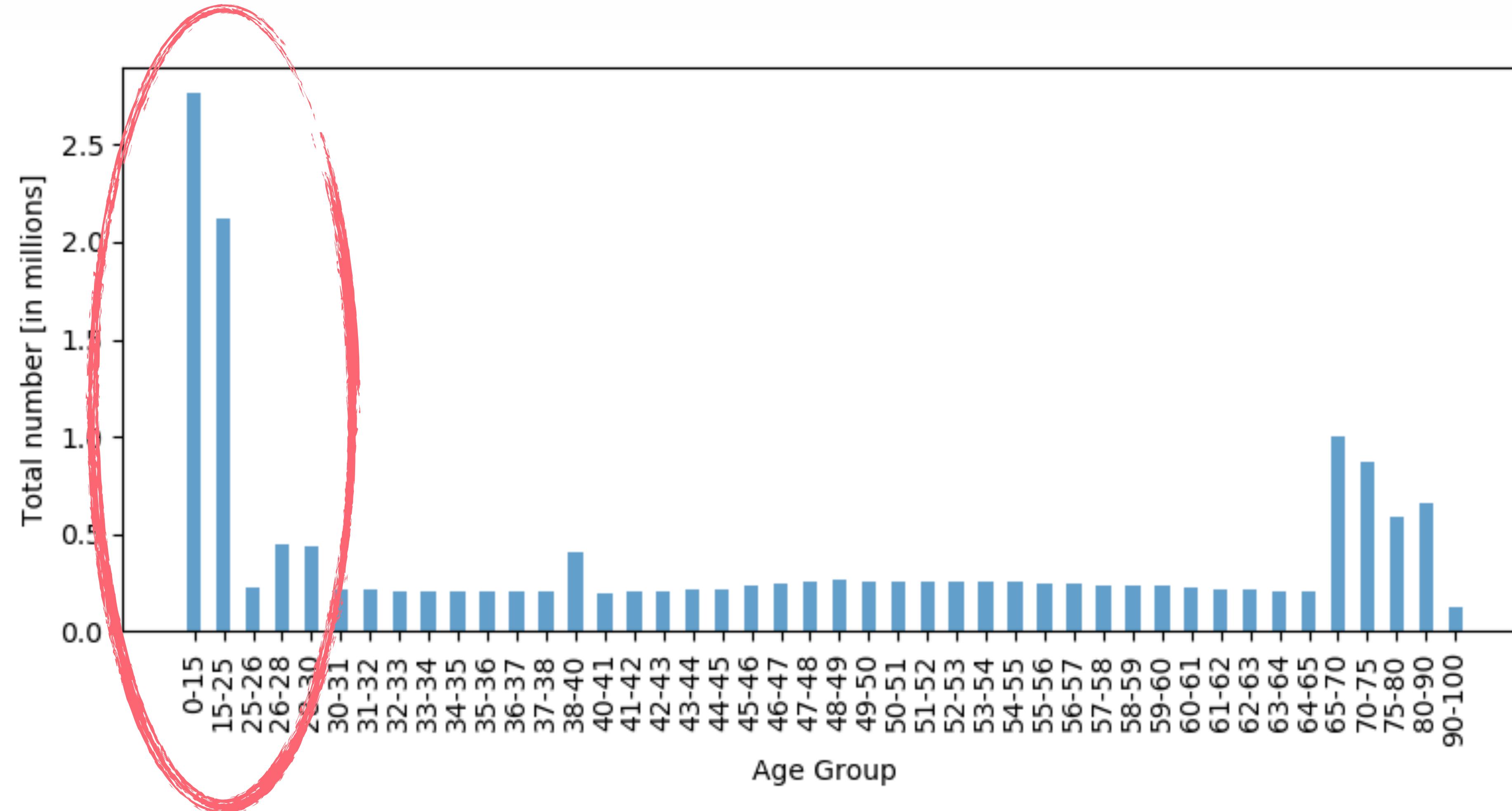
Where should the Netherlands invest their tax money?

- Daycare and schools?
- Elderly care
- Something else?

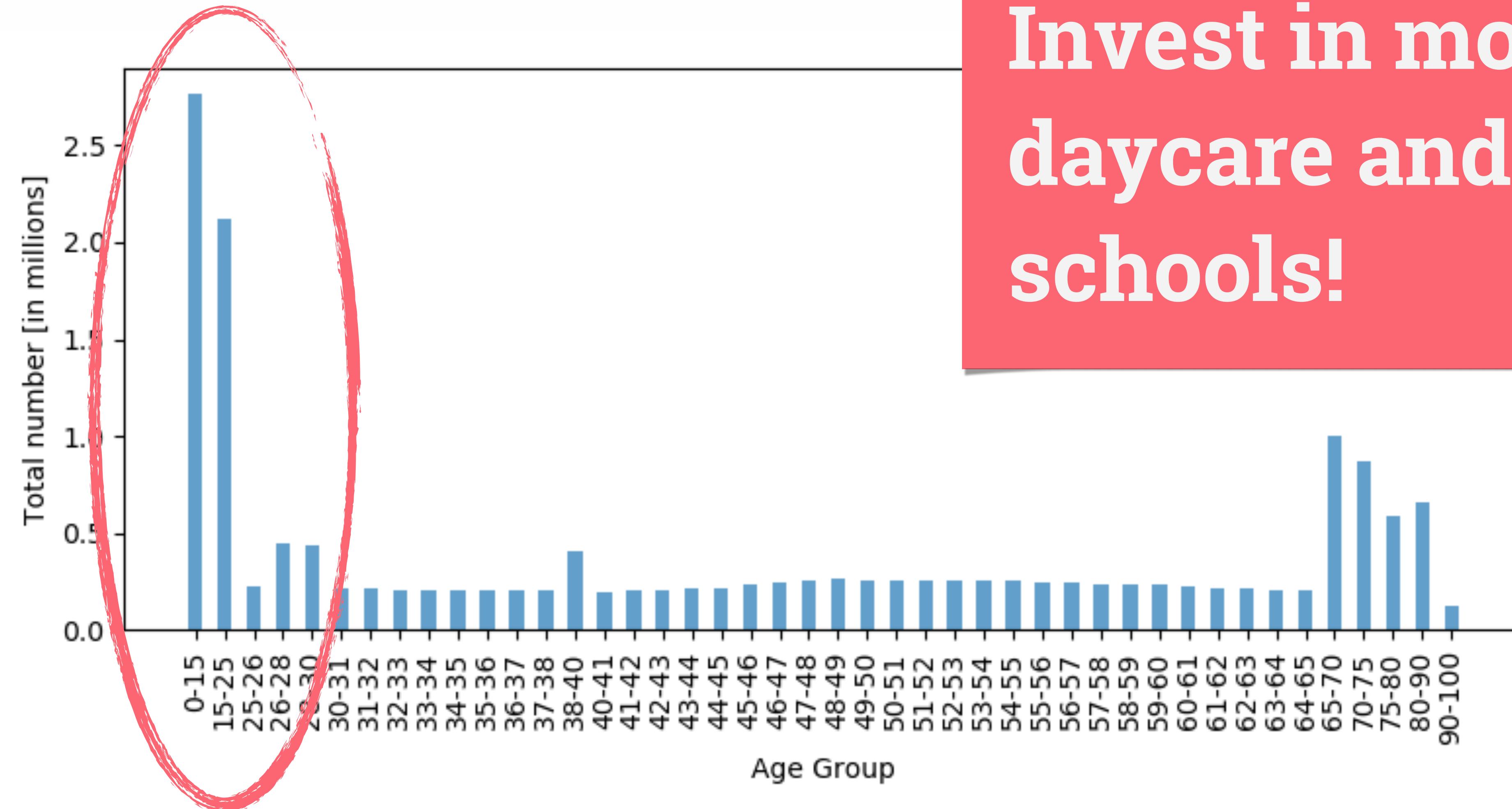
Where should the Netherlands invest their tax money?



