



Impact Metrics and Data Visualization at the National Institute of Standards and Technology

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NIST Information Services Office

Leveraging Data to Lead
SLA Maryland Chapter
Johns Hopkins University, Applied Physics Lab
November 5, 2015

Presentation Outline




- Overview of NIST
- Evolution of our metrics and visualization techniques
- Becoming Strategic Research Partners
- Next steps



Note: The identification of any commercial product or trade name does not imply endorsement or recommendation by the National Institute of Standards and Technology.

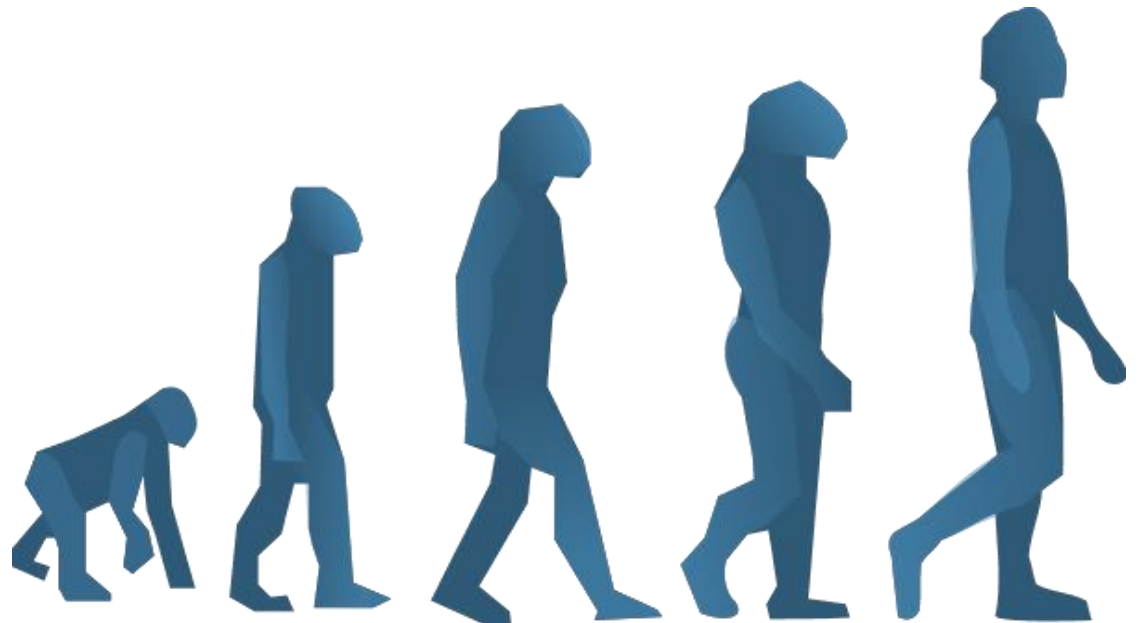
National Institute of Standards and Technology



- Non-regulatory federal agency made up of about 3,000 science and technology researchers
 - NIST promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology
 - The Information Services Office (ISO) supports and enhances research activities of the NIST scientific community through a comprehensive program of knowledge management
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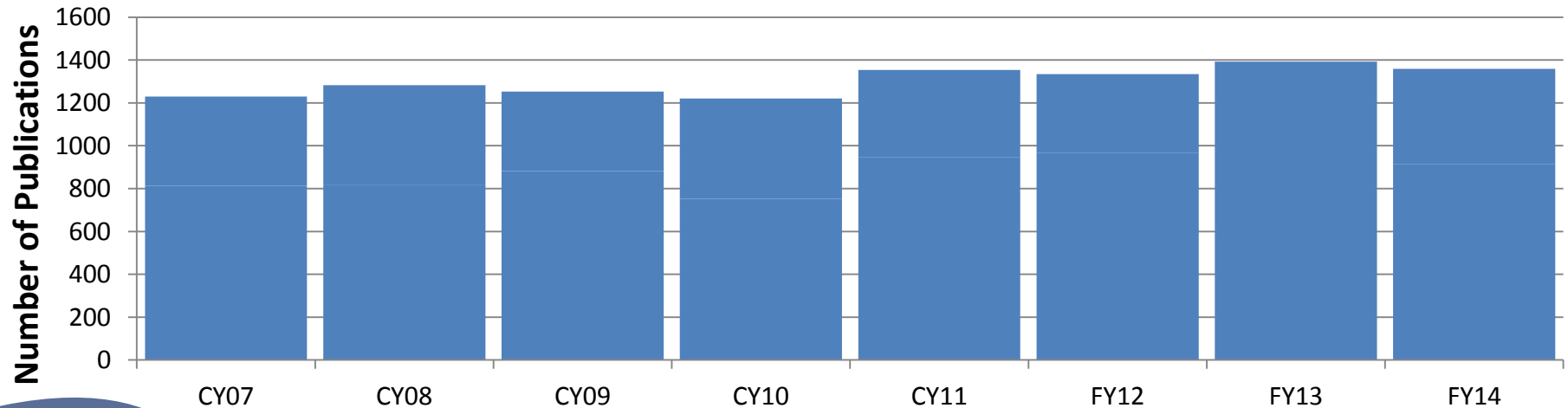
Our Evolution

