Visual Insights | Sentient Architectures

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ISE Undergraduate Student Orientation

November 2, 2017

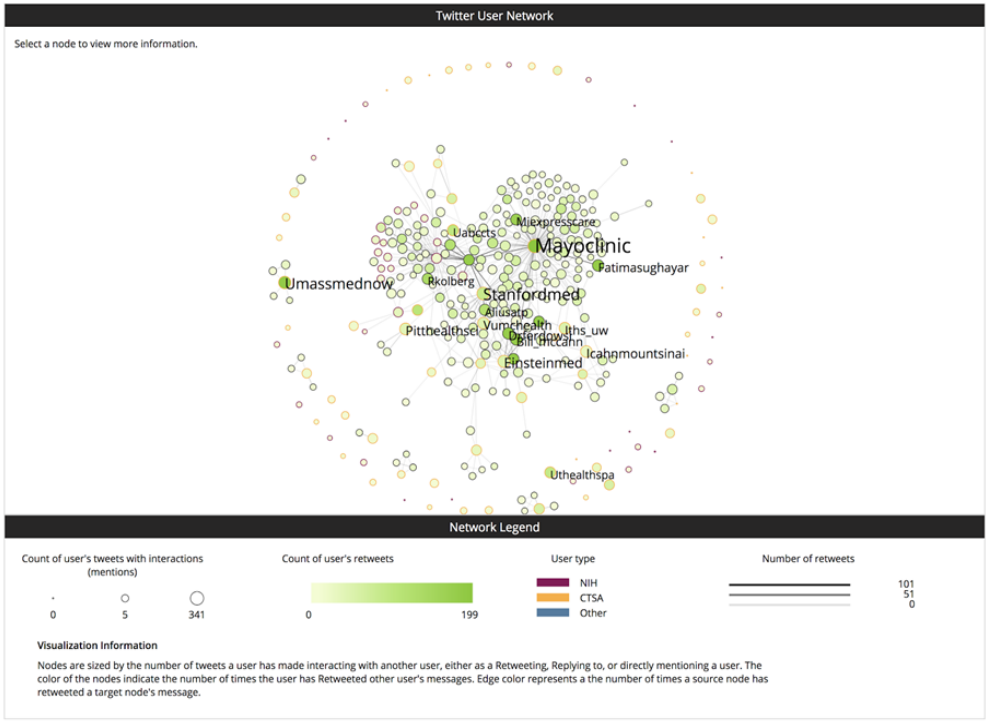
Research

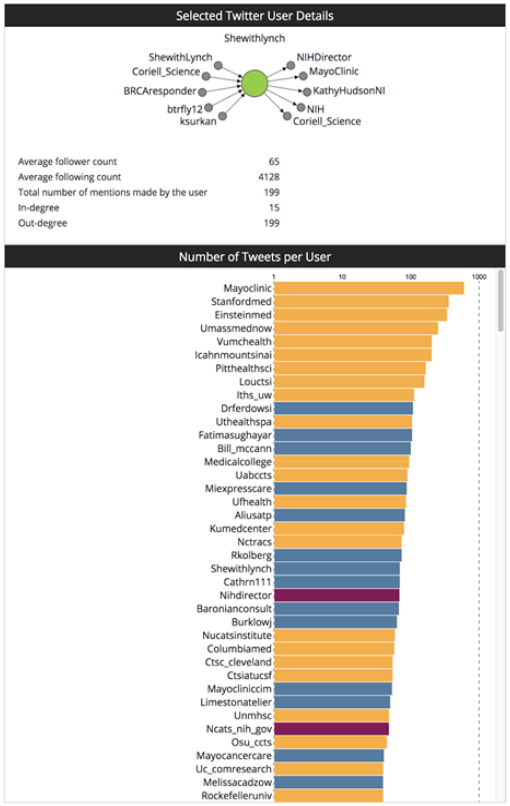
Interactive Visualizations using CNS WebVis Framework

