



Data Streams and Evolving STI

Every day, there are new

- Datasets/streams
- Tools and services
- Professional training opportunities

The landscape of science, technology, and innovation is changing:

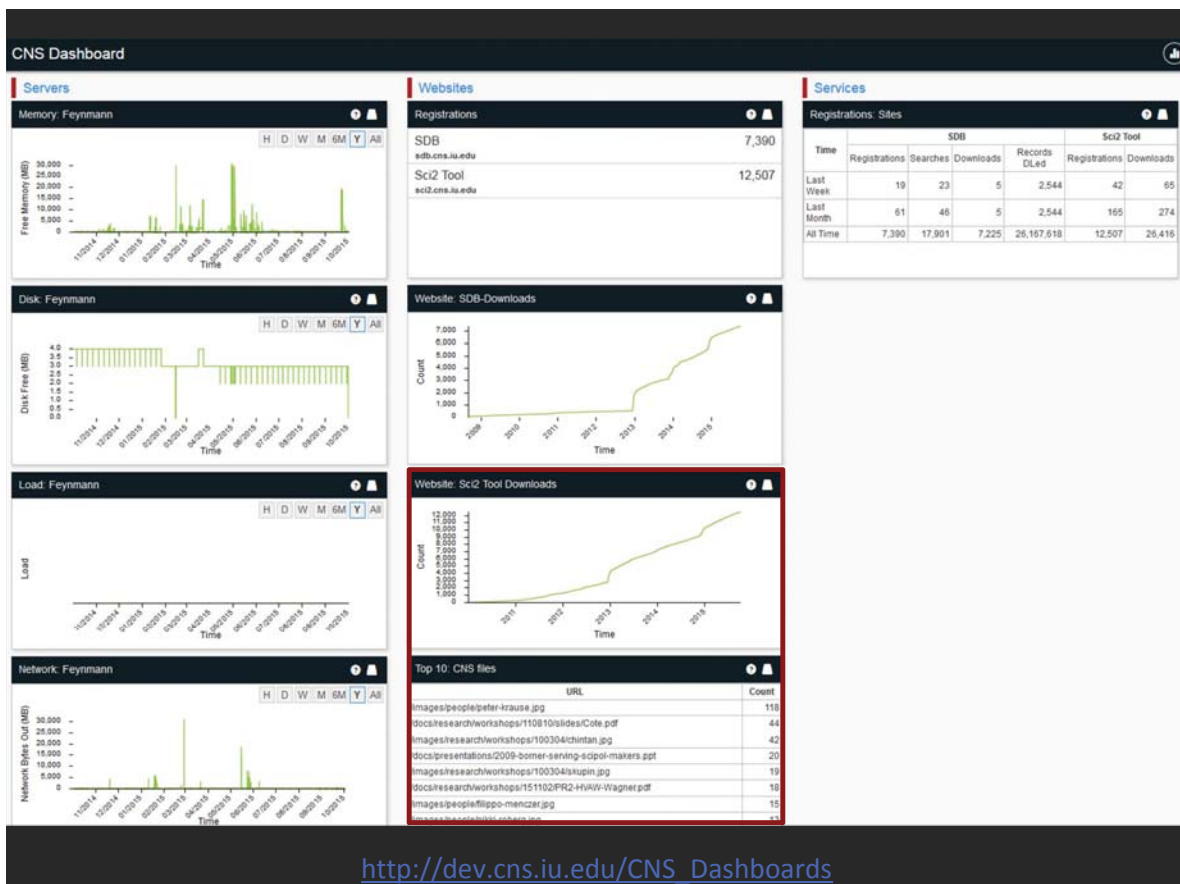
- New trends
- Bursts of activity
- New players
- Evolving R&D areas

Data Streams Important for CNS

Real-time monitoring of

- Servers (Hardware, Jetstream cloud)
Memory, disk, load, network
- Websites (CNS.iu.edu, Scimaps.org)
Users, accesses, top-URLs
- Services (IVMOOC, Sci2, SDB, VIVO)
Registrations, searches, downloads, exams completed

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http://dev.cns.iu.edu/CNS_Dashboards



Data Streams Important for Regenstrief

Real-time monitoring of healthcare data

- Dropped data feeds
- Changes in data volume
- Degrading quality of data (missing data, noise)
- New data fields

Research specific monitoring

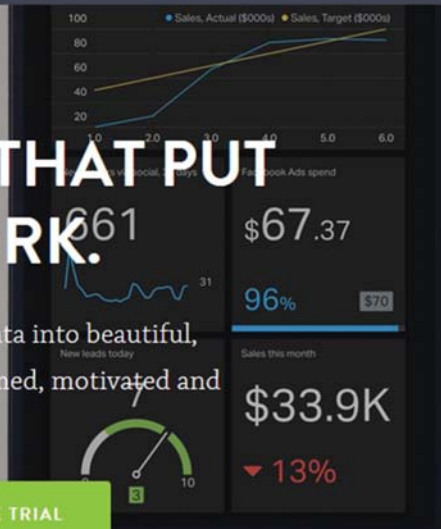
- # clinical trials
- # papers, citations
- # projects
- # news items, tweets

KPI DASHBOARDS THAT PUT YOUR DATA TO WORK.

Use Geckoboard to turn your key performance data into beautiful, accessible KPI dashboards that keep teams informed, motivated and data-driven.

BOOK A DEMO

START YOUR FREE TRIAL



<https://www.geckoboard.com>

A grid of 12 columns (A-L) and 5 rows of dashboard widgets. Row A includes Airbrake, Amazon Web Services, and AppFolio. Row B includes Basecamp, Bitly, and Buffer. Row C includes CSV, Campaign Monitor, and Chargify. Row D includes Chartbeat and Clock. Row E includes DesignRabbit. Row F includes Facebook Ads, Facebook, and FLURRY. Row G includes FreshBooks, Satisfaction, GitHub, and GoSquared. Row H includes Zendesk, Instagram, and HubSpot. Row I includes JIRA and Jenkins. Row J includes KLOUT. Row K includes LinkedIn. The text 'plus many more ...' is located at the bottom right of the grid.

