Visualization & Visual Analytics 1

Angus Forbes

creativecoding.evl.uic.edu/courses/cs424

Grades

- grading rewards bravery, originality, curiosity, creativity, difficulty
- grading of assignments is purposefully harsh… not to crush your spirit, but to give you a sense of how I think others would judge
- goal is to *get better* during the class, it would be absurd to expect to already be an expert – if that was so, then you wouldn't need to take this class
- will provide a list of requirements for grades for the complete project
- seemed to be a lack of awareness about how hard it was to make sense of your sketches

Visual communication

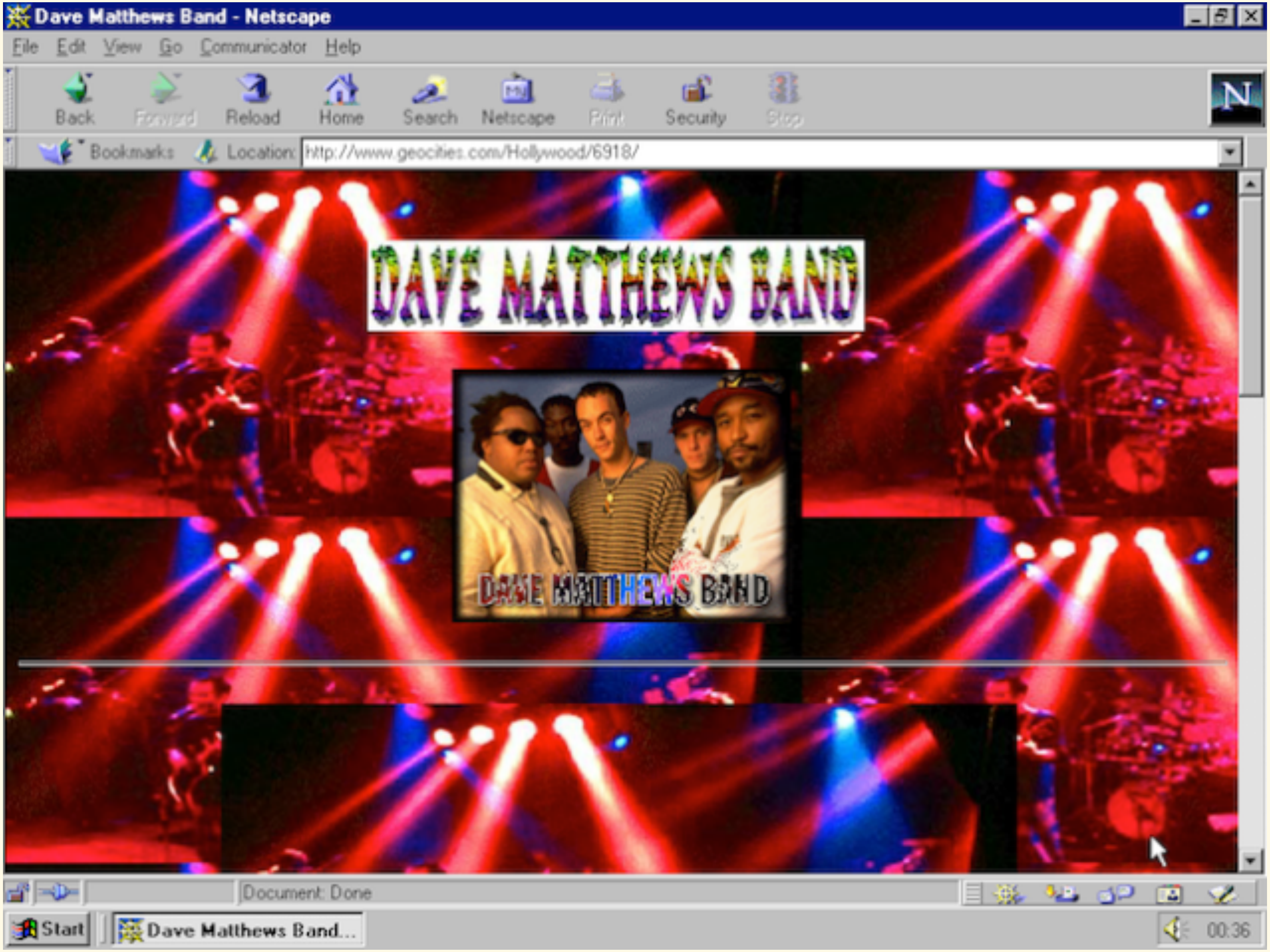
- Humans are very good at picking up on even subtle cues about… pretty much anything that we can take in with our senses. We are instinctively aware of what is appropriate in what contexts.
- Any image can be interpreted in multiple ways. In addition to overt, intended meaning of a representation, there are hidden meanings, the “subtext” of an image, accidental unintended meanings. As producers and consumers of images – we should be aware of these meanings.

Visual communication

This ability to interpret images is partly **innate** (how our brains have evolved to process the world), partly **personal** (due to our experiences and attachments to particular forms and colors, etc), and partly **cultural** (our conscious or unconscious awareness of what forms are appropriate, interesting, current, etc).

While we can't (yet) manipulate the structure of our brains, our awareness as individuals, and as a culture, changes over time...


Click here and you can listen to the greeting announcement
Take a wistful gaze into my
celestial coffee cup...
You're visiting my Dream
Enchanted


Dave Matthews Band - Netscape
File Edit View Go Communicator Help
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DAVE MATTHEWS BAND
DAVE MATTHEWS BAND
Document: Done
Start
Dave Matthews Band...
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JULY 14
Welcome to Apple 1997
Find It
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Preorder Mac OS 8
Now you can preorder Mac OS 8, described by Macworld as "the most comprehensive update to the Mac OS in years, sporting a bold new look, a speedier Finder, more
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Mac
iPad
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Watch
TV
Music
Support
WATCH
SERIES 2
10:09
MESSAGES
Euna Kwon
We just sat down. Want us to order for you?
1PM CARDIO BOOT CAMP
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Introducing Series 2.


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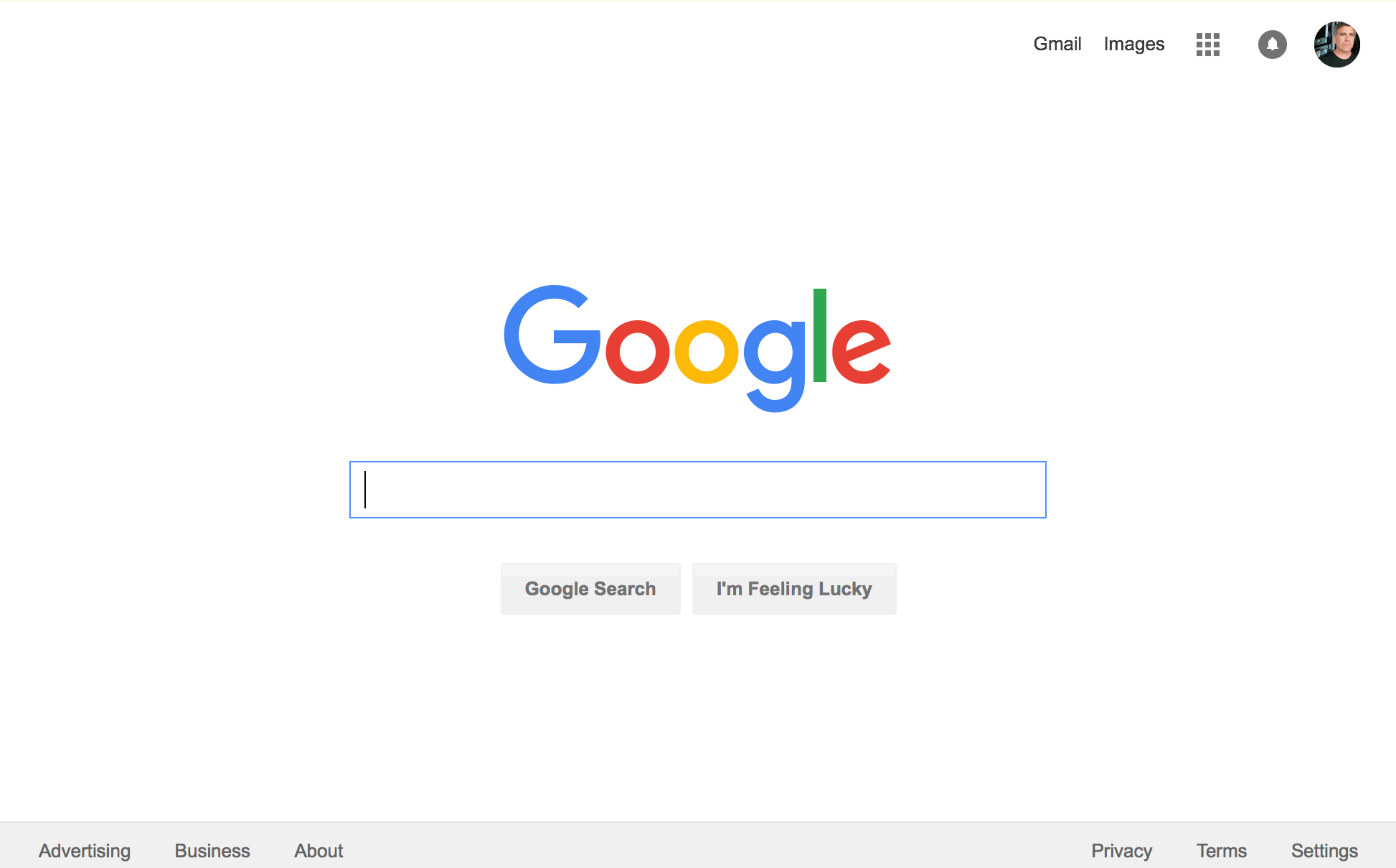
Gmail
Images
Google
Google Search
I'm Feeling Lucky
Advertising
Business
About
Privacy
Terms
Settings


