https://newsmap-js.herokuapp.com

Storing in the DB

Hierarchical Structures

from Isabel Meirelles

Design for Information

Chapter 1

Stefanie Posavec & Greg McInerny

American graphic designer in London.

Art, Books

About

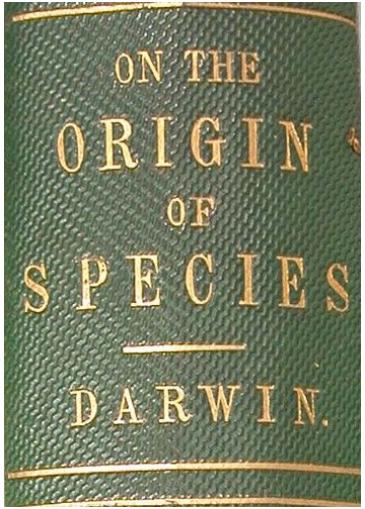
Visual aspect of the (En)tangled Word Bank.

Assistant Professor, MS Research Cambridge

Research Project

Gathering data and programming (C++, R) for the (En)tangled Word Bank.

(En)tangled Word Bank project (2009)



The project visualises the insertions / deletions of text through the six editions of '*The Origin of Species*' by Charles Darwin.

Each sentence is coloured according to whether the sentence will survive to the next edition (blue) or whether it will be deleted and not be within the next edition (orange).

MOMA Exhibit

Explained on Flickr, Explained by AAAS

On the Origin of Species by Charles Darwin - all six editions

Charles Darwin ‘The Origin of Species’

Sentences are “blue” or “orange” leaflets

Paragraph “leaves”

Subchapters

Chapters

Hierarchical systems are ordered sets where elements and/or subsets are organized in a given **relationship** to one another, both among themselves and within the whole.

Hierarchical Structures or Trees

- Cartesian coordinate system
  - Node-link layout
  - Dendrogram
  - Indented layout
  - Cone-tree
  - Icicle tree
  - Treemap
- Polar coordinate system
  - Node-link radial layout
  - Radial icicle or sunburst
- Other
  - 3D hyperbolic tree
  - Voronoi

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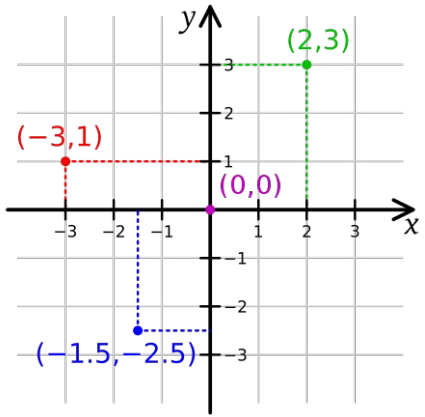
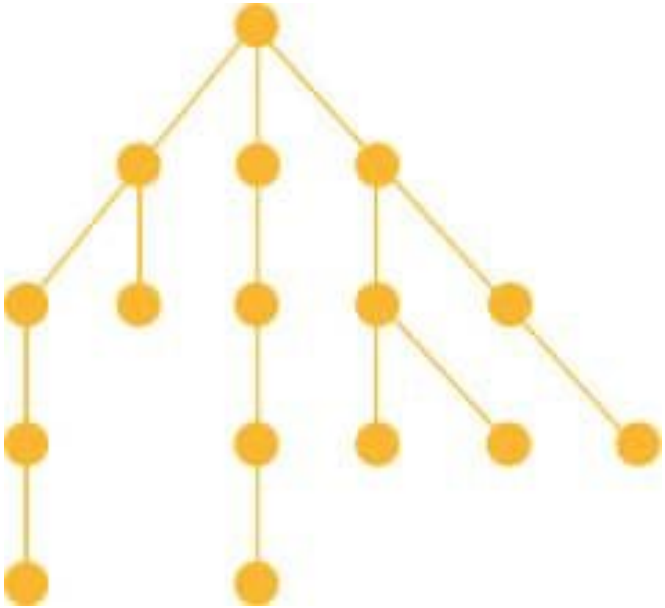
Cartesian



Classical node-link layout

Connect nodes together with line segments. In Tableau



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Dendrogram

https://learning.oreilly.com/library/view/design-for-information/9781592538065/xhtml/ch01.xhtml

Dendrogram

In hierarchical clustering, a dendogram illustrates an arrangement of clusters:
https://www.displayr.com/what-is-dendrogram/

Horizontal and vertical dendrogram; a dendrogram above a heatmap:

https://www.data-to-viz.com/graph/dendrogram.html

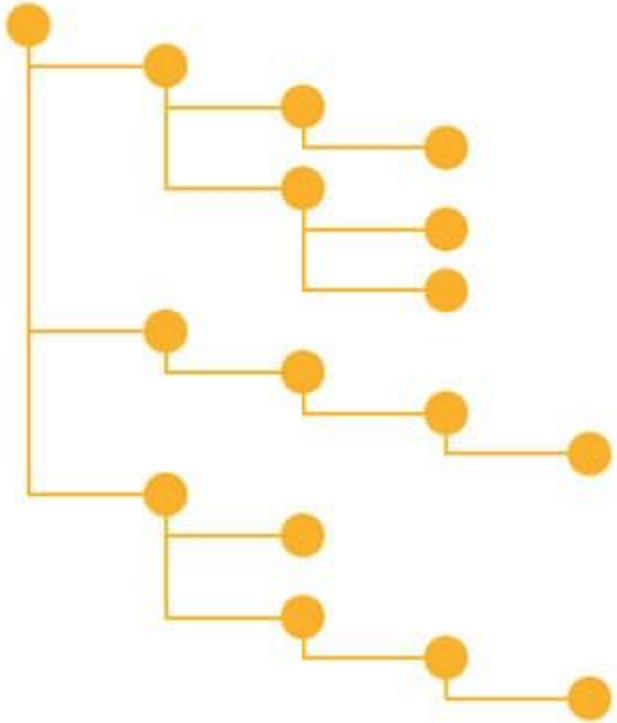
Dendrogram in Tableau

What is the difference?

https://bl.ocks.org/Andrew-Reid/c7ae41a98b8cbb38f1febf13deb9d294

The difference between a dendrogram and a tree is that **a dendrogram puts all childless nodes (terminal nodes) at the same level**, while the tree layout places all nodes with the same parent at the same level.

