

# "Sci2 Tool: Temporal, Geospatial, Topical, and Network Analysis and Visualization" Tutorial for Digital Arts and Humanities Scholars \*Bounce-Back\*



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<http://cns.iu.edu>

With special thanks to Kevin W. Boyack, Chin Hua Kong, Micah Linnemeier, Russell J. Duhon, Patrick Phillips, Chintan Tank, Thomas Smith, Nianli Ma, Scott Weingart, Hanning Guo, Mark A. Price, Angela M. Zoss, Ted Polley, and Sean Lind.

**Please download the new Sci2 Tool v0.5.2  
release from <http://sci2.cns.iu.edu> and  
complete the Tool Questionnaire.**

*Meertens Institute, Amsterdam, The Netherlands  
Thursday April 19, 2012 • 14-16:00*



## Software, Datasets, Plugins, and Documentation

- These slides  
<http://ivl.slis.indiana.edu/km/pres/2012-borner-sci2tutorial-meertens-part2.pdf>
- Slides from original tutorial on Feb 16, 2012  
<http://ivl.slis.indiana.edu/km/pres/2012-borner-sci2tutorial-meertens.pdf>
- Scott Weingart's slides on Analyzing and Visualizing Correspondence Networks, July 1, 2011, Den Haag, The Netherlands.  
<http://ivl.slis.indiana.edu/km/pres/2011-weingart-hague.pdf>
- Sci2 Tool Manual v0.5.1 Alpha  
<http://sci2.wiki.cns.iu.edu>
- Sci2 Tool v0.5.2 Alpha (April 9, 2012)  
<http://sci2.cns.iu.edu>
  
- Additional Datasets  
<http://sci2.wiki.cns.iu.edu/2.5+Sample+Datasets>
- Additional Plugins  
<http://sci2.wiki.cns.iu.edu/3.2+Additional+Plugins>

Or copy them from the memory stick.



## Sci2 Tool v0.5.2 Alpha (April 9, 2012)

### **New Features**

- Support new Web of Science format from ISI
- Support network overlay for geographical map
- Support Prefuse's visualizations on Macs OS

### **Improvements**

- Improve memory usage and processing time of Extract top N nodes and Extract top N Edges algorithms
- Unify merging algorithms used by database

### **Bug fixes**

- Fix legend boundary issue in geographical map
- Fix typo error on the output data label
- Fix slice by year algorithm

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## Tutorial Overview

**14:00 Welcome and Overview of Tutorial and Attendees**

**14:15 New Sci2 Functionality**

- **Horizontal Line Graphs**
- **Geomap with Gephi Network Overlay**
- **Adding a New Plugins, e.g., Cytoscape**
- **Optimizing the Menu System**

**15:15 Presentations by Participants**

**15:45 Q&A**

**16:00 Adjourn**

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# Tutorial Overview

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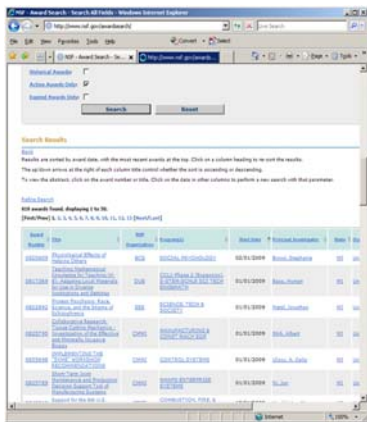
16:00 Adjourn



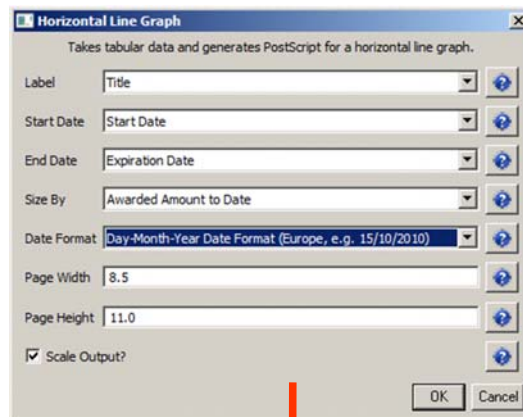
## Horizontal line graph of NSF projects

See [5.2.1 Funding Profiles of Three Universities \(NSF Data\)](#)

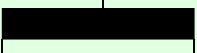
Download NSF data


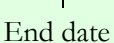


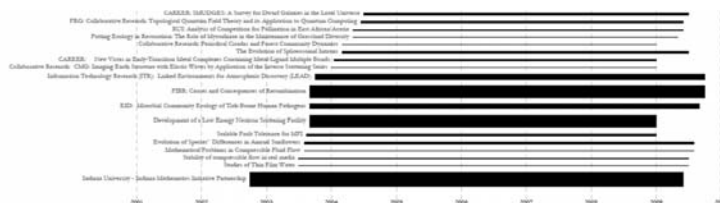
Visualize as Horizontal Line Graph



Area size equals numerical value, e.g., award amount.