[thefacebook]
login register about
Email:
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login
Welcome to Thefacebook!
[Welcome to Thefacebook]
Thefacebook is an online directory that connects people through social networks at colleges.
We have opened up Thefacebook for popular consumption at Harvard University.
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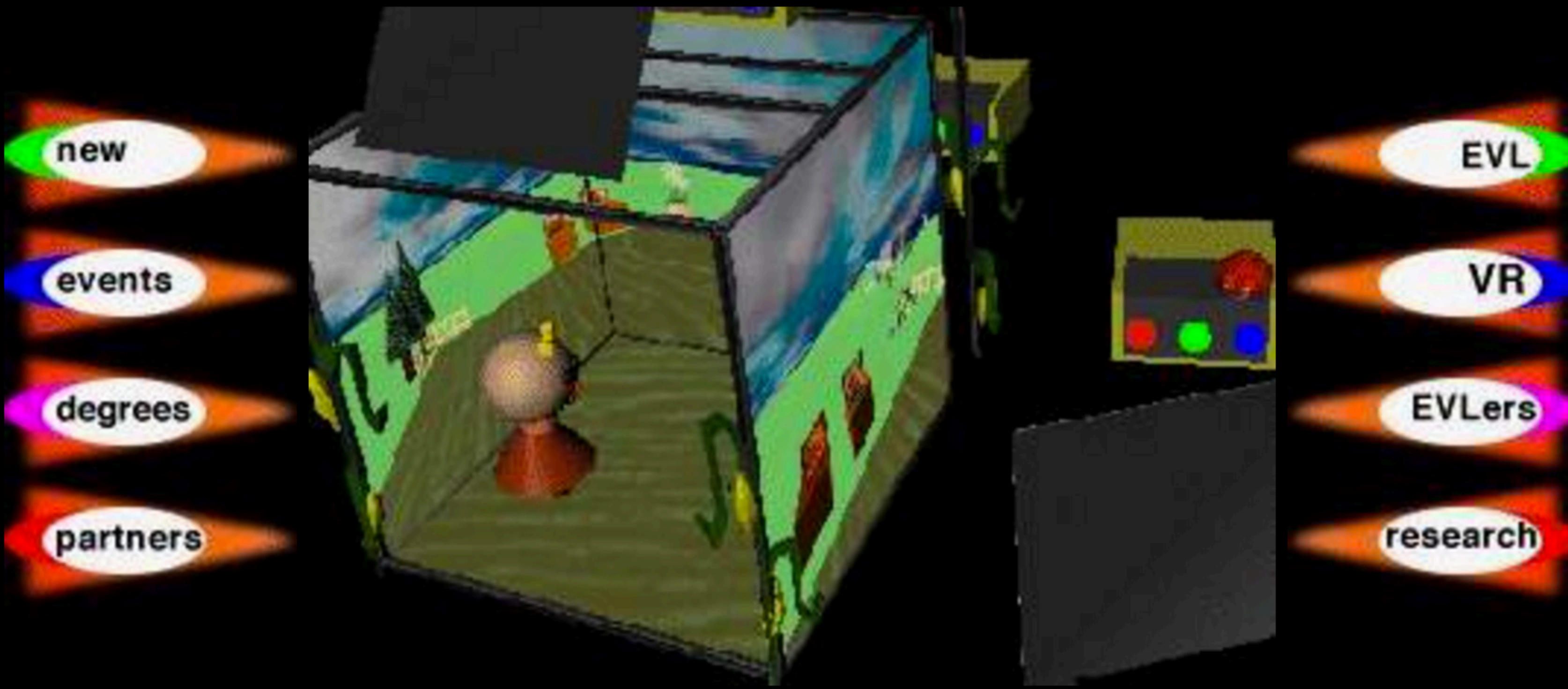
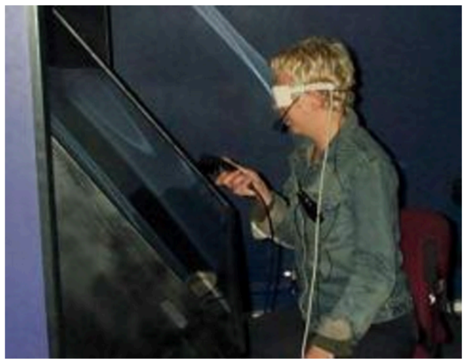
Register Login

University of Illinois at Chicago

Electronic Visualization Laboratory



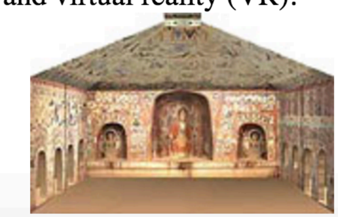
overview



The Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago (UIC) is a graduate research laboratory specializing in virtual reality and real-time interactive computer graphics. A joint effort of UIC's College of Engineering and School of Art and Design, EVL represents the oldest formal collaboration between engineering and art in the country offering graduate degrees in electronic visualization (MFA, MS, PhD).

Electronic Visualization is the art and science of creating images on electronic screens and on virtual reality display devices. The primary goal of the Electronic Visualization graduate program is to further students' visual goals using the tools of advanced computer graphics, computer animation, interactive graphics, video, and virtual reality (VR).

Related research goals include scientific visualization, new methodologies for informal science and engineering education, paradigms for information display, distributed computing, sonification, human/computer interfaces, every-citizen interfaces, and abstract math visualization. EVL is also involved in evaluating virtual reality as an educational tool.



overview

The Electronic Visualization Laboratory (EVL), is an interdisciplinary graduate research laboratory that combines art and computer science, specializing in virtual reality, visualization and high-speed networking. The laboratory is a joint effort of UIC's College of Engineering and The School of Art & Design, and represents the oldest formal collaboration between engineering and art in the country offering graduate degrees in visualization (MFA, MS, PhD). Funded research projects include; tele-immersion, collaborative software, the development of viable, scalable, deployable stereo displays and management of next-generation advanced networking initiatives.

In 1992, EVL invented the CAVE® virtual reality theater, followed by the ImmersaDesk® in 1995. These are now used globally for tele-immersive scientific discovery, art exhibition and industrial prototyping.

