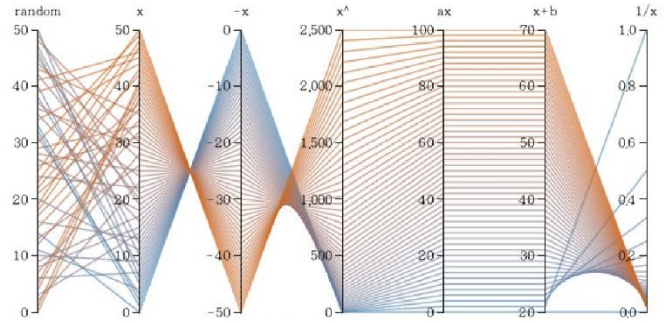
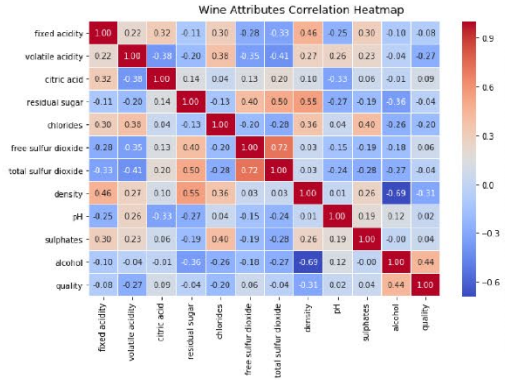
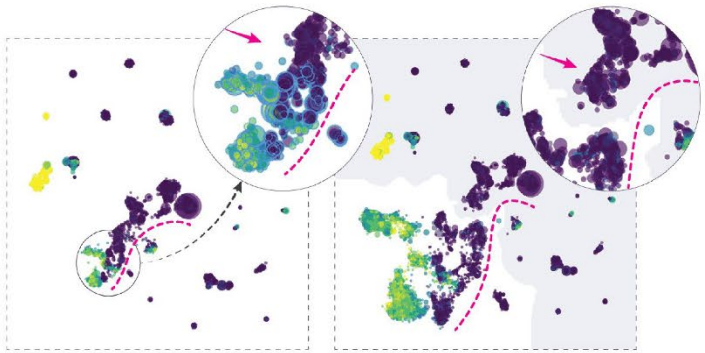
JBI100 Visualization

VISUALIZATION DESIGN AND ENCODINGS







Anna Vilanova, Prof. dr.

Mathematics & Computer Science, Visualization Cluster

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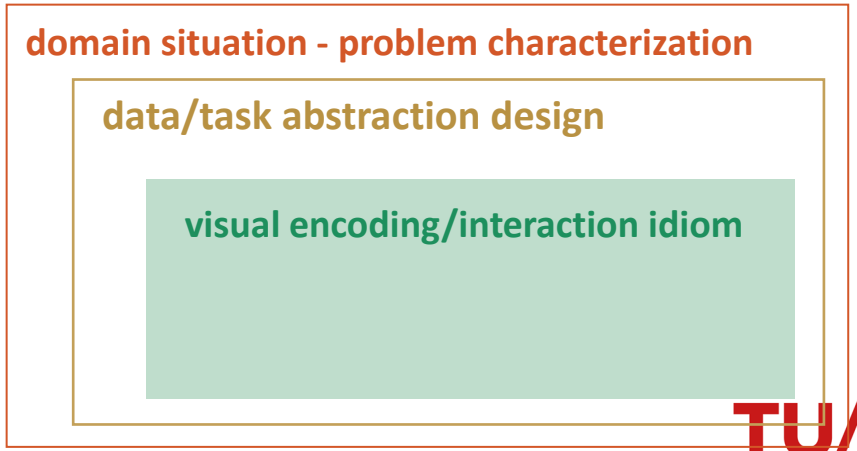
Analysis framework

- **What** is shown?
  data abstraction
- **Why** is the user looking at it?
  task abstraction
- **How** is it shown?
  visual encoding and interaction



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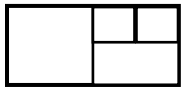
Marks & Channels