Where should the Netherlands invest their tax money?

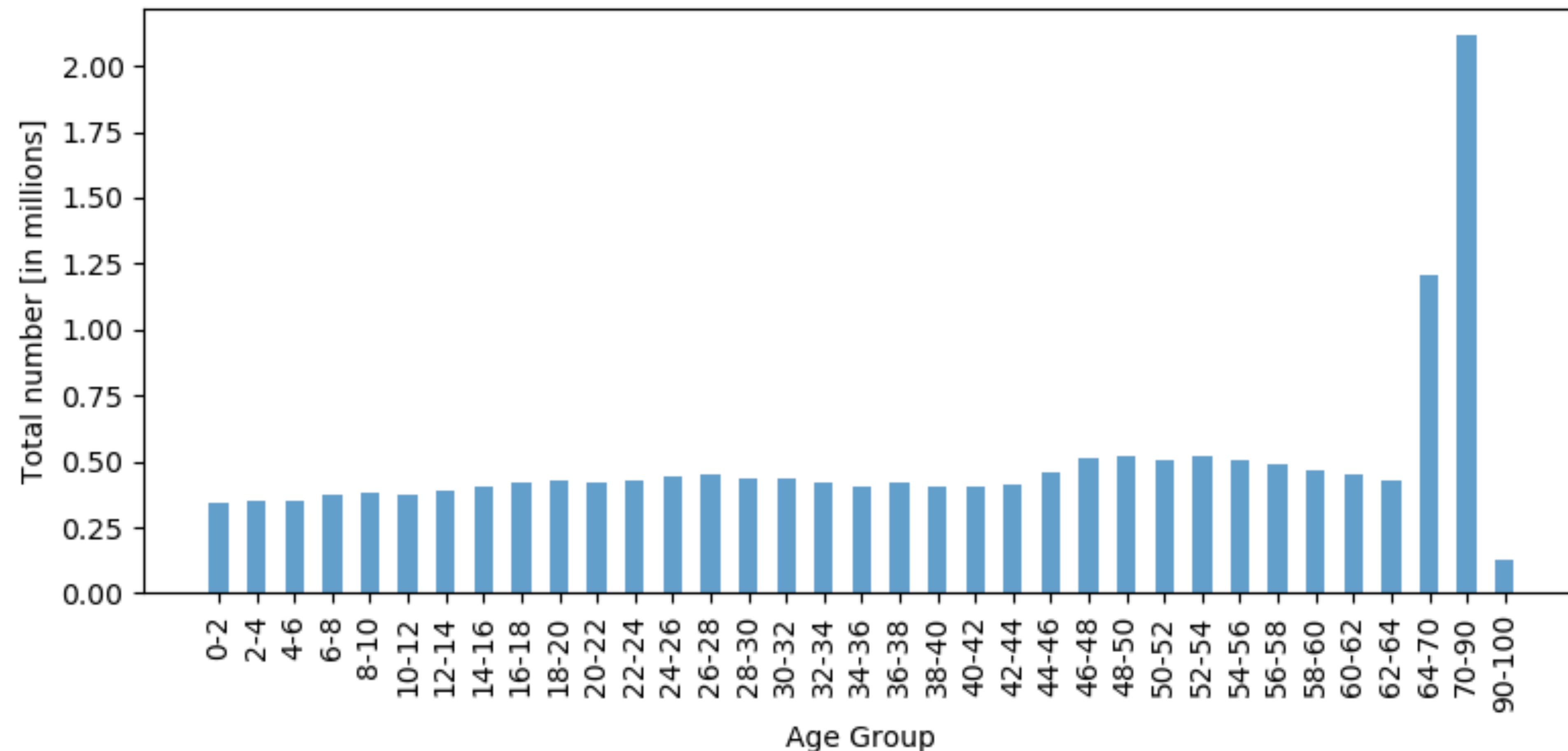


Where should the Netherlands invest their tax money?

