Visual Stenography: Feature Recreation and Preservation in Sketches of Line Charts

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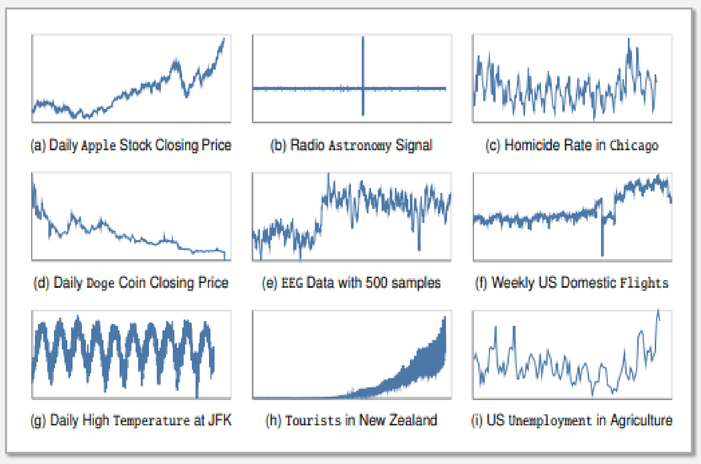
Line charts are a staple in the realm of data visualization.
To design line charts that genuinely serve the designer's intent, it is critical to investigate how people discern and engage with them.

We explore, which **features of line charts viewers identify** and how they **preserve** them in sketch.

20 participants performed a **Visual Stenography** task where they saw a series of 9 different line charts and re-drew them.

The **goal** was to see how participants **preserve different features** of line charts in their sketches.

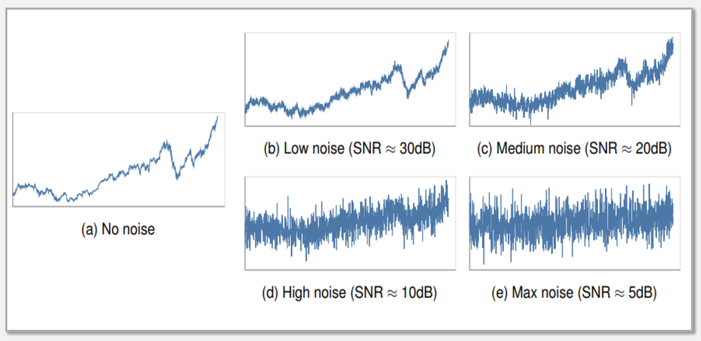
Nine datasets

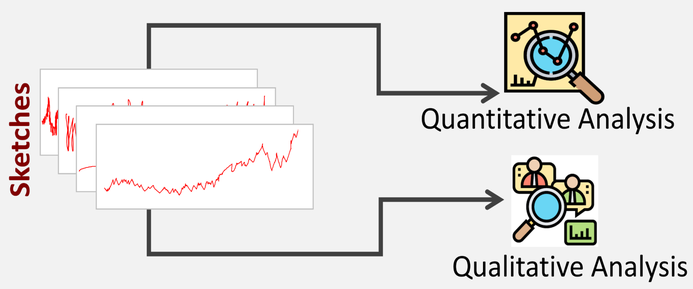


Data properties

Dataset	Description	Overall Trend	Periodic Pattern	Peaks or Valleys
Apple	Daily Apple Stock Closing Price	↗		✓
Astronomy	Radio Astronomy Signal	→		✓
Chicago	Monthly Homicide Rate in Chicago	→	✓	✓
Temperature	Daily High Temperature at JFK Airport	→	✓	
Doge	Daily Doge Coin Closing Price	↘		✓
EEG	Single Channel of EEG Data	↗		✓
Flights	Weekly US Domestic Flights	↗		✓
Tourists	Monthly Tourists in New Zealand	↗		
Unemployment	US Monthly Unemployment in Agriculture	→	✓	✓