<https://www.geckoboard.com>

SPACE WEATHER PREDICTION CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Sunday, November 01, 2015 02:51:38 UTC

HOME ABOUT SPACE WEATHER PRODUCTS AND DATA DASHBOARDS MEDIA AND RESOURCES SUBSCRIBE ANNUAL MEETING FEEDBACK

Search

SPACE WEATHER CONDITIONS on NOAA Scales

24-Hour Observed Maximums: **R1** (minor), **S** (none), **G** (none)

Latest Observed: **R** (none), **S** (none), **G** (none)

Predicted 2015-11-01 UTC: **R1-R2** (55%), **S1 or greater** (1%), **R3-R5** (15%), **G** (none)

Solar Wind Speed: **366** km/sec Solar Wind Magnetic Fields: Bt **6** nT, Bz **-3** nT Noon 10.7cm Radio Flux: **119** sfu

USAF Wing Kp Predicted Activity Index (Begin: 2015-08-24 14:00:00UTC)

G3 (Strong) & G2 (Moderate) Geomagnetic Storm Watches Issued for 02-03 November
published: Saturday, October 31, 2015 19:51 UTC
A G3 (Strong) geomagnetic storm watch has been issued for 02 November (UTC day) and a G2 (Moderate) watch has been issued for 03 November as a recu

National Space Weather Strategy and Action Plan Released
published: Thursday, October 29, 2015 21:59 UTC
Today, OSTP Director John Holdren announced the release of the [plan](#)

Wing Kp Model Output to Change
published: Friday, October 23, 2015 21:30 UTC
The Wing Kp model output will be modified as SWPC

Sometimes the Aurora can be Predicted
published: Thursday, October 22, 2015 13:04 UTC
It can sometimes be difficult to predict the timing and intensity of geomagnetic storming and correspondingly, the aurora, but sometimes it isn't.

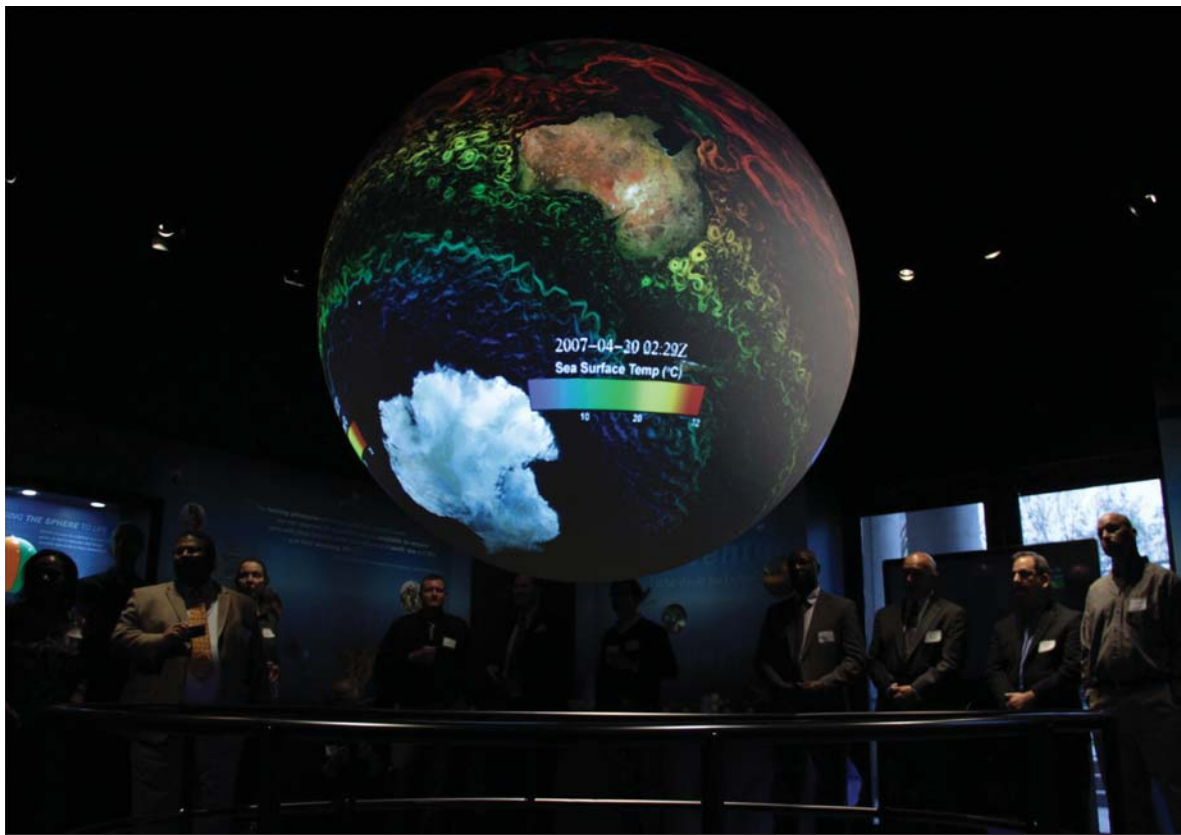
SERVING ESSENTIAL SPACE WEATHER COMMUNITIES

- Aviation Radio Communications
- Electric Power Satellites
- Emergency Management Space Weather Enthusiasts
- Global Positioning System (GPS)

THE SUN'S X-RAYS
GOES-15 S30 Level 3
NOAA/SWPC Boulder, CO

CORONAL MASS EJECTIONS

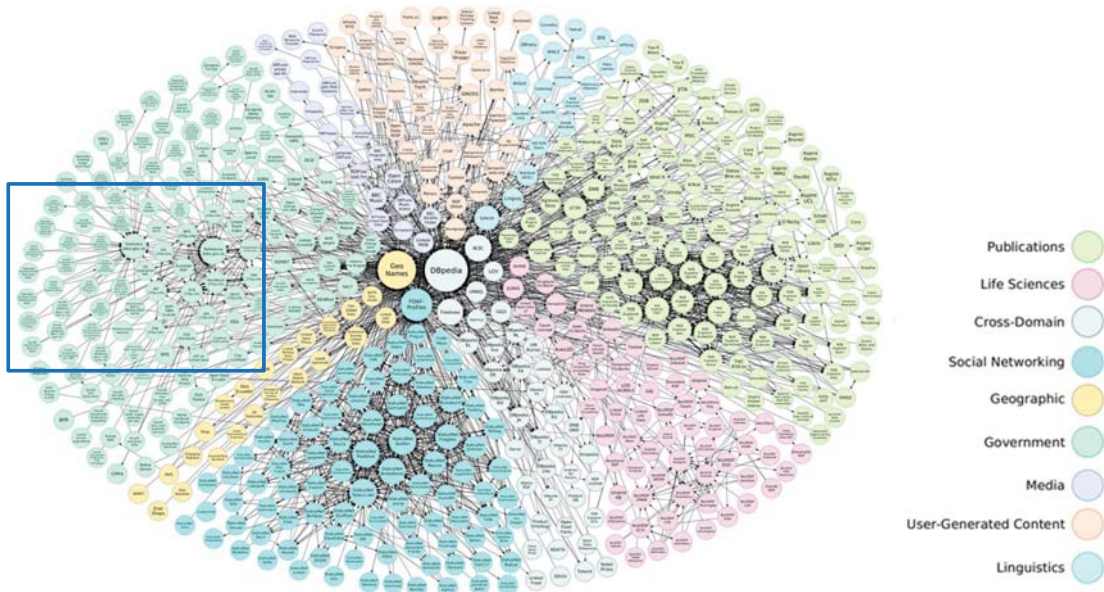
THE AURORA
Aurora Forecast
NOVAION Prime Model