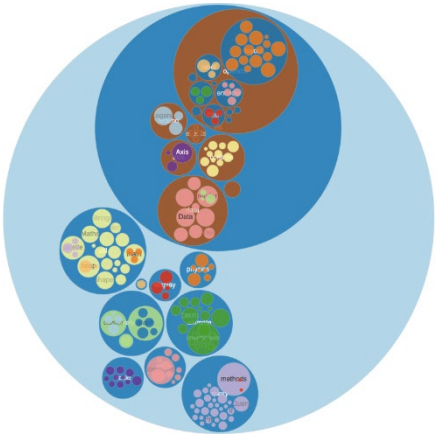
Marks: geometric primitives

- Points
- Lines
- Areas 
- 3D Marks: Volume, …

Marks & Channels

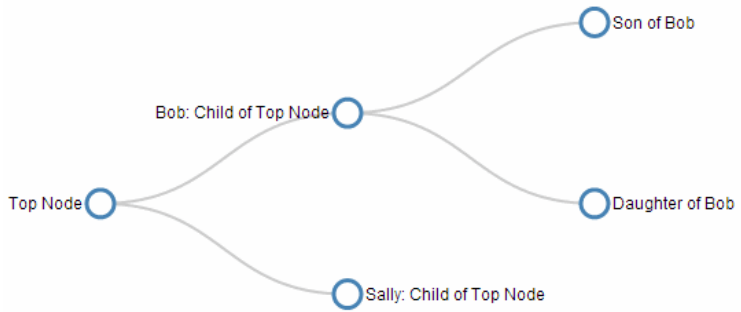
- Links

Containtment



https://github.com/vasturiano/circlepack-chart

Connection



http://www.d3noob.org/2014/01/tree-diagrams-in-d3js_11.html

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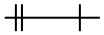
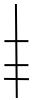
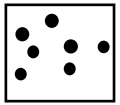
Marks & Channels

Visual channels: control appearance of marks

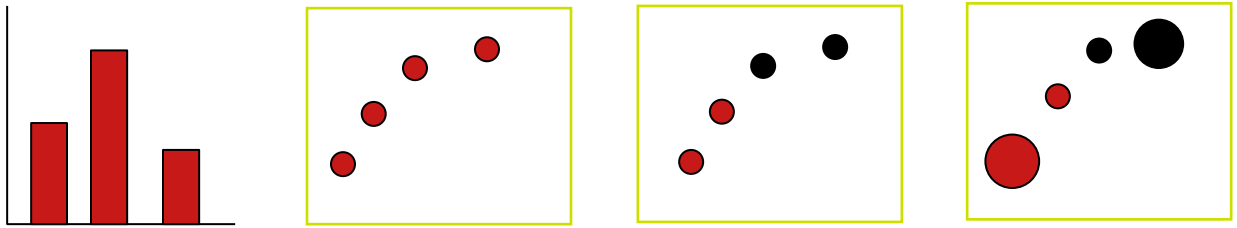
- Position

  Horizontal  vertical  or both 

- Color
- Tilt (angle)
- Size
- Shape
- Motion
- …

Visual Encoding

Analyze as combination of marks and channels showing data attributes



Channel	Length (Vertical pos.)
Mark	Line (Bar charts)

Visual Encoding

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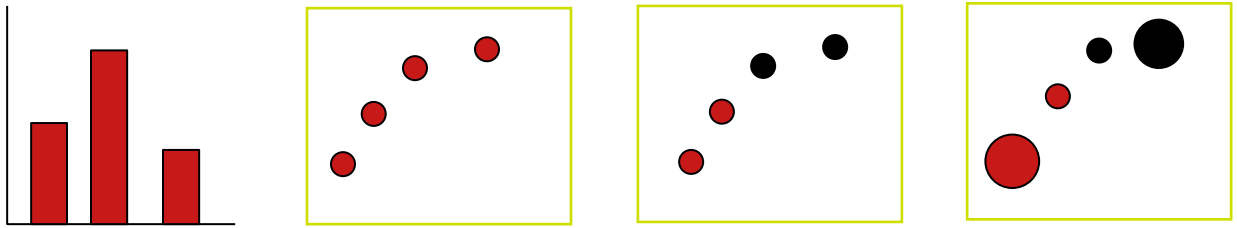

Channel	Length (Vertical pos.)	Vertical pos. Horizontal pos.	Vertical pos. Horizontal pos. Color	Vertical pos. Horizontal pos. Color Size
Mark	Line (Bar charts)	Point (Scatter plots)	Point	Point

