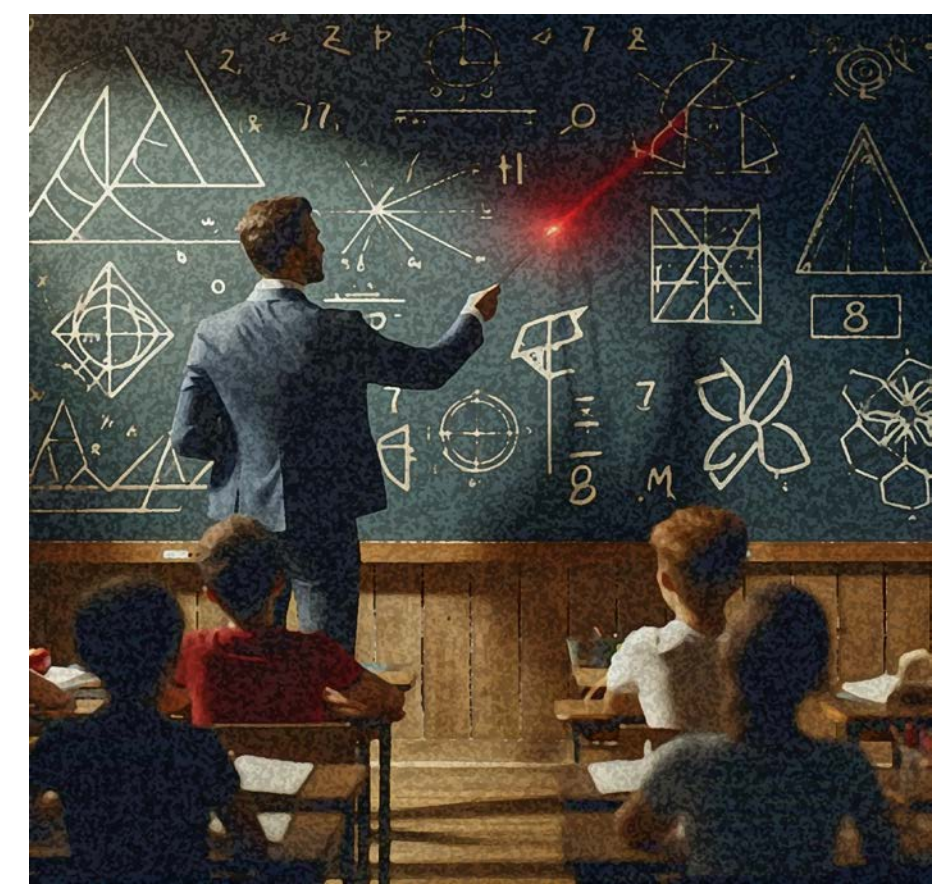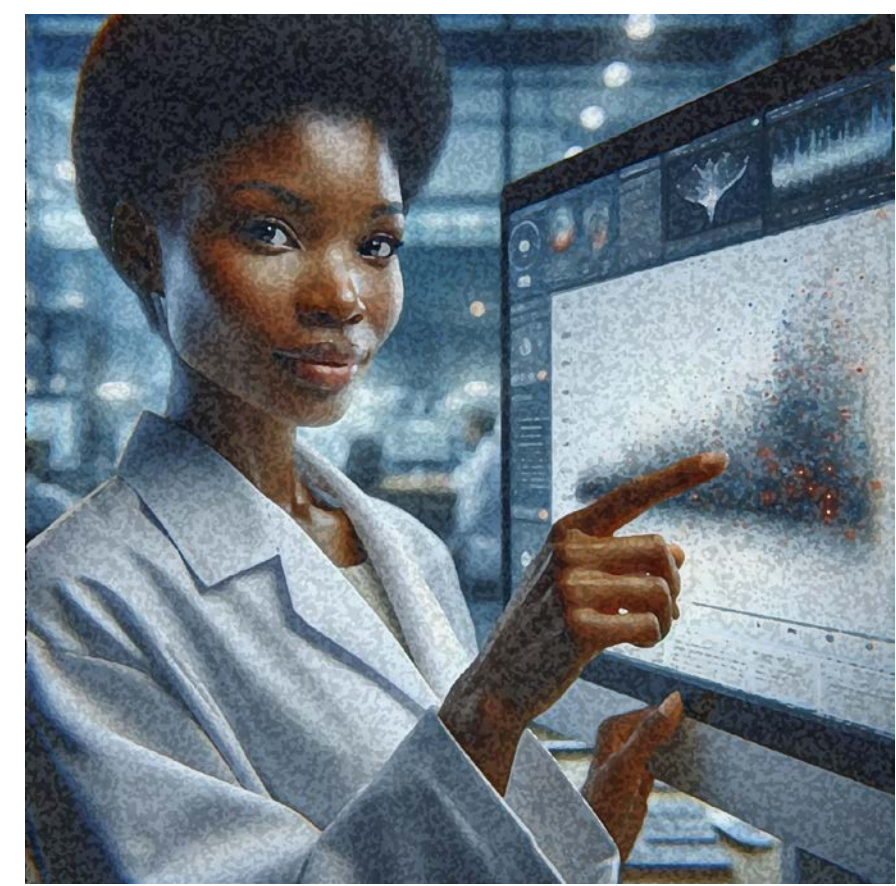# Deixis-Centered Documentation for Data Meetings

