

# Information Visualization

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## Temporal Data

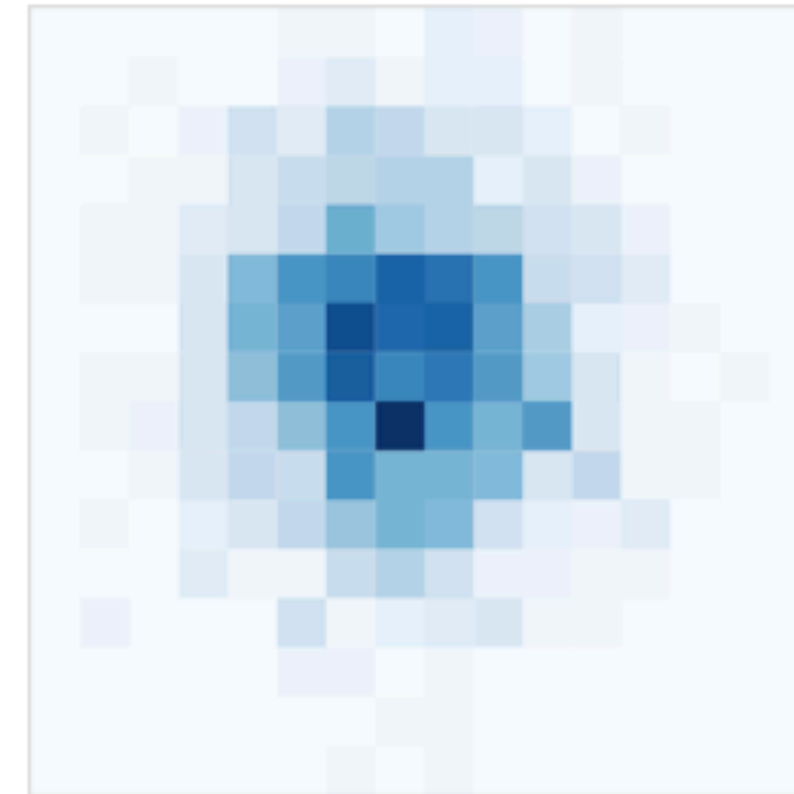
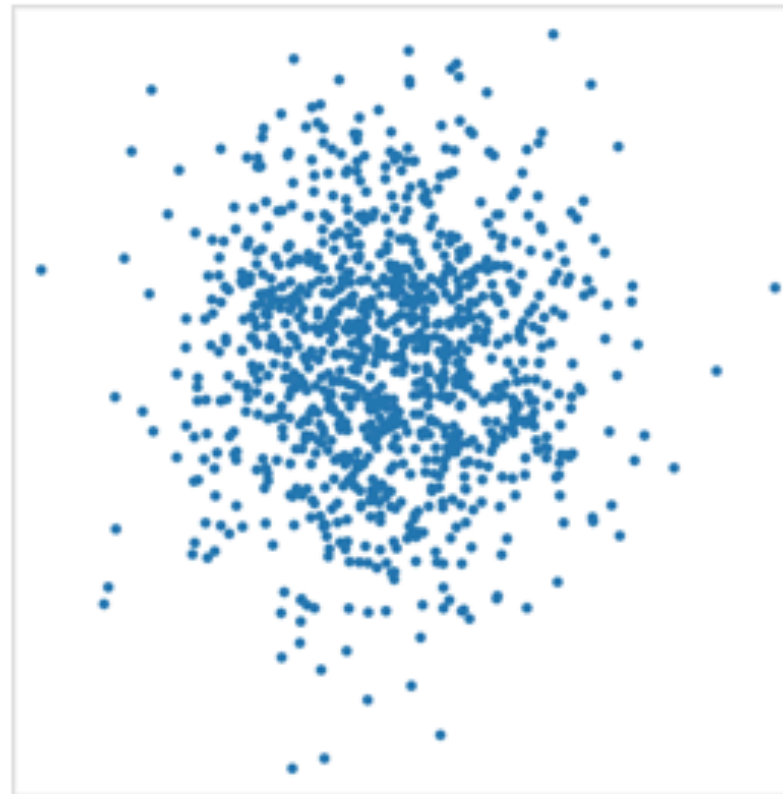
Dr. David Koop

# Multiclass Density Maps (MDMs)

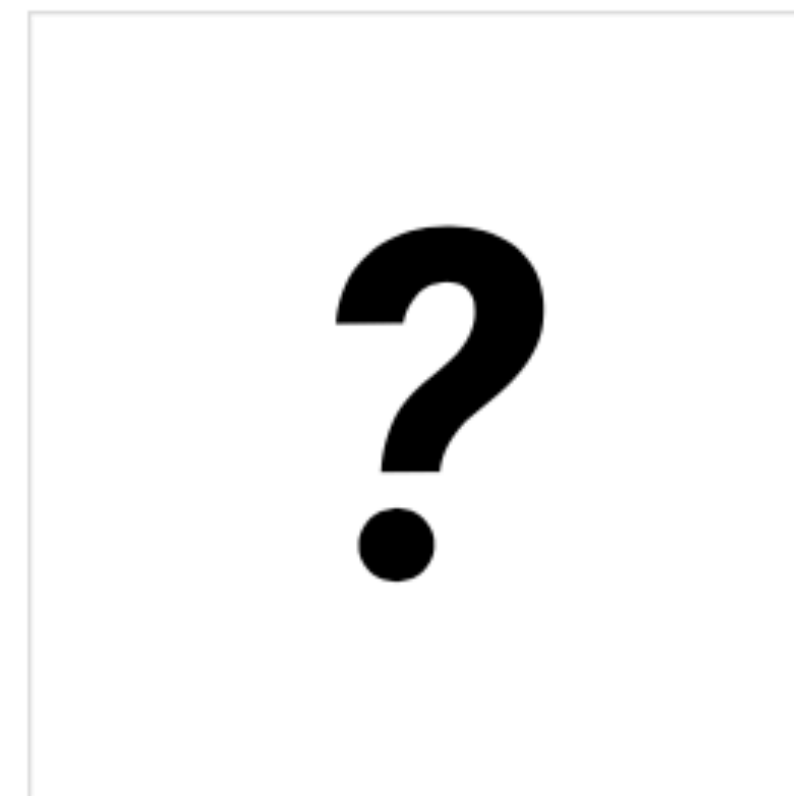
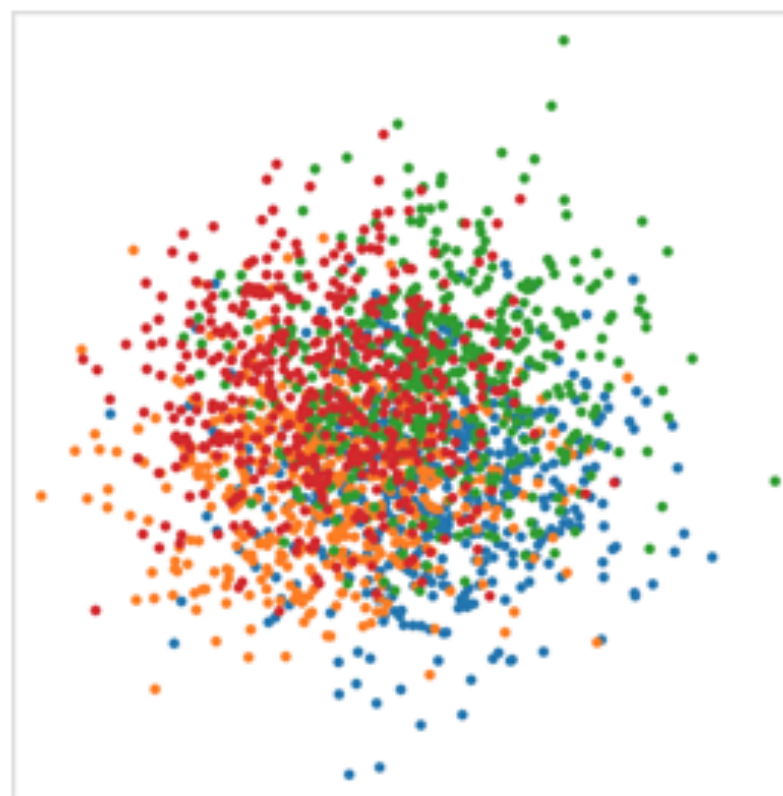
*Scatterplots*

