Information Visualization Rules of Thumb

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Lect 20, 19 Mar 2020

https://www.cs.ubc.ca/~tmm/courses/436V-20
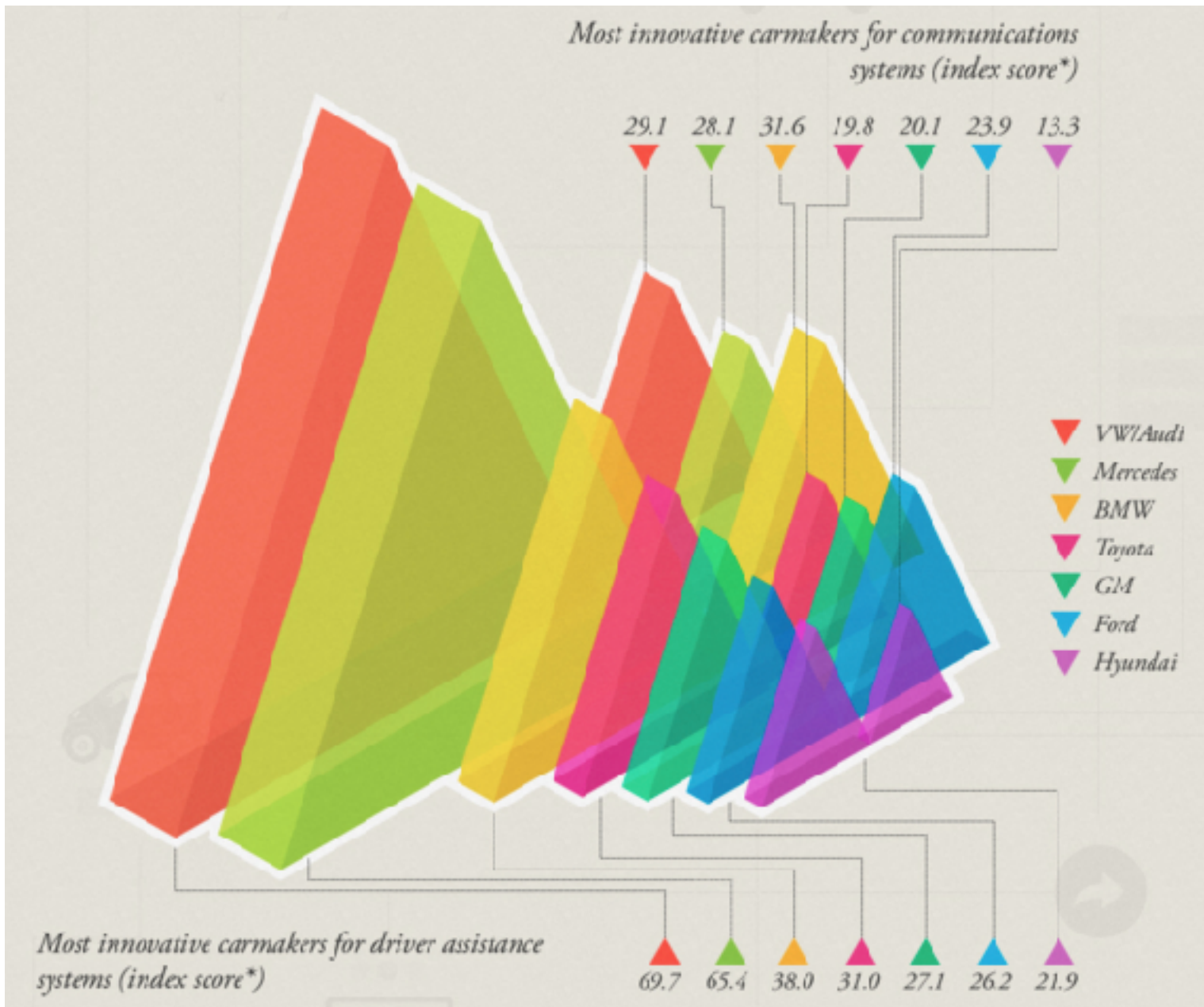
Upcoming

- Milestone 2: still due Wed Mar 25 11:59pm
  - (remember update announced w/ schedule status component)
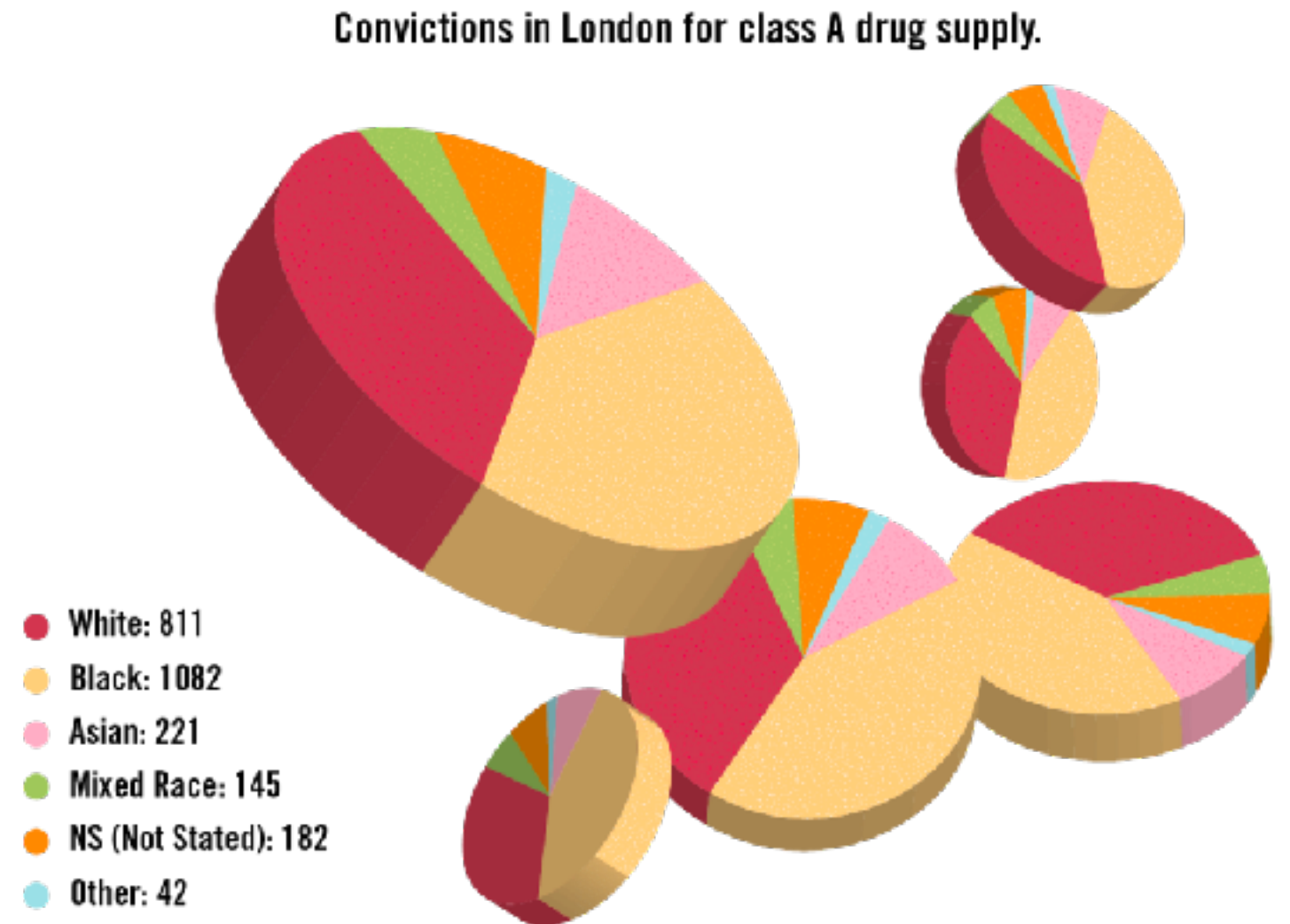
Rules of Thumb

