DS 294 – Data Analysis & Visualization
Seminar Presentation

Tree visualization: Indented lists and Node-link trees

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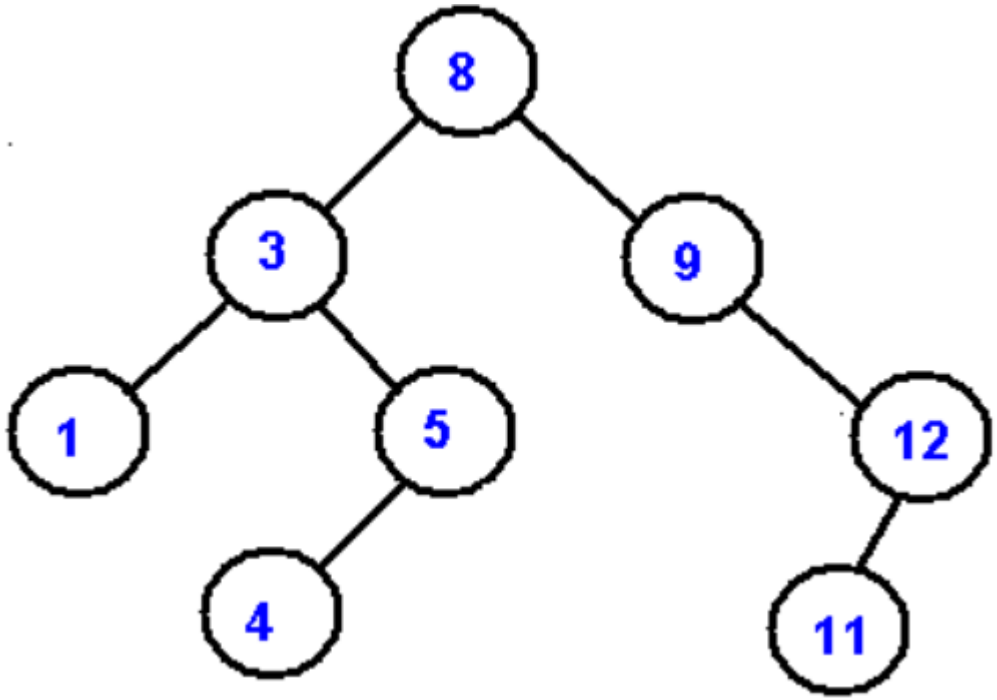
Tree - Definition

General

- Connected & Acyclic
- N vertices & N-1 edges
- May contain labels



Rooted Tree

- One vertex defined as root
- Vertices can have 0+ children

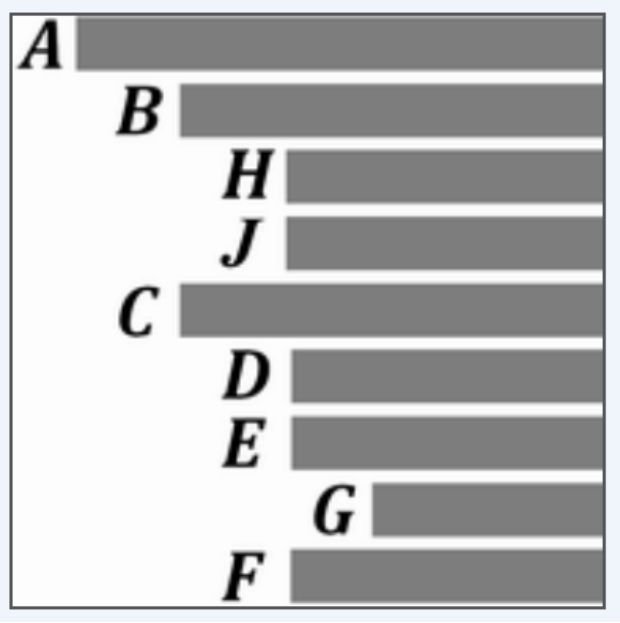
Image: https://www.cs.cmu.edu/~adamchik/15-121/lectures/Trees/trees.html

Indented Lists

- Vertices displayed as indented rows
- Level of indentation -> Level in the tree
- Works well for hierarchical relations
- Suitable for parent -> child traversal
- Mainly used as UI element
- Difficult to display the full tree