*Density Maps*

***Uniclass***



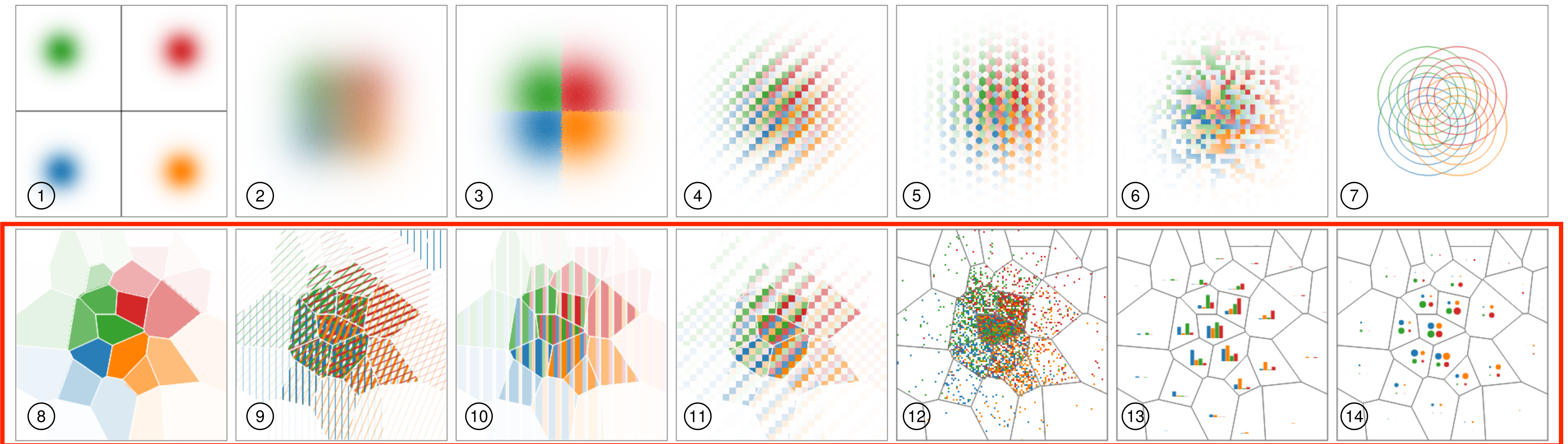
***Multiclass***



*"Multiclass Density Maps (MDM)"*

[J. Jo et al.]

# MDM Gallery



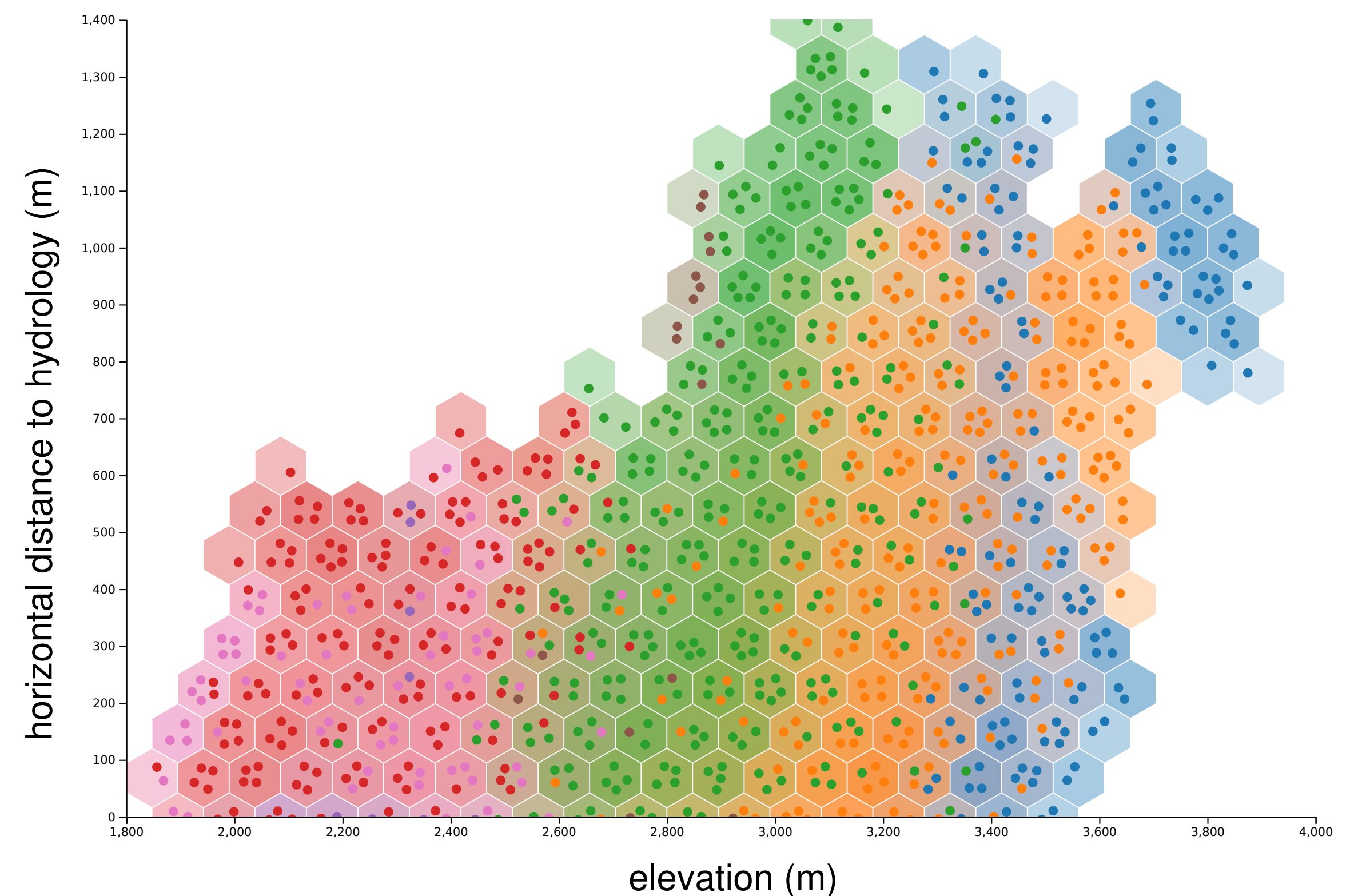
Rebinned and Aggregated

[J. Jo et al., 2019]



# What about other techniques?

- Are there other possibilities?
- Does the grammar cover these?
- How do we evaluate how well these techniques work?