Indented Layout



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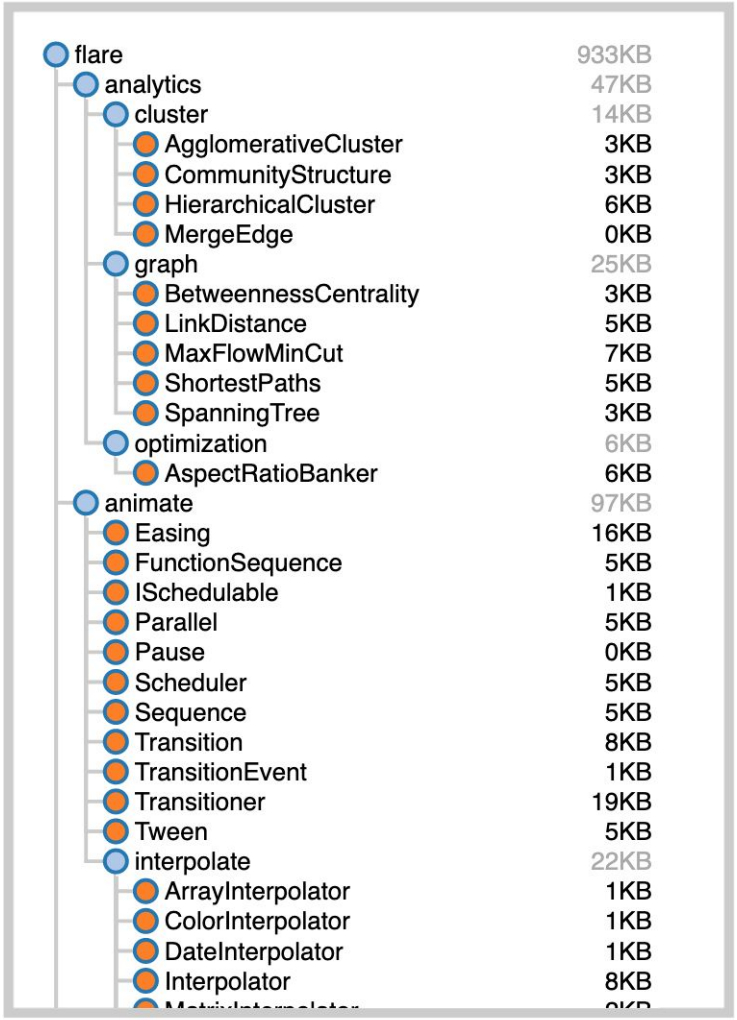
Example

Indented layout trees are widely used to represent **file systems**.

In this example, alignment against left margin is utilized.

Parent–child relationships are visualized with relative vertical position, in addition to **tree depth** with horizontal position.



Cone-tree is a 3D node-link layout

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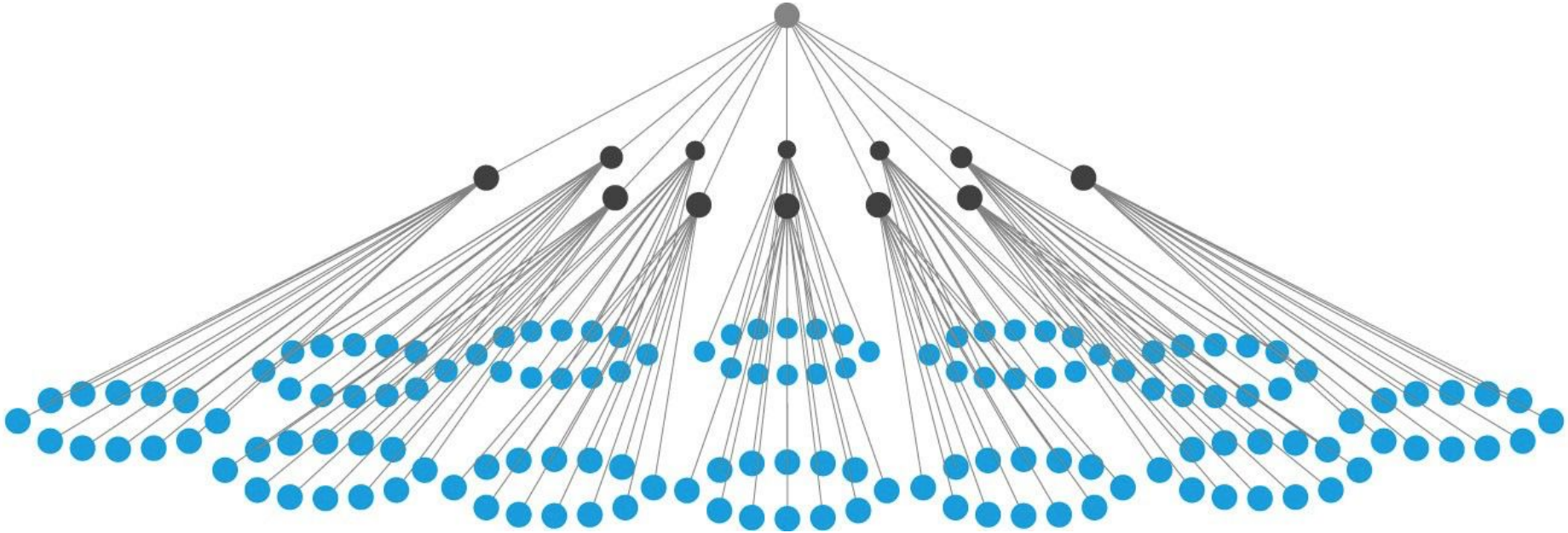


From https://www.interaction-design.org/literature/article/how-to-show-hierarchical-data-with-information-visualization

