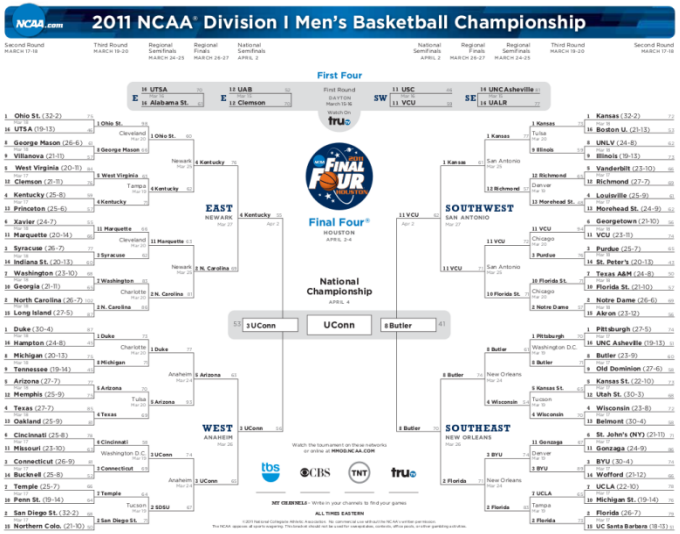
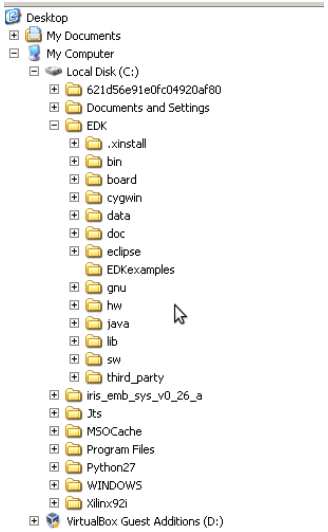
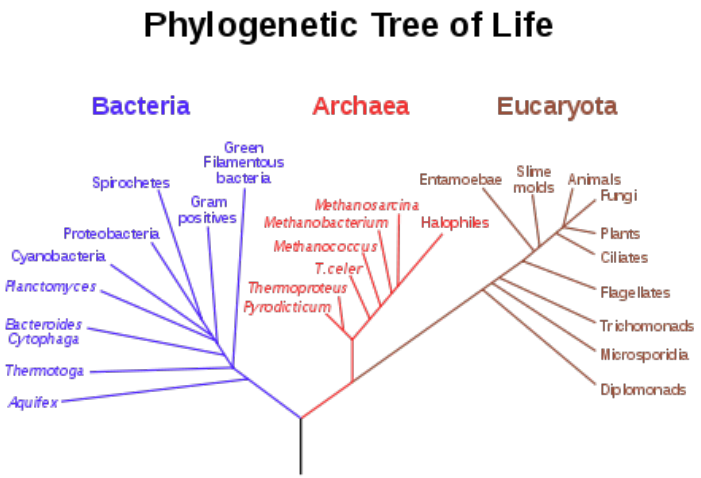
Trees and Hierarchies

Trees are everywhere



http://www.ncaa.com





A speculatively rooted tree for rRNA genes, showing major branches Bacteria,Archaea, and Eucaryote.
http://en.wikipedia.org/wiki/Phylogenetic_tree

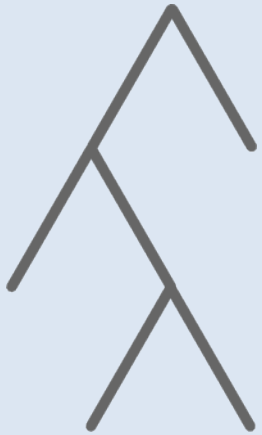
Definition

- Set of nodes and links that express the parent-to-child relationship.
- Where each node:
  - Is uniquely labeled in the tree.
  - Contains one or more numeric variables with values over time.
  - Contains one or more categorical attributes that may have more than one value.