[F. Heimerl et al., Tech Report]

# What about Tasks? (Bin and Class Tasks)

Task		Bin-centric	Class-centric
browsing	Explore neighborhood	1 Explore properties of bins in a neighborhood	2 Explore properties of classes in a neighborhood
	Search for known motif	3 Find known pattern across bins	4 Find known pattern across classes
	Explore data	5 Unusual patterns within or across bins, global trends between bins	6 Unusual patterns within or across classes, global trends within or between classes
aggregate-level	Characterize distribution	7 Do bins close to each other have similar properties? Or within a certain area or range of values?	8 Does a class occupy certain areas of the plot? Does its distribution have a particular shape? Do classes correlate in certain areas?
	Identify anomalies	9 Identify bins that are outliers based on the general distribution	10 Identify classes or subsets of classes that are outliers in a certain region
	Identify correlation	11 Determine level of correlation of bin properties along both dimensions	12 Determine level of correlation for class members along both dimensions
	Numerosity comparison	13 Compare density in different regions of the space	14 Compare class density in different regions of the space
	Understand distances	15 Understand a given spatialization and the coverage of the bins	16 Understand a given spatialization and the coverage of classes

# Project Proposal Feedback

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- Posted in Blackboard
- Most have strong background in what has been done or the problem area, and the starts of ideas on where to go
- Try to more critically think about what the problem is and how you will address it through visualization
- **Focus on visualization!**

# Annotated Bibliography

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- Likely related to your project, but can be another subject area
- Wider breadth than just the related work of your project
- Find 30-40 references, and write a few sentences on how they relate to your work/ideas
  - Ok to include papers that show novel variations of a technique, even if the paper is not mostly about the subject area!
  - Your annotations are not the abstract of the paper, include relationship with the subject area you're focusing on
- Due **Thursday**

# Paper Presentations

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- Primary: Provide necessary background, present core ideas, step through techniques, discuss experiments and results
  - Channel the original authors as much as possible
- Secondary: Provide critique: what is problematic, what could be improved, where could techniques be extended
  - Channel the reviewers as much as possible
- Everyone: Read the paper, come with questions and discussion points
- Starts **Thursday**



# Paper Critique

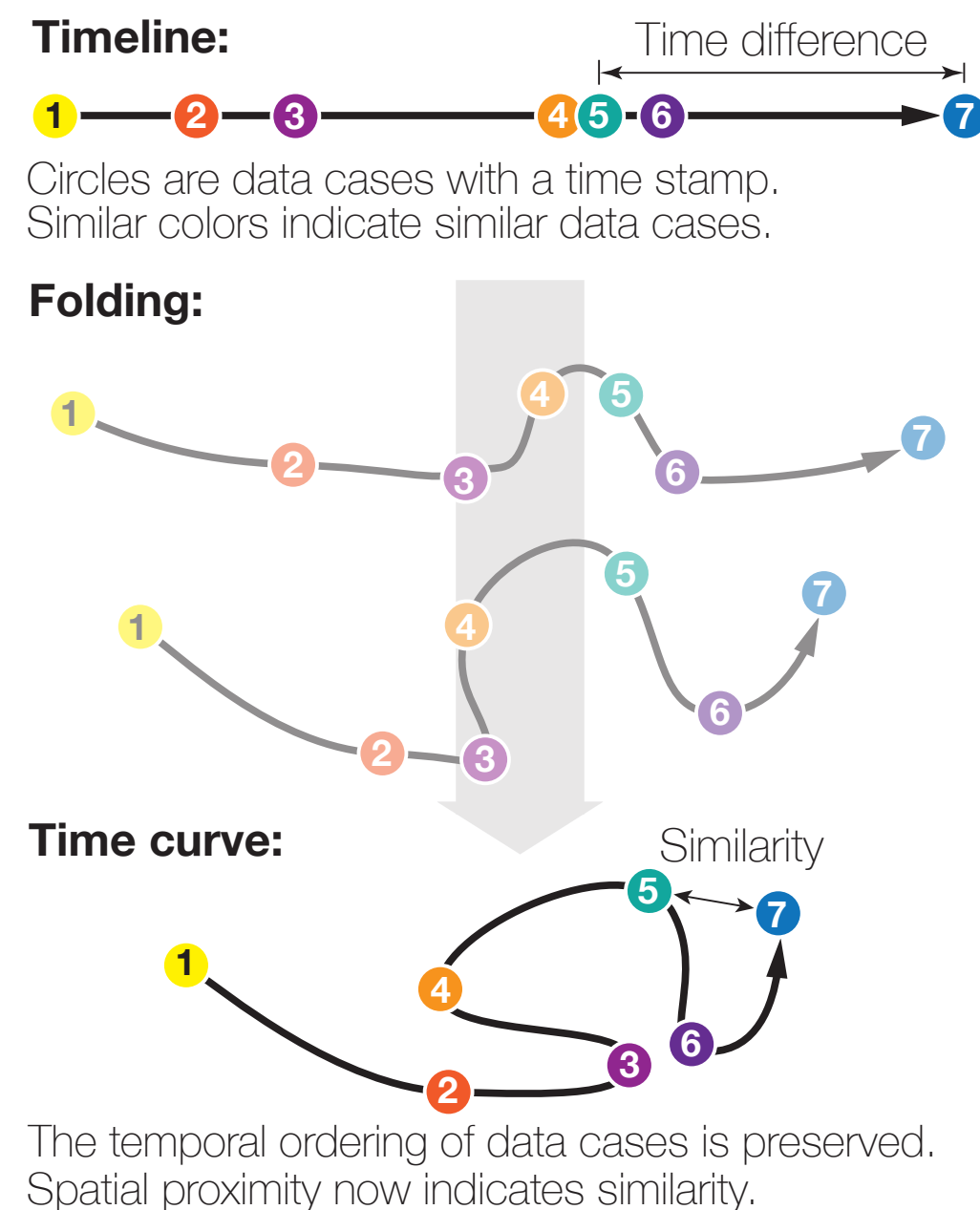
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- Those not presenting (i.e. not primary or secondary) should prepare a short (1-2 paragraphs) critique of the Time Curves paper, and come with at least one question about it
- Submit via Blackboard **before class** on **Thursday**