<http://sos.noaa.gov> and [http://sos.noaa.gov/Getting SOS/first_steps.html](http://sos.noaa.gov/Getting_SOS/first_steps.html)

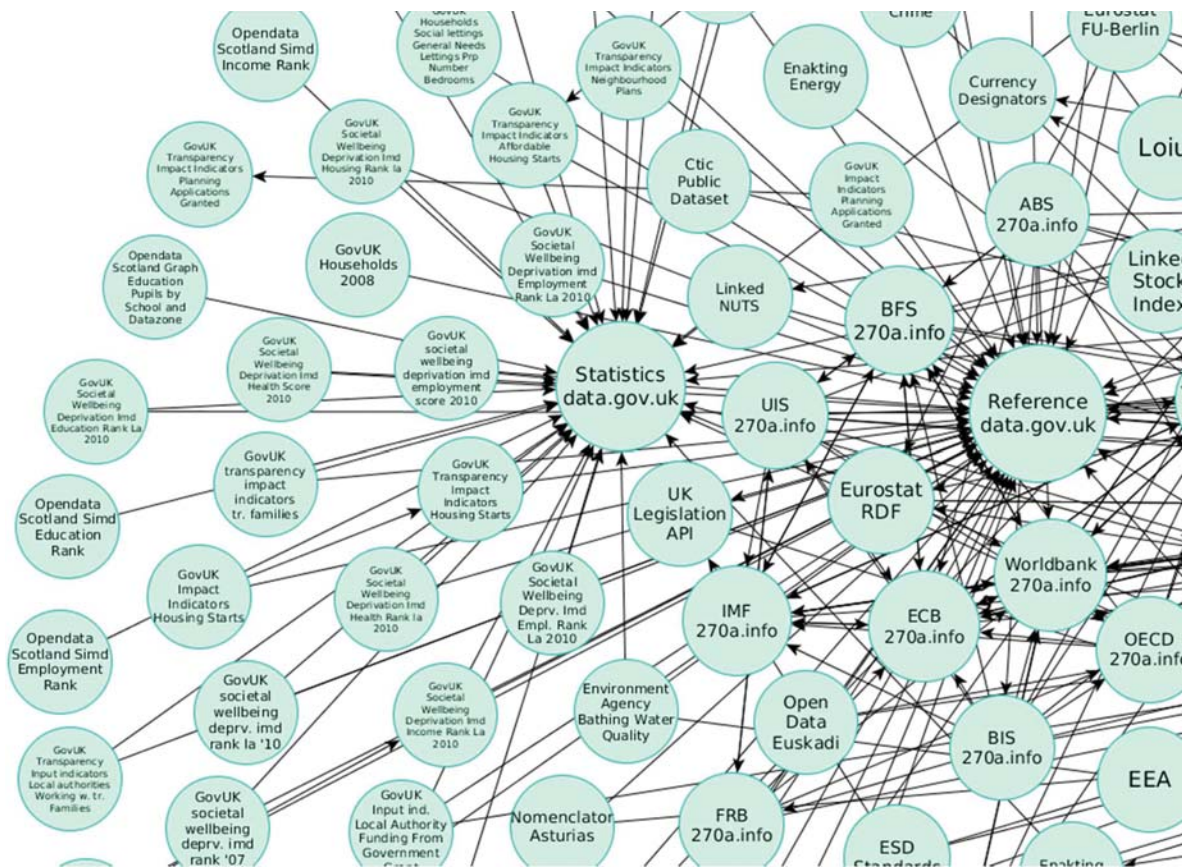


Data – medical, environmental, scientific, patent

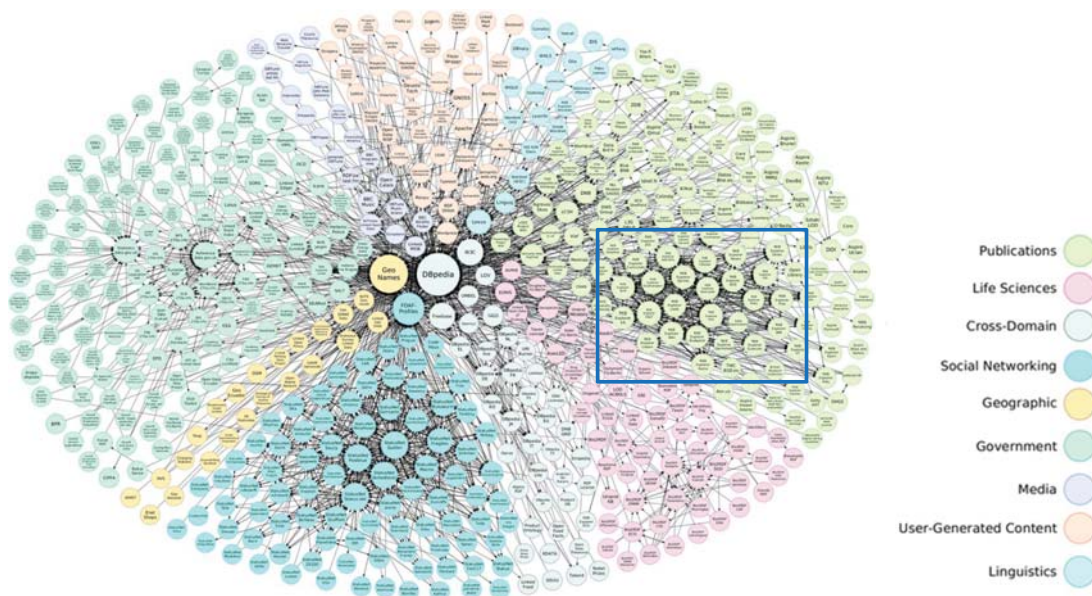


Linked Open Data Cloud Diagram 2014

<http://data.dws.informatik.uni-mannheim.de/lodcloud/2014/>

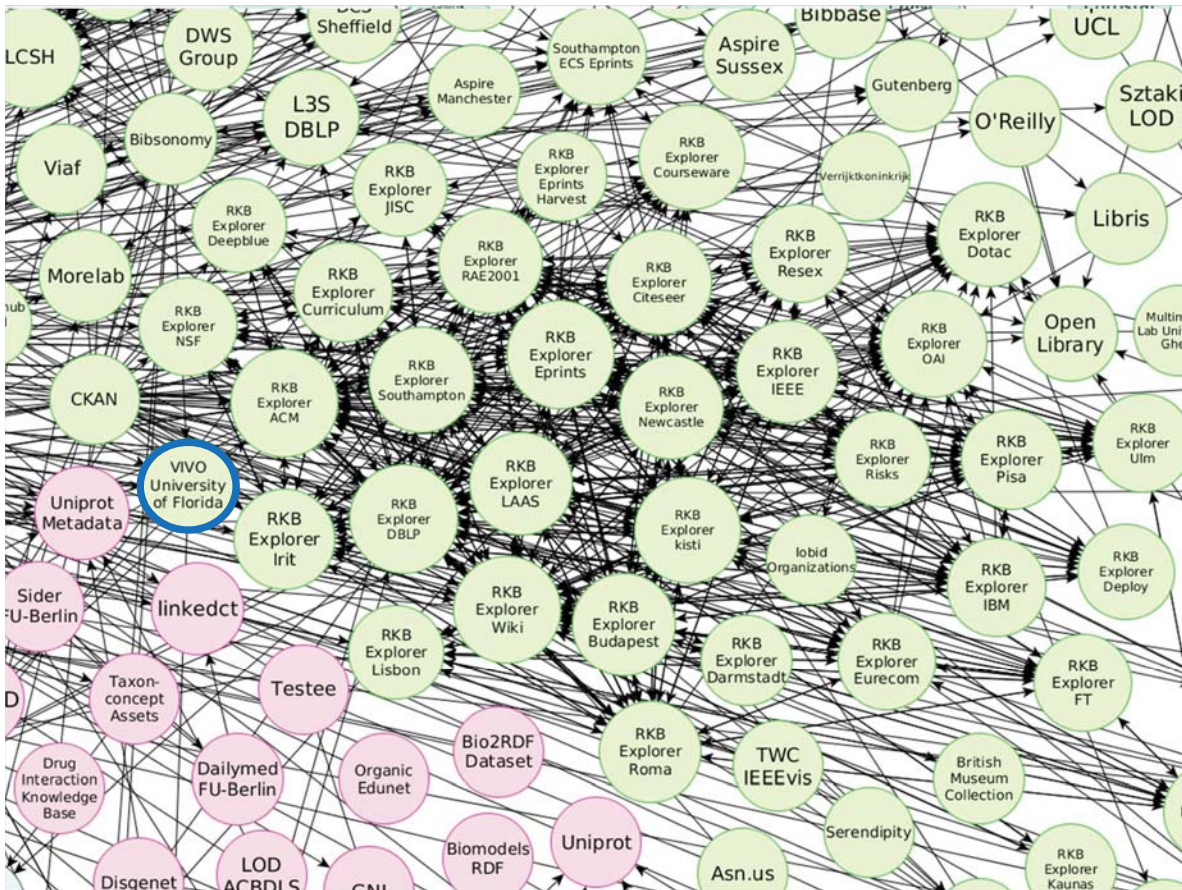


Data – Expertise



Linked Open Data Cloud Diagram 2014

