

ARTS1422 Data Visualization

Lecture 1

Course Introduction
&
Data Visualization Overview

Quan Li
Spring 2024
2024. 02.27

Organization

Instructor

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<http://faculty.sist.shanghaitech.edu.cn/liquan/>



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愿新的一年平安喜乐万事顺遂
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Organization

- **Textbook**

- Visualization Analysis and Design, by Tamara Munzner
- 数据可视化, by 陈为、沈则潜、陶煜波等
- **Piazza** (<https://piazza.com/shanghaitech.edu.cn/spring2023/arts1422>) (**Please JOIN as students!**)
 - Lecture slides, announcements, programming assignment, project, QA and discussions, etc.

- **ShanghaiTech Cloud Storage**

- Homework submission

- **Academic Integrity**

- Unless explicitly noted, work turned in should reflect your own/independent capabilities
- No cheating (We will check carefully!)
 - Don't share your homework/code!
 - No fake solutions!
 - No plagiarism!
 - Serious consequences!



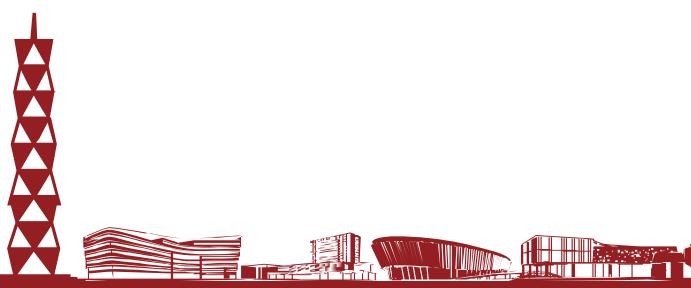
Organization



- Grading
 - Assignments: Coding and Paper Presentation (20%)
 - Quiz (10%)
 - The quiz will be only with a two-sided A4 cheat sheet
 - Top VIS Competition (10%)
 - Course Project (60%)

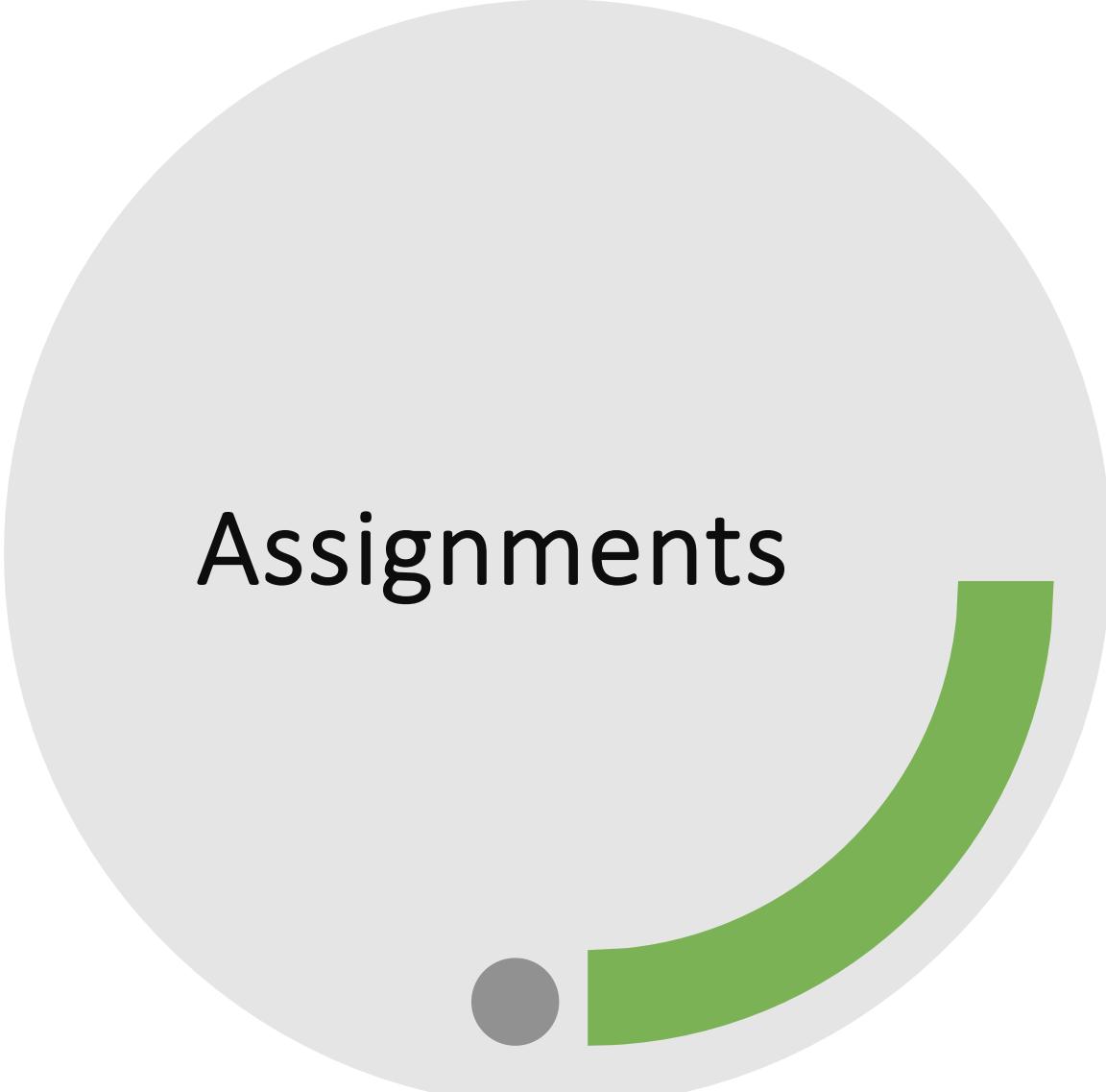
一月				二月				三月				四月				五月				六月				七月				八月				
1 旦	8	15	22	29	5	12	19	26	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10 端午节	17	24	1	8	15	22	29	5	12
2	9	16	23	30	6	13	20	27	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13
3	10	17	24	31	7	14	21	28	6	13	20	27	3	10	17	24	1 劳动节	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14
4	11	18	25	1	8	15	22	29	7	14	21	28	4 清明	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15
5	12	19	26	2	9	16	23	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16
6	13	20	27	3	10 春节	17	24	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17
7	14	21	28	4	11	18	25	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18
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寒假				春学期 (2024.2.26-2024.6.30)												暑学期 (2024.7.1-2024.7.28)				暑学期				暑假								
				一. 2月25日本科生、研究生注册 二. 2月26日本科生、研究生上课 三. 17、18周本科生、研究生考试																												

Dates for assignments, quiz, vis competition, course project will be announced in due course~



- Content
 - Programming using visualization tools
 - MS Excel
 - Tableau
 - Python
 - JavaScript
 - D3.js
 - Preparation for top vis competition and group project

Assignments



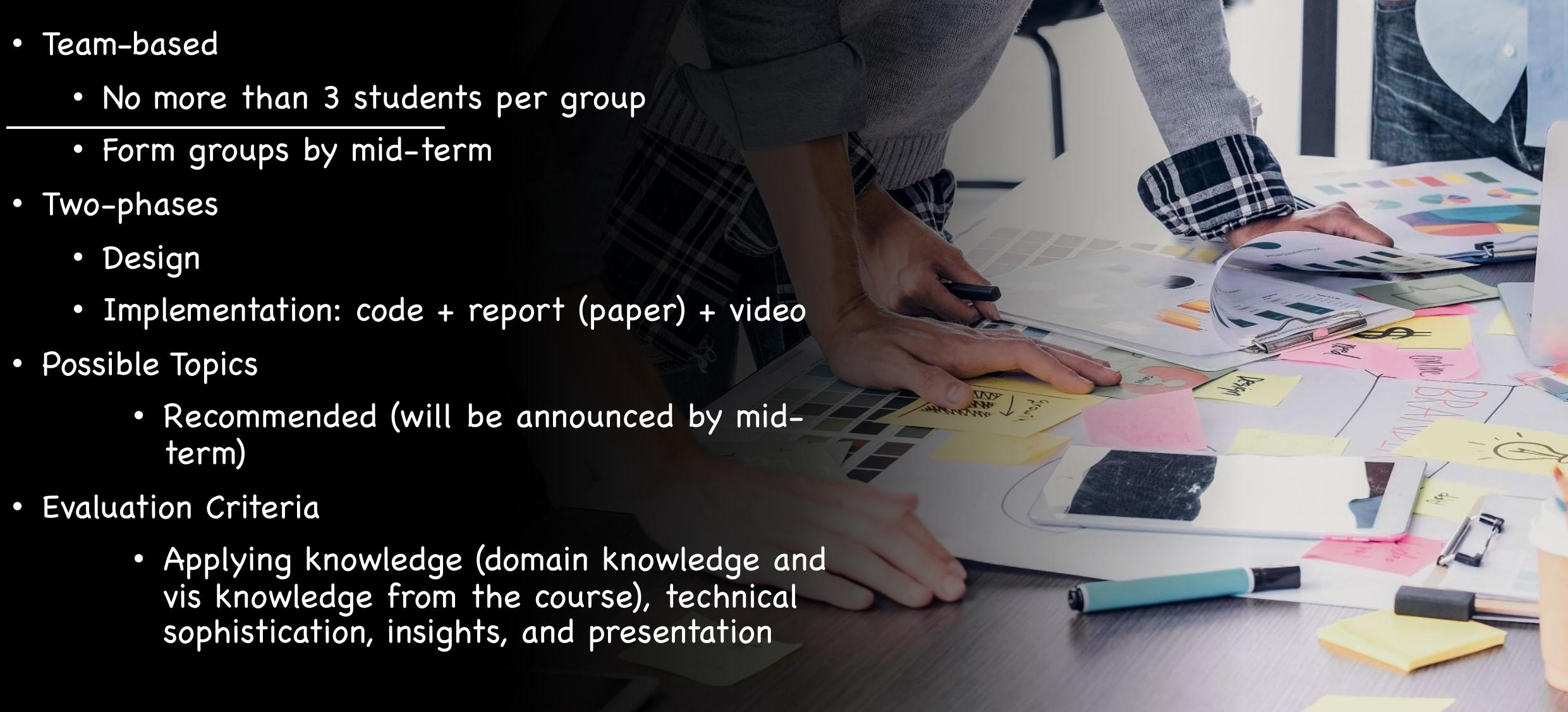
Top Vis Competition

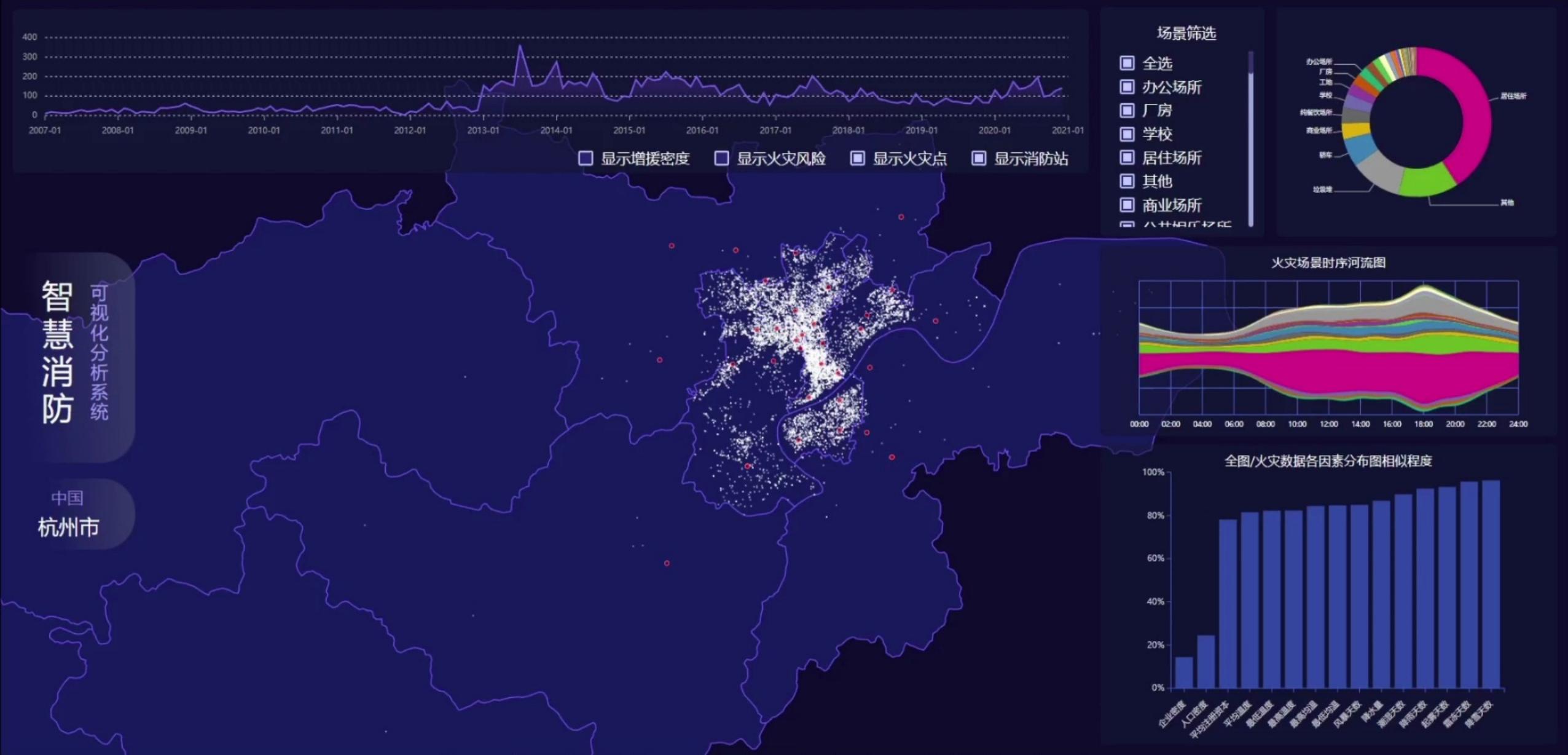
- Choose a visualization you like
 - News, social media, research paper, etc.
- Pitch it in class (2~3 min) and write an essay (1~2 pages)
 - Why it is the best visualization
- Peer voting based on presentation



Final Project

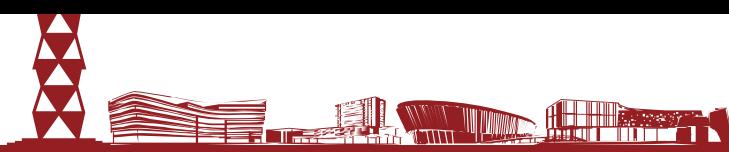
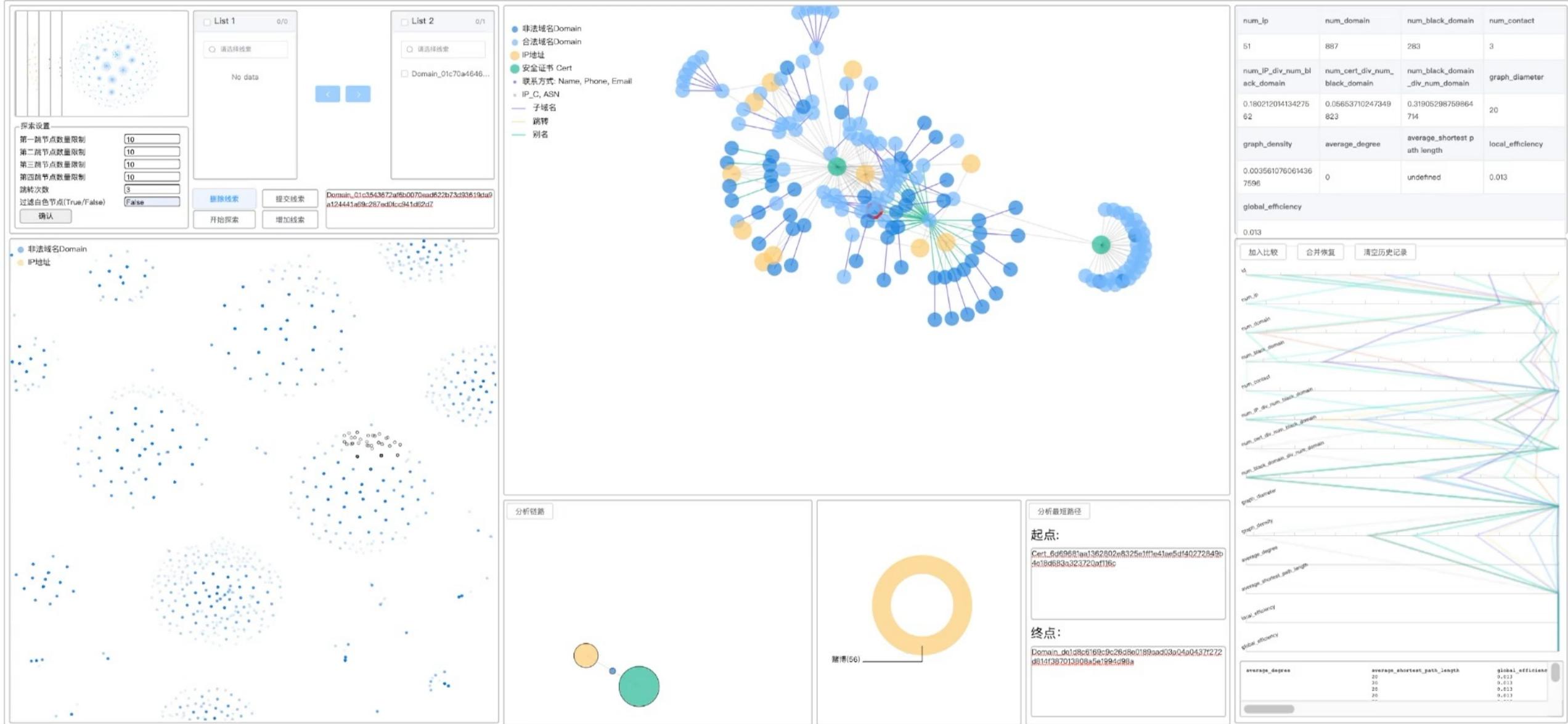
- Team-based
 - No more than 3 students per group
 - Form groups by mid-term
- Two-phases
 - Design
 - Implementation: code + report (paper) + video
- Possible Topics
 - Recommended (will be announced by mid-term)
- Evaluation Criteria
 - Applying knowledge (domain knowledge and vis knowledge from the course), technical sophistication, insights, and presentation





使用可视化系统进行对火灾发生规律的统计分析。

The visual system is used to analyze the statistics of fire occurrence



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Quiz

- Materials covered in the whole semester
- Content
 - Knowledge
 - Design
- Evaluation
 - Computational thinking
 - Critical thinking
 - Creative thinking



This Course

- Introduction to Data Visualization
- Perception and Cognition
- Data Analysis and Modeling
- Spatial Data Visualization
- High-dimensional Data Visualization
- Temporal Data Visualization
- Hierarchical Data Visualization
- Network Data Visualization
- Cross-Media Data Visualization
- Interactions in Visualization
- Visual Analytics
- VIS4AI and AI4VIS

Course Learning Outcomes

Lecture, Projects, Quiz	Lecture, Project	Lecture, Projects, (Quiz)	Projects and Participation
<ul style="list-style-type: none">• Understand the basic concepts and methods in data visualization• Understand the foundations and trends of visualization applications	<ul style="list-style-type: none">• Learn to identify user needs, abilities, and constraints• Learn to design, prototype, and evaluate visualization technologies	<ul style="list-style-type: none">• Analyze potential social impact and responsibilities as well as possible ethical, legal, security, and privacy issues	<ul style="list-style-type: none">• Communicate effectively with target users and different stakeholders in academia and industry



Resources

- References
 - Visualization Analysis and Design by Tamara Munzner (<http://www.cs.ubc.ca/~tmm/vadbook/>)
 - Interactive Data Visualization: Foundations, Techniques, and Applications by Matthew Ward, Georges Grinstein, and Daniel Keim
 - The visualization handbook
 - Information visualization: perception for design
 - The visual display of quantitative information
 - Envisioning information
 - Visual explanations: images and quantities, evidence and narrative
- Web
 - visualcomplexity.com
 - [information aesthetics - Information Visualization & Visual Communication](http://information-aesthetics.com)

- 1 What is data visualization
- 2 Visualization is hot & cool & young
- 3 How to create visualization?



- 1 What is data visualization
- 2 Visualization is hot & cool & young
- 3 How to create visualization?



A few examples



Visualizing Flight Patterns



Aaron Koblin, TED 2006

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

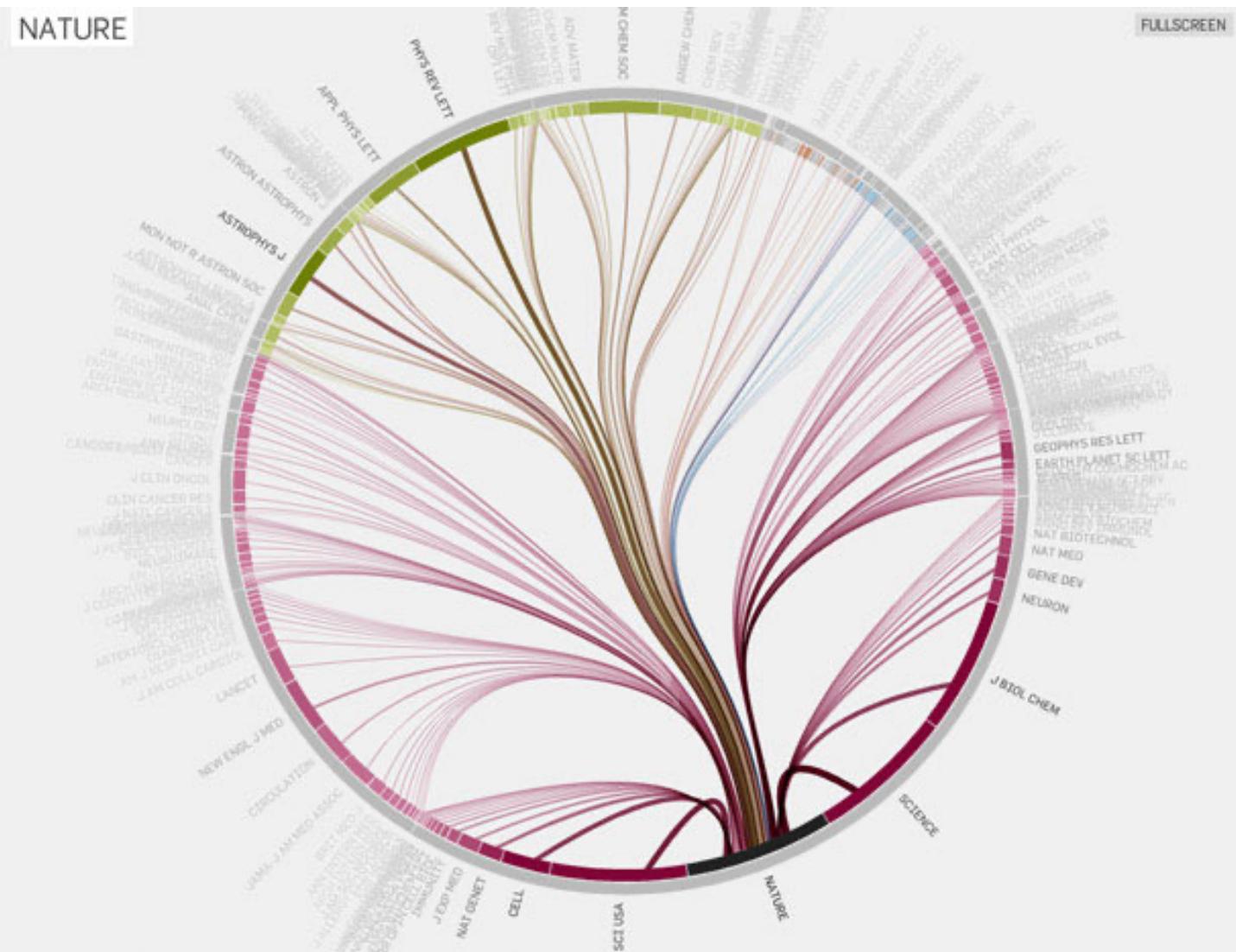


2024/2/27

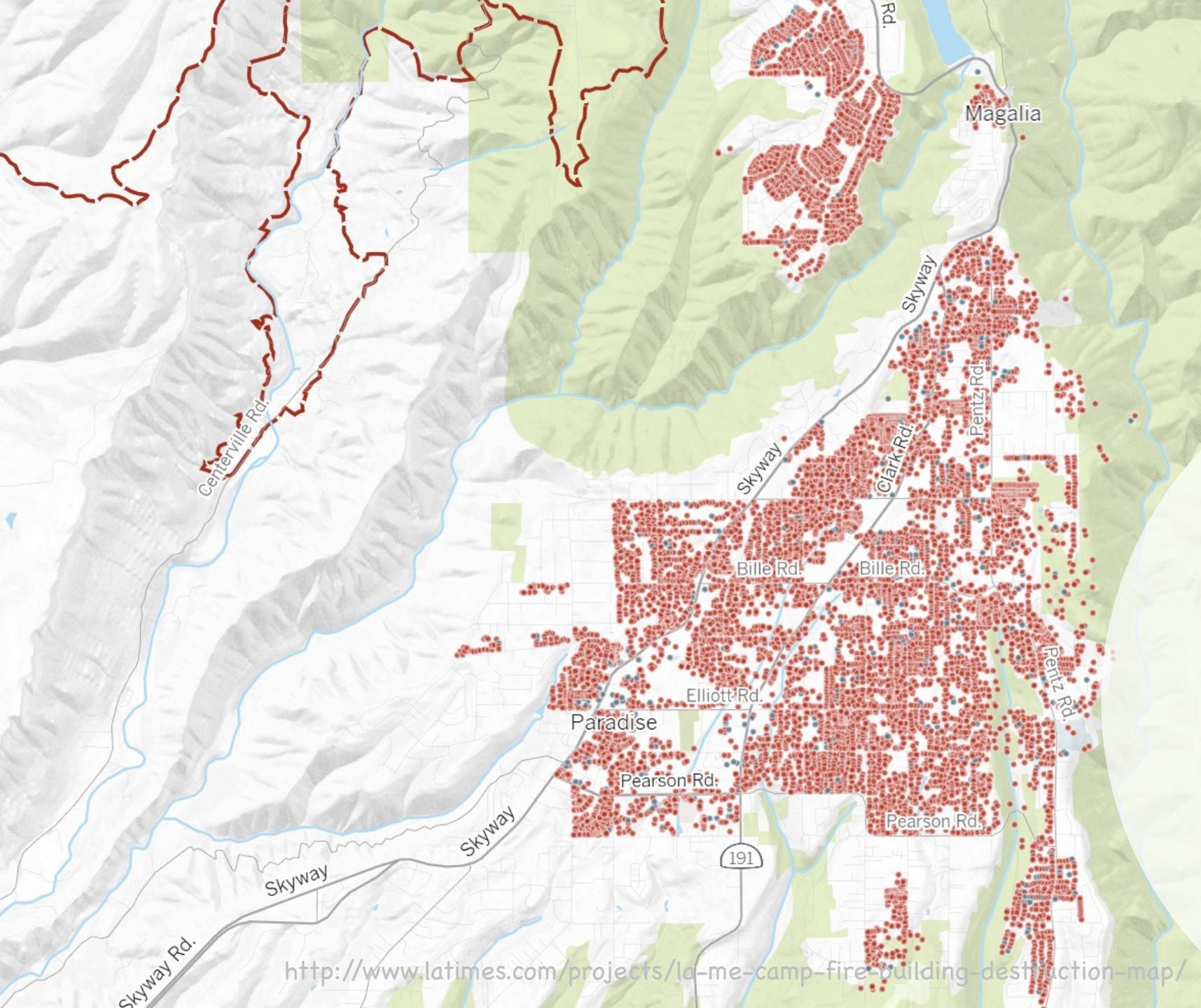
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NATURE

