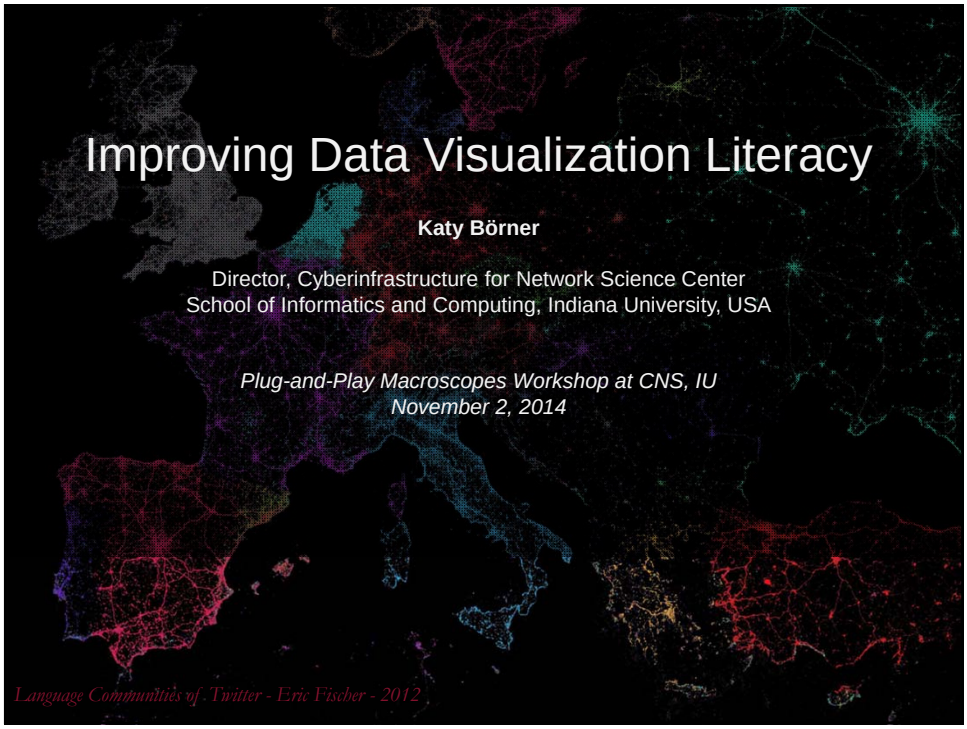


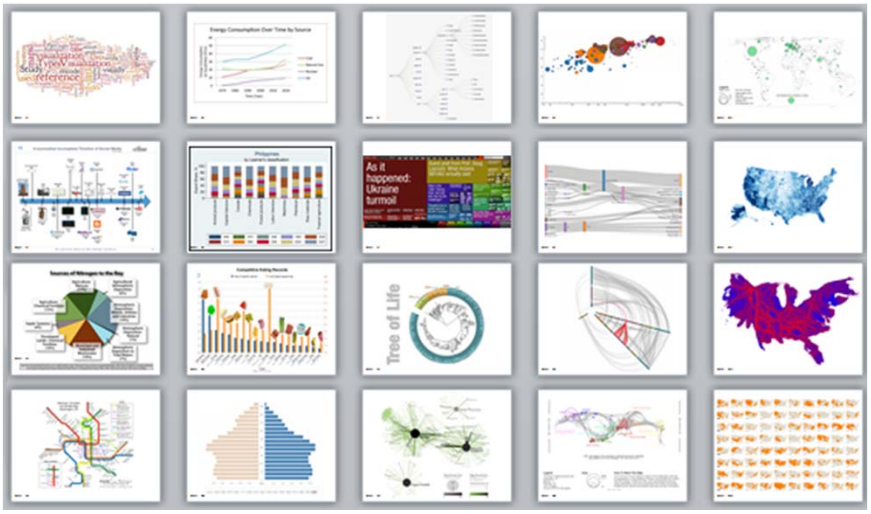
Data Visualization Literacy Study

900 youth and adult visitors across six U.S. science museums. Results show that:

- a very high proportion of the population, both adult and youth, cannot interpret data visualizations beyond very basic reference systems;
- construction of complex visualizations led to more accurate interpretation than deconstruction; and
- individuals are willing to spend time attempting to make meaning in representations depending on their personal interest in the topic.

Joint work with Adam V. Maltese, Russell N. Balliet, Joe Heimlich and the NYScience, SMM, WonderLab.