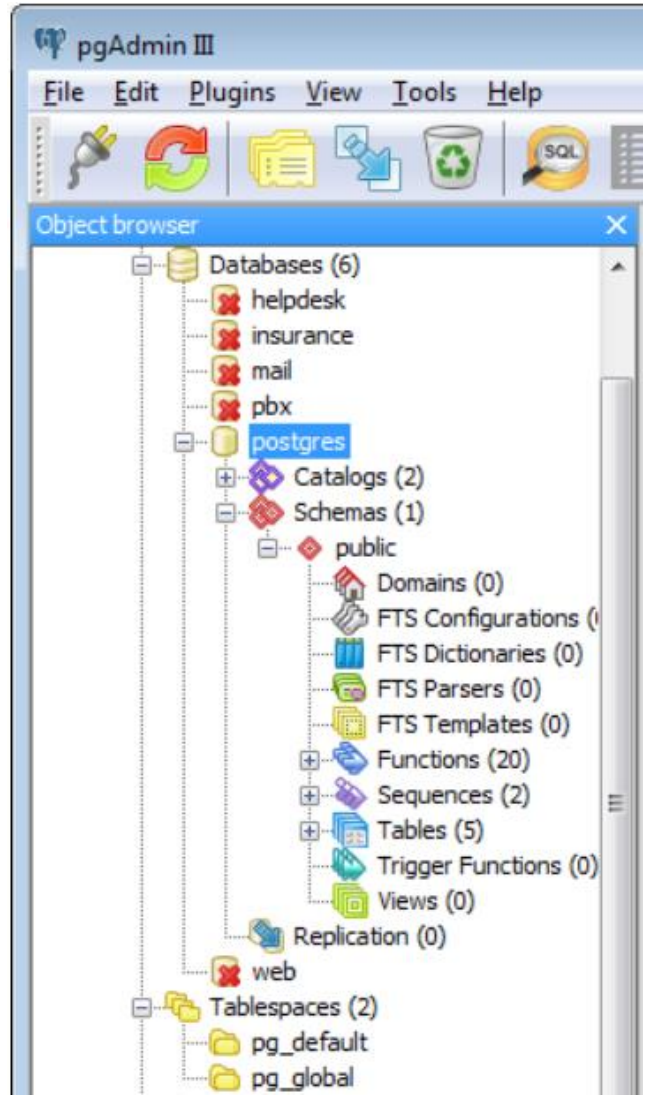
- Node 8
  - Node 3
    - Node1
    - Node 5
      - Node 4
  - Node 9
    - Node 12
      - Node 11

Indented Lists - Examples



[1]

[2]

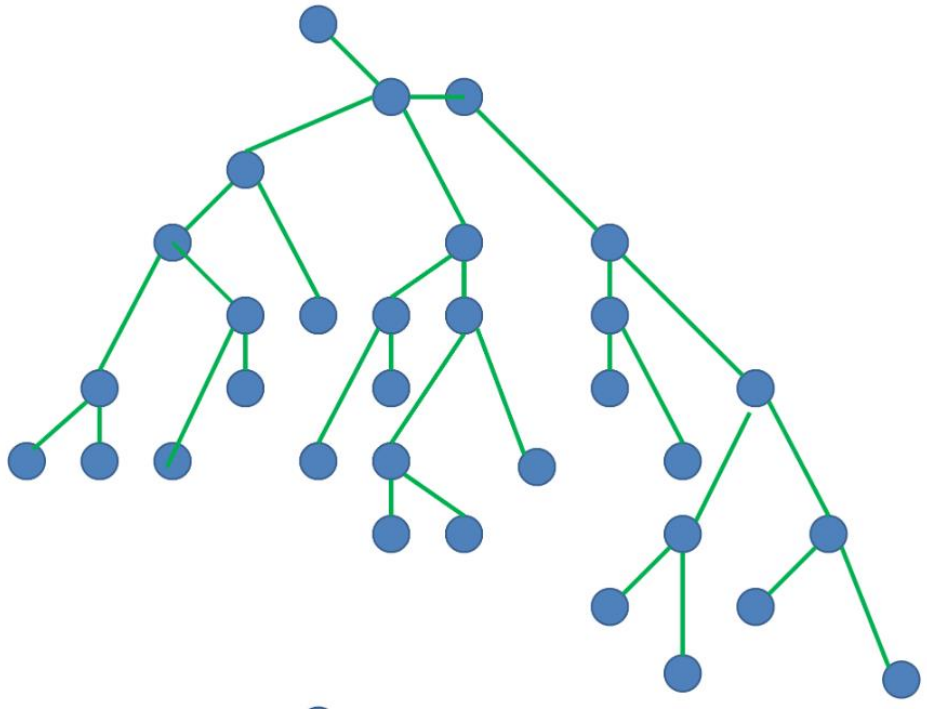


[3]