Rules of Thumb Summary

- No unjustified 3D
- No unjustified 2D
- Eyes beat memory
- Resolution over immersion
- Overview first, zoom and filter, details on demand
- Responsiveness is required
- Function first, form next

Unjustified 3D all too common, in the news and elsewhere

http://viz.wtf/post/137826497077/eye-popping-3d-triangles

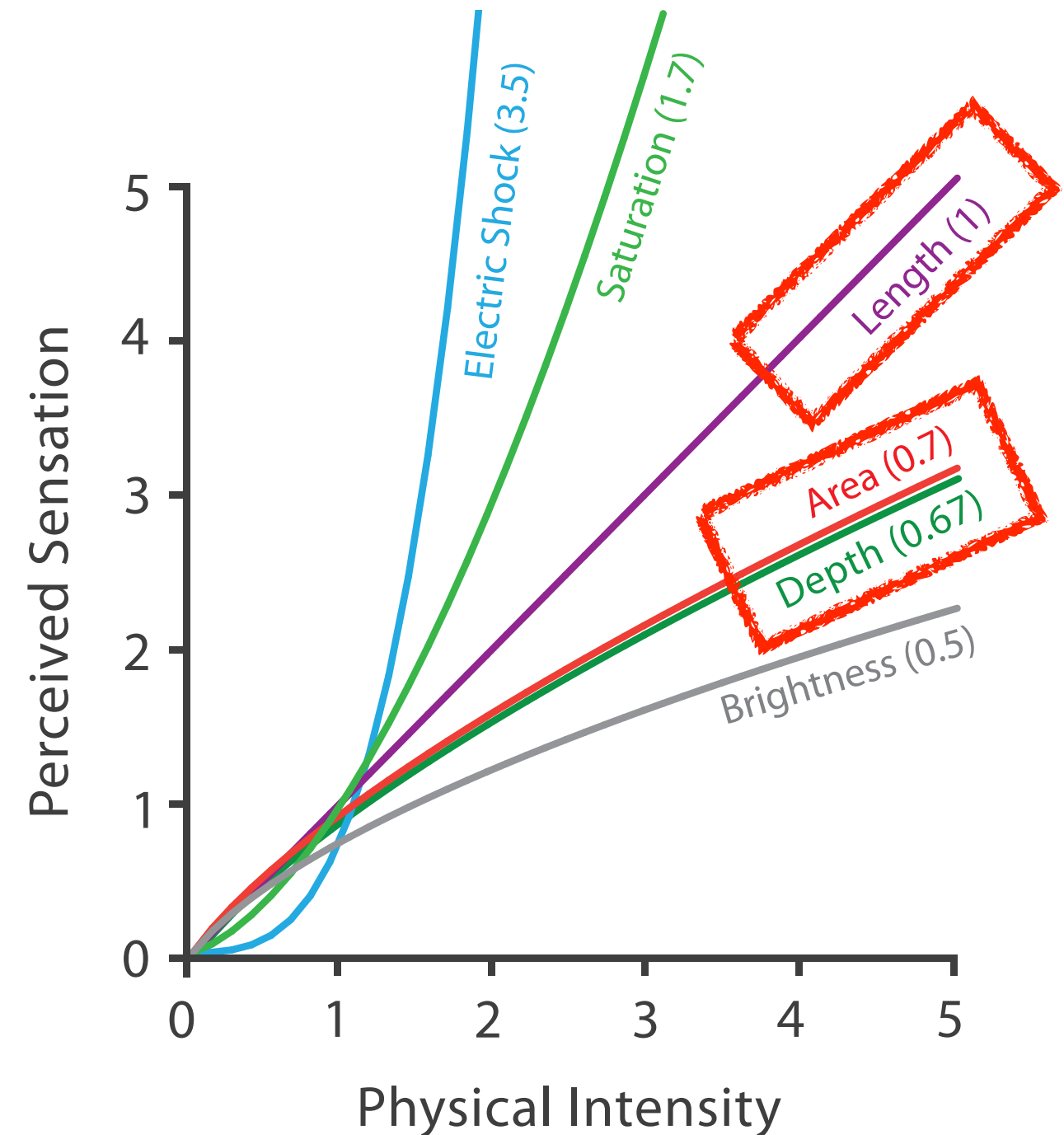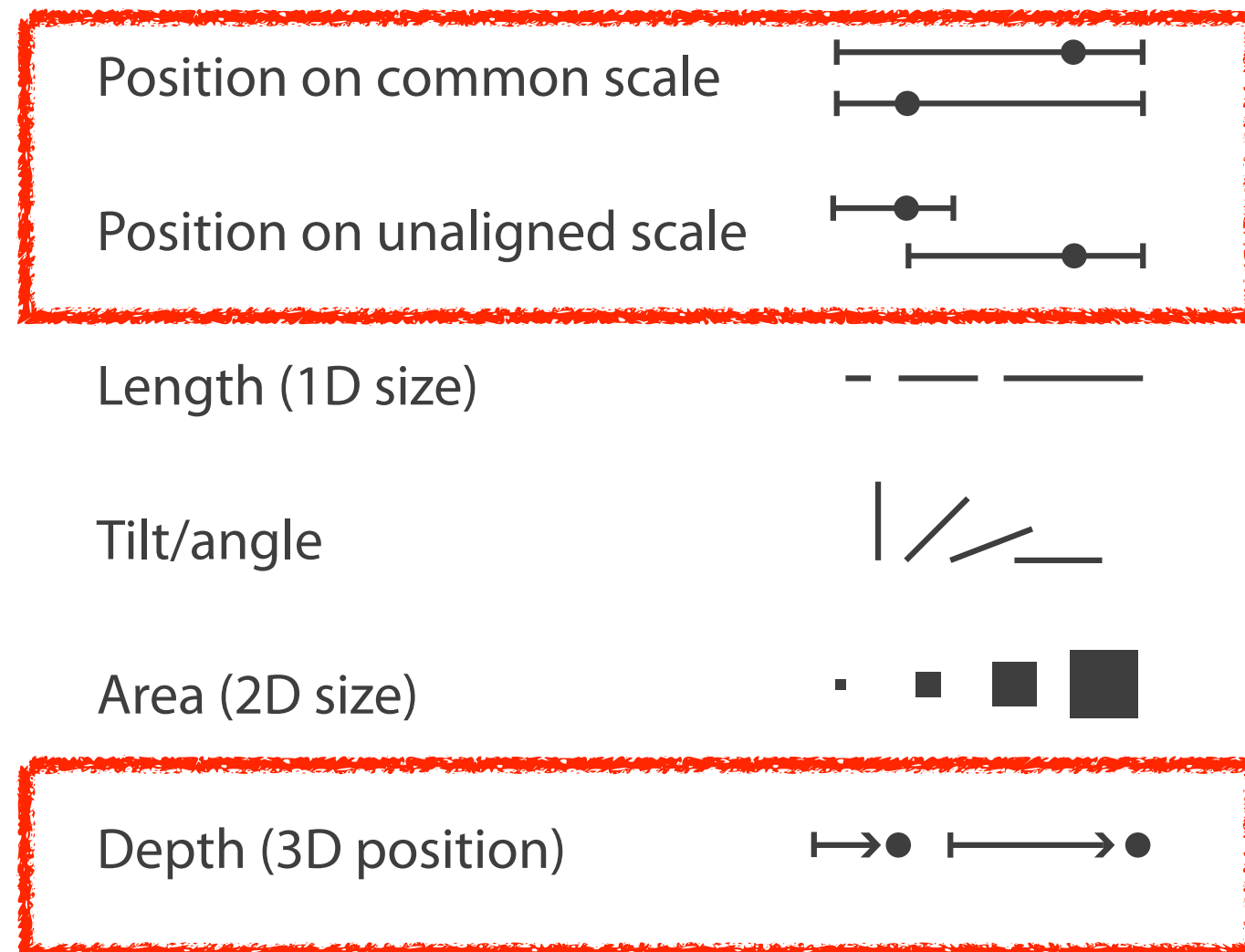http://viz.wtf/post/139002022202/designer-drugs-ht-ducqn

