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

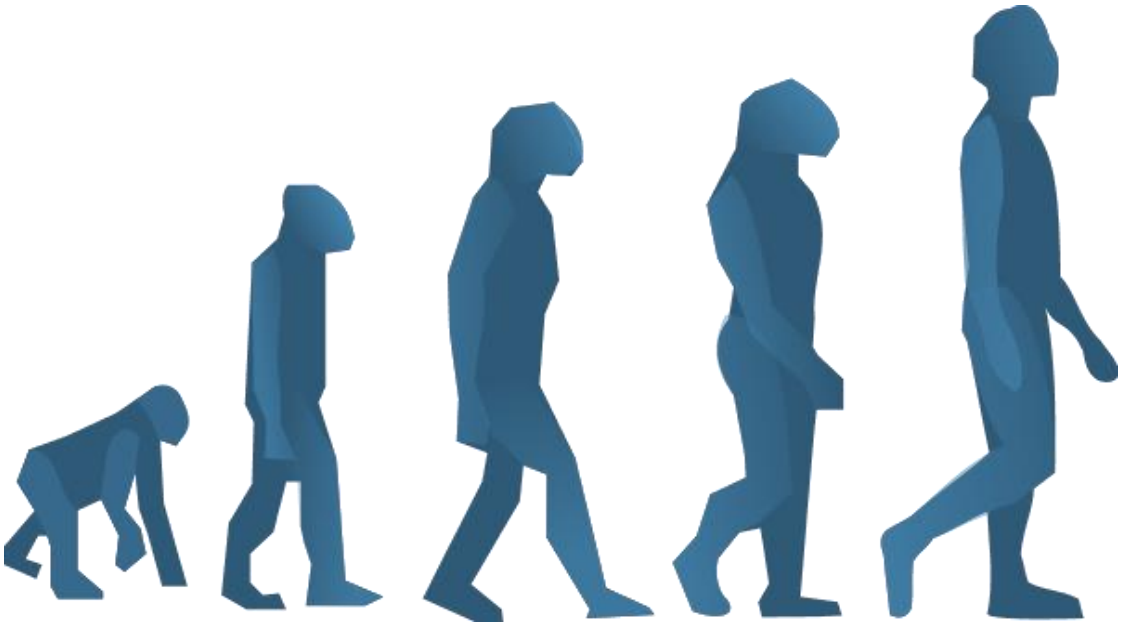
Note: The identification of any commercial product or trade name does not imply endorsement or recommendation by the National Institute of Standards and Technology.

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

Our Evolution

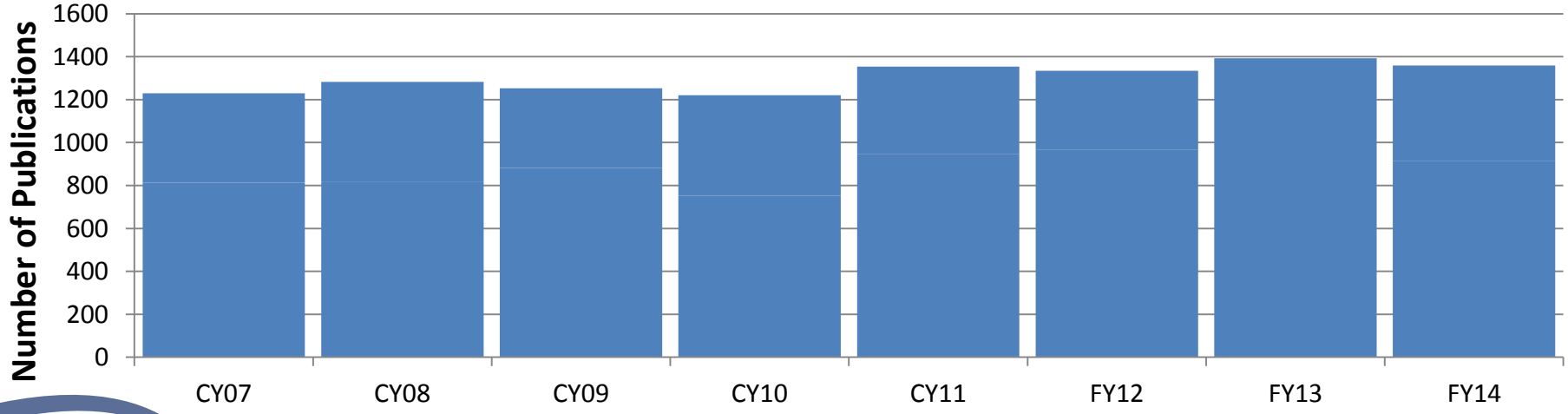
- Expanding our skill set
- Creating innovative metrics and visualizations
- Becoming a key player within NIST