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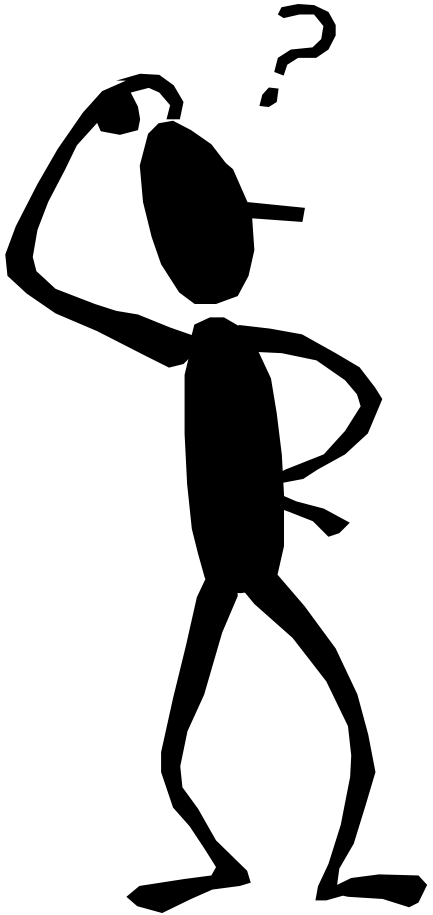

How can we select Visual Encodings?

- Expressiveness principle

  show all but only what is in the data.

  match the channel/mark to data characteristics.

- Effectiveness principle (salience):

  encode most important attributes with highest ranked channels

- Rankings based on:

  accuracy, discriminability,separability, popout

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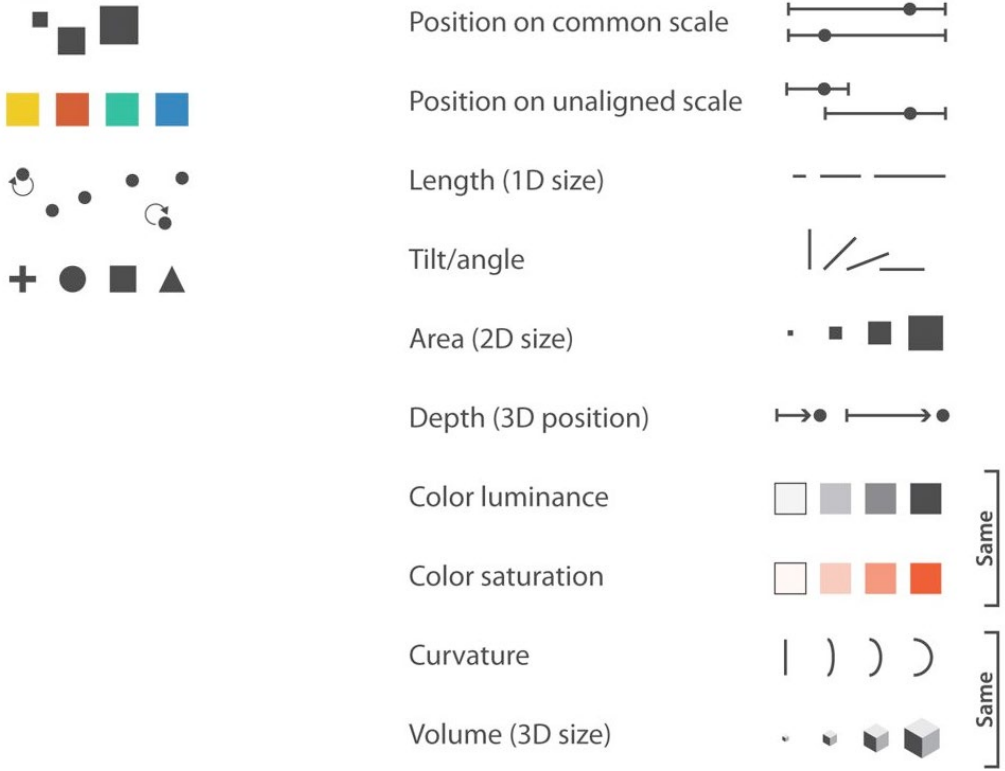
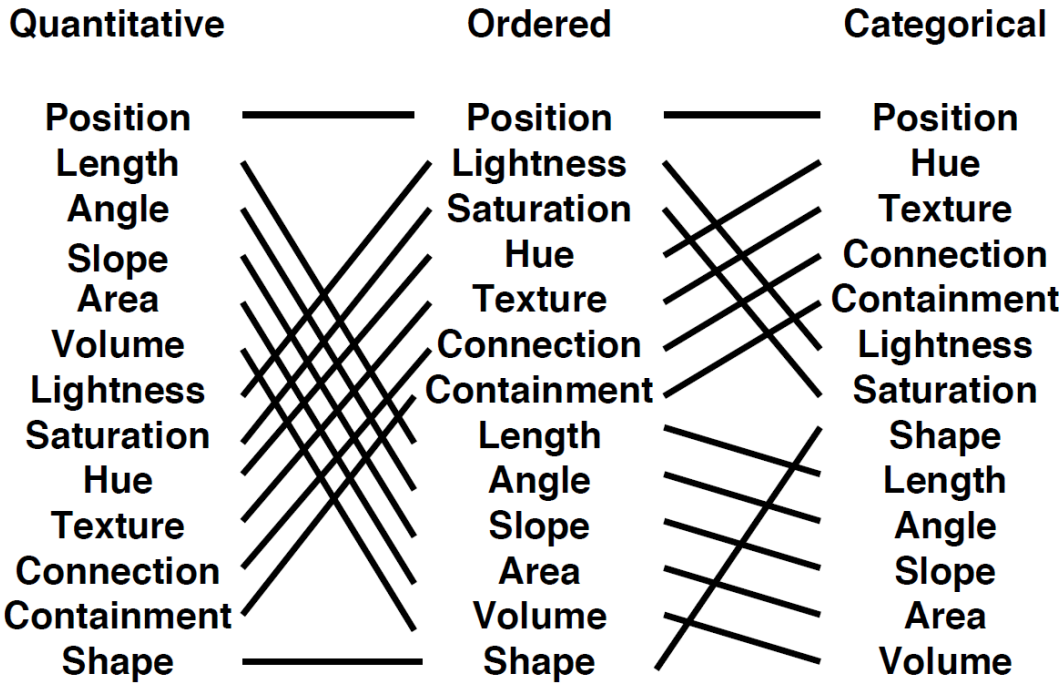
Visual Channel Rankings (Munzner's)