- Expanding our skill set
- Creating innovative metrics and visualizations
- Becoming a key player within NIST



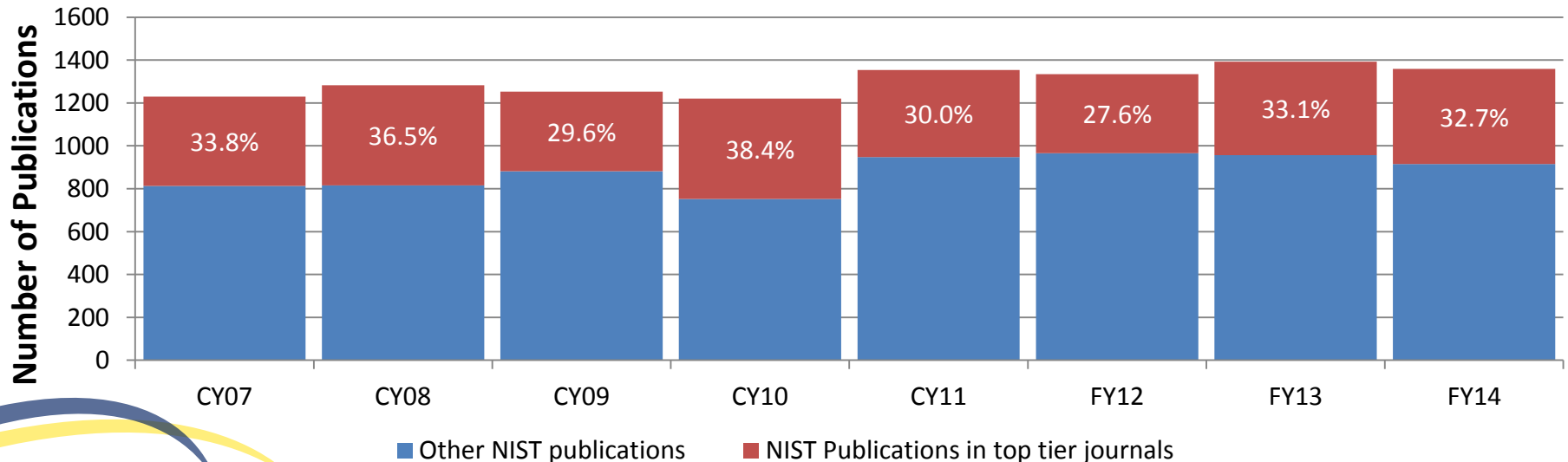
A Simple Start

- Overall publication output
- Web of Science used to determine publication counts
- Plain bar chart of publication counts
- Included in NIST's report to Office of Management & Budget (OMB)



Developing Depth

- What is the quality of those papers?
 - Used Journal Citation Reports to establish top ten percent of journals (by impact factor) in each of 173 categories and created a master journal list (updated annually)
 - Compared NIST journal papers to the top tier journal list



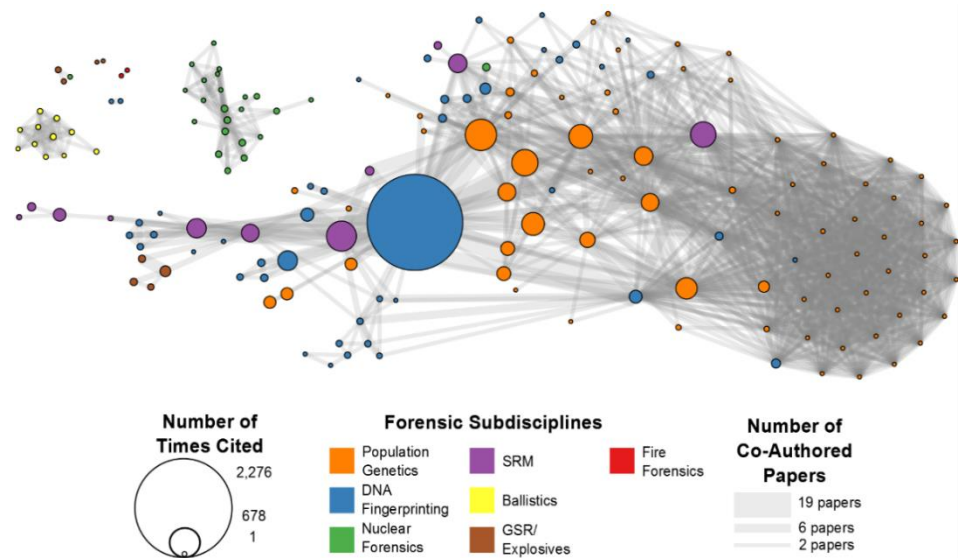
Providing Insight

- Identifying and assessing collaborations
 - Organization
 - Country
 - Author
- Used Web of Science outputs
- Manual manipulation to identify unique collaborating authors