Types of trees

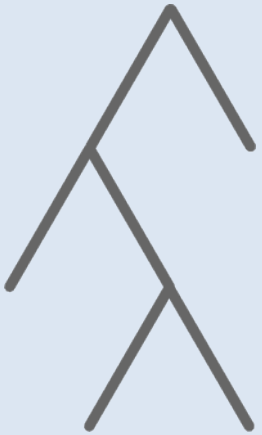
Fixed

State
↓
County
↓
City



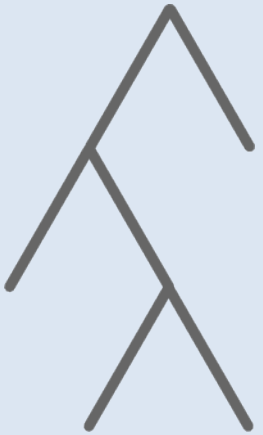
Dynamic

Gender
↕
Ethnicity
↕
Age range

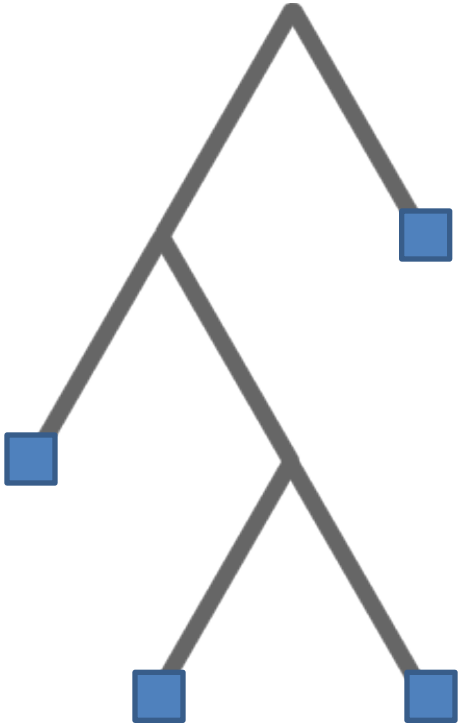


Mixed