Visualization: Twitter Network

Project: IAI

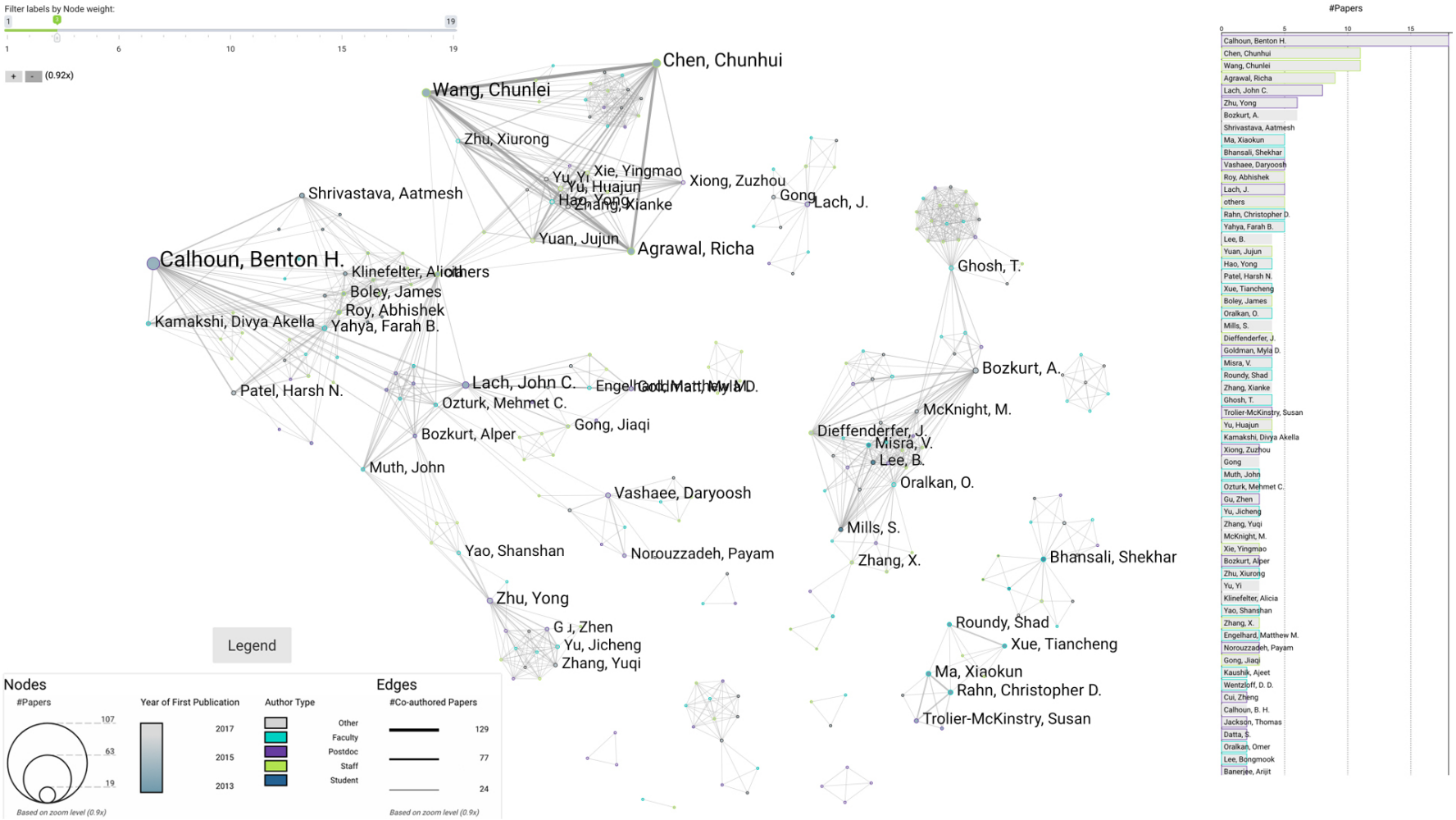
demo.cns.iu.edu/client/iai/twitter.html





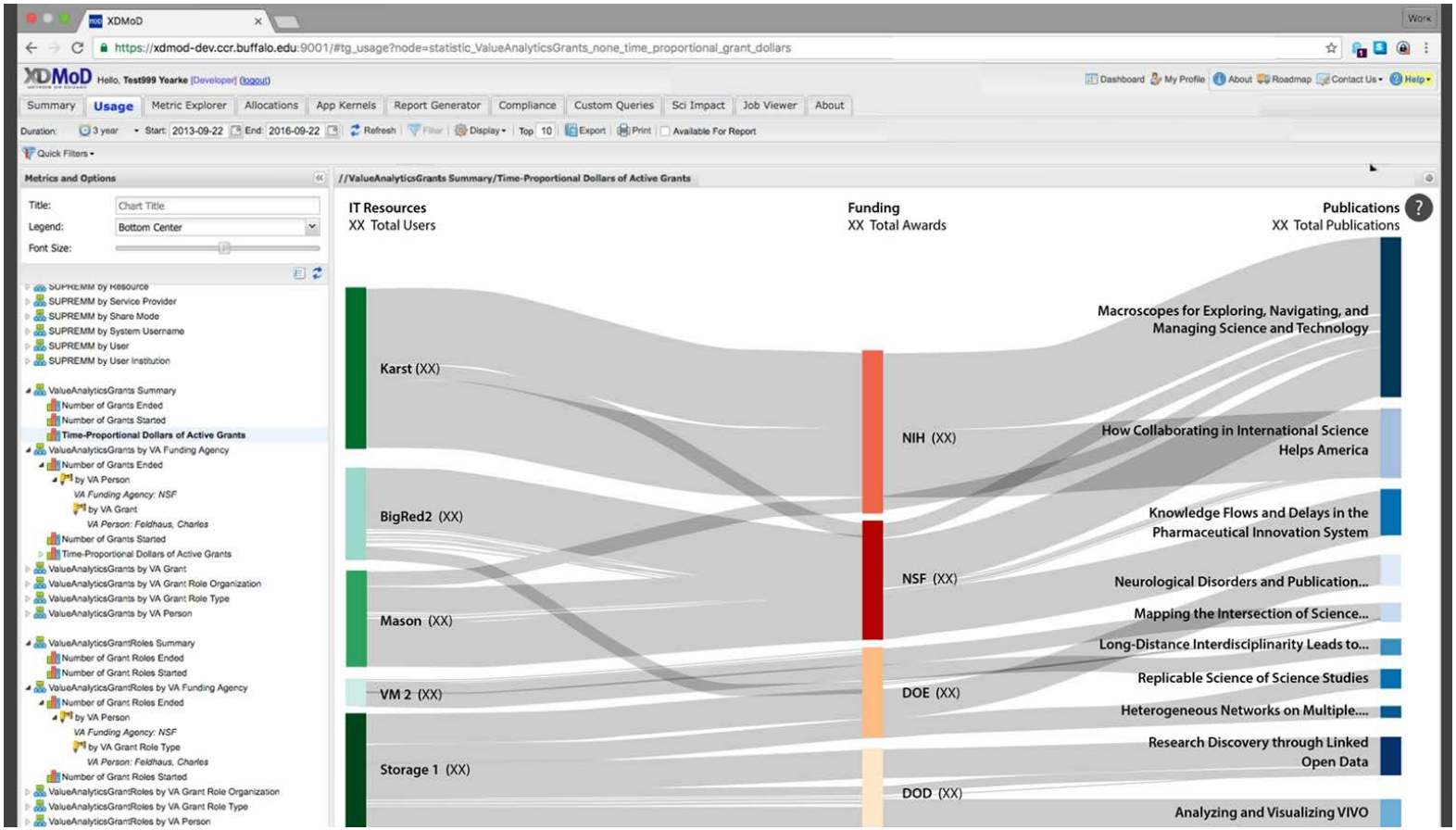
Visualization: Co-Author Networks (nanoHUB.org)

Project: ERC



Visualization: Sankey Diagram

Project: XDMoD

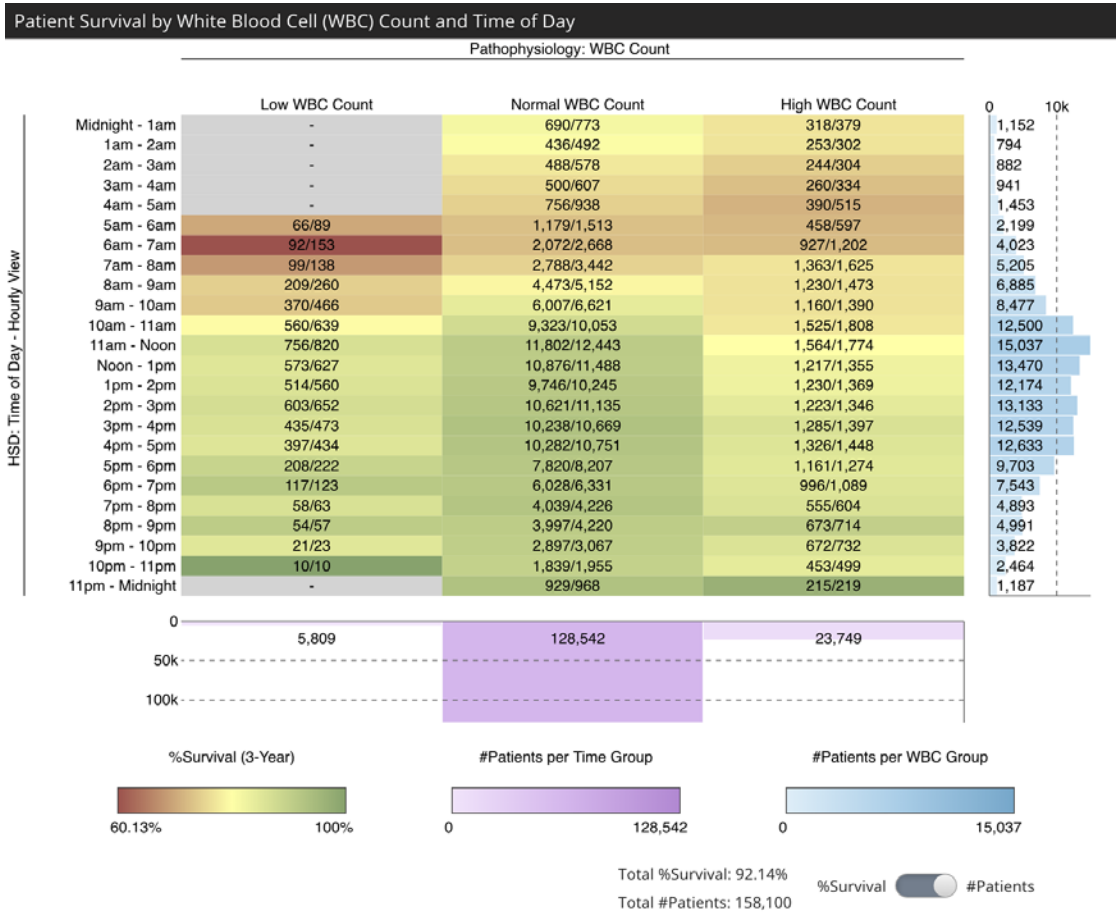


This Sankey diagram displays a multivariate analysis of the relationship between IT resources, funding agencies, and publications. The width of each line represents grant dollars awarded to researchers. The configuration model allows for easy metric switching.

