

# Design- Portfolio.

by Zezhong Wang

## Current Position

Postdoctoral Fellow  
Simon Fraser University

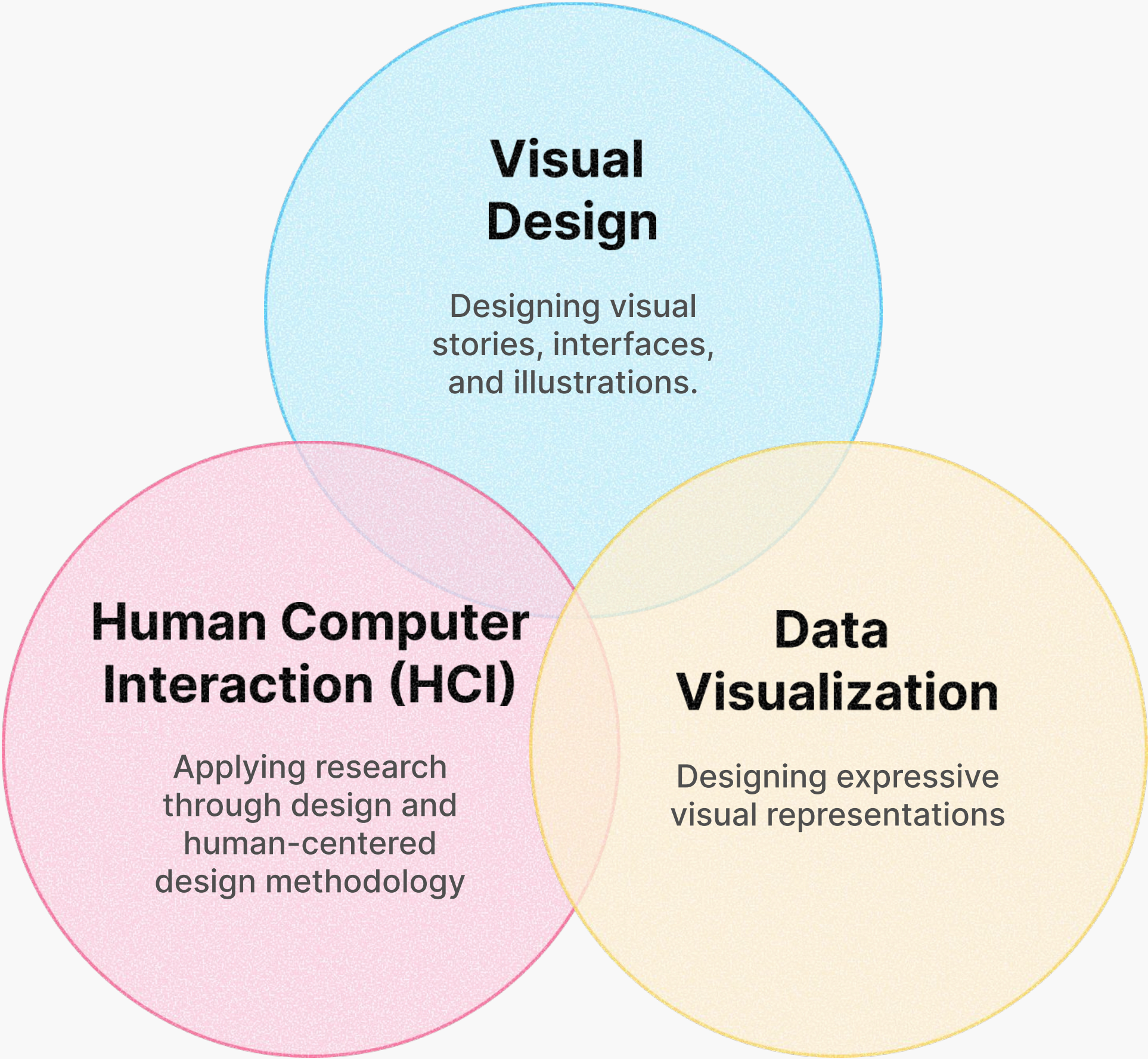
## Contact

Email: wangzezhong2016@gmail.com

## Website

[www.zezhongwang.com](http://www.zezhongwang.com)

# Research & Design Interests



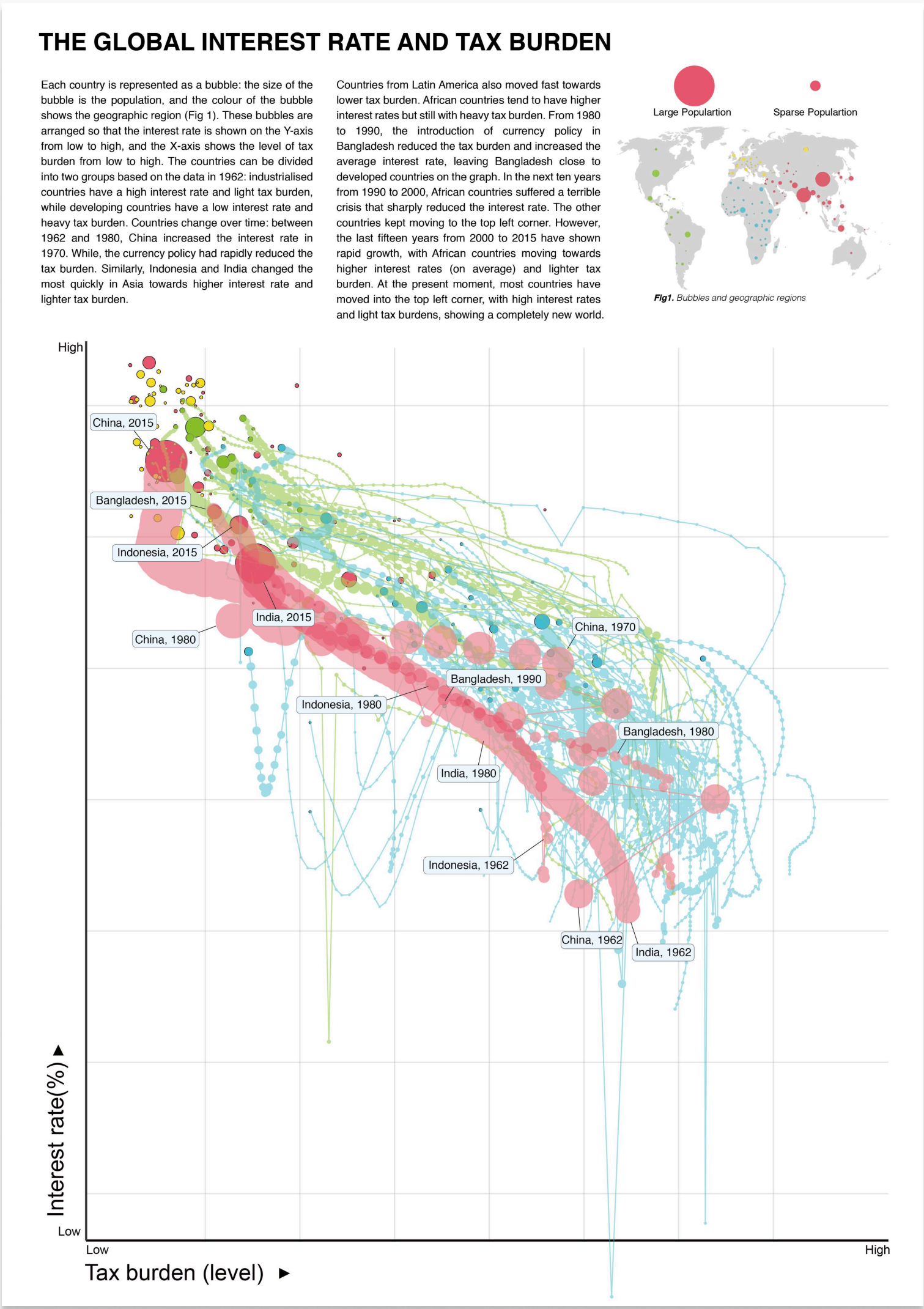
I am currently a postdoctoral fellow at the Interactive Experiences Lab, Simon Fraser University, Canada. I earned my PhD from the School of Informatics, University of Edinburgh. I am a passionate interdisciplinary designer and researcher with a keen eye for creating work that centers on people’s curiosity about data. I like creating designs that are **helpful**, **ethical**, and **whimsical** (playfully quaint or fanciful, especially in an appealing and amusing way).

With a background in visual design (digital media design), human-computer interaction (UX/UI design), and data visualization. I focus on making data accessible to a broad audience through visual and interactive storytelling techniques by using human-centered design thinking and research through design methodology.

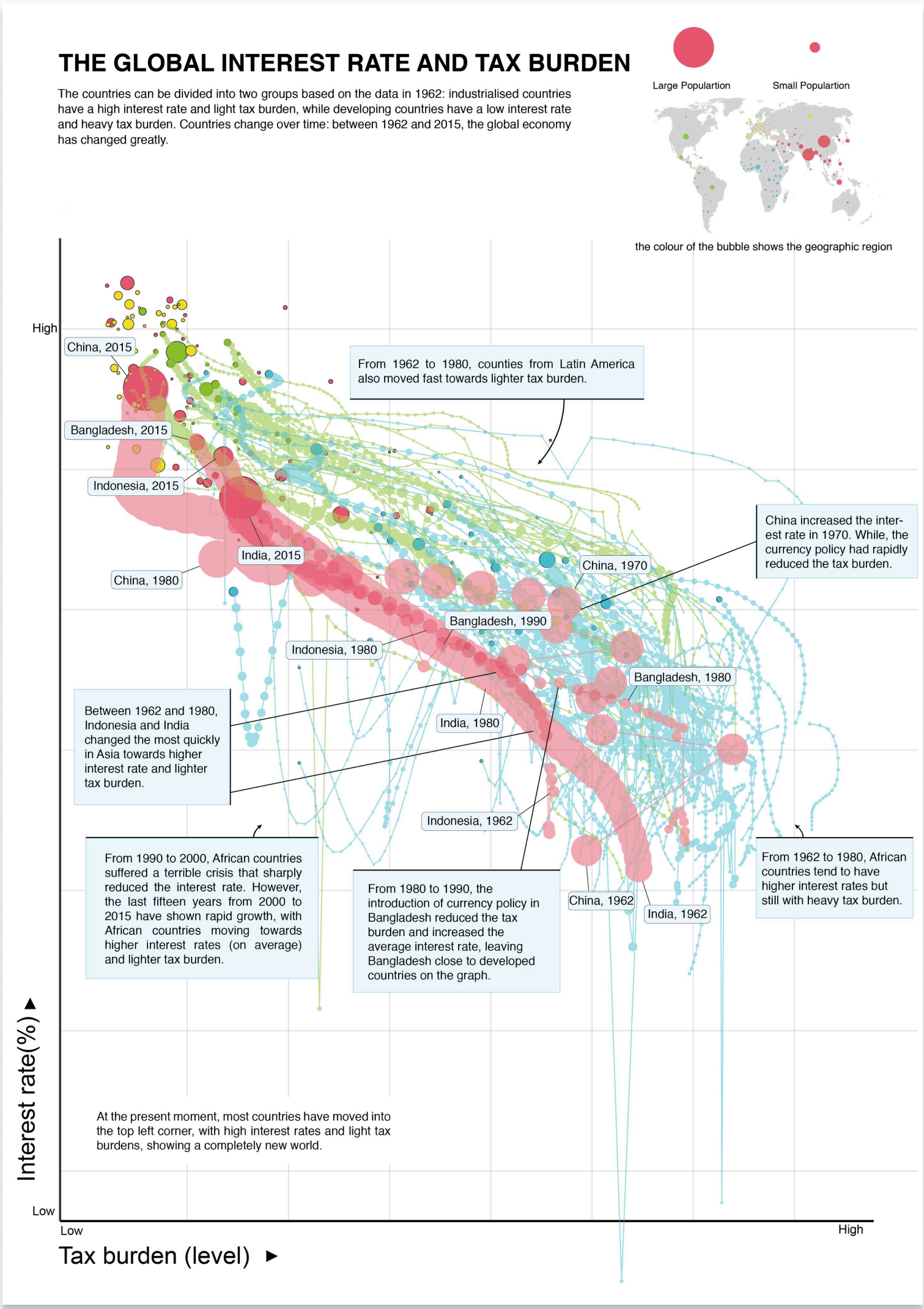


To explore how visual data stories can be designed to promote understanding, I started by studying the positional relationship between text and visualizations.

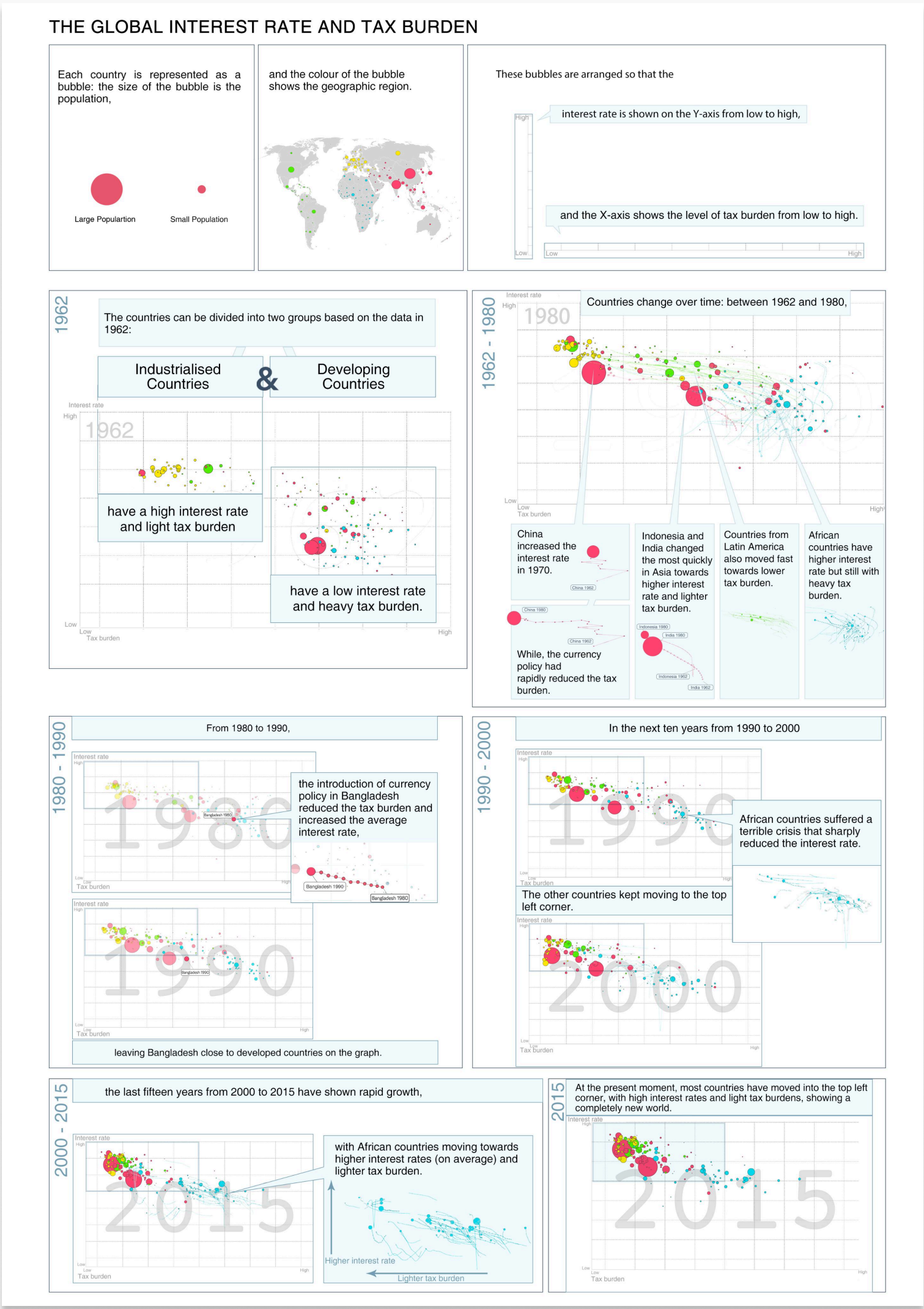
Texts and images are **separated**



Texts and images are **more integrated**



Text and images are **tightly integrated**





# Comparing the Effectiveness

I conducted studies in the lab and in the wild to examine how different conditions influence **comprehension, recall, and engagement**.

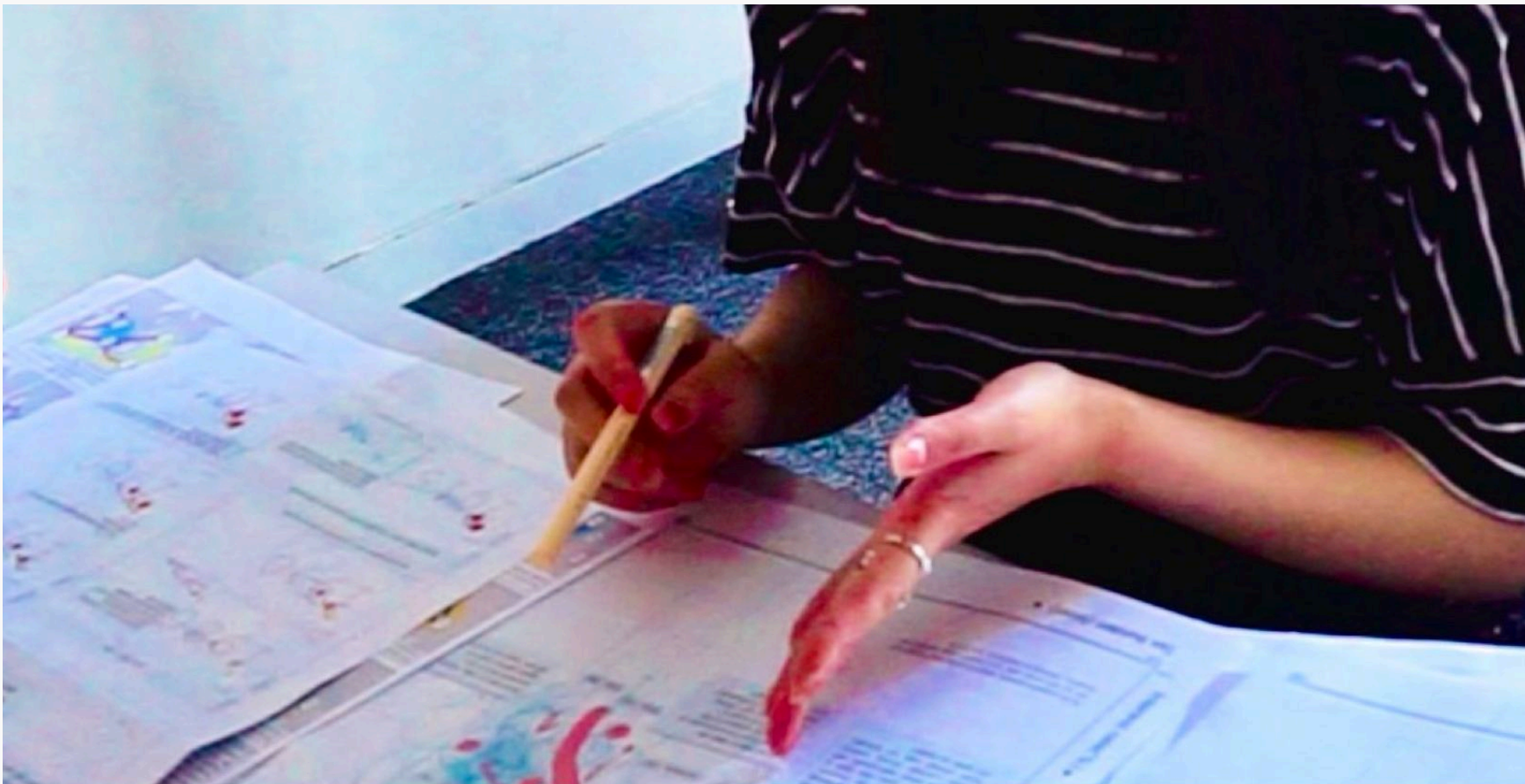
Participants were also asked to **draw their reading order** to help see how design conditions guided their reading.

I discovered that people engage and recall more details about the data when it is presented in a comic, forming a deeper understanding and connections to this data.

