Visualizing Information

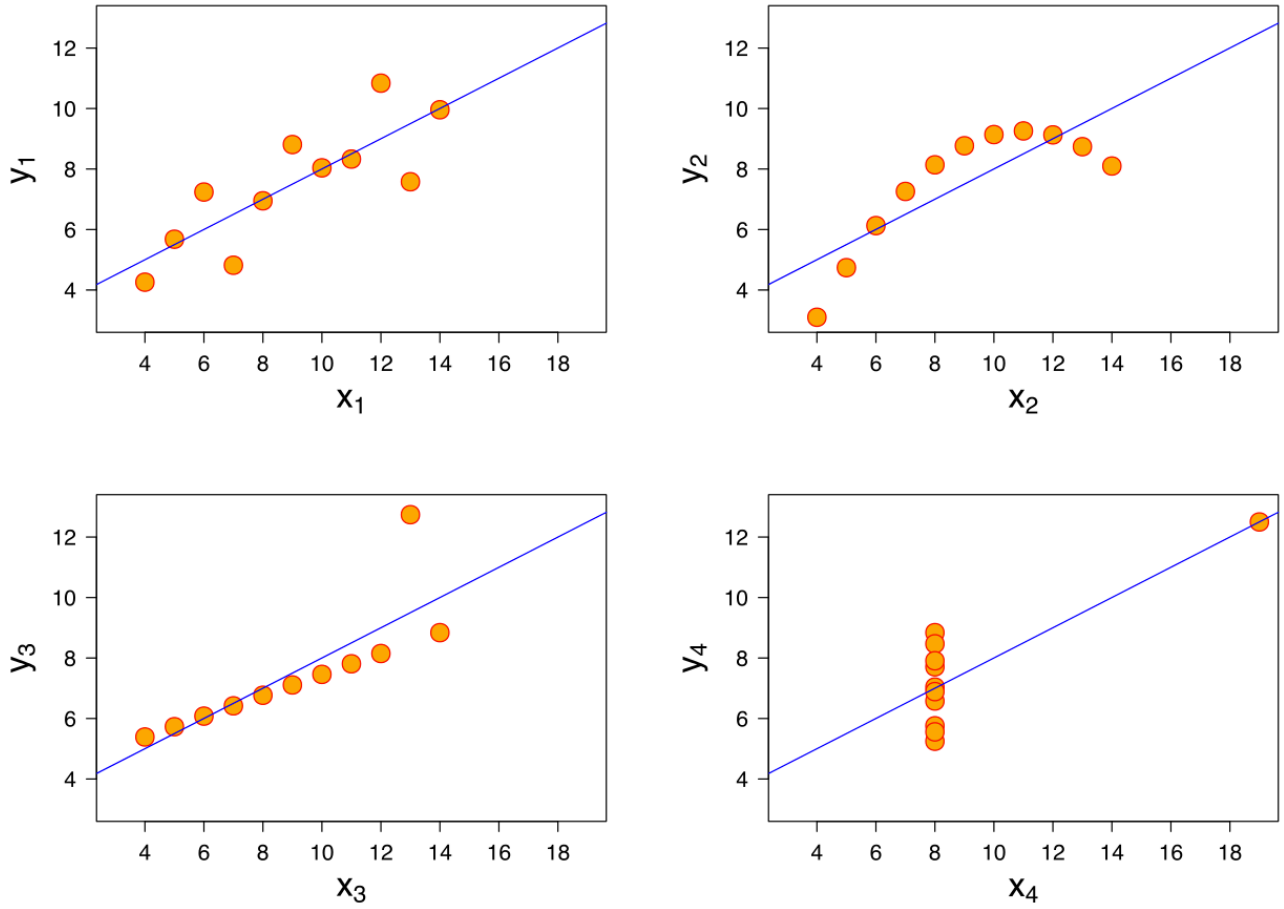
Concepts in Data Visualization

- Visual Variables
- Types of Data
- Information Hierarchies

Five Hat Racks

Instructional Strategies

Why Visualize Data?



Anscombe's quartet – a visual demostration of the power of visualization.

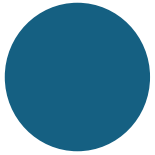
The big challenge for data visualization:
There are only 7 visual variables onto which you can map data variables.

Visual Variables

(from Jacques Bertin: *Semiology of Graphics*, 1967)

1) Position
   - Map data onto the x, y, z location of the marker.

2) Size
   - Map data onto the length, area, or repetition of the marker.



3) Shape
   - Shape of the marker.

4) Value
   - Map data onto variations from light to dark

5) Color
   - Map data onto the hue of the marker

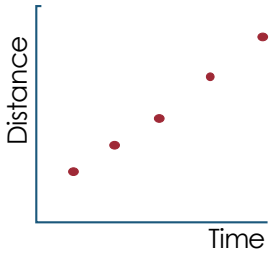
6) Texture
   - Fill pattern of the marker

7) Orientation
   - Map data onto direction of the marker

DATA			
Qualitative (Descriptive)		**Quantitative** (Numerical)	
Nominal Data has no natural order. Includes objects, names, and concepts. Examples: gender, race, religion, sport	**Ordinal** Data can be arranged in order or rank Examples: sizes (small, medium, large), attitudes (strongly disagree, disagree, neutral, agree, strongly agree), house number.	**Discrete** Data is countable, and exists only in whole numbers Examples: Number of people taking this class, Number of candy bars collected on Halloween.	**Continuous** Data is measured on a continuous scale. Examples: Temperature, length, height

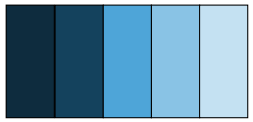
Visual variables for quantitative data (used to represent quantities)

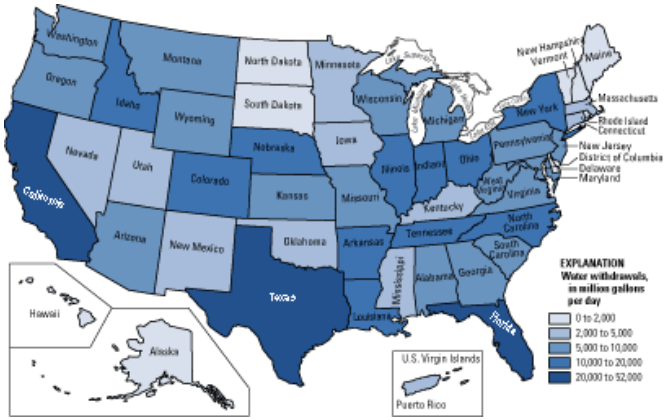
Position



Size

Value



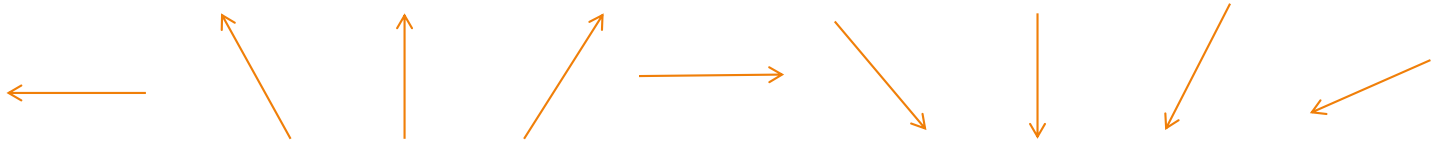


Visual variables for qualitative data (used to represent a category)

