

# Augmenting **MATLAB** with **Semantic** Objects for an **Interactive** Visual Environment

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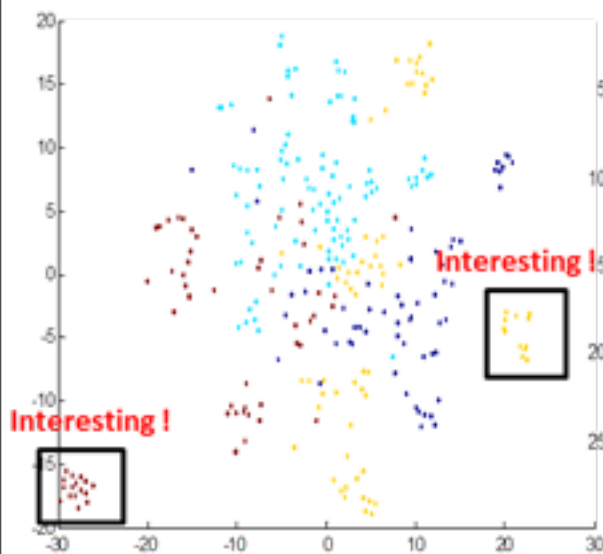
# Why add “semantics” to Matlab?

- Typical generic data analysis tools provide
  - Powerful computation
  - Visualization
- Weaknesses
  - Ignore any semantic meanings
  - Just numerical vectors or matrices

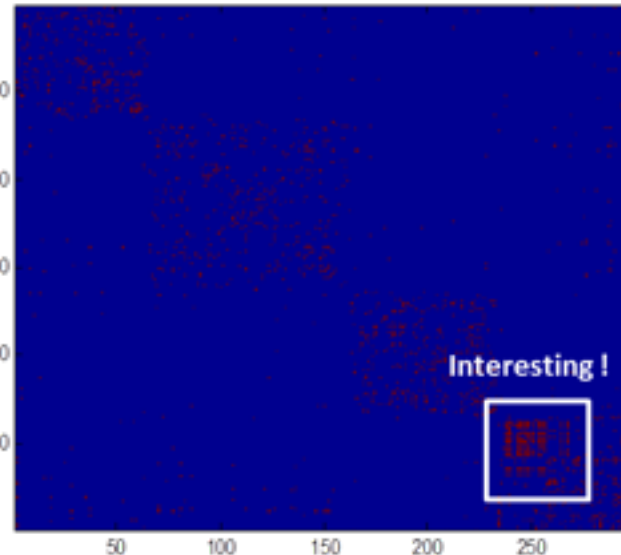
# Analyzing a movie dataset

What Matlab can do today

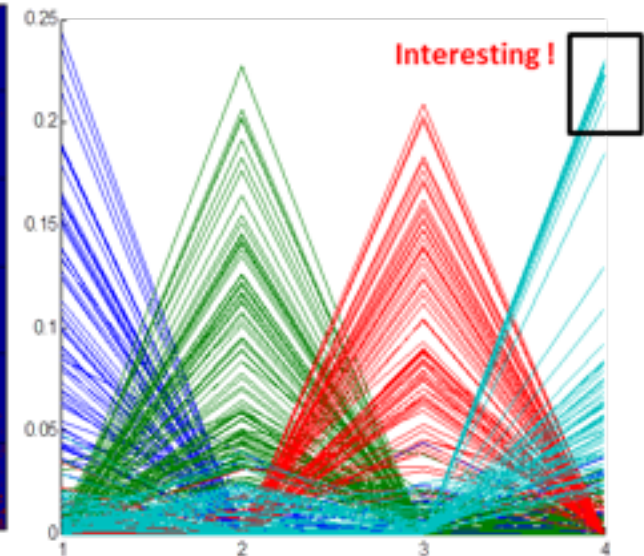
Scatter plot



Heat-map



Parallel Coordinates



- Hardly possible
  - Details-on-demand
  - Access back to the sub-matrix
  - Brushing-and-linking