<http://data.dws.informatik.uni-mannheim.de/lodcloud/2014/>



VIVO connect + share + discover

Home About Download

<http://vivoweb.org>

An interdisciplinary network

Enabling **collaboration** and discovery among **scientists** across all disciplines.

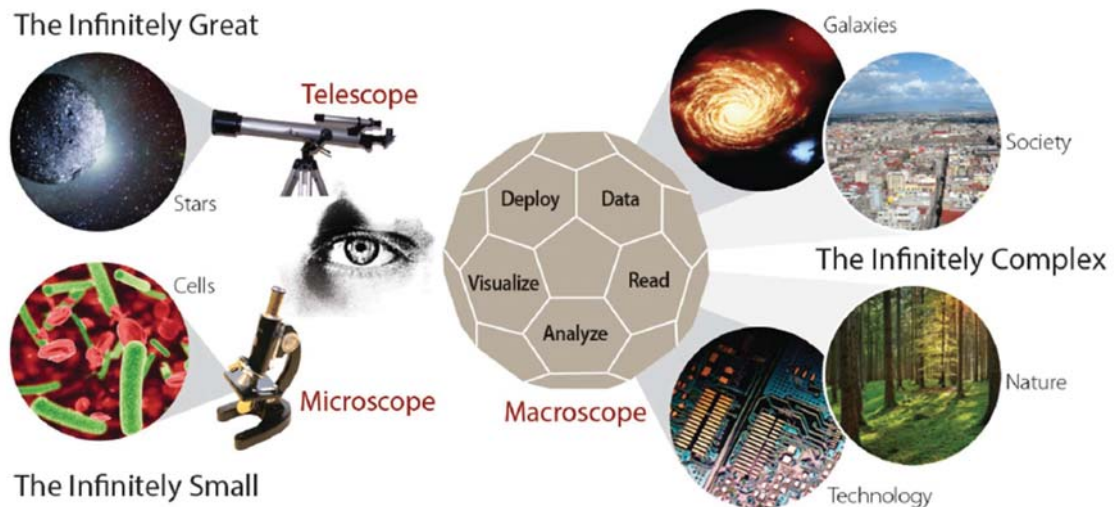


<http://nrn.cns.iu.edu>

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Code – analysis, simulation, visualization

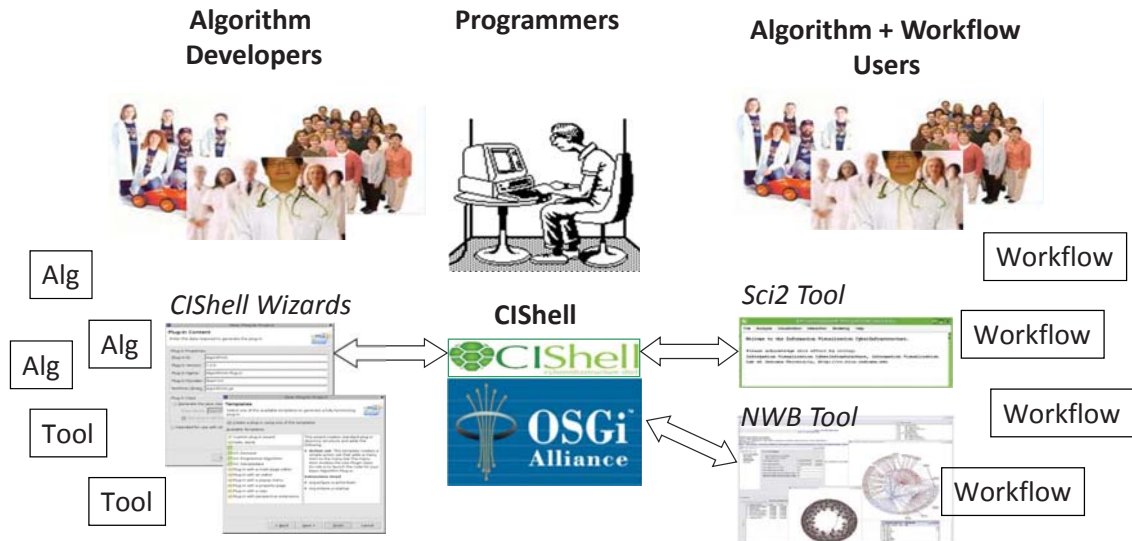
Microscopes, Telescopes, Macrosopes Plug-and-Play Macrosopes



