



Information Visualization

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'OUTLINE'

01

What is data visualization

02

Visualization is hot & cool & young

03

How to create visualization?

'OUTLINE'

01

What is data visualization

02

Visualization is hot & cool & young

03

How to create visualization?

How many “V” ?

MTHIVLWYADCEQGHKILKMTWYN
ARDCAIREQGHLVKMFPSTWYARN
GFPSVCEILQGKMFPSNDRCEQDIFP
SGHLMFHKMVPSTWYACEQTWRN

How many “V” ?

MTHIVLWYADCEQGHKILKMTWYN
ARDCAIREQGHLVKMFNSTWYARN
GFPSVCEILQGKMFPSNDRCEQDIFP
SGHLMFHKMVPSTWYACEQTWRN



vi·su·al·i·za·tion

1. Formation of mental visual images
2. The act or process of interpreting in visual terms or of putting into visible form

—The American Heritage Dictionary

A few examples

Visualizing Flight Patterns



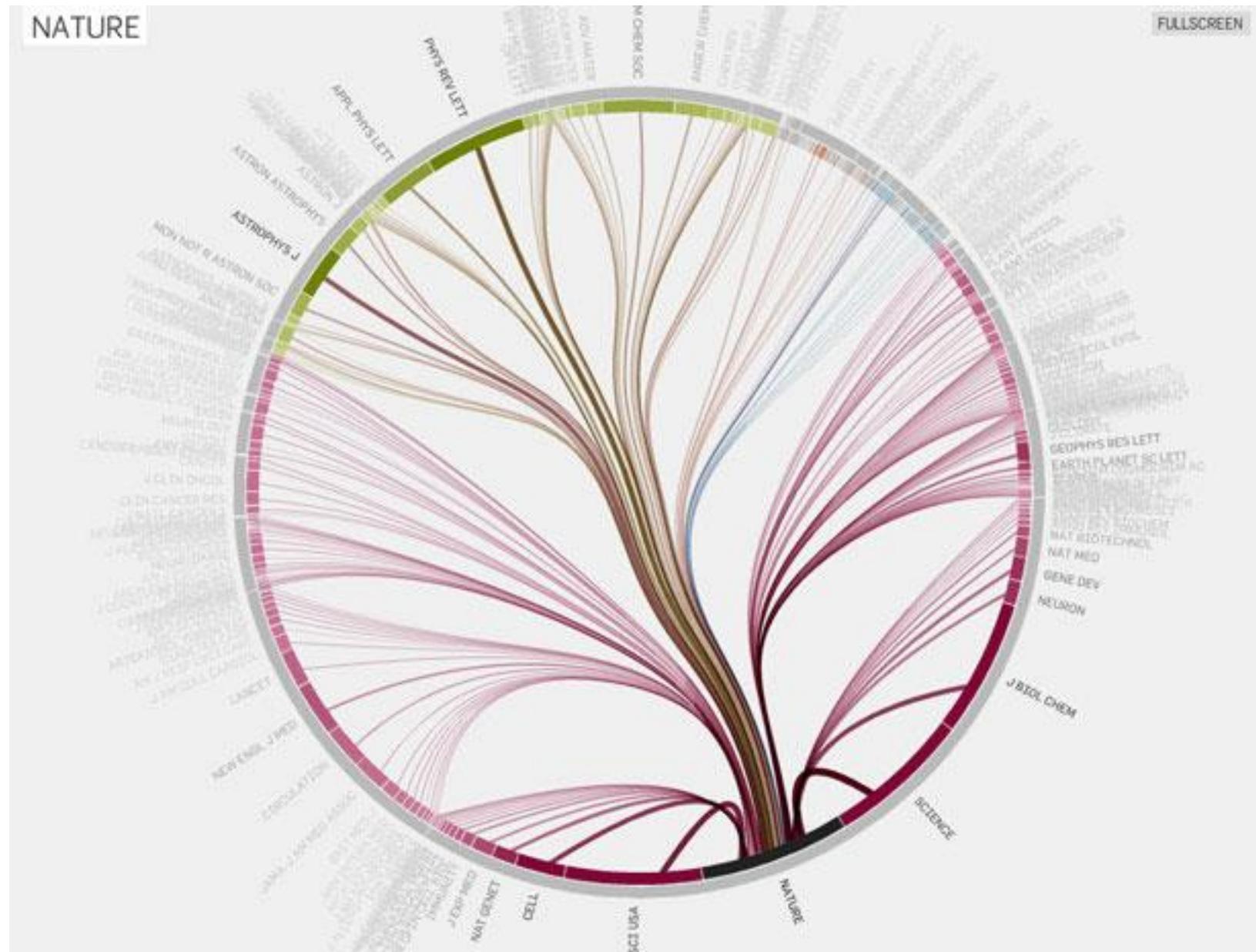
这个方案叫做“飞行模式”。

This is a project called Flight Patterns.

Aaron Koblin, TED 2006

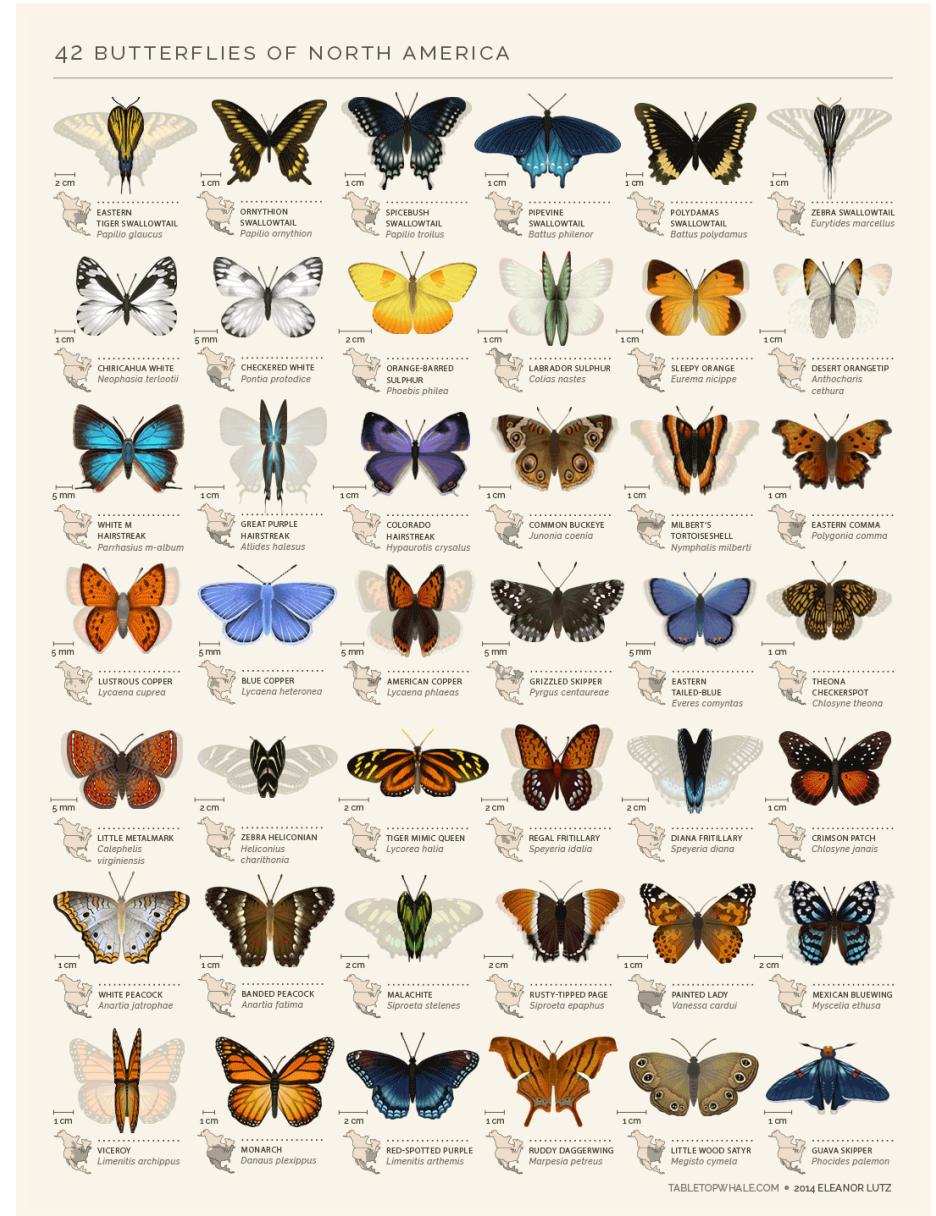
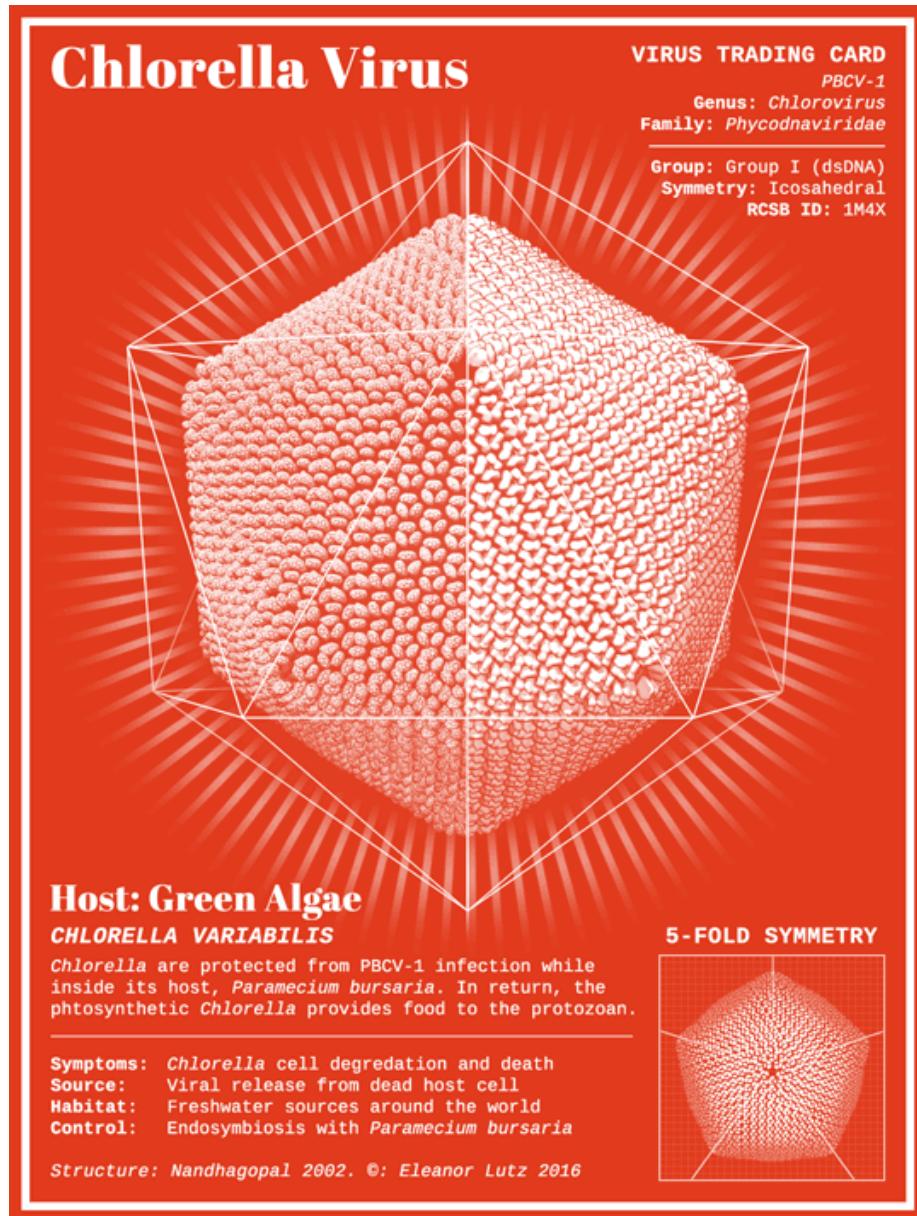
<http://www.aaronkoblin.com/work/flighthpatterns/>

Visualizing Information Flow in Science



Visualizing Information Flow in Science

Eleanor Lutz



Presidential Election Results: Donald J. Trump Wins

NOV. 11, 2016, 10:55 PM ET

Here's a look at [how Trump reshaped the election map](#). As of Thursday morning, Michigan and New Hampshire are still too close to call. This page will be updated when a winner is called in those states.

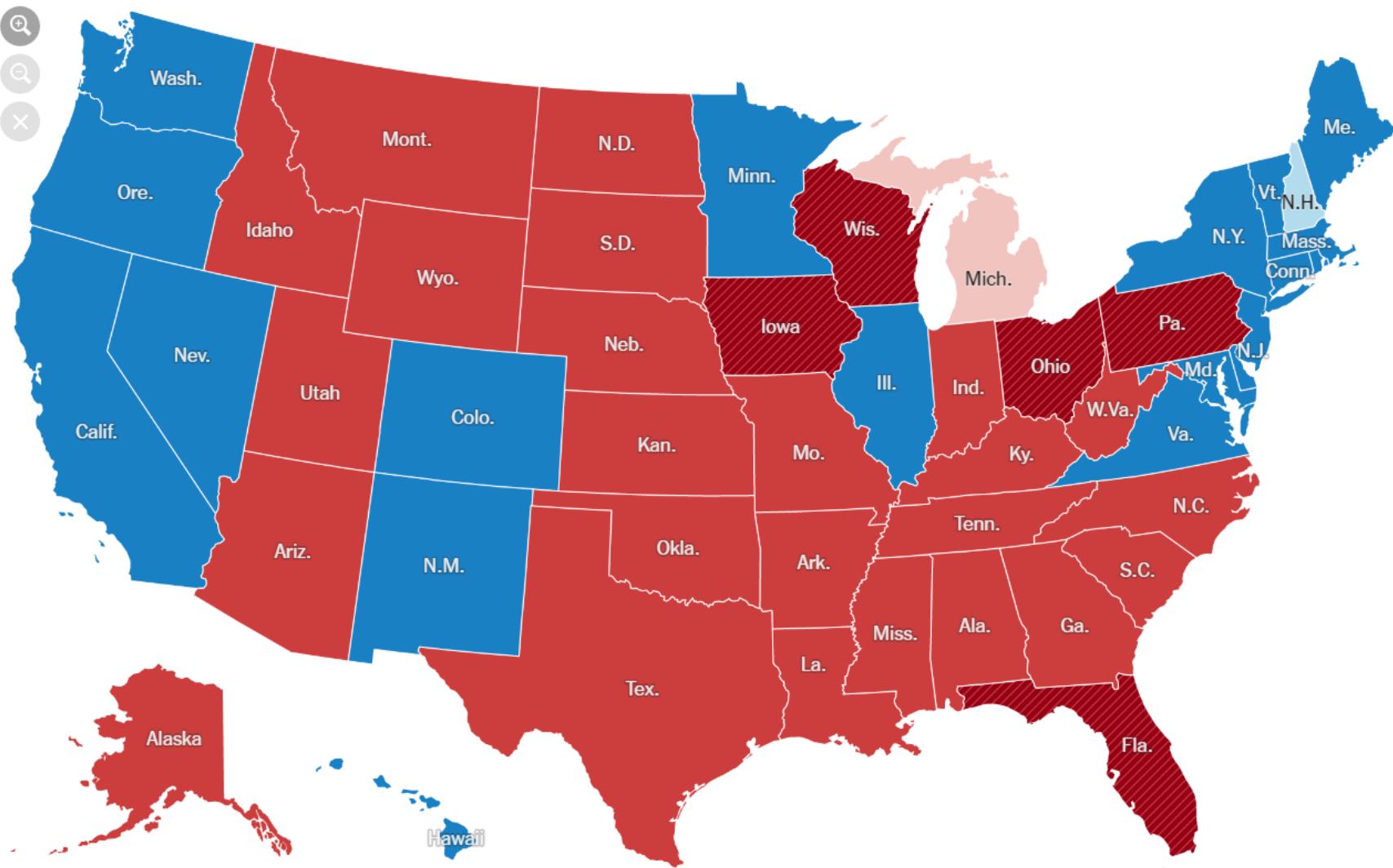
228 Hillary Clinton

60,605,174 votes (47.7%)

270 to win

290 Donald J. Trump

60,144,993 votes (47.4%)



What is visualization?

What is visualization?

- “Data visualization is the creation and study of the visual representation of data” - wiki
- Input: **data** Output: **visual form** Goal: **insight**



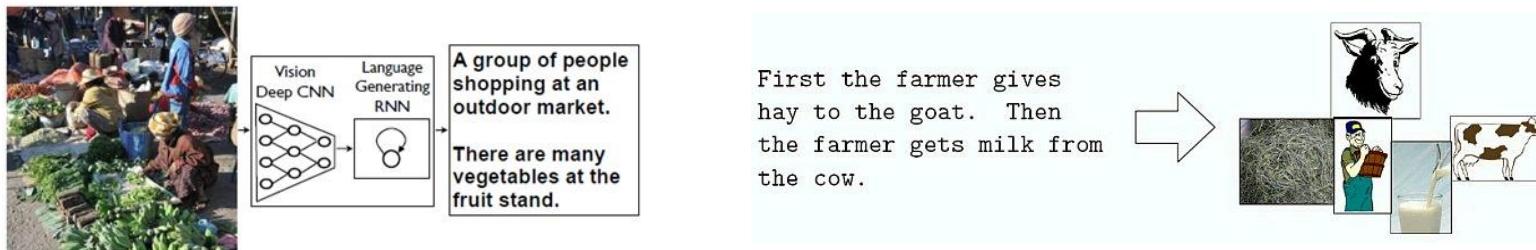
Visual Thinking

Why is a Diagram (Sometimes)
Worth 10,000 Words

Larkin and Simon, Cognitive Science, 1987

Why is a Diagram (Sometimes) Worth 10,000 Words

图表表达与句型表达具有信息和计算上的等价性 [Simon 1978]



Dual transformation between images and text

Why is a Diagram (Sometimes) Worth 10,000 Words

图表具有拓扑和几何的关联，将信息基于位置进行索引，所见处即所得

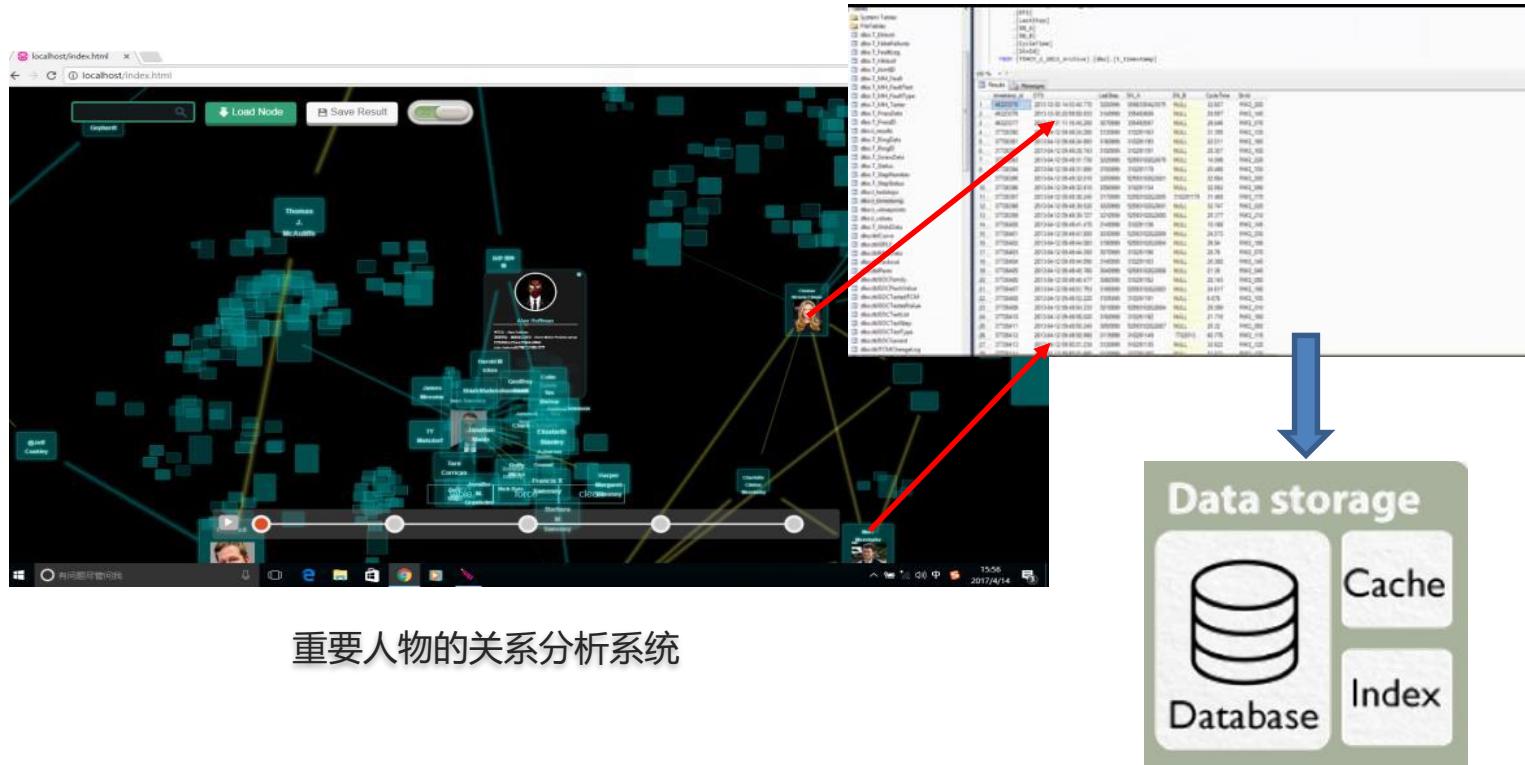


Dual Domain Clustering

Dual mapping between pairs of 3D fibers and 2D points

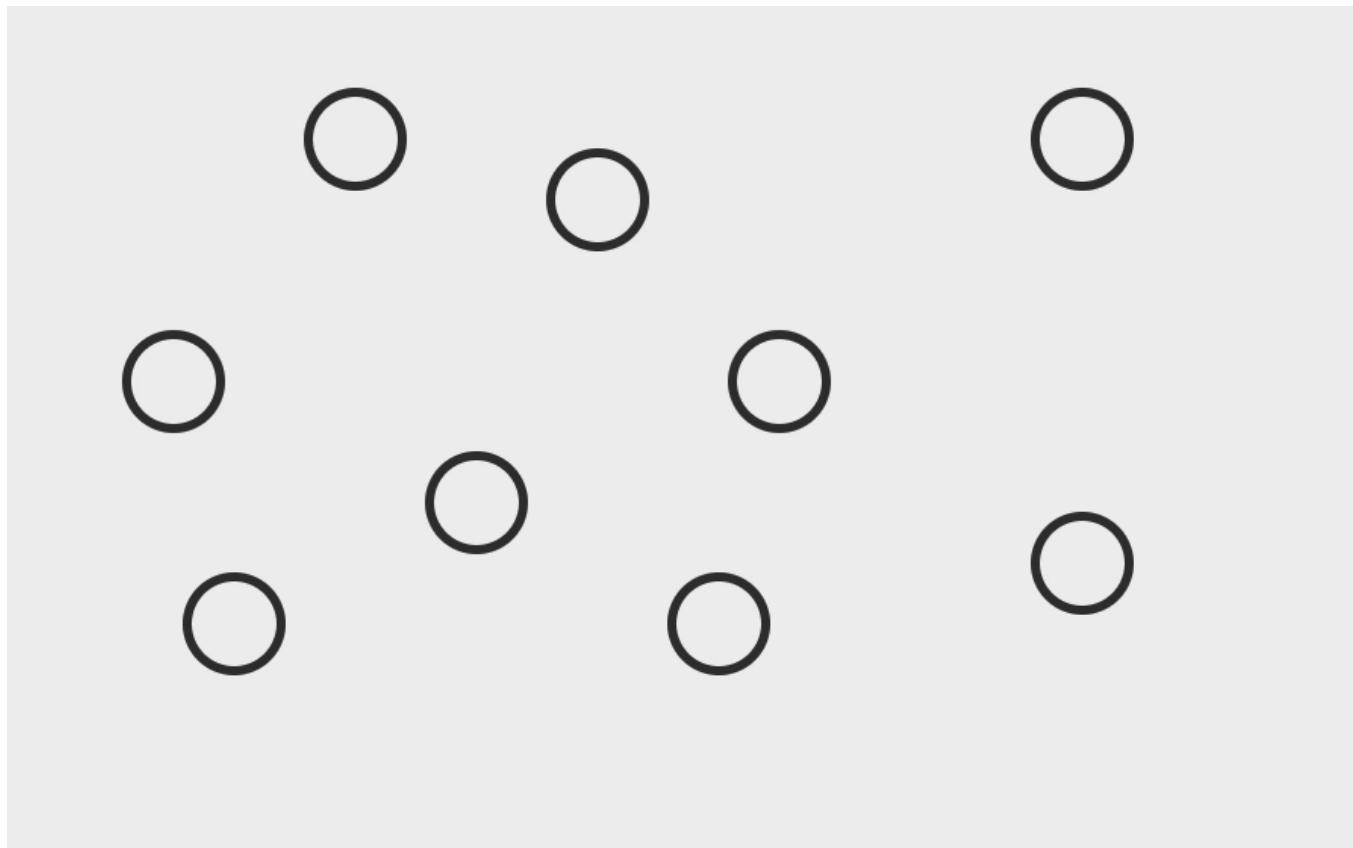
Why is a Diagram (Sometimes) Worth 10,000 Words

- 句型表达具有时间或逻辑方面的序列，显式地表达了单个元素。
- 句型表达假设每句话是串行阵列；而图表表达有一个简洁的语义网络，认知时只需要在不同的节点间定位。



Why is a Diagram (Sometimes) Worth 10,000 Words

在求解问题时，图表表达可以提供搜索与认知的便利；句型表达在搜索时需要记住更多的信息。



[求凸包 <https://visualgo.net/en>](https://visualgo.net/en)