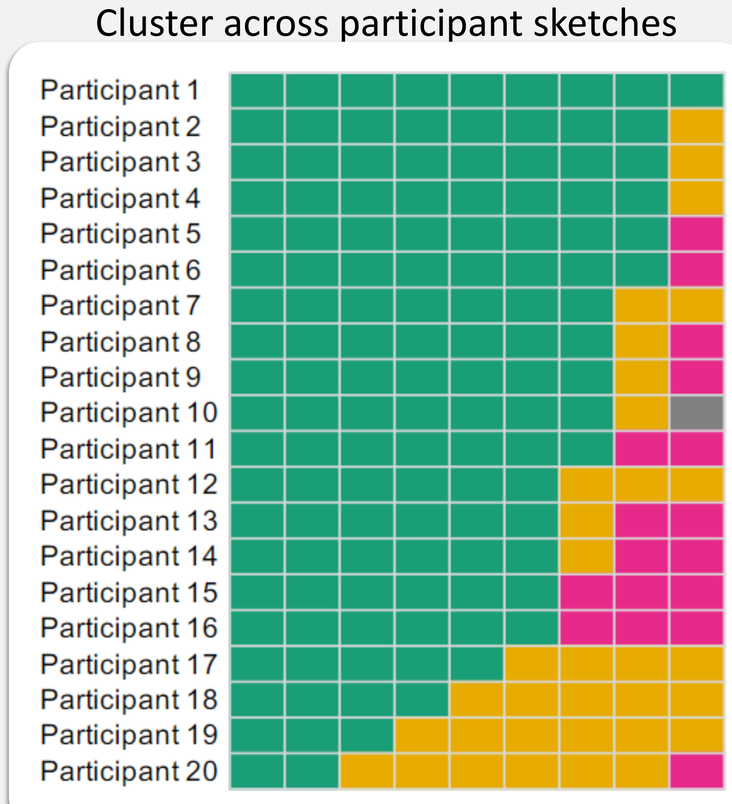
Gaussian noise



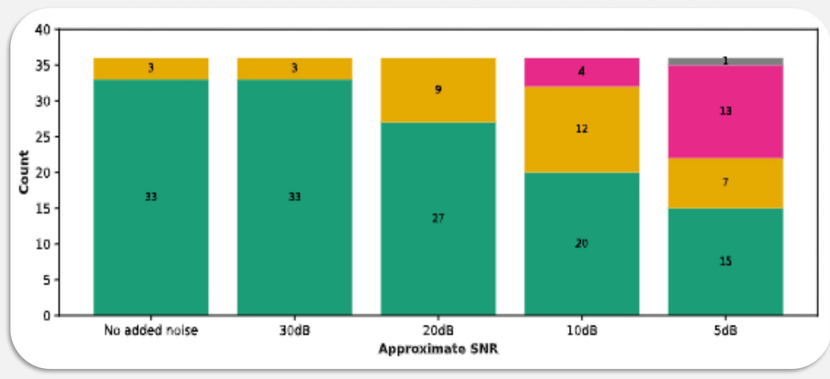


We found that **individual participants did not consistently exhibit the same behavior** across all stimuli but, instead, behaved in ways that we grouped into **three main clusters**.

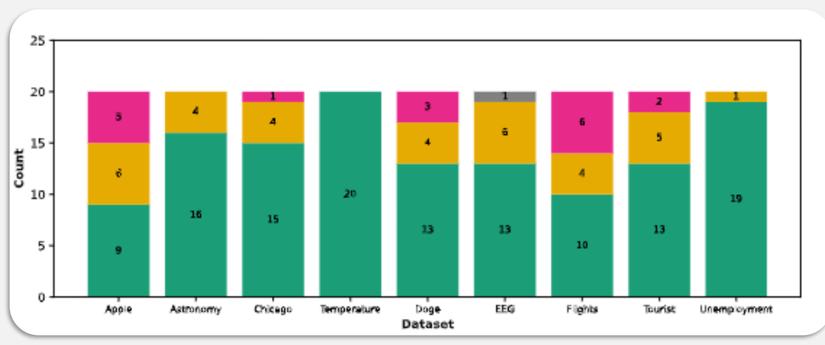
Cluster across participant sketches



Clusters across different noise levels

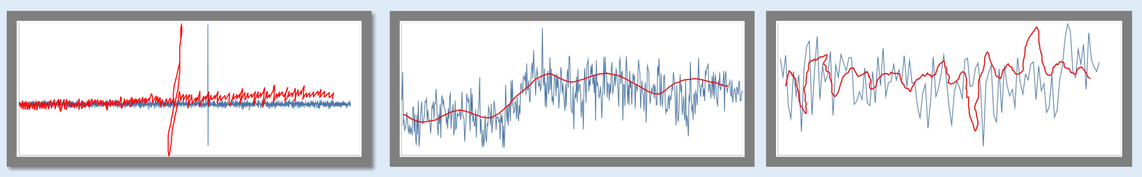


Clusters across different datasets

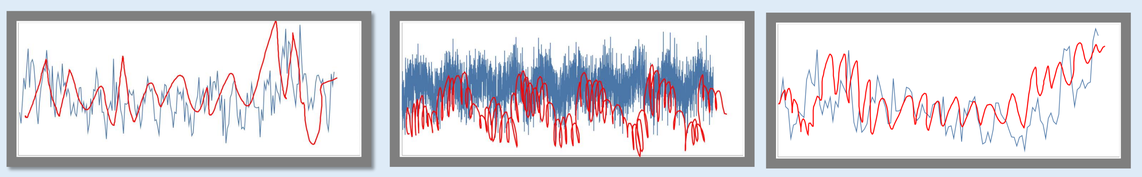


People follow one of three **patterns of behaviors** when they re-draw line charts.

Viewers are generally **robust to noise** in terms of identifying trends, periodicity and peaks and valleys.



Periodicity and noisiness is often **represented semantically** in sketches.



The **findings** of this research suggest the **following implications** for line chart design:

- Smoothing may not always be necessary to show trend and periodicity.
- Highlight peaks and valleys in noisy line charts.
- Annotate important features.
- Make visual query systems more adaptable.
- Summaries of line charts may require less detail than you think.

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