SIGGRAPH ASIA 2016 MACAO

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VideoForest: Interactive Visual Summarization of Video Streams Based on Danmu Data

Zhida Sun[†], Mingfei Sun[†], Nan Cao[‡], Xiaojuan Ma[†]

[†]Department of Computer Science and Engineering, Hong Kong University of Science and Technology

[‡]College of Design and Innovation, TongJi University

SENG 工學院 SCHOOL OF ENGINEERING | 香港科技大學 THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

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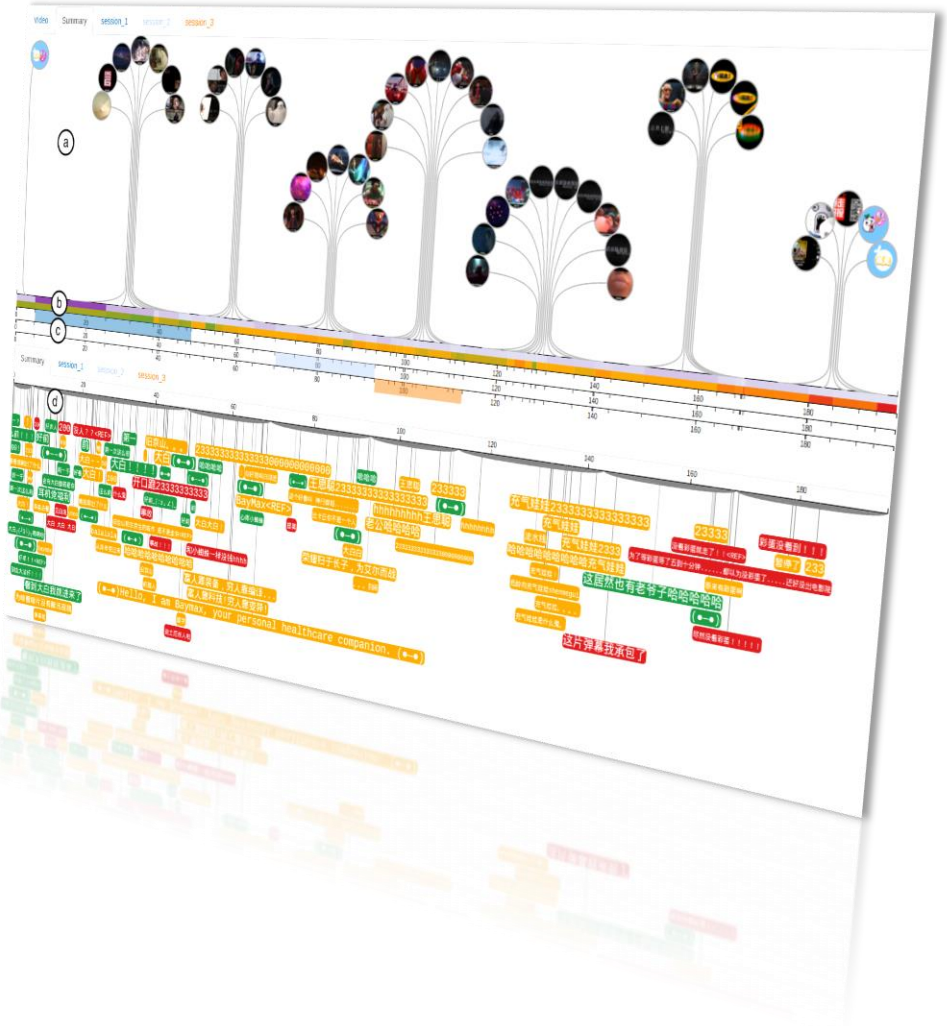
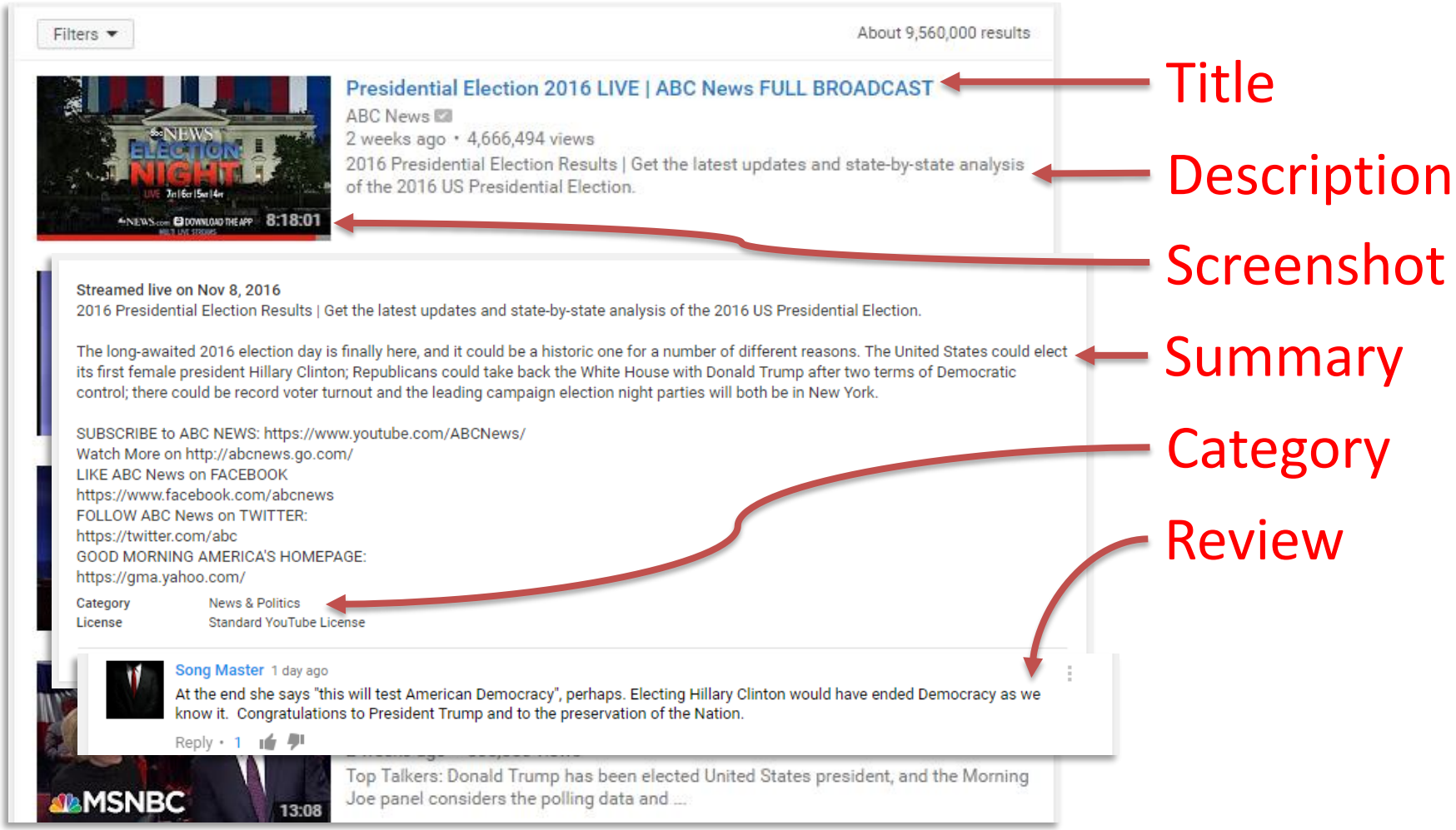
Outline

- Motivation
- System
  - Architecture
  - System overview
  - Preprocessing
  - Analysis
  - Visualization
- Evaluation
- Conclusion

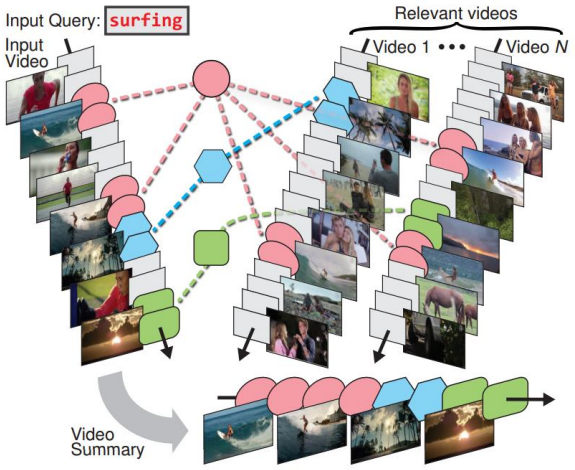


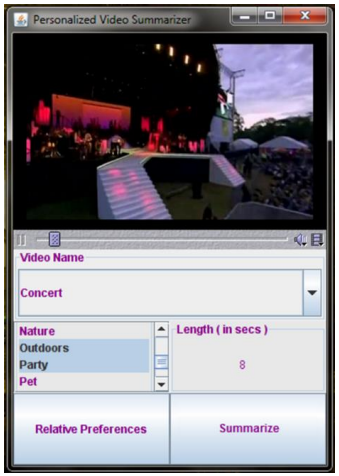
Video Summarization on Youtube



Summarization of Video Streams

- Internal summarization techniques
  - Video, audio, linguistic features
- External summarization techniques
  - Audience's preferences and interests