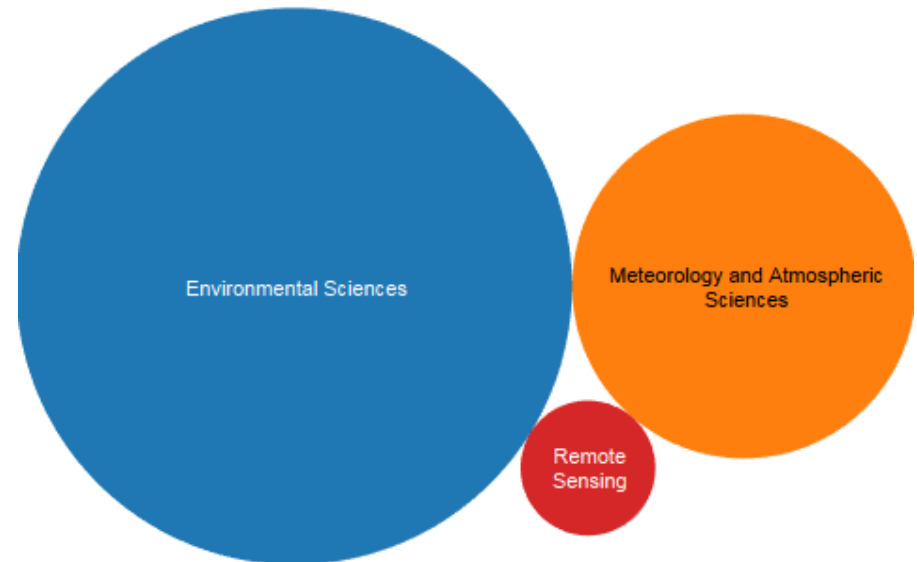
Applying Innovative Metrics

- Forensics@NIST Symposium
- Tools Used:
 - Web of Science
 - Sci²
 - Gephi
 - Tableau
- Resulted in multiple requests for similar research studies




Benchmarking

- Request to NIST from another Federal agency
- Used Web of Science analysis function to study Research Areas of interest
- Provide quarterly assessment reports that track trend analysis




Moving Beyond Publications



- Assessing the impact of NIST Standard Reference Databases (NIST SRDs)
 - Sci-tech journal literature
 - *Google Scholar* (grey technical literature)
 - Patent literature
 - *NEXIS* (non-technical literature)
 - Our beginning with alternative ways to measure NIST's impact beyond publications
 - ISO impact assessment studies were shared with the NIST SRD Program Review Committee
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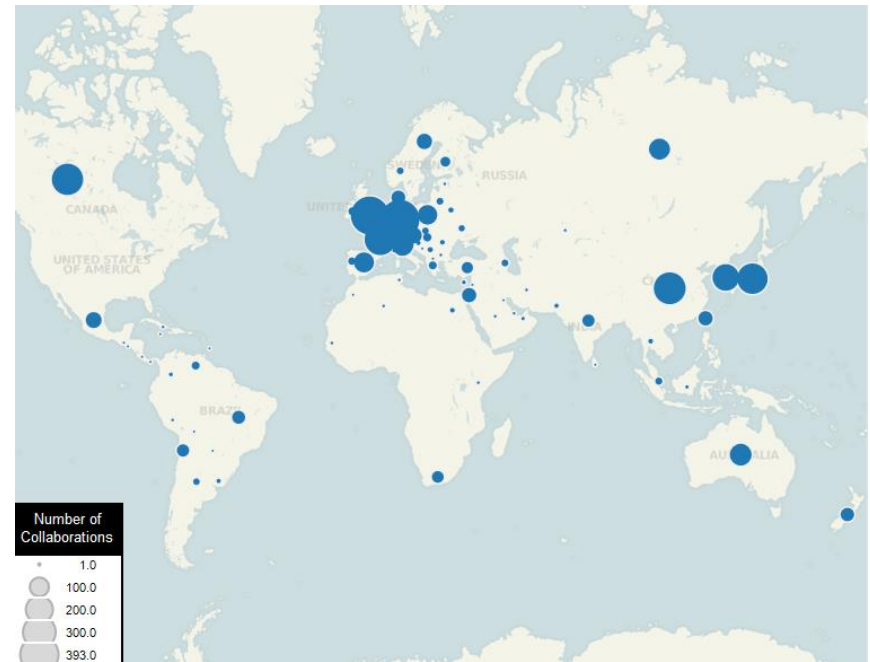
Visualizing Data