Having received recognition for developing the CAVE® and ImmersaDesk® virtual reality systems, EVL's current research focus is electronic visualization laboratory

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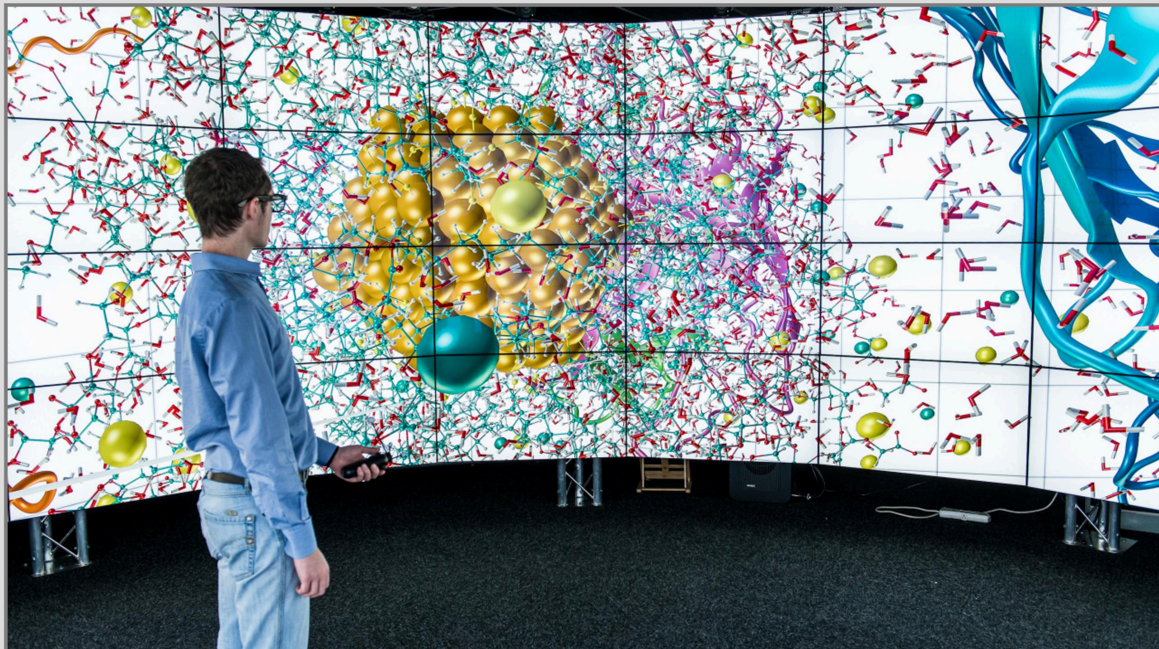
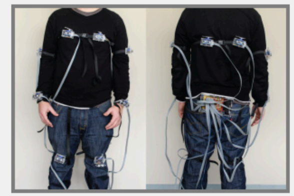


Wallcology: Technology based learning and scientific inquiry



SpiderSense

Exploring BioPax and the Pathway Commons API Using Linked Views

Gold Nanoparticle

Participants can explore the self-assembly of a ligated gold nanoparticle and proteins inside an ionic solution in the CAVE2™ Hybrid Reality Environment. Data and visualization provided by the Petr Kral Research Group at the Department of… Read more

UIC University of Illinois at Chicago

Sections

- [Campus]
- [Students]
- [Classroom]
- [Computers]
- [Libraries]
- [Research]
- [Community]
- [The World]

NEW May 29 What's new

Guaranteed Professional Program Admissions (GPPA)

Employment Opportunities:
Academic and Student

Academic Opportunities:
Admissions and Records

UIC at a Glance	Intercollegiate Athletics
UICNEWS	Campus Unions / Bookstores

Campus Organization

All departments with home pages are under Academic Programs. Other campus units, such as Human Resources, Business Affairs, or the Police are under Campus Units.

- Campus Phonebook

- Academic Programs
- Campus Units
- Health Sciences Center
- University-wide Units

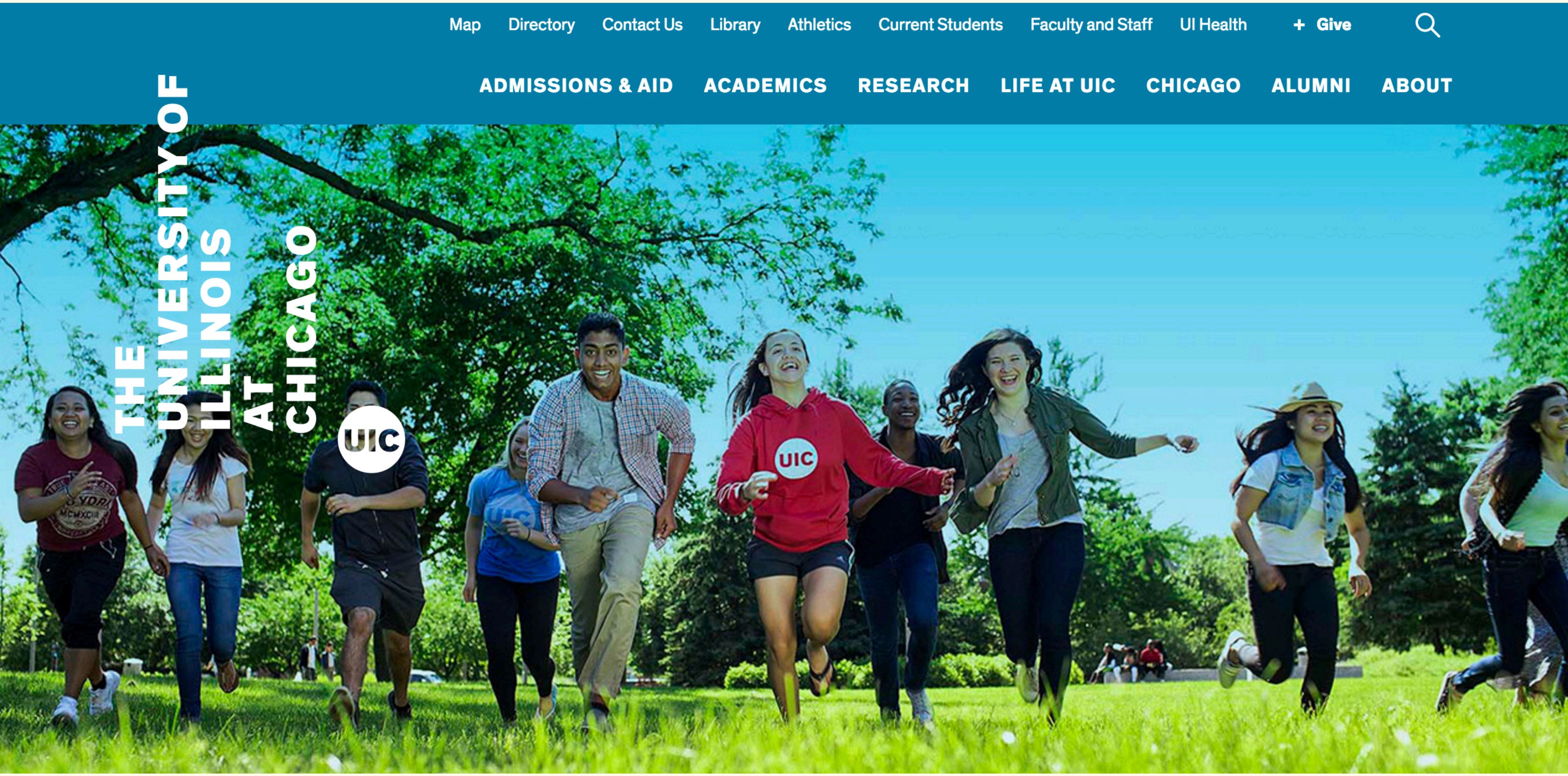
- Academic Senate

Students

- Undergraduate Catalog

- Graduate Catalog

- Services
- Organizations
- Governance



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THE UNIVERSITY OF ILLINOIS AT CHICAGO
UIC

Visual communication

This ability and compulsion to interpret applies to everything – fashion, personality advertisements, cell phones, cars, the way we speak, the phrases we use, how we socialize, how we think and organize, political beliefs, interactions with technology, research methodologies …

For the purpose of this class - I want everyone to think about communication that takes place on images and screens…

Visual communication

Even though it's a relatively new field, our use of **interactive data visualizations** have become much more sophisticated in recent years.

A good visual designer is aware of:

the *history* and *context* of different types of images and visualizations,

the *audiences* they are presenting to and an expectation of how different audiences will respond,

their own *personality* - interests, biases, etc.