http://www.clipshrine.com/Darwin-evolution-theory-2618-medium.html

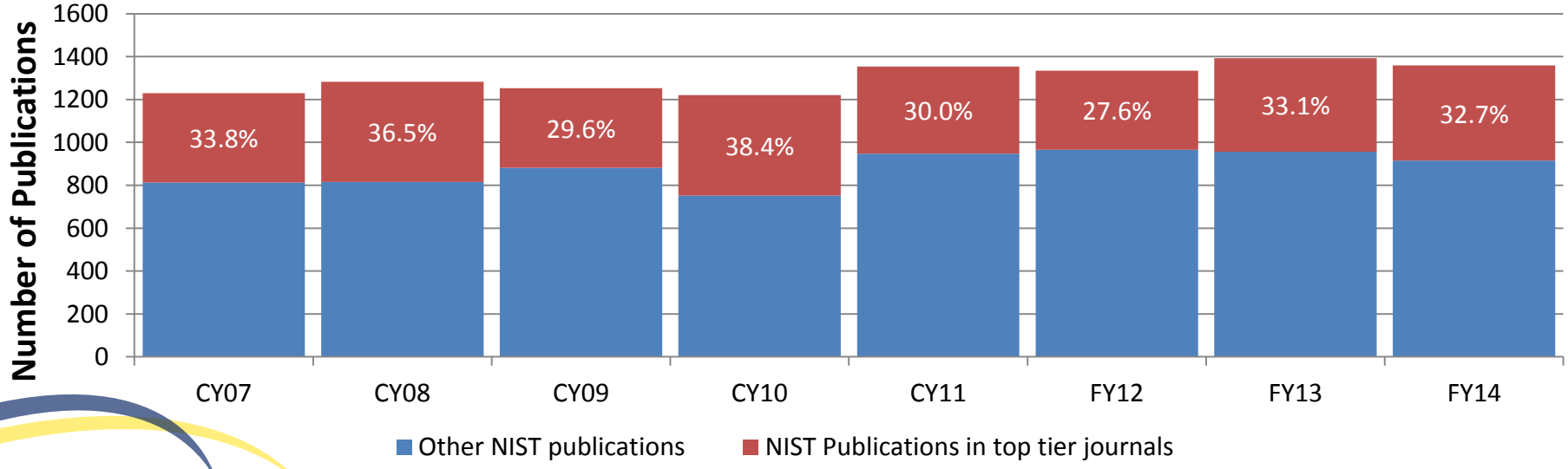
A Simple Start

- 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)