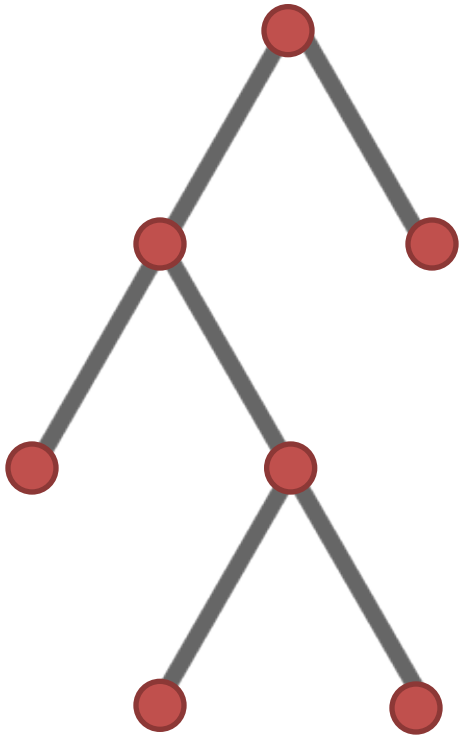
Gender
↕
State
↓
City



Types of trees (II)



Only leaves



Leaves and interior nodes

Edge Representation

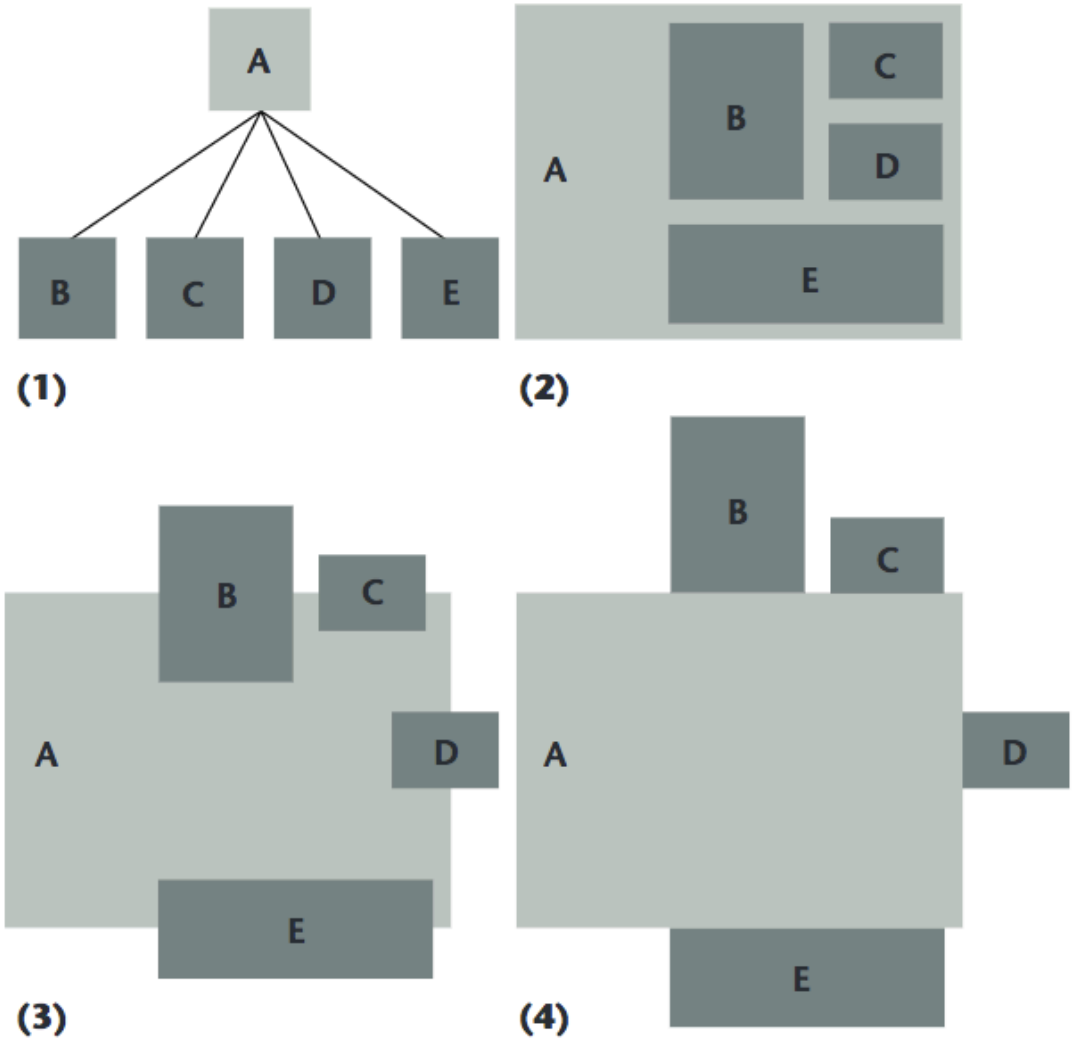
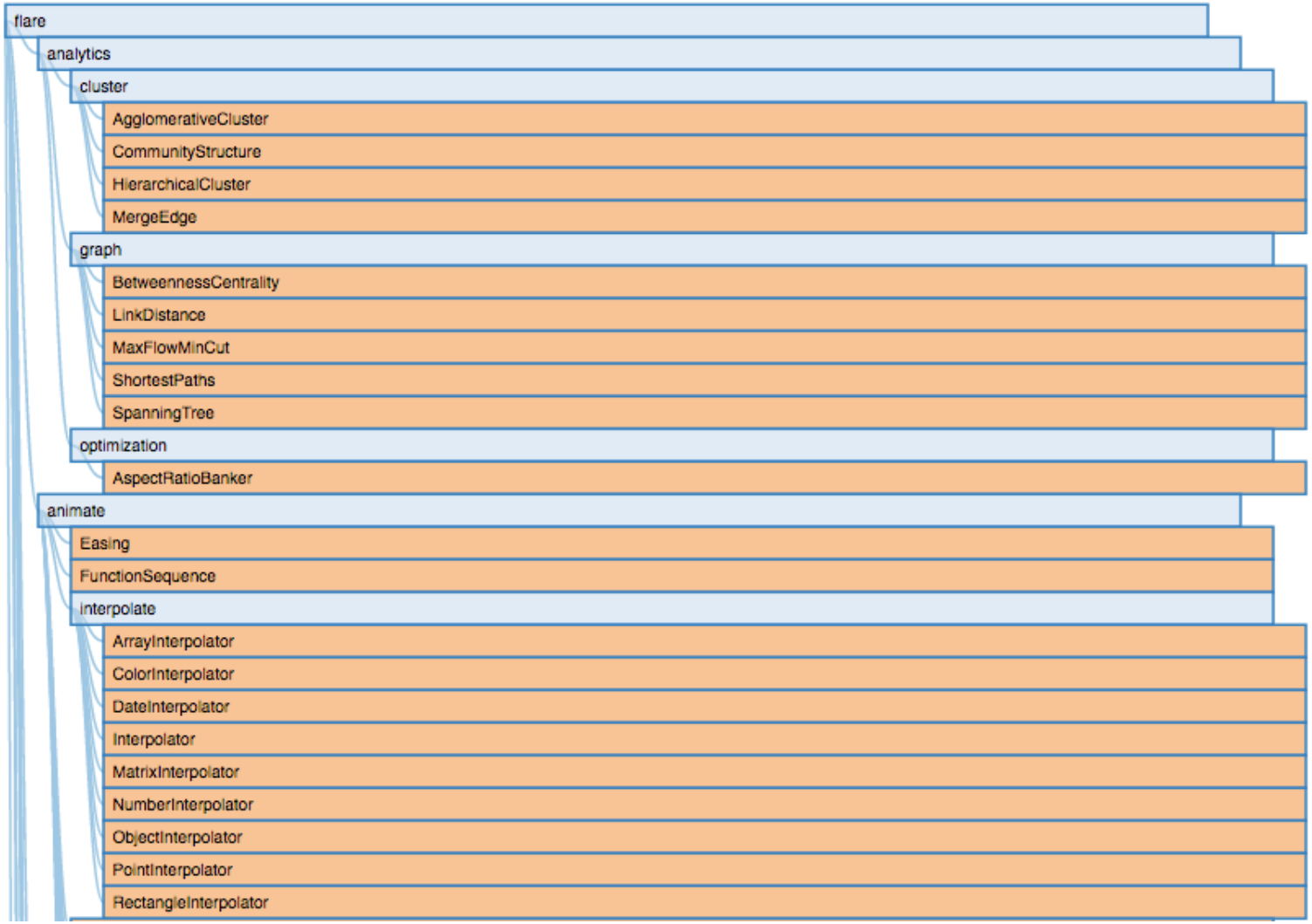


