S. Rinzivillo – rinzivillo@isti.cnr.it

DATA VISUALIZATION AND VISUAL ANALYTICS

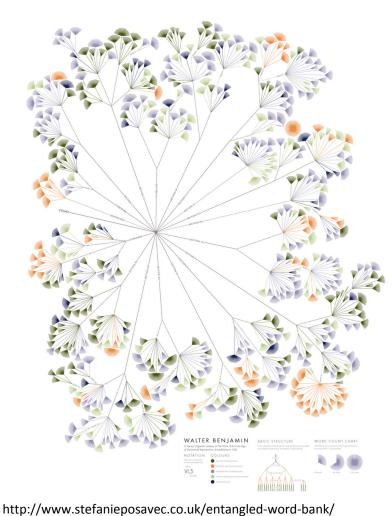
Hierarchy

- Oxford Dictionary:
 - a system in which members of an organization or society are ranked according to relative status or authority
 - an arrangement or classification of things according to relative importance or inclusiveness
- Hierarchical systems are ordered sets where elements are organized in a given relationship to one another
 - Parent-node relationship
 - Sibling relationship

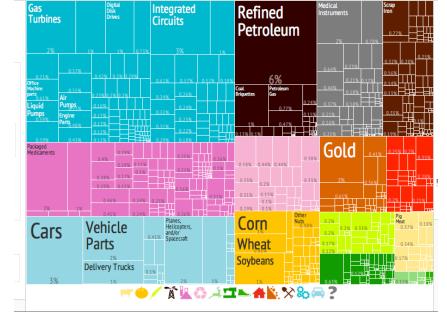
Hierarchy

- Complexity often takes form of hierarchy
- Hierarchy is one of the central structures to represents complexity

Hierachical Structures



What did the United States export in 2011?



http://atlas.media.mit.edu/

Representation

- Two main visualization approaches
 - Stacked
 - Higher ranks are arranged in a directional relationship
 - Vertically, top to bottom
 - Horizontally, left to right, right to left
 - Centrally, center to periphery
 - Lines connect elements in the sets
 - One-dimensional visual elements
 - Nested

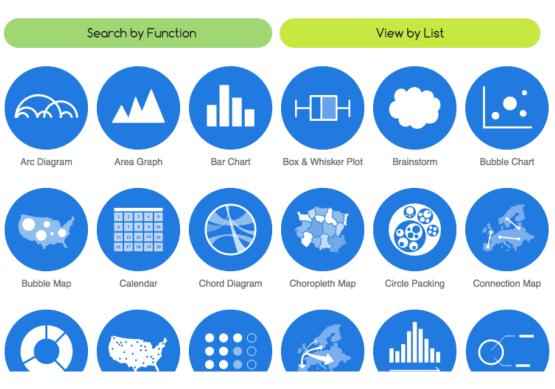
Representation

- Two main visualization approaches
 - Stacked
 - Nested
 - Elements organized in containers
 - Higher ranking elements contains lower ranked ones
 - Container is a geometric object: two-dimensional plane, three dimensional solid
 - Container provides the grouping for all the descendant

