

4

Advanced Plotly

"True art is alive and inspired by humanity"

- Leonid Afremov, Contemporary Artist

Introduction

After being introduced to basic visualizations in Plotly in the previous module, the students will now explore advanced visualizations in Plotly such as maps and contour plots. In addition, students will learn about the aesthetics of data visualizations and how to create them. Through these explorations, students will learn an important skill that is crucial for article writing for SLX.

Objectives

1. Students will be able to recognize what makes a solid data visualization.
2. Students will be able to utilize Plotly to create simple visualizations (pie, bar) and advanced visualizations (contour maps, choropleth).
3. Students will be introduced to other data visualization tools such as Infogram.
4. Students will get practice creating advanced data visuals on real data.
5. Students will be able to apply these skills to projects.

Agenda

1. Review of the "Structure" of Plotly Visuals from Module 2
2. Getting Comfortable with Advanced Plotly
3. Aesthetics with Data Visualizations and Styling Visualizations
4. Examples of Advanced Plotly Visualizations
5. Activities

<https://fivethirtyeight.com/features/universal-basic-income/>

Look at the welfare cliffs chart

Activities

Having Fun Learning Advanced Plotly Skills (15 minutes)

Purpose:

To teach students the Atlas maps, Choropleth maps, Contour plots. These plots are necessary for students' projects, especially if the project pertains to solving a world-wide problem. Maps will be extremely useful for covering a wider aspect of the data. Plots can be extremely useful.

Materials:

Computers

Directions:

Show a few examples of these types of plots, and teach the students how to make these types of plots. Put them up on a shared screen and then walk the students through the procedure of making similar plots. Use COVID data for maps

<https://github.com/CSSEGISandData/COVID-19>.

Use IMSA Grades data for histograms, available in the datasets folder.

<https://help.plot.ly/tutorials/#maps> - Maps

<https://help.plot.ly/tutorials/#statistical> - Plots



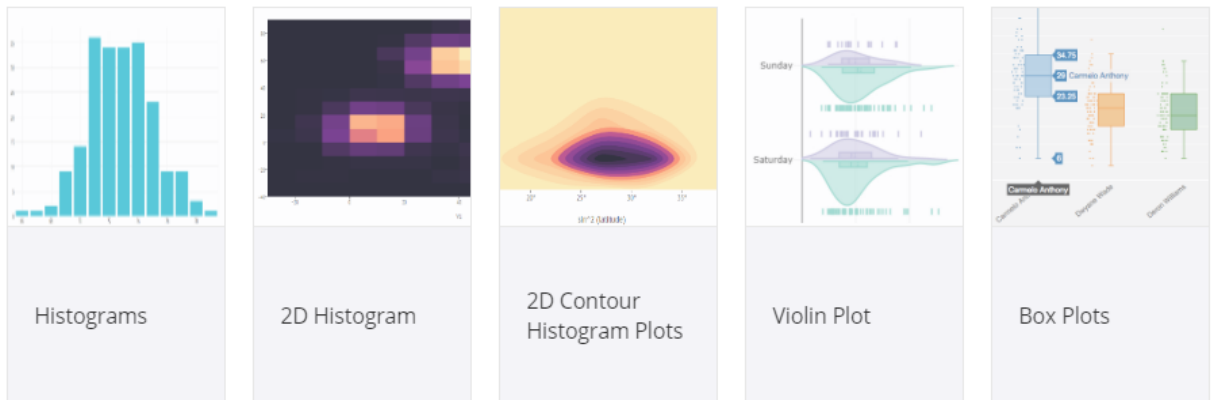
Atlas Maps



Choropleth
Maps



Mapbox



Discussion:

1. Why would you choose to use these types of data visualizations?
2. Where do you think these visualizations could be used?

In the case that students do not know about the uses of these visualizations, the facilitators can give an example of a possible use of a choropleth map. Choropleth maps are used to represent a sequential value, or a number in a specific range, as a specific shade of a color in any form of geographical map. For example, choropleth maps can be used to represent that number of deaths due to heart disease per 100,000 people for every state in the United States.