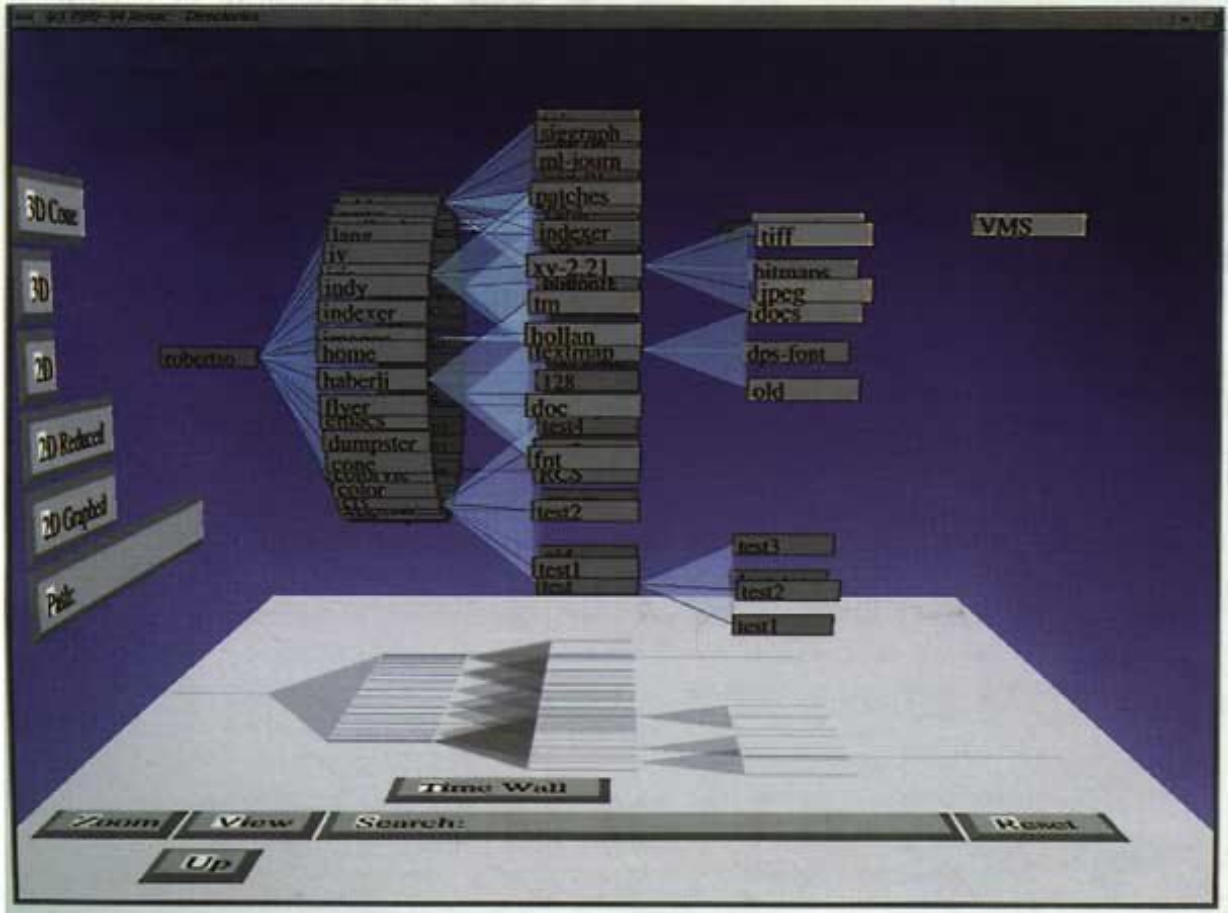
Cone-tree layout

Each tree node is the apex of a cone. The children of each node are drawn around the base of its associated cone.

3D hierarchy model was developed at Xerox PARC in the 1990s.

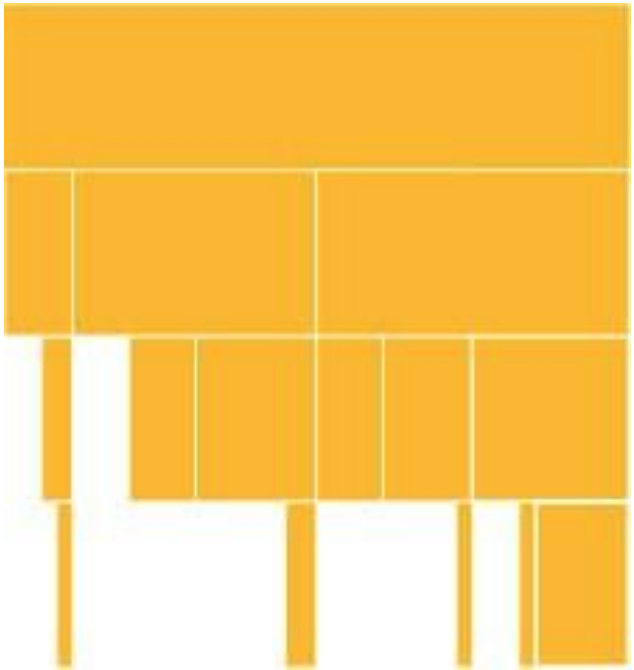
https://research.tableau.com/sites/default/files/p189-robertson.pdf

https://infovis-wiki.net/wiki/Cone_Trees



The original cone-tree by Xerox

Icicle Tree



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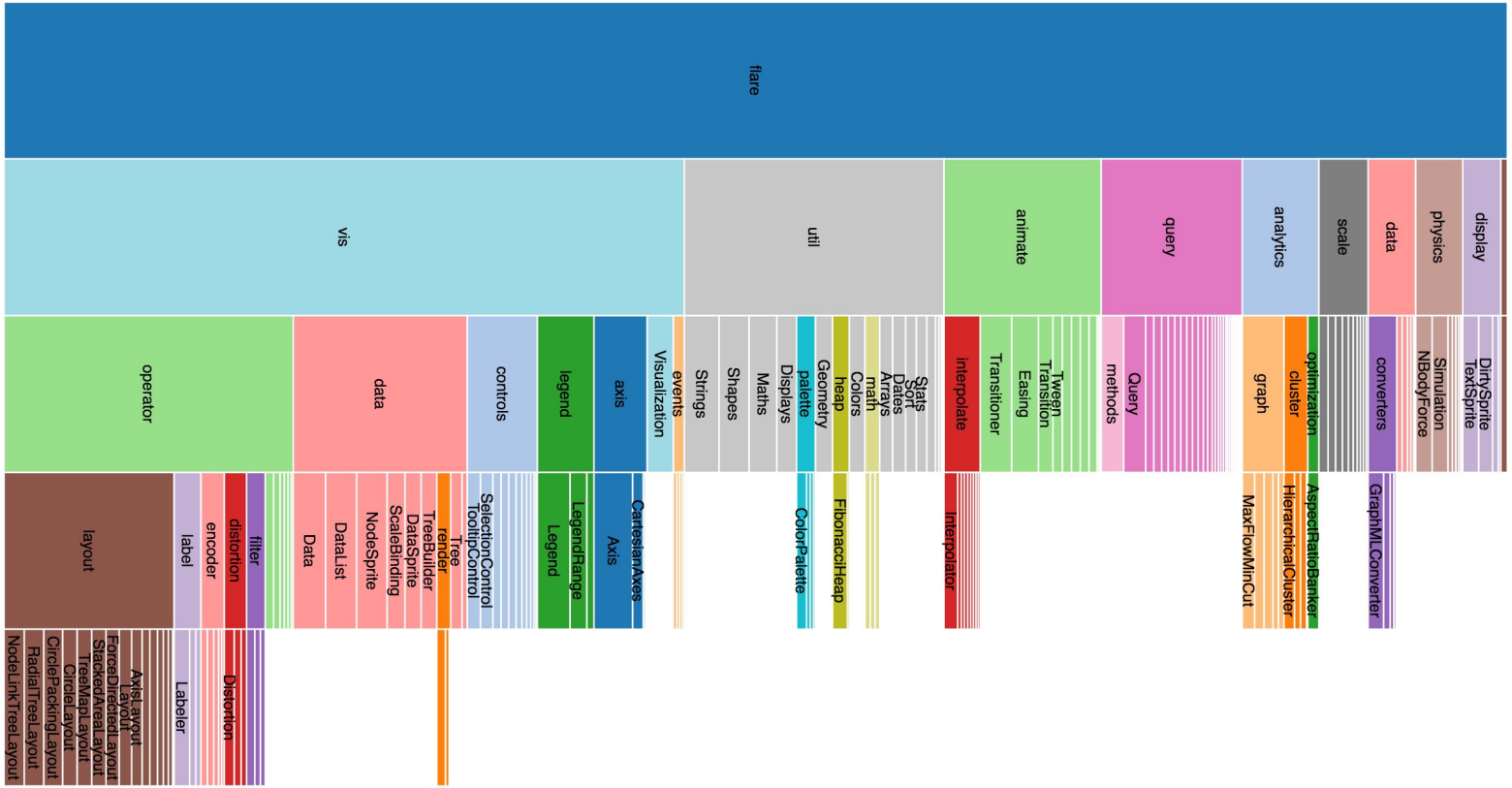