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## Background

When discussing data and data visualizations, gestures like pointing play a key role in communication, adding context to statements—a concept known as *deixis* in the linguistics community.
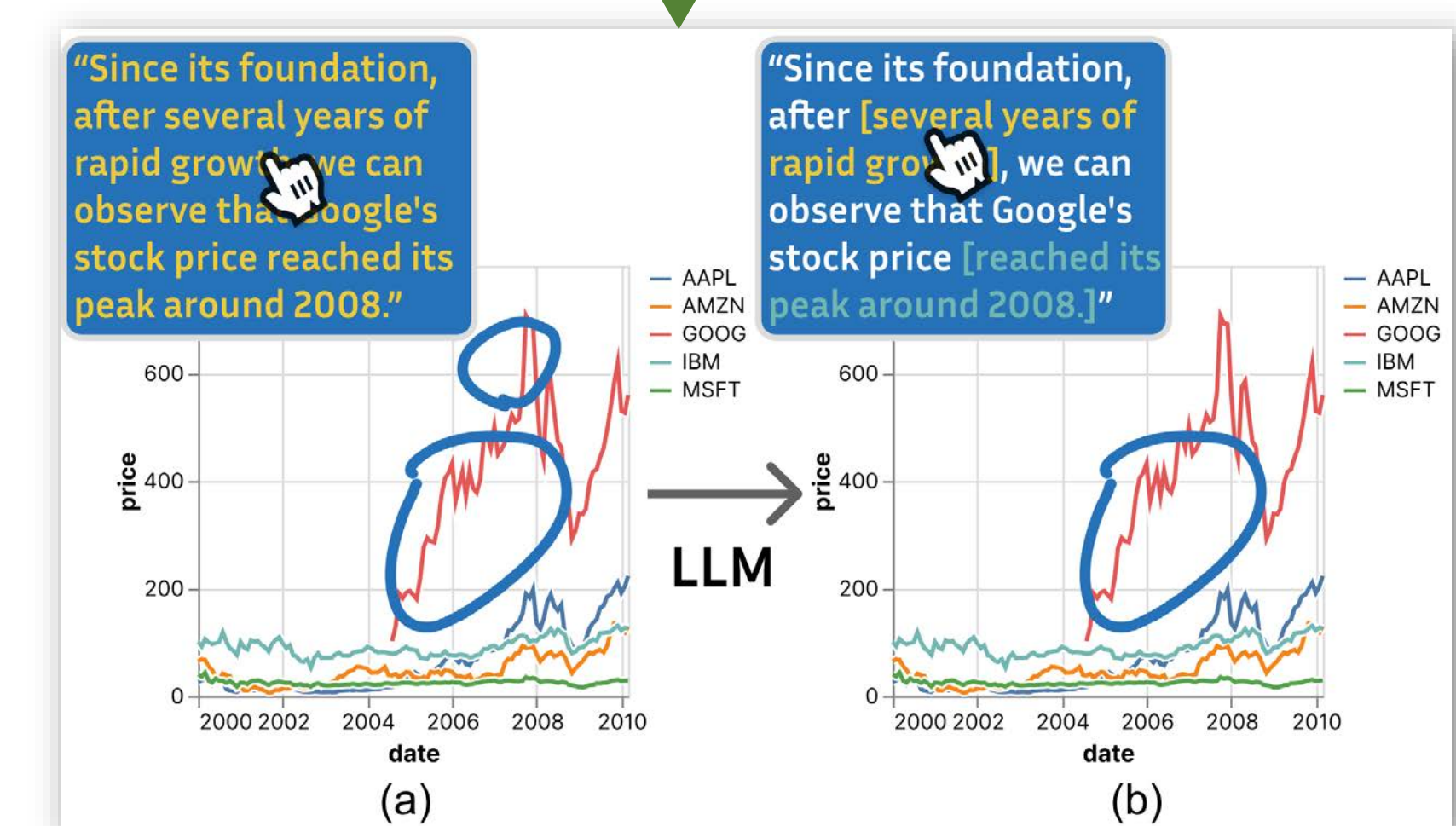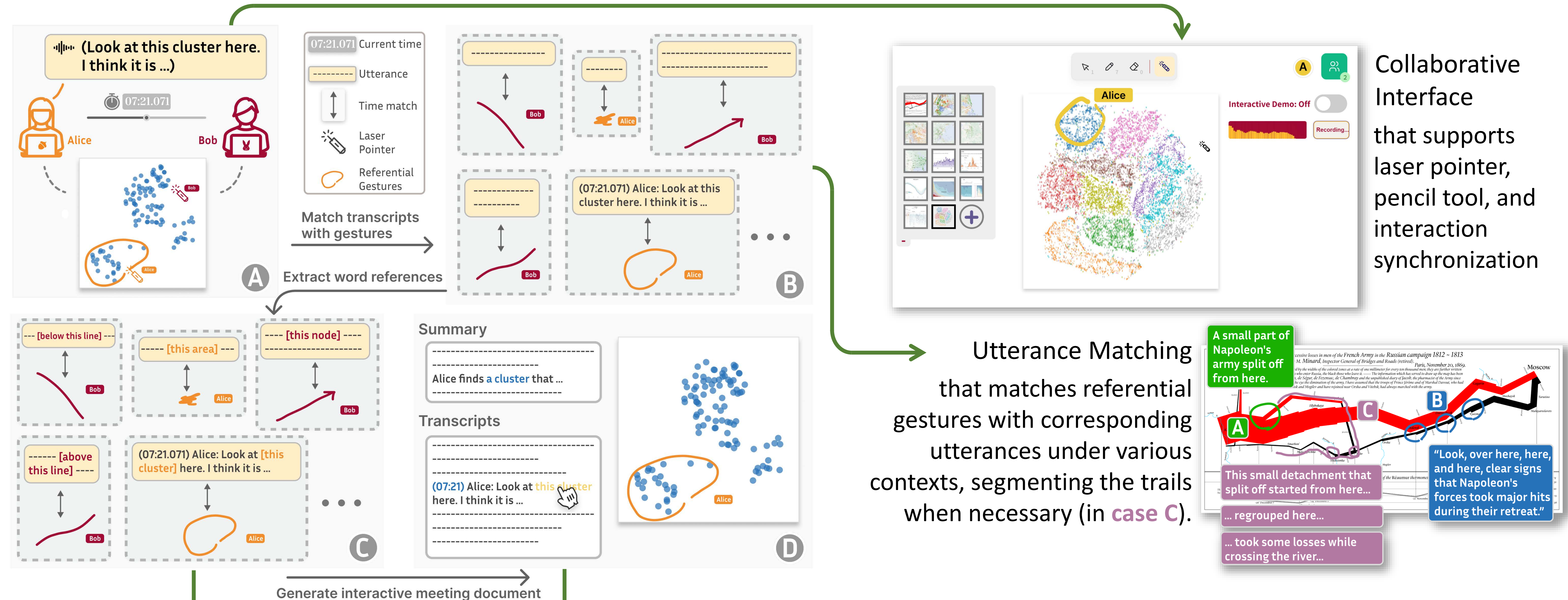
*Generated with DALL-E*

In face-to-face settings, they're made with fingers or laser pointers, while in remote meetings, video conferencing tools allow for similar gestures with digital annotations.