Text 

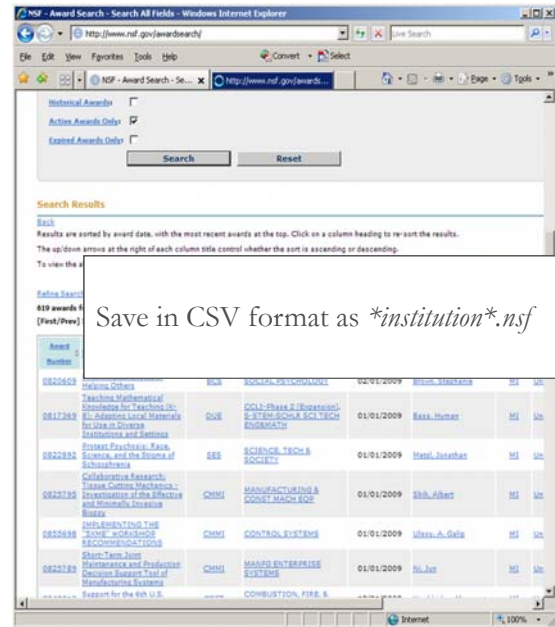
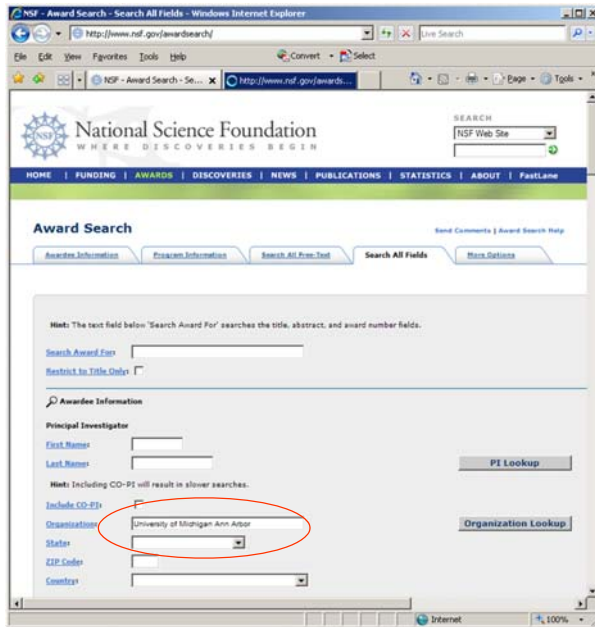
Start date  End date 



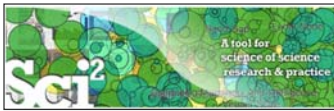


## Horizontal line graph of NSF projects

NSF Awards Search via <http://www.nsf.gov/awardsearch>



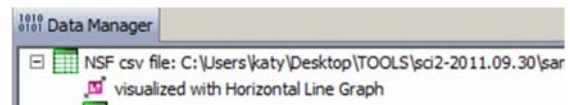
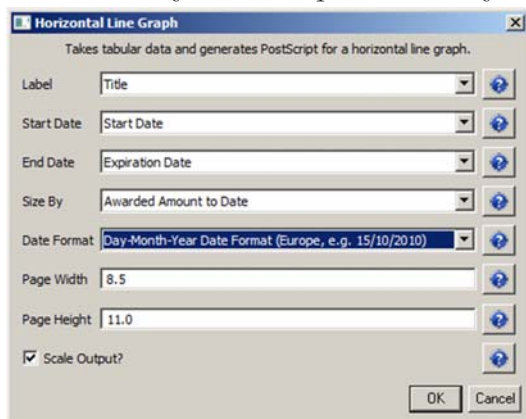
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## Horizontal line graph of NSF projects

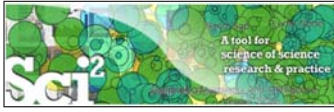
Download and load a dataset of your choice or load one of the sample data files, e.g., *'sampledata/scientometrics/nsf/Michigan.nsf.'*

Run *'Visualization > Temporal > Horizontal Line Graph'* using parameters:

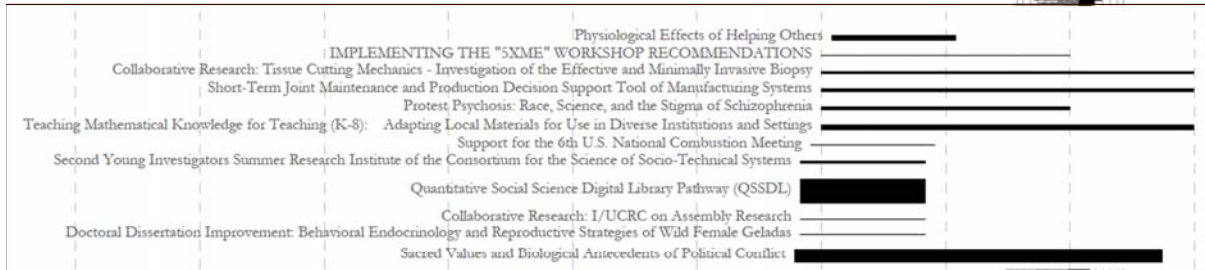
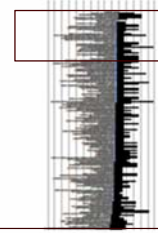
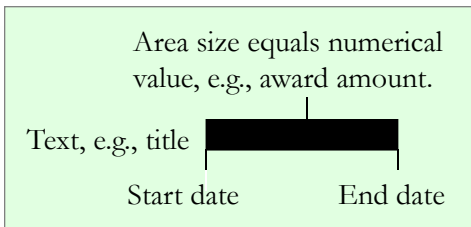


Save *'visualized with Horizontal Line Graph'* as ps or eps file. Convert into pdf and view. Zoom to see details in visualizations of large datasets, e.g., all NSF awards ever made.