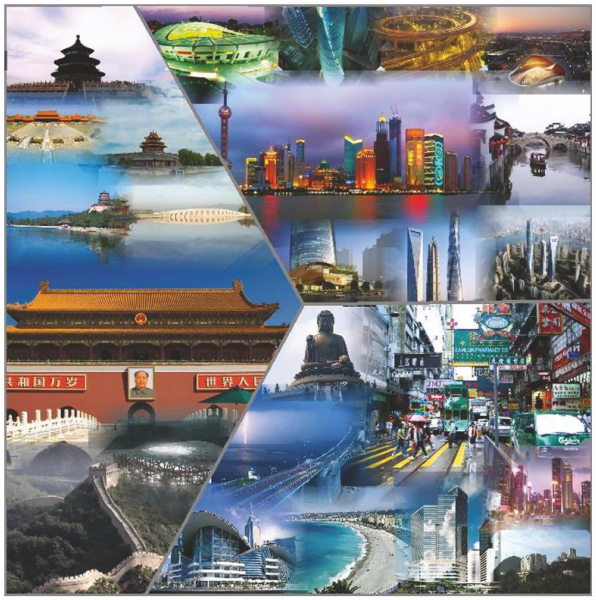


Video co-summarization [Chu et al. 2015] *User preferences based* [Kannan et al. 2013]

Summarization of Video Streams

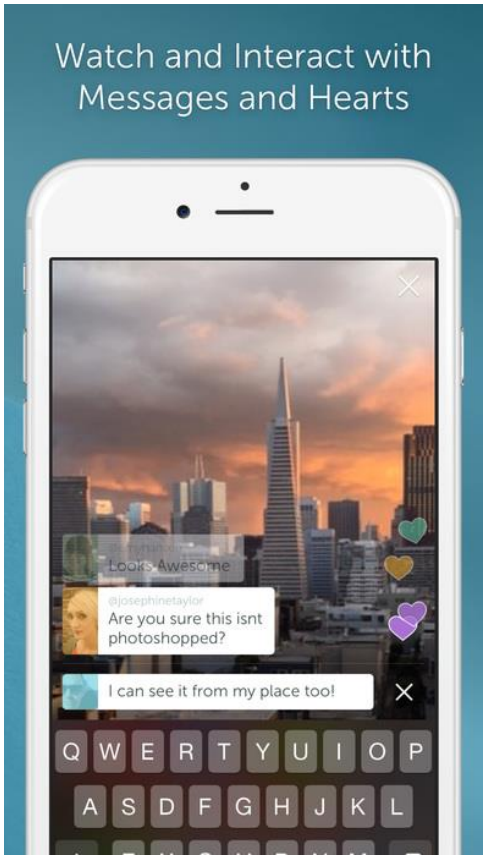
- Summarization representation
  - Matrix form [Lu and Grauman 2013]
  - Illustration: Visual storyline & Imagehive

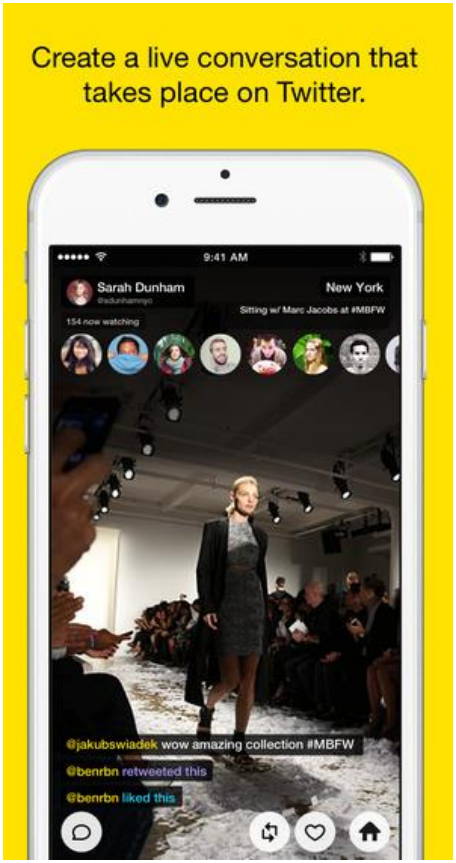
Visual storylines [Chen et al., 2012]

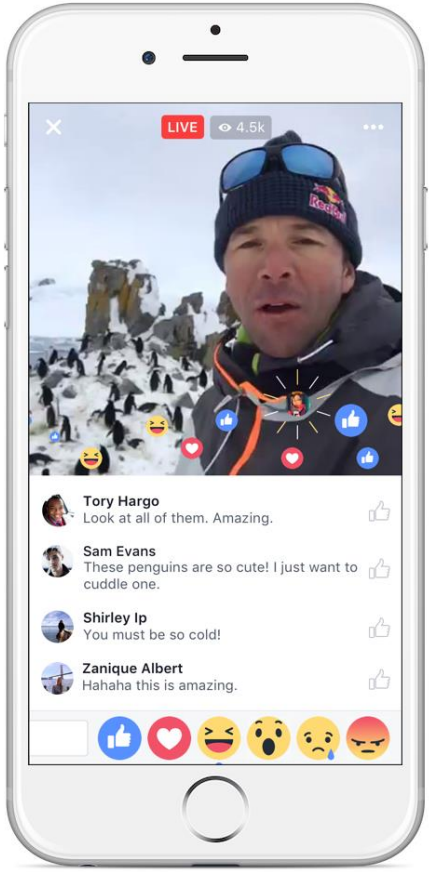


Imagehive [Tan et al., 2011]