Depth vs power of the plane

- high-ranked spatial position channels: **planar** spatial position
  - not depth!

Steven's Psychophysical Power Law: $S = I^N$

→ **Magnitude** Channels: **Ordered** Attributes

Position on common scale	
Position on unaligned scale	
Length (1D size)	
Tilt/angle	
Area (2D size)	
Depth (3D position)	

Electric Shock (3.5)
Saturation (1.7)
Length (1)
Area (0.7)
Depth (0.67)
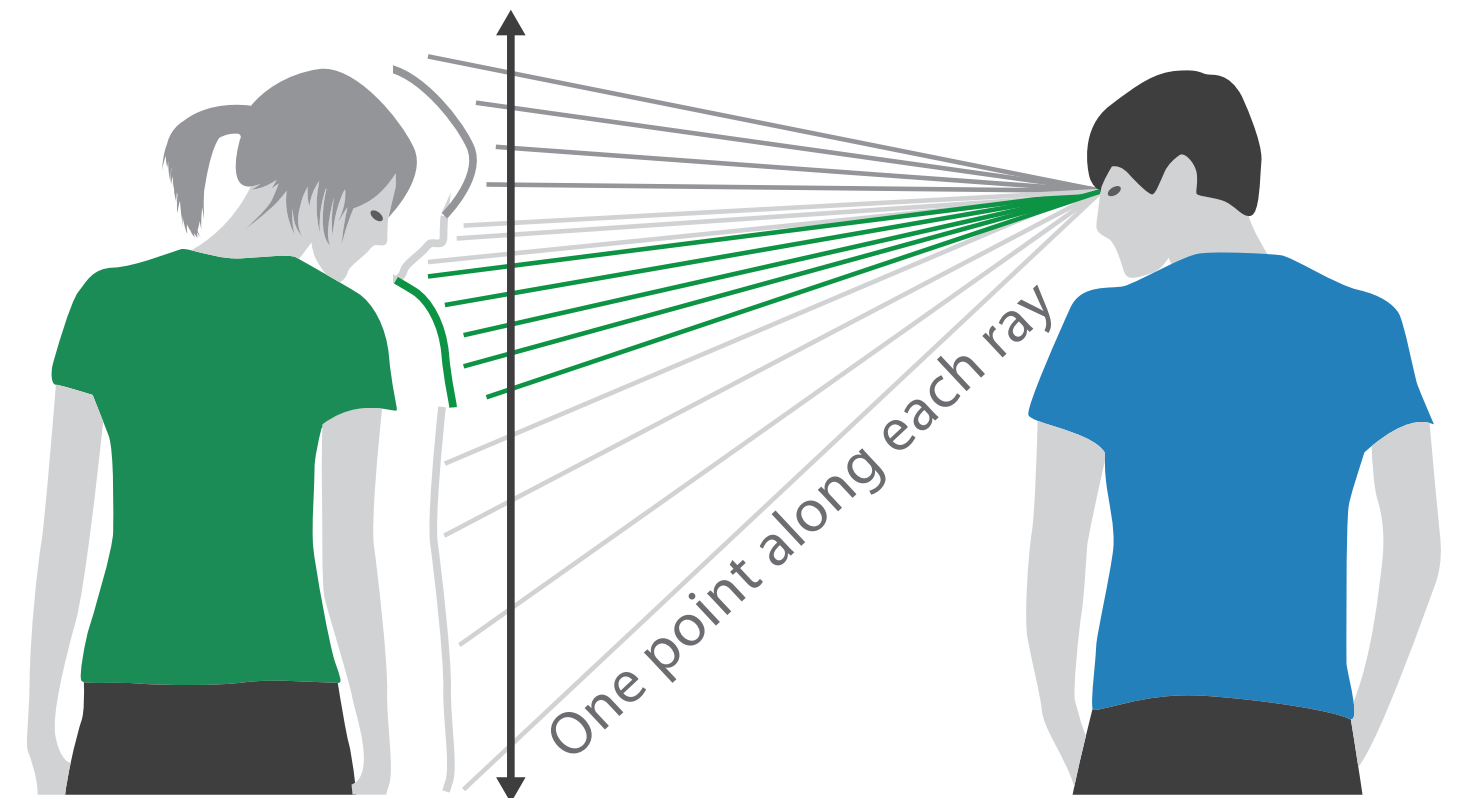Brightness (0.5)