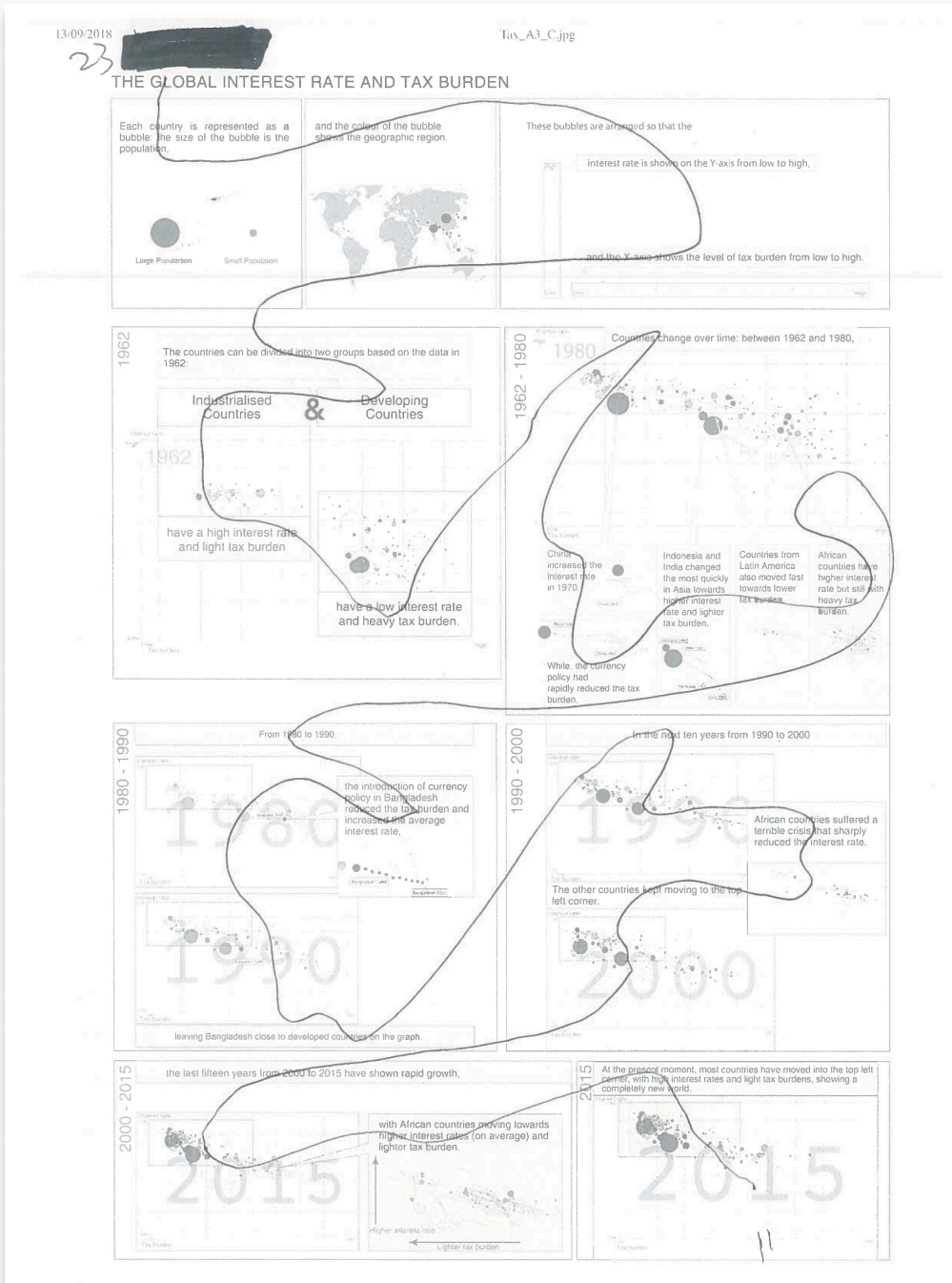
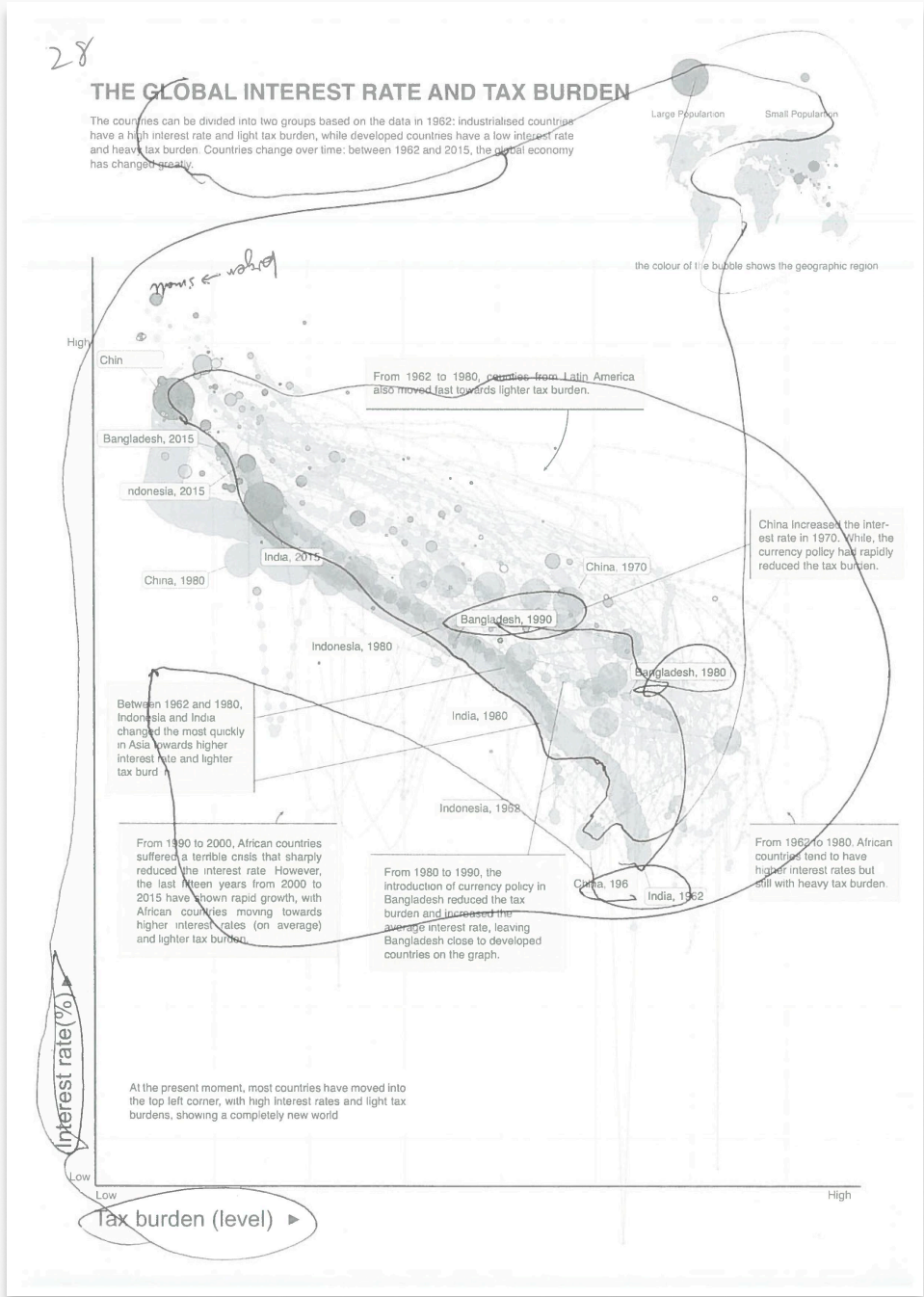
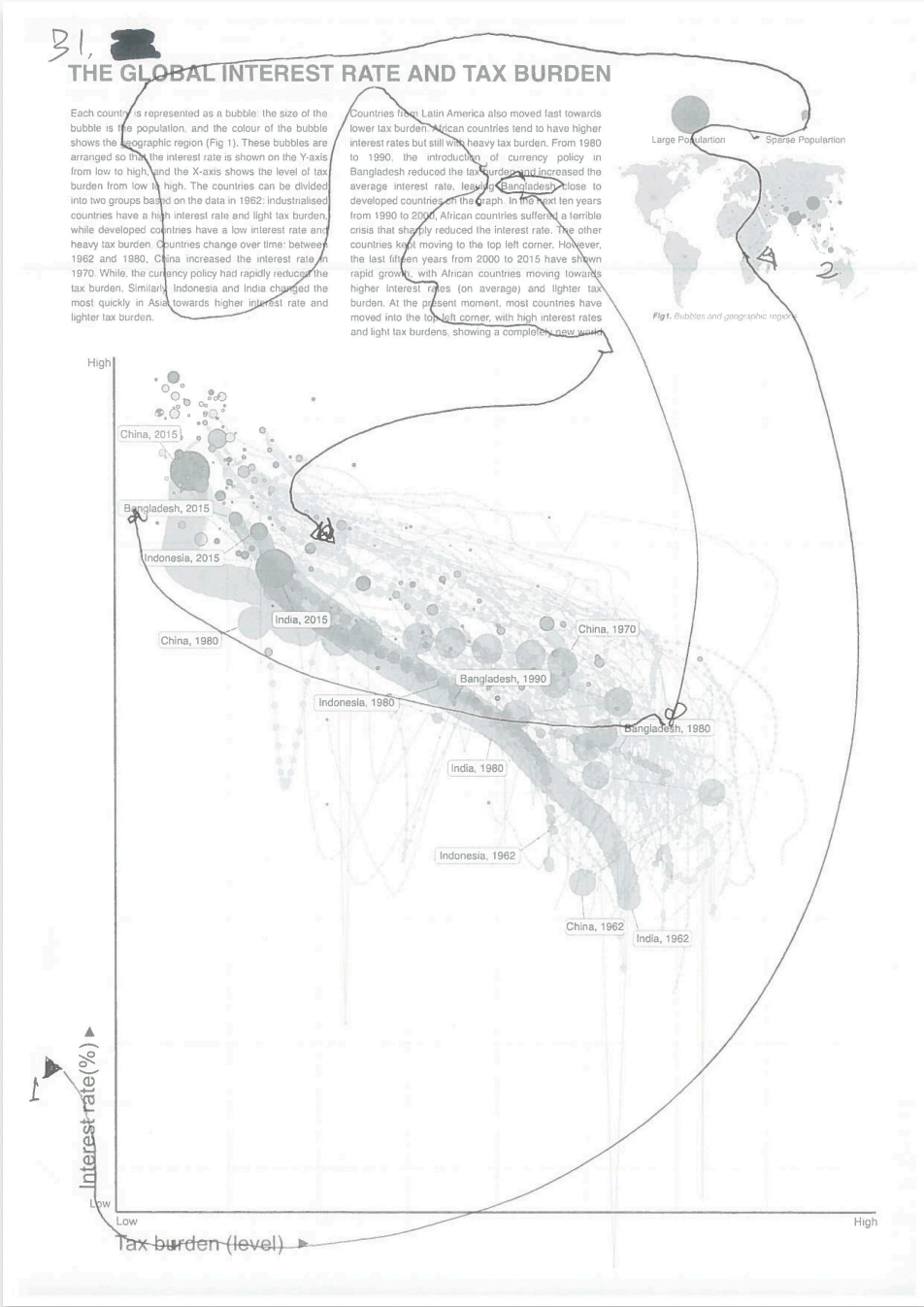
**Z. Wang**, S. Wang, M. Farinella, D. Murray-Rust, N. Henry Riche, and B. Bach (CHI 2019). Comparing effectiveness and engagement of data comics and infographics. In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems.

[Find the Paper ↗](#)

## Lab Study



## In-the-Wild Study



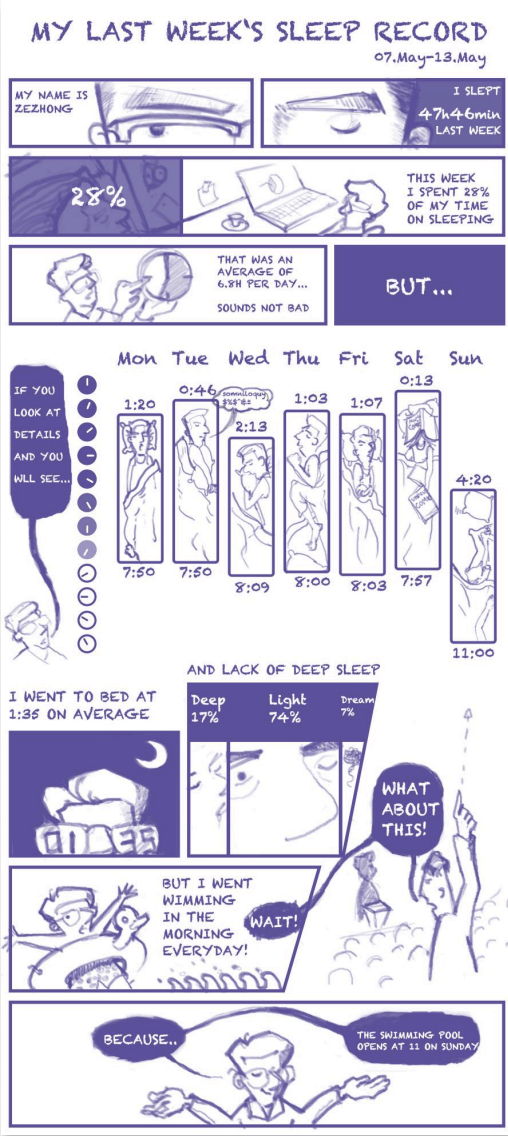


# Exploring the Design of Data Comics

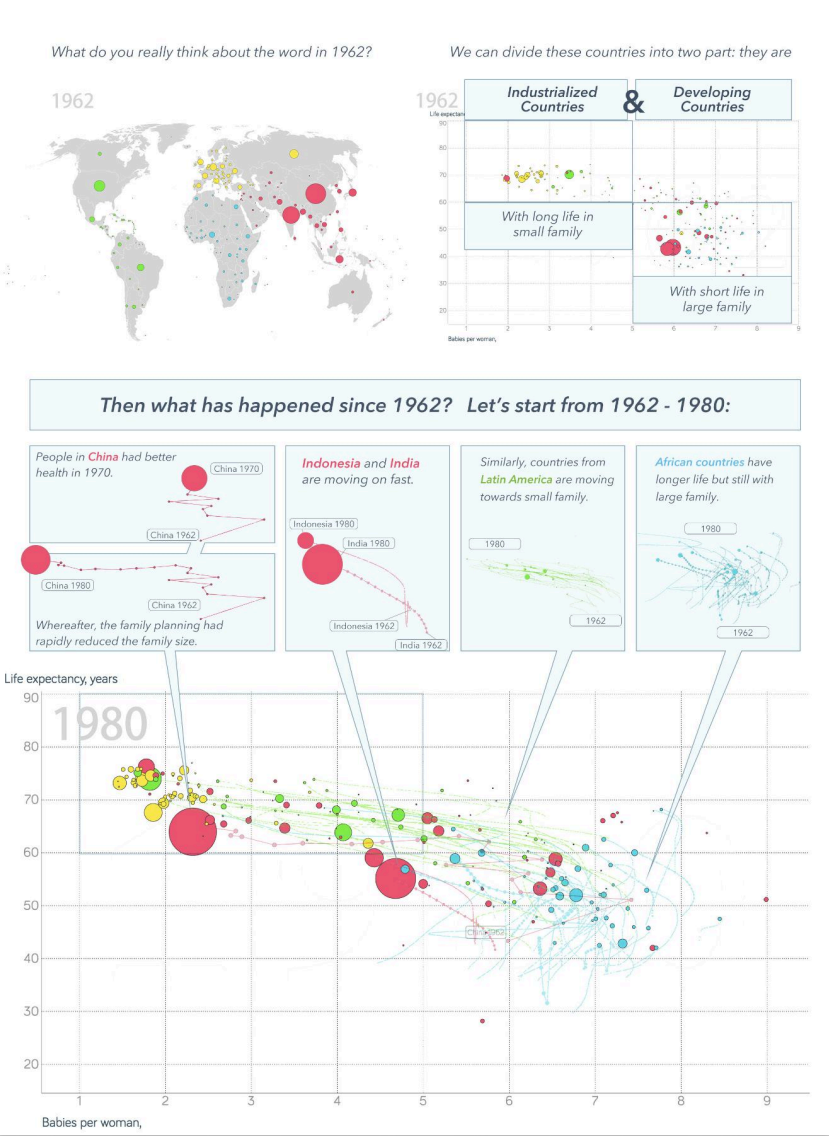
## I started to explore the new format -- Data Comics

The positive results from the study encouraged me to explore the potential of this new form data comics. I explored different styles and data, looking into their ability to offer rich contextualizing of data representations; their support in navigating data complexity through guided interpretation and the gradual unfolding of data narratives; and their capacity to support meaning-making and engagement through rhetorical devices such as juxtaposition, metaphor, humor, etc.

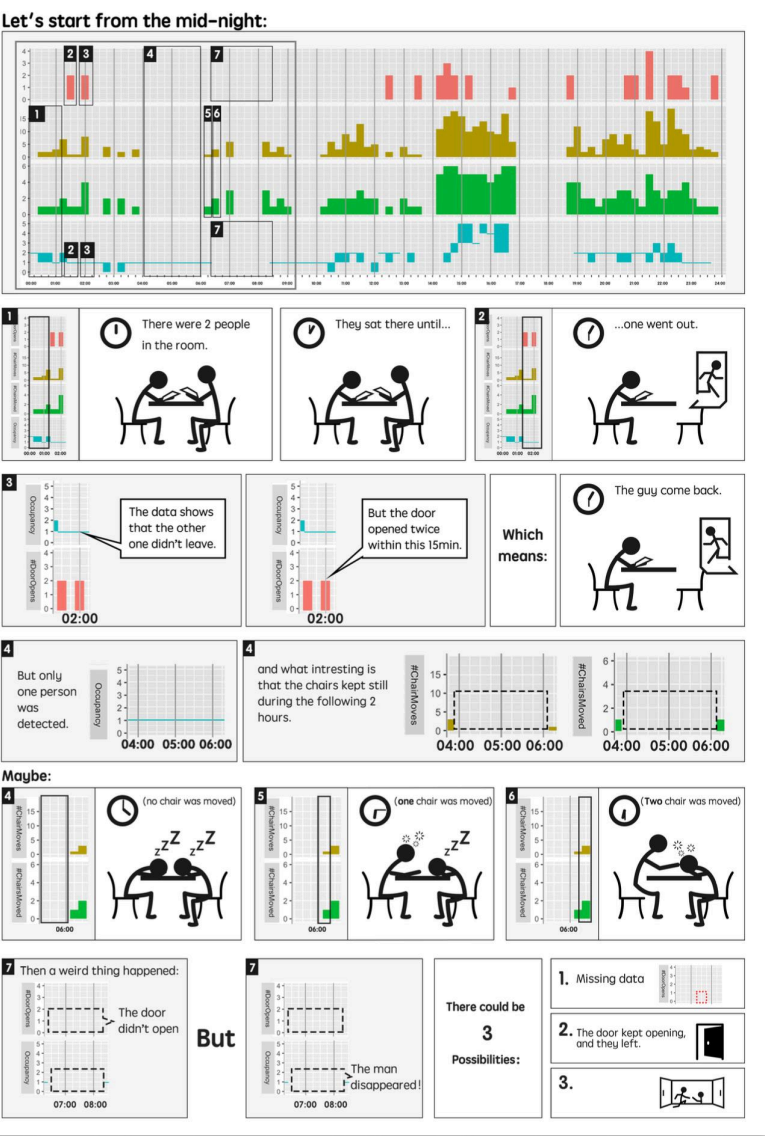
### My Personal Data Tracking



### Life expectancy & Babies per Women in the World



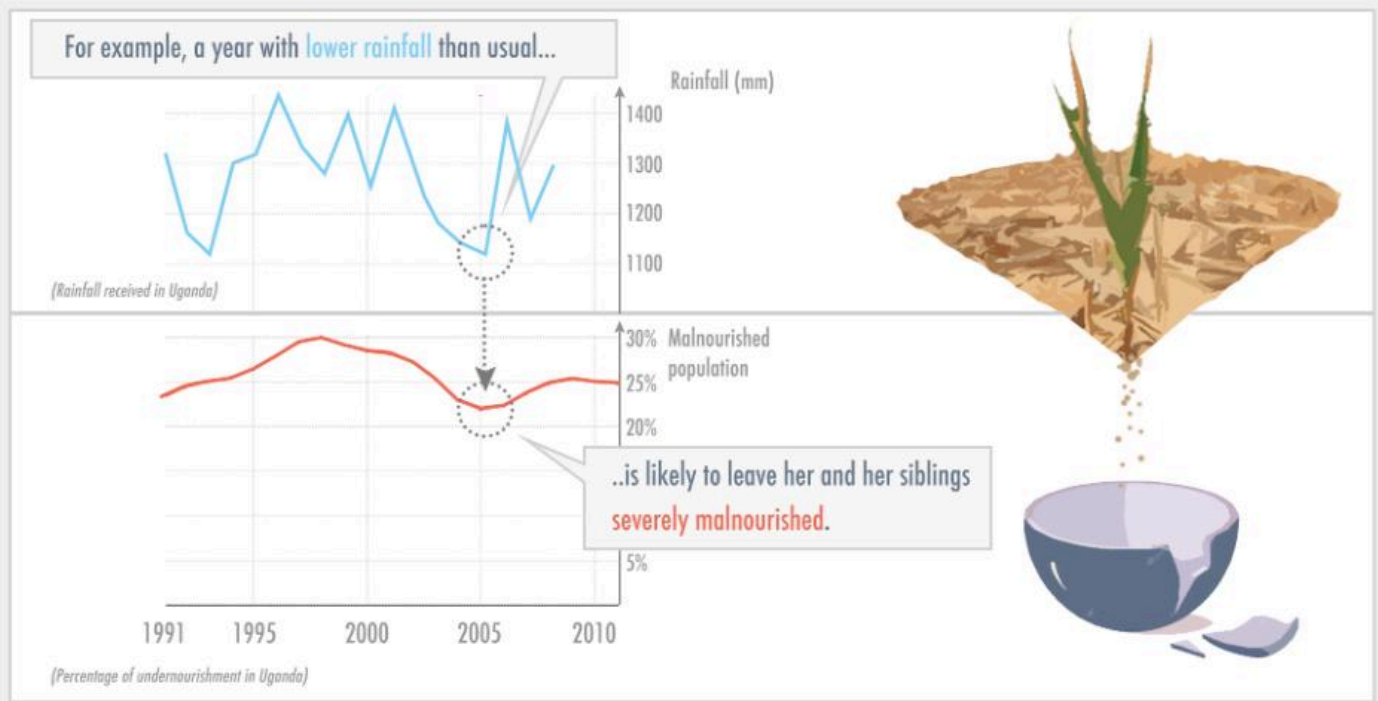
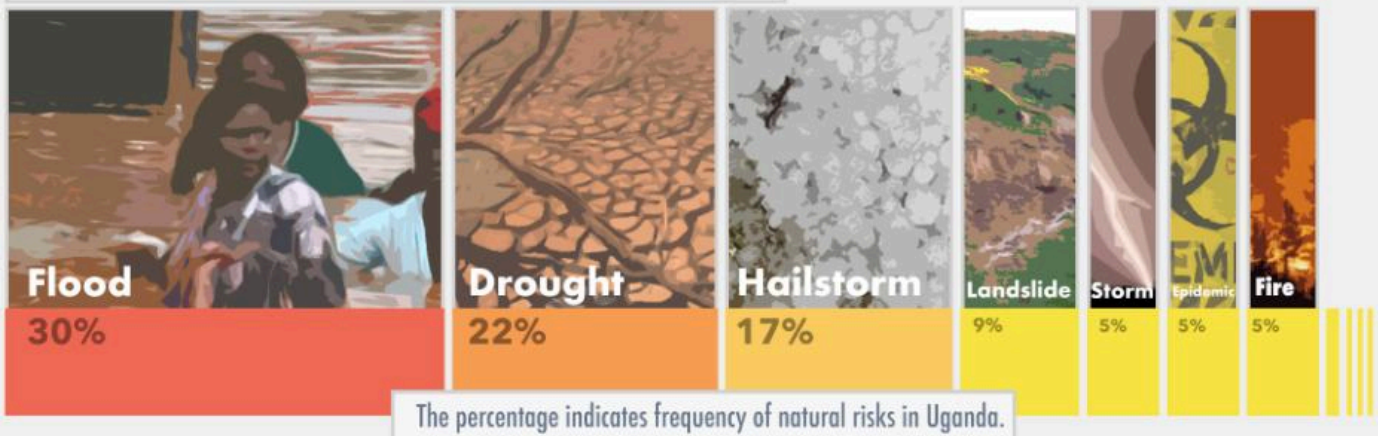
### Sensor Data and Activity Prediction