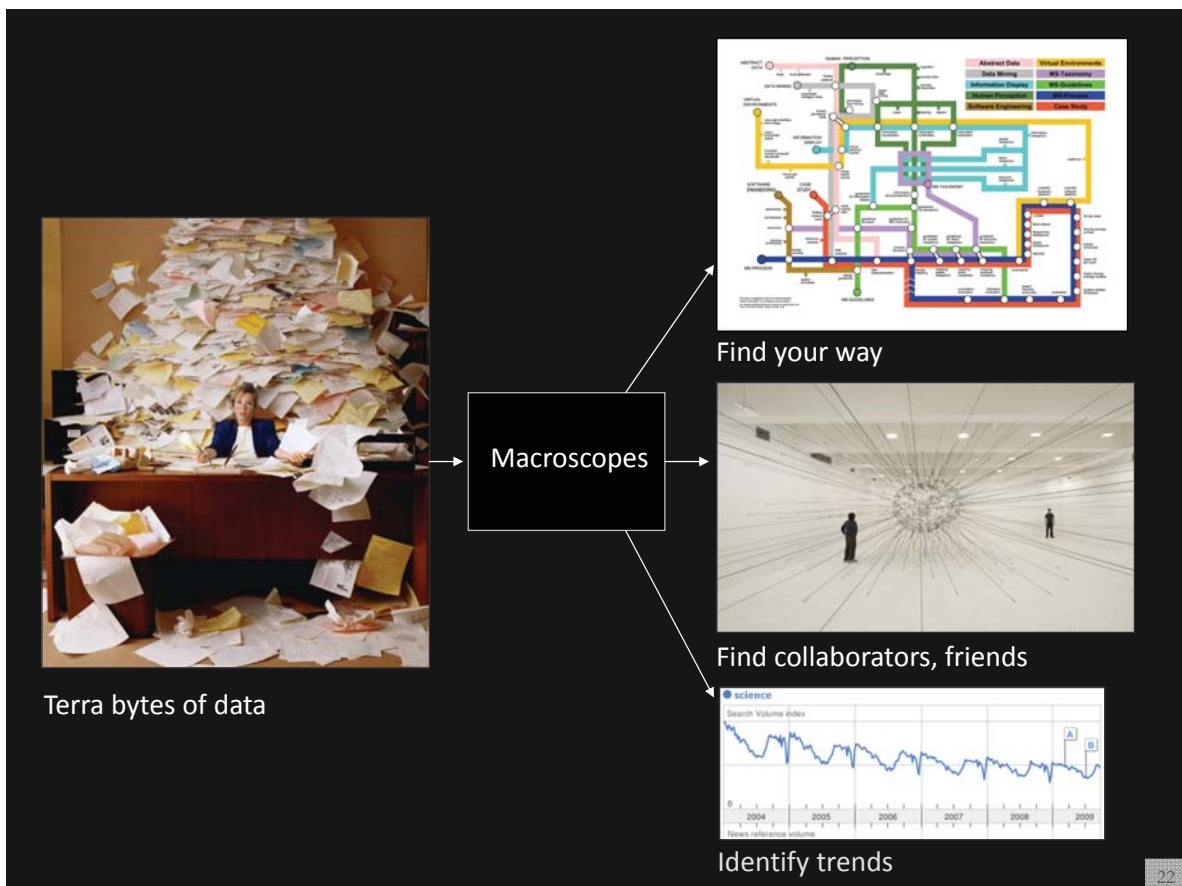
20

Code – analysis, simulation, visualization

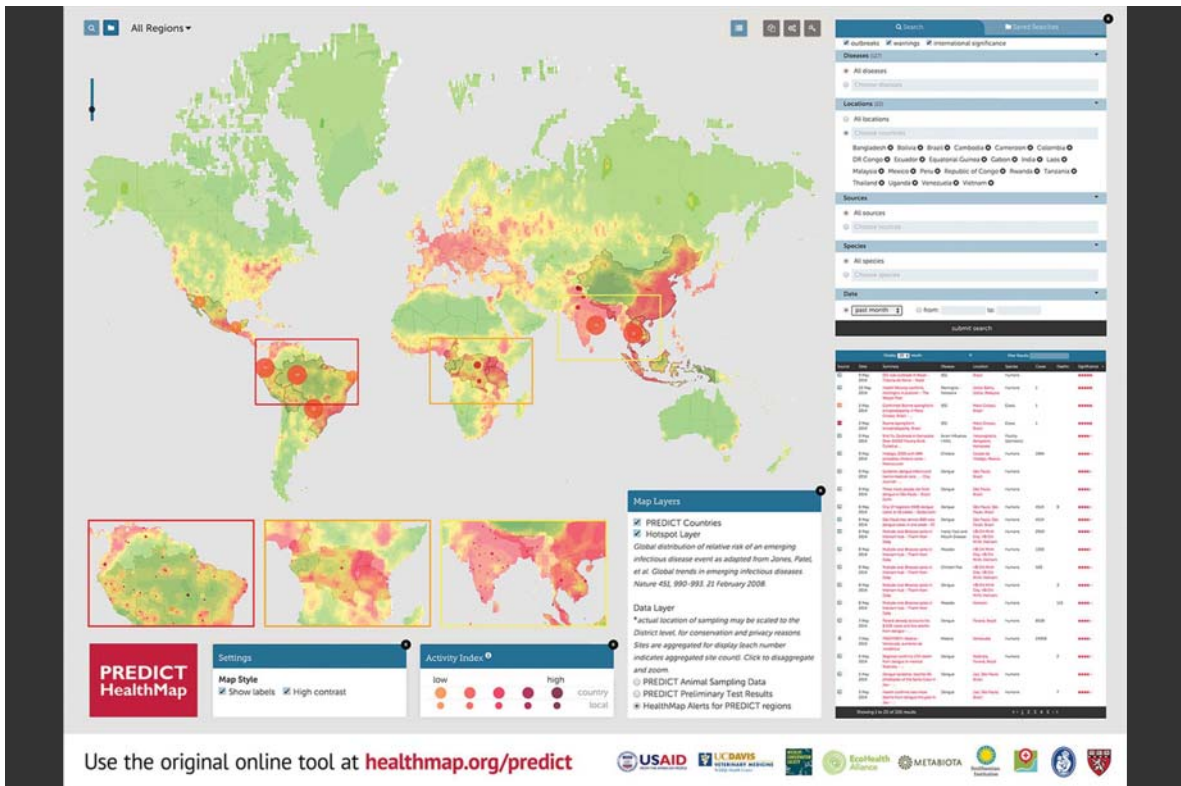
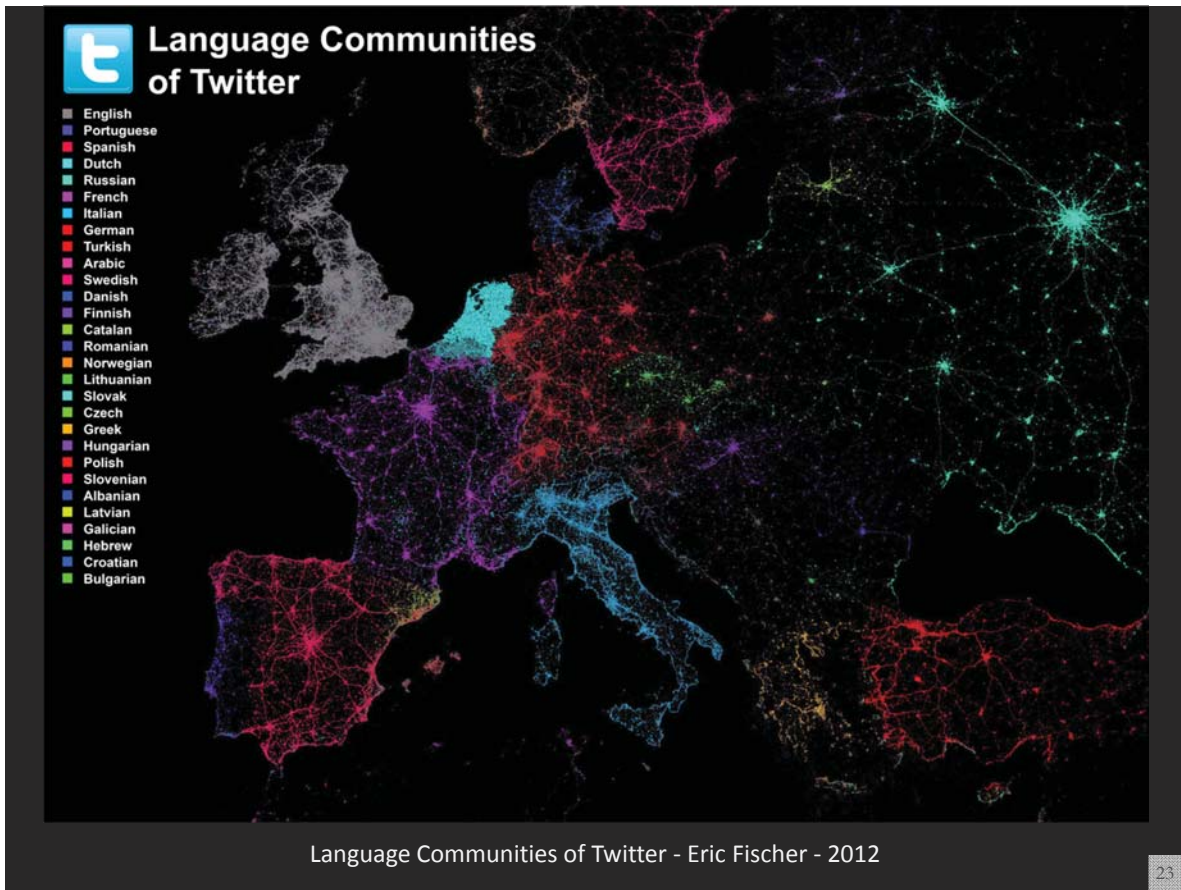
Plug-and-Play Macroscopes