Perceived Sensation

Physical Intensity

No unjustified 3D: Danger of depth

- we don't really live in 3D: we *see* in 2.05D
  - acquire more info on image plane quickly from eye movements
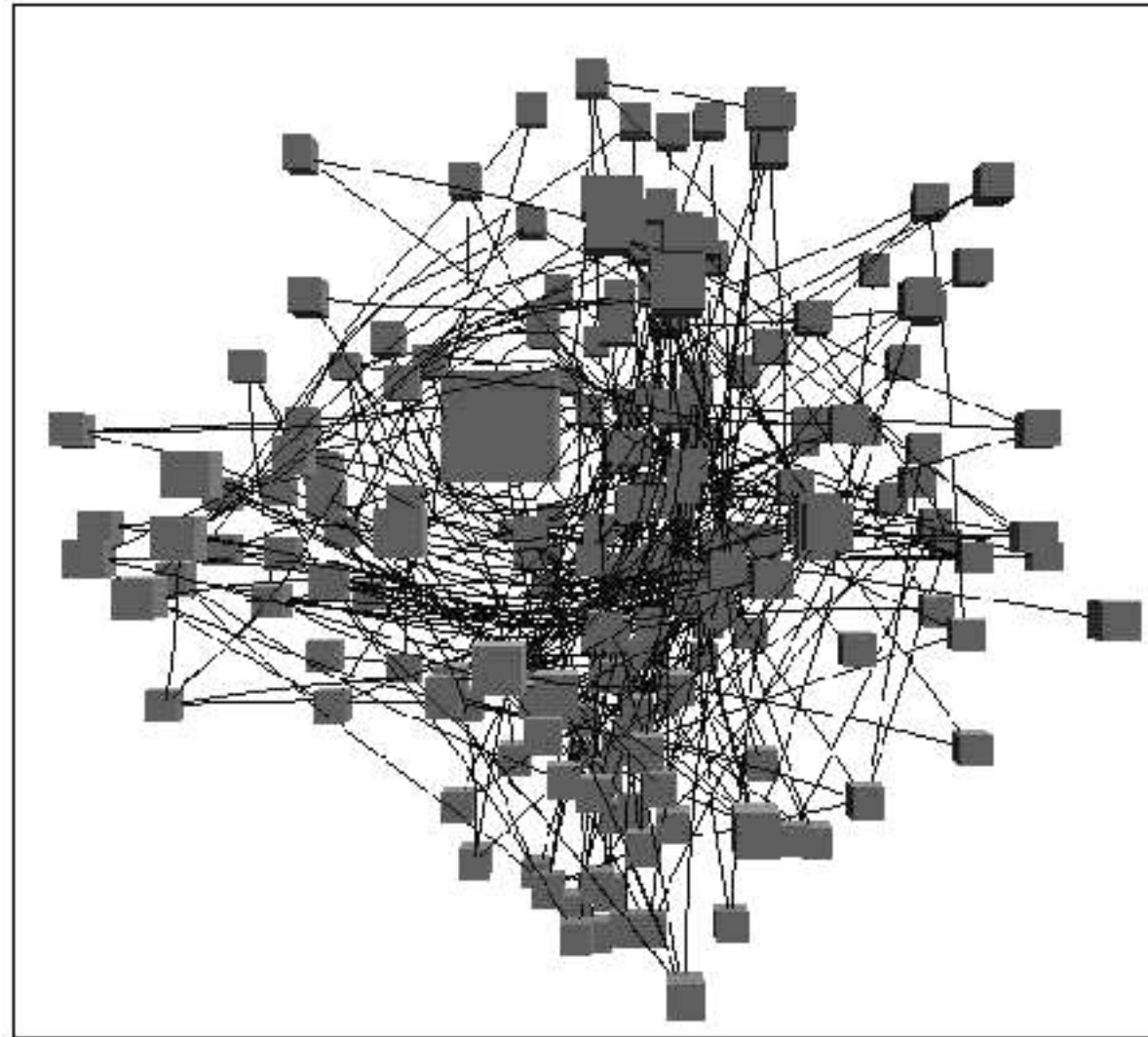 - acquire more info for depth slower, from head/body motion

