Information Visualization

Daniel Gonçalves, Sandra Gama

10

Visualizing Relationships

Relationships

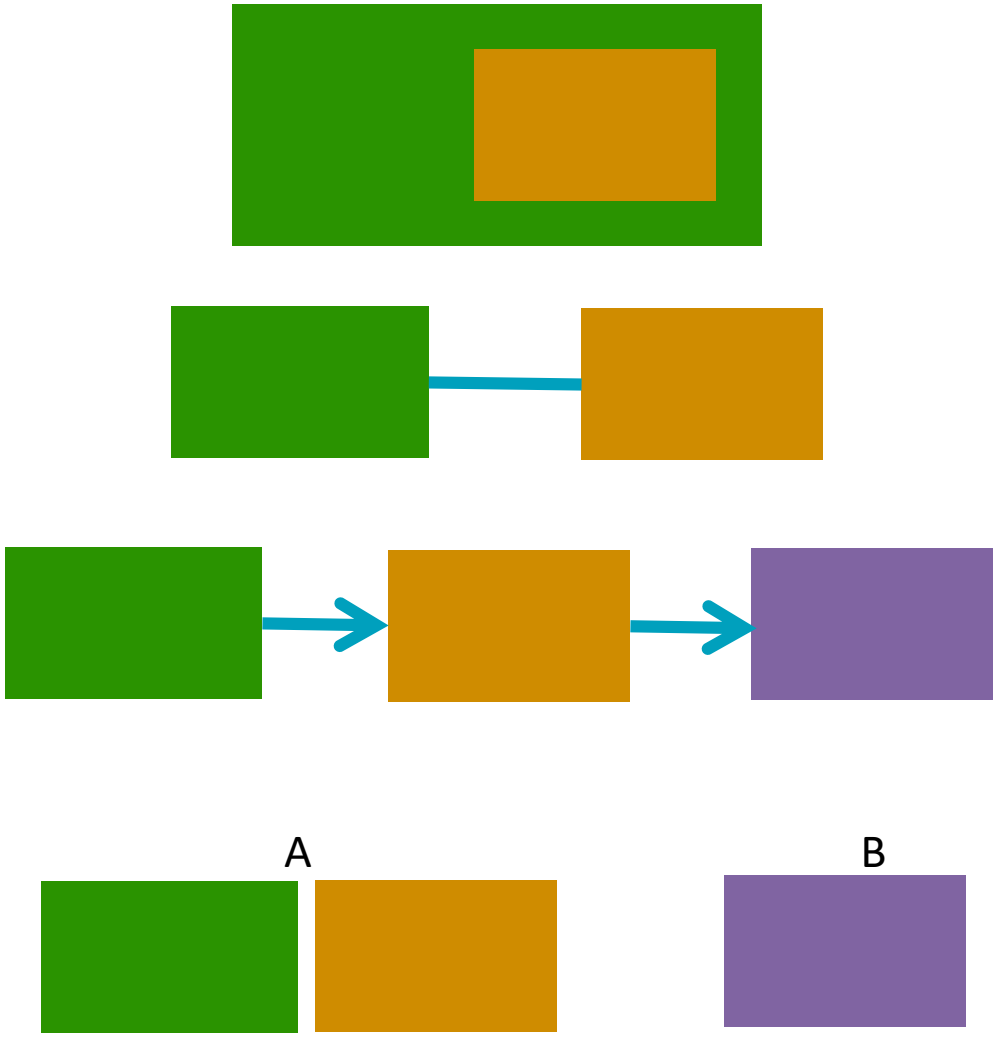
Part/subpart

Connectedness

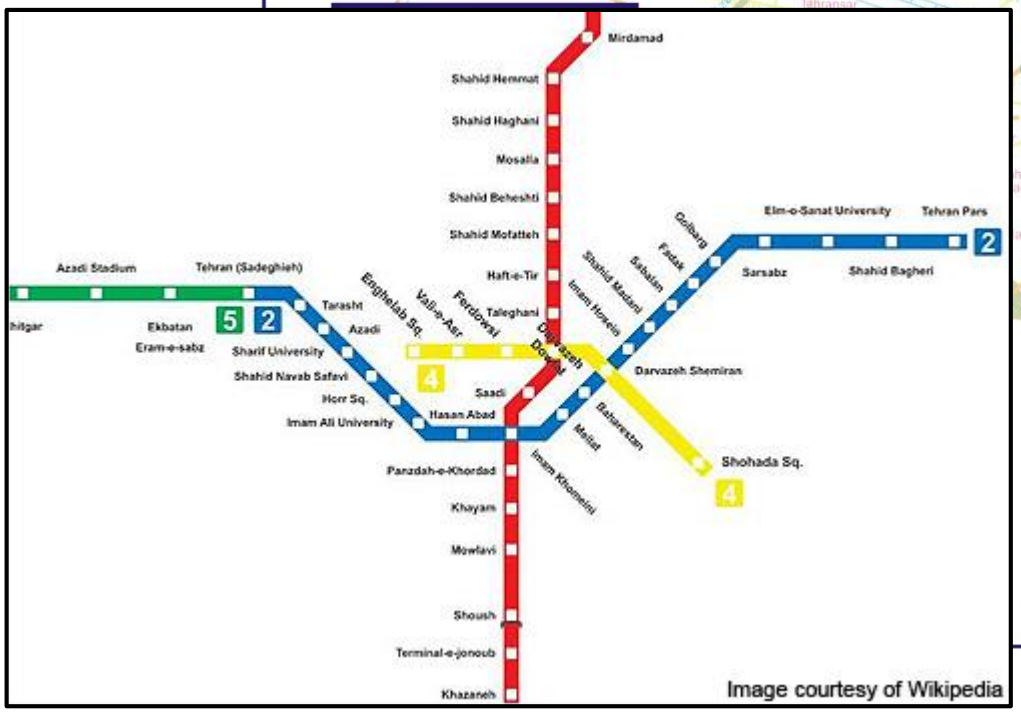
Steps or stages

Classification

Etc.



More Topology than Geometry



01

HIERARCHIES

Breakout!

Draw this…

Name	Father	Mother
Afonso VII of Castilla y Leon	---	---
Ximena Muñoz	---	---
Teresa of Leon	Afonso VII	Ximena Muñoz
Afonso	Henrique de Borgonha	Teresa de Leão
Sancha	Henrique de Borgonha	Teresa de Leão
Henrique	Henrique de Borgonha	Teresa de Leão
Afonso Henriques	Henrique de Borgonha	Teresa de Leão
Mafalda de Saboia	---	---
Urraca	Afonso Henriques	Mafalda de Saboia
Sancho I	Afonso Henriques	Mafalda de Saboia
Teresa	Afonso Henriques	Mafalda de Saboia
Ramon IV Berenguer	---	---
Petronilha of Aragon	---	---
Dulce de Barcelona	Ramon IV Berenguer	Petronilha of Aragon
Afonso II	Sancho I	Dulce de Barcelona

Draw this…

https://bit.ly/3TDh7HI

05:00

Name	Father	Mother
Afonso VII of Castilla y Leon	---	---
Ximena Muñoz	---	---
Teresa of Leon	Afonso VII	Ximena Muñoz
Afonso	Henrique de Borgonha	Teresa de Leão
Sancha	Henrique de Borgonha	Teresa de Leão
Henrique	Henrique de Borgonha	Teresa de Leão
Afonso Henriques	Henrique de Borgonha	Teresa de Leão
Mafalda de Saboia	---	---
Urraca	Afonso Henriques	Mafalda de Saboia
Sancho I	Afonso Henriques	Mafalda de Saboia
Teresa	Afonso Henriques	Mafalda de Saboia
Ramon IV Berenguer	---	---
Petronilha of Aragon	---	---
Dulce de Barcelona	Ramon IV Berenguer	Petronilha of Aragon
Afonso II	Sancho I	Dulce de Barcelona

A Special Type of Graph - Trees

No Cycles

Directed Edges

Special Node

Draw this…

… focusing on D. Afonso Henriques!

Name	Father	Mother
Afonso VII of Castilla y Leon	---	---
Ximena Muñoz	---	---
Teresa of Leon	Afonso VII	Ximena Muñoz
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Sancha	Henrique de Borgonha	Teresa de Leão
Henrique	Henrique de Borgonha	Teresa de Leão
Afonso Henriques	Henrique de Borgonha	Teresa de Leão
Mafalda de Saboia	---	---
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Sancho I	Afonso Henriques	Mafalda de Saboia
Teresa	Afonso Henriques	Mafalda de Saboia
Ramon IV Berenguer	---	---
Petronilha of Aragon	---	---
Dulce de Barcelona	Ramon IV Berenguer	Petronilha of Aragon
Afonso II	Sancho I	Dulce de Barcelona

Draw this…

https://bit.ly/3TDh7HI

05:00

… focusing on D. Afonso Henriques!