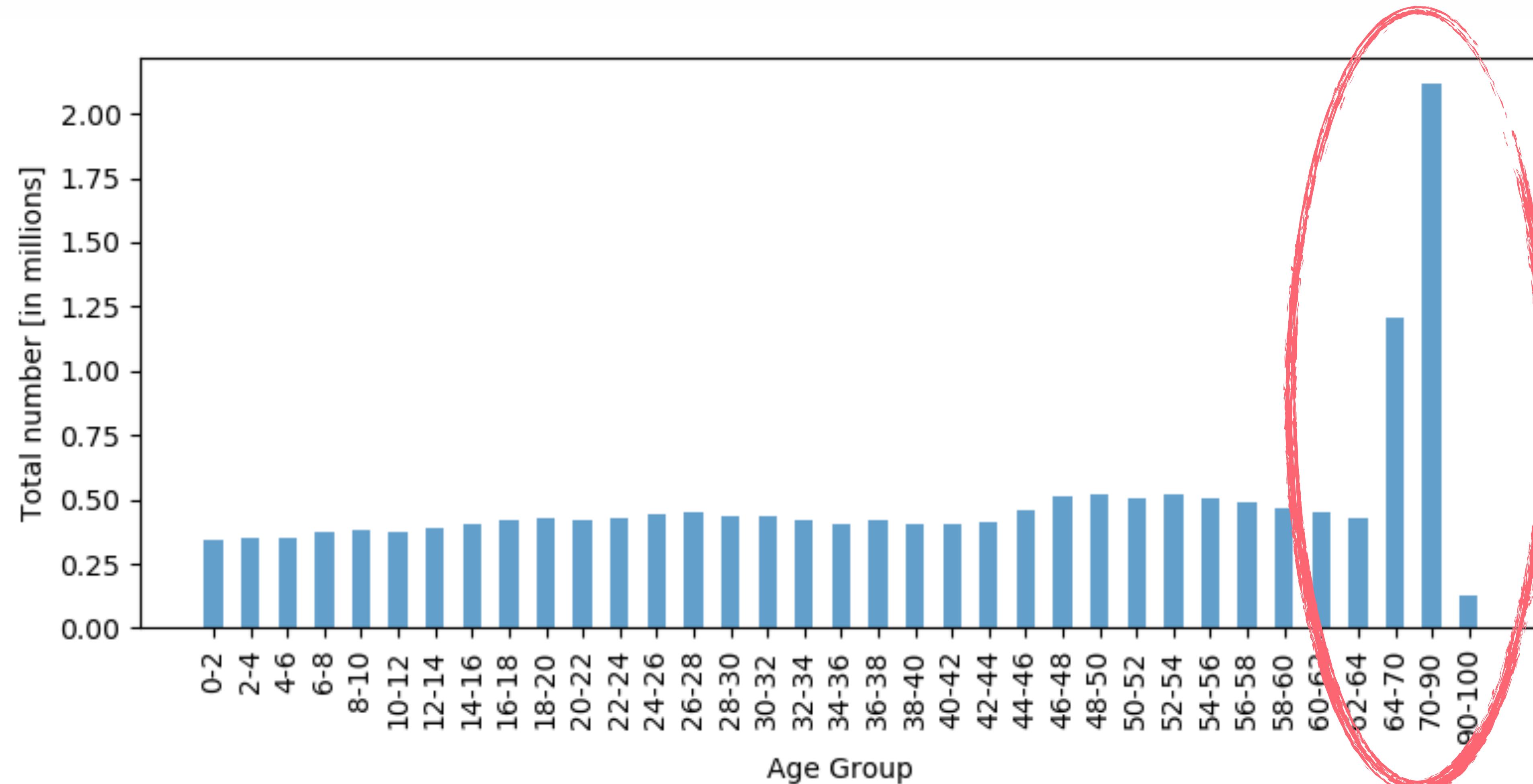


Invest in more
daycare and
schools!

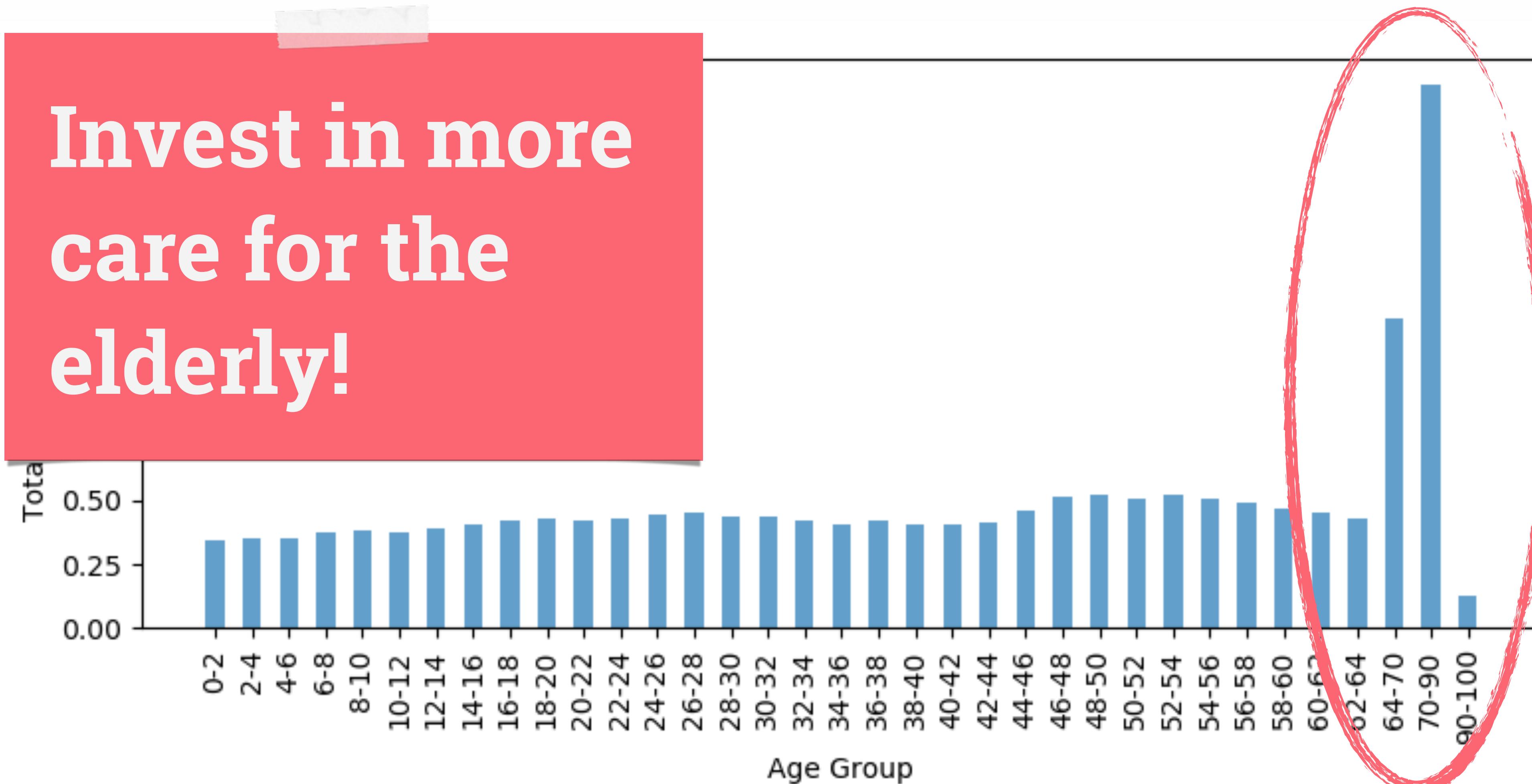
Where should the Netherlands invest their tax money?



