

Visualizing Data	Tools to explore
<p><b>Important Suggestions</b></p> <p><u><a href="#">See this website from Google!</a></u></p> <p><b>Improve Data-to-Ink Ratio:</b> “Is this [shape] necessary?”</p> <p><b>Ensure Visual Quality:</b> “Is this geometry telling the truth?”</p> <p><b>Reduce Clutter:</b> “Is this color choice or layout necessary?”</p> <p><b>Increase Efficiency:</b> “Is it too hard or time consuming to read?”</p> <p><b>Consider Accessibility:</b> “Is this colorblind safe? Is the font size large enough?”</p> <p><b>Organize and Guide:</b> “Should I regroup my data? Can I add helpful text?”</p>	<p><b>General utilities:</b> <a href="#">matplotlib</a>, <a href="#">seaborn</a>, <a href="#">ggplot2(R)</a></p> <p><b>Volumetric Data:</b> <a href="#">ParaView</a>, <a href="#">VisIt</a></p> <p><b>Web-facing:</b> <a href="#">D3.js</a>, <a href="#">x3dom</a>, <a href="#">Bokeh</a>, <a href="#">Plotly</a>, <a href="#">WebGL (three.js)</a>, <a href="#">shiny</a>, <a href="#">datavrapper</a></p> <p><b>General Interactives:</b> <a href="#">Processing</a>, <a href="#">OpenGL</a></p> <p><b>Artist Tools:</b> <a href="#">Photoshop</a>, <a href="#">Illustrator</a>, <a href="#">Maya</a>, <a href="#">Blender</a>, <a href="#">ffmpeg</a>, <a href="#">Image Magick</a></p> <p><b>Mapping :</b> <a href="#">NASA World Wind</a>, <a href="#">cartopy</a>, <a href="#">basemap</a></p> <p><b>You can find some examples and further information here :</b>  <a href="https://github.com/ageller/IDEAS_FSS-Vis">https://github.com/ageller/IDEAS_FSS-Vis</a></p>
<p><b>Distinguishing Measurements</b></p> <p>From easier to harder for reader to distinguish differences</p> <ol style="list-style-type: none"> <li><b>Position:</b> e.g., x,y location, height of bar graph</li> <li><b>1D Length, 2D Area, 3D volume:</b> e.g. pie charts, stacked bars</li> <li><b>Orientation:</b> e.g., multiple line plots overlapping</li> <li><b>Temperature:</b> e.g., monochromatic color schemes</li> </ol>	
<p><b>Visual Encoding of Data</b></p> <p><b>Tools to utilize</b> to distinguish between categories and/or highlight specific data (multiple encodings are OK, and sometimes very helpful)</p> <p><b>Color:</b></p> <ul style="list-style-type: none"> <li>Use colorblind safe colors, e.g. see <a href="#">colorbrewer2.org</a> and <a href="#">viz-palette</a> and <a href="#">google's suggestions</a></li> <li>Colors carry meaning (e.g., red = bad &amp; green = good, or dark = lots &amp; light = few)</li> <li>Less colors are usually better; use sparingly to highlight important data</li> </ul> <p><b>Shape:</b></p> <ul style="list-style-type: none"> <li>Symbol shape is more powerful than symbol size in distinguishing between data sets</li> <li>Consider using shape with color and/or line styles for multiple encodings</li> <li>Are your shapes easy enough to distinguish? (circle vs. square is easy, hexagon vs. pentagon is harder)</li> <li>Do your shapes allow for the precision your plot requires (are they too big/small? If you are using a bar chart, make sure the top is flat!)</li> </ul> <p><b>Text &amp; Legends:</b></p> <ul style="list-style-type: none"> <li>Increase the font! Most default font sizes from plotting tools are too small to read easily.</li> <li>Will it help to move a label/legend onto the figure to label points directly? (often the answer is YES)</li> <li>Should you reduce/increase the number of labels on the x or y axes?</li> <li>Do you always need both axes? (e.g., a bar chart could simply have one axis with values written inside the bars)</li> <li>Try not to rotate text anything other than vertical or horizontal</li> </ul>	
<p><b>Common Chart Types in Astrophysics</b></p> <p><b>Often used:</b> scatter, line, bar (histogram), contour, heatmap</p> <p><b>Rarely used:</b> pie, 3D plots, stacked histograms, network diagrams</p> <p><b>Static Formats:</b> .pdf or .eps is required for most journals</p> <p><b>Interactive Formats:</b> AAS journals allow x3dom, Bokeh, blink, or astropy.timeseries</p> <p><u><a href="#">See the AAS graphics information</a></u></p>	