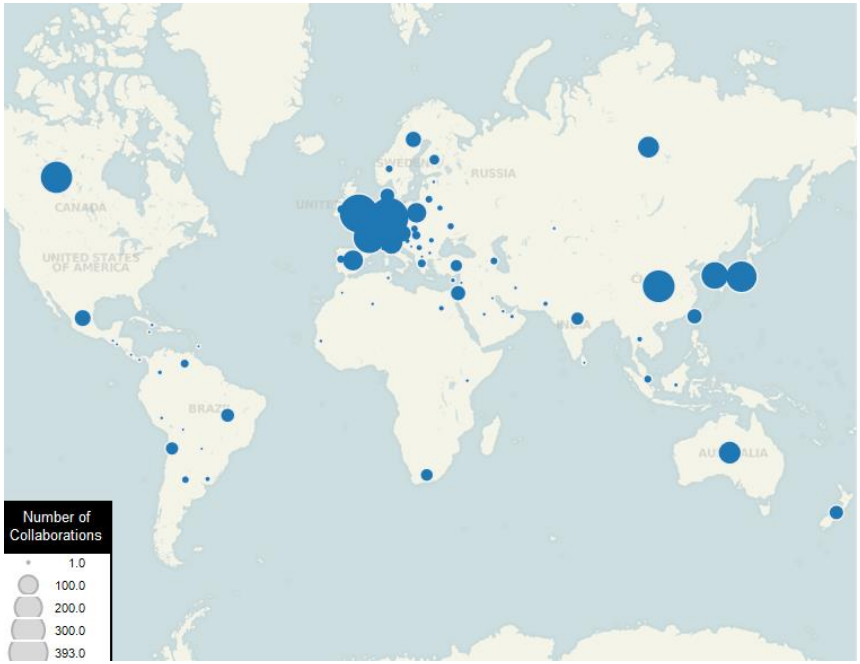
Developing Depth

- 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



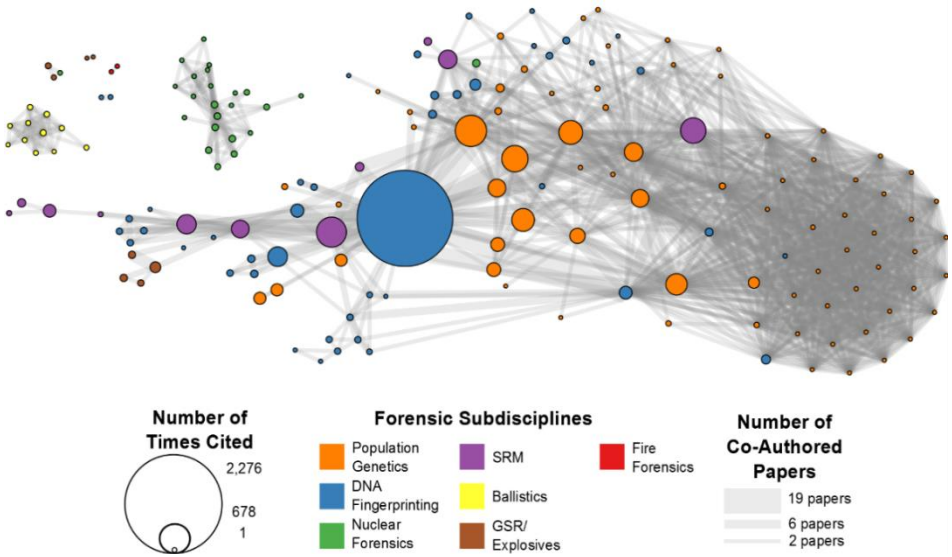
Providing Insight

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



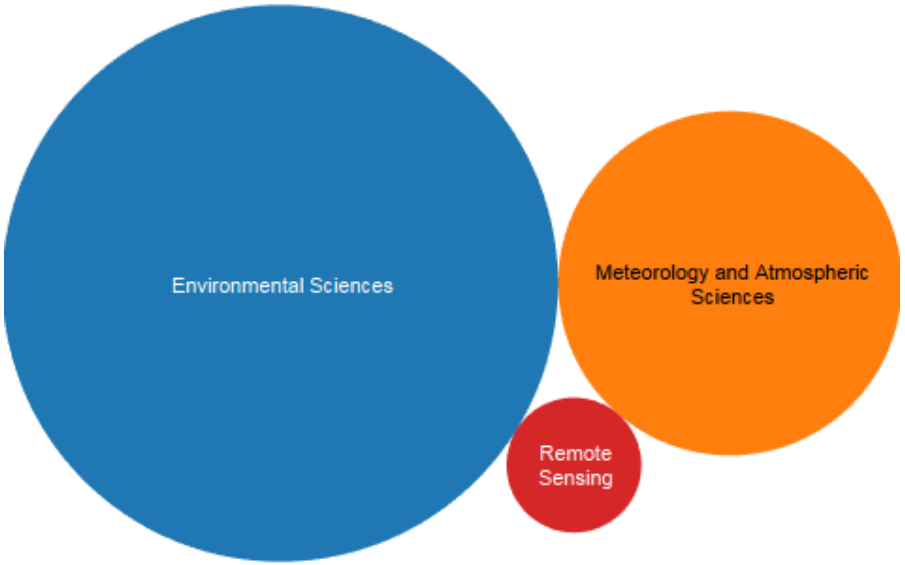
Applying Innovative Metrics

- Forensics@NIST Symposium
- Tools Used:
  - Web of Science
  - Sci^2
  - 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

Visualizing Data

- Tools used to meet the challenges of our customers' requests
  - Tableau
  - Science of Science Tool (SCI^2)
  - Gephi
- ISO's Data Visualization Computer
- Next steps

Providing Insight

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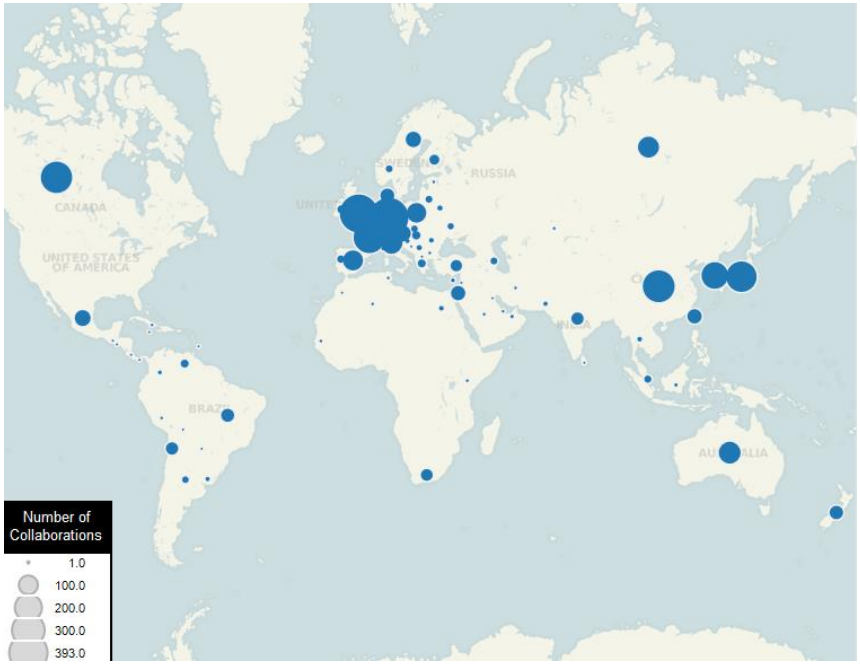