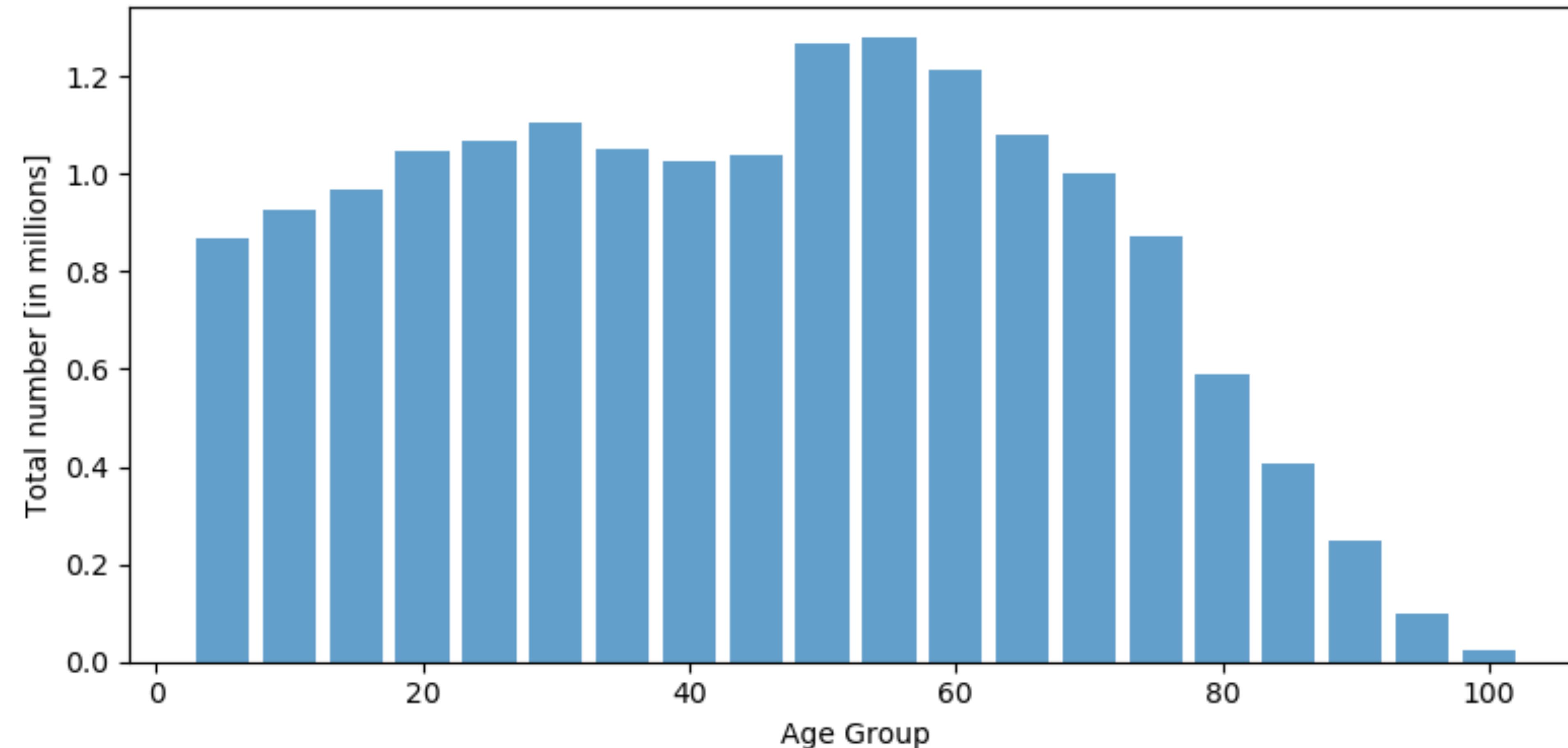
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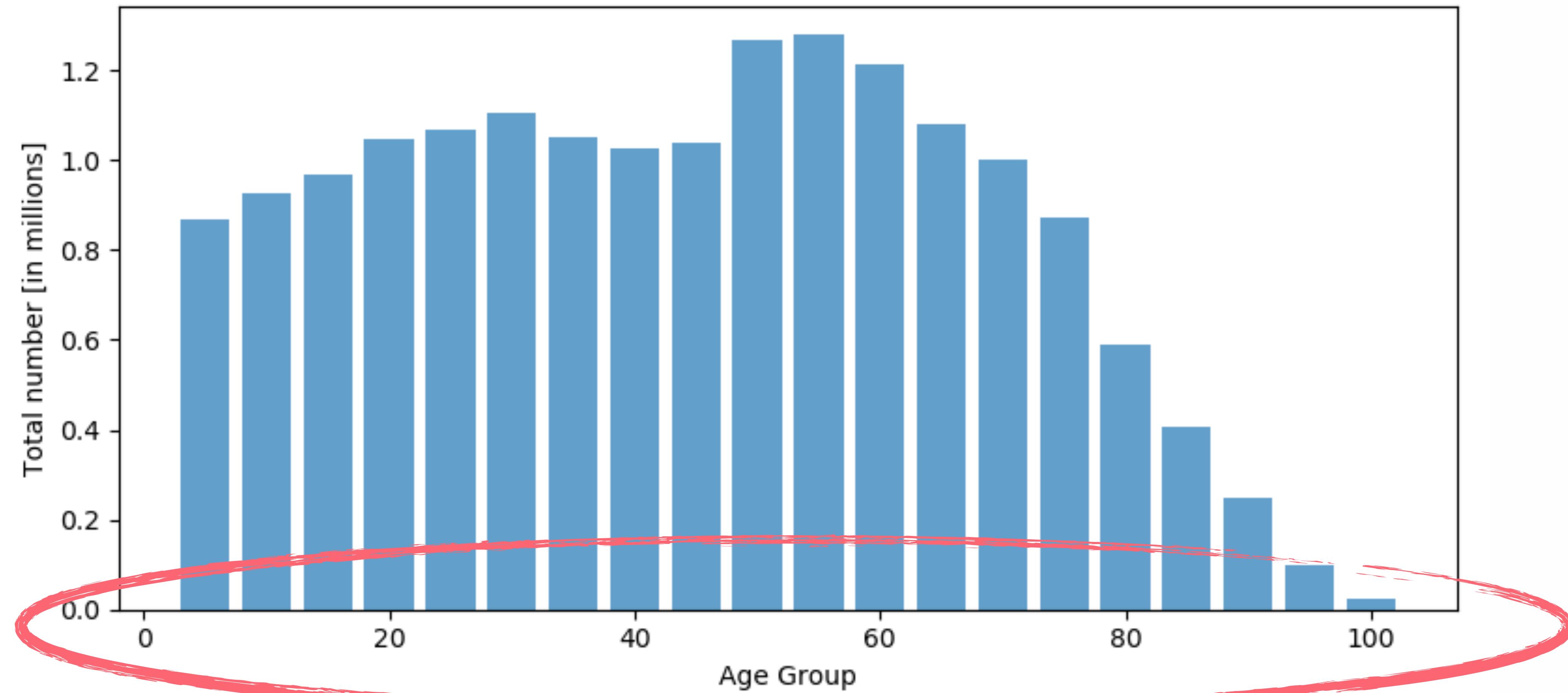