Study 2: Can 273 Science Museum Visitors Read 20 Visualizations?



3

Visitors saw 5/20 visualizations and were asked to answer:

- Does this type of data presentation look at all familiar?
- Where might you have seen images like this?
- How do you think you read this type of data presentation?
- What would you call this type of data presentation?

		n=273
Male	Female	Not Recorded
16.1	26.4	10.6
Boy	Girl	Not Recorded
19.4	21.2	6.2

Results omitted as paper is under review

4

Visitors saw 5/20 visualizations and were asked to answer:

- Does this type of data presentation look at all familiar?

Results omitted as paper is under review

5

Theoretically Grounded and Practically Useful Visualization Framework

developed to empower the broadest spectrum of users to read and make data visualizations that are useful and meaningful to them.

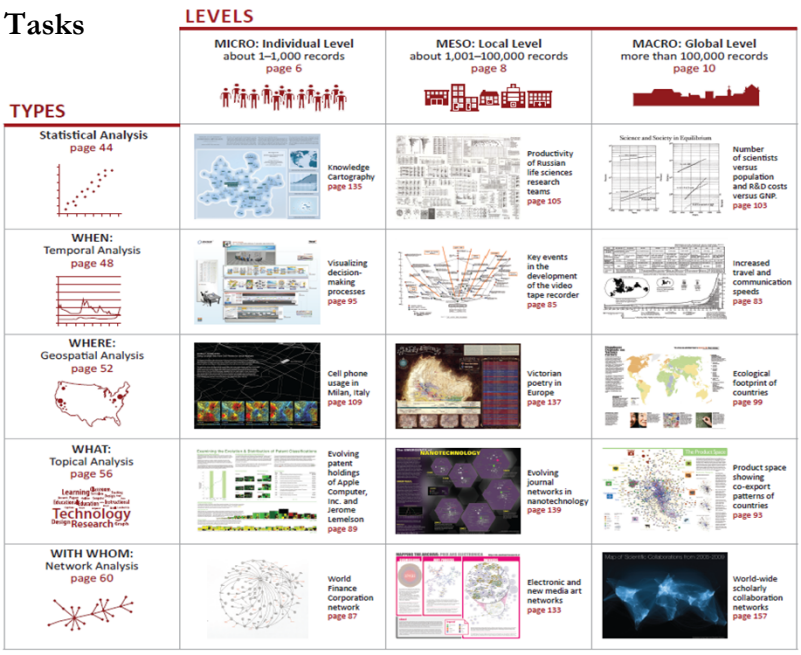
The visualization framework was used to

- design the aforementioned study and
- develop plug-and-play macroscope tools that improve the data visualization literacy of researchers, practitioners, IVMOOC students, museum visitors, and others.

Börner, Katy. 2015. *Atlas of Knowledge: Anyone Can Map.* The MIT Press. http://scimaps.org/atlas2

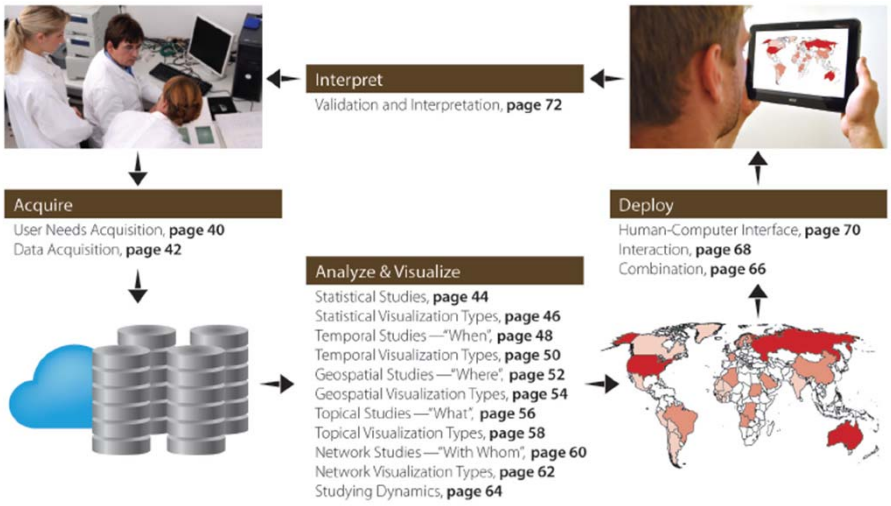
6

Tasks



7

Workflow Design



Börner, Katy. 2015. *Atlas of Knowledge: Anyone Can Map*. The MIT Press.
http://scimaps.org/atlas2