Tableau

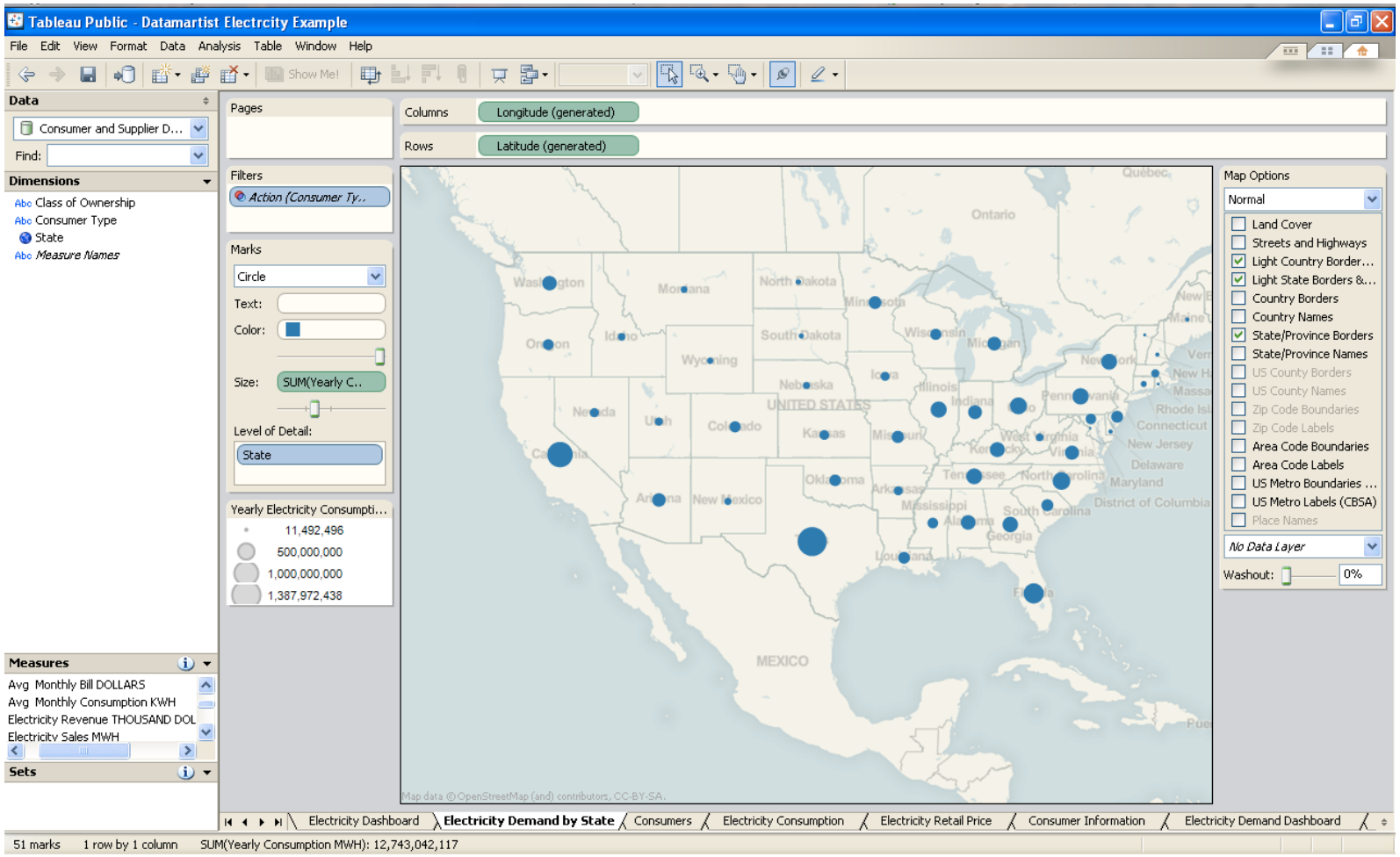
Tableau Public - Datamartist Electrcity Example
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Show Me!
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Abc Class of Ownership
Abc Consumer Type
State
Abc Measure Names
Measures
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Columns
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Map Options
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Streets and Highways
Light Country Border...
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Country Borders
Country Names
State/Province Borders
State/Province Names
US County Borders
US County Names
Zip Code Boundaries
Zip Code Labels
Area Code Boundaries
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Colorado
Kansas
Missouri
UNITED STATES
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Kentucky
Tennessee
North Carolina
South Carolina
Georgia
Alabama
Mississippi
Arkansas
Oklahoma
Texas
New Mexico
Arizona
California
Florida
MEXICO
Map data ©OpenStreetMap (and) contributors, CC-BY-SA.
Electricity Dashboard
Electricity Demand by State
Consumers
Electricity Consumption
Electricity Retail Price
Consumer Information
Electricity Demand Dashboard
51 marks
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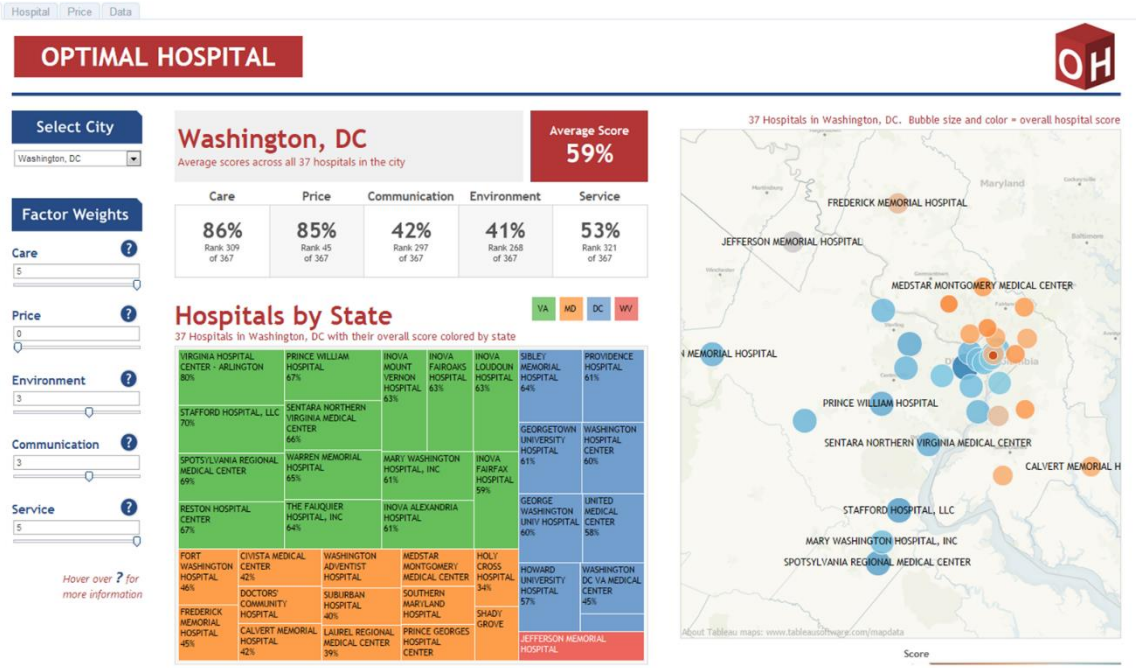
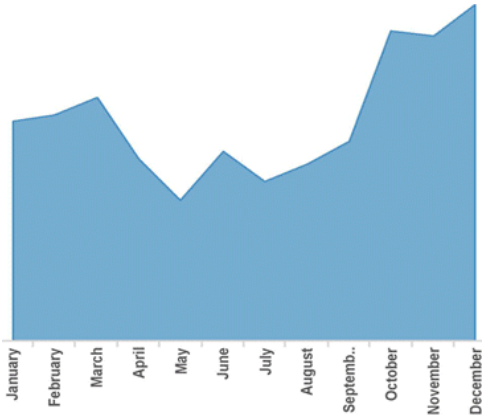
SUM(Yearly Consumption MWH): 12,743,042,117