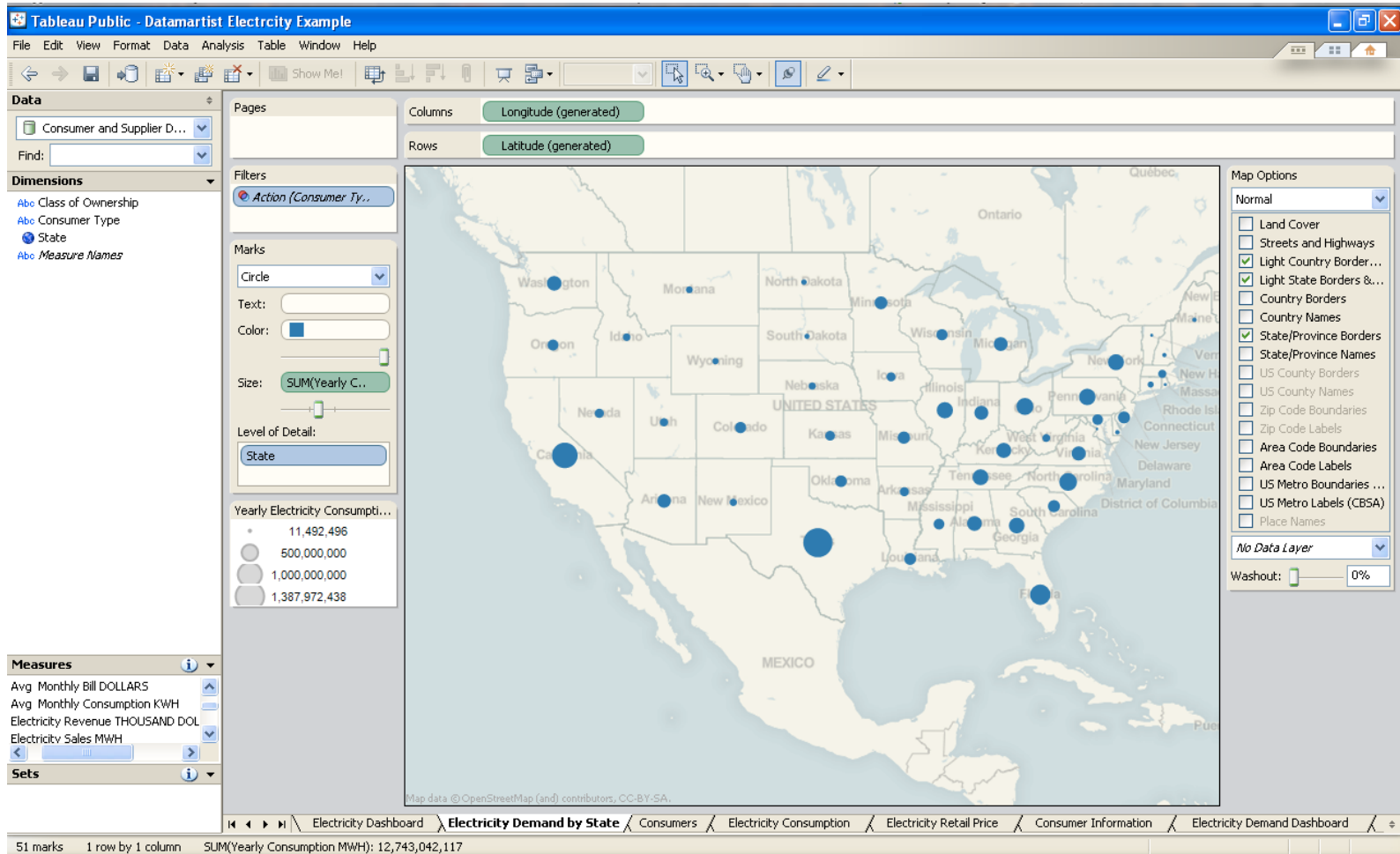
- Tools used to meet the challenges of our customers' requests
 - Tableau
 - Science of Science Tool (SCI²)
 - Gephi
 - ISO's Data Visualization Computer
 - Next steps
- 