Name	Father	Mother
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Henrique	Henrique de Borgonha	Teresa de Leão
Afonso Henriques	Henrique de Borgonha	Teresa de Leão
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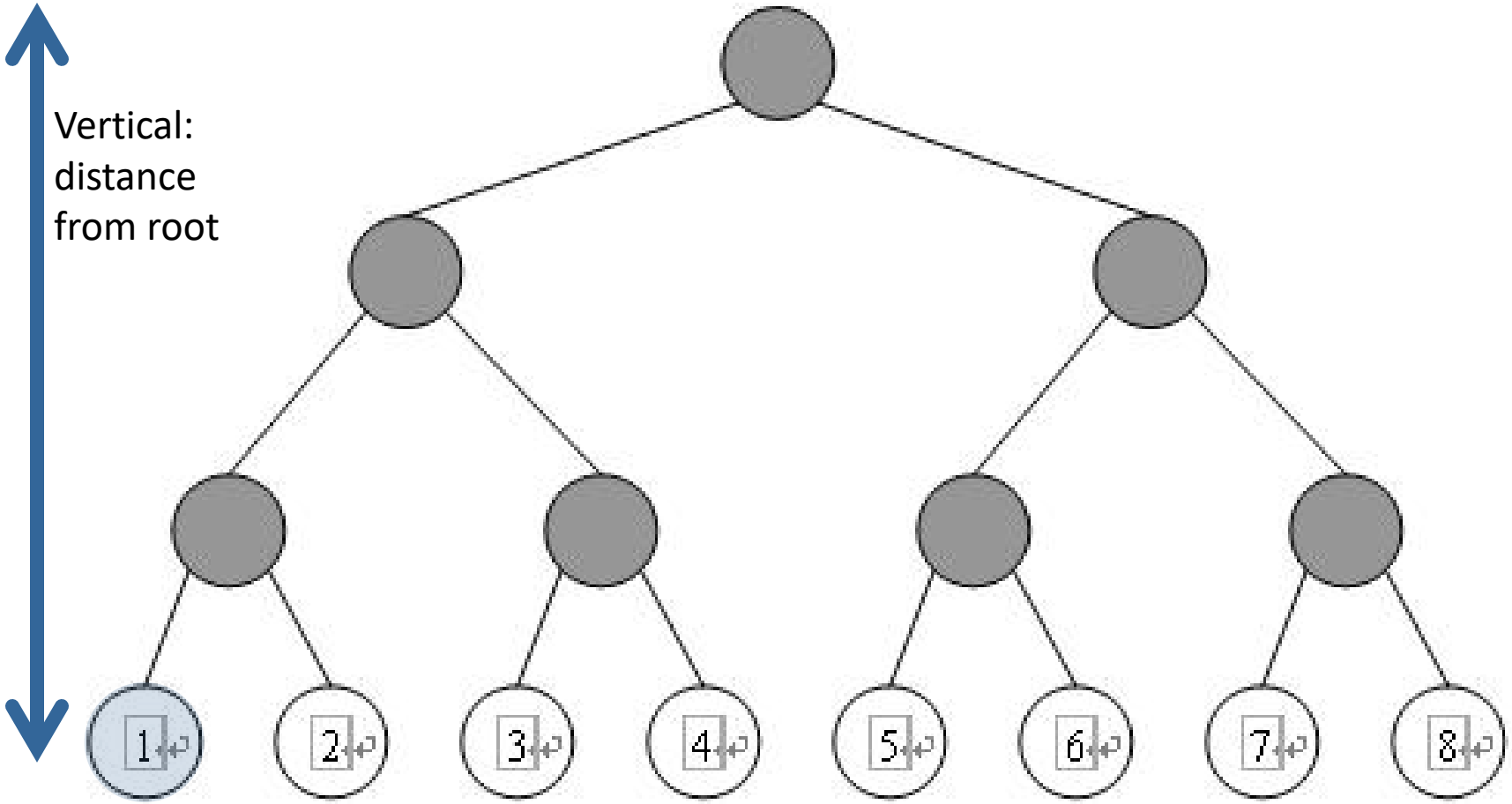
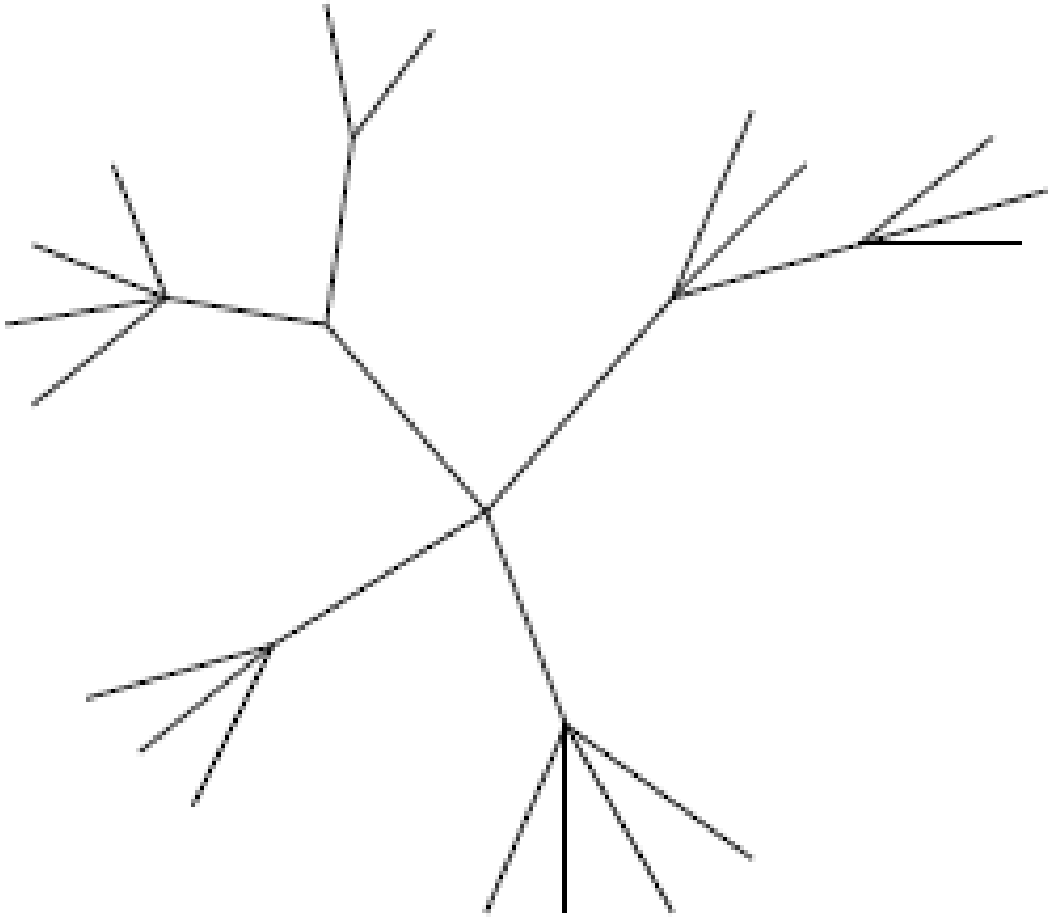
Urraca	Afonso Henriques	Mafalda de Saboia
Sancho I	Afonso Henriques	Mafalda de Saboia
Teresa	Afonso Henriques	Mafalda de Saboia
Ramon IV Berenguer	---	---
Petronilha of Aragon	---	---
Dulce de Barcelona	Ramon IV Berenguer	Petronilha of Aragon
Afonso II	Sancho I	Dulce de Barcelona

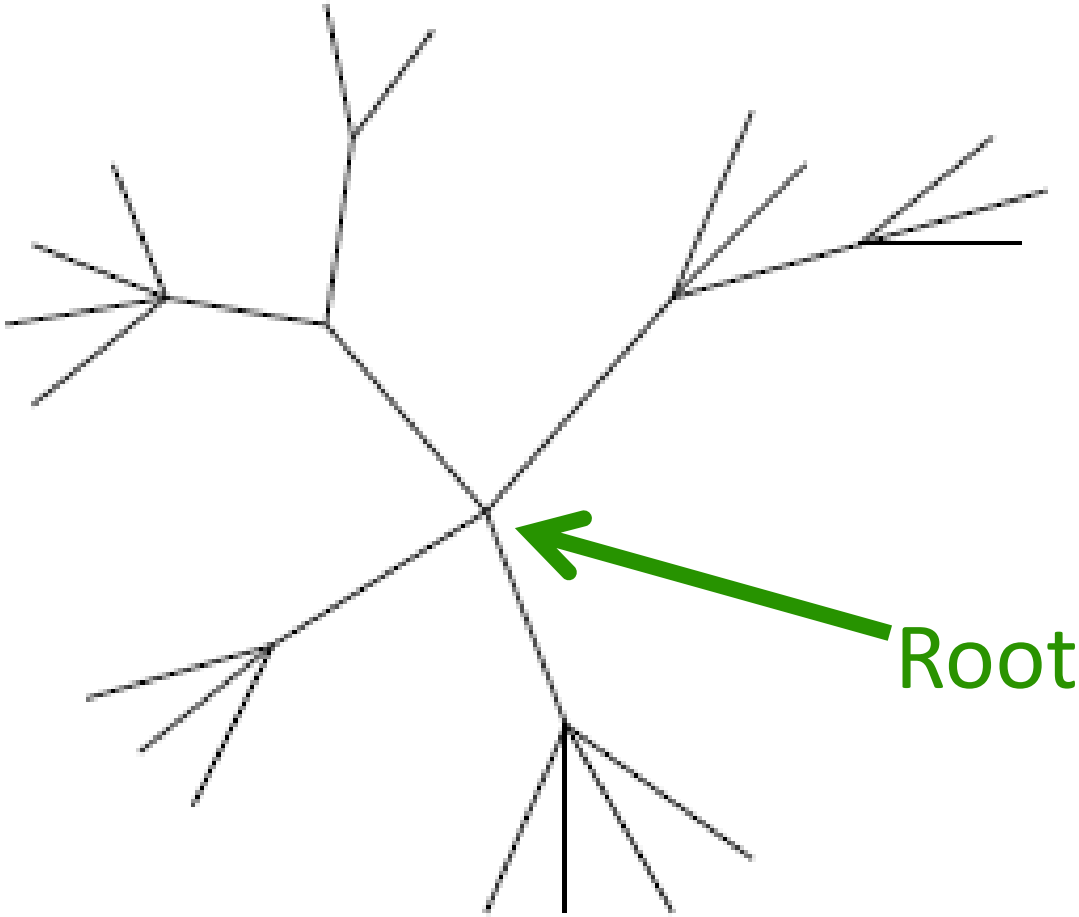
Traditionally: in layers



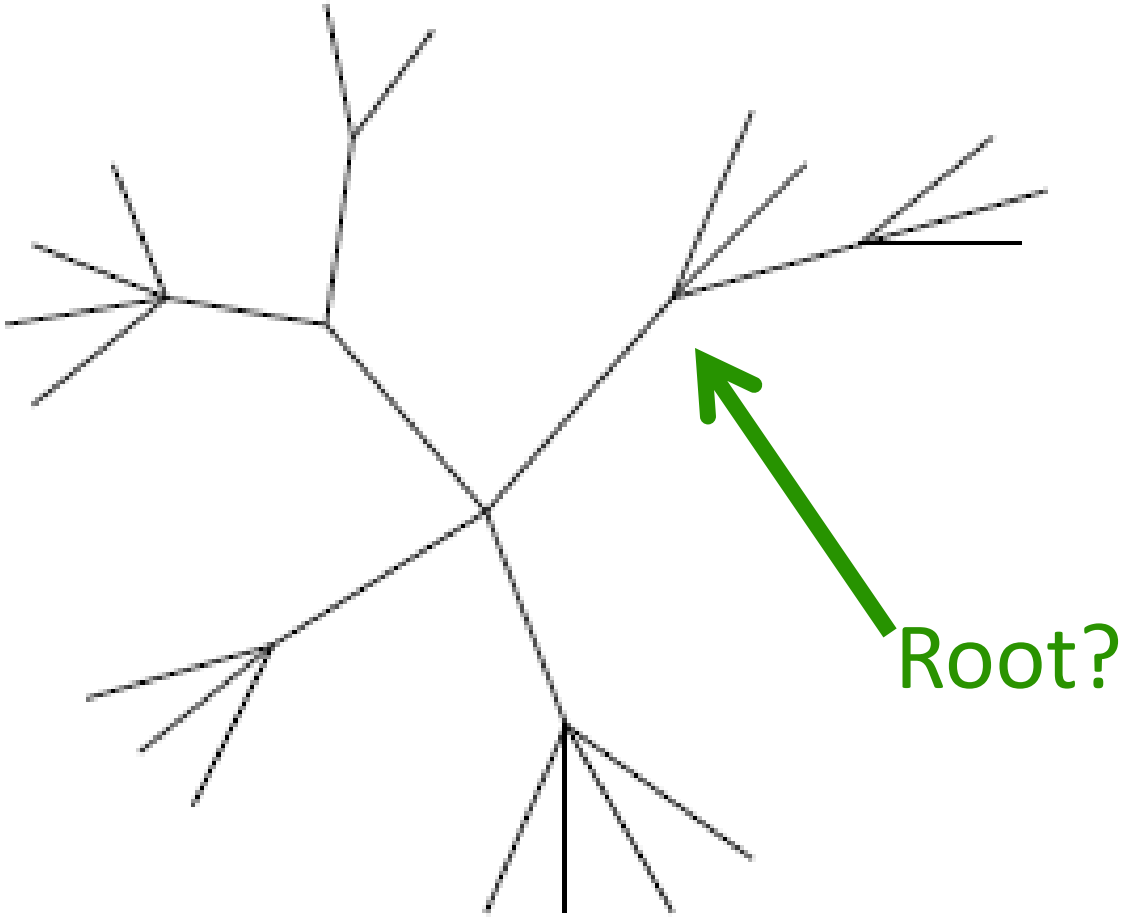
Radial Trees: Root doesn't need to be on top…