Texture

Colour

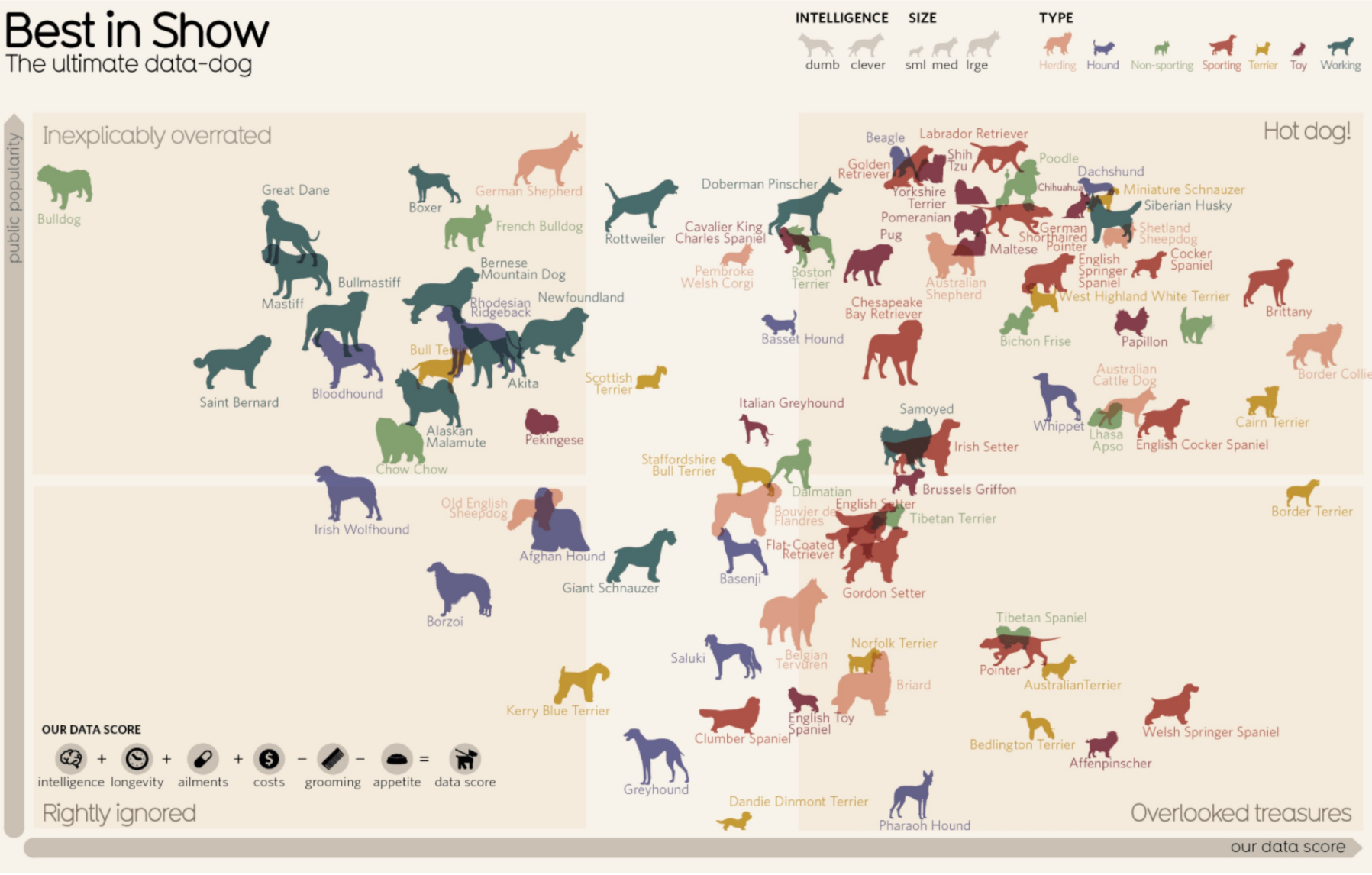
Orientation



Shape

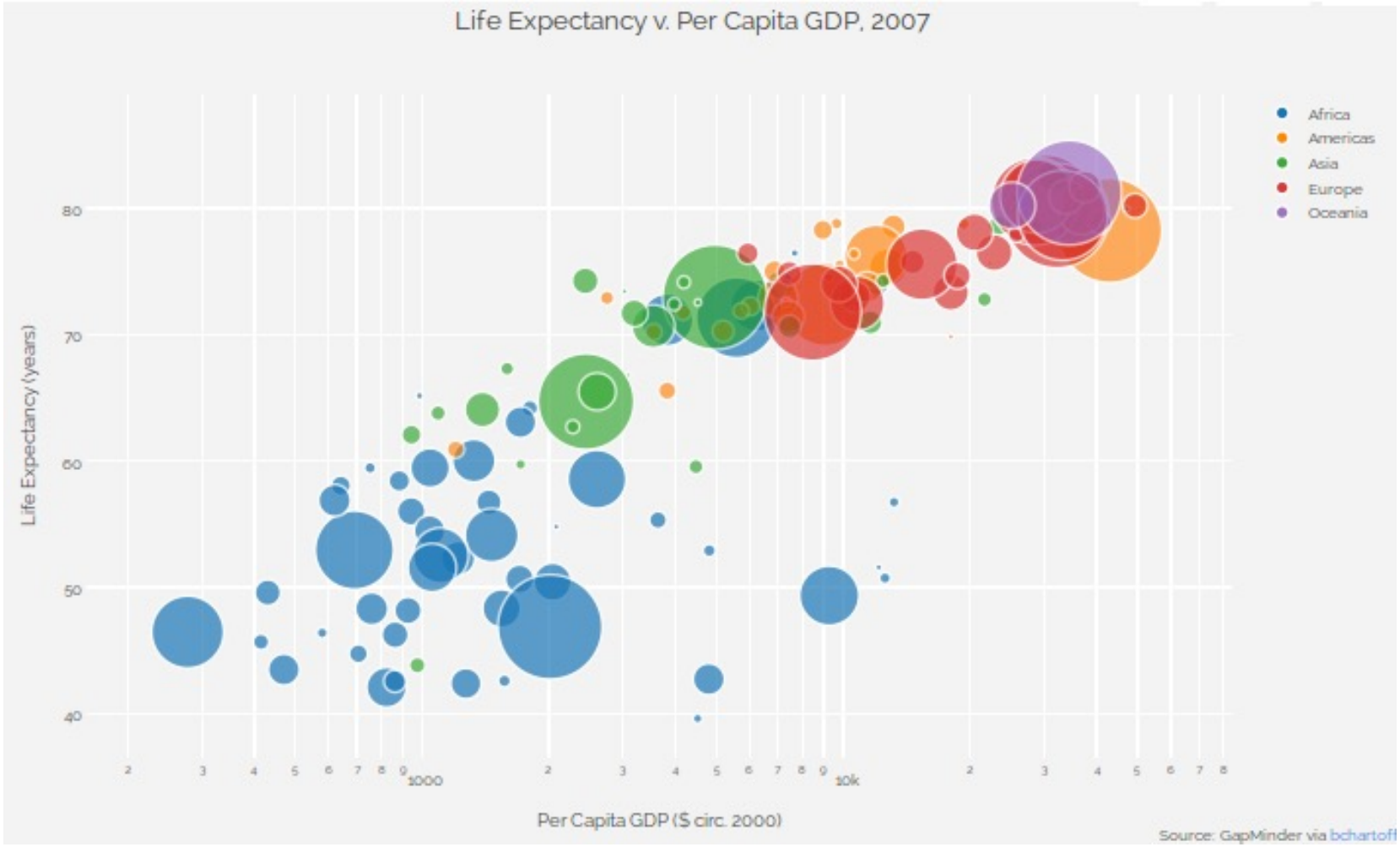
Best in Show

The ultimate data-dog



https://informationisbeautiful.net/visualizations/best-in-show-whats-the-top-data-dog/

Gapminder!



https://www.gapminder.org/

Hierarchical Structures

Figurative Trees

See Book:

The Book of Trees
Visualizing Branches of Knowledge

Manuel Lima

Loyset Liédet
Tree of cosanguinity
1471

Image Source:
http://visualoop.com/blog/16793/vintage-infodesign-53

Hierarchical Structures

Vertical Trees

First level of abstraction.