Providing Insight

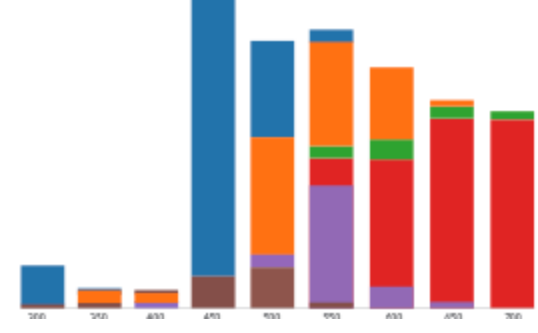
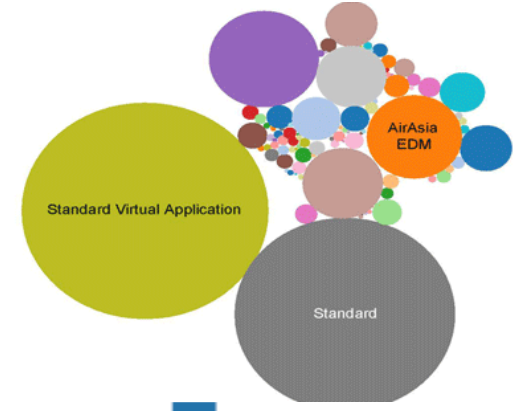
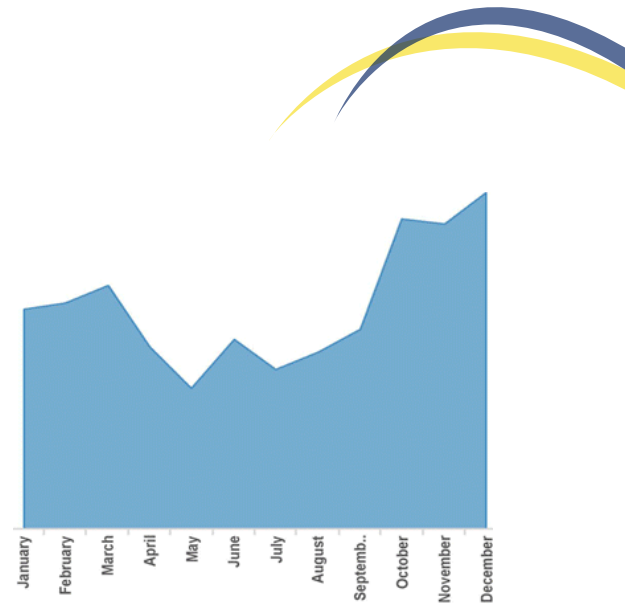
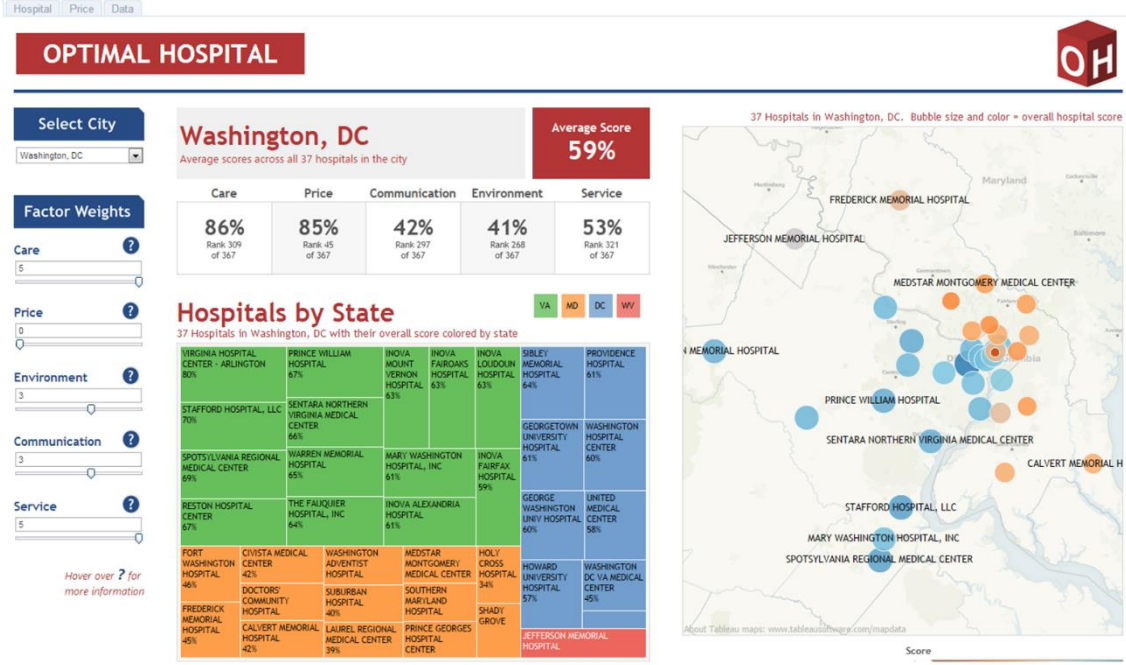
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Tableau