Visualization: Heatmap

Project: HSD

demo.cns.iu.edu/client/hsd/static/heatmap_hour.html



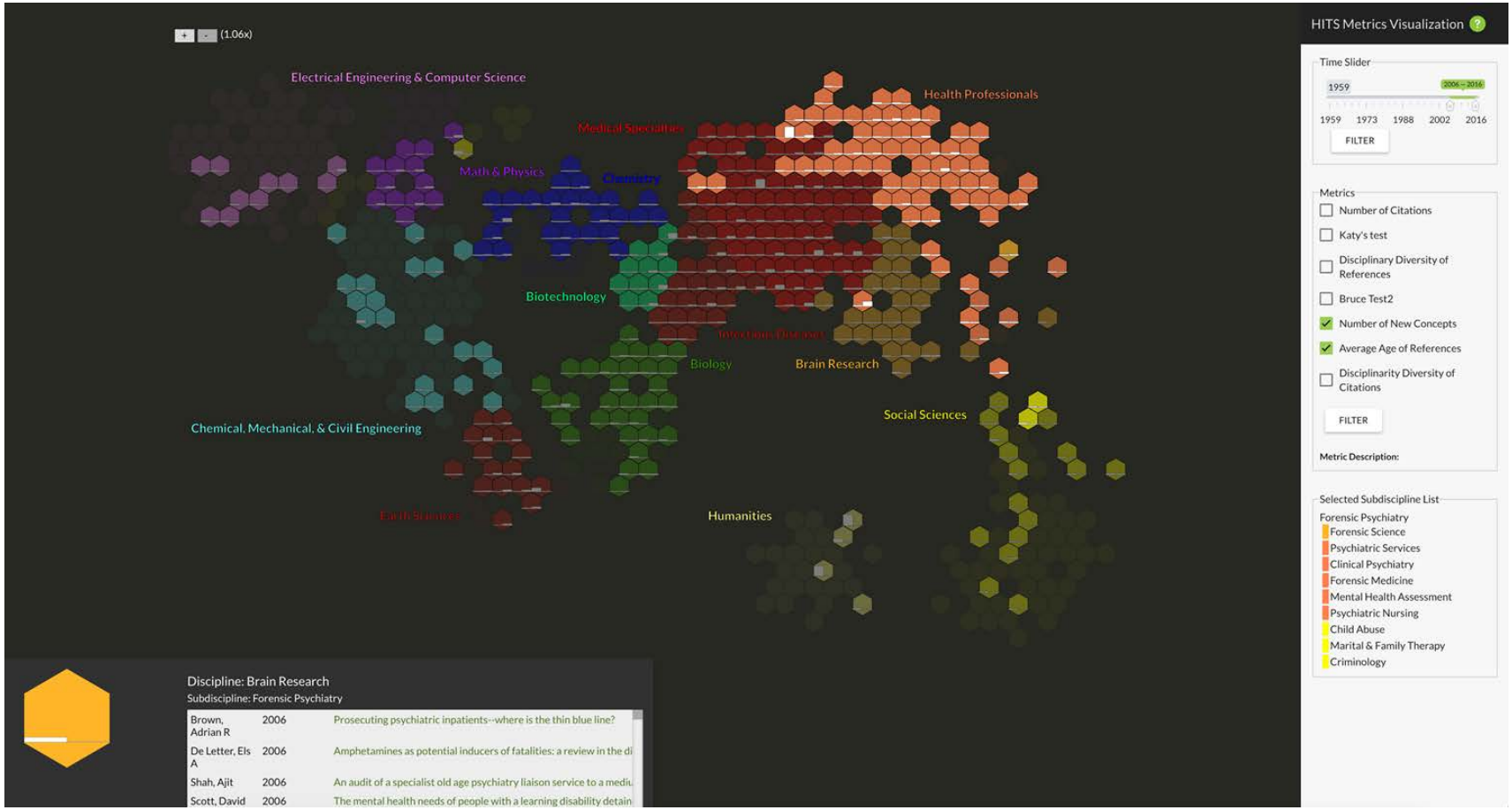
This visualization shows how white blood cell (WBC) laboratory tests correlate with three-year survival rates. The HSD dimension of the data (rows) is the time of the day of the test; and three-year survival rate (numbers and colors in the boxes) is an outcome variable. **Aggregation level for the HSD time of day are shown— 24 hourly blocks on the right.**. The lowest survival rates are for patients with a low WBC value in the morning (specifically at 6am).

In this project, we created data visualizations to explain HSD to users and to help them incorporate it into in their research.

Visualization: Hex Map of Science

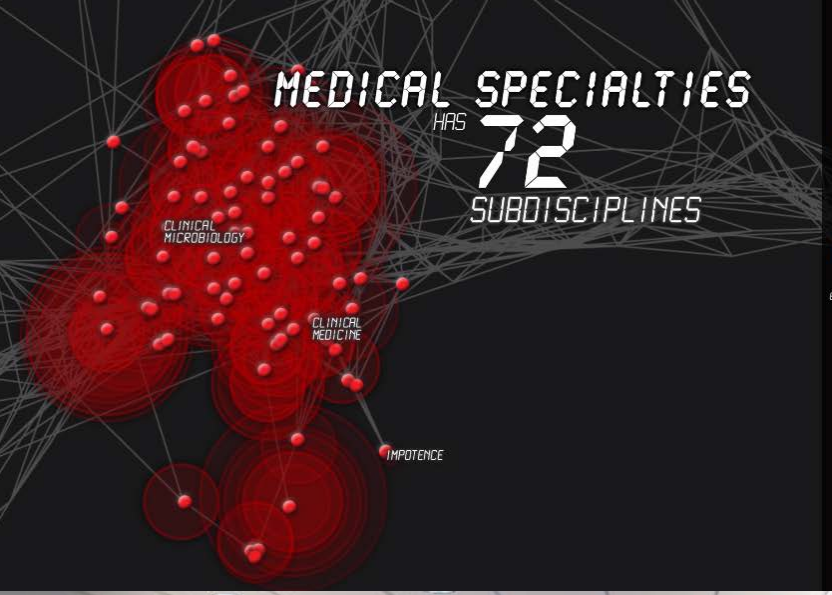
Project: ECON

demo.cns.iu.edu/client/econ-hexmap



Hex-style rendering of the UCSD map of science allows for easier investigation of metric bars within each hexagon node. This Interactive map allows the user to hover over a discipline label to highlight all its subdisciplines, and also hover over a subdiscipline to see all subdisciplines it is connected to.

Science Forecast S1:E1, 2015



Sentient Veil, Isabella Stewart Gardner Museum, Boston, MA (2017)

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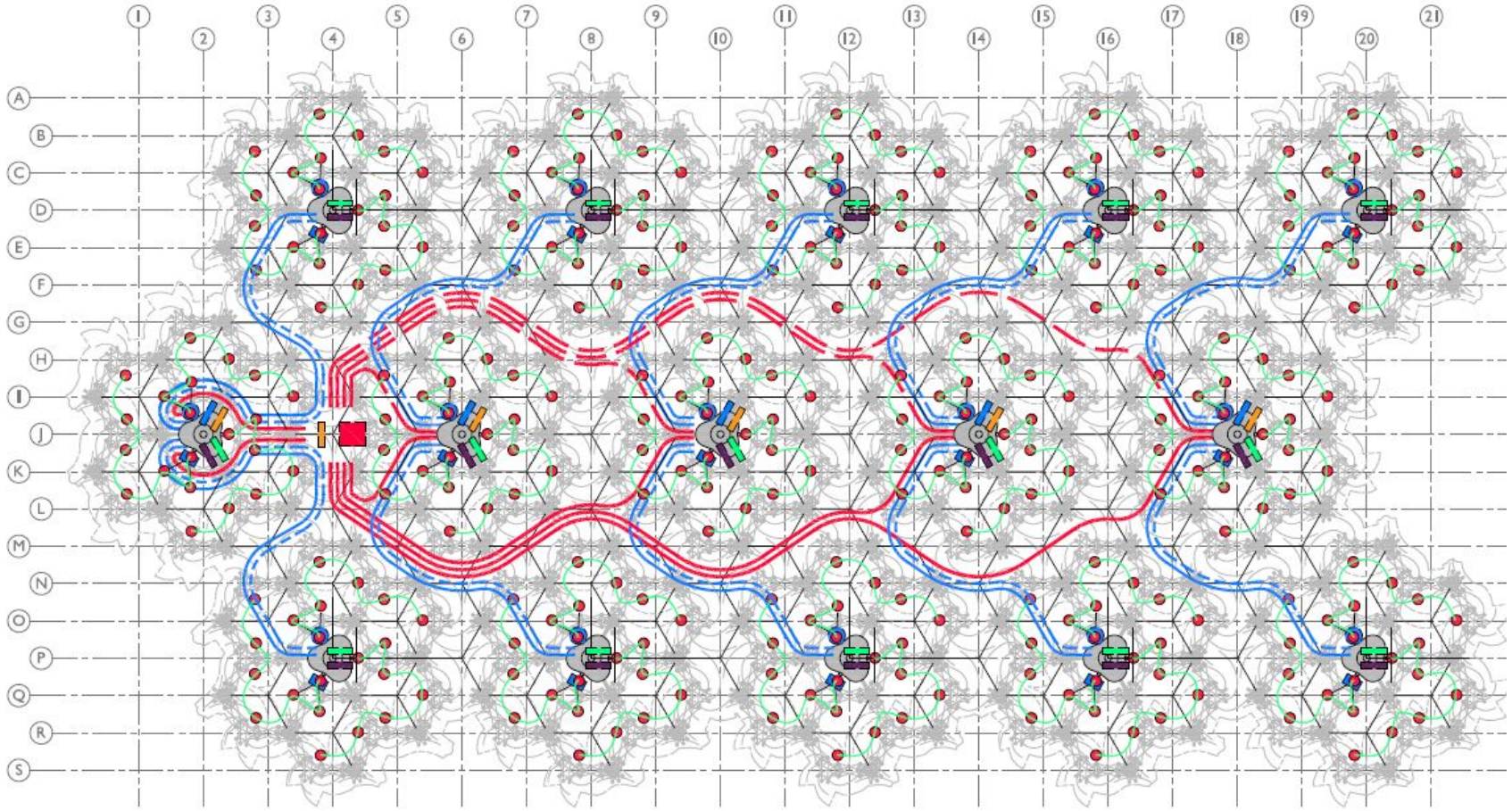