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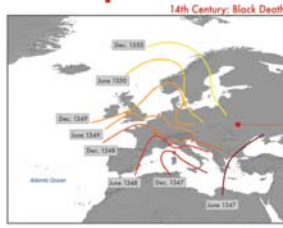


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PREDICT: HealthMap - John Brownstein, Damien Joly, William Karesh, Peter Daszak, Nathan Wolfe, Tracey Goldstein, Susan Aman, Clark Freifeld, Sumiko Mekaru, Tammie O'Rourke, Stephen Morse, Christine Kreuder Johnson, Jonna Mazet, and the PREDICT Consortium - 2014

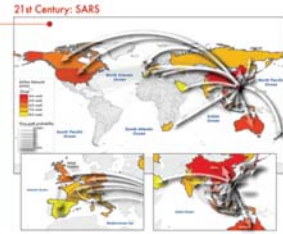
Impact of Air Travel on Global Spread of Infectious Diseases



Epidemic spreading pattern changed dramatically after the development of modern transportation systems.

In pre-industrial times disease spread was mainly a spatial diffusion phenomenon. During the spread of Black Death in the 14th century Europe, only few traveling means were available and typical trips were limited to relatively short distances on the time scale of one day. Historical studies confirm that the disease diffused smoothly generating an epidemic front traveling as a continuous wave through the continent at an approximate velocity of 200-400 miles per year.

The SARS outbreak on the other hand was characterized by a patchy and heterogeneous spatiotemporal pattern, mainly due to the air transportation network identified as the major channel of epidemic diffusion and ability to connect far apart regions in a short time period. The SARS maps are obtained with a data-driven stochastic computational model aimed at the study of the SARS epidemic pattern and analysis of the accuracy of the model's predictions. Simulation results describe a spatiotemporal evolution of the disease (color coded countries) in agreement with the historical data. Analysis on the robustness of the model's forecasts leads to the emergence and identification of epidemic pathways as the most probable routes of propagation of the disease. Only few preferential channels are selected (arrows), while indicating the probability of propagation along that path) out of the huge number of possible paths the infection could take by following the complex nature of airline connections (light grey, source: IATA).



Forecasts of the Next Pandemic Influenza

Seasonal

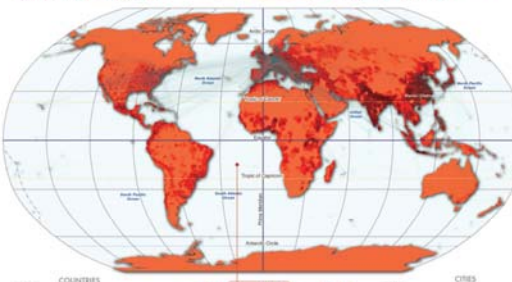


Forecasts are obtained with a stochastic computational model which explicitly incorporates data on worldwide air travel and detailed census data to simulate the global spread of an influenza pandemic.

The modeling approach considers infection dynamics (i.e., virus transmission, onset of symptoms, infectiousness, recovery, etc.) among individuals living in urban areas around the world, and assumes that individuals are allowed to travel from one city to another by means of the airline transportation network.

Numerical simulations provide results for the temporal and geographic evolution of the pandemic influenza in 2,100 urban areas located in 220 different countries. The model allows to study different spreading scenarios, characterized by different initial outbreak conditions, both geographical and seasonal.

The central map represents the cumulative number of cases in the world after the first year from the start of a pandemic influenza with $R_0=1.9$ originating in Hanoi (Vietnam) in the Spring.



The US maps focus on the situation in the US after one year, and show the effect of changes in the original scenario analyzed. Different color coding is used for the sake of visualization.

The model includes the worldwide air transportation network (source: IATA) consisting of 3,100 airports in 220 countries and 47,182 direct connections, each of them associated to the corresponding passenger flow. This dataset accounts for 99% of the worldwide traffic and is complemented by the census data of each large metropolitan area served by the corresponding airport.