Represent information

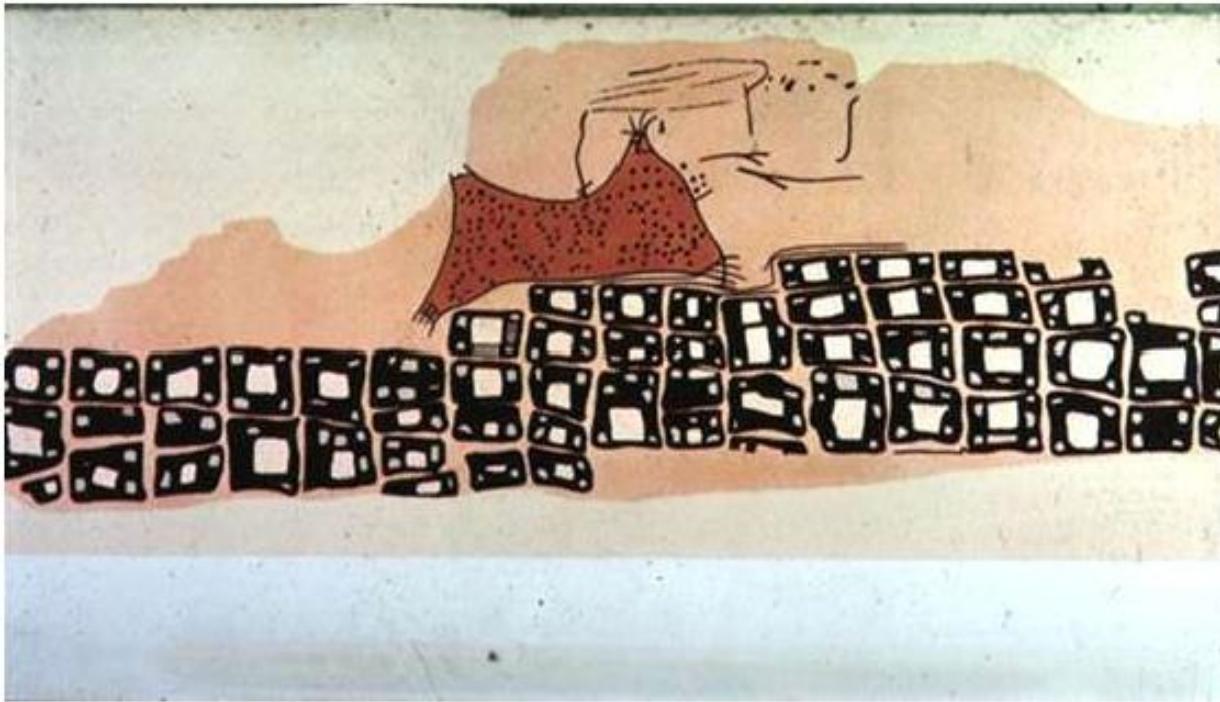
Analyze data

Communicate data

Represent information

Analyze data

Communicate data

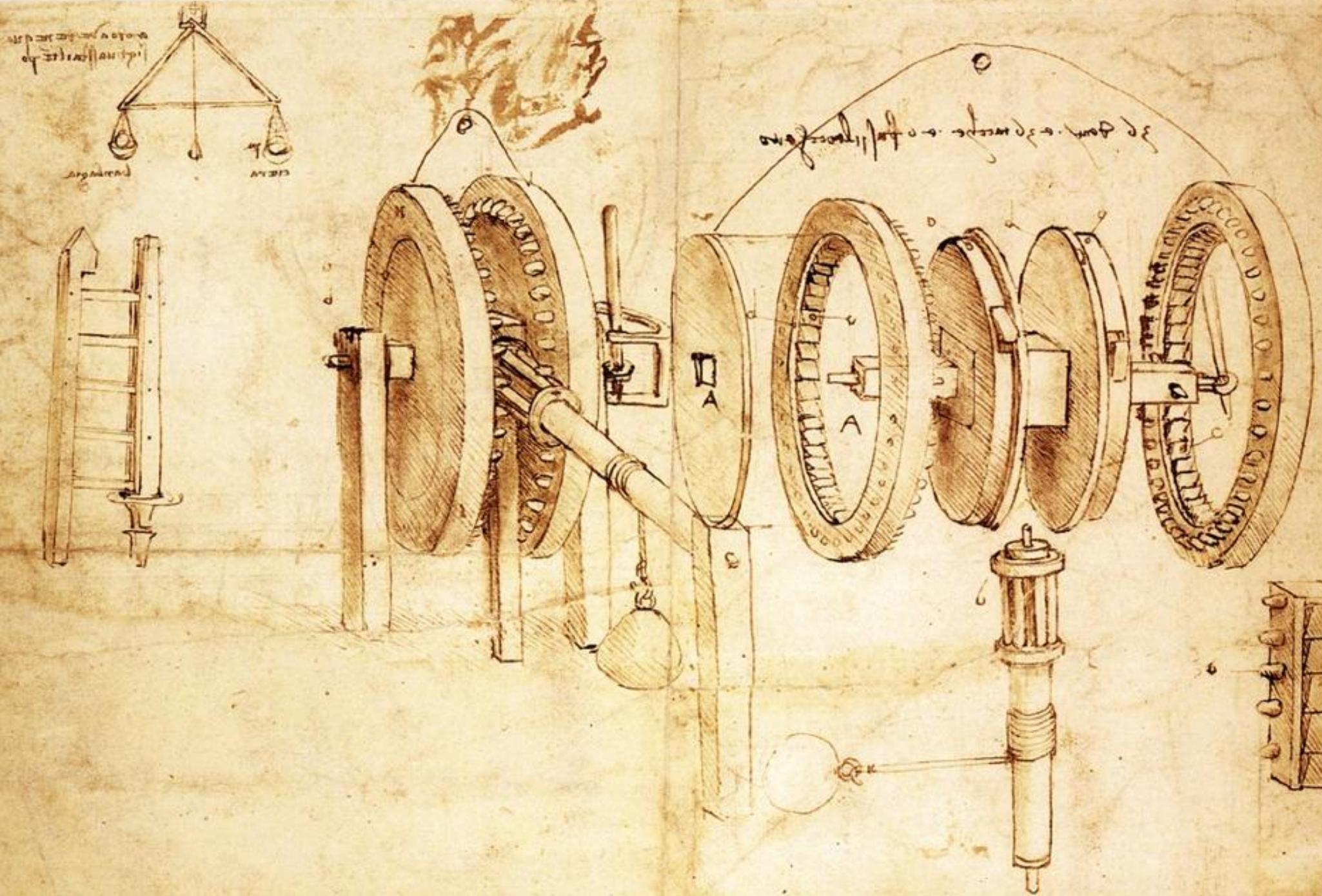


Konya town map, Turkey,
c.6200 BC



Anaximander's Map of the World

Anaximander of Miletus
c.550 BC

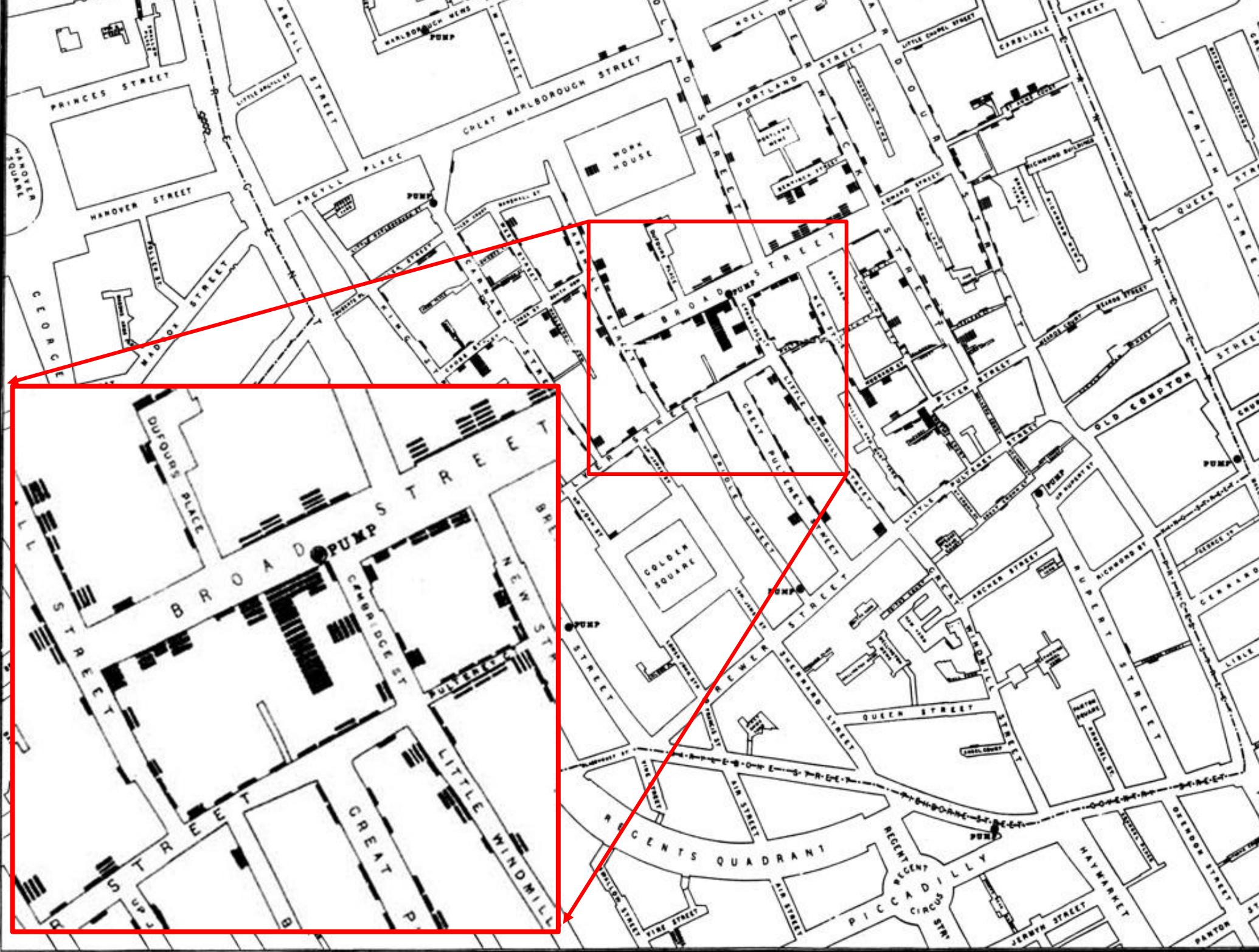


Leonardo da Vinci 1485

Represent information

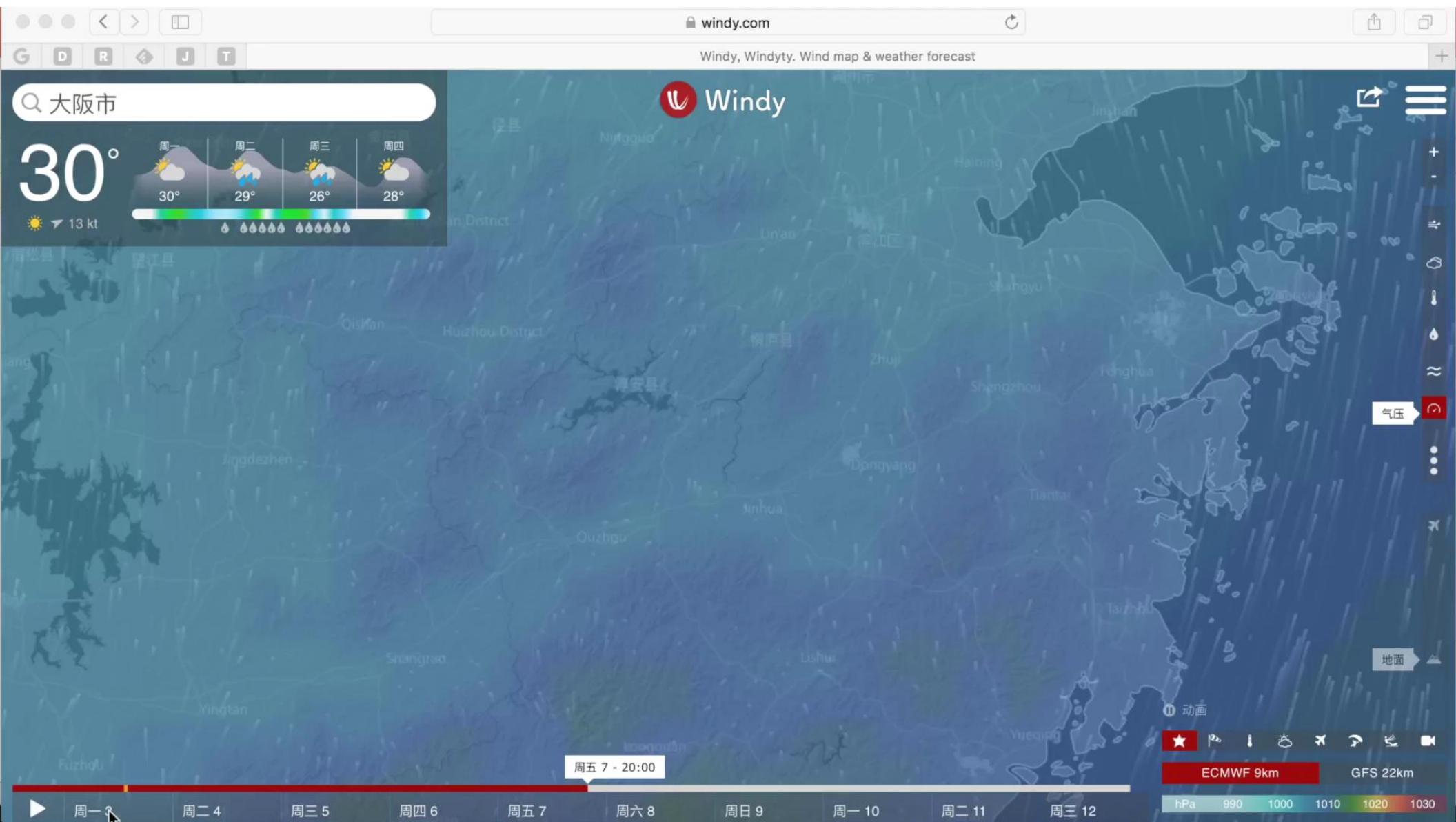
Analyze data

Communicate data



Reveal Patterns

世界风向图



<https://www.windytv.com/>

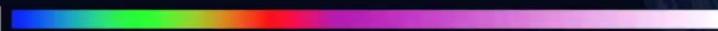
Reveal Patterns

Earth Nullschool: 全球风、天气和大洋状况地图。

earth

Date | 2017-07-03 11:00 Local ⇢ UTC

Data | Wind @ Surface

Scale | 

Source | GFS / NCEP / US National Weather Service

Control | Now << <- >- >> + Grid ▶ HD

Mode | Air – Ocean – Chem – Particulates

Height | Sfc – 1000 – 850 – 700 – 500 – 250 – 70 – 10 hPa

Overlay | Wind – Temp – RH – WPD – 3HPA – CAPE

| TPW – TCW – MSLP – MI – None

Projection | A – AE – CE – E – O – P – S – WB – W3

about    

中文 (简体) 

<https://earth.nullschool.net>

Carte Figurative des pertes successives en hommes de l'Armée Française dans la Campagne de Russie 1812-1813.

Deçue par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite.

Paris, le 20 Novembre 1869

Les nombres d'hommes perdus sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en trèfles 20 zones. Le rouge désigne les hommes qui restent en Russie, le noir ceux qui en sortent. — Les renseignements qui ont servi à dresser la carte me sont prisés dans les ouvrages de M. M. Chiers, de Legur, de Feroniac, de Chambray et le journal intime de Jacob, pharmacien de l'Armée depuis le 28 Octobre.

Pour mieux faire juger à l'ail la diminution de l'armée, j'ai supposé que les corps du Prince Napoléon et du Maréchal Davout, qui avaient été détachés sur Moscou et Wladiwostok au commencement de l'expédition vers Orléans et Wladiwostok, avaient toujours marché avec l'armée.

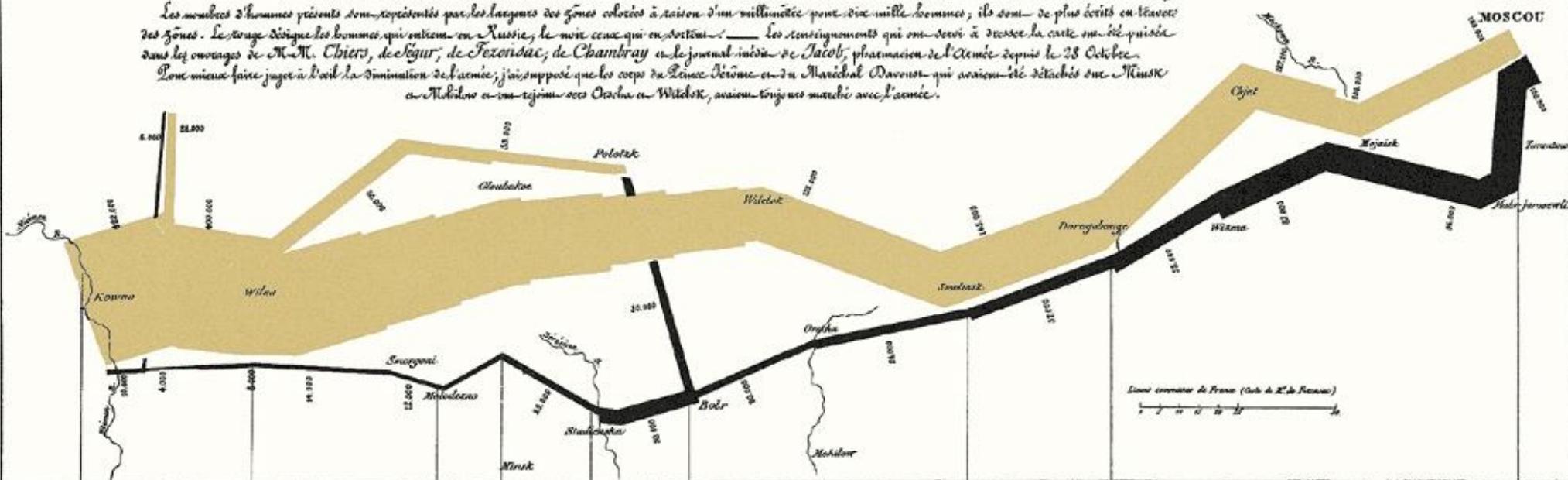


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.

Les Cosaques passent au gelé
le Néman gelé.

- 20° le 7 X.^{me}

- 30° le 6 X.^{me}

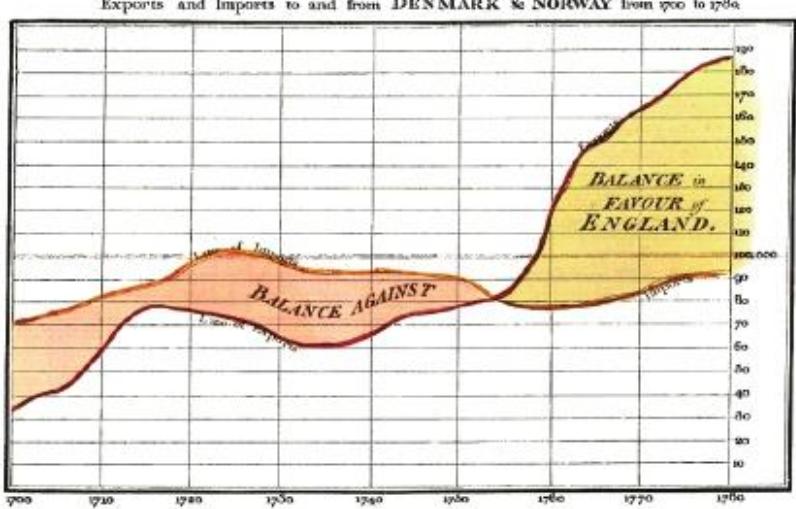
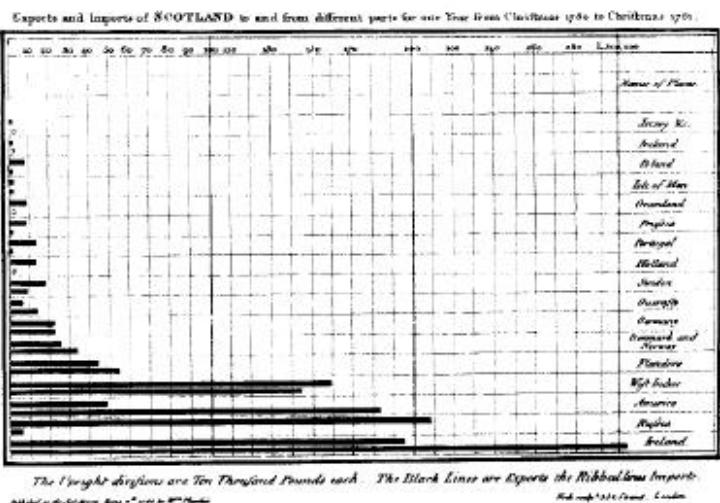
C.J. Minard, 1869

E.Tufte,Writings,Artworks,News

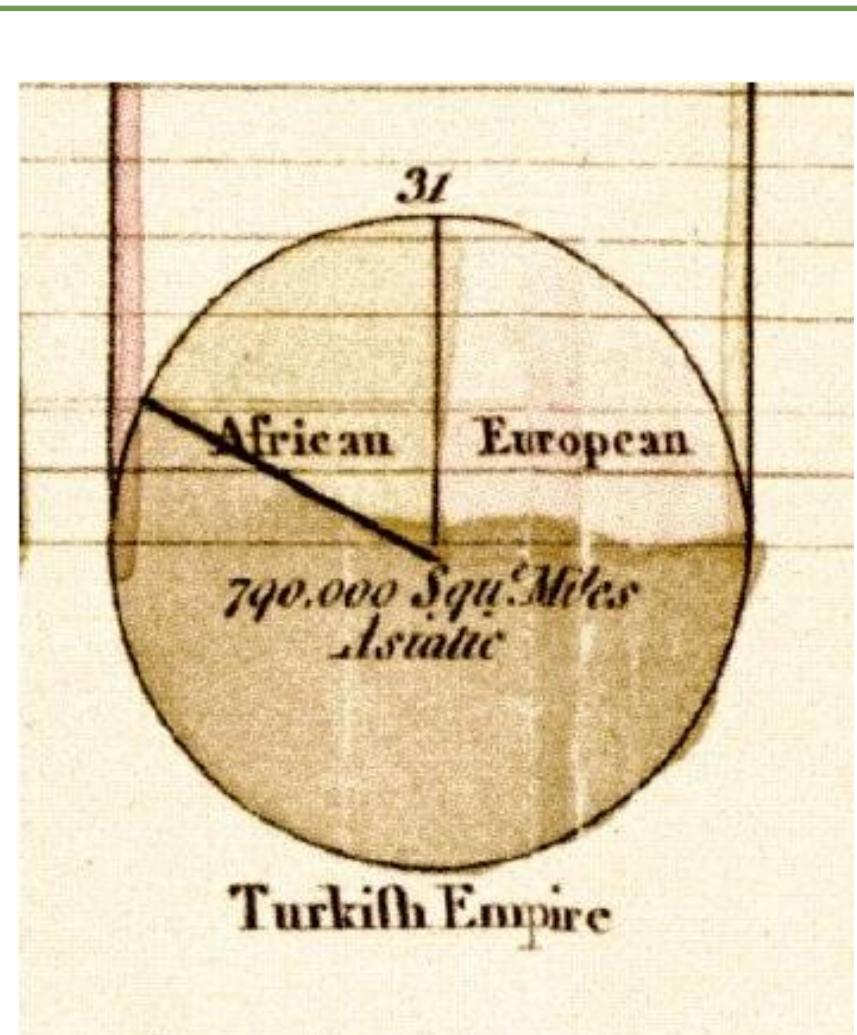
Represent information

Analyze data

Communicate data



W.Playfair,1786



W.Playfair,1801

2.
APRIL 1855 to MARCH 1856.

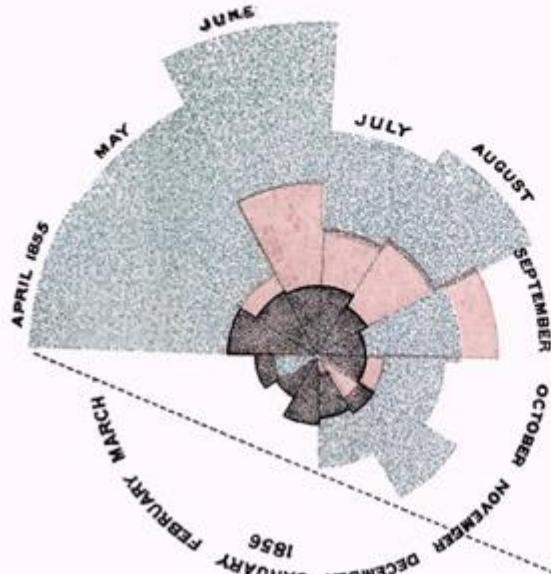
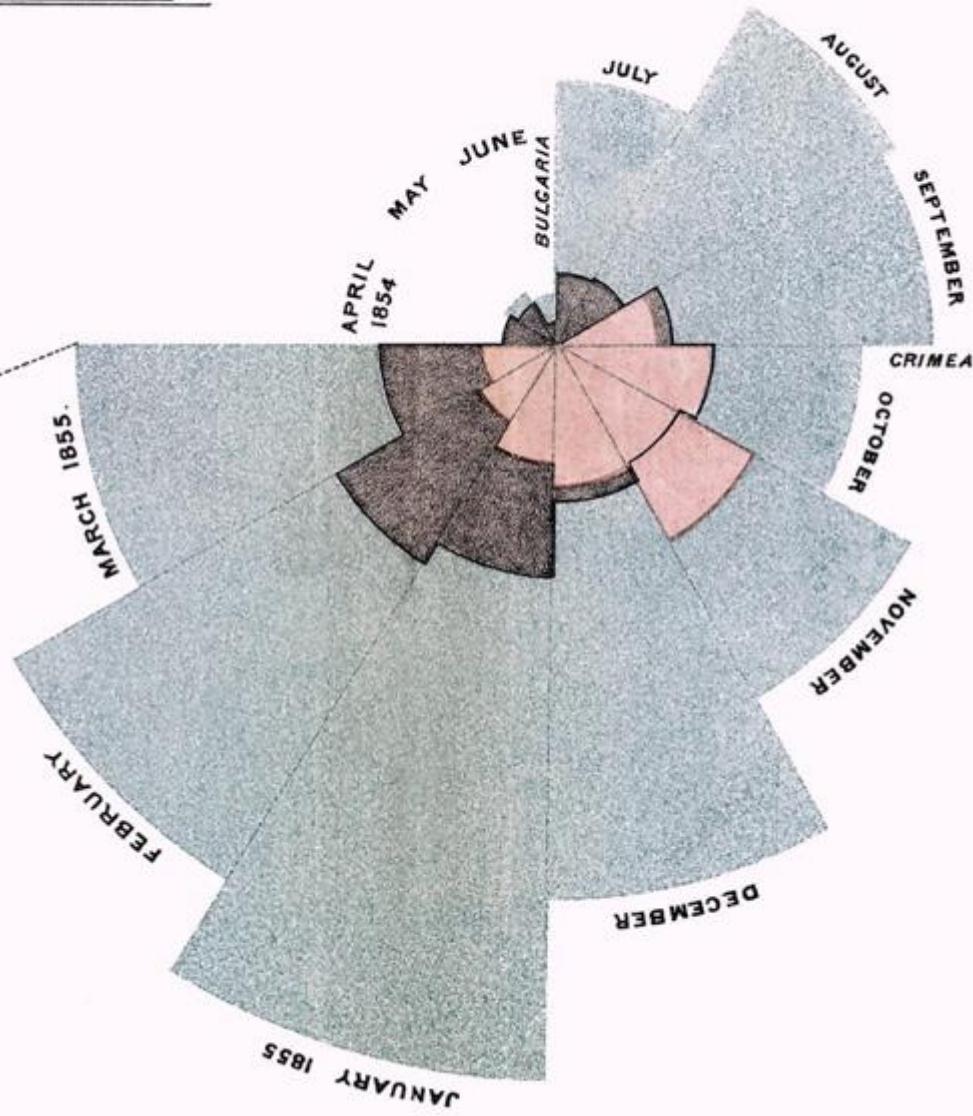


DIAGRAM OF THE CAUSES OF MORTALITY IN THE ARMY IN THE EAST.

1.
APRIL 1854 to MARCH 1855.



The Areas of the blue, red, & black wedges are each measured from the centre as the common vertex.

The blue wedges measured from the centre of the circle represent area for area the deaths from Preventible or Mitigable Zymotic diseases, the red wedges measured from the centre the deaths from wounds, & the black wedges measured from the centre the deaths from all other causes.

The black line across the red triangle in Nov. 1854 marks the boundary of the deaths from all other causes during the month.

In October 1854, & April 1855, the black area coincides with the red; in January & February 1856, the blue coincides with the black.

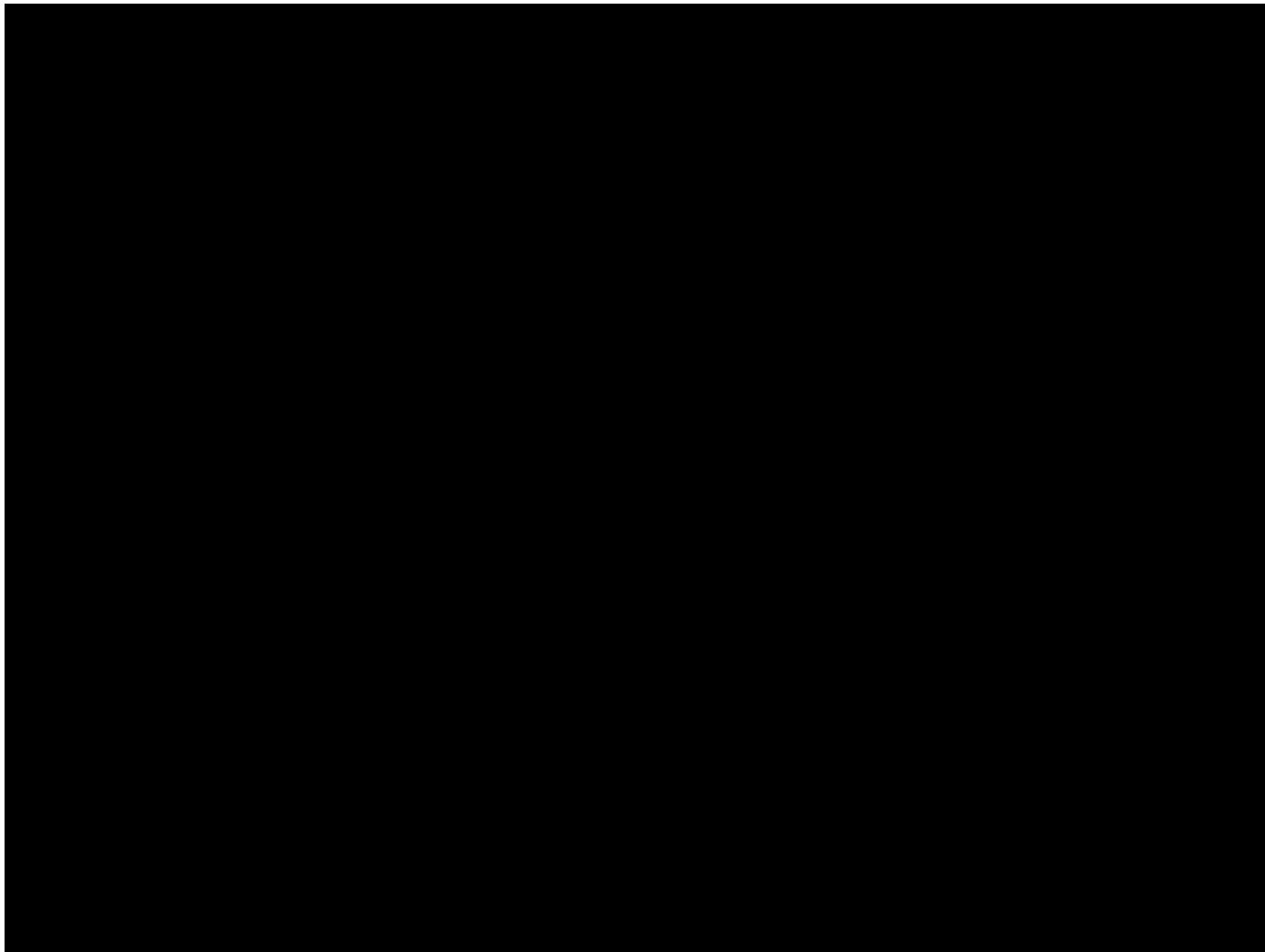
The entire areas may be compared by following the blue, the red & the black lines enclosing them.

