

Data Visualization

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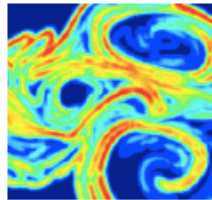
About Me

- Professor at Ohio State
- Visualization research since 1990
- Worked at NASA between 1996 and 1999
- Directing the GRAVITY research group
- Primarily focused on large scale data visualization research

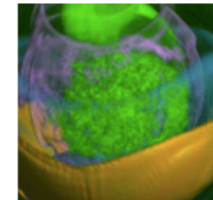
The GRAVITY Research Group

The GRAphics and Visualization sTudY (GRAVITY) research group is primarily concerned with large scale data visualization and analysis. Visualization research is at a unique intersection of computer graphics and data analysis and mining. It has been playing an increasingly important role in a wide range of disciplines such as computational sciences, biomedical imaging, visual analytics, and social network data analysis.

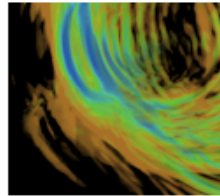
Research Projects



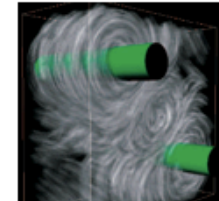
Information-Theoretic Visualization Framework



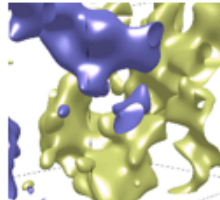
Parallel and High Performance Visualization



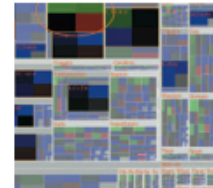
Time-Varying Data Visualization



Vector & Flow Visualization



Isosurface Extraction



Information Visualization



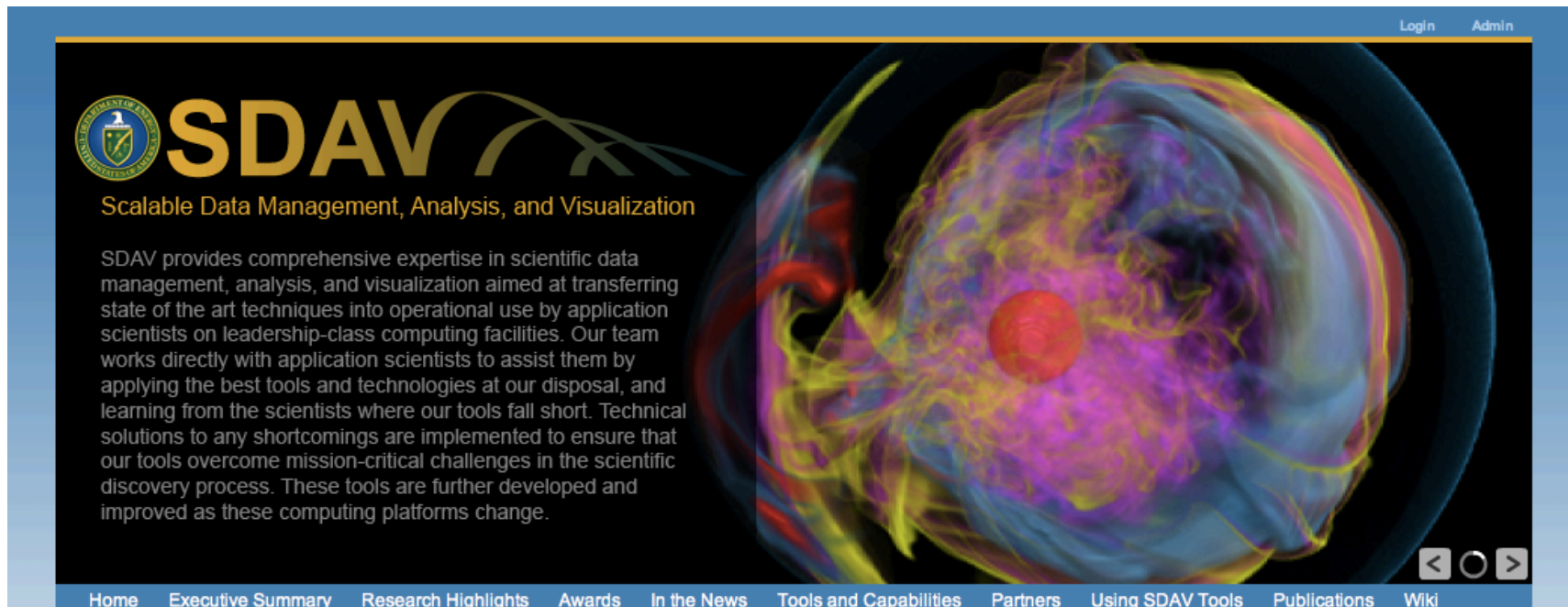
Medical Visualization

mean time, you can still visit our slightly out-dated old [research page](#).