Zoomable icicle tree: https://vasturiano.github.io/icicle-chart/example/flare/

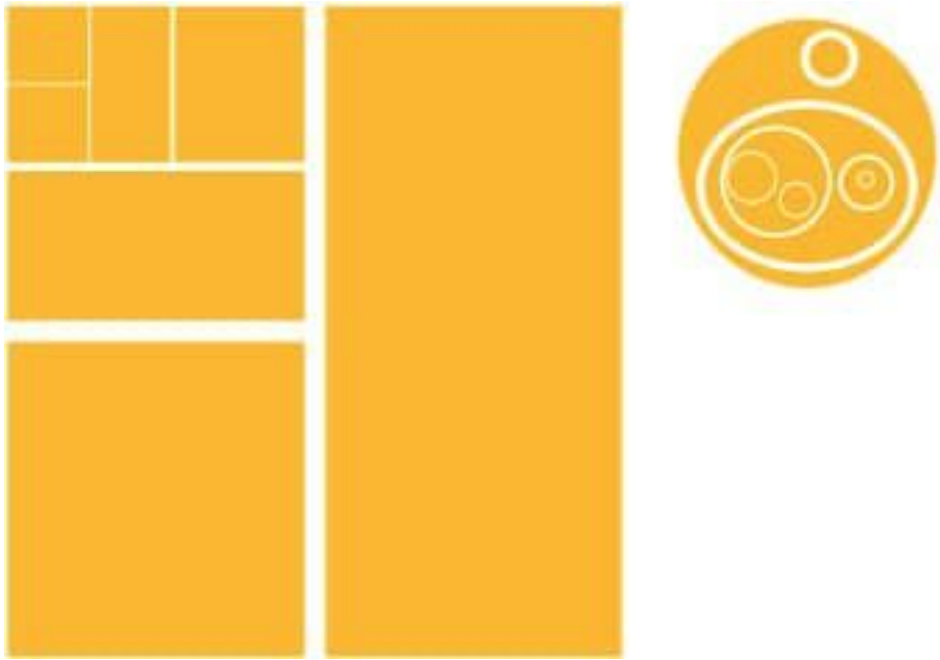
Icicle layout

Adjacency diagrams are space-filling variants of node-link diagrams; rather than drawing a link between parent and child in the hierarchy, **nodes are drawn as solid areas** (either arcs or bars), **and their placement relative to adjacent nodes reveals their position in the hierarchy**. The above "icicle" layout is similar to the first node-link diagram, in that the root node appears at the top, with child nodes underneath. However, because the nodes are now space-filling, we can use a length encoding for the size of the tree (software classes and packages). This reveals an additional dimension that would be difficult to show in a node-link diagram.

From https://homes.cs.washington.edu/~jheer/files/zoo/

https://www.cs.middlebury.edu/~candrews/showcase/infovis_techniques_s16/icicle_plots/icicleplots.html

Treemap



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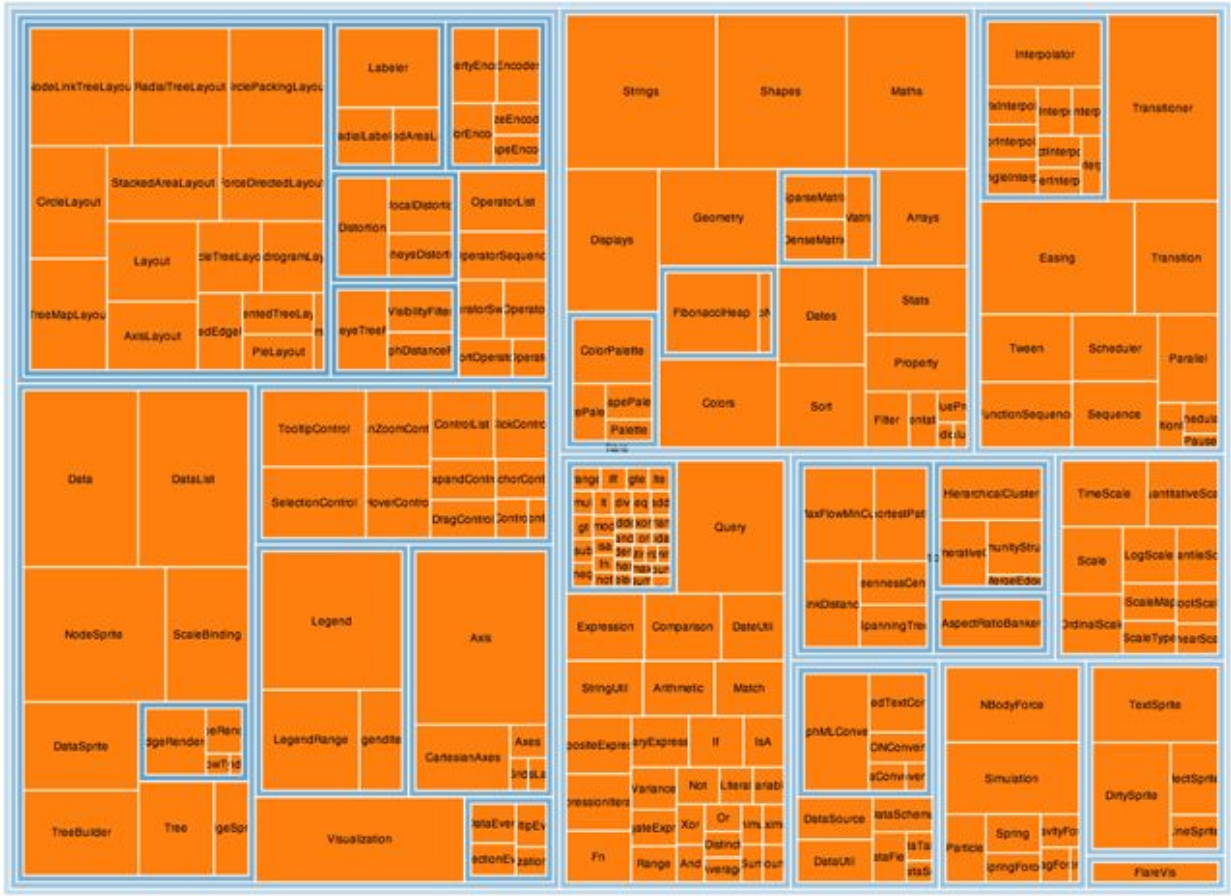