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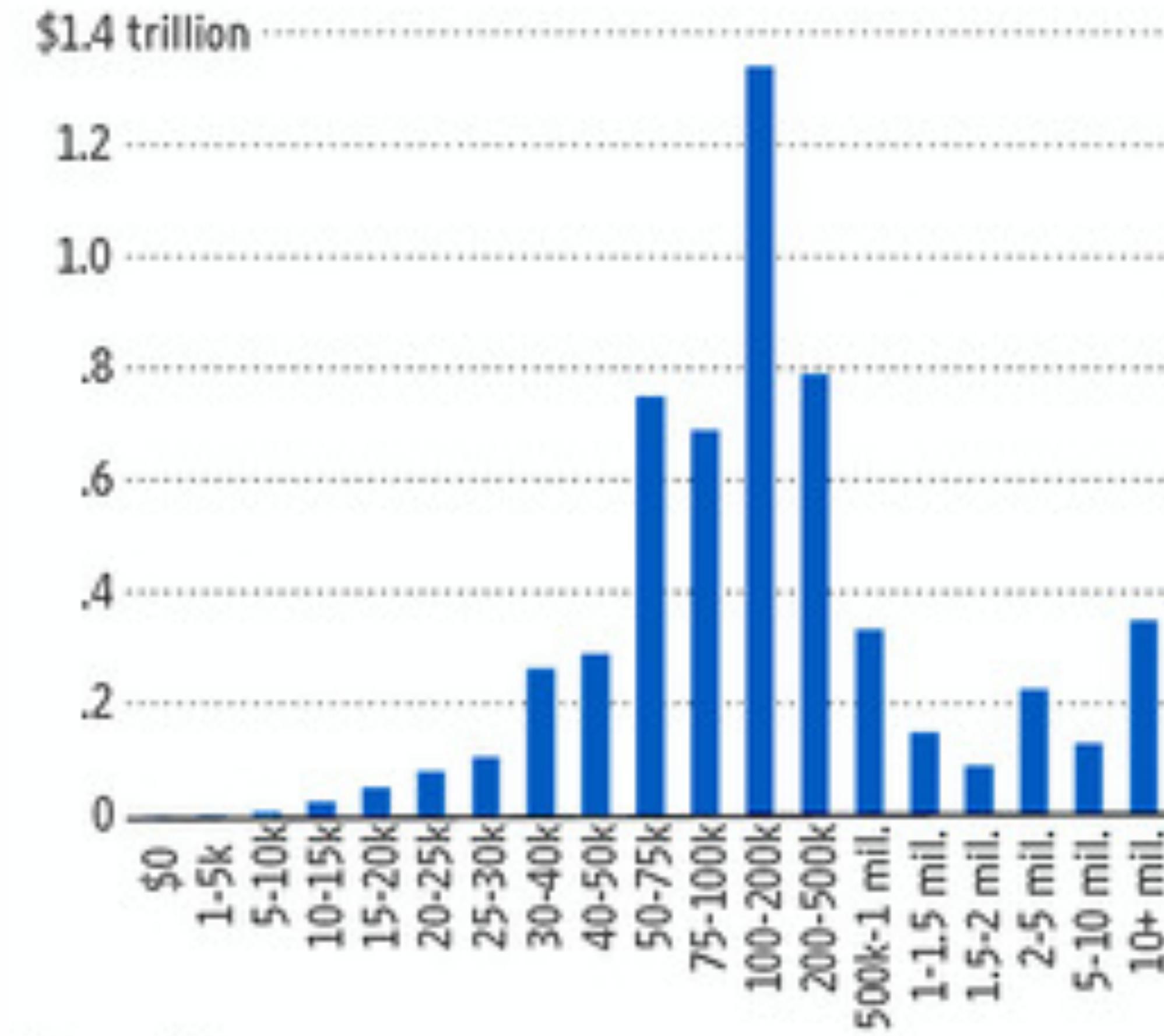


