# Roslingifier: Semi-automated Storytelling for Animated Scatterplots

**Minjeong Shin**, Joohee Kim, Yunha Han, Lexing Xie, Mitchell Whitelaw, Bum Chul Kwon, Sungahn Ko, and Niklas Elmqvist

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# Motivation

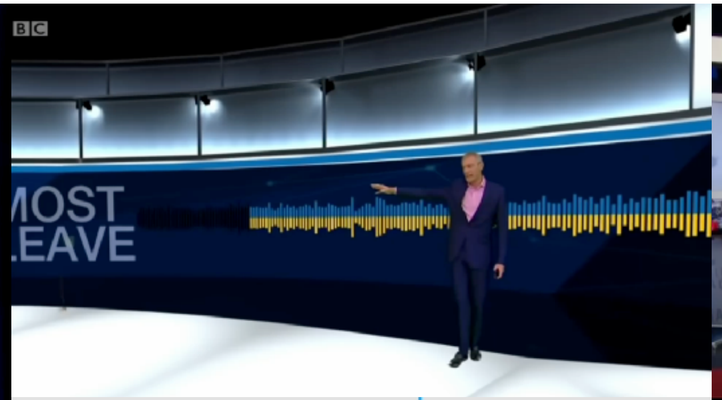
## Hans Rosling (1948-2017)

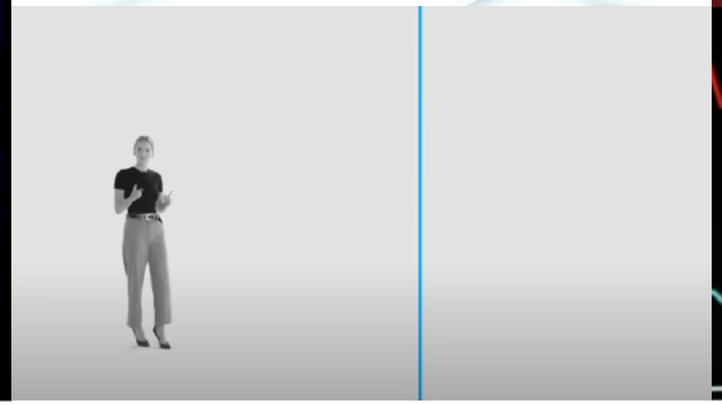

> *...and all of the rest of the world moves up into the corner where we have long lives and small families, and we have a completely new world.*
>
> *— Dr. Hans Rosling, 2006.*

[1] H. Rosling, “Debunking myths about the ‘third world’,” https://youtu.be/RUwS1uAdUcI, 2006.

# Motivation

## The new kind of presentations using animated data visualization

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[T2] RepresentUs. Unbreaking America: Solving the Corruption Crisis. Feb 27, 2019. https://youtu.be/TfQij4aQq1k

[M1] CNBC Television. Jim Cramer unveils the scariest pattern in the chart book. Jan 17, 2020. https://youtu.be/zQIZJQmnoV0

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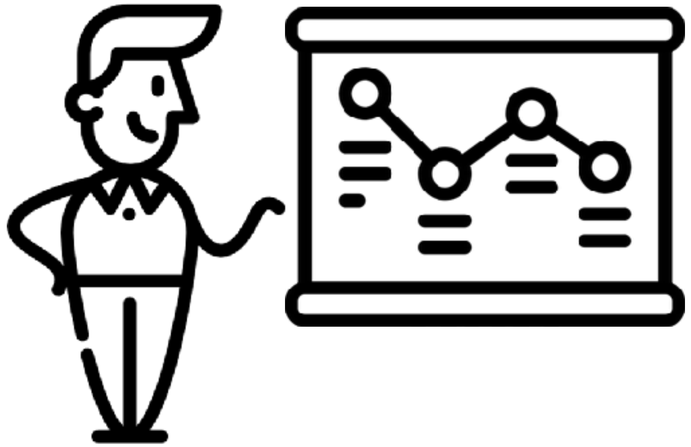
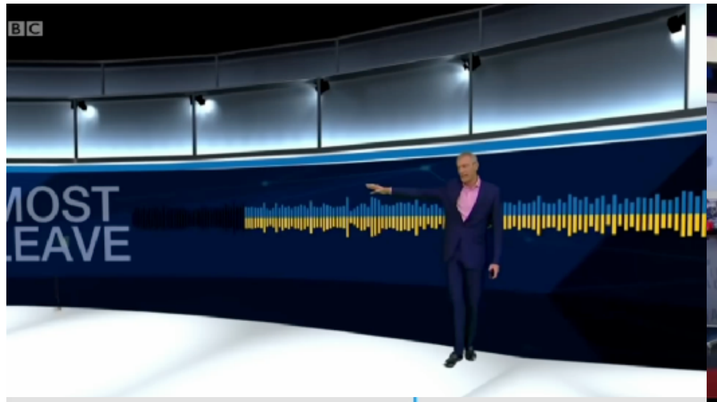
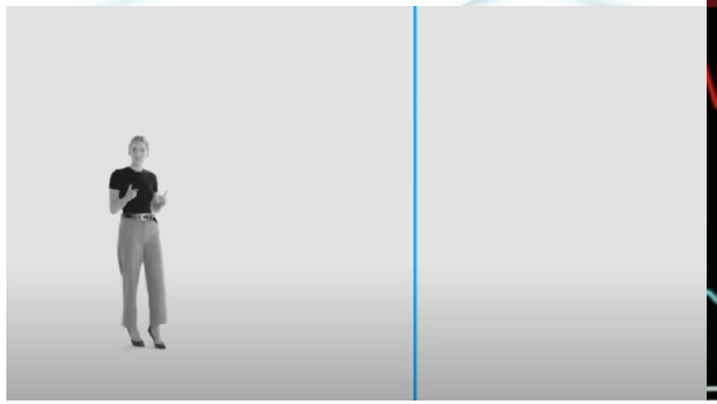


- Communicate information about data
- Include an interactive or animated visualization
- Presented by an in-person speaker





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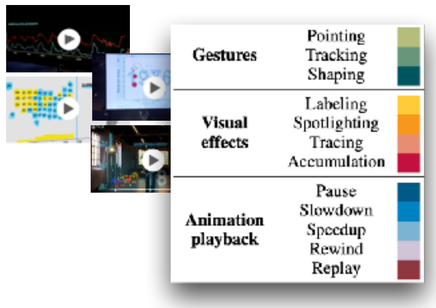
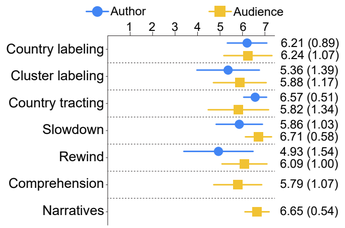
# Contribution

1. A formative study to define a design space of data presentation




2. Roslingifier: the data presentation authoring tool

3. User studies evaluating from both author and audience perspectives




4. A discussion of lessons learned and design implications for future research (In the paper)

# Design Space

## Data Presentation Survey

1 **Collect data presentations** from online streaming services:

- TED talks
- News and weather reports
- Data-driven organizations

| | |
|---|---|
| **Gestures** | Pointing<br>Tracking<br>Shaping |
| **Visual effects** | Labeling<br>Spotlighting<br>Tracing<br>Accumulation |
| **Animation playback** | Pause<br>Slowdown<br>Speedup<br>Rewind<br>Replay |

2 Two **authors independently code the videos into actions performed**.

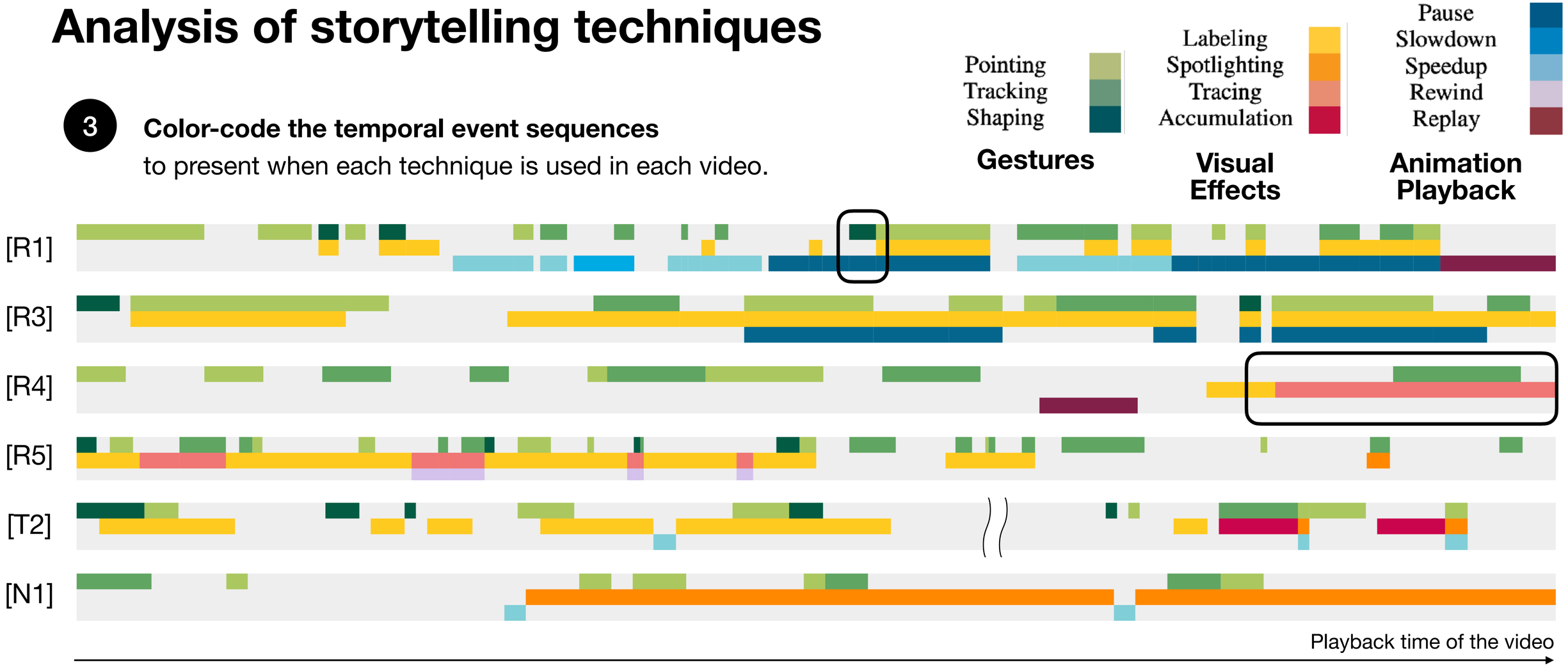
→ Resolve the conflict through discussion.