BIG
DATA
INFORMATION
STORAGE
LARGE
SETS
SEARCH
PETABYTES
ANALYSIS
MANAGEMENT
TECHNOLOGIES
SOFTWARE
MILLION
SCIENCE
DEVELOPMENT
TECHNOLOGY
VOLUME
PROCESS
GOVERNMENT
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NAS
SOCIAL
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SIMULATIONS
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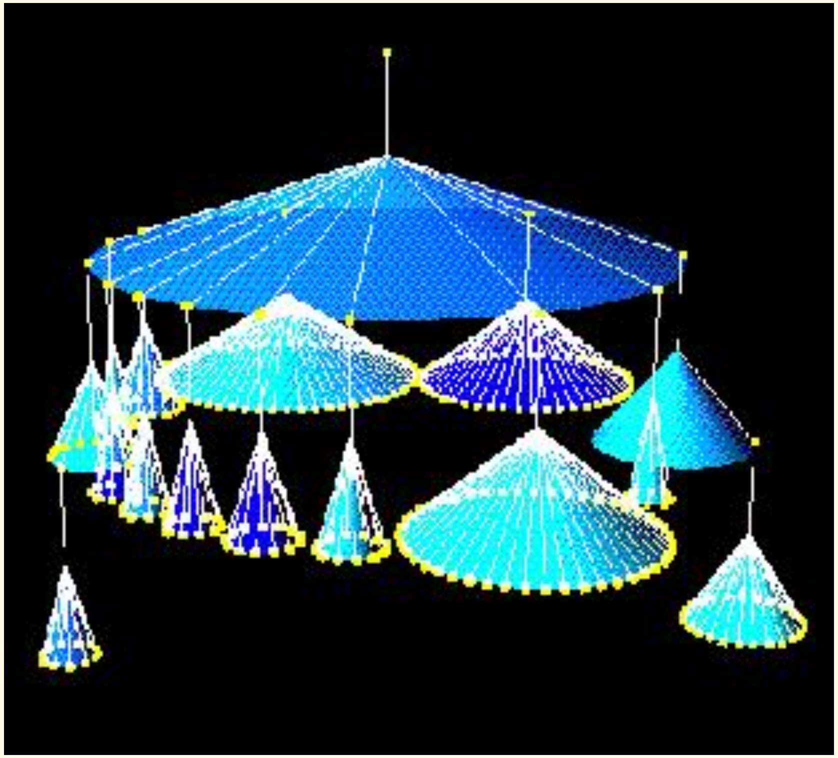