Tableau


Hospital
Price
Data
OPTIMAL HOSPITAL
OH
Select City
Washington, DC
Factor Weights
Care
Price
Environment
Communication
Service
Hover over ? for more information
Washington, DC
Average scores across all 37 hospitals in the city
Average Score
59%
Care
86%
Rank 309 of 367
Price
85%
Rank 45 of 367
Communication
42%
Rank 297 of 367
Environment
41%
Rank 268 of 367
Service
53%
Rank 321 of 367
Hospitals by State
37 Hospitals in Washington, DC with their overall score colored by state
VA
MD
DC
WV
37 Hospitals in Washington, DC. Bubble size and color = overall hospital score
FREDERICK MEMORIAL HOSPITAL
JEFFERSON MEMORIAL HOSPITAL
MEDSTAR MONTGOMERY MEDICAL CENTER
PRINCE WILLIAM HOSPITAL
SENTARA NORTHERN VIRGINIA MEDICAL CENTER
STAFFORD HOSPITAL, LLC
MARY WASHINGTON HOSPITAL, INC
SPOTSYLVANIA REGIONAL MEDICAL CENTER
Score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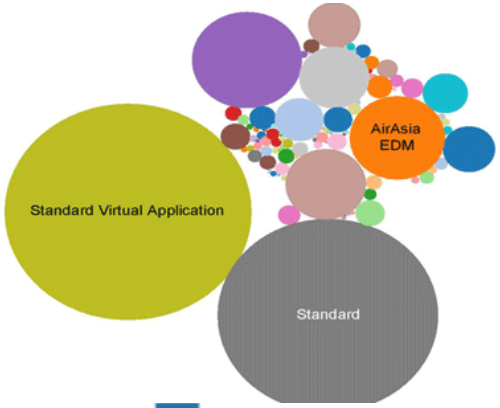
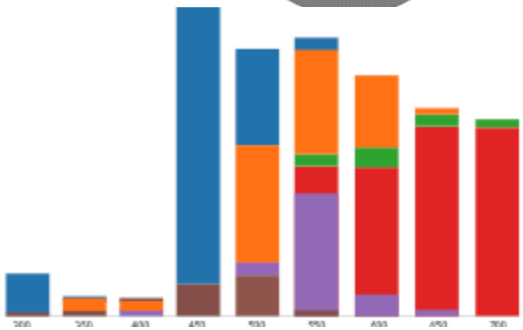