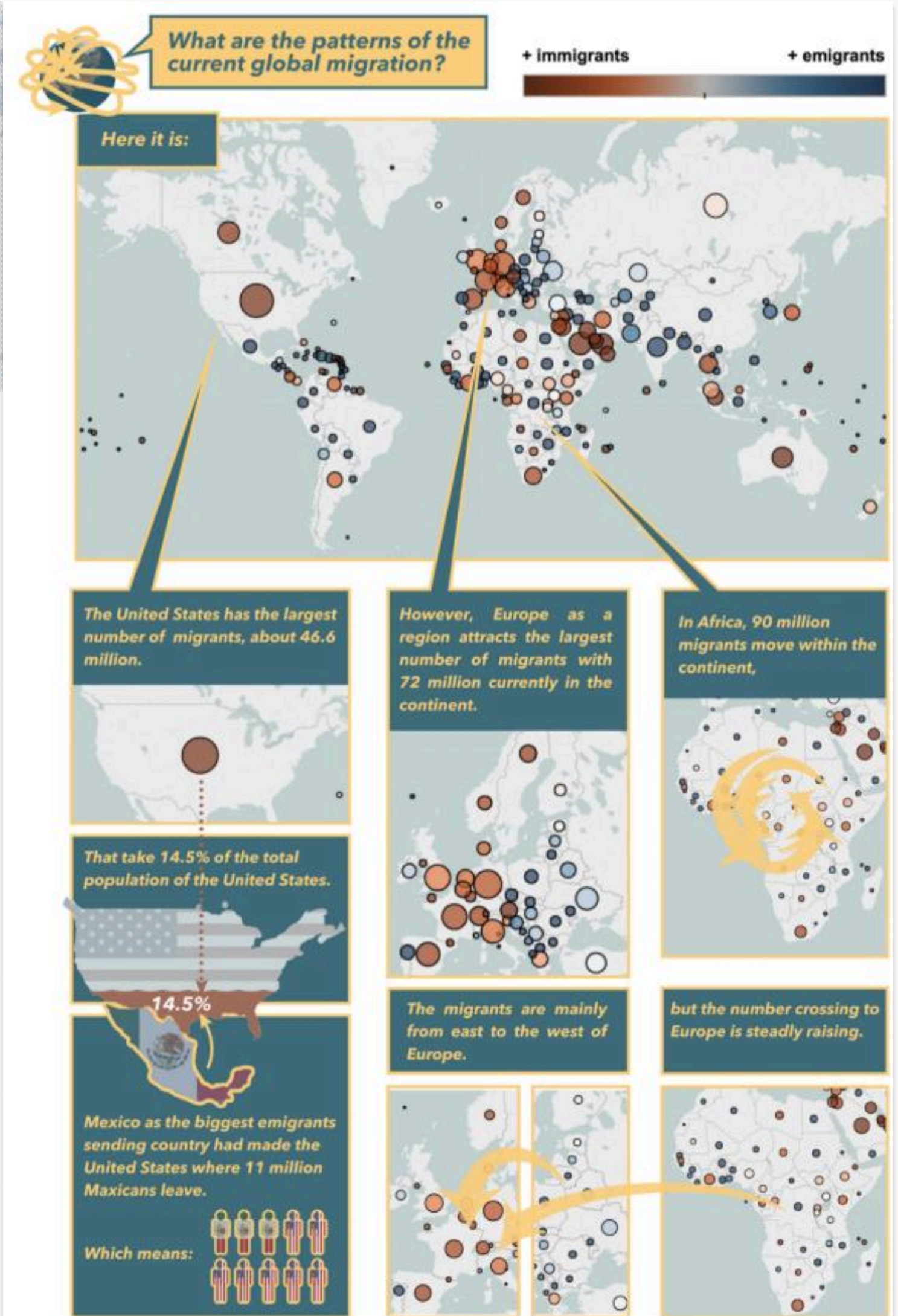
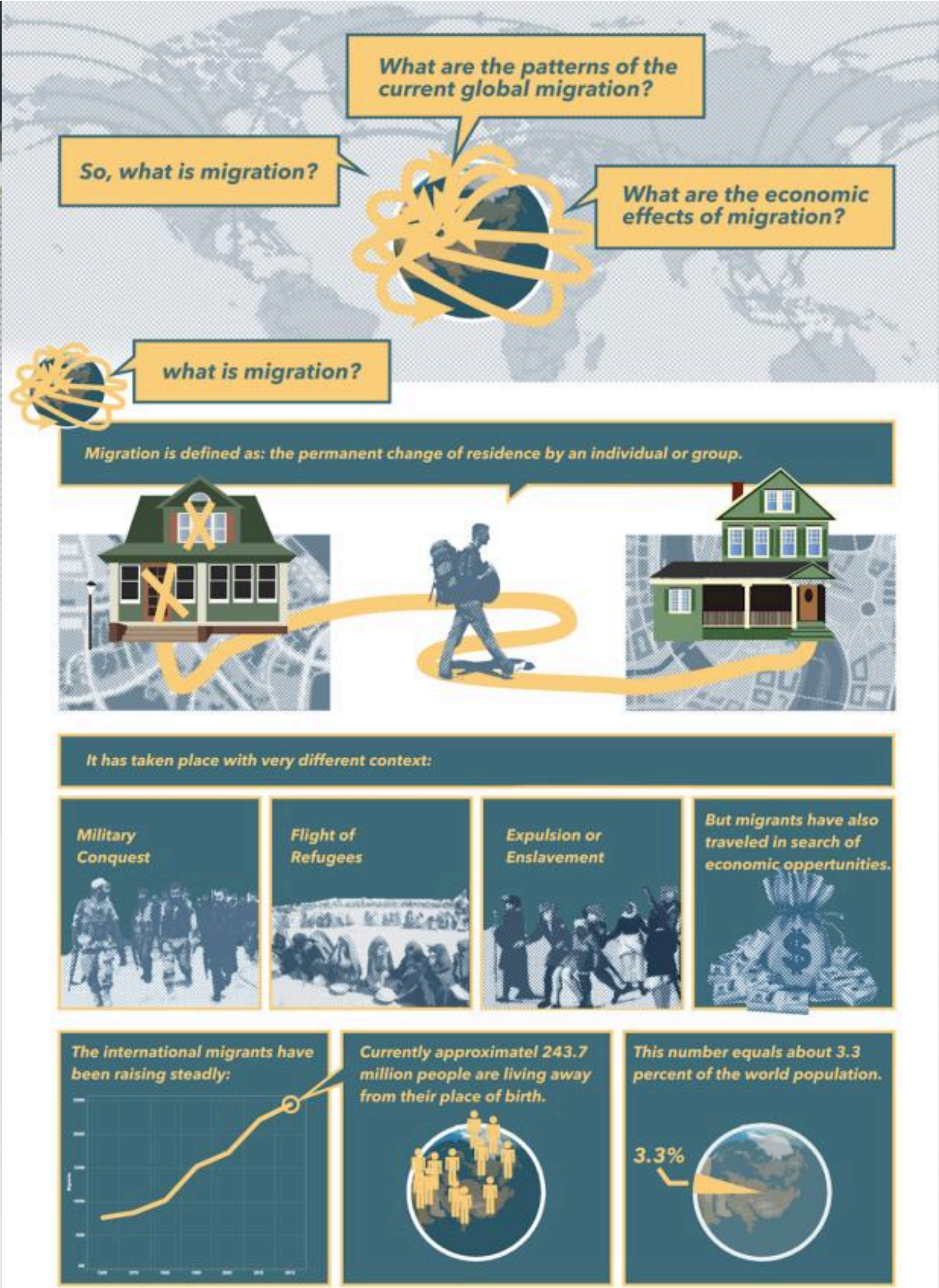
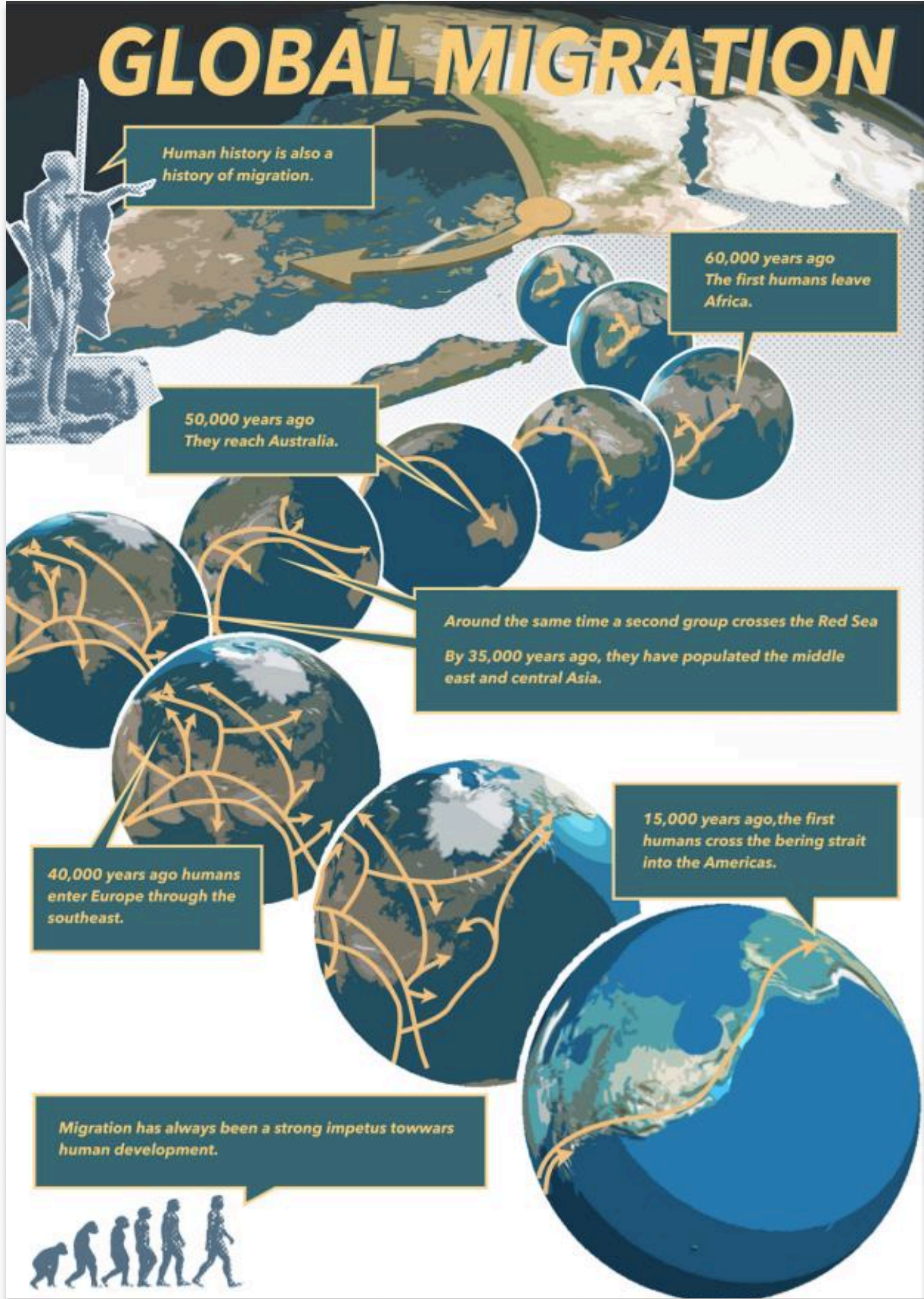
## Living condition of adolescents in Uganda



She and her family are extremely vulnerable to environmental shocks such as:





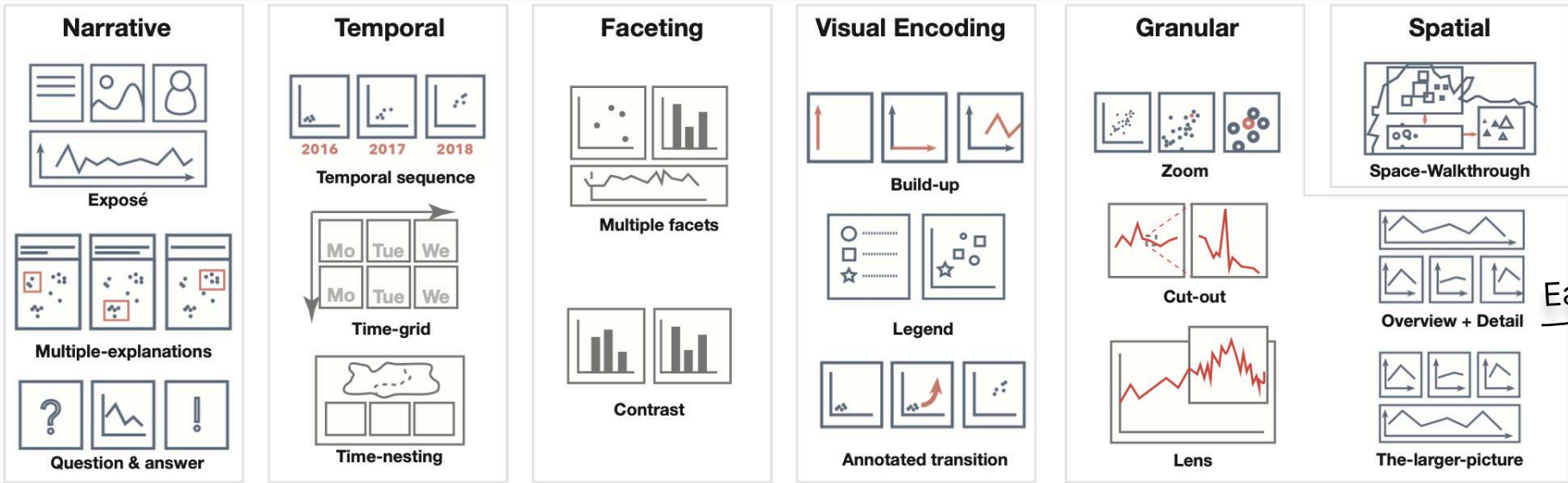




# Design Patterns for Data Comics

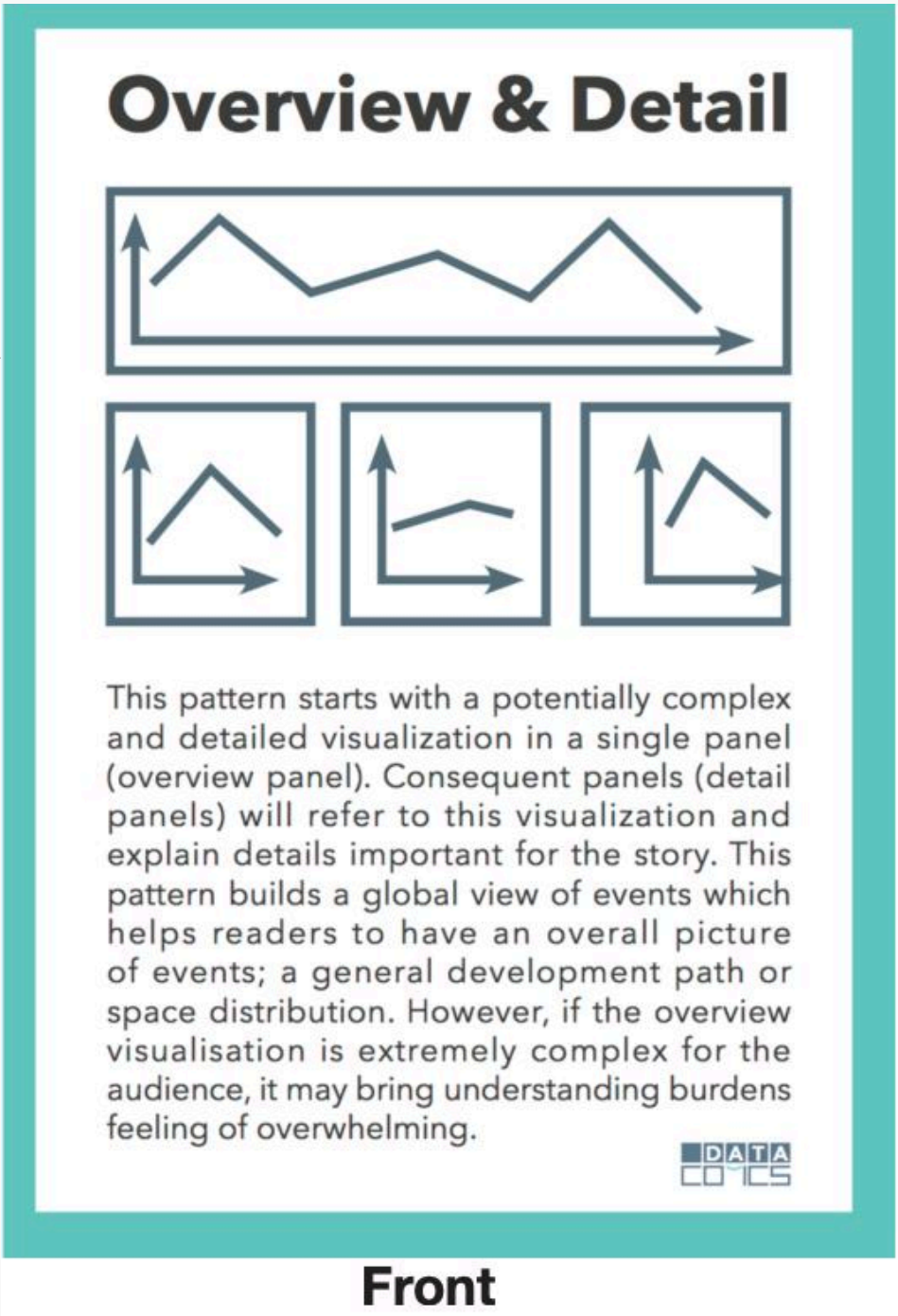
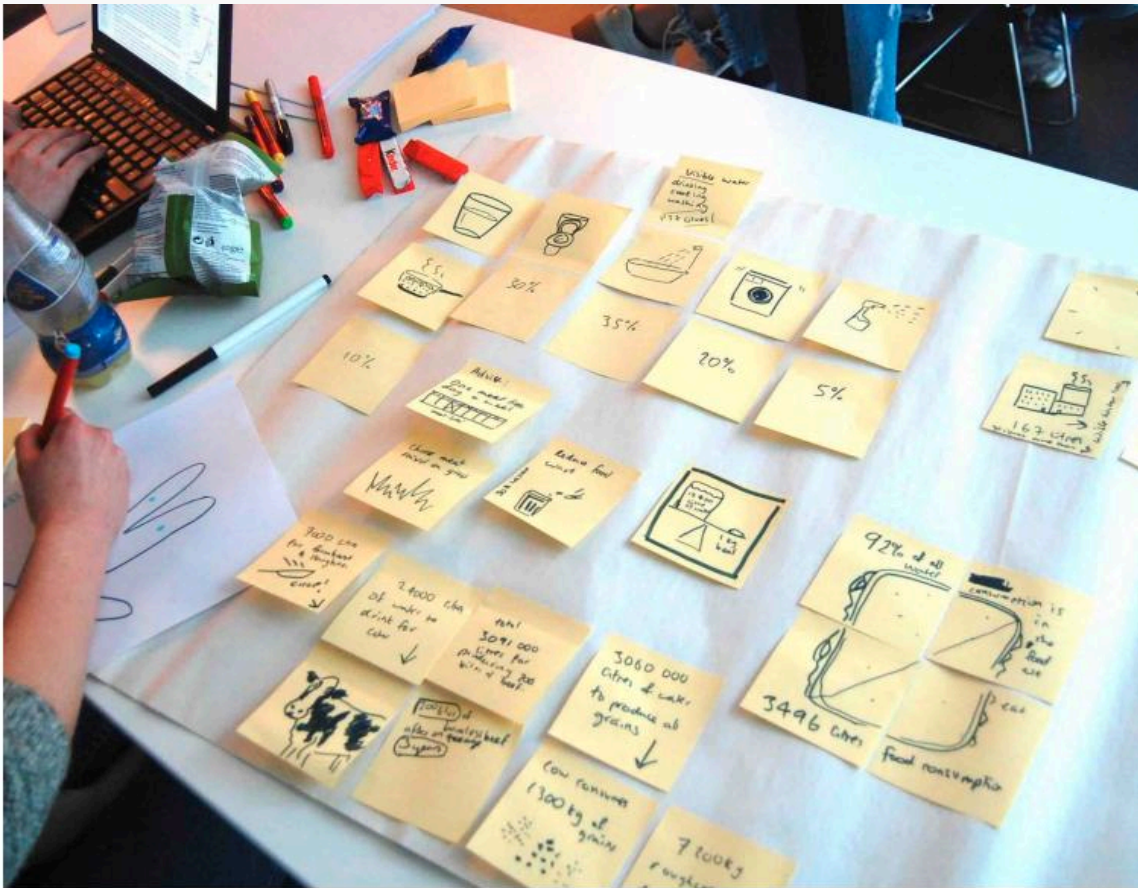
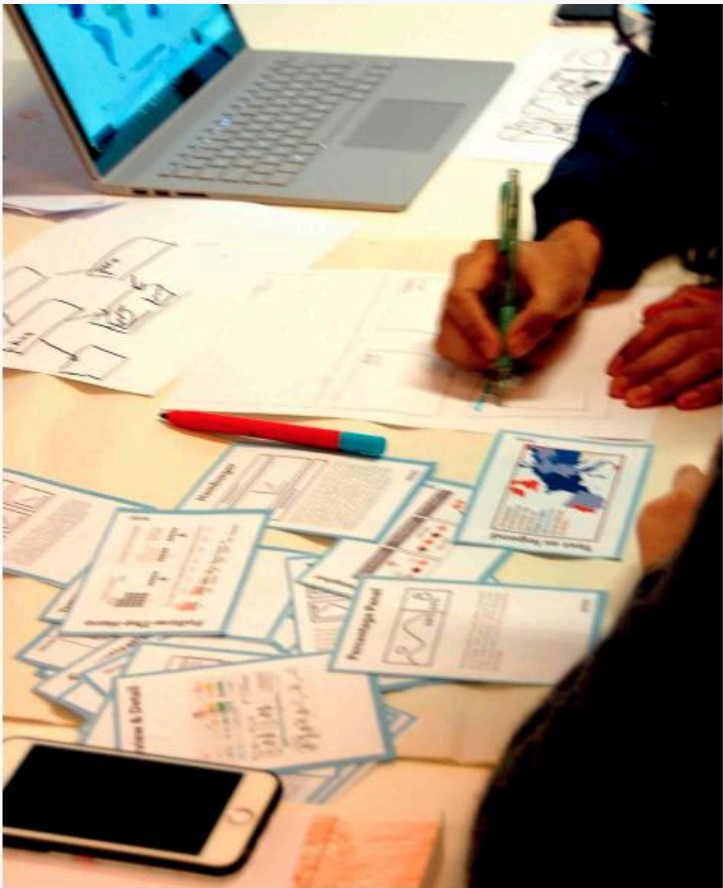
[Ready-to-Print Design Pattern Cards ↗](#)

From design explorations, an initial set of **42 design patterns** was presented, such design patterns provide an extensible set of templates that can help in the creation phase of comics. We printed a set of **design patterns cards** and provided them to the workshop participants.

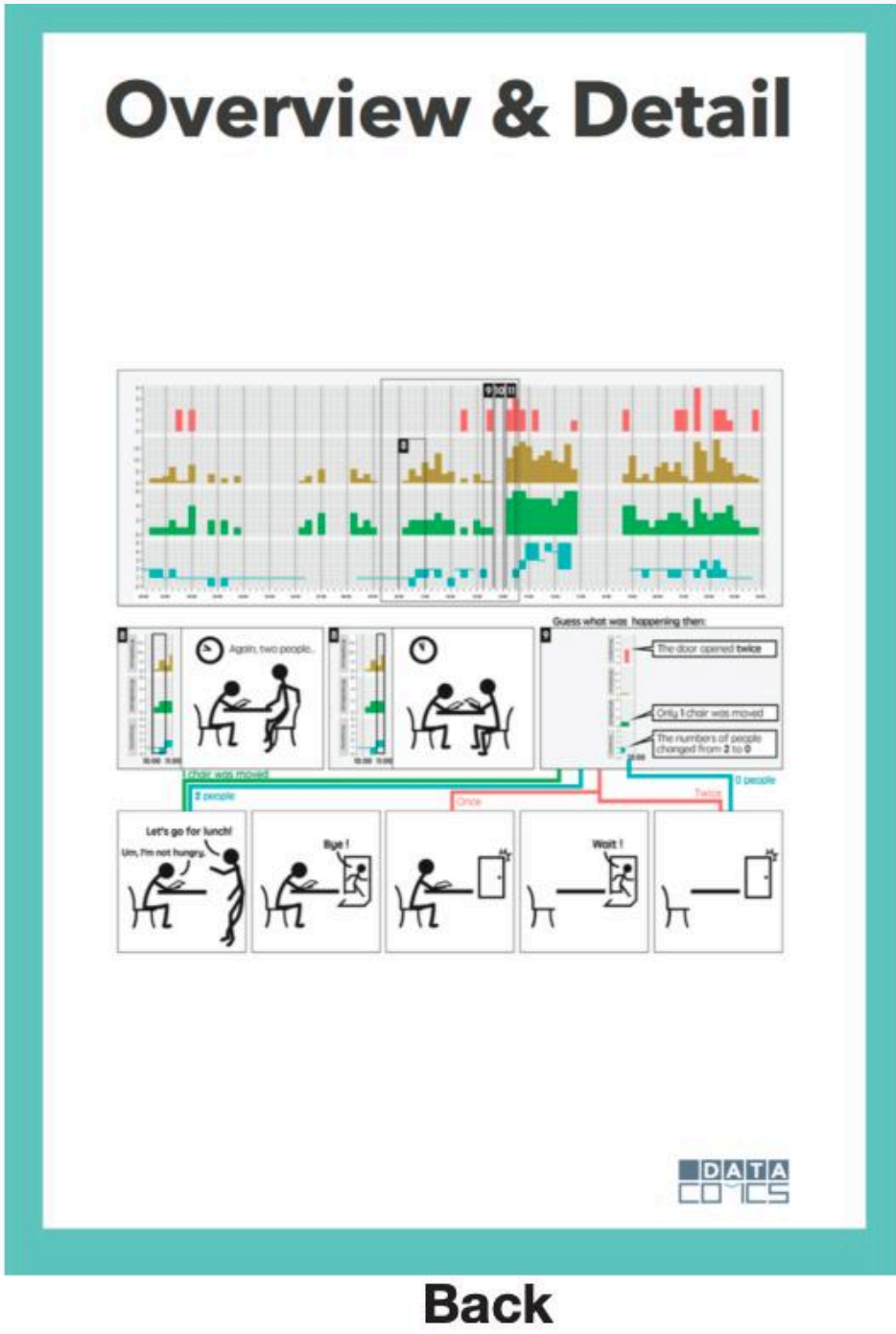


Bach, B., **Wang, Z.**, Farinella, M., Murray-Rust, D., & Henry Riche, N. (2018, April). Design patterns for data comics. In Proceedings of the 2018 chi conference on human factors in computing systems (pp. 1-12).

[Find the Paper ↗](#)



Front



Back



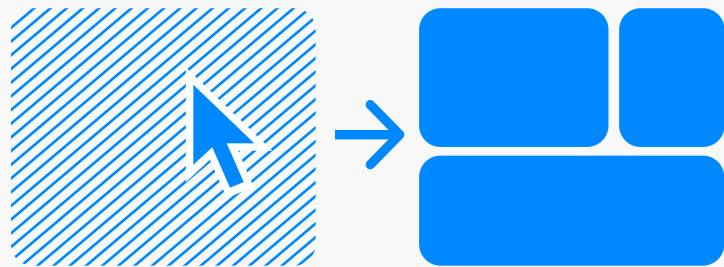
# Interactive Data Comics

[Project Website](#)

I designed a set of **operations** that extend data comics beyond traditional, linear storylines. These operations allow adding or removing panels within defined layouts to enable branching narratives, shifts in perspective, and detail-on-demand exploration. They also support data interaction and personalization, letting readers focus on what matters most to them.

To make this possible, we created **COMICSCRIPT**, a lightweight specification language that allows designers to bring interactivity to static comics.

## For example: Replace Panel



```
{
  "trigger": "click",
  "element": "p1",
  "operation": "replace",
  "replace": "p1",
  "newpanels": ["p1", "p2", ["p3"]]
}
```

Wang, Z., Romat, H., Chevalier, F., Riche, N. H., Murray-Rust, D., & Bach, B. (2021). Interactive data comics. IEEE Transactions on Visualization and Computer Graphics, 28(1), 944-954.