Flow charts, hierarchies

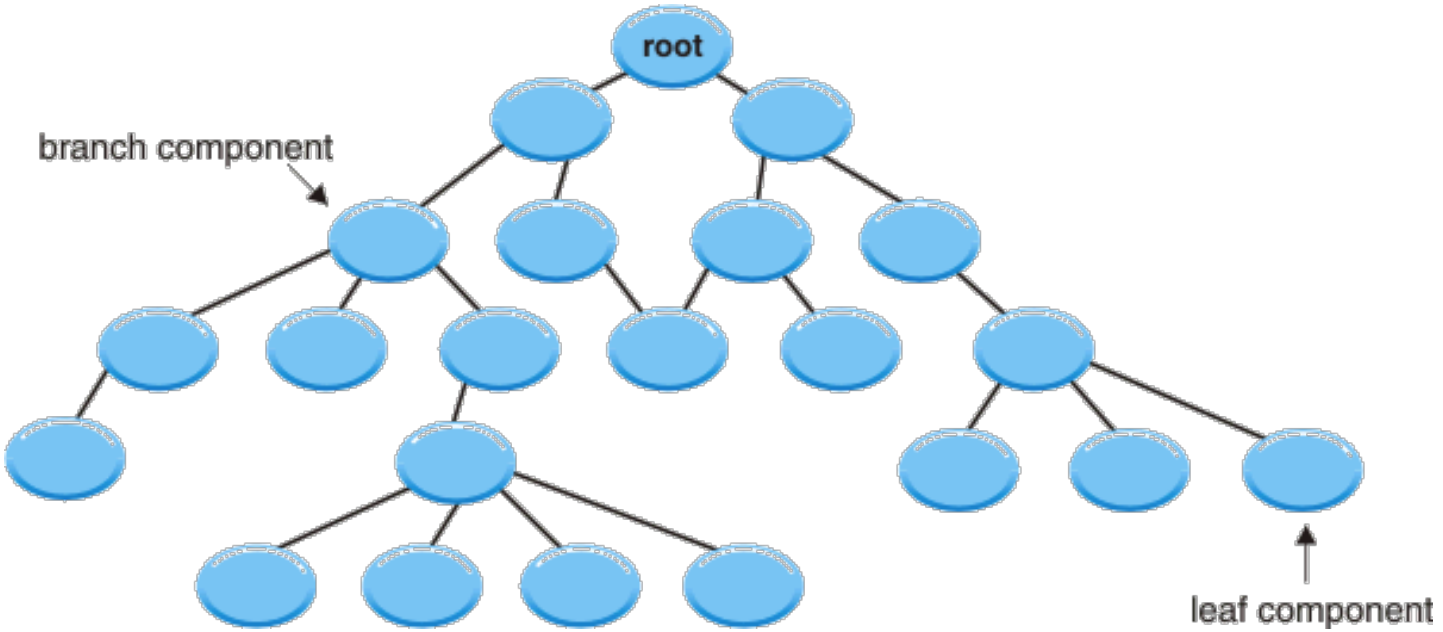


Image from: http://software.clearlake.ibm.com/CMVC/4.0/infocenter/htdocs/help/whatis/content/09.gif

Hierarchical Structures

Horizontal Trees

Image Source:
https://developers.google.com/chart/interactive/docs/gallery/wordtree