AirAsia EDM
Standard Virtual Application
Standard



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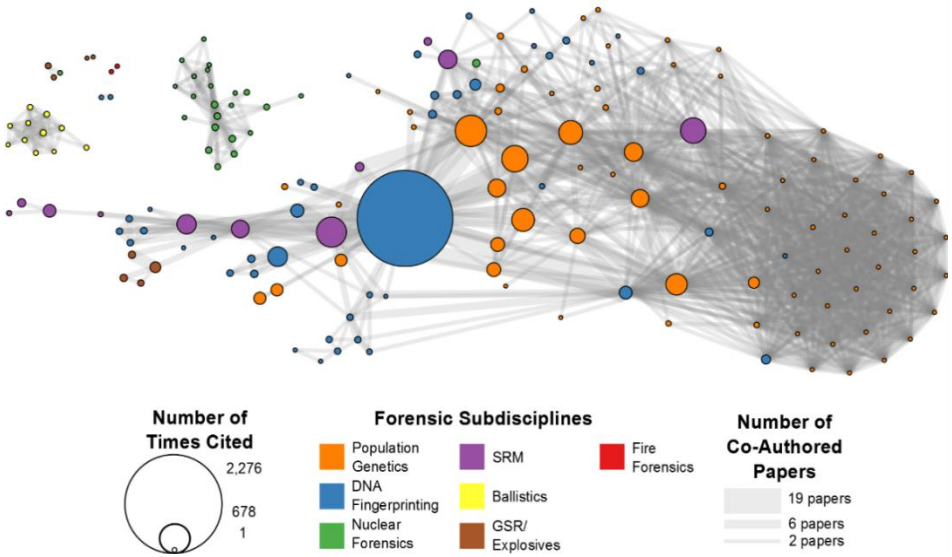
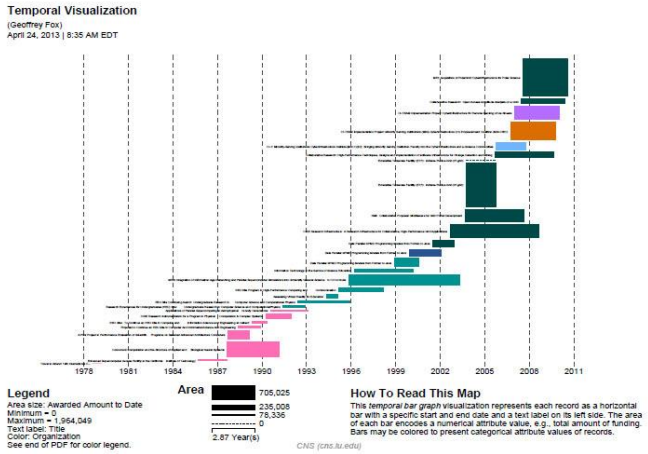
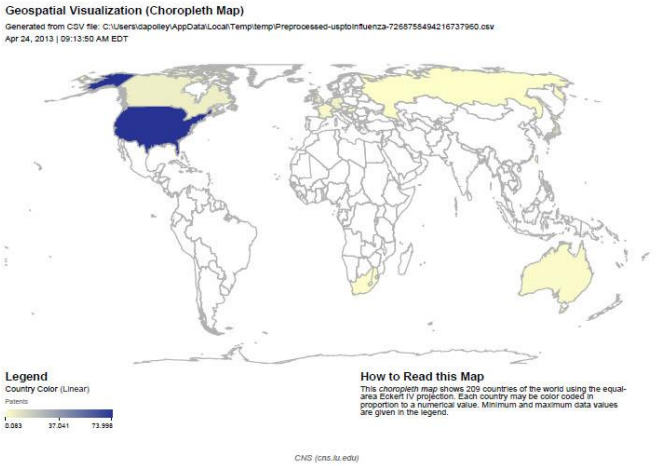
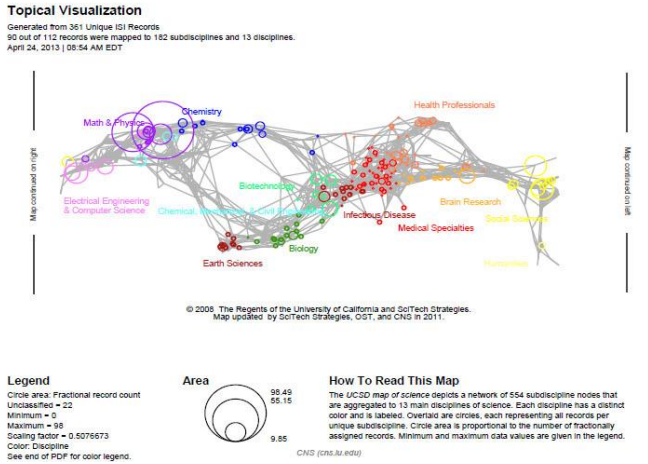
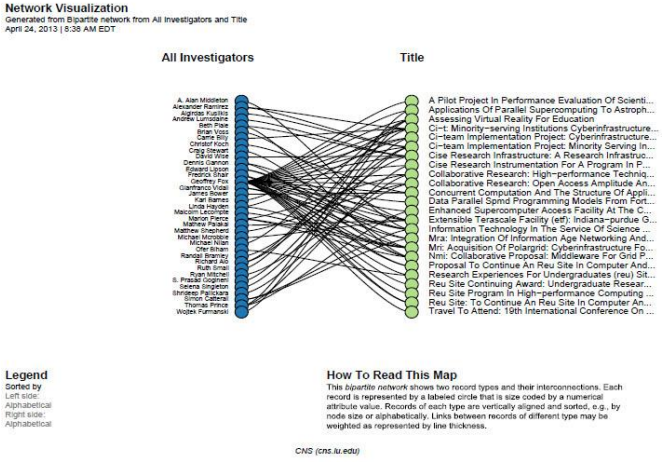