<http://www.cse.ohio-state.edu/~hwshen/Research>

DOE Big Data Initiative

- Scalable Data Management, Analysis, and Visualization (SDAV) Institute. \$25M for 5 years (\$750K OSU share, PI Shen)
- ANL, LBNL, LLNL, ORNL, SNL, GTech, NCSU, NWU, OSU, UCD, Rutgers, Utah, Kitware
- Applications examples: climate, astrophysics, fusion, cosmology, etc.
- <http://www.sdav-scidac.org>



The screenshot shows the homepage of the Scalable Data Management, Analysis, and Visualization (SDAV) Institute. The page has a blue header with "Login" and "Admin" links. The main content area is divided into two sections. On the left, there is a logo for the Department of Energy and the SDAV acronym, followed by the full name "Scalable Data Management, Analysis, and Visualization". Below this is a paragraph of text describing the institute's mission. On the right, there is a large, colorful 3D visualization of a complex, multi-colored structure, possibly representing a scientific simulation or data set. The bottom of the page features a navigation menu with links to "Home", "Executive Summary", "Research Highlights", "Awards", "In the News", "Tools and Capabilities", "Partners", "Using SDAV Tools", "Publications", and "Wiki".

SDAV
Scalable Data Management, Analysis, and Visualization

SDAV provides comprehensive expertise in scientific data management, analysis, and visualization aimed at transferring state of the art techniques into operational use by application scientists on leadership-class computing facilities. Our team works directly with application scientists to assist them by applying the best tools and technologies at our disposal, and learning from the scientists where our tools fall short. Technical solutions to any shortcomings are implemented to ensure that our tools overcome mission-critical challenges in the scientific discovery process. These tools are further developed and improved as these computing platforms change.

Home Executive Summary Research Highlights Awards In the News Tools and Capabilities Partners Using SDAV Tools Publications Wiki

NSF Big Data Research Initiative

- OSU Computer Science and Engineering (Shen PI) and Mechanical Engineering (Chen co-PI) ~ \$750K for three years
- Fluid flow data analytics and visualization



NSF National Science Foundation
Directorate for Computer & Information Science & Engineering (CISE)

QUICK LINKS

SEARCH 

[CISE HOME](#) [CISE FUNDING](#) [CISE AWARDS](#) [CISE DISCOVERIES](#) [CISE NEWS](#) [ABOUT CISE](#)