Visual Taxonomy

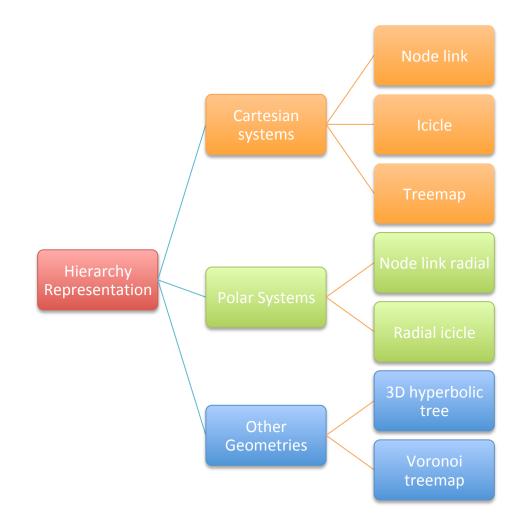
The Data Visualisation Catalogue

About · Suggest · Shop · Resources



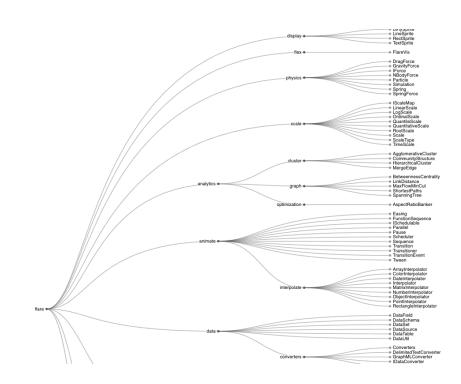
http://www.datavizcatalogue.com/

Taxonomy of Visual Representations



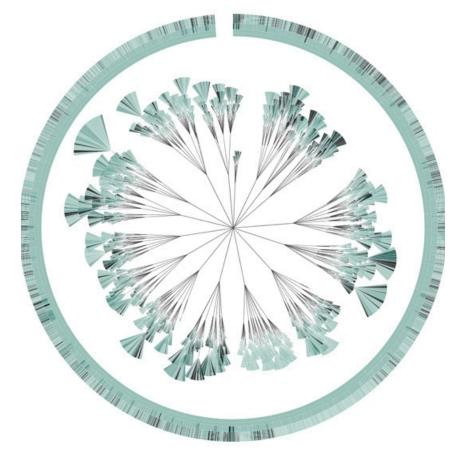
Node link layout

- Stacked scheme
- Node link
- Direction for arrangement
 - Vertically
 - Horizontally
 - Centrally
- Sometimes lines encode properties of the relationship



Node link layout

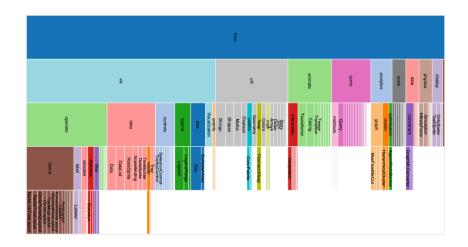
- Stacked scheme
- Node link
- Direction for arrangement
 - Vertically
 - Horizontally
 - Centrally
- Sometimes lines encode properties of the relationship



http://research.microsoft.com/en-us/projects/TextVis/ https://observablehq.com/@d3/radial-tidy-tree

Icicle layout

- Stacked scheme
- Direction for arrangement
 - Vertically
 - Horizontally
 - Centrally
- Height/color of each shape/node may encode properties

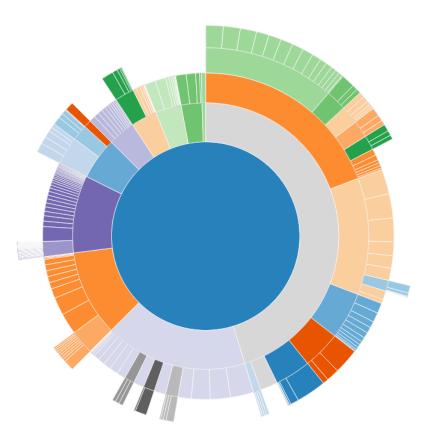


http://champsring.com/collections/latest

https://observablehq.com/@d3/icicle

Radial Icicle layout

- Stacked scheme
- Direction for arrangement
 - Vertically
 - Horizontally
 - Centrally
- Height/color of each shape/node may encode properties



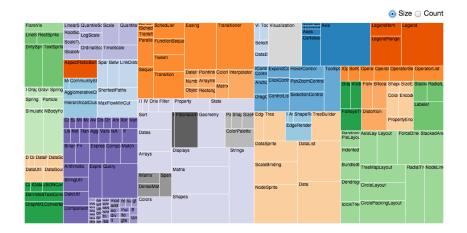
Treemap layout

- Container scheme
- No direction for arrangement
- Height/color of each shape/node may encode properties
- Usually additional linked display are useful to explore data