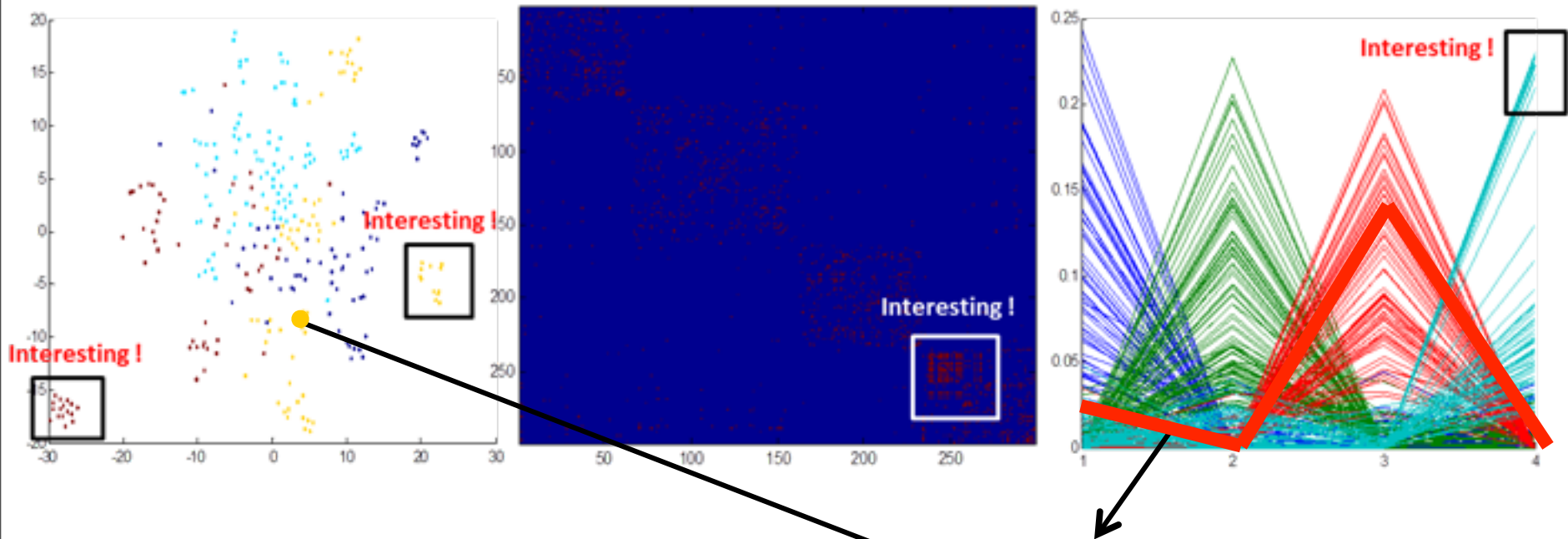
# Analyzing a movie dataset

## What Matlab can do today

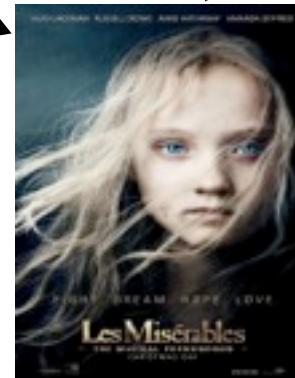
Scatter plot

Heat-map

Parallel Coordinates



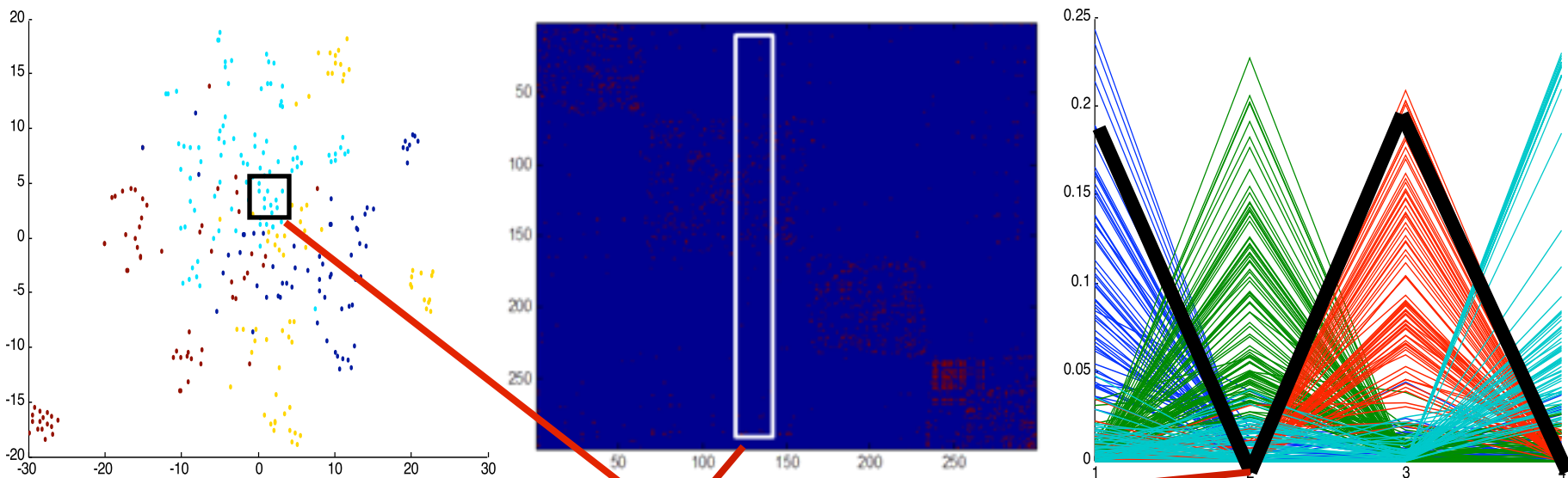
- Hardly possible
  - Details-on-demand
  - Access to back-up indices
  - **Brushing-and-linking (limited)**