Also see:
https://www.chrisharrison.net/index.php/Visualizations/WebTrigrams

Hierarchical Structures

Radial Trees

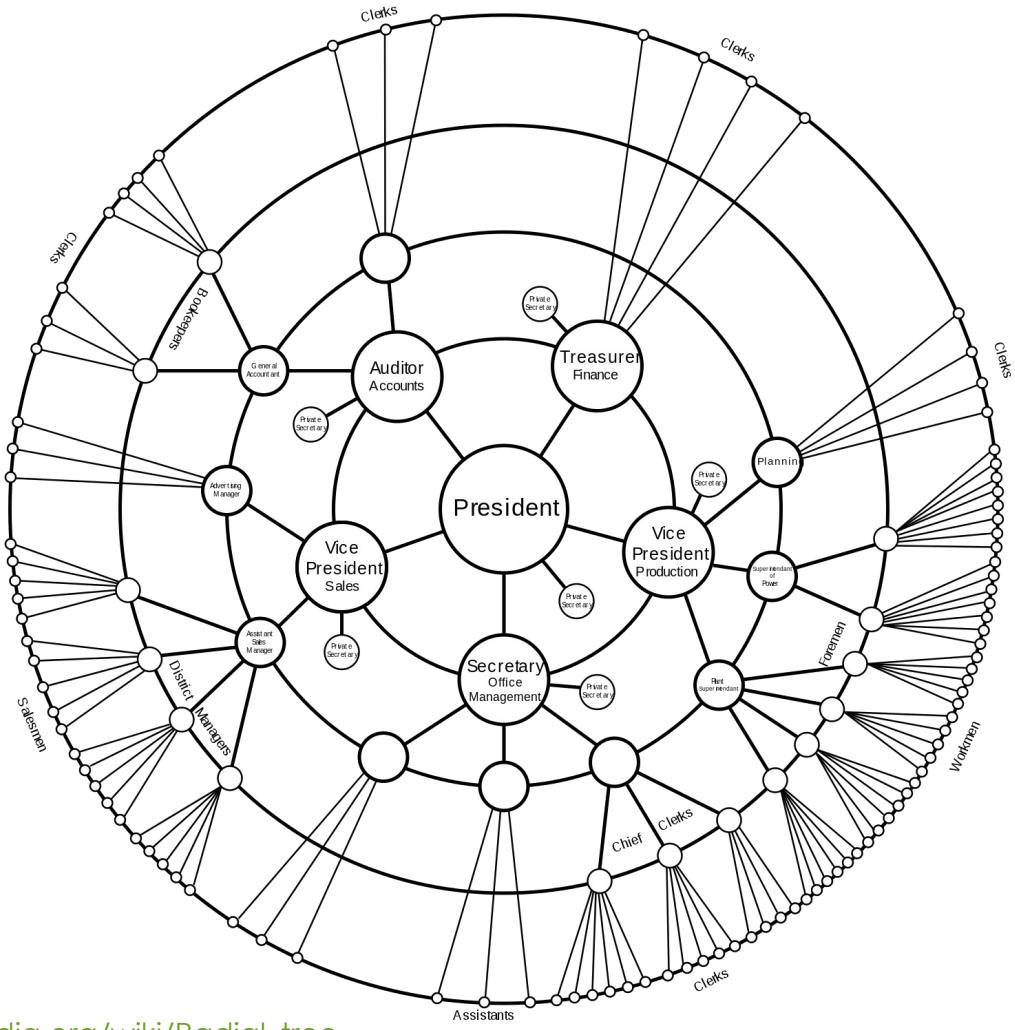


Image from: https://en.wikipedia.org/wiki/Radial_tree

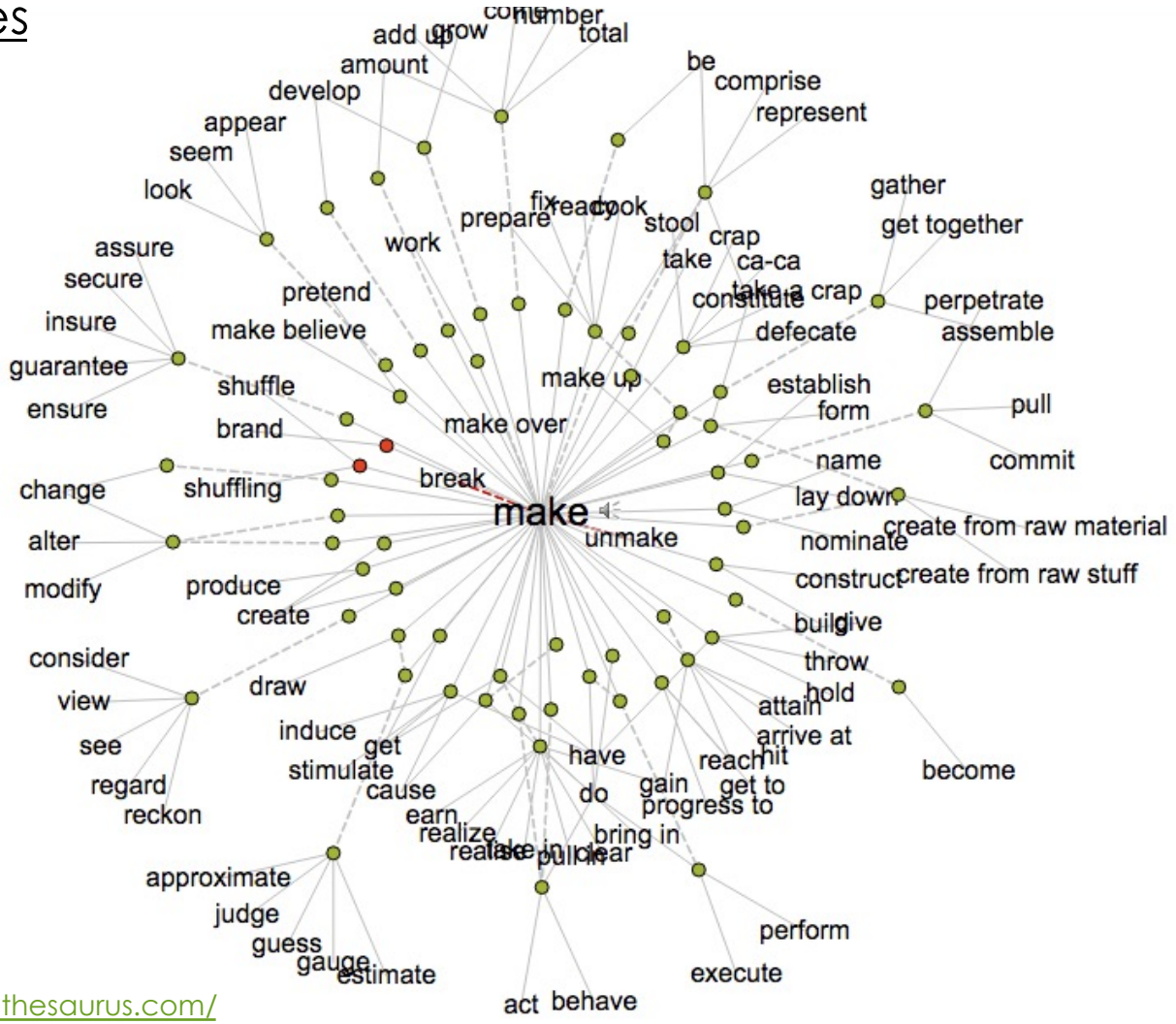
Hierarchical Structures

Radial Trees

https://www.visualthesaurus.com/

Hierarchical Structures

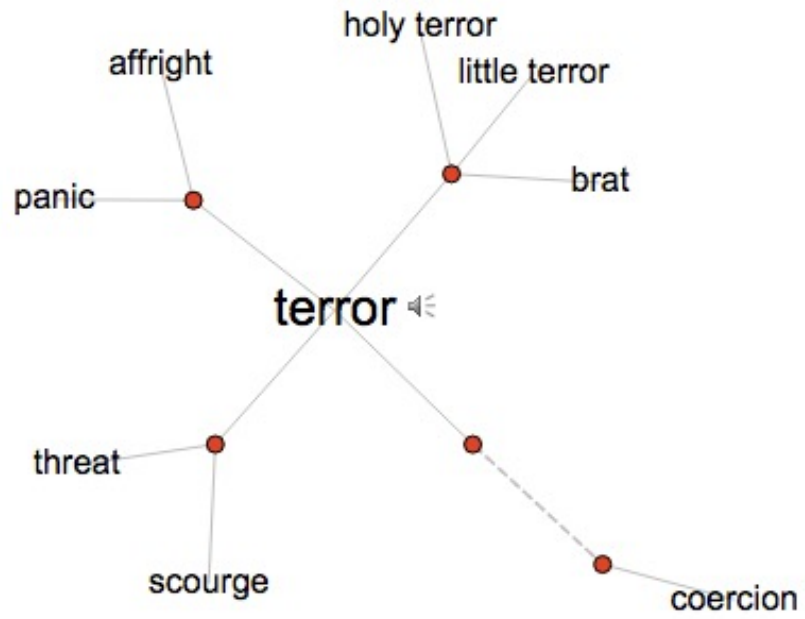
Radial Trees



https://www.visualthesaurus.com/

Hierarchical Structures