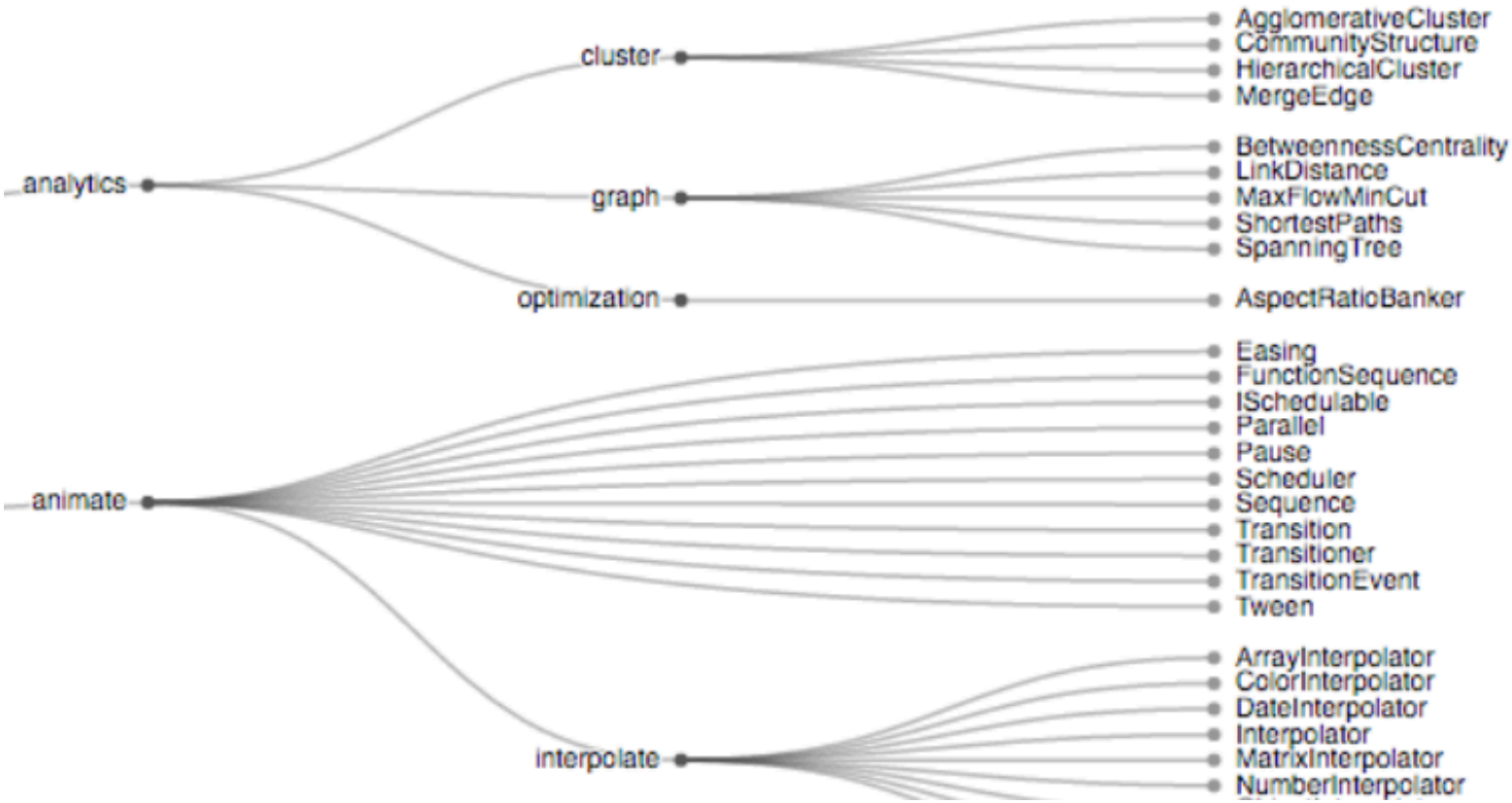
Diagram Source: Schulz, H. J. (2011). Treevisnet: A tree visualization reference. *IEEE Computer Graphics and Applications*, *31*(6), 11-15.