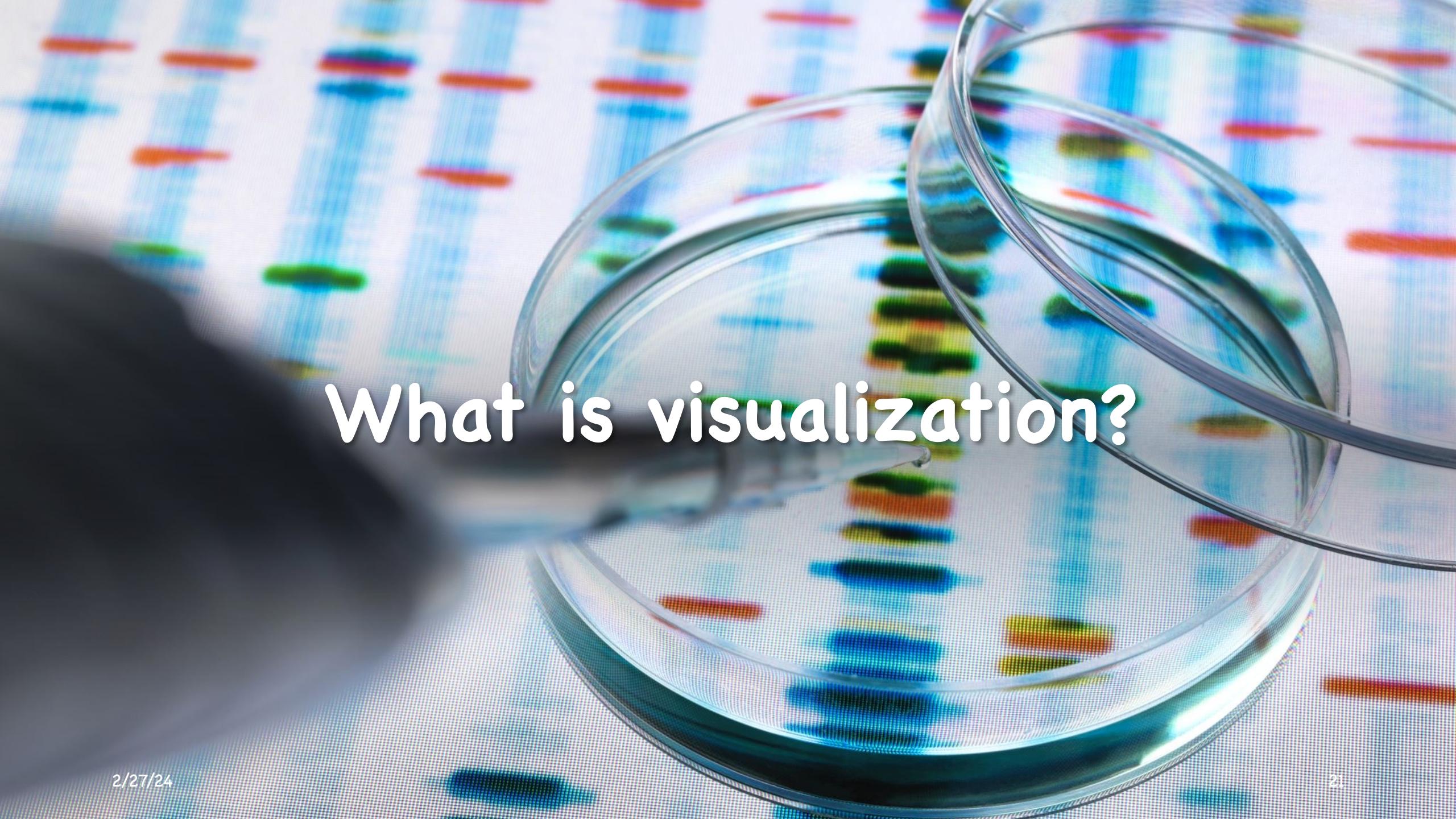
FULLSCREEN



Visualizing Information Flow in Science



Buildings destroyed by the Camp fire



What is visualization?

What is visualization?

Visualization is the creation and study of the visual representation of data

Input: **data** Output: **visual form** Goal:
insight



What can visualization do?

- Represent information
- Analyze data
- Communicate data

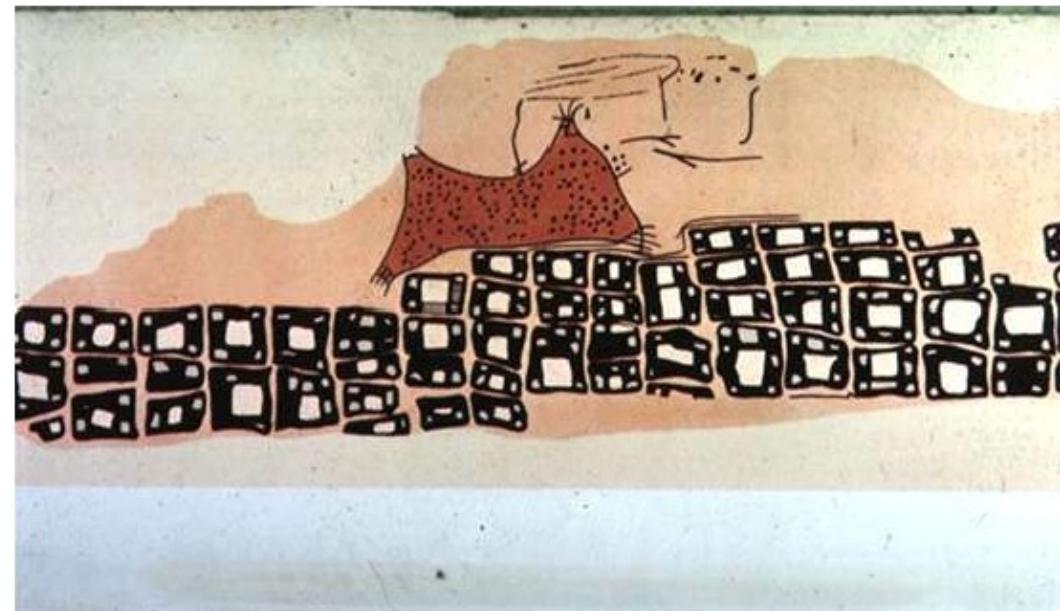
What can visualization do?

Represent information

Analyze data

Communicate data

Represent Information

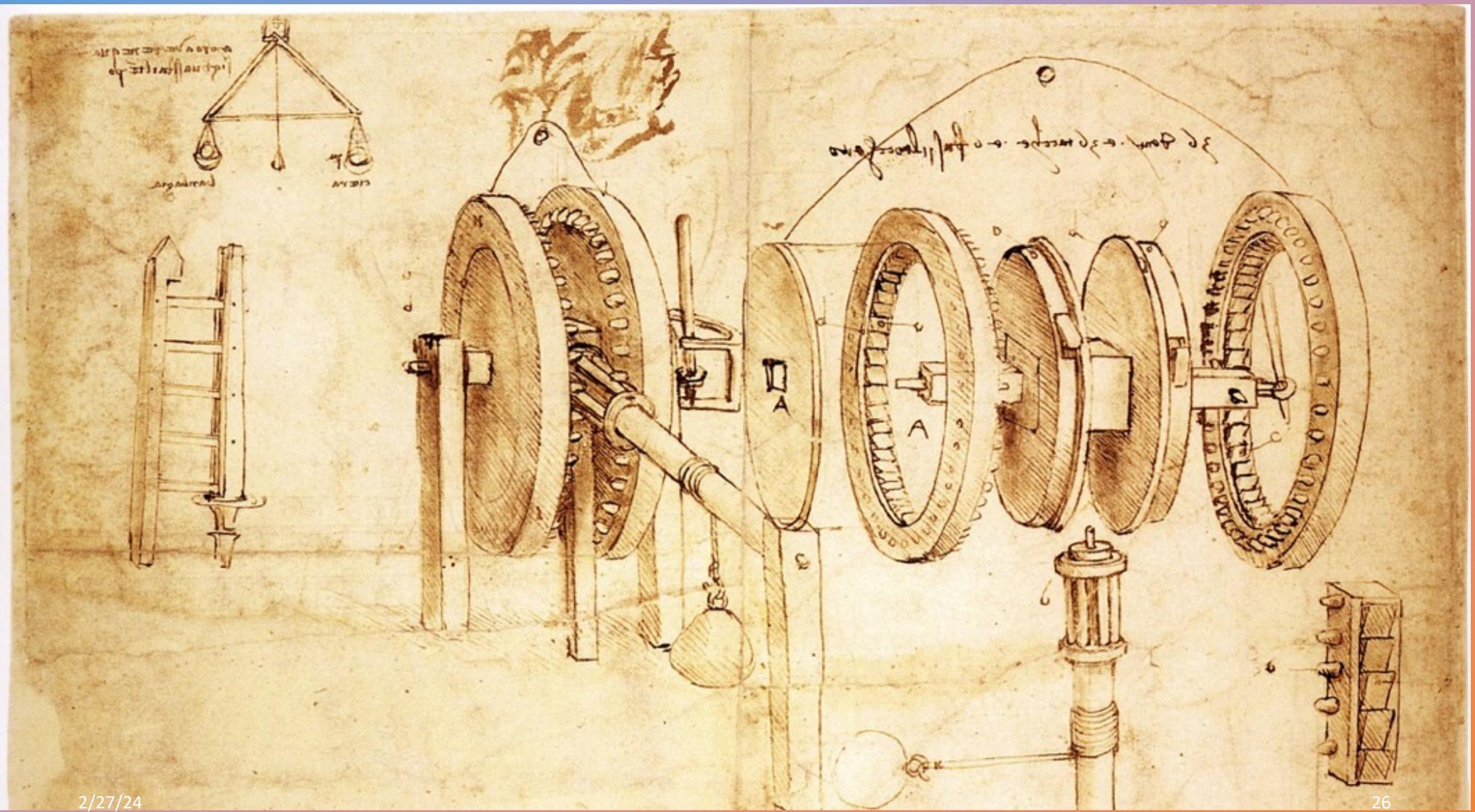


Konya town map, Turkey, c.6200 BC



Anaximander's Map of the World, c.550 BC





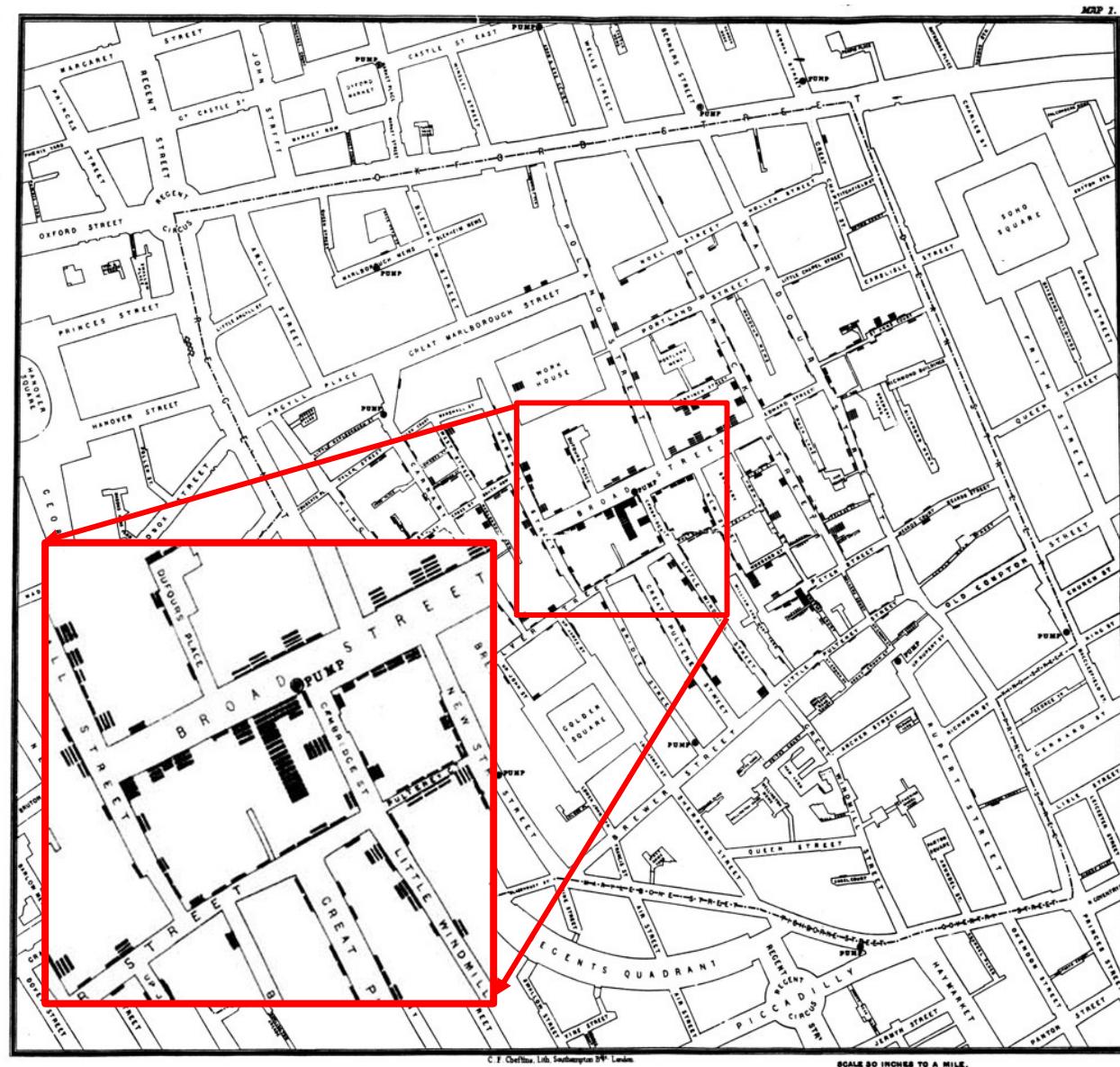


What can visualization do?

Represent information

Analyze data

Communicate data

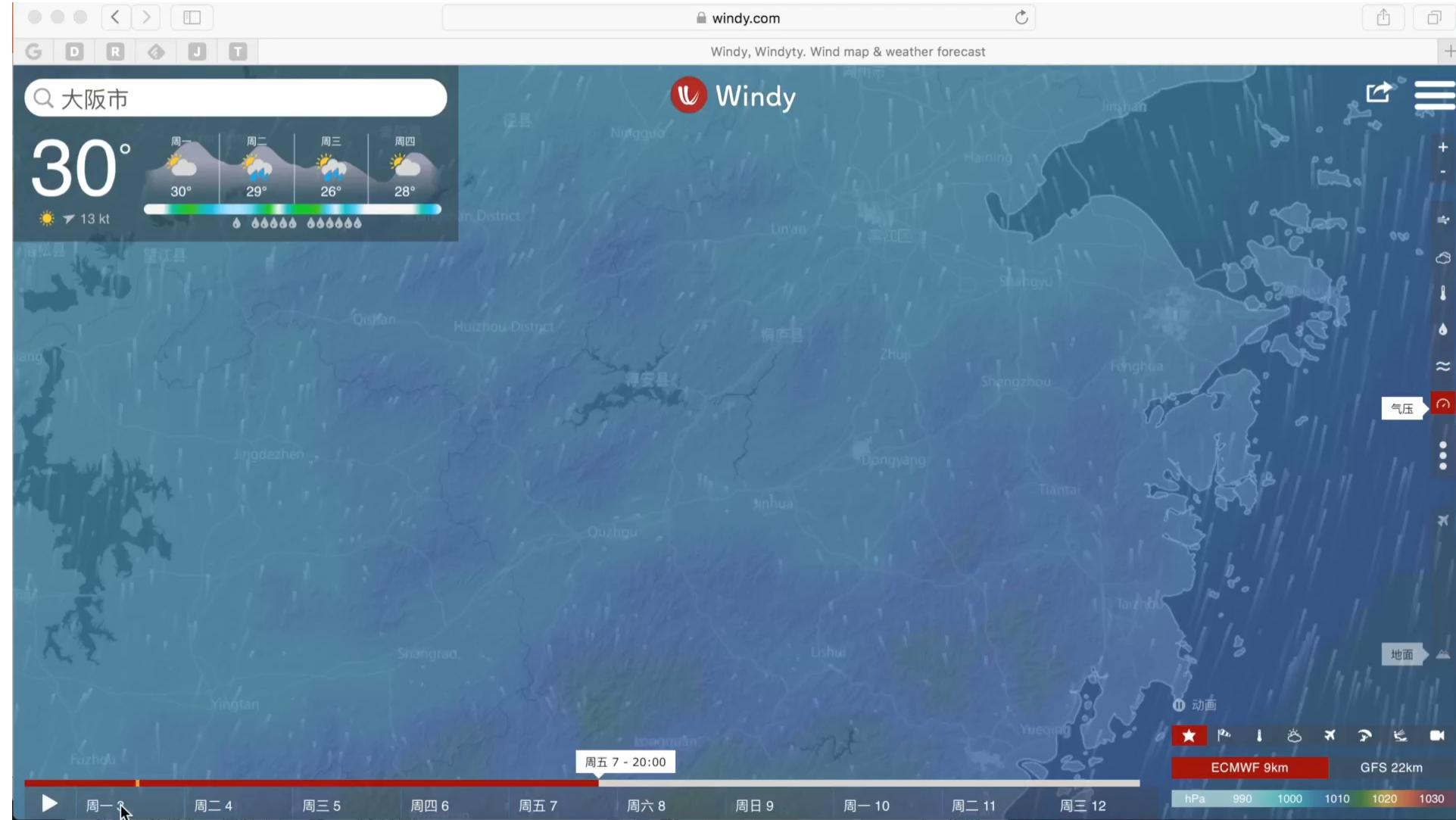


Reveal Patterns



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Map of World Wind Directions



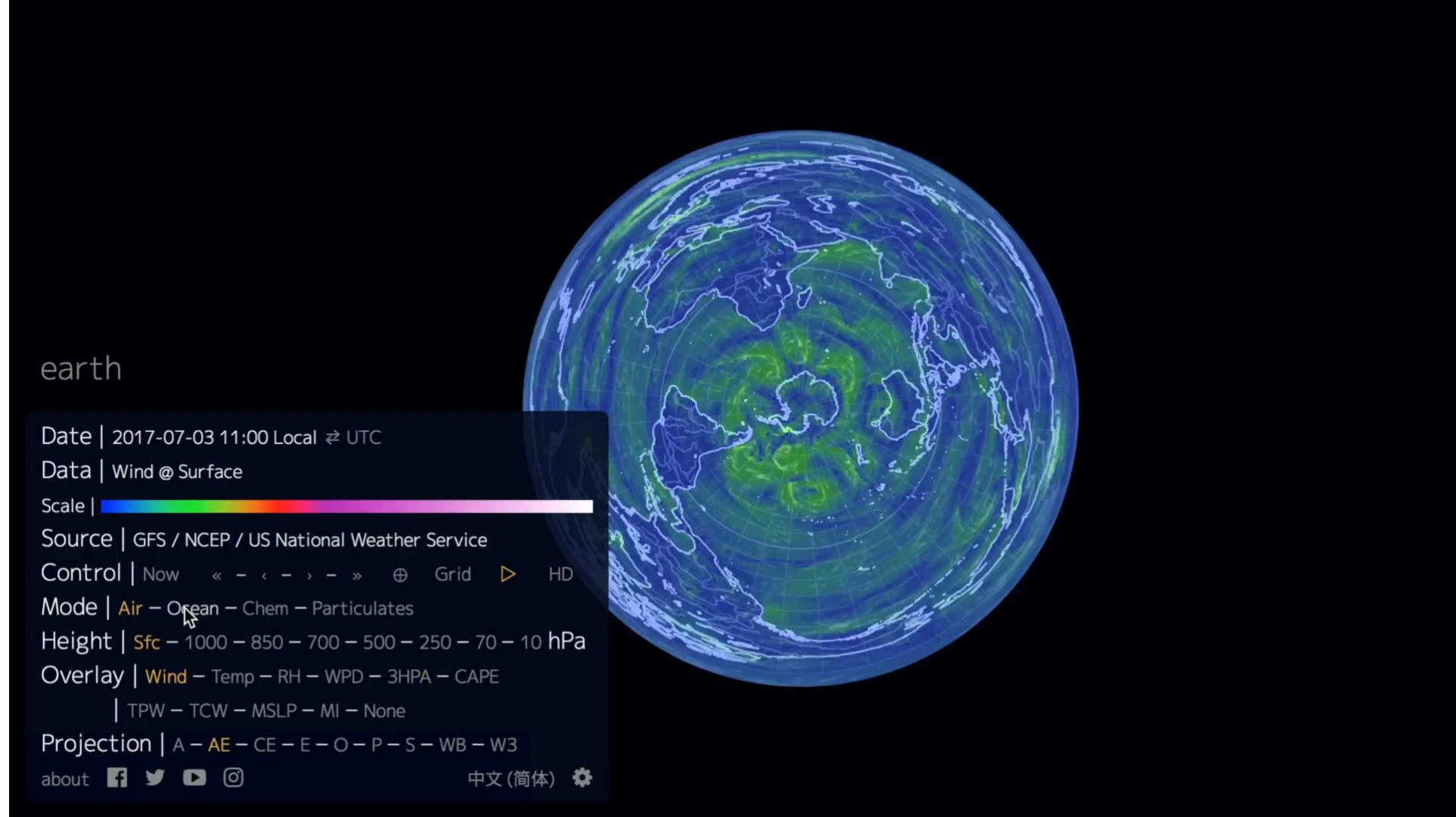
<https://www.windytv.com/>



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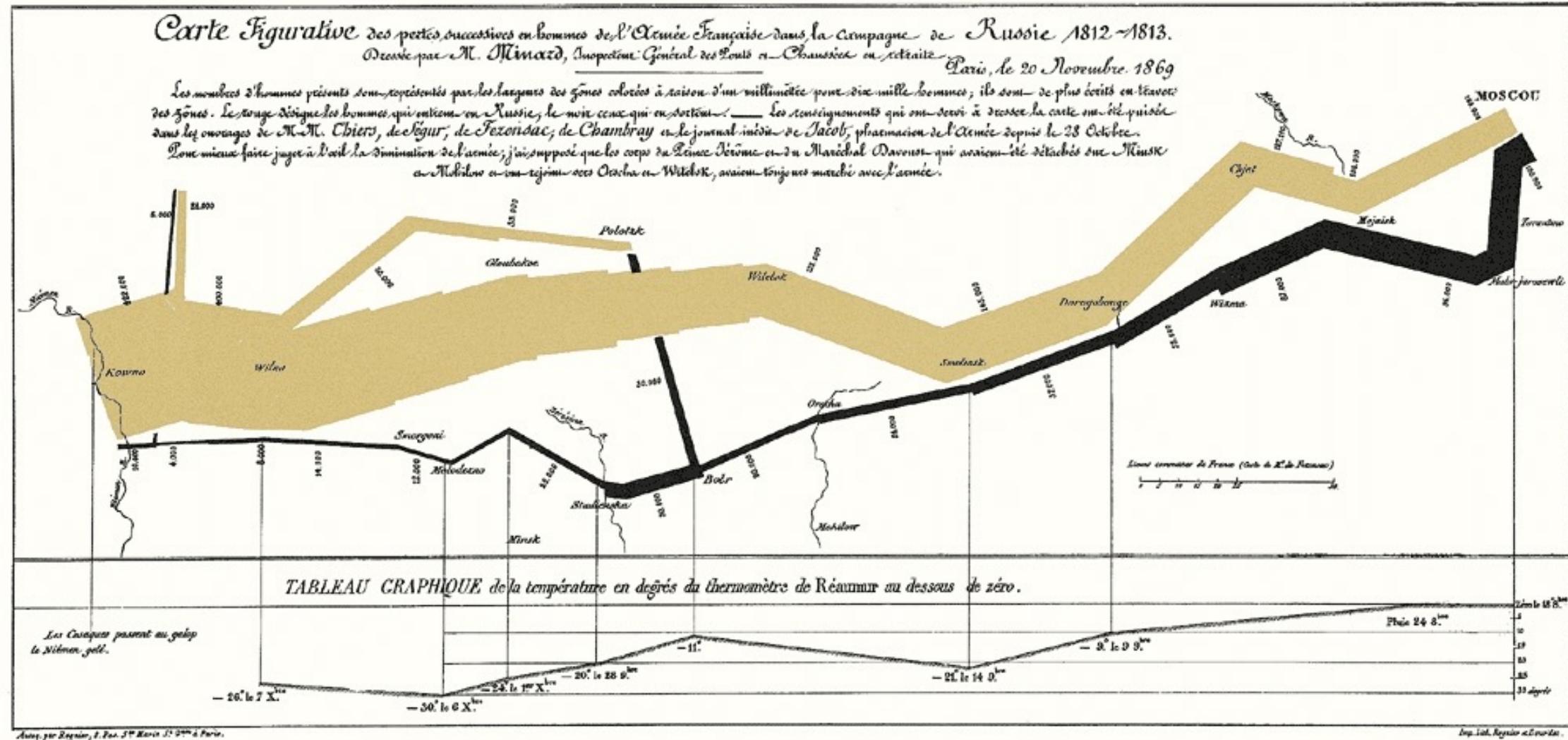
Reveal Patterns



Earth Nullschool: Map of Global Wind, Weather and Ocean conditions



Reveal Patterns



C.J.Minard,1869

E.Tufte,Writings,Artworks,News



What can visualization do?

Represent information

Analyze data

Communicate data

Hans Rosling' TED Talk



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Why visualization?