PCBs

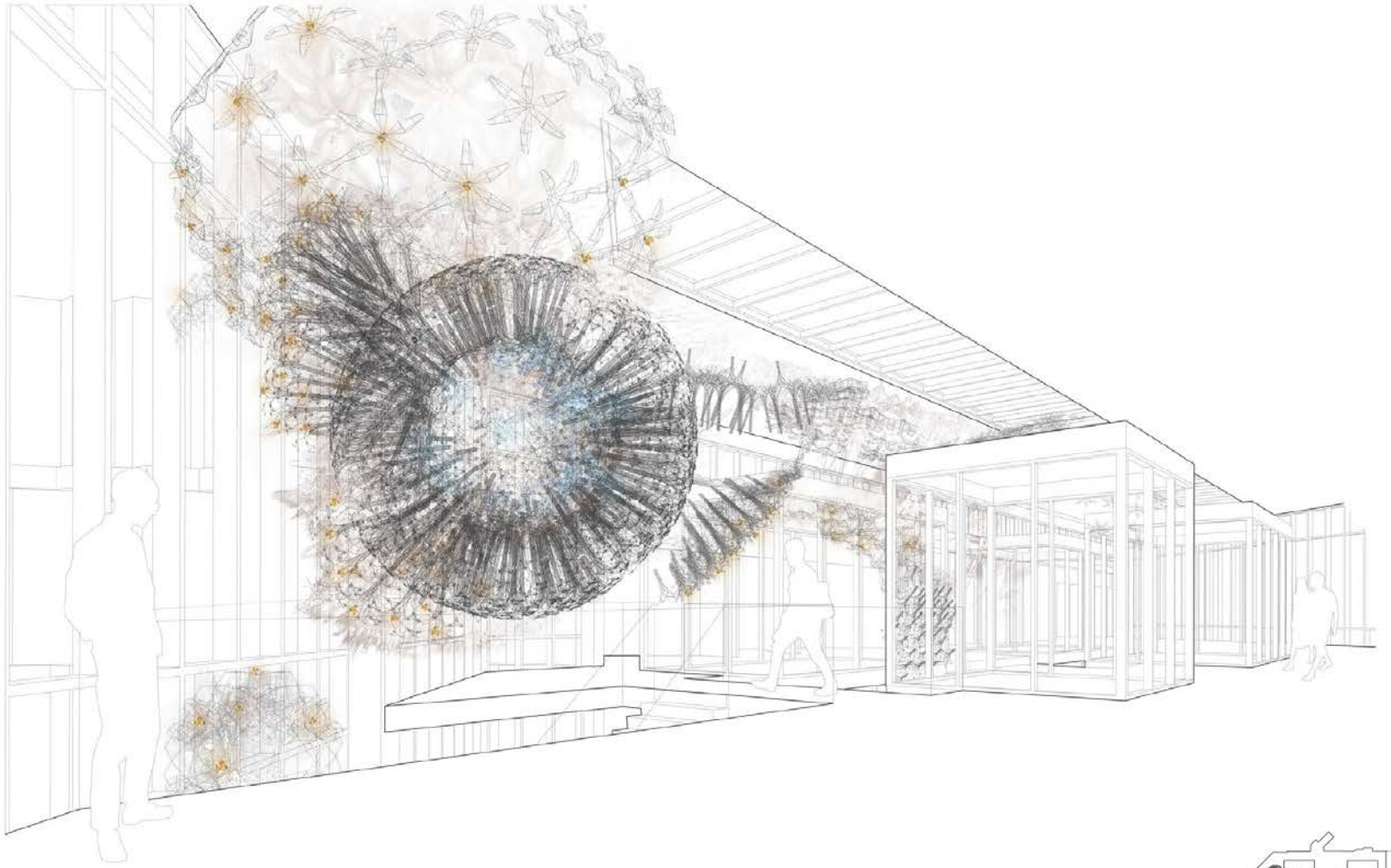
- Raspberry Pi 3.0 B
- 3.1 Control Node
- 3.1 Device Module
- Power Distribution board
- Mp3 Trigger board

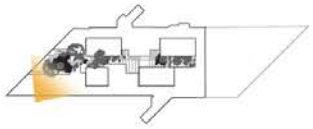
Interactive Devices

- Light Module Cluster
- Sound Unit
- Short Range IR Proximity Sensor
- Microphone Sensor

Mechanisms

- Main Power Trunk
- Main Communications Trunk
- Node to Device Module Power
- Node to Device Module Communications
- Neo Pixel Chain

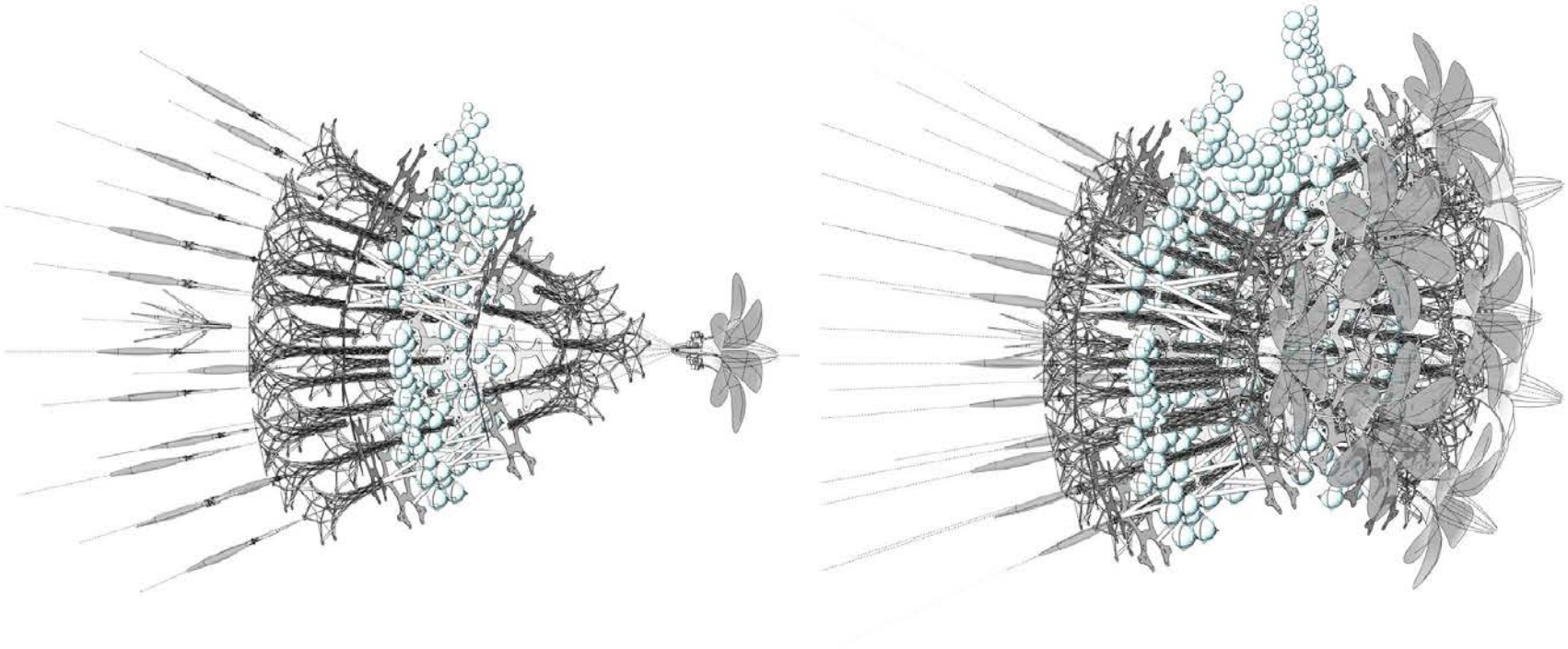




Luddy Hall Installation
Indiana University Bloomington
April 29 2017

UPPER ATRIUM

Philip Beesley • Living Architecture Systems



Luddy Hall Installation
Indiana University Bloomington
April 29 2017

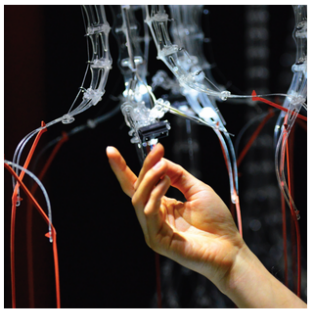
ASSEMBLY SAMPLE

Philip Beesley • Living Architecture Systems

Faculty + Student Work
Learning Facilities
Grunwald Gallery
Centers
Sage Collection
McKinney Visiting Artist Series
Archive

Philip Beesley: Digital Arts

Friday, November 3, 2017
5:00 P.M. – 6:00 P.M.