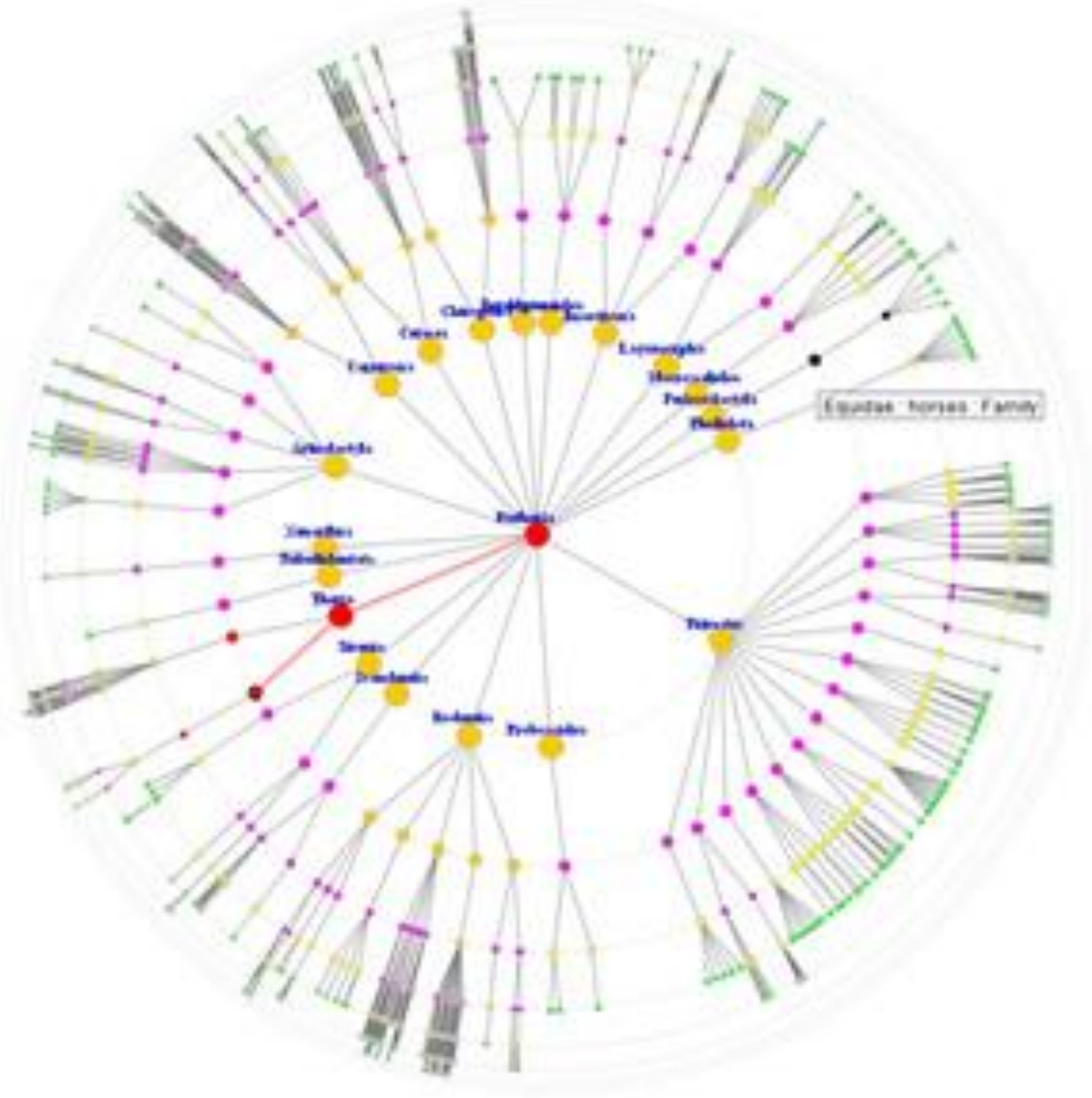
Seen like this…



Why can’t this guy be the root?



Radial Trees



Breakout Over!

03

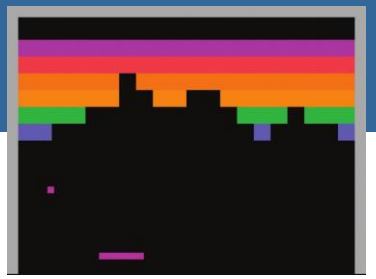
PART-SUBPART

Breakout!

Here is a dataset…

	Value	Parent
A	10	--
B	15	A
C	5	A
D	15	A
E	10	B
F	10	B
G	8	E
H	2	E
I	10	C
J	10	C
K	15	C
L	5	C
M	20	K
N	10	K

Time to Break Out



Discuss among yourselves

Draw it in three different ways!

Do it **ONCE PER BREAKOUT GROUP**

Could you represent all the information in all the idioms?

Here is a dataset…

https://bit.ly/3f0XOJ8

	Value	Parent
A	10	--
B	15	A
C	5	A
D	15	A
E	10	B
F	10	B
G	8	E
H	2	E
I	10	C
J	10	C
K	15	C
L	5	C
M	20	K
N	10	K

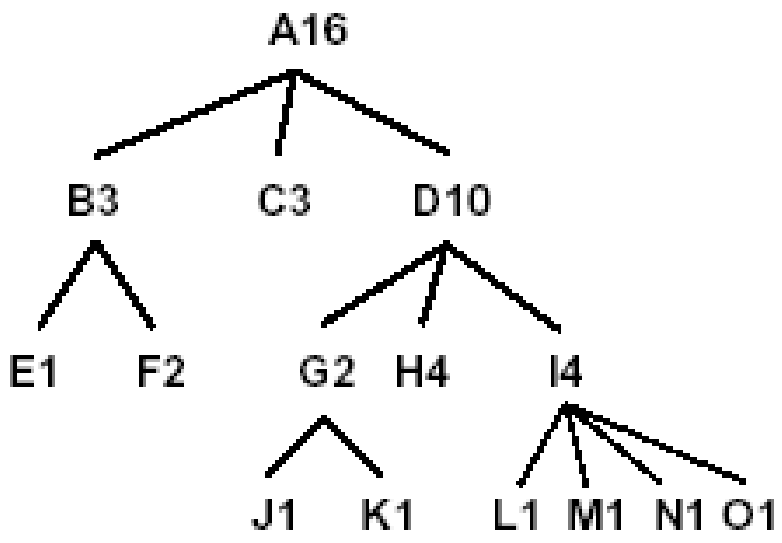
10:00

Space Filling: Treemap

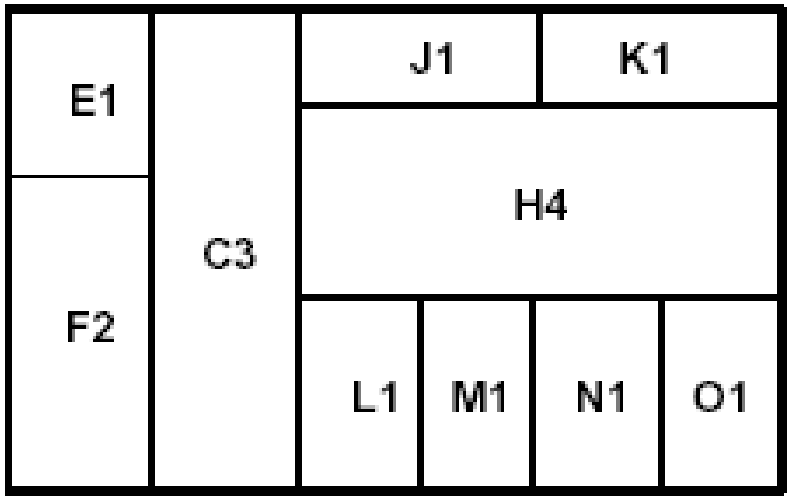
http://www.cs.umd.edu/hcil/treemap-history/index.shtml