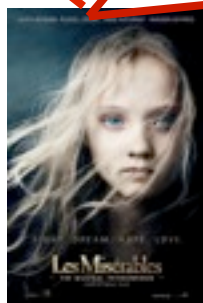
# Our proposed system

adding semantics to visualization

Visual objects

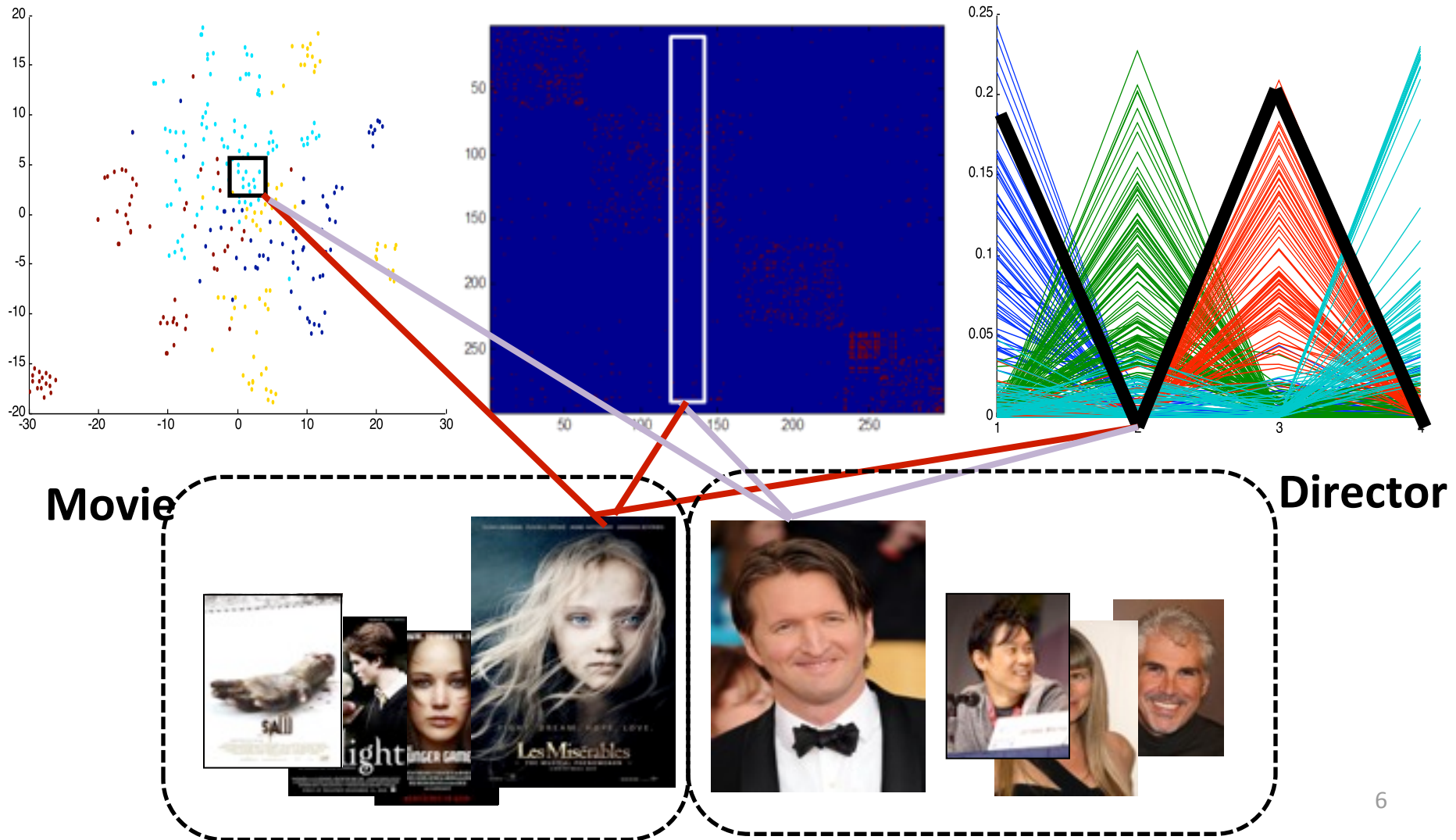


Semantic objects



# Our proposed system

We support **multiple linkage**

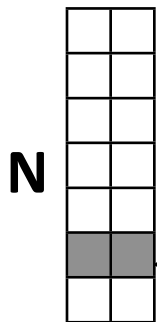
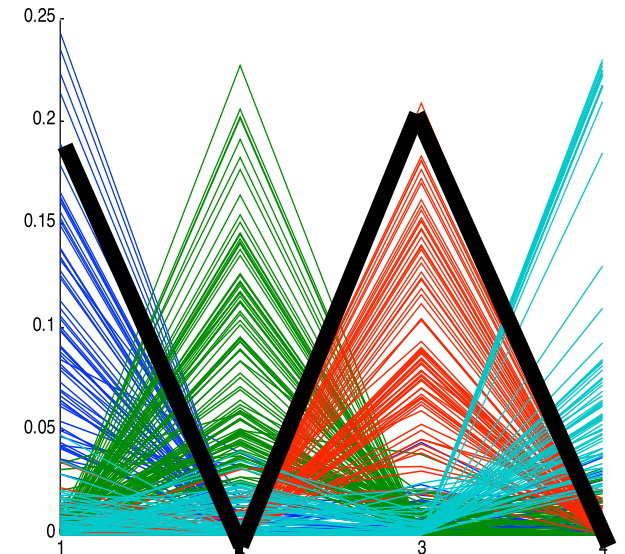
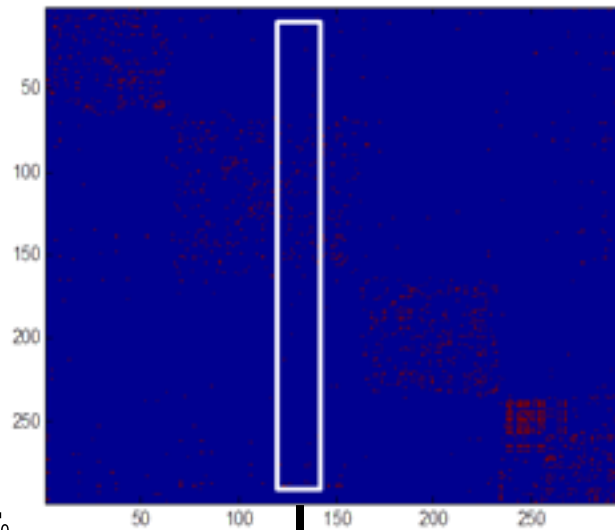
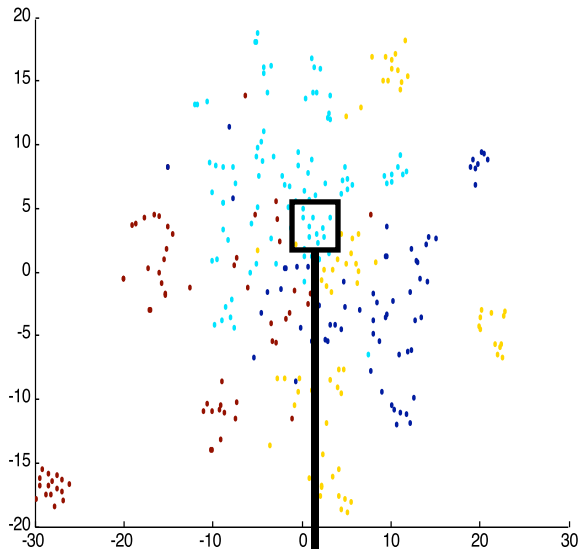