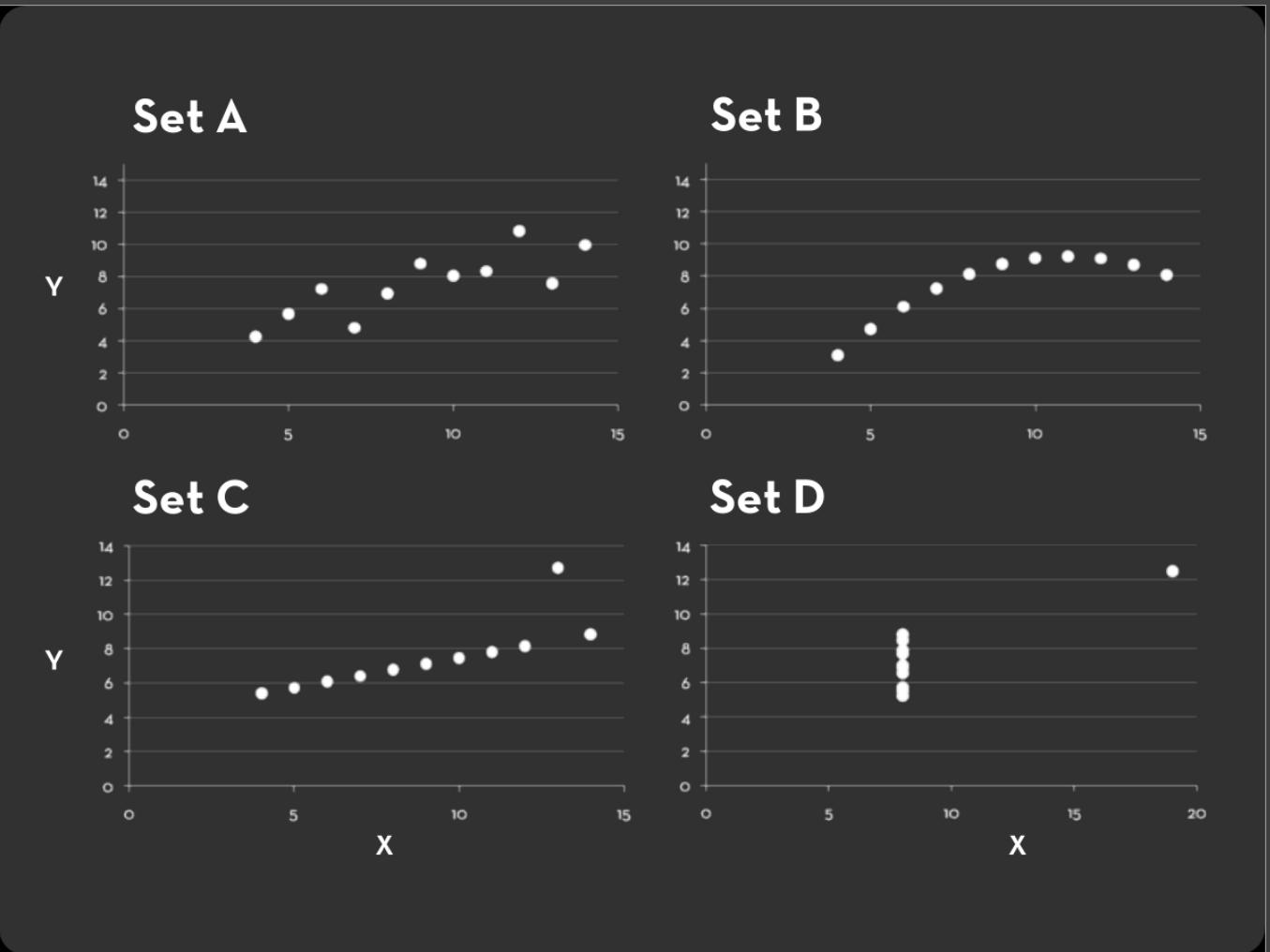


	Set A		Set B		Set C		Set D	
	X	Y	X	Y	X	Y	X	Y
0	10	8.04	10	9.14	10	7.46	8	6.58
1	8	6.95	8	8.14	8	6.77	8	5.76
2	13	7.58	13	8.74	13	12.74	8	7.71
3	9	8.81	9	8.77	9	7.11	8	8.84
4	11	8.33	11	9.26	11	7.81	8	8.47
5	14	9.96	14	8.10	14	8.84	8	7.04
6	6	7.24	6	6.13	6	6.08	8	5.25
7	4	4.26	4	3.10	4	5.39	19	12.50
8	12	10.84	12	9.13	12	8.15	8	5.56
9	7	4.82	7	7.26	7	6.42	8	7.91
10	5	5.68	5	4.74	5	5.73	8	6.89
mean	9.00	7.50	9.00	7.50	9.00	7.50	9.00	7.50
std	3.32	2.03	3.32	2.03	3.32	2.03	3.32	2.03
corr	0.82		0.82		0.82		0.82	
lin. reg.	$y = 3.00 + 0.500x$		$y = 3.00 + 0.500x$		$y = 3.00 + 0.500x$		$y = 3.00 + 0.500x$	

Anscombe's Quartet: Four Different Datasets

Why Statistics May Not Work

Limits of Cognition



Anscombe, Francis J. "Graphs in statistical analysis." *The American Statistician* 27, no. 1 (1973): 17-21.

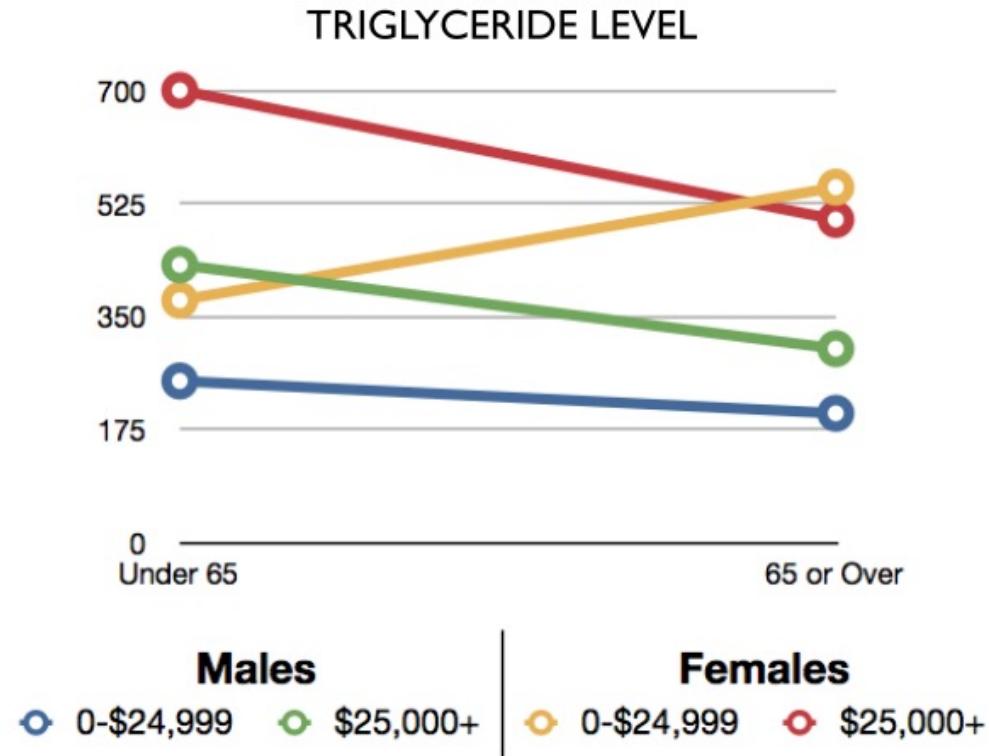
	Males		Females	
Income Group	Under 65	65 or Over	Under 65	65 or Over
0-\$24,999	250	200	375	550
\$25,000+	430	300	700	500

A Small Quiz

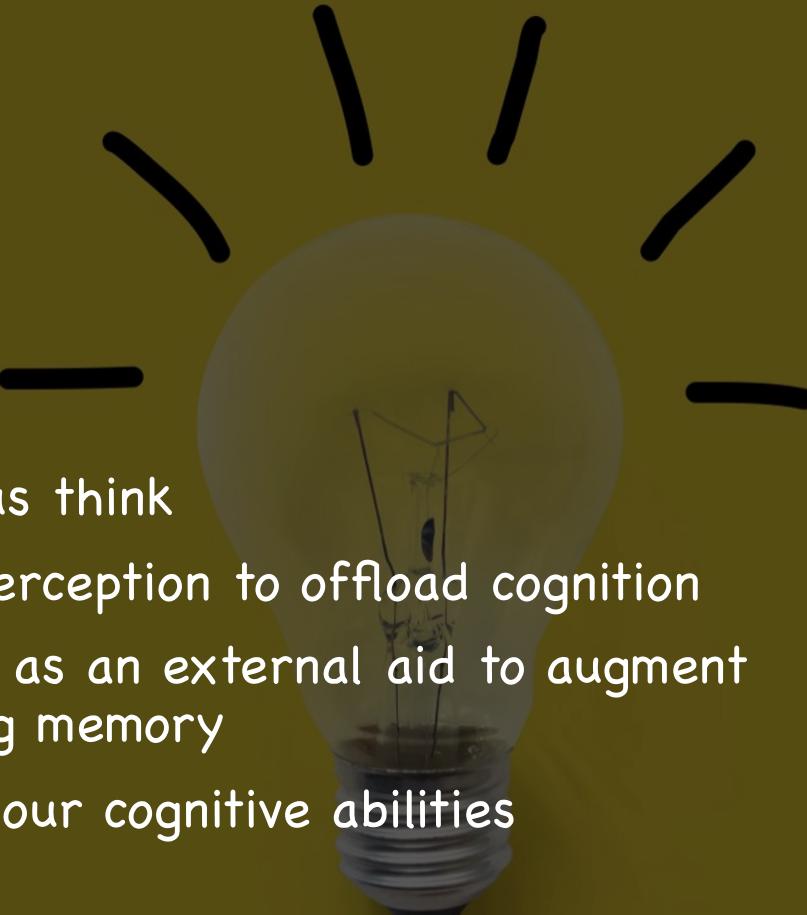
- Which gender or income level group shows different effects of age on triglyceride levels?

The Power of Visualization

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



Visualization

- 
1. Helps us think
 2. Uses perception to offload cognition
 3. Serves as an external aid to augment working memory
 4. Boosts our cognitive abilities

Why Big Data Visualization?

Information Explosion

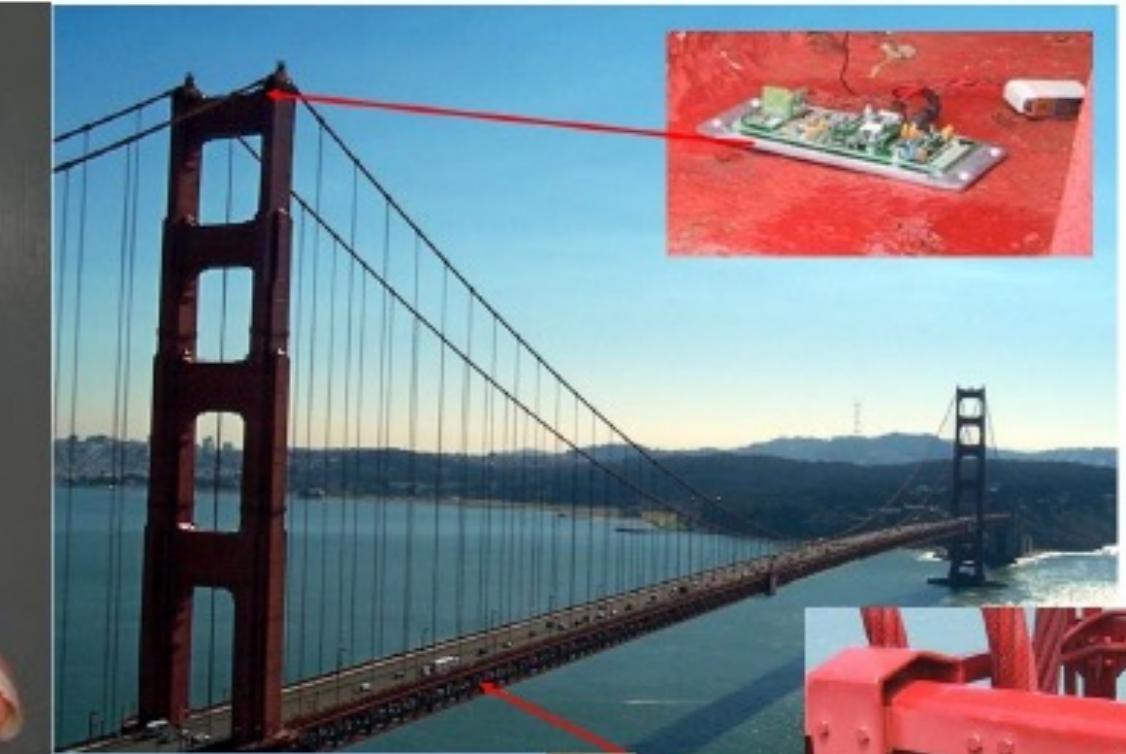
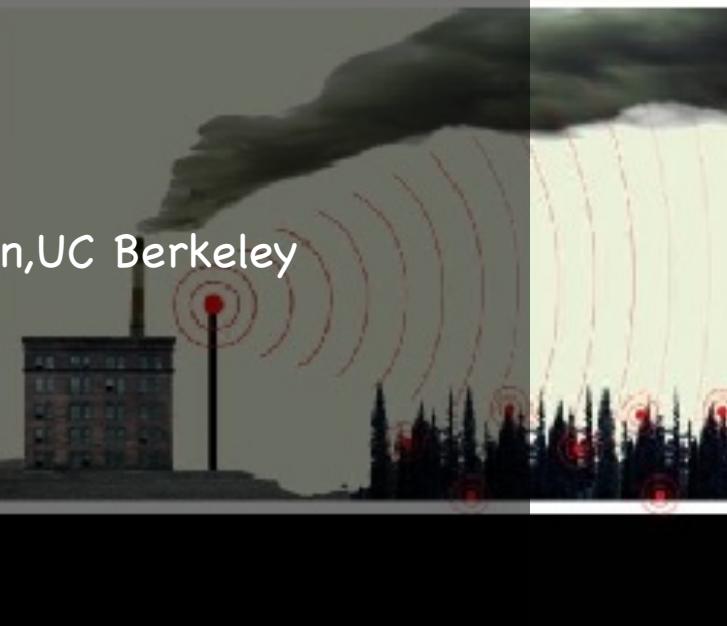
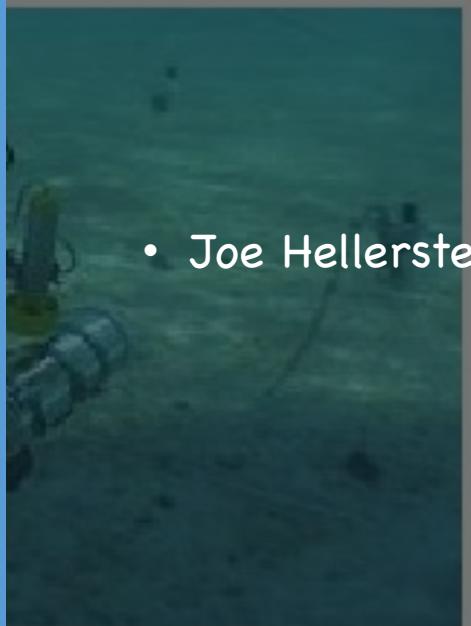
The image is a composite of several screenshots from different websites, illustrating the interconnected nature of online information:

- Google Reader:** Shows a feed of news items, including "Data Mining: Text Mining, Visualization and Social Media" and "Subtraction".
- Digg:** A social news website showing stories like "Barack Obama wins South Carolina Democratic primary" and "Driver Who Killed Teen Suspect for Damaged Vehicle".
- Wikipedia:** The English Wikipedia homepage featuring the iconic globe logo.
- Twitter:** The user hpfister's profile page with a status update about a SlideShare presentation.
- Facebook:** A group page for "Barack Obama for President in 2008" with a large photo of Barack Obama.
- Other Pages:** Includes screenshots of a blog post about "TechMeme - Beyond the List", a "Tips and tricks" sidebar, and a "Recently started" section on a website.

“The Industrial Revolution of Data”

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- Joe Hellerstein, UC Berkeley

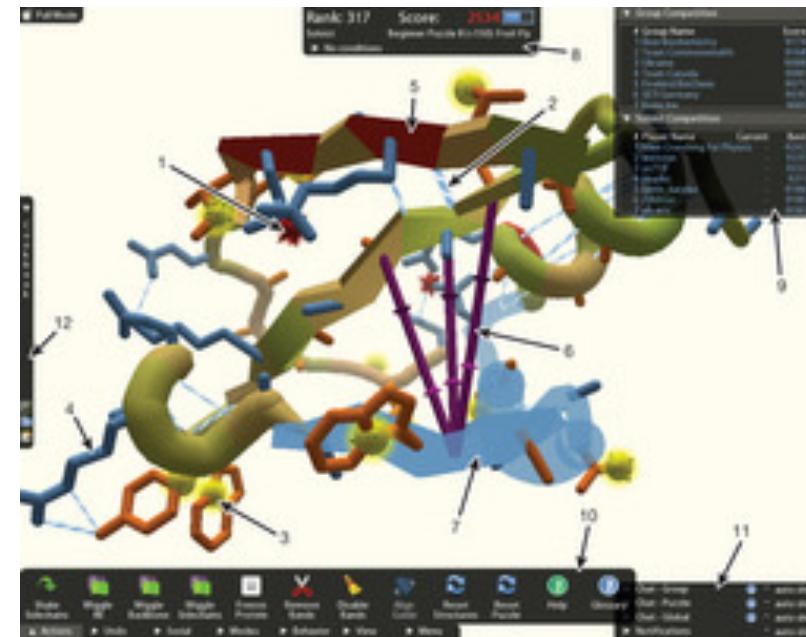
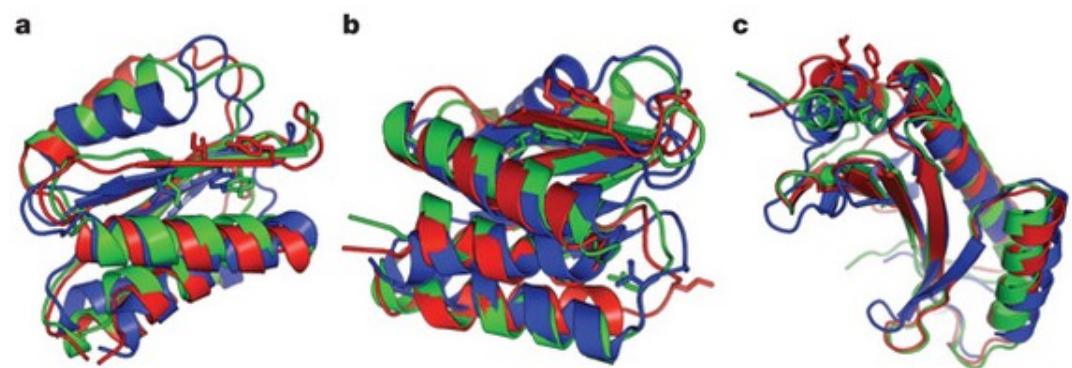




“The ability to take data—to be able to **understand** it, to **process** it, to **extract value** from it, to **visualize** it, to **communicate** it —that's going to be a hugely important skill in the next decades,... because now we really do have essentially free and ubiquitous data.”

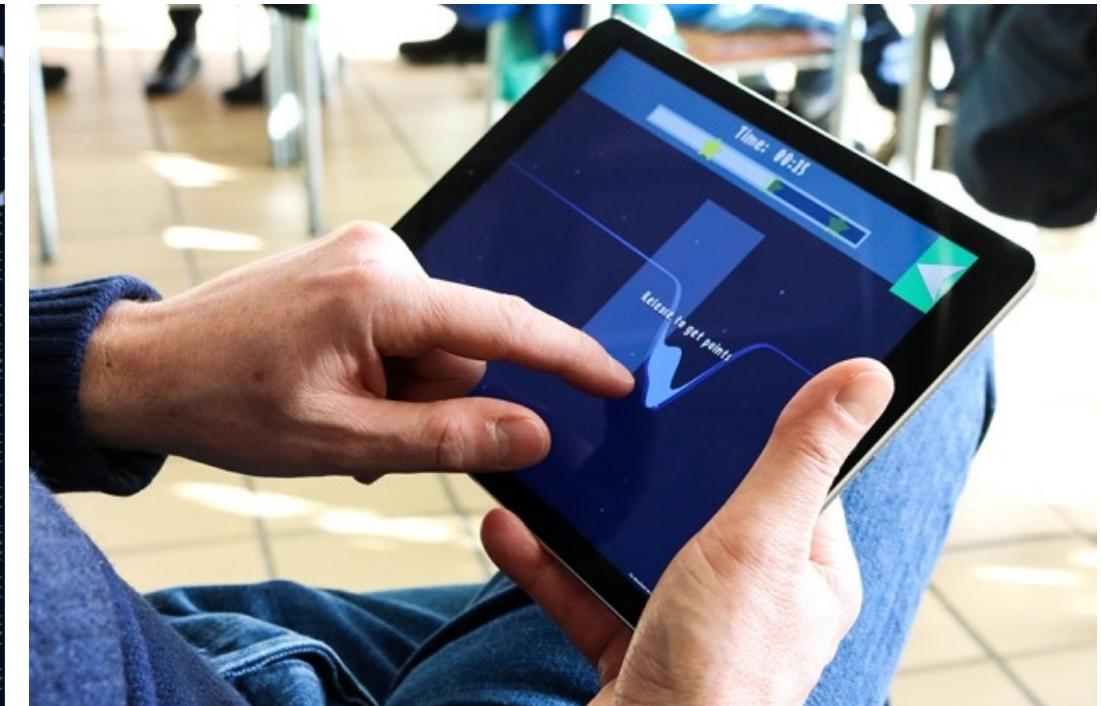
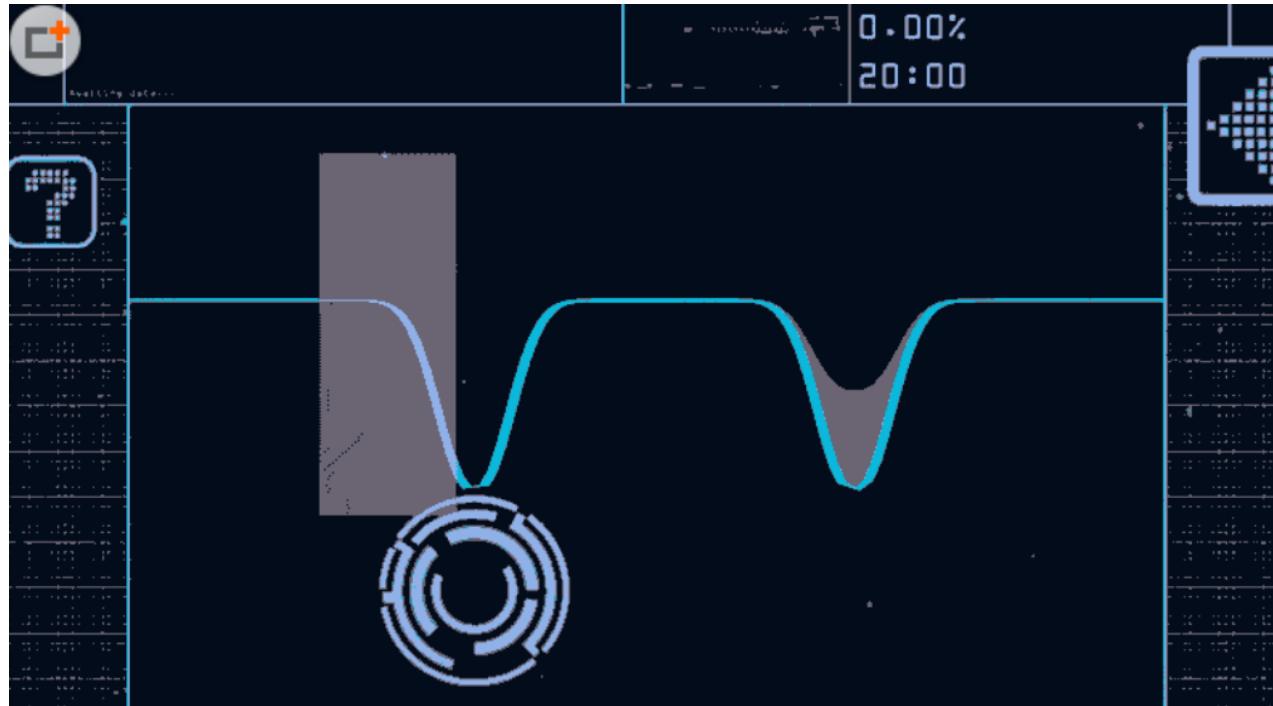
HalVarian , Google's Chief Economist, The McKinsey Quarterly,Jan 2009





An Example

Another Example



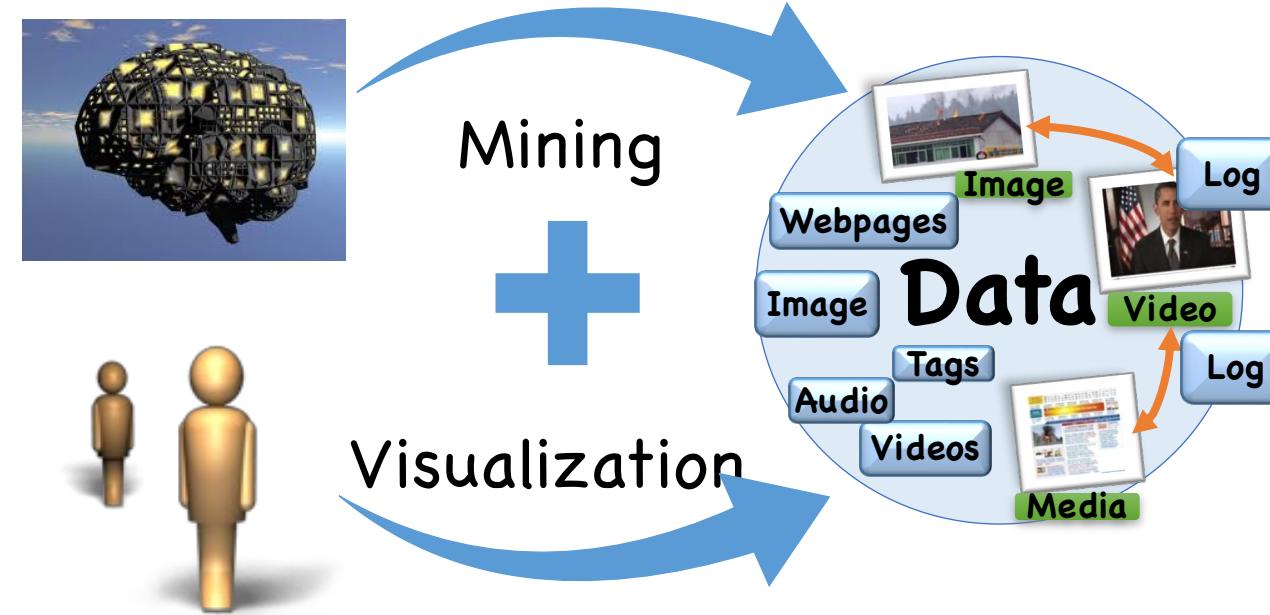
Quantum Moves

Nature 532, 160–161 (14 April 2016)



Visual Analytics

Core idea: human and machine work as a team

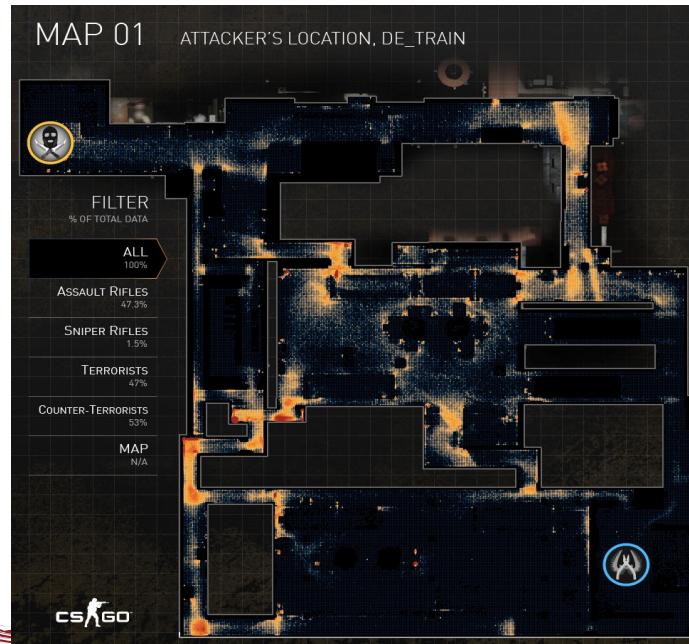


Visual Analytics: analytical reasoning facilitated by interactive visual interfaces

A Small Example

Valve, the game company that develops the counter-terrorism elite, recently described on their blog how they use visualization and data analysis to help with game design. In the anti-terrorist elite game, almost every action of the player is recorded, from every bullet fired to every purchase of a weapon. The thermal map above shows the location of shots fired by all players in the map DE_TRAIN, a total of 6.5 million times. The colors from red to yellow, blue, and then to black are used. Red indicates the most common shooting site, while black represents the rarest shooting site. You can see that the corners and lanes are the places where the fighting is the fiercest.