[Find the Paper](#)

# Interactive Operations and COMICSCRIPT

**Slider**



```
panels: [
  {
    "id": "p1",
    "url": "/CO2Footprint/inputPanel.svg"
  },
  {
    "id": "slider_movementSpeed",
    "variable": "movementSpeed",
    "min": 100,
    "max": 200,
    {
      "id": "slider_movementVelocity",
      "variable": "movementVelocity"
    }
  }
]
```

**Number Input**



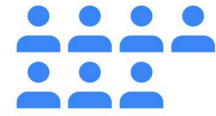
```
{
  "input": [
    {
      "id": "inputPlaceholder",
      "variable": "movementVelocity"
    }
  ]
}
```

**Conditions**

`[x > 10]`

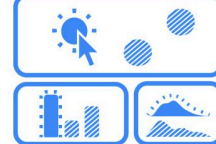
```
{
  "trigger": "click",
  "condition": ["totalCO2", "> 10"],
  "operation": "loadlayout"
}
```

**Isotype**



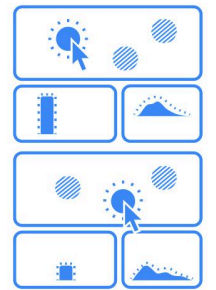
```
{
  "operation": "isotype",
  "variable": "totalMovement",
  "to": "peoplePlaceholder",
  "attr": {
    "width": 21,
    "icon": "images/people.svg"
  }
}
```

**Highlight**



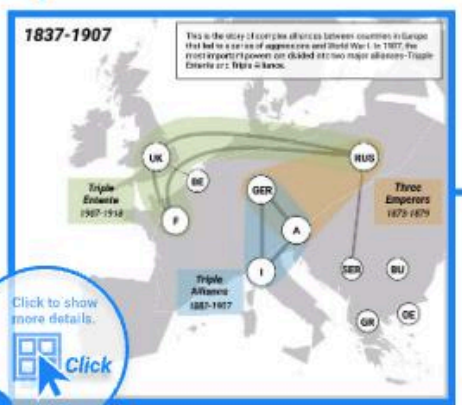
```
{
  "trigger": "mouseover",
  "element": "Country1",
  "operation": "highlight",
  "after": {
    "style": {
      "fill": "blue",
      "stroke": "blue"
    }
  }
}
```

**Classes**

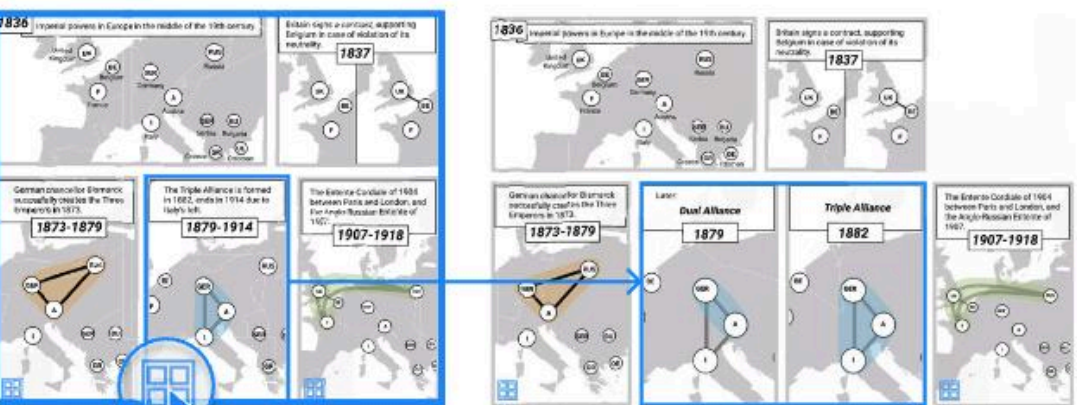


```
{
  "classes": [
    {
      "class": "France",
      "elements": ["France-circle", "France-bar"],
      "class": "Germany",
      "elements": ["Germany-circle", "Germany-bar"]
    }
  ],
  "operations": [
    {
      "trigger": "mouseover",
      "element": ["France-circle", "Germany-circle"],
      "operation": "loadLayers",
      "layer": ["France", "Germany"]
    }
  ]
}
```

**Drill down to reveal more details**



**Clicking the small event buttons at the bottom corner in a panels can replace that panel with other panels, showing more detail about the events described inside that panel**



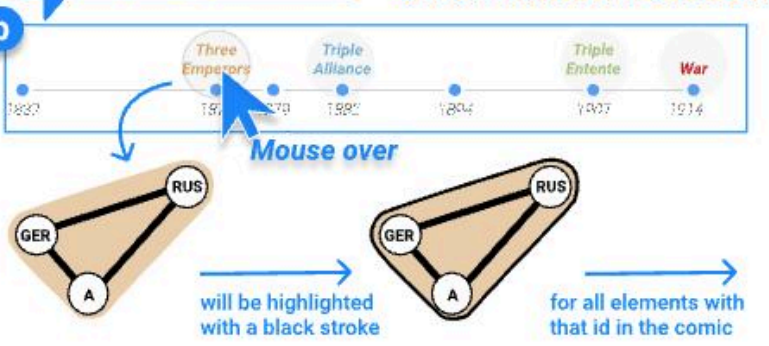
**Applied operation**

**Replace**

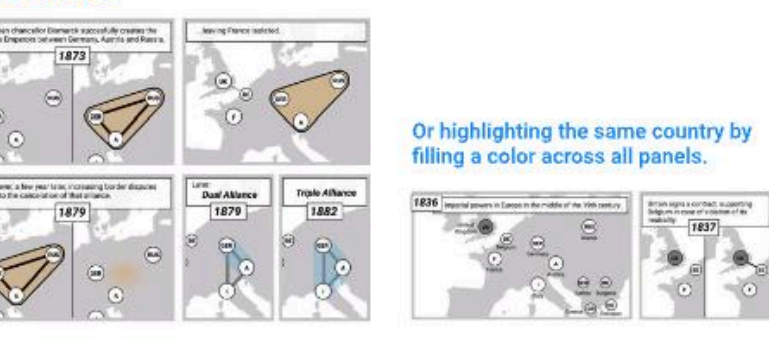


These interactions are supported by the "replace" operation

**Highlighting elements**



**Mouseover highlights occurrences of individual elements across the comics, providing a visual reference to these elements' stories.**



**Applied operation**

**Highlight**



These interactions are supported by the "highlight" operation

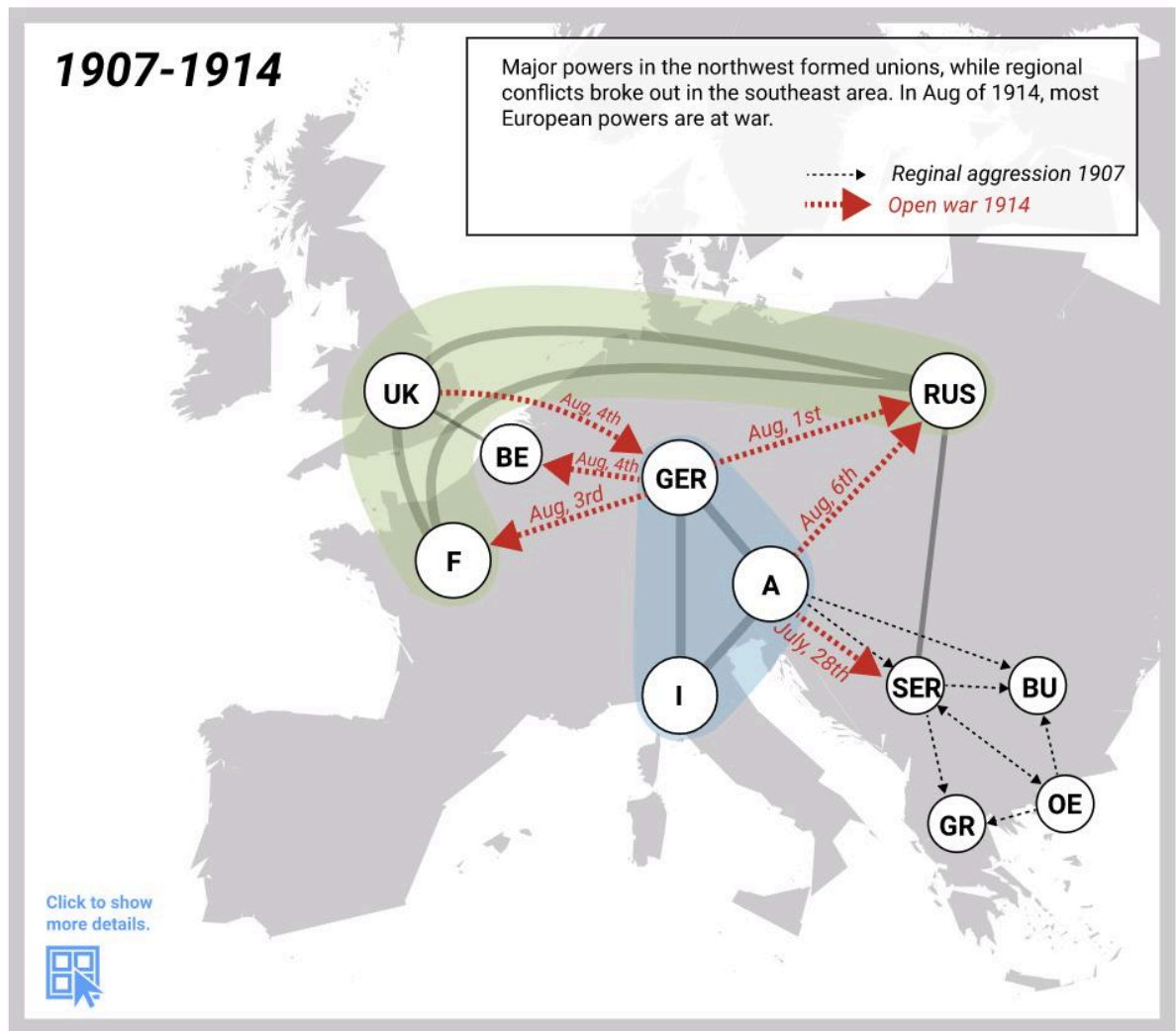
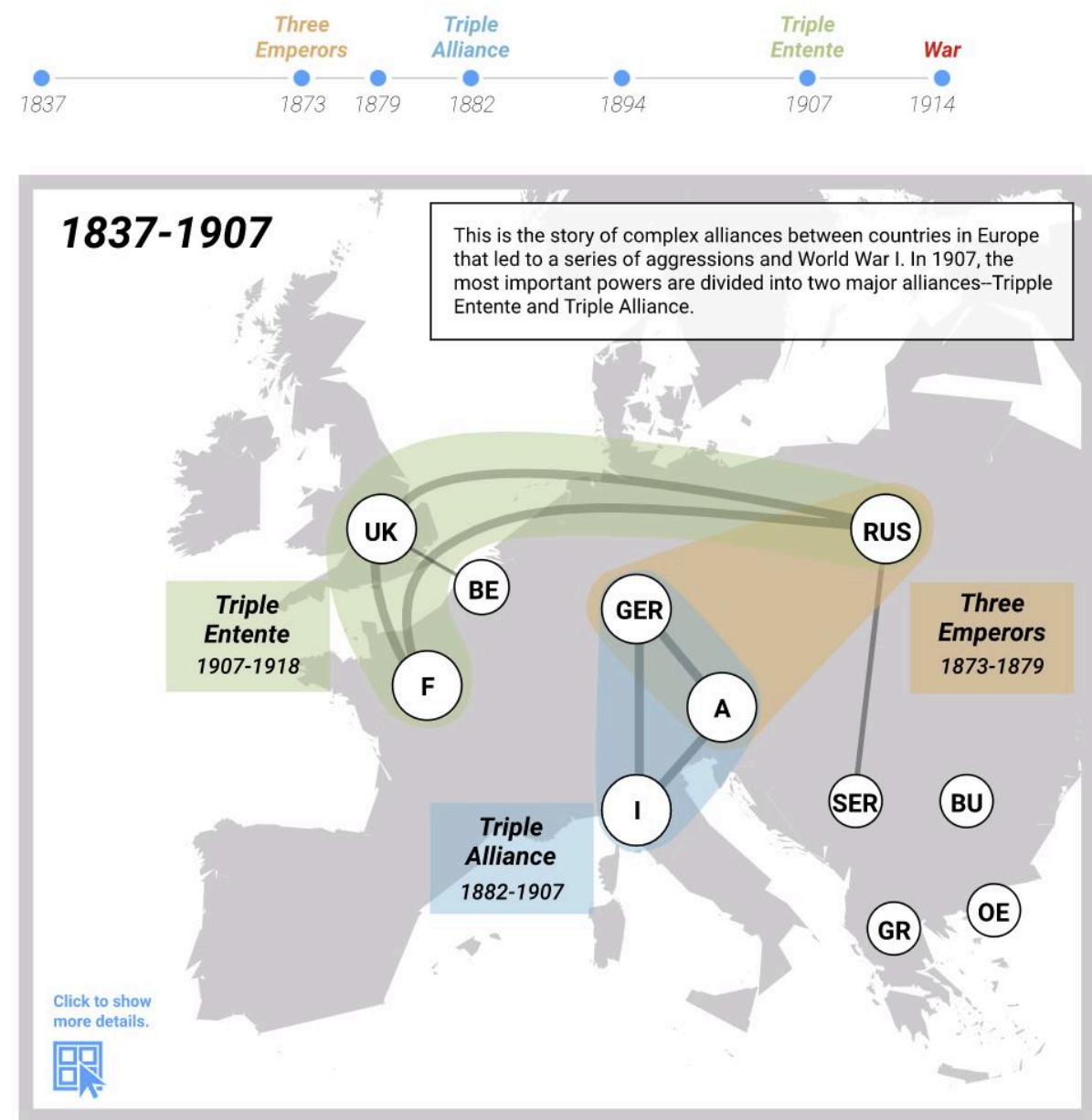


# Interactive Data Comic Examples

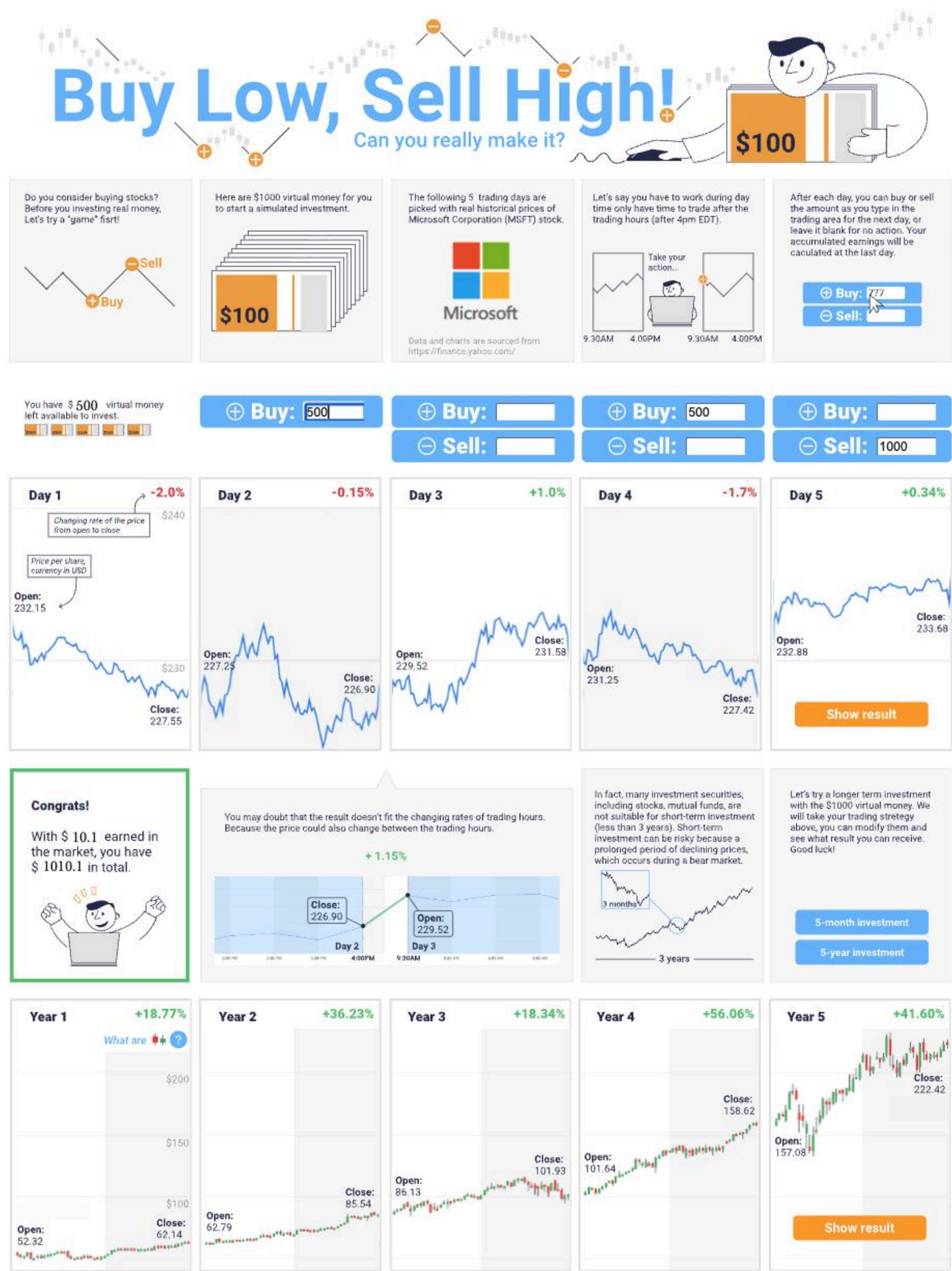
Try these interactive by clicking the links

[Try Interactive - European Alliances before World War I ↗](#)

## European Alliances before World War I



[Try Interactive - Buy Low, Sell High! ↗](#)



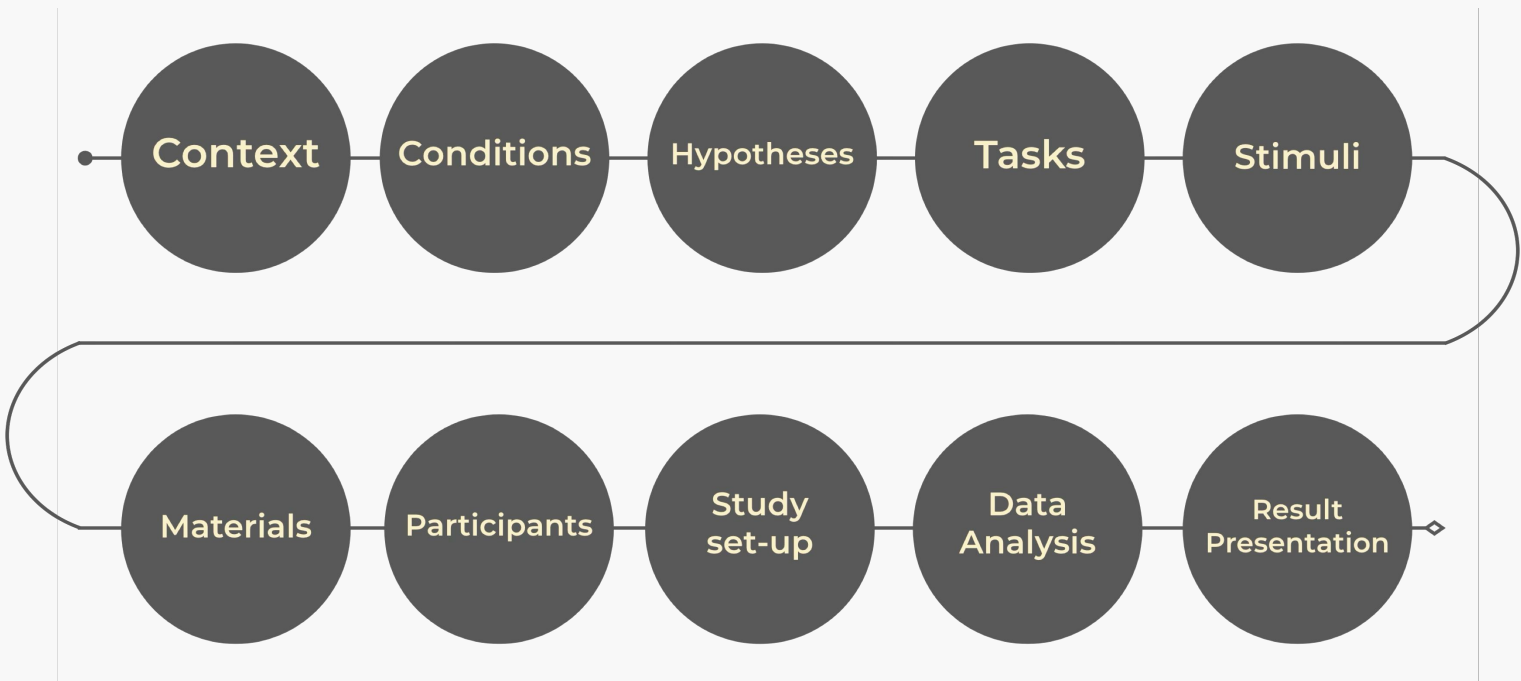


# Applying Data Comics for Scientific Reporting

[Project Website ↗](#)

I explored using data comics as study reports to provide a glanceable view of studies by tightly integrating text and images, which can be compelling to non-scientists and researchers alike.

I explored this approach by co-designing comics with the authors of several HCI papers on both qualitative and quantitative studies, and developing **design solutions for ten common stages in HCI studies**.



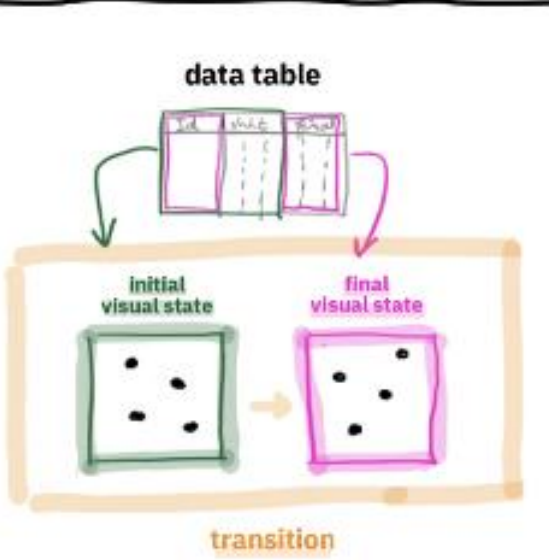
Wang, Z., Ritchie, J., Zhou, J., Chevalier, F., & Bach, B. (2020). Data comics for reporting controlled user studies in human-computer interaction. IEEE Transactions on Visualization and Computer Graphics, 27(2), 967-977.

[Find the Paper ↗](#)

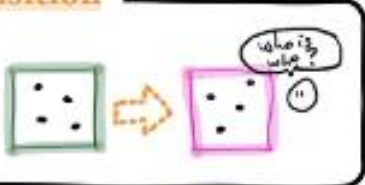
For example:

**Context:** The comic explains key concepts ('transition', 'initial visual state', 'final visual state', 'animation') before introducing the study.

A **transition** is a pair of visual states, an **initial visual state** and a **final visual state** obtained from visual encoding of data values from a table.



An abrupt **transition** makes it difficult to track objects.

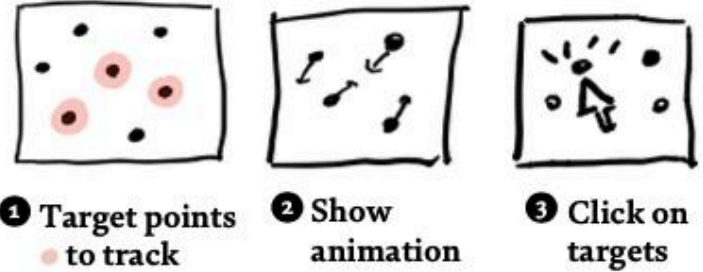


An animation, that is, a **sequence of intermediating images** that gives the illustration between the visual states can help.