Up

Right

Away   Towards
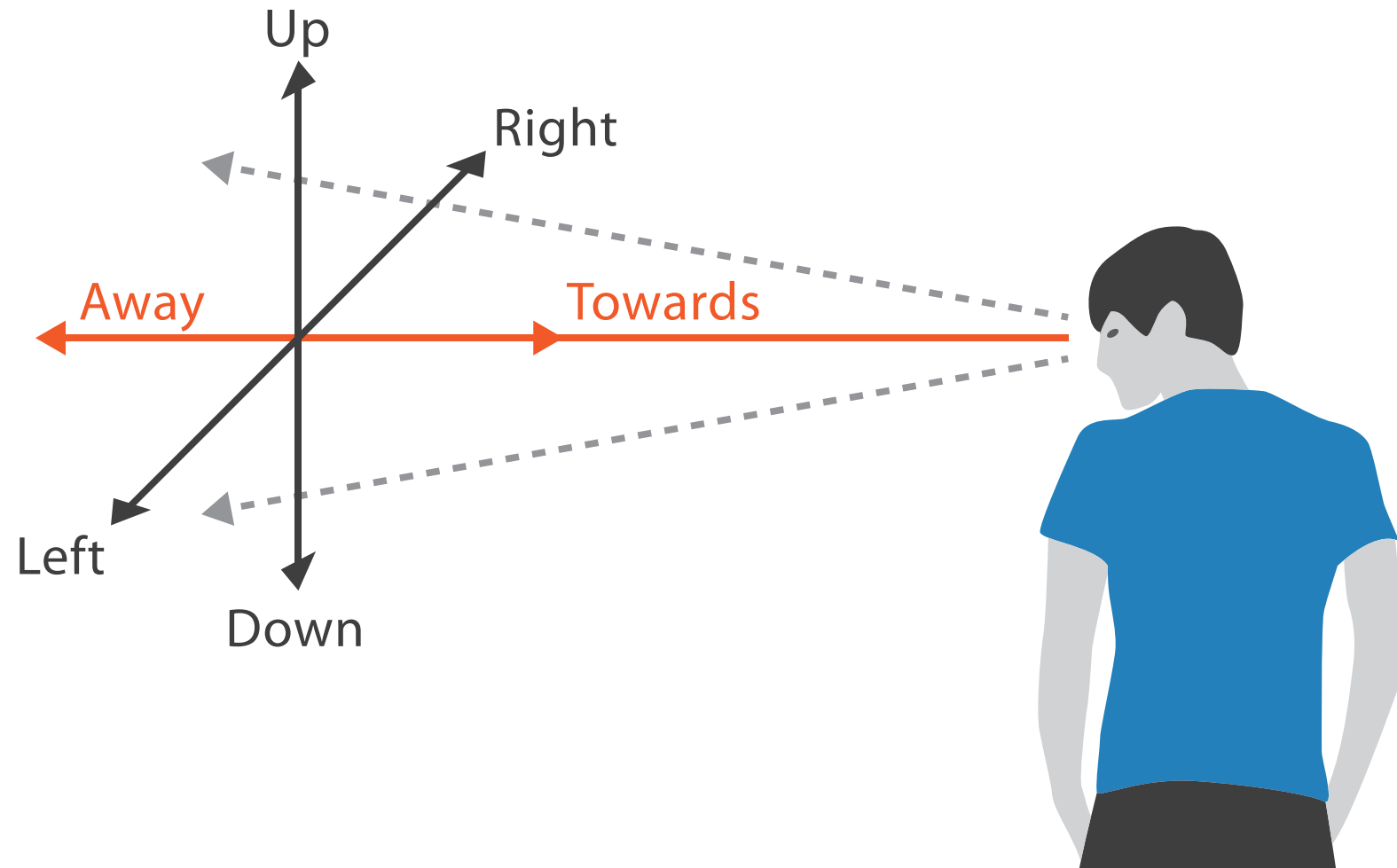
Left

Down

Thousands of points up/down and left/right

One point along each ray

We can only see the outside shell of the world

Occlusion hides information

- occlusion
- interaction can resolve, but at cost of time and cognitive load

[Distortion Viewing Techniques for 3D Data. Carpendale et al. InfoVis 1996.]

Perspective distortion loses information

- perspective distortion
  - interferes with all size channel encodings
  - power of the plane is lost!

[Visualizing the Results of Multimedia Web Search Engines.
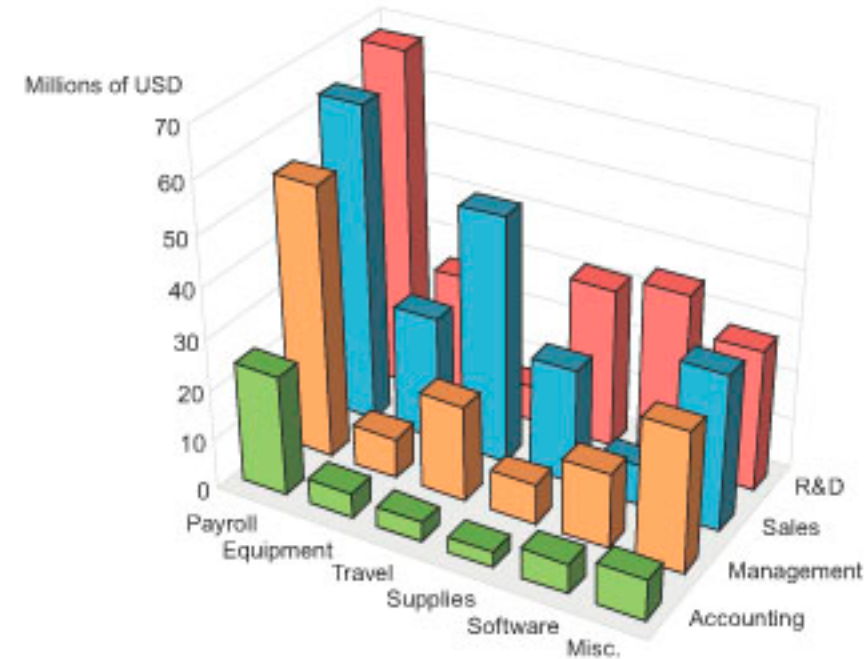*Mukherjea, Hirata, and Hara. InfoVis 96]*

3D vs 2D bar charts

- **3D bars very difficult to justify!**
  - perspective distortion
  - occlusion