All shootings



Shootings of Sniper Rifles



Shootings of Assault Rifles



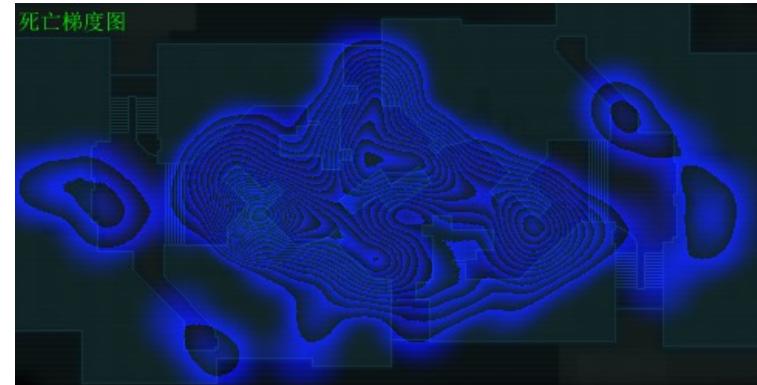
KD Visualization on an FPS Map



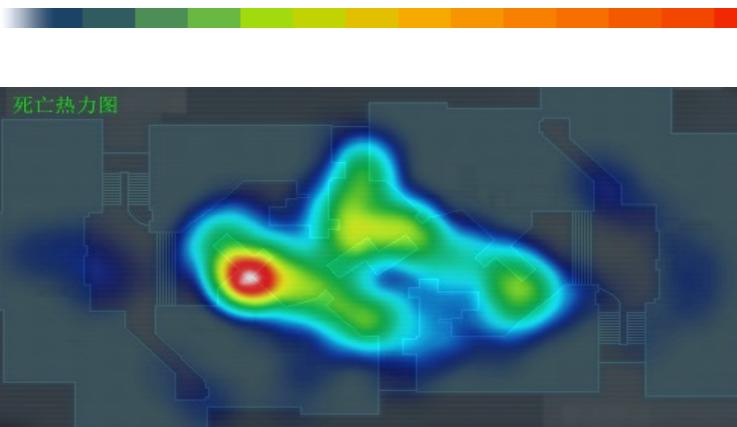
Initially we use scatterplot to visualize the KD distribution on the FPS map



Visual clutter occurs when too many shootings



 Render the gradient visualization to indicate the density distribution

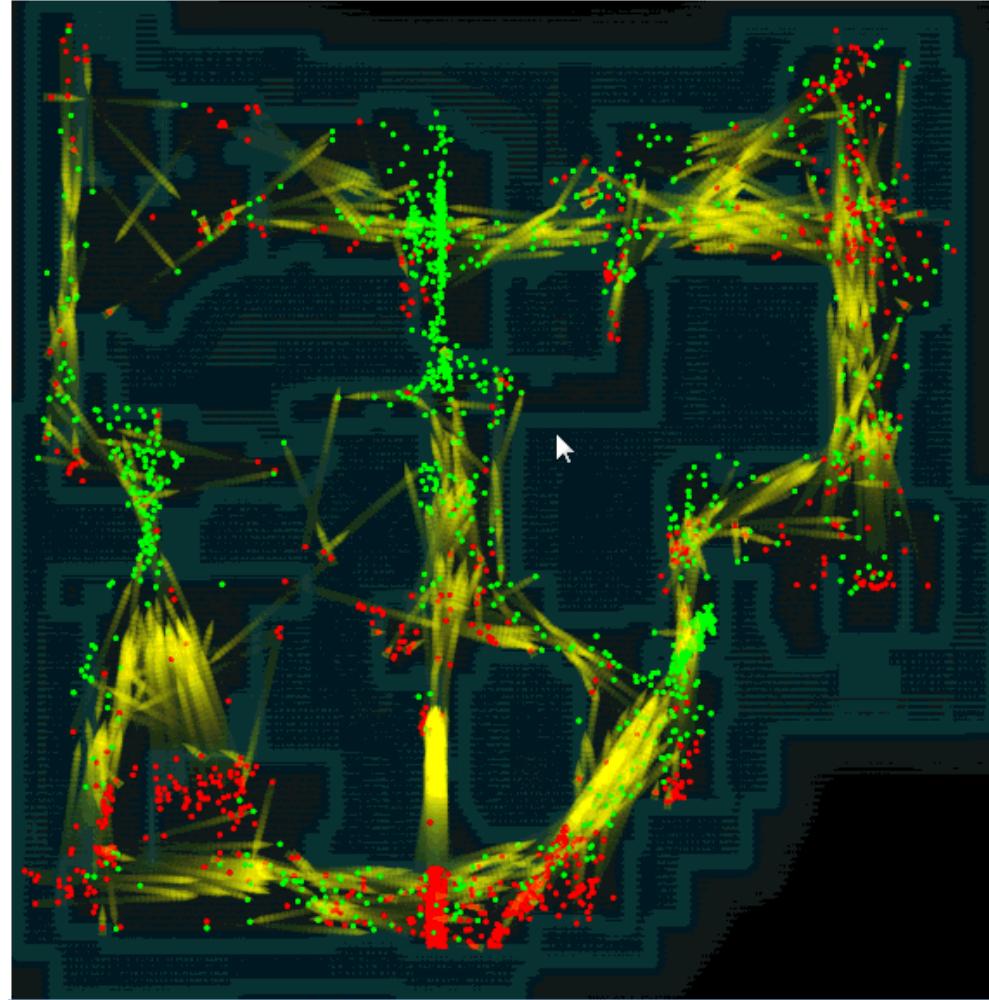


 Render the heatmap by using a color bar on the gradient visualization

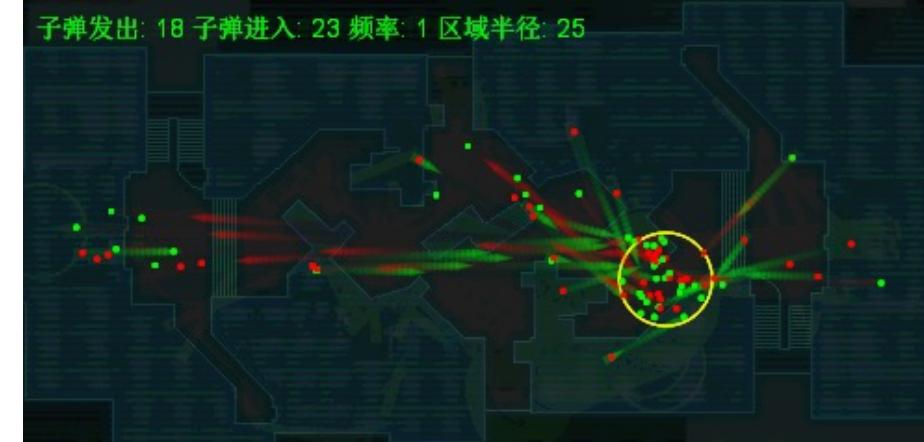


Information Loss

- Only render the killing or death position of players on the game map
- The trajectory of how the bullet arrives from the firing position to the hitting position is lost



Red: firing position; green: hitting position; yellow arrow: the trajectory of bullet from firing to hitting

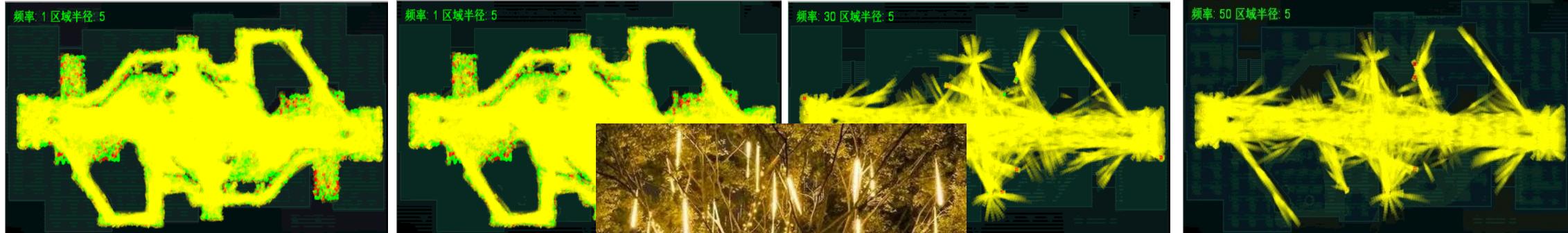


Interactively filtering to check the design balance of the map

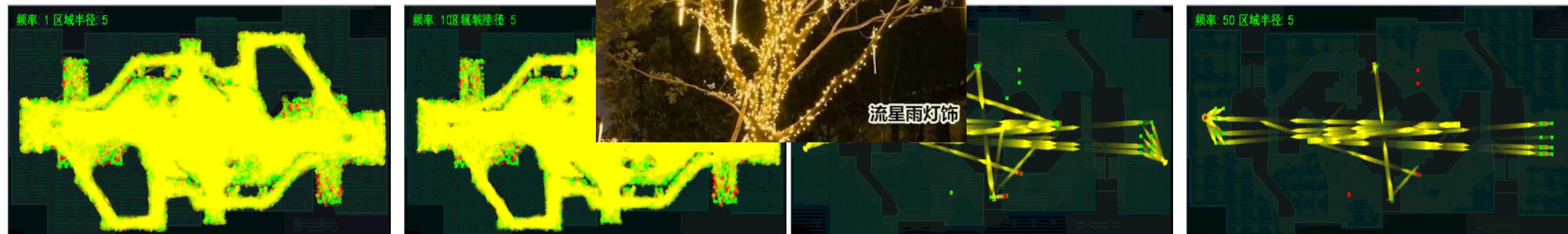


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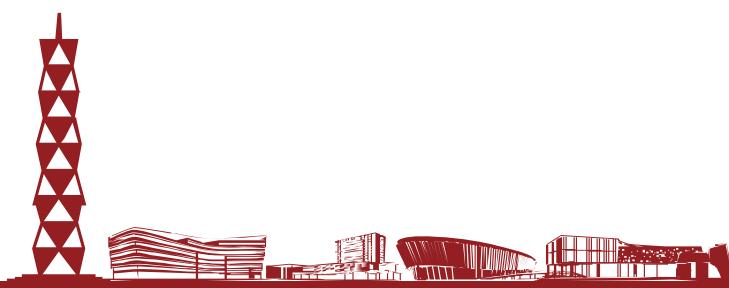
Interactions



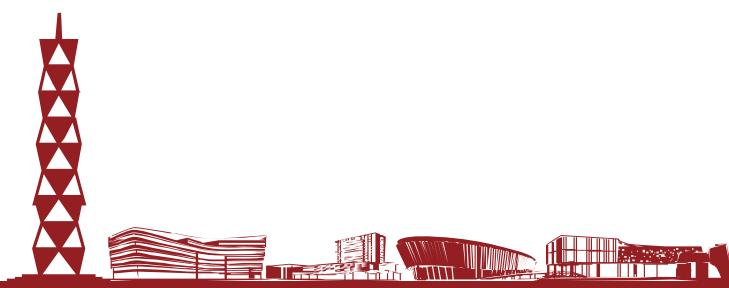
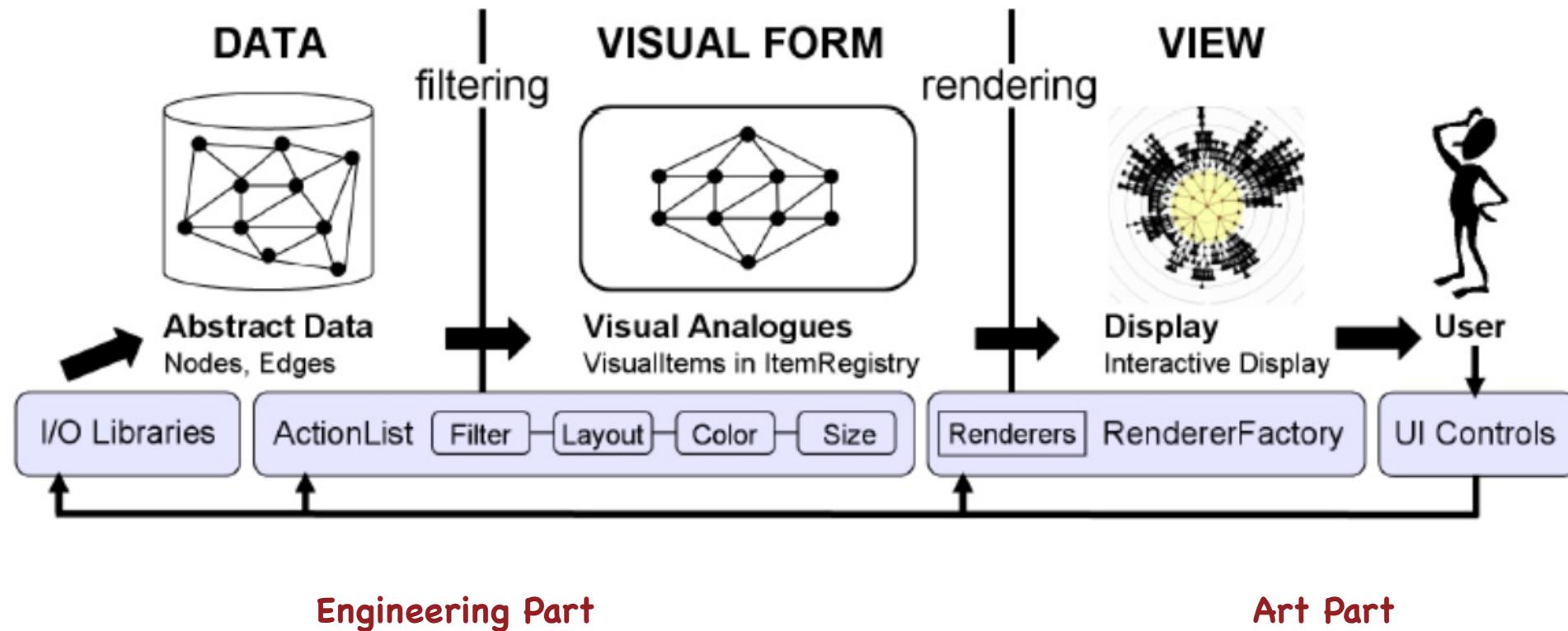
Display the trajectories of both the firework and the tree branches when their frequencies are larger than a predefined threshold



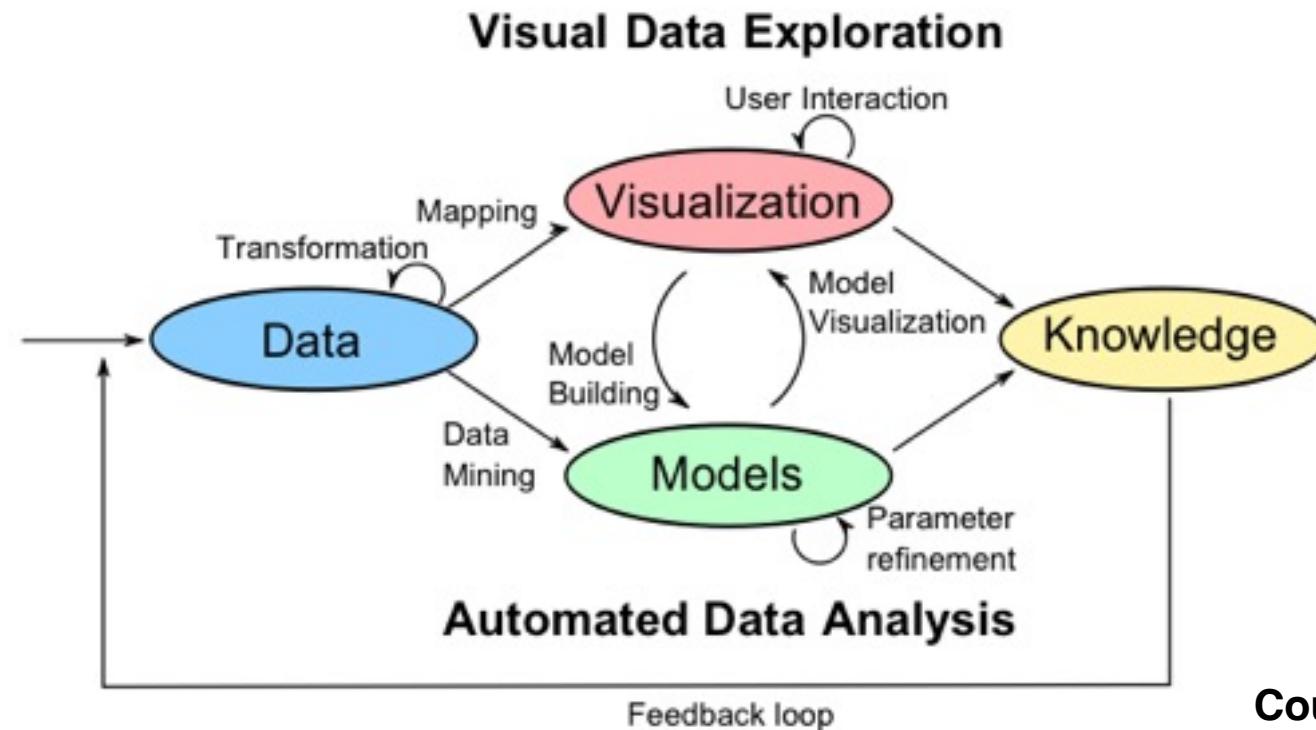
Anomalies



Pipeline of Visualization in the 1990's



Pipeline of Visualization after the 2000's



Courtesy of Denial Keim et al.

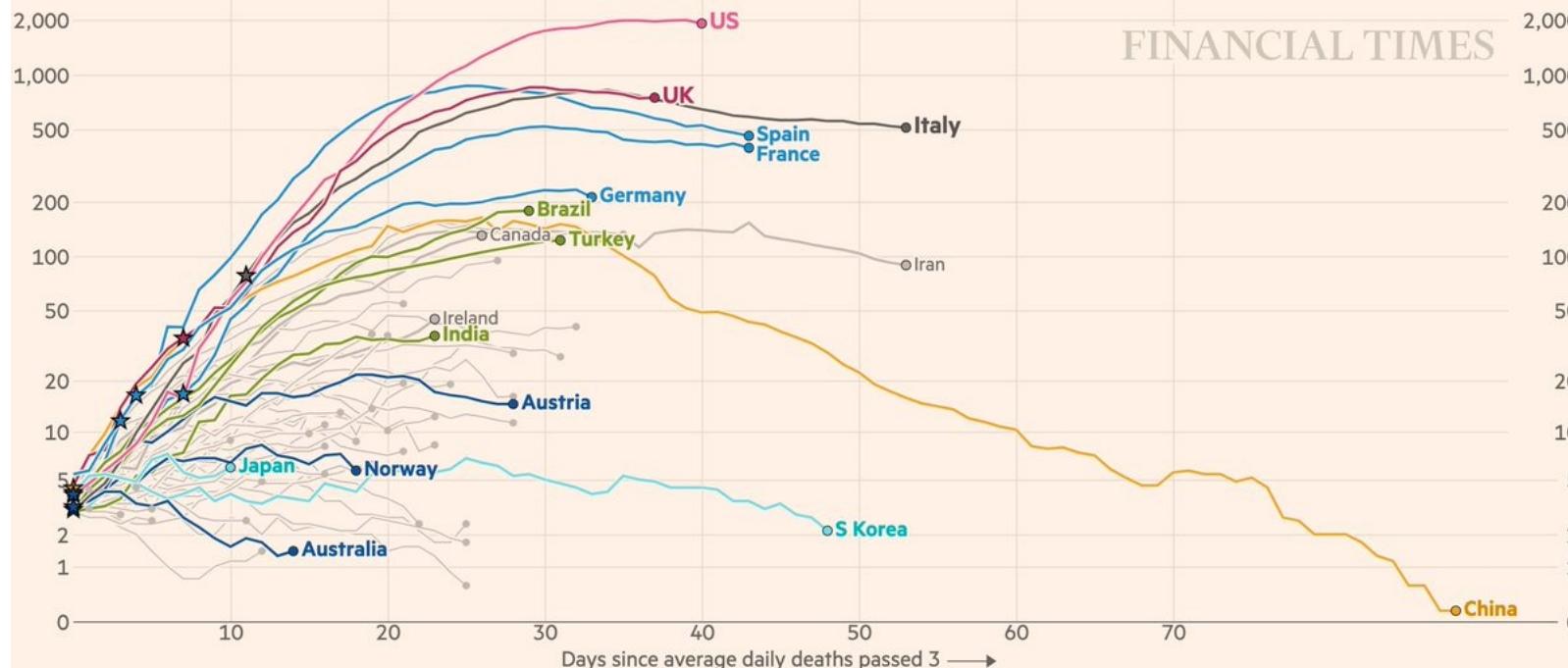
How to involve human in the analysis loop?

What are efficient user interactions and interfaces?

What knowledge can be attained and conveyed from the visualizations?

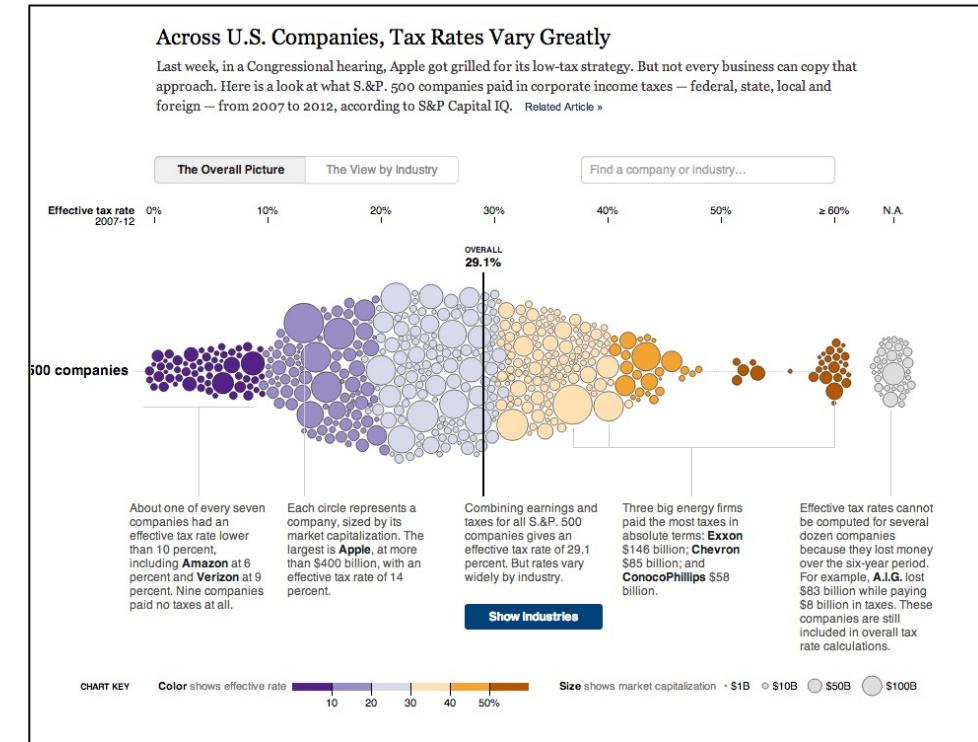
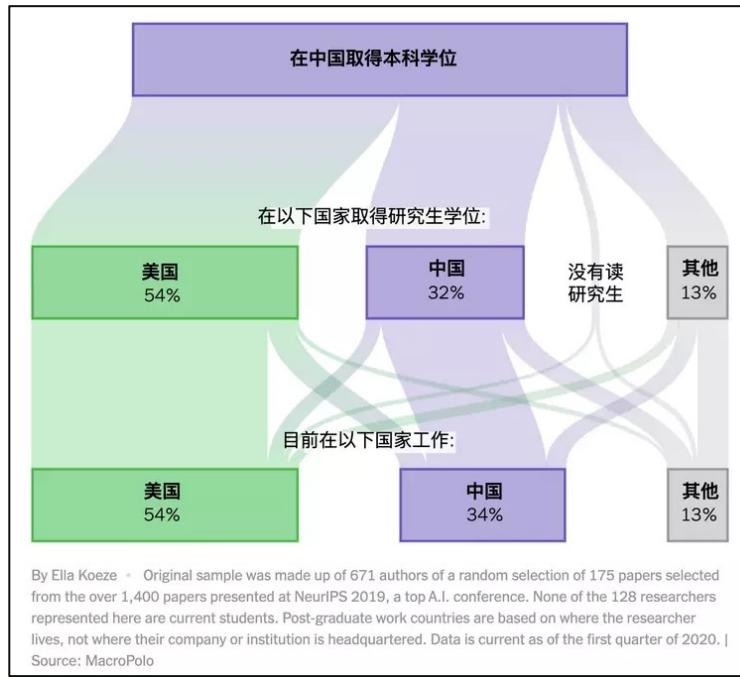
Ability to Interpret Pictures

Daily death tolls are now at their peak or falling in many western countries
 Daily deaths with coronavirus (7-day rolling average), by number of days since 3 daily deaths first recorded
 Stars represent national lockdowns ★



- Nobel laureate: if China falsifies epidemic data, they need a time machine
- The Global Times quoted Russian television today as saying that Michael Levitt (Michael Levitt), a professor of structural biology at Stanford University and a Nobel laureate in chemistry, said in an interview with the media that there was no reason to suspect that there was something wrong with the official epidemic data in China, because the data in China were completely consistent with the epidemic curve observed elsewhere.