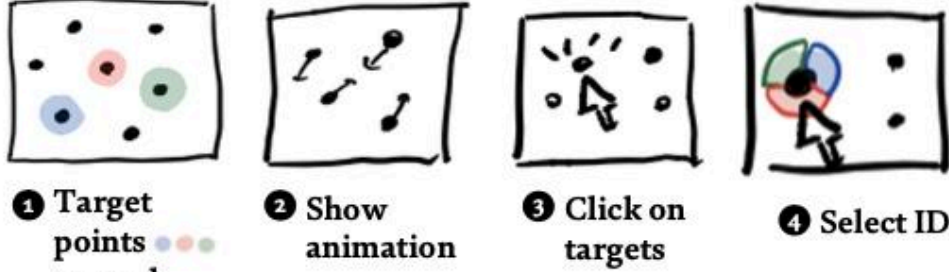
**Task:** how participants in a perceptual study select targets in two conditions:

**Task: NoId**



1 Target points to track  
2 Show animation  
3 Click on targets

**Task: Id**

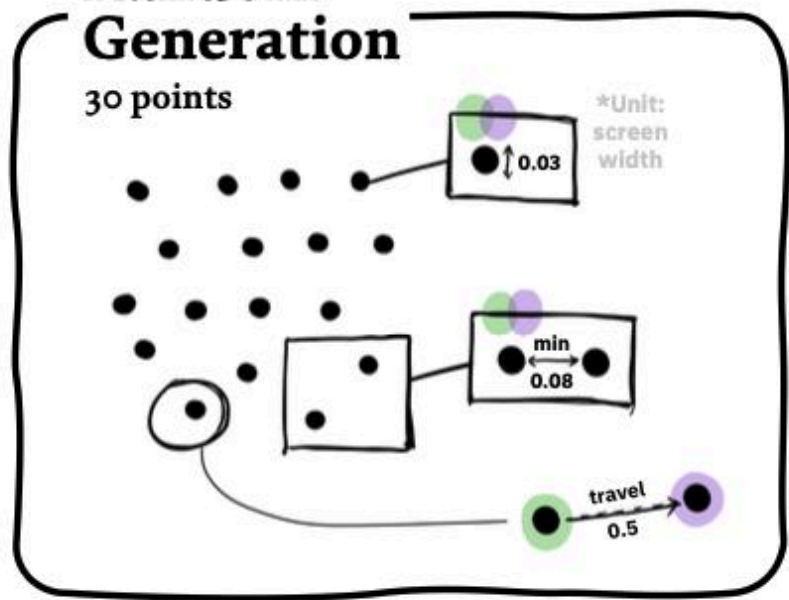


1 Target points to track  
2 Show animation  
3 Click on targets  
4 Select ID

**Stimuli:** how the stimuli are generated for these tasks:

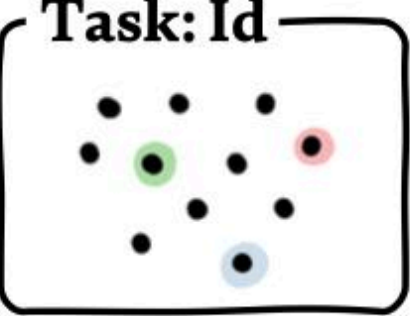
**Random Generation**

30 points



**Task: Id**

3 targets



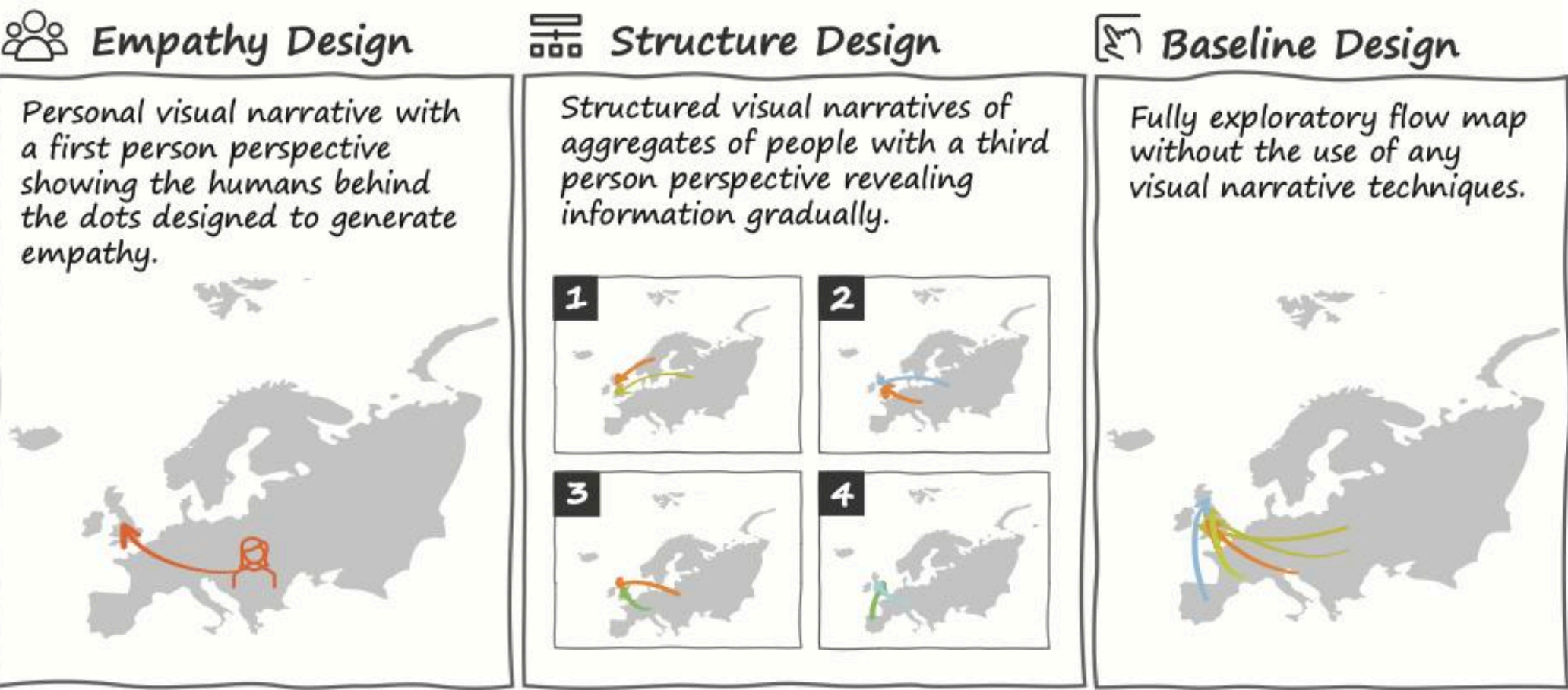
**Task: NoId**

3 targets

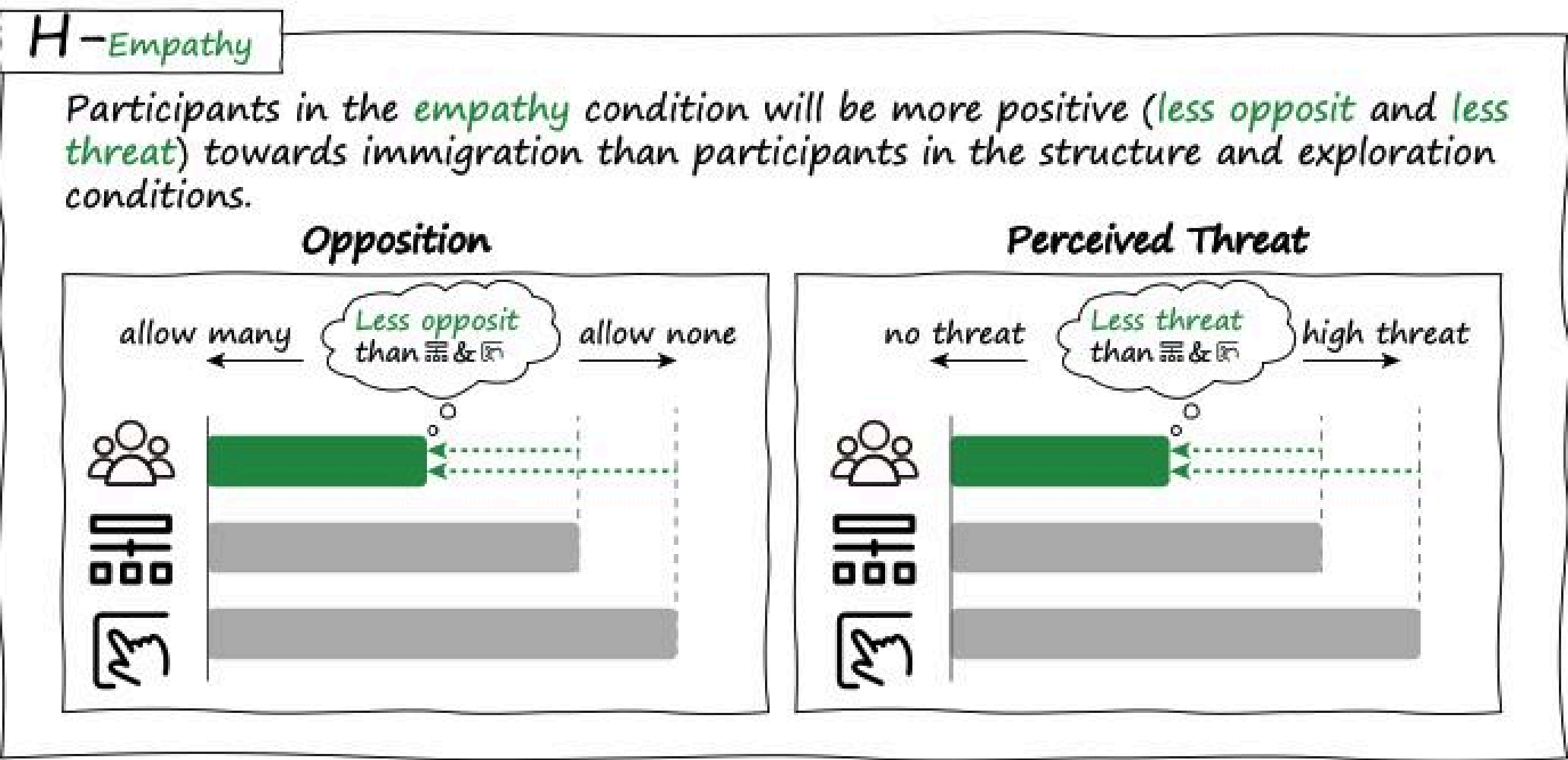




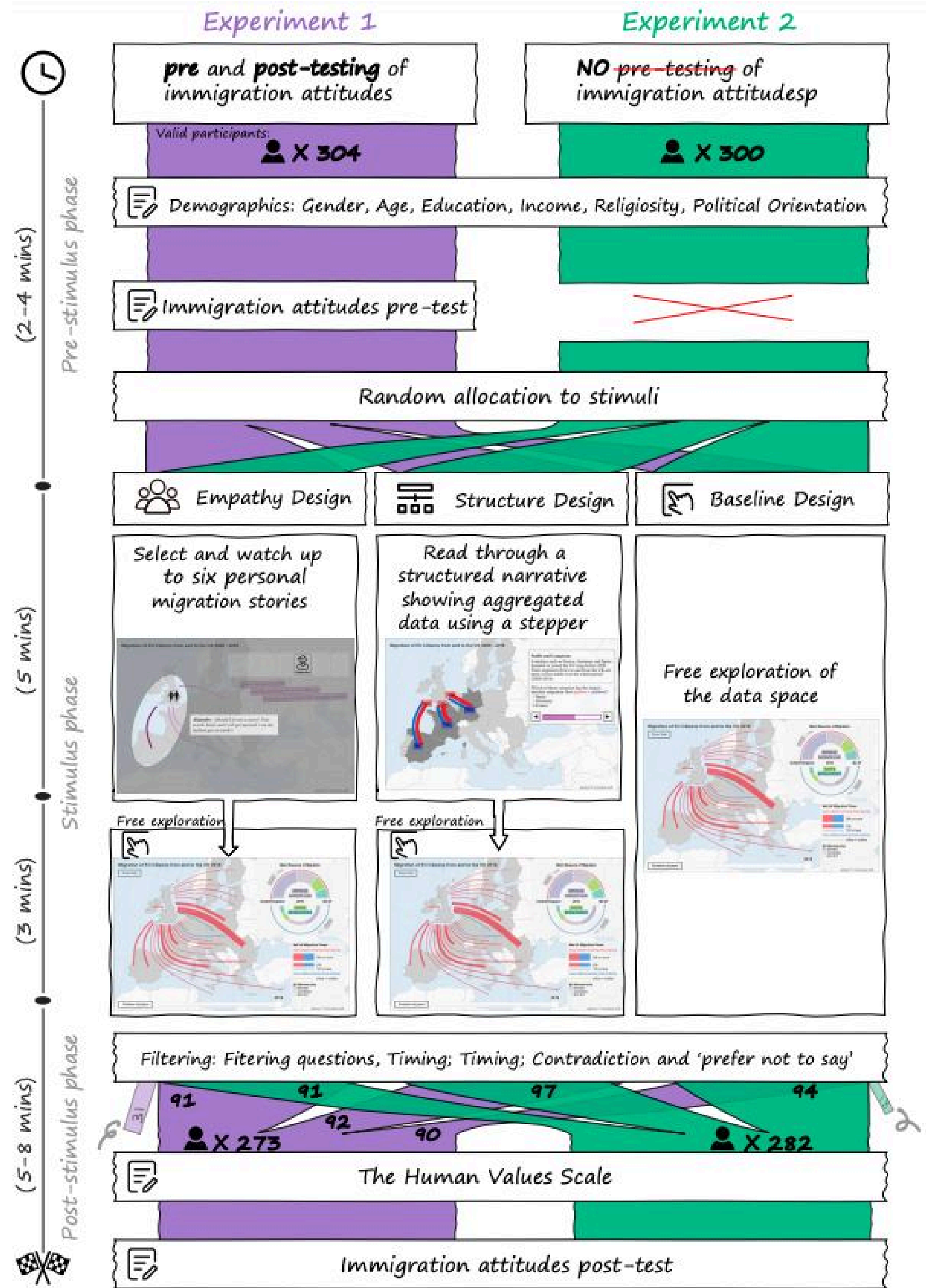
Conditions: describing study conditions to be compared in the study:



Hypotheses: Descriptions of hypotheses for the visualization study:



Conditions: pipeline describes the sequence of study steps and how procedures differed between conditions across two experiments:





# FUZZINESS WITH REPRESENTATION

The co-design began with two visualization researchers (V1 and V2) and two Vancouver Island-based artists (A1 and A2) exploring potential ideas for visualizing arts funding data. Among them, V1, A1, and A2 were the main co-designers during this phase.

This stage was exploratory and fuzzy, as the scope was broad and the direction had not yet been defined. The collaborators continually exchanged ideas and explored possibilities. E.g., A1 reviewed relevant examples and potential dataset.

V1 also worked on exploring the funding application process: how people apply, what are the barriers that people may face while applying, etc. Through this process, mutual understanding gradually developed and a shared vision of the project began to emerge.



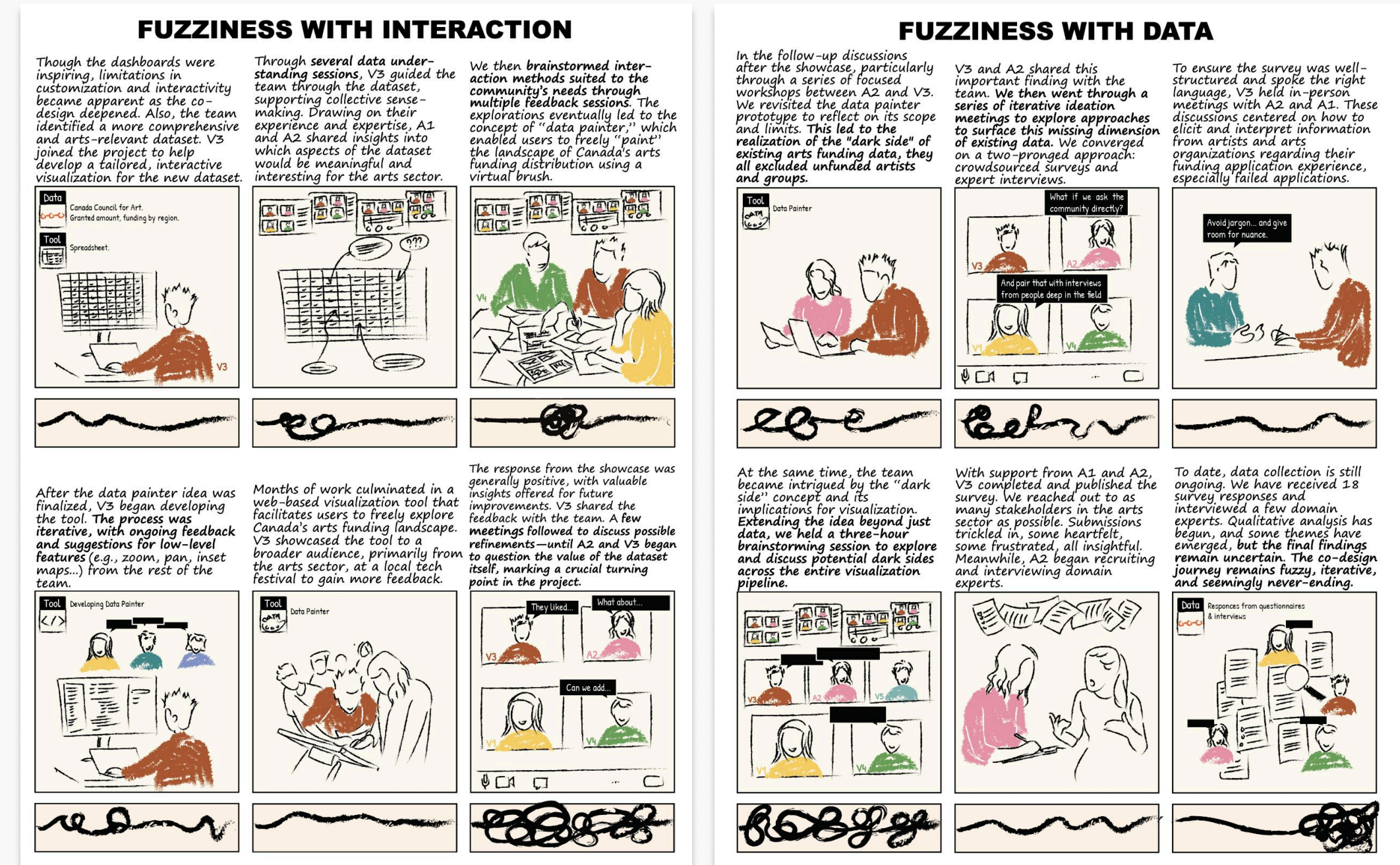
Once the direction was more clearly defined, V1 began building prototype visualizations, with valuable feedback and suggestions for refinements from A1 and A2 through regular meetings. The process involved a great deal of back-and-forth.

The iterative process helped the team build common ground between visualization researchers and domain experts and navigate the fuzziness of data representation decisions, i.e., using the size of circles to encode arts funding data. Initially unfamiliar with data visualization, A1 and A2 responded with enthusiasm when V1 presented early prototypes using Tableau. Their engagement grew steadily, ultimately contributing to the development of several Tableau dashboards.



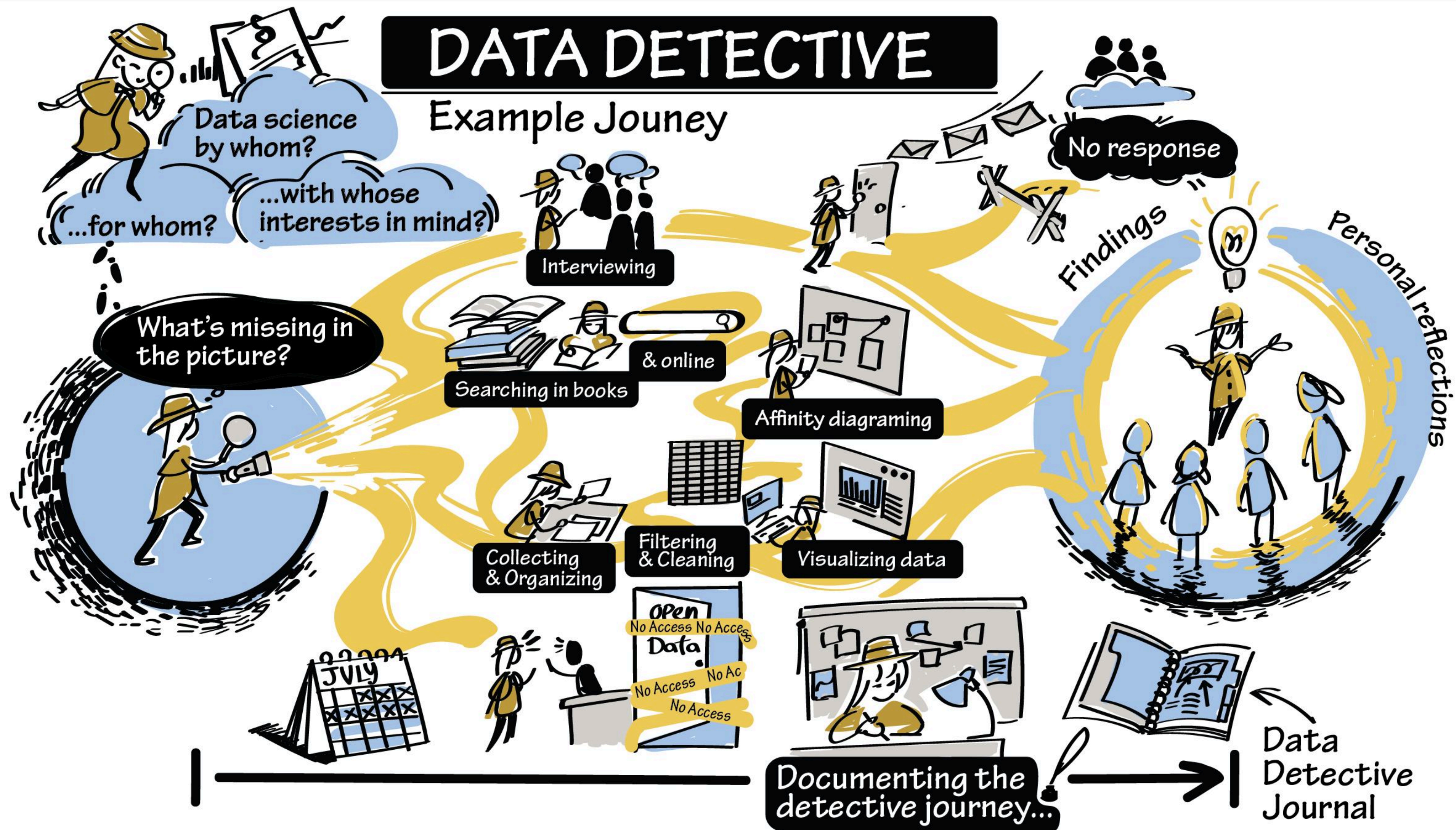
I partnered with Vancouver Island's arts community to explore how data visualization could help them understand and advocate for better arts funding. The following comic as a section of the paper tells the story of our year-long co-design process.

The messier the lines at the bottom of each panel, the fuzzier things felt at that moment.



Wei W, Daneshzand F, Wang Z, Mattson E, Perin C, Carpendale S (2025, Sep). The Fuzzy Front Ends: Reflections on the Never-Ending Story of Visualization Co-Design. In IEEE VIS alt.vis workshop.







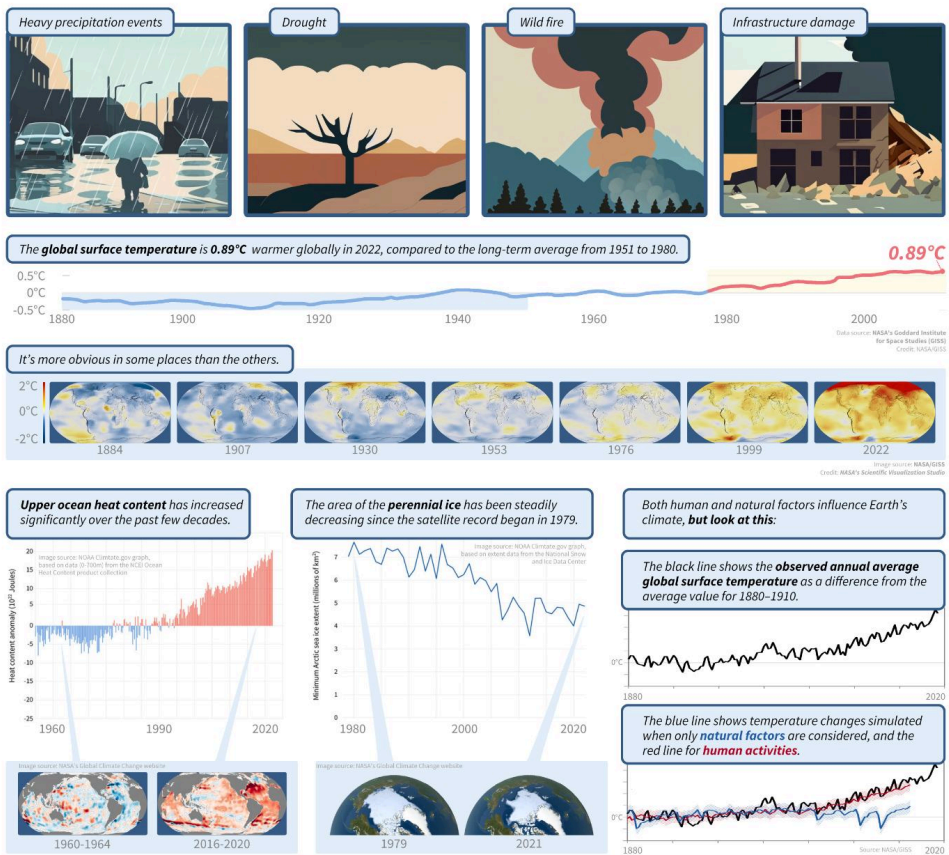
# Applying Data Comics for Explaining Climate Change

[Project Website](#) ➔

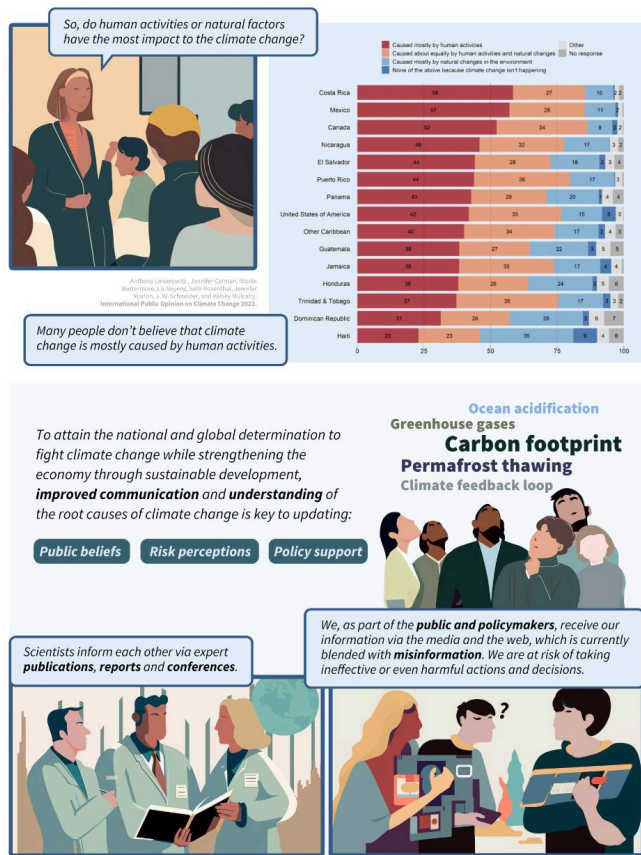
While there is a gap between what the general public and policymakers understand about science and what is known by experts, this gap is particularly perilous regarding climate change.