Computer & Information Sciences & Engineering

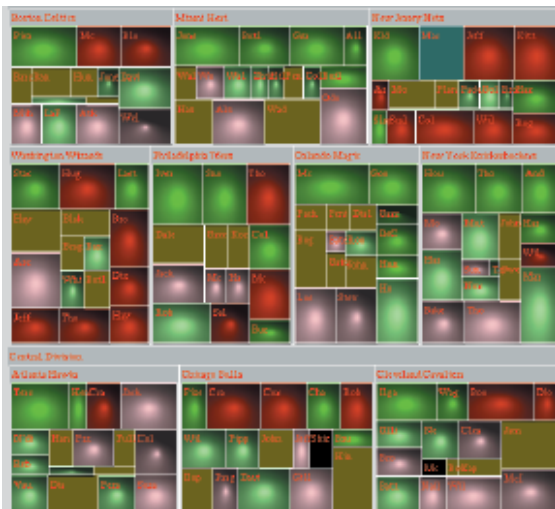
Big Data Research Initiative

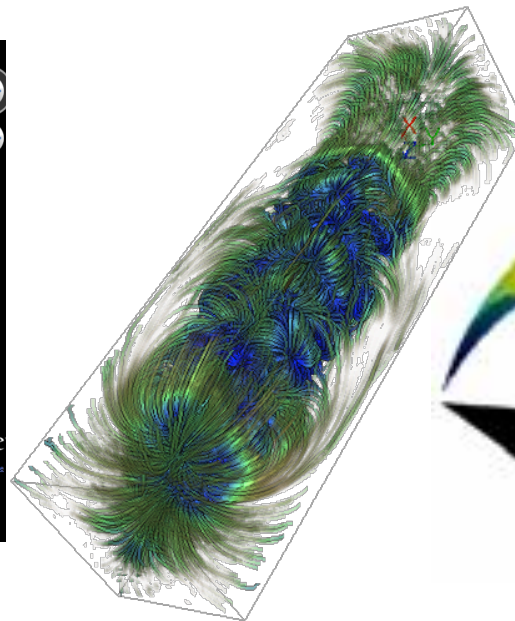
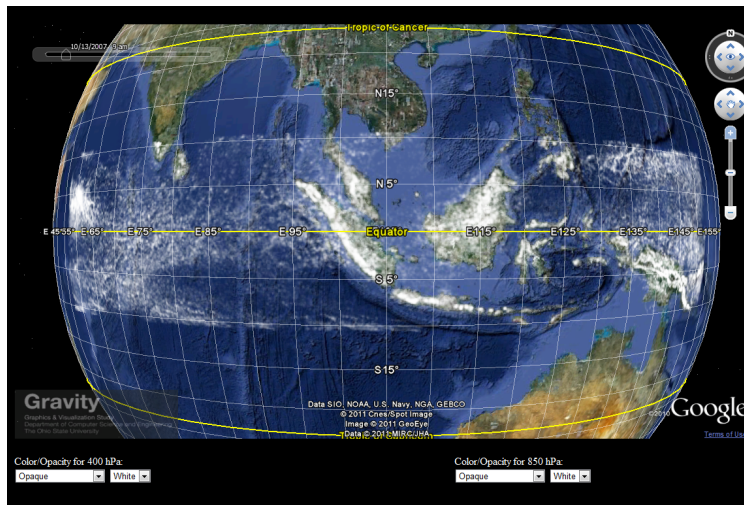
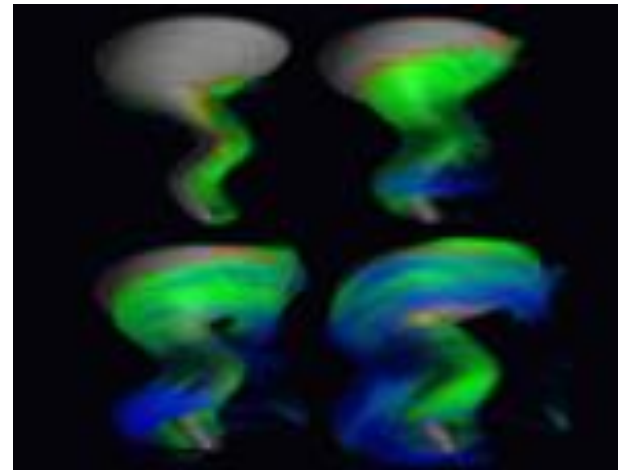
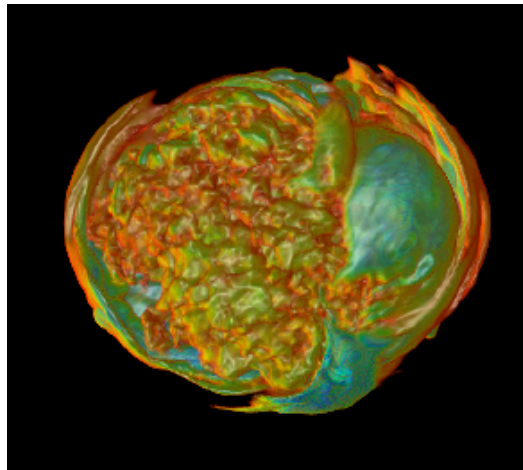
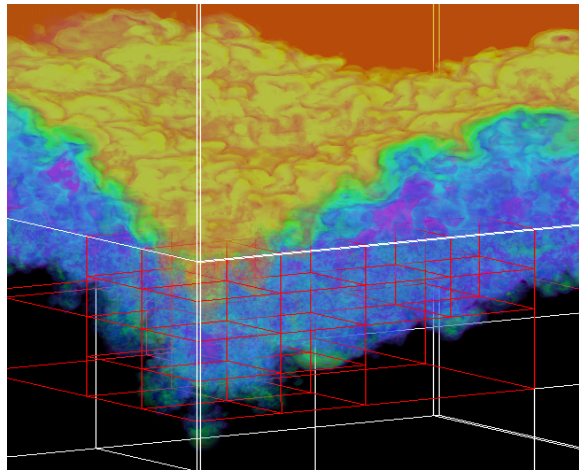
At a White House event on March 29, NSF Director, Dr. Subra Suresh, joined other federal science agency leaders to discuss cross-agency plans and announce new research efforts to extract knowledge and insights from large and complex collections of digital data. NSF will direct its current efforts to develop new methods to derive knowledge from data; construct new infrastructure to manage, curate and serve data to communities; and forge new approaches for associated education and training. Specific announcements relevant to the CISE community include:

[CISE Home](#)

Visualization Research

- Graphical representation of data
 - Spatial data: scalar/vector/tensor fields defined on structured/unstructured meshes; particles
 - Non-spatial data: graphs, trees, texts, tables, etc.





Data Visualization

- Visualization:
 - To form a mental image of;
 - To make visible.
 - Example: NYC subway map
- It provides external aids to increased our memory, thought, and reasoning



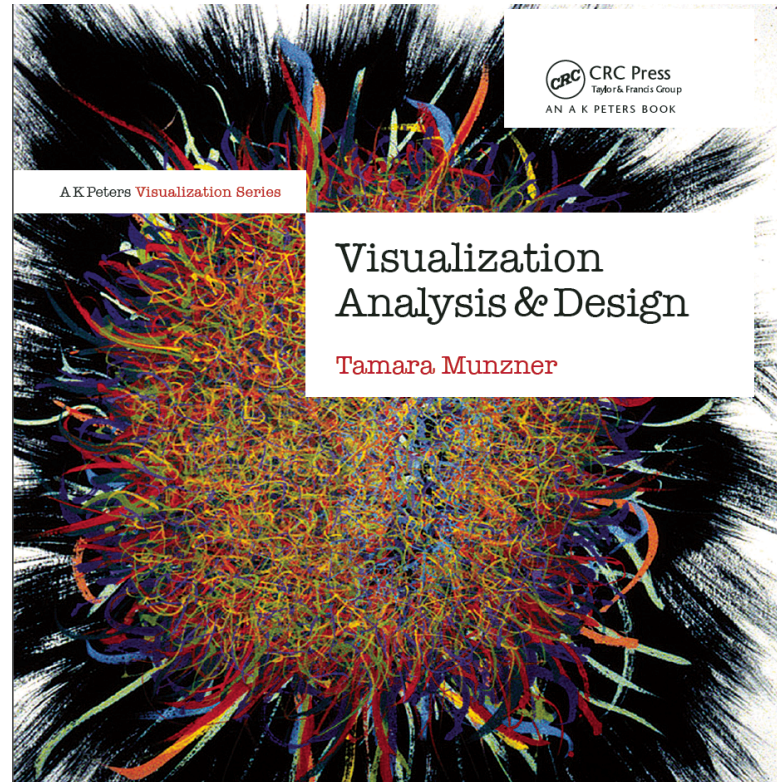
Why Visualization?

- A picture is worth ten thousand words
- Amplify our cognition ability
 - Cognition: the acquisition or use of knowledge
- Specific goals:
 - Communicate ideas
 - Create and discover ideas
 - Use visual perception to solve problems
- To get a 'Ah HA' response from the viewer