→ Establish names for the storytelling techniques.

# Design Space

## Analysis of storytelling techniques

**3** **Color-code the temporal event sequences**
to present when each technique is used in each video.



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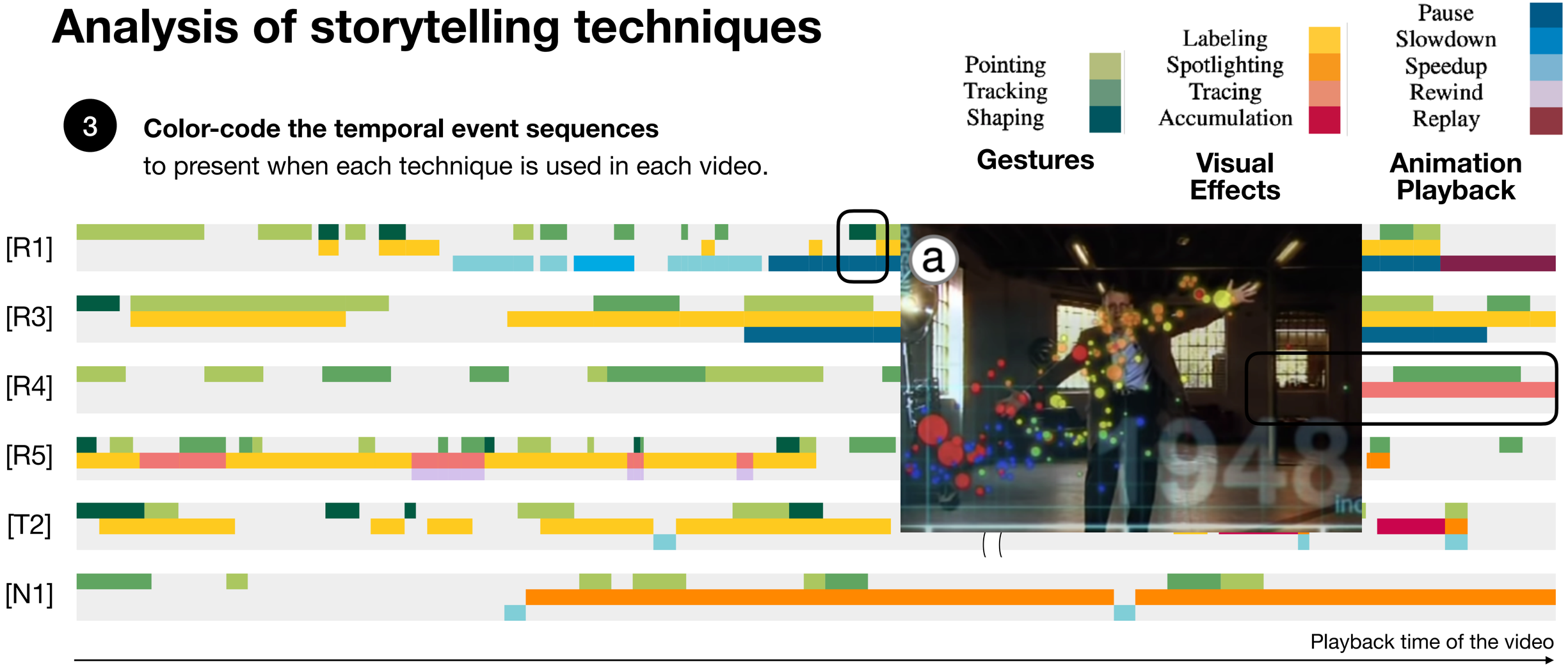

