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**

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Our proposed system

We support multiple linkage
Our proposed system

Easily go from visualization back to matrices/vectors

Visual objects
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

1. importing
2. visualizations
3. Command line
4. details

A. Select
B. Highlighted
A screenshot of our system
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1. importing
2. visualizations
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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

- Topic 3
- Topic 5
- Topic 7
- Topic 9

Frequency

Words
Second Scenario: Movie Graph

A. Select the isolated group from others

B. Brushing-and-linking columns
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!