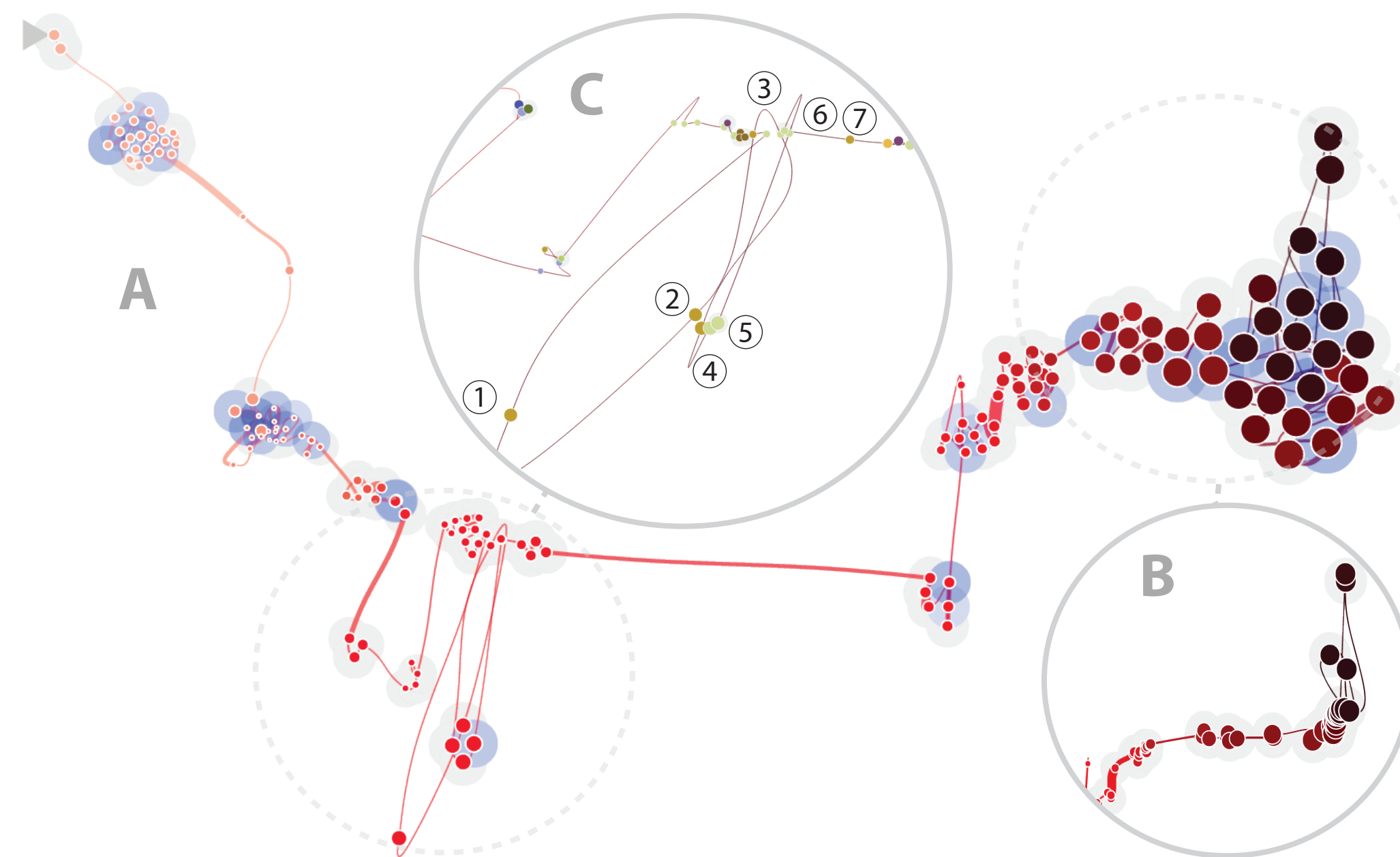
# Thursday: Next Paper

## Time Curves: Folding Time to Visualize Patterns of Temporal Evolution in Data

Benjamin Bach, Conglei Shi, Nicolas Heulot, Tara Madhyastha, Tom Grabowski, Pierre Dragicevic



(a) Folding time



(b) History of the Wikipedia article on Palestine

# Temporal Data

# Temporal Data References

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- B. Bach's Lecture Slides: much of this lecture's structure
- Timelines Revisited, M. Brehmer et al.



# Temporal Data Techniques

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B. Bach

# Temporal Data

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- Events: position and duration
- Trajectories: position changes over time
- Calendar: cyclic, relationship to human structures (weeks, months)
- Time Series: quantitative values over time

[B. Bach]

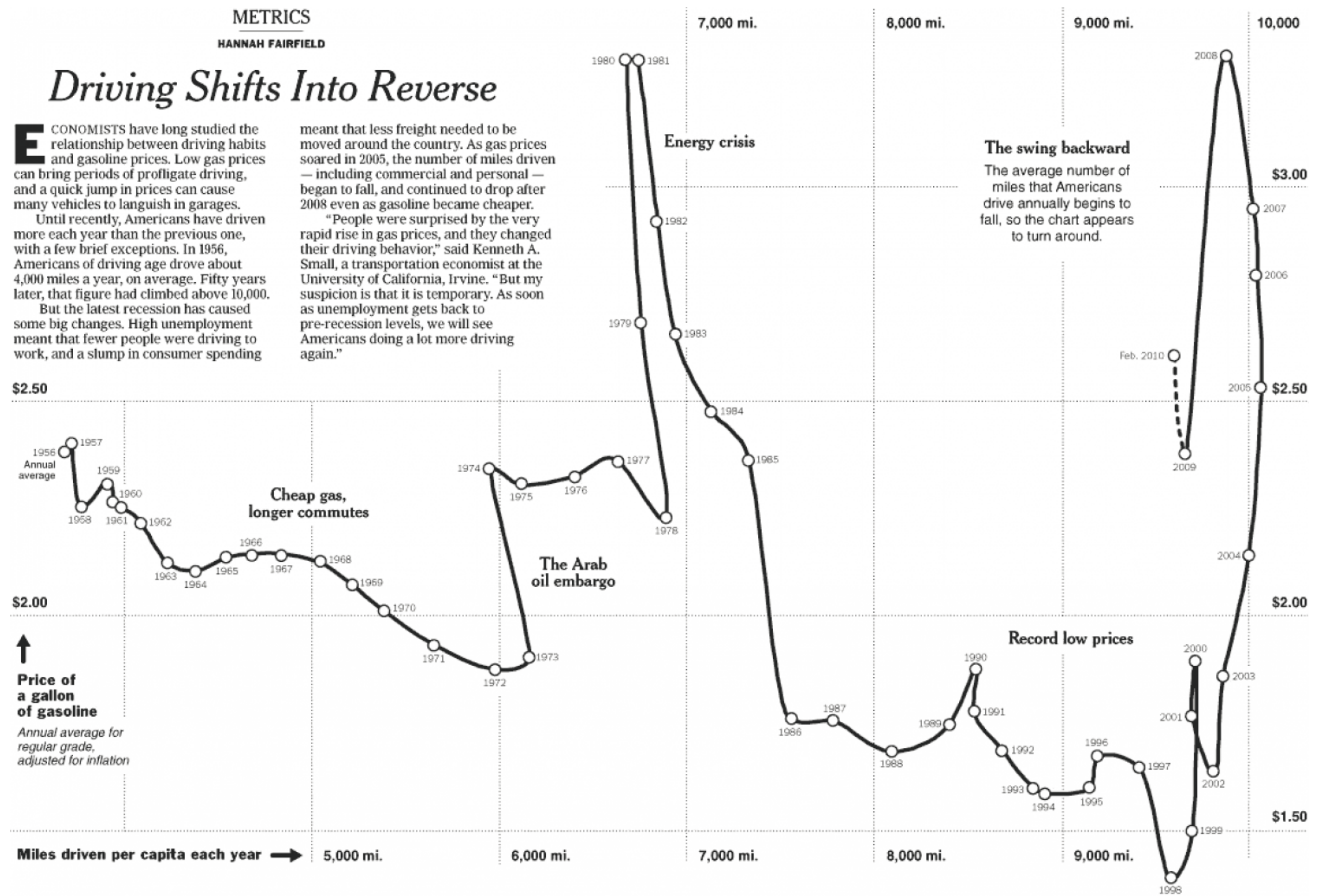
# Temporal Data Tasks

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- Statistics: min/max, trends, outliers
- Difference and rate of change
- Order & variation
- Noise vs. signal
- Correlations (including with events)
- Space and Time relationships