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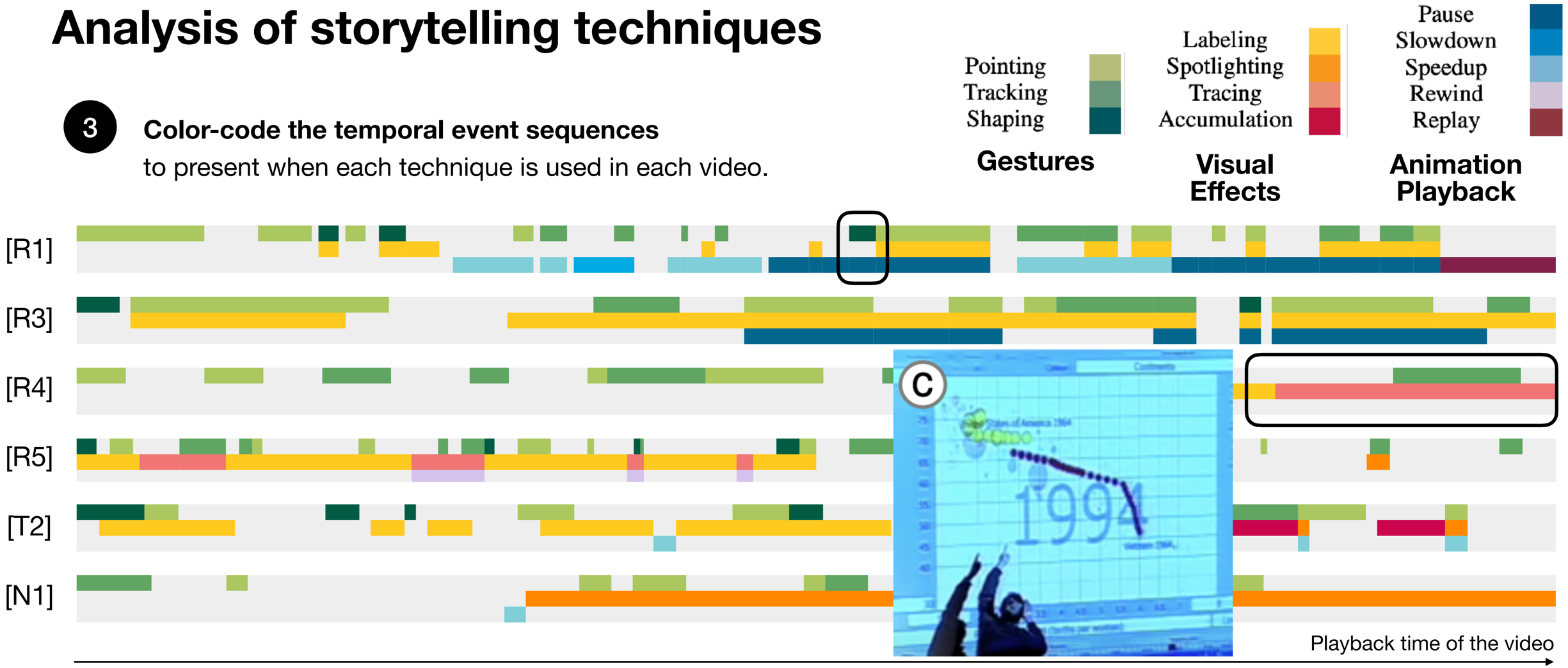
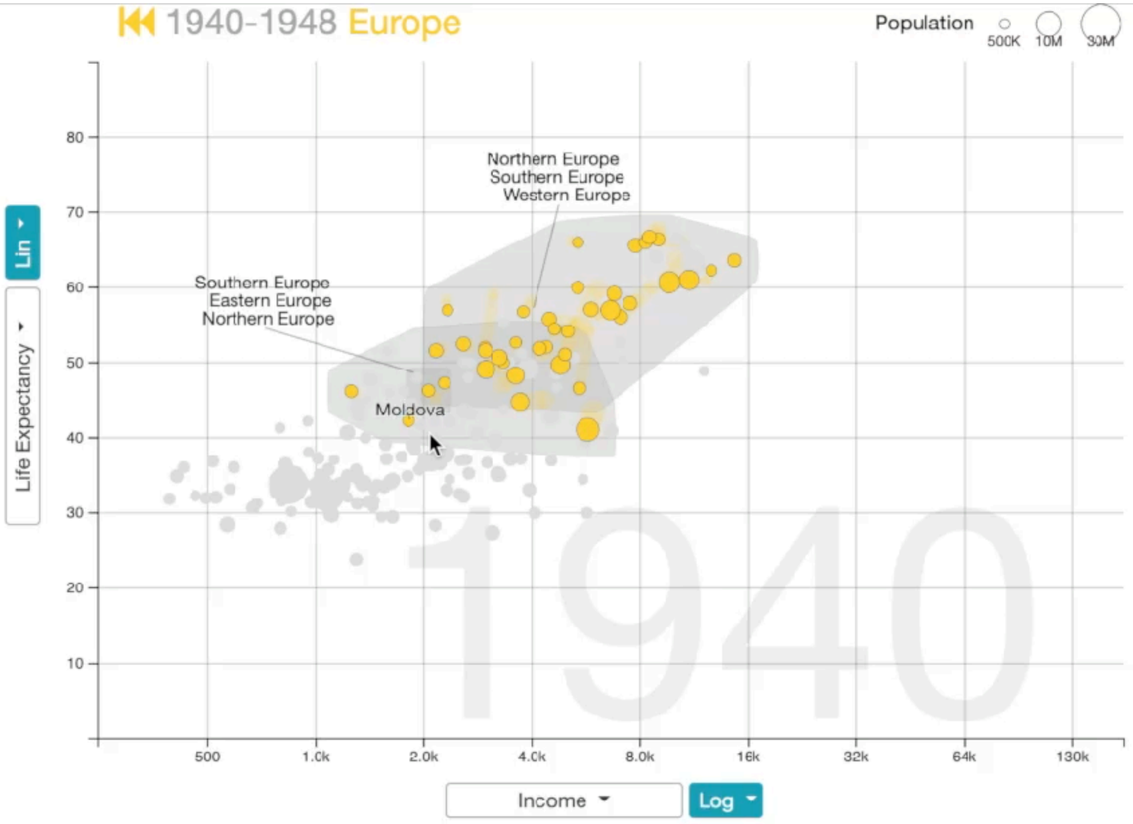
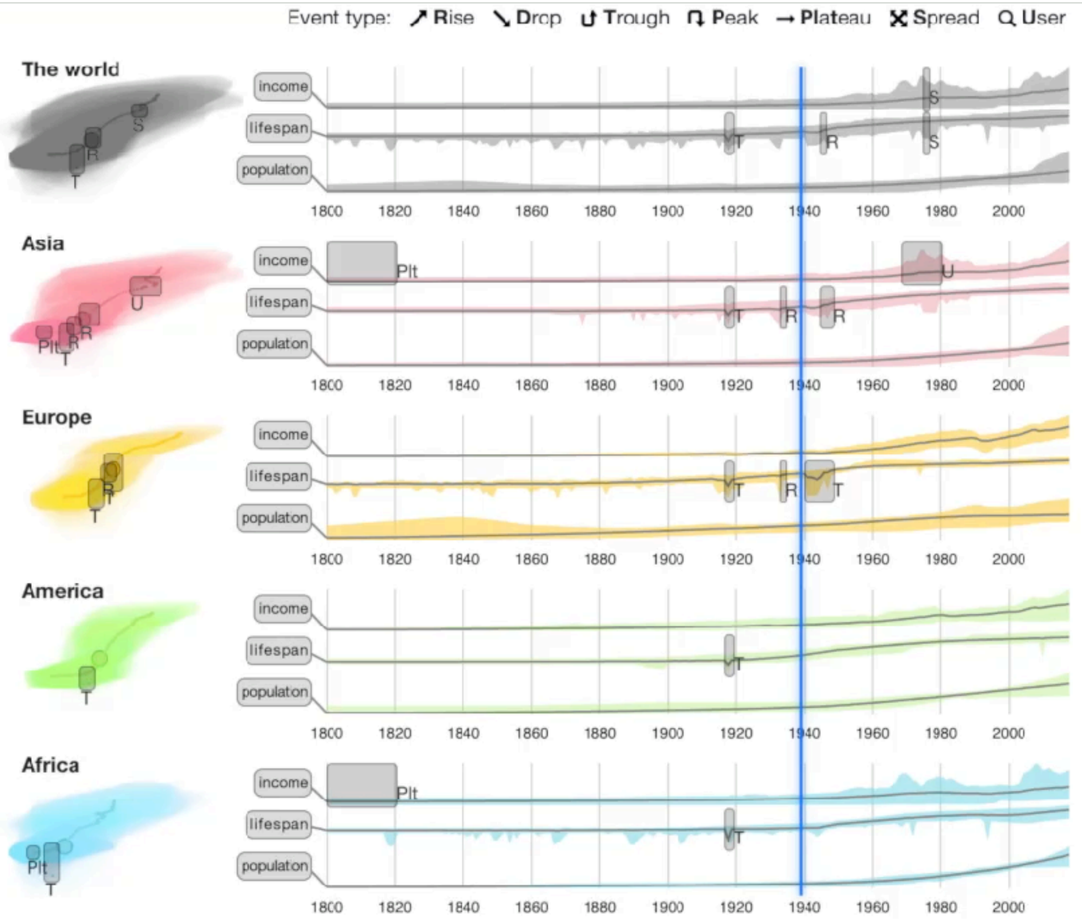
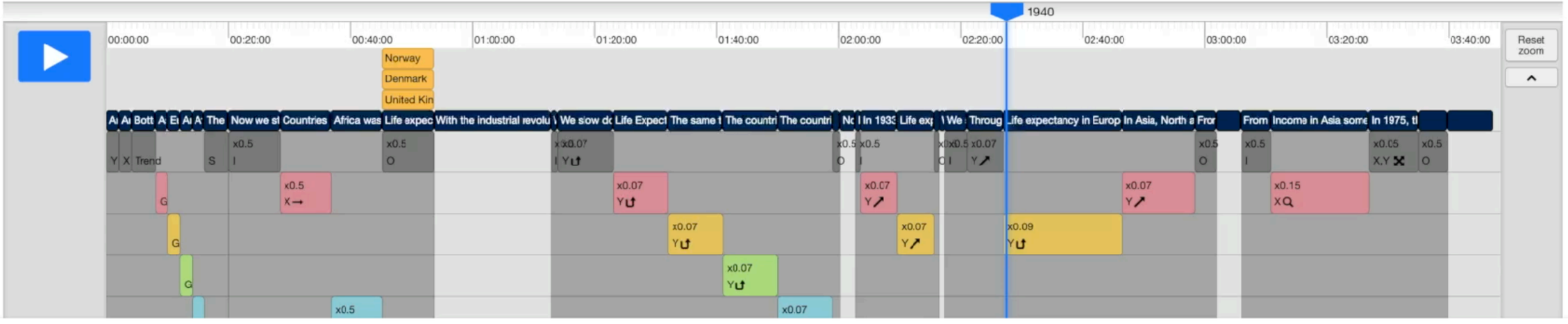
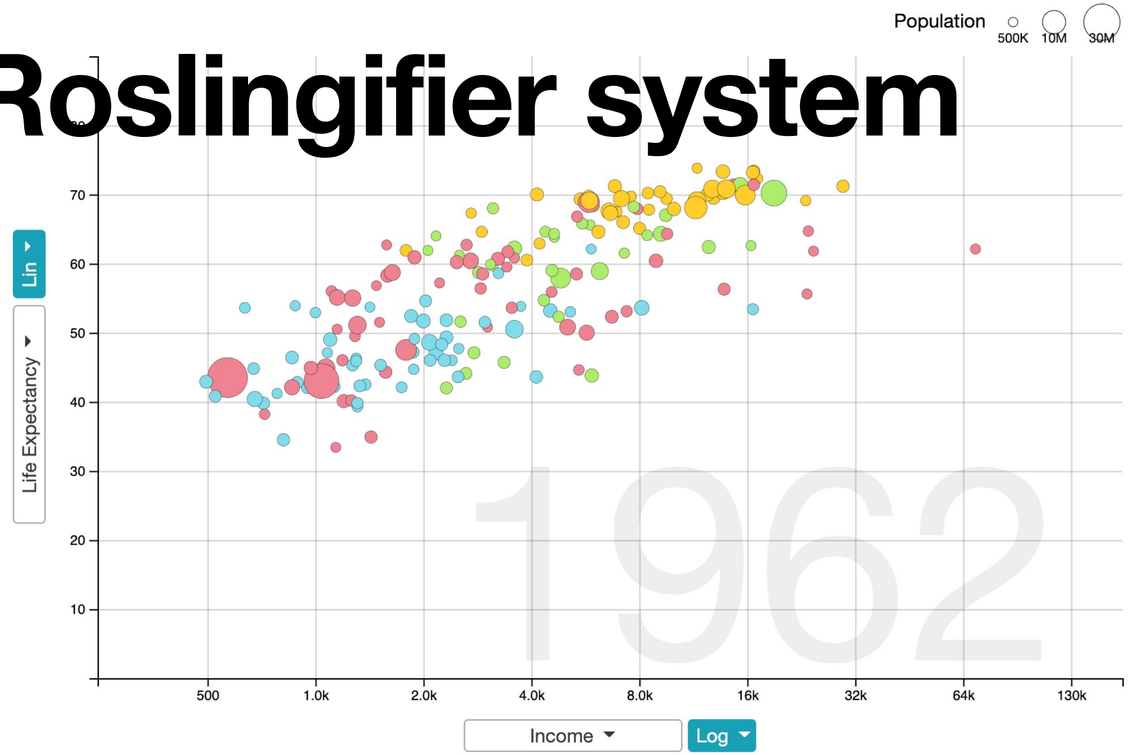



1940-1948 Europe
Population
500K
10M
30M
Lin
Life Expectancy
Northern Europe
Southern Europe
Western Europe
Southern Europe
Eastern Europe
Northern Europe
Moldova
1940
Income
Log
Life expectancy in Europe dropped a lot but recovered when the war was over in 1948.

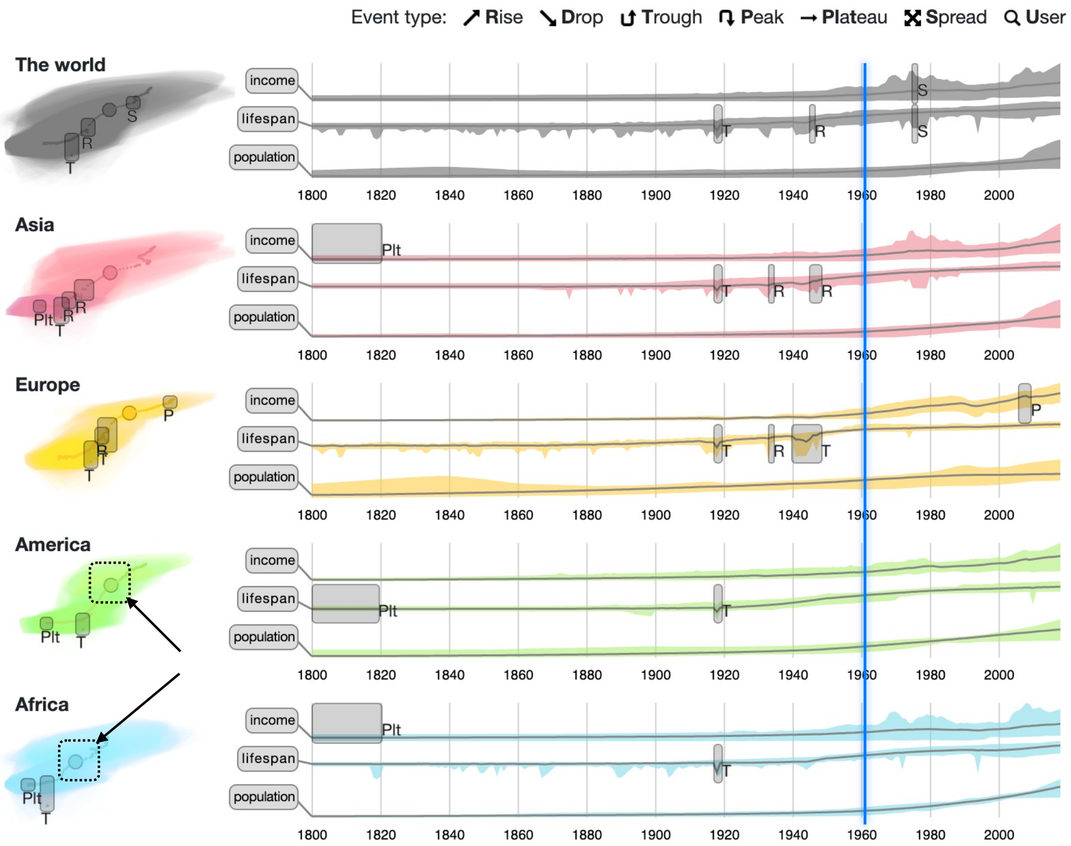

Event type: Rise Drop Trough Peak Plateau Spread User
The world
Asia
Europe
America
Africa
income
lifespan
populaton
1800 1820 1840 1860 1880 1900 1920 1940 1960 1980 2000