https://homes.cs.washington.edu/~jheer/files/zoo/ex/hierarchies/treemap.html

Treemap

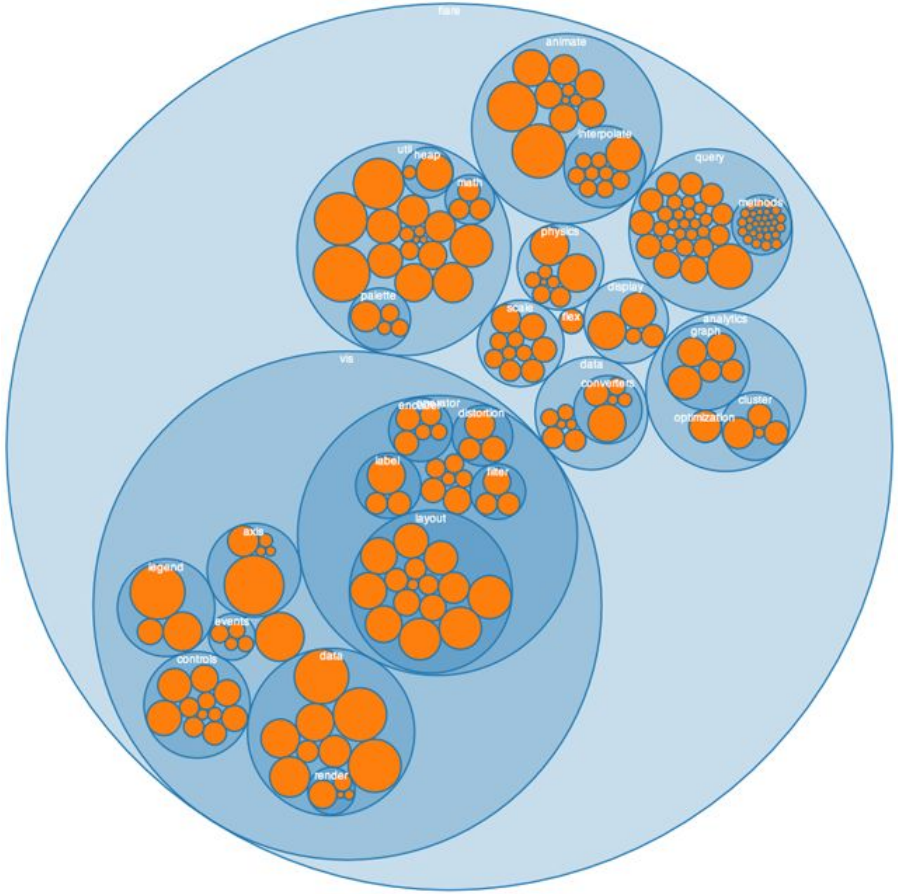
Enclosure diagrams are also space-filling, **using containment rather than adjacency to represent the hierarchy**. Introduced by Ben Shneiderman in 1991, a treemap recursively subdivides area into rectangles. As with adjacency diagrams, the size of any node in the tree is quickly revealed. The above example uses padding (in blue) to emphasize enclosure; an alternative saturation encoding is sometimes used. Squarified treemaps use approximately-square rectangles, which offer better readability and size estimation than a naive "slice-and-dice" subdivision.

From https://homes.cs.washington.edu/~jheer/files/zoo/

TreeMap Case Studies

Newsmap

S&P 500 TreeMap, About Market Treemap (1998) - one of the fist web viz.



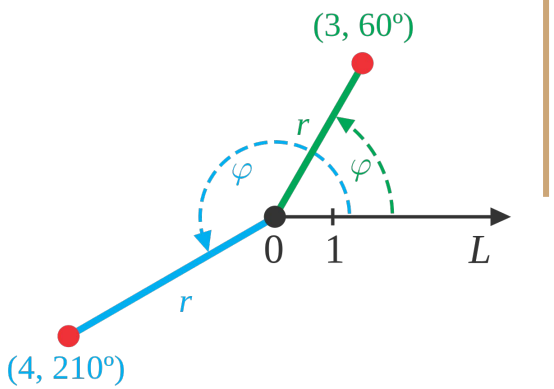
https://homes.cs.washington.edu/~jheer/files/zoo/ex/hierarchies/pack.html

Treemap cont.