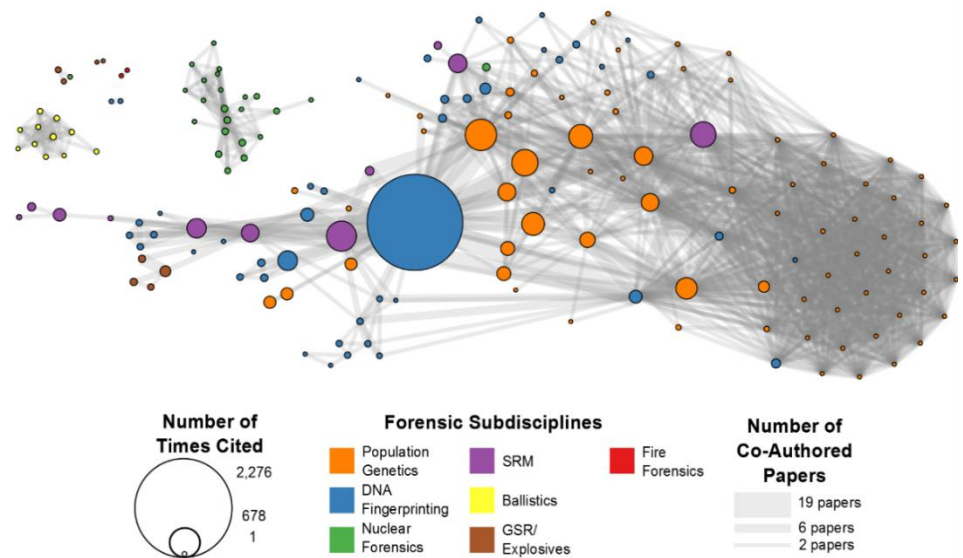
Tableau



Hover over ? for more information

Applying Innovative Metrics

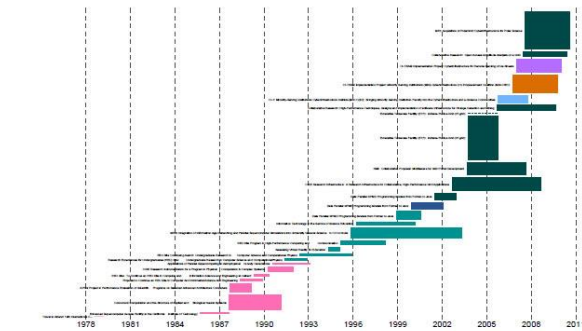
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Science of Science Tool (Sci²)

Temporal Visualization

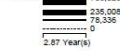
(Geoffrey Fox)
April 24, 2013 | 8:35 AM EDT



Legend

Area size: Awarded Amount to Date
Minimum = 0
Maximum = 1,964,049
Text label: Title
Color: Organization
See end of PDF for color legend.

Area



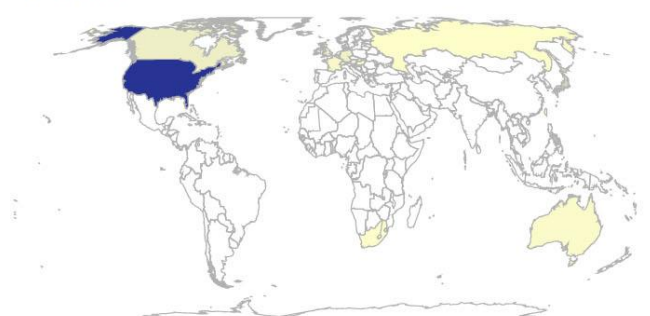
How To Read This Map

This temporal bar graph visualization represents each record as a horizontal bar with a specific start and end date and a text label on its left side. The area of each bar encodes a numerical attribute value, e.g., total amount of funding. Bars may be colored to present categorical attribute values of records.

CNSD [cns.lu.edu]

Geospatial Visualization (Choropleth Map)

Generated from CSV file: C:\Users\jcapoley\AppData\Local\Temp\Temp\ProcessGeo-uspto\Influenza-7258755494216737960.csv
Apr 24, 2013 | 09:13:59 AM EDT



Legend

Country Color (Linear)



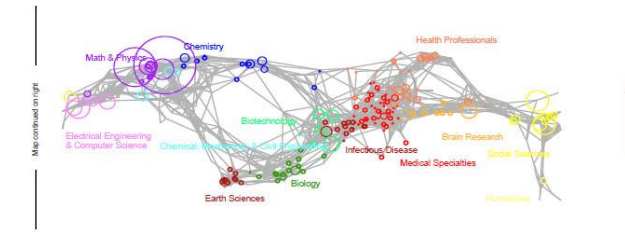
How to Read This Map

This choropleth map shows 206 countries of the world using the equal-area Eckert IV projection. Each country may be color coded in proportion to a numerical value. Minimum and maximum data values are given in the legend.

CNSD [cns.lu.edu]

Topical Visualization

Generated from 361 Unique ISI Records
90 out of 112 records were mapped to 182 subdisciplines and 13 disciplines.
April 24, 2013 | 08:54 AM EDT



© 2008. The Regents of the University of California and SciTech Strategies.
Map updated by SciTech Strategies, CGT, and CNSD in 2011.

Legend

Circle area: Fractional record count
Unclassified = 22
Minimum = 0
Maximum = 98
Scaling factor = 0.5076673
Color: Discipline
See end of PDF for color legend.

Area



How To Read This Map

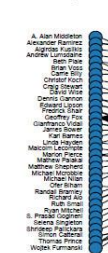
The UCSD map of science depicts a network of 554 subdiscipline nodes that are aggregated to 13 main disciplines of science. Each discipline has a distinct color and is labeled. Overlaid are circles, each representing all records per unique subdiscipline. Circle area is proportional to the number of fractionally assigned records. Minimum and maximum data values are given in the legend.

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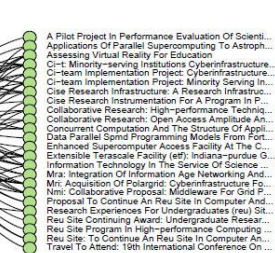
Network Visualization

Generated from Bipartite network from All Investigators and Title
April 24, 2013 | 8:38 AM EDT