To close this gap, I have been collaborated with experts in data visualization, narrative construction, and climate change. I develop climate change data comics that combine compelling narratives with comprehensible data visualization that are informed and verified by the scientists.

## CLIMATE CHANGE IS A GLOBAL CHALLENGE



## BUT MANY PEOPLE DO NOT UNDERSTAND

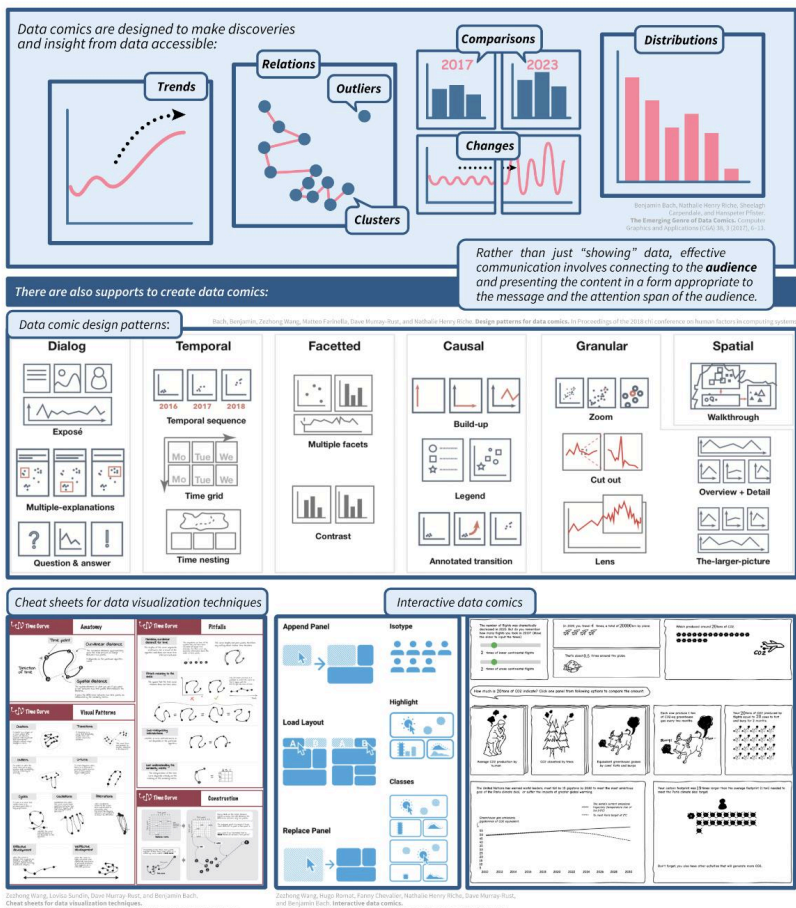


# DATA COMICS

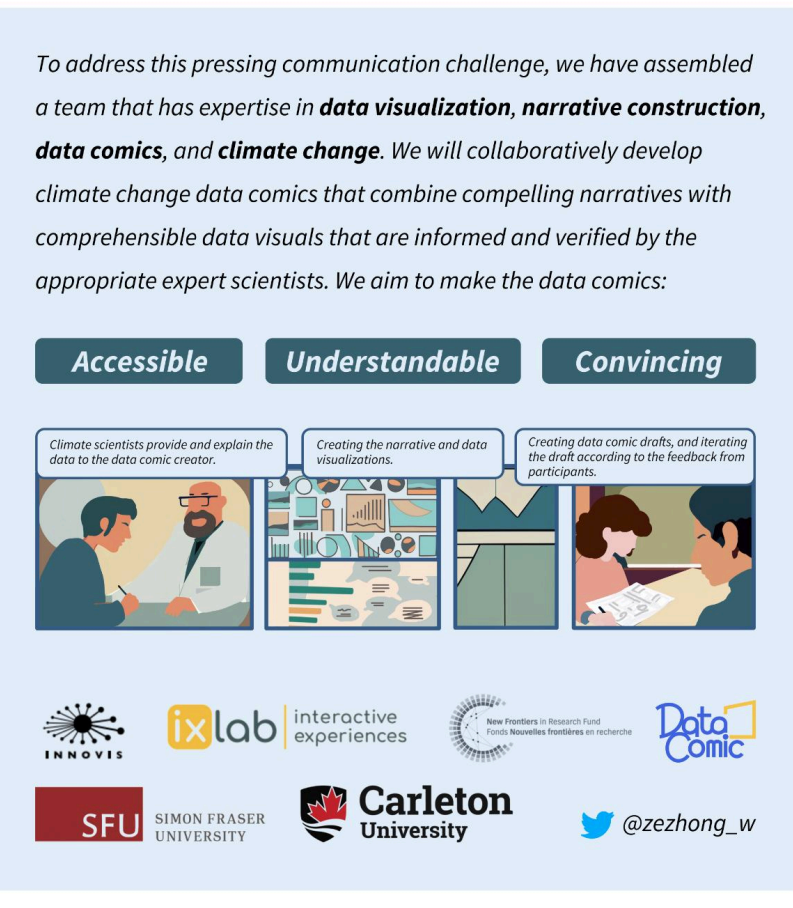
for Understanding Climate Change

Zezhong Wang   Stephan Gruber   Michelle Levy   Sheelagh Carpendale

## USING DATA COMICS AND DATA-DRIVEN STORYTELLING



## WE WILL CREATE DATA COMICS WITH CLIMATE SCIENTISTS





The story was developed from a local news article about a hut that had stood in Banff National Park for 100 years but was recently taken down because the thawing permafrost beneath it made the building unsafe.

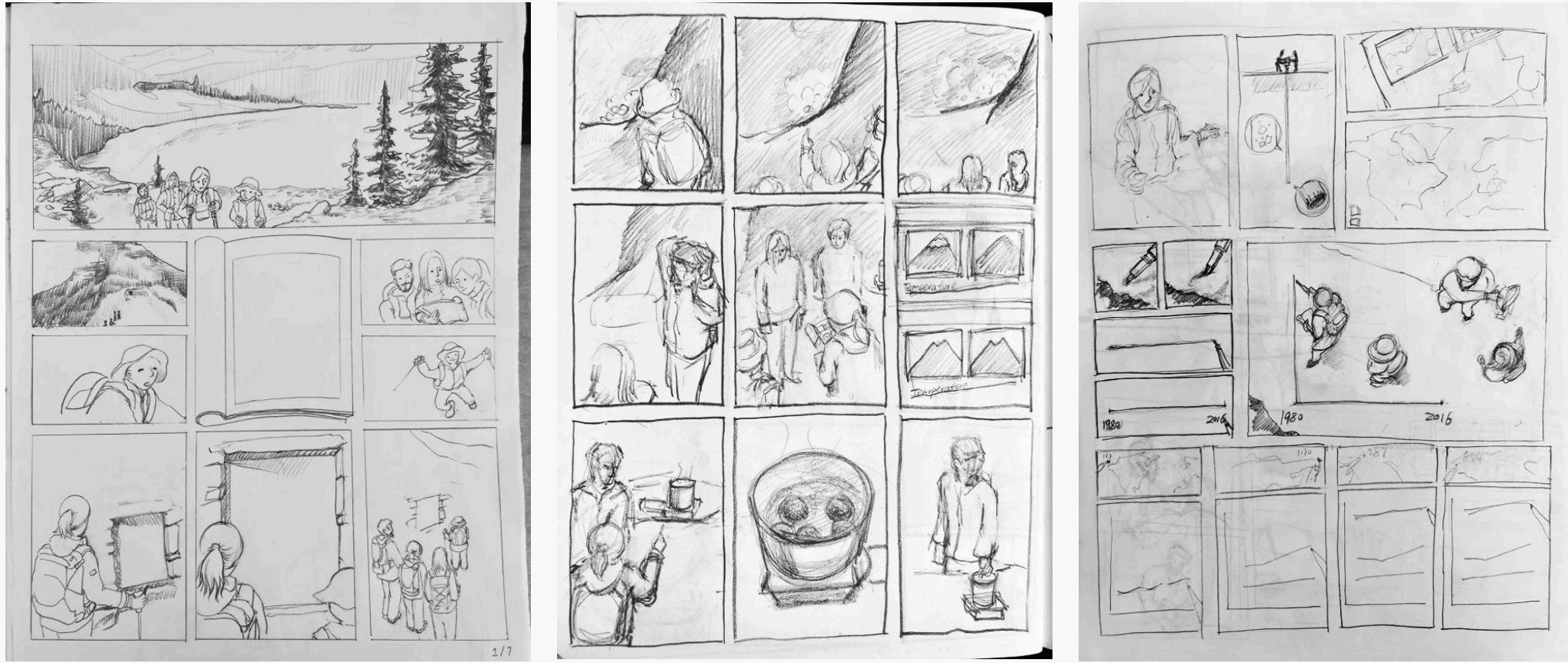


The newly constructed Abbot Pass Hut in **1922**.  
Photo: Courtesy of the Whyte Museum of the Canadian Rockies, V200-PA-81B