8

Types

Insight Need Types page 26	Data Scale Types page 28	Visualization Types page 30	Graphic Symbol Types page 32	Graphic Variable Types page 34	Interaction Types page 26
• categorize/cluster • order/rank/sort • distributions (also outliers, gaps) • comparisons • trends (process and time) • geospatial • compositions (also of text) • correlations/relationships	• nominal • ordinal • interval • ratio	• table • chart • graph • map • network layout	• geometric symbols point line area surface volume • linguistic symbols text numerals punctuation marks • pictorial symbols images icons statistical glyphs	• spatial position • retinal form color optics motion	• overview • zoom • search and locate • filter • details-on-demand • history • extract • link and brush • projection • distortion

Börner, Katy. 2015. *Atlas of Knowledge: Anyone Can Map.* The MIT Press.
http://scimaps.org/atlas2

9

Types

Basic Task Types								
Bertin, 1967	Wehrend & Lewis, 1996	Few, 2004	Yau, 2011	Rendgen & Wiedemann, 2012	Frankel, 2012	Tool: Many Eyes	Tool: Chart Chooser	Börner, 2014
selection	categorize			category				categorize/ cluster
order	rank	ranking					table	order/rank/ sort
	distribution	distribution					distribution	distributions (also outliers, gaps)
	compare	nominal comparison & deviation	differences		compare and contrast	compare data values	comparison	comparisons
		time series	patterns over time	time	process and time	track rises and falls over time	trend	trends (process and time)
		geospatial	spatial relations	location		generate maps		geospatial
quantity		part-to-whole	proportions		form and structure	see parts of whole, analyze text	composition	compositions (also of text)
association	correlate	correlation	relationships	hierarchy		relations between data points	relationship	correlations/ relationships

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Types

Insight Need Types page 26	Data Scale Types page 28	Visualization Types page 30	Graphic Symbol Types page 32	Graphic Variable Types page 34	Interaction Types page 26
• categorize/cluster • order/rank/sort • distributions (also outliers, gaps) • comparisons • trends (process and time) • geospatial • compositions (also of text) • correlations/relationships	• nominal • ordinal • interval • ratio	• table • chart • graph • map • network layout	• geometric symbols point line area surface volume • linguistic symbols text numerals punctuation marks • pictorial symbols images icons statistical glyphs	• spatial position • retinal form color optics motion	• overview • zoom • search and locate • filter • details-on-demand • history • extract • link and brush • projection • distortion

Börner, Katy. 2015. *Atlas of Knowledge: Anyone Can Map*. The MIT Press.
http://scimaps.org/atlas2

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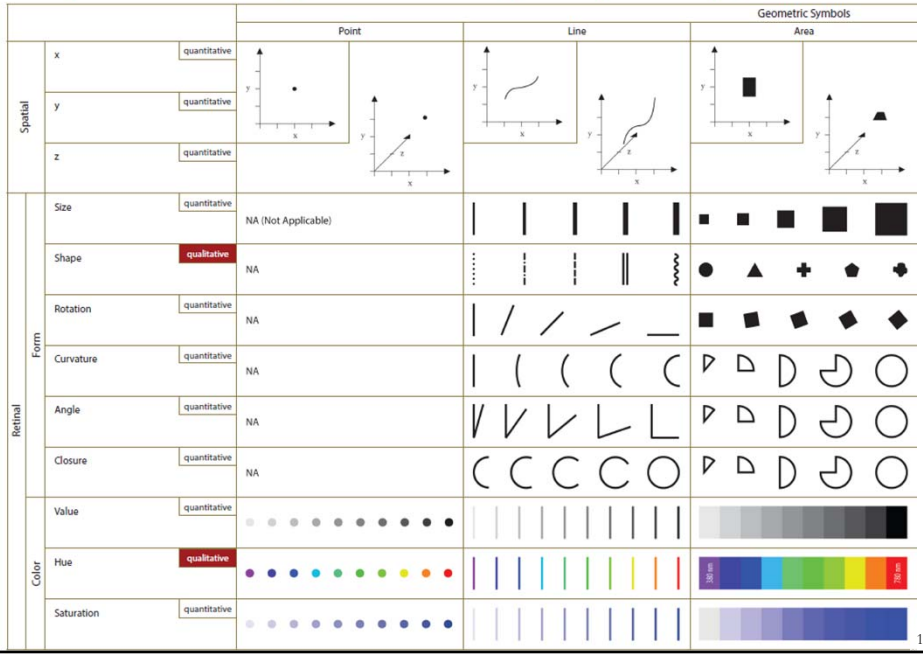
Graphic Variable Types Versus Graphic Symbol Types