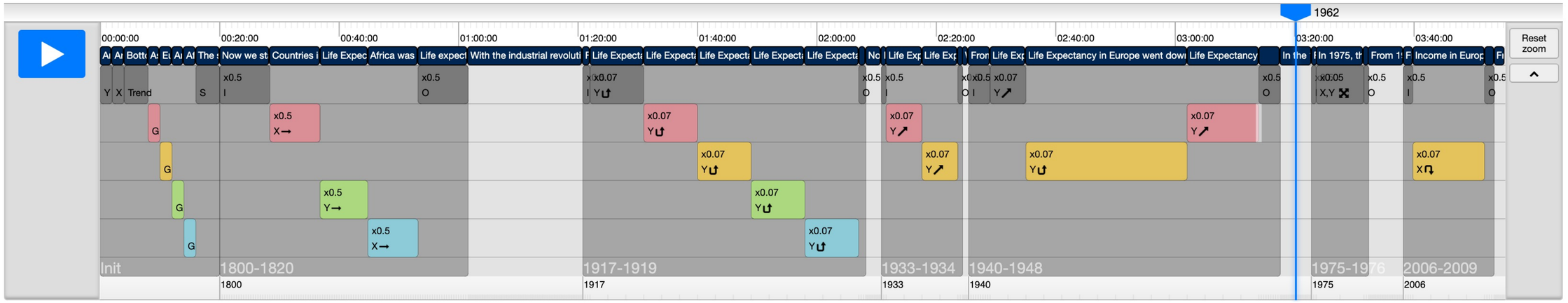

1940
00:00:00 00:20:00 00:40:00 01:00:00 01:20:00 01:40:00 02:00:00 02:20:00 02:40:00 03:00:00 03:20:00 03:40:00
Reset zoom
Norway
Denmark
United Kin
Trend

# Roslingifier system




In the 1950s, formal colonies gained independence, and finally, they started to get healthier and wealthier.

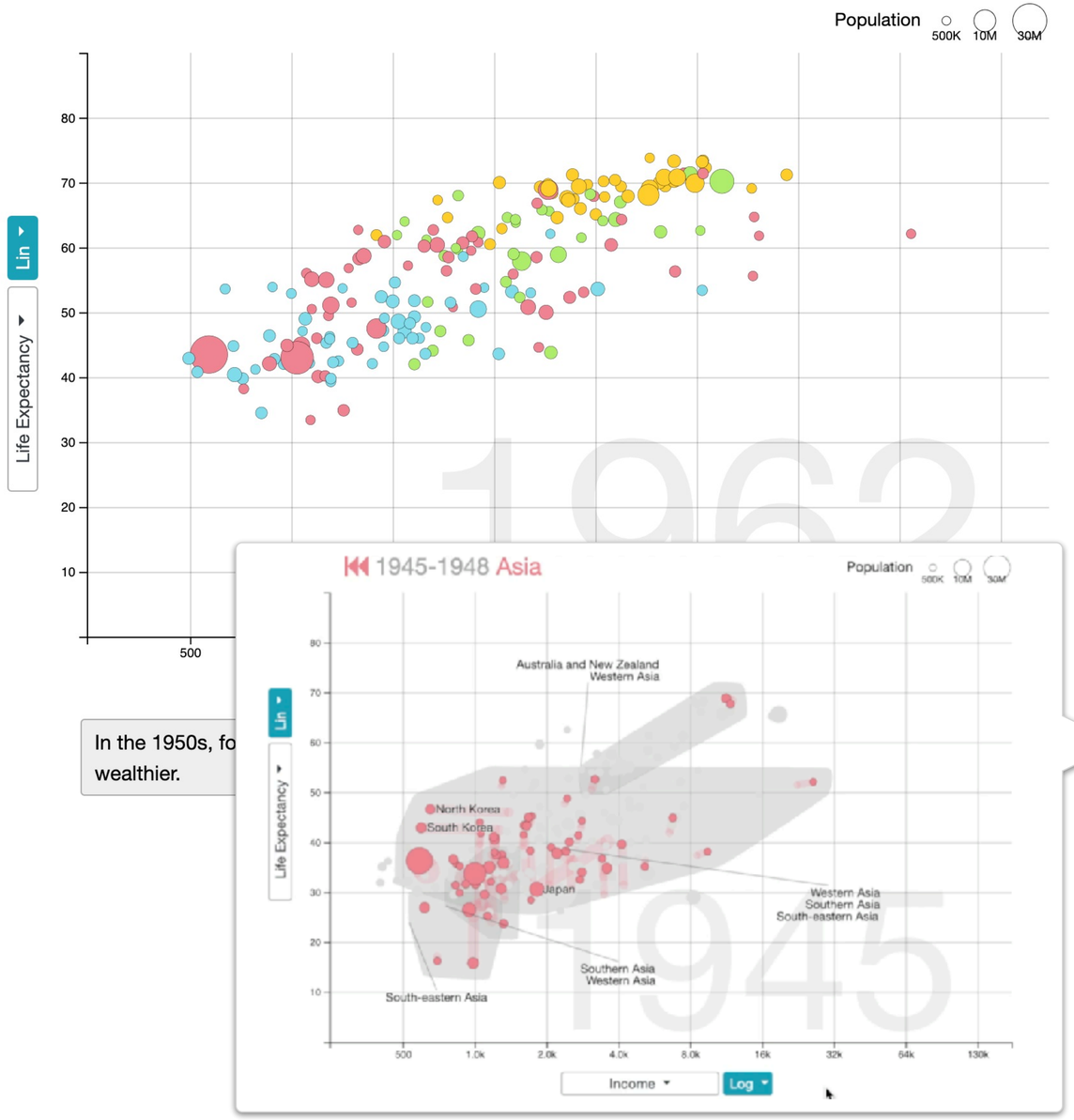



# Presentation Output View

Central component used for animated presentations

- Turn on and off the labels
- Change the position of the label
- Edit/check the narratives




# Presentation Output View

Central component used for animated presentations

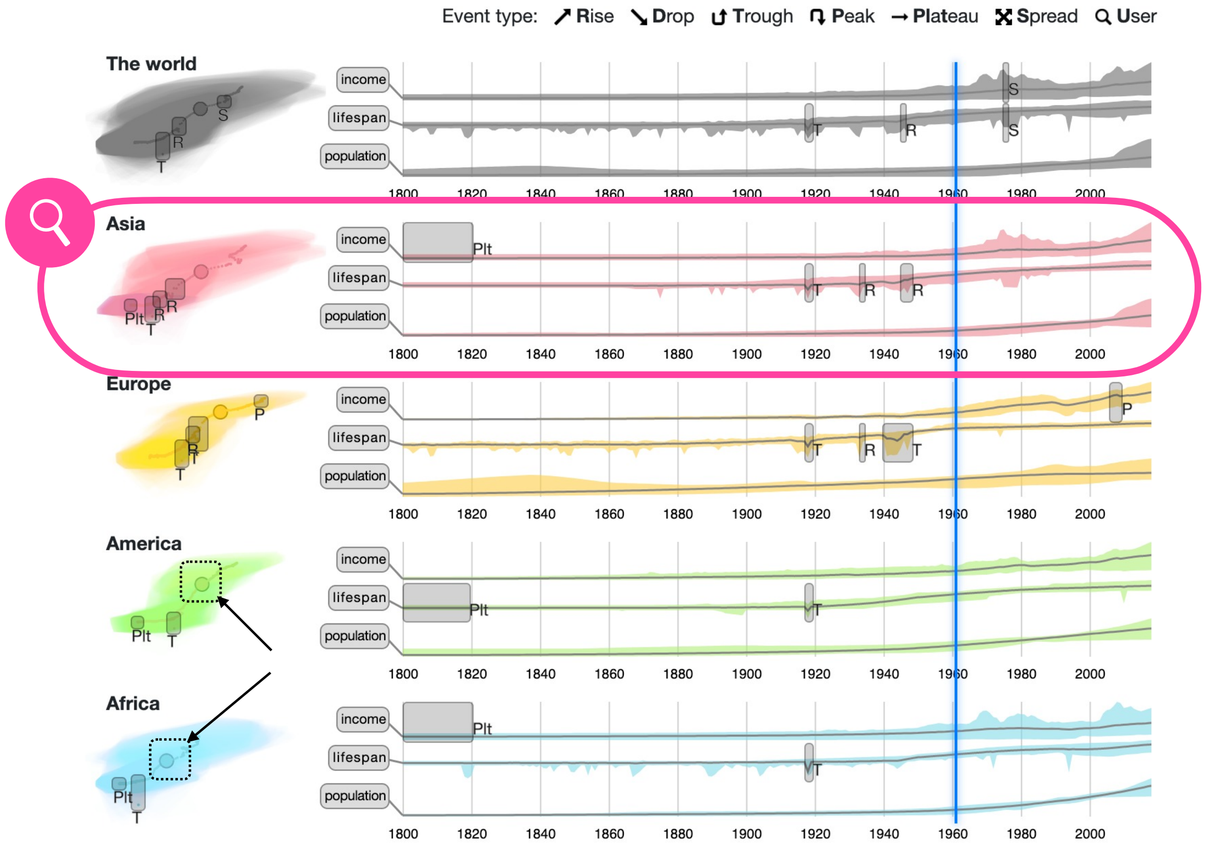
- Turn on and off the labels
- Change the position of the label
- Edit/check the narratives