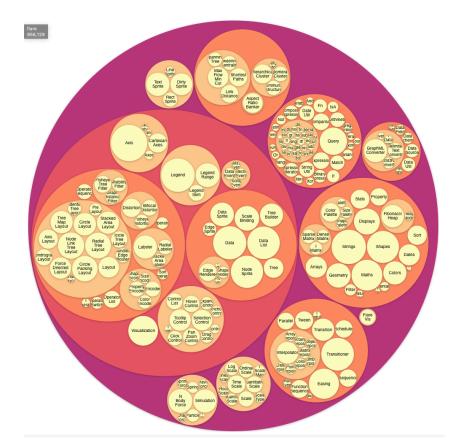
Treemap layout

- Container scheme
- No direction for arrangement
- Height/color of each shape/node may encode properties
- Usually additional linked display are useful to explore data

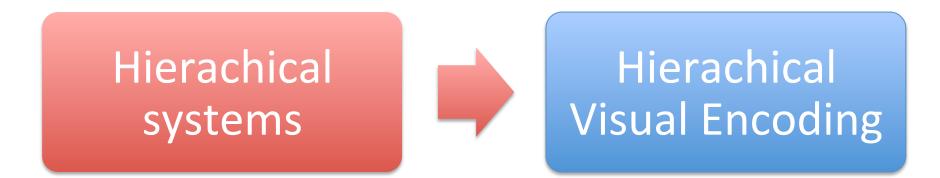


Treemap layout

- Container scheme
- No direction for arrangement
- Height/color of each shape/node may encode properties
- Usually additional linked display are useful to explore data



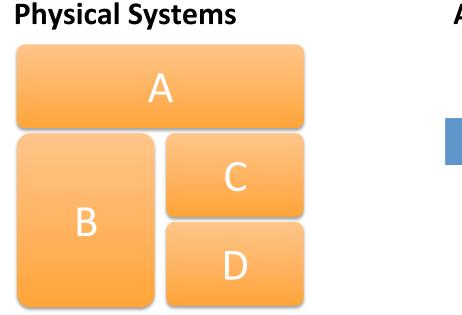
Visual Hierarchies



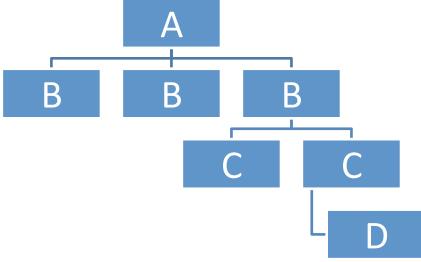
- Spatial encoding is crucial for visualization
- Two separate cognitive processes
 - Spatial properties (position and size)
 - Object properties (shape, color, texture, etc.)



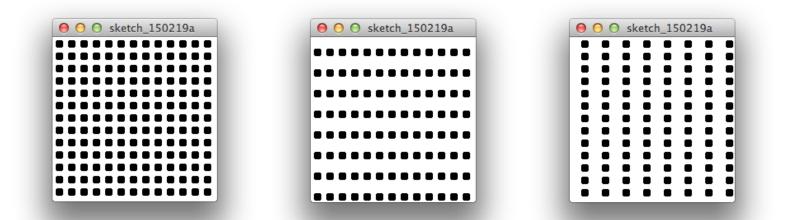
Proximity describes the tendency to group visual elements that are near one another Visual proximity (should) corresponds to real proximity



Abstract Systems



Proximity, Groups, Clusters



- Space between dots allows us to perceive groups as columns or rows
- Spatial proximity facilitate the detection of related data
- Conceptually related concepts should be represented spatially close

Hierarchical Abstract Domains

- Abstract domains usually do not provide visual clues
- Assigning a visual representation to abstract data is crucial for a robust visualization