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## Horizontal line graph of NSF projects



More NSF data workflows can be found in wiki tutorial:

[5.1.3 Funding Profiles of Three Researchers at Indiana University \(NSF Data\)](#)

[5.2.1 Funding Profiles of Three Universities \(NSF Data\)](#)

[5.2.3 Biomedical Funding Profile of NSF \(NSF Data\)](#)



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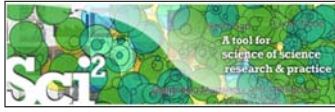
14:15 New Sci2 Functionality

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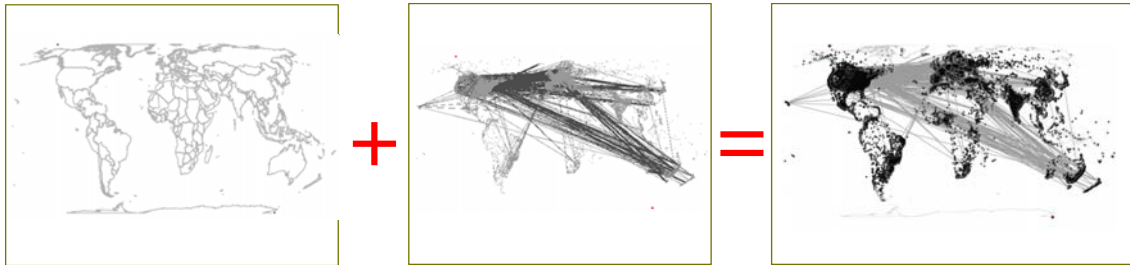


## Geomap with Gephi Network Overlay

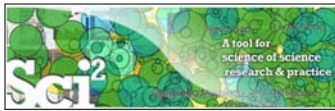
See 4.7.6 on <http://sci2.wiki.cns.in.edu>

File with geolocations and linkage info, e.g., an isi bibliography file. → Use Yahoo! Geocoder to identify Latitude, Longitude for each geolocation  
Extract attributes per geolocation, e.g., total times cited (TC)  
Extract linkages and their attributes, e.g., number of co-occurrences  
See sample /geo/LaszloBarabasiGeo.net with co-occurrence of “Research Addresses” and full counting of TC per geolocation.

↓  
Read into Sci2 Tool to generate geomap and network file → Layout network in Gephi → Combine geomap and network in Photoshop



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## Relevant Sci2 Manual entry

Dashboard > Sci2 Manual > ... > 4 Workflow Design > 4.7 Geospatial Analysis (Where) Browse Log In Search Confluence

Search

- Home
- 1 Introduction
- 2 Getting Started
- 3 Algorithms, Tools, and Plugins
- 4 Workflow Design
  - 4.1 Overview
  - 4.2 Data Acquisition and Preparation
  - 4.3 Database Loading and Manipulation
  - 4.4 Summaries and Table Extractions
  - 4.5 Statistical Analysis and Profiling
  - 4.6 Temporal Analysis (When)
  - 4.7 Geospatial Analysis (Where)
  - 4.8 Topical Analysis (What)
  - 4.9 Network Analysis (With Whom?)
  - 4.10 Modeling (Why?)
- 5 Sample Workflows
- 6 Sample Science Studies & Online Services
- 7 Extending the Sci2 Tool
- 8 Relevant Datasets and Tools
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### 4.7.6 Using Gephi to Render Networks Overlaid on Geo Maps

**Loading and Saving Geovisualization Files in Sci2**

This algorithm allows for the geospatial visualization of network data. The algorithm produces a network file and corresponding blank map. Gephi is used to edit the network produced by Sci2. Once the network has been edited in Gephi it can be exported in a format that will allow it to be overlaid on the map, facilitating visualization of the geospatial data. The following is a brief workflow explaining the process, beginning to end.

1. Load [this](#) network in Sci2.
2. Once the network had been loaded in Sci2 run "Visualization > Geospatial > Geo Map (network template, not fully rendered)" and set the following parameters:

Geo Maps (network template)

Creates a world map, and processes the input network so that latitude

Map: Countries

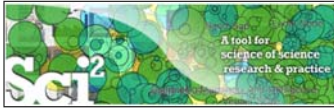
Latitude: ypos

Longitude: xpos

OK Cancel

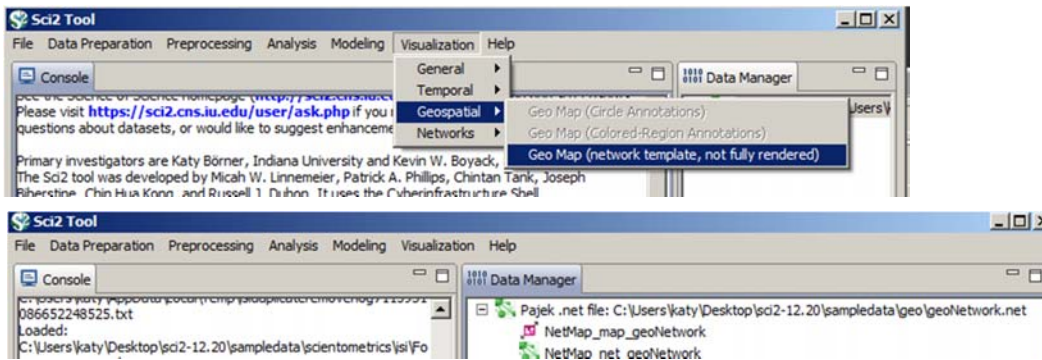
<http://sci2.wiki.cns.in.edu/display/SCI2TUTORIAL/4.7+Geospatial+Analysis+%28Where%29#4.7GeospatialAnalysis%28Where%29-4.7.6UsingGephitoRenderNetworksOverlaidonGeoMaps>

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## Use Sci2 Tool to Generate Geomap and Network File

Read prepared .net file and run:



Save map file as Postscript file and use Adobe or other view to read. It looks like:

Save .net file as GraphML (Prefuse) and rename to .graphml so that Gephi can read it.