Hans Rosling' TED talk



Why Visualization?

Limits of Cognition



Daniel J.Simons and Daniel T.Levin, Failure to
detect changes to people during a real world interaction, 1998

Set A		Set B		Set C		Set D	
X	Y	X	Y	X	Y	X	Y
10	8.04	10	9.14	10	7.46	8	6.58
8	6.95	8	8.14	8	6.77	8	5.76
13	7.58	13	8.74	13	12.74	8	7.71
9	8.81	9	8.77	9	7.11	8	8.84
11	8.33	11	9.26	11	7.81	8	8.47
14	9.96	14	8.1	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.1	4	5.39	19	12.5
12	10.84	12	9.11	12	8.15	8	5.56
7	4.82	7	7.26	7	6.42	8	7.91
5	5.68	5	4.74	5	5.73	8	6.89

Summary Statistics

$$\mu_X = 9.0 \quad \sigma_X = 3.317$$

$$\mu_Y = 7.5 \quad \sigma_Y = 2.03$$

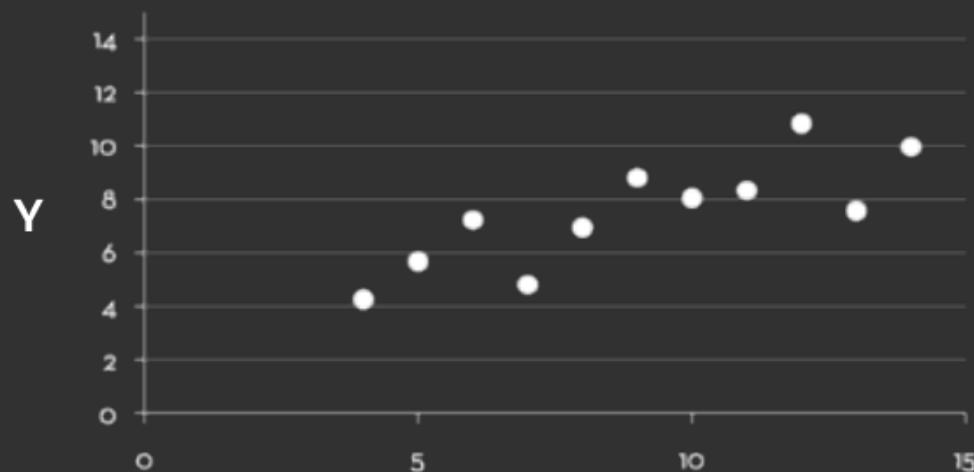
Linear Regression

$$Y = 3 + 0.5 X$$

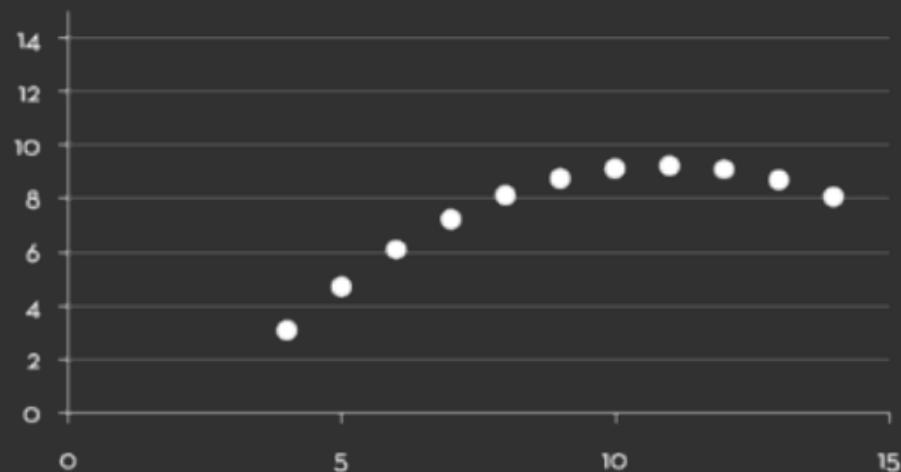
$$R^2 = 0.67$$

[Anscombe 73]

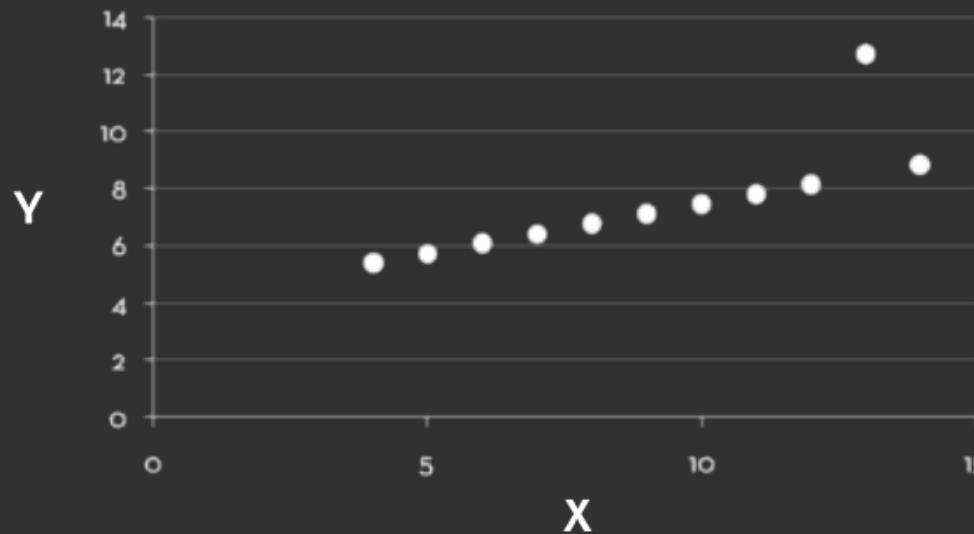
Set A



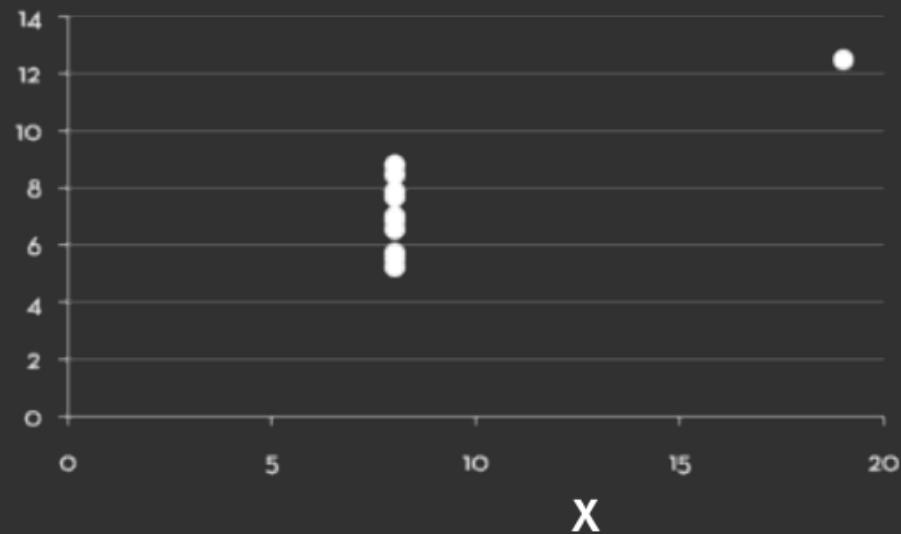
Set B



Set C



Set D



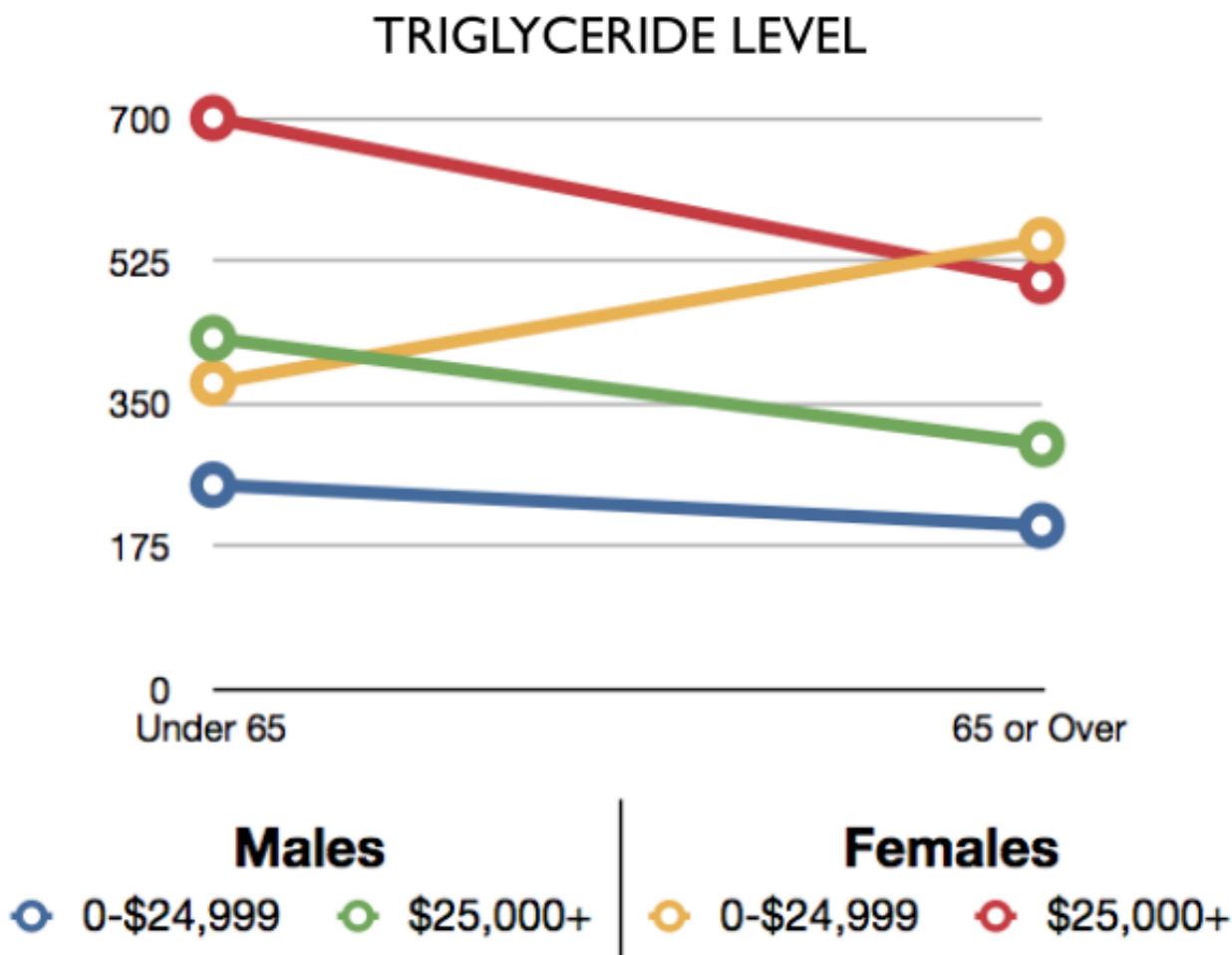
A Small Quiz

- Which gender or income level group shows different effects of age on triglyceride levels?

	Males		Females	
Income Group	Under 65	65 or Over	Under 65	65 or Over
0-\$24,999	250	200	375	550
\$25,000+	430	300	700	500

The Power of Visualization

- Which gender or income level group shows different effects of age on triglyceride levels?



Visualization

- 01 Helps us think
- 02 Uses perception to offload cognition
- 03 Serves as an external aid to augment working memory
- 04 Boosts our cognitive abilities

Why Big Data Visualization?

Information Explosion

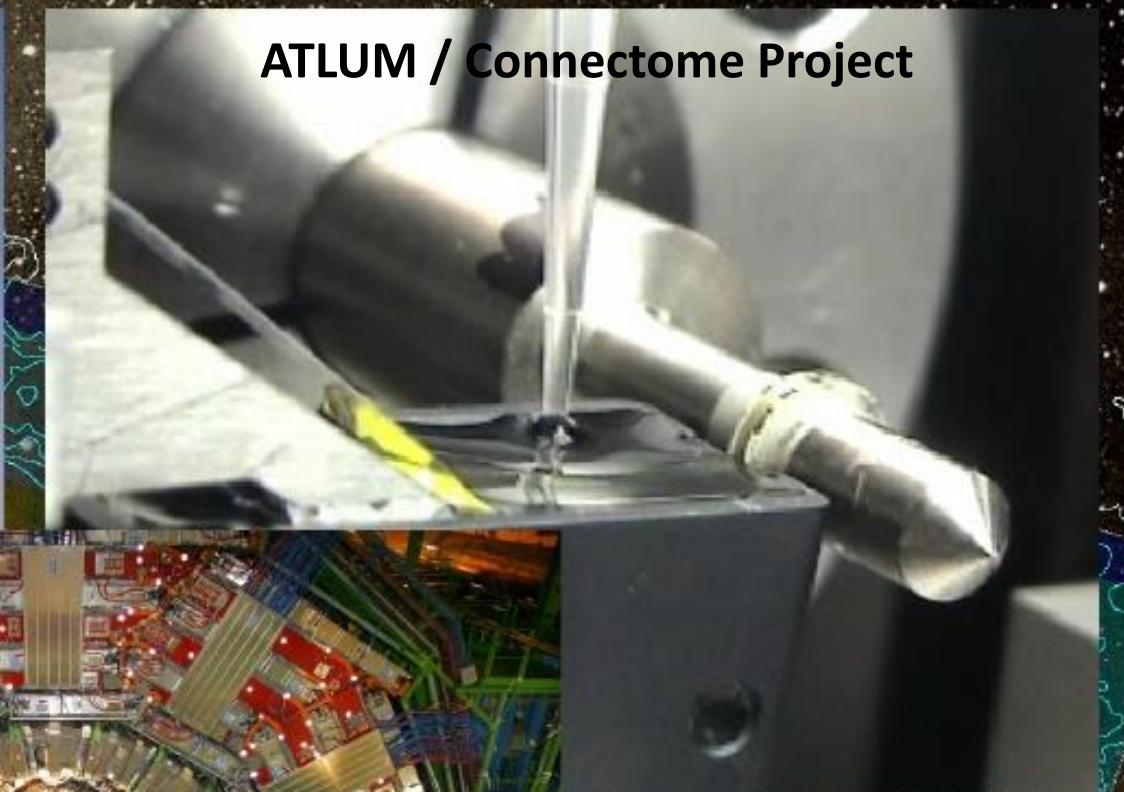


Instrument Data Explosion

Sloan Digital Sky Survey



ATLUM / Connectome Project



Maximilien Brice, © CERN

“The Industrial Revolution of Data”

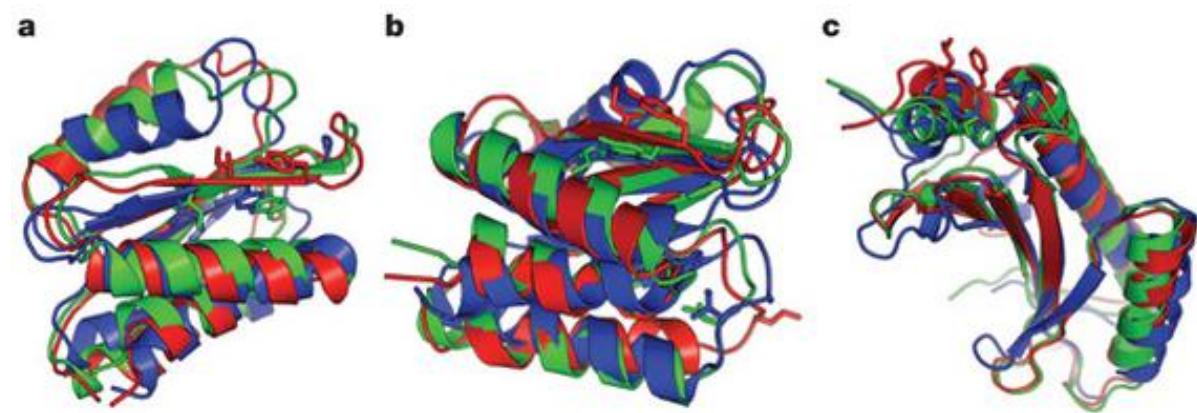
Joe Hellerstein, UC Berkeley



“The ability to take data—to be able to understand it, to process it, to extract value from it, to **visualize** it, to **communicate** it — that’s going to be a hugely important skill in the next decades,... because now we really do have essentially free and ubiquitous data.”

HalVarian , Google’s Chief Economist
The McKinsey Quarterly,Jan 2009

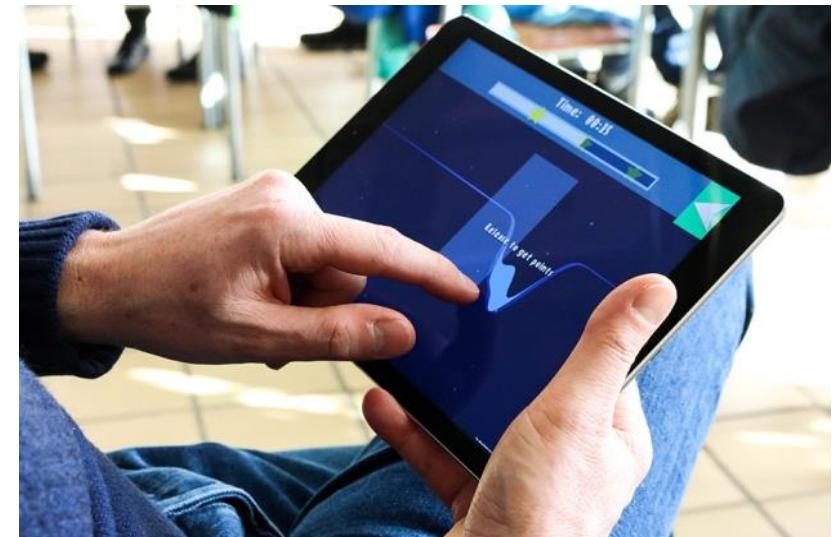
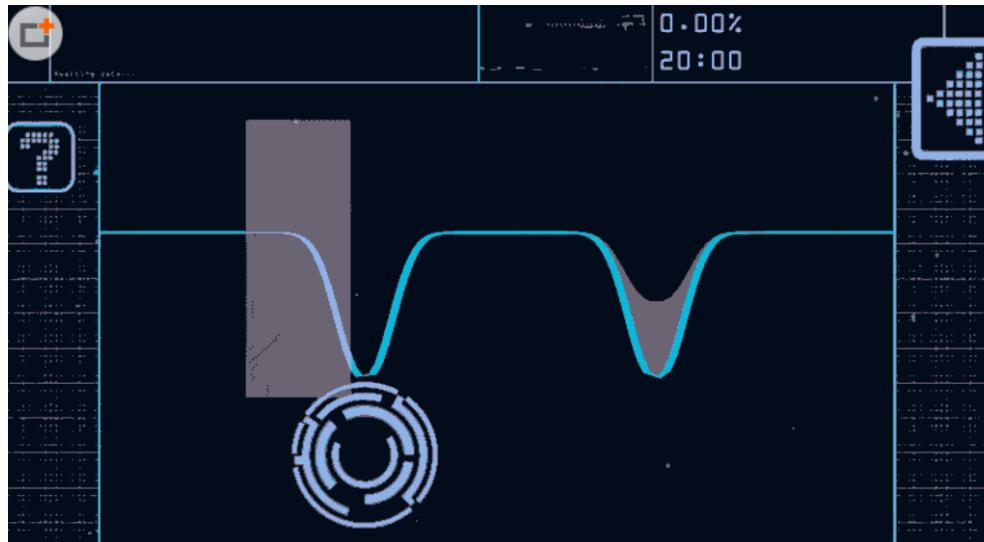
An Example



Foldit

Nature 466, 765-770, 2010

Another Example

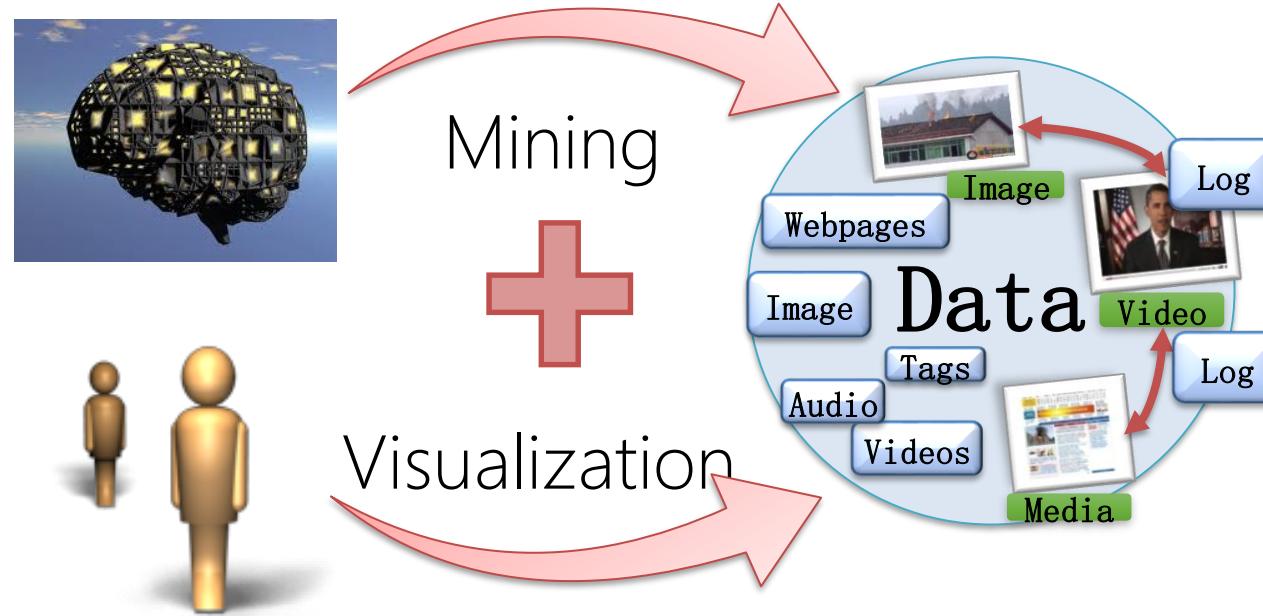


Quantum Moves

Nature 532, 160–161 (14 April 2016)

Visual Analytics

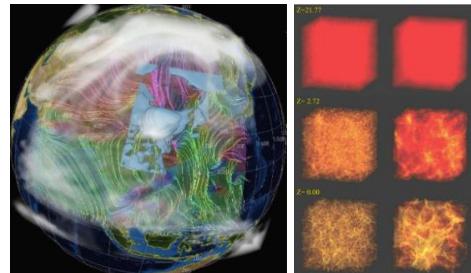
Core idea: human and machine work as a team



Visual Analytics: analytical reasoning facilitated by interactive visual interfaces.

Visual Analytics Plays Important Roles

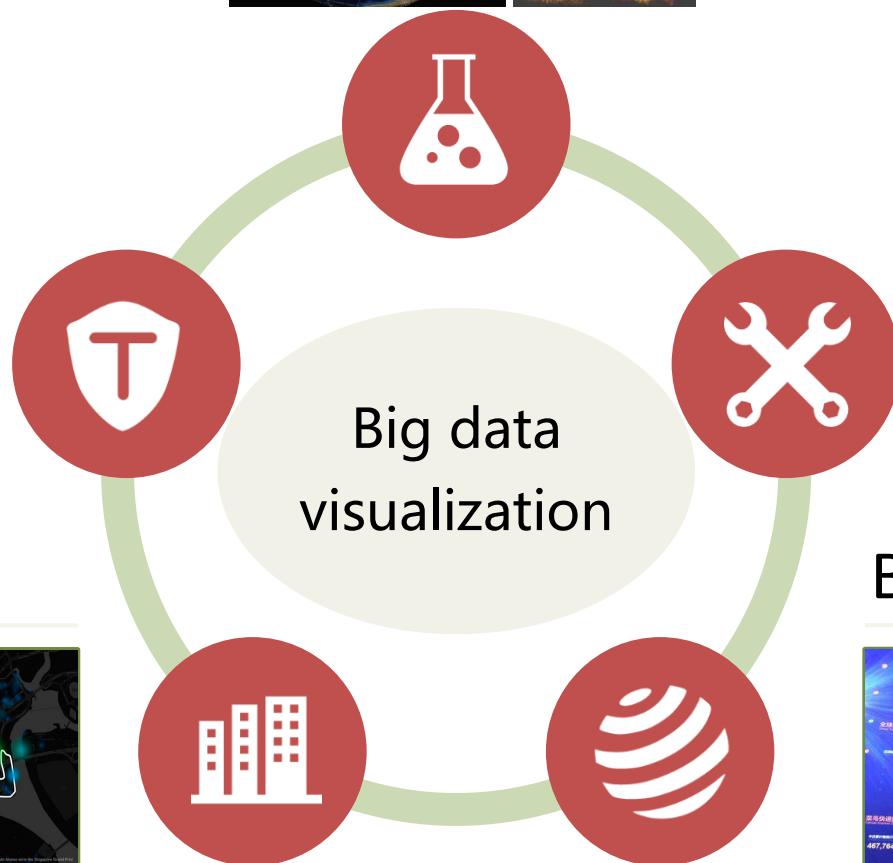
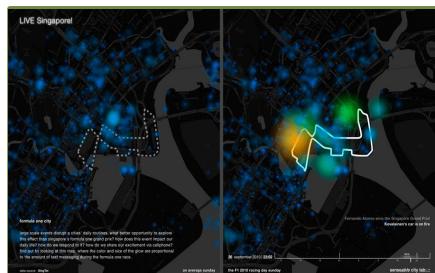
Big Science