Indented Tree/Tree List



https://bl.ocks.org/mbostock/1093025

Node link tree



https://github.com/d3/d3-hierarchy

Radial Node Link

https://bl.ocks.org/mbostock/4063550

Treemaps

Good for:

- Saving space
- Seeing entire tree
- Seeing large/small

Challenging:

- Depth accuracy

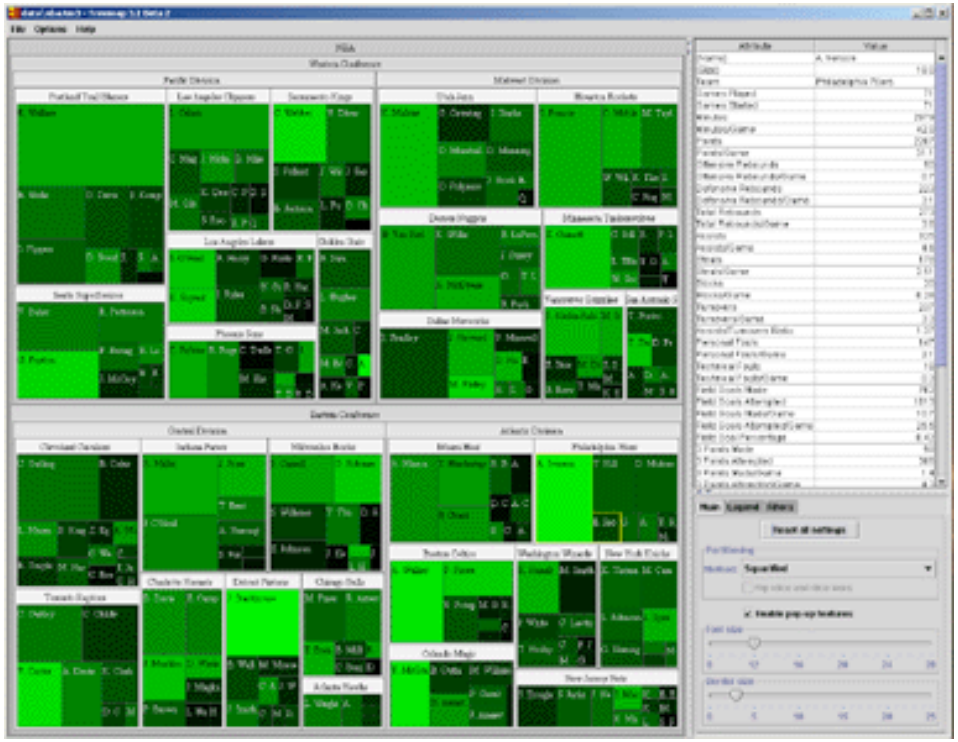


Chart Source: http://www.cs.umd.edu/hcil/treemap/index.shtml

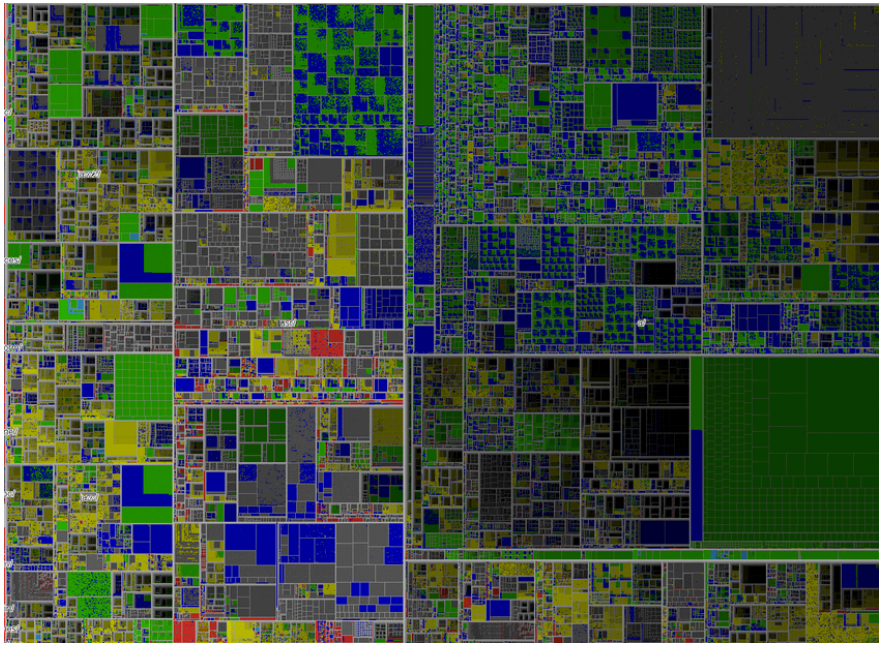
Scaling Treemaps

Goal: Show one million items effectively

Used:

- Shading
- Transparency,
- Stereovision
- Animation

(Fekete & Plaisant, 2002)