Containment, not connection

emphasize node attributes, not topological structure

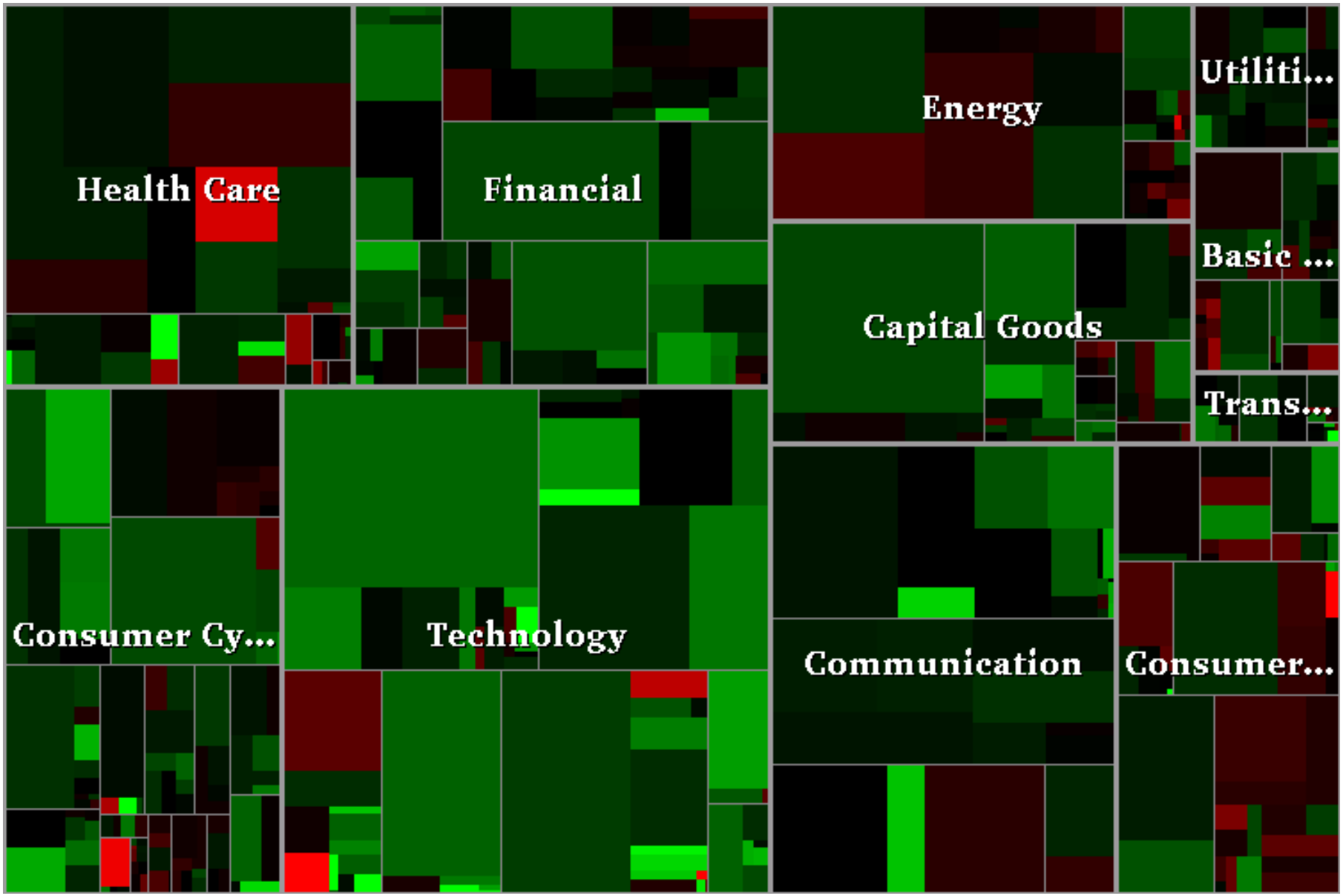


Node and link diagram

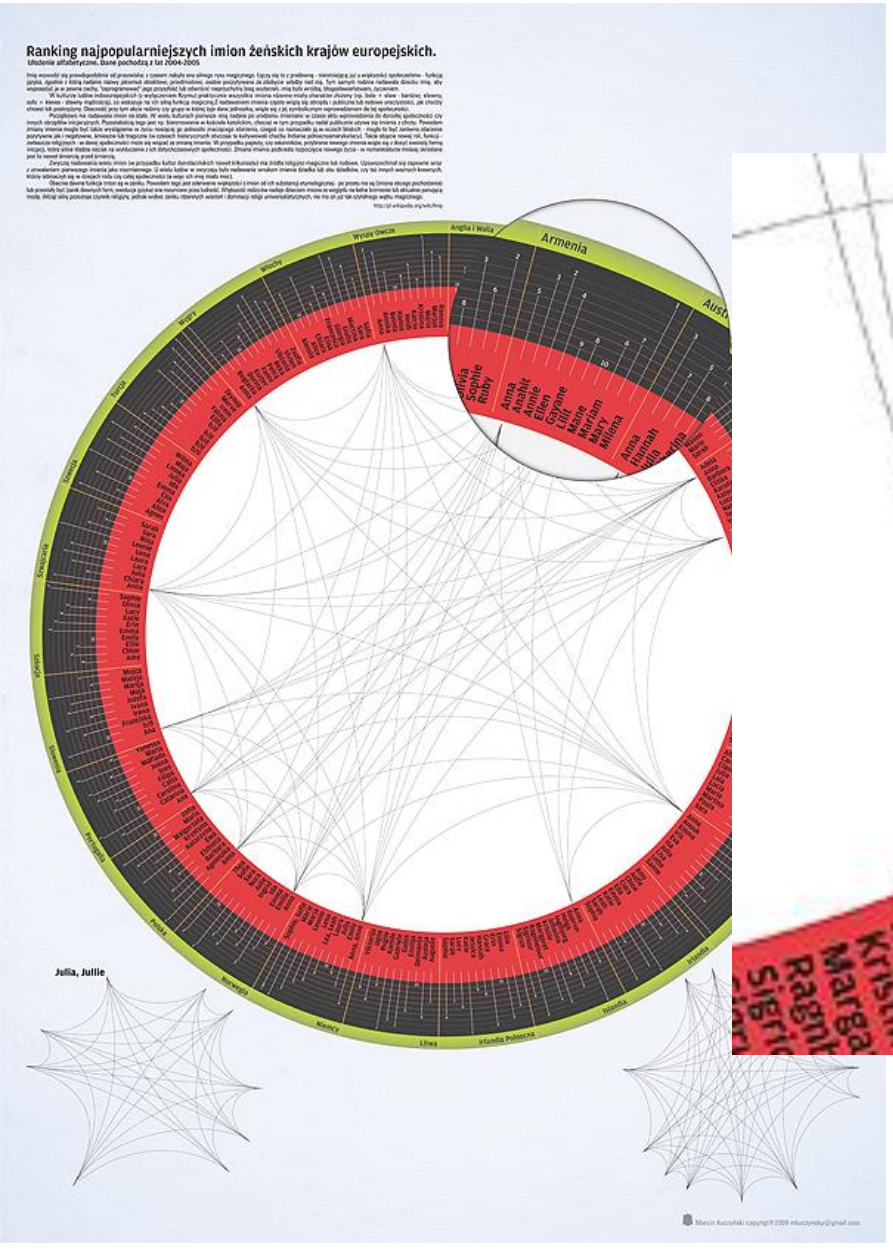


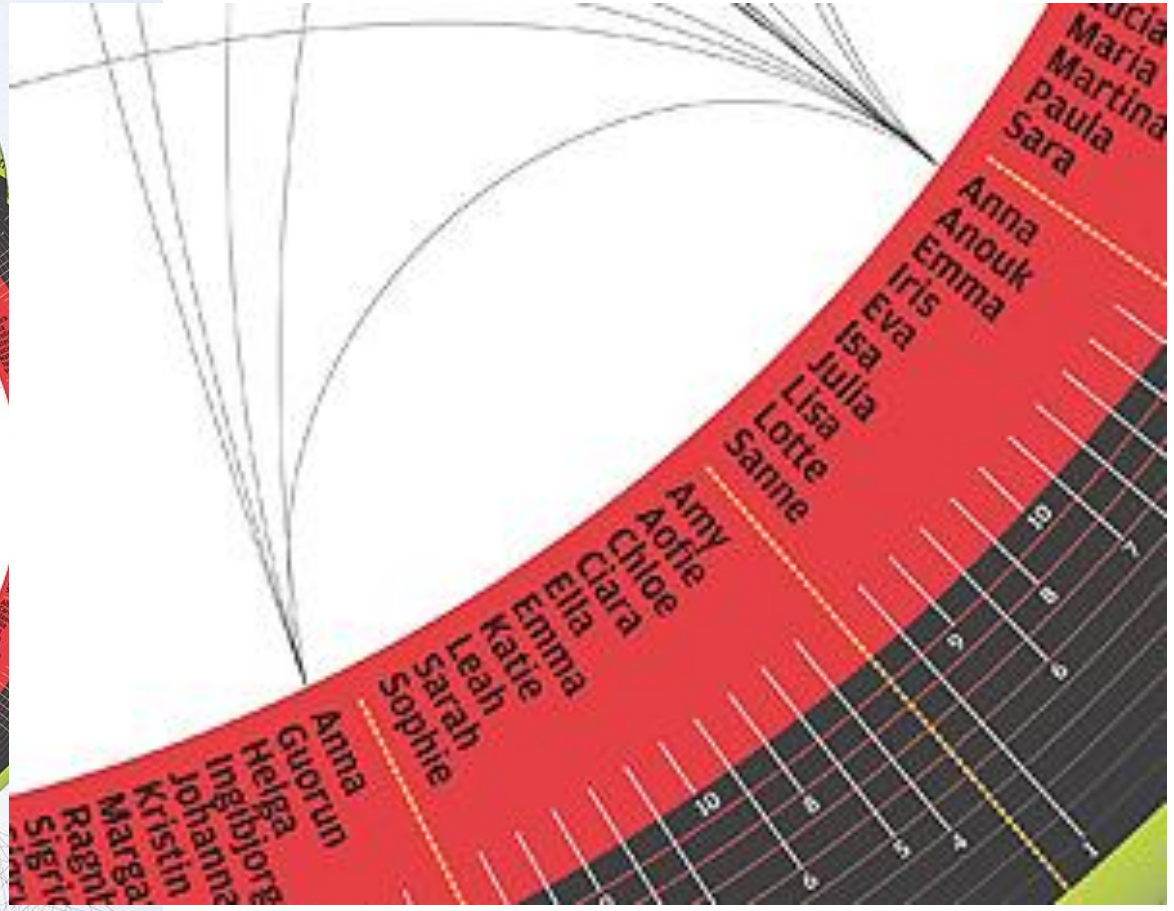
Treemap

Treemap


Health Care
Financial
Energy
Utiliti...
Basic ...
Capital Goods
Trans...
Consumer Cy...
Technology
Communication
Consumer...