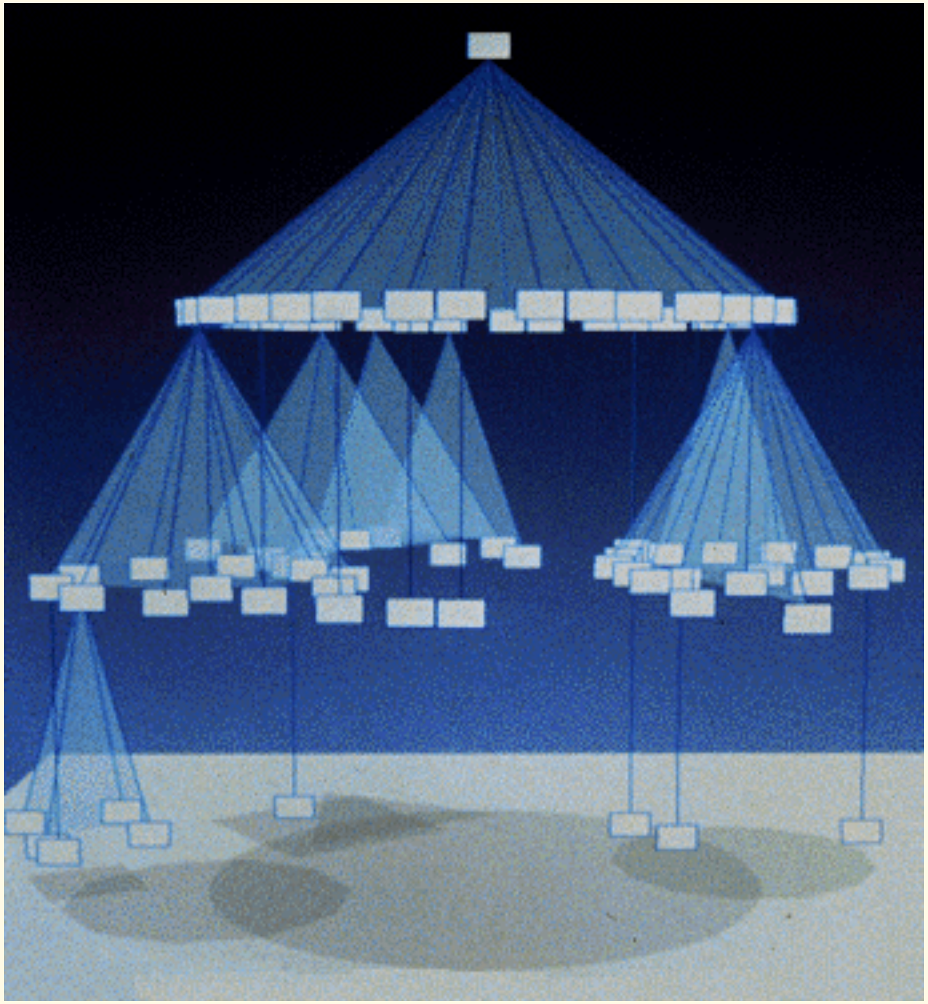

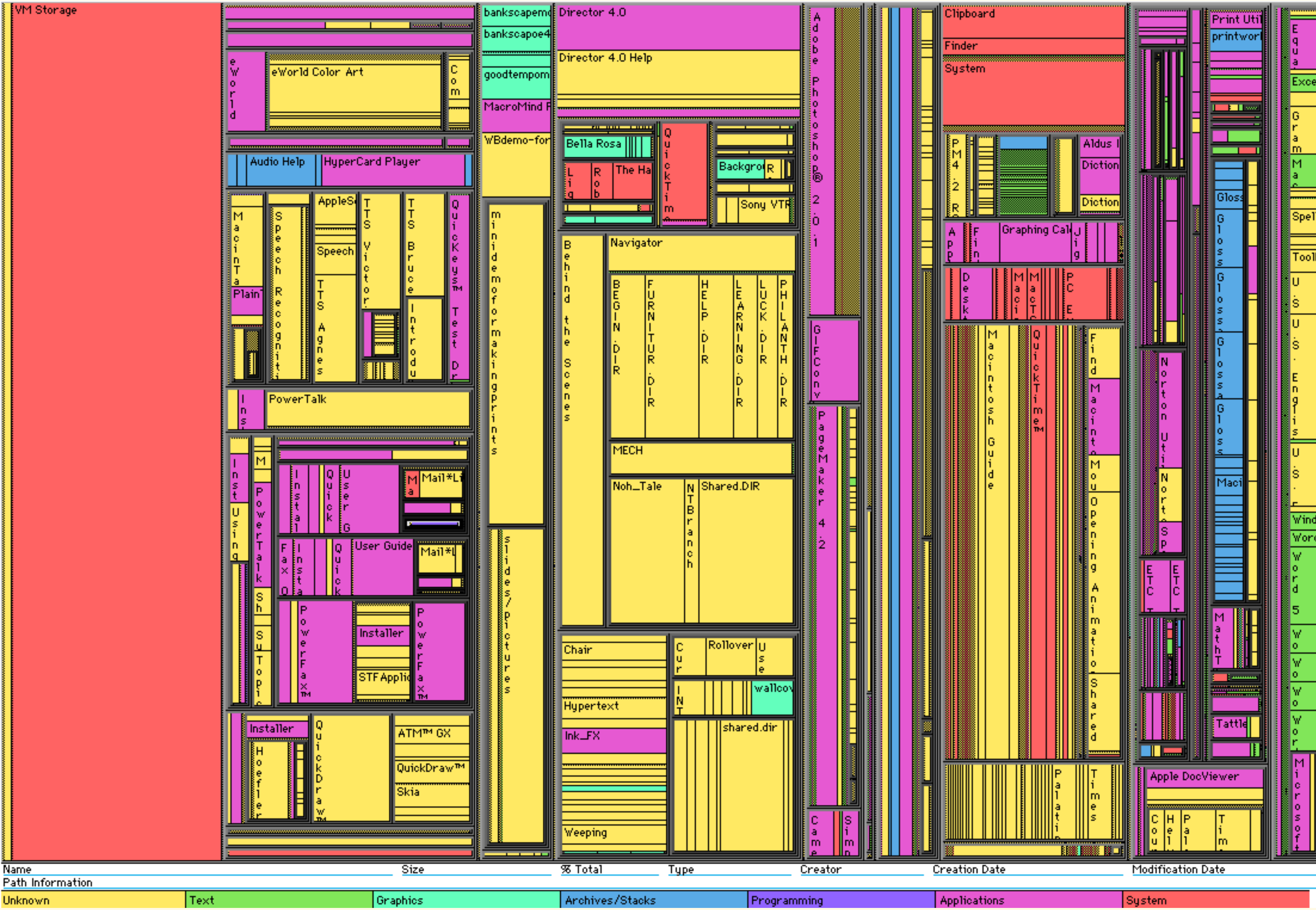
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User Guide
Installer
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MacroMind F
VBdemo-for
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slides/pictures
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GIFConv
PageMaker 4.2
Clipboard
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Graphing Calc
Macintosh Guide
QuickTime™
Opening Animation Shared
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Programming
Applications
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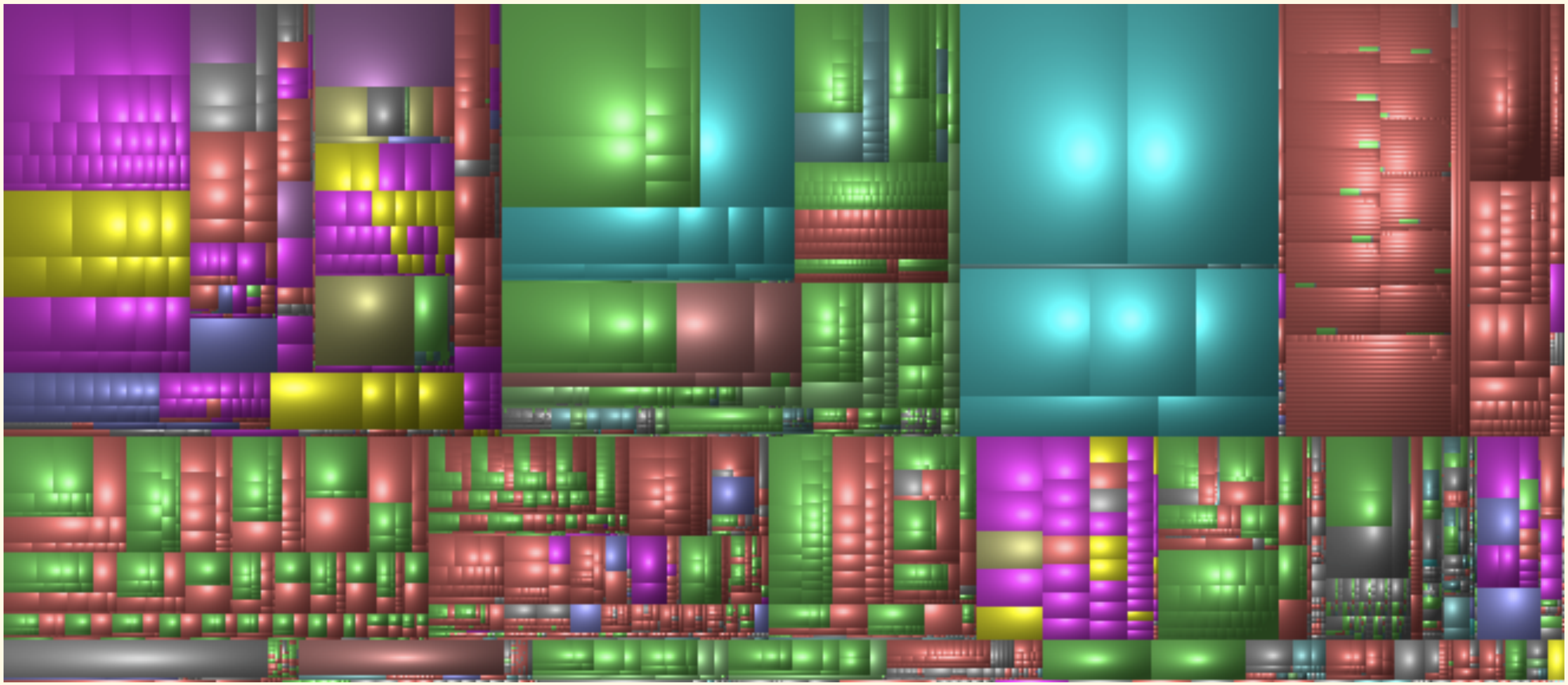