The Abbot Pass Hut and the erosion in **2021**.  
Photo: Parks Canada

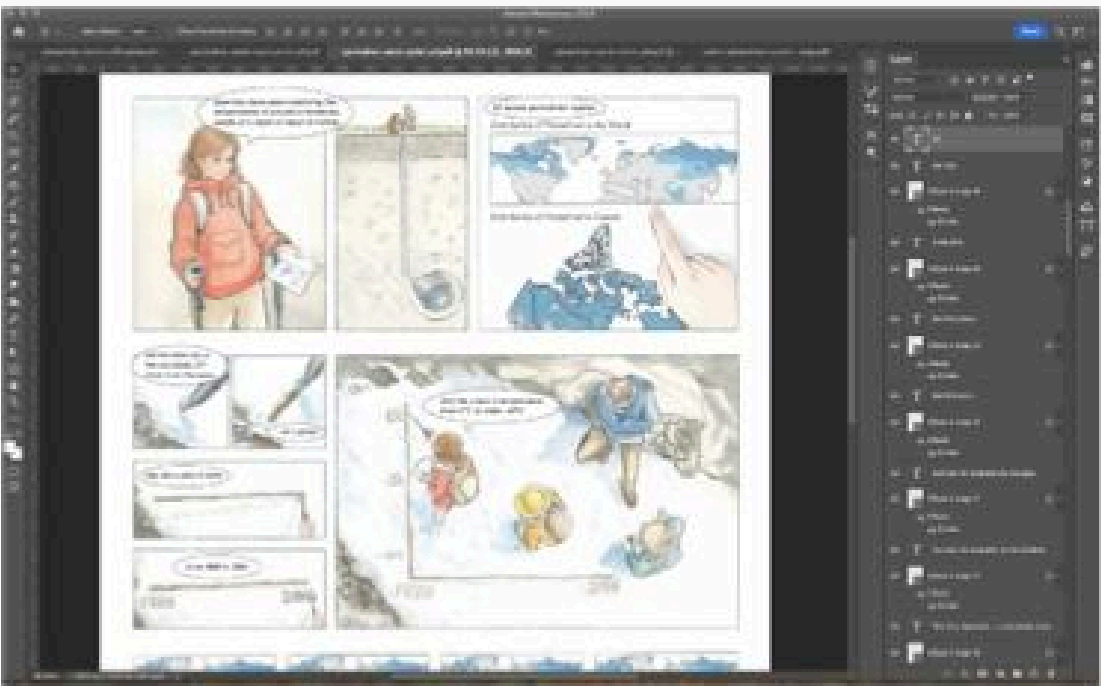




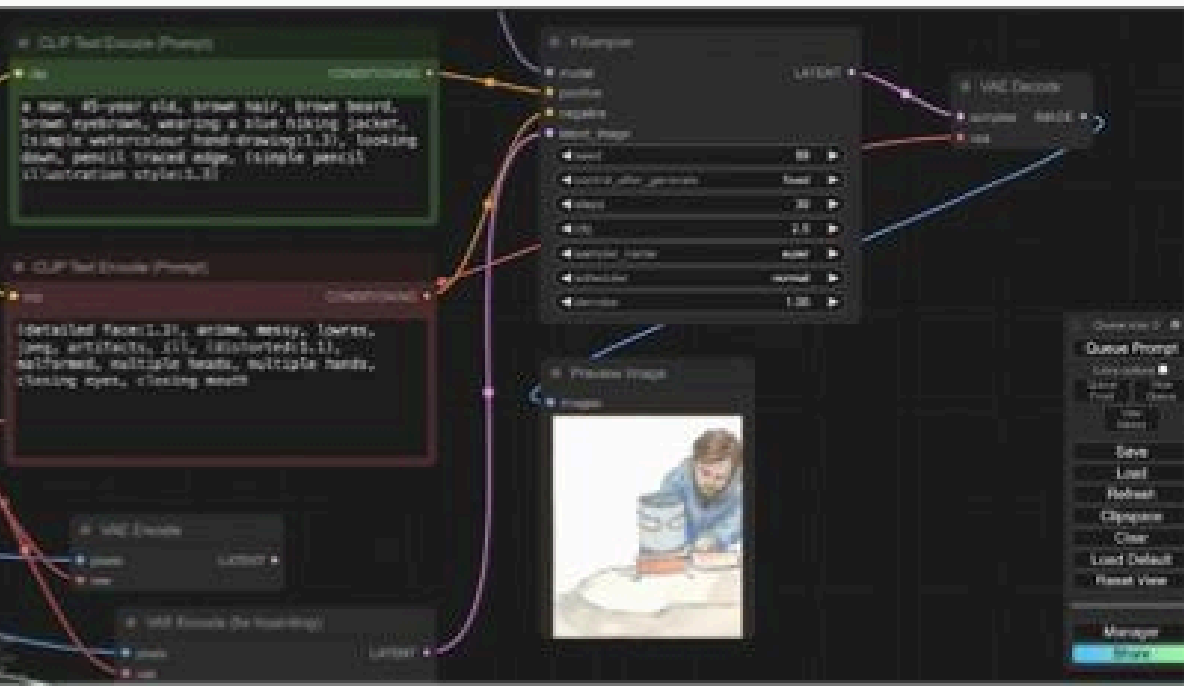
It was colored with water color



Fine-tuned with Photoshop



and Stable Diffusion with ComfyUI



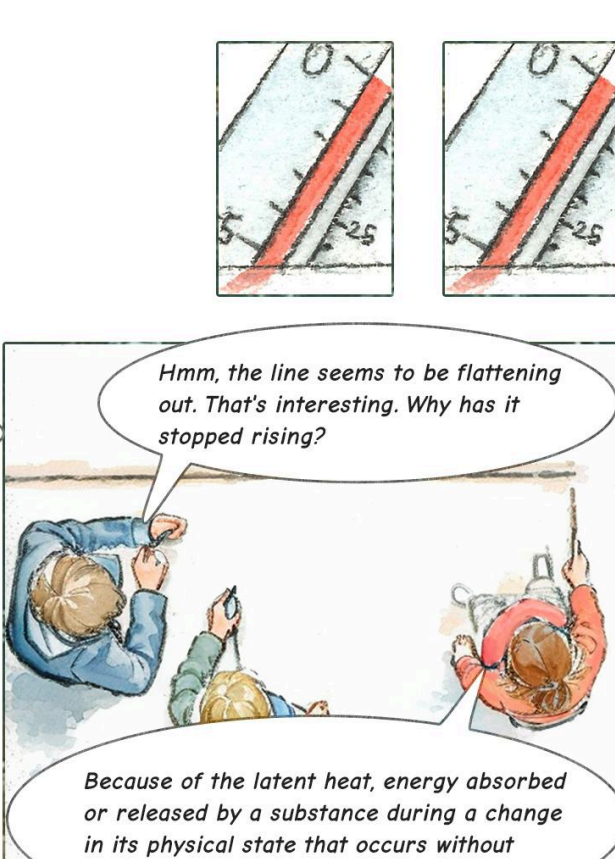
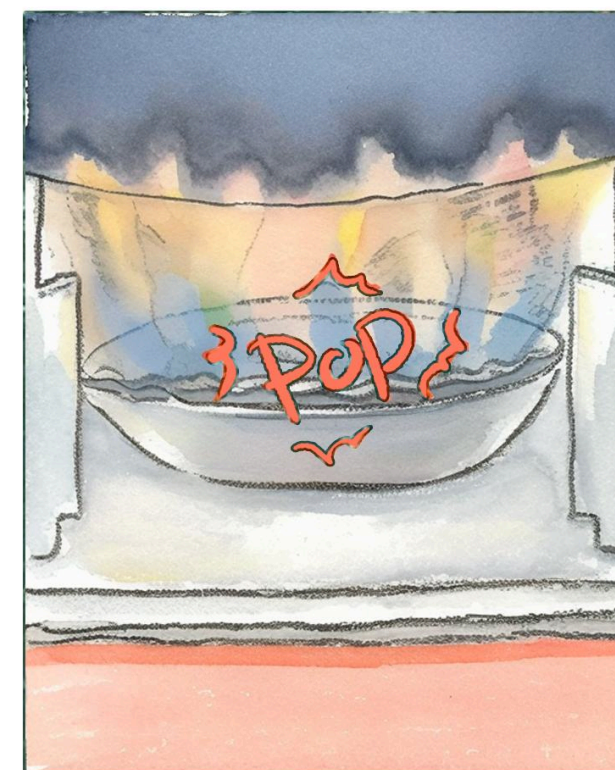
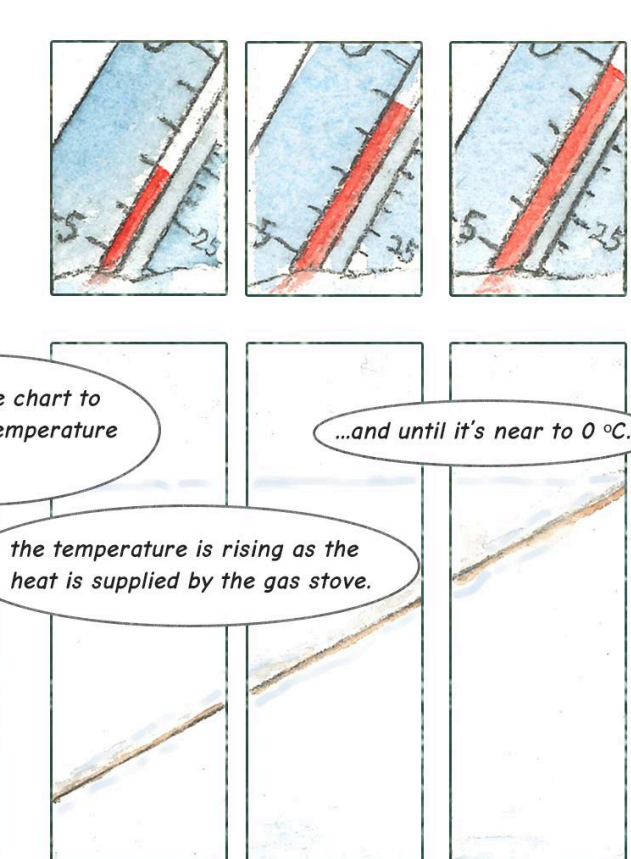
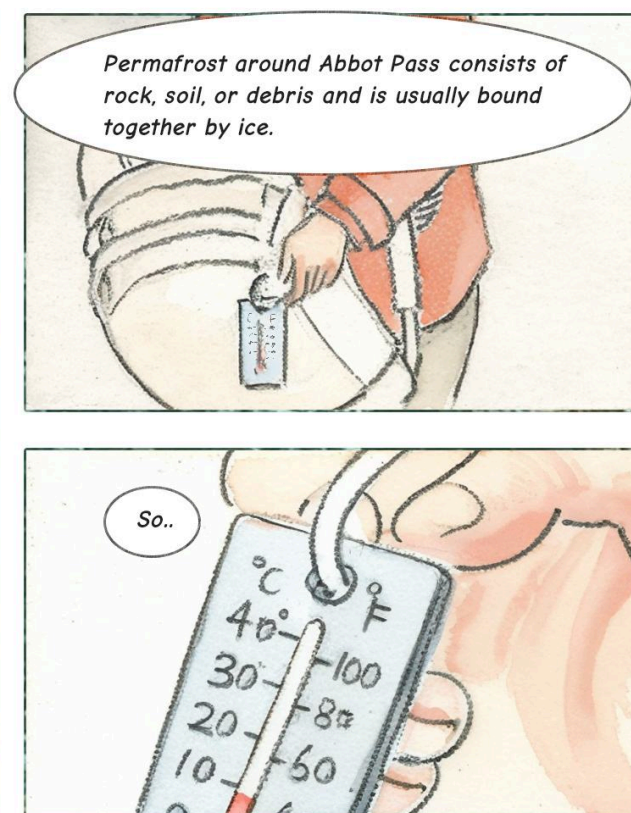
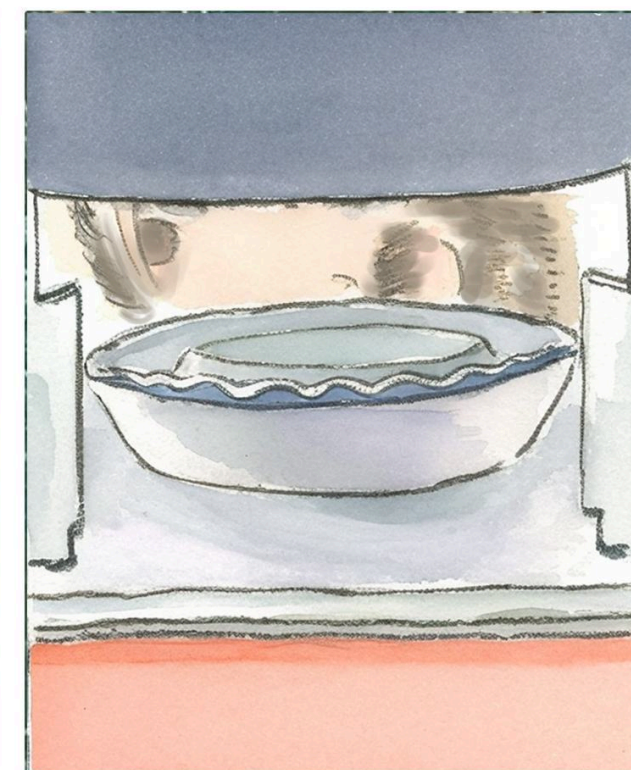
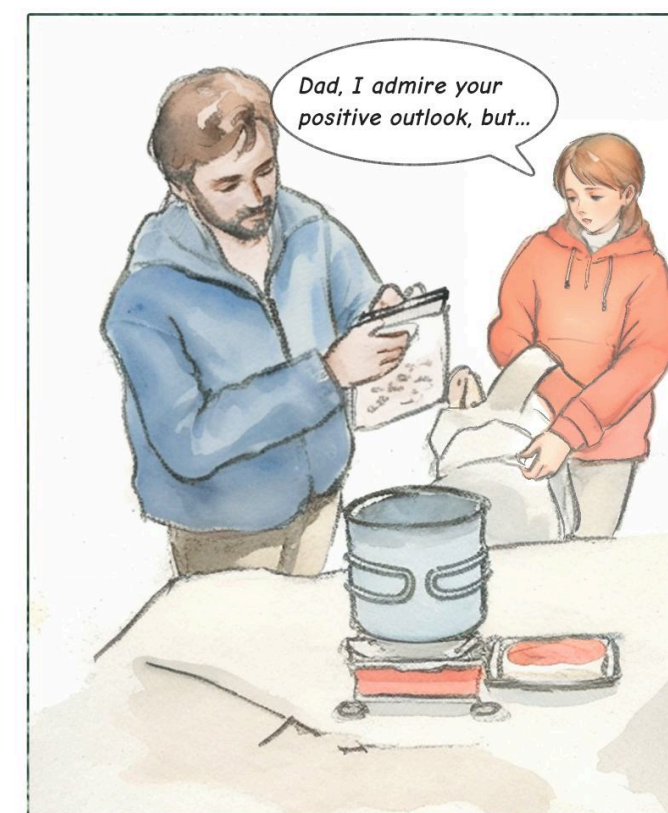
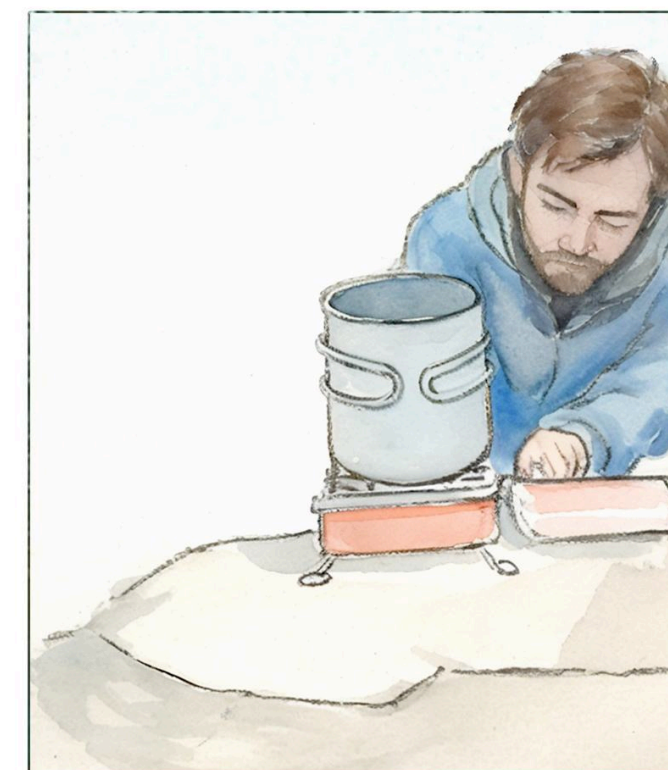
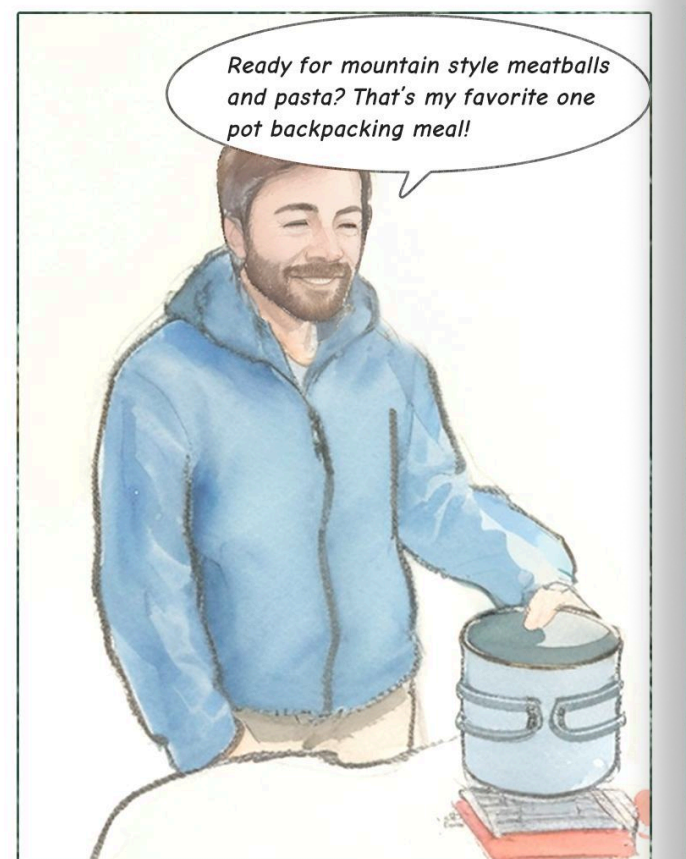
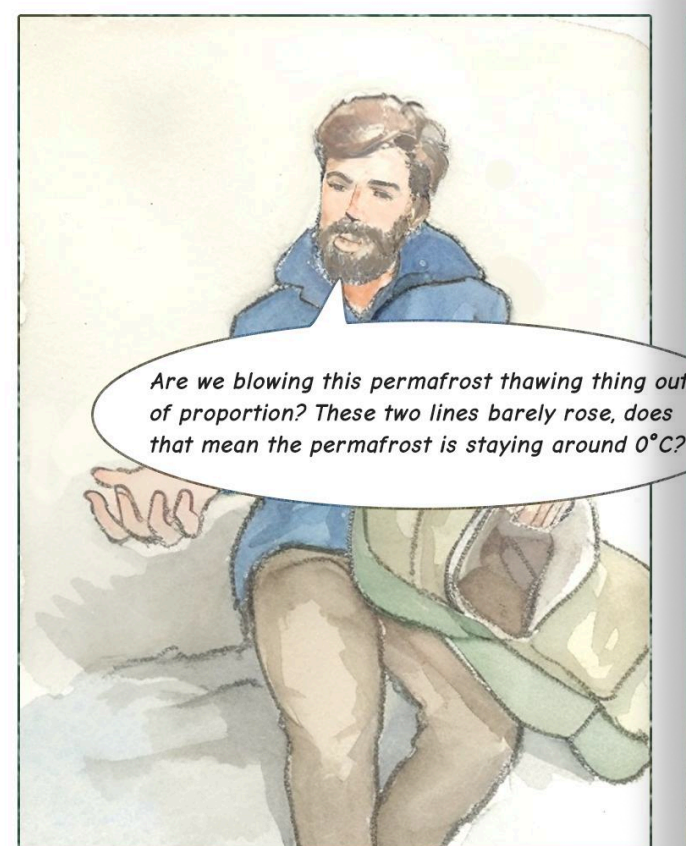
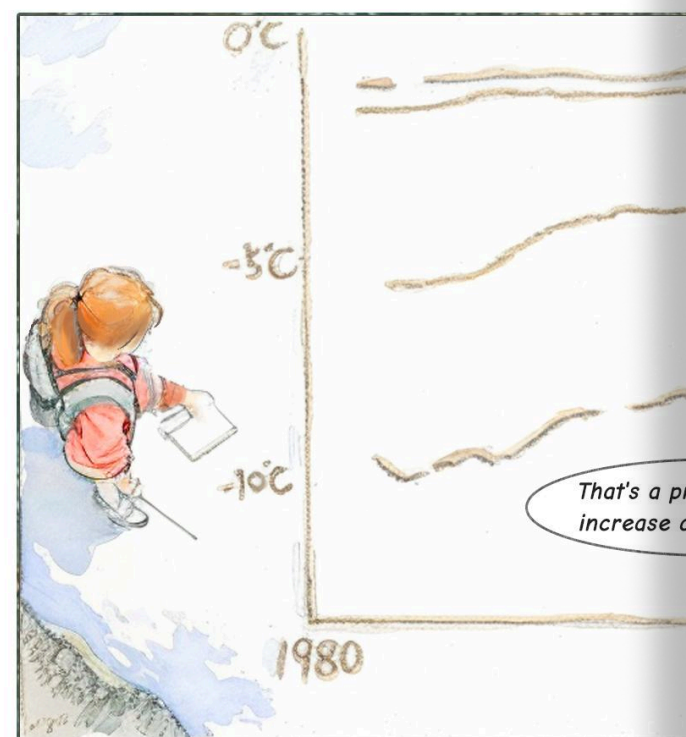
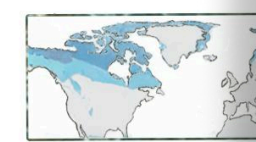
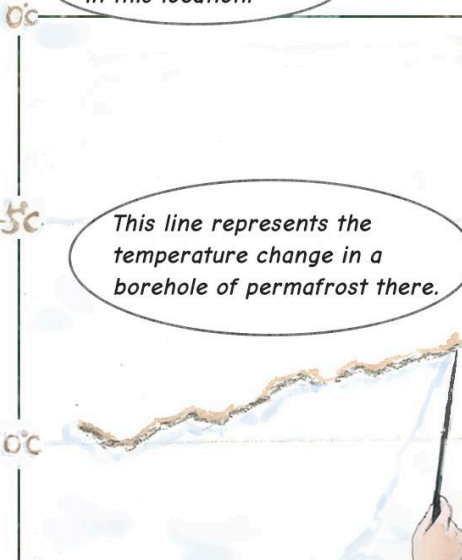
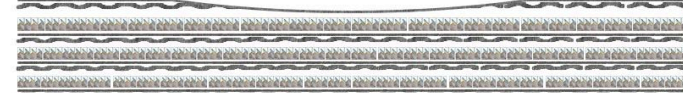
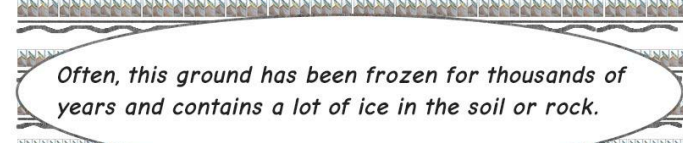
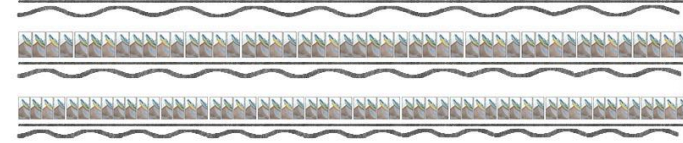
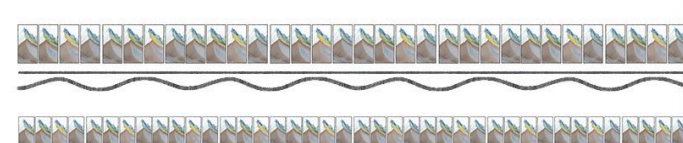
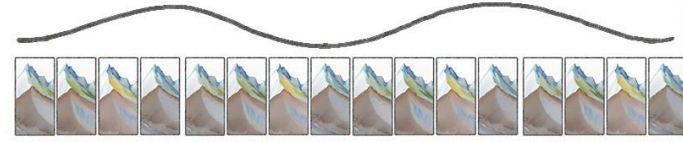
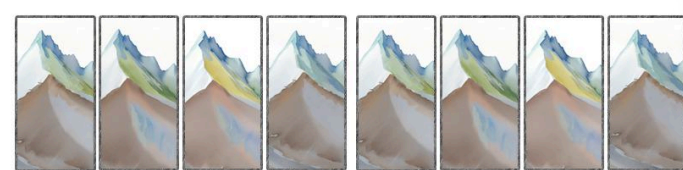




# PASTA OR DISASTER

[Project Website](#) ↗





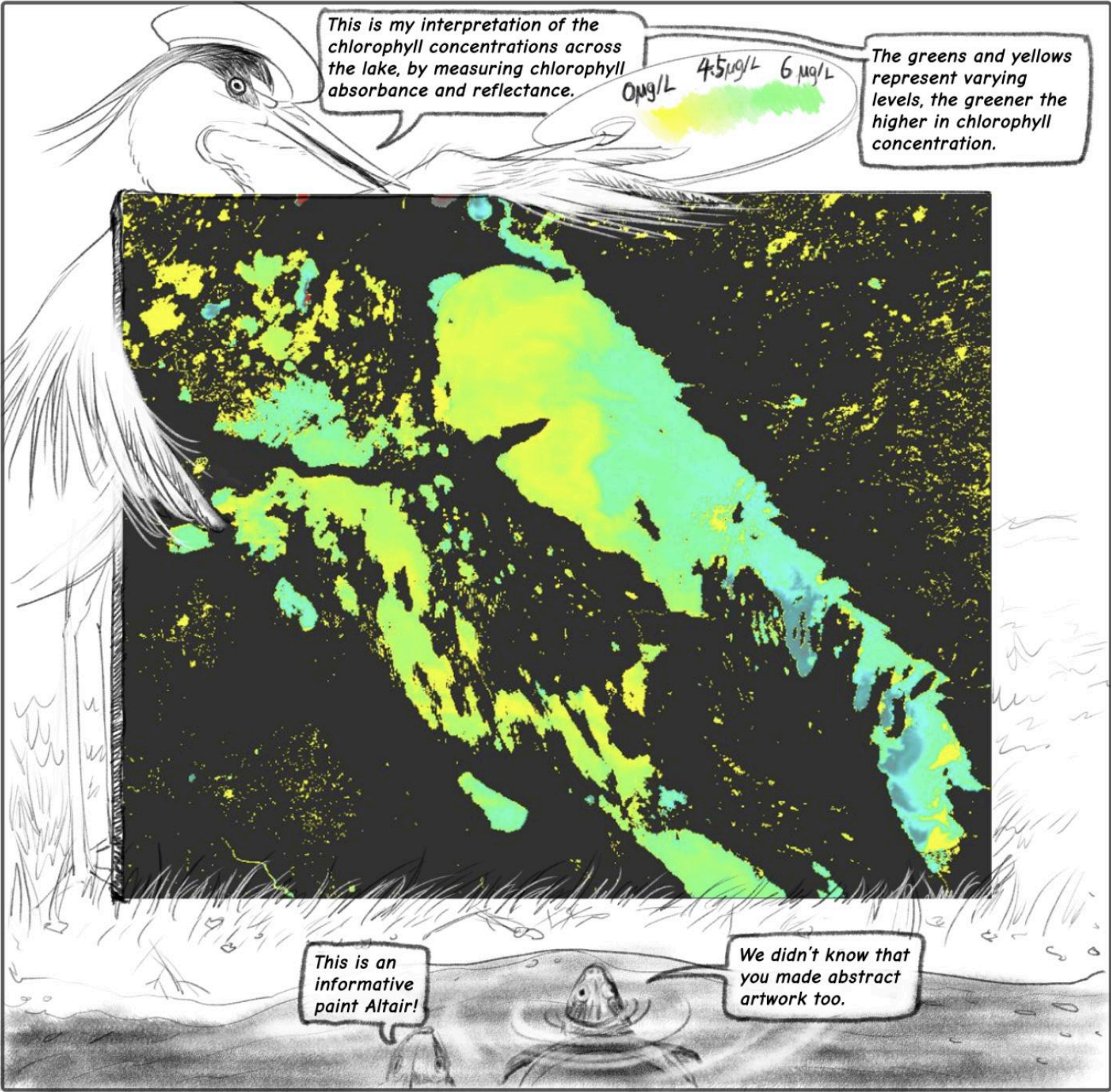


I explore different approaches to deliver the validated data in an accessible way:

**Faction:** Combining elements of *fact* and *fiction* to make verifiable and justifiable claims to truth and simultaneously engage readers.

**Explaining Scientific Concepts:** Using diagrams to explain climate science concepts, preparing the audience to understand the data and its relation to climate.

**Expressive Data Visualizations:** Adapting visualizations from technical reports and academic papers to fit the scenarios and narratives with expressive design, integrating them seamlessly into the storytelling.



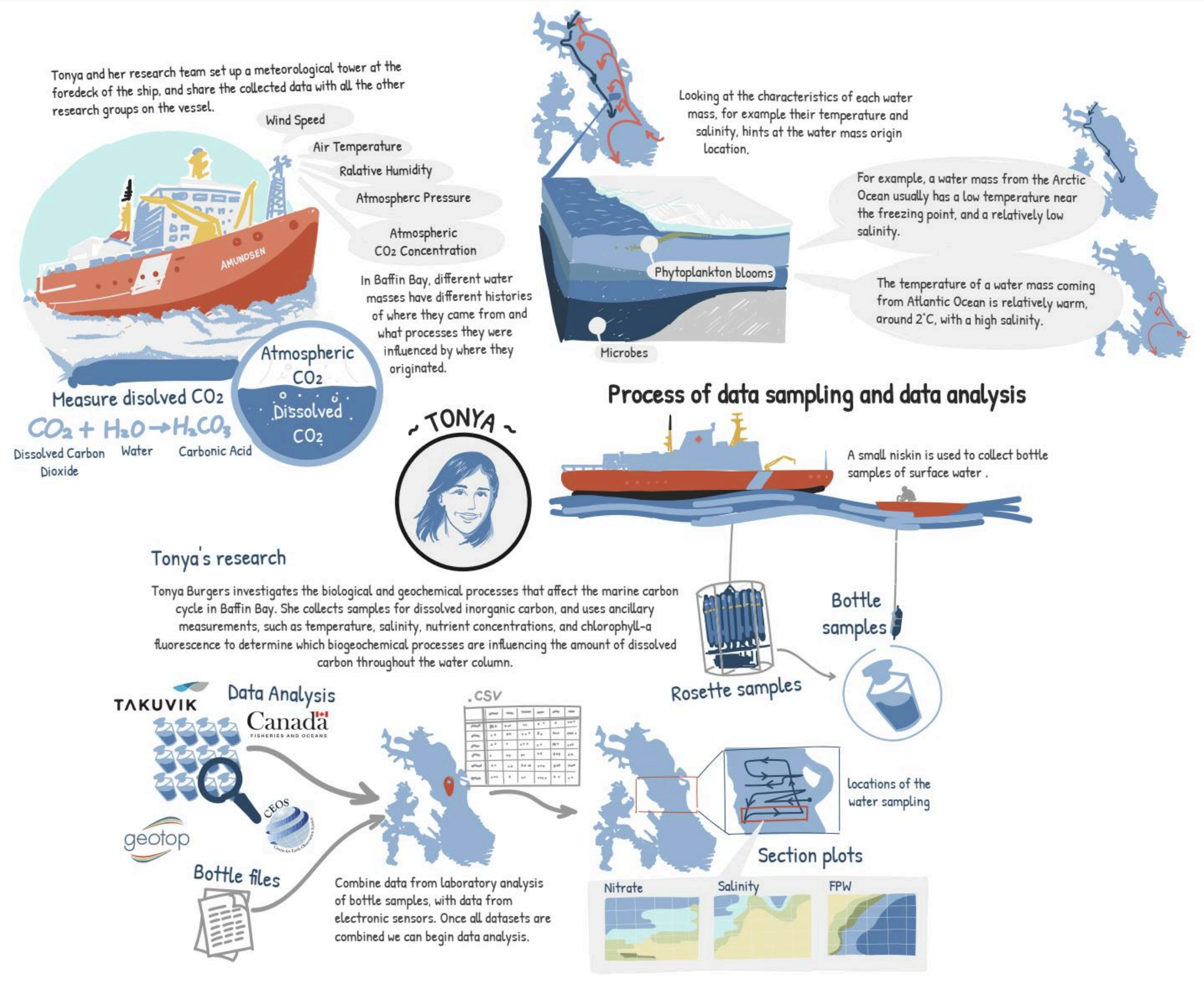


# DataBuffet

[Project Website](#) ➤

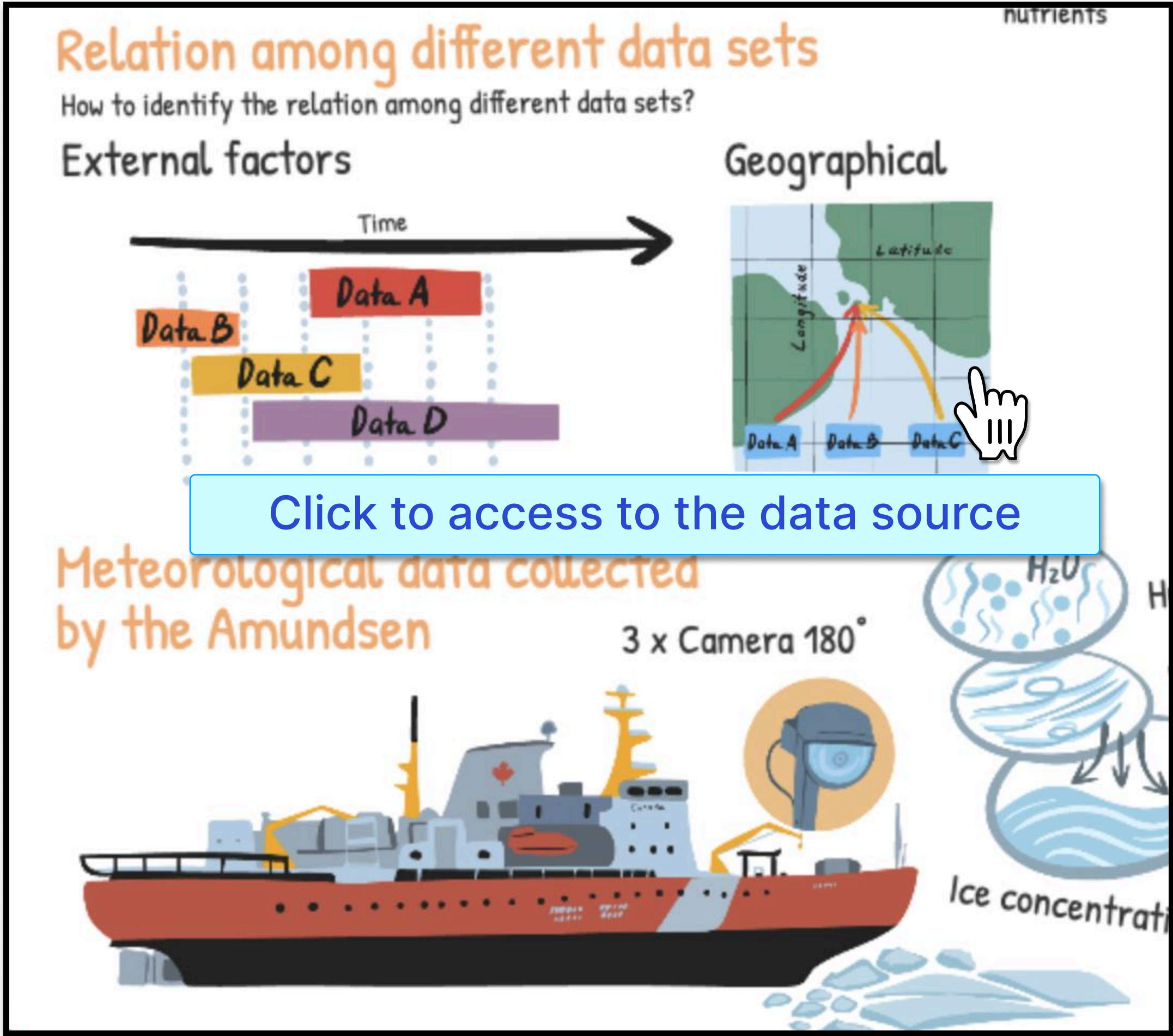
DataBuffet is a web-based **user interface** that highlights the motivation, complexity, challenges, and fascination of people from Canadian Consortium for Arctic Data Interoperability (CCADI) who work with data regularly. The interface uses a sketch-based approach to make both the data and its context more relatable and accessible.

The context of these data is complex, involving administrative processes, institutional and governmental regulations, the issues being addressed, and the methods and devices used for data collection—all of which are scattered across different sources. By interviewing the people working with these data, I translated their stories into visual sketches and interface concepts, and collaborated with an engineer on the team to build a system with a backend that allows users to upload new SVGs and add interactions themselves.