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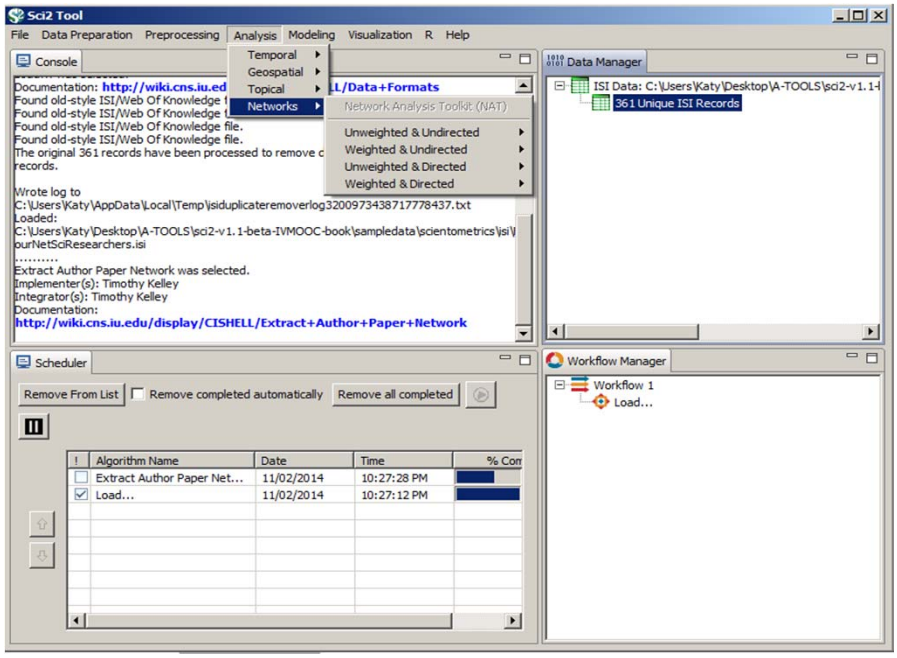
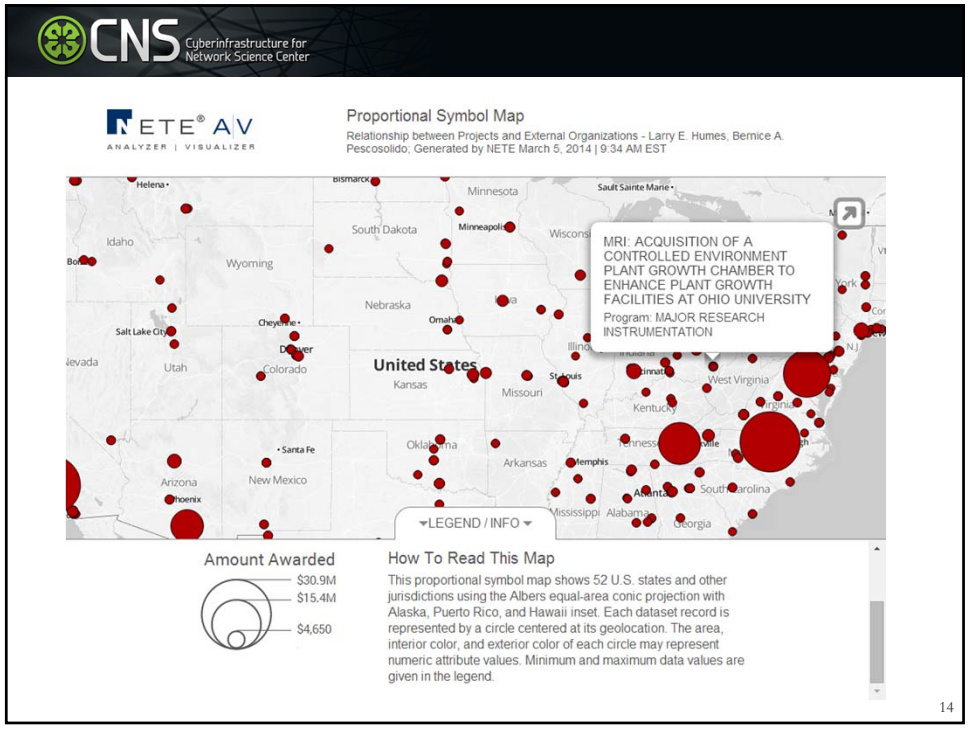