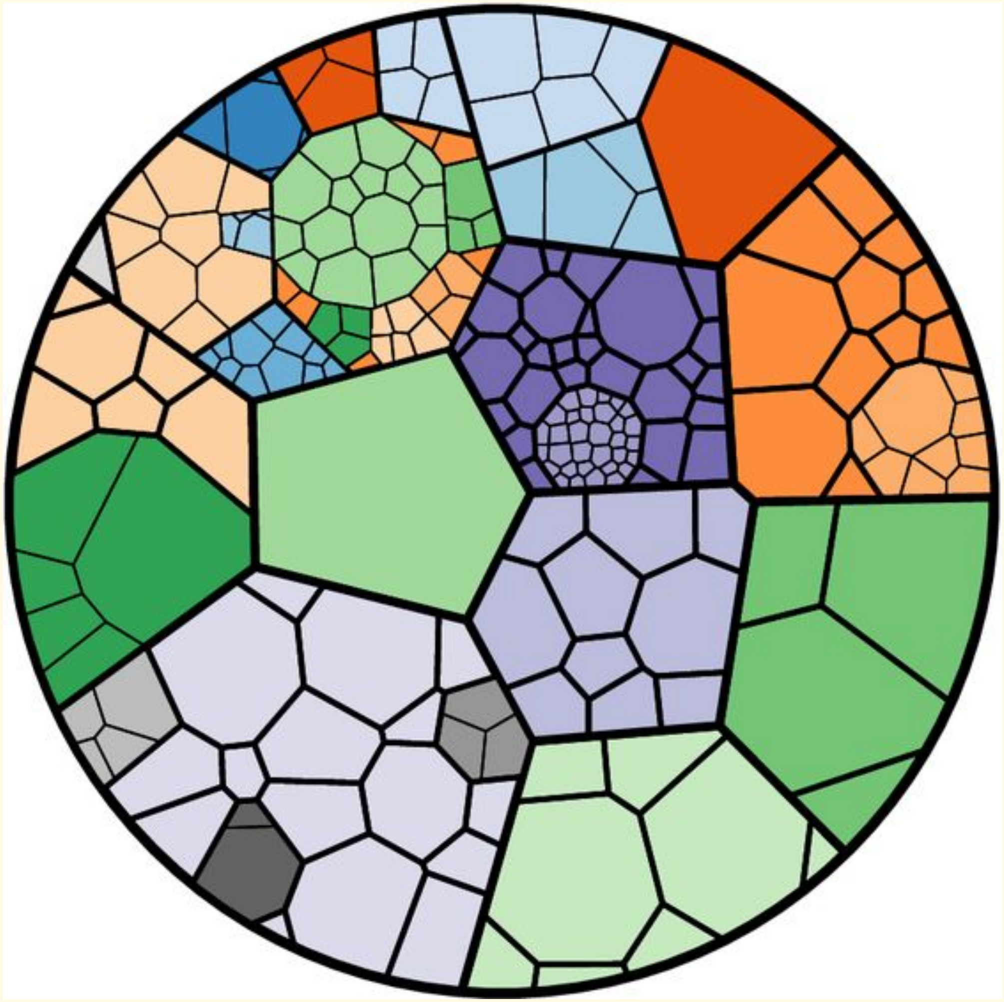

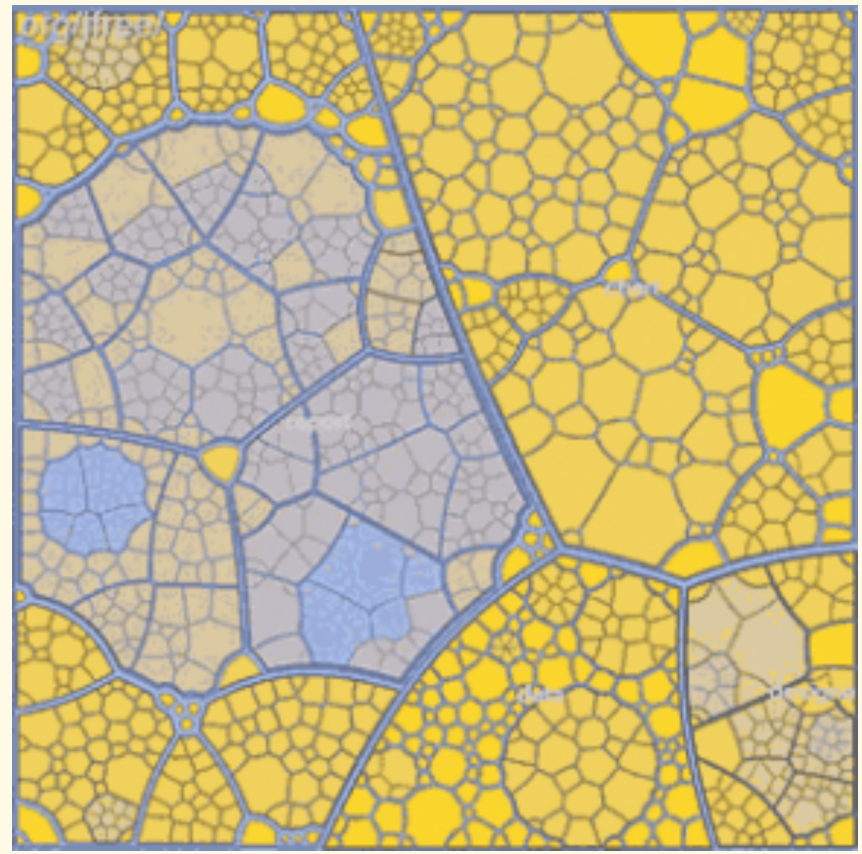

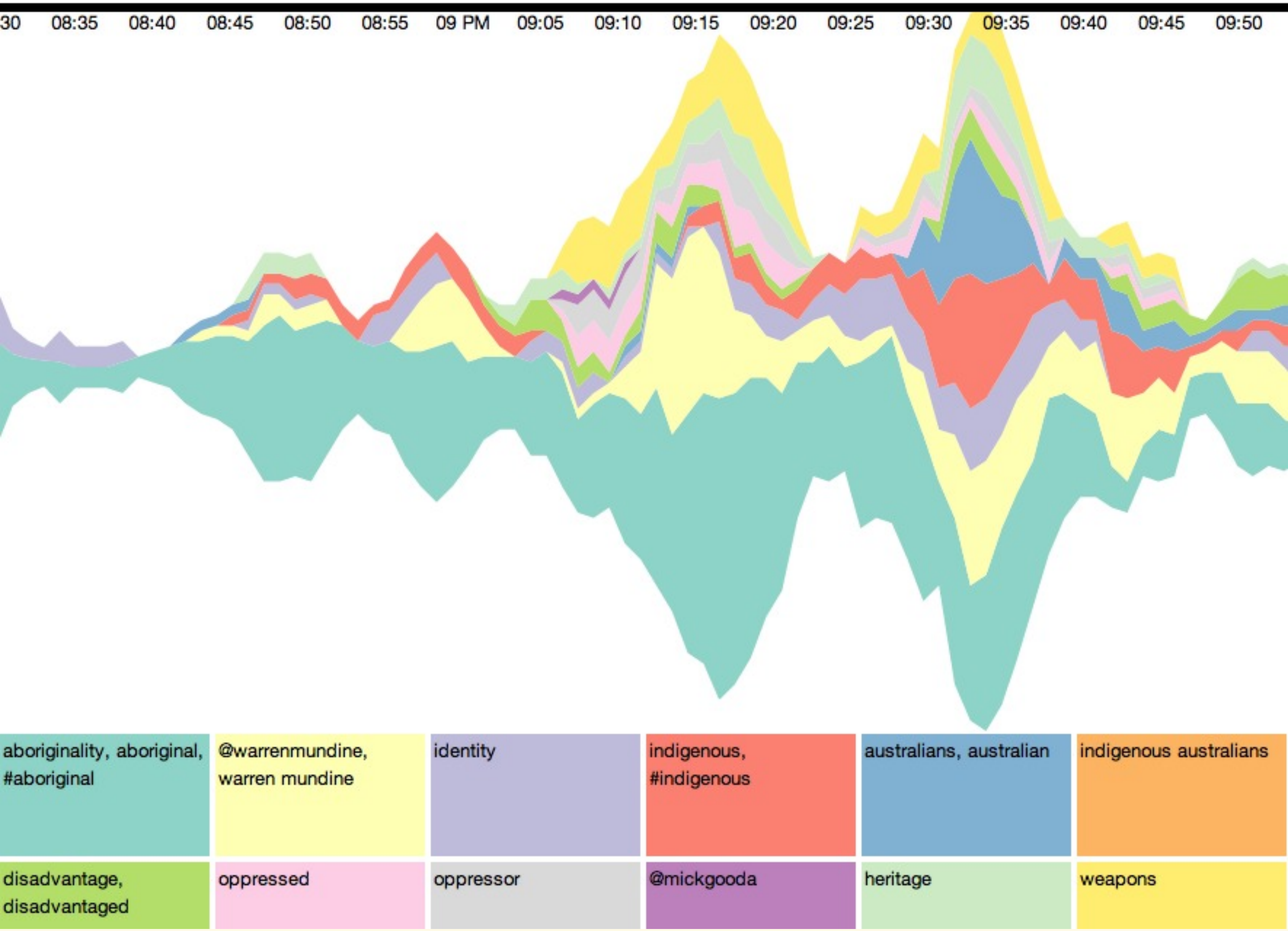

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@warrenmundine, warren mundine
identity
indigenous, #indigenous
australians, australian
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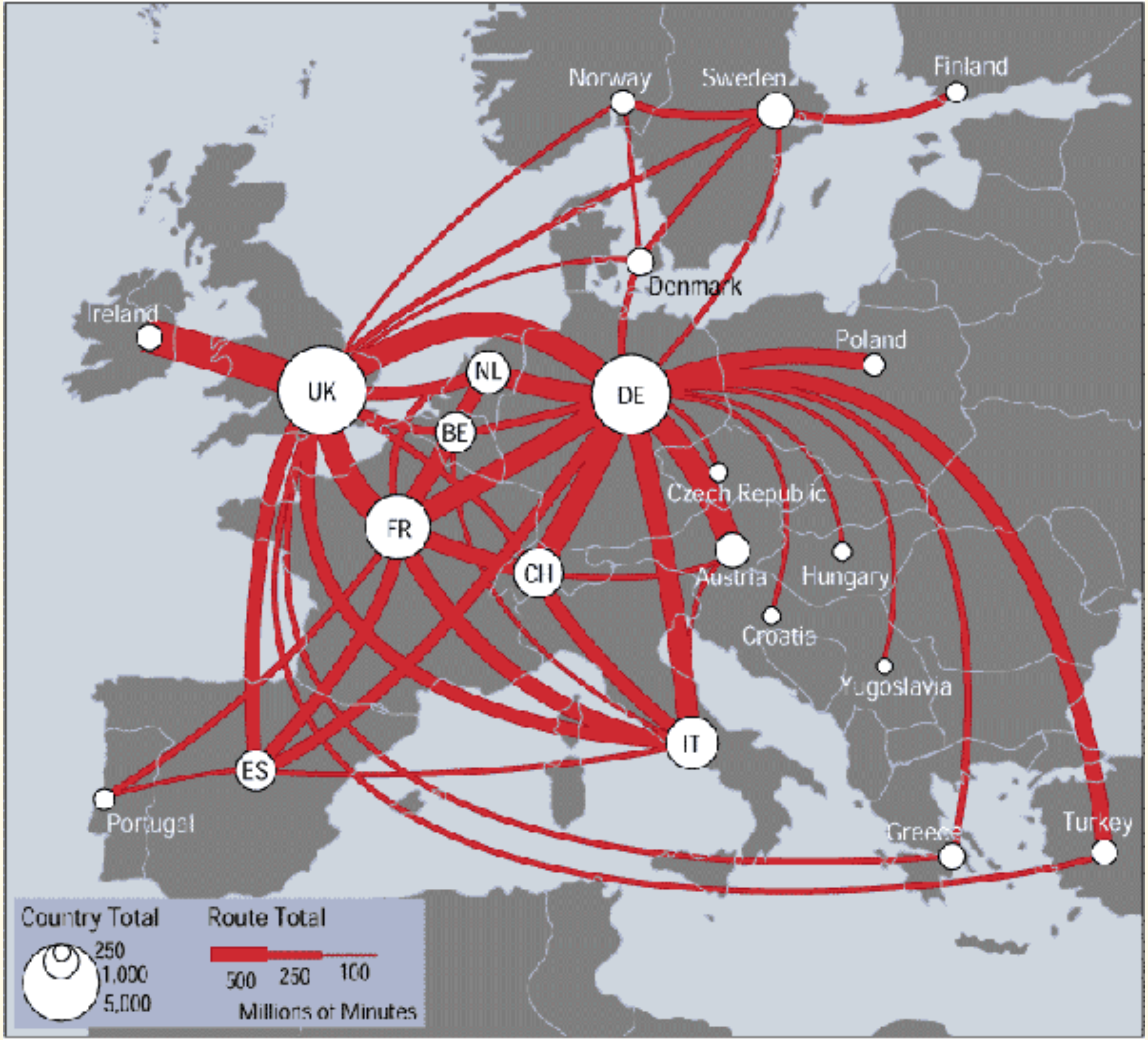
disadvantage, disadvantaged
oppressed
oppressor
@mickgooda
heritage
weapons