Live Streaming Platforms

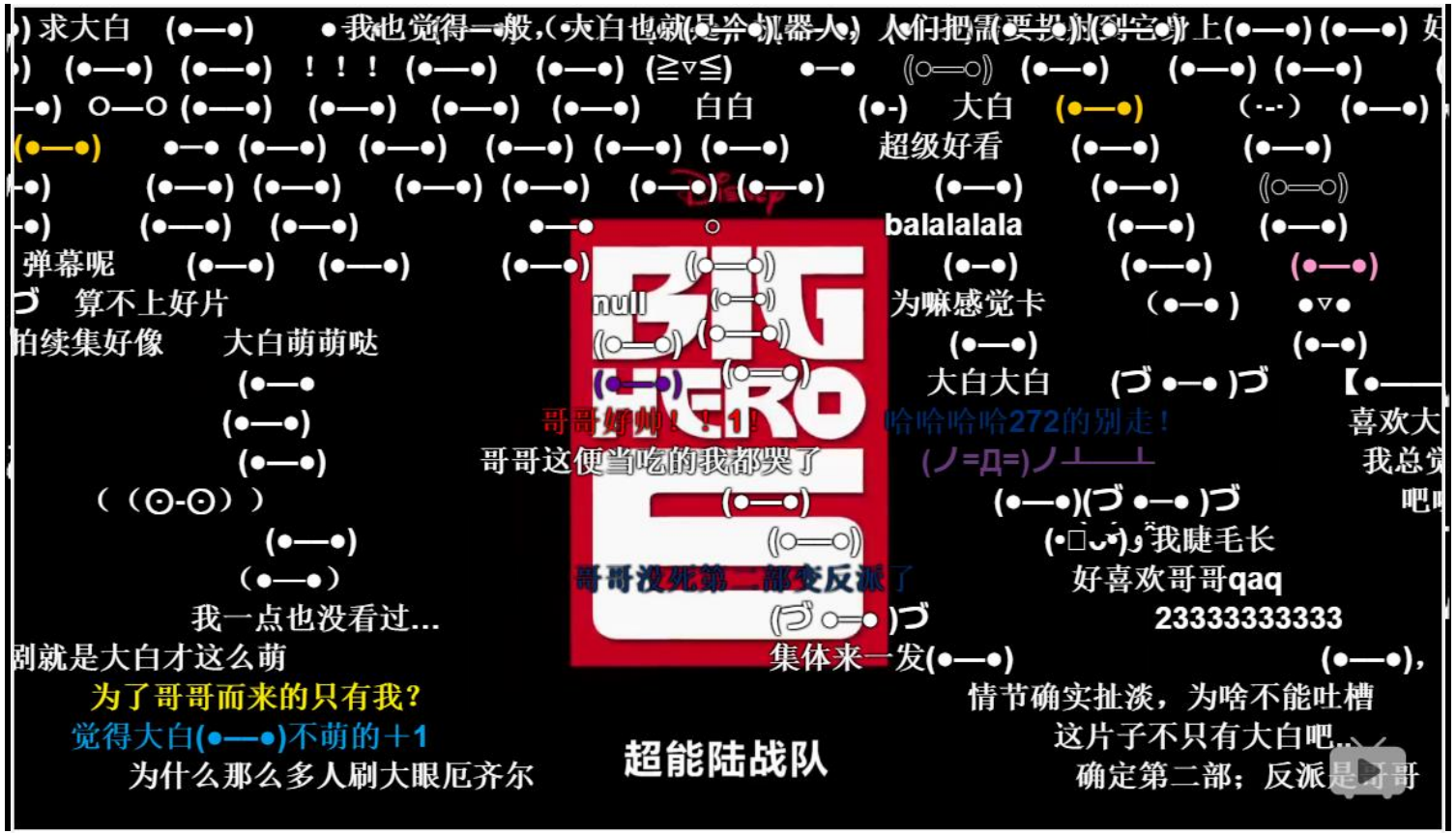






Video Platforms with Danmu

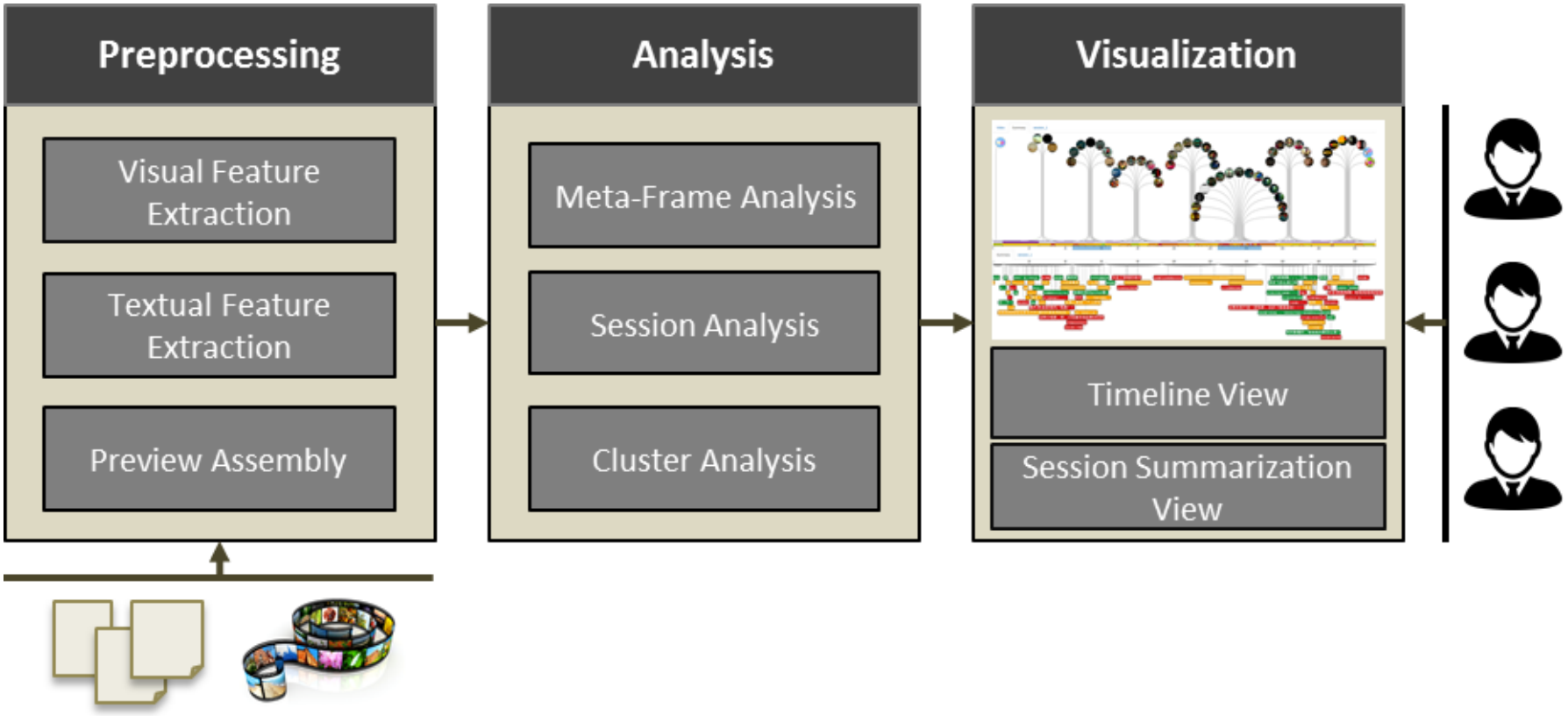
niconico bilibili ビリビリ DOUGA ACFUN



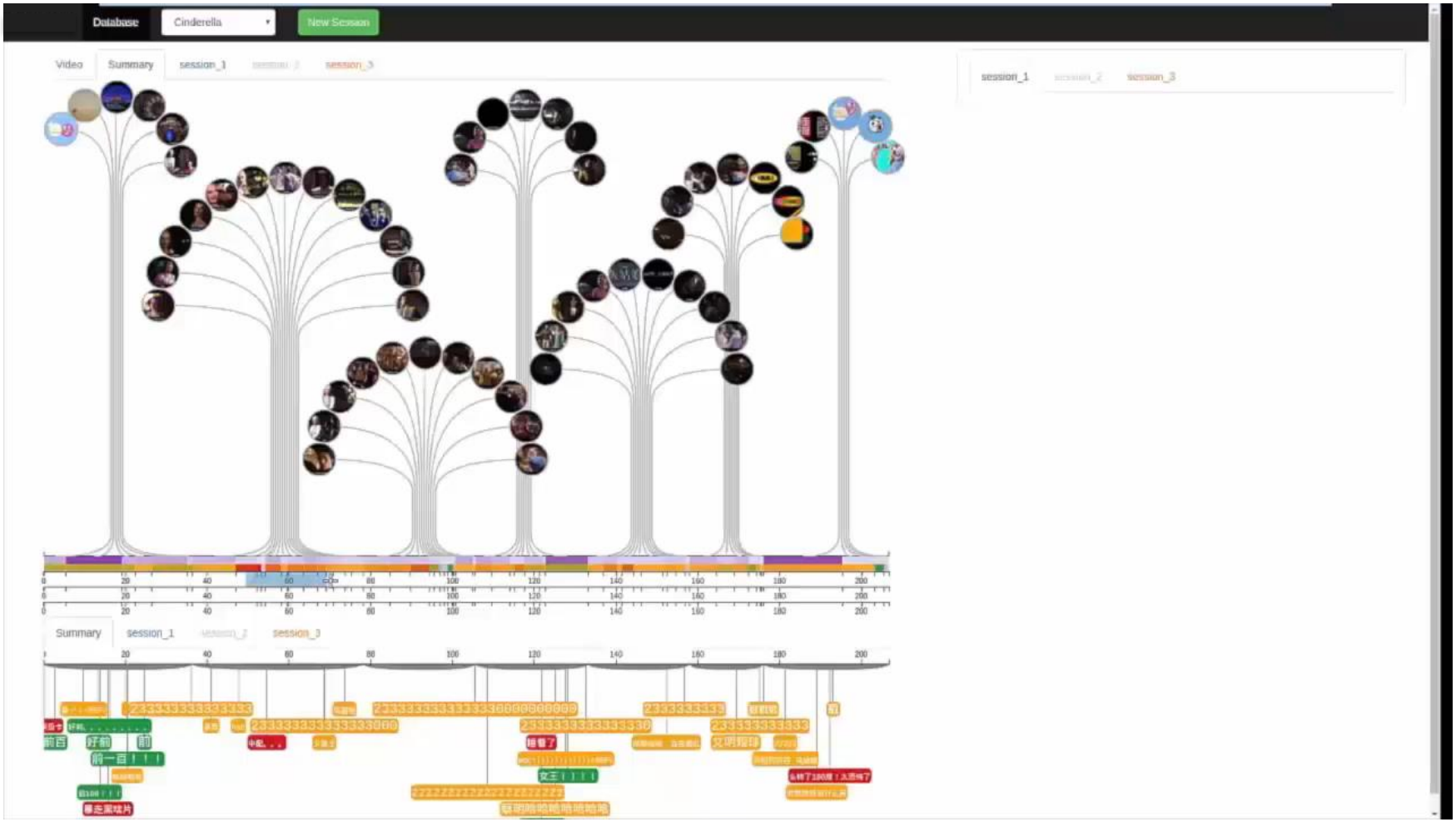
Danmaku screencapture

System Architecture

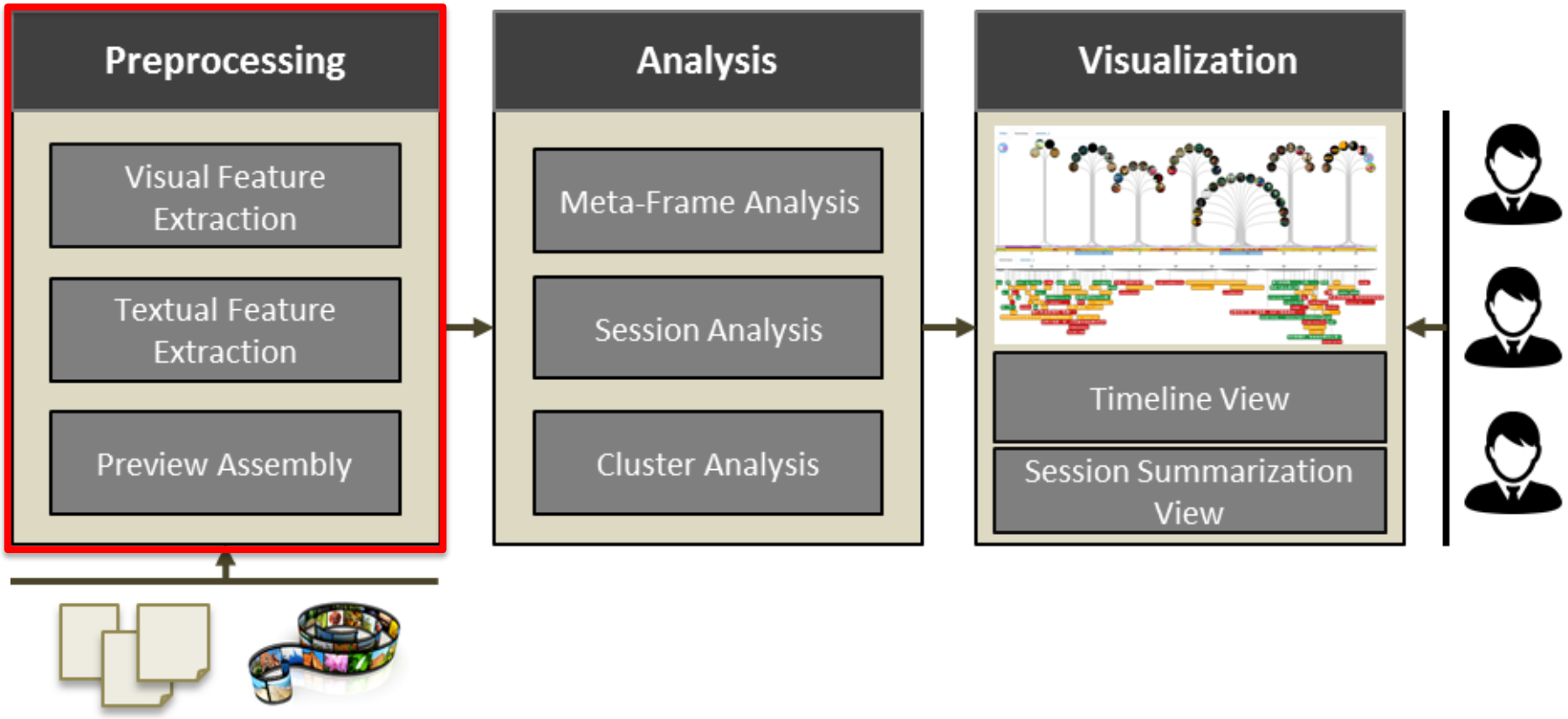
Goal: Video + Danmu + Interaction → Summarization