Big Security



Big Cities



Big Engineering

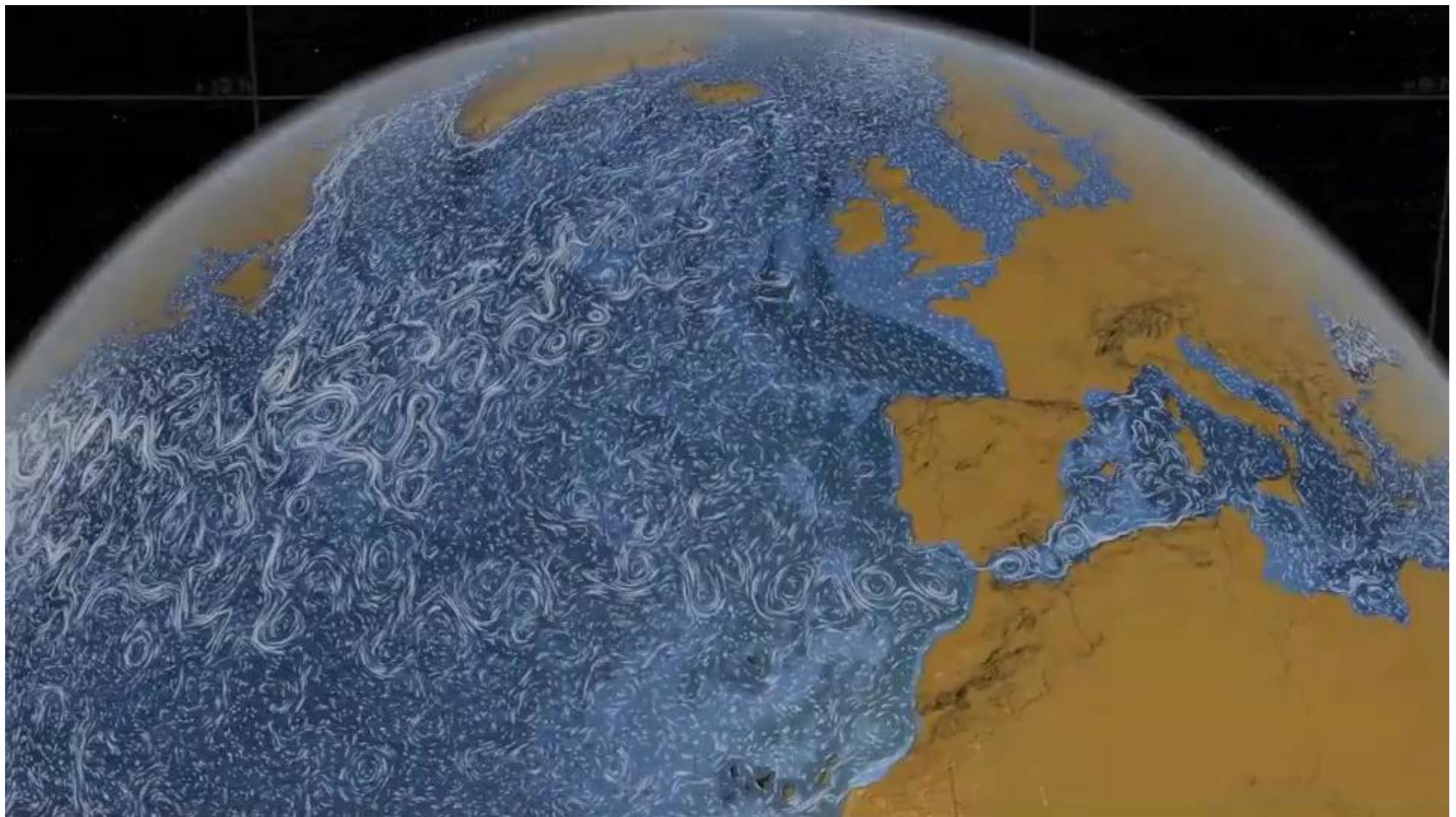


Big Internet



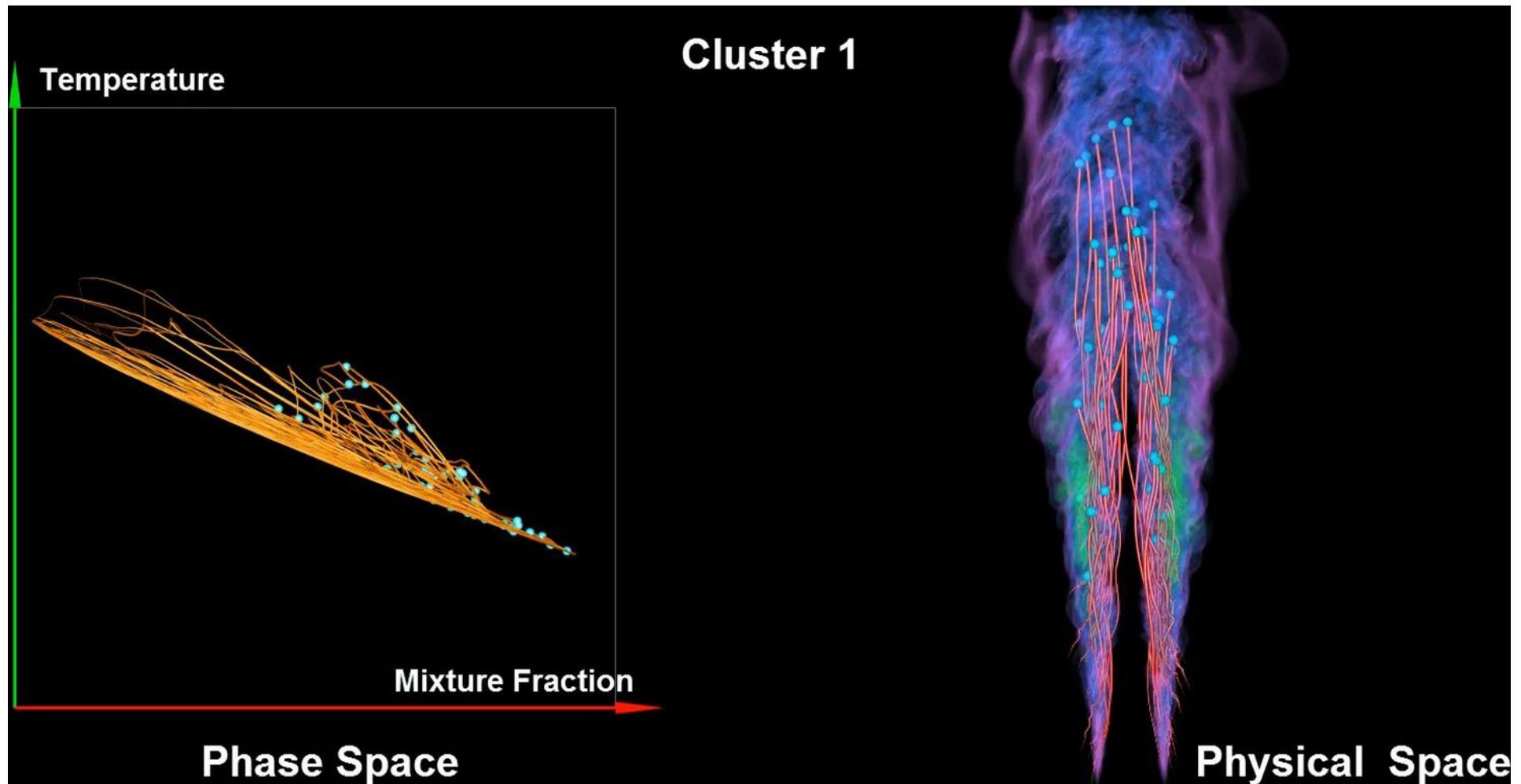
Visualization in Science

可视化是基础自然科学的必要手段，是科学大数据发展的必需



地震

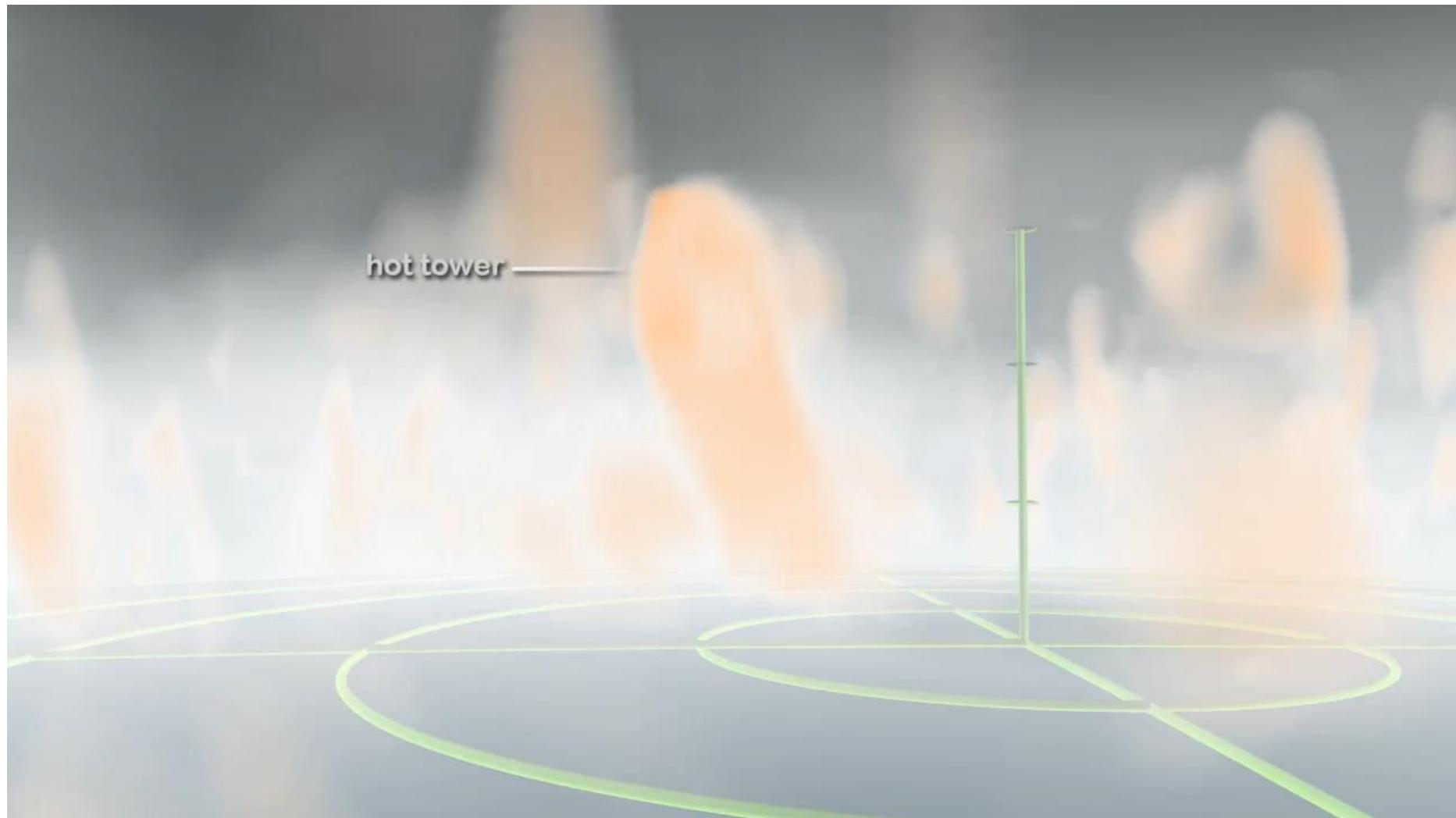
Visualization in Science



大气

地震

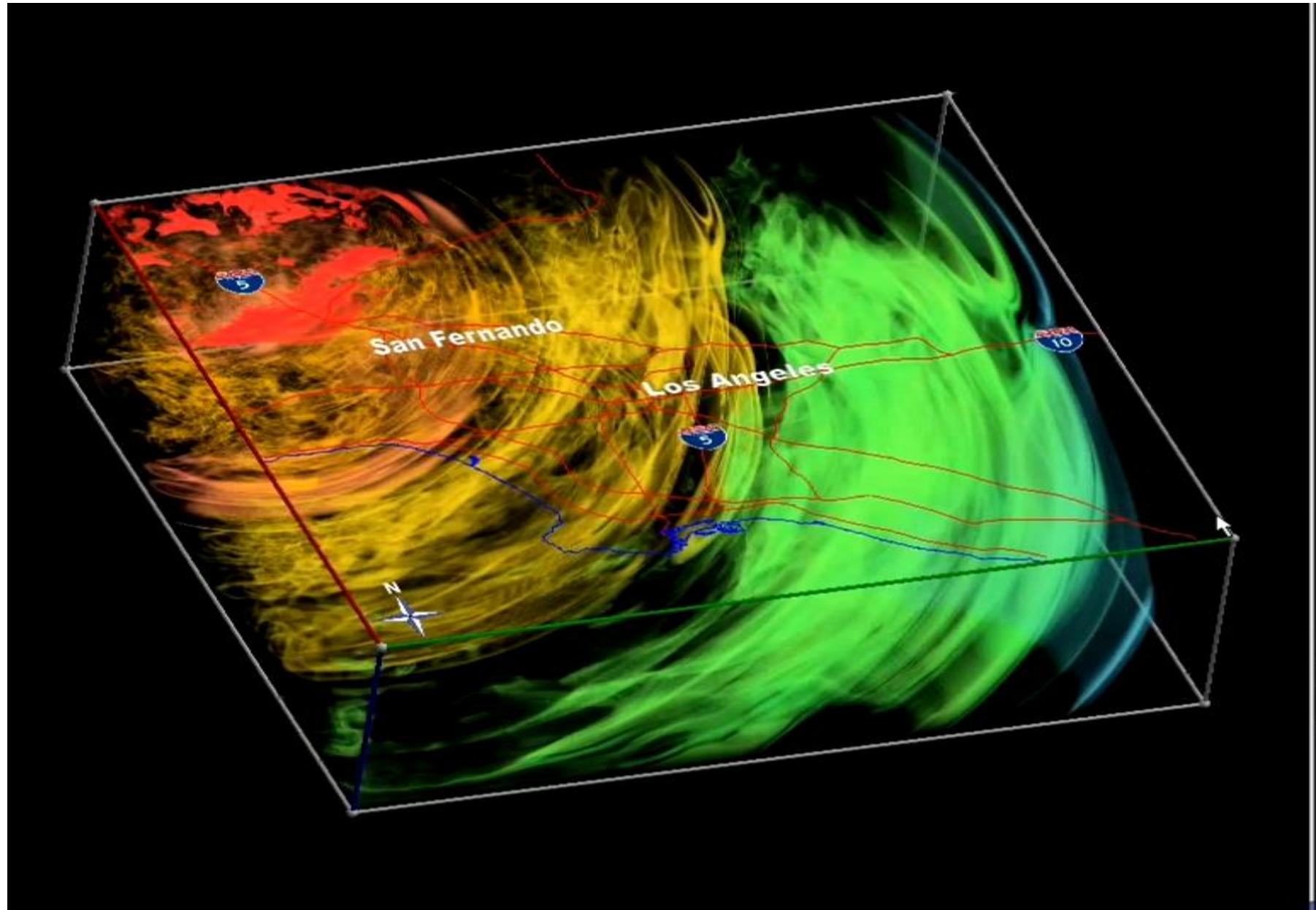
Visualization in Science



大气

地震

Visualization in Science



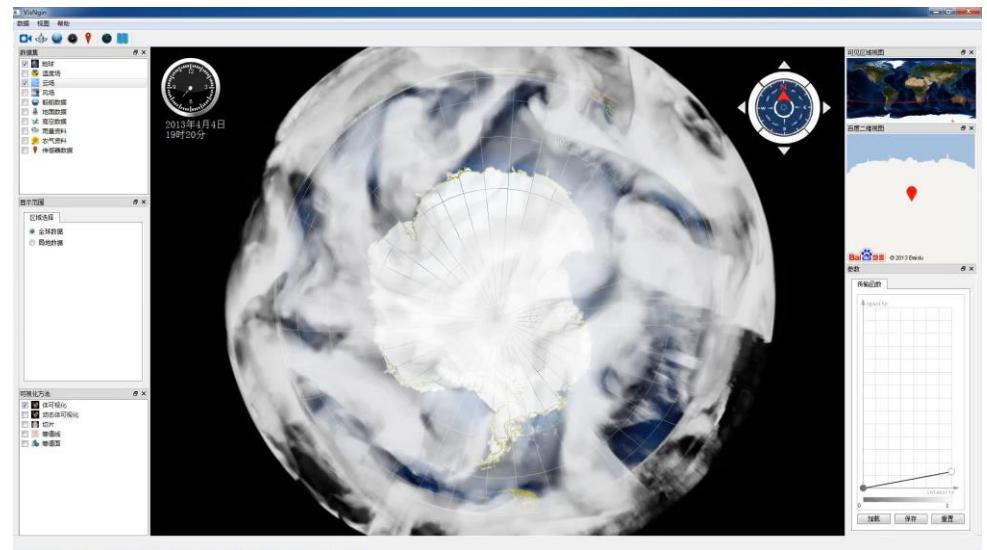
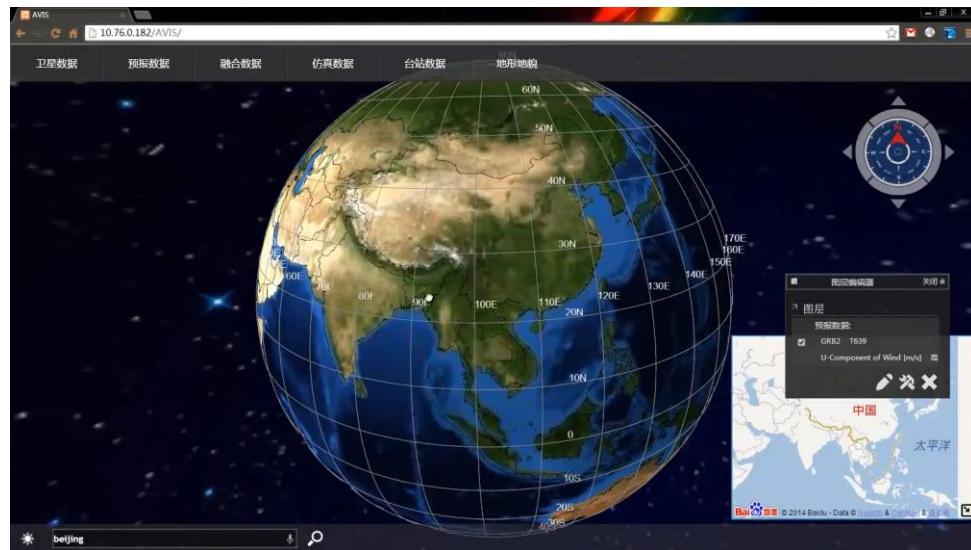
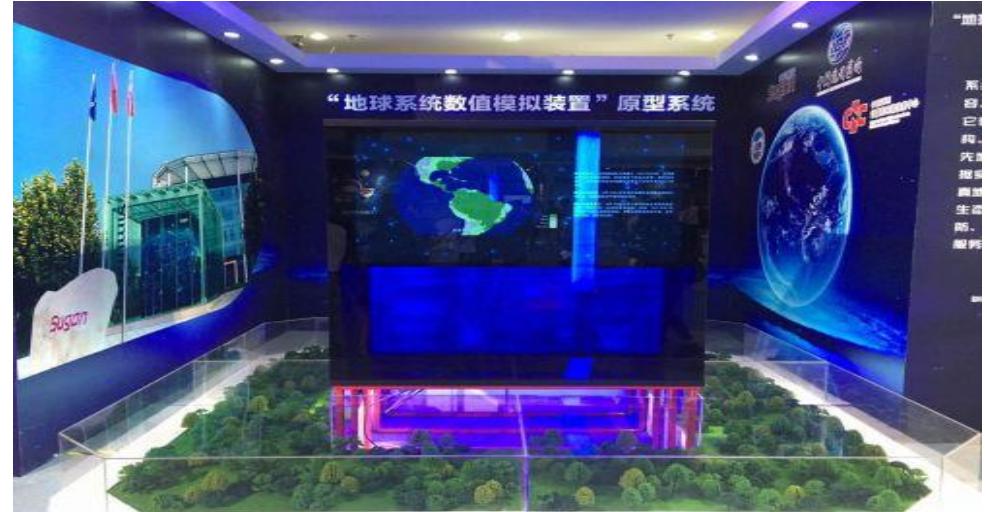
大气

地震

Visualization in Science

“地球系统数值模拟装置”

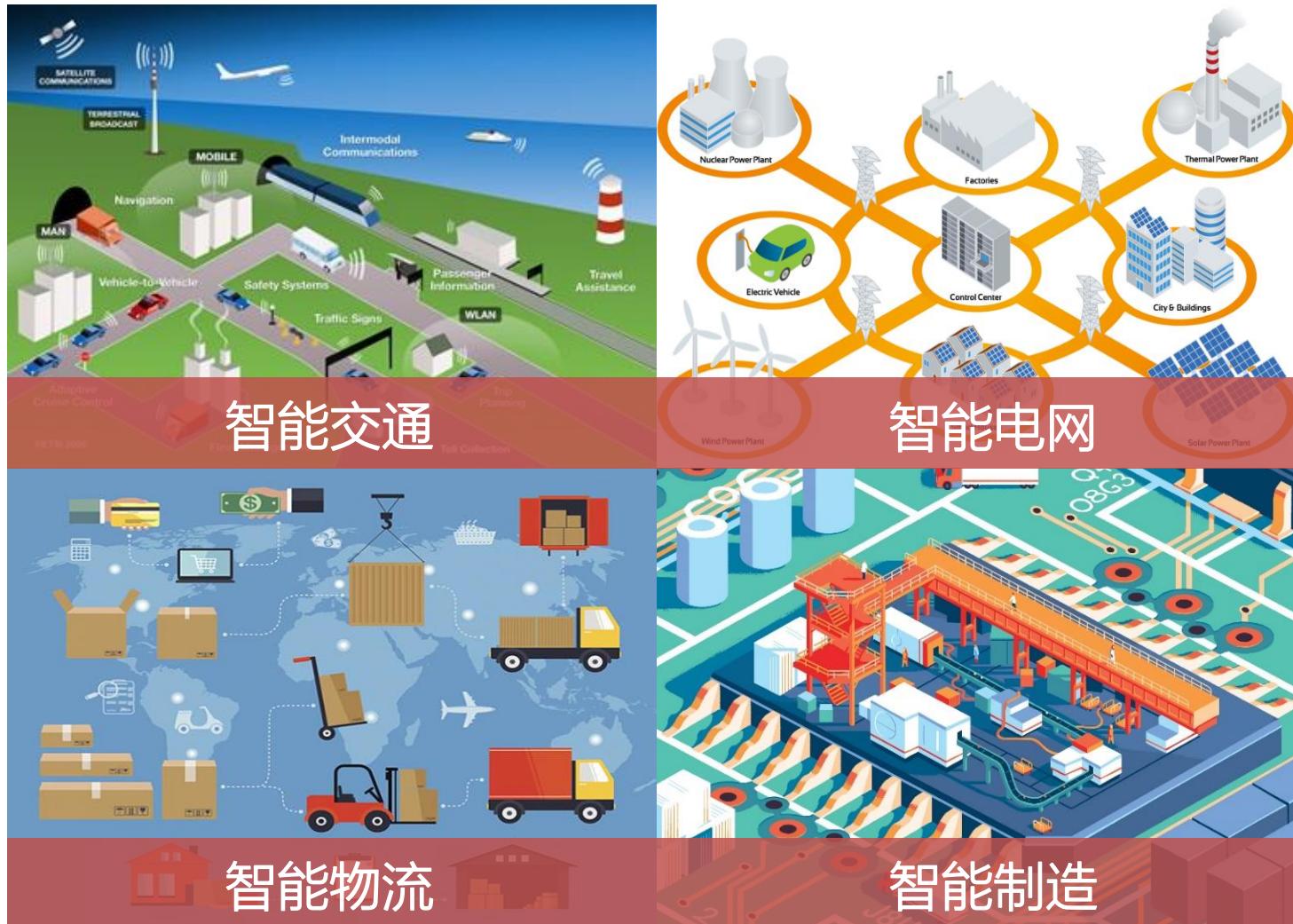
国家十三五重大科学装置项目，拟投资13亿，其中**可视化部分7000万。**



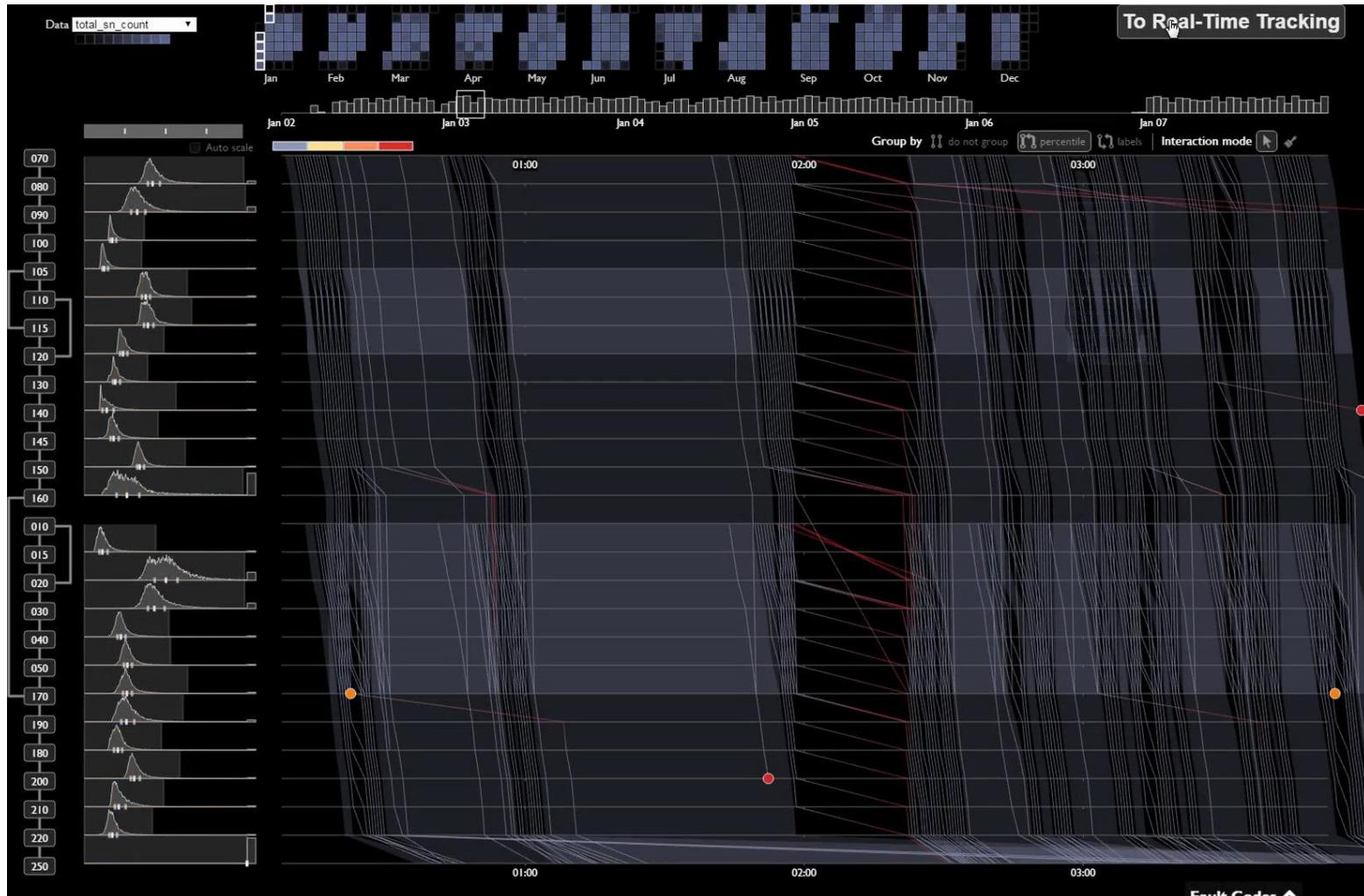
国家卫星气象中心全球大气数据可视化平台
(浙江大学)

Big Engineering

可视化是对大工程仿真、实测、融合、预测、测试等不同环节产生的信息进行综合理解与分析的必要手段



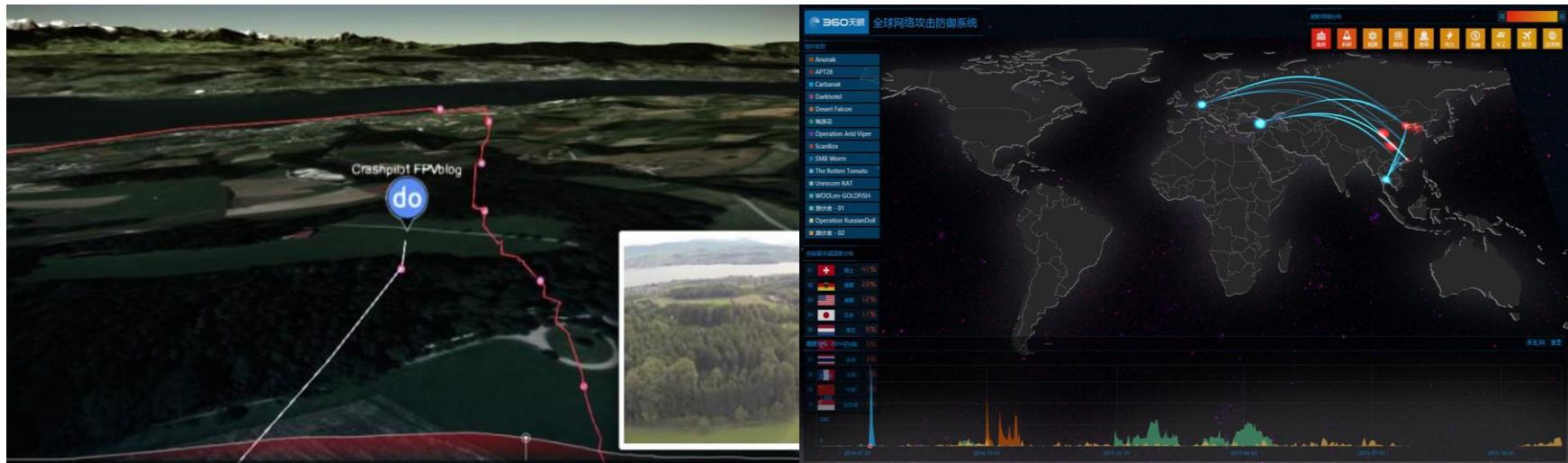
Big Engineering



博世智能工厂数据可视化分析
(美国博世研究院, 浙江大学)