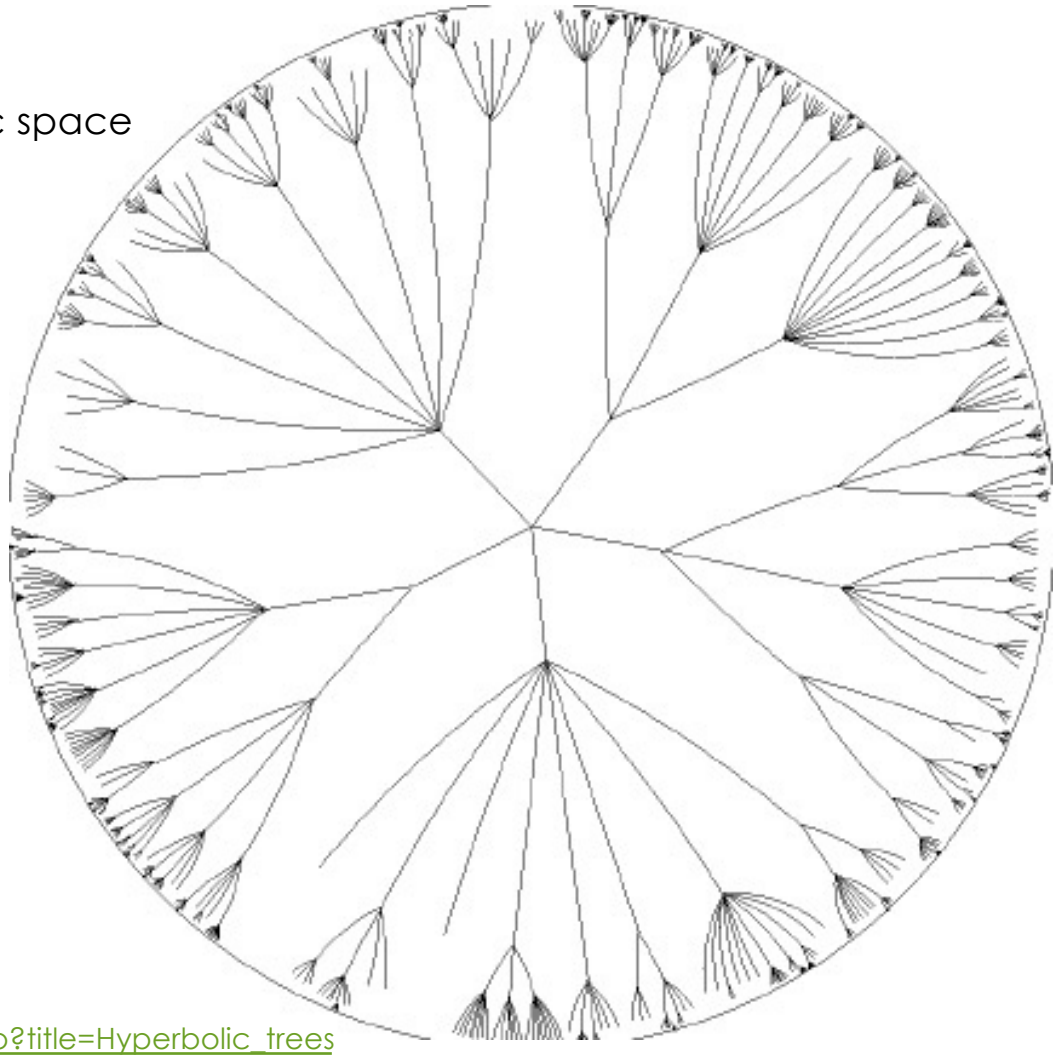
Radial Trees



http://www.visualthesaurus.com/

Hyperbolic Trees

Radial tree in hyperbolic space

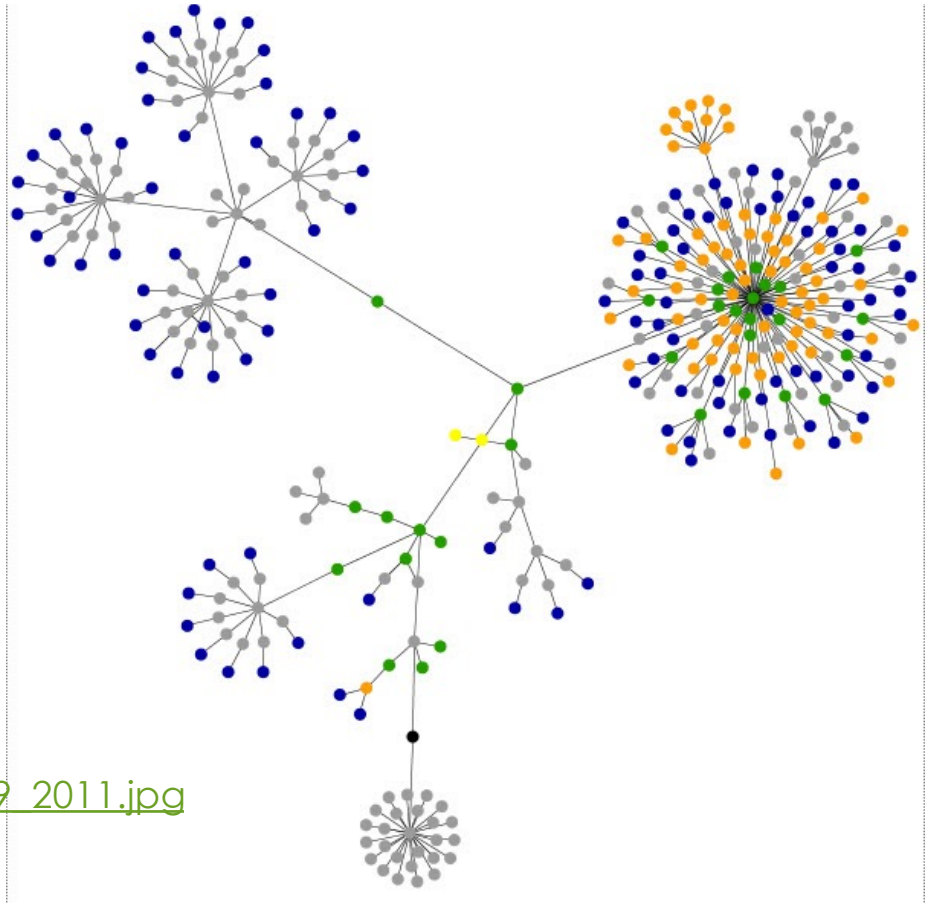


http://infovis-wiki.net/index.php?title=Hyperbolic_trees

Hierarchical Structures

Multidirectional Trees

Example:
Marcel Salathé
Websites as Graphs
2006



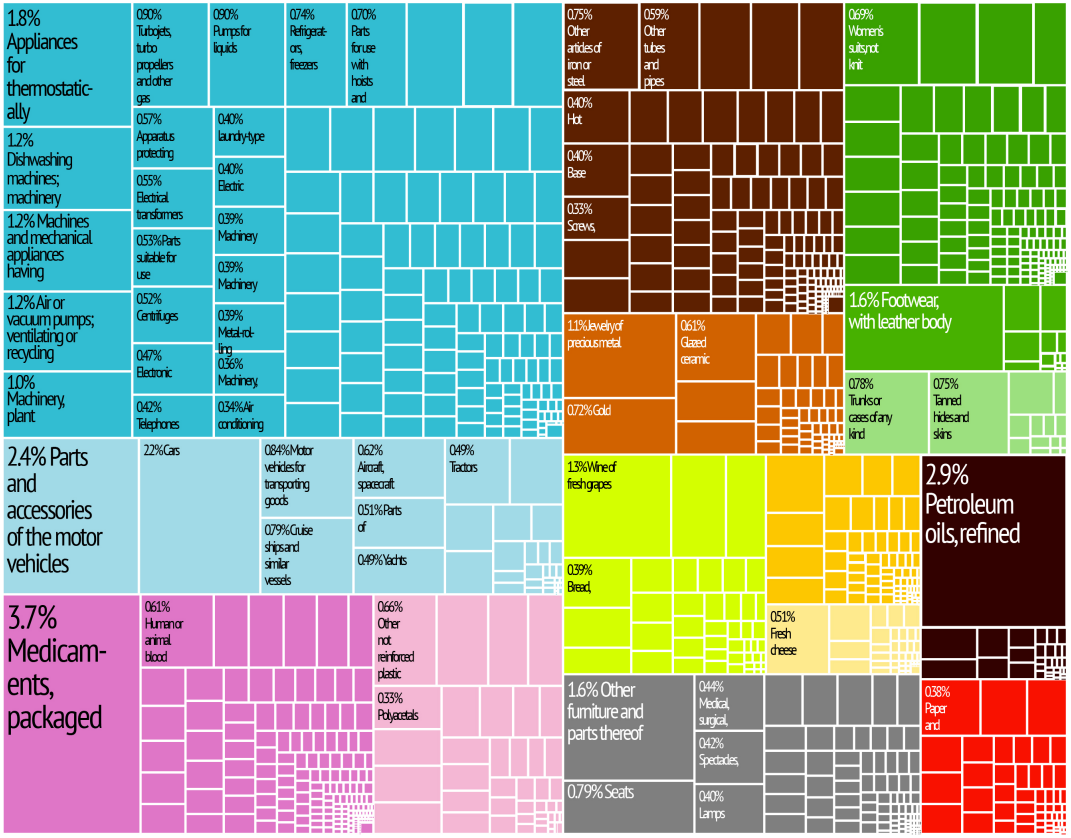
Also see:
Yifan Hu
The Tree of Life
2011
http://yifanhu.net/TOL/tol_9_19_2011.jpg