[1] https://treevis.net/#Knuth1968
[2] https://www.homeandlearn.co.uk/BC/bcs1p7.html
[3] https://www.pgadmin.org/docs/pgadmin3/1.22/main.html

Node-link trees

- 2-D layout of vertices (nodes)
- Vertices connected by links (edges)
- Distance b/w vertices denote level
- Versatile & used for all kinds of trees
- Can be extended to generic graphs
- Different algorithms & types

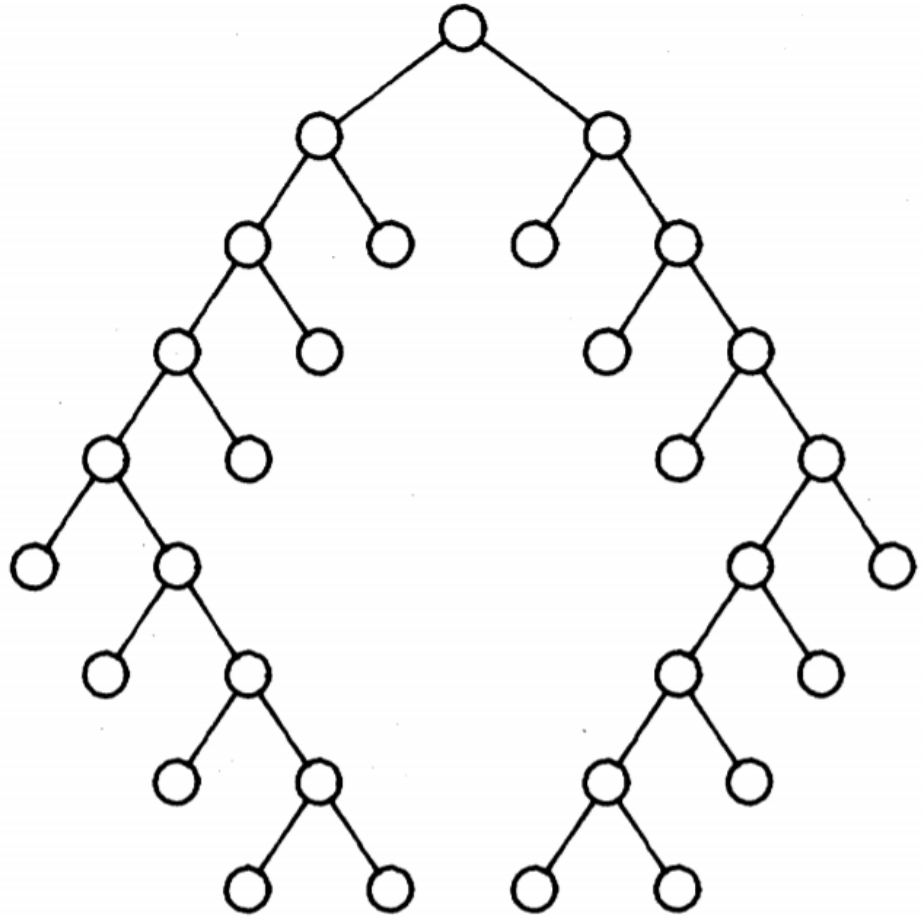


[1]

[1] https://stackoverflow.com/questions/8025342/undirected-graph-conversion-to-tree