Video Demo

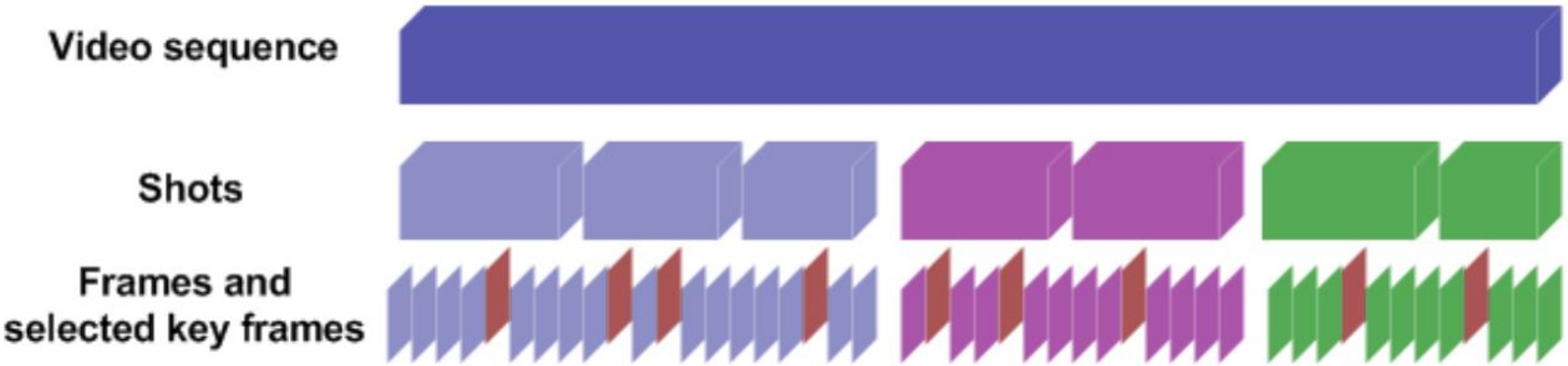

Database
Cinderella
New Session
Video
Summary
session_1
session_3
Summary
session_1
session_3

Processing


Preprocessing
Visual Feature Extraction
Textual Feature Extraction
Preview Assembly
Analysis
Meta-Frame Analysis
Session Analysis
Cluster Analysis
Visualization
Timeline View
Session Summarization View

Feature Extraction

- Visual feature extraction
  - Key frames extraction from compressed video



Hierarchical structure of a video sequence [Mendi and Bayrak 2010]

Feature extraction

- Textual feature extraction
  - syntactic and semantic analysis

Similarity

Sentiment

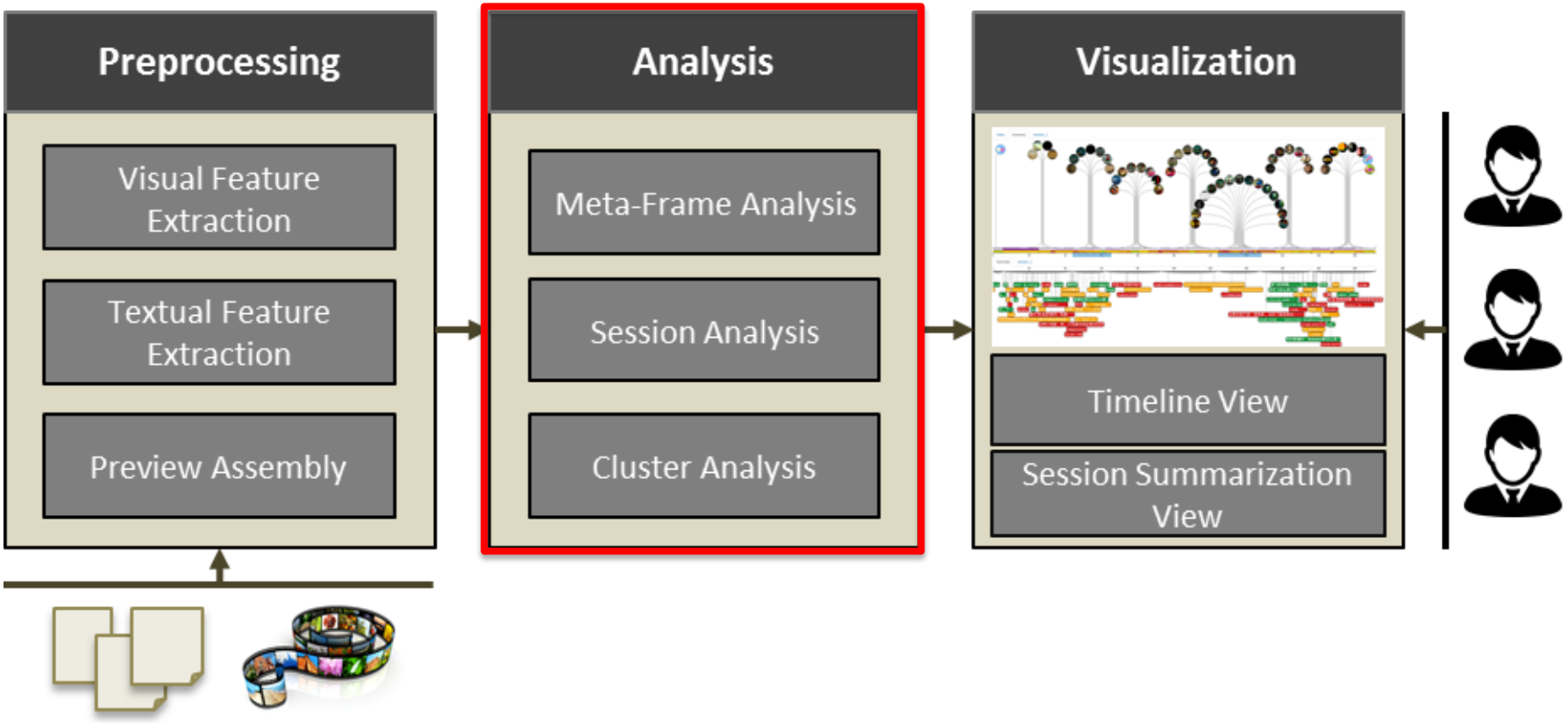
Topic

Function

Symbol

Pattern

Analysis


Preprocessing
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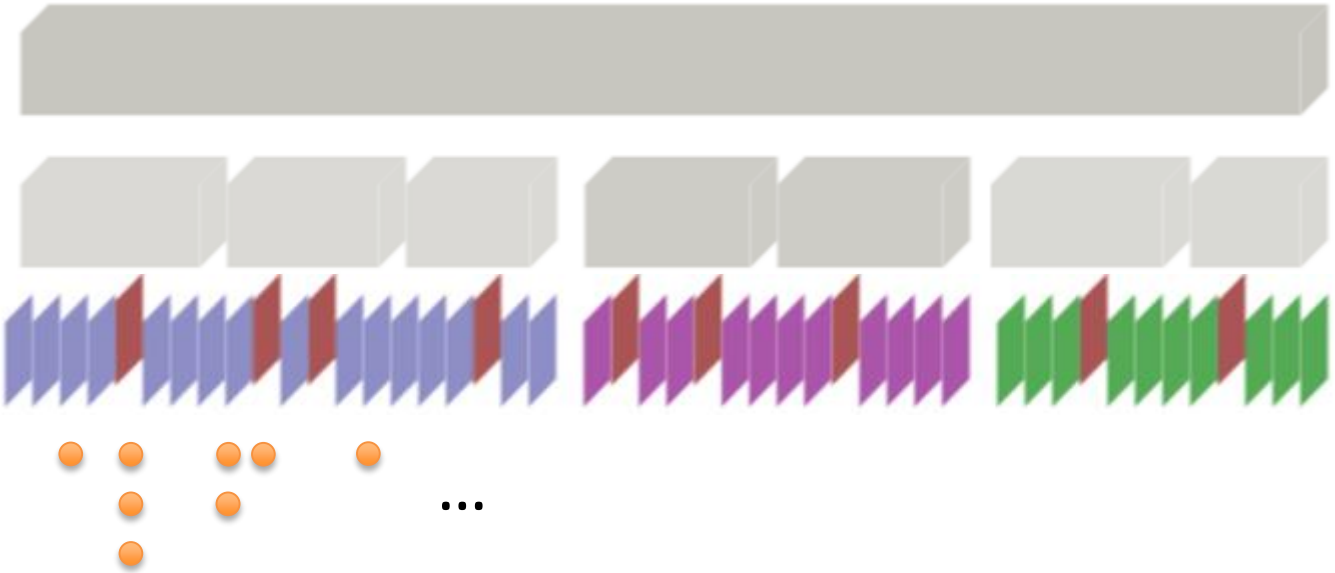
Meta-frame, Session and Scene Cluster