Despite their importance, deixis are often overlooked in meeting documentation. We introduce a novel method for documenting collaborative data meetings that treats deixis as a first-class citizen.
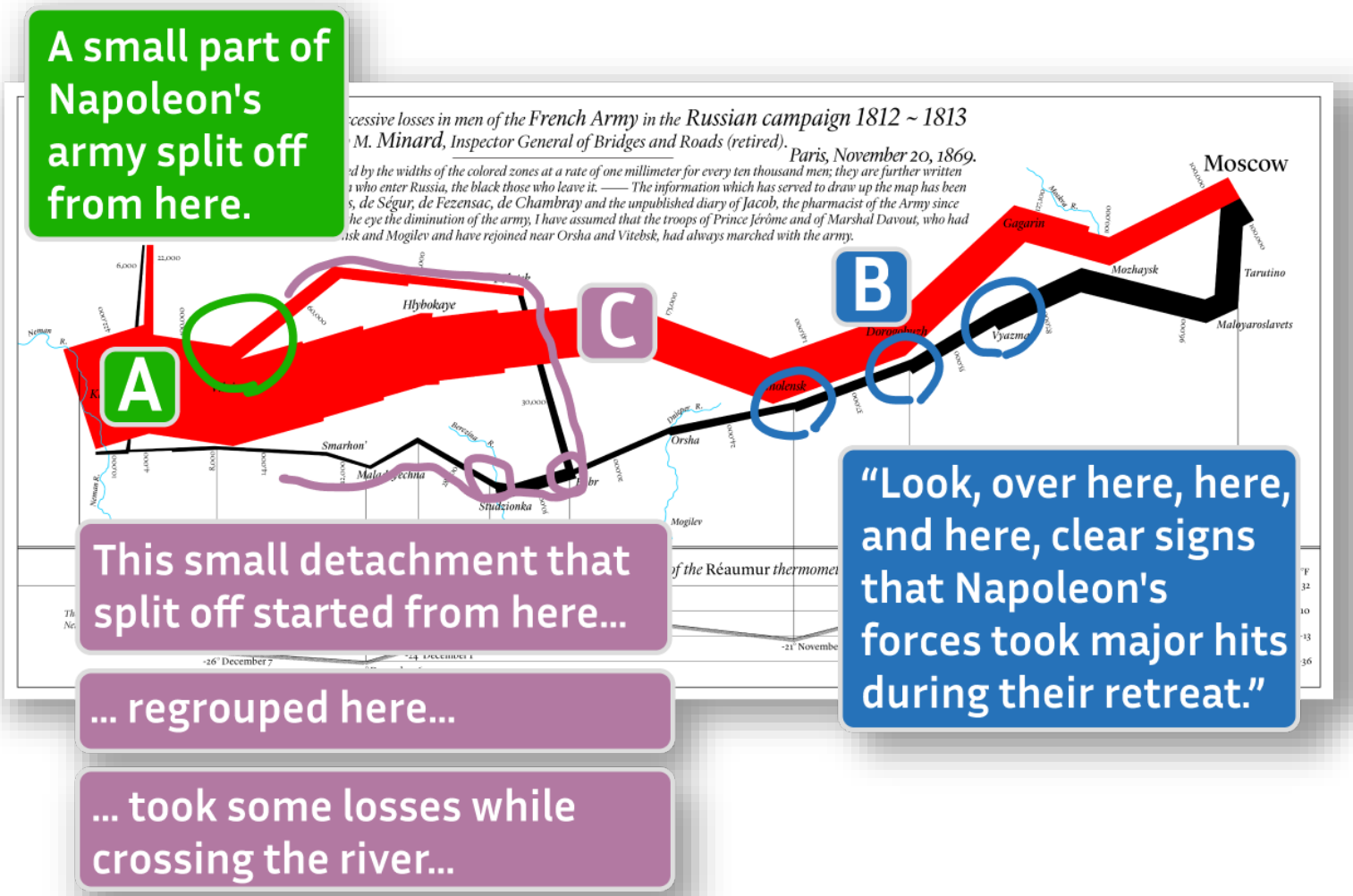


| | | ① | ② | ③ | ④ |
|---|---|---|---|---|---|
| A | Direct Attention* | | | | |
| B | Highlight Trends | | | | |
| C | Depict Path | | | | |
| D | Outline boundary | | | | |
| E | Indicate area/group | | | | |
| F | Refer to absent objects | | | | |
| G | Indicate Interval | | | | |
| H | Connect components | | | | |
| I | Direct reading direction | | | | |