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Country Total
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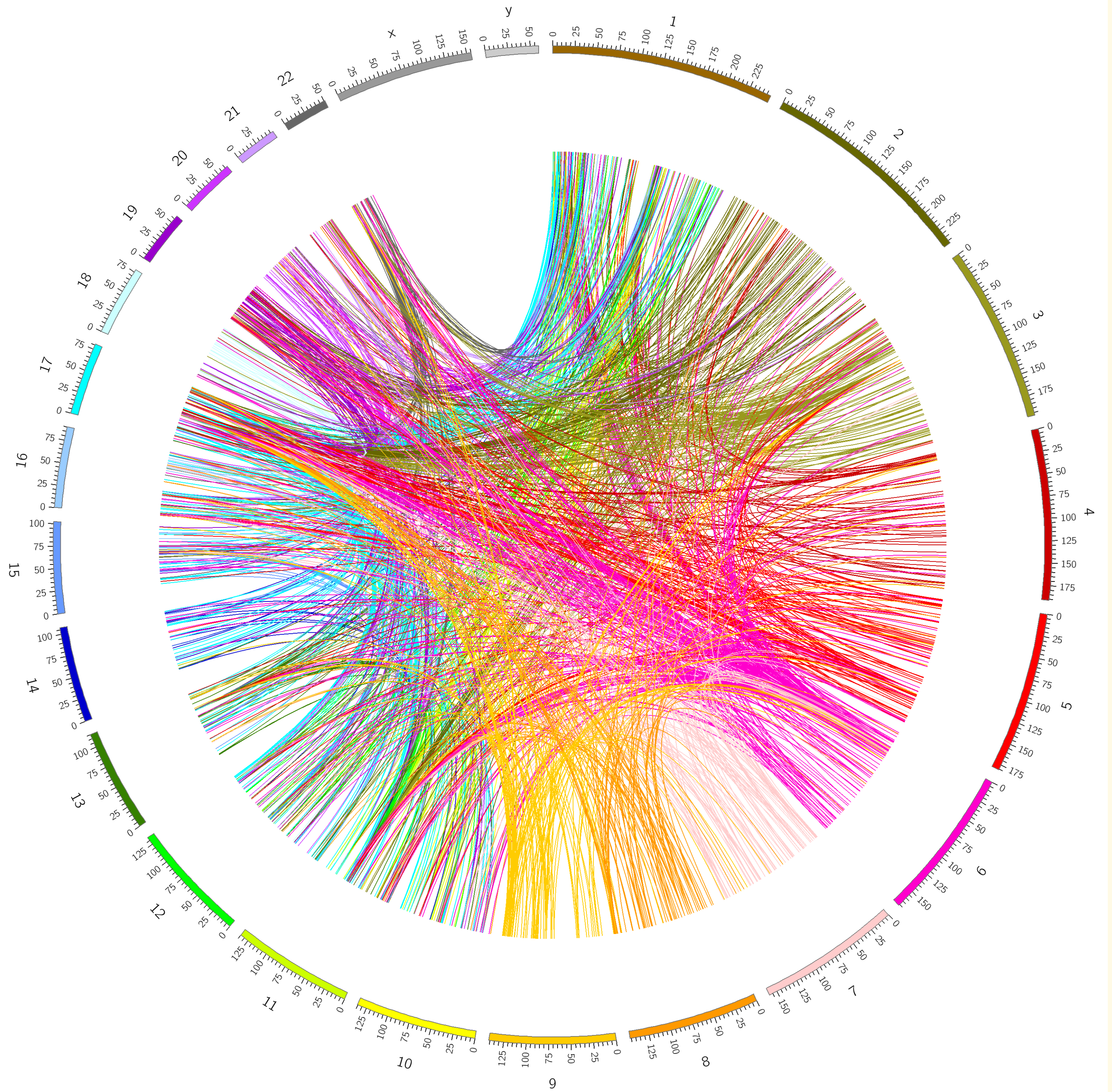
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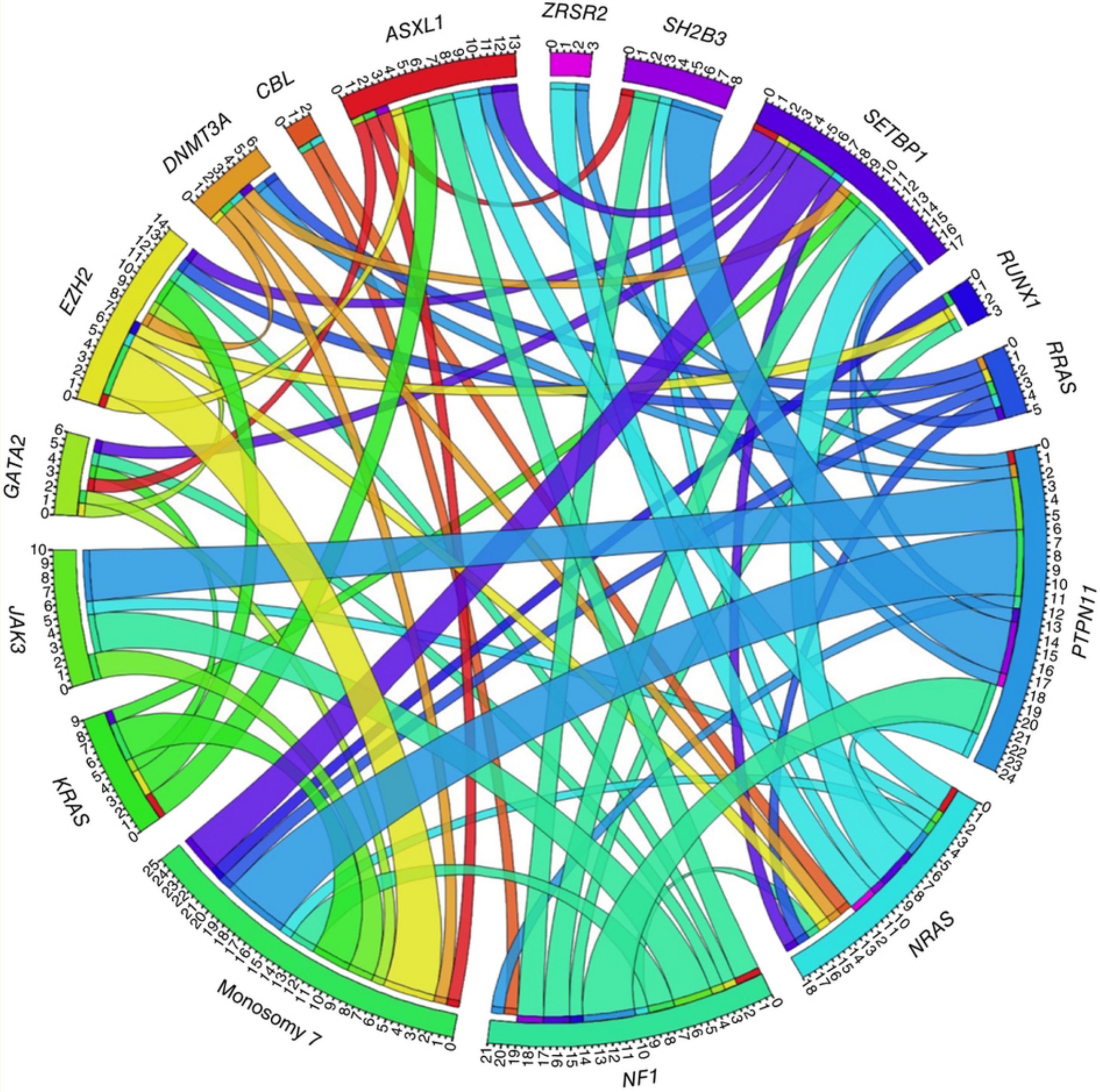