Meta-frame

- Visual attributes: image content
- Textual attributes: audience's reaction

Meta-frame, Session and Scene Cluster

Session

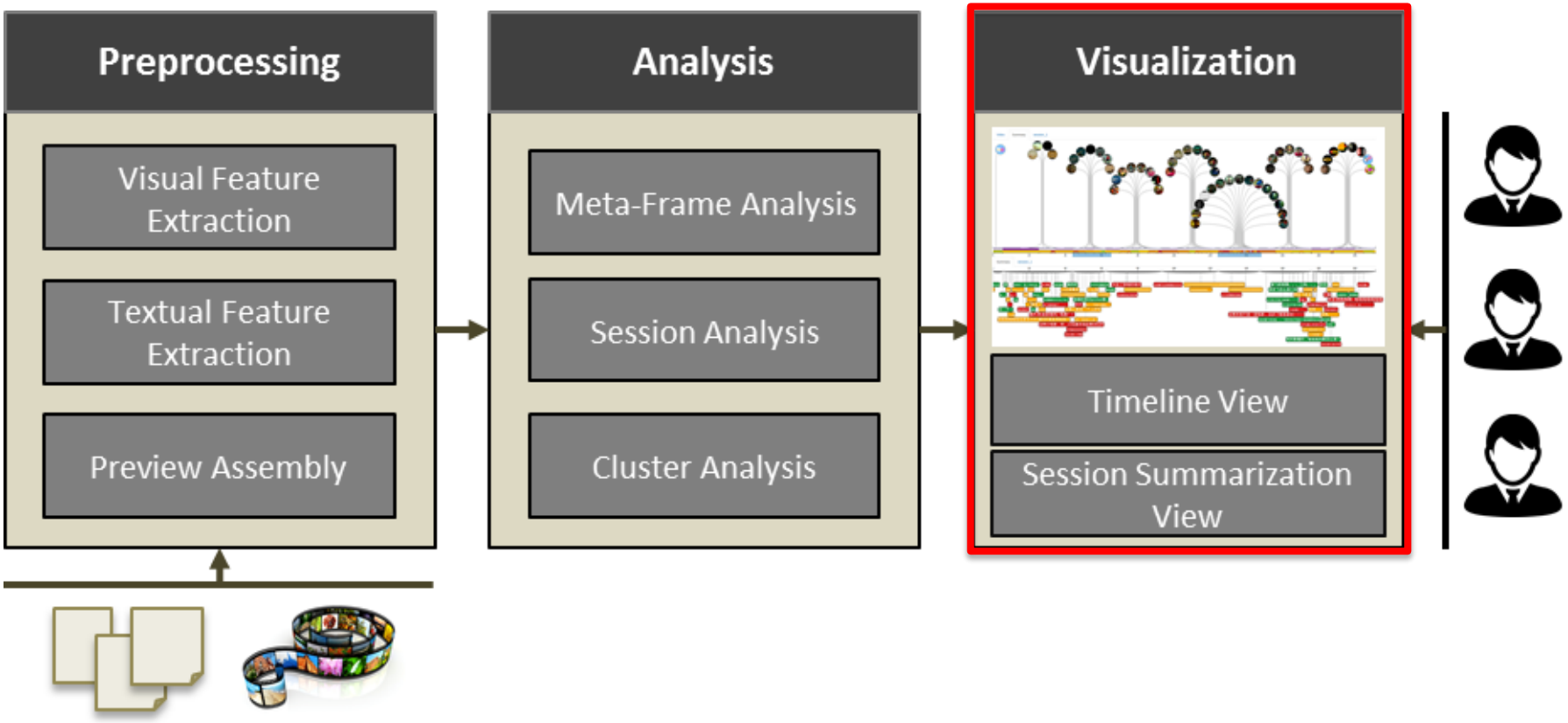
- Color palette of the entire session
- Synoptic linguistic attributes of danmu in the time range