- **faceting into 2D almost always better choice**

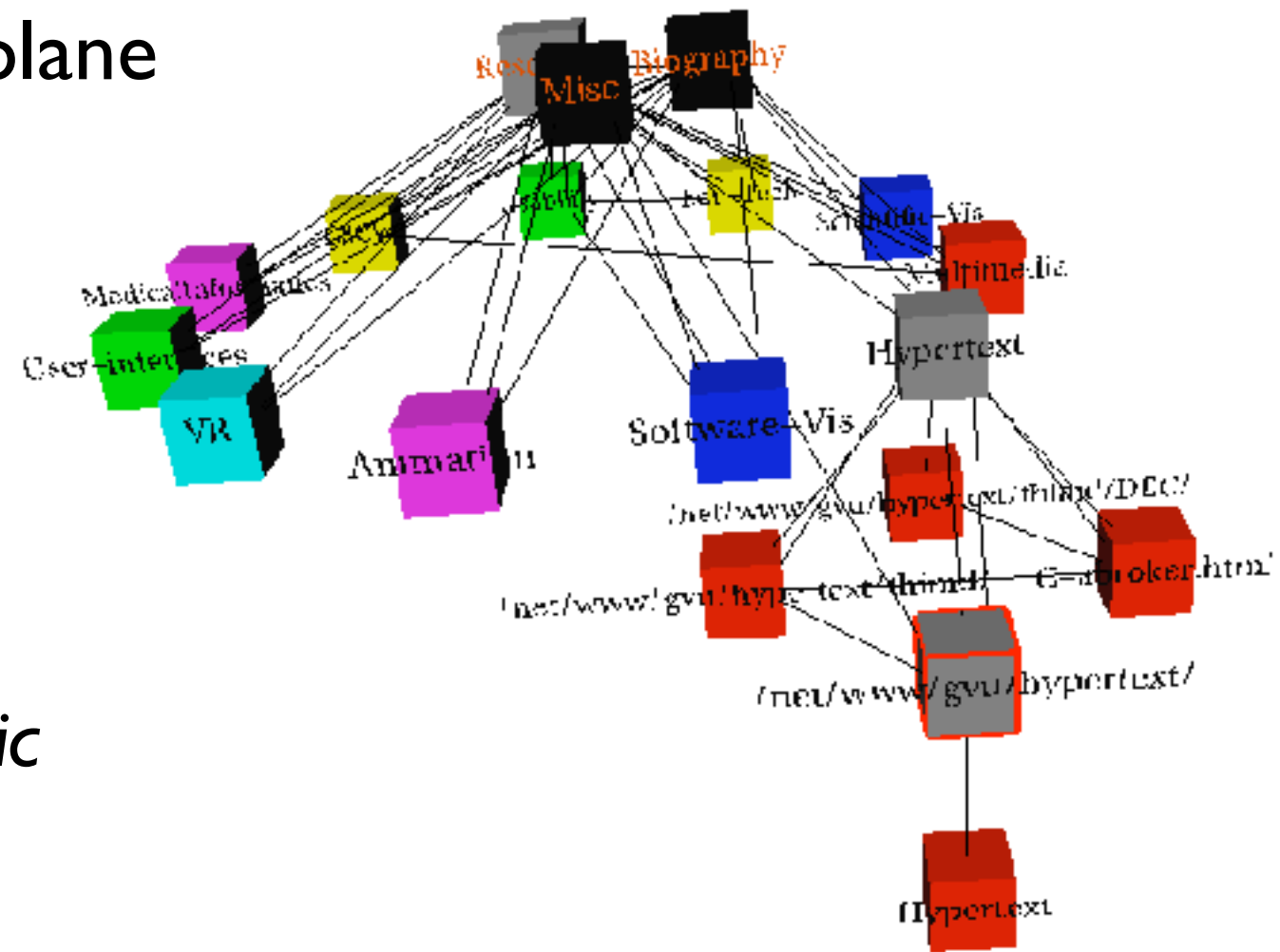*[http://perceptualedge.com/files/GraphDesignIQ.html]*
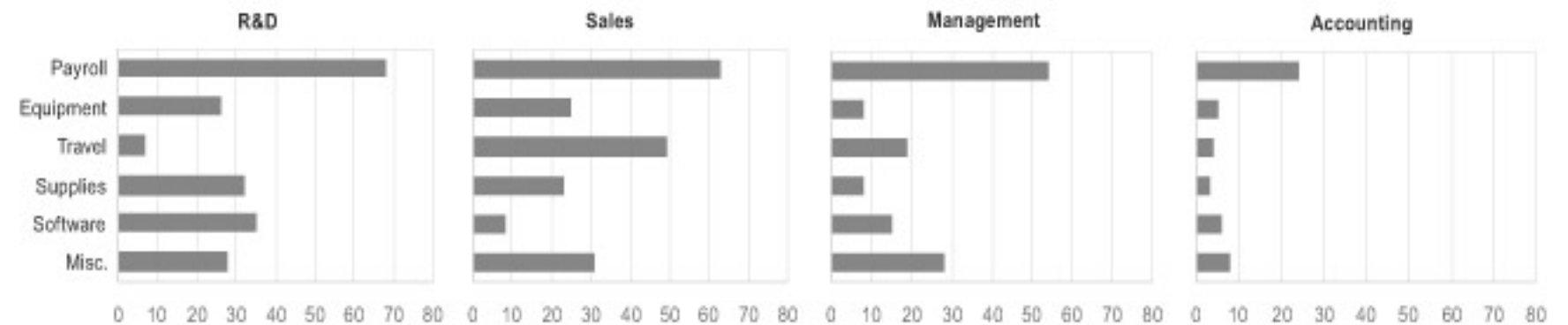
Tilted text isn't legible

- text legibility
  - far worse when tilted from image plane

- further reading

  [Exploring and Reducing the Effects of Orientation on Text Readability in Volumetric Displays.
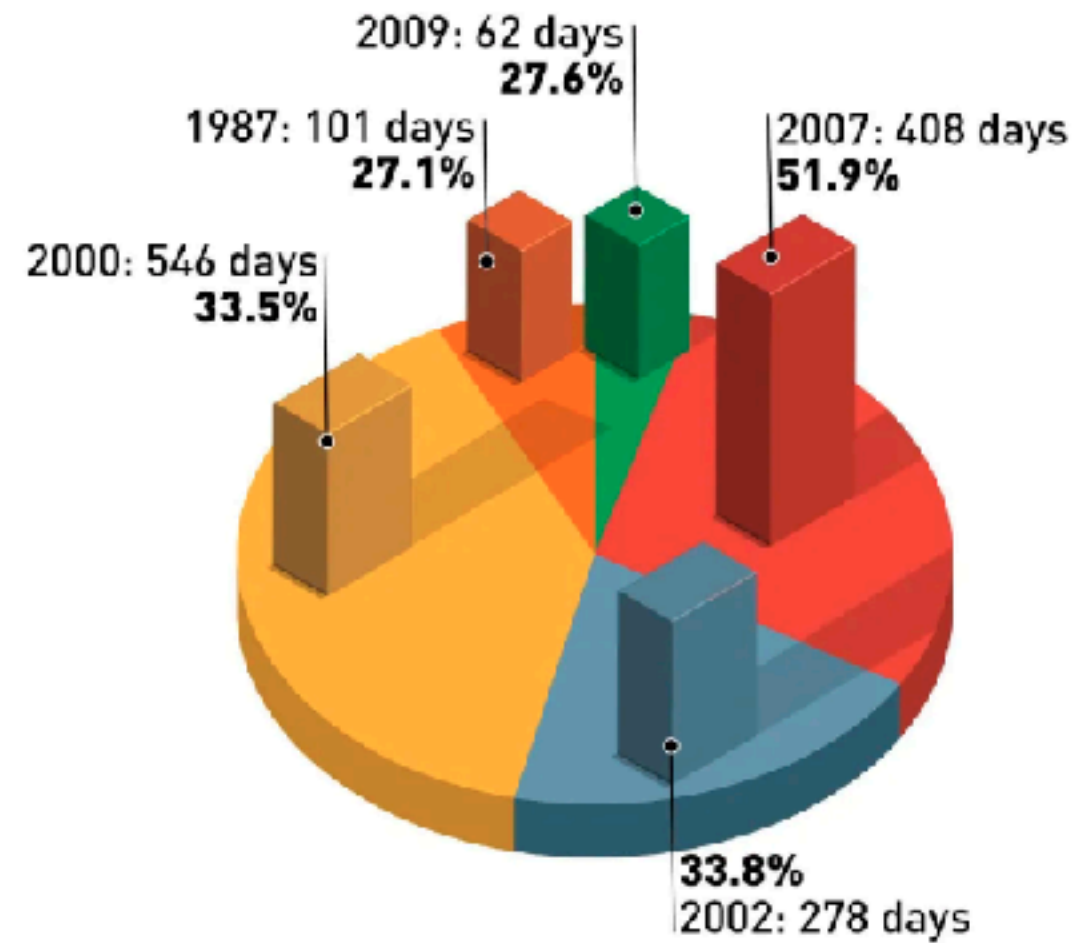 *Grossman et al. CHI 2007]*

[Visualizing the World-Wide Web with the Navigational View Builder.
Mukherjea and Foley. Computer Networks and ISDN Systems,
1995.]