Sci2 Tool
File Data Preparation Preprocessing Analysis Modeling Visualization R Help
Temporal
Geospatial
Topical
Networks
Network Analysis Toolkit (NAT)
Unweighted & Undirected
Weighted & Undirected
Unweighted & Directed
Weighted & Directed
Console
Documentation: http://wiki.cns.iu.ed
L/Data+Formats
Found old-style ISI/Web Of Knowledge file.
Found old-style ISI/Web Of Knowledge file.
Found old-style ISI/Web Of Knowledge file.
The original 361 records have been processed to remove d
records.
Wrote log to
C:\Users\Katy\AppData\Local\Temp\siduplicateremoverlog3200973438717778437.txt
Loaded:
C:\Users\Katy\Desktop\A-TOOLS\sci2-v1.1-beta-IVMOOC-book\sampledata\scientometrics\isi\
ourNetSciResearchers.isi
.....
Extract Author Paper Network was selected.
Implementer(s): Timothy Kelley
Integrator(s): Timothy Kelley
Documentation:
http://wiki.cns.iu.edu/display/CISHELL/Extract+Author+Paper+Network
Data Manager
ISI Data: C:\Users\Katy\Desktop\A-TOOLS\sci2-v1.1-
361 Unique ISI Records
Scheduler
Remove From List
Remove completed automatically
Remove all completed
! Algorithm Name Date Time % Com
Extract Author Paper Net... 11/02/2014 10:27:28 PM
Load... 11/02/2014 10:27:12 PM
Workflow Manager
Workflow 1
Load...

13


CNS Cyberinfrastructure for Network Science Center
NETE® AV
ANALYZER | VISUALIZER
Proportional Symbol Map
Relationship between Projects and External Organizations - Larry E. Humes, Bernice A. Pescosolido; Generated by NETE March 5, 2014 | 9:34 AM EST
Helena
Bismarck
Minnesota
Sault Sainte Marie
Idaho
South Dakota
Minneapolis
Wyoming
Nebraska
Omaha
Salt Lake City
Cheyenne
Denver
Colorado
Utah
Nevada
United States
Kansas
Missouri
St. Louis
Cincinnati
West Virginia
Kentucky
Santa Fe
Arizona
New Mexico
Phoenix
Oklahoma
Arkansas
Memphis
South Carolina
Mississippi
Alabama
Georgia
MRI: ACQUISITION OF A CONTROLLED ENVIRONMENT PLANT GROWTH CHAMBER TO ENHANCE PLANT GROWTH FACILITIES AT OHIO UNIVERSITY
Program: MAJOR RESEARCH INSTRUMENTATION
LEGEND / INFO
Amount Awarded
$30.9M
$15.4M
$4,650
How To Read This Map
This proportional symbol map shows 52 U.S. states and other jurisdictions using the Albers equal-area conic projection with Alaska, Puerto Rico, and Hawaii inset. Each dataset record is represented by a circle centered at its geolocation. The area, interior color, and exterior color of each circle may represent numeric attribute values. Minimum and maximum data values are given in the legend.