Popularity of names in Europe

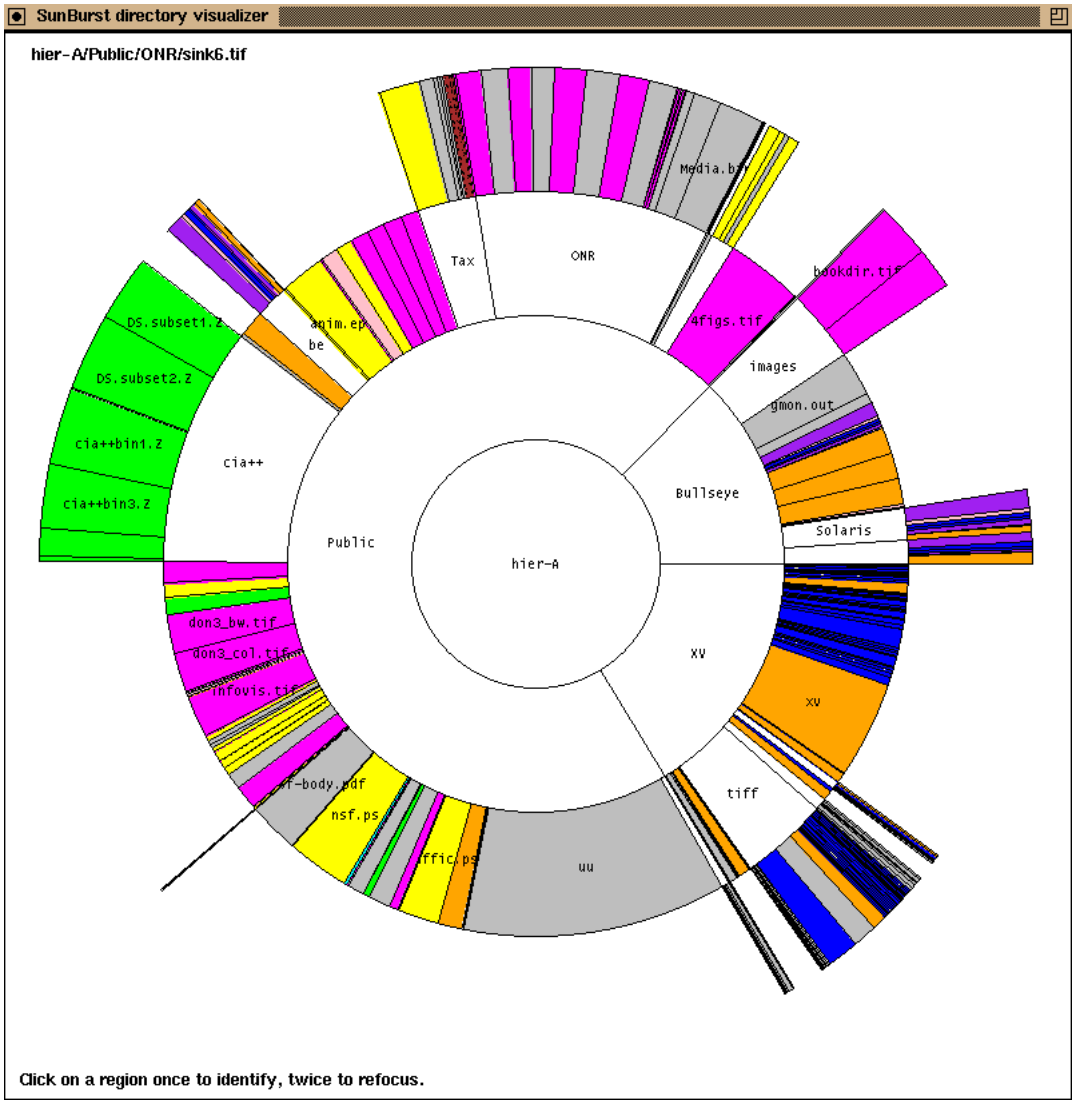




http://datavisualization.ch/showcases/what-are-europes-most-popular-names

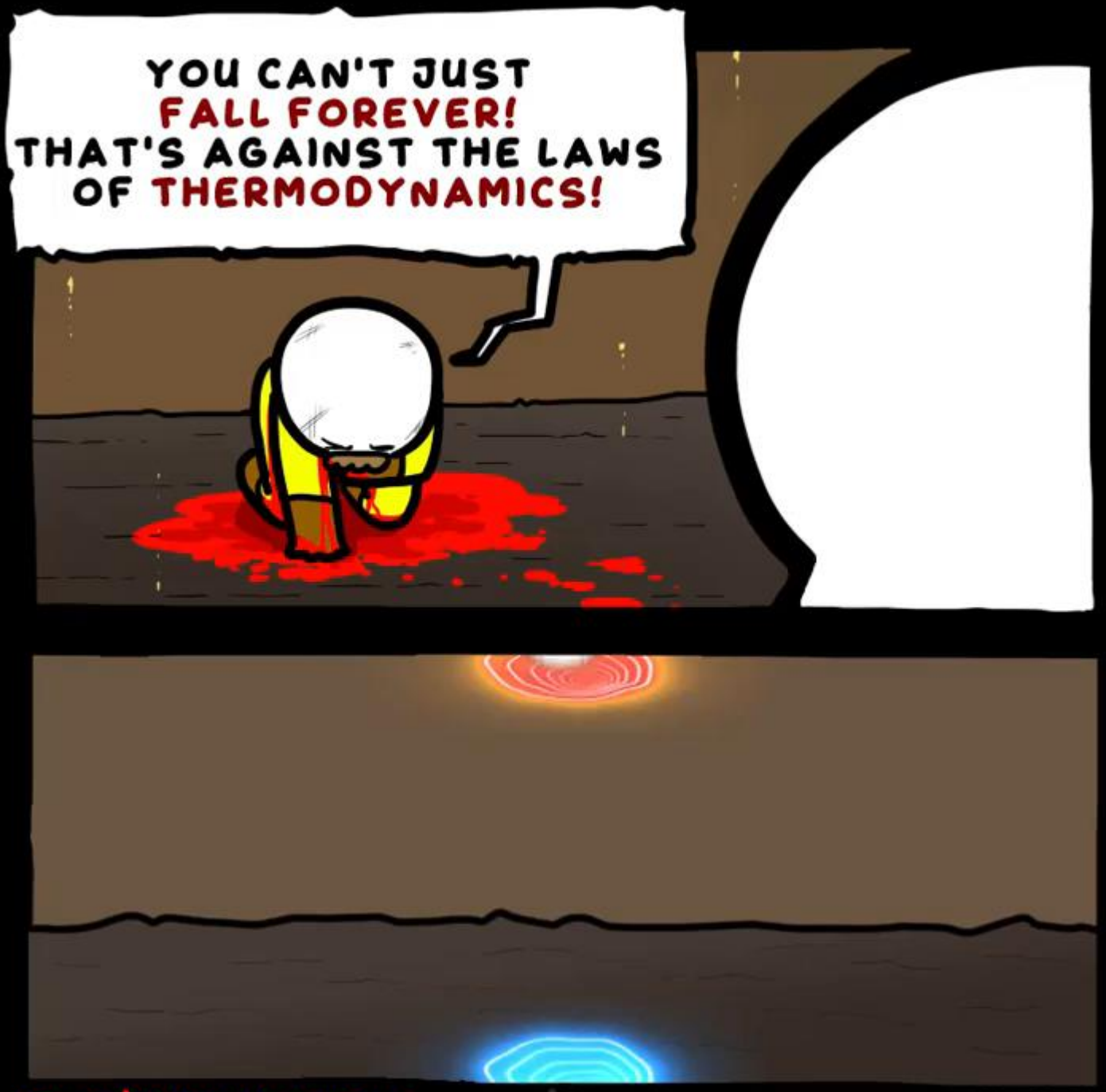
Sunburst

http://www.cc.gatech.edu/gvu/ii/sunburst/sb-full.html



Breakout Over!

THERE WILL
NOW BE A
BRIEF
INTERMISSION

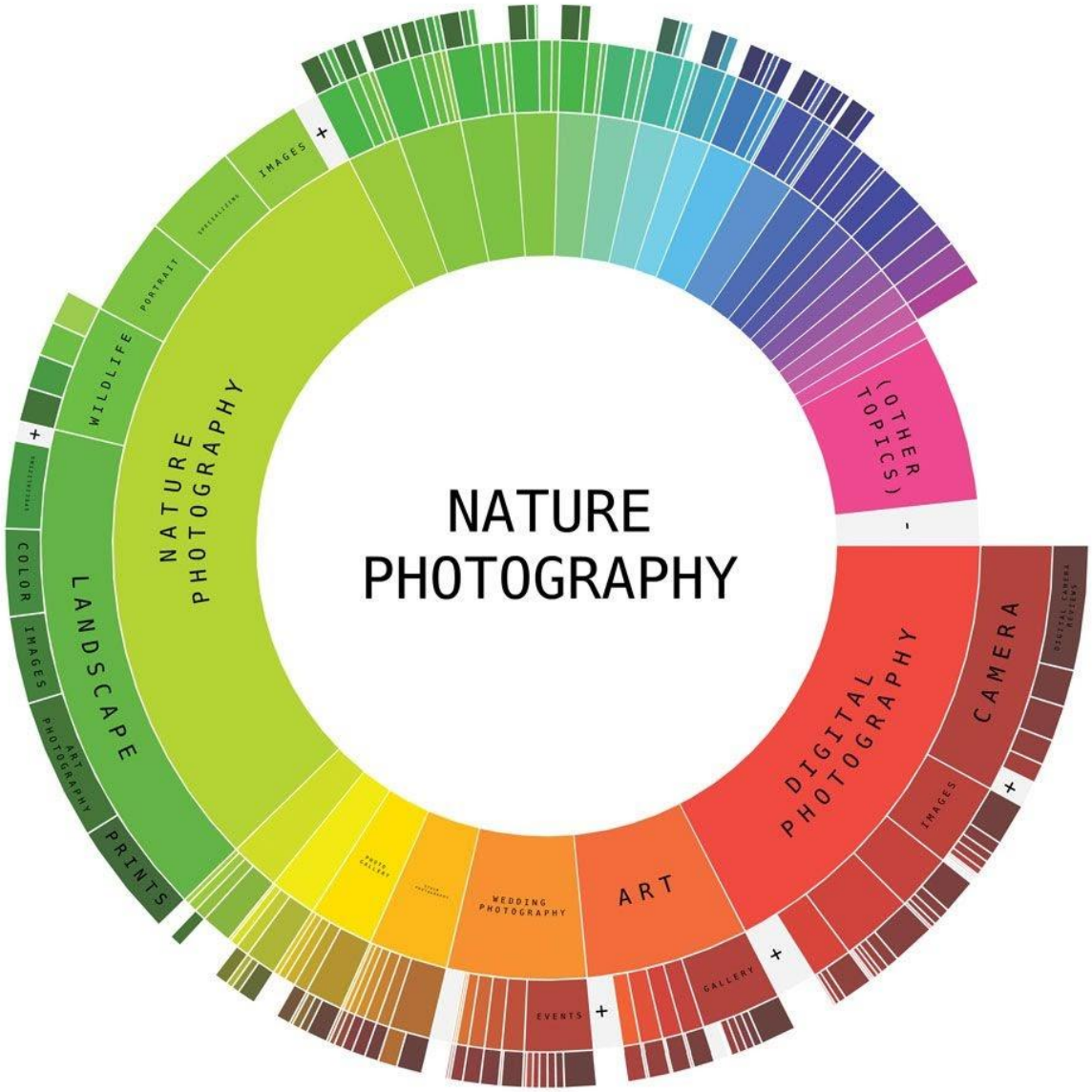

YOU CAN'T JUST FALL FOREVER! THAT'S AGAINST THE LAWS OF THERMODYNAMICS!
YOU WON'T GET AWAY WITH THIS
u/RACHAE
SRGRAFO

THERE WILL
NOW BE A
BRIEF
INTERMISSION

GOOD or EVIL?

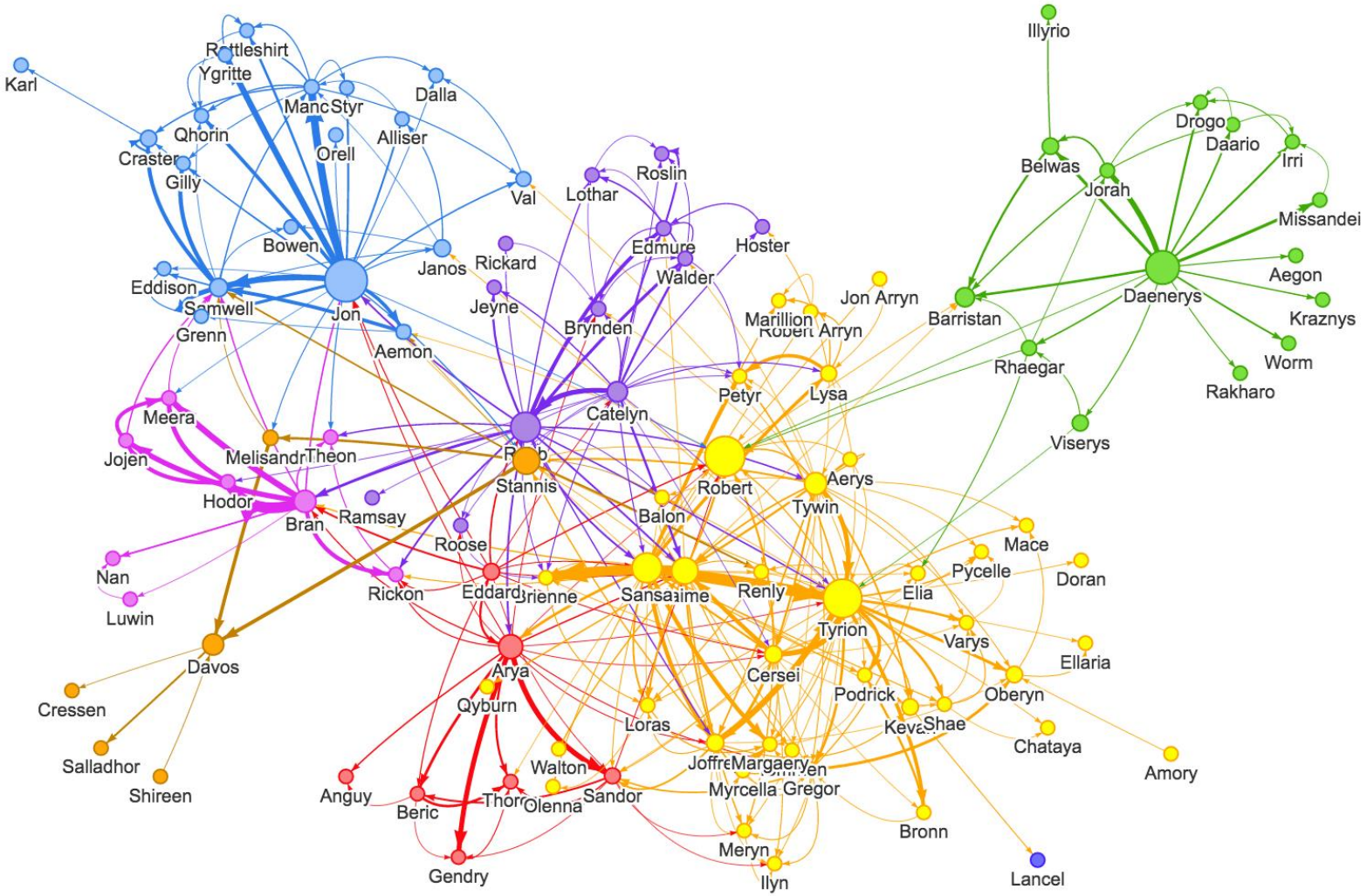
EXIBIT A

https://www.pinterest.ca/pin/241013017533455430/?lp=true



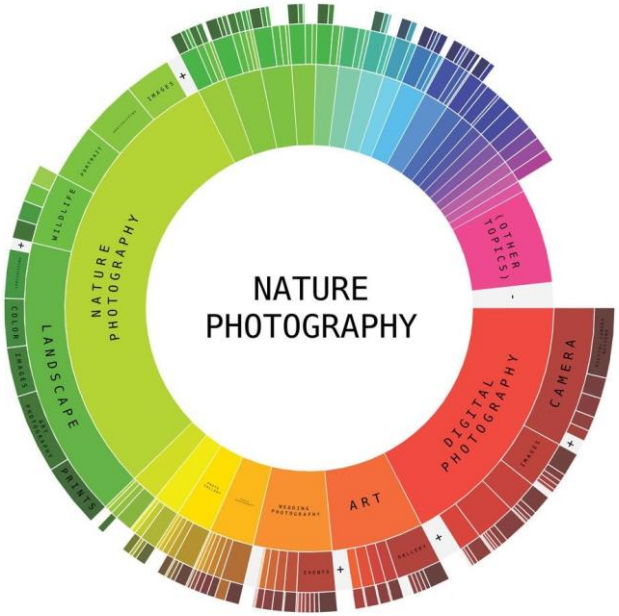
EXIBIT B

https://www.reddit.com/r/dataisbeautiful/comments/9xpf86/6_months_of_work_on_my_masters_thesis_oc/