Who should pay the most taxes?

Total Taxable Income

The Middle Class Tax Target

The amount of total taxable income (left scale) for all filers by adjusted gross income level for 2008



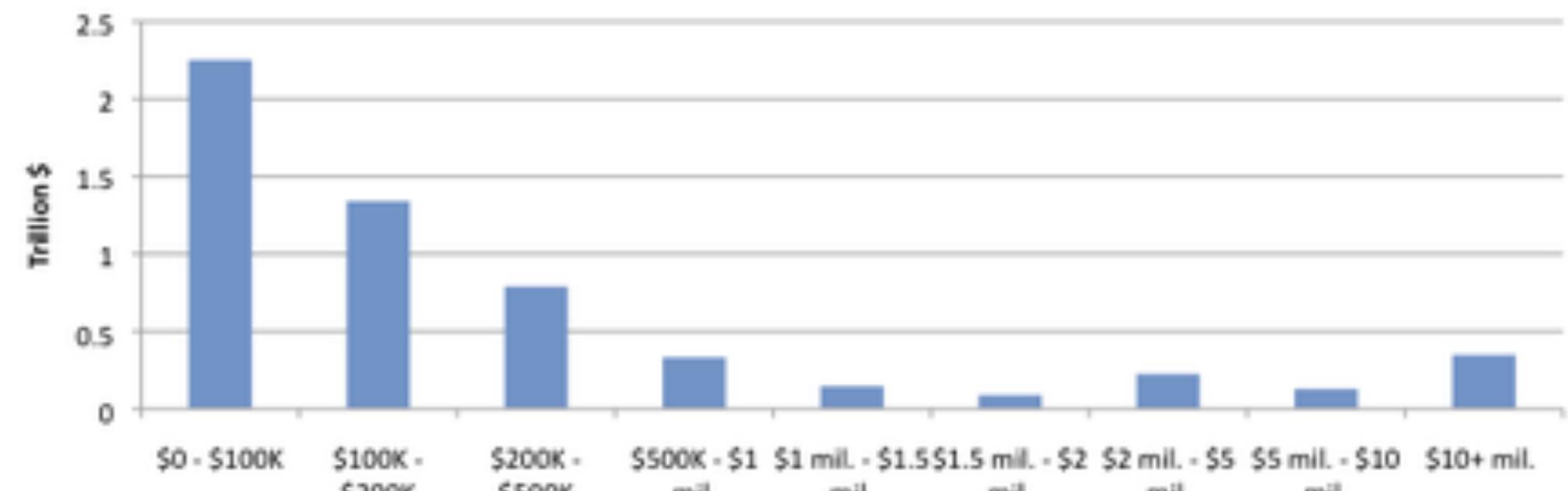
Source: IRS

Income per person

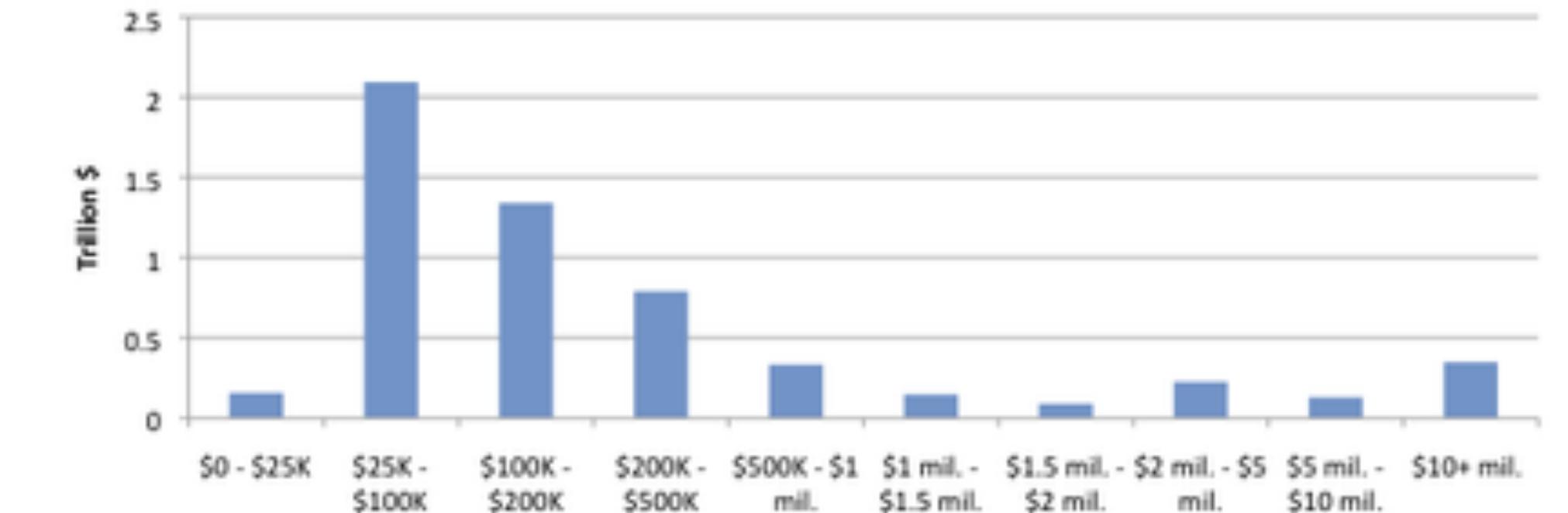
Who should pay the most taxes?