Advanced Plotly Features (30 minutes)

Purpose:

To give students time to explore the more advanced features of Plotly so they can spice up their projects.

Materials:

Computers

Directions:

Walk students through the “Style” tab of Plot.ly. Split students into two breakout rooms and have them make one interesting plotly chart each, and have them present their chart to the rest of the group.

<https://help.plot.ly/tutorials/> - anything but the ‘simple’ section

Students must make three advanced visualizations to show what they have learned: one map and two different other advanced visualizations.

Discussion:

3. What do you think was the toughest part about making these types of visualizations?
4. Where do you think that these visualizations would be used?

What Makes a Good Data Visualization

RESEARCH:

Source 1: <https://www.informationisbeautiful.net/visualizations/what-makes-a-good-data-visualization/>

There are four important elements:

- Information
- Function
- Story
- Visual form

Source 2: <https://sphweb.bumc.bu.edu/otlt/mph-modules/bs/datapresentation/DataPresentation3.html>

Give the viewer the greatest number of ideas, in the shortest time, with the least ink in the smallest space.

Source 3: <https://www.e-nor.com/blog/data-visualization/makes-good-visualization>

Less is more

(Visit the website to see a really good demonstration of this concept)

Source 4:

Three main things: Data analysis, story telling, design.

Perform good analysis on the data to see what you can take out of those numbers.

Storytelling makes it worthwhile for the readers to look at your visual.

Good design makes it easy for the reader to learn from the visual.

Source 5:

Use the right chart:

Area graph

Bar chart

Bubble chart

Candlestick chart

Histogram

Line graph

Marimekko/Mosaic Chart

Multi set Bar Chart

Population Pyramid

Radar Chart

Pie chart/donut chart

Scatterplot

Timeline

Venn diagram

Stacked Area Graph

Stacked Bar Graph

Heatmap

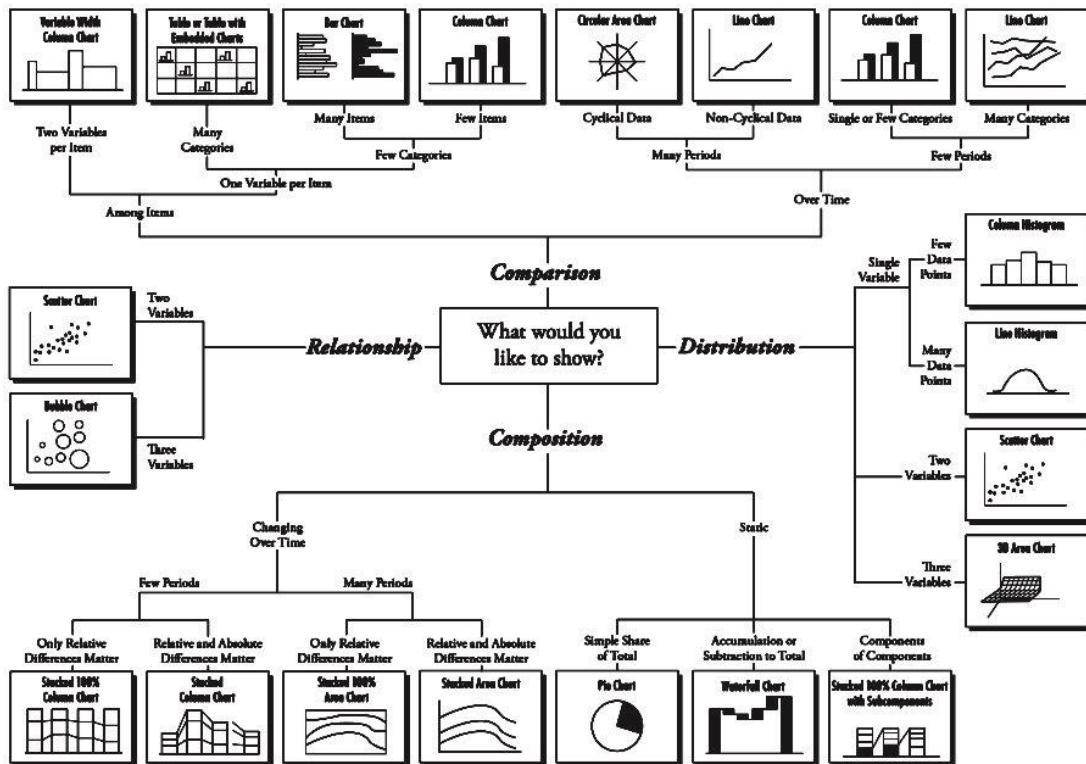
Nightingale Rose Chart

Choropleth map

We will list possibilities that they can research later.

Helpful Chart: (from link in Source 3)

Chart Suggestions—A Thought-Starter



www.Extremepresentation.com
© 2009 A. Abela — a.abela@gmail.com

Source 6: <https://infogram.com/page/data-visualization>

Purpose:

To show them how to make a good data visualization that will make a lasting impact (no pun intended)

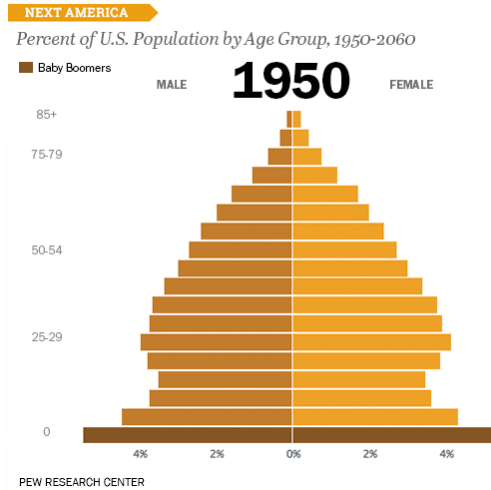
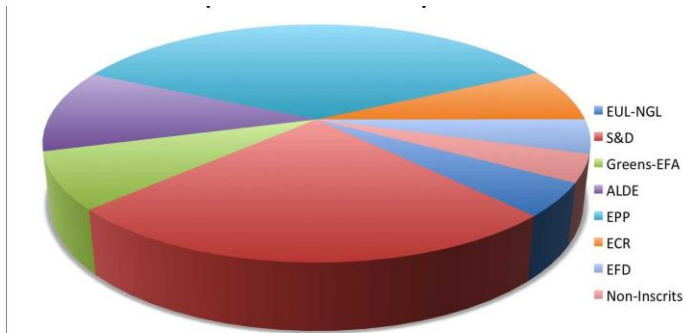
Materials:

Projector
Computers

Directions:

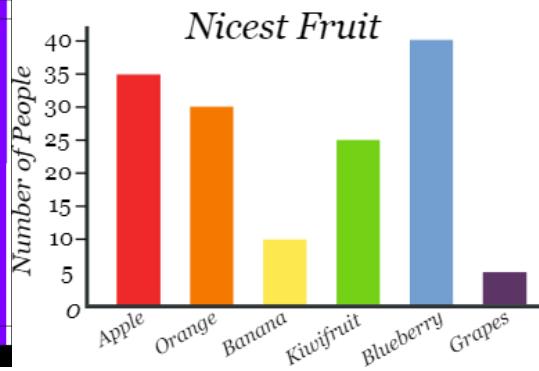
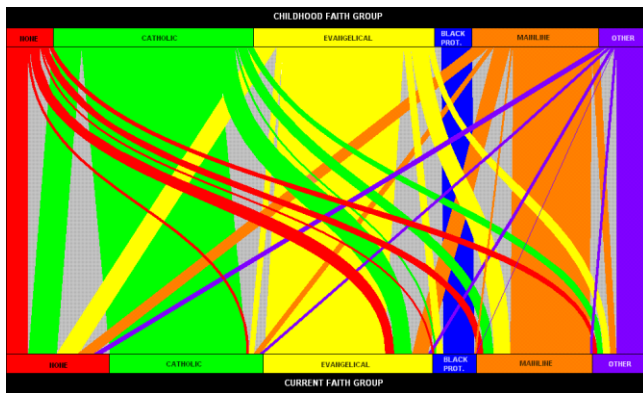
Explain to the students that there are three factors in a good graph: Functionality, Aesthetics, and Storytelling. For each one, introduce a graph that does it well, and one that doesn't, and ask the class for their input on why the graph works/doesn't work.