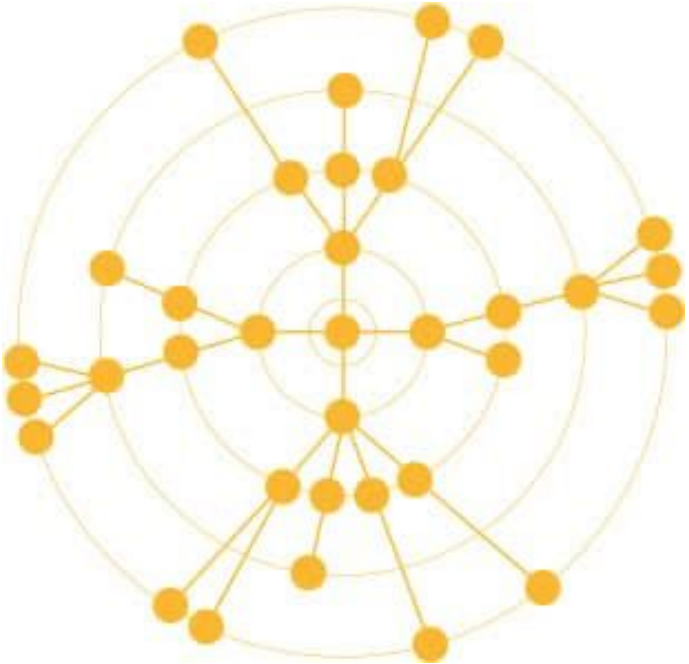
By packing circles instead of subdividing rectangles, we can produce a different sort of enclosure diagram that has an almost organic appearance. While it does not use space as efficiently as a treemap, **the "wasted space" of circle-packing layouts effectively reveals the hierarchy**. At the same time, node sizes can be rapidly compared using area judgments.

From https://homes.cs.washington.edu/~jheer/files/zoo/

Polar Systems



Node-link radial layout



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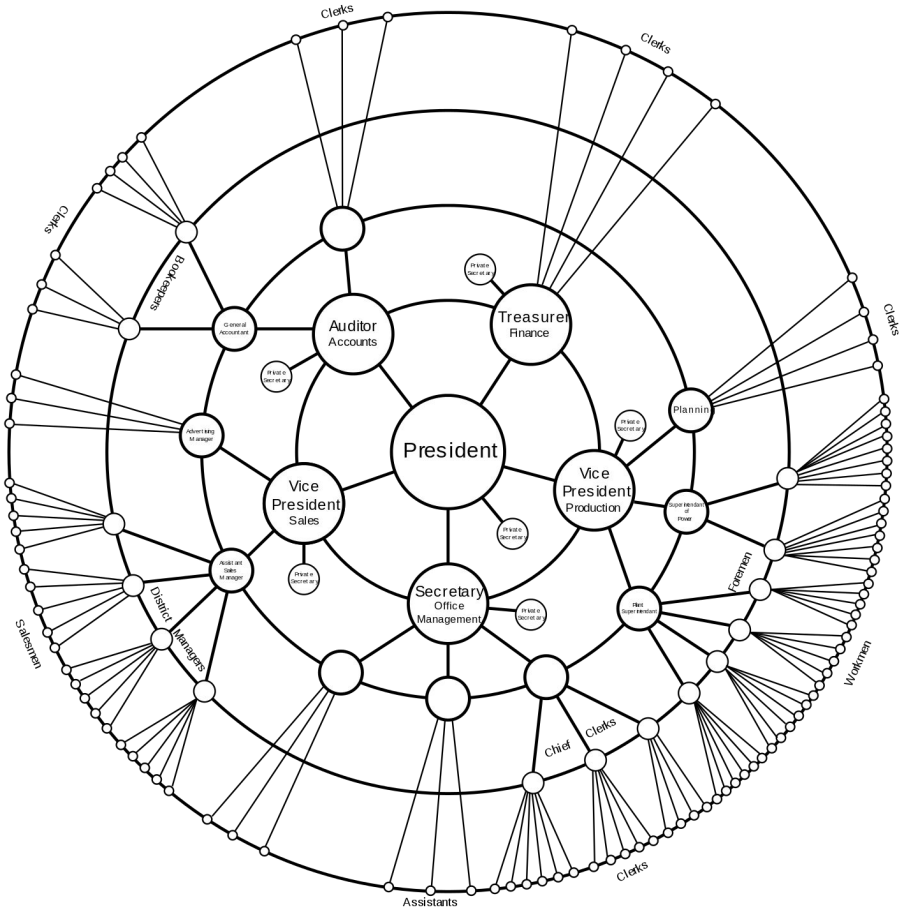
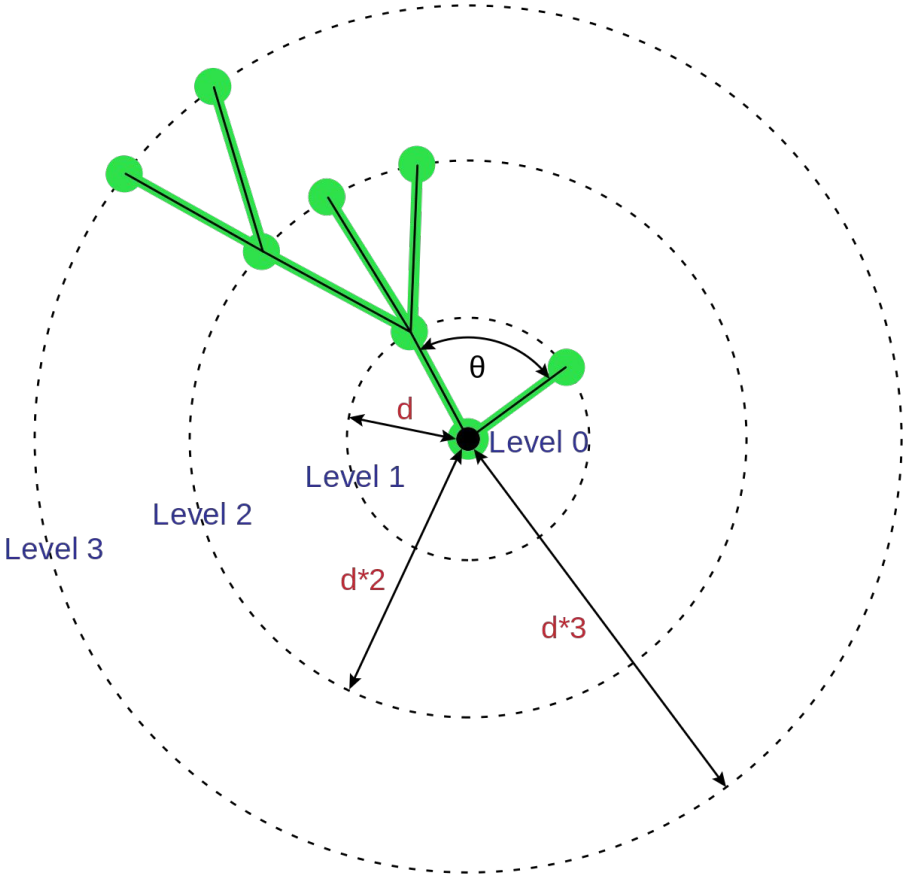


1924 organization chart that emphasizes a central authority

From https://en.wikipedia.org/wiki/Radial_tree



Schematic radial tree from https://en.wikipedia.org/wiki/Radial_tree

Layout of a radial tree

Layout is generated by working outward from the center, root. Each generation is displayed in a new, outer orbit.