[B. Bach]

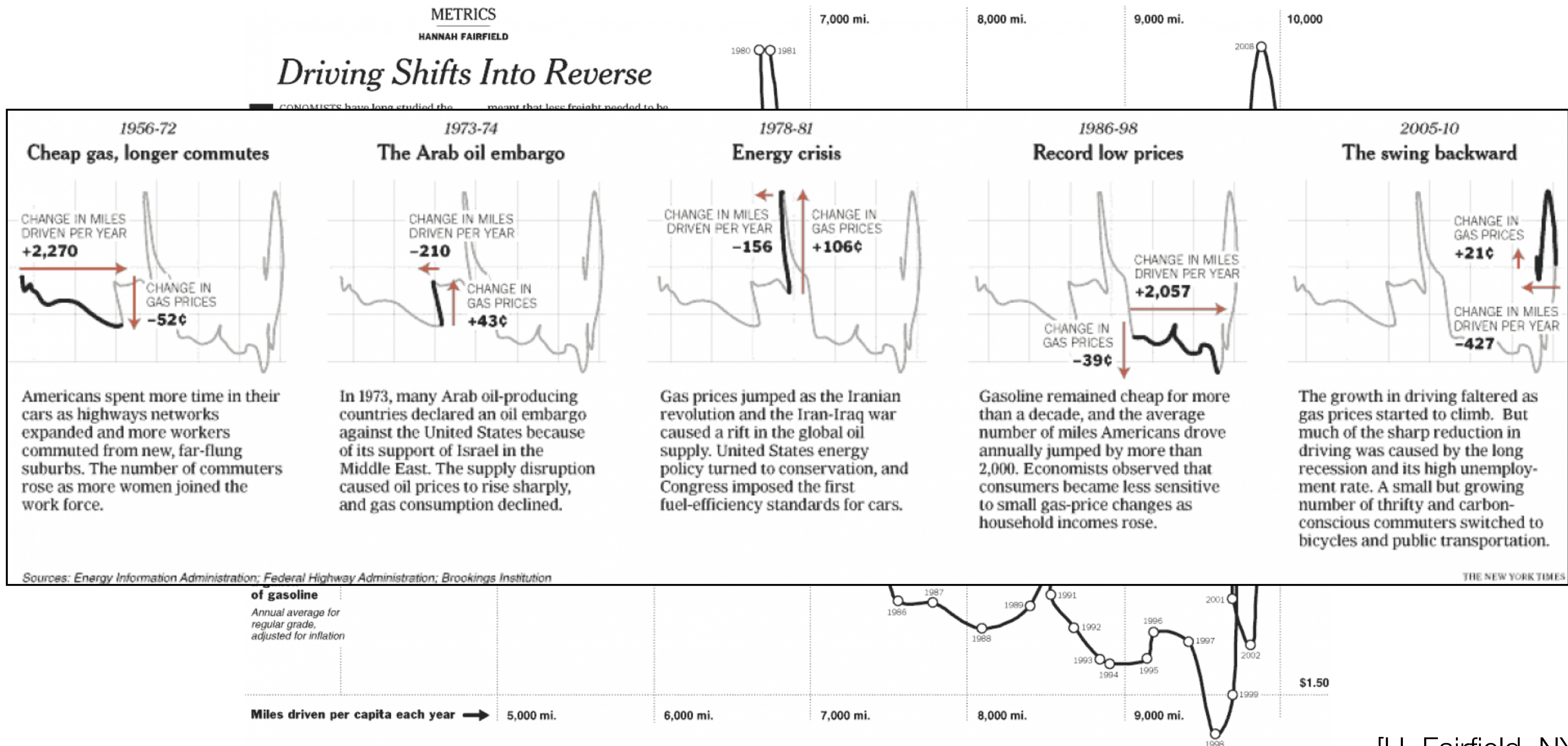
# Connected Scatterplot



[H. Fairfield, [NYTimes](#)]