Functionality



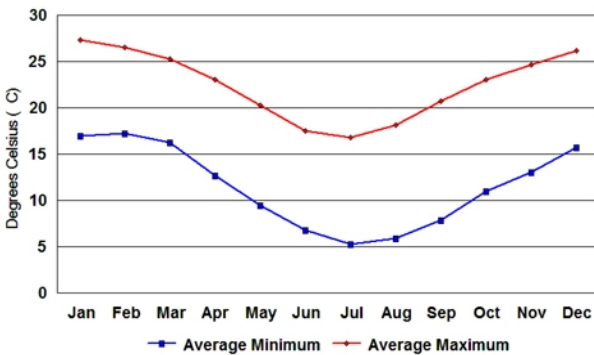
Bad (left) - the red section seems to be the largest, but the blue section actually is.
 Good (right) - the two halves represent the two sexes, and there's no confusion as to what this graph conveys

Aesthetics

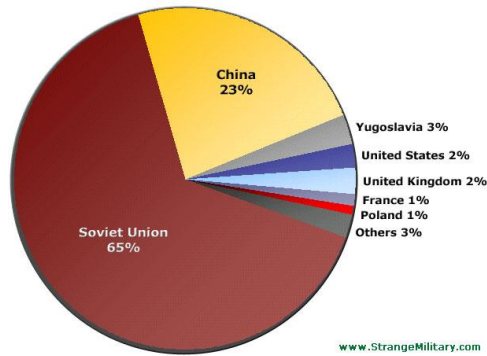


Bad (left) - the colors are wayyy too bright, and this is just harsh on the eyes
 Good (right) - there is color where it needs to be, and they also match with the fruit they represent
 Visit the website <https://www.e-nor.com/blog/data-visualization/makes-good-visualization> to see a really good demonstration of the concept "less is more"

Enlightening



World War II Military Deaths (Allies)



Bad (left) - the info that this graph presents is expected - the minimums are lower than the maximums, and the average temperatures change with the season. Who knew?
 Good (right) - this graph will come as a surprise to many, showing how the Soviet Union exploited large swaths of its population to try to overwhelm the enemy (instead of using better training and tactics). It presents new information to the audience that they can't deduce on their own.

Discussion:

1. (throughout the activity) Why are these factors important?
 - a. Functionality - The visualization should be able to convey the right information to the reader. The cleanest data visualization won't matter if it does not correctly inform the reader. Functionality adds substance to the graphic.
 - b. Aesthetics - Just like how writers use hooks to grab readers' attention, the data visualization has to be eye catching in order for it to be noticed. Aesthetics give the graphic more traction.
 - c. Enlightening - A graphic can be functional and aesthetic but still may be lacking if the information is not utilized to change the reader's mind. If the graphic is not enlightening, then viewing the graphic is only a waste of time.
2. Would there be any other essential features to a good data visual?

Supplemental Vitamins and Minerals

Introduction to Infogram (10 min)

- **As an alternative to using plotly if students would like**

Purpose: The purpose of this activity is to introduce the students to Infogram, another tool that students can use to create visualizations for their projects and beyond. Due to the fact that there are only 60 minutes for each module, this activity can be integrated into the other activities.

Materials: Computer (<https://infogram.com/>)

Directions: First, inform the students that they will be introduced to another data visualization tool named Infogram, and ask the students to go to <https://infogram.com/>. Then, ask students to select the "Get Started" box in the upper-right-hand corner and create an account using their IMSA Google account.



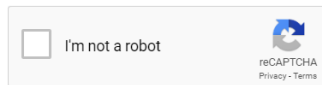
Let's get started



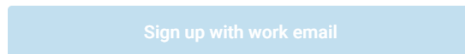
Email:

Password:

Enter a password between 8 and 32 characters long