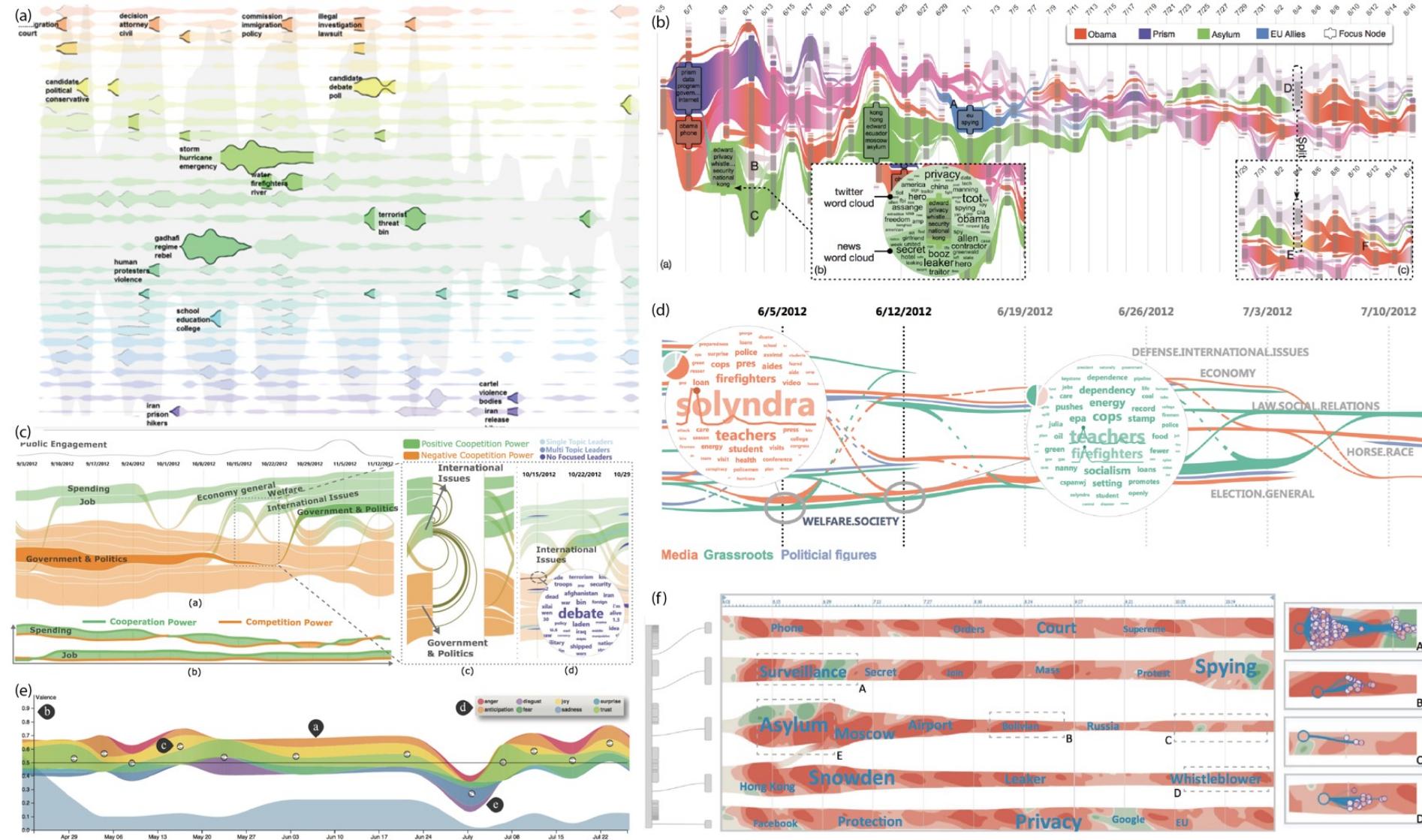
Different Levels of Ability to Interpret Pictures: Elementary and Intermediate



- The most elementary ability to interpret pictures, which is suitable for the general public
- Many media have used images to tell stories and display data

Intermediate ability to interpret pictures can only be mastered after some training

Different Levels of Ability to Interpret Pictures: Advanced



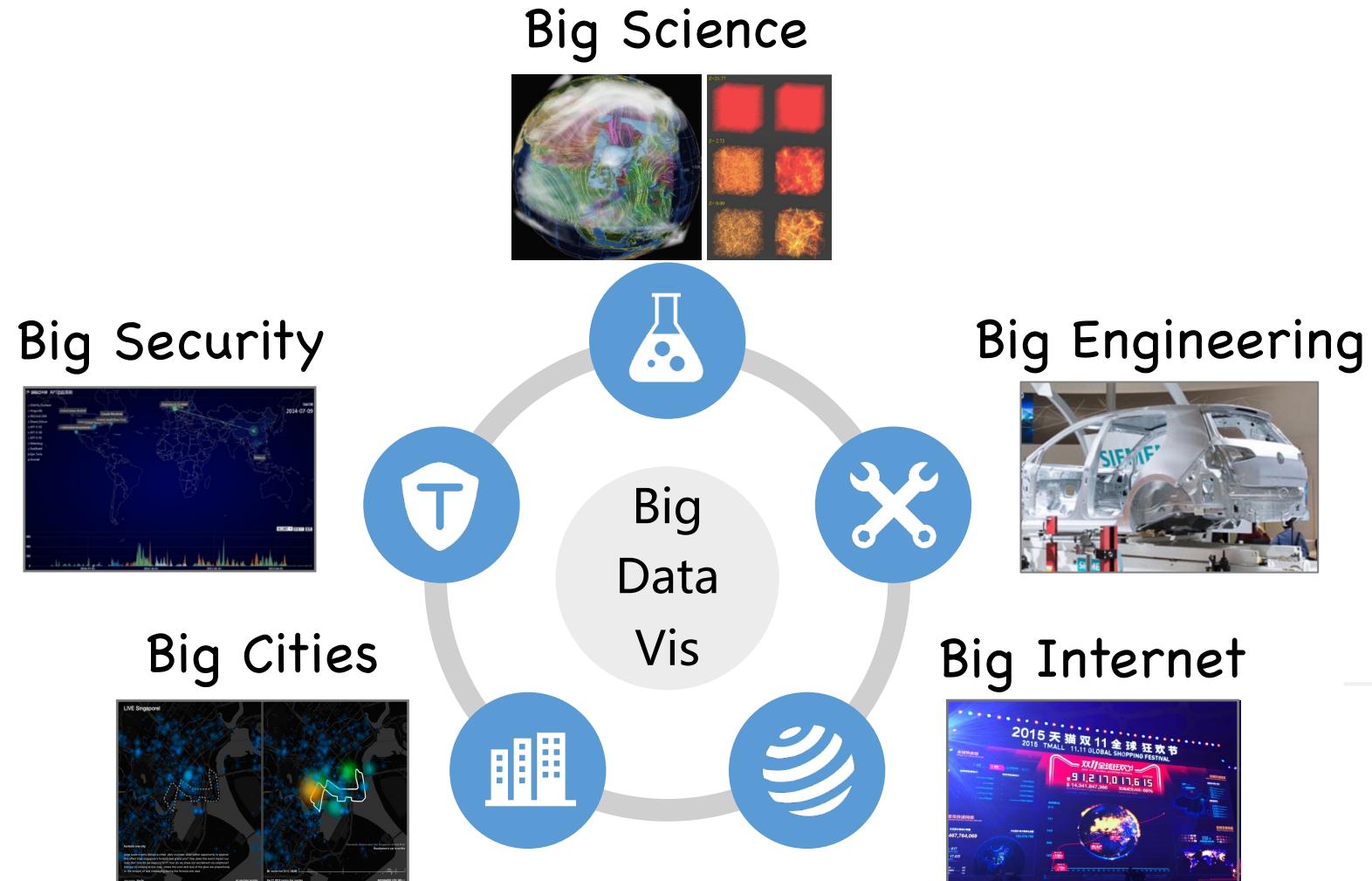
Text and Content Visualization Summary: River-like Visual Metaphor



Visual Analytics Plays Important Roles



2024/2/27

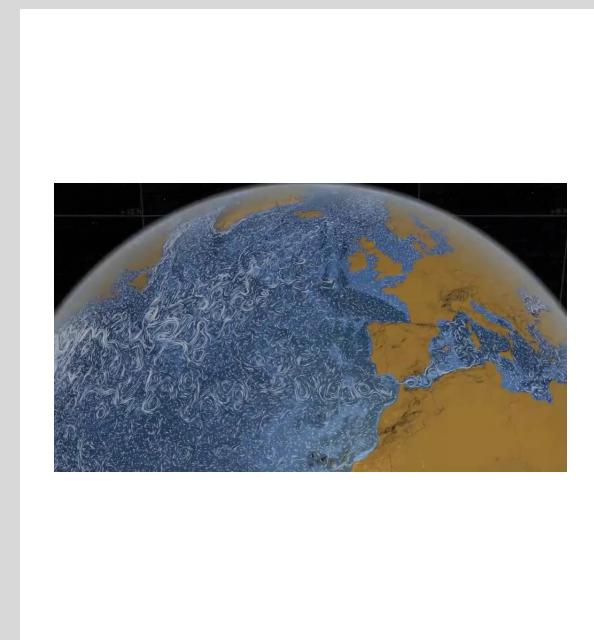
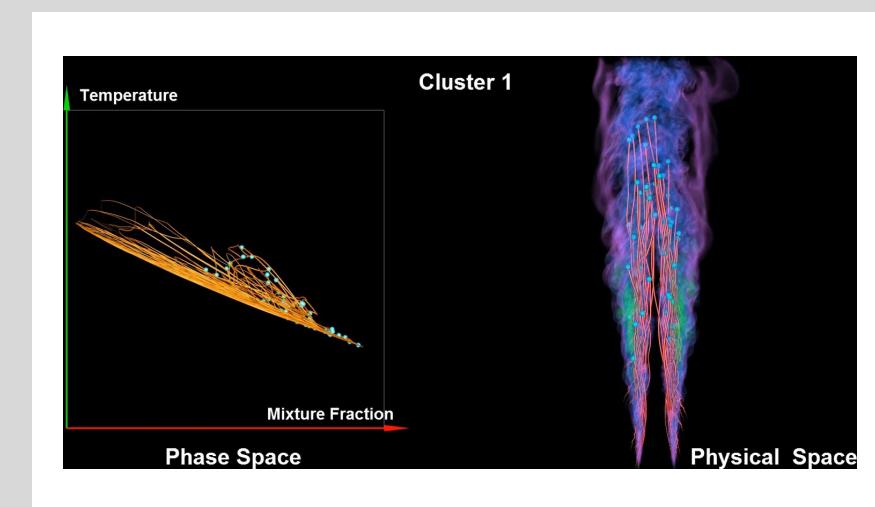
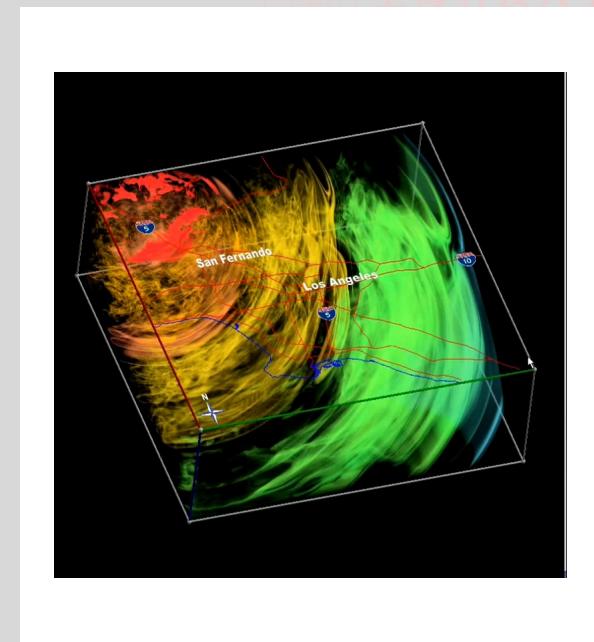
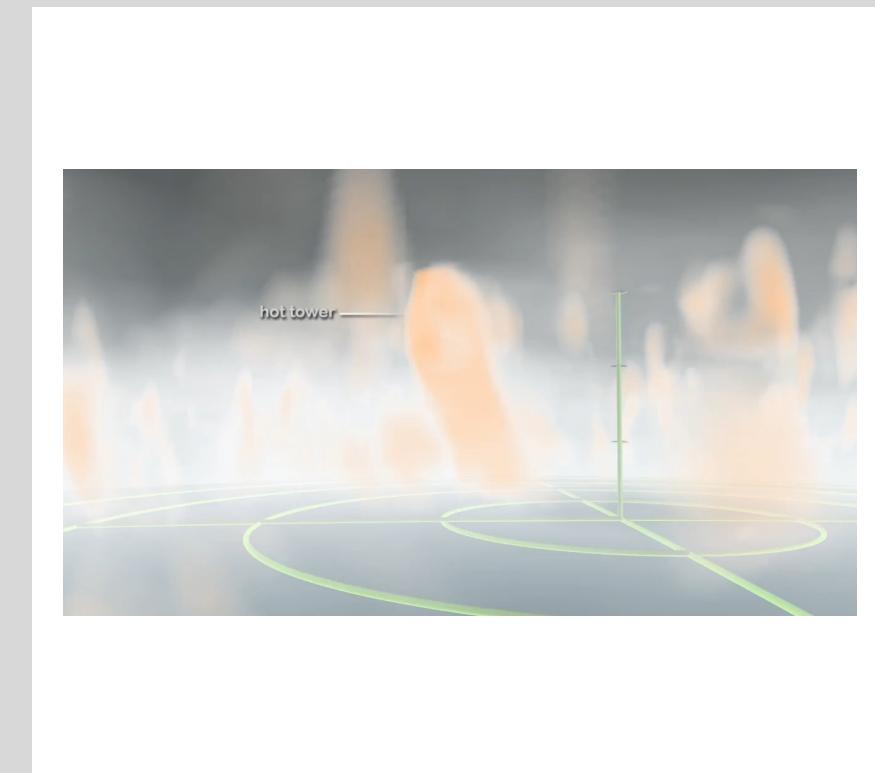


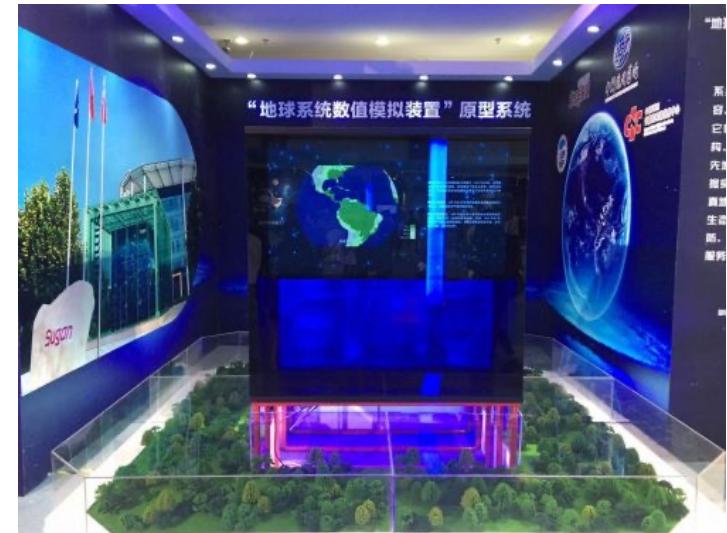
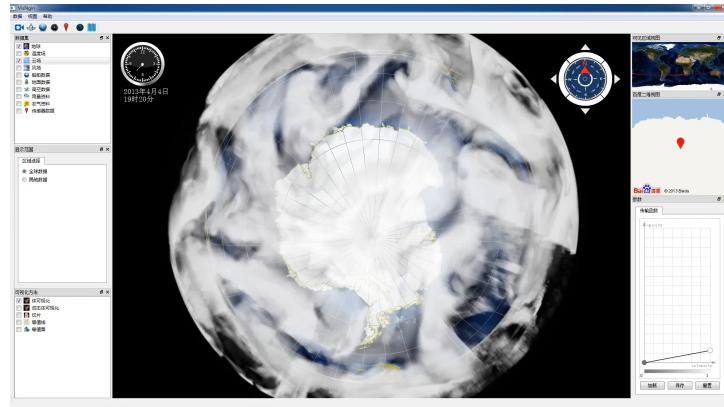


2024/2/27

Important applications of visual analytics: science

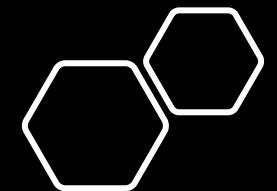
- Visualization is a necessary means of basic natural science and a necessity for the development of scientific big data





Important applications of visual analytics: science

- “Earth system numerical simulation device”
The national 13th five-year Plan major scientific installation project plans to invest 1.3 billion, of which the visualization part is 70 million.



Important applications of visual analytics: engineering

- Visualization is a necessary means to comprehensively understand and analyze the information generated by different links of large-scale engineering simulation, measurement, fusion, prediction, testing and so on



**Important
applications
of visual
analytics:
engineering**

DX: Visual Diagnostics of Assembly Line Performance in Smart Factories

IEEE VAST 2016 – Conference on Visual Analytics Science and Technology

(TVCG Track)

Panpan Xu

Bosch Research
Palo Alto, CA

Honghui Mei

Zhejiang University
Hangzhou, China

Liu Ren

Bosch Research
Palo Alto, CA

Wei Chen

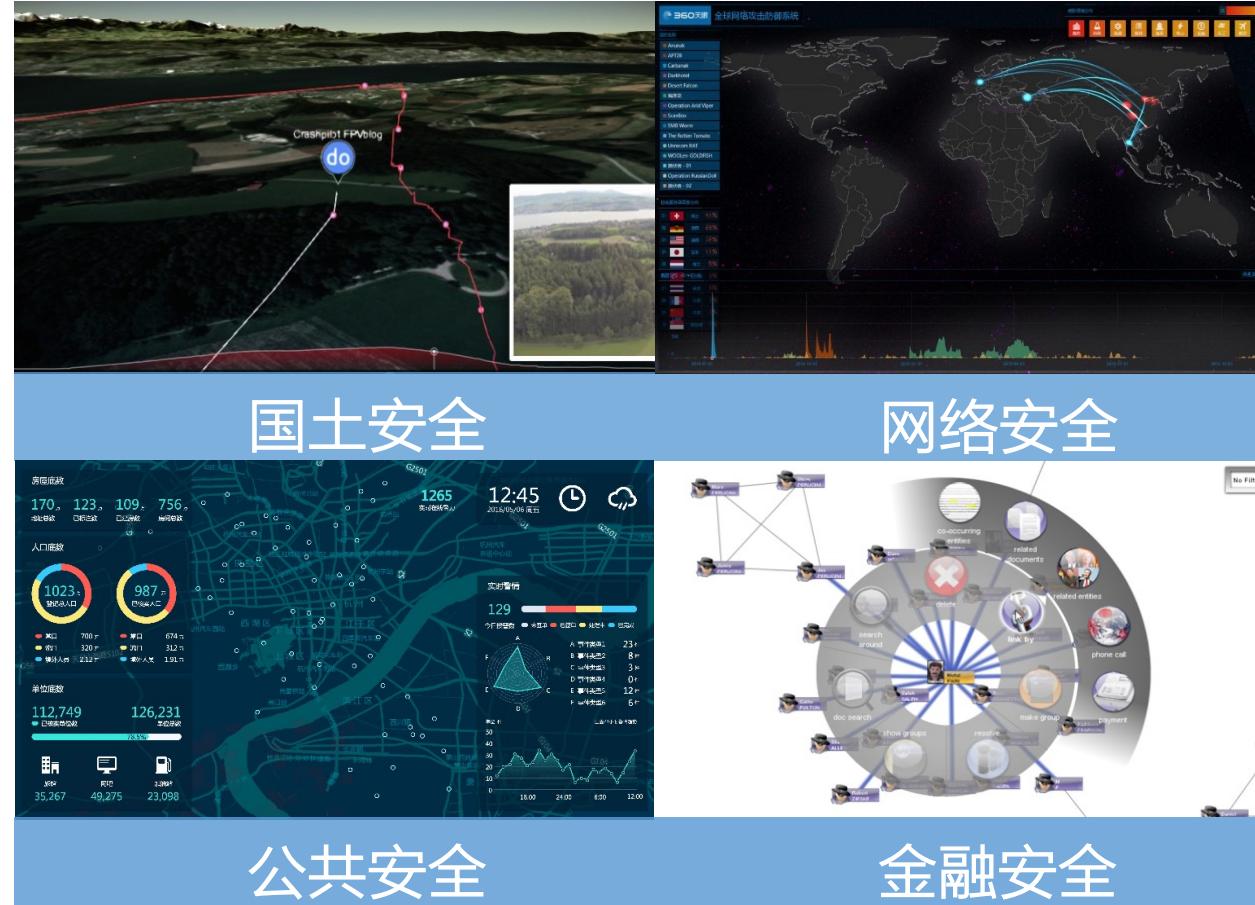
Zhejiang University
Hangzhou, China

(With Audio)



Important applications of visual analytics: security

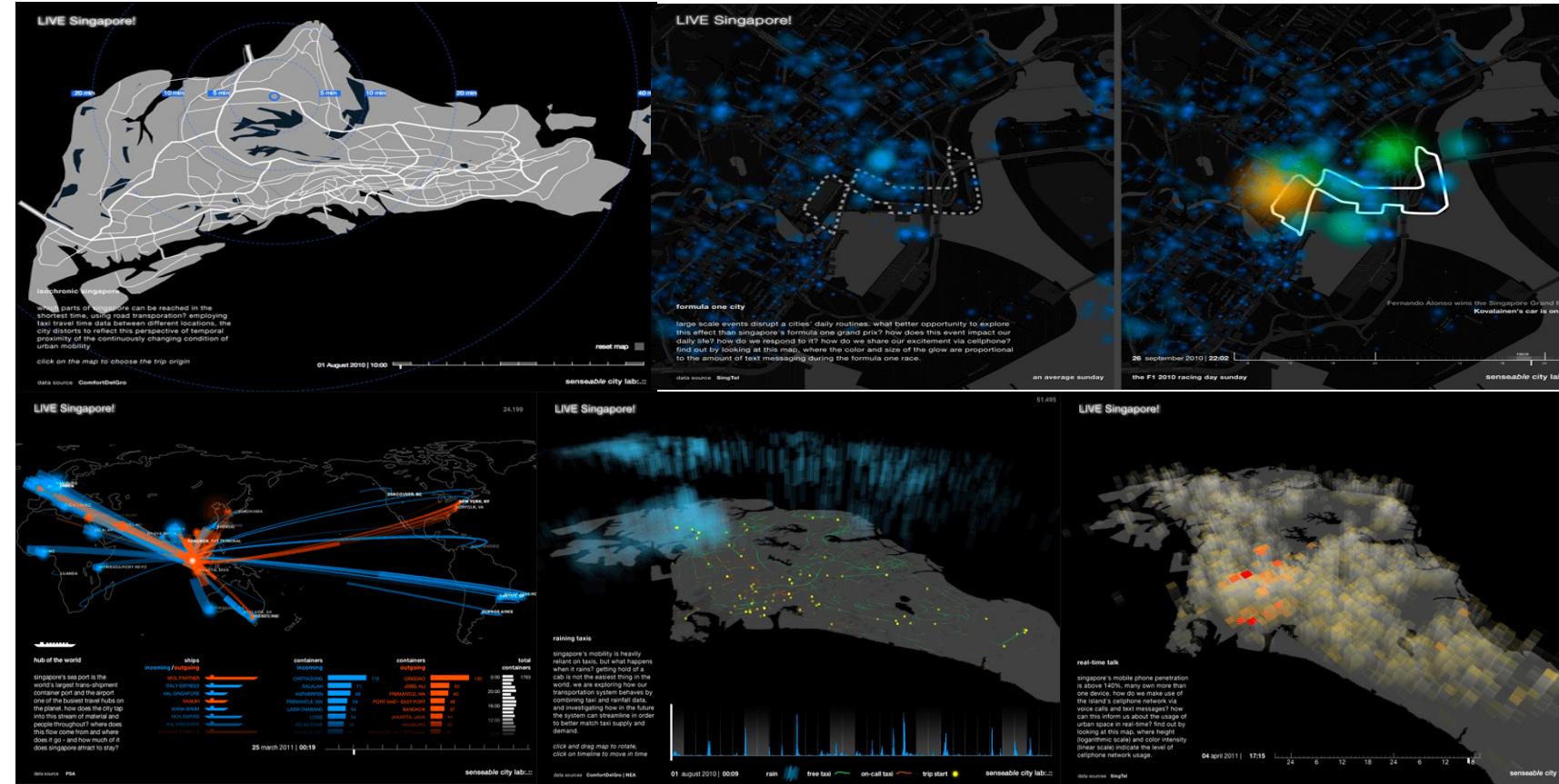
- Visualization is the most important interactive interface for intelligent analysis of game tasks with people.