Categorical	Ordered
Spatial region	Position on common scale
Color hue	Position on unaligned scale
Motion	Length (1D size)
Shape	Tilt/angle
	Area (2D size)
	Depth (3D position)
	Color luminance
	Color saturation
	Curvature
	Volume (3D size)



Visual Channel Rankings (Mackinlay)



Mackinlay, Automating the Design of Graphical Presentations of Relational Information, ACM TOG 5:2, 1986]

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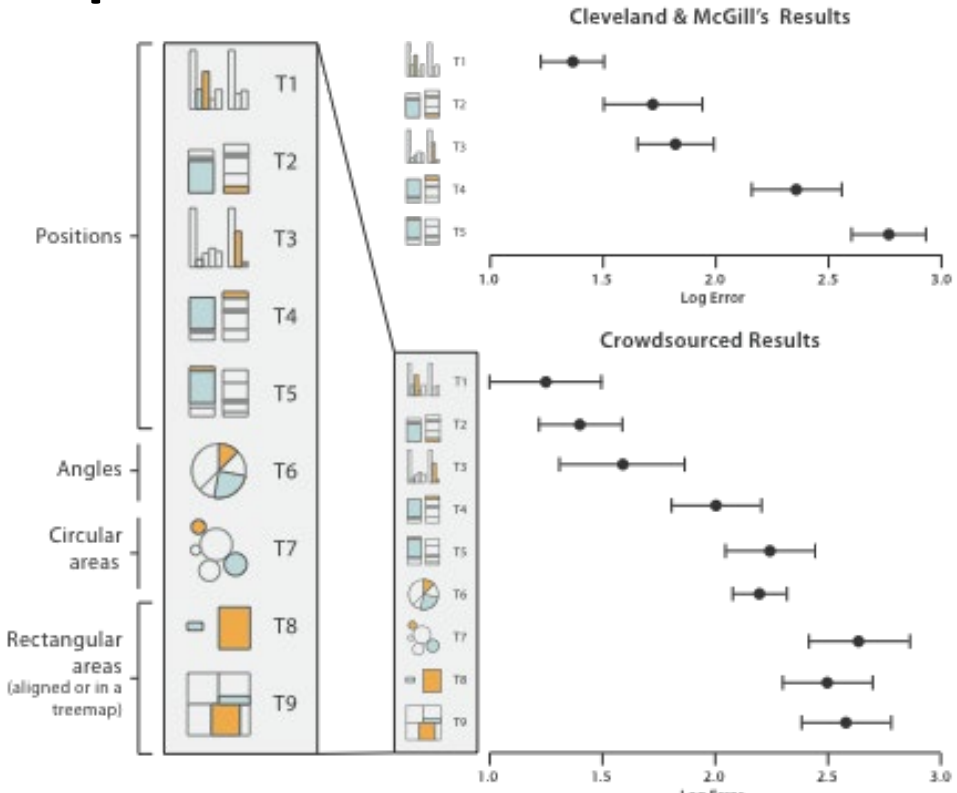
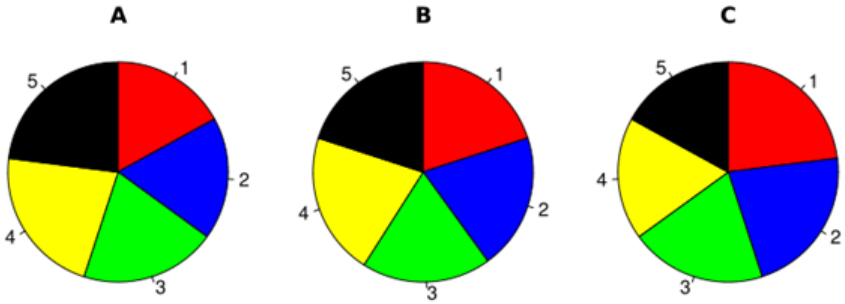
Accuracy: experiments