Newsmap

Federica Pellegrini s i 100 stile libero: vit con dedica toccante	tutta l'Inter Idee da			ovo cor	HOR FRANCE GERM ne crepe del so Brocchi. pel gioco?	I mille volti di Prince, l'artista					U.K.	Earth Day, gli appuntamenti in tutto il mondo. E i proventi delle app di Apple andranno al Wwf					
Volley, Superlega: Lube e Trento tornano in cosa	Navarro, se Fenati e Bu	P1: Acuto di lavarro, seguono enati e Bulega		ppietta di ary: "Gol?) mio"	GOI? Urra di Civitanova e Trento		che viveva per					«Perfetti sconosciuti» fa il miglior sceneggiatura al	bis: sar ecc	Mika annuncia che non sarà giudice di X-Factor 10, ecco perché			
Di Francesco ha rinnovato. Al Sassuolo fino al 2019	Premier: Sanc formato Champions, l'Arsenal metti freccia	e la Milan,	"Inter da sempre! So ssimo solo se segno , Berlusconi: "S	o" dice no al P: l'accordo co Voley, SuperLega	sg, c'è già in lo United Matulaasita	Milano, botte a malati psichiatrici: le telecamere filmano il pestaggio Veniti: tibotèedè Tati; Venkne: téadoun capteno	la musica						Tribeca Mainetti: «Totti è come Jeeg Robot	t» Ave Gia	Amon stucch is particles Independence bas: Revendence, so andro oble is animale Aventimo, il Giardino degli Aranci Princeli monte, l reveli monte, l anima superioritatione statuo Princeli anima anima Aventimo, il Giardino degli Makeritane l takto Princeli anima Aranci Makeritane l takto Princeli anima		
Serie A: 3 turni di squalifica a Chibsah	Inter, che triste déjà-vu. Ma og arrivano i cine:	igi mani Bacca a) sarà solo in sicure" secco: sostituito. o truce a Brocchi	Viente stitiante per l Barcellona toma in Viante, Associat stor abbalado il muro de		Cmici in ulkice almer spunta anche la spystory Totle Bysori: sarch Faddo sarch Faddo chrase yer 4 most e. hysolitik witten 0% iterati	Rimini, maltratta i b della scuola materr maestra arrestata Il benzinaio che ucc	a: s	Voto di scambio, l'ex senatore Pd Papania condannato a otto me di carcere Solar Impulse 2. l'aereo		1 uzeko nesi		Ecuador, nuova scossa magnitudo 6				
Canone Rai, altri chiarimenti: smartphone, tablet e pc non sono apparecchi tv Canone Rai in bolletta: arrivano i problemi	Dieselgate, Volksw l'accordo con gli Us maxi-rimborsi		lsa. In arrivo tal ca		computer, smartphone e ablet non pagano il anone Rai		bandito «Sparò col fi È legittima difesa» Caso Yara, Bossetti (quelle lettere hard) una detenuta in car	icile alim sola sola	Solia mipulse 2, racito presente positive positive positive and a solare structure for a solar		ber	Lo sfregio d dell'acido: s pena solo a	cont	conto di priorità Martina massima pe			
	Borse europee poco mosse dop quattro rialzi. Pr Eurozona in cal	o di risul ni		Banche, Renzi: e un nuovo provve per la solidità Eurozona divisa su	dimento	Boom investimenti in rinnovabili all'estero nel 2015 Cementir punta a	Confisca beni 36 Min,anche hotel romano	Caso la Parmal prezzo p	pili tesso"	No a tre consiglier in più: il Consiglio boccia Tol ineste e uccide droma ai deminiti	protestore		Su Brexit arriva 'assist di	Usa, scope tunnel dell droga tra	erto 🌆	l'Euro ime, Olizaprio e Elena Pers al 100 più infuent defann	
	Popolare di Milano: Fi pone sotto osservazio il rating di lungo term (LT IDR)	ch Stato ne	Grecia e titoli di urta ai 3 miliardi	Panama Papers Alphabet i risultati		rafforzarsi nei Paesi dove è già presente	Marco Canestrari e «verità» su Casalegi	jio con s bar	con spari in un bar		Armalo di collello sui binari, asspesa la		Cameron	Messico e California	Vinn asce	AddoPrince: I foletio d Winnegold troato error vitain accenzon: Aerea 57 anni contracte sulla Pepe Ne	
	Salvatore Ferragamo dell'assemblea al bilancio. Norsa pront lasciare	di fatturat ok	b	finanziari del Q1 2016 Cannels: silla il 16maggio Fautoente almo per chi non ha la tr		aumento per ondirie tatibado necessaria balani Perel porte del 25 aprile 7 milionie del 25 aprile 7 milionie del 25 aprile 7 milionie del 25 aprile 7 milionie del 25 aprile 8 april	Android, 400 milioni dispositivi esposti a malware dice Google					Google, que app che no vanno giù all'antitrust	realtà virtuale: Predator, notebook e desktop per il garning in 3D Foto		Macinato Ritirato dal Mercato: Info		
Inewsmap Fri April 22, 2016 11:42:15 NEWSMAP IS @2004-2010 MARCOS M	ESKAMP CONTACT	BLOG AB	powered b out Google	by hosting by "heten	nl	+ SELECT ALL -	WORLD	hational	BUSINE	ESS	TECHNOLOGY	SPC SPC	RTS ENTERTA	AINMENT 🗸	HEALTH	MORE TH	an 10 min. Ago Ian 10 min. Ago Ian 1 hour ago