Socrative quiz: 3D pie charts++

Bear markets, how long do they last?

2009: 62 days **27.6%**

1987: 101 days **27.1%**

2007: 408 days **51.9%**

2000: 546 days **33.5%**
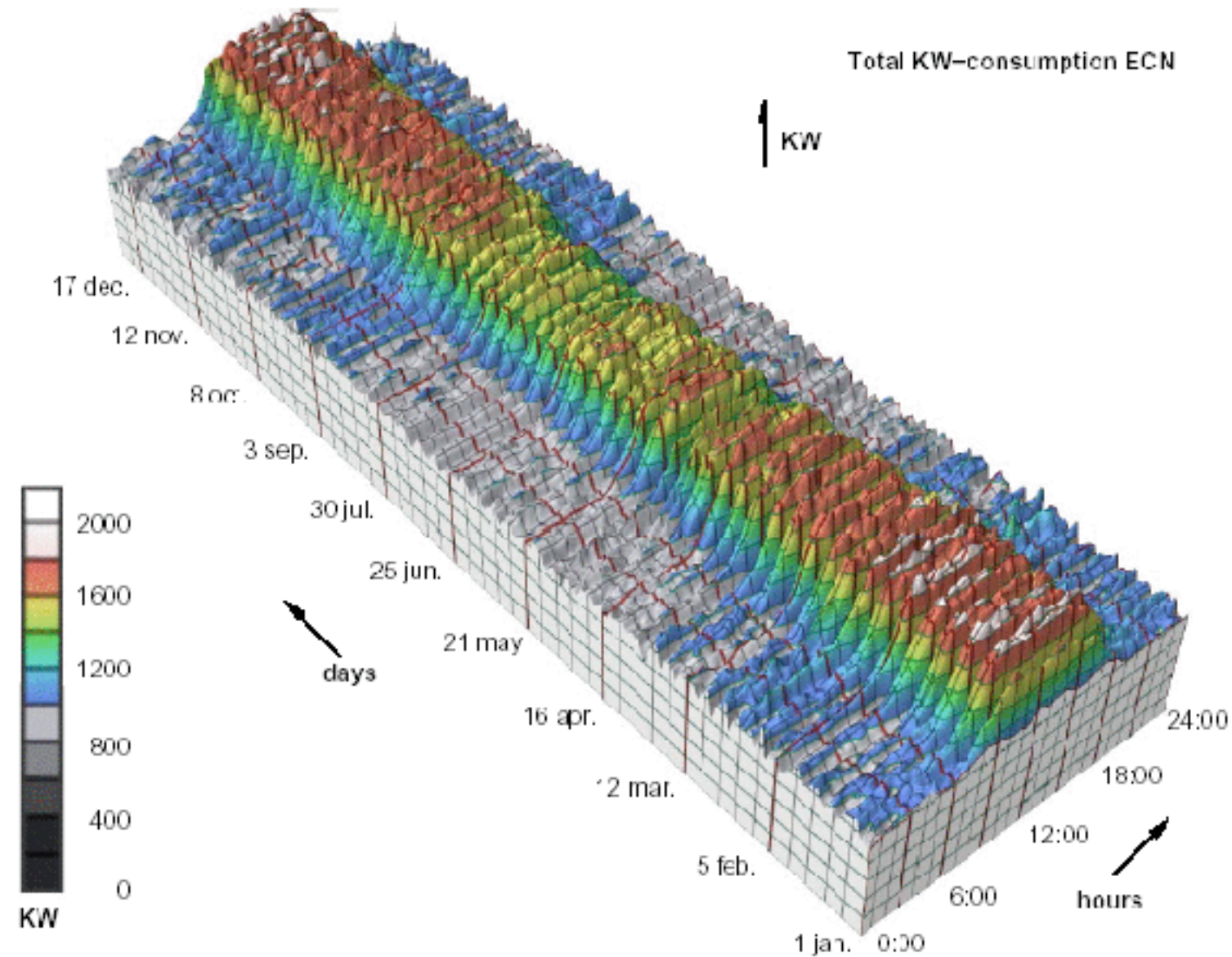
33.8% 2002: 278 days

CBC NEWS

This shows the lengths and depths of the last five bear markets on the S&P 500 that we've seen, prior to this one. (Scott Galley/CBC)
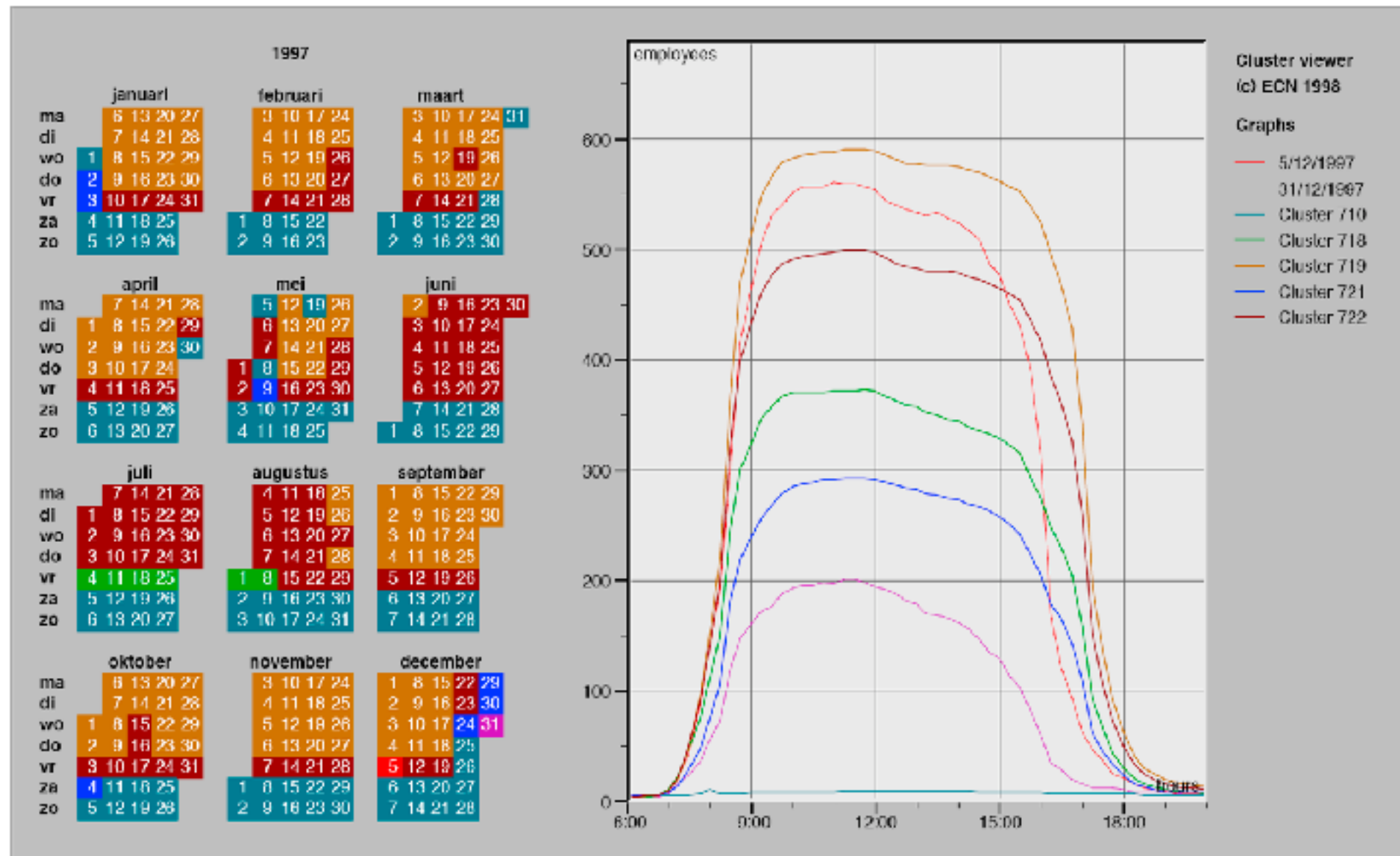
No unjustified 3D example: Time-series data