User can freely explore the interface and access to the data source by clicking on visual elements:





# Cheat Sheets for Data Visualization Techniques

[Project Website ↗](#)

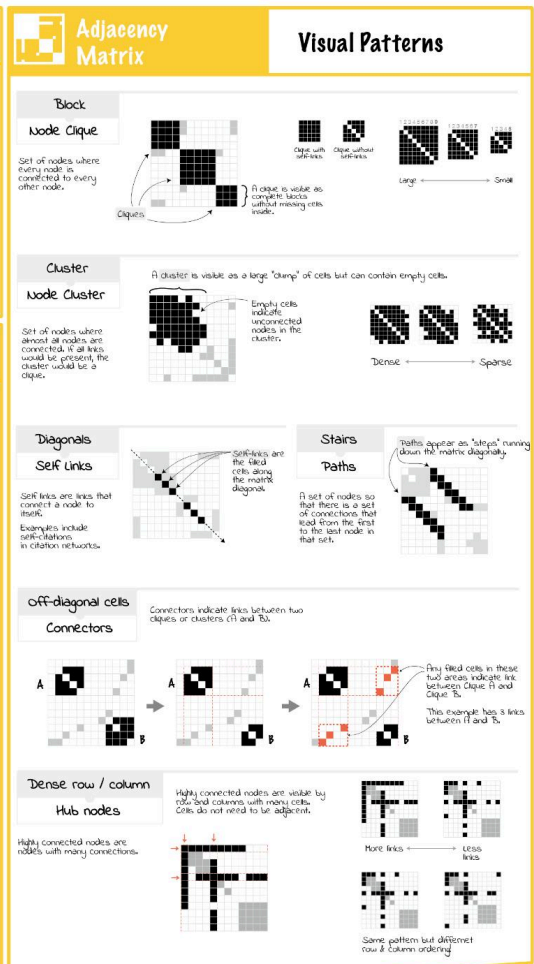
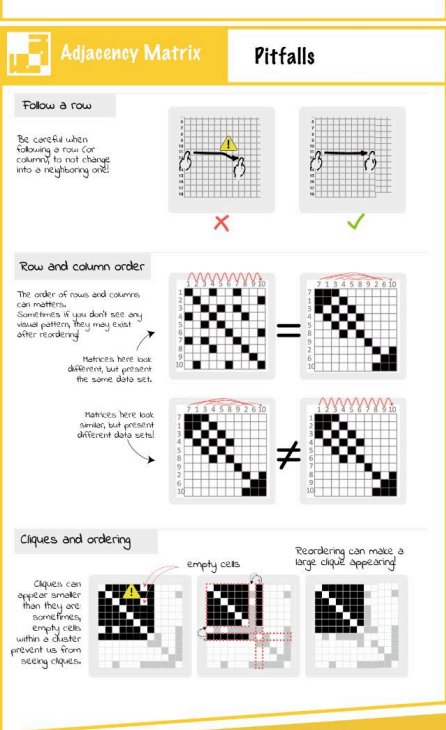
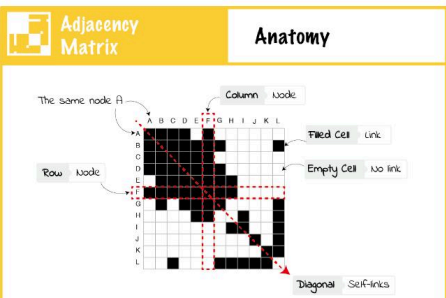
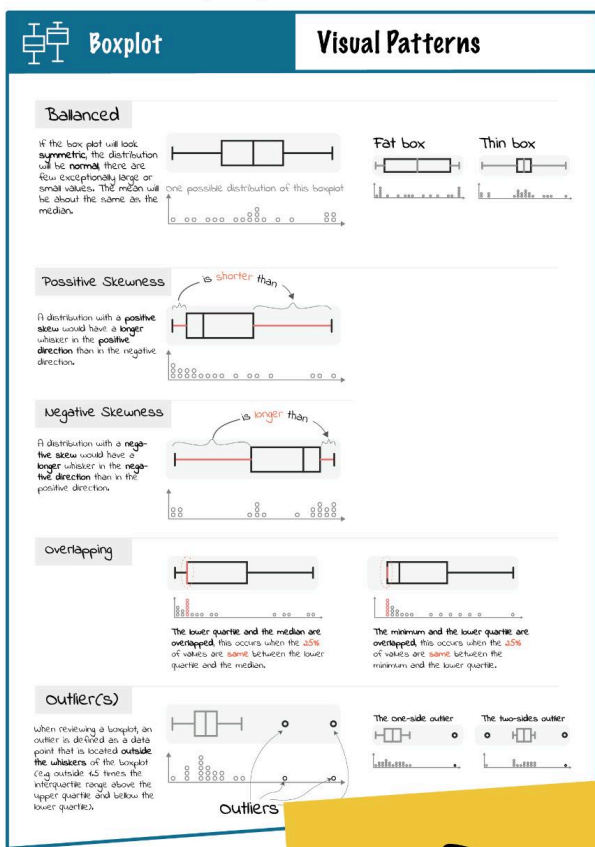
Cheat sheets are sets of concise graphical and textual explanations, inspired by infographics, data comics, and cheat sheets in other domains. Cheat sheets aim to support **learning**, **teaching**, and the regular use of both common and novel **visualization techniques** in a variety of contexts.

I designed these cheat sheets in collaboration with visualization educators and iterated on them based on feedback from students. Each sheet includes six key components: anatomy, construction, visual patterns, pitfalls, false friends, and well-known relatives. I evaluated them through a qualitative user study, which demonstrated the readability and usefulness of the cheat sheets.

**Wang, Z., Sundin, L., Murray-Rust, D., & Bach, B. (2020, April).** Cheat sheets for data visualization techniques. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (pp. 1-13).

[Find the Paper ↗](#)

**A cheat sheet** is a set of concise graphical and textual explanations, inspired by infographics, data comics, and cheat sheets in other domains. Cheat sheets aim to support learning, teaching, and the regular use of both common and novel visualization techniques in a variety of contexts. To design cheat sheets for visualization techniques, we describe four components of a cheat sheet: **anatomy**, **visual patterns**, **pitfalls**, and **introduction**. Our cheat sheets address the increasing need for accessible material that supports understanding data visualization techniques, their use, their fallacies and so forth by a larger audience.



## Cheat Sheets

Exploring for Data Visualization Techniques

Ze Zhong Wang  
Lovisa Sundin  
Dave Murray-Rust  
Benjamin Bach

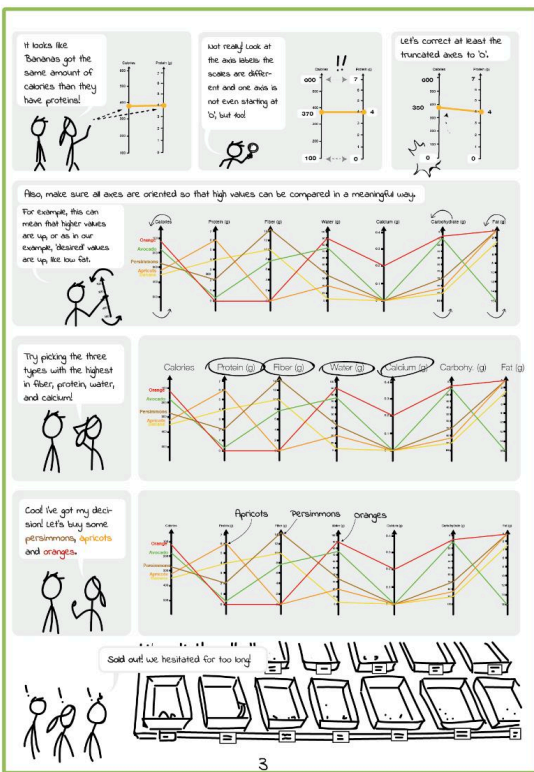
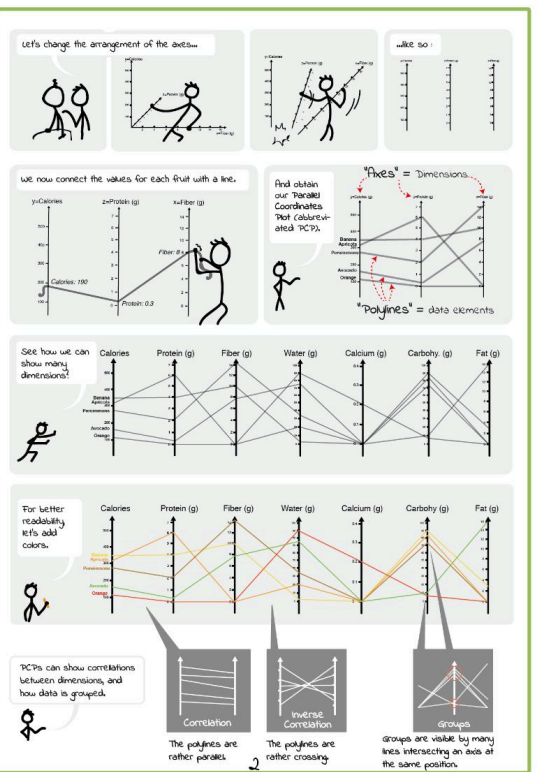
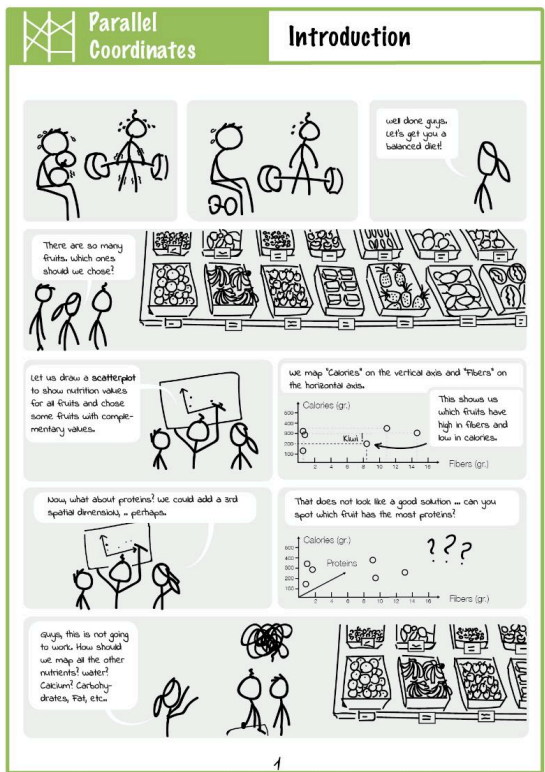
THE UNIVERSITY of EDINBURGH  
University of Glasgow

An **Introduction** introduces a visualization technique in a specific context, explains its purpose, and highlights important aspects described in the individual sheets.

**Anatomy** explains the visual elements of a visualization technique, their composition, their specific terminology, and how they relate to the data.

**Visual patterns** sheet provides a catalogue of meaningful patterns visible in a visualization.

**Pitfalls** show possible misinterpretations of a visualization. Some pitfalls are introduced by bad or intentional design of an individual visualization, other pitfalls are intrinsic to the technique and require knowledge, rather than better design.



zezhong.wang@ed.ac.uk



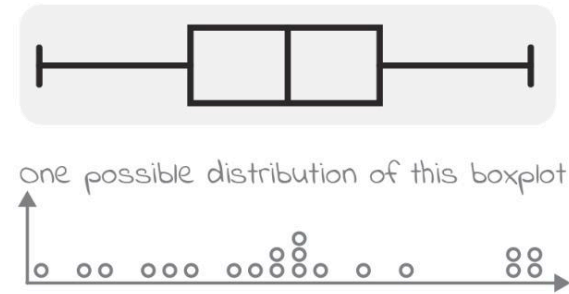


## Boxplot

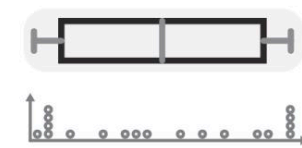
## Visual Patterns

### Balanced

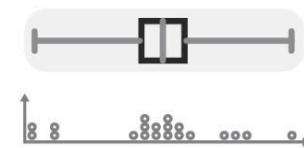
If the box plot will look **symmetric**, the distribution will be **normal**, there are few exceptionally large or small values. The mean will be about the same as the median.



### Fat box

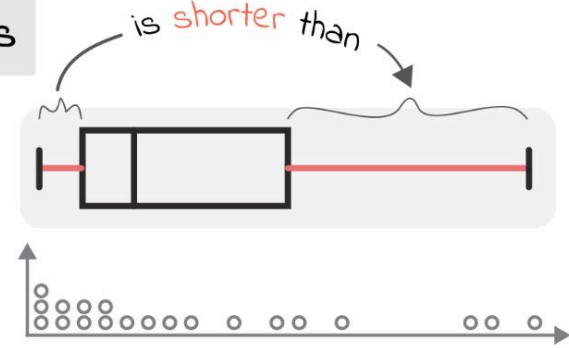


### Thin box



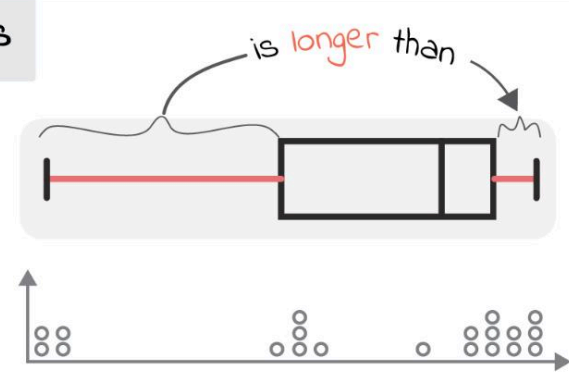
### Positive Skewness

A distribution with a **positive skew** would have a **longer** whisker in the **positive** direction than in the **negative** direction.

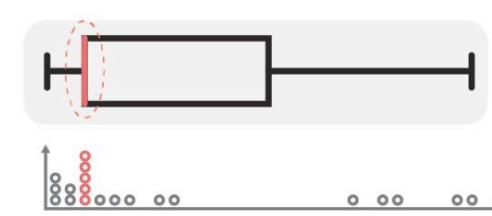


### Negative Skewness

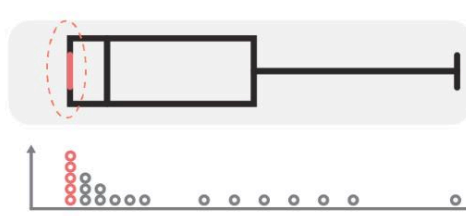
A distribution with a **negative skew** would have a **longer** whisker in the **negative** direction than in the **positive** direction.



### Overlapping



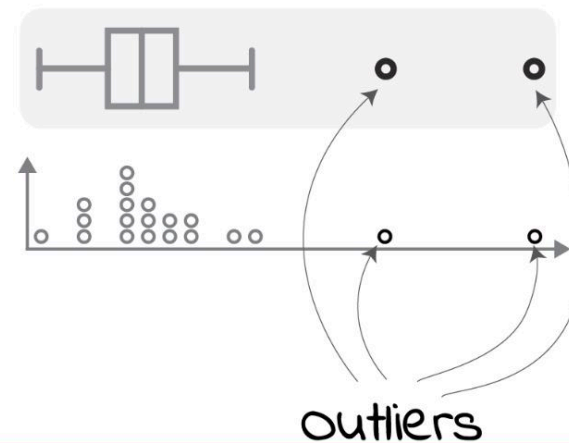
The lower quartile and the median are **overlapped**, this occurs when the **25%** of values are **same** between the lower quartile and the median.



The minimum and the lower quartile are **overlapped**, this occurs when the **25%** of values are **same** between the minimum and the lower quartile.

### Outlier(s)

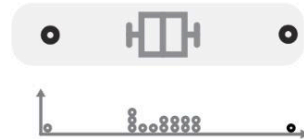
When reviewing a boxplot, an outlier is defined as a data point that is located **outside the whiskers** of the boxplot (e.g. outside 1.5 times the interquartile range above the upper quartile and below the lower quartile).



### The one-side outlier



### The two-sides outlier



## Trees

Trees are hierarchically organised sets of nodes, where each node is connected to its parent node.

## Hubs

Hubs are highly connected nodes, i.e., nodes with many connections.



## Parallel Coordinates

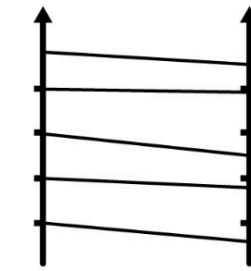
## Visual Patterns

### Parallel lines

### Positive Corre-

Correlations indicate that high values in one data dimension co-occur with high values in another dimension.

Correlations are not



A correlation is visible through parallel polylines between



Strong correla-

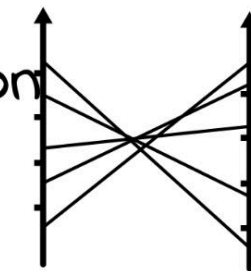


Weak correla-

### Crossing

### Negative Correlation

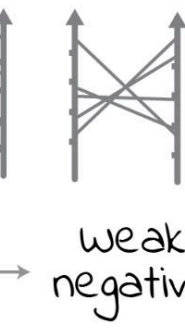
Inverse correlations indicate that high values in one data dimension co-occur with low values in



An inverse correlation is visible through lots of crossing polylines between



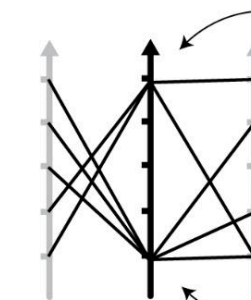
Strong negative correlation



Weak negative

### Converging lines Groups

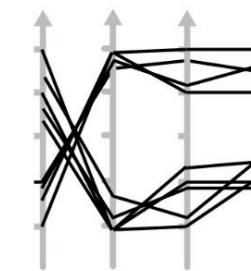
Groups indicate many elements with the same value or similar values.



Groups are visible by many lines intersecting an axis at the same position.

### Grouped lines Clusters

Clusters indicate data elements with similar values across several dimensions.



Clusters are visible as polylines following each other across several axes, resulting in



## Confluence Graph

## Visual Patterns

### Clus-

Set of nodes where almost all nodes are connected. If all links would be present, the cluster is called a clique. There is no strict

The bundling makes a cluster appear less dense than it normally is.

### Cliques

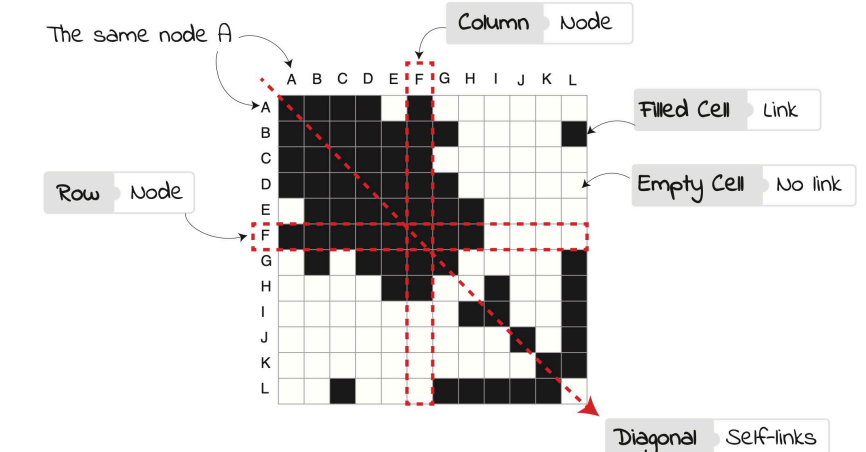
Set of nodes where every node is connected to every other node.

Nodes in confluence drawings can sometimes appear star-like at a distance, but tightly



## Adjacency Matrix

## Anatomy



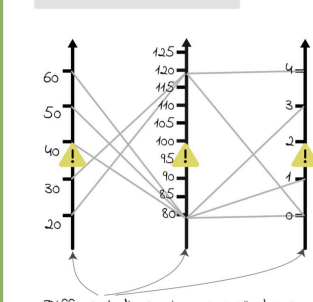
<https://visualizationcheatsheets.github.io>



## Parallel Coordinates

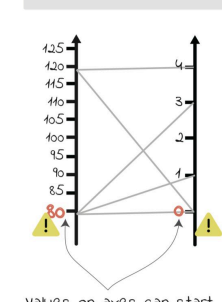
## Pitfalls

### Axis scales



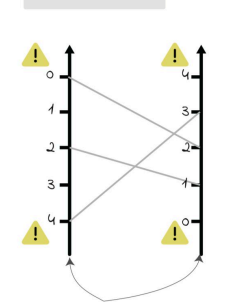
Different dimensions usually have different scales and units.

### Truncated axes



Values on axes can start from values other than '0'.

### Axes order



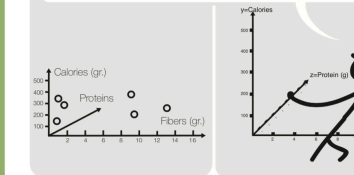
Values on axes can be either descending or ascending.



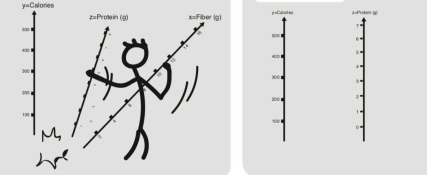
## Parallel Coordinates

## Construction

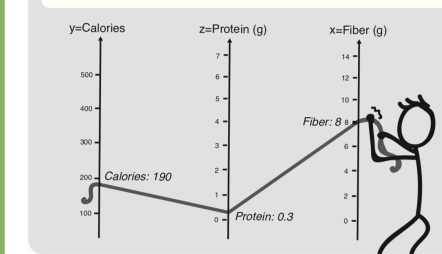
### Let's change the arrangement of the axes...



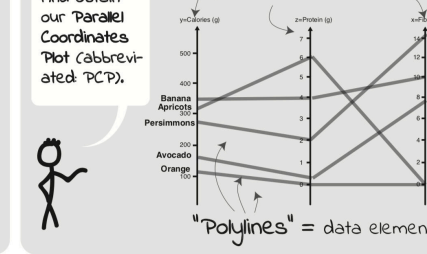
### like so:



### We now connect the values for each fruit with a line.



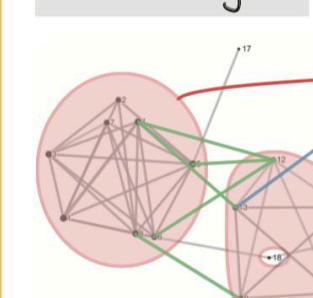
### And obtain our 'Parallel Coordinates Plot' (abbreviated 'PCP').



## Adjacency Matrix

## Well-known relative

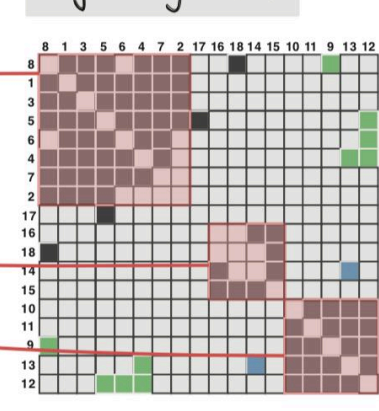
### Node-link diagram



In the example, nodes are connected in three clusters, and these clusters are connected as well.

<https://visualizationcheatsheets.github.io>

### Adjacency Matrix



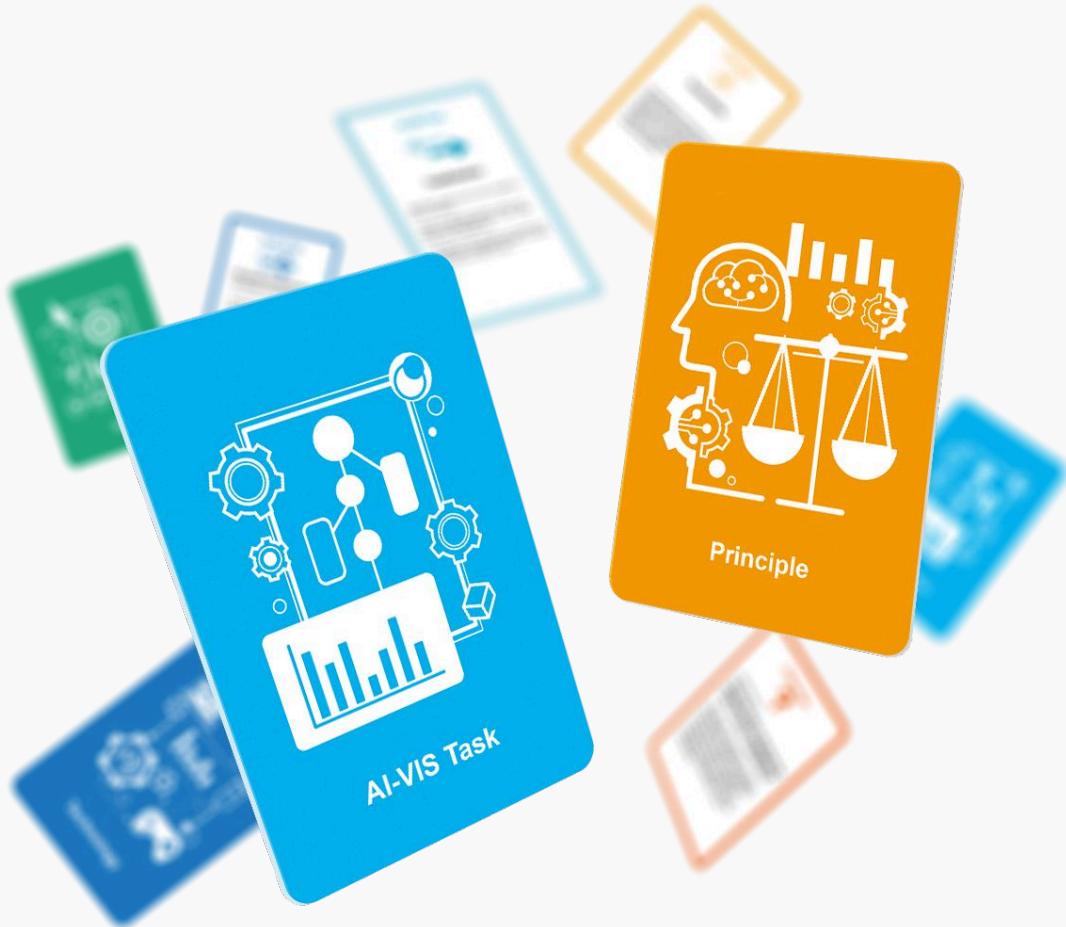


# AI-VIS EthiCards

[Project Website](#) ➤

AI-VIS EthiCards is designed to **facilitate ethical exploration** in the emerging field of **AI for Visualization**. The continuous integration of artificial intelligence and data visualization has brought about significant efficiency and benefits, but it also raises ethical concerns.

AI for Visualization applications, characterized by their interdisciplinary and multifaceted nature, require researchers, designers, and practitioners to develop ethical awareness and critically reflect on their responsibilities within this domain. AI-VIS EthiCards, organized into six categories (Goal, AI-VIS Task, Technology, Ethical Principle, People-in-Focus, and Challenge), serve as a framework for learning, discussion, and ethical reflection.



[Find the Paper](#) ➤





# Thank- you.