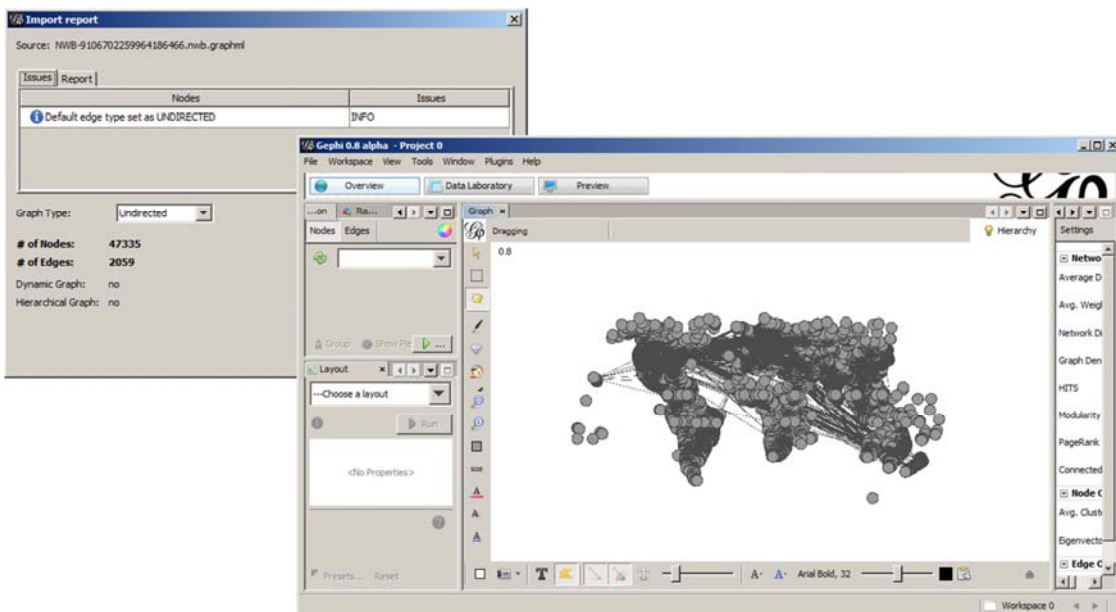


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## Use Gephi to Generate Network Layout

Start gephi. Use *New Project > Open a graph file* to read .graphml file that Sci2 generated.



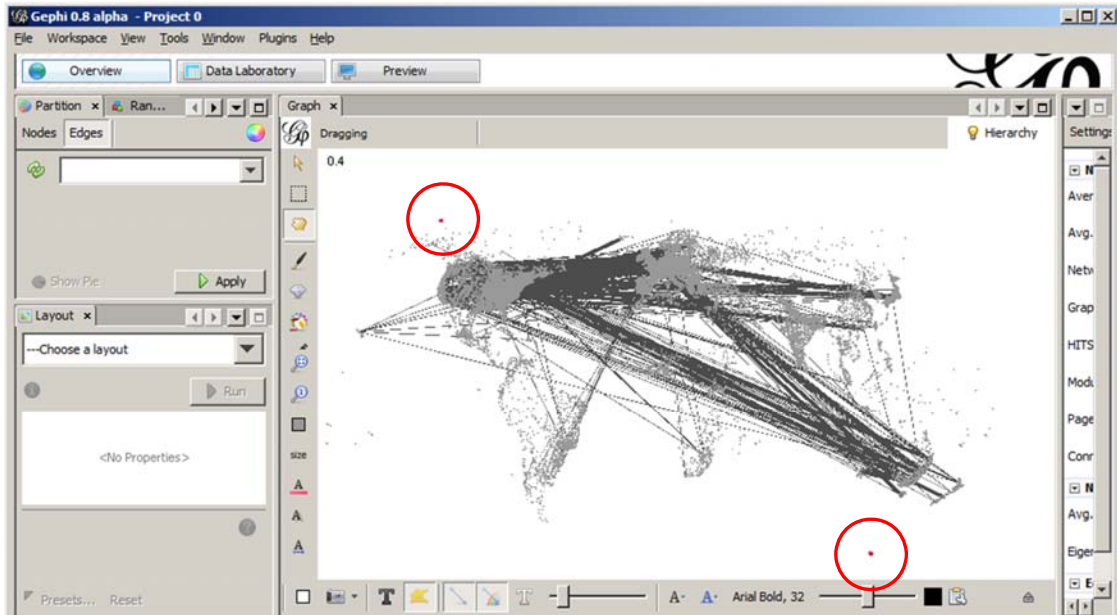
Follow instructions in online tutorial on **Manipulating the Network File in Gephi**

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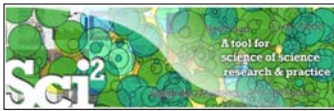


## Use Gephi to Generate Network Layout

Color or size code the “Near Alaska” and “Near Antarctica” anchor nodes to ease alignment of geomap and network overlay, see instructions in online tutorial on **Manipulating the Network File in Gephi**. Save result using *File > Export > SVG/PDF file*.