[Crowdsourcing Graphical Perception: Using Mechanical Turk to Assess Visualization Design. Heer and Bostock. Proc ACM Conf. Human Factors in Computing Systems (CHI) 2010, p. 203–212.]

Angles



https://eazybi.com/blog/data_visualization_and_chart_types/

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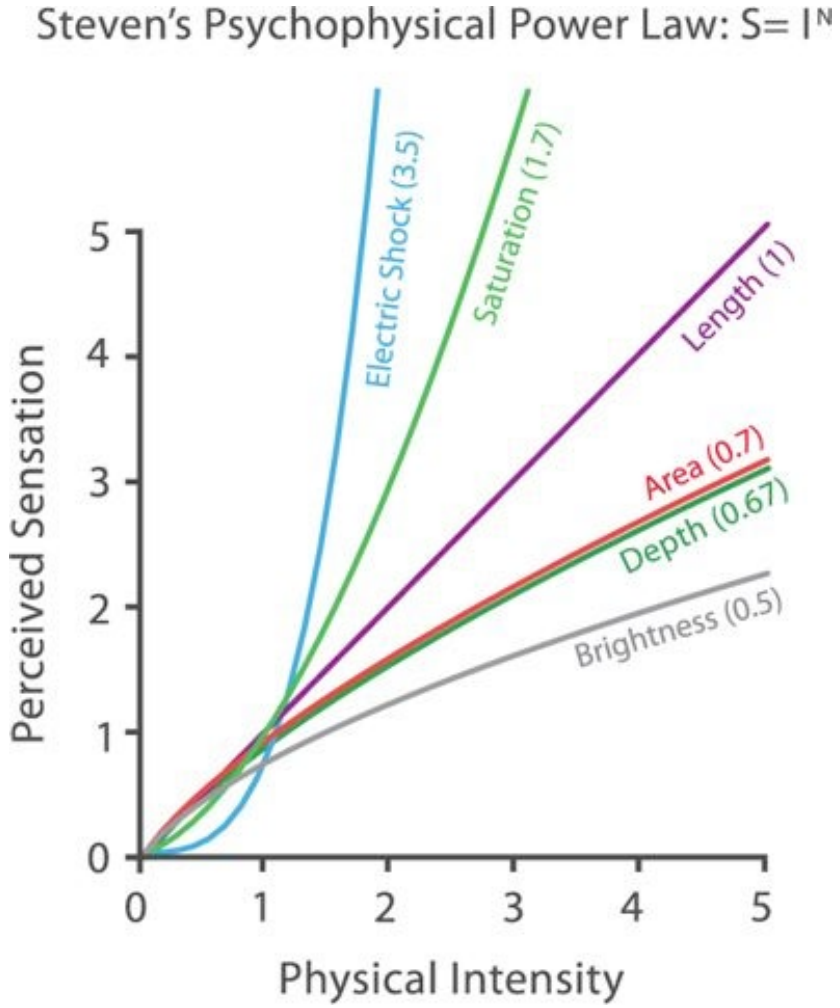
Accuracy

S – *perceived sensation*

I – *intensity stimuli*