Temporal Analysis using Sci2



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Please download Sci2 at <u>http://sci2.cns.iu.edu</u> See documentation at <u>http://wiki.cns.iu.edu/display/SCI2TUTORIAL</u>

Overview

Cyberinfrastructure for Network Science Center School of Library and Information Science Indiana University Bloomington LI001 Wells Library Monday October 15, 2012 – 6:00pm-7:00pm







- Burst Detection
- Slice Time by Table
- Temporal Bar Graph
- Burst Detection Workflow
- Evolving Co-Authorship Network Workflow



Introduction to Temporal Analysis

- Science evolves over time
- Temporal analysis seeks to study this evolution by examining patterns, trends, seasonality, outliers, and bursts of activity
- Time series data can be thought of as either discrete or continuous
- Many scholarly datasets can be understood as a discrete time series with events or observations (publications etc.) that happen at regularly spaced intervals (journal publication cycles etc.)



Introduction to Temporal Analysis

- Demonstrate and discuss the utility of Kleinberg's burst detection algorithm as implemented in Sci2
- Design evolving network visualizations using Sci2



- Sci2 uses an implementation of Kleinberg's burst detection algorithm (Kleinberg 2002) to study bursts in usage of words in scholarly data
- Algorithm **does not** calculate the frequency of individual words
- Algorithm uses probabilistic model to determine the rate at which use of a word increases or decreases, identifying bursts in usage of a word

Kleinberg, J. (2002). <u>Bursty and Hierarchical Structure in Streams</u>. Proceedings from the Eighth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, Edmonton, Canada: ACM.



Temporal Analysis: Slice Table by Time

- Divides a table into new tables based on date/time column
- The column for date should have a single value for each row of data
- The output of this algorithm is separate tables so longitudinal analysis will require working with separate files, networks can be extracted from each of these tables to show evolution of a network over time
- The Slice Table by Time algorithm uses the <u>Joda Time</u> library extensively



Temporal Analysis: Temporal Bar Graph

- Visualizes numeric data over time
- It accepts a CSV file as input, including NSF grant data
- Start and end dates for each record are necessary to use the temporal bar graph visualization algorithm
- The output of the visualization consists of labeled horizontal bars that correspond to records in the original dataset.



Temporal Analysis: Burst Detection

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For this workflow we will be using the AlessandroVespignani.isi file, which is available from <u>2.5 Sample Datasets</u>

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Temporal Analysis: Burst Detection

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Gamma – the higher this value, the smaller the list of generated bursts.

Density Scaling – determines how much "more bursty" each level is beyond the previous one.

Bursting states – determines how many bursting states there will be, beyond the non-bursting states.

Date Column – name of the column in the original data with date/time when events/topics happen.

Date Format – specifies how the date column will be interpreted.

Burst Length Unit – specifies how to divide the date range into burstable units.

Burst Length – specifies the number of burstable units per burstable period.

Text Column – the name of the column with values (delimiter and tokens) to be computed for bursting results.

Text Separator – delimits the tokens in the text column.



Temporal Analysis: Burst Detection

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Temporal Analysis: Burst Detection

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Right-click on the visualized with Temporal Bar Graph file in the Data Manager and save the PostScript file to your desired location



If you do not have a program to convert PostScript files look here.





For this analysis we will be studying the evolution of Alessandro Vespignani's co-authorship network over time. We will see his network of collaborators grow from 1990 to 2006, giving us a sense of how his scholarly output has grown.

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Temporal Analysis: Evolving Co-Authorship Network







Temporal Analysis: Evolving Co-Authorship Network

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Temporal Analysis: Evolving Co-Authorship Network



Interpreter Graph Modifier /

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1990-2001





Next session we will each download our own data to use for topical analysis. Please register for the Scholarly Database before the next session on November 19, 2012.



Register for the Scholarly Database at http://sdb.cns.iu.edu/





If you have questions feel free to email me dapolley[at]indiana[dot]edu