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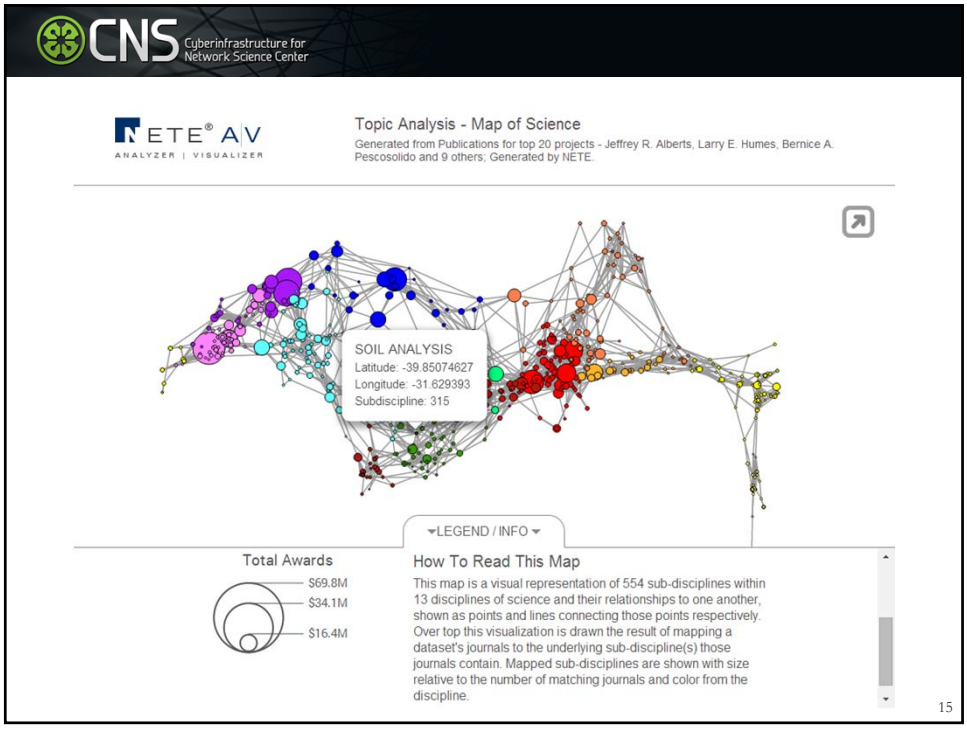

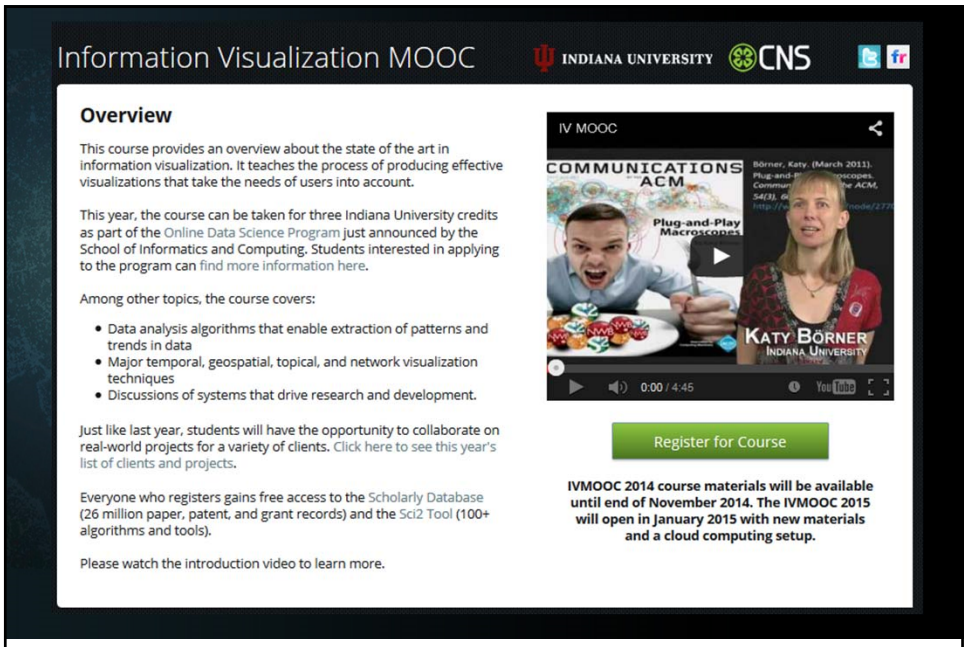

Register for free at http://ivmooc.cns.iu.edu. Class will restart in January 2015.

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Börner, Katy, Chen, Chaomei, and Boyack, Kevin. (2003). **Visualizing Knowledge Domains.** In Blaise Cronin (Ed.), *ARIST*, Medford, NJ: Information Today, Volume 37, Chapter 5, pp. 179-255. http://ivl.slis.indiana.edu/km/pub/2003-borner-arist.pdf

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All papers, maps, tools, talks, press are linked from http://cns.iu.edu
These slides will soon be at http://cns.iu.edu/docs/presentations

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