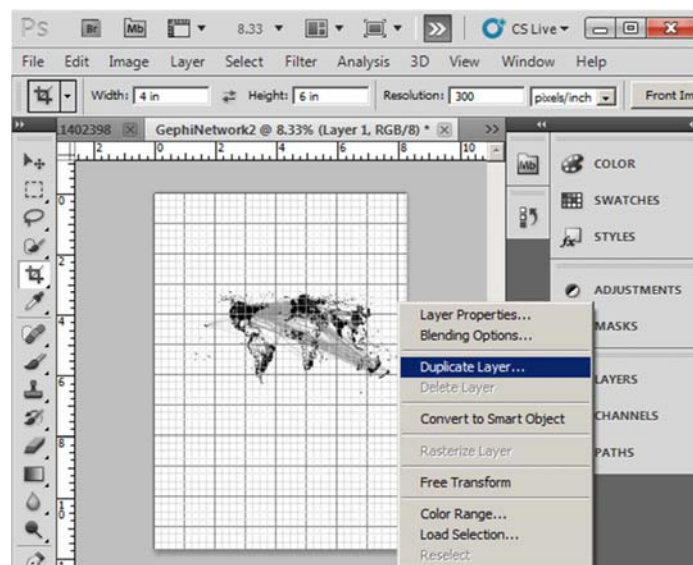


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## Use Photoshop to Overlay Network on Geomap

Load geomap and network files into Photoshop. Select ‘network’ layer and use ‘Right click, Duplicate Layer’ to copy network over to ‘geomap’ file as a second layer. Use *Edit > Transform > Scale* and align using the “Near Antarctica” anchor nodes, see instructions in online tutorial on **Creating the Visualization in Photoshop**.