Image from:
http://www.guylevans.co.uk/blog/wp-content/uploads/2010/04/Website-Graph.jpg

Hierarchical Structures

Rectangular Treemaps

Uses nested rectangles to express hierarchy
Also communicates quantitative data, using size

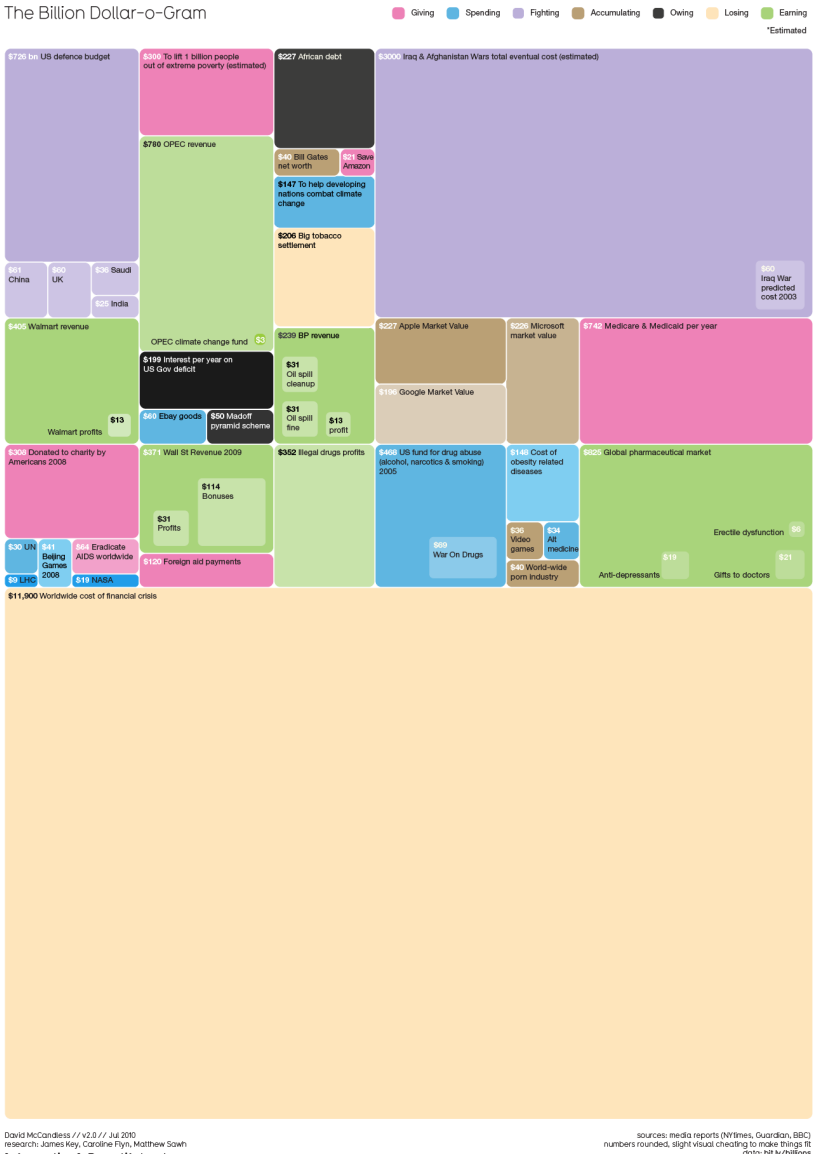


https://commons.wikimedia.org/wiki/File:Italy_Export_Treemap.jpg

Hierarchical Structures

Rectangular Treemaps

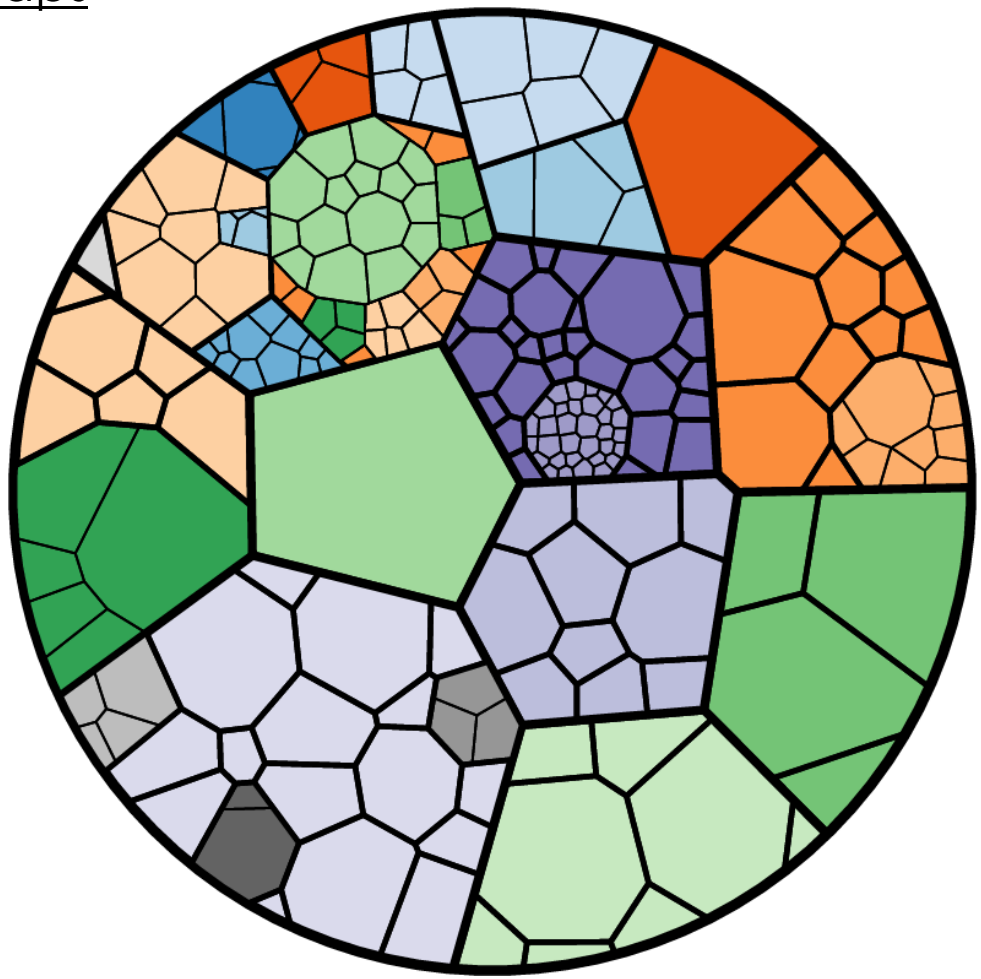
http://arcadenw.org/article/scientific-visualization-unaids-treemaps-and-more