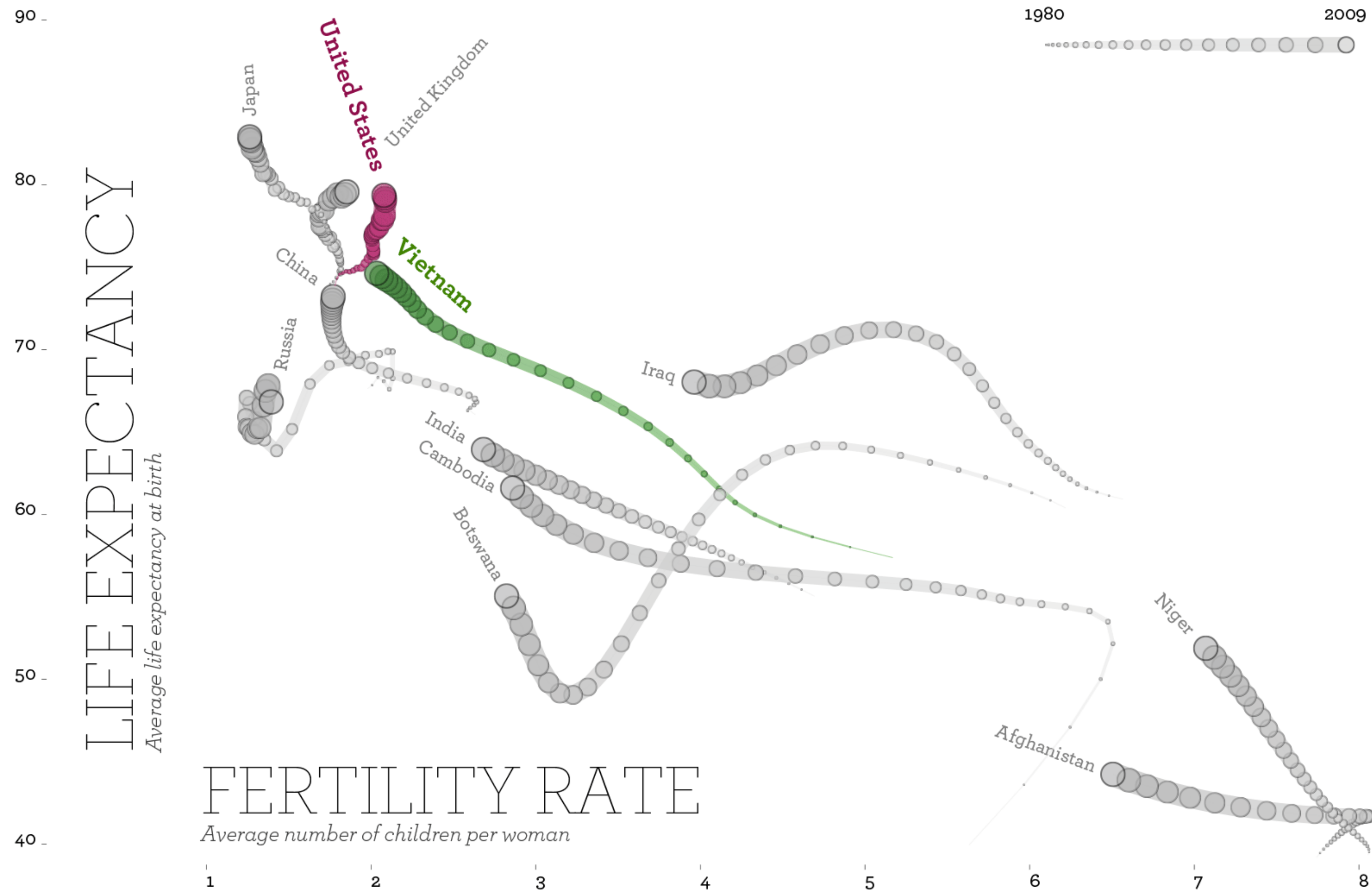


# Connected Scatterplot



[H. Fairfield, [NYTimes](#)]

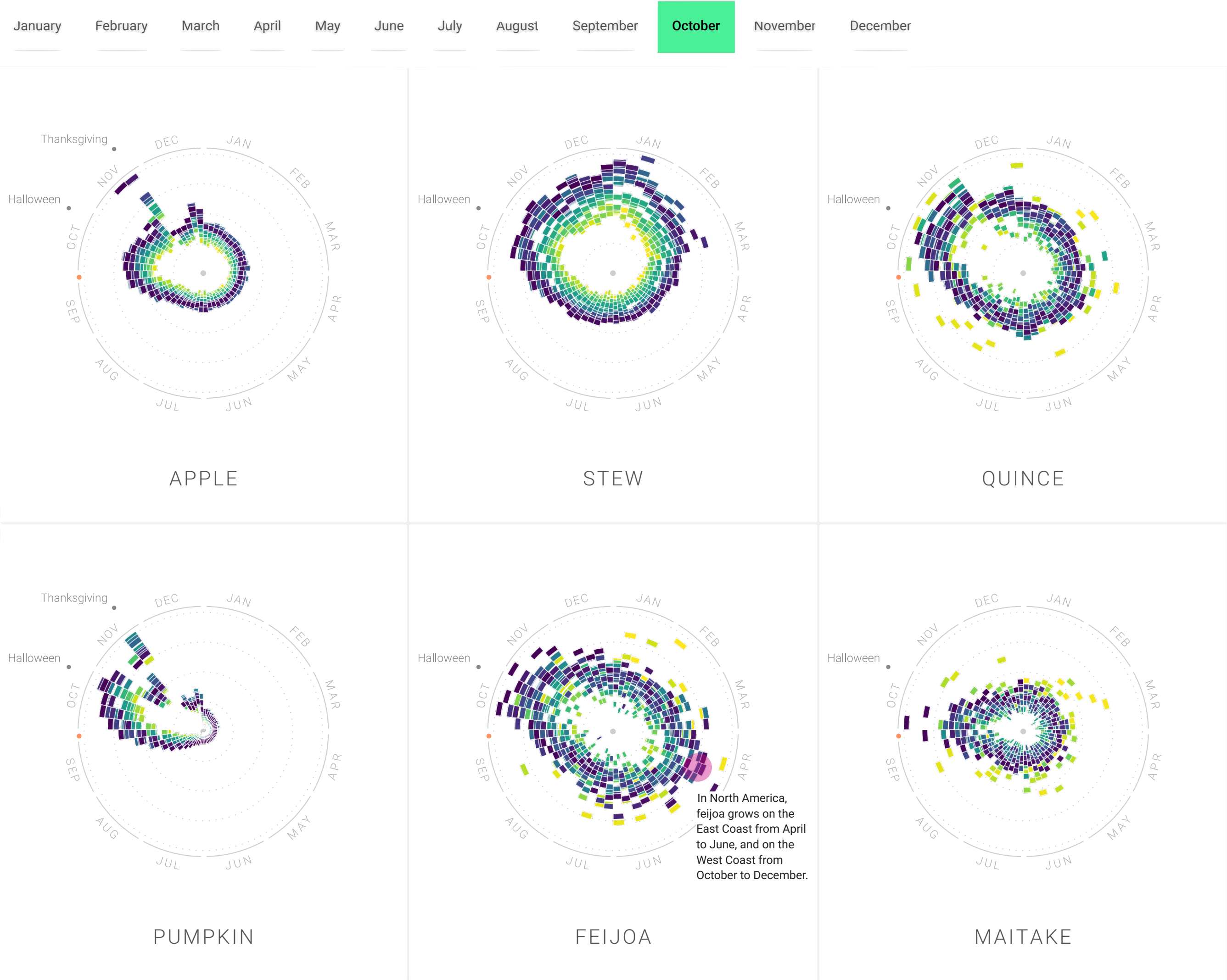
# Connected Scatterplot



[M. Stefaner]



# Cyclic Data



[Rhythm of Food]