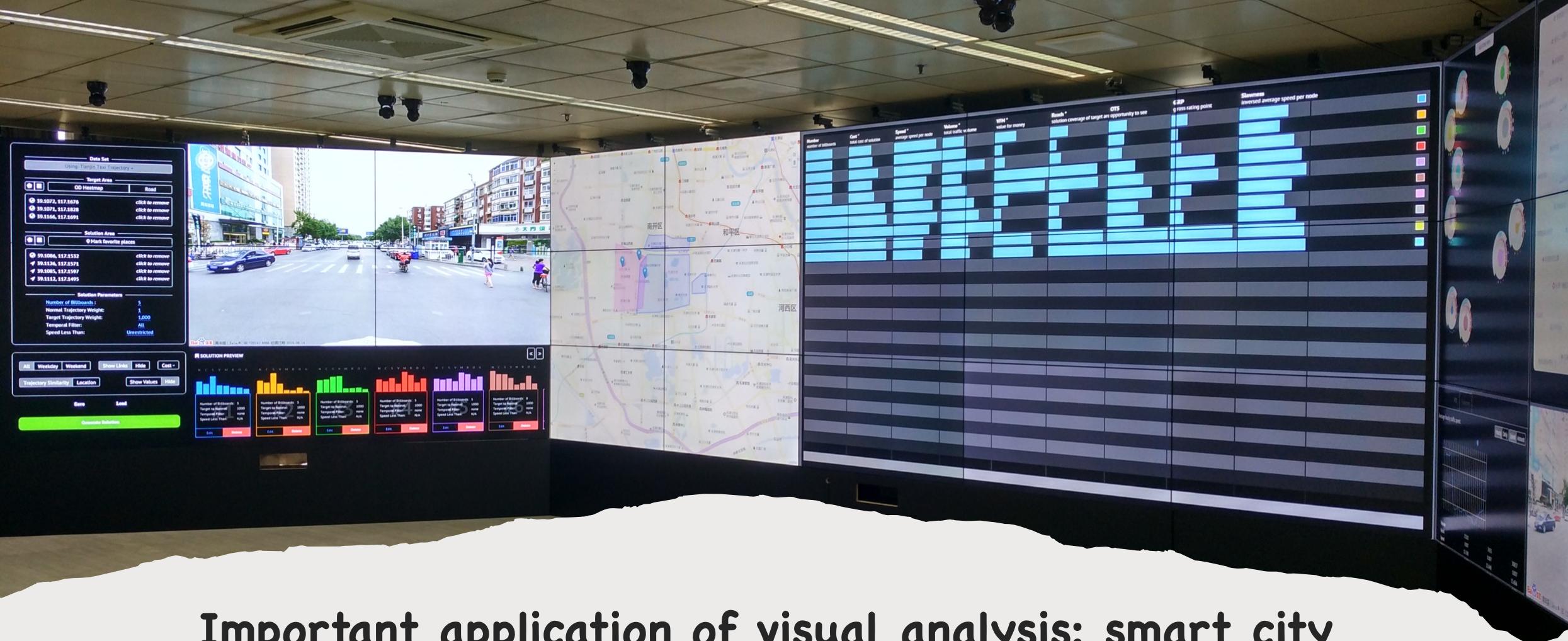


Important applications of Visual Analysis: Internet of things and Smart City



- Visualization is an agile analysis approach to planning, understanding and decision-making based on urban data.





Important application of visual analysis: smart city

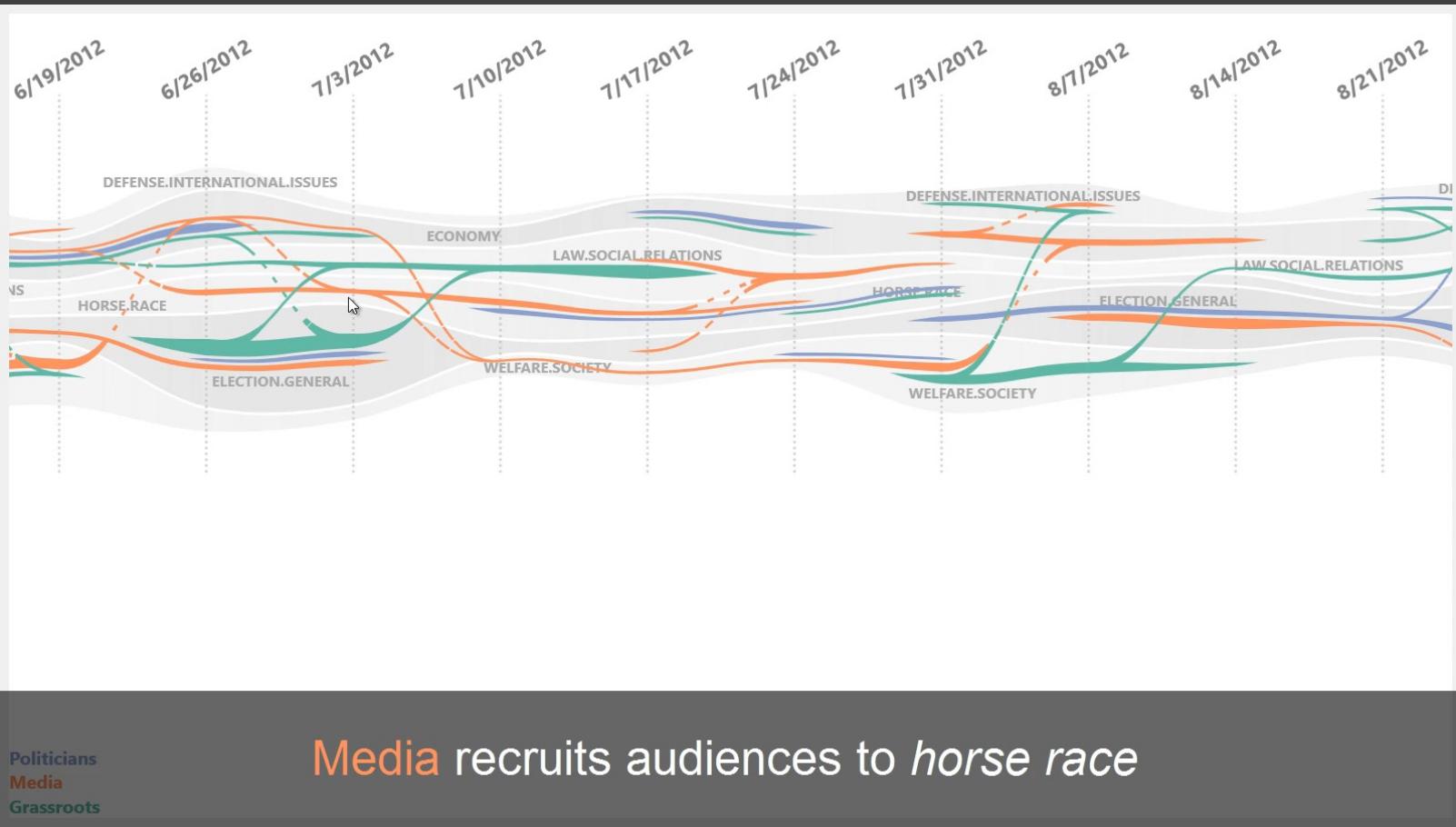
Important application of visual analysis: smart city

HomeFinder Revisited: Finding Ideal Homes with
Reachability-Centric Multi-Criteria Decision Making



The poster features the Zhejiang University logo and Microsoft Research logo at the top right. Below them, the text "ACM CHI 2018" is displayed. The main title "HOMEFINDER REVISITED" is prominently shown with a house icon. Below the title, the subtitle "Finding Ideal Homes with Reachability-Centric Multi-Criteria Decision Making" is presented. The authors listed are Di Weng, Heming Zhu, Jie Bao, Yu Zheng, and Yingcai Wu, each associated with their respective institutions: State Key Lab of CAD&CG, Zhejiang University, Hangzhou, China; State Key Lab of CAD&CG, Zhejiang University, Hangzhou, China; Microsoft Research Asia, Beijing, China; Microsoft Research Asia, Beijing, China; and State Key Lab of CAD&CG, Zhejiang University, Hangzhou, China. On the right side of the poster, there is a screenshot of a mobile application interface titled "ReACH". The interface shows a map of a residential area with several green dots representing homes. Two specific points are highlighted: one at 07:45 labeled "664 Homes" and another at 08:00 labeled "77 School". Below the map, there is an "ACTIVITY EDITOR" section with icons for walking, cycling, and driving. A "LOCATION PRIORITIES" section lists "Homes" and "Schools" with sliders for "LOW", "MEDIUM", and "HIGH". A "FILTERS" section shows "ORIGIN: DESTINATION" with a note "No other activity yet". A "LOCATIONS" section lists various residential areas with their total price in RMB: 滨城蓝湾社区 (30,000,146), 建桥花园 (22,000,000.2), 黄江阳光海岸 (20,000,000.0), 滨江公寓 (18,000,000.0), 滨水公寓 (18,000,000.2), 黄江阳光海岸 (18,000,013.4), 国宾公馆 (18,000,000.0), and 水印公馆 (17,000,000.0). At the bottom, there are buttons for "+ Add constraint" and "+ View constraints". A large blue button at the bottom of the poster says "In this video, we present ReACH".





Important applications of visual analysis: Internet and social media

- Visualization is an important way for massive behavior mining, analysis, modeling and understanding.

- 1 What is data visualization
- 2 Visualization is hot & cool & young
- 3 How to create visualization?



A photograph of a volcano erupting at night. A massive, bright orange and yellow plume of lava and ash rises from the crater, illuminated by the intense fire within. The surrounding landscape is dark, with the glow of the eruption lighting up the sky and casting long shadows. The volcano's peak is visible in the background, partially obscured by smoke.

Visualization is Hot & Cool

big data visualization



All Images News Videos Maps More ▾ Search tools

About 12,300,000 results (0.59 seconds)

Data Visualization: What it is and why matters | SAS

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

Data **visualization** is the presentation of data in a graphical format. Learn about ... Data **visualization**: A wise investment in your **big data** future. With **big data** ...

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** ...

Zoomdata: Big Data Analytics & Visualization

www.zoomdata.com/ ▾

Zoomdata is the fastest visual analytics for big data. Unlock insights with **big data visualization** at the speed of thought.

Big Data Visualization - Datameer

www.datameer.com/product/big-data-visualization/ ▾

Communicating the results of your **big data** analyses is easy in Datameer's self-service Business Infographic Designer that is consumable on any device.

THE WALL STREET JOURNAL. ▾

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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. 16, 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?

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

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 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.



Popular Now

ARTICLES

1 McDonald's Vows Fresh Thinking



2 U.S. Goals Shift in Militant Fight



3 iPad Air 2 Review: The Best Tablet Needs to Work Harder



Office of Science and Technology Policy
Executive Office of the President
New Executive Office Building
Washington, DC 20502

FOR IMMEDIATE RELEASE

March 29, 2012

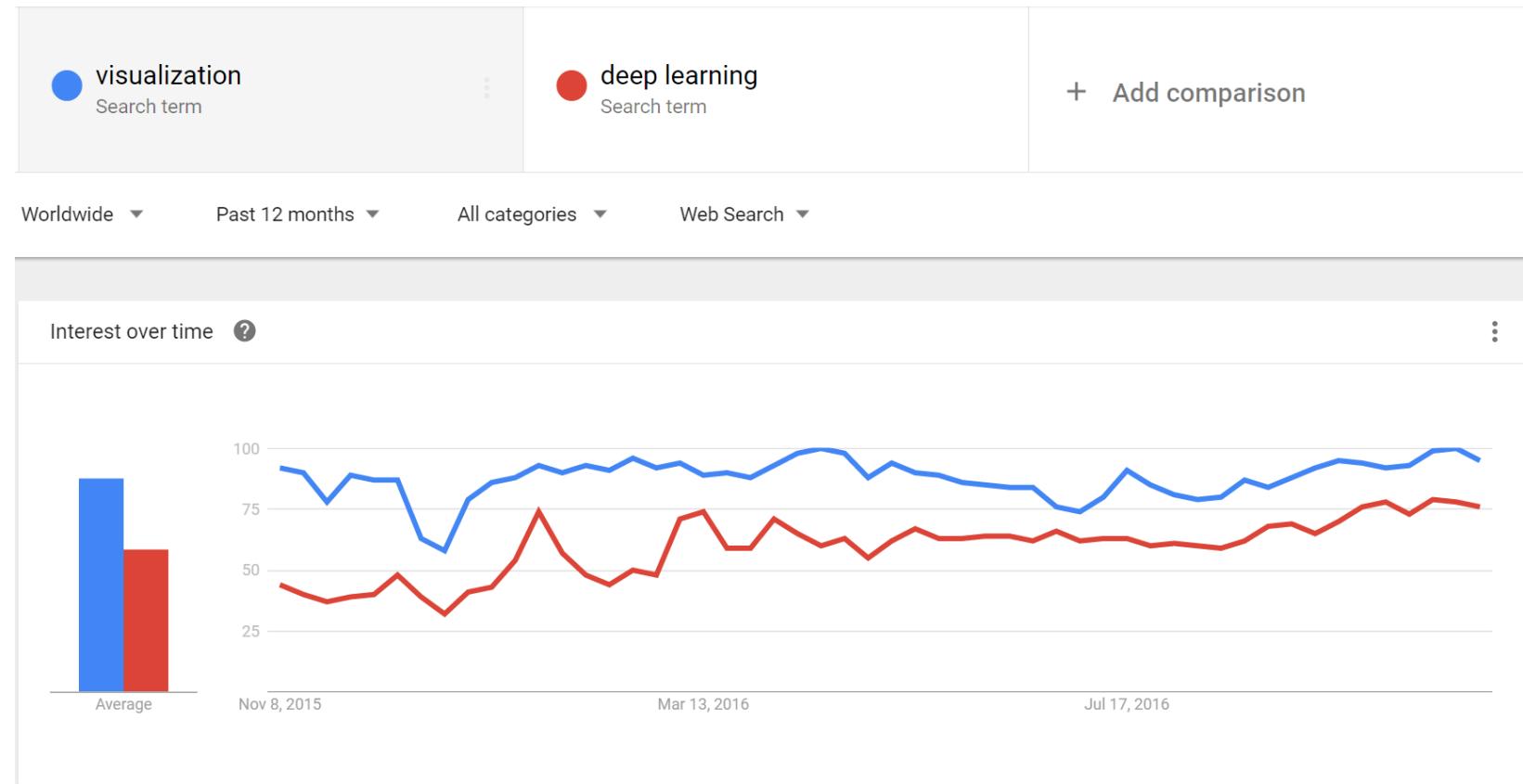
Contact: Rick Weiss 202 456-6037 rweiss@ostp.eop.gov
Lisa-Joy Zgorski 703 292-8311 ljzgorski@ostp.gov

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.

Popularity of Visualization

Visualization VS. Deep Learning



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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[FULL BIO >](#)

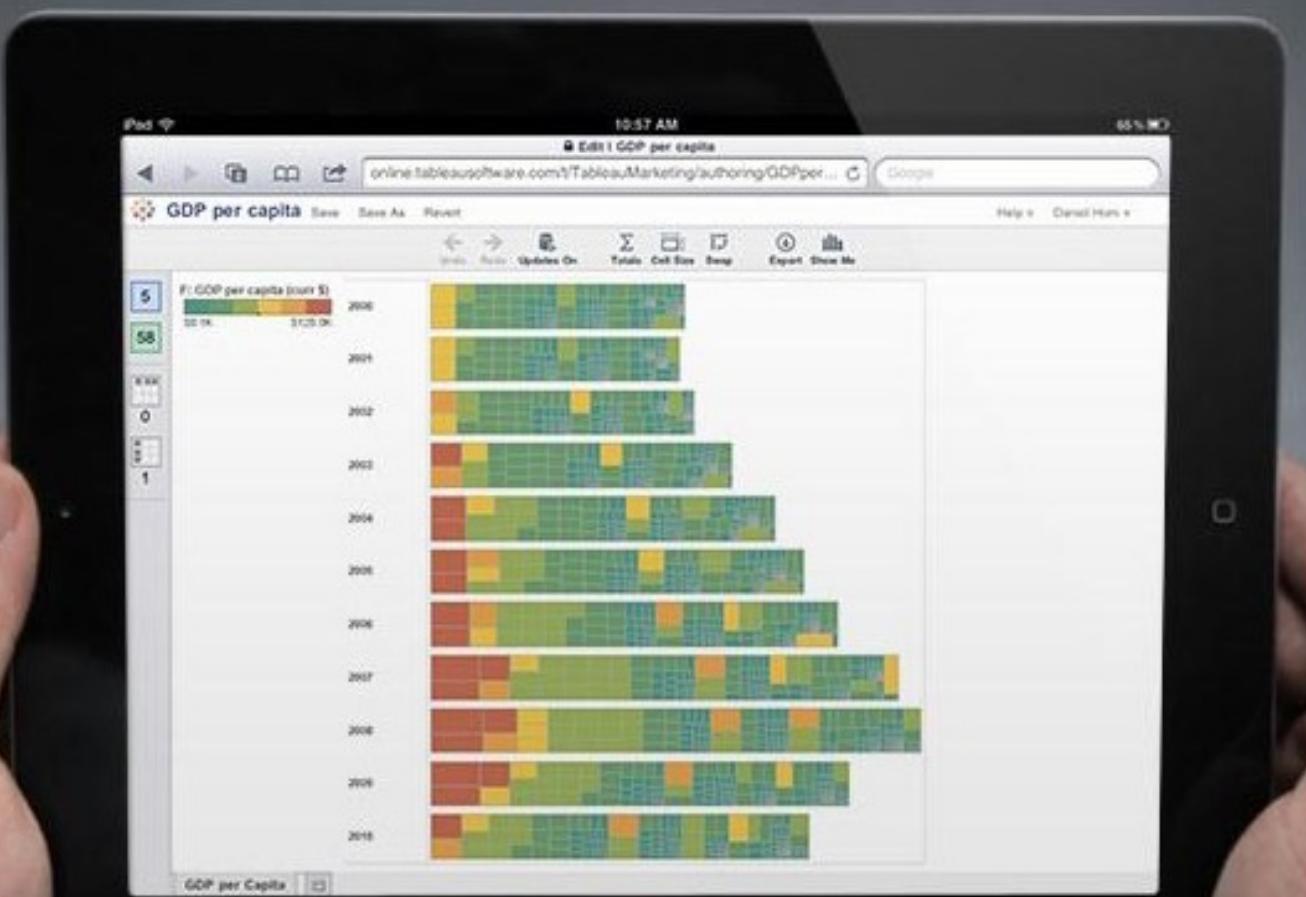
Opinions expressed by Forbes Contributors are their own.

"*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

Get answers from interactive dashboards wherever you go.

SEE HOW



FOR EVERYONE

Tableau Desktop



GO

BUSINESS
INTELLIGENCE

Tableau Server



GO

ANALYTICS IN
THE CLOUD

Tableau Online



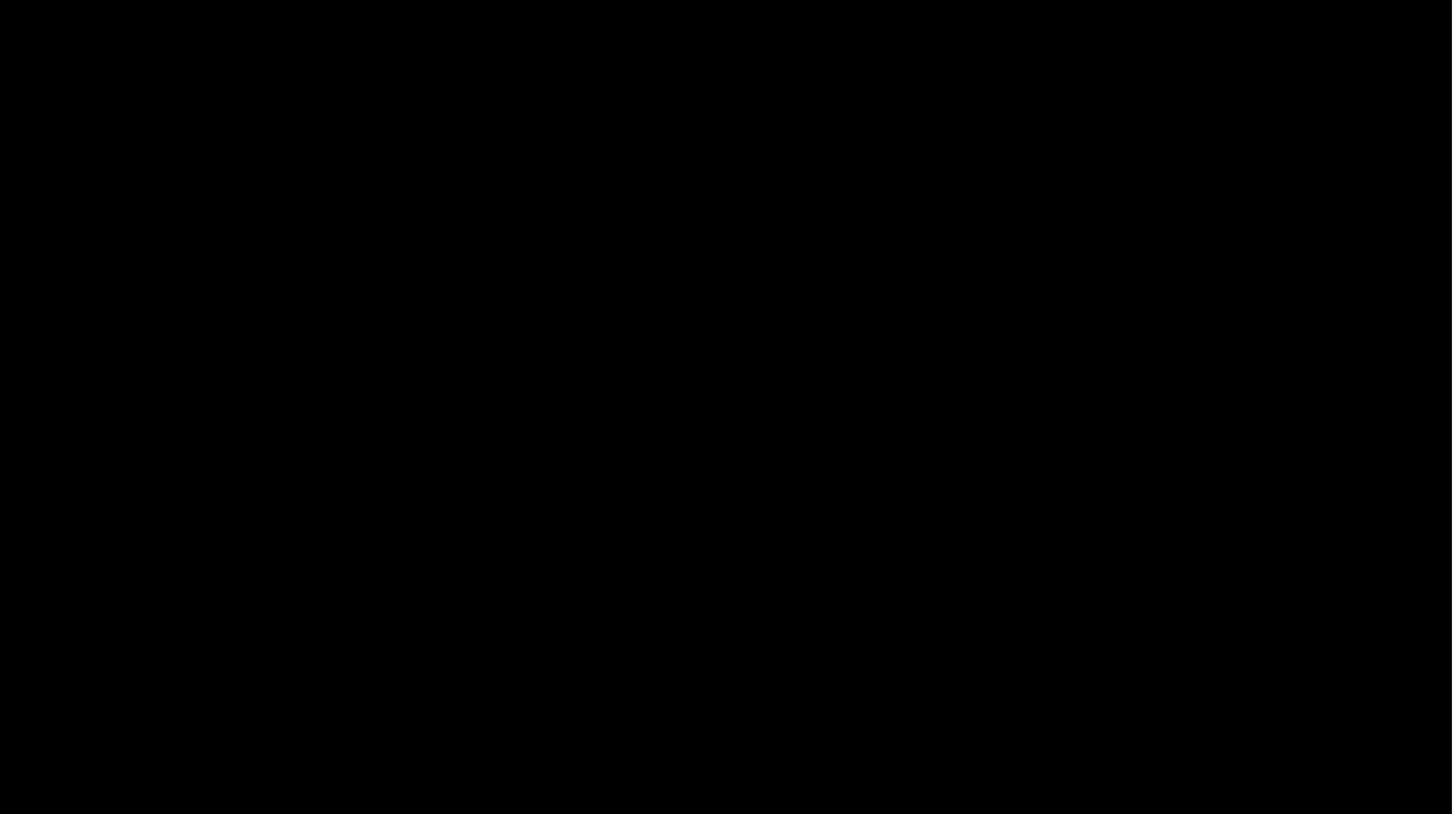
GO



PowerMap



上海科技大学
ShanghaiTech University



2024/2/27

立志成才报国裕民

BIG DATA

Adobe Rolls Out New Data Visualization Tool



Posted September 25, 2015

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

THIS
Adobe Rolls Out New Data Visualization Tool

Microsoft Launches New Cloud Services for Azure Platform 

YOU ARE HERE: HOME ■■■ BIG DATA ■■■ THIS STORY

 TEAMBSITE 8 [Web Content Management Solutions](#)

NEWS OPS

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

SHARE



2024/2/2

Technology company Adobe is getting in on the analytics trend with a new solution that helps companies analyze, share and leverage marketing 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 spin

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.

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.

54

SHARES





Canon Launches Data Analysis and Visualization Tool

October 13 2016

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.



SEARCH: Job No. News No./Keyword Agency No./Keyword
Type Ref No. or Search Term and Hit Return

Daily Research News Online

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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 Intagent.

Trending Research



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



Mobile App Analytics: What
winning mobile developers use



The State of Marketing Technology

PRODUCTS BUILT FOR A PURPOSE

Ten years ago, we set out to create products that would transform the way organizations use their data. Today, our products are deployed at the most critical government, commercial, and non-profit institutions in the world to solve problems we hadn't even dreamed of back then.

THIS IS OUR STORY ➤

Palantir

SCALE, SPEED, AGILITY



2012 the Beauty of Microsoft programming-the Visualization of big data



天池数据可视化
大赛全球众智清除
污染，共建健康地球！

Tianchi Data Visualization
Gather Worldwide Wisdom,
Clean Pollution, Build a Healthy Earth!



III

Obama's big data plans



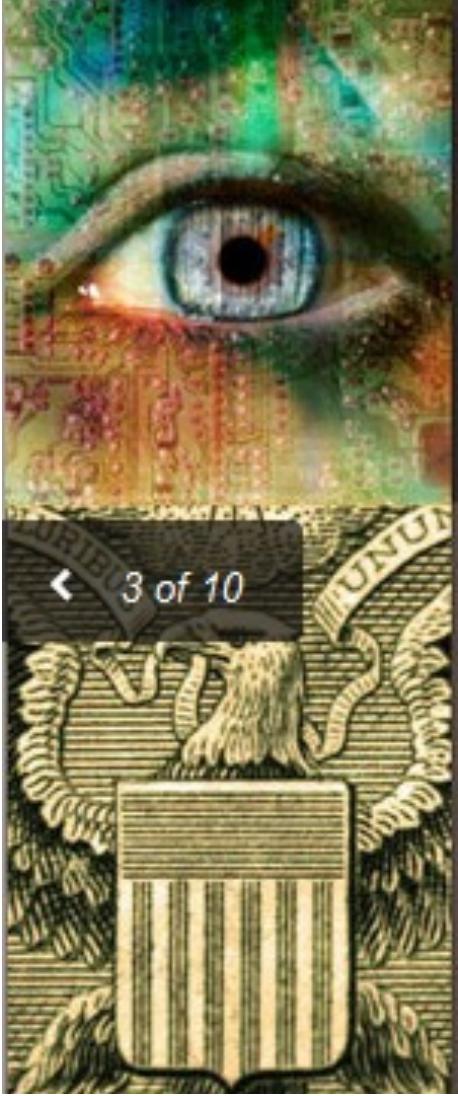
Office of Science and Technology Policy
Executive Office of the President
New Executive Office Building
Washington, DC 20502

FOR IMMEDIATE RELEASE
March 29, 2012

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



Visualization Tool Developers

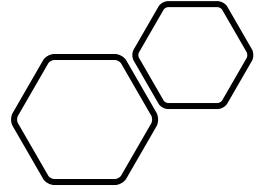
AVERAGE ANNUAL SALARY:(Expert Level Salary)

\$150,000-\$175,000

AVERAGE PAY RATE PER HOUR:

\$57.50

Strong
Demand
in US



Strong Demand in China

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



A close-up photograph of two young ducklings. One duckling is standing on a rough, textured concrete ledge in the foreground, facing right. Another duckling is partially visible behind it, also facing right. The background is a soft-focus view of green foliage and water.