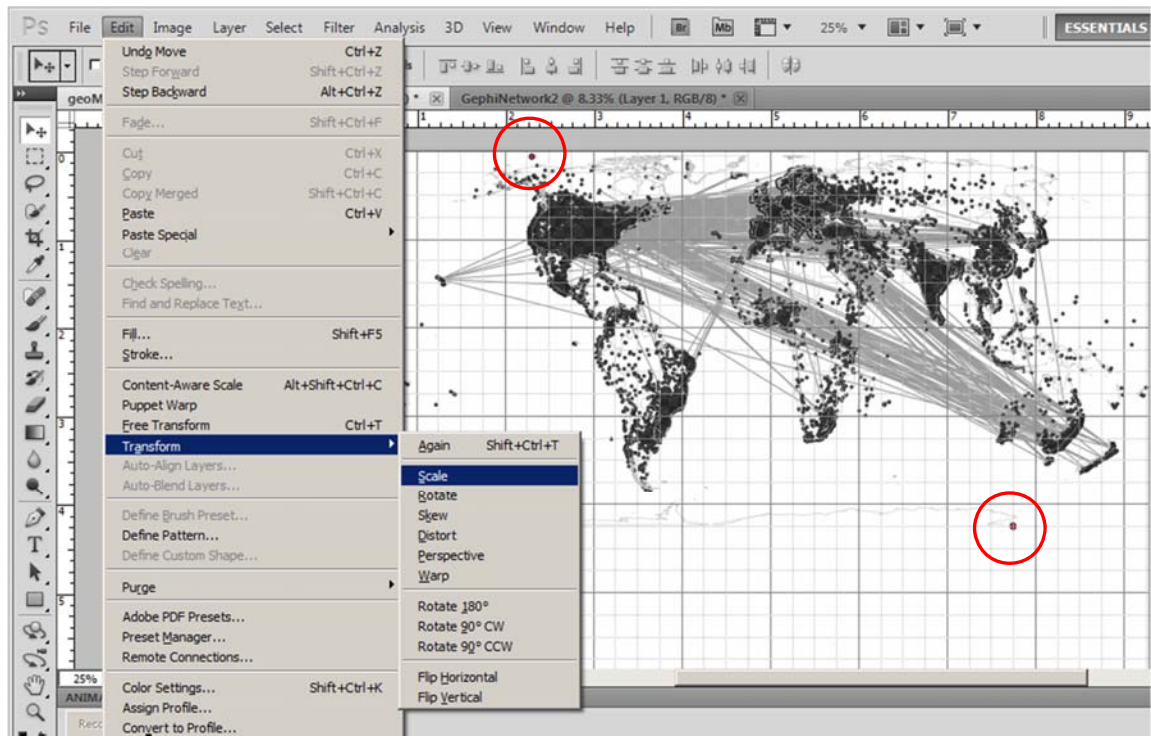


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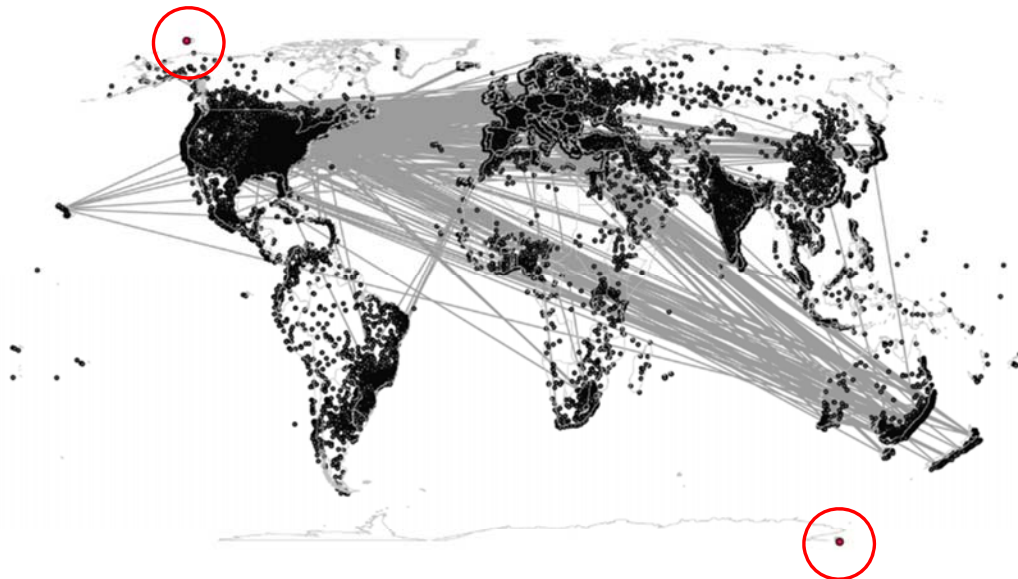


## Use Photoshop to Overlay Network on Geomap



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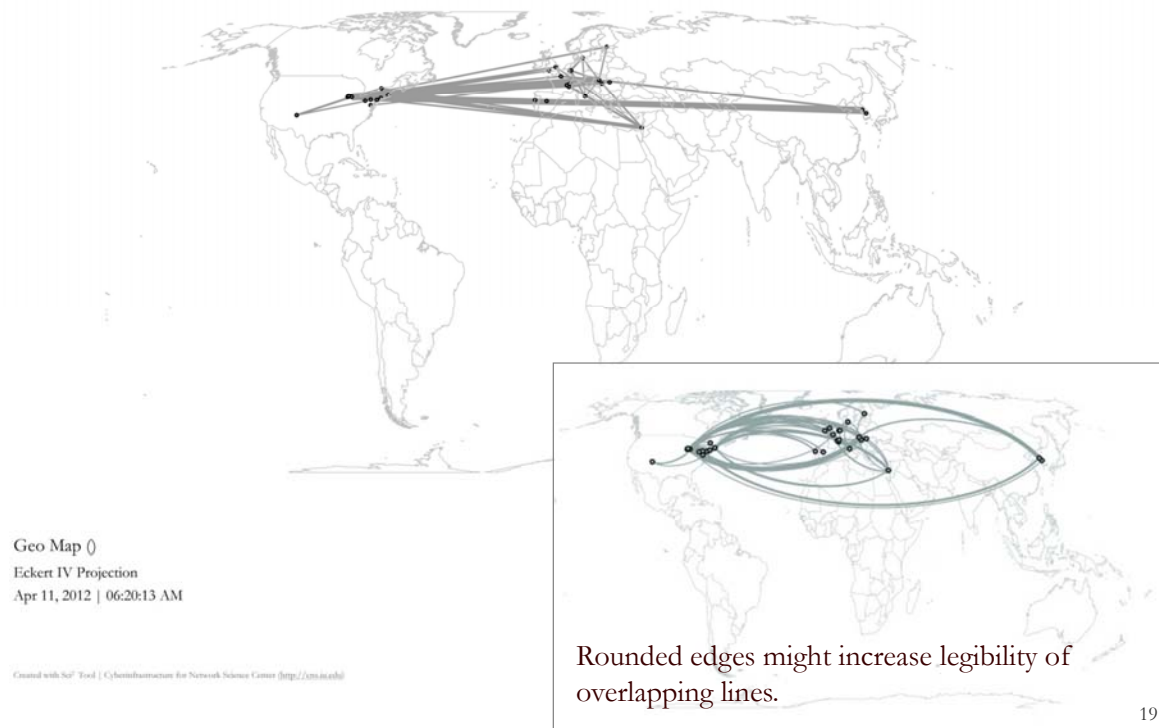
Delete anchor nodes and save in preferred format.



Geo Map ()  
Eckert IV Projection  
Apr 06, 2012 | 03:19:51 AM

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Practice these steps using “LaszloBarabasi-collaborations.net” linked from Sci2 wiki:  
**4.7.6 Using Gephi to Render Networks Overlaid on GeoMaps**

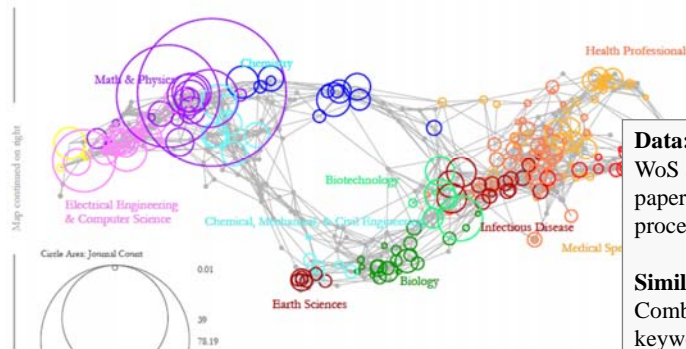


### Topic Mapping: UCSD Science Map

Science Map via Journals for FourNetSciResearchers.isi

314 journal references matched out of 361 found.