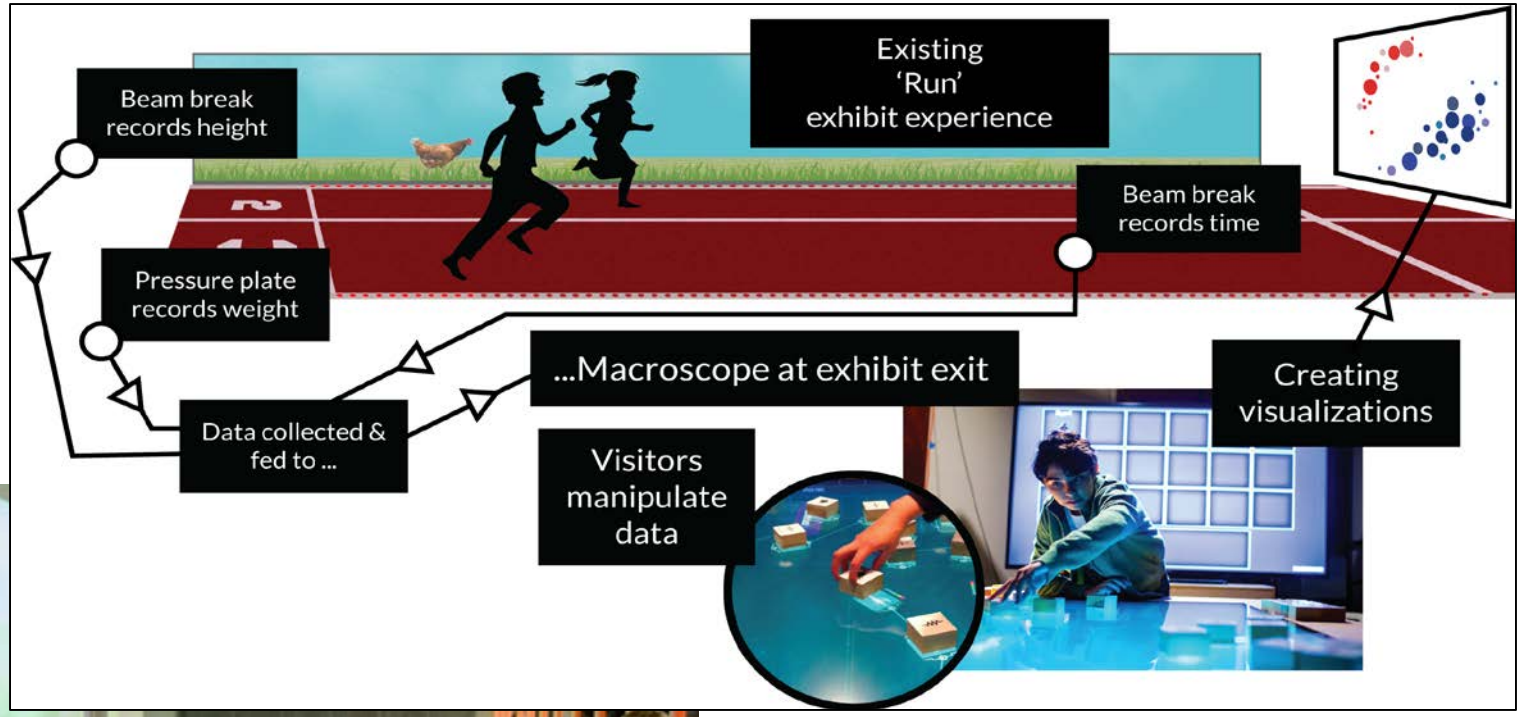


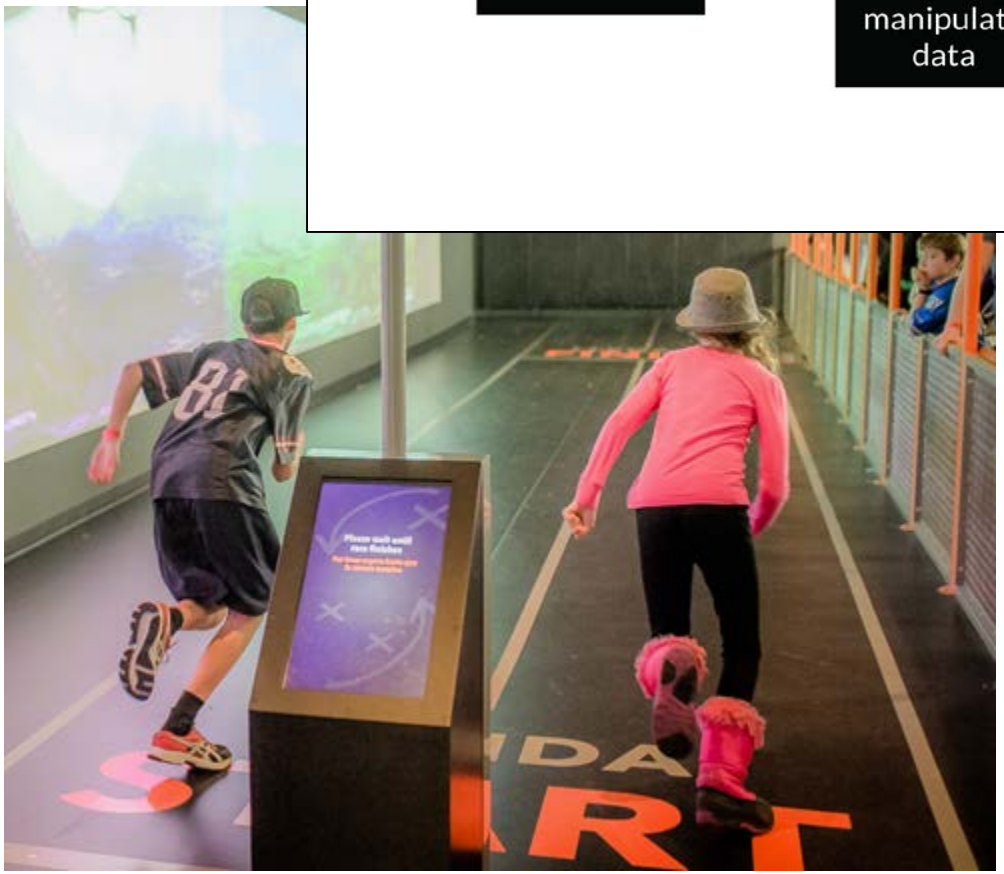
This lecture will take place in Fine Arts 015.

Philip Beesley's (FRAIC OAA RCA, visual artist, architect) research focuses on next-generation architecture that asks fundamental questions: can architecture feel, and care? Can new digital fabrication, artificial intelligence, and synthetic biology combine in architecture that comes close to life itself? Beesley's practice includes multiple crafts of architecture, sculpture, industrial design, instrument making, and mechatronics. He often collaborates with artists, including couture designer Iris van Herpen and futurist Rachel Armstrong. He is a Professor at the University of Waterloo and European Graduate School, and serves as the Director for the 40-partner Living Architecture Systems Group and Riverside Architectural Press. He has authored and edited sixteen books and proceedings, and has appeared on the cover of Artificial Life (MIT), LEONARDO and AD journals. Features include Vogue, WIRED, and a series of TED talks. His work has received multiple distinctions, and was selected to represent Canada at the 2010 Venice Biennale for Architecture.

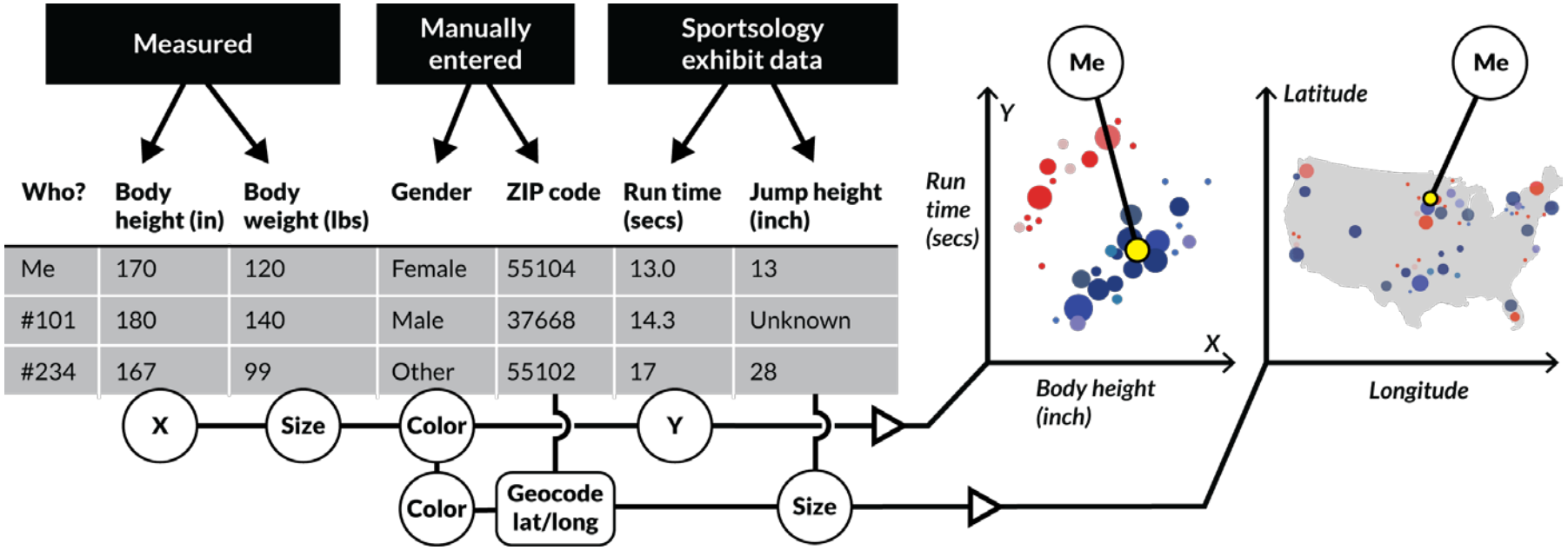
Data Visualization Literacy: Research and Tools that Advance Public Understanding of Scientific Data

NSF Org:	DRL Division Of Research On Learning
Initial Amendment Date:	June 13, 2017
Latest Amendment Date:	June 13, 2017
Award Number:	1713567
Award Instrument:	Standard Grant
Program Manager:	Arlene M. de Strulle DRL Division Of Research On Learning EHR Direct For Education and Human Resources
Start Date:	August 1, 2017
End Date:	July 31, 2021 (Estimated)
Awarded Amount to Date:	$1,355,236.00
Investigator(s):	Katy Borner katy@indiana.edu (Principal Investigator) Kylie Peppler (Co-Principal Investigator) Bryan Kennedy (Co-Principal Investigator) Stephen Uzzo (Co-Principal Investigator) Joe Heimlich (Co-Principal Investigator)

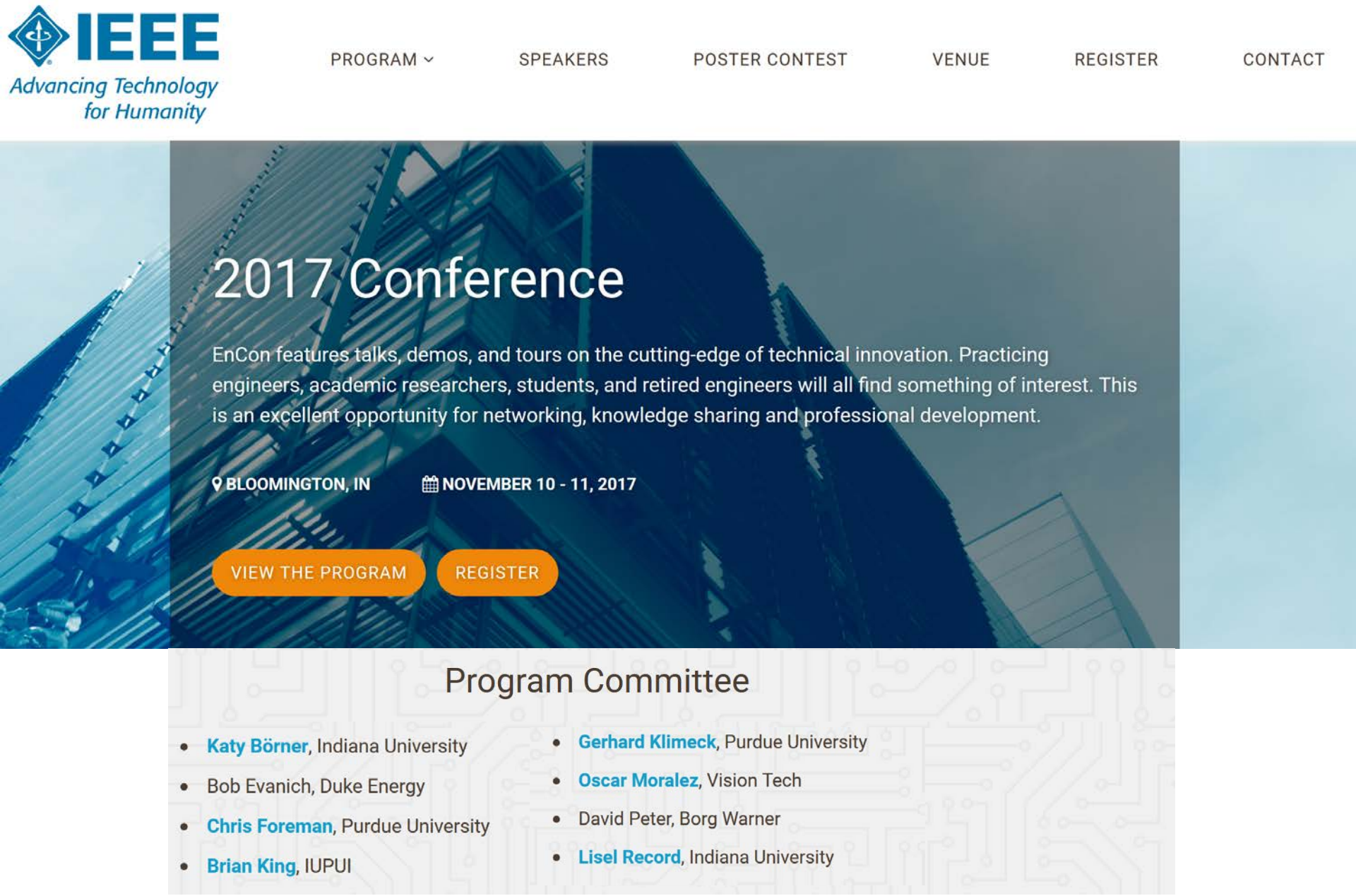




Sketch of the *Run* exhibit including data collection (top) and macroscope add-on that lets interested visitors explore more complex data visualizations using table-top displays.



xMacroscope general setup and activity—Raw data on left is converted to visualization on right by dragging and dropping (or connecting) column headers to axes, paint buckets, size, and shape.



http://www.cis-ieee.org/encon2017

CSWS Session: Visualizing STEAM Data in Support of Smart Decision Making
November 15-17, 2017, Tokyo, Japan. http://scws2017.org

Teaching

ENGR-E 483/E-583 Information Visualization, http://ivmooc.cns.iu.edu

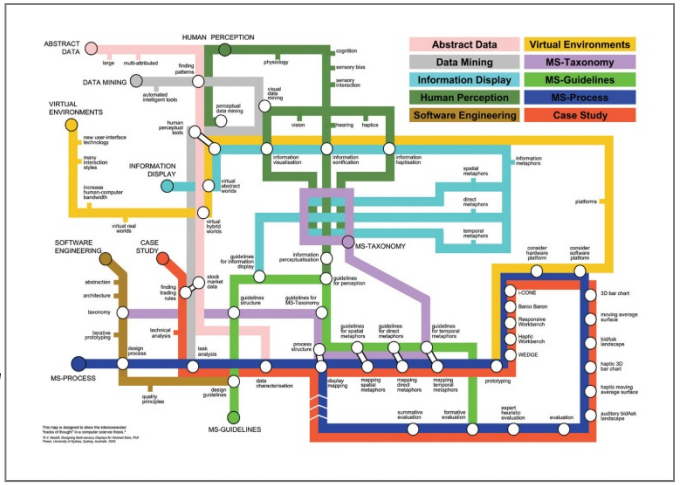
Iteration XI (2015): Macroscopes for Interacting with Science

http://scimaps.org/iteration/11

Different Question Types

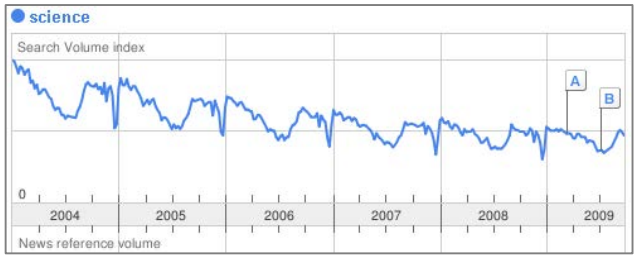
Terabytes of data

Descriptive & Predictive Models



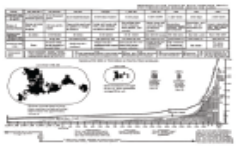
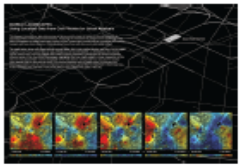
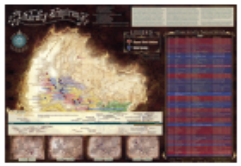
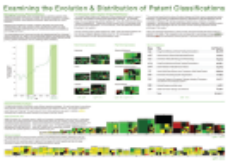
Find your way

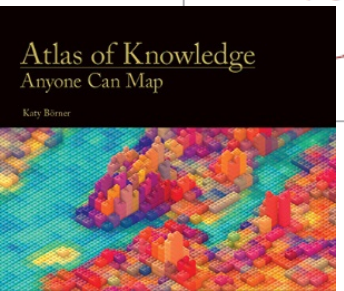
Find collaborators, friends



Identify trends

Tasks

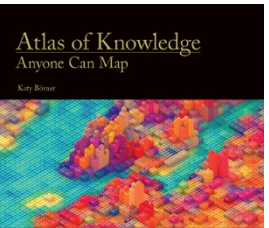
TYPES	LEVELS		
	MICRO: Individual Level about 1–1,000 records page 6	**MESO: Local Level** about 1,001–100,000 records page 8	**MACRO: Global Level** more than 100,000 records page 10
Statistical Analysis page 44	Knowledge Cartography page 135	Productivity of Russian life sciences research teams page 105	Number of scientists versus population and R&D costs versus GNP. page 103
WHEN: Temporal Analysis page 48	Visualizing decision-making processes page 95	Key events in the development of the video tape recorder page 85	 Increased travel and communication speeds page 83
WHERE: Geospatial Analysis page 52	 Cell phone usage in Milan, Italy page 109	 Victorian poetry in Europe page 137	Ecological footprint of countries page 99
WHAT: Topical Analysis page 56	 Evolving patent holdings of Apple Computer, Inc. and Jerome Lemelson page 89	Evolving journal networks in nanotechnology page 139	Product space showing co-export patterns of countries page 93
WITH WHOM: Network Analysis page 60	World Finance Corporation network page 87	Electronic and new media art networks page 133	World-wide scholarly collaboration networks page 157



See *Atlas of Science: Anyone Can Map*, page 5

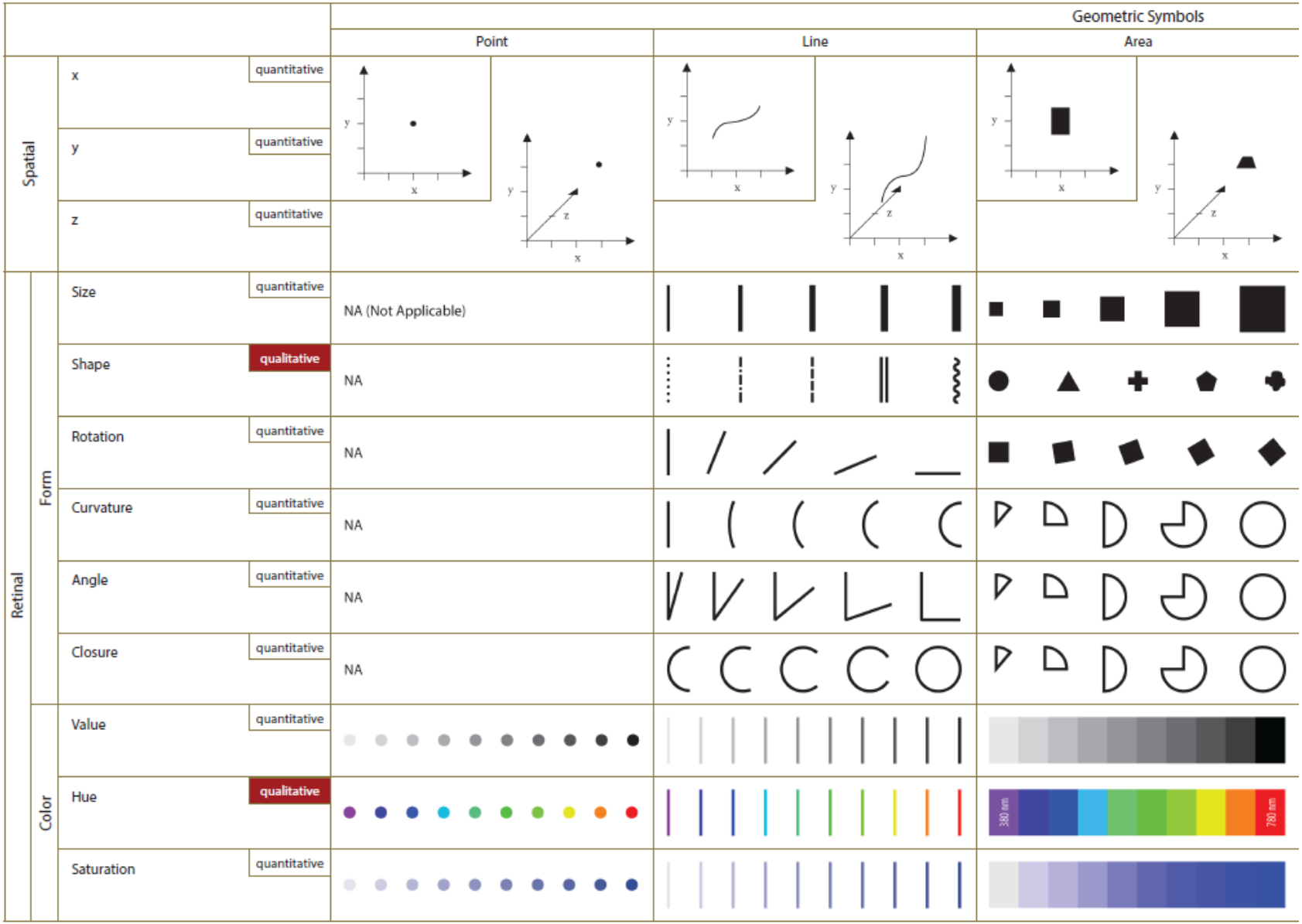
Visualization Framework

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

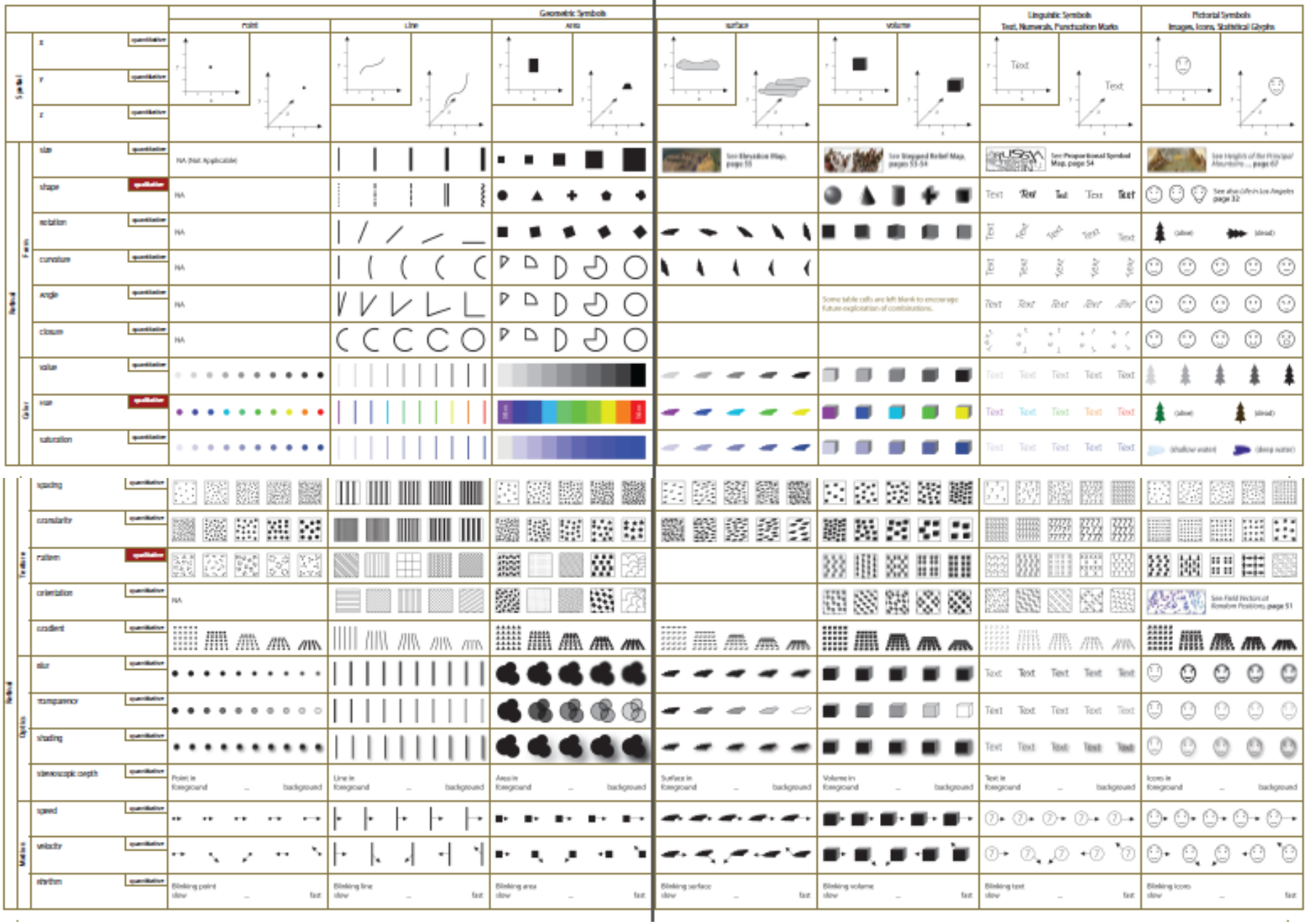


See page 24

Graphic Variable Types Versus Graphic Symbol Types

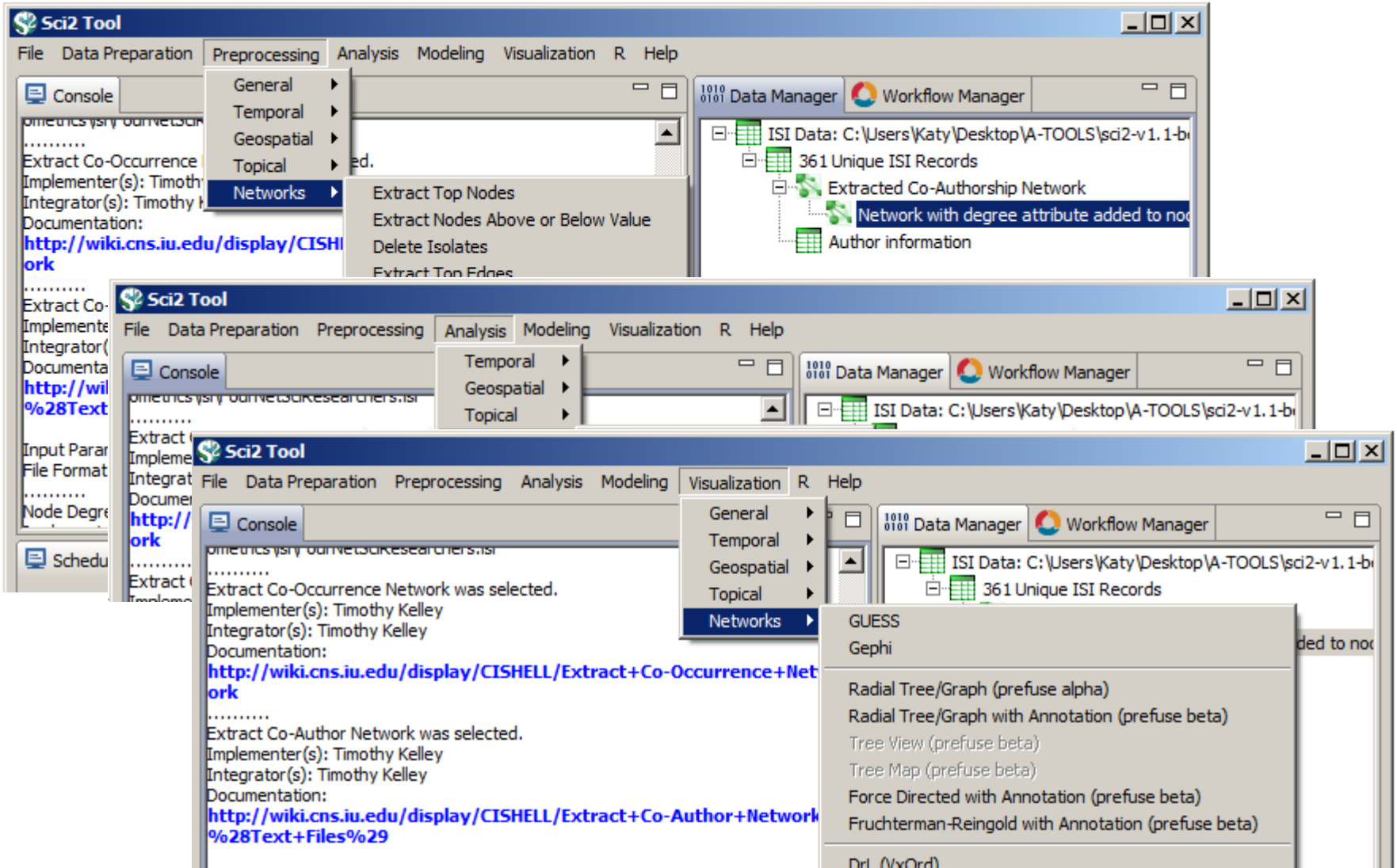


Graphic Variable Types Versus Graphic Symbol Types



Sci2 Tool Interface Components Implement Vis Framework

Download tool for free at http://sci2.cns.iu.edu



Load **One** File and Run **Many** Analyses and Visualizations

Times Cited	Publication Year	City of Publisher	Country	Journal Title (Full)	Title	Subject Category	Authors
12	2011	NEW YORK	USA	COMMUNICATIONS OF THE ACM	Plug-and-Play Macroscopes	Computer Science	Borner, K
18	2010	MALDEN	USA	CTS-CLINICAL AND TRANSLATIONAL SCIENCE	Advancing the Science of Team Science	Research & Experimental Medicine	Falk-Krzesinski, HJ|Borner, K|Contractor, N|Fiore, SM|Hall, KL|Keyton, J|Spring, B|Stokols, D|Trochim, W|Uzzi, B
13	2010	WASHINGTON	USA	SCIENCE TRANSLATIONAL MEDICINE	A Multi-Level Systems Perspective for the Science of Team Science	Cell Biology |Research & Experimental Medicine	Borner, K|Contractor, N|Falk-Krzesinski, HJ|Fiore, SM|Hall, KL|Keyton, J|Spring, B|Stokols, D|Trochim, W|Uzzi, B

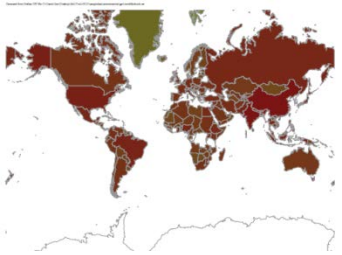
Statistical Analysis–p. 44

Location	*Count*	*# Citations*
Netherlands	13	292
United States	9	318
Germany	11	36
United Kingdom	1	2

Temporal Burst Analysis–p. 48

Geospatial Analysis–p. 52

Geospatial Analysis–p. 52



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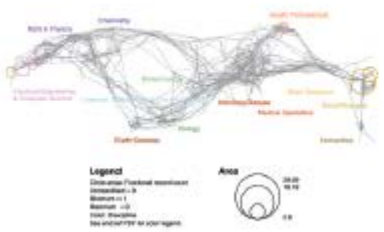
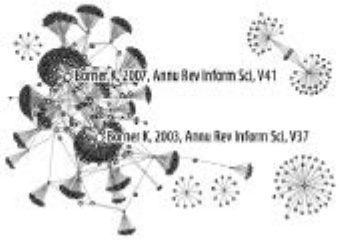
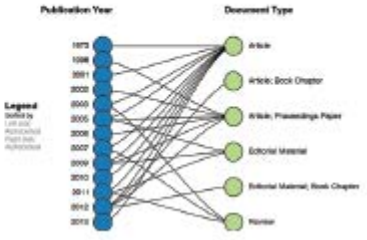
Topical Analysis–p. 56



Paper Citation Network–p. 60



Bi-Modal Network–p. 60



Co-author and many other bi-modal networks.

INDIANA UNIVERSITY
INTELLIGENT SYSTEMS ENGINEERING

HOME CAMPS ABOUT ISE LOCATIONS CONTACT

Sentient Architecture — Sculptures that Listen and Talk

As the built environment becomes increasingly more complex and integrated with new technologies—including the emerging Internet of Things (IoT)—there is an urgent need to understand how embedded technologies affect the experience of individuals that inhabit these spaces.

View Sentient Architecture Camp

http://camps.engineering.indiana.edu

Join us at Bloomington’s Makevention on Aug 26, 2017

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

CNS Facebook: http://www.facebook.com/cnscenter
Mapping Science Exhibit Facebook: http://www.facebook.com/mappingscience