- extruded curves: detailed comparisons impossible

[Cluster and Calendar based Visualization of Time Series Data. van Wijk and van Selow, Proc. InfoVis 99.]

No unjustified 3D example: Transform for new data abstraction

- derived data: cluster hierarchy
- juxtapose multiple views: calendar, superimposed 2D curves

[Cluster and Calendar based Visualization of Time Series Data. van Wijk and van Selow, Proc. InfoVis 99.]
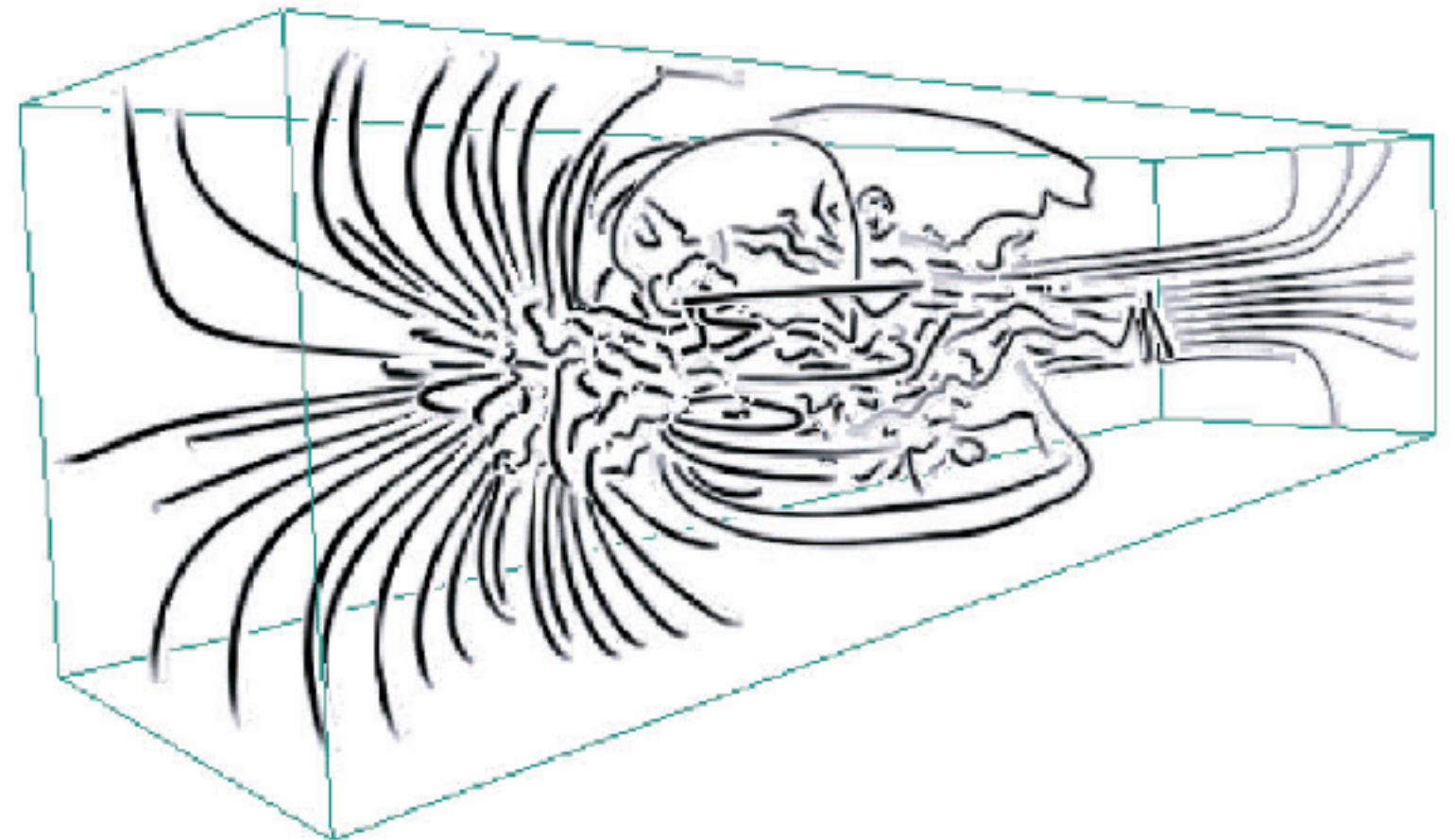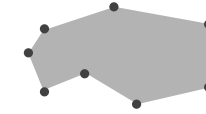
Justified 3D: shape perception

- benefits outweigh costs when task is shape perception for **3D** spatial data

  - interactive navigation supports synthesis across many viewpoints

🗄 Targets

→ Spatial Data

  ↳ Shape

[Image-Based Streamline Generation and Rendering. Li and Shen. IEEE Trans. Visualization and Computer Graphics (TVCG) 13:3 (2007), 630–640.]

Credits

- Visualization Analysis and Design (Ch 6)