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SH2B3
SETBP1
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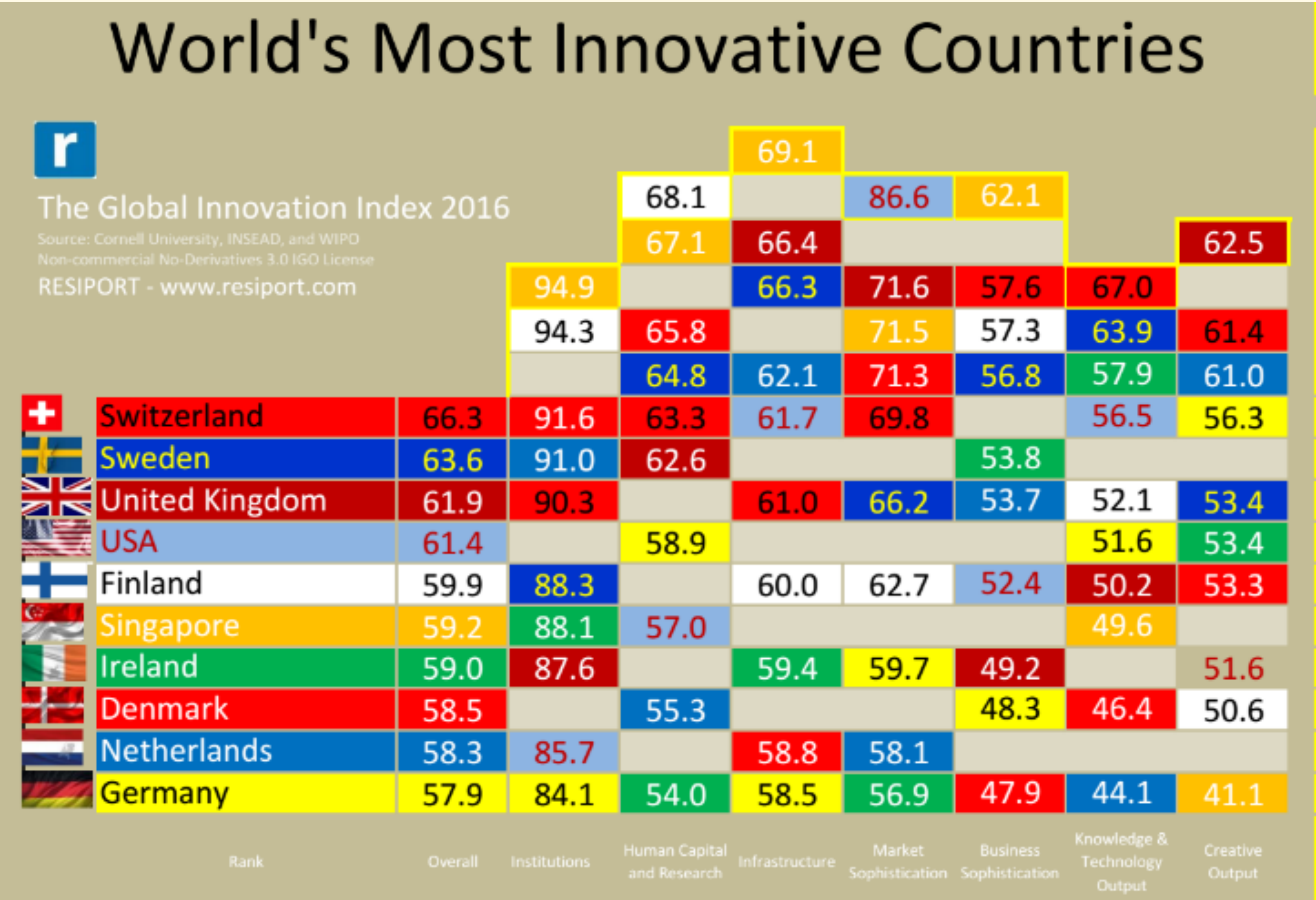
World's Most Innovative Countries
The Global Innovation Index 2016
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RESIPORT - www.resiport.com
Switzerland 66.3
Sweden 63.6
United Kingdom 61.9
USA 61.4
Finland 59.9
Singapore 59.2
Ireland 59.0
Denmark 58.5
Netherlands 58.3
Germany 57.9
94.9 94.3 91.6 91.0 90.3 88.3 88.1 87.6 85.7 84.1
68.1 67.1 65.8 64.8 63.3 62.6 58.9 57.0 55.3 54.0
69.1 66.4 66.3 62.1 61.7 61.0 60.0 59.4 58.8 58.5
86.6 71.6 71.5 71.3 69.8 66.2 62.7 59.7 58.1 56.9
62.1 57.6 57.3 56.8 53.8 53.7 52.4 49.2 48.3 47.9
67.0 63.9 57.9 56.5 52.1 51.6 50.2 49.6 46.4 44.1
62.5 61.4 61.0 56.3 53.4 53.4 53.3 51.6 50.6 41.1
Rank
Overall
Institutions
Human Capital and Research
Infrastructure
Market Sophistication
Business Sophistication
Knowledge & Technology Output
Creative Output

Interpretive Perspectives

Paul Martin Lester lists different *perspectives* you can have when producing or interpreting an image:

- Personal
- Historical
- Technical
- Ethical
- Cultural
- Critical

Dataset type / Data types

Tamara Munzner tries to present a comprehensive overview of *what* can be visualized, and what *elements* can be used to visualize them.

She further discusses the *visual encodings* that can be used to build, highlight, and emphasize elements in the datasets.

She also discusses various *tasks* that can be accomplished using visualization.

Dataset type / Data types

According to her, there are four basic (and three less common) "dataset types":

Tables - [space defined by rows and columns, ordered in some way]

Networks - [space defined by algorithms to minimize clutter]

Fields - [mins and maxs]

Geometry (i.e. 2D maps) - [real world positions]
Clusters, **Sets**, **Lists** - [no intrinsic spatial position]

Dataset type / Data types

Furthermore, each of these "dataset types” is made up of “data types" that include

- *items, attributes, links, positions, and grids.*

For each of these, the data type can be

- *categorical, ordinal, or quantitative.*

Finally, this data can either be

- *static* or *dynamic.*

Dataset type / Data types

item - an item is a discreet entity, separate from other entities

attribute - an item can have many (or zero) attributes, depending on what the item represents.

link - a link is a relationship between items

grid - a grid indicates the visualization strategy for sampling continuous data

position - a specific spatial location, i.e. lat/lng on a map.

Dataset type / Data types

- not every dataset necessarily requires making use of all of these data types...

Tables have *items* and *attributes*

Networks have *items*, *attributes*, and *links*

Fields have *grids* and *positions* within the grid

Geometry has *items* and *positions*

Clusters, **Sets**, **Lists** have *items*

Visualization Tasks

Tasks are made up of

- *Actions*

  things you can do with the data

- *Targets*

  results of what your action

Data Actions

Analyze

- *Consume* existing information
  - Discover / Generate or Validate hypotheses
  - Present / Communicate
  - Enjoy / Inspire
- *Produce* new information
  - Annotate
  - Record
  - Derive / Transform

Data Actions

Search

- Lookup
- Browse
- Locate
- Explore

Query

- Identify
- Compare
- Summarize

Data Targets

Trends

Outliers

Features

Distribution

Extremes (maxima/minima)

Dependencies / Relationships

Correlation / Causality

Similarity

Topology

Paths

Shapes

Exercise

Convene in groups of 2 or 3, contrive a dataset consisting of your family members and/or close friends and information about them. [items, categorical or ordered or quantitative attributes, relationships, etc]

- Sketch up 4 different visualizations for each of the dataset types (table, network/tree, field, geometry) – Sketch up a 5th one which merges two of the dataset types…

- Show how your visualization could facilitate analysis, search, and/or query tasks and what a "target" output might look like

Exercise

“Don’t just draw what you’re given; decide what the right thing to show is, create it with a series of transformations from the original dataset, and draw that!” –Munzner

What is Vis, and Why do it?

In other words – there is lots of room for innovation in visualization:

- layout algorithms
- interaction techniques
- analysis techniques
- application to particular datasets & assisting "domain experts" with their tasks

For next week

For Tuesday, read Munzner, Chapter 3 and 5 (you can skip Chapter 4 for now)

Quiz on Tuesday – D3.js and Munzner chapters 1,2,3, and 5

Project 1 due on Thursday – I will post minimum requirements for C, B, A