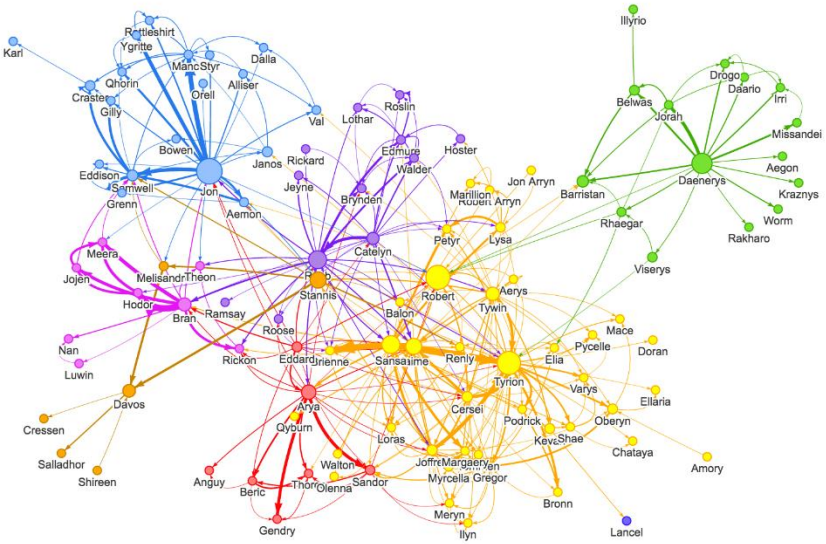


Where does the Evil Hide?

A



B

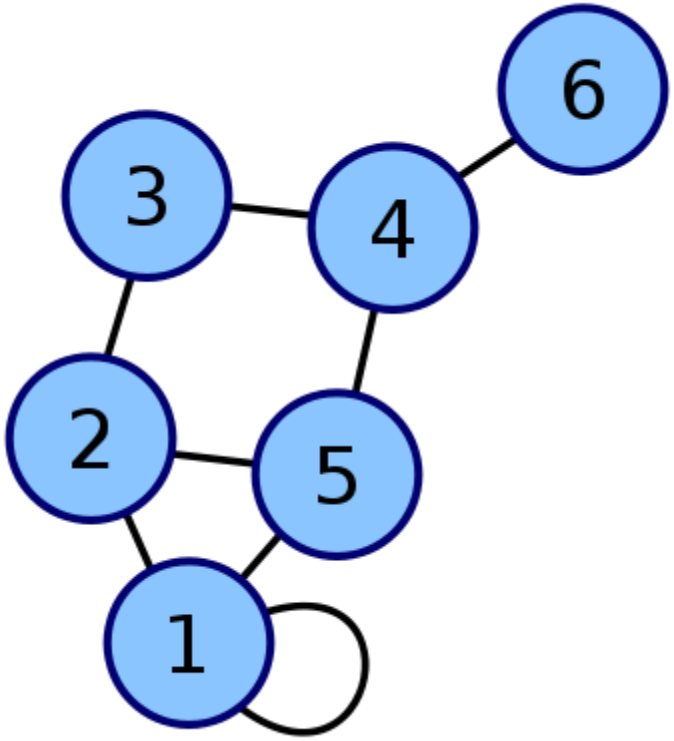


02

RELATIONSHIPS

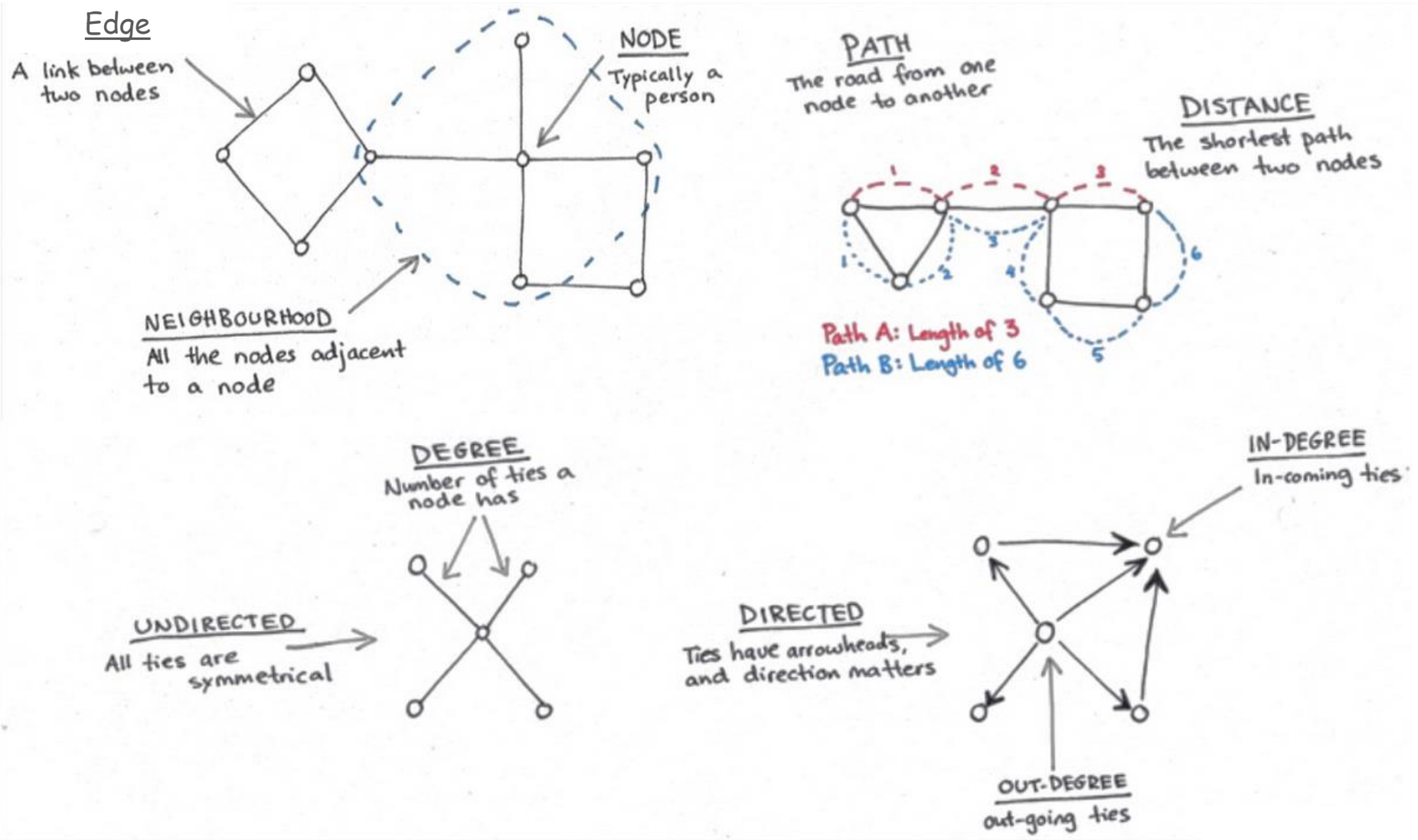
Graphs

Vertices (nodes) connected by Edges (links)

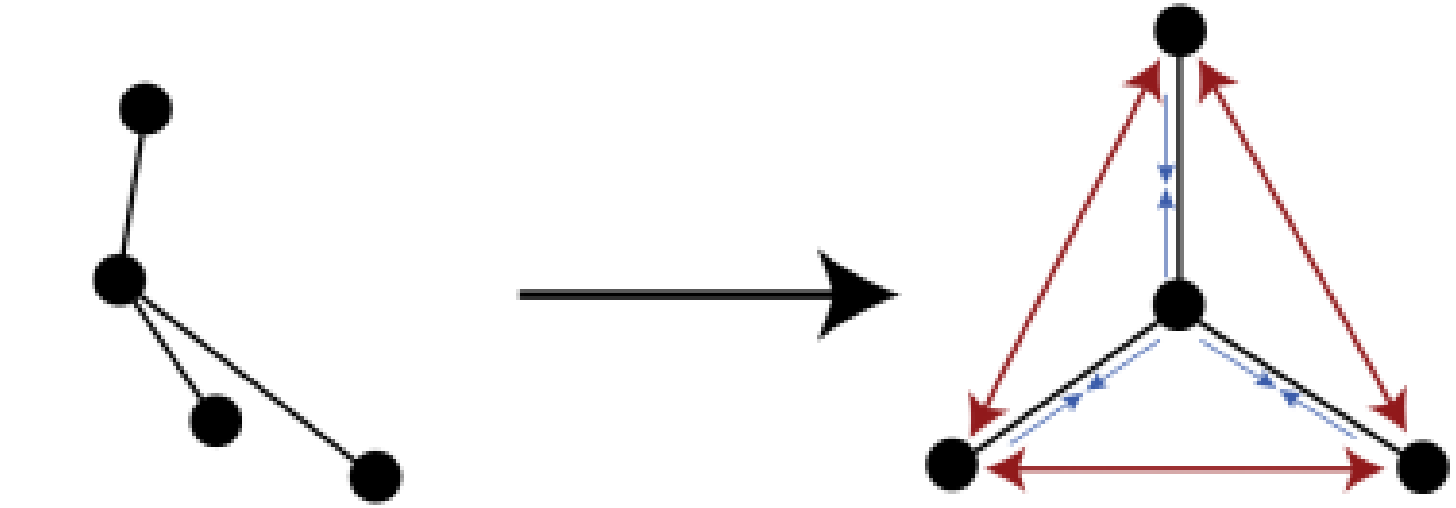


Graph Concepts

http://www.slideshare.net/Optimice/social-network-analysis-and-graph-theory-concepts-explained