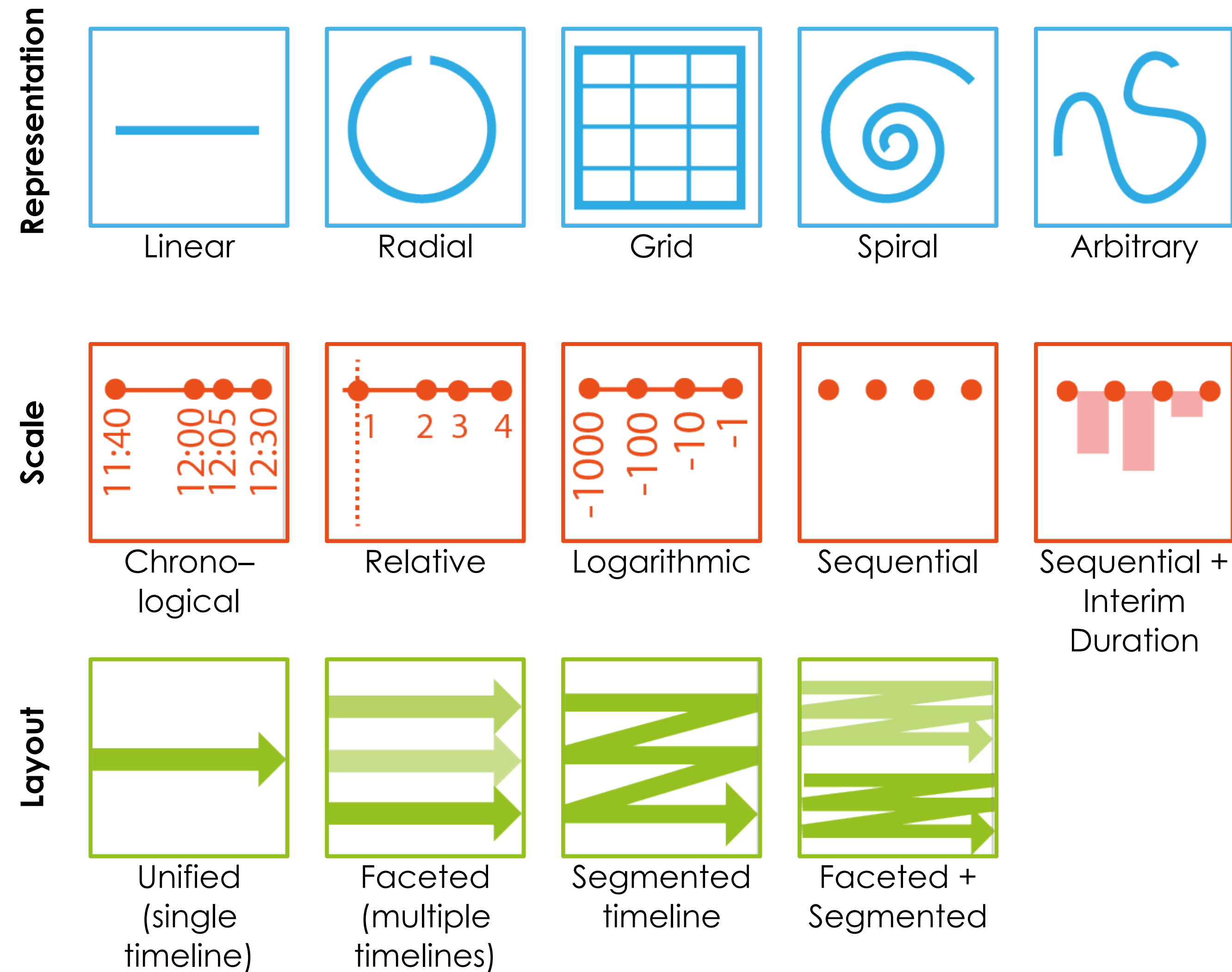
# Timelines Revisited

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M. Brehmer, B. Lee, B. Bach, N. H. Riche, and T. Munzner

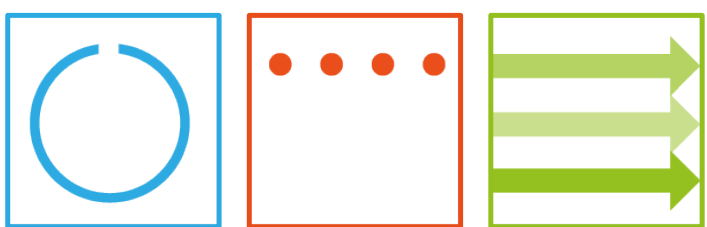
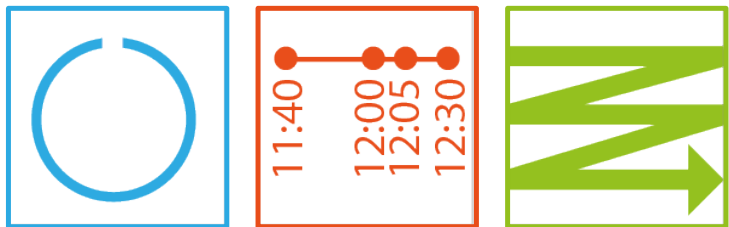
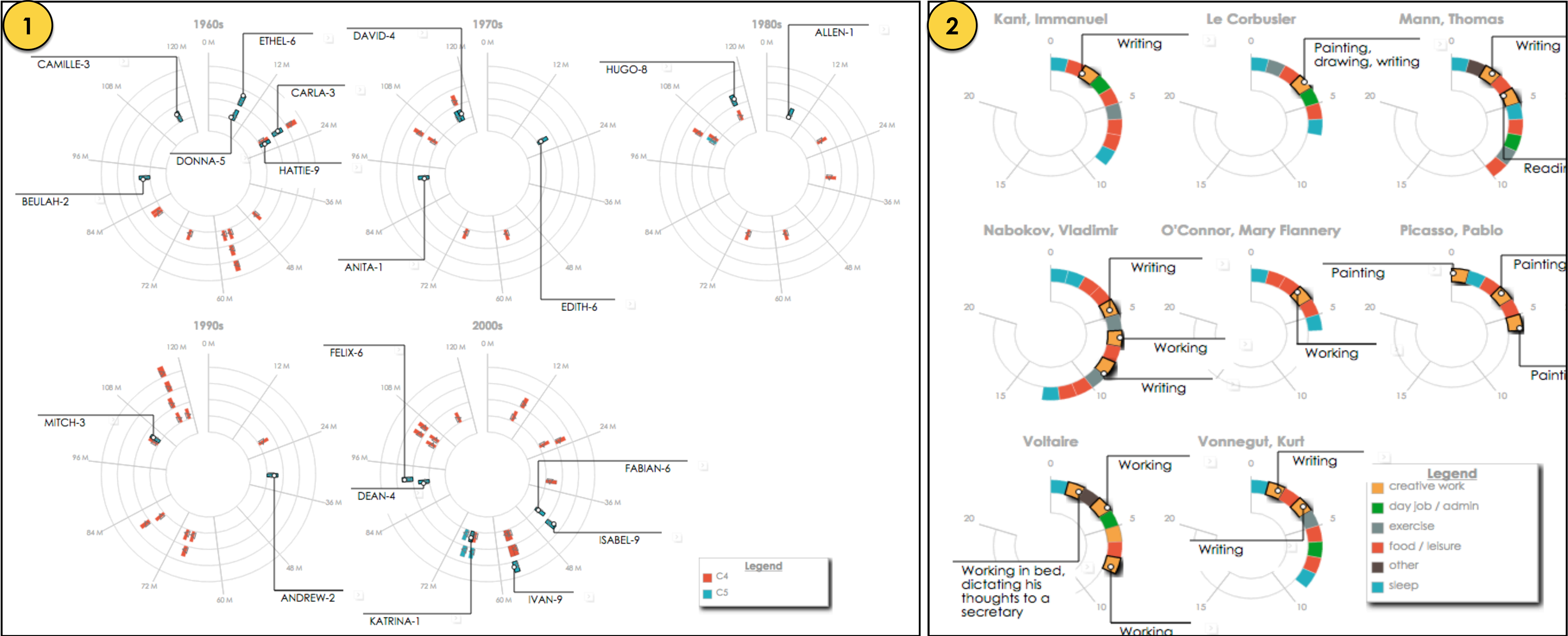


# Design Space



[M. Brehmer et al.]