Course Focus

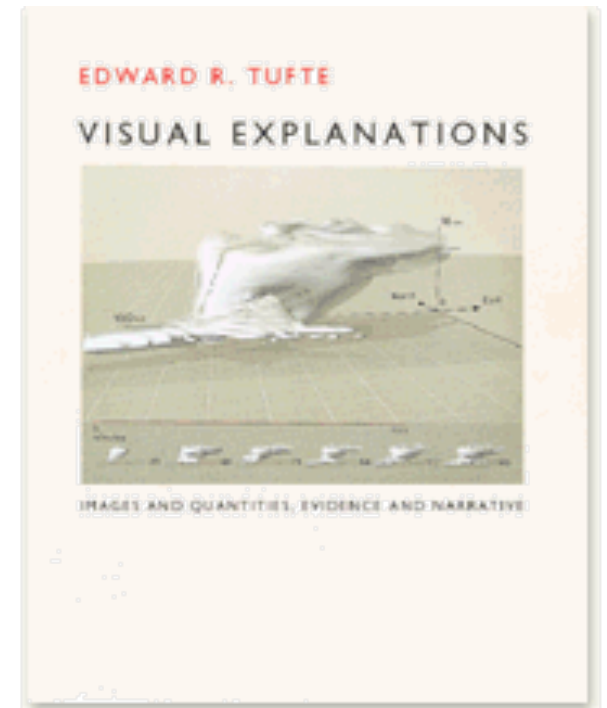
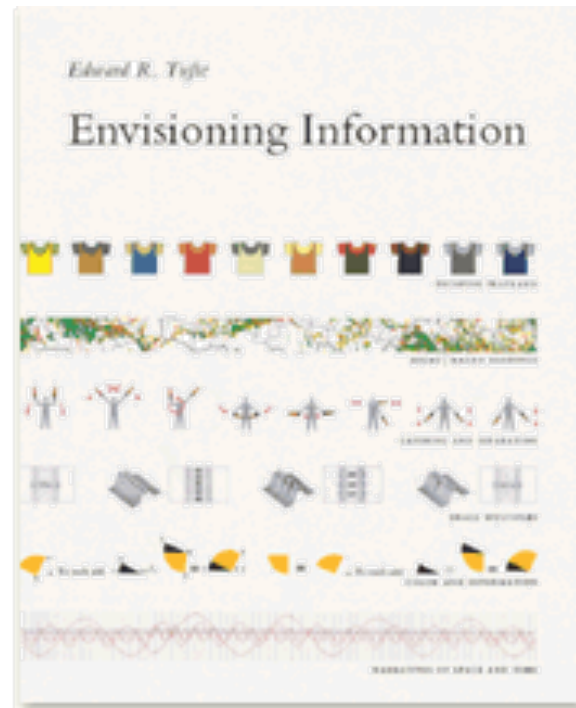
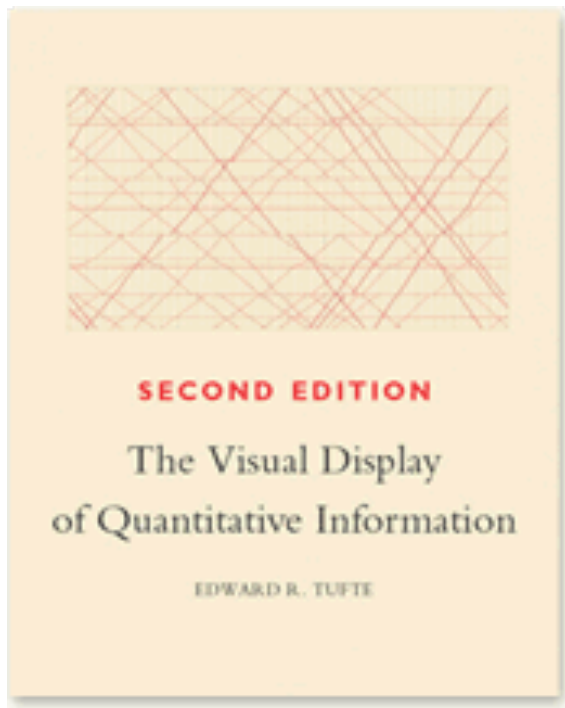
- A framework for analyzing existing visualization techniques/idioms as a springboard for designing new ones (Tamera Munzner)
- Understand how we think visually (Colin Ware)
 - How to organize space
 - Which color and shape will stand out
 - When we should use images instead of words.
- Practical Examples of Visual Design for Envisioning Information (Tufte)
 - Practical theories of visual design for data analysis
 - Design Strategies
- Data visualization via D3/Javascript/Web programming