Meta-frame, Session and Scene Cluster

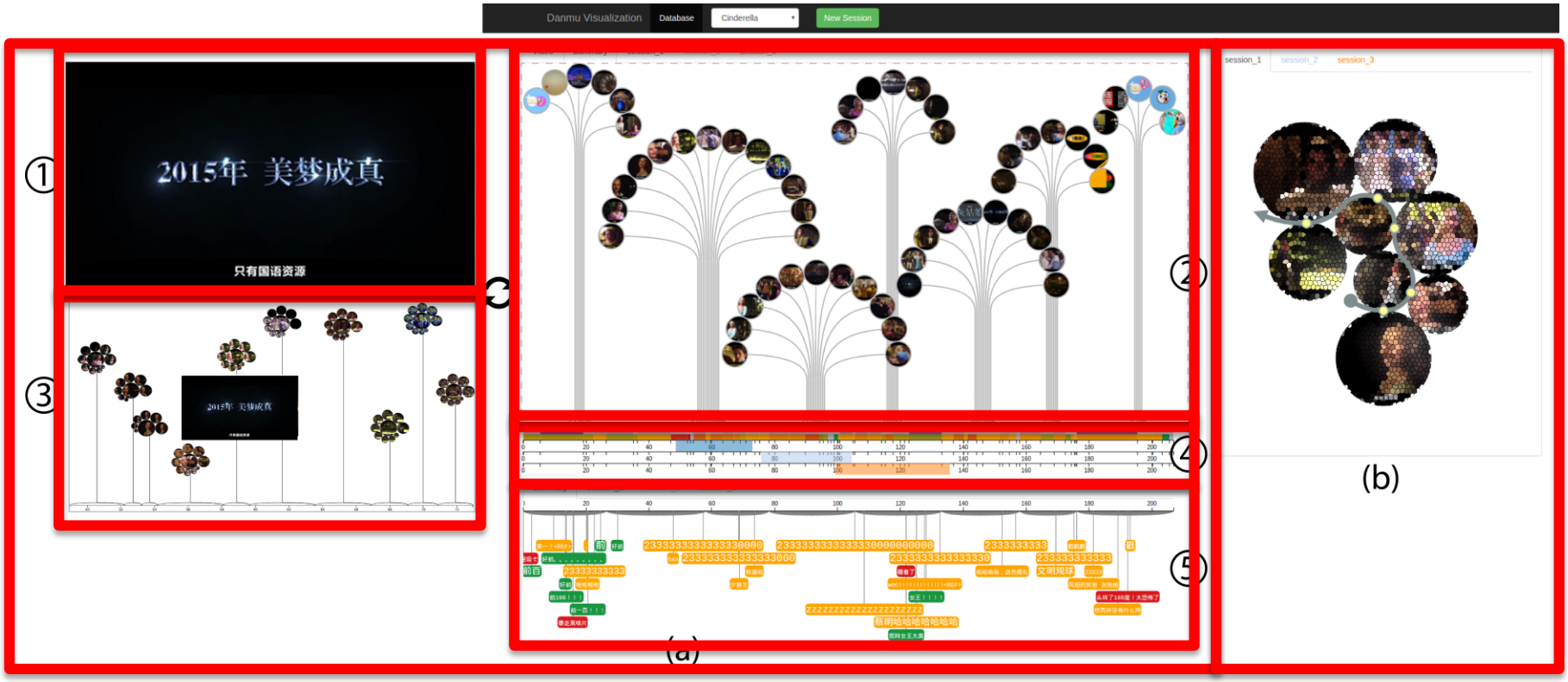
Scene cluster

- Danmu commentary density

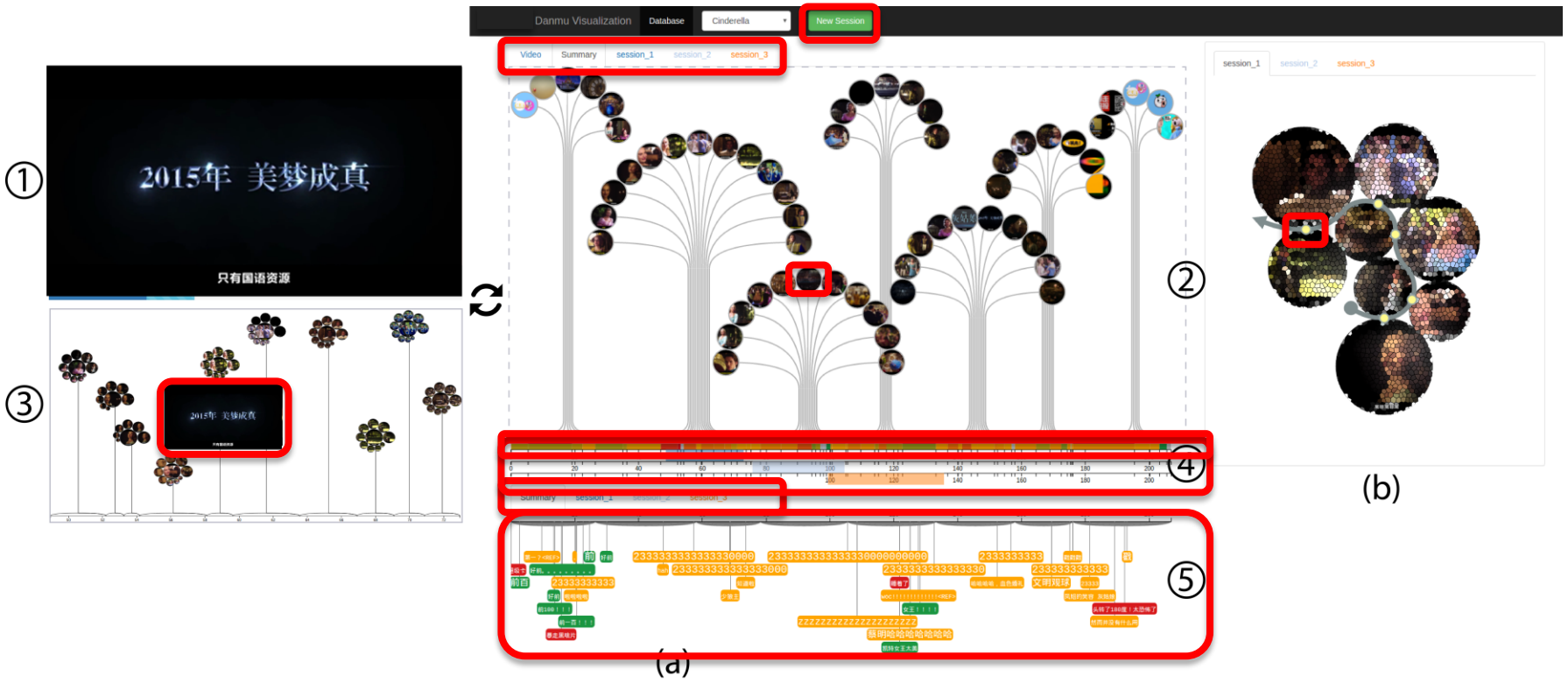
Visualization



System Interface Overview



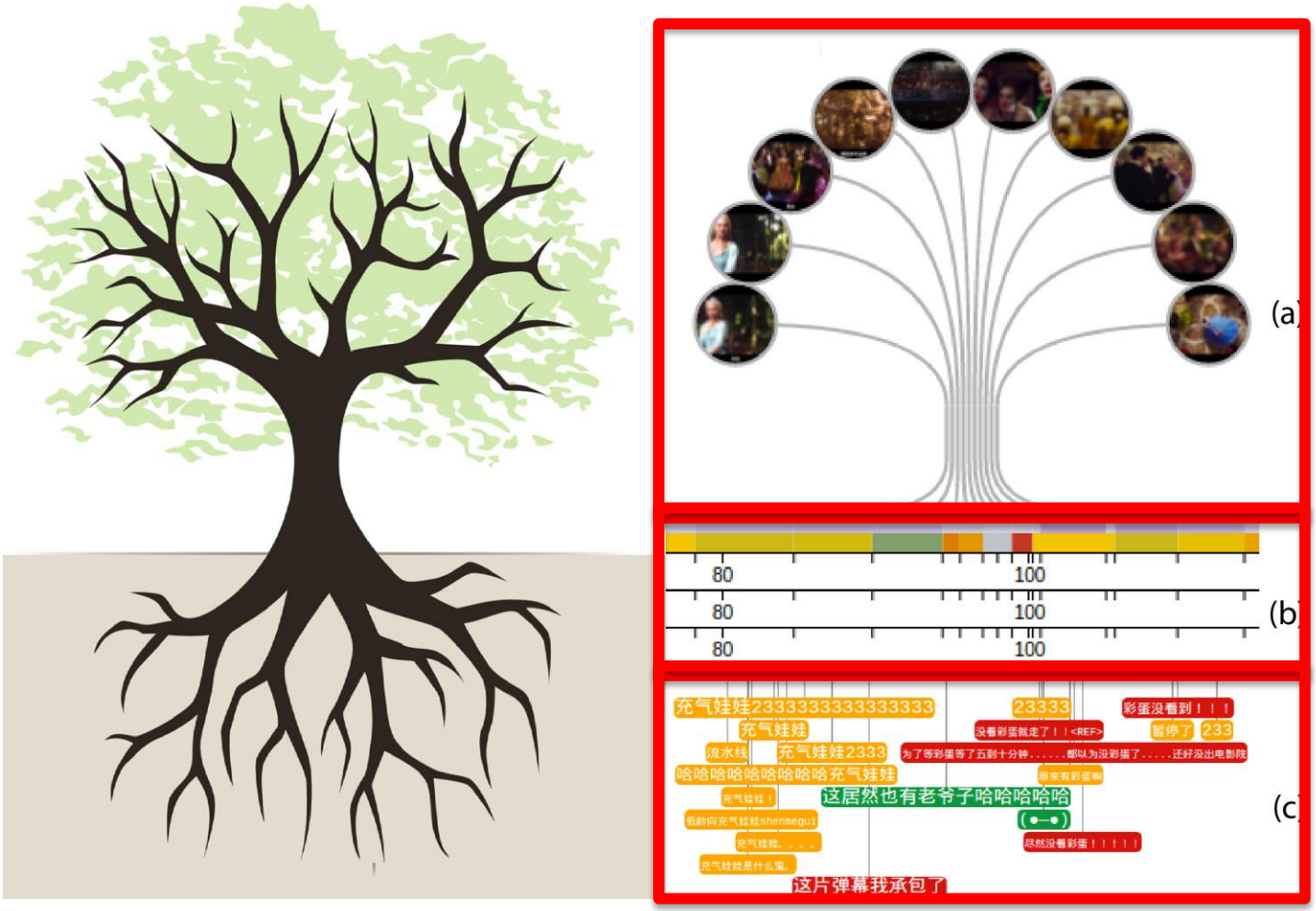
Interactions



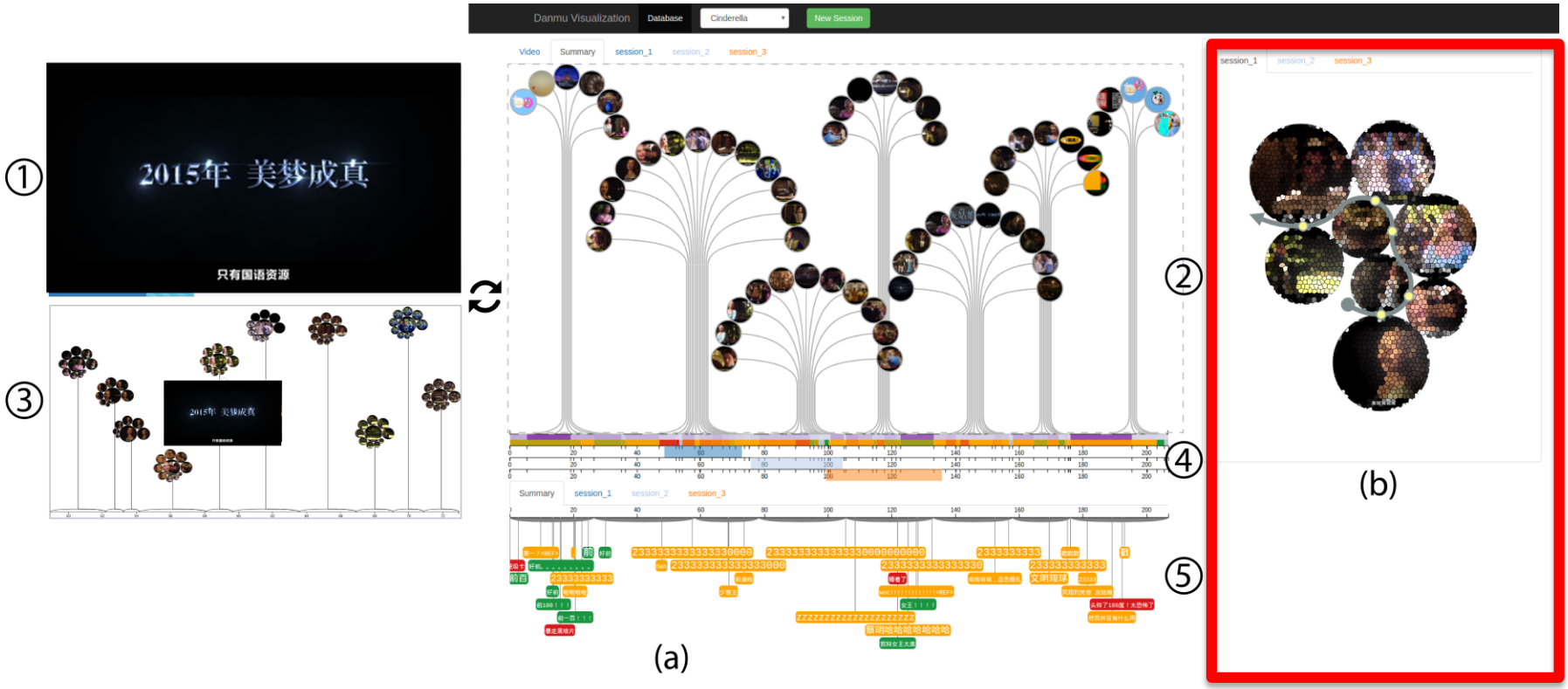
Smart summarization Scene preview Highlighting