Taxonomy of Deictic Gestures Derived from User Studies

## Pipeline of the Method



(Look at this cluster here. I think it is …)

| | |
|---|---|
| 07:21.071 | Current time |
| - - - - - | Utterance |
| ↕ | Time match |
| ✦ | Laser Pointer |
| ⬭ | Referential Gestures |

Alice     Bob

**(A)** Match transcripts with gestures → Extract word references

(07:21.071) Alice: Look at this cluster here. I think it is … **(B)**

**(C)** [below this line] / [this area] / [this node] / [above this line] / (07:21.071) Alice: Look at [this cluster] here. I think it is …

**Summary**
Alice finds a cluster that …

**Transcripts**
(07:21) Alice: Look at this cluster here. I think it is …  **(D)**

Generate interactive meeting document

"Since its foundation, after several years of rapid growth, we can observe that Google's stock price reached its peak around 2008."

→ LLM →

"Since its foundation, after [several years of rapid growth], we can observe that Google's stock price [reached its peak around 2008.]"

(a)     (b)

**Reference Extraction** that further extracts connections between words or phrases within the matched utterances and referential gesture pairs.

**Collaborative Interface** that supports laser pointer, pencil tool, and interaction synchronization

**Utterance Matching** that matches referential gestures with corresponding utterances under various contexts, segmenting the trails when necessary (in **case C**).

A small part of Napoleon's army split off from here.

This small detachment that split off started from here…
… regrouped here…
… took some losses while crossing the river…

"Look, over here, here, and here, clear signs that Napoleon's forces took major hits during their retreat."

**(A) Interactive Text**     **(B) Visual Media**

ethnic segregation within U.S. cities.

### 1.5 City Segregation Patterns Comparison

(00:13:30) Bob agreed to Alice's suggestion to proceed with their analysis. He introduced the task of examining five maps that depict the segregation conditions in various U.S. cities, where each dot represents 120 individuals, and different colors symbolize different ethnic groups. Their objective was to identify patterns of neighborhood segregation, compare patterns across cities, and discuss similarities and differences between them.

**(a₁) Transcripts**

(00:14:45) Alice: Yes, the blacks are more concentrated here.

(00:14:52) Bob: One more interesting thing I can see is that Asians are everywhere. We can see red dots here. Asians are not just forming a neighborhood in one area; they are present everywhere.

(00:15:12) Alice: The diversity of these colors seems to change as we move from the city southward. For example, if you notice more concentration in this area, it might be due to psychological patterns or residential trends as we move southward. I notice that the colors vary as we move away from the city center, and that's the main observation. Here, the blacks are more concentrated in this area and the Hispanics are more concentrated in that area.

(00:16:00) Bob: This area is multicultural, with people of various backgrounds including whites, blacks, and others.

(00:16:09) Bob: I do not see the red dots.

(00:16:15) Bob: There are some small dots here.

(00:16:18) Alice: There is a difference between red and yellow.

(00:16:20) Bob: Understood.

(00:16:24) Alice: I can see reds here, like in the center of the city, and then some dots everywhere.

**(a₂) Summary**

(00:14:45) Alice observed that Black populations appeared more distilled in certain areas. Bob added that Asians seemed to be dispersed across the cities, as indicated by red dots scattered throughout the area, suggesting their presence was not confined to specific neighborhoods.

(00:15:12) Alice noted a shift in the diversity of colors as one moves southward from the city center, indicating a change in the concentration of ethnic groups, possibly due to socioeconomic patterns or residential trends. She pointed out areas where Black and Hispanic populations were more concentrated, suggesting a pattern of segregation within the city.

(00:16:00) Bob described a particular area as multicultural, with a mix of ethnic groups. The conversation then shifted to the differentiation between red and yellow dots, indicating various ethnic groups' presence in the city center and other areas.

(00:16:50) The discussion moved to comparing another city, Salix City, where Alice observed a higher presence of White populations, represented by green dots throughout the city, and a less pronounced presence of Asian and Black populations. Bob noted the absence of distinct clustering of different communities in Salix City, highlighting the intermingling of Hispanic and White populations in various areas and the presence of other ethnic groups not observed in Boston, indicated by purple dots.

## Interactive Meeting Notes

with: (A) Interactive text, comprising transcripts from audio and the LLM-generated summary. (B) Visual media from the meetings are presented with annotations based on parameters transmitted by the interactive text on the left.