# New Designs (Not Found in Survey)

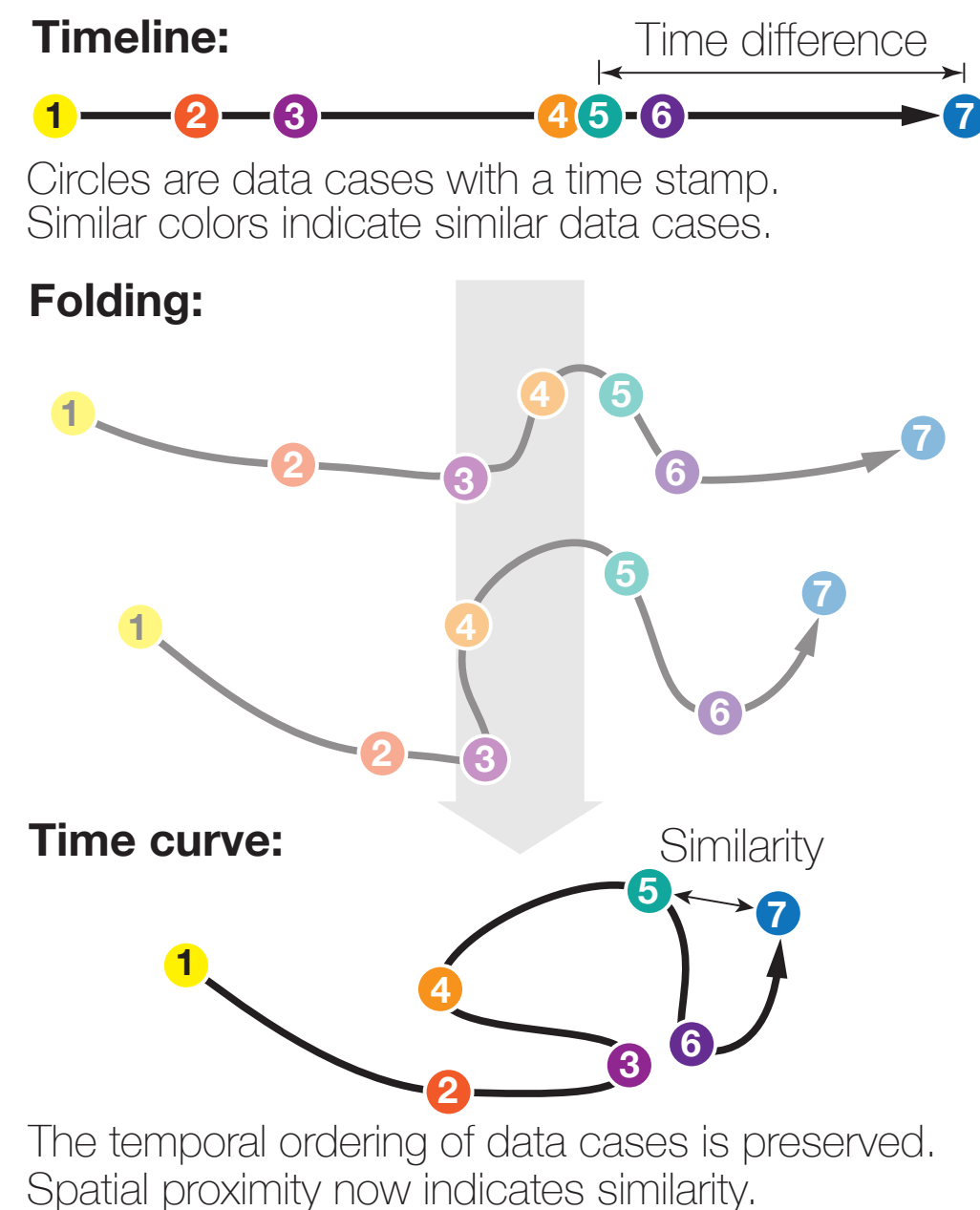


[M. Brehmer et al.]

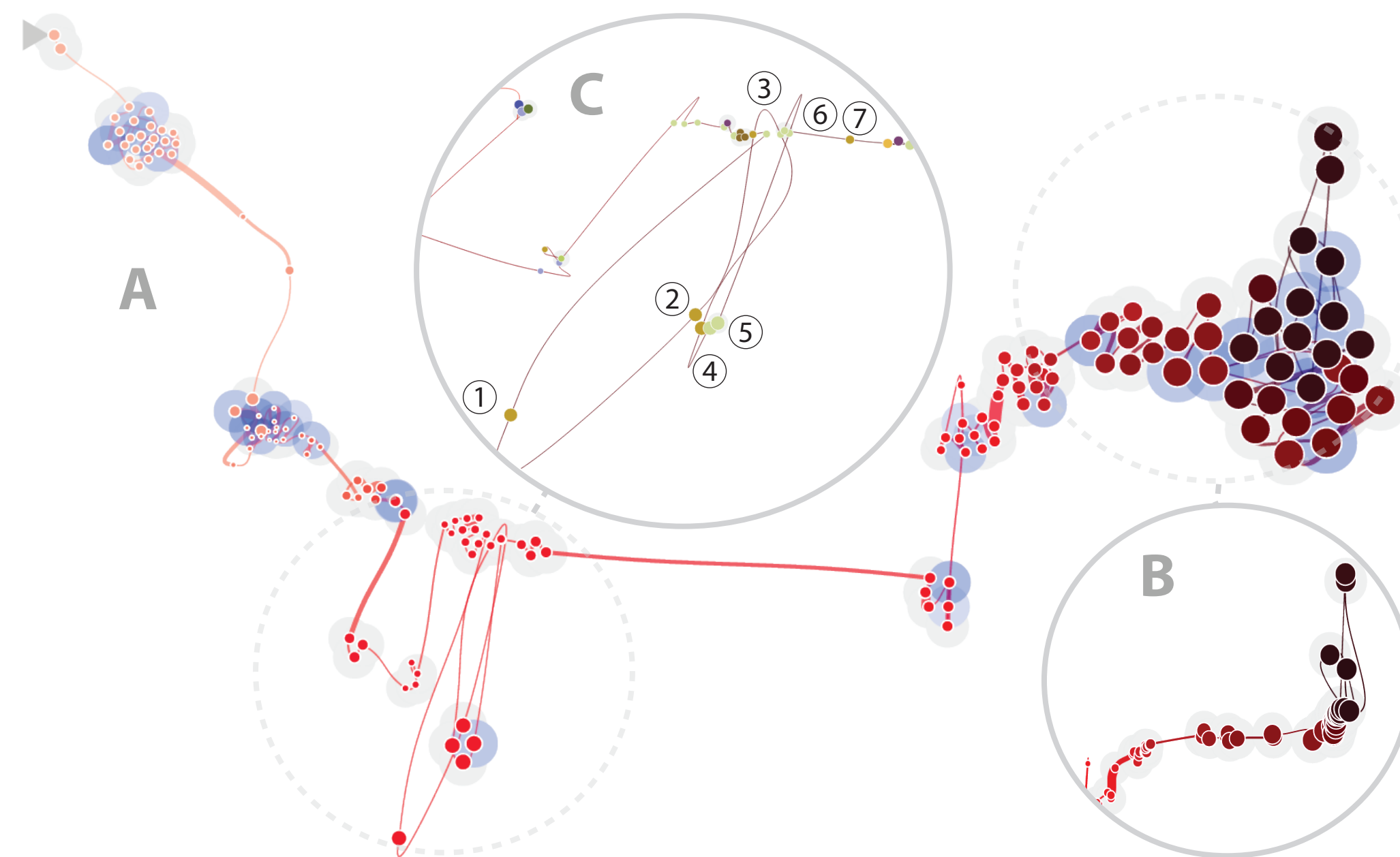
# Thursday: Remember Critique

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Benjamin Bach, Conglei Shi, Nicolas Heulot, Tara Madhyastha, Tom Grabowski, Pierre Dragicevic



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(b) History of the Wikipedia article on Palestine