Big Security

可视化是面向与人博弈任务的智能分析的最主要的交互界面

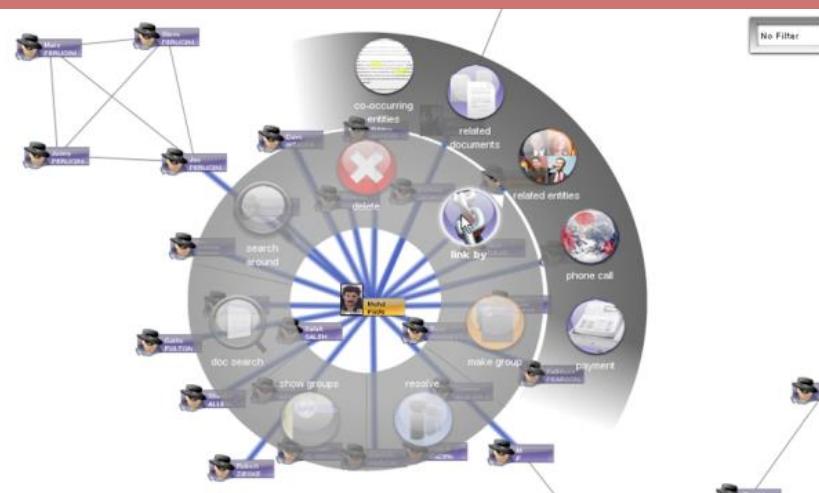


国土安全

网络安全



公共安全



金融安全

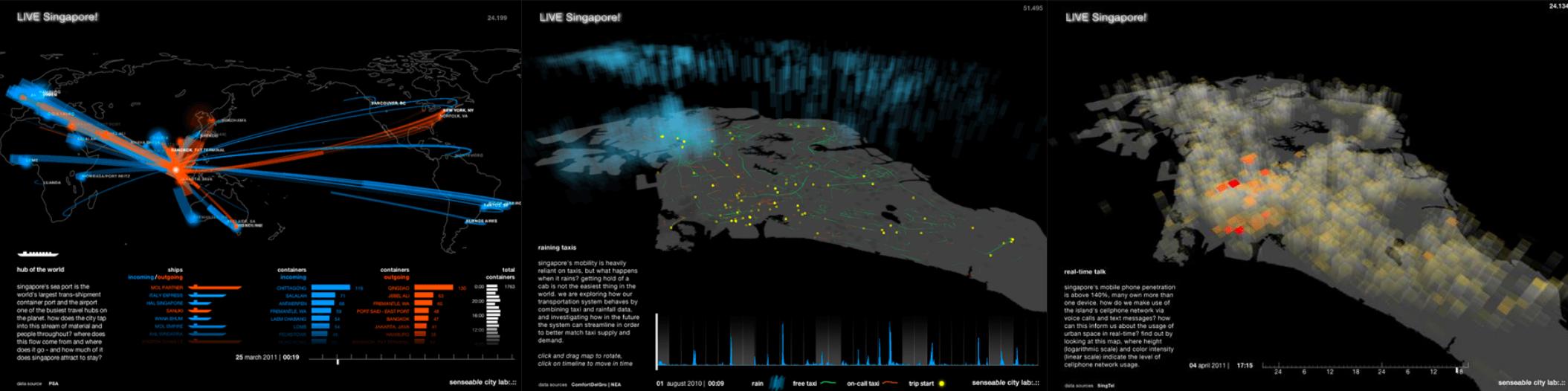
Big Security



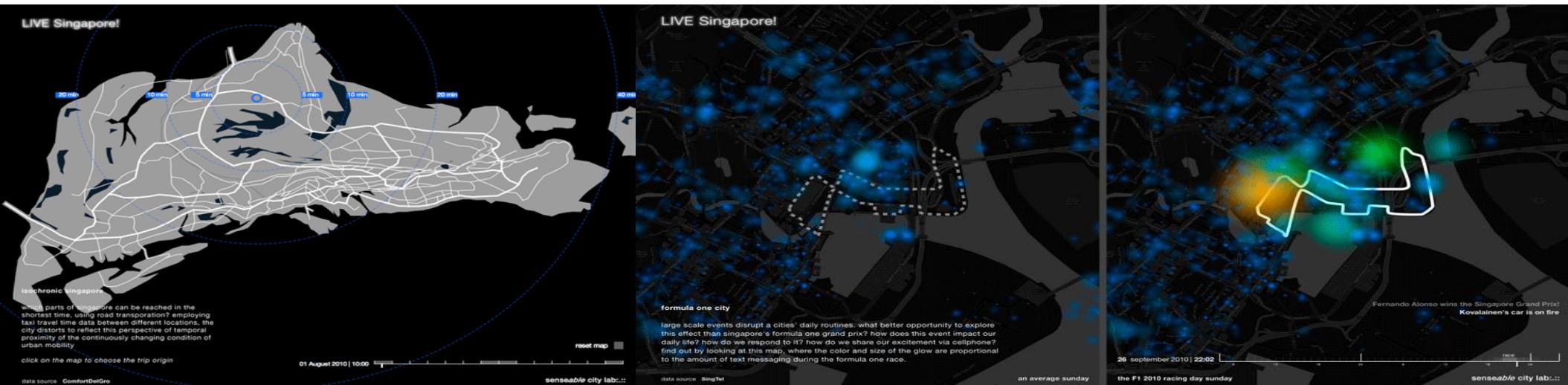
Manually extracting the names of
two POIs from the post

基于定位、网络和社交数据的时空城市数据可视查询 (浙江大学)

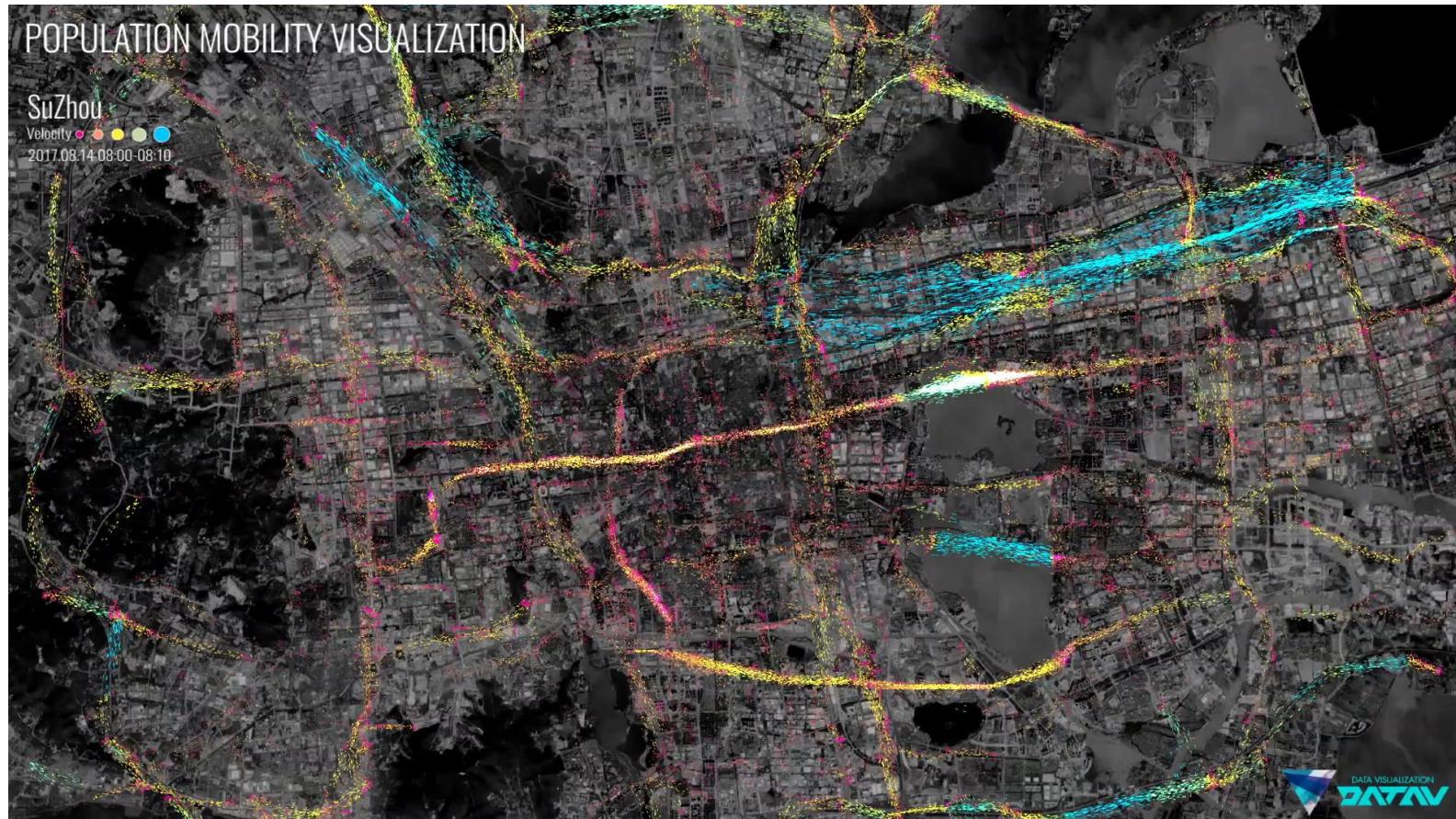
IoT and Smart Cities



可视化是基于城市数据进行规划、理解、决策的敏捷分析途径

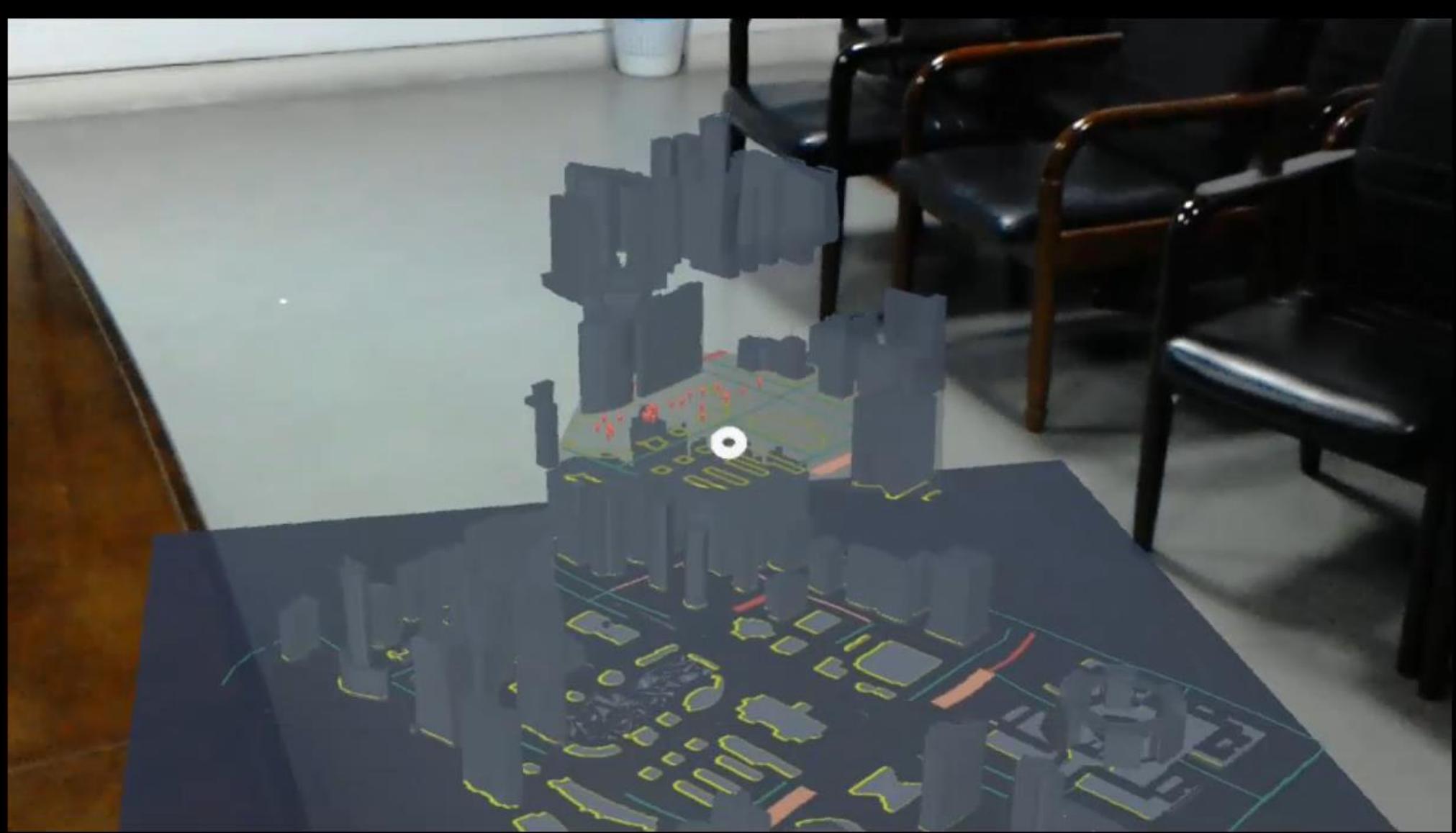


Smart cities



阿里-浙大：苏州城市大脑

AR + Smart city



Smart City

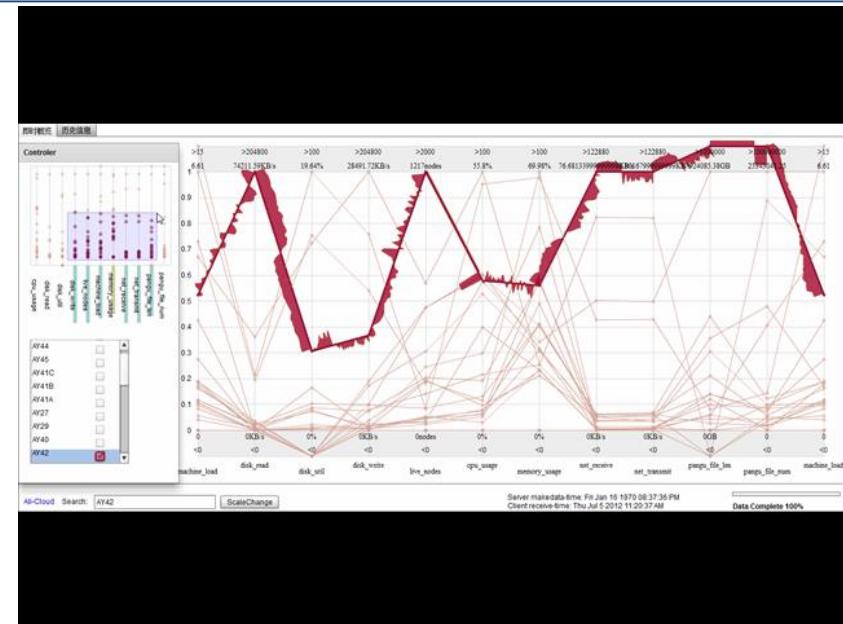


基于城市大数据的可视化选址
(浙江大学、香港科技大学、微软研究院)

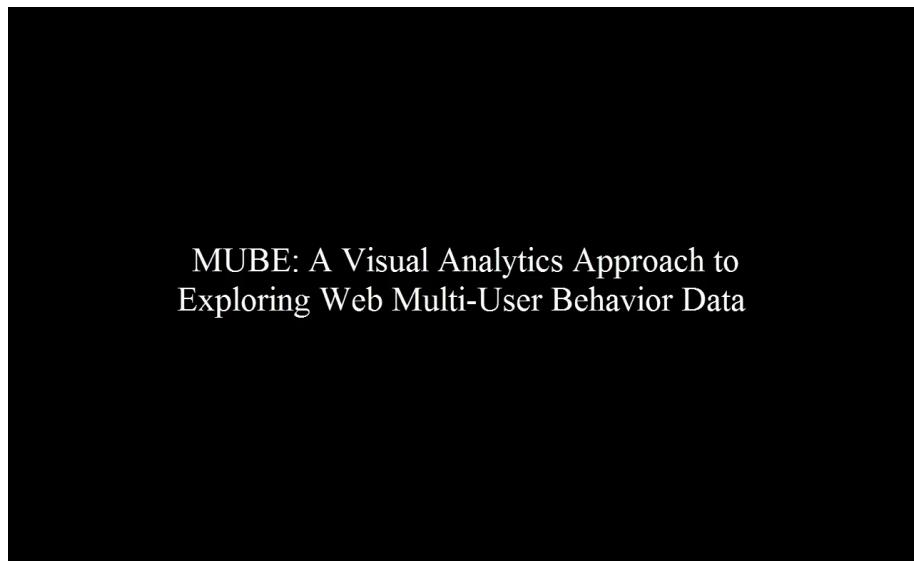
Internet and social media



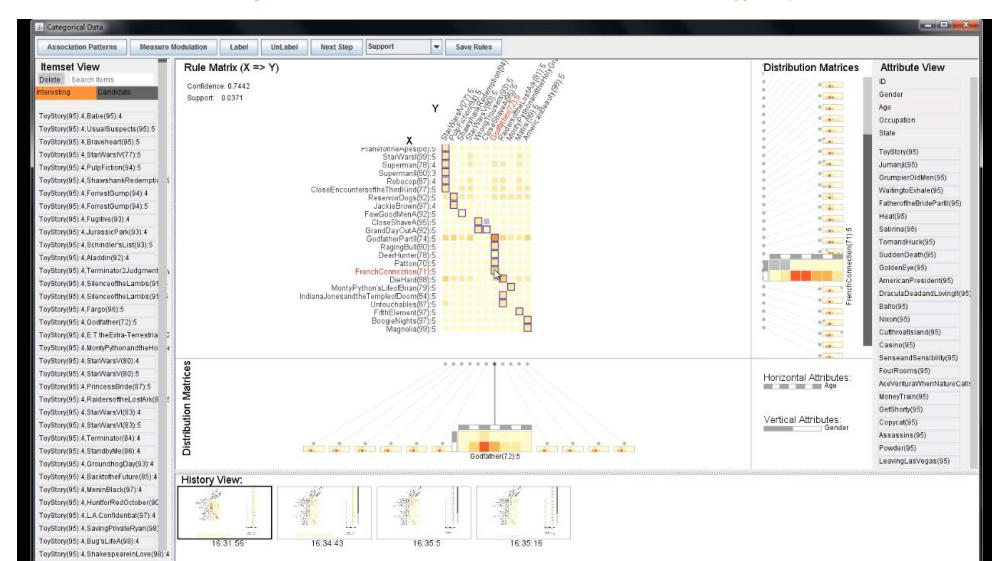
城市间电子商务物流可视化



阿里云监控日志的可视化



MUBE: A Visual Analytics Approach to Exploring Web Multi-User Behavior Data

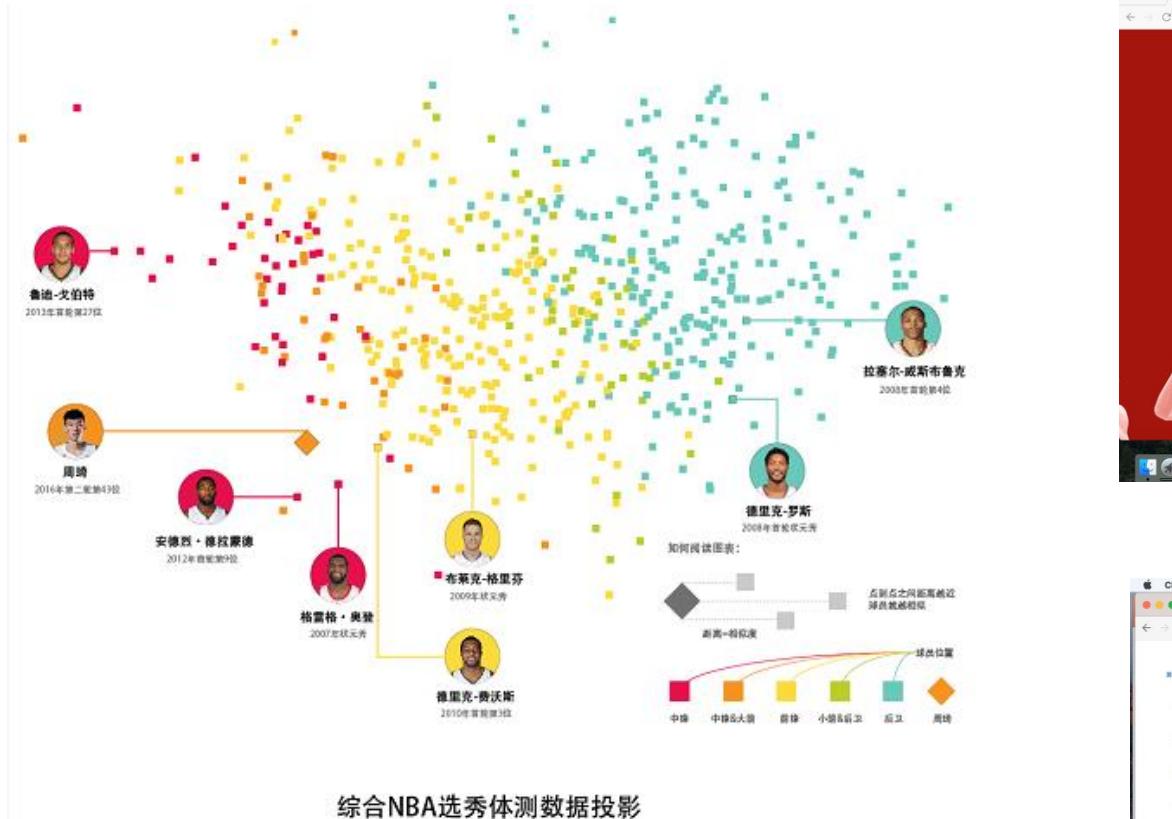


基于电子交易数据的异常交易可视分析

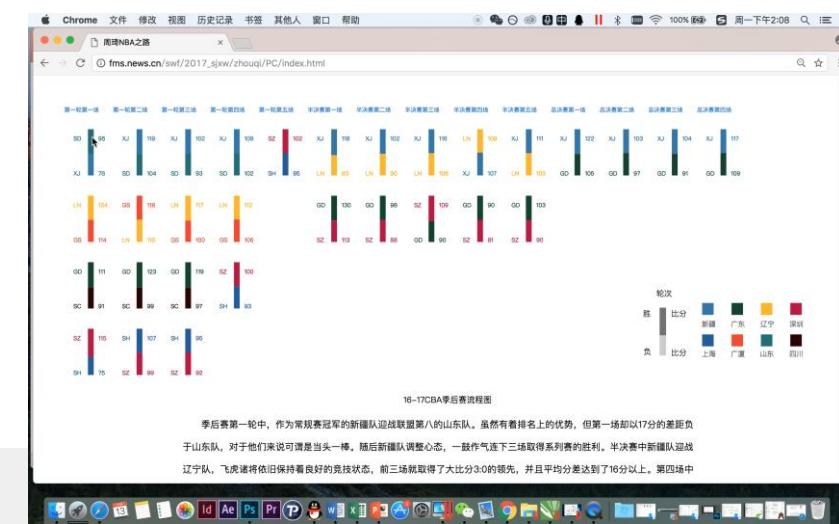
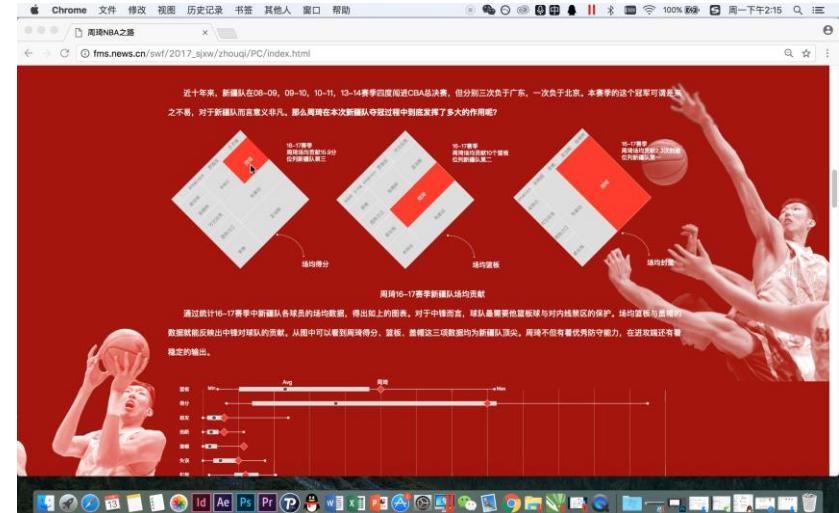
电子商务交易的关联规则可视分析

Internet and social media

浙大-新华网制作的数据新闻：周琦的NBA之路



http://fms.news.cn/swf/2017_sjxw/zhouqi/PC/index.html

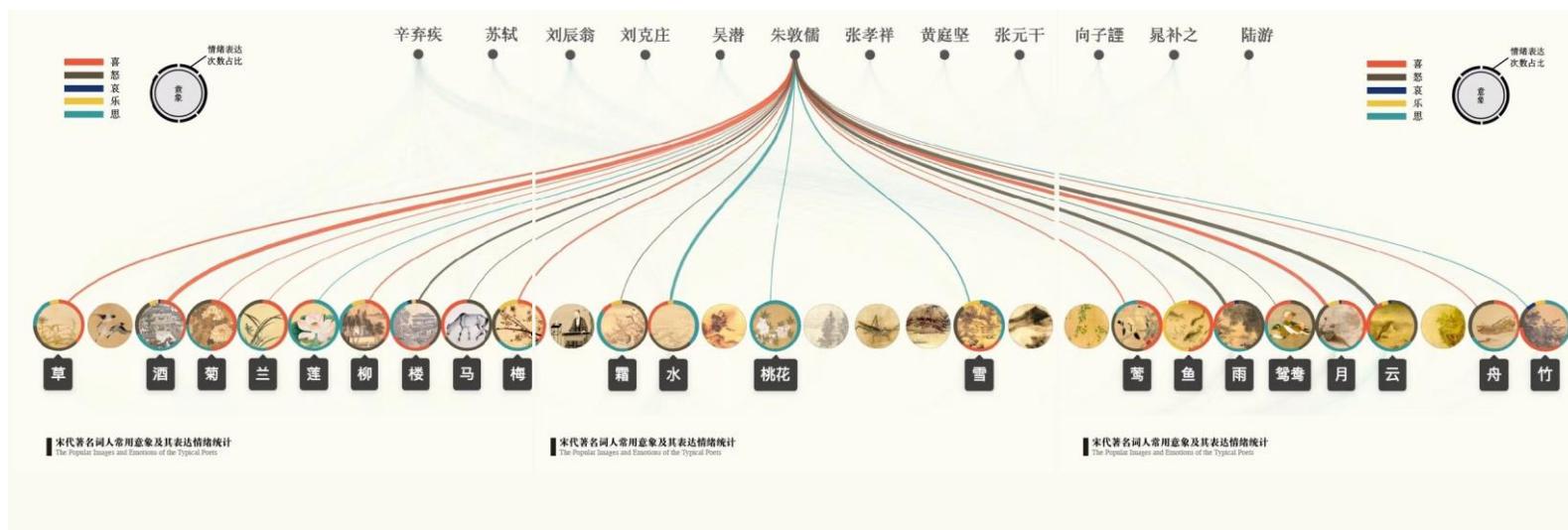
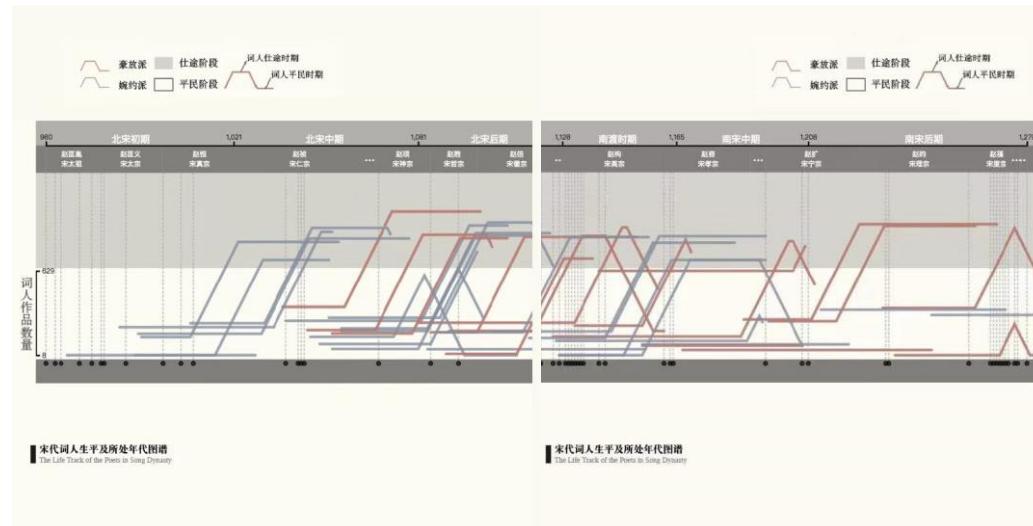


Internet and social media

NBA Games Viewer

Visualization of NBA games

Internet and social media

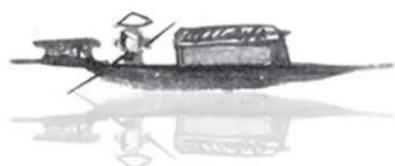


互动版（pc端支持更多交互）：http://fms.news.cn/swf/2018_sjxw/quansongci/index.html#/
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Internet and social media



*Visual Reasoning for Uncertainty
in Historical Figures and Spatial-temporal Events*



Submission ID : 1074

'OUTLINE'

01

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02

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03

How to create visualization?