**Highlighting mode** is activated when playing events:

- Colored legend / traces
- The entities are clustered based on temporal proximity

# Event Exploration View

Explores trends and recommends events



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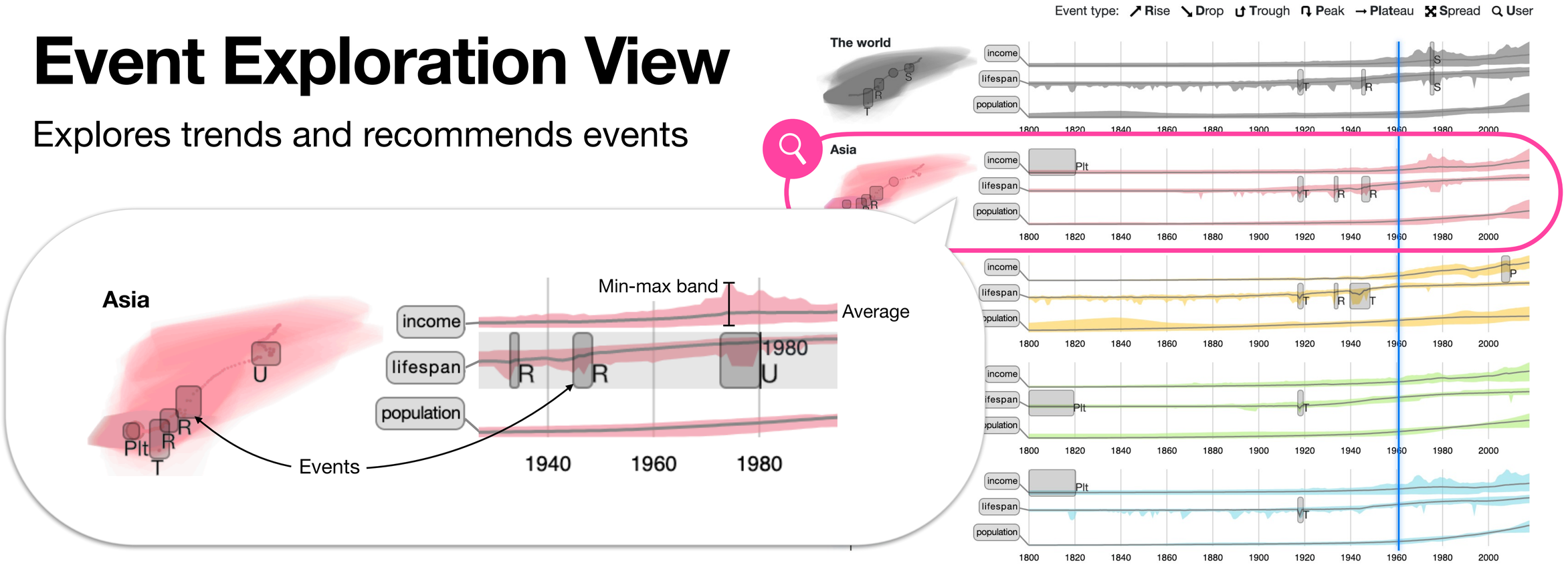



**Hull traces**:

- Show the temporal distribution of entities for each legend

**Line charts**:

- Show the changes in values and capture the trends in each data dimensions

# Event Exploration View

Explores trends and recommends events

- ↗ RISE
- ↘ DROP
- ↺ TROUGH
- ↻ PEAK

Depending on the movement of values in the interval

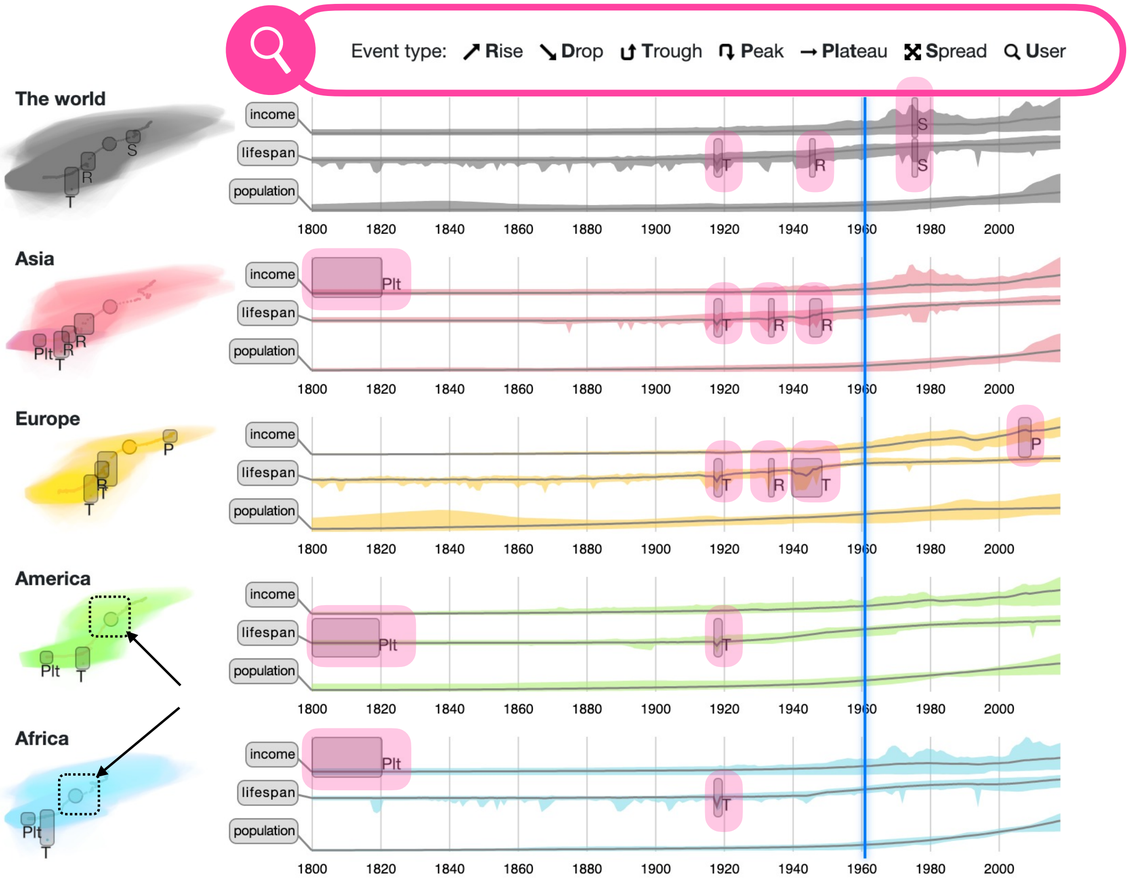
- → PLATEAU

Intervals with no change

- ⤧ SPREAD

The difference between the values is the largest

- 🔍 USER



# Event Exploration View

Explores trends and recommends events

- RISE
- DROP
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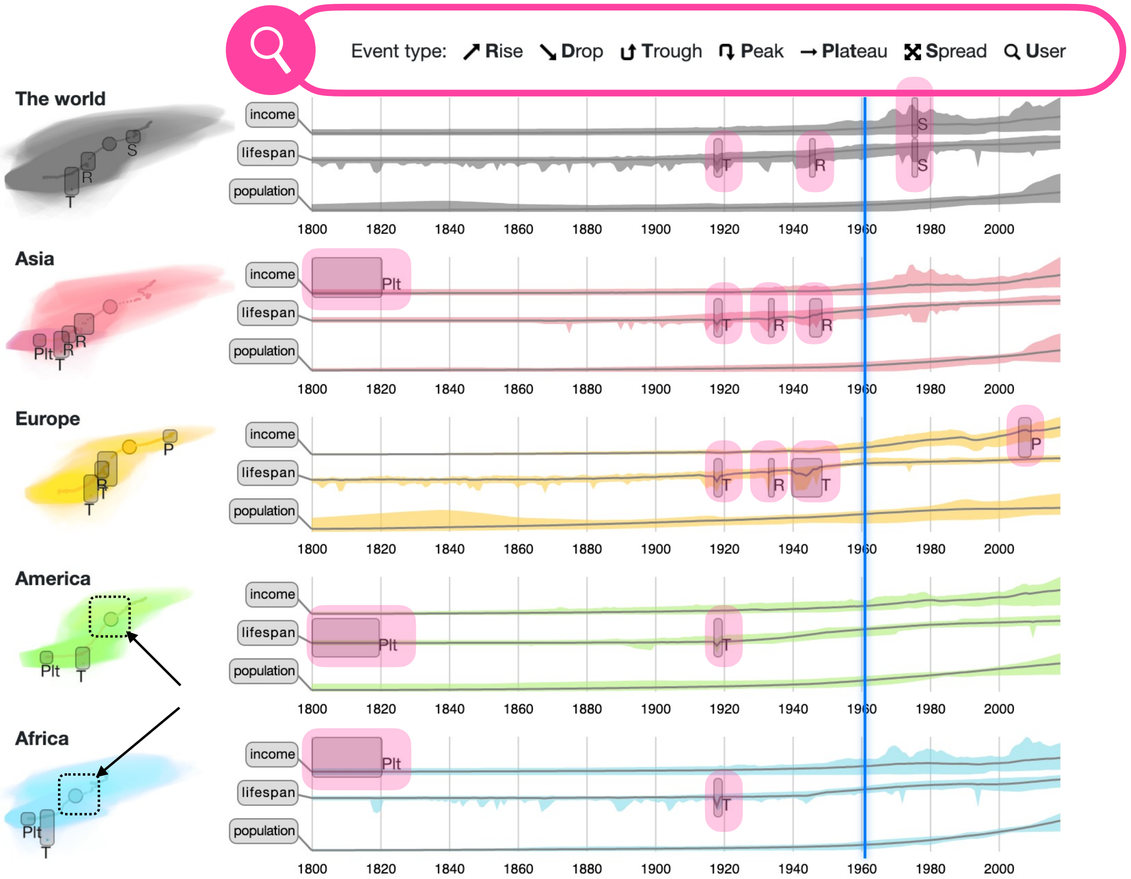
- SPREAD
- USER

[Template]

$D$ in $g$ increased between $t\_s$ and $t\_e$.