New session generating View switching

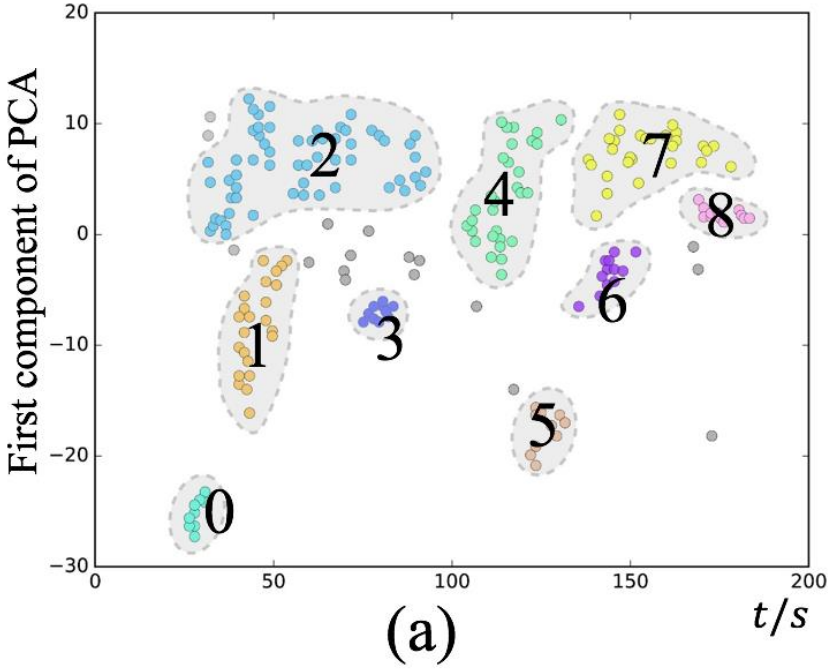
Visual Metaphor and Encoding

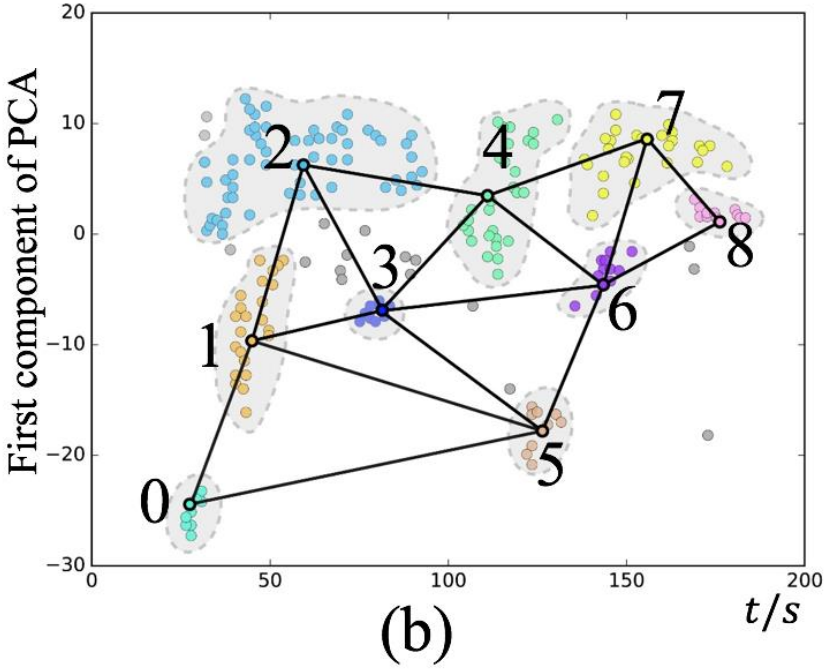


Session Summary View

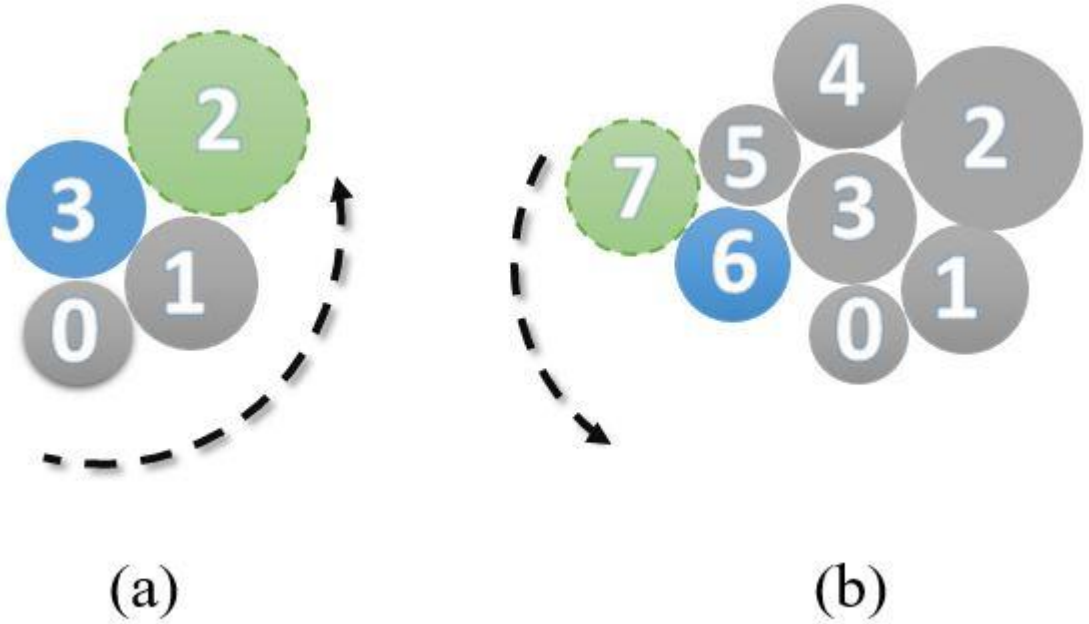


Meta-frame aggregation

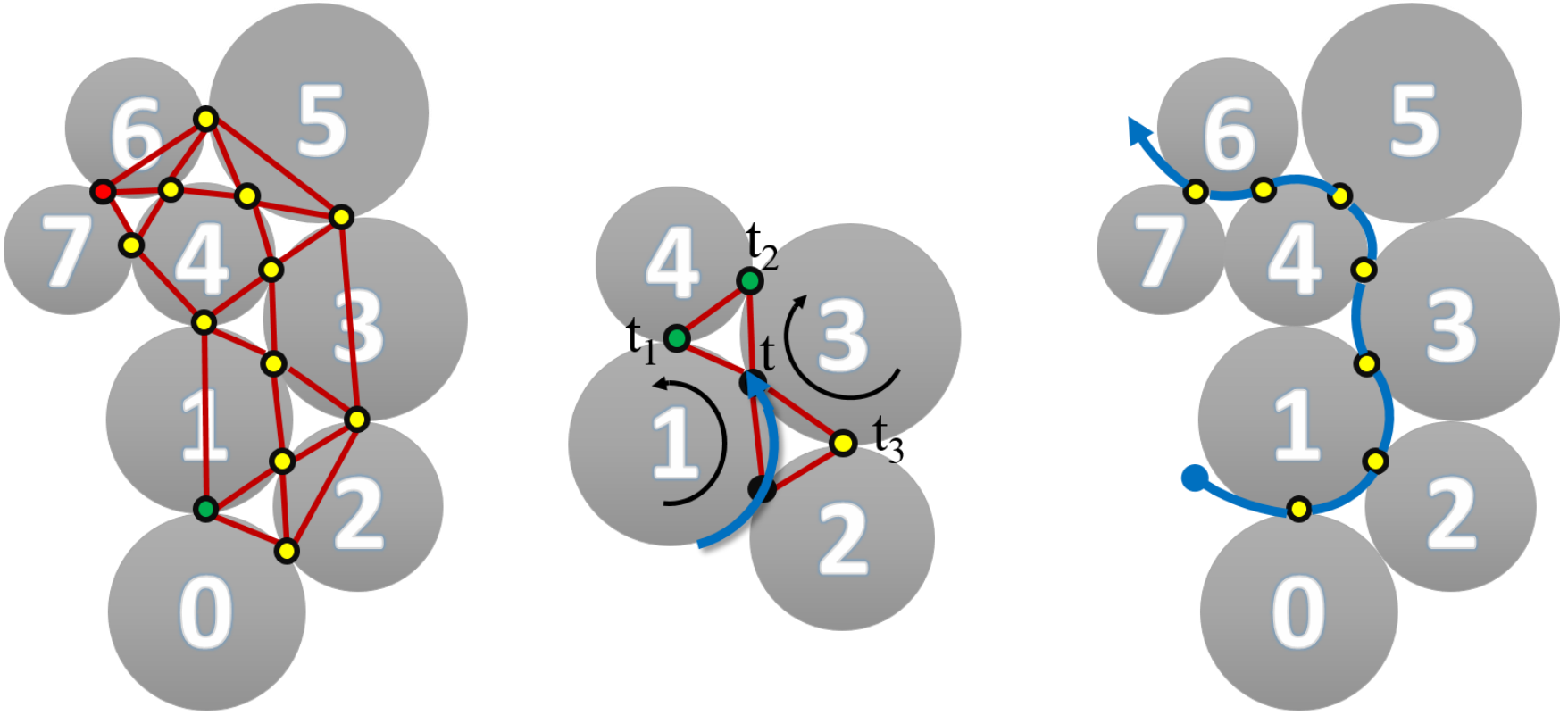




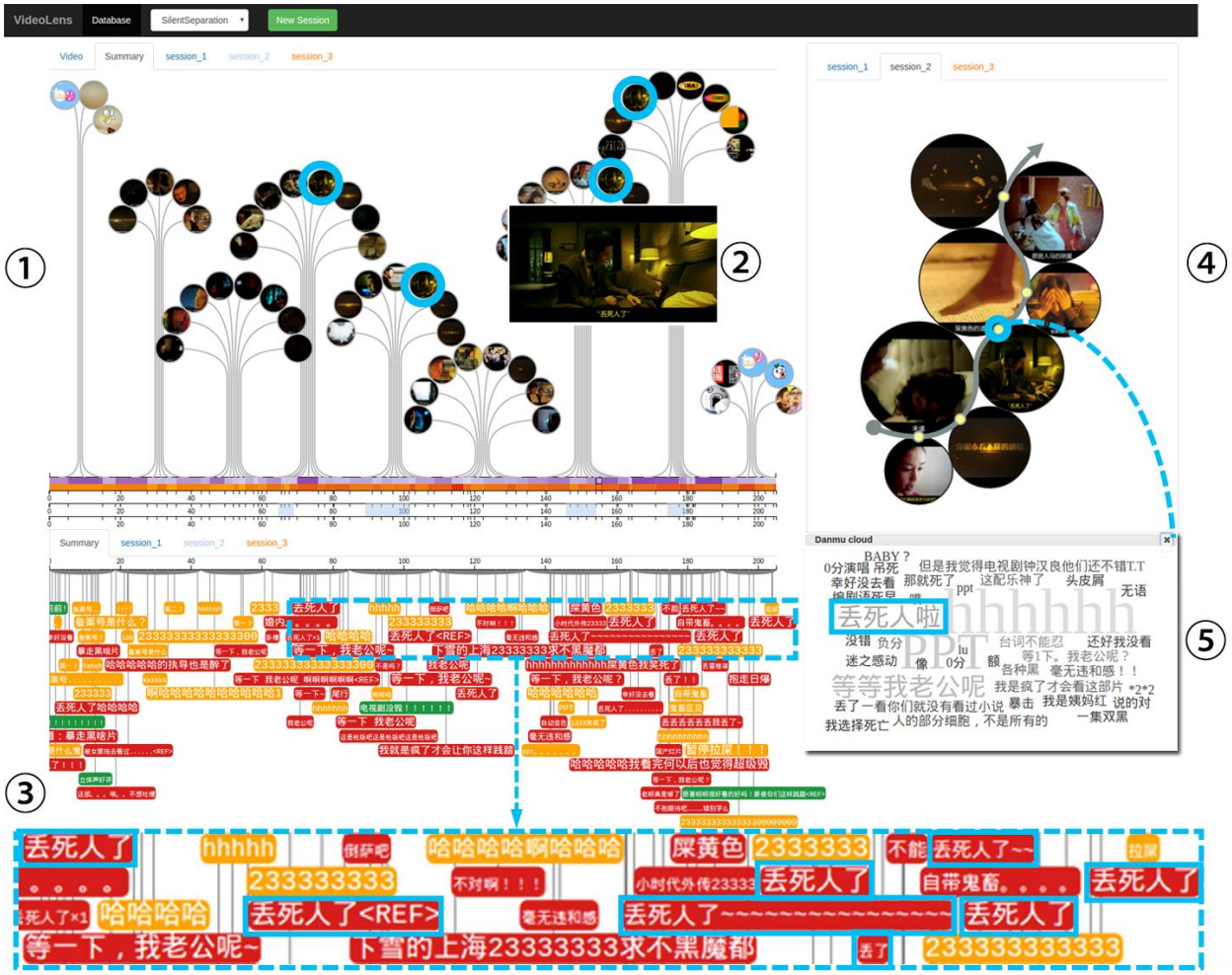
Circle Image Packing



Storyline threading



Case study



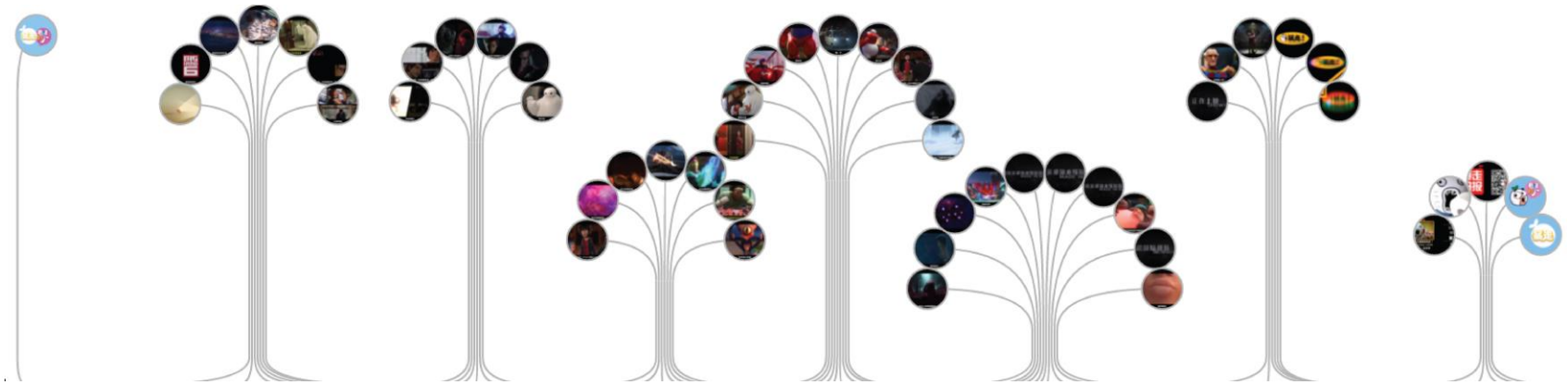
- *205* seconds long
- *2052* danmu posts
- *61* I-frames
- *1804* P-frames
- *61* sessions