Science of Science Tool (Sci²)

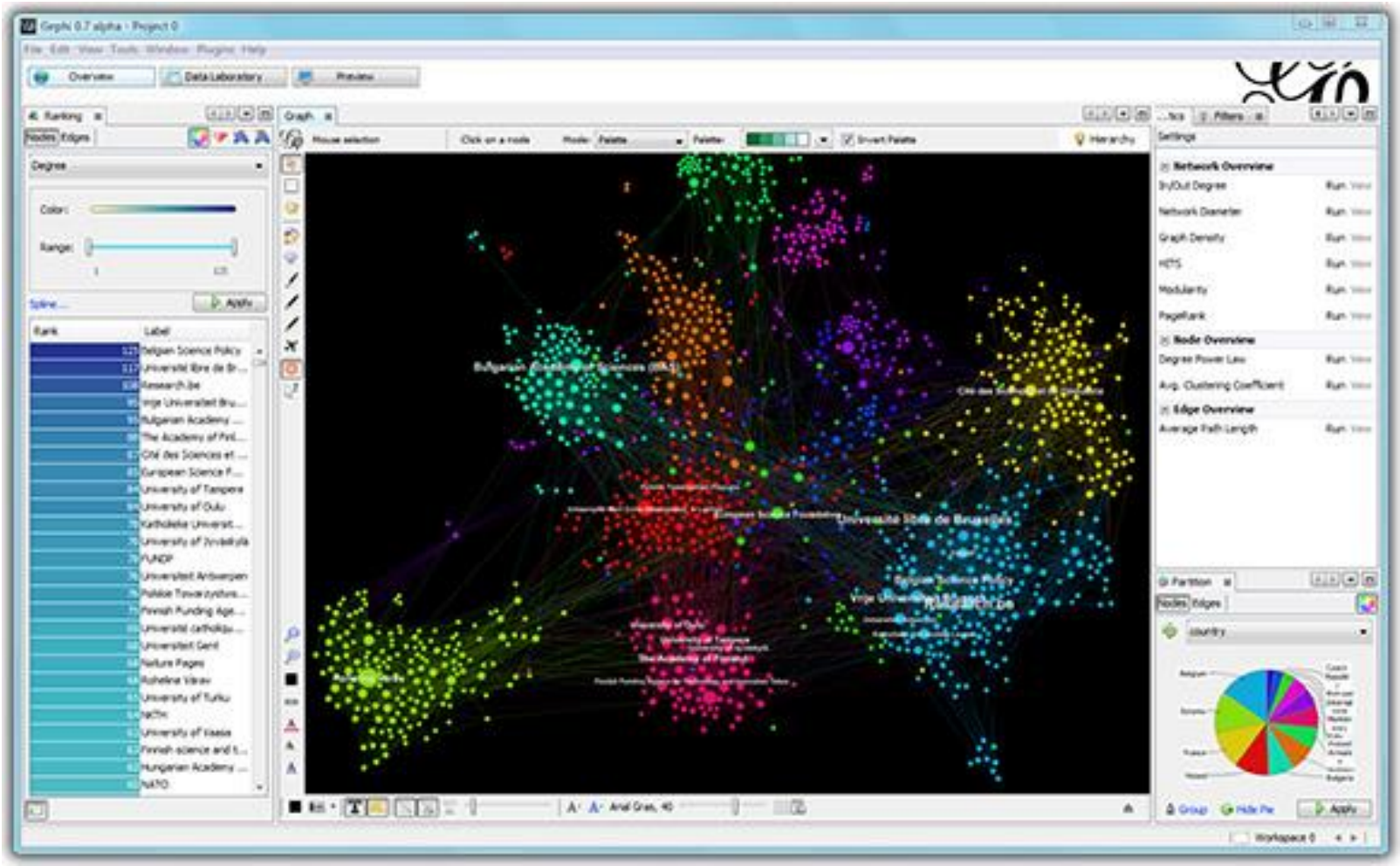








Gephi


Overview
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Bulgarian Academy
University of Tampere
University of Oulu
Katholieke Universit
University of Jyväskylä
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Pohlse Towarzystwo
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PageRank
Node Overview
Degree Power Law
Avg. Clustering Coefficient