[Narrative]

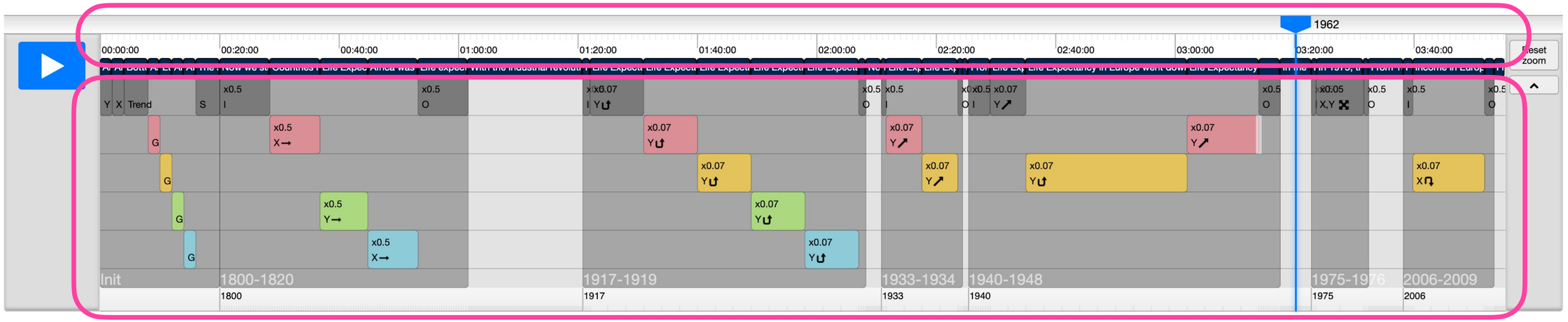
*Life expectancy* in *Europe* increased between *1915* to *1918*.



# Presentation Editor

Determines which frames to run in which playback time

- **Top Timeline:** running time of the presentation, e.g. 00:00:00
- **Bottom Timeline:** data time of the events, e.g. 1917



# Presentation Editor

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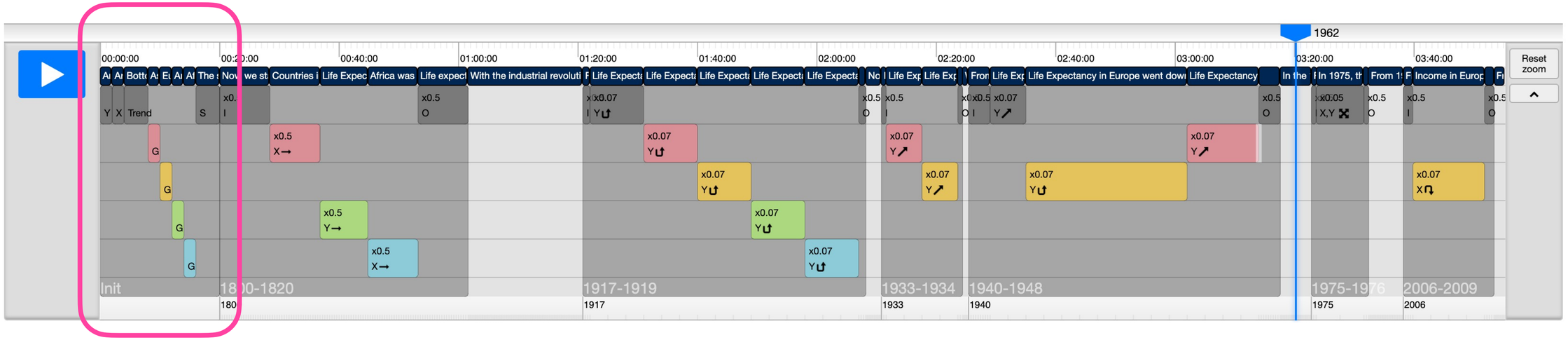
- **Initial segments:** located at the beginning and explain basic components
  - Variables assigned to the axes and legends



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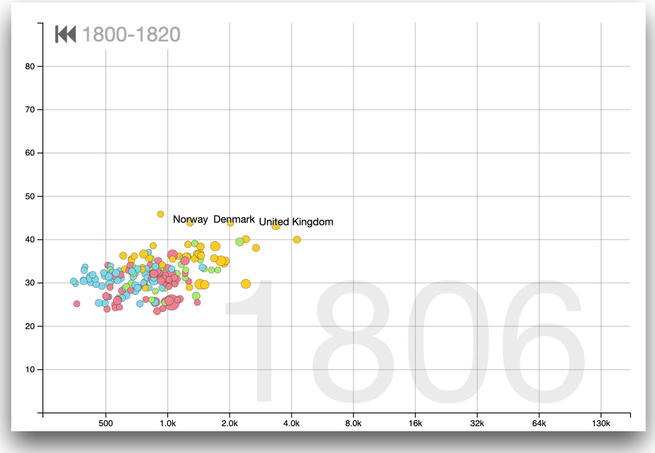
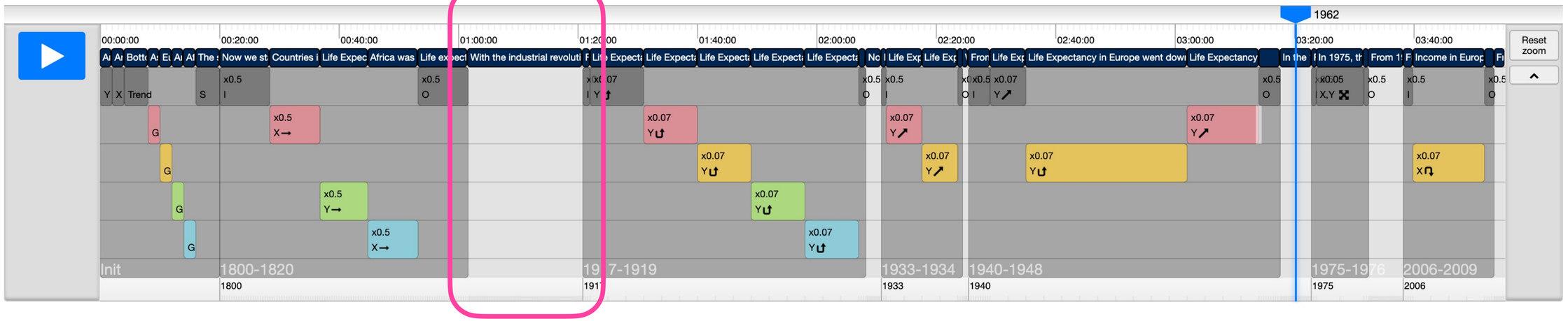


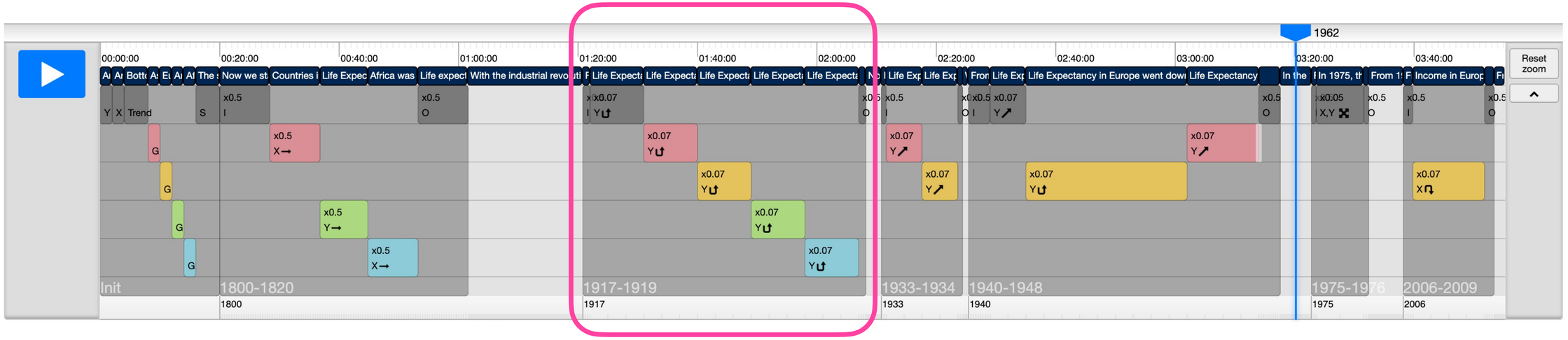

- **Blank frames:** created by default and chronologically animates the plots
  - Each data snapshot is played for a unit time.
  - Presentation Output view shows the default mode.



# Presentation Editor

Determines which frames to run in which playback time

- **Event segments:** replaces the blank frames if an event is detected
  - The event group is created: Intro, events, and outro.
  - Presentation Output View shows the highlighting mode.
  - Rewind multiple times to play different events in the same period.
  - Runs slower than a regular speed (speed and order can be editable).