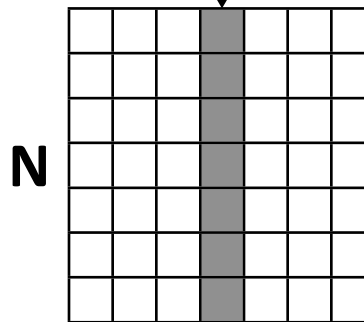
# Our proposed system

Easily go from visualization back to matrices/vectors

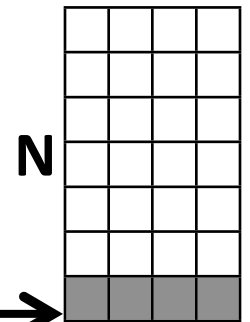
Visual objects



2



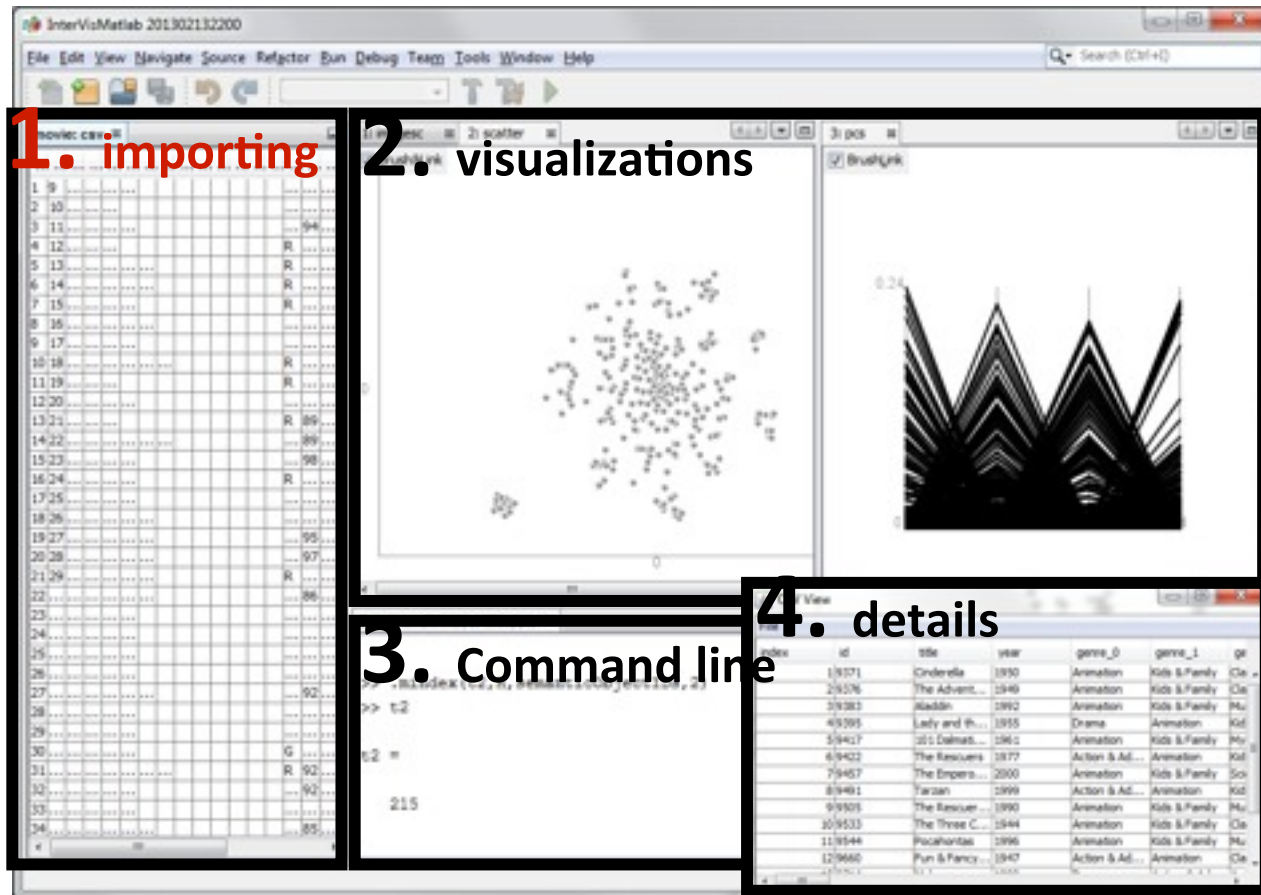
N



4

# A screenshot of our system

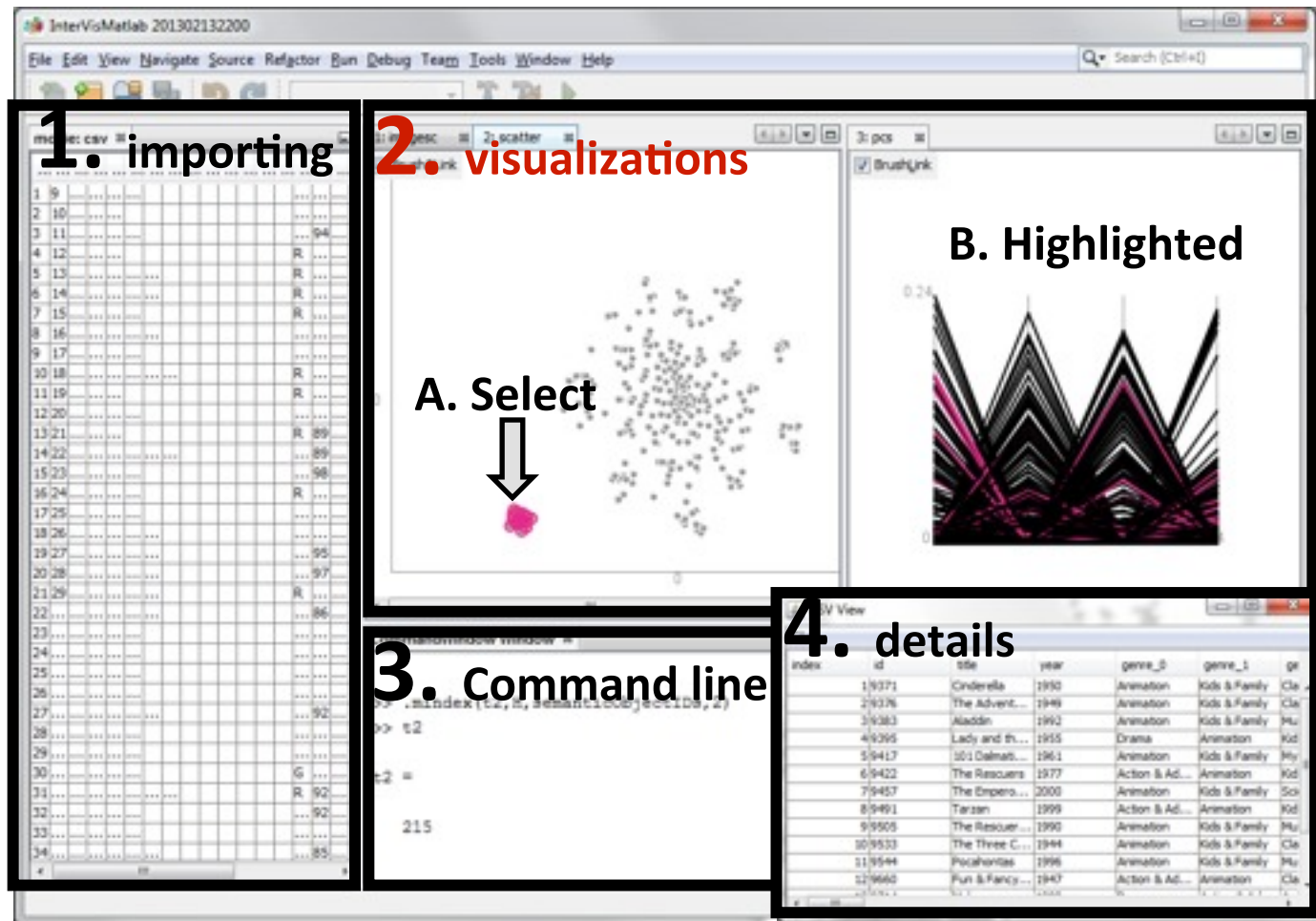
we “wrap around” Matlab to maintain full capabilities