Edge Overview
Average Path Length
Partition
Nodes
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Country
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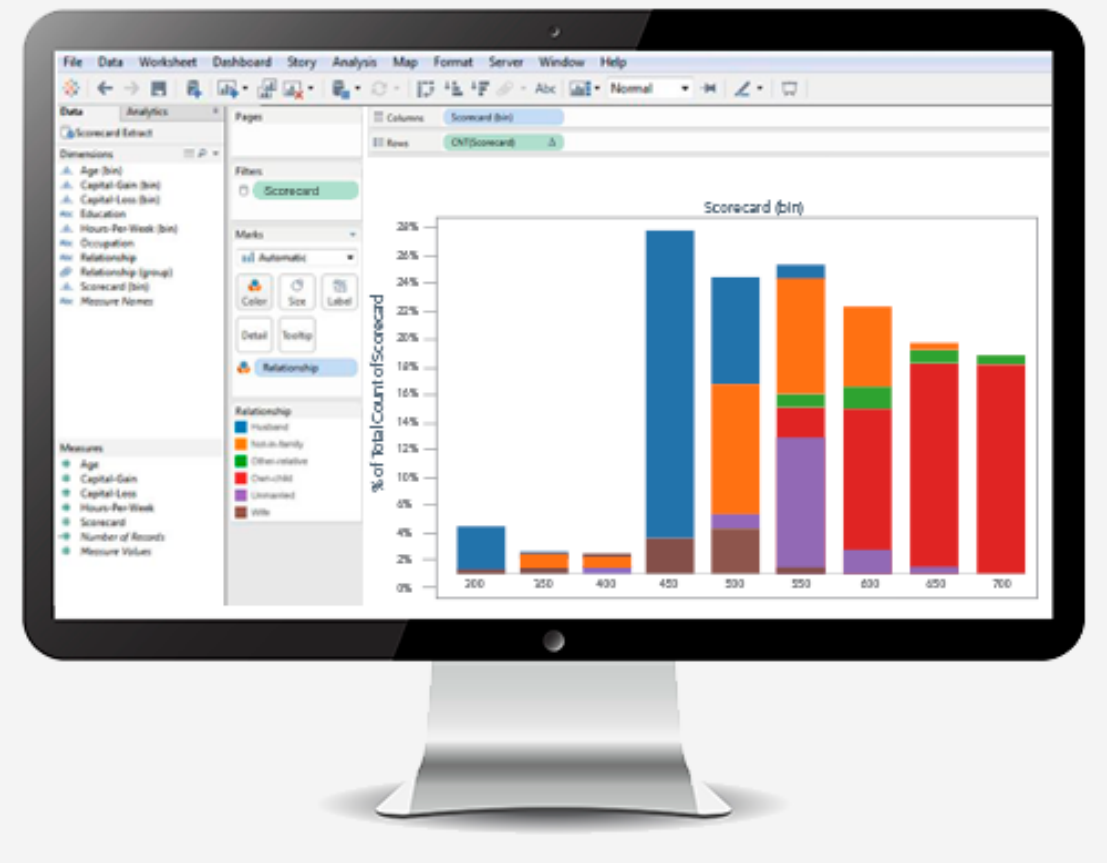
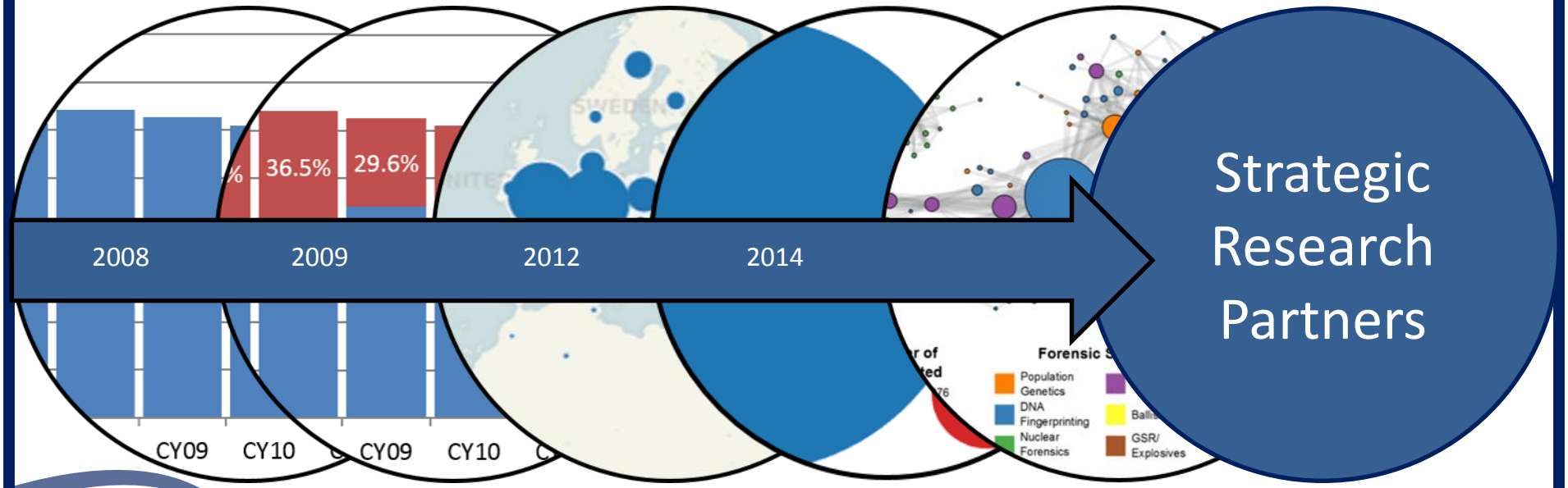
Data Visualization Computer

- Sci^2
- 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



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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