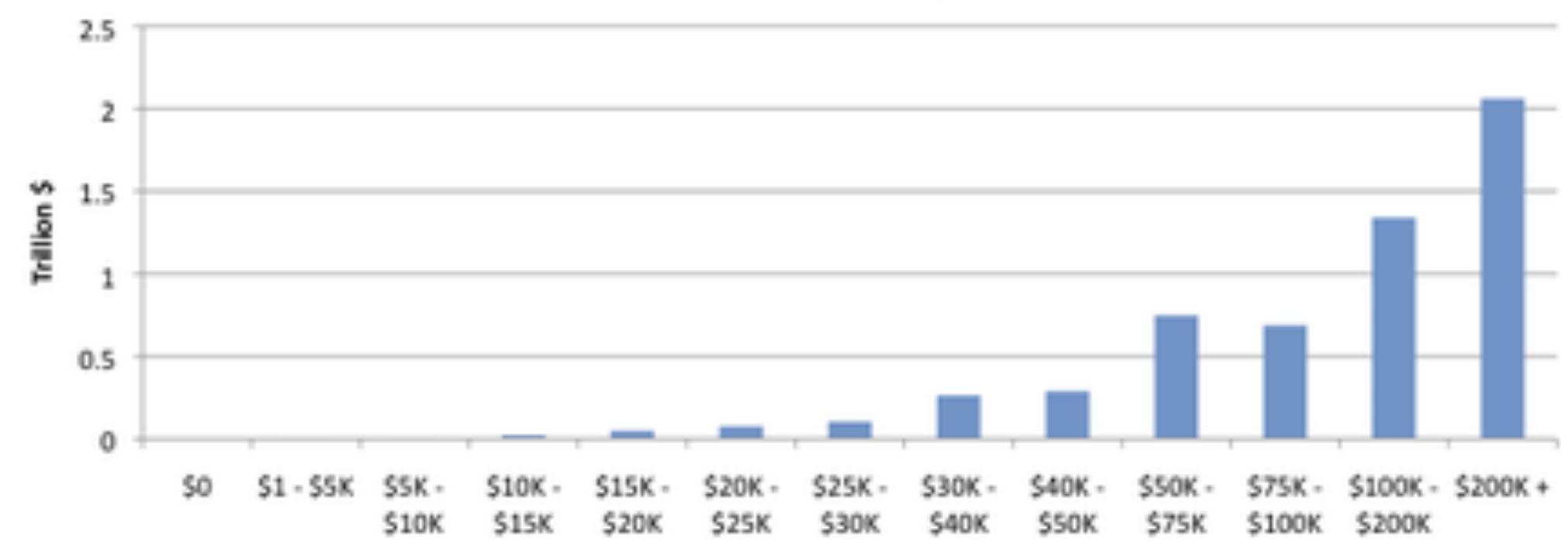
Tax the Poor!



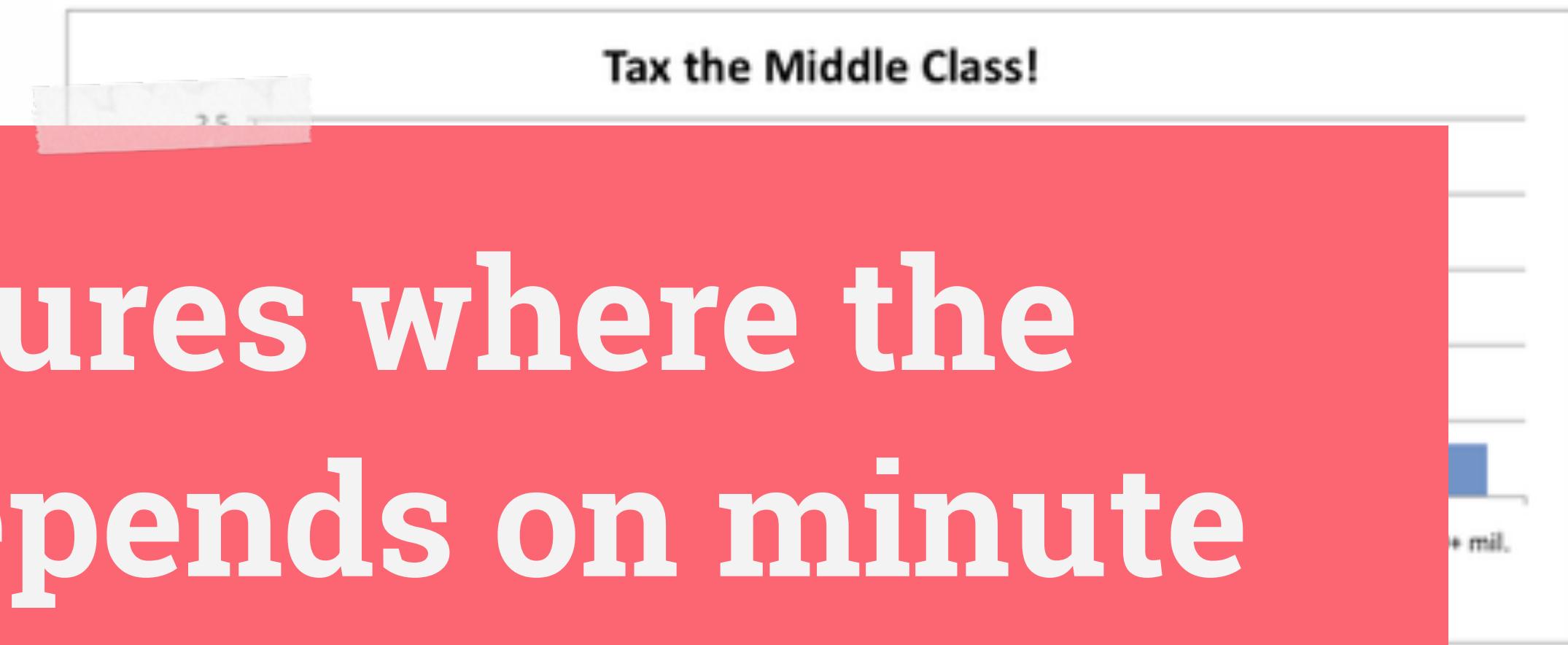
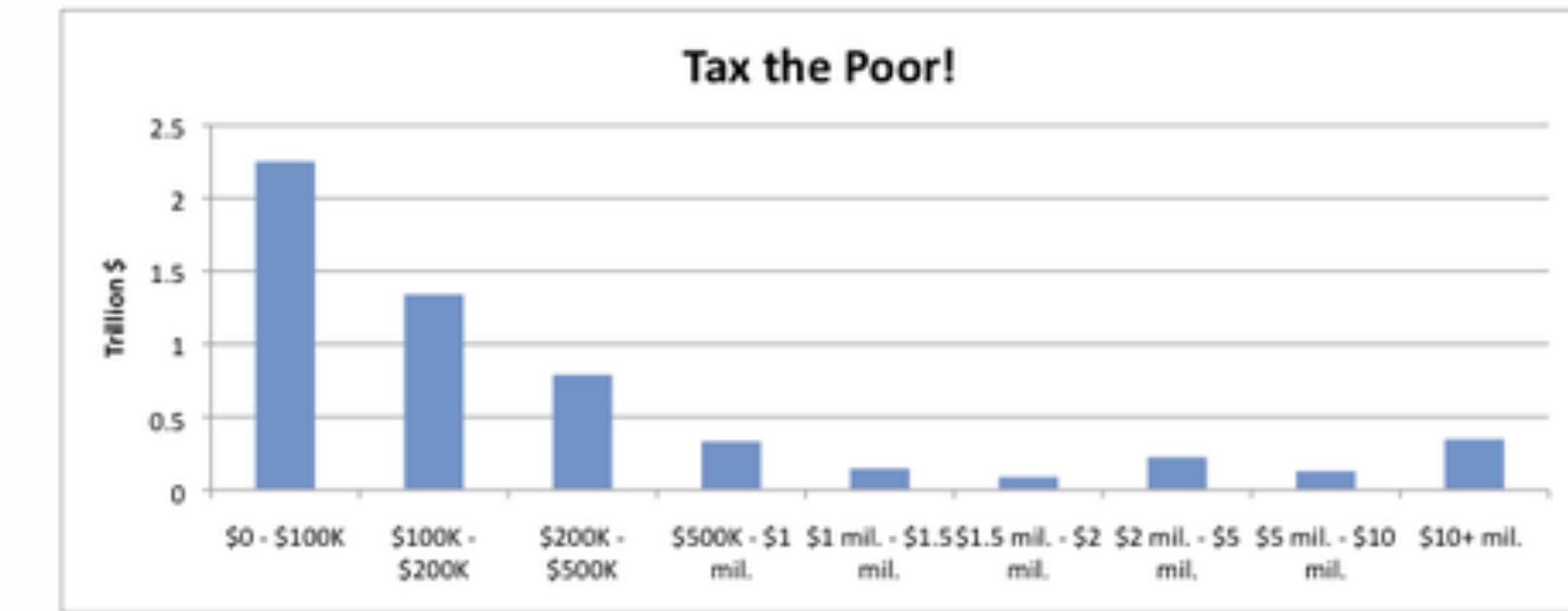
Tax the Middle Class!