All Investigators



Title



Legend

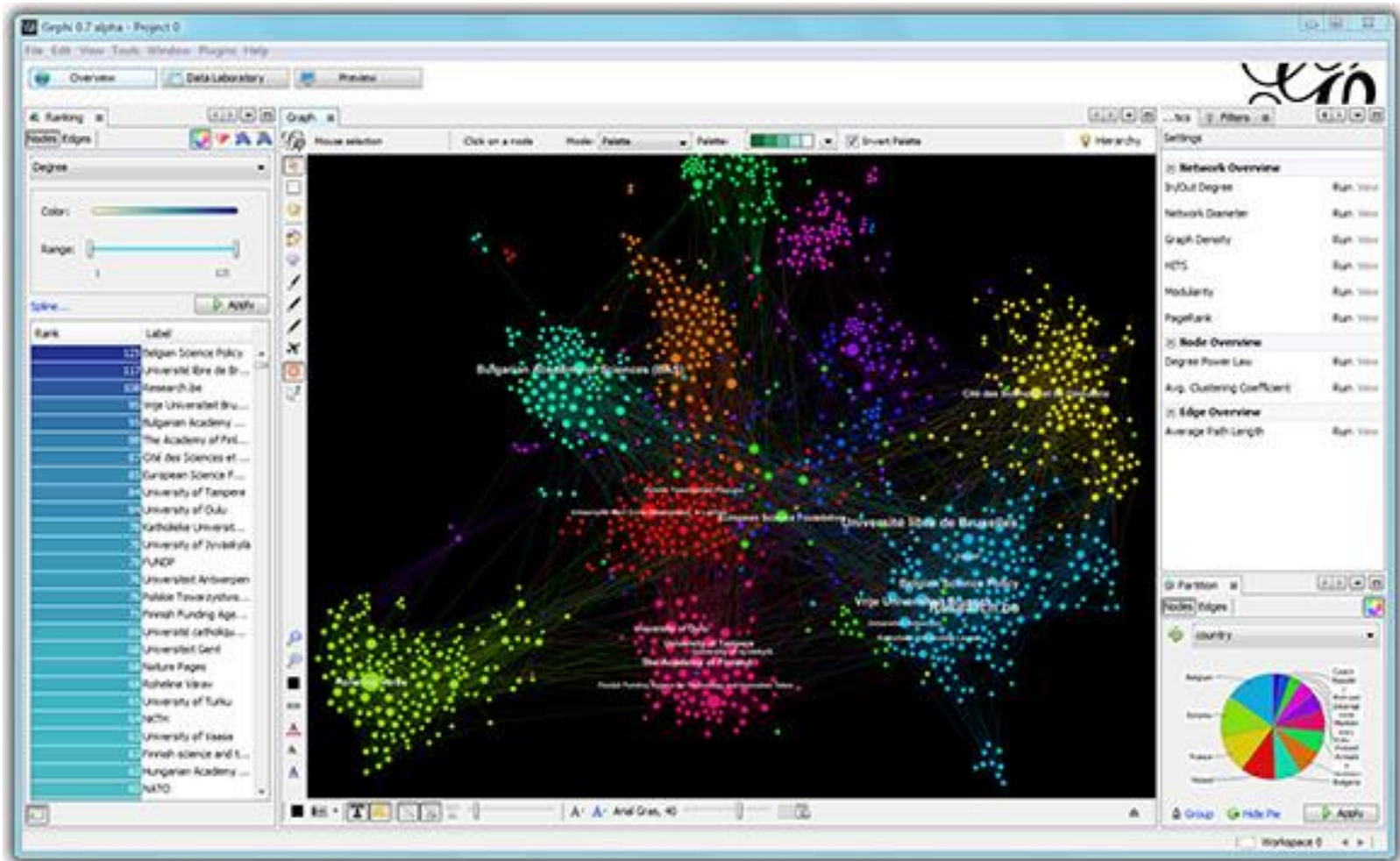
Sorted by
Left side:
Alphabetical
Right side:
Alphabetical

How To Read This Map

This Bipartite network shows two record types and their interconnections. Each record is represented by a labeled circle that is size coded by a numerical attribute value. Records of each type are vertically aligned and sorted, e.g., by node size or alphabetically. Links between records of different type may be weighted as represented by link thickness.