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big data visualization

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Data Visualization: What it is and why matters | SAS

www.sas.com/en_us/insights/big-data/data-visualization.html ▾

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Big Data Visualization: Review of the 20 Best Tools - Inspire - ...

inspire.blufra.me/big-data-visualization-review-of-the-20-best-tools/ ▾

Nov 22, 2015 - Big Data is made of numbers, and I think we all agree when we say: Numbers are difficult to look at. Enter **Big Data visualization**. Google ...

What Does Big Data Look Like? Visualization Is Key for Hum...

<https://www.wired.com/.../big-data-look-like-visualization-key-humans/> ▾

A simple Google image search on "big data" reveals numerous instances of three dimensional one's and zero's, a few explanatory infographics, and even the ...

10 Data Visualization Tools To Bring Analytics Into Focus ...

www.informationweek.com/big-data/...data-visualization.../1325679 ▾

Jun 1, 2016 - **Data visualizations** can help business users understand analytics ... Many of these are available to try without making a big capital commitment.

[PDF] Big Data Visualization: Turning Big Data into Big Insights - ...

www.intel.com/.../big-data-visualization-turning-big-data-into-big-insigh... ▾

Several usage examples of visualization-based data discovery tools from TIBCO* Software, the world's ... 2. Intel IT Center White Paper | **Big Data Visualization** ...

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JOURNAL REPORTS / LEADERSHIP

Pictures Make Sense of Big Data

Visualization technology can turn data into pictures that are far more comprehensible

By DEBORAH GAGE | CONNECT

Updated Sept. 15, 2013 5:18 p.m. ET

Most people have trouble recalling strings of numbers that are longer than their phone numbers. So how do we begin to comprehend a hundred rows of data, let alone a thousand or a million or a billion rows?

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- Stop Information Theft by Employees

Humans are fundamentally different from computers—we're wired to comprehend shapes, patterns and colors. So technology companies are using data visualization to help companies turn large sets of data into pictures that lead people intuitively to the information that is most important to them.



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Executive Office of the President
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FOR IMMEDIATE RELEASE

March 29, 2012

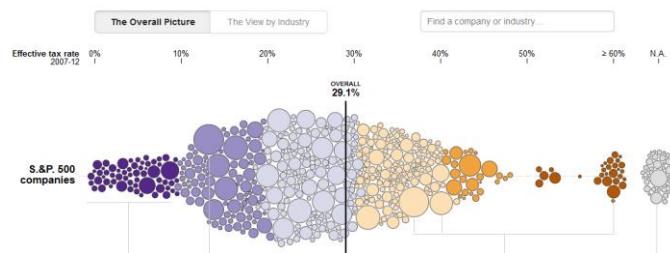
Contact: Rick Weiss 202 456-6037 rweiss@ostp.eop.gov
Lisa-Joy Zgorski 703 292-8311 lisaj@ostp.gov

OBAMA ADMINISTRATION UNVEILS "BIG DATA" INITIATIVE: ANNOUNCES \$200 MILLION IN NEW R&D INVESTMENTS

- Issuing a \$2 million award for a research training group to support training for undergraduates to use graphical and visualization techniques for complex data.

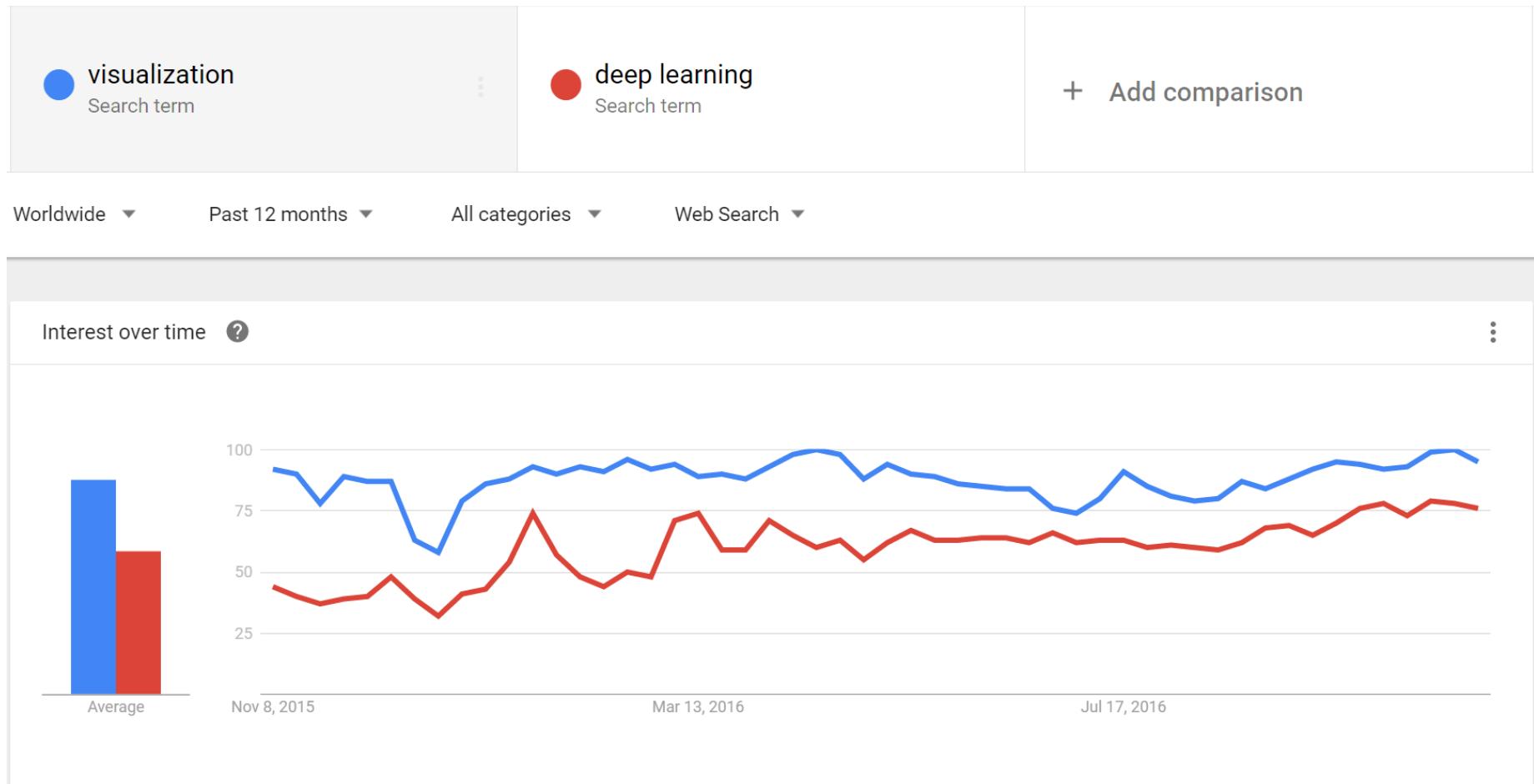
Across U.S. Companies, Tax Rates Vary Greatly

Last week, in a Congressional hearing, Apple got grilled for its low-tax strategy. But not every business can copy that approach. Here is a look at what S&P 500 companies paid in corporate income taxes — federal, state, local and foreign — from 2007 to 2012, according to S&P Capital IQ. [Related Article »](#)



可视化热度

可视化与深度学习



MAR 10, 2014 @ 11:53 AM 24,747 VIEWS

Data Visualization Is The Future - Here's Why

We've all heard that Big Data is the future. But according to Phil Simon's new book *The Visual Organization: Data Visualization, Big Data, and the Quest for Better Decisions*, that may not be quite right. Big Data is a powerful discovery tool for companies seeking to glean new insights. But without the right framework for understanding it, much of that knowledge may go unrecognized. Oftentimes, it's data *visualization* that allows Big Data to unleash its true impact.

Dorie Clark
CONTRIBUTOR

I write about marketing, branding and business strategy.

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Opinions expressed by Forbes Contributors are their own.

"*The Visual Organization* is fundamentally about how progressive organizations today are using a wide array of data visualization (dataviz) tools to ask better questions of their data – and make better business decisions," says Simon, citing the example of companies such as Amazon, Apple AAPL -0.91%, Facebook, Google GOOG -0.20%, Twitter, and Netflix NFLX -0.93%, among others.

Of course, many companies have long been using rudimentary dataviz tools, such as a Microsoft Excel graph or chart, he notes. "But that's unlikely to promote true data discovery." On the contrary, at the most advanced companies, "you'll see that employees are doing a great deal more than creating simple graphs, bar charts, and pivot tables. Employees here are *interacting* with their data, and learning new things about their businesses in the process."

THE WALL STREET JOURNAL.

TOP STORIES IN WSJ

1 of 12



 U.S. Goals Shift in Militant Fight



2 of 12

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3 of 12

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JOURNAL REPORTS: LEADERSHIP

Pictures Make Sense of Big Data

Visualization technology can turn data into pictures that are far more comprehensible

By DEBORAH GAGE 

Updated Sept. 15, 2013 5:18 p.m. ET

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Journal Report

- Insights from **The Experts**
- Read more at [WSJ.com/LeadershipReport](#)

More in Technology

The Best Way for Companies to...

- Stay Secure Without Passwords
- Manage Employees' Mobile Devices
- Stop Information Theft by Employees

technology companies are using data visualization to help companies turn large sets of data into pictures that lead people intuitively to the information that is most important to them.

That's the dilemma so many companies face, thanks to technology advances that make it easier to routinely collect enormous amounts of data.

The answer is pictures.

Humans are fundamentally different from computers—we're wired to comprehend shapes, patterns and colors. So

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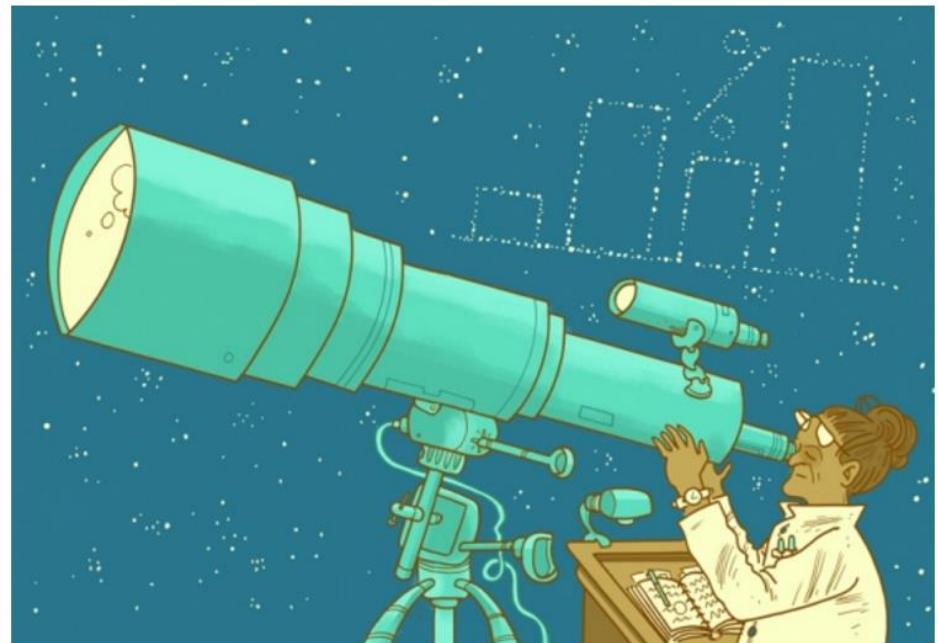
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How to Use Data Visualization to Improve Your Business

Understanding how our minds read visualizations can help answer your organization's most important questions.

Based on insights from Steven Franconeri and Joel K. Shapiro



Businesses today are awash in data. But visualizing that data for consumption remains a complicated, and often misunderstood, process.

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How P&G Presents Data to Decision-Makers

by Tom Davenport | 3:00 PM April 4, 2013



The screenshot shows a web-based dashboard titled "My Cockpit". It includes sections for "Alerts" (with items like "LastDance down 4% this month" and "Shipments 2.25% behind expectations"), "My Reports" (listing "All Outed Share - US Market - Through Aug 2008" and "Board of Directors Share Reports - July 08"), and "My Links" (with links to "Media Coverage", "Commercial Excellence", "gbs Decision Cockpit", and "Marketing Grid"). The main area features a "Shipments Quick Overview" chart for "Global" and "Region" levels, and two line graphs: "NA Daily O&S Report" and "NA Market Measurement/Control Chart". A "NA MDC Scorecard" table is also visible at the bottom.



Keys to big data in the brain, not the computer, former NSA exec says

◦ By [Rutrell Yasin](#) ◦ Apr 26, 2012

Data visualization tools are critical to the success of big data analytics.

But achieving that success will require more than people with engineering skills; it will require input from cultural anthropologists and social scientists, a former National Security Agency executive told an audience in the Washington, D.C. metro area.

Richard Schaeffer, former information assurance director for NSA and head of the consulting firm Riverbank Associates, said April 26 in a keynote address at SAP National Security Services' Big Data Day in McLean, Va.

CIA Funding for Data Visualization Firm Brainspace

October 19 2016

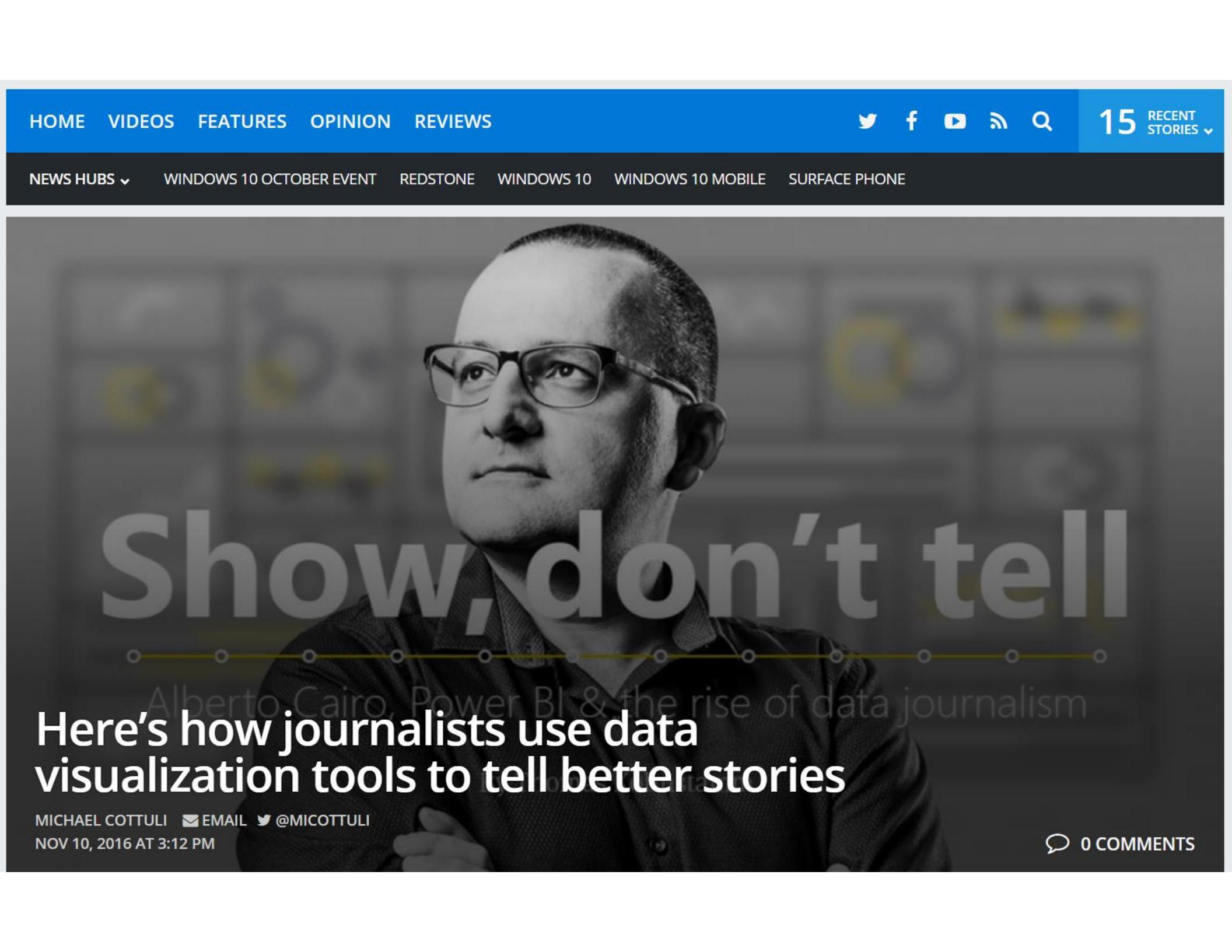
In the US, machine learning, semantic technology and data visualization specialist Brainspace has received an undisclosed amount of funding from non-profit venture capital firm In-Q-Tel (IQT), which is itself funded by the Central Intelligence Agency (CIA).

Dallas, Texas-based Brainspace has developed a patented platform called Discovery, for text analytics, e-discovery, digital investigations and document classification. This software detects and relates specific phrases in massive unstructured datasets - without the need for lexicons or taxonomies - with resulting information expressed through interactive visualizations.

Its new investor, IQT, identifies and partners with startup companies developing technologies that help the CIA's mission to gather intelligence. Last month, IQT signed an investment and technology development agreement with big data exploration, visualization and analytics platform Zoomdata. According to an article published in online publication The Intercept, among the portfolio of companies in receipt of IQT funding - which includes [Dataminr](#), [Geofeedia](#), PATHAR, and TransVoyant, which mine data from platforms such as Twitter - the key focus is involvement in social media data mining.



Commenting on his firm's latest funding round, Brainspace CEO Dave Copps (pictured) said: 'Throughout the intelligence community there is a huge challenge and untapped value in being able to surface insights, answers, and threats in unstructured data. Our products directly address this need through augmented intelligence. IQT's investment reflects the need for machine learning, powerful user experiences, and next-generation investigative tools in a growing number of industries, including federal'.



Show, don't tell

Alberto Cairo, Power BI & the rise of data journalism

Here's how journalists use data visualization tools to tell better stories

MICHAEL COTTULI [✉ EMAIL](#) [@MICOTTULI](#)

NOV 10, 2016 AT 3:12 PM

0 COMMENTS



The key to better BI is better governance.
Forbes Insights reveals why.

[GET THE REPORT](#)

Visualization is Key to Proactive Risk Management

by Donna Weiss | October 27, 2016 5:30 am | 0 Comments



Donna Weiss, Senior Director, Product Marketing, NICE Actimize

There are numerous benefits to leveraging visual analytics, including accelerating the investigative processes and allowing users to go in any direction with their analysis. But simply stated, visual analytics can help prevent financial crime. By presenting an immediate and comprehensive view of risk, organizations gain a more complete understanding of the threats they face and become more proactive in their response to them. With a robust solution, users can also quickly create their own visualizations to see and explore their data, empowering them to operate more efficiently and intelligently than ever before.

Data Visualization tools are especially powerful when used in concert with alert and case management solutions. It becomes easier for Risk and Compliance Officers to incorporate visualizations into standard, best practice investigation processes. Thinking back to the organization we spoke to where this process took three months, it's easy to see the benefits and return on investment institutions can gain at the outset with a strong data visualization solution.

In the end, powerful visualizations provide deeper insights and a better understanding of financial crime and compliance risks, enabling organizations to understand where they are exposed at any given time so they can improve operational decision-making, strategies and processes, resulting in a more proactive approach to financial crime. In addition, relationship managers, traders, investment bankers and other client facing and revenue-generating departments have had access and greatly benefited from visual analytic tools for quite some time. Fortunately, the financial services industry is finally moving rapidly to more visualization technology across all core areas of financial crime risk. This move will not only benefit the institutions, but also prove to be a great asset to both customers and the financial markets.

Donna Weiss has more than 15 years of distinguished product management and marketing experience in solution definition, strategy, enterprise application design, and new product launch. Prior to joining NICE Actimize, she served as Director of Product Management at Oracle-Hyperion.

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SiliconANGLE » How Hollywood Is Reshaping Big Data Visualization

How Hollywood is reshaping Big Data visualization

RYAN COX | MAY 6TH

READ MORE

Hollywood storytelling is reshaping the world Big Data. We've heard plenty about Big Data changing business, but here is an interesting angle on how the Hollywood business is reshaping Big Data. One great example comes by way of Tableau, the data visualization platform. They have been stocking up on film industry veterans to reach their goal of storytelling with data, starting with Pat Hanrahan. He's one of Tableau's three co-founders, and one of the founding employees of Pixar. Hanrahan just won his third Academy Award this year. Adding to this all star lineup, Tableau recently hired a couple of smart people from Lucasfilm.



Big Data's Hot Cousin

Data visualization: Big Data's hot cousin

Clever coders make data fun and easy, as vendors add tools to catch up

By Simon Sharwood, 26th April 2012

A large white square containing a black number '1' with a small black arrow pointing towards it from the top-left.

1

Moritz Stefaner calls himself a "Truth and Beauty Operator". But if you don't understand what that means, he'll translate to the safer "Freelance information Visualizer" and explain that "Large companies approach me with large data sets they want visualized. I take their data and turn it into something beautiful."

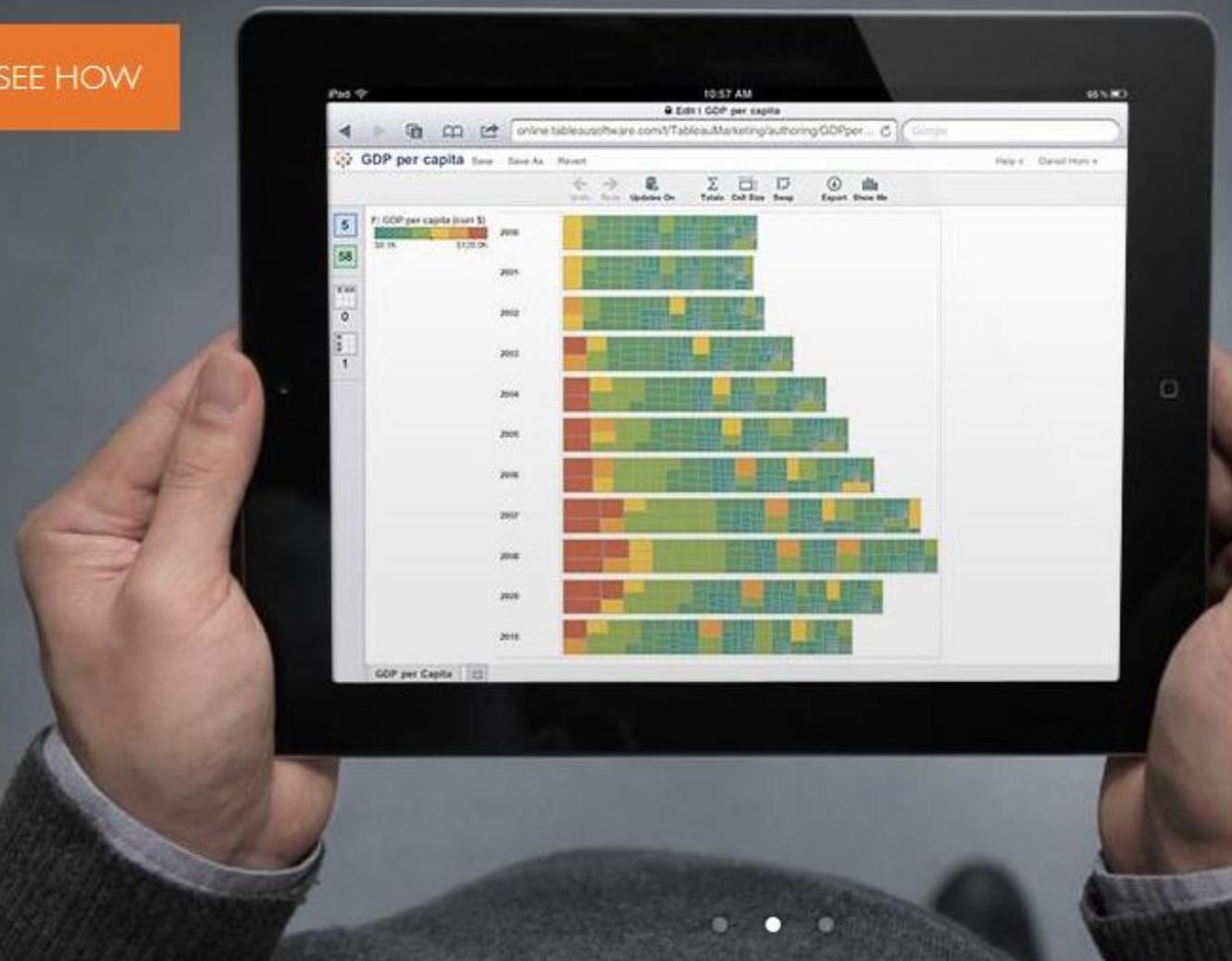
Two small grey icons: a document with a blue outline and a lightbulb with a blue outline.

Beauty is important to Stefaner because he feels it is a way to address the problem of data overload.

DATA ON THE GO

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PowerMap

Google takes on Microsoft & Tableau with free data visualization tool

by Mike Wheatley | May 27, 2016 | 0 comments

[Sample] Acme Marketing Website

File View Page Help

SHARE

1 / 1

ACME

Marketing Website Summary

Data From Google Analytics

Users: 102,475 (-5.2%) Sessions: 116,494 (-5.1%) Pageviews: 560,394 (-0.9%) Bounce Rate: 44.99% (-0.1%)

How are site sessions trending? Last 30 days vs. previous period

What are the top countries by sessions? Sessions over the last 30 days

Which channels are driving engagement? Goal: Engaged Users

Country Sessions Pageviews

Country	Sessions	Pageviews
United States	50,051	50,051
Turkey	7,777	7,777

The screenshot displays a user interface for a marketing website analysis tool. At the top, it shows a navigation bar with 'File', 'View', 'Page', 'Help', and a 'SHARE' button. Below the header, there's a date range selector set to 'Apr 24, 2016 - May 23, 2016'. The main content area is titled 'Marketing Website Summary' and 'Data From Google Analytics'. It features four key metrics: Users (102,475), Sessions (116,494), Pageviews (560,394), and Bounce Rate (44.99%). Below these, two sections are shown: 'How are site sessions trending?' (a line chart comparing current sessions to the previous 30 days) and 'What are the top countries by sessions?' (a world map where darker shades represent higher session counts). A third section, 'Which channels are driving engagement?', includes a goal of 'Engaged Users' and a table ranking countries by sessions and pageviews. The table shows the United States at the top with 50,051 sessions and 50,051 pageviews, followed by Turkey.

Adobe Rolls Out New Data Visualization Tool

Posted September 25, 2015



EARLIER
IBM's Watson AI System Gets New Digs in San Francisco

THIS STORY
Adobe Rolls Out New Data Visualization Tool

LATER
Microsoft Launches New Cloud Services for Azure Platform

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BIG DATA

THIS STORY

HP TEAMSITE 8

[Web Content Management Solutions](#)

NEWS OPS

By Jennifer LeClaire
Updated September 25, 2015 10:11AM

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Technology company Adobe is getting in on the analytics trend with a new solution that helps companies analyze, share and leverage market data through Adobe Analytics. The new tool is called Analysis Workspace and it aims to change how you organize and visualize data in your company.

With Analysis Workspace, you can look at the data from just about any angle. The tool lets you manipulate data views to

SearchMarketing DAILY

Adobe Adds Data Visualization Tools, Making It More Intelligent

by Laurie Sullivan@lauriesullivan, October 20, 2016, 1:55 PM

★ Recommend (10)

 Adobe began offering new features in its analytics platform Thursday to meet the increasing need for visual data on mobile devices as well as desktops.

54 SHARES

One capability in Analysis Workspace offers a way for marketers to pull in data, search for insights, and visualize how consumers move through the purchase process. It can identify a group of customers based on their behavioral pattern.

✉

It helps people build stories to help them answer questions about orders or campaigns, for example, said Jeff Allen, senior director of product marketing at Adobe.

✉

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Canon Business Process Services, a division of the photography and office technology company, has launched a tool called BusinessInsights, designed to give clients business performance metrics to benchmark and improve their processing of documents.

Reports cover nine service areas including records management, mail and print services, document imaging and materials management logistics. The tool offers rich data visualizations via a Web-based portal, for user-friendly tracking and management of performance statistics, split by location and user; while large corporate clients can view metrics across multiple sites and customize metrics, for example to view cost-per-user or space utilization. Users can also compare performance with SLAs and KPIs.