http://newsmap.jp/

Voronoi Treemap

All of Inflation's Little Parts

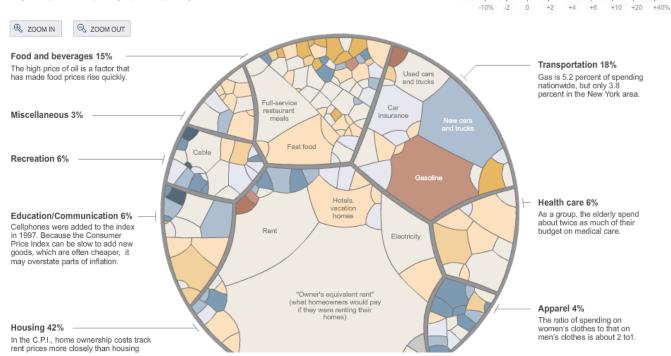
Each month, the Bureau of Labor Statistics gathers 84,000 prices in about 200 categories — like gasoline, bananas, dresses and garbage collection — to form the Consumer Price Index, one measure of inflation.

An Average Consumer's Spending

Each shape below represents how much the average American spends in different categories. Larger shapes make up a larger part of spending. SIGN IN TO E-MAIL OR SAVE THIS FEEDBACK

Color shows change in prices from March 2007 to March 2008

It's among the statistics that the Federal Reserve considered when it cut interest rates on Wednesday. The categories are weighted according to an estimate of what the average American spends, as shown below.



http://www.nytimes.com/interactive/2008/05/03/business/20080403_SPENDING_GRAPHIC.html?_r=0

LAYOUTS



- A layout encapsulate a strategy to position elements on the screen
- For example: alignment along a reference axis
 - Exploit d3.scale to handle the projection on the screen

Layout

- A layout works on a set of elements (unlinke for selection)
- In d3, a layout enrich the input data to provide new properties to determine the position on the screen

Available Layouts

- D3 provides a vast library of layouts
 - Hierarchies https://github.com/ d3/d3-hierarchy
 - Chords https://github.com/ d3/d3-chord
 - Force https://github.com/ d3/d3-force
 - Voronoi https://github.com/ d3/d3-voronoi