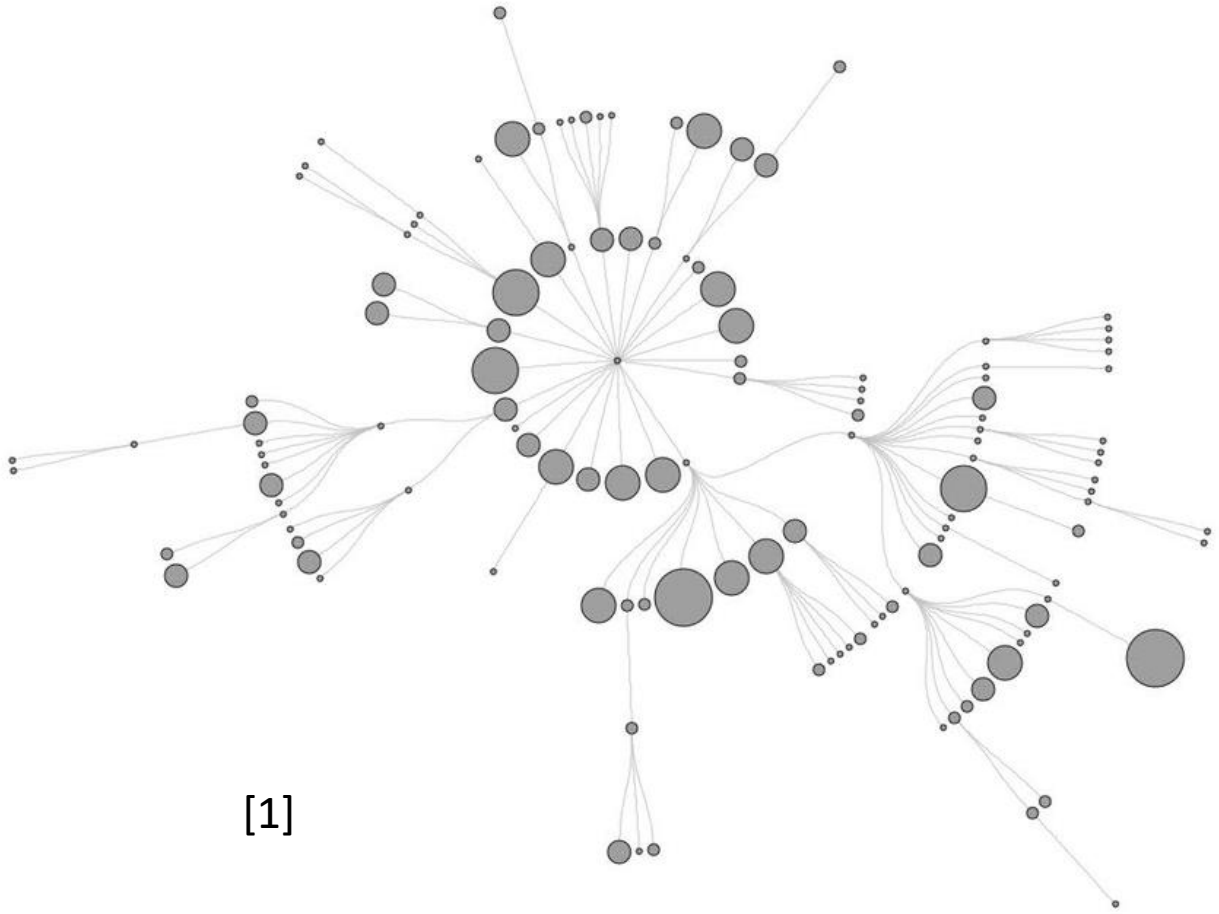
Node-link Trees – Basic Layout

- Aesthetic 1 – Nodes at the same level should lie along a straight line
- Aesthetic 2 – If there is left and right child semantics, then left child should be positioned to the left of its parent and a right child to the right
- Aesthetic 3 – A parent node should be centered over its children