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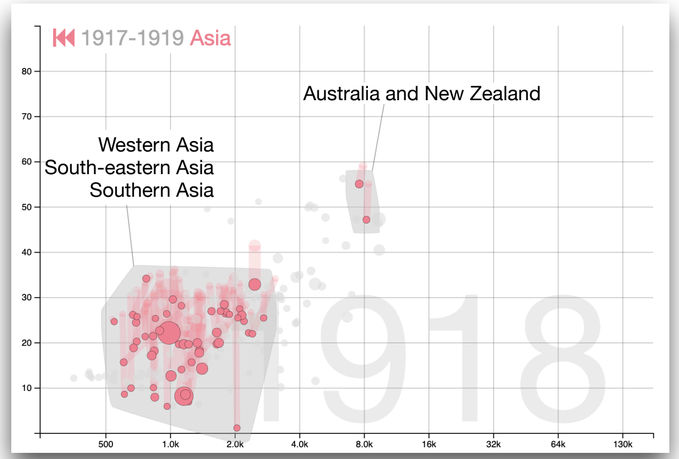


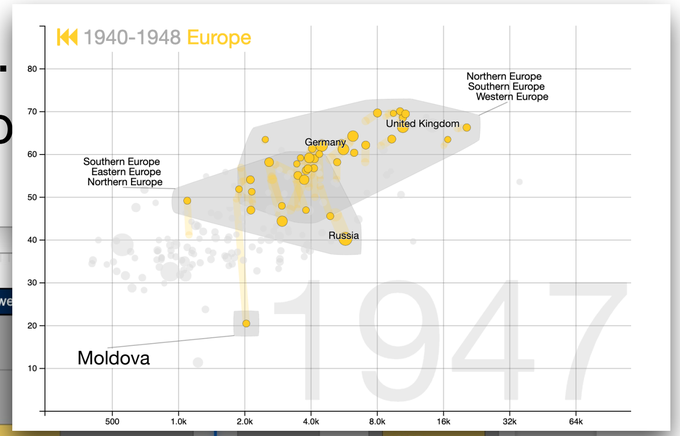


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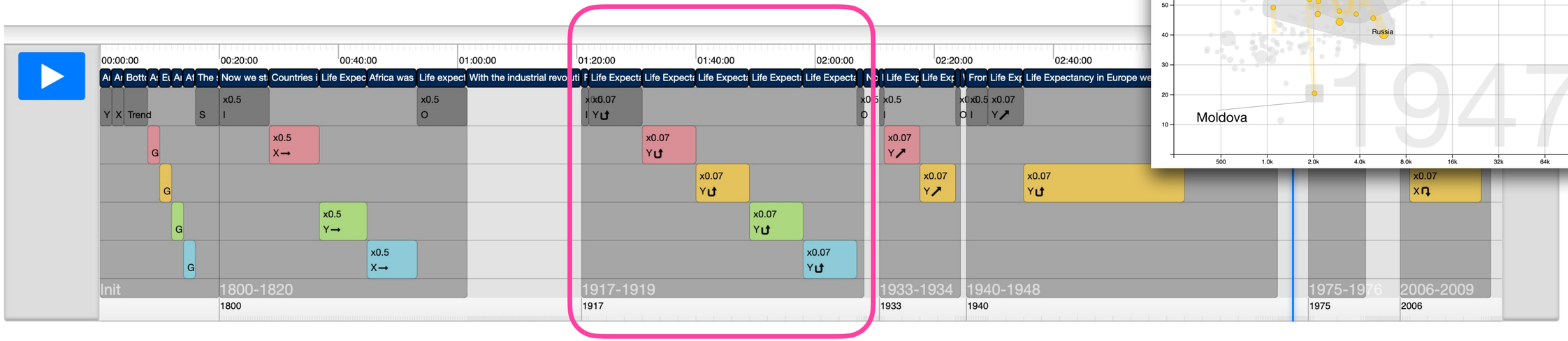
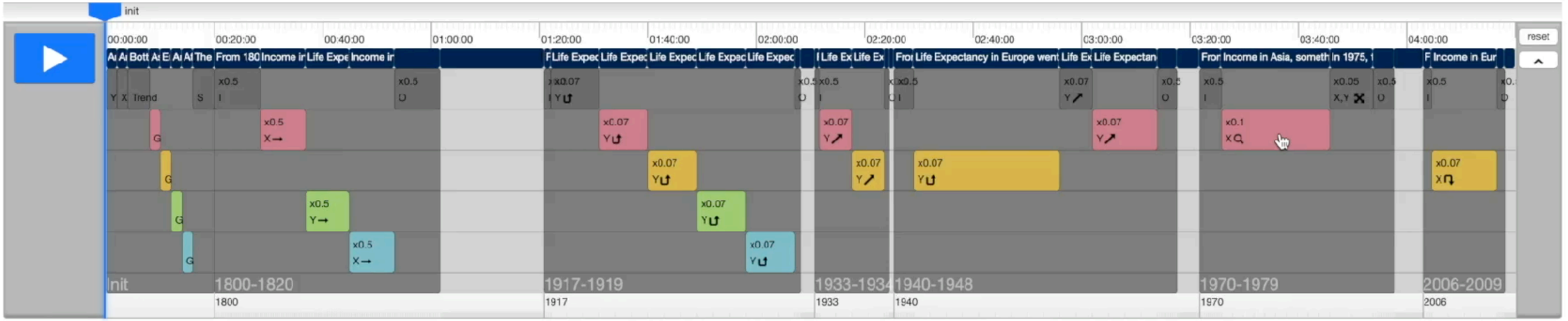


# Presentation Editor

Determines which frames to run in which playback time

- Support user edit:
  - Swap the order within a group, delete events, or edit the playback time



# User Evaluation

## Author (creation)

Understand how Roslingifier can support general users to create a data presentation and organize the story

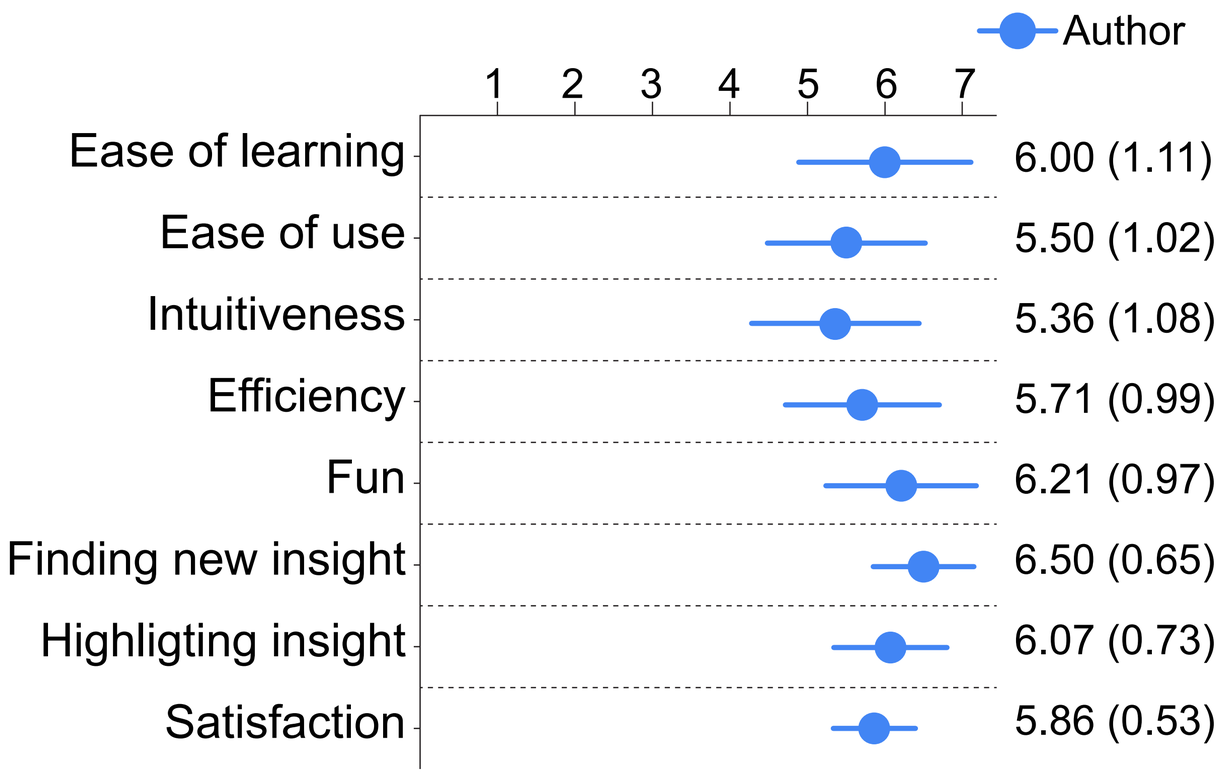
- 14 university students (non-experts).
- **Task**: Create a data presentation using Roslingifier with the data of the relation between life expectancy and income in the Gapminder dataset.
- Spent 1 hour and 9 minutes to create 5 mins 8 seconds long presentations.

## Audience (consumption)

Assess how the data presentations created with Roslingifier are interesting and insightful

- 36 participants from a crowdsourced platform, Prolific.
- **Task**: Watch the data presentation created using Roslingifier, and leave the comments on 1) interesting segments, and 2) gained insights from the video.
- Spent 19.3 mins, made 6.61 comments

# User Study: Authoring




Ease of use

"Automatic clustering and drawing traces save a lot of effort in creating a story compared to when doing it manually."

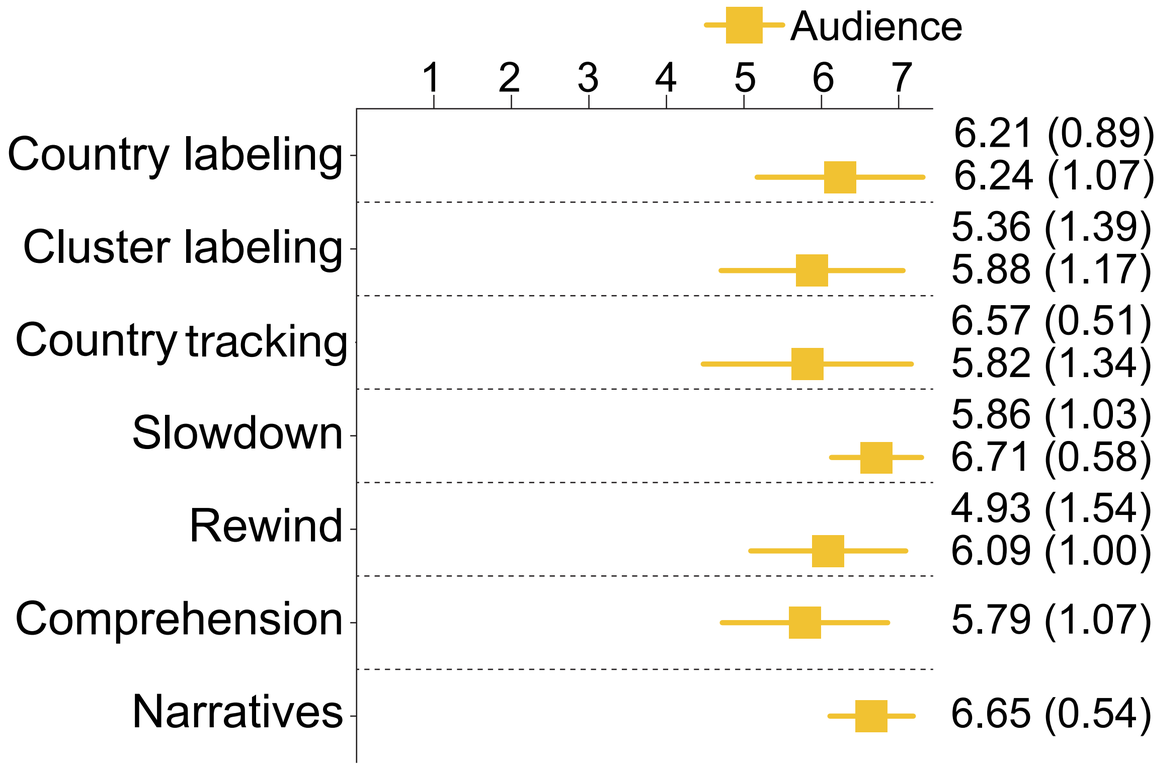
"The min-max band in the line charts effectively show the general trends and outliers."