Required Textbook



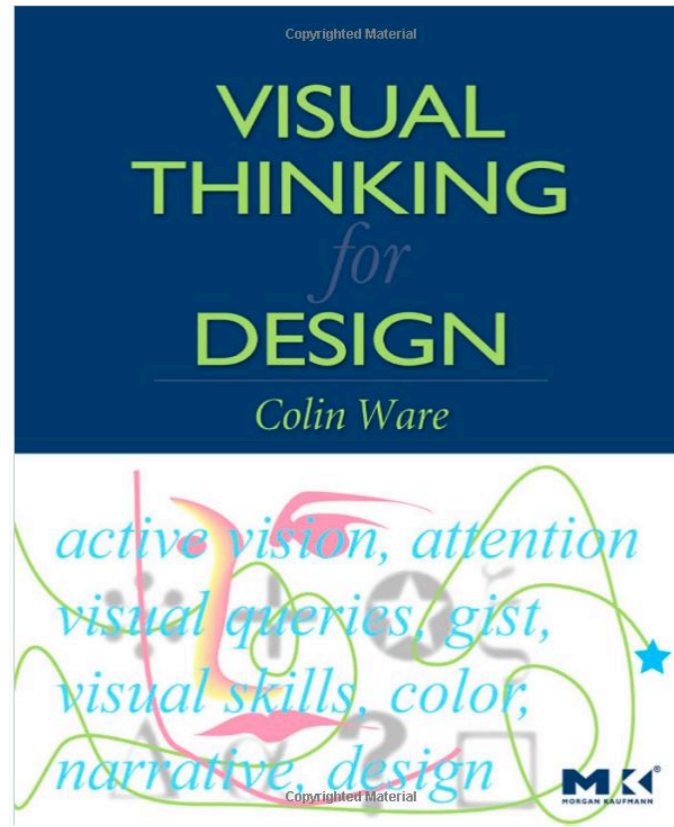
Visualization Analysis & Design Tamara Munzner
CRC Press, 2014

Reference Books



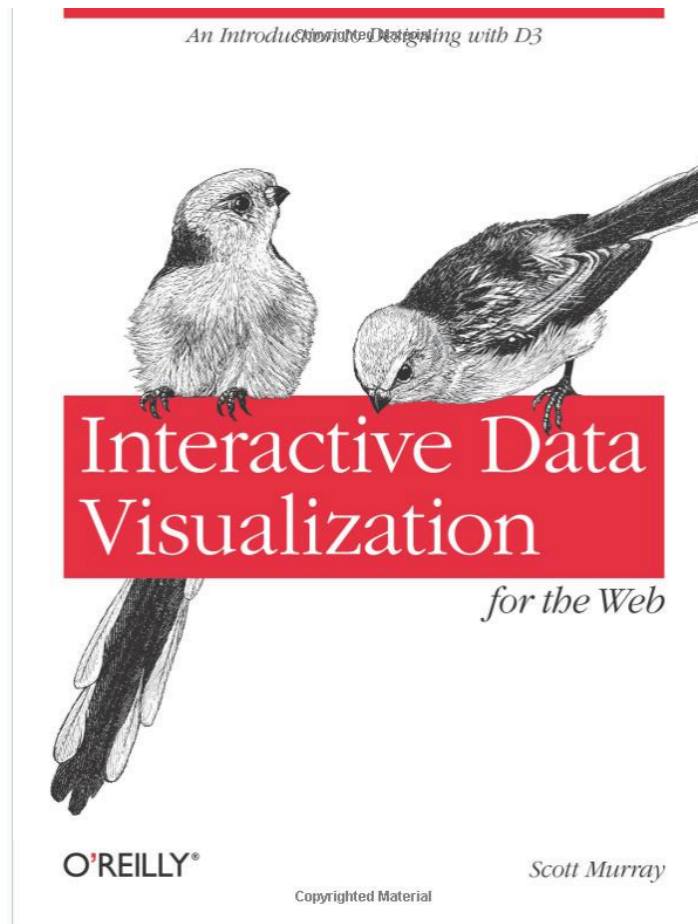
- The Visual Display of Quantitative Information
 - Envisioning Information
 - Visual Explanations
- Edward Tufte

Reference Books



Visual Thinking for Design
Colin Ware

D3 Programming (Afternoon)



Interactive Data Visualization for the Web

Scott Murray

Student Assessment

- In-class quiz (June 25): 20%
 - Individual, may include simple programming questions
- Syndicate assignment (July 16): 20%
- Final Exam (July 30): 60%
 - written, closed book, two hours