http://www.informationisbeautiful.net/visualizations/billion-dollar-o-gram-2013/

Hierarchical Structures

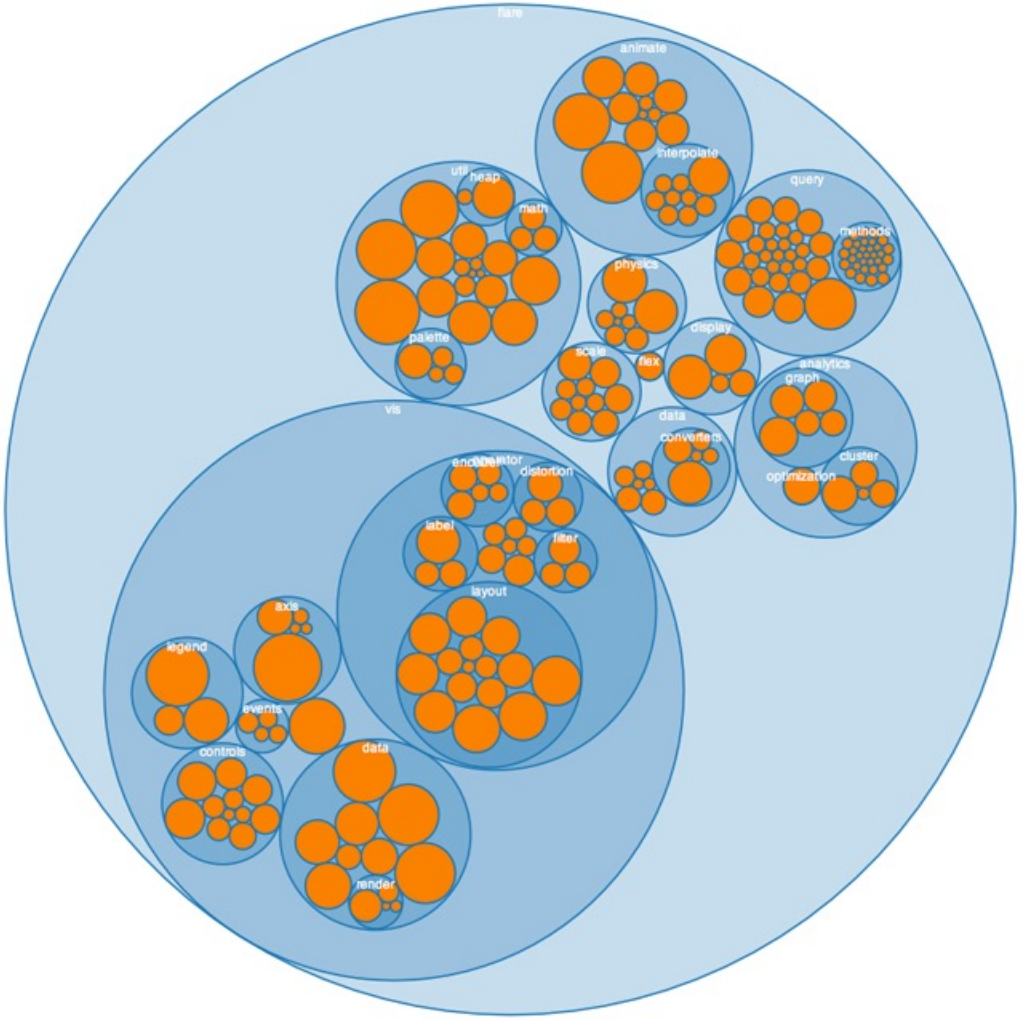
Voronoi Treemaps



http://cse512-14w.github.io/fp-plvines-djpeter/

Hierarchical Structures

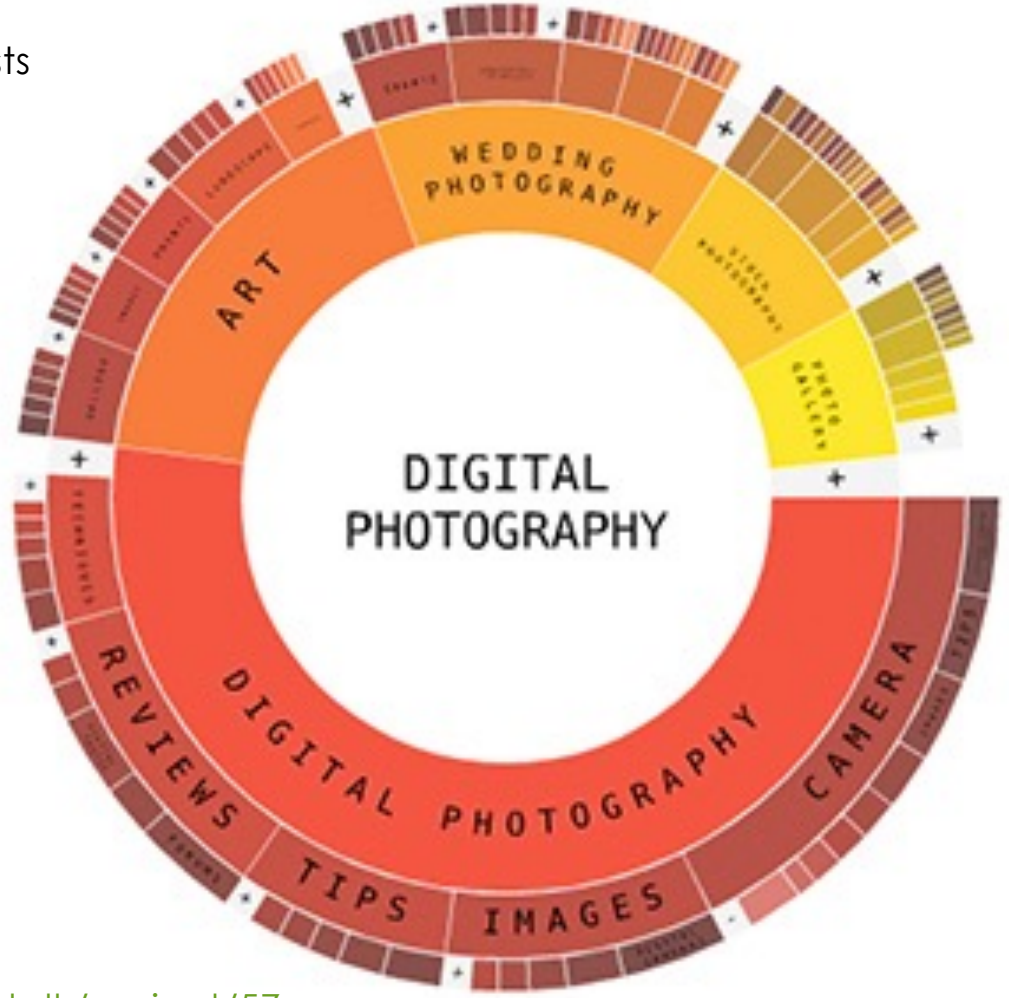
Circular Treemaps



http://homes.cs.washington.edu/~jheer/files/zoo/

Radial Treemaps

Also known as Sunbursts

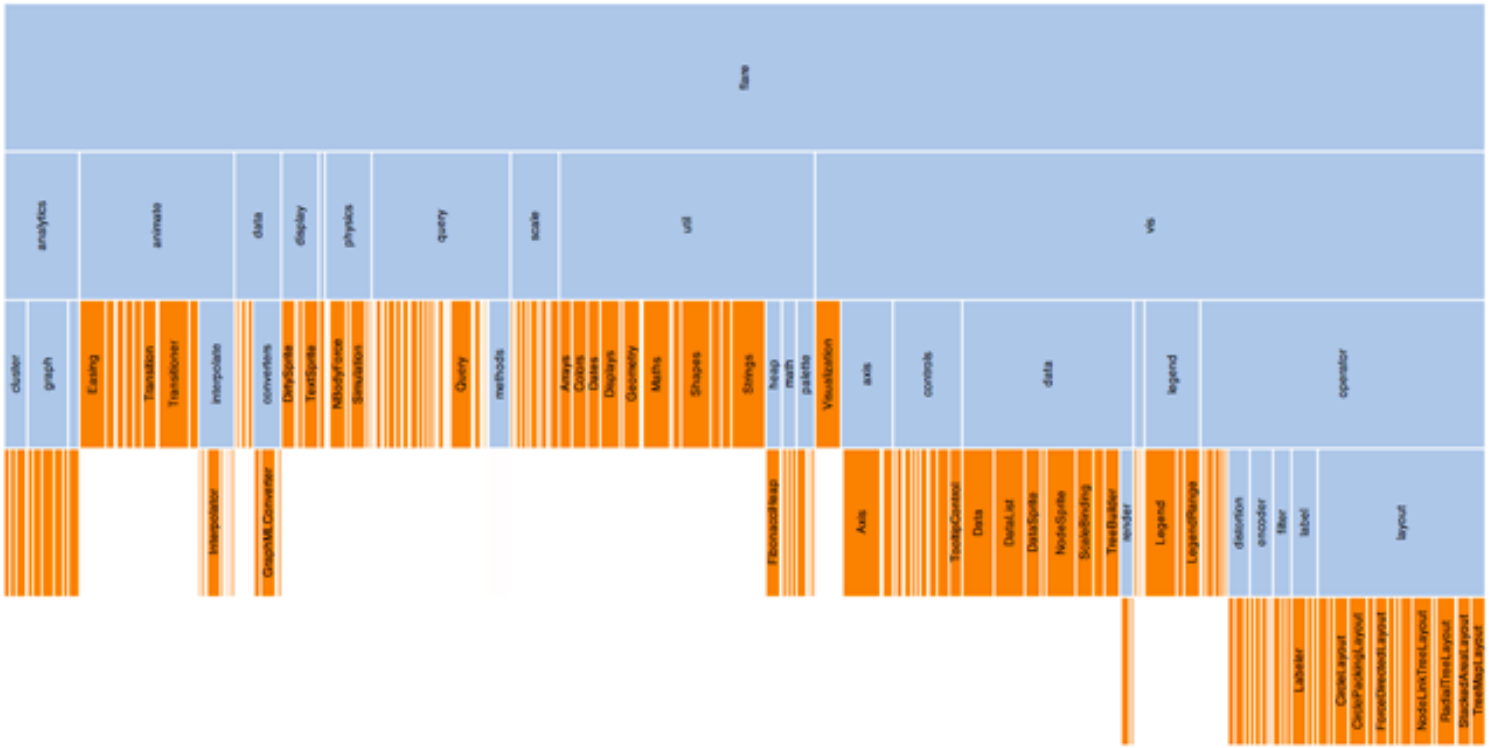


http://www.shiftcontrol.dk/project/57

Hierarchical Structures

Icicle Treemaps

Equivalent Sunbursts, in rectangular coordinates



http://homes.cs.washington.edu/~jheer/files/zoo/