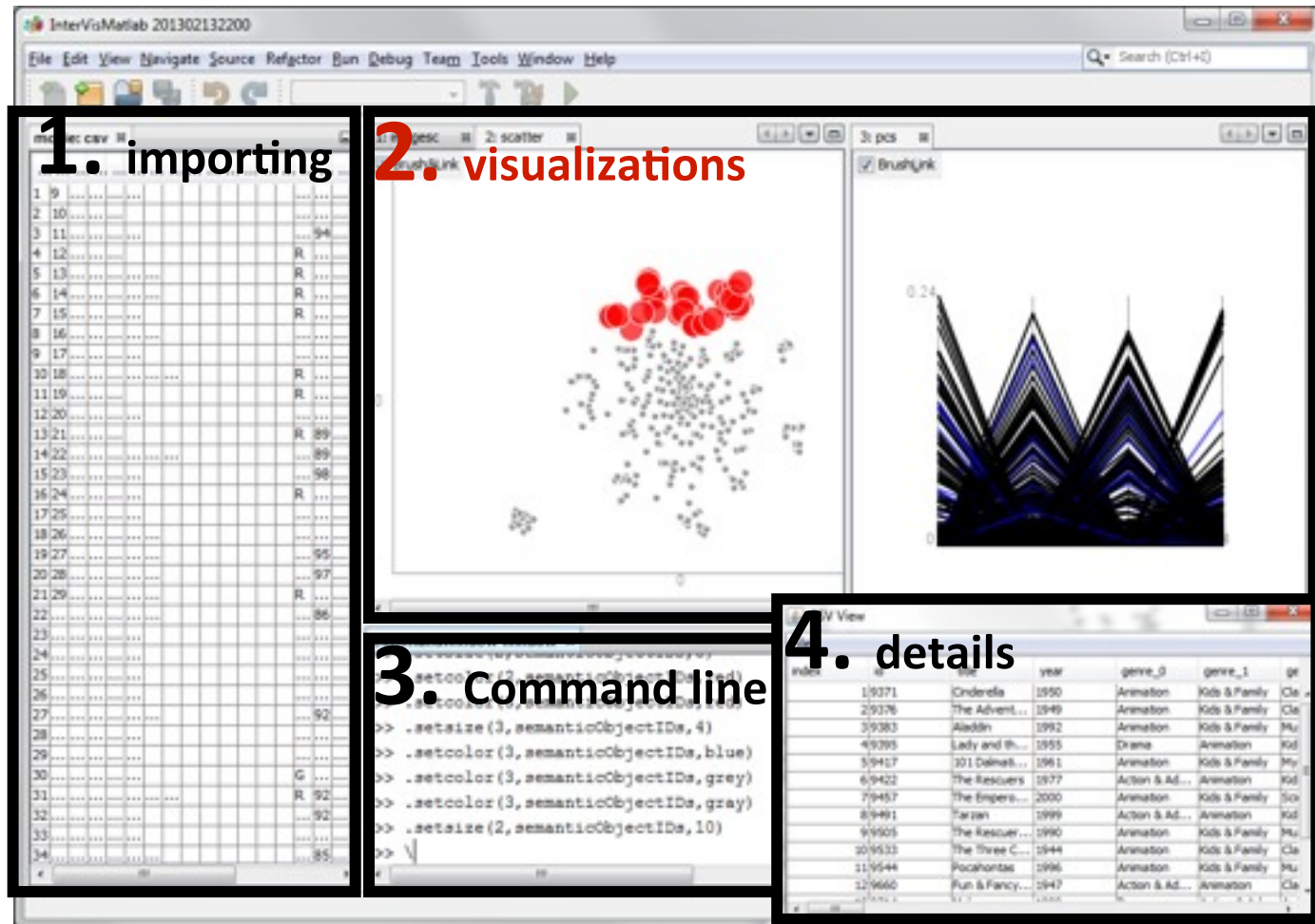
# A screenshot of our system

we “wrap around” Matlab to maintain full capabilities



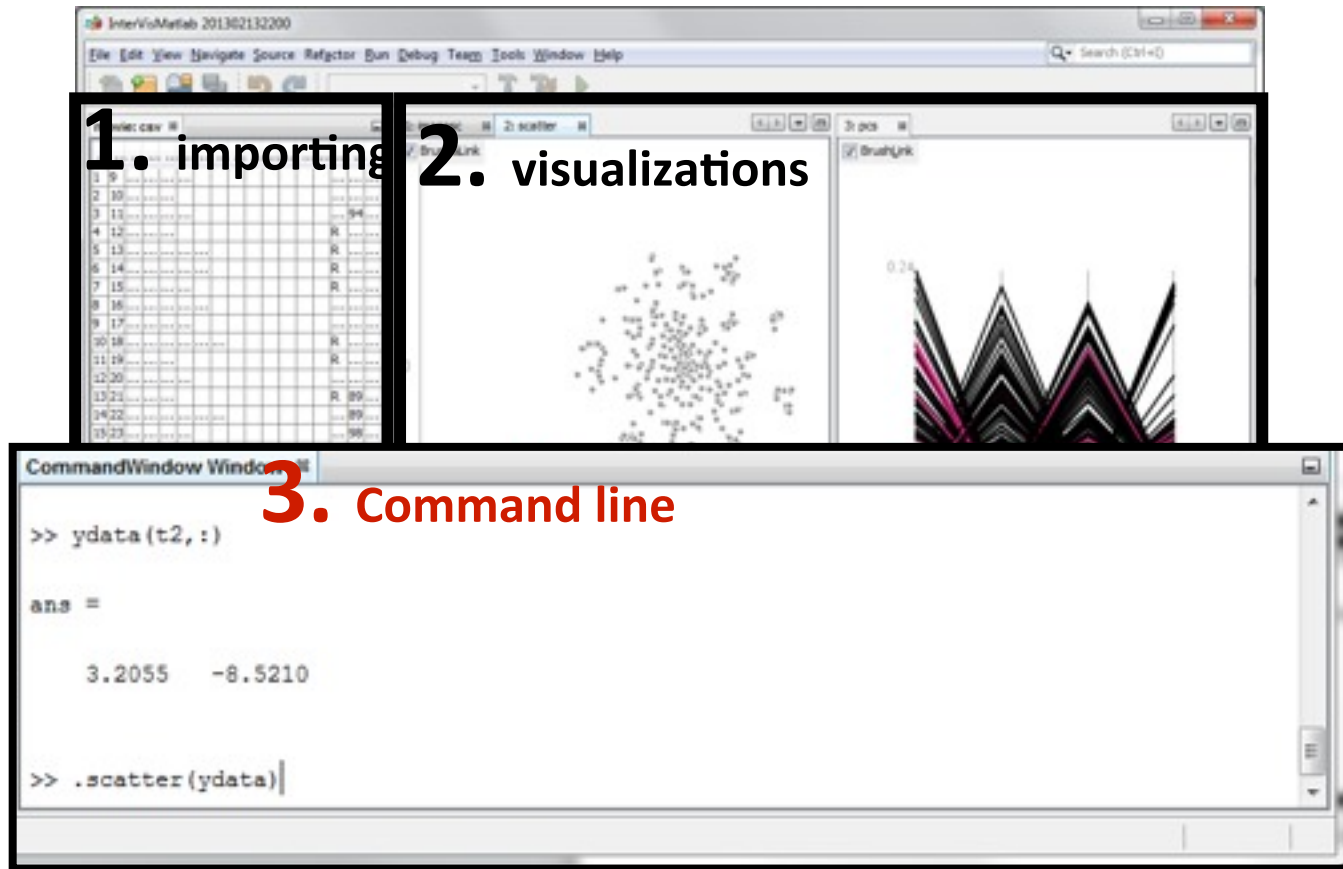
# A screenshot of our system

we “wrap around” Matlab to maintain full capabilities



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we “wrap around” Matlab to maintain full capabilities