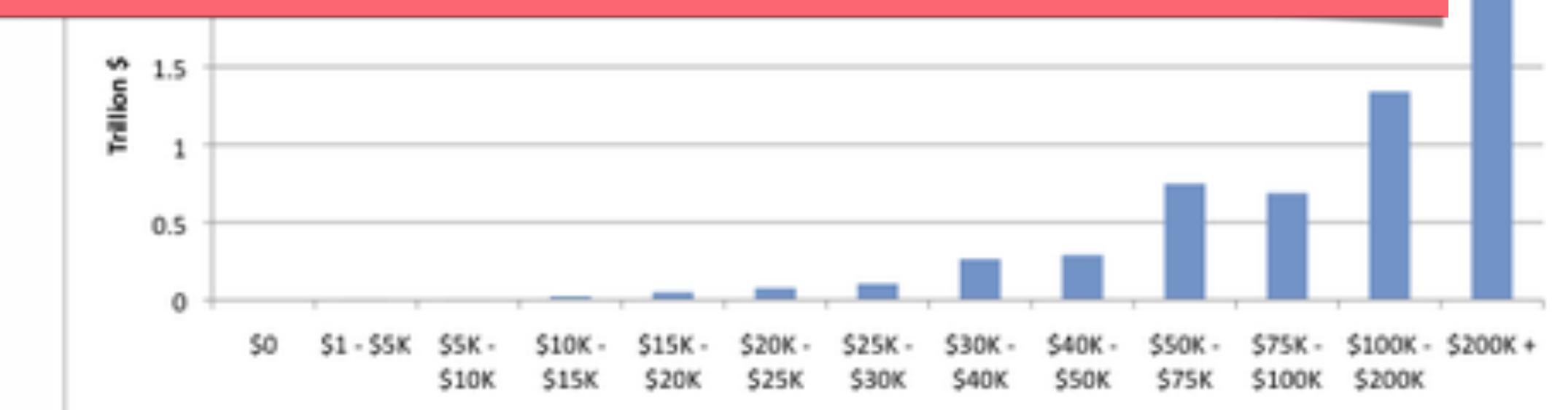
Tax the Wealthy!



Who should pay the most taxes?



Be wary of figures where the **conclusion** depends on minute plotting choices!





Ask yourself: what is the motive of the creator of the visualization?

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Aim to represent data faithfully

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Aim to **represent** data **faithfully**

Make visualizations **easy to understand**



<http://huppenkothen.org/data-visualization-tutorial/>

(You can **help me improve** this tutorial:
<https://github.com/dhuppenkothen/data-visualization-tutorial>)

1. Introduction
2. Exercise: Co-creating best practices
3. Accessibility in Data Visualization
4. Pre-Attentive Processing
5. Gestalt Principles
6. Data Visualization + Society
7. Exercise: Wireframing

Exercise: Wireframing

1. Form teams of 4-5
2. Go to <http://huppenkothen.org/data-visualization-tutorial/11-improveaviz/index.html> and pick a visualization (or use one of your own!) ~5 minutes
1. Discuss: what is the main point of the visualization? What does it do well? What could be improved? ~10 minutes
3. Come up with your own version of a visual representation of the data ~7 minutes
4. Pick a piece of paper and a set of pens/crayons and create a sketch of your new version ~8 minutes

Time: 30 minutes