INC Summer Neuroimaging Bootcamp 2022
Visualizations
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As Neuroscientists, We Tell Stories.

- Our stories are based on large, complex, and detailed data.
- We want our stories to be insightful, understood, and remembered.
- Visual elements provide a mechanism to interpret and present massive amounts of data to augment our story-telling.
The purpose of visualization is not about pretty pictures. The purpose of visualization is to provide insight. Visualization is a mechanism for conveying information in an accurate, meaningful, and impactful manner.
3 Principals of Impactful Visualization

1. Truthful
   • based on thorough, objective research
   • portray data, models, and procedures accurately

2. Insightful
   • your story, evidence, complex trends, relationships, and inferences should be easy to see and understand
   • viewers should be enlightened by the information you present and able to act on accordingly

3. Beautiful
   • Effective visualization should be well-designed, draw attention, and be aesthetically pleasing.
   • Aesthetics should be effectively deployed in service of the data-driven story
Visualizations that require mental gymnastics are not the G.O.A.T.

“Glass brains, worst brains.”
-Simone Biles
(if she was a neuroscientist)
Jacques Bertin

“He never had problems with drawing....”
- actual quote from his Wikipedia page

Inventor of the PHYSICALLY Reorderable Matrix
http://dataphys.org/list/bertins-reorderable-matrices/

If you ever doubt you live in the future, watch this...

not Danny Devito, sorry Lauren
Jacques Bertin introduced "Retinal Variables":
position, size, shape, value, color, orientation, texture
visualizations should make use of the elements of perception of the human eye.
Data visualization is a translation of abstract ideas—such as numbers and statistics—to communicate your scientific story. A picture is worth a thousand words, but always label your axes.
What story is this visualization telling?
2D Slices for Neuroimage Visualization

let's slice some brains!
Choose a Slice Plane that Captures Your Data Best

$y$ – anterior/posterior – coronal
Choose a Slice Plane that Captures Your Data Best

z – superior/inferior – axial
Choose a Slice Plane that Captures Your Data Best

$x$ – left/right – sagittal
Thresholding and Winsorizing
Compositing
Colors

• color scales are best when colors draw attention to data or levels or values of interest, colors “pop out”

• ideally, the color scale you choose should be robust against a change in apparent scale for colorblind individuals as well as when printed or displayed in grayscale
jet

Deut anomaly

Prot anomaly

Trit anomaly

Desaturated
red/white/blue
viridis plasma
cubehelix
cubehelix
Representations of Colors

• RGB
  • red, green, and blue values from 0 to 255, indicating the mixture of additive colors
  • this pink is 255, 105, 180

• Hex Colors
  • computers have bits (0’s and 1’s) arranged into groups of 8, making a byte
  • $2^8 = 256$, hence we can represent 8 bit RGB colors with three binary values
    • in binary this pink is 11111111, 01101001, 10110100
    • but that’s a lot of digits
  • base 16 digits, or hexadecimal makes this easier, we can represent every byte with 2 digits (0,1,2,3,4,5,6,7,8,9,0,A,B,C,D,E,F)
  • in Hex, hot pink is #FF69B4
There is a lot of visualization software out there...

This list is woefully incomplete, because I got tired of looking.
Get out there, visualize some brains, and tell your story.