Since the length of each orbit increases with the radius, there tends to be more room for the nodes. A radial tree will spread the larger number of nodes over a larger area as the levels increase. We use the terms level and depth interchangeably. Nevertheless, the number of nodes increases exponentially with the distance from the first node, whereas the circumference of each orbit increases linearly, so, by the outer orbits, the nodes tend to be packed together.

From https://en.wikipedia.org/wiki/Radial_tree

Radial Icicle or Sunburst

The sunburst layout is equivalent to the icicle layout, but in polar coordinates.

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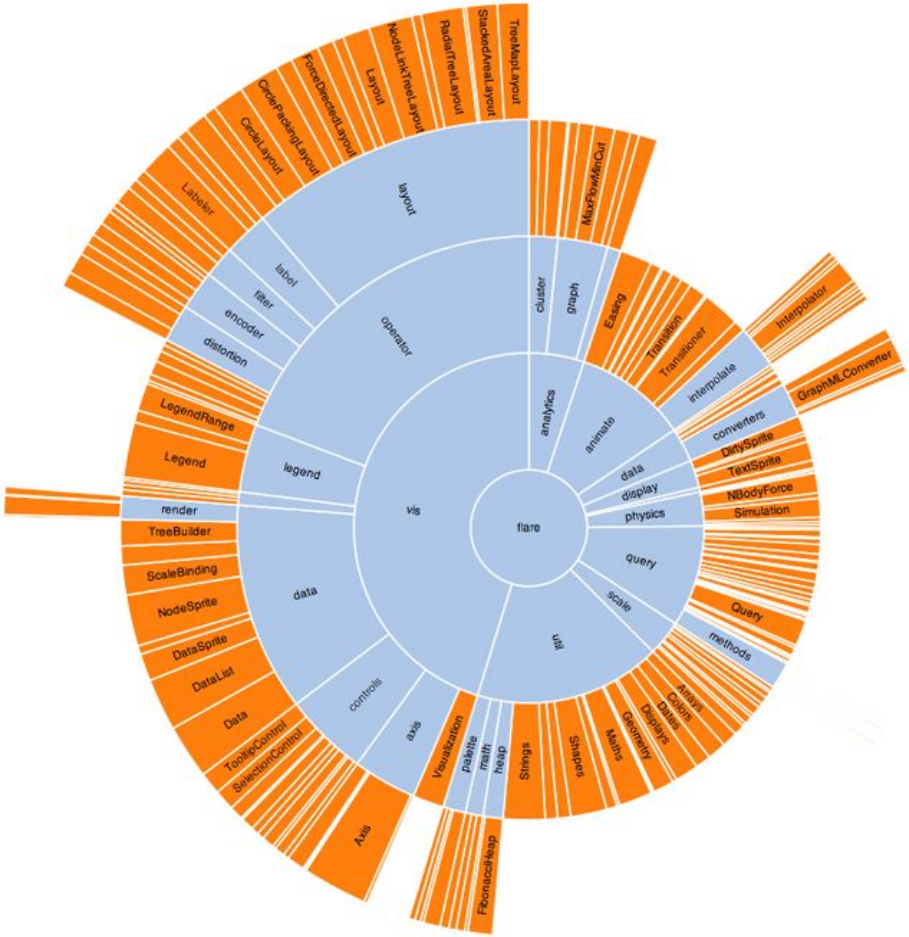


From https://homes.cs.washington.edu/~jheer/files/zoo/ex/hierarchies/sunburst.html

Radial Icicle

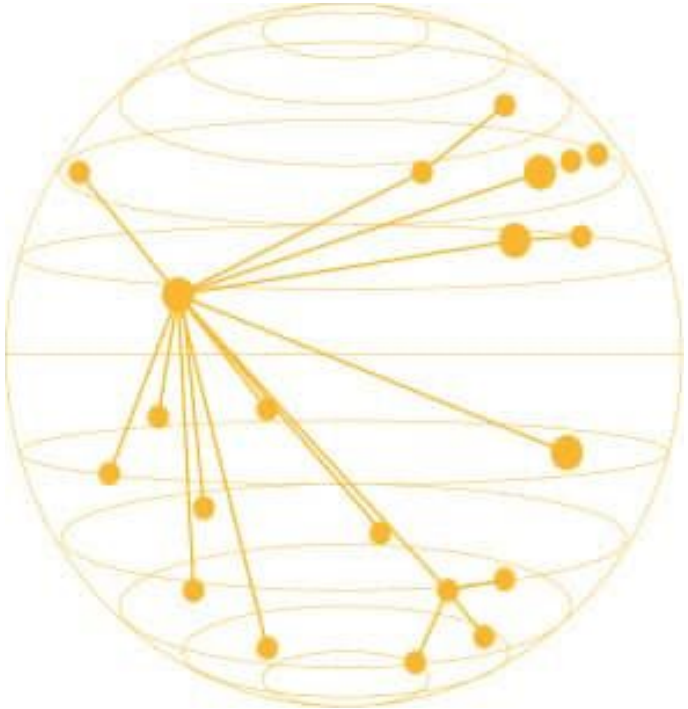
A Sunburst Chart consists of an inner circle surrounded by rings of deeper hierarchy levels. The angle of each segment is either proportional to a value or divided equally under its parent node.

From https://www.anychart.com/chartopedia/chart-type/sunburst-chart/

More examples: https://www.anychart.com/products/anychart/gallery/Sunburst_Charts/