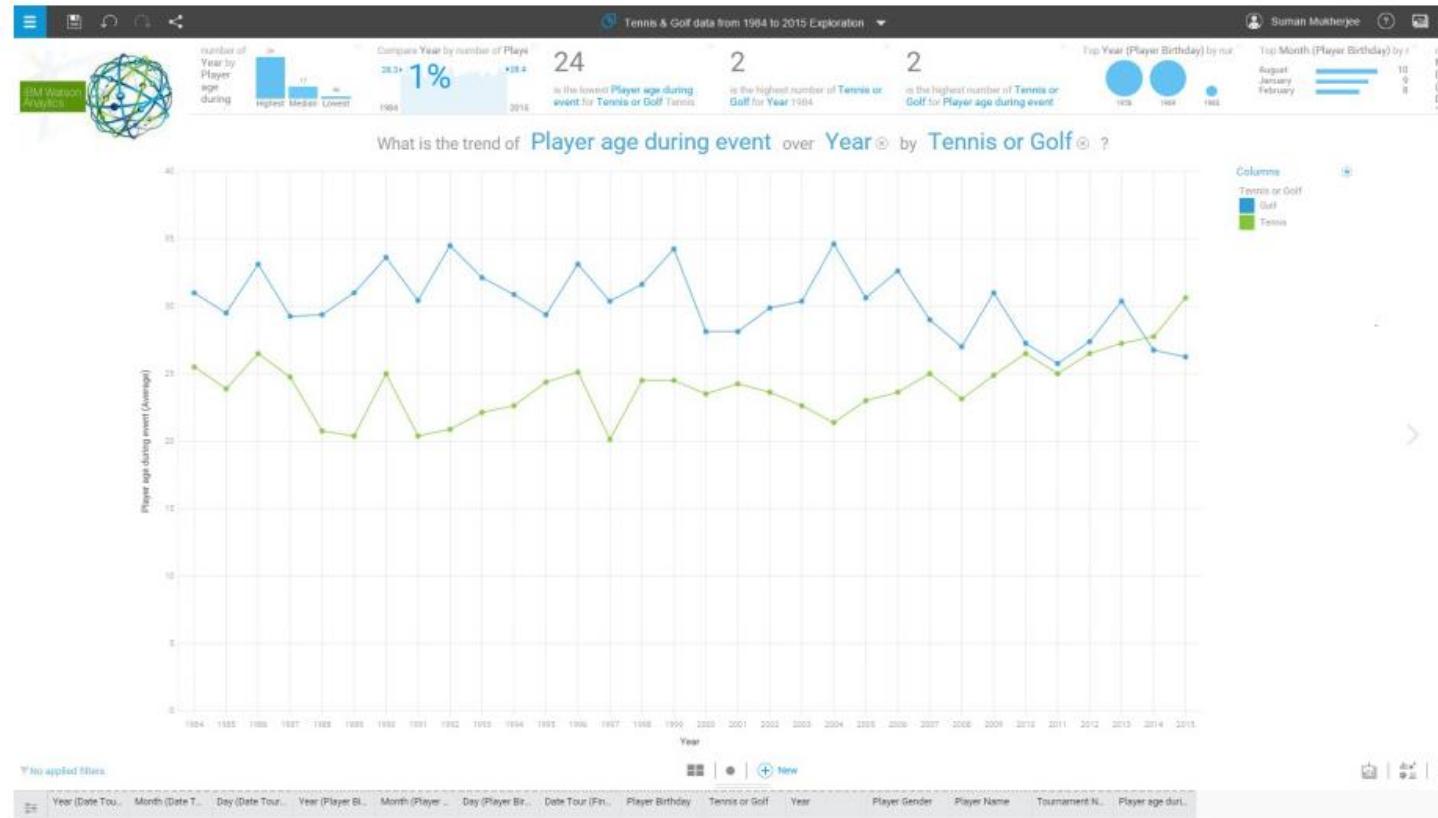


Canon BPS says the tool has already helped a client save almost \$500,000 in its first year, by trawling three years of data and spotting excessive use of overnight services to send non-urgent documents.

The division, which also offers Business Process Outsourcing and managed specialty staffing, is online at www.cbps.canon.com.

IBM adds to Watson Analytics with Expert Storybooks, connectors to Oracle, Salesforce, Microsoft Azure, AWS

JORDAN NOVET OCTOBER 13, 2015 9:01 PM



Above: A data visualization in IBM's Watson Analytics.

Image Credit: IBM

IBM today is announcing new ways for business users to easily explore and visualize company data, with its Watson Analytics cloud-based big data analytics tool. Now the service will have new connectors to draw on data in several cloud services and on-premises databases, as well as new Expert Storybooks to point out trends hidden in corporate data.

IBM put together the Expert Storybooks — for working with data on sports, weather, marketing, social media, and finance — in partnership with AriBall, The Weather Co., OgilvyOne, Twitter, American Marketing Association, Nucleus Research, MarketShare, and Intangent.

Trending Research



The State of Marketing Analytics:
Insights in the age of the customer



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The State of Marketing Technology

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THIS IS OUR STORY ➤

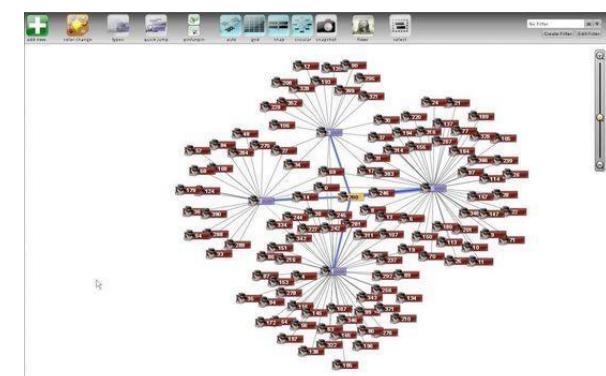
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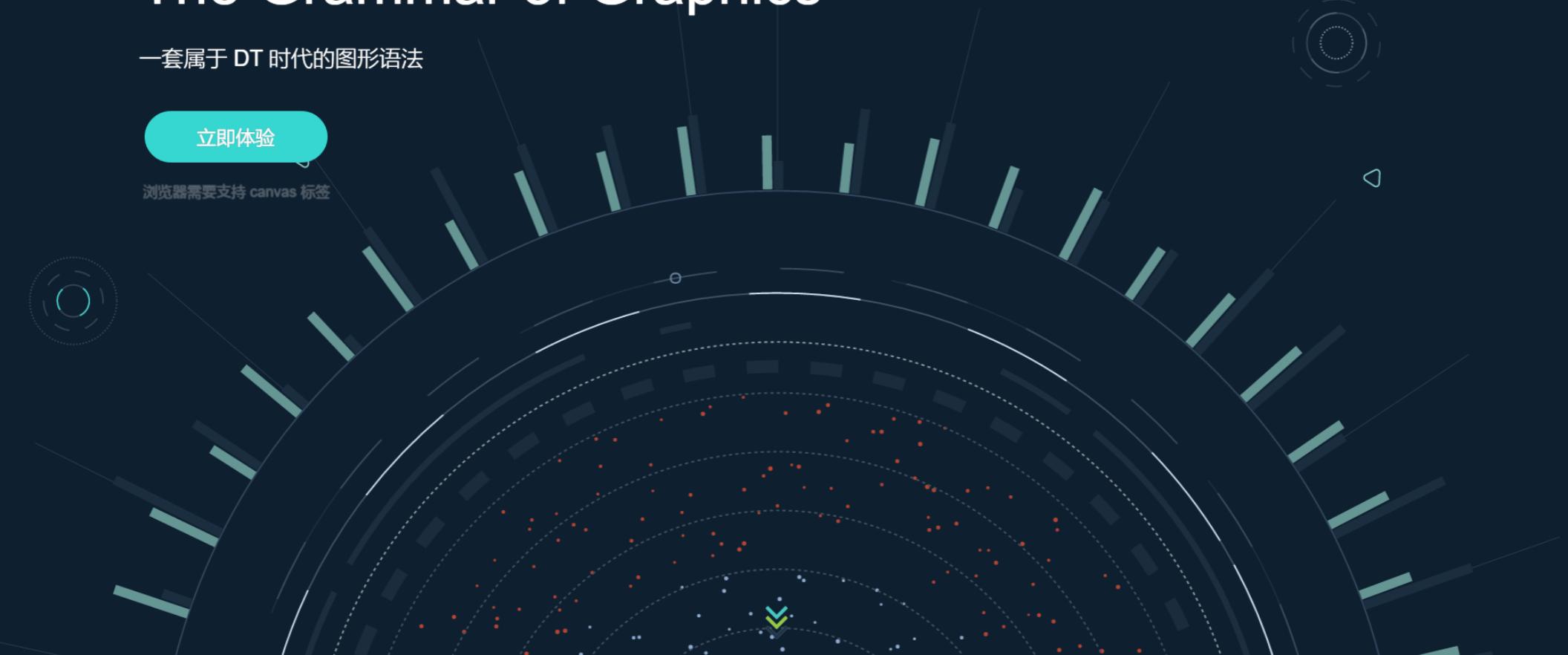
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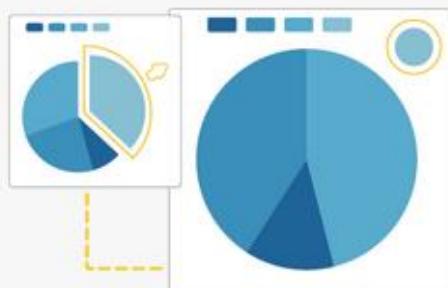
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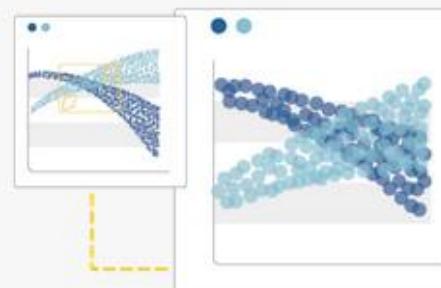
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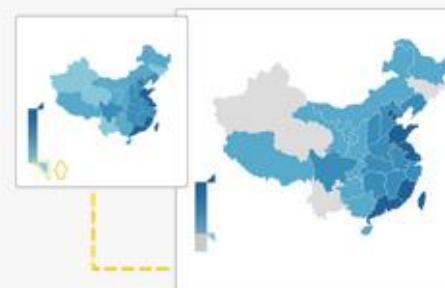
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拖拽重计算特性（专利）带来了数据统计图表从未有过的用户体验，允许用户对统计数据进行有效的提取、整合，甚至在多个图表间交换数据，赋予了用户对数据进行挖掘、整合的能力。



大规模数据模式

如何展现成千上百万的数据？貌似除了用专业的统计工具（如MATLAB）别无选择？不，在拥有众多交互特性下ECharts依然可以做到直角系图表（折、柱、散点、K线）20万数据秒级出图。



值域漫游

基于坐标的图表（如地图、散点图）通过色彩变化表现数值的大小能直观形象的展示数据分布。但如何聚焦到我所关心的数值上？ECharts拥有值域漫游的功能，让你可以轻松进行数值筛选。

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Obama's big data plans



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FOR IMMEDIATE RELEASE
March 29, 2012

Contact: Rick Weiss 202 456-6037 rweiss@ostp.eop.gov
Lisa-Joy Zgorski 703 292-8311 lisajoy@nsf.gov

OBAMA ADMINISTRATION UNVEILS “BIG DATA” INITIATIVE: ANNOUNCES \$200 MILLION IN NEW R&D INVESTMENTS

- Issuing a \$2 million award for a research training group to support training for undergraduates to use graphical and visualization techniques for complex data.

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国务院2015年9月 《促进大数据发展行动纲要》

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4. 新热点融入大数据多样化处理模式
5. 大数据提升社会治理和民生领域应用
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7. 深度分析推动大数据智能应用
8. 数据权属与数据主权备受关注
9. 互联网、金融、健康保持热度，智慧城市、企业数据化、工业大数据是新增长点
10. 开源、测评、大赛催生良性人才与技术生态

CCF大数据专家委员会



可视化推动大数据平民化

1

可视化让大数据靠近国计民生

可视化让技术高深的大数据在政策决策者和普通百姓中得到更好的理解，进而发挥价值。

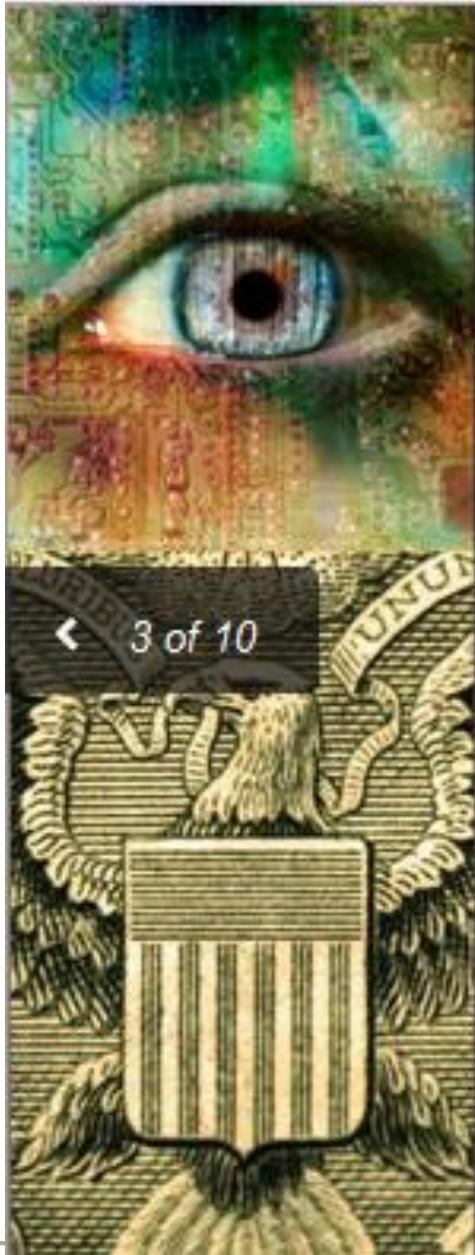
各种可视化技术和工具提升大数据分析

除了传统的可视化技术（各种图形）之外，如何表示图数据，特别是图数据相当大的情况下，并且方便用户进行交互，以及如何有效地对其它类型的数据进行可视化（社区的演变、时空轨迹等），值得关注。

从电子表格，到时间线动画，再到3D可视化，大数据创业公司提供了各种各样的分析工具和界面，有的面向数据科学家，有的选择绕过数据科学家直接面向业务部门。

CCF大数据专家委员会

Strong Demand in US



Visualization Tool Developers

AVERAGE ANNUAL SALARY: (Expert Level Salary)

\$150,000-\$175,000

AVERAGE PAY RATE PER HOUR:

\$57.50

Strong Demand in China

- Academia
 - MSRA, Tsinghua, PKU, ZJU, TJU, ...
- Industry
 - Alibaba, 163.com, Huawei, Baidu, Tencent, ...



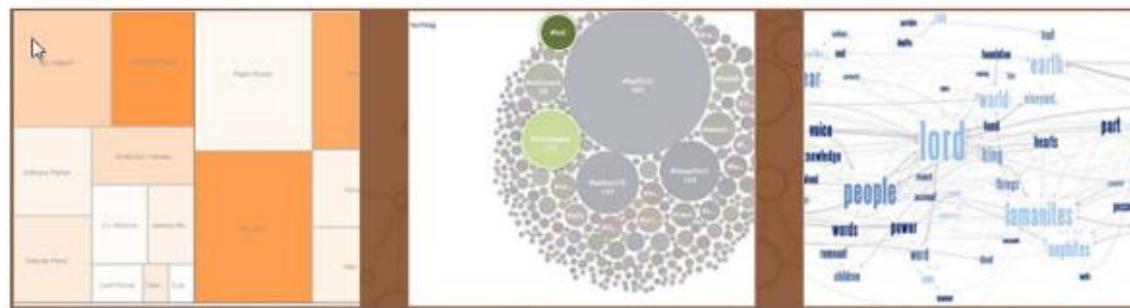
Visualization Is Young

VIS - Subfields

- Scientific Visualization (SciVis) – Spatial data



- Information Visualization (InfoVis) – Abstract data

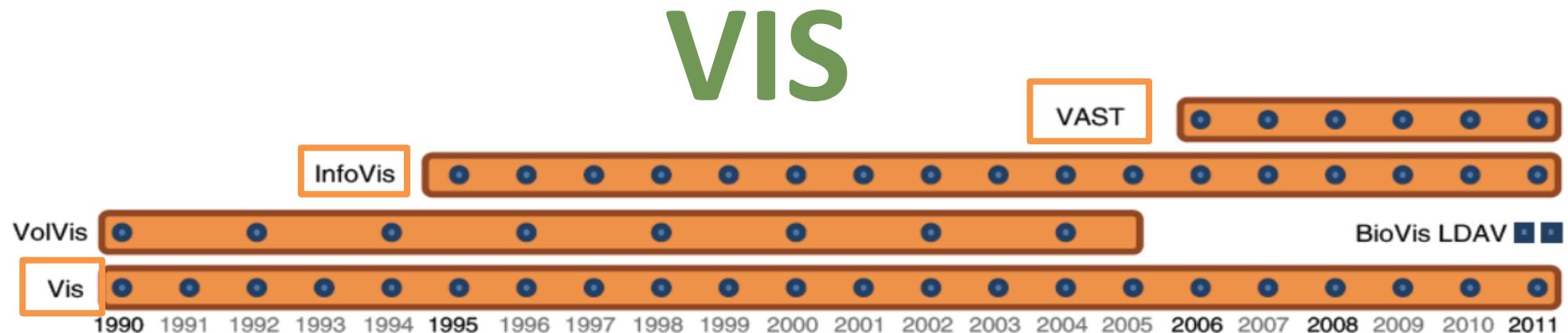


- Visual Analytics (VAST) – Analytical reasoning



Top VIS Conferences

- VAST (Visual Analytics Science and Technology)
- InfoVis (Information Visualization)
- SciVis (Scientific Visualization)



VIS - Graphics



Graphics

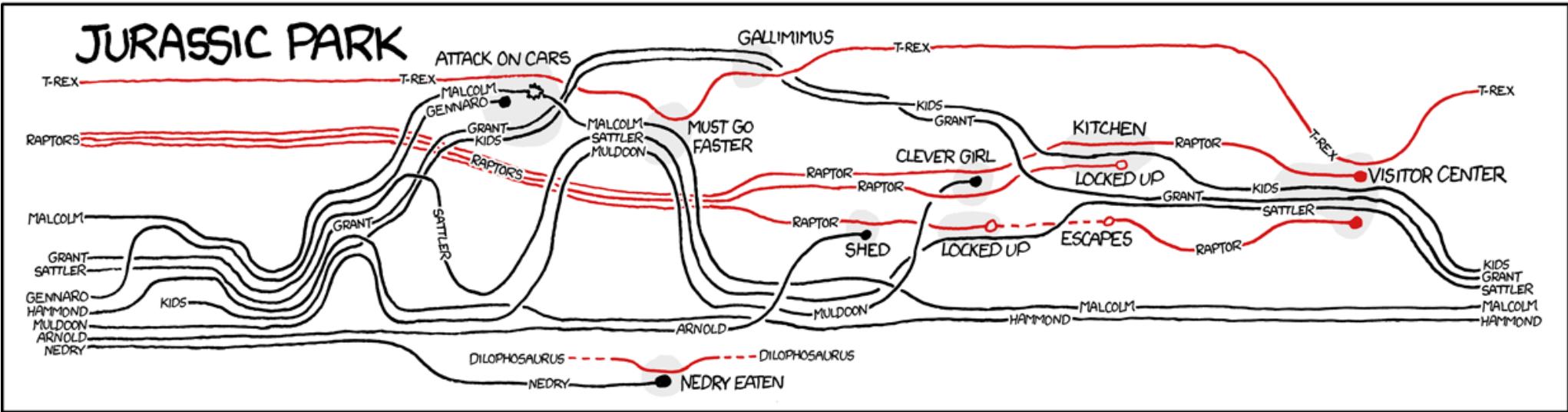
- Photo-realistic
- Simulation
- Real-world
- Visual media

Visualization

- Illustrative
- Understanding
- X-world
- Information

VIS - Infographics

- Infographics is **static**

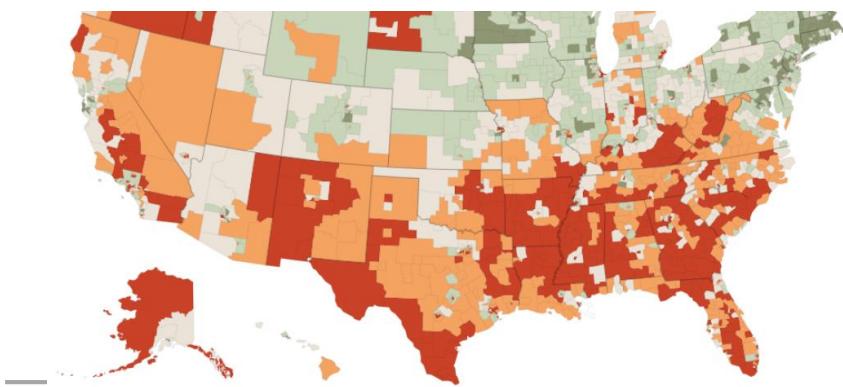
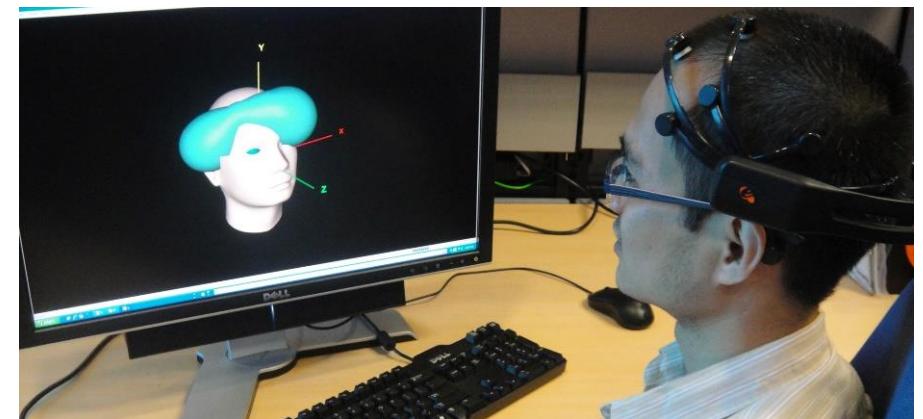
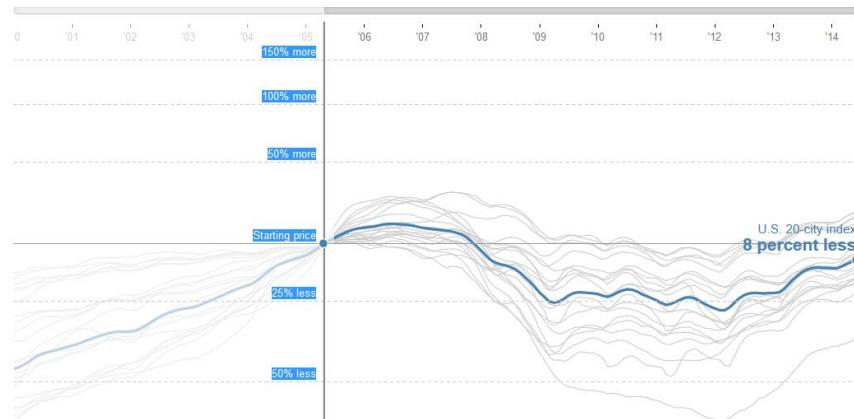


- Visualization is **interactive**

Evaluation

VIS - HCI

- Visualization deals with **data**
- HCI deals with everything involving **human & computer interaction**



▀ VIS - Data Mining

- **Data mining focuses more on automatic algorithms**
- **Visualization keeps human in the loop and focuses more on interactive analysis**



Huamin Qu's perspective on visual analytics

A large triangle is positioned in the center of the image. The top vertex contains the text "Data Mining" above "Data". The bottom-left vertex contains the text "Visualization". The bottom-right vertex contains the text "Human Computer Interaction".

Data Mining

Visual Analytics

Visualization

Human Computer
Interaction

A Typical Visual Analytics Problem

- **IEEE VAST Challenge 2009**
 - An employee is leaking important information to the outside world; hypotheses about his identity and network need to be made or confirmed.
 - There are three datasets:
 - Badge and computer network traffic
 - Social network (with a very small geospatial component)
 - Video

A Typical Visual Analytics Problem

- **IEEE VAST Challenge 2016**

Mini-Challenge 1

The Euybia Island Resort and Conference Center is a busy convention resort hotel and casino off the coast of Kronos. You are a designer specializing in visual analytics and human-computer interaction. Euybia Island has hired you to design an innovative interactive visual interface that enables their facility's security investigators to conduct real-time analysis of streaming data. Successful designs will provide investigators with the ability to understand current situations as they evolve, look at past data that puts current data in context, and anticipate what might happen next. It will also allow investigators to reconsider recent data in light of new events.

Please visit [VAST Challenge 2016: Mini-Challenge 1](#) for more information and to download the data.

Mini-Challenge 2 and 3

After the successful resolution of the 2014 kidnapping at GASTech's Abila, Kronos office, GASTech officials determined that Abila offices needed a significant upgrade. In 2015, the growing company moved into a state-of-the-art three-story building near their previous location. The new office is built to the highest energy efficiency standards, and it is fully instrumented with sensors that identify everything from building temperatures to concentration levels of various chemicals.

GASTech has recently introduced new security processes. Staff members are now required to wear proximity (prox) cards while in the building, so that incidents like the 2014 kidnapping cannot occur again.

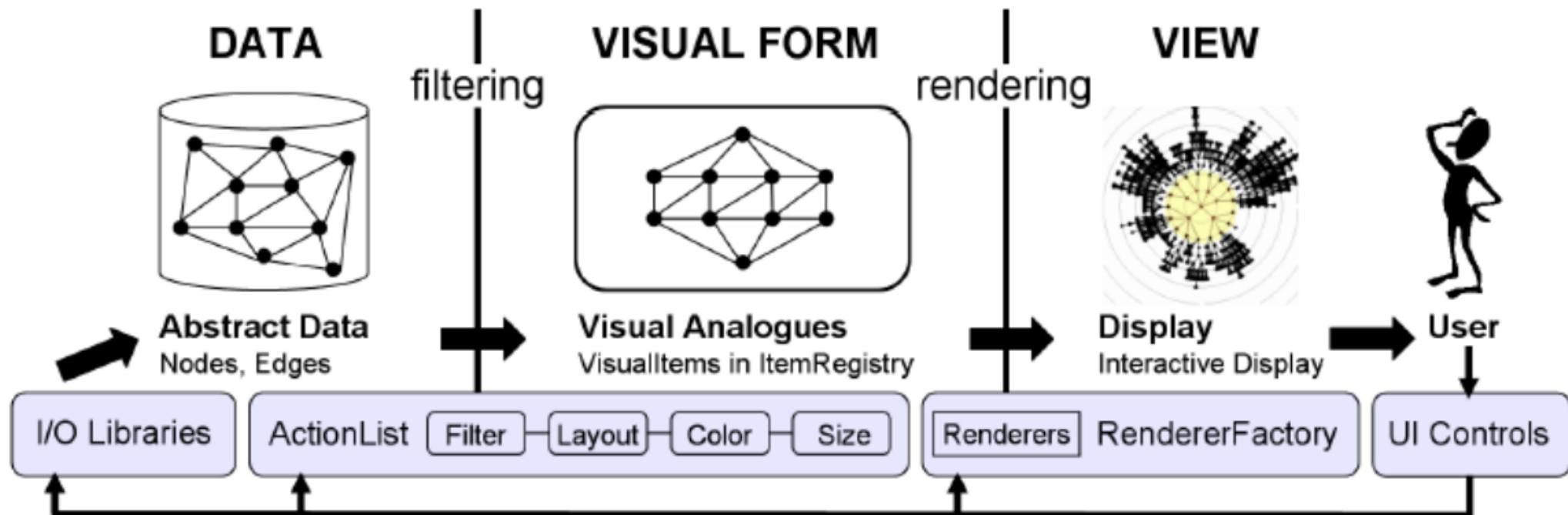
As an expert in visual analytics, you have been hired to help GASTech understand its steady stream of operations data. This includes data from stationary and mobile sensors of multiple types. The company needs your help in operational issues as well as security issues. Can you identify the issues to safeguard the company's employees?

Mini-Challenge 2 asks you to analyze two weeks of building sensor data to identify patterns of concern. Please see [VAST Challenge 2016: Mini-Challenge 2](#) for more information.