Force-Directed



Ex: https://observablehq.com/@d3/force-directed-graph

Force-Directed: Dangers

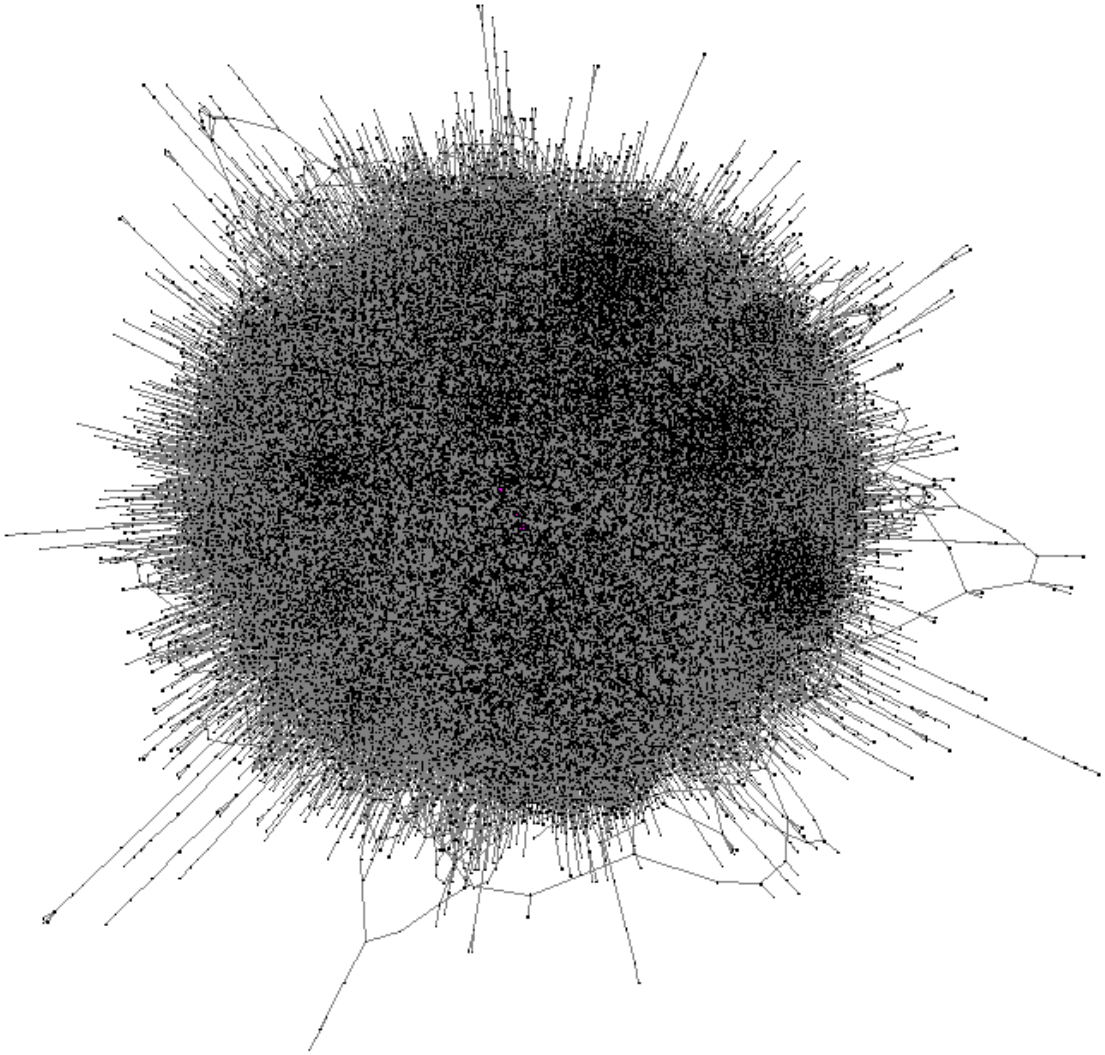
Unstable

Slow

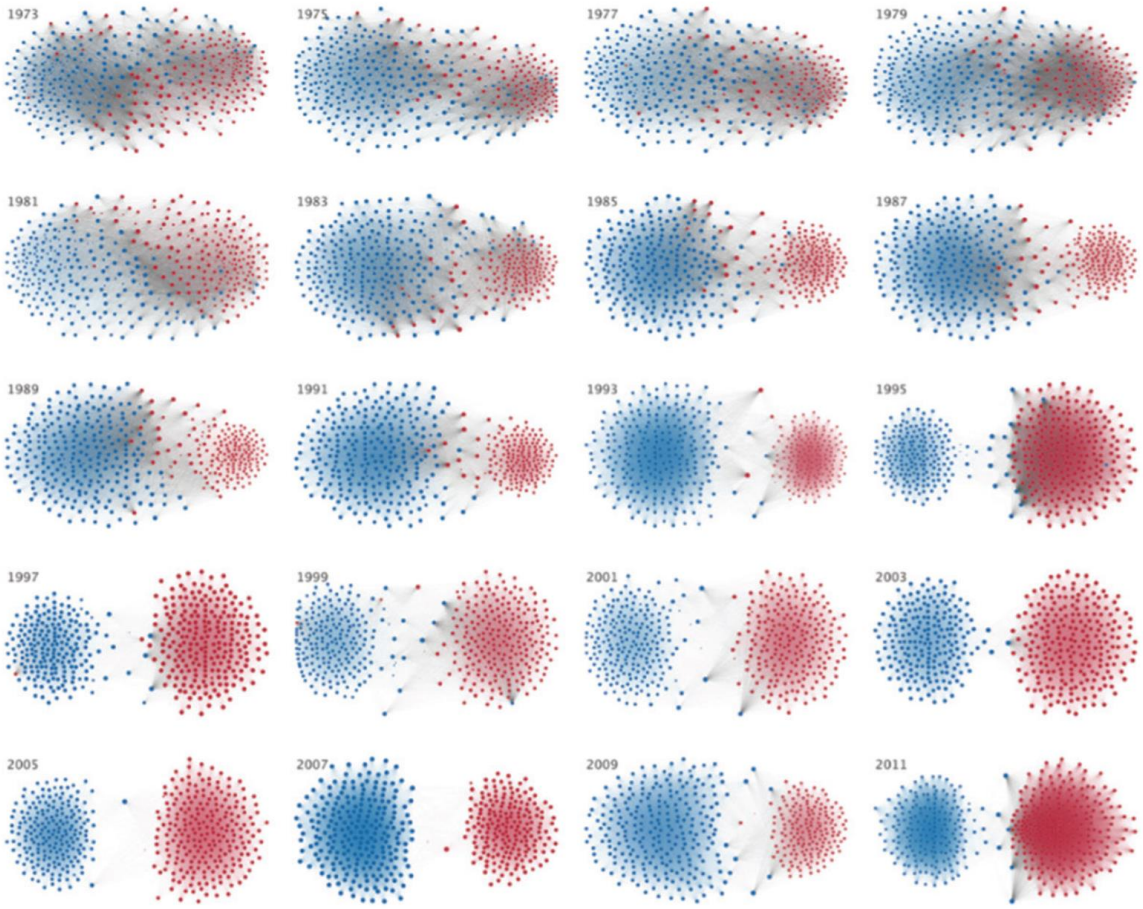
Hard to reproduce

Convergence

Hairballs…



Sometimes, not the point…



This small multiples set of network diagrams from Andris et al. (2015) shows voting behavior in the United States Congress.

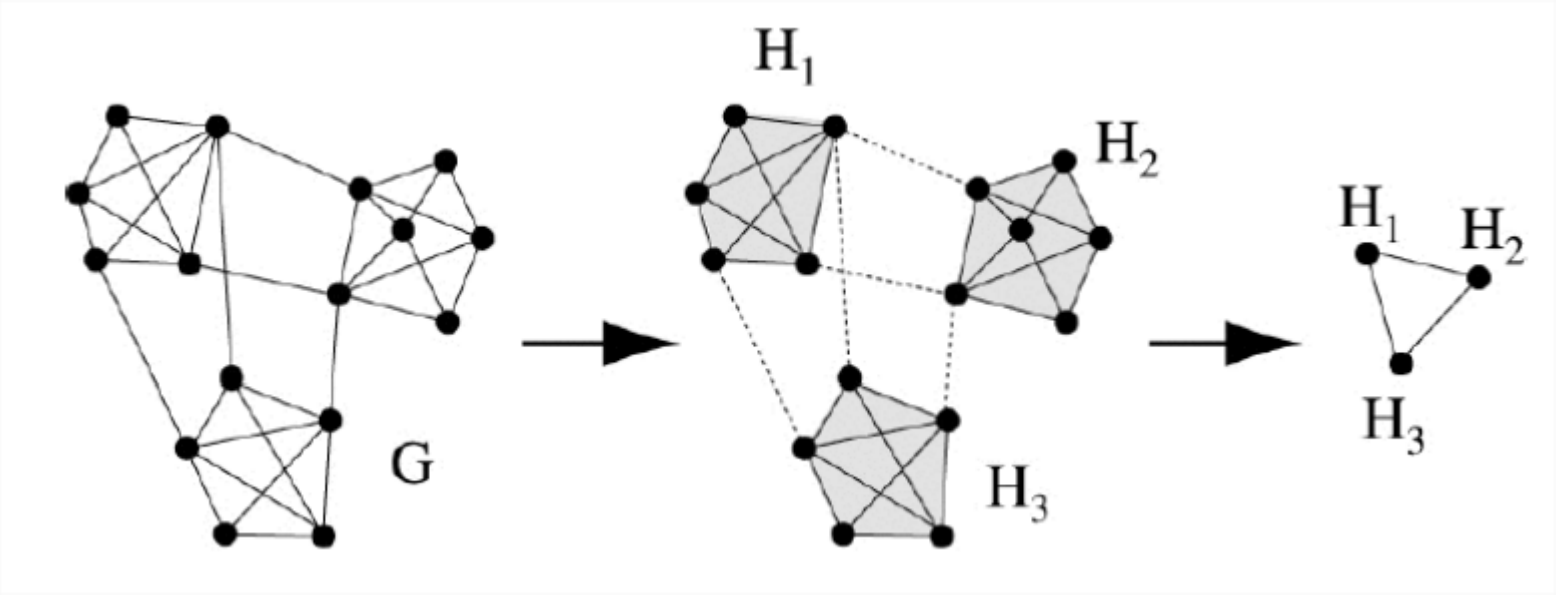
Small-World Networks

High clustering, small path length

high clustering, small path length

maximal disconnected subgraphs

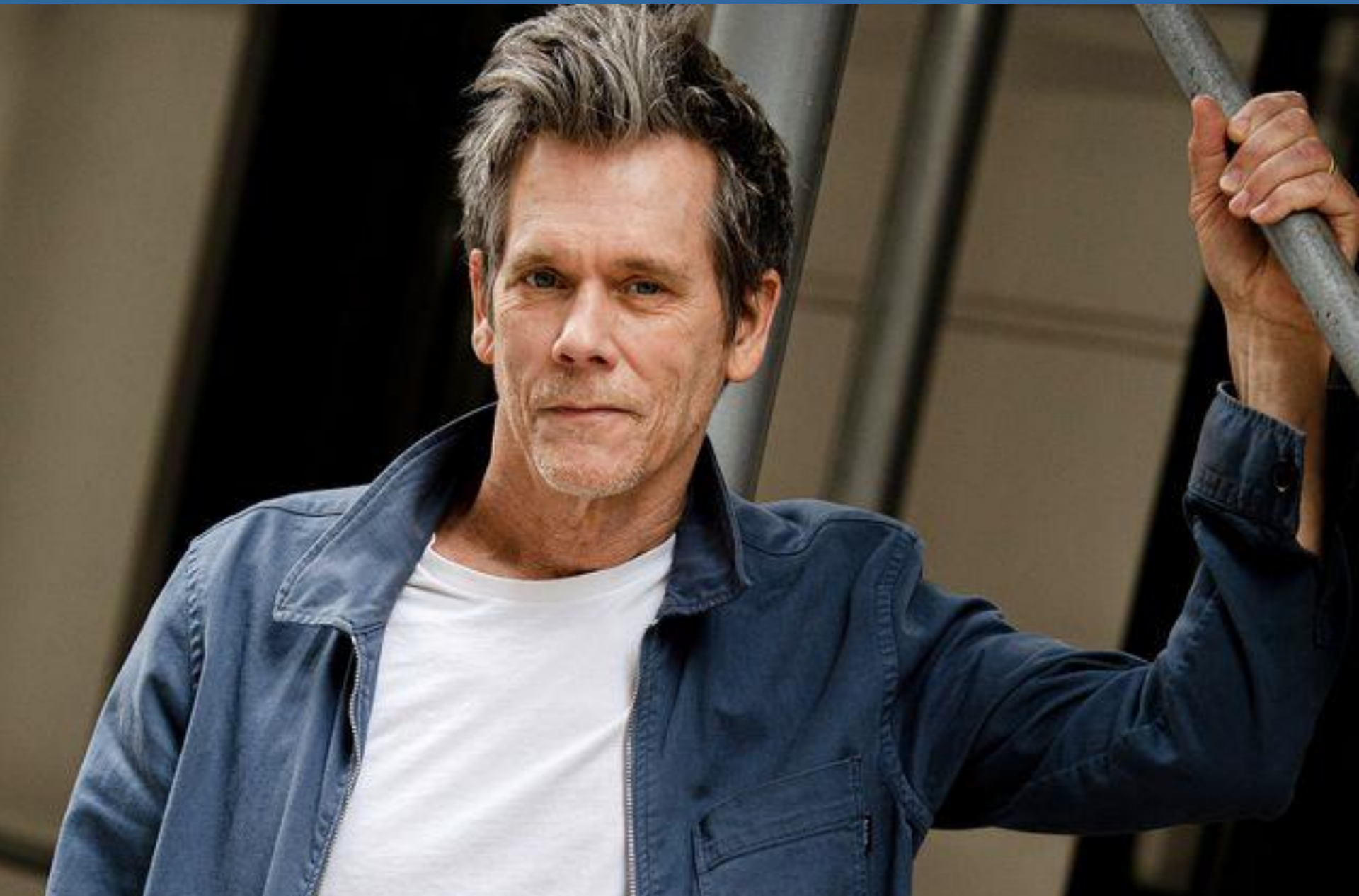
quotient graph: subgraph = higher-level node