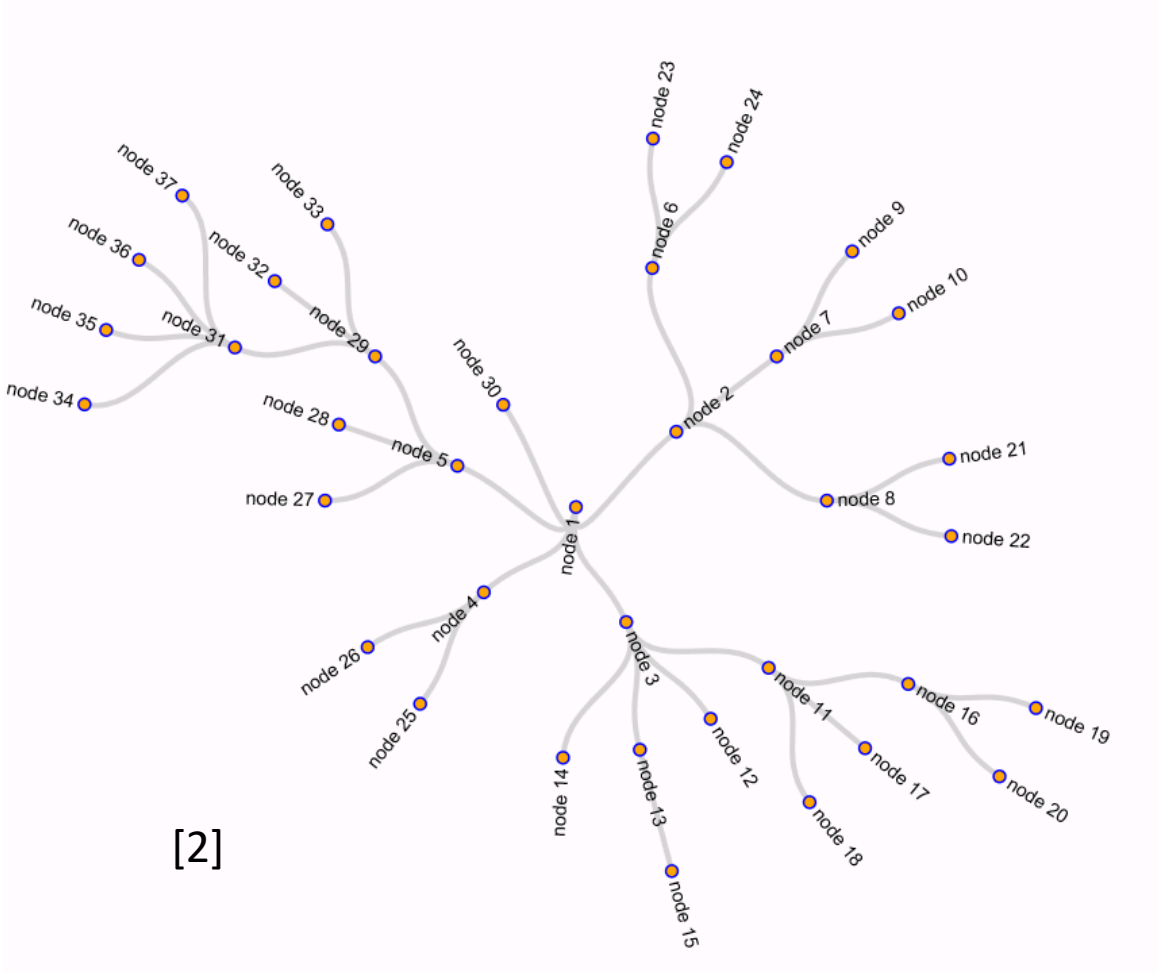


E. M. Reingold and J. S. Tilford. Tidier Drawings of Trees. IEEE Transactions on Software Engineering, 7(2):223–228, 1981

Node-link trees – Radial Layout



[1]