Additional spreading scenarios can be obtained by modeling different levels of infectiousness of the virus, as expressed in terms of the reproductive number R_0 , representing the average number of infections generated by a sick person in a fully susceptible population.

Intervention strategies modeling the use of antiviral drugs can be considered. Two scenarios are compared: an uncooperative strategy in which countries only use their own stockpiles, and a cooperative intervention which envisions a limited worldwide sharing of the resources.

Reproductive Number (R_0)



Intervention



Impact of Air Travel on Global Spread of Infectious Diseases - Vittoria Colizza, Alessandro Vespignani - 2007

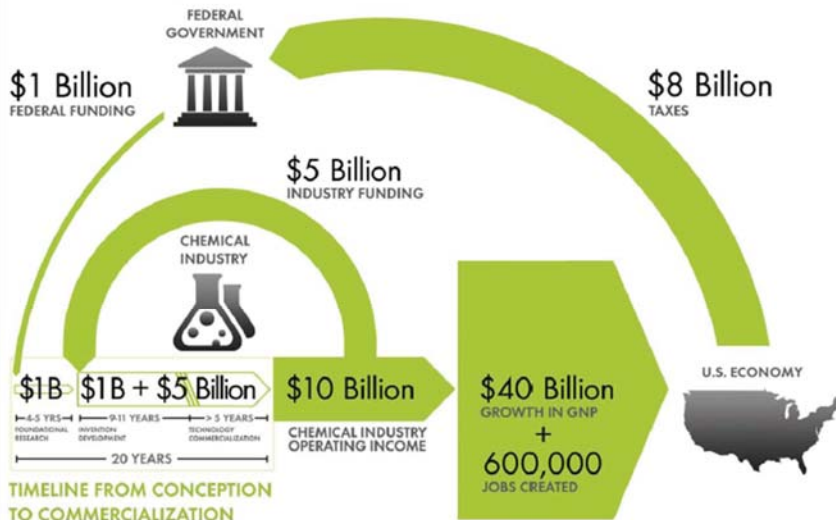
Chemical Research & Development Powers the U.S. Innovation Engine

Macroeconomic Implications of Public and Private R&D Investments in Chemical Sciences

The Council for Chemical Research (CCR)

has provided the U.S. Congress and government policy makers with important results regarding the impact of Federal Research & Development (R&D) investments on U.S. innovation and global competitiveness through its commissioned 5-year two phase study. To take full advantage of typically brief access to policy makers, CCR developed the graphic below as a communication tool that distills the complex data produced by these studies in direct, concise and clear terms.

INVESTMENT IN CHEMICAL SCIENCE R&D



The design shows that an input of \$1B in federal investment, leveraged by \$5B industry investment, brings new technologies to market and results in \$10B of operating income for the chemical industry, \$40B growth in the Gross National Product (GNP) and further impacts the US economy by generating approximately 600,000 jobs, along with a return of \$8B in taxes. Additional details, also reported in the map to the left. This map clearly shows the two R&D investment cycles: the shorter industry investment cycle; the longer federal investment cycle which begins in basic research and culminates in national economic and job growth along with the increase tax base that in turn is available for investment in basic research.

Council for Chemical Research. 2009. Chemical R&D Powers the U.S. Innovation Engine. Washington, DC. Courtesy of the Council for Chemical Research.



Illuminated Diagram Display on display at the Smithsonian in DC. http://scimaps.org/exhibit_info/#ID

Geographic Map: Where Science Gets Done

Science Map: How Scientific Disciplines Relate

About

This Illuminated Diagram display adds the flexibility of an interactive program to the incredibly high data density of a print. This technique is generally useful when there is too much pertinent data to be displayed on a screen but the data is relatively stable. The computer can direct the eye to what's important by using projectors or screens as smart spotlights, animating the research impact of individuals, giving a "grand tour" of science, or highlighting query results (as when you touch the lectern or use the keyboard) with an overlay of moving light.

Top Five Continents

- North America - 4,000 records
- South & East Asia - 3,589
- Australia - 2,431
- Africa - 2,208
- South America - 1,562

Top Five Scientific Disciplines

- Math & Physics - 4,000 records
- Health Professionals - 3,589
- Social Sciences - 2,431
- Aeronautical, Chemical, Mechanical & Civil Engineering - 2,208
- Humanities - 1,562

Input your search query here.

| | | | | | | | | | |
|-------|---|---|---|---|---|---|---|---|----|
| Q | W | E | R | T | Y | U | I | O | P |
| A | S | D | F | G | H | J | K | L | " |
| Z | X | C | V | B | N | M | | | |
| Space | | | | | | | | | Go |

Search

The keyboard supports retrieval and display of papers based on their Medical Subject Headings (MeSH) and MeSH qualifier terms. If multiple terms are entered in a field, they are automatically combined using "OR". So, "breast cancer" matches any record with "breast" or "cancer" in that field. You can put AND between terms to combine with "AND". Thus "breast AND cancer" would only match records that contain both terms. Double quotation can be used to match compound terms, e.g., "breast cancer" retrieves records with the phrase "breast cancer", and not records where "breast" and "cancer" are both present, but the exact phrase.

<http://scimaps.org>

People & Topics

Geographic Map: Where Science Gets Done

Regions labeled: North America, Central America, South America, Oceania, Antarctica, Europe, North & West Asia, South & East Asia, Africa, Australia.

Science Map: How Scientific Disciplines Relate

Disciplines shown: Math & Physics, Chemistry, Health, Professional, Social, Sciences, Brain Research, Humanities, Inference, Statistics, Biology, Earth Sciences, Biotechnology, Agricultural, Chemical, Mechanical & Civil Engineering, Medical Operations.

Copyright © 2008 The Regents of the University of California

About

This Illuminated Diagram display adds the flexibility of an interactive program to the incredibly high data density of a print. This technique is generally useful when there is too much pertinent data to be displayed on a screen but the data is relatively stable. The computer can direct the eye to what's important by using projectors or screens as smart spotlights, animating the research impact of individuals, giving a "grand tour" of science, or highlighting query results (as when you touch the lectern or use the keyboard) with an overlay of moving light.

Elinor Ostrom - Nobel Prize in Economic Sciences 2009

Born: 7 August 1933, New York, NY, USA
Affiliation at the time of the award: Indiana University, Bloomington, IN, USA, Arizona State University, Tempe, AZ, USA
Prize motivation: "for her analysis of economic governance, especially the commons"
Field: Economic governance
Contribution: Challenged the conventional wisdom by demonstrating how local property can be successfully managed by local commons without any regulation by central authorities or privatization.