Auber et al. Multiscale Visualization of Small World Networks. Proc. InfoVis 2003, p 75-81

Consult the Oracle!

http://oracleofbacon.org/

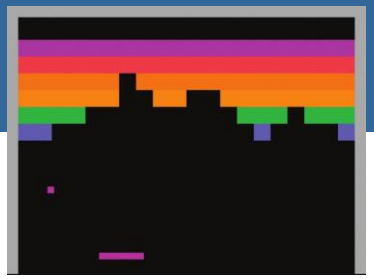


Breakout!

Here is a dataset…

	AVT	DJ	EDI	AID	IAJ	LN	VI
AVT		4	1	0	5	4	6
DJ	4		2	2	17	4	2
EDI	1	2		2	0	1	10
AID	0	2	2		8	16	24
IAJ	5	17	0	8		5	3
LN	4	4	1	16	5		18
LN	6	2	10	24	3	18	

Time to Break Out



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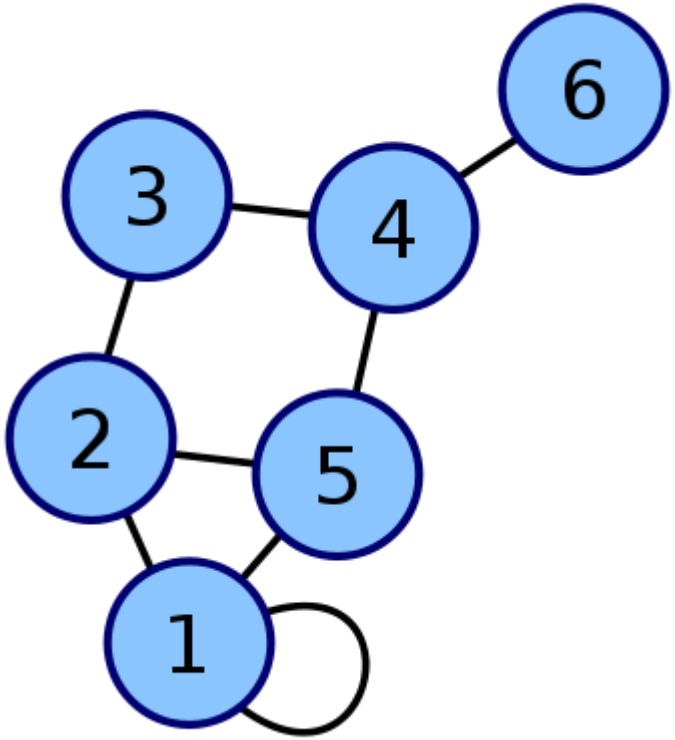
IAJ	5	17	0	8		5	3
LN	4	4	1	16	5		18
LN	6	2	10	24	3	18	

https://bit.ly/3f0ytzc

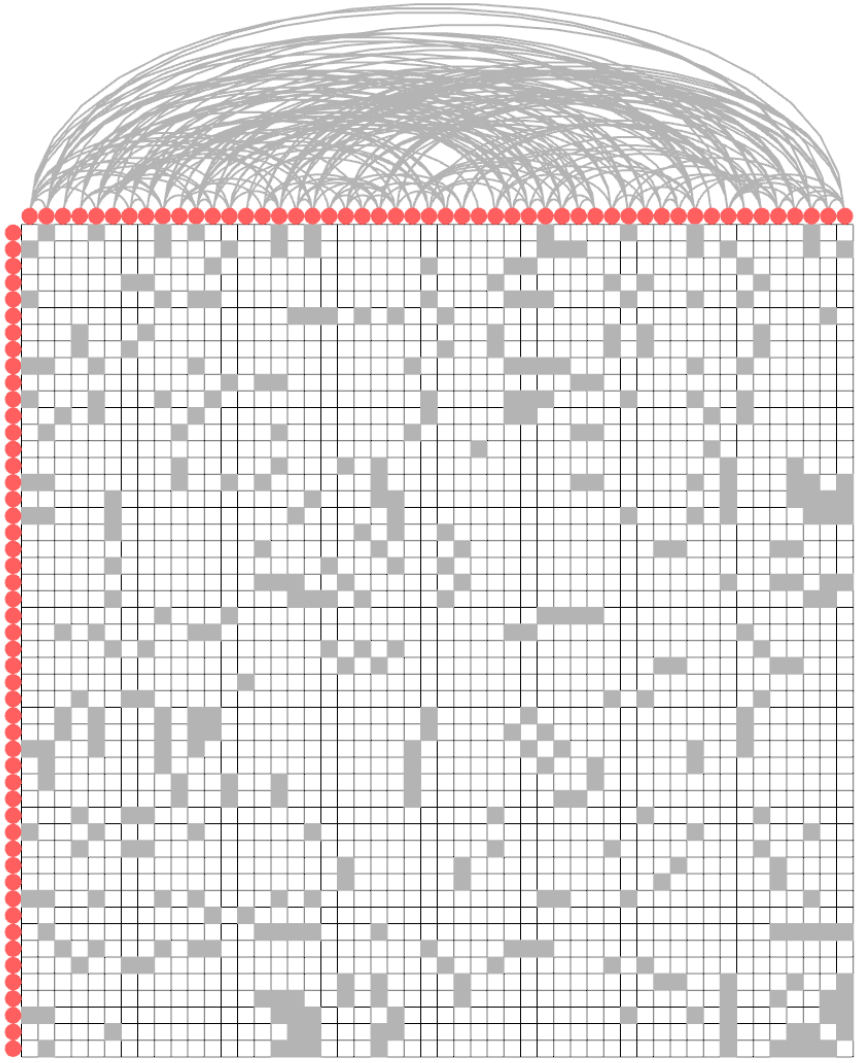
10:00

Adjacency Matrix



$$\begin{pmatrix} 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \end{pmatrix}$$

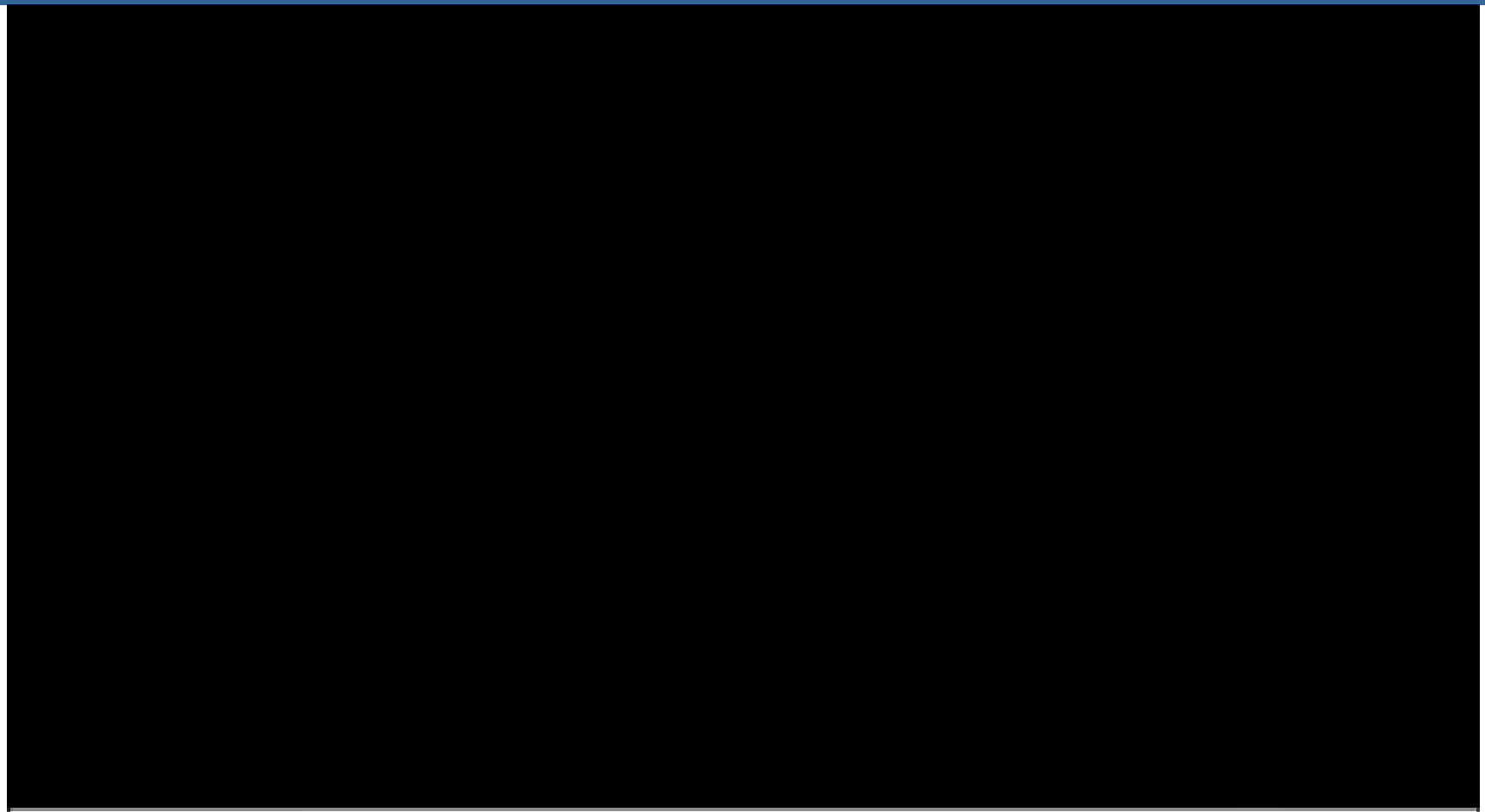
Adjacency Matrix



Breakout Over!

Hybrid Approach: NodeTrix

http://www.aviz.fr/wiki/pmwiki.php/Research/Nodetrix



INRIA

UNIVERSITÉ PARIS-SUD 11

The University of Sydney

UNIVERSITY OF TORONTO

QUESTIONS?