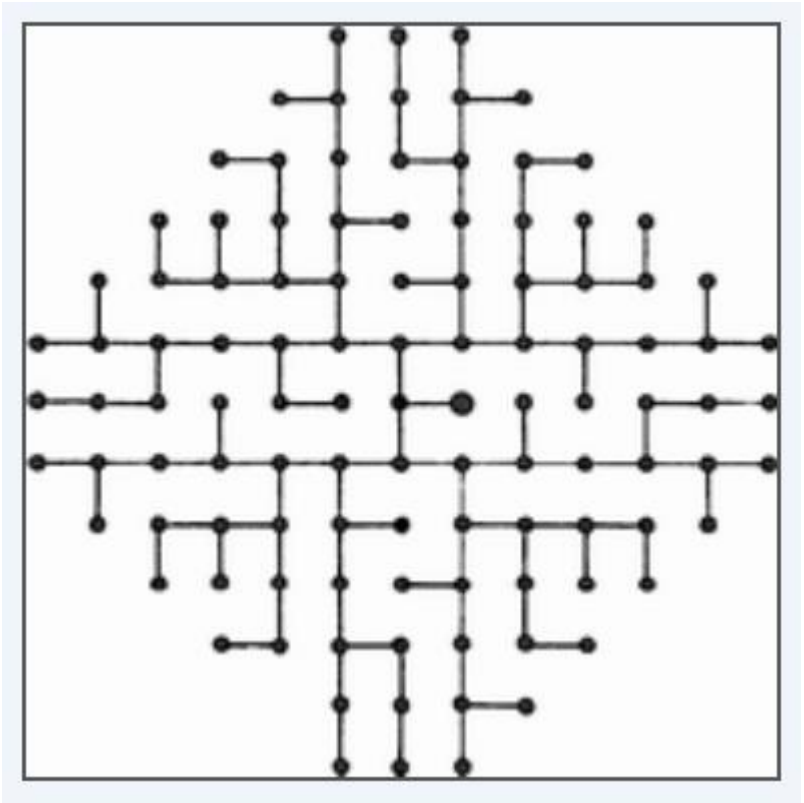


[2]

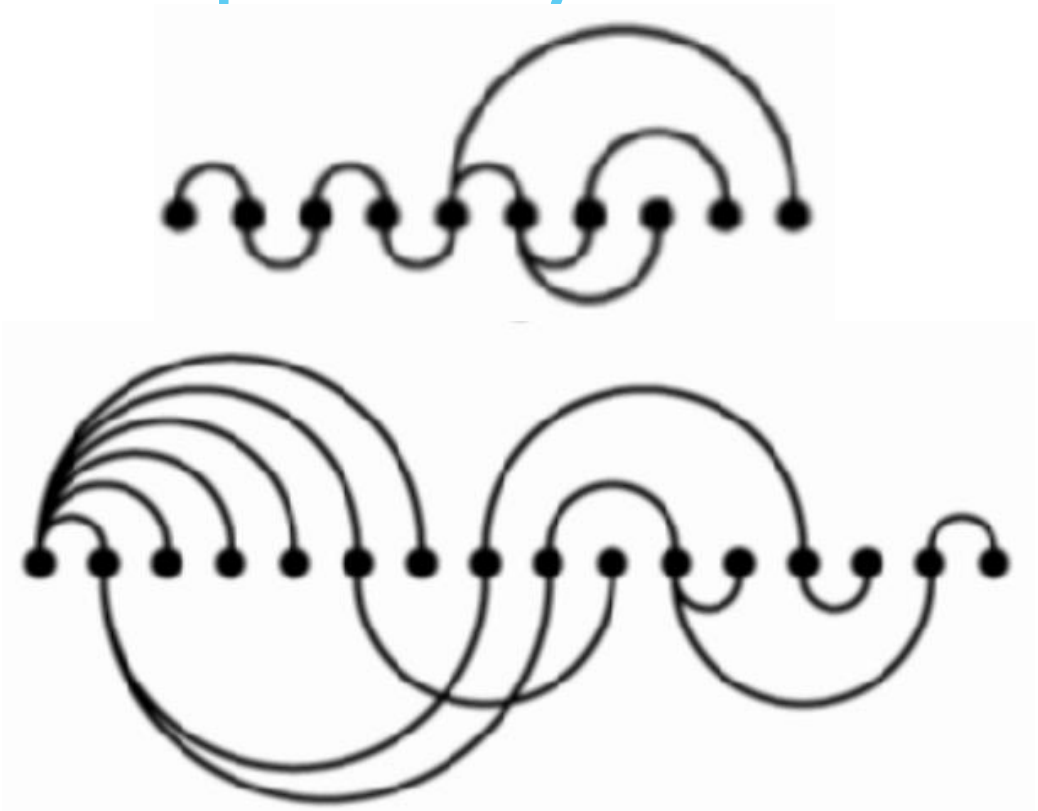
[1] https://www.researchgate.net/figure/Radial-Tree-Layout_fig1_280851993

[2] https://raw.githubusercontent.com/countnazgul/RadialTree/master/Screenshots/RadialTree1.png

Node-link trees – More Complex Layouts



[1] Orthogonal Grid Embedding



[2] Thread Arcs

[1] https://treevis.net/#Gregori1989
[2] https://treevis.net/#Kerr2003