Visualization is Young

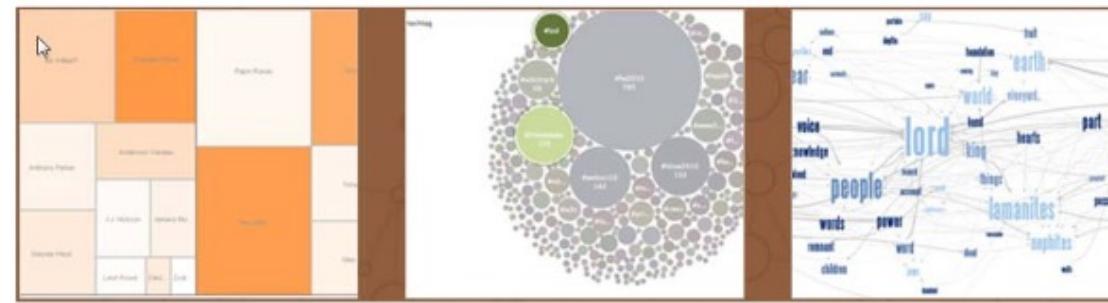
VIS – Subfields



Scientific Visualization (SciVis) – Spatial data



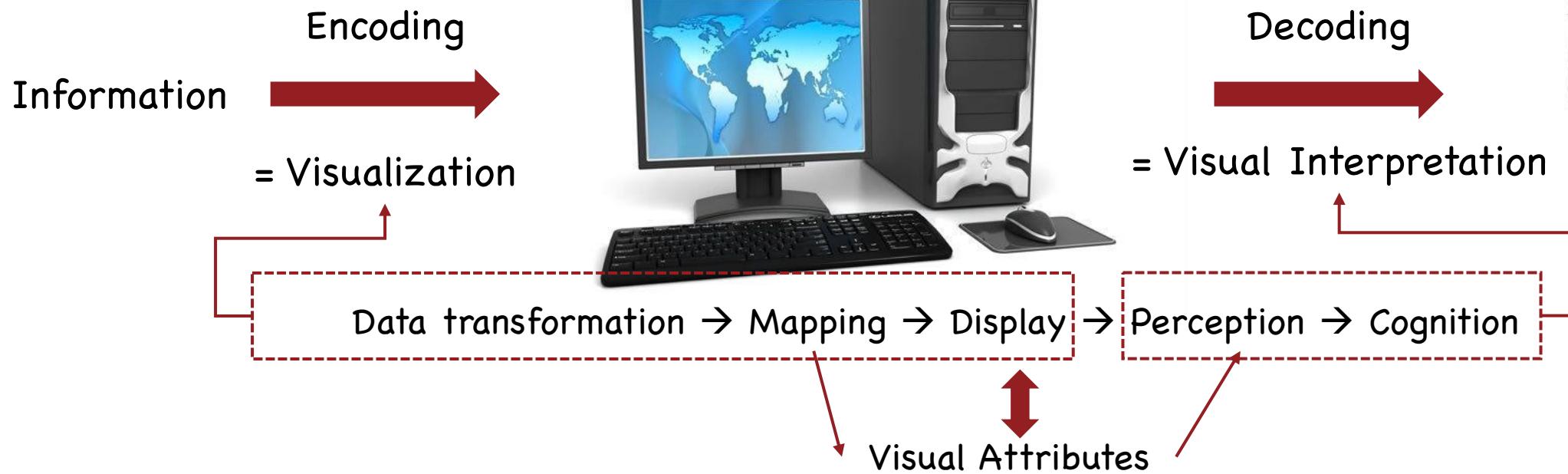
Information Visualization (InfoVis) – Abstract data



Visual Analytics (VAST) – Analytical Reasoning



The Visualization Pipeline



- **Data transformation:** converts raw data into a more suitable intermediate representation (e.g., resampling, interpolation, coordinate transformation)
- **Mapping:** converts intermediate data into a number of graphical entities called visualization icons (e.g., isosurfaces, vector arrows, LIC textures, streamlines)
- **Rendering:** Displays the graphical entities on screen
- **Visual perception:** recognition of visual attributes such as color, shape, length, contrast and texture
- **Cognition:** association of low and high level visual information with meaning (e.g., yellow means high temperature, vectors show the direction and speed of a water flow)



Types of Visualization



Area 1: Theoretical & Empirical

This area focuses on theoretical and empirical research topics that aim to establish the foundation of VIS as a scientific subject.

Theoretical & Empirical →

Area 2: Applications

This area encompasses all forms of application-focused research.

Applications →

Area 3: Systems & Rendering

This area focuses on the themes of building systems, algorithms for rendering, and alternate input and output modalities.

Systems & Rendering →

Area 4: Representations & Interaction

This area focuses on the design of visual representations and interaction techniques for different types of data, users, and visualization tasks.

Representations & Interaction →

Area 5: Data Transformations

This area focuses on the algorithms and techniques that transform data from one form to another to enable effective and efficient visual mapping as required by the intended visual representations.

Data Transformations →

Area 6: Analytics & Decisions

This area focuses on the design and optimization of integrated workflows for visual data analysis, knowledge discovery, decision support, machine learning, and other data intelligence tasks.

Analytics & Decisions →





Types of Visualization

- Scientific Visualization (SciVis)
- Information Visualization (InfoVis)
- Visual Analytics (VAST)

IEEE Conference on Visual Analytics Science & Technology (VAST)

Papers in VAST typically focus on problems that integrate data analysis algorithms and visual interfaces to support data analysis and analytical reasoning.

[VAST Paper Types →](#)

IEEE Conference on Information Visualization (InfoVis)

Papers in InfoVis typically relate to the design or evaluation of new or improved visual encodings or interaction techniques of abstract data such as graphs, tables, or text data, as well as models and theories of visualization.

[InfoVis Paper Types →](#)

IEEE Conference on Scientific Visualization (SciVis)

Papers in SciVis typically focus on new or improved visual encodings, mathematical models, algorithms, or interaction techniques for the visualization of data related to science and engineering, as well as integration into novel applications and systems.

[SciVis Paper Types →](#)

Before 2021



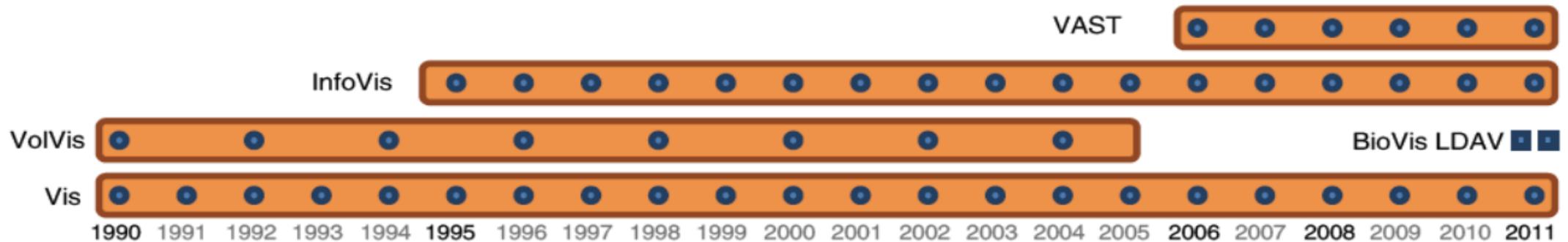
立志成才报国裕民

Top VIS Conferences

VAST (Visual Analytics Science and Technology)

InfoVis (Information Visualization)

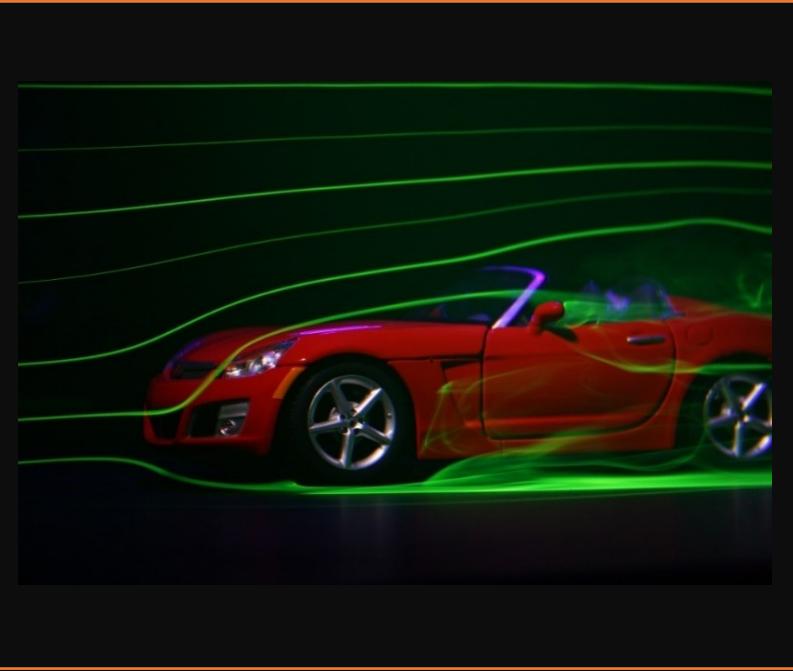
SciVis (Scientific Visualization)



VIS - Graphics

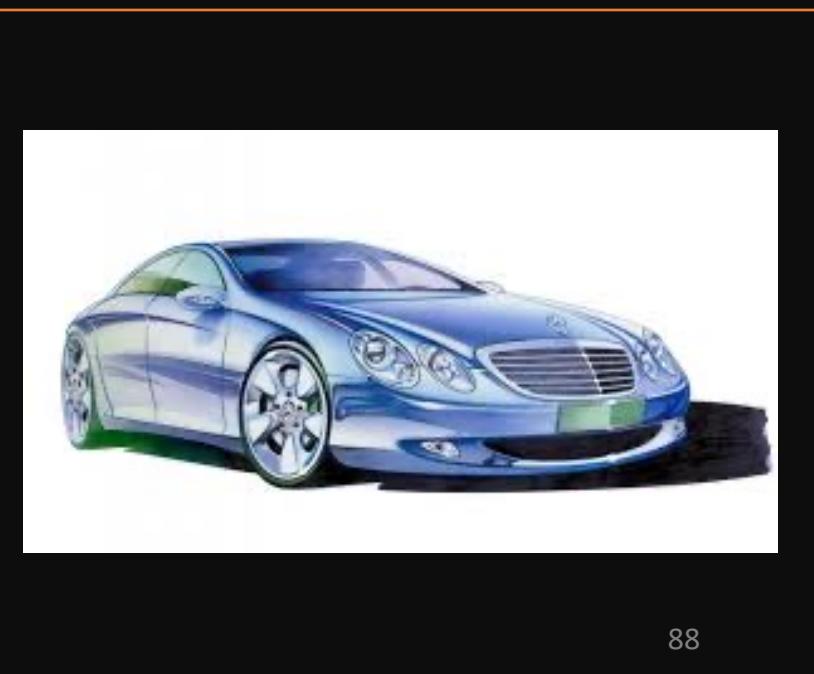
Graphics

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



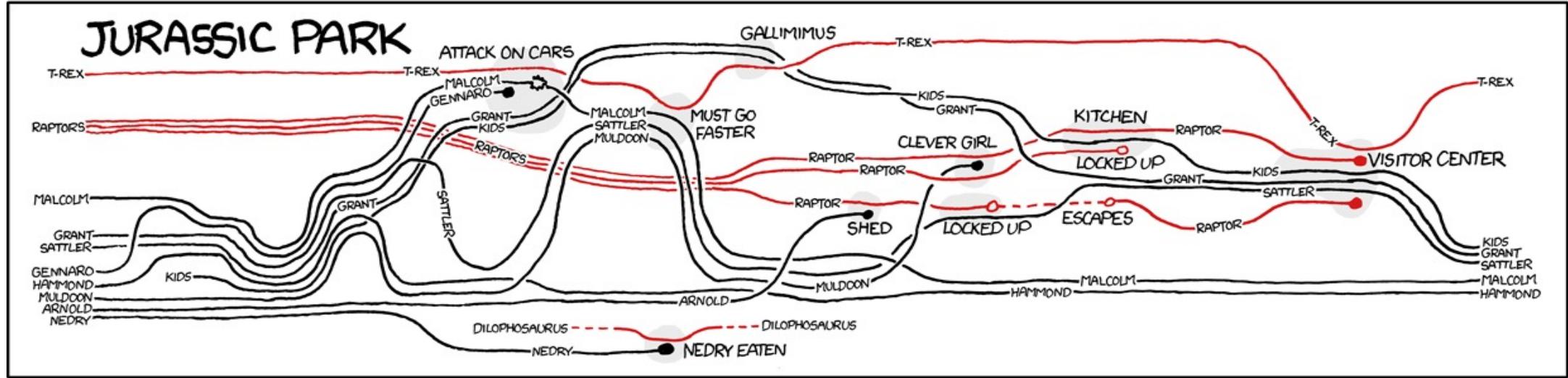
Visualization

- Illustrative
- Understanding
- X-world
- Information



VIS - Infographics

Infographics is **static**



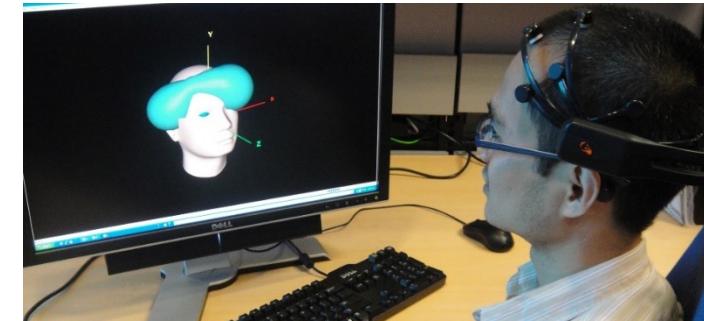
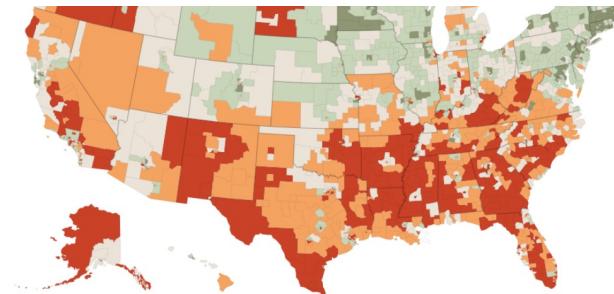
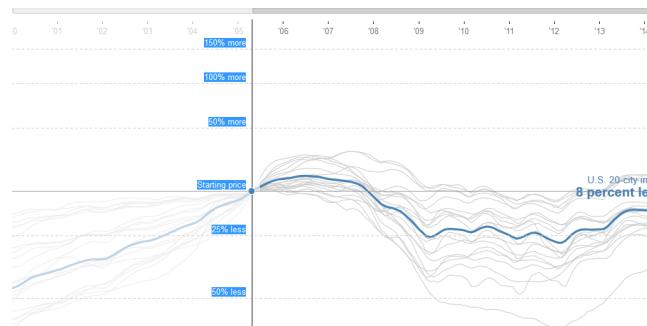
Visualization is **interactive**

Evaluation

VIS – HCI

Visualization deals with **data**

HCI deals with everything involving **human & computer interaction**

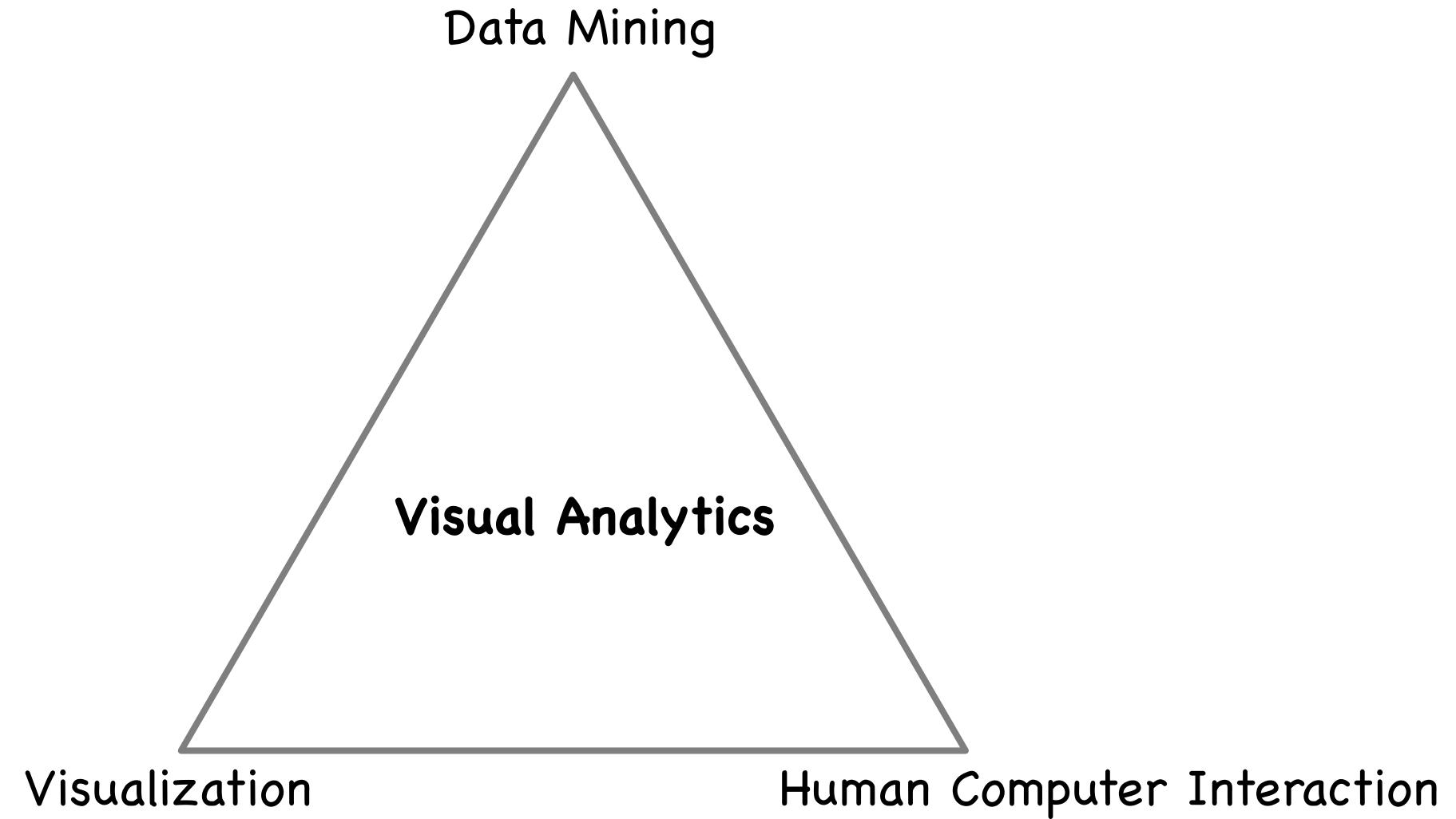


VIS - Data Mining

Data mining focuses more on **automatic algorithms**

Visualization keeps **human in the loop** and focuses more on **interactive analysis**





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

VAST Challenge 2021 2021 VAST Challenge Workshop Agenda

Note: All times are in CDT (UTC-5)

October 24

12:00 - 1:30 Session 1

- Intro and welcome
- [Overview of Mini-Challenge 1](#)
- Mini-Challenge 1 Award: *Award for Effective Design of Interactive Analytics*
Visual Analytics of Multifaceted Relationships between Different Entities in Text Collections
PKU (#1010)
- Mini-Challenge 1 Award: *Award for Effective Combination of Analytics and Visualization*
Visual Analytics of Media Bias
TJU (#1001)
- [Overview of Mini-Challenge 2](#)
- Mini-Challenge 2 Award: *Award for Outstanding Comprehensive MC2 Submission*
An Interactive Visualization System for Spatio-temporal Situation Awareness with Multi-data Fusion
Data Star and Fudan (#1012)

1:30 - 2:00 Mid-session break

2:00 - 3:30 Session 2

- Mini-Challenge 2 Award Presentation: *Award for Strong Support for Visual Exploration*
Human-in-the-Loop Integration of Complex and Noisy Data
Hasselt (#1008)
- [Overview of Mini-Challenge 3](#)
- Mini-Challenge 3 Award: *Award for Innovative Narrative Visualization and Analysis Methodology*
Mining and Understanding Stories in Text Sequences with Narrative Visualization
TJU (#1011)
- Mini-Challenge 3 Award: *Award for Strong Human-in-the-Loop Analysis Methodology*

Mixed-Initiative Visual Exploration of Social Media Text and Events
Data Star and Fudan (#1019)
- Mini-Challenge 3 Honorable Mention: *Honorable Mention for Effective Visual Design and for Academic Outreach*
CloudAnnotator: Clustering and Annotating Streaming Text Data
JMU and Purdue (#1015)
- Closing Committee
- Adjourn



A Typical Visual Analytics Problem

ChinaVis2019 Data Visualization Challenge

挑战赛内容

挑战1

CICSC (China Intelligence Cyber Security Conference) (虚构) 是一个智能网络安全领域的全国性学术大会，会议旨在增进学界，商界，及社会人士之间的交流与合作，推动该领域的发展创新。本次会议为期三天，包括学术研讨、成果展览、黑客大赛三大组成部分，设置数据安全、物联网安全、移动安全、隐私保护、智能场馆、及智能安全技术创新六大研讨主题。会议期间有多位资深专家和商业大咖带来精彩的主旨报告、经验分享与成果展示，同时还邀请了许多参展单位和媒体记者。本次会议参会人员规模在5000人左右。

为了加强会场管理，也为了呼应“智能场馆安全运营”的会议主题，本次会议采用了无线传感器技术获取参会人员的实时位置信息。参会人员在进入会场时需要佩戴电子胸牌，胸牌内置信号发射器并绑定其个人信息。会场内布置的无线传感器可以实时接收并记录其覆盖范围内的信号发射器发出的信号。采集的传感器数据可用于实时检测会场人群分布情况，便于会场管理人员及时合理地调动资源，处理各种突发状况，为会议各项议题的顺利进行保驾护航。会议组委会临时成立了一个数据分析小组，负责分析这些传感器数据，协助组委会管理会场，响应和处理各类应急事件。假设您是数据分析小组成员，请您设计并实现一套数据可视分析解决方案，完成组委会交代的数据分析任务。

挑战2

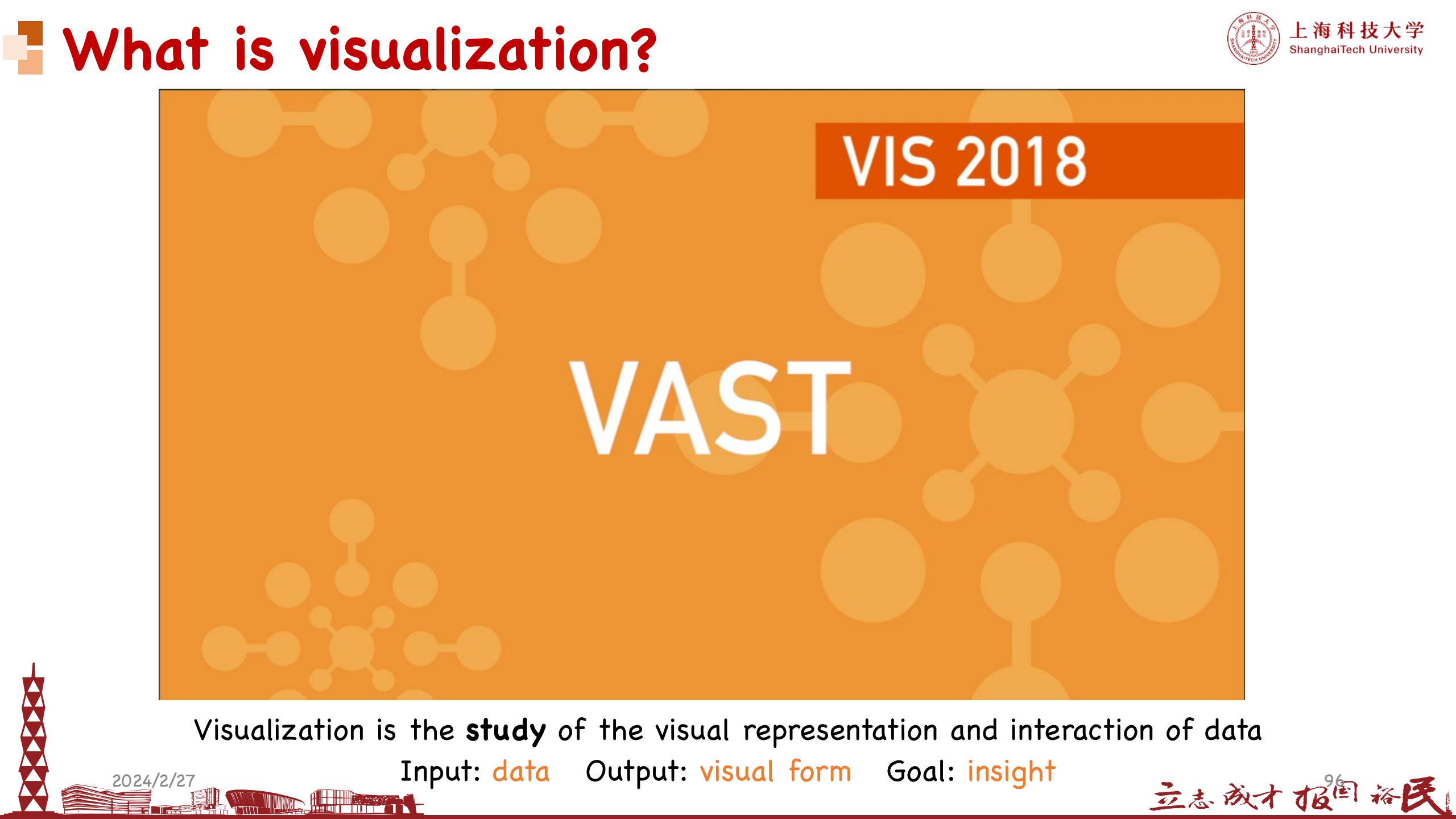
为满足城市化发展过程中市民不断增长的精神生活需求，城市中举办大型文化体育活动频率也随之升高。在这些大型活动举办期间，活动场地周围交通量往往剧增。载有GPS设备的移动车辆可以采集交通动态数据，管理者可以通过移动车辆轨迹数据观测交通状态，为公众提供动态、准确的交通控制和引导信息。成都中国现代五项赛事中心自创建以来，举办了多项大型体育竞技和文娱活动，但活动开始和结束时突增的交通流量，常导致人群入场与离场缓慢、附近区域交通拥堵等情况。假设你是成都中国现代五项赛事中心管理人员，请设计一套可视分析方案，根据“滴滴”公司提供的2018年5月1日某活动期间赛事中心附近的网约车订单和轨迹数据（已脱敏），分析赛事中心附近的交通流量演变过程和交通拥堵特征，为以后活动提供更好的交通疏导方案。



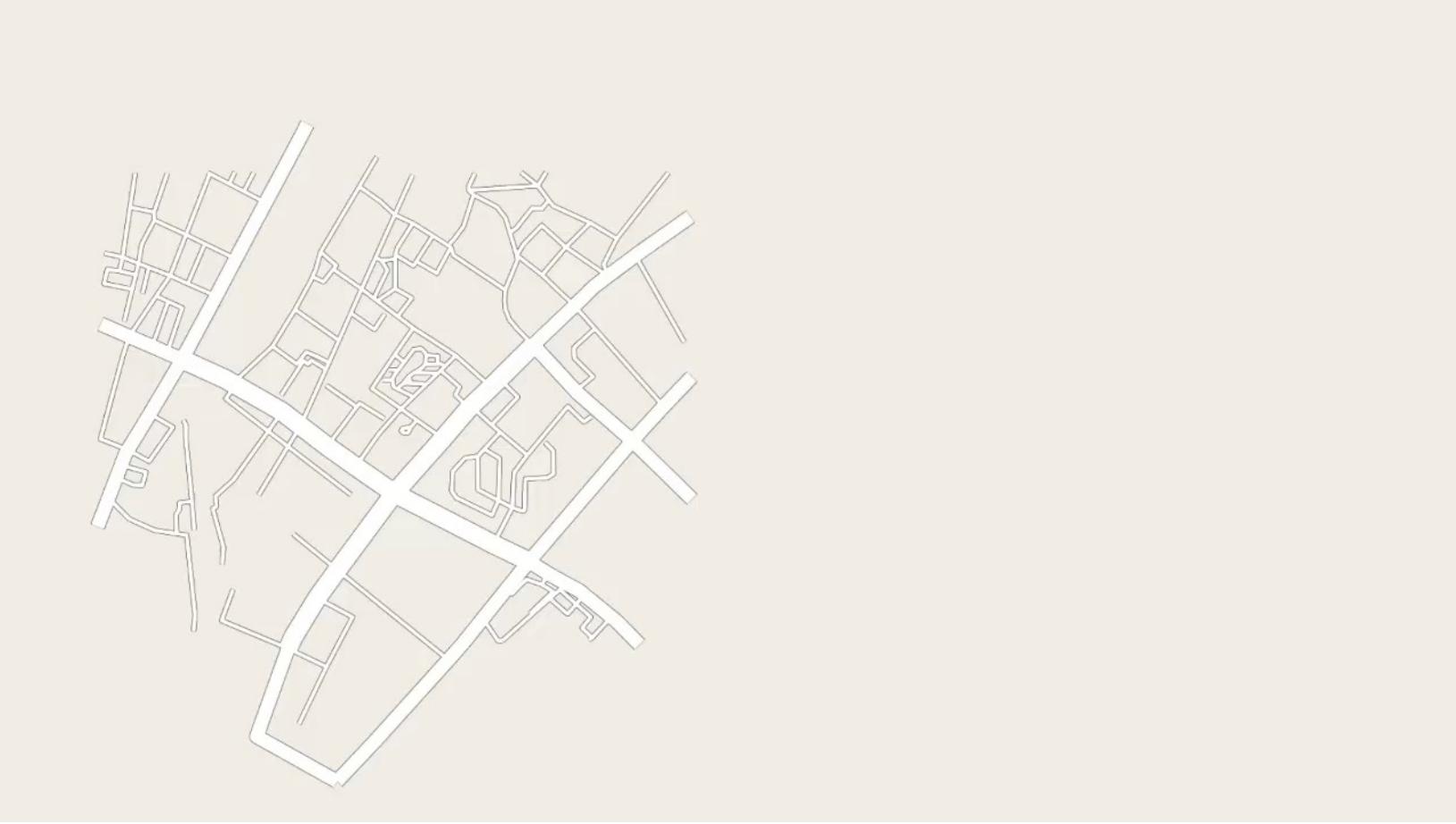
立志成才报国裕民

What is VIS Research?