# A screenshot of our system

we “wrap around” Matlab to maintain full capabilities

The screenshot displays the InterVisMatlab 201302132200 interface. It is divided into four main sections:

- 1. importing:** A table with columns for data points and labels (e.g., R, G, B).
- 2. visualizations:** Two plots. The left plot is a scatter plot labeled 'A. Select' with a magnifying glass over a cluster of points. The right plot is a fractal-like image labeled 'B. Open'.
- 3. Command line:** A MATLAB command window showing the prompt 't2' and the output '215'.
- 4. details:** A CSV view of a dataset, likely Disney movies, with columns for title, year, genre, and other attributes.

	year	genre_5	genre_1	ge	
1/9371	Cinderella	1950	Animation	Kids & Family	Cla
2/9376	The Advent...	1949	Animation	Kids & Family	Cla
3/9383	Aladdin	1992	Animation	Kids & Family	Mu
4/9395	Lady and B...	1955	Drama	Animation	Kid
5/9417	101 Dalmat...	1961	Animation	Kids & Family	My
6/9422	The Rescuers	1977	Action & Ad...	Animation	Kid
7/9457	The Empero...	2000	Animation	Kids & Family	Sci
8/9491	Tarzan	1999	Action & Ad...	Animation	Kid
9/9505	The Rescuers...	1990	Animation	Kids & Family	Mu
10/9530	The Three C...	1944	Animation	Kids & Family	Cla
11/9544	Pocahontas	1996	Animation	Kids & Family	Mu
12/9660	Fun & Fancy...	1947	Animation	Action & Ad...	Cla

# Implementation

- Written in Java 1.6, Matlab 7.13
- Java Matlab Interface (JMI)
  - Communication with Matlab process
  - <https://code.google.com/p/matlabcontrol/wiki/JMI>
- Beanshell library
  - Dynamic execution of the command-line interface
  - <http://www.beanshell.org>
- JFreeChart
  - A line chart
  - <http://www.jfree.org/jfreechart>

# Two Example Usage Scenarios

## 1. Document data set

- InfoVis and VAST papers from 2001 to 2012.
- Total number of documents is 515
- Total number of words is 5,935