These 314 references are associated with 13 of 13 disciplines of science and 255 of 554 research specialties in the UCSD Map of Science.



**Data:**  
 WoS and Scopus for 2001–2005, 7.2 million papers, more than 16,000 separate journals, proceedings, and series

**Similarity Metric:**  
 Combination of bibliographic coupling and keyword vectors

**Number of Disciplines:**  
 554 journal clusters further aggregated into 13 main scientific disciplines that are labeled and color coded in a metaphorical way, e.g., Medicine is blood red and Earth Sciences are brown as soil.



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## CIShell – Integrate New Algorithms

### About the Cyberinfrastructure Shell

The Cyberinfrastructure Shell (CIShell) is an open source, community-driven platform for the integration and utilization of datasets, algorithms, tools, and computing resources. Algorithm integration support is built in for Java and most other programming languages. Being Java based, it will run on almost all platforms. The software and specification is released under an Apache 2.0 License.

CIShell is the basis of [Network Workbench](#), [TexTrend](#), [SciF](#) and the upcoming [EpiC](#) tool.

CIShell supports remote execution of algorithms. A standard web service definition is in development that will allow pools of algorithms to transparently be used in a peer-to-peer, client-server, or web front-end fashion.

### CIShell Features

**A framework for easy integration of new and existing algorithms written in any programming language**

Using CIShell, an algorithm writer can fully concentrate on creating their own algorithm in whatever language they are comfortable with. Simple tools are provided to then take their algorithm and

### Learn More...

- [CIShell Papers](#)
- [CIShell Powered Tools](#)
- [Algorithms](#)
- [Plugins \(coming soon\)](#)
- [Misc. Tool Documentation](#)
- [CIShell Web Services \(coming soon\)](#)
- [Screenshots](#)

### Getting Started...

- [Documentation & Developer Resources](#)
- [Download](#)

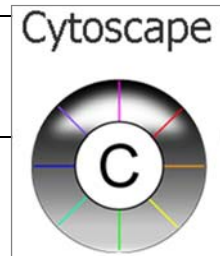
### Getting Involved...

- [Contact Us](#)

CIShell Developer Guide is at <http://cishell.wiki.cns.iu.edu>

Additional Sci2 Plugins are at <http://sci2.wiki.cns.iu.edu/3.2+Additional+Plugins>

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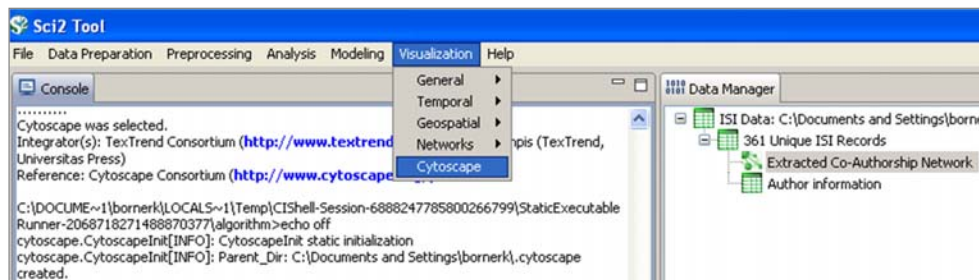


Adding more layout algorithms and network visualization interactivity via Cytoscape <http://www.cytoscape.org>.

Simply add *org.textrend.visualization.cytoscape\_0.0.3.jar* into your /plugin directory.

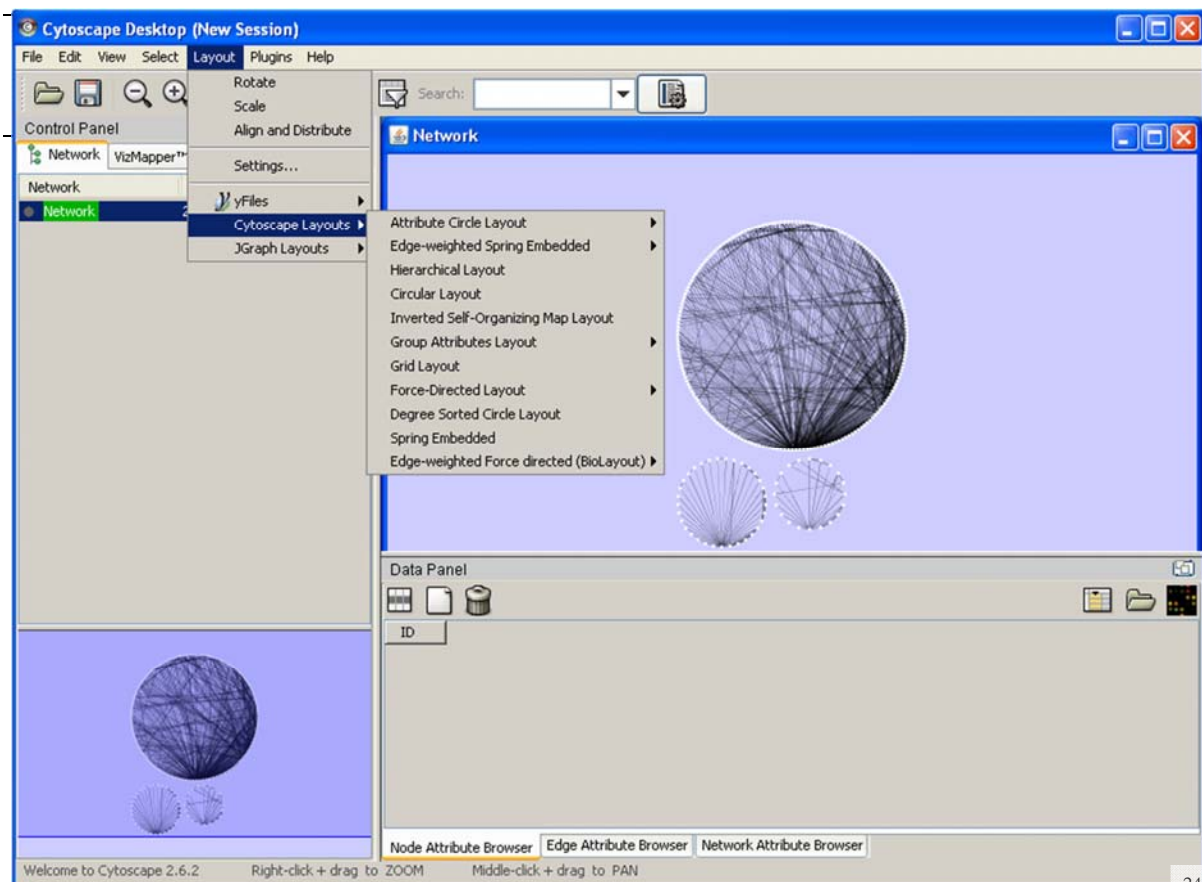
Restart Sci2 Tool.