Information Design

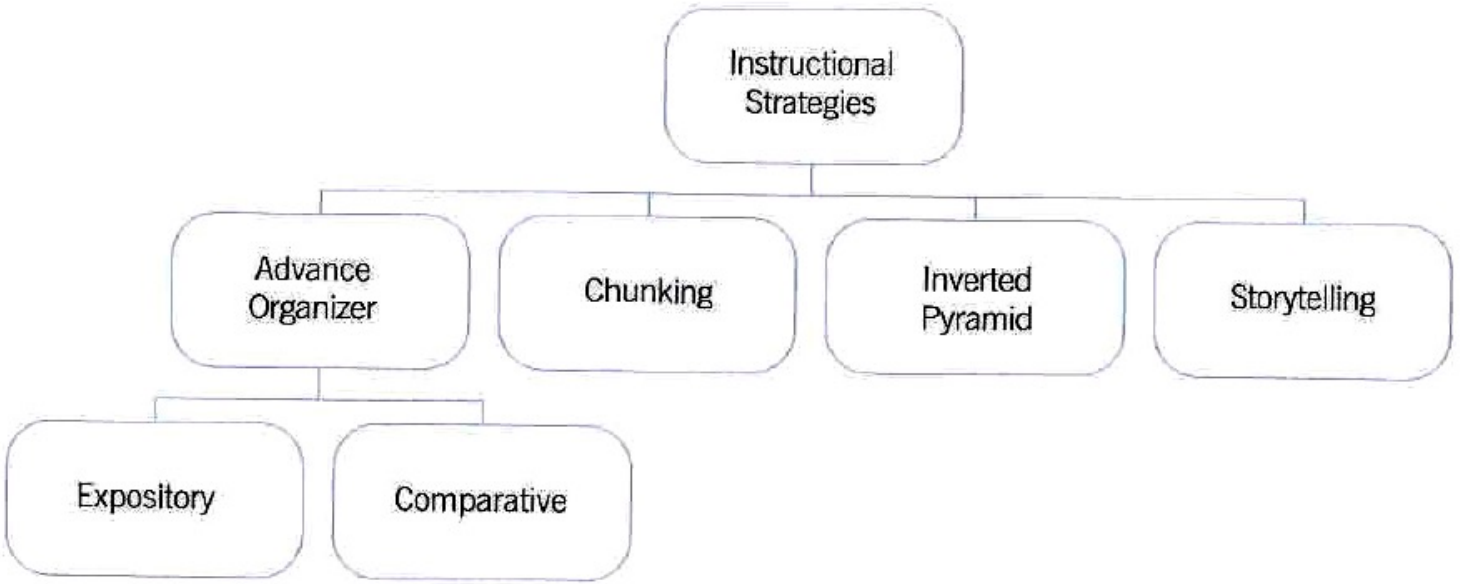
Five Hat Racks

There are five ways to organize information:
category,
time,
location,
alphabet, and
continuum (hierarchy).

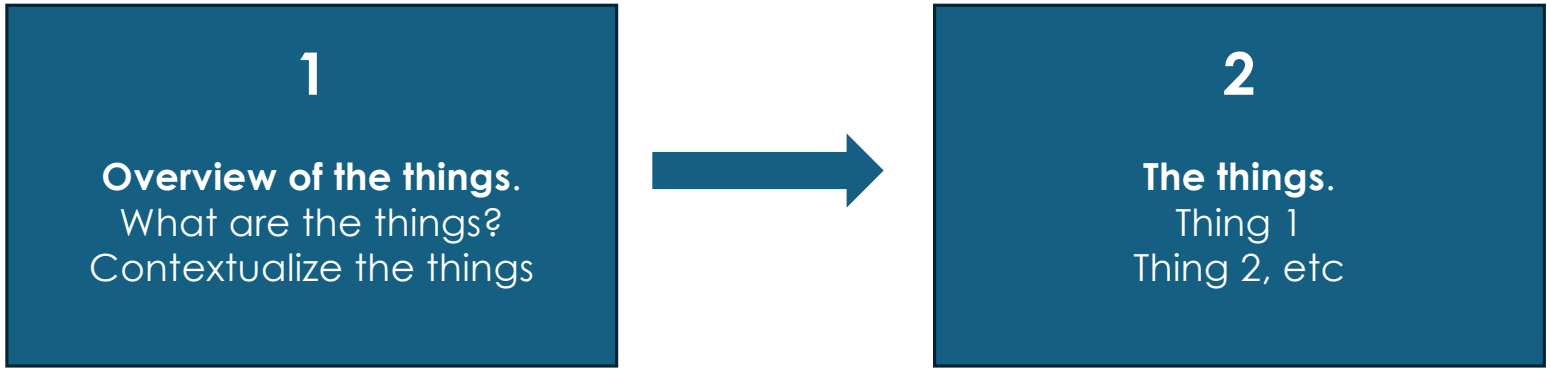
Also known as LATCH:

Location
Alphabet
Time
Category
Hierarchy

Instructional Strategies



Advance Organizer



Types of Advance Organizers:

- Expository
- Comparative
- Graphic
- Narrative
- Skimming

Chunking

Breaking down information into digestible chunks.

For aiding memory or for aiding concentration.

Examples: Phone numbers, step by step instructions, content chunking in courses.