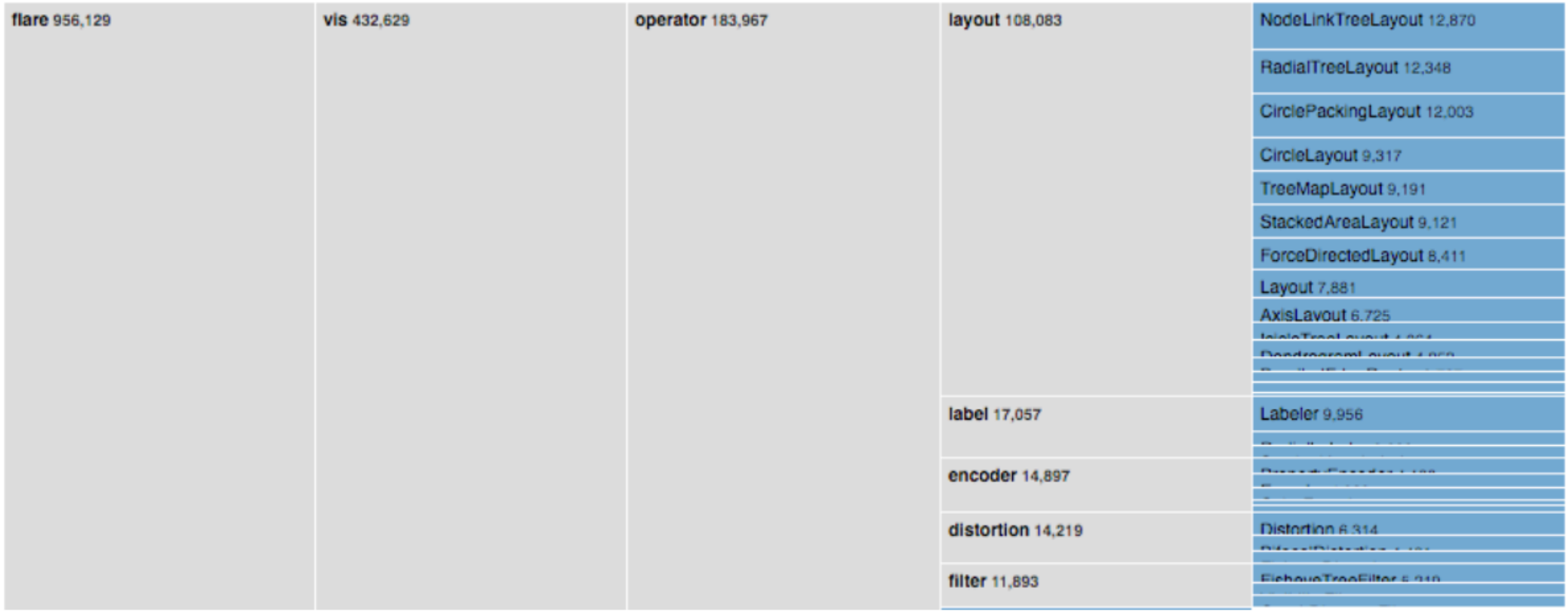


http://www.cs.umd.edu/hcil/VisuMillion/

Labels

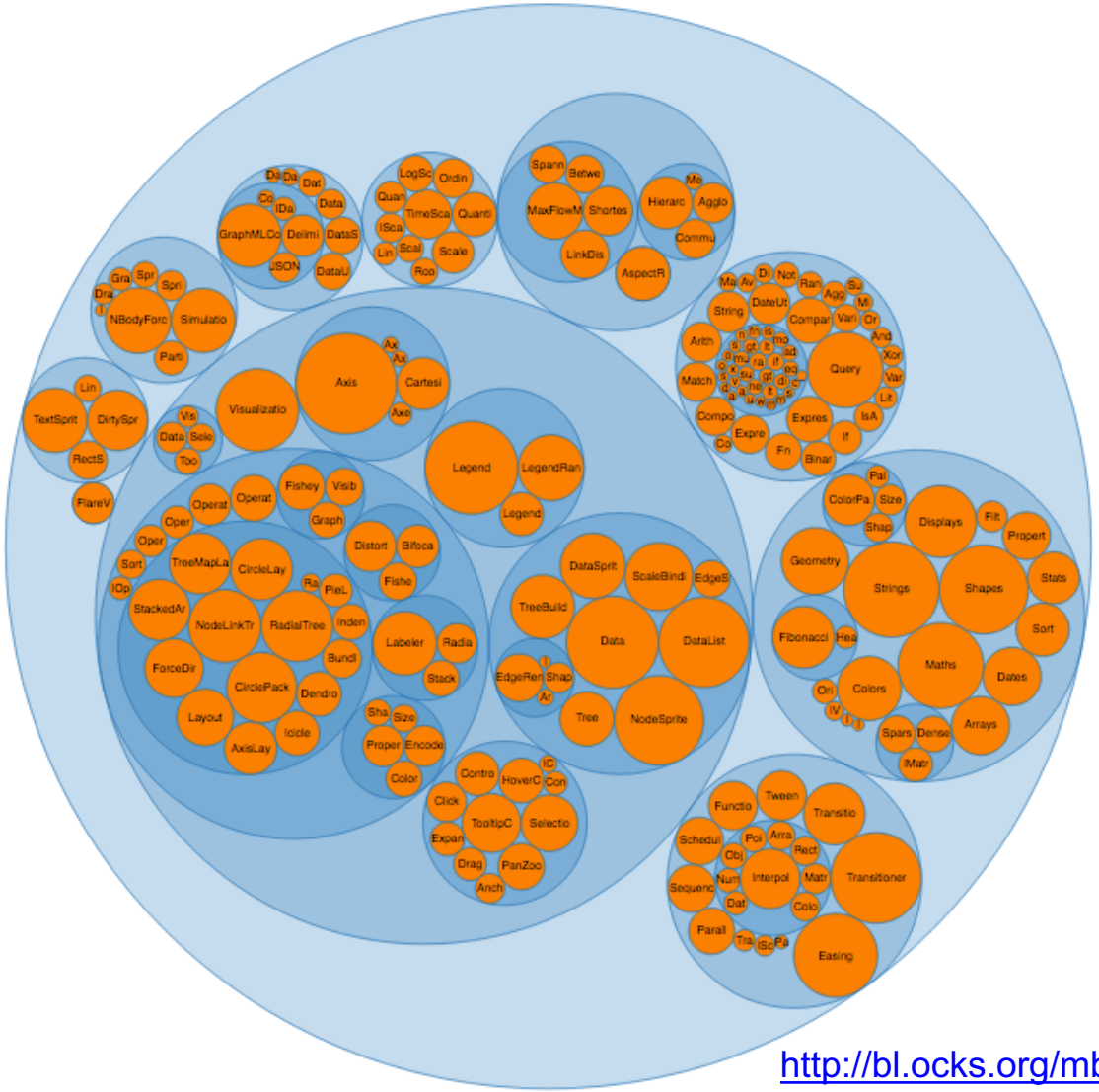

A
Philippines
Mindanao
Mindanao Island
Visayas
Bohol
Leyte
Cebu
Panay
Negros
Samar
Palawan
Luzon
Luzon Island
Mindoro
B
Philippines
Mindanao
Sulu Archipelago
Mindanao Island
Visayas
Leyte
Masbate
Cebu
Bohol
Panay
Negros
Samar
Palawan
Luzon
Mindoro
Luzon Island
C
Philippines
Luzon
Mindanao
Visayas
Luzon Island
Mindoro
Mindanao Island
Palawan
Samar
Negros
Panay
Leyte
Cebu
Bohol
Masbate
D
Philippines
Luzon
Mindanao
Visayas
Luzon Island
Mindoro
Mindanao Island
Sulu Archipelago
Palawan
Samar
Negros
Panay
Leyte
Cebu
Bohol
Masbate