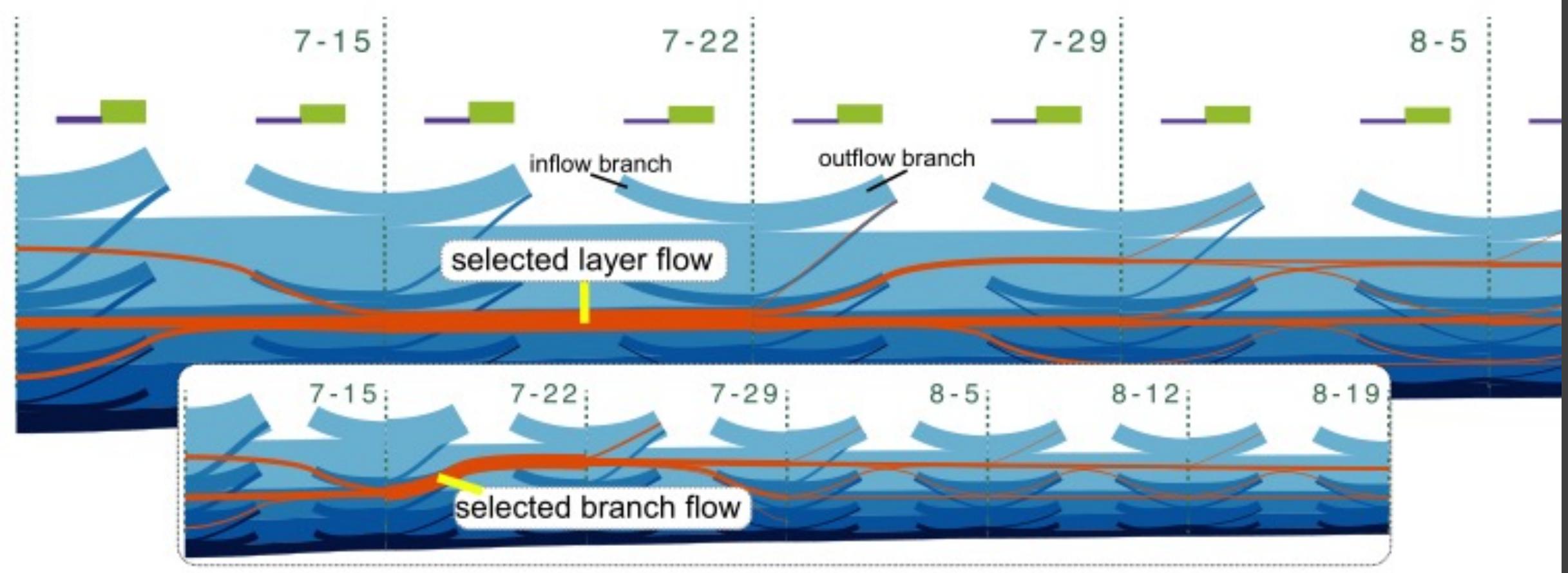




Technique Papers

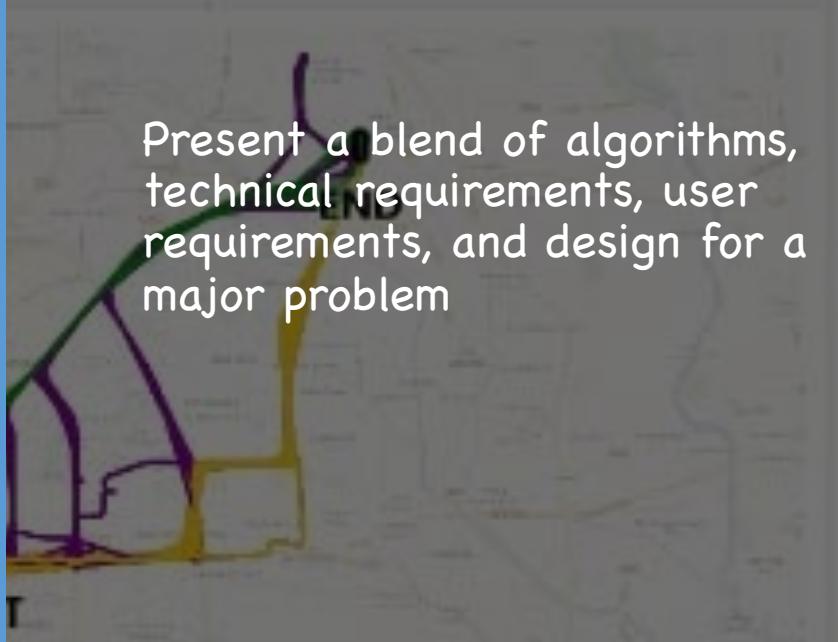


Introduce novel techniques or algorithms that have not previously appeared in the literature, or that significantly extend known techniques

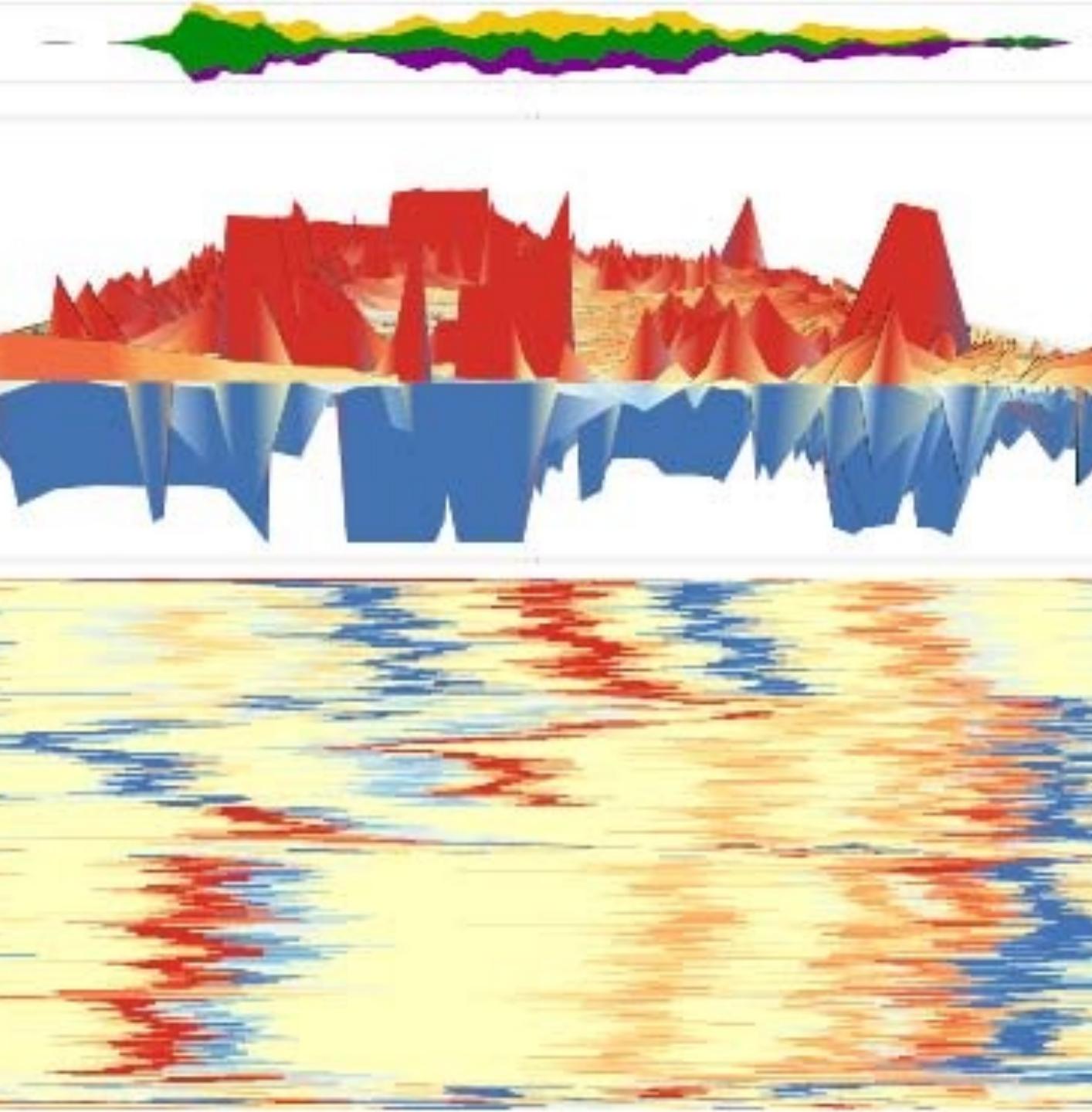


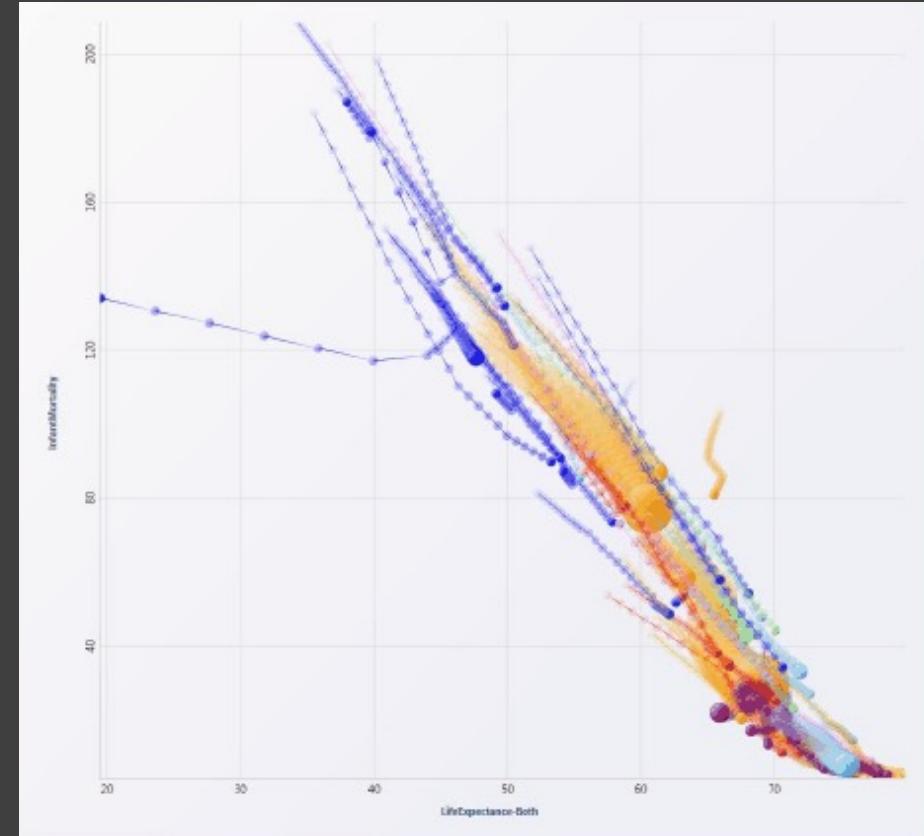
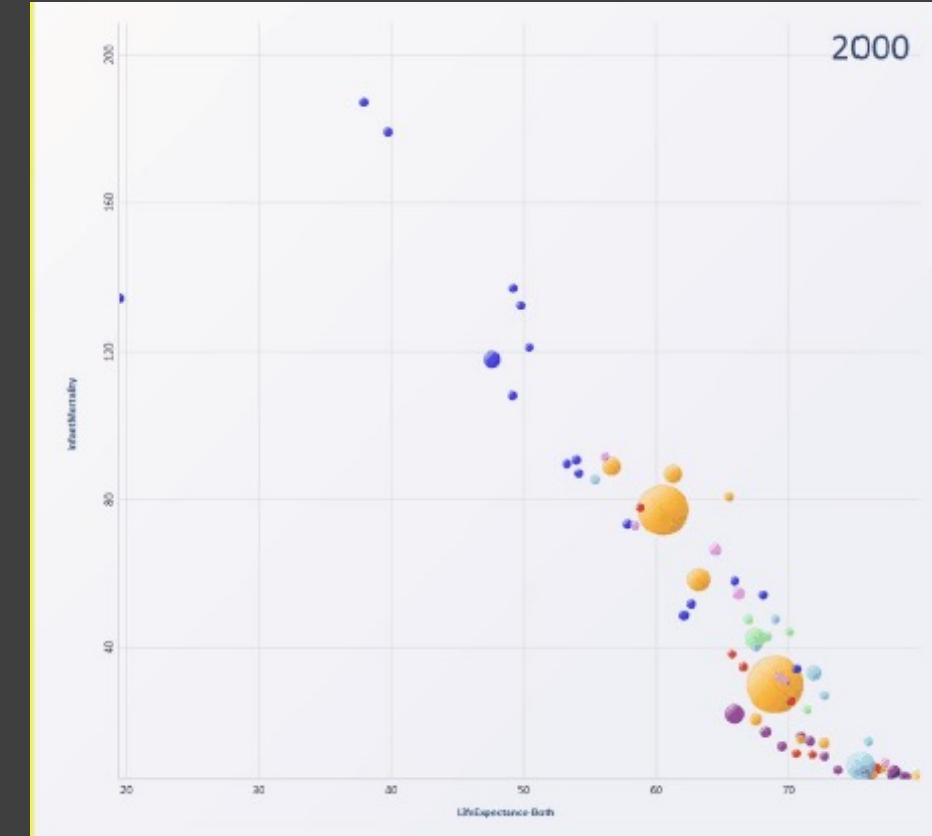
Application/Design n Study Papers

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



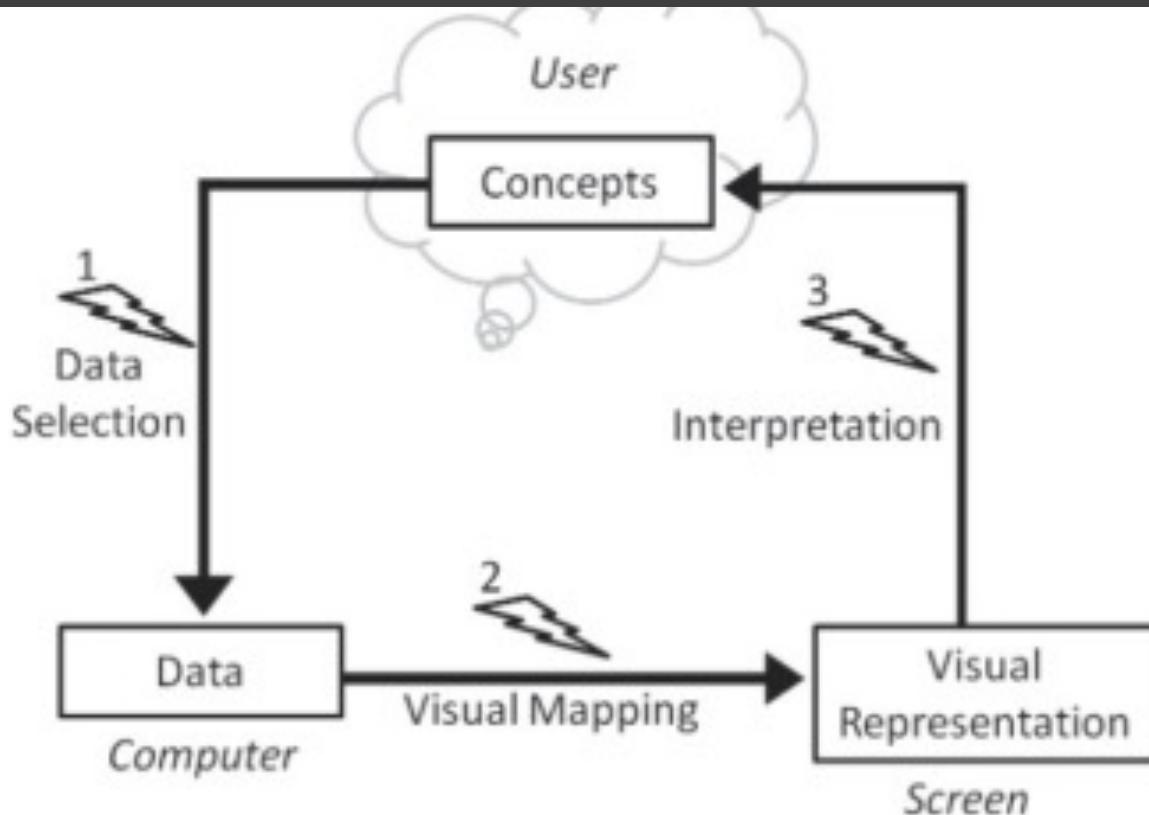
System Papers





Evaluation Papers

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



How Information Visualization Novices Construct Visualizations

Grammel et al. IEEE TVCG 2010

Fig.5. Barriers in InfoVis Novices' Visual Data Exploration Process.

Theory/Model papers

Present new interpretations of the foundational theory of visualization and visual analytics

- 1 What is data visualization
- 2 Visualization is hot & cool & young
- 3 How to create visualization?

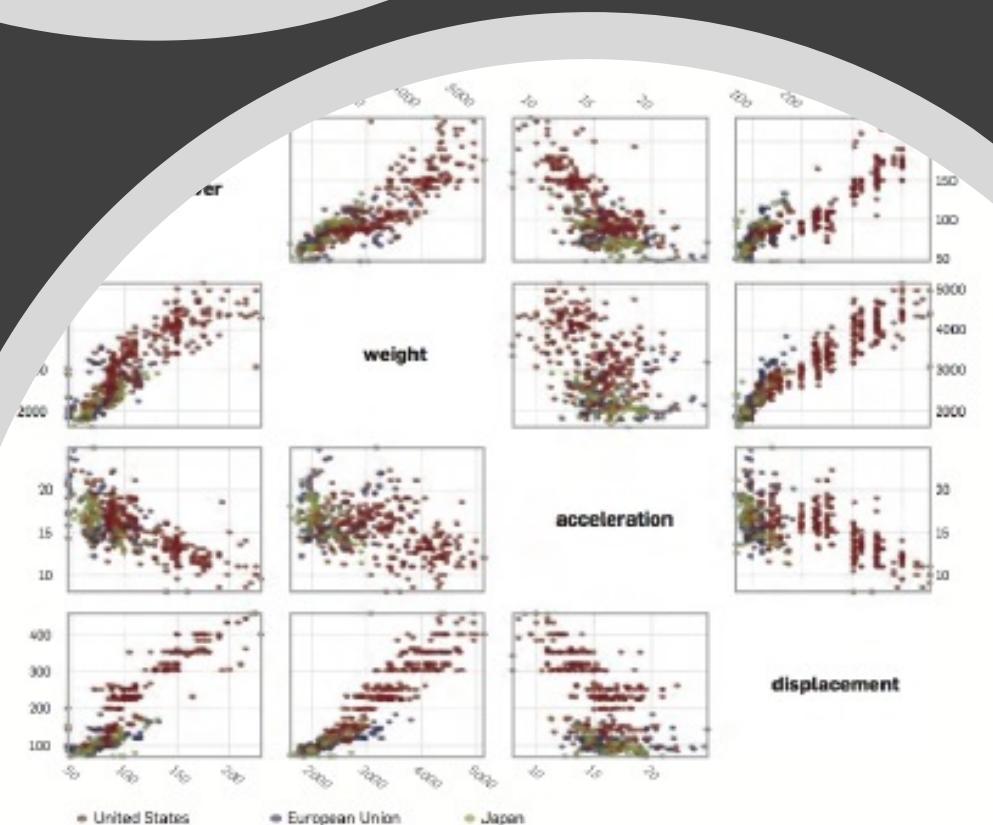
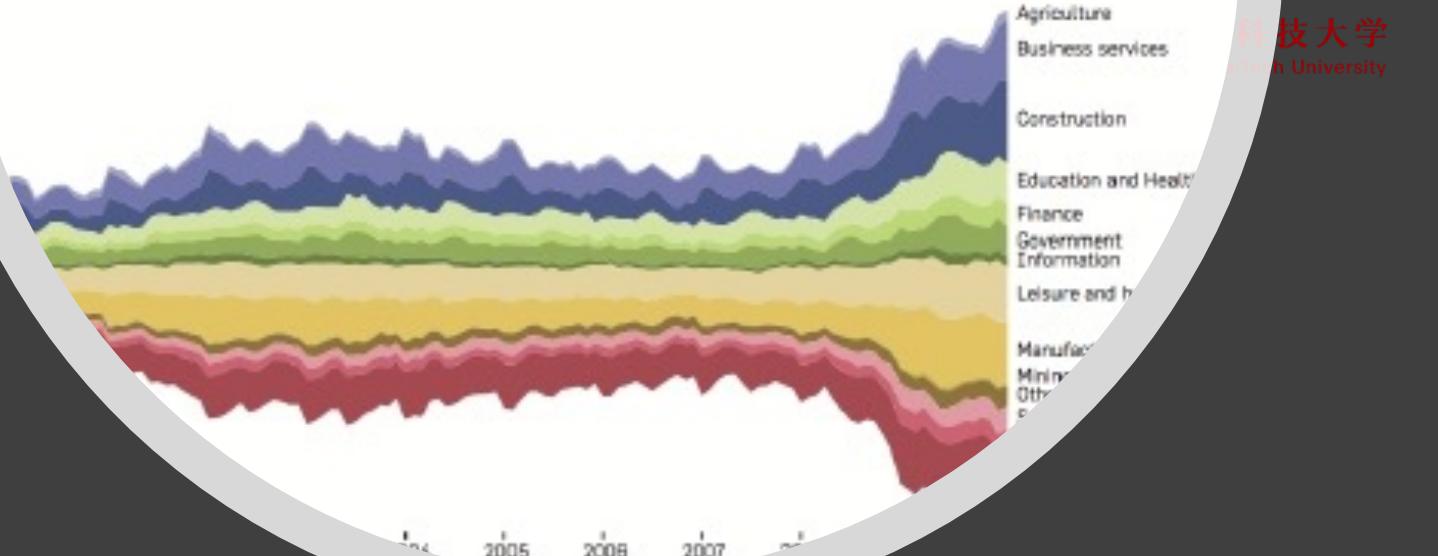


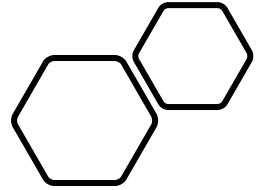
Act I: Foundations

1. Design Principles
2. Process & Data
3. Tasks & Interaction
4. Perception
5. Visual Encodings
6. Color

Act II: Methods

1. SingleViews
2. MultipleViews
3. Filtering & Aggregation
4. Dimensionality Reduction
5. Evaluation



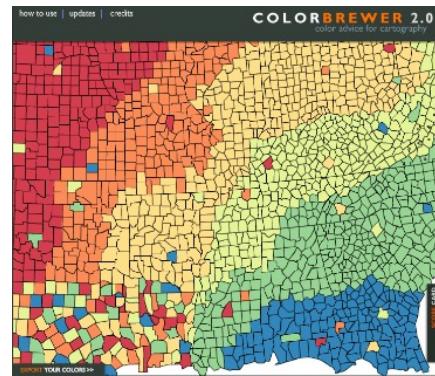
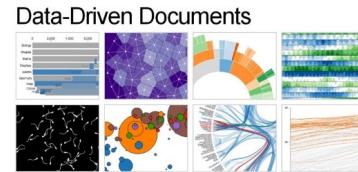


Act III: Techniques

1. Statistical Graphs
2. Trees & Networks
3. Maps
4. Text & Images

100-Mangement
Uncertainty
Different Countries
Strategy
User Satisfaction
Customer Relationship Management
Instrument
Simulations
Performance
Hiring
User Evaluation
General
Health club
New products
National library
Methodology
Parties
TAM
Business
Governance
Enterpreneur
E-commerce
Accessibility
Information retrieval
Delone Model
Task Performance
Agents
Daily
Operationalization





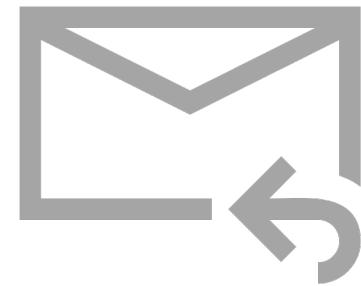
How to create a
visualization
yourself?

1. Google Refine
2. Tableau
3. R
4. Processing
5. D3 (JS)
6. ColorBrewer



Quan Li

Questions?
Thank you 😊



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