Interact

Select any location on the Geographic Map location (by brushing your finger over an area on the lectern's touch screen) and topics studied in that area will highlight on the Science Map; the brighter a topic glows, the more papers on that topic originated in the selected area. Conversely, touching a scientific area in the Science Map illuminates places on the Geographic Map where that topic is studied. People and topic buttons support the exploration of publication output by selected Nobel laureates and particular lines of research using MEDLINE data from 2000-2009.

<http://scimaps.org>

Cancer

Cloning

HIV

Robert G. Edwards

Roger D. Kornberg

Elinor Ostrom

Obesity

Quality of Life

Smoking

Stanley B. Prusiner

Ahmed H. Zewail

View All

Keyword Search

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Open Education

Education – K-12, college, grad., informal, professional training



“Expedition Zukunft” German science train visiting 62 cities in 7 months. 12 coaches, 300 m long.



North Carolina State’s Immersion Theater



Hidalgo, et al., 2007.
See also The Product Space map in <http://scimaps.org>

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Places & Spaces Exhibit at the David J. Sencer CDC Museum, Atlanta, GA
January 25-June 17, 2016

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Overview

This course provides an overview about the state of the art in information visualization. It teaches the process of producing effective visualizations that take the needs of users into account.

The course can be taken for three Indiana University credits as part of the **Online Data Science Program**, as part of the Information and Library Science M.S. program, and as part of the online Data Science M.S. Program offered by the School of Informatics and Computing. Students seeking enrollment information should contact Rhonda Spencer at 812-855-2018, ilsmain@indiana.edu or datasci@indiana.edu.
















[Register for Course](#)

Already registered? [Click here to go to the course.](#)
 Forgot your password? [Click here to reset it.](#)

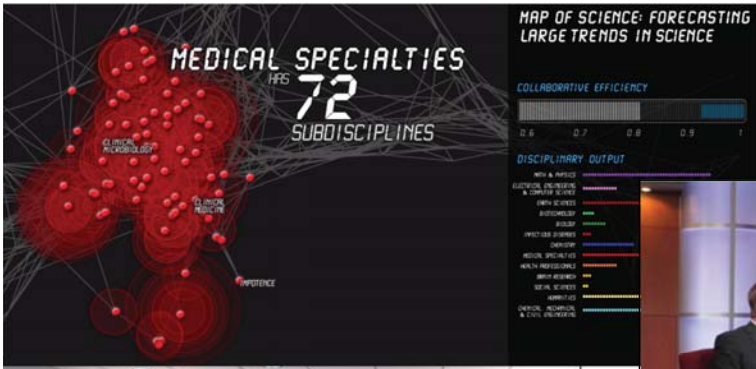
Among other topics, the course covers:

- Data analysis algorithms that enable extraction of patterns and trends in data
- Major temporal, geospatial, topical, and network visualization techniques
- Discussions of systems that drive research and development.

Register for free at <http://ivmooc.cns.iu.edu>. Class restarts January 12, 2016.

| 50 courses available | | Add | Course Name | Start Date | Rating |
|--|--|---|---|----------------|---|
| By start date | |  | Introduction to Programming for the Visual Arts with p5.js <small>University of California, Los Angeles via Kadenze</small> | 4th Nov, 2015 | ★★★★★ |
| Recently started or starting soon (12) | |  | Data Visualization <small>University of Illinois at Urbana-Champaign via Coursera</small> EARN A CREDENTIAL Part of Data Mining Specialization | 20th Jul, 2015 | ★★★★☆  |
| Just Announced (2) | |  | Information Visualization <small>Indiana University via Independent</small> | 13th Jan, 2015 | ★★★★☆  |
| Courses in Progress (4) | |  | Data Management and Visualization <small>Wesleyan University via Coursera</small> EARN A CREDENTIAL Part of Data Analysis and Interpretation Specialization | 26th Oct, 2015 | ★★★★★  |
| Future courses (14) | |  | Data Visualization and D3.js <small>via Udacity</small> | Self paced | ★★★★☆  |
| Self Paced (9) | |  | Communicating Results: Visualization, Ethics, Reproducibility <small>University of Washington via Coursera</small> EARN A CREDENTIAL Part of Data Science at Scale Specialization | 1st Nov, 2015 | ★★★★☆  |
| Finished courses (20) | |  | Data Visualization and Communication with Tableau <small>Duke University via Coursera</small> EARN A CREDENTIAL Part of Excel to MySQL: Analytic Techniques for Business Specialization | 1st Nov, 2015 | ★★★★☆  |

<https://www.class-central.com/search?q=visualization>



Science Forecast
S1:E1, 2015



Science Forecast | S1:E1 | 2015

References

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>

Shiffrin, Richard M. and Börner, Katy (Eds.) (2004). **Mapping Knowledge Domains**. *Proceedings of the National Academy of Sciences of the United States of America*, 101(Suppl_1). http://www.pnas.org/content/vol101/suppl_1

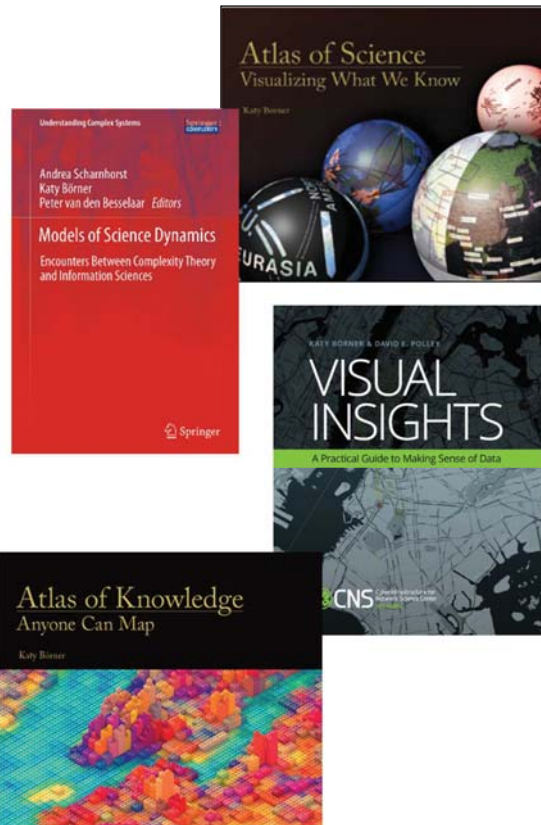
Börner, Katy (2010) **Atlas of Science: Visualizing What We Know**. The MIT Press. <http://scimaps.org/atlas>

Scharnhorst, Andrea, Börner, Katy, van den Besselaar, Peter (2012) **Models of Science Dynamics**. Springer Verlag.

Katy Börner, Michael Conlon, Jon Corson-Rikert, Cornell, Ying Ding (2012) **VIVO: A Semantic Approach to Scholarly Networking and Discovery**. Morgan & Claypool.

Katy Börner and David E Polley (2014) **Visual Insights: A Practical Guide to Making Sense of Data**. The MIT Press.

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



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

These slides are at <http://cns.iu.edu/docs/presentations>

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

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

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