Icicle Tree



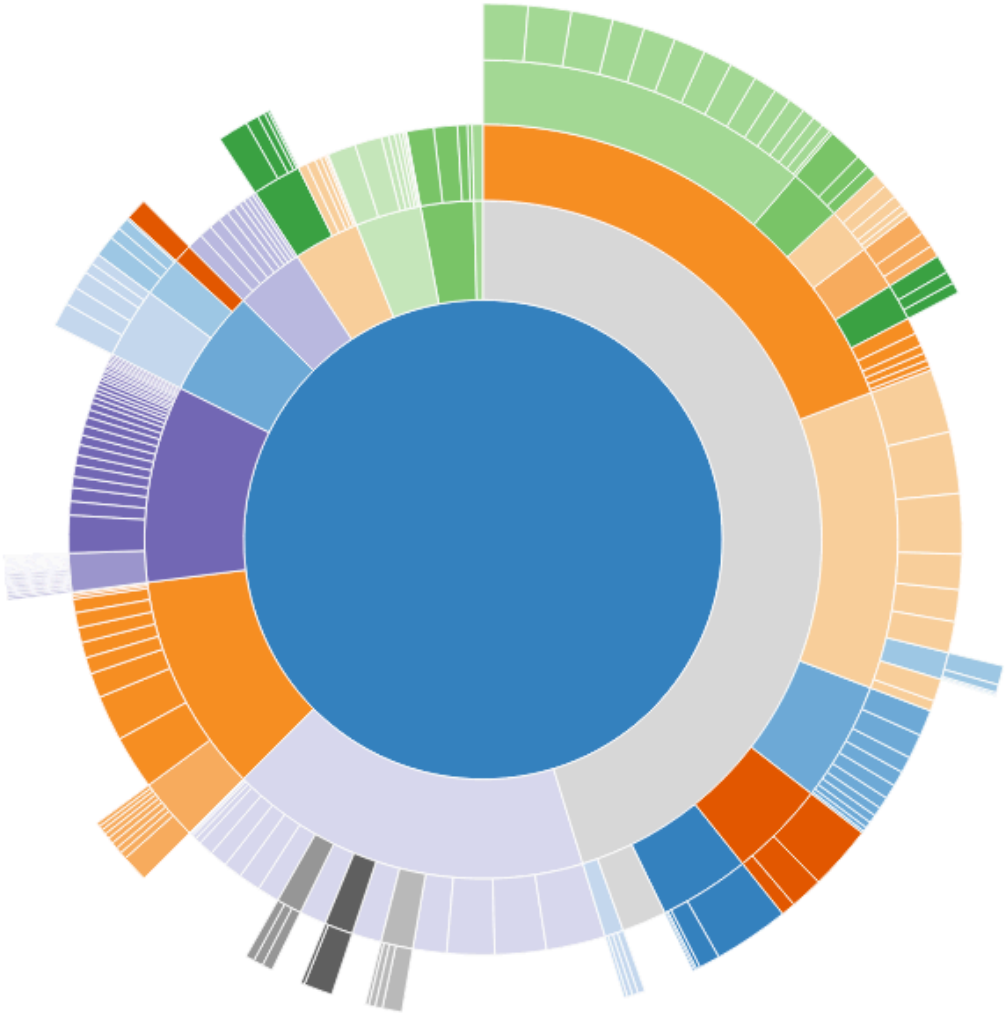
https://github.com/d3/d3-hierarchy

Circular Treemap



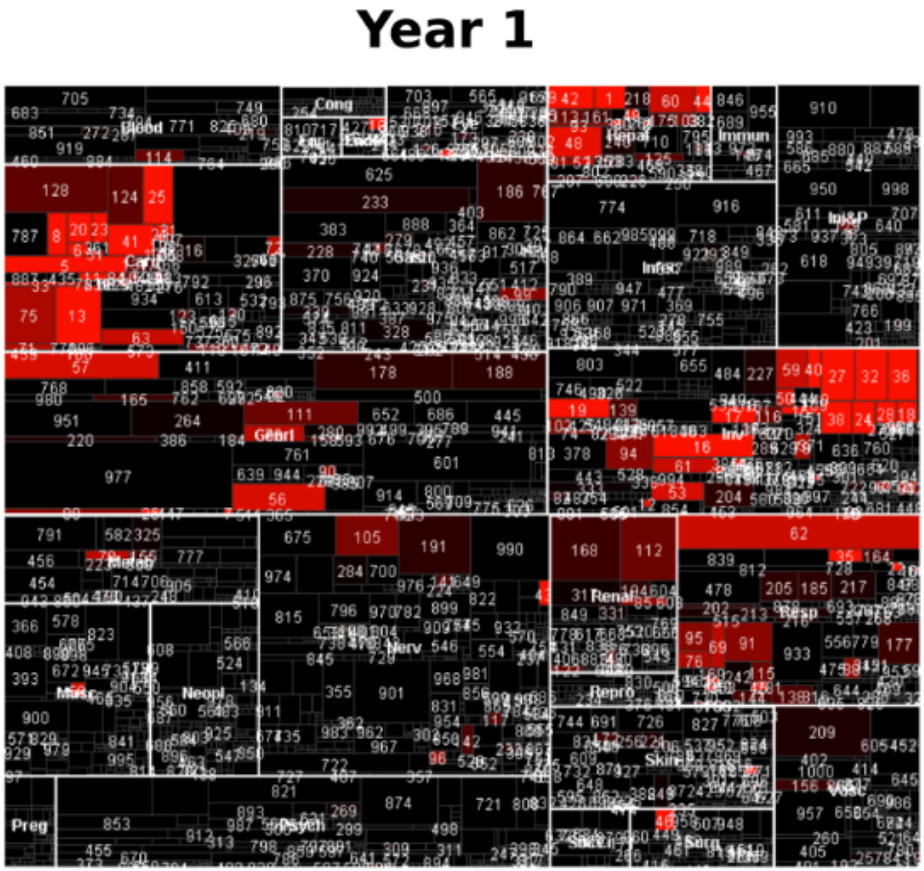
http://bl.ocks.org/mbostock/4063530

Sunburst



http://bl.ocks.org/mbostock/4348373

Comparison: Poor



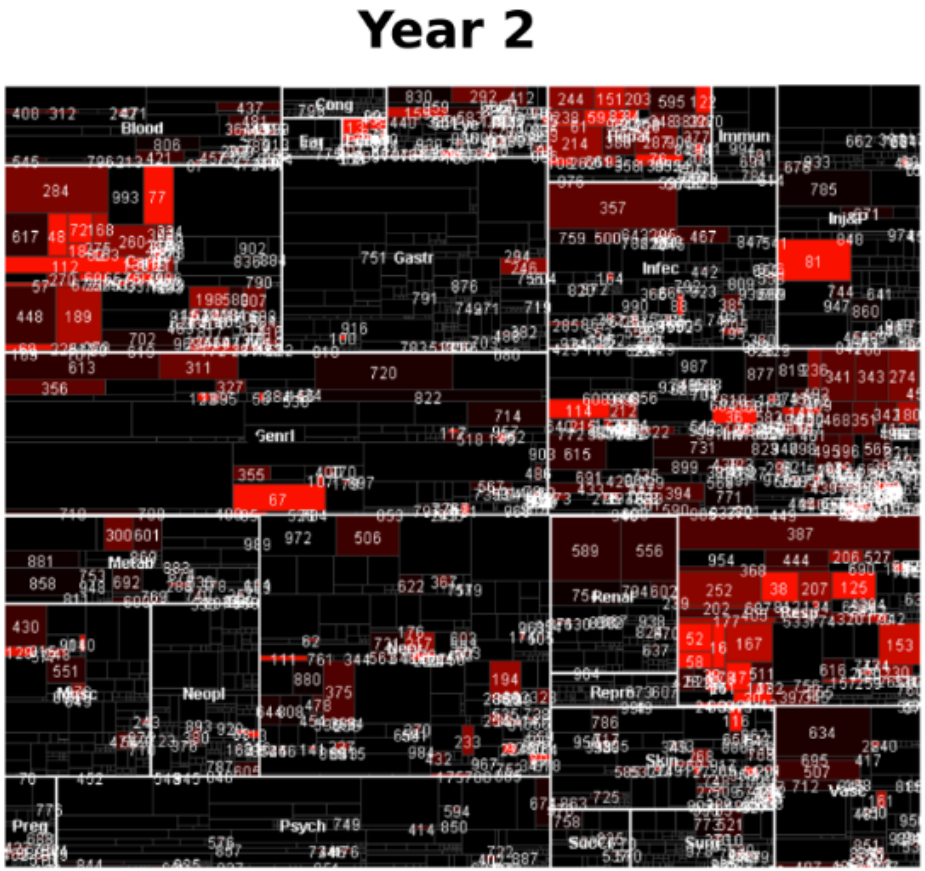


Diagram source: Guerra Gomez, J., Pack, M., Plaisant, C., & Shneiderman, B. Visualizing changes over time in datasets using dynamic hierarchies.