Other geometries

3D hyperbolic tree



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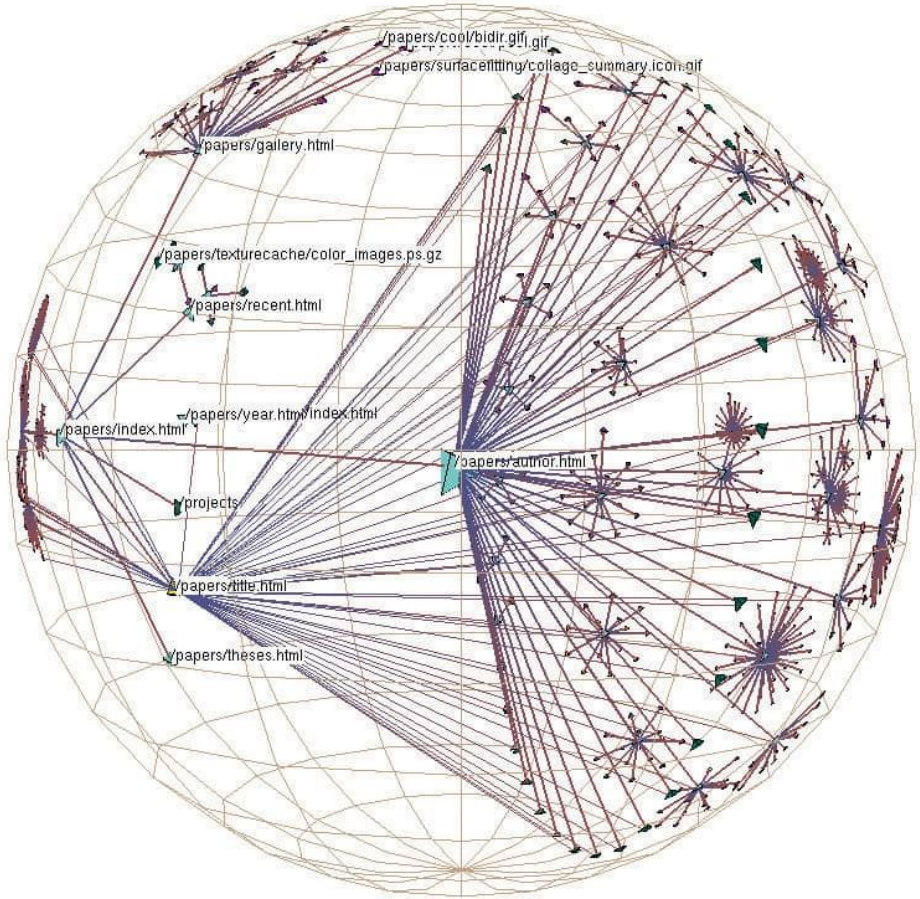
Tamara Munzner, U.S.

Munzner devised and implemented the 3-D Hyperbolic Tree technique to navigate large datasets with the objective of reducing visual cluster and supporting dynamic exploration. Tamara explains that the layout in three-dimensional hyperbolic space allows for focus on a point of interest while providing enough context.

http://graphics.stanford.edu/papers/h3/

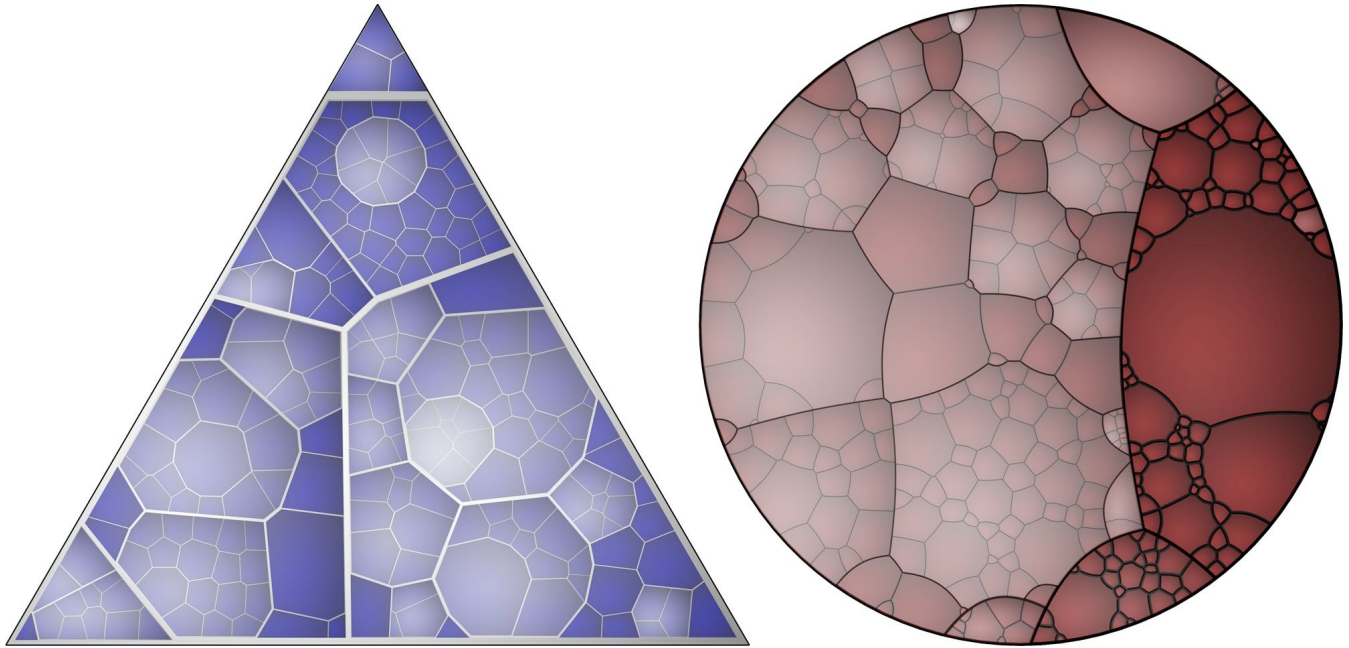
From
https://learning.oreilly.com/library/view/design-for-information/9781592538065/xhtml/ch01.xhtml



https://graphics.stanford.edu/papers/h3cga/

Voronoi Treemap

https://learning.oreilly.com/library/view/design-for-information/9781592538065/xhtml/ch01.xhtml



‘Voronoi Treemaps For The Visualization Of Software Metrics’

M. Balzer, O. Deussen, C. Lewerentz

http://graphics.uni-konstanz.de/publikationen/Balzer2005VoronoiTreemapsVisualization/index.html

From M. Balzer, O. Deussen, C. Lewerentz

A given area is subdivided by a given hierarchy without producing holes or overlappings. Polygons distinguish themselves, meaning they have irregular shapes and do not run into each other. Also, polygons are compact, which means that the aspect ratio between their width and height converge to one.

The first step of the layout is to consider the objects of the top level in the hierarchy. These objects are distributed in the given area – mostly a rectangle, but other shapes are possible, too. The output is a set of polygons. For the next hierarchy level, this algorithm is performed recursively within the polygons of the considered objects in the hierarchy, and so on.

From
http://graphics.uni-konstanz.de/publikationen/Balzer2005VoronoiTreemapsVisualization/Balzer2005VoronoiTreemapsVisualization.pdf

Pastry chef Dinara Kasko uses Voronoi diagram to create silicone molds made with a 3D printer to shape her cakes.