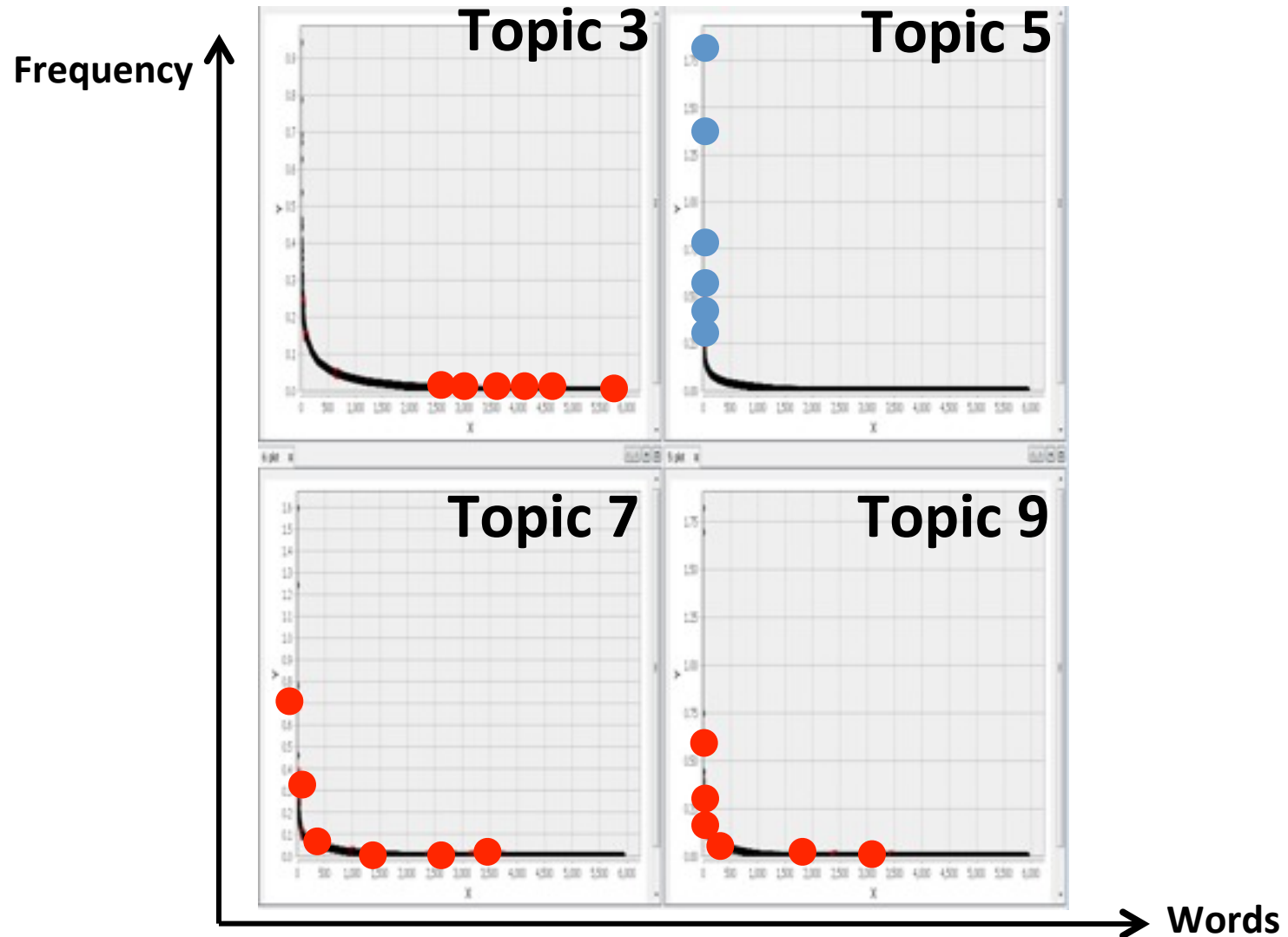
## 2. Graph data set - RottenTomatoes



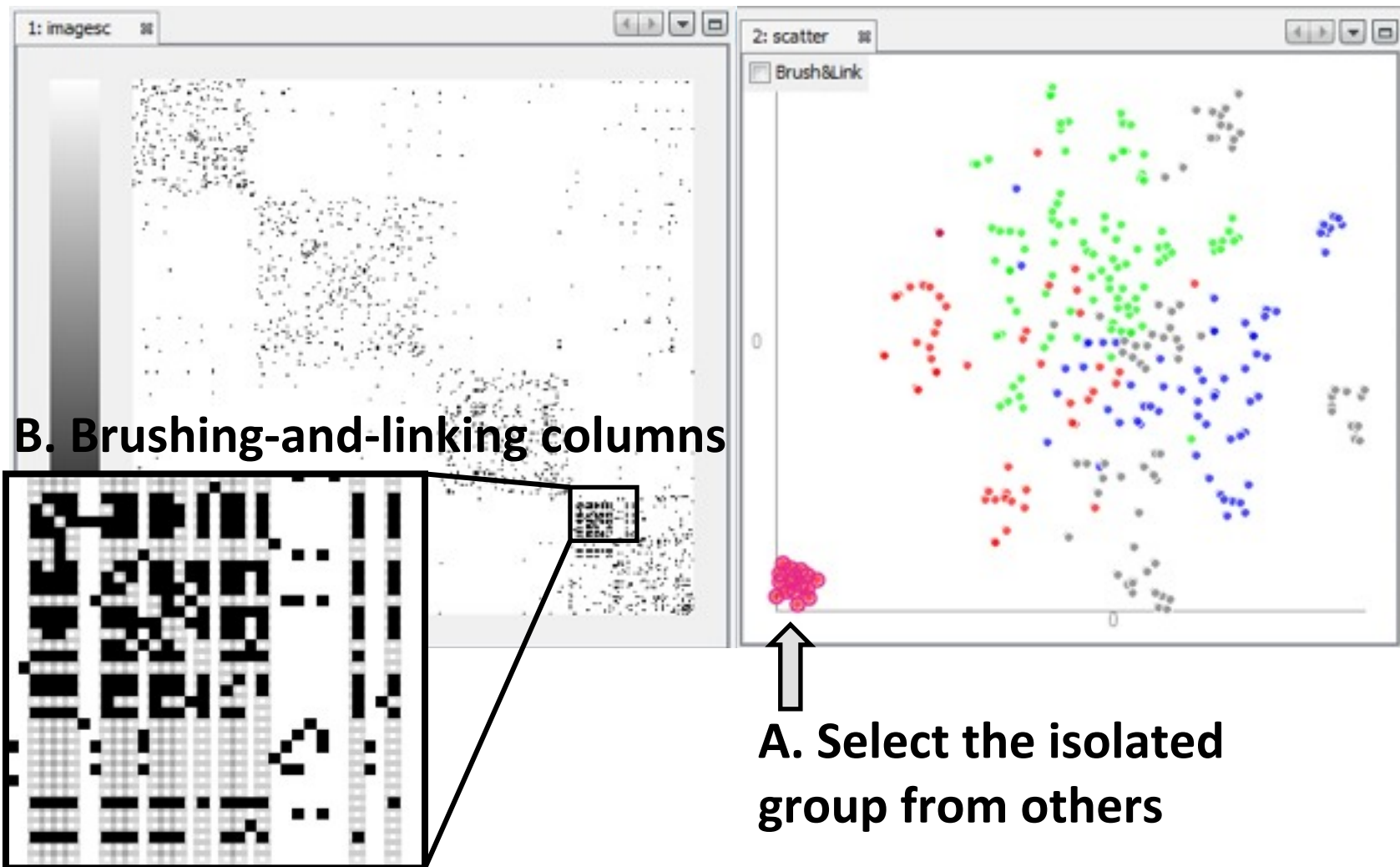
- Pairwise similarity scores from movie rating
- Among 200,000 movies we randomly choose 300 movies



# First Scenario with Document Data



# Second Scenario : Movie Graph



# Conclusions

- Matlab has Powerful computation, but little interactivity
  - Difficult to interpret real-world data sets.
- Adding semantic objects to Matlab
  - Matlab's advantages
  - Enhancing visual interactivity
- Connections with Matrix
  - Allows users to go from visualization to the input

Thank you !