Cytoscape now shows in the Visualization Menu.



Select a network in Data Manager, run Cytoscape and the tool will start with this network loaded.

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## CIShell – Customize Menu

- The file *'yourtooldirectory/configuration/default\_menu.xml'* encodes the structure of the menu system.
- In NWB Tool, the Modeling menu (left) is encoded by the following piece of xml code:

The screenshot shows the Network Workbench Tool interface with the Modeling menu open. The menu items are: Random Graph, Watts-Strogatz Small World, Barabási-Albert Scale-Free, Can, Chord, Hypergrid, PRU, TARL, Discrete Network Dynamics (DNDA), and Evolving Network (Weighted). The XML code for the Modeling menu is as follows:

```
<top_menu name="Modeling">
  <menu pid="edu.iu.nwb.modeling.erdosrandomgraph"/>
  <menu pid="edu.iu.nwb.modeling.smallworld"/>
  <menu pid="edu.iu.nwb.modeling.barabasiabert"/>
  <menu type="break"/>
  <menu pid="edu.iu.iv.modeling.p2p.can.CanAlgorithm"/>
  <menu pid="edu.iu.iv.modeling.p2p.chord.ChordAlgorithm"/>
  <menu pid="edu.id.iv.modeling.p2p.hypergrid.Hypergrid"/>
  <menu pid="edu.iu.iv.modeling.p2p.pru.PruAlgorithm"/>
  <menu type="break"/>
  <menu pid="edu.iu.iv.modeling.tarl.TarlAlgorithm"/>
  <menu type="break"/>
  <menu pid="edu.iu.nwb.modeling.discretenetworkdynamics.DNDAAlgorithm"/>
  <menu type="break"/>
  <menu pid="edu.iu.nwb.modeling.weighted.evolvingnetwork"/>
</top_menu>
```

### Exercise:

Add *org.textrend.visualization.cytoscape* to the “Visualization > Networks” panel in Sci2 (right under GUESS).

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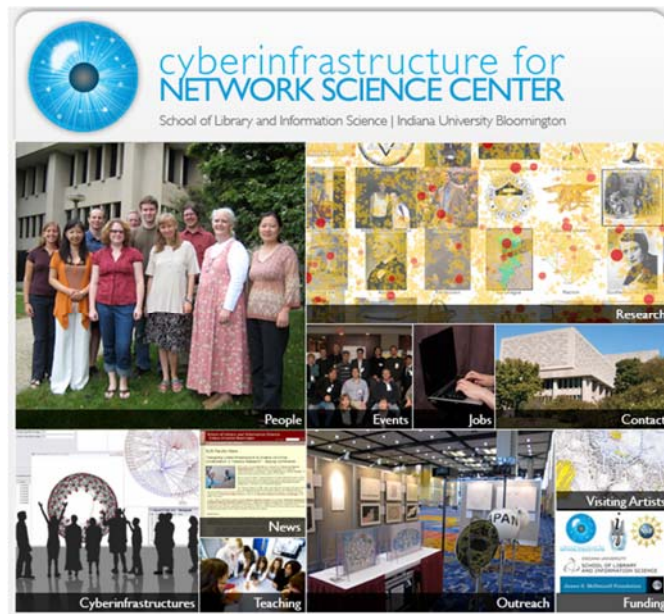
If you enjoyed the tutorial, please thank Andrea Scharnhorst, Albert Meroño Peñuela, Jeannette Haagsma, Anja de Haas, Nick Jankowski, Sally Wyatt; US side: Chin Hua Kong, Joseph R. Biberstine, Samantha Hale

There will be another Sci2 Tutorial for *Science Policy Makers* at the Institut für Forschungsinformation und Qualitätssicherung in Berlin, Germany on June 28, 2012.

# Q & A

**Bug reports and all comments are welcome.**

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All papers, maps, tools, talks, press are linked from <http://cns.iu.edu>

CNS Facebook: <http://www.facebook.com/cnscenter>

Mapping Science Exhibit Facebook: <http://www.facebook.com/mappingscience>