Comparison: Better

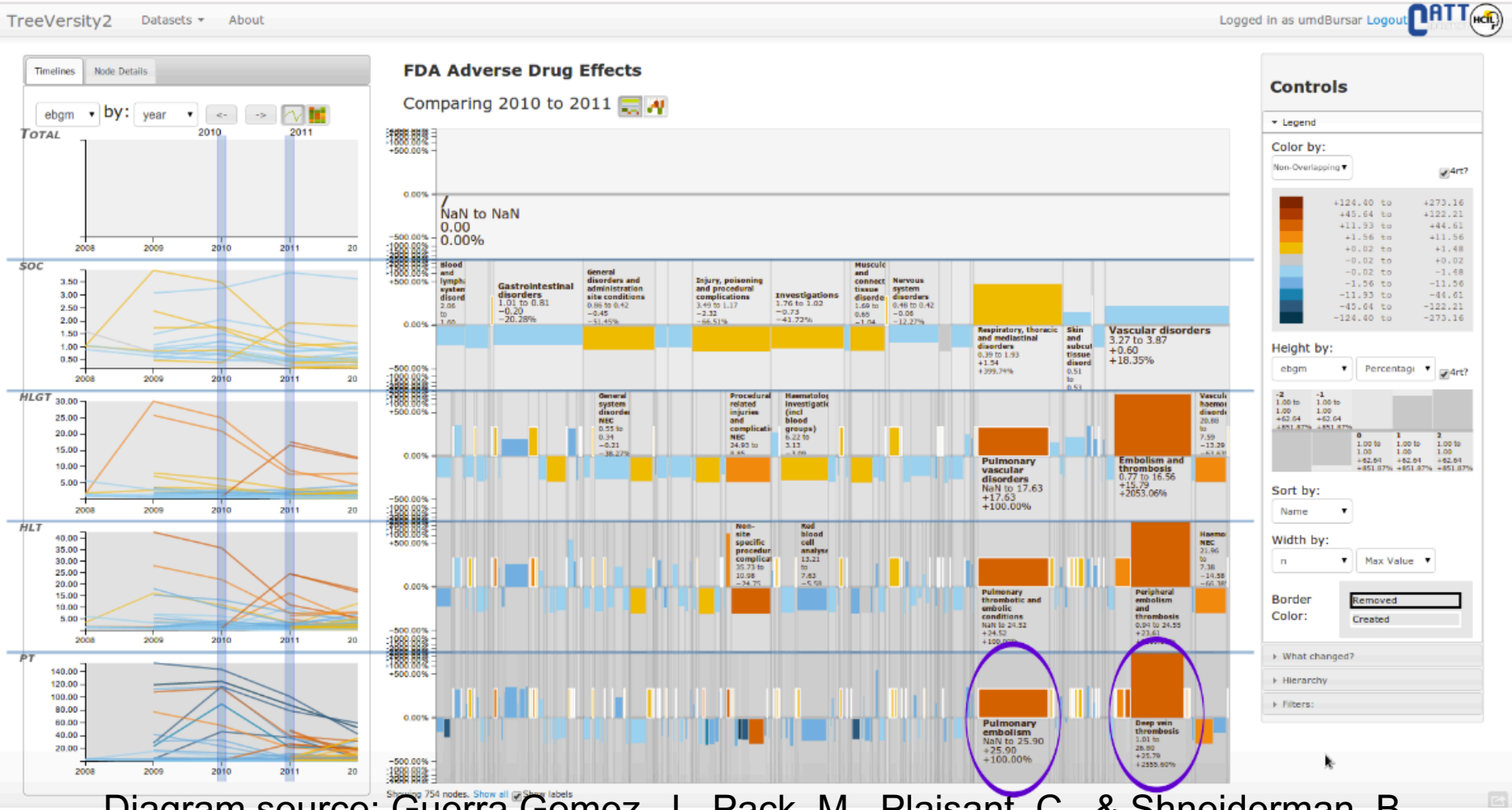
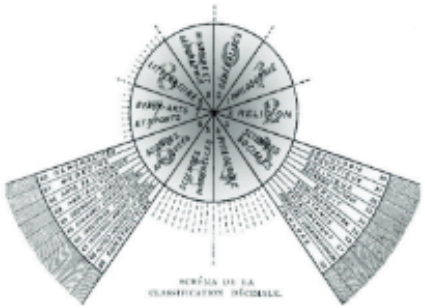
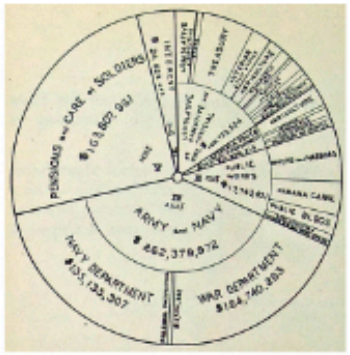


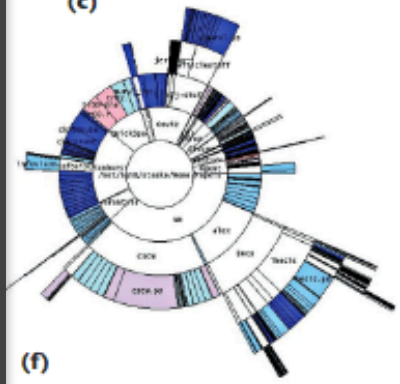
Diagram source: Guerra Gomez, J., Pack, M., Plaisant, C., & Shneiderman, B. Visualizing changes over time in datasets using dynamic hierarchies.



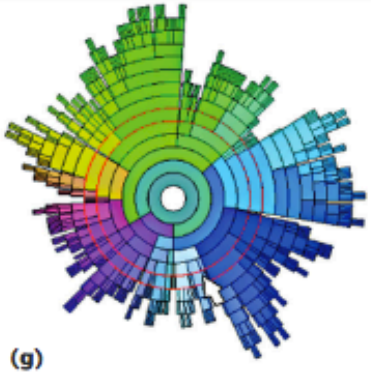


Design Guidelines

(c)



(f)



(g)

(h)

(i)

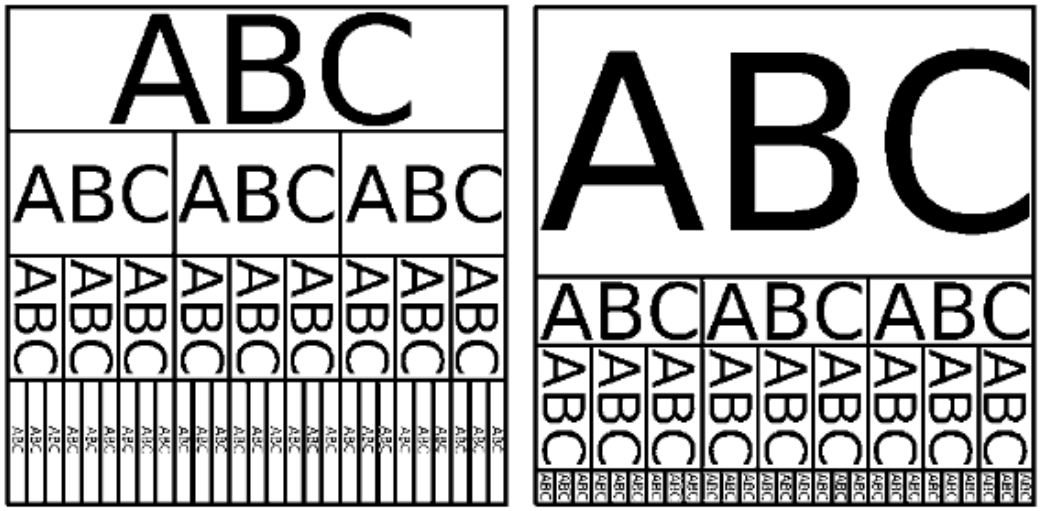
Diagram Source: Schulz, H. J. (2011). Treevisnet: A tree visualization reference. *IEEE Computer Graphics and Applications*, *31*(6), 11-15.

Selecting a Layout

- Consider the data: node number, depth, and ordering
- Rectilinear or radial layout

Label Visibility

- Match label and leaf-node aspect ratio
- Orient labels appropriately



McGuffin, M. J., & Robert, J. M. (2010). Quantifying the space-efficiency of 2D graphical representations of trees. *Information Visualization, 9*(2), 115-140.

Interactions

Use interaction capabilities to save space when appropriate

- Zoom
- Collapsible
- Hover over

When in doubt, test it!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