- *9* scenes

User observation

- Thirteen experts
- Live demo
- Interview & open discussion
  - Insights
  - Applications

Future Work and Conclusion

- Conclusion



- Future work
  - Long video stream scalability
    - Hierarchical aggregation
  - Advanced video analysis techniques

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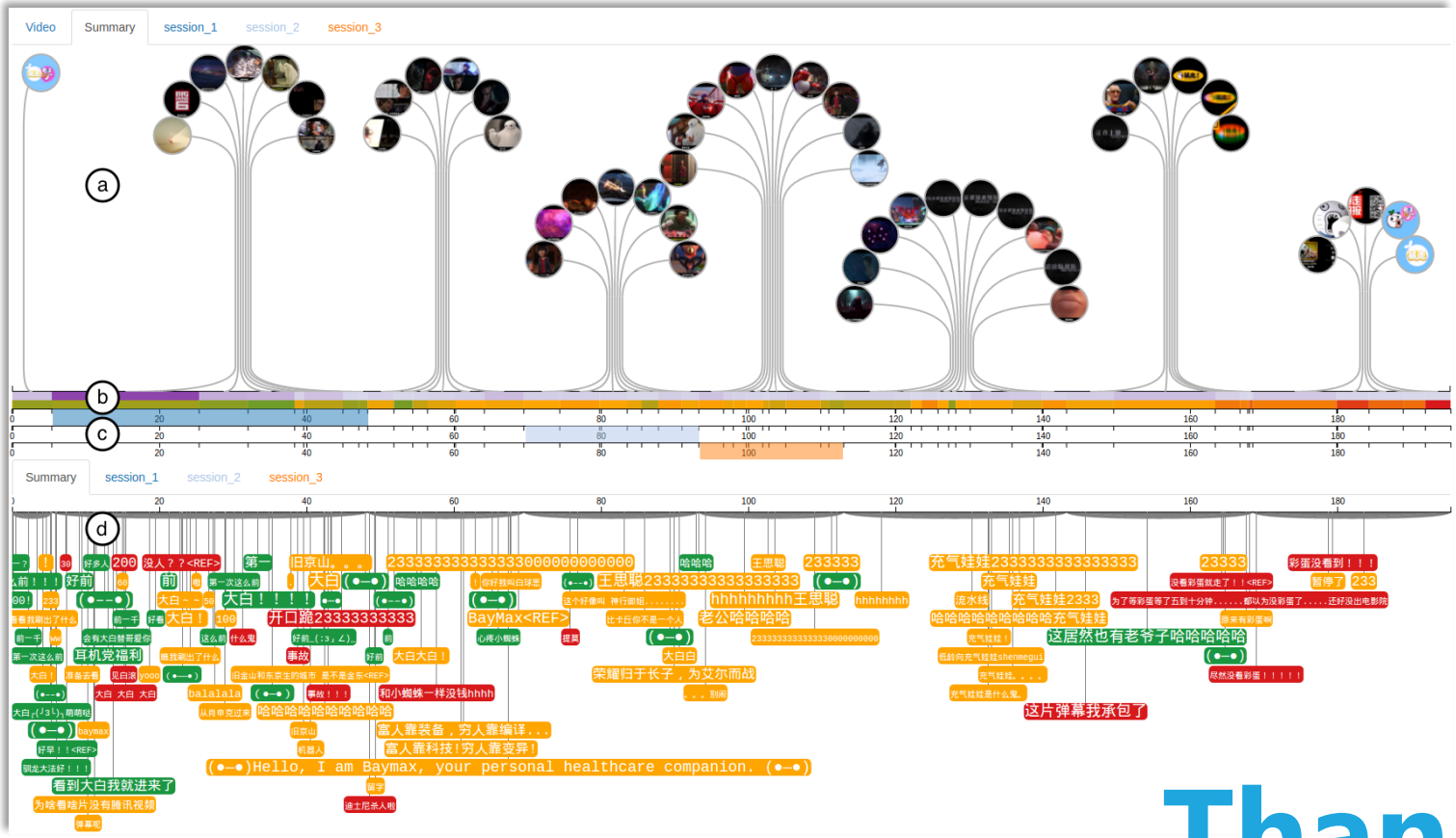

Thank you

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Zhida Sun
zhida.sun@connect.ust.hk

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