Mini-Challenge 3 poses a streaming analysis challenge. You will be given access to two days of streaming building sensor data. How can you identify important changes in the stream in real time? How can you quickly come up to speed on changes in the data since you last looked at it? What sensor would you add in order to better understand the suspicious events? Please visit [VAST Challenge 2016: Mini-Challenge 3](#) for more information.

What is VIS Research?

Visualization Pipeline

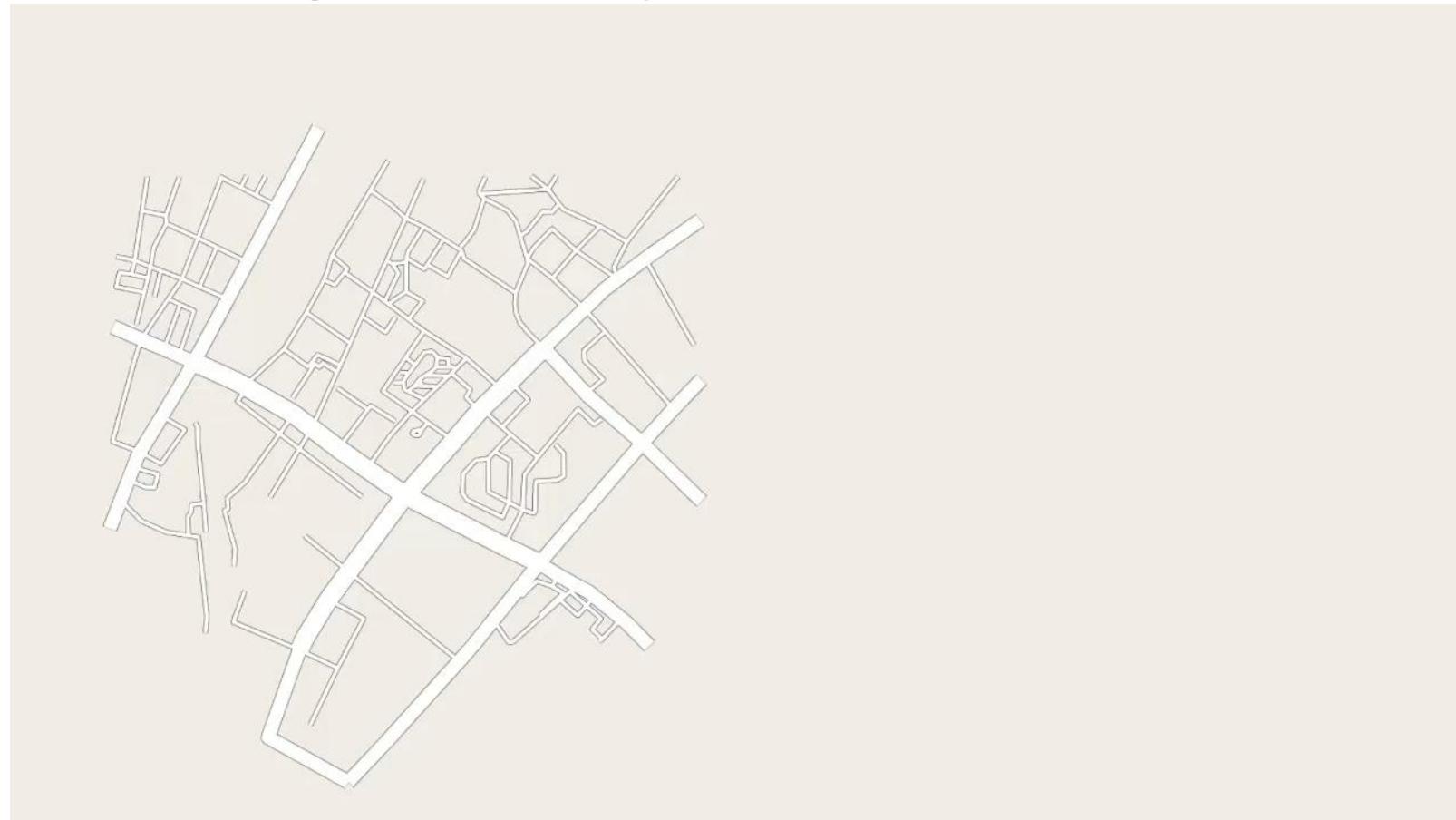


Engineering part

Visual design part

Technique Papers

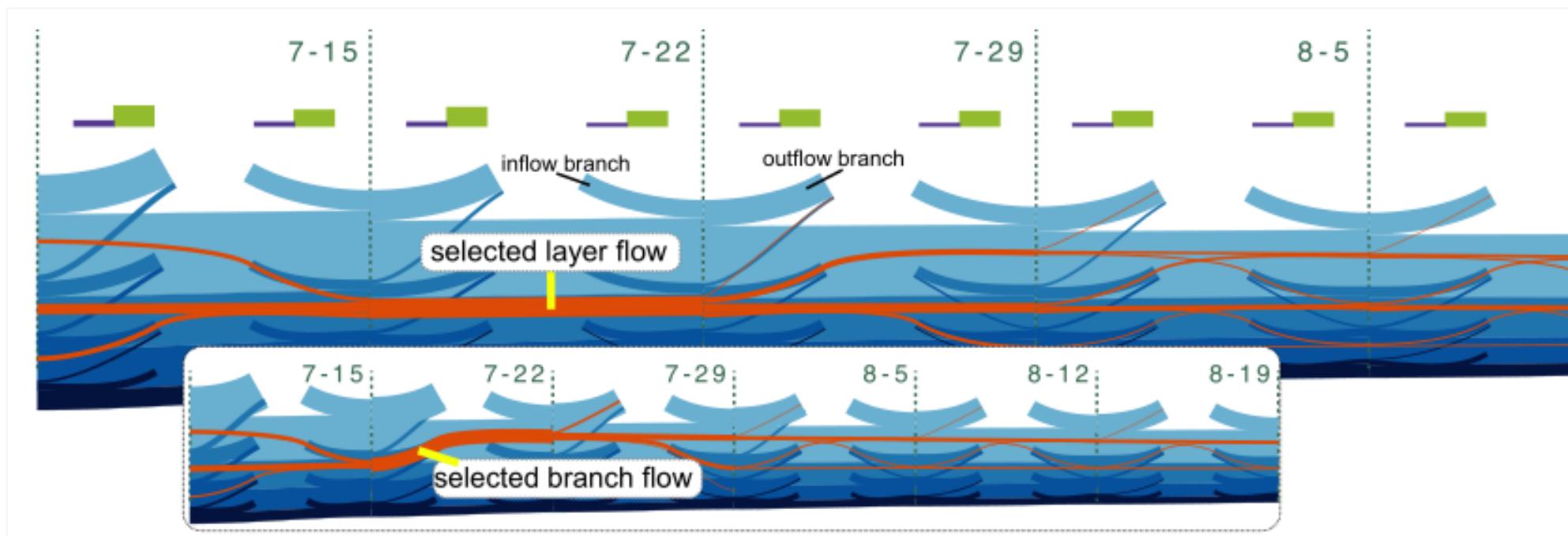
- **Introduce novel techniques or algorithms that have not previously appeared in the literature, or that significantly extend known techniques**



A Route-Zooming Technique

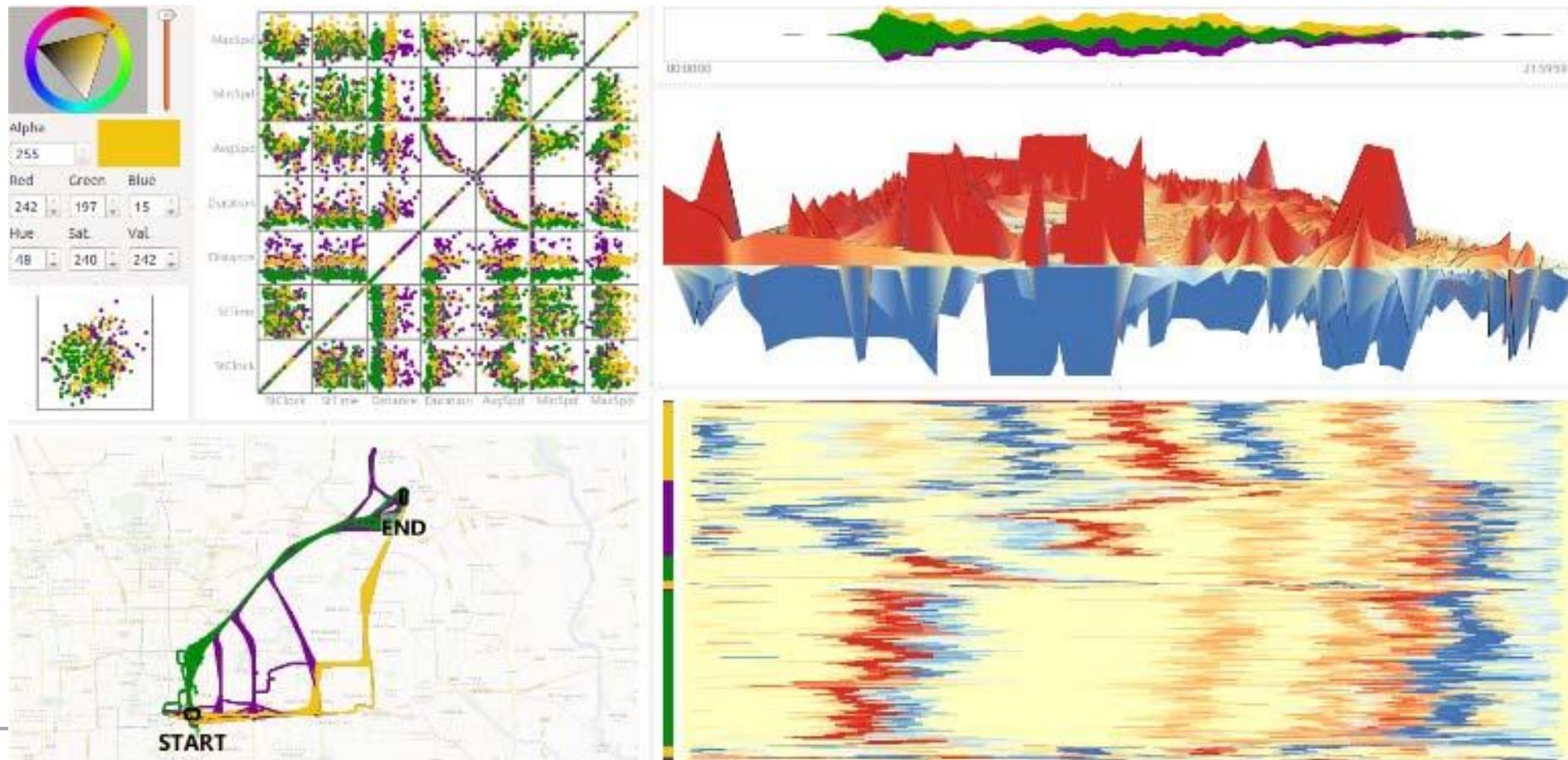
Application/Design Study Papers

- Explore the choices made when applying visualization and visual analytics techniques in an application area



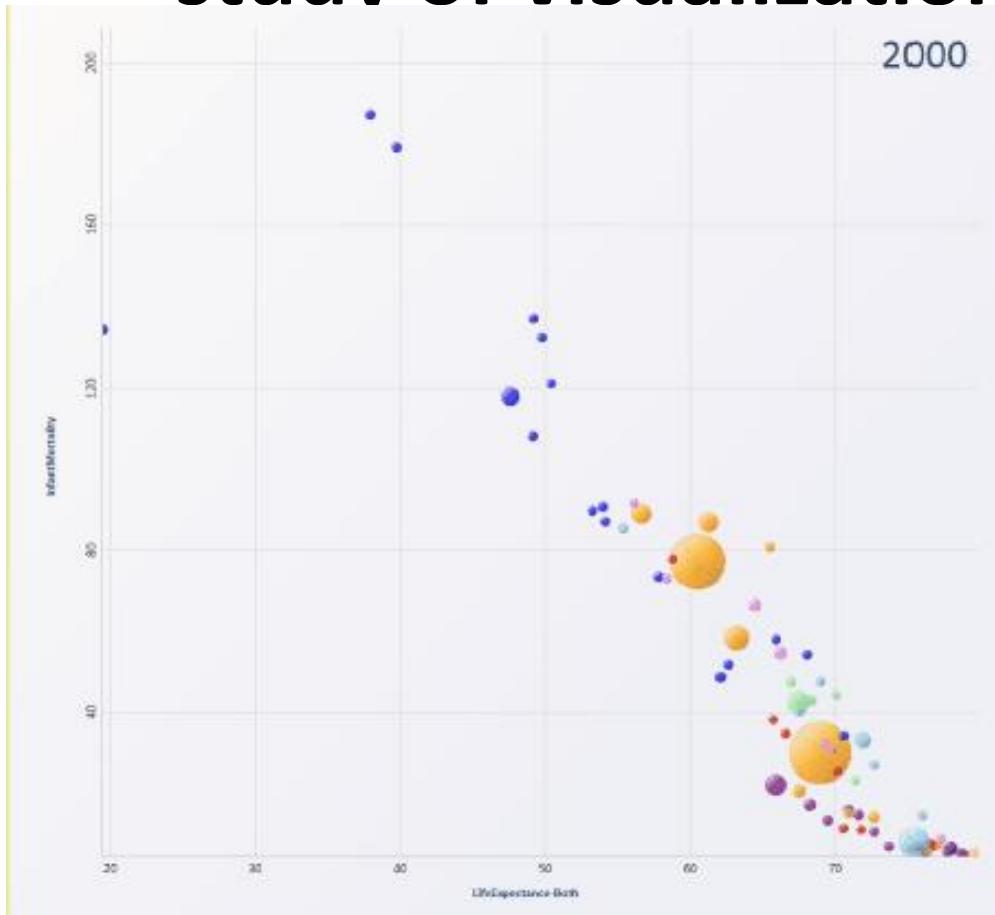
System Papers

- Present a blend of algorithms, technical requirements, user requirements, and design for a major problem

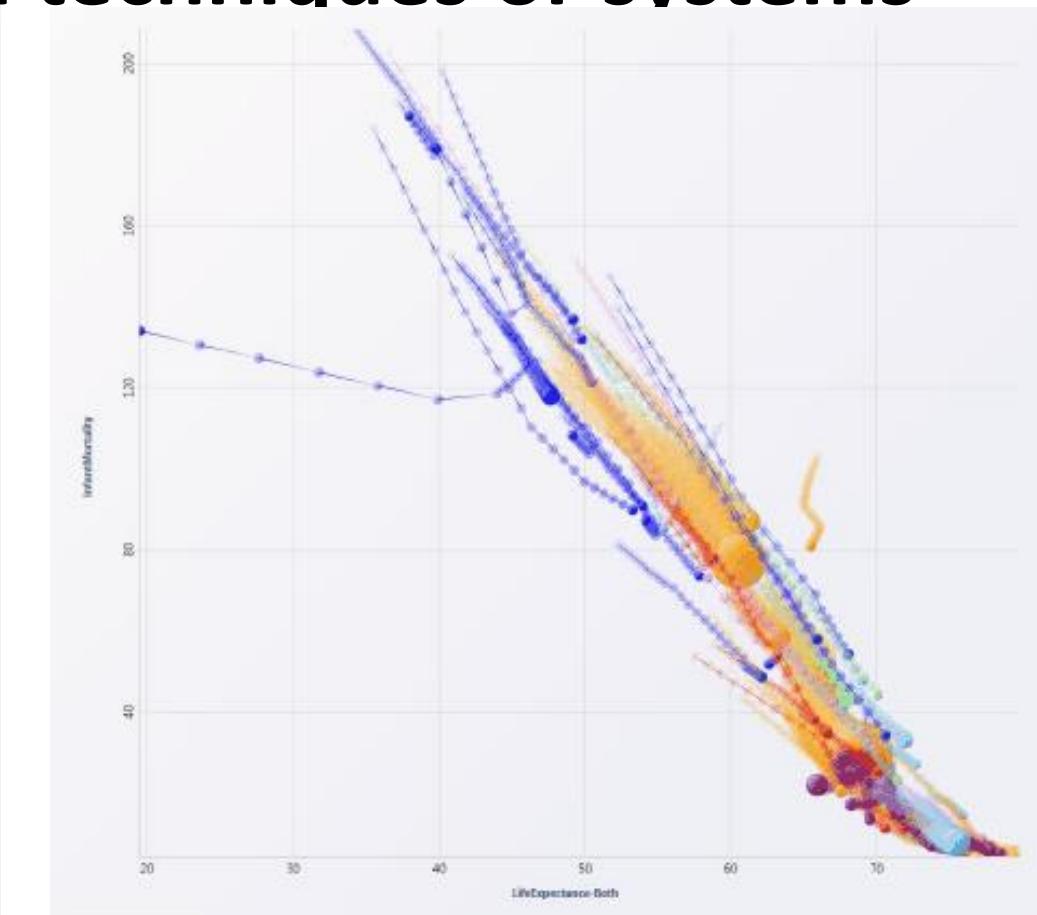


Evaluation Papers

- Explore the usage of visualization and visual analytics by users, and present an empirical study of visualization techniques or systems



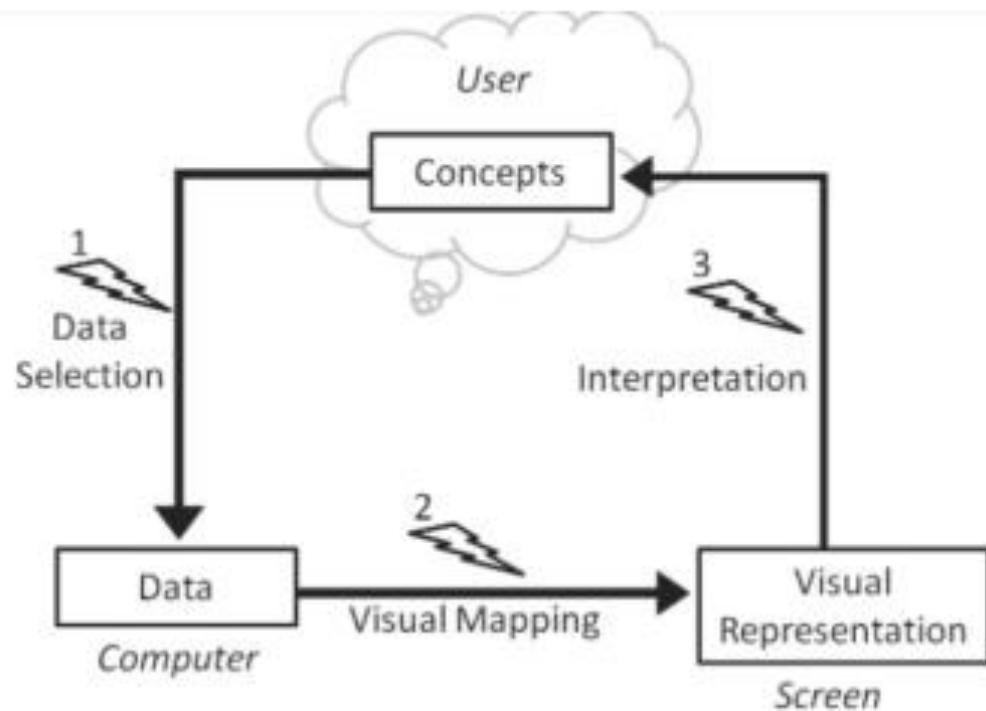
Animations



Traces

Theory/Model papers

- Present new interpretations of the foundational theory of visualization and



How Information Visualization
Novices Construct Visualizations

Grammel et al. IEEE TVCG 2010

Fig.5. Barriers in InfoVis Novices' Visual Data Exploration Process.
Barriers are indicated with lightning bolts. 1: selection barrier; 2: visual mapping barrier; 3: interpretation barrier

'OUTLINE'

01

What is data visualization

02

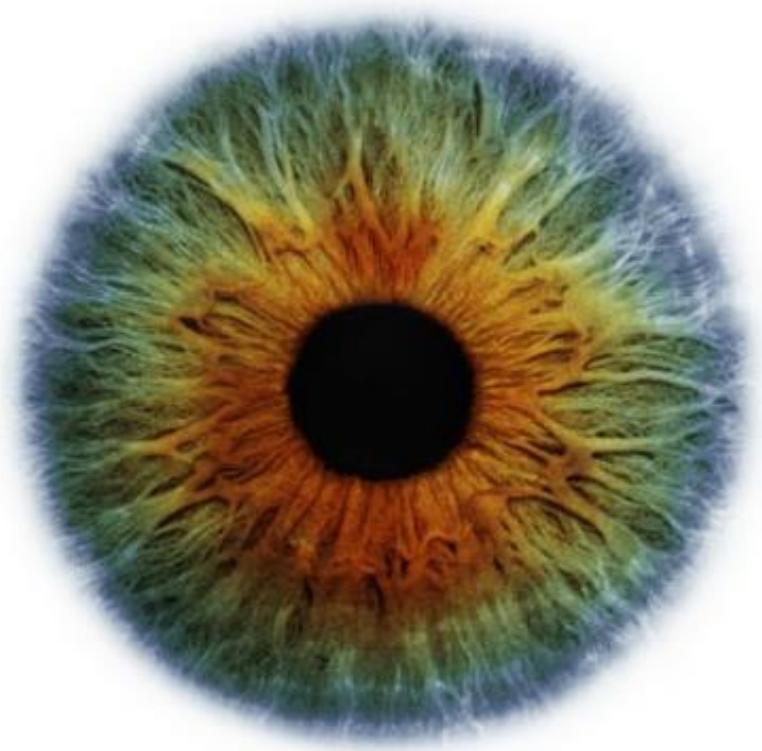
Visualization is hot & cool & young

03

How to create visualization?

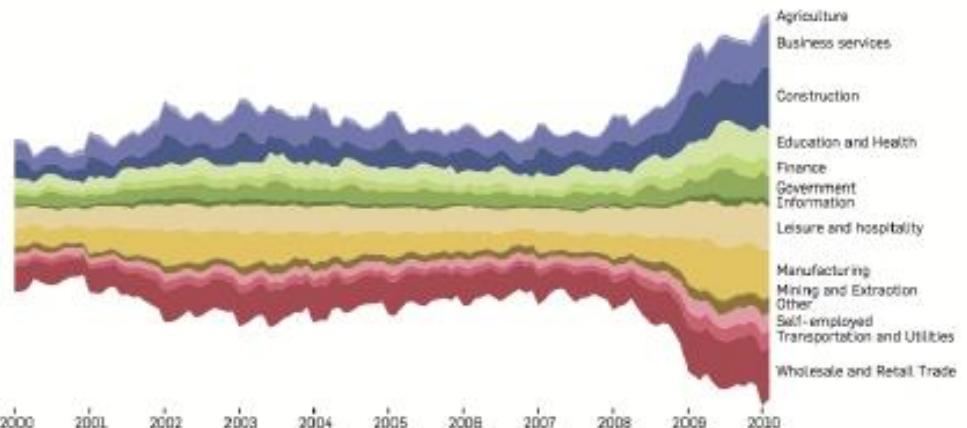
Act I: Foundations

- 01 Design Principles
- 02 Process & Data
- 03 Tasks & Interaction
- 04 Perception
- 05 Visual Encodings
- 06 Color



Act II:Methods

01 SingleViews

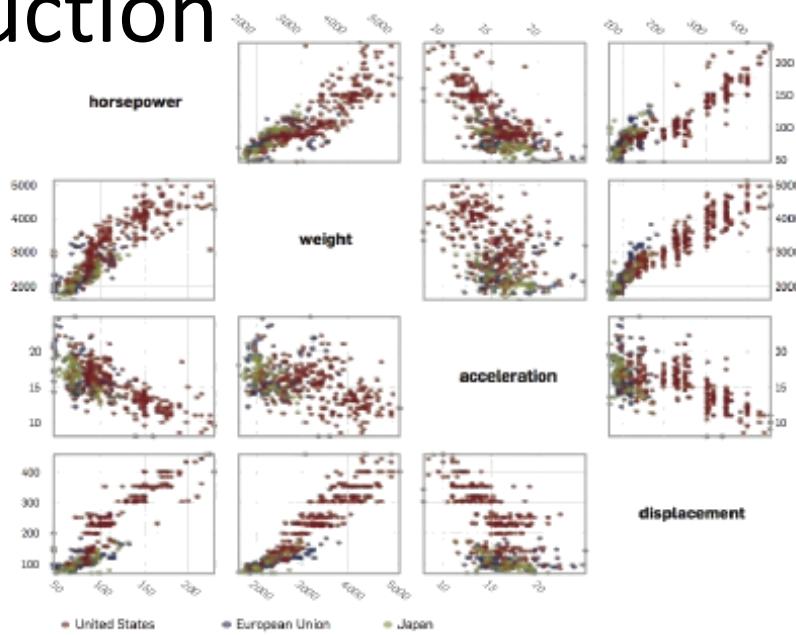


02 MultipleViews

03 Filtering & Aggregation

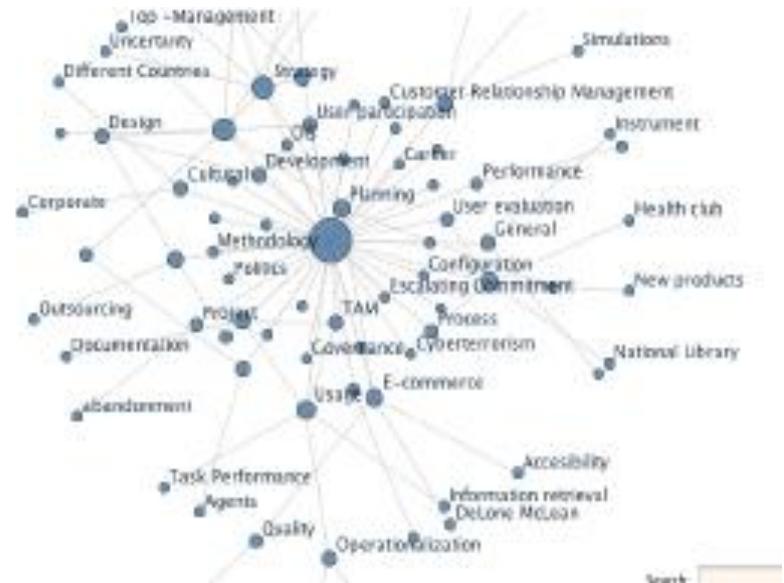
04 Dimensionality Reduction

05 Evaluation



Act III: Techniques

- 01 Statistical Graphs
 - 02 Trees & Networks
 - 03 Maps
 - 04 Text & Images



How to create a visualization yourself?

01 Google Refine

02 Tableau

03 R

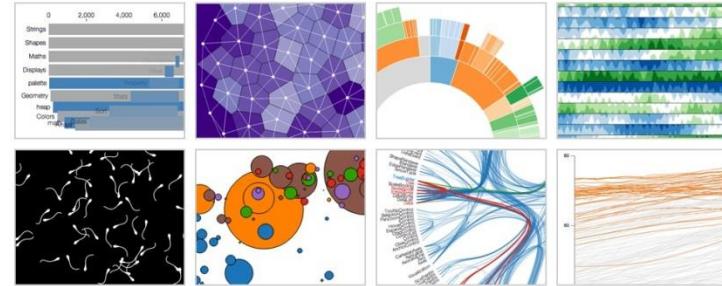
04 Processing

05 D3 (JS)

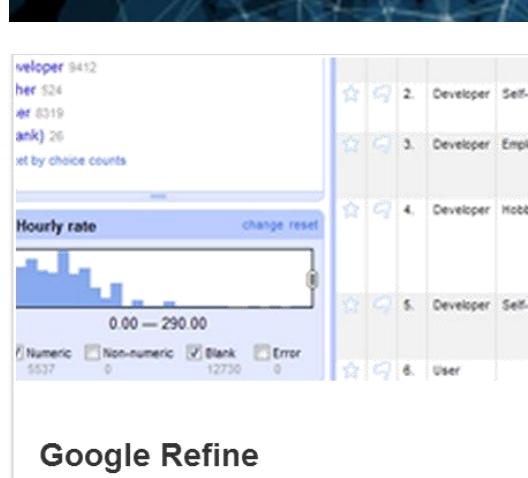
06 ColorBrewer



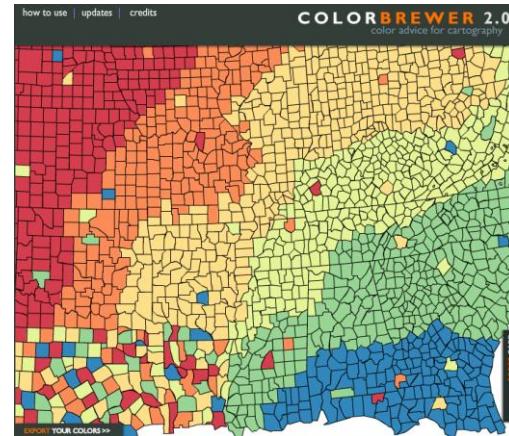
Data-Driven Documents



Processing



Google Refine



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Thanks

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