Finding new insight

"[Roslingifier] is fun to use as I can directly see the changes on the chart by selecting interesting periods."

Fun

# User Study: Audience Viewing



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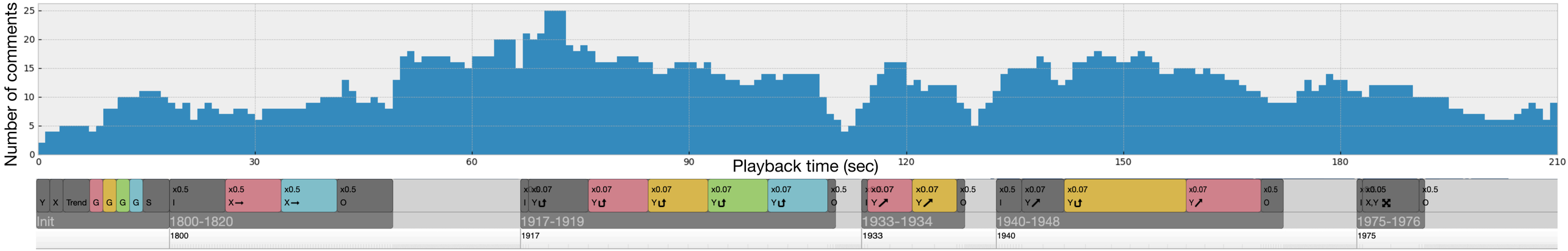



"Plotting the descriptions of each corner physically on the plot really clarifies the meaning of the axes"

**Comprehension**

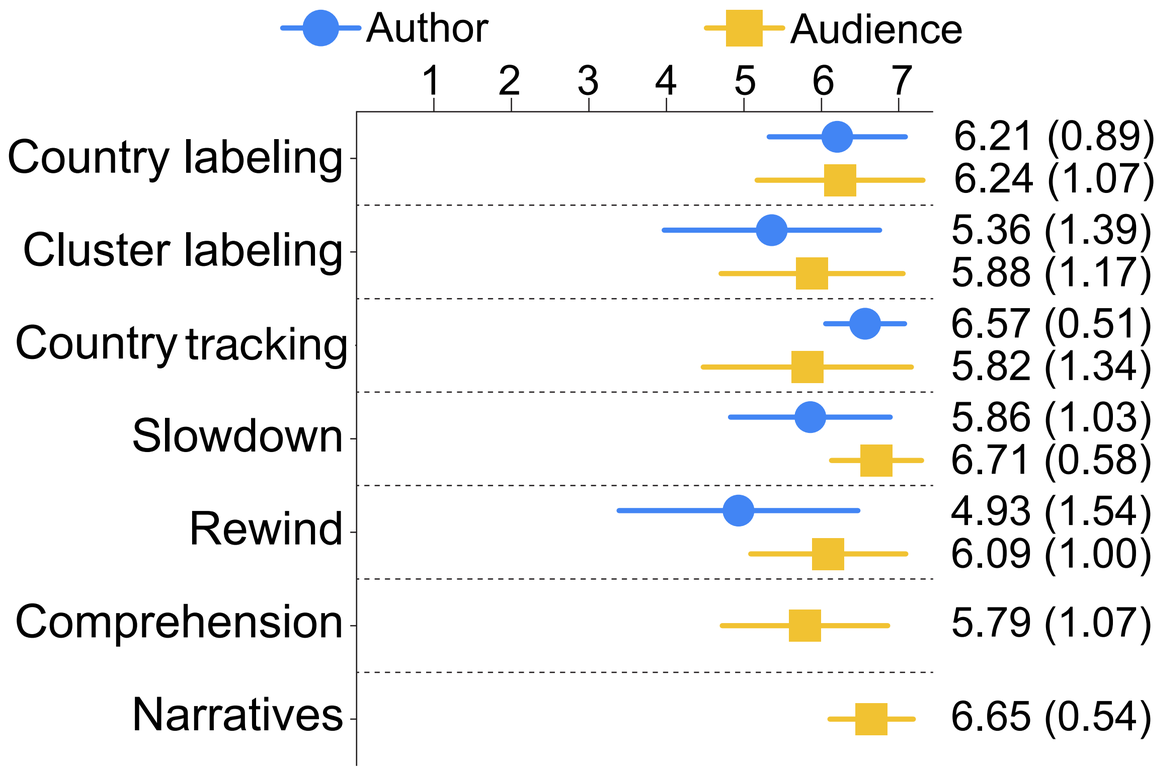
"The sudden increase in life expectancy in Kazakhstan and other Central Asian countries makes me curious to find out […]"

**Cluster labeling**

"The trace of bubbles here clearly exemplifies how horrific the mortality rate was globally [...]"

**Country tracking**

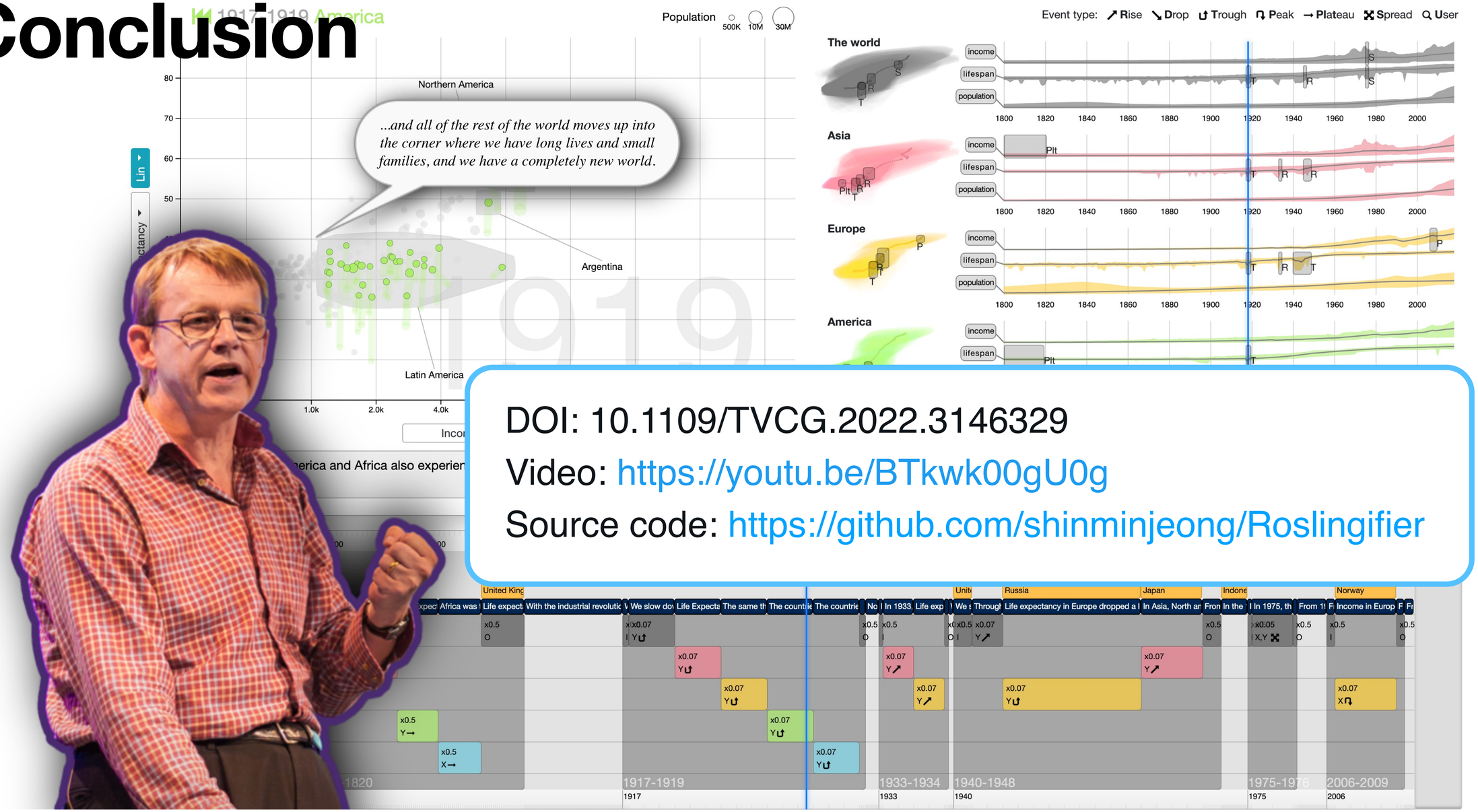
# Usefulness for Authors vs. Audiences




"[…] the idea of going back and repeating the same period was a little confusing to me."

"Separately showing how each continent/group of countries were affected by the Second World War was a good way to help break all the information down and keep the visual easy to digest."

# Conclusion




DOI: 10.1109/TVCG.2022.3146329

Video: https://youtu.be/BTkwk00gU0g

Source code: https://github.com/shinminjeong/Roslingifier