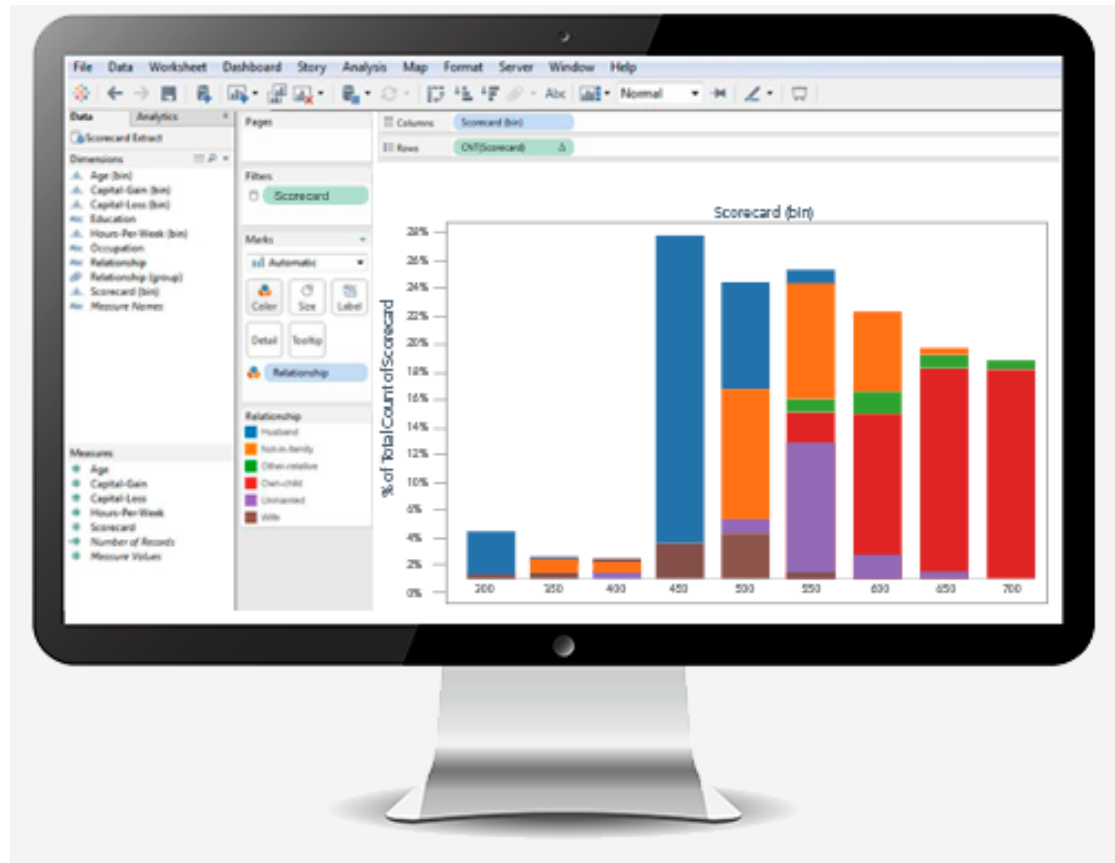
CNSD [cns.lu.edu]

Gephi



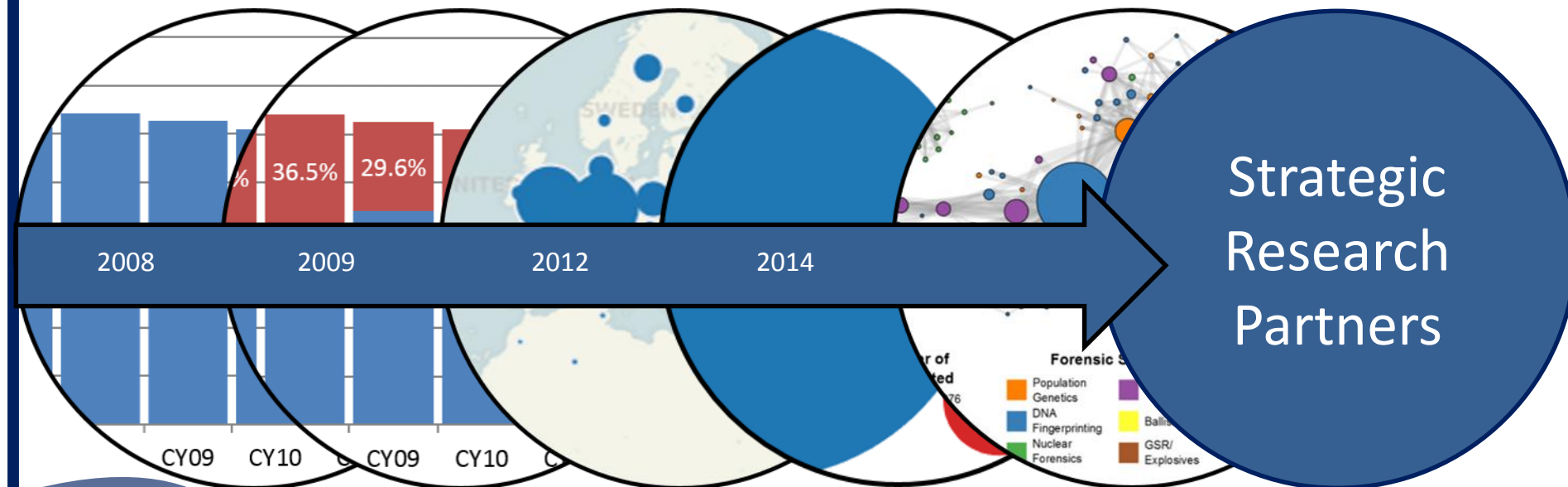
Data Visualization Computer

- Sci²
- Gephi
- Tableau
- Matlab
- Mathematica
- Adobe CS
- Inkscape



Strategic Research Partners


- Evolving ISO's skill sets
- Positioning ourselves to anticipate future needs and questions and begin to drive the research questions



Strategic
Research
Partners

Next Steps



- Continue re-skilling
 - Data tools
 - Altmetrics
 - Data analysis
 - Some future projects
 - Assess the impact of a researcher's work beyond publications (beyond the h-index)
 - Create a visualization wall for sharing data
- 

Questions?

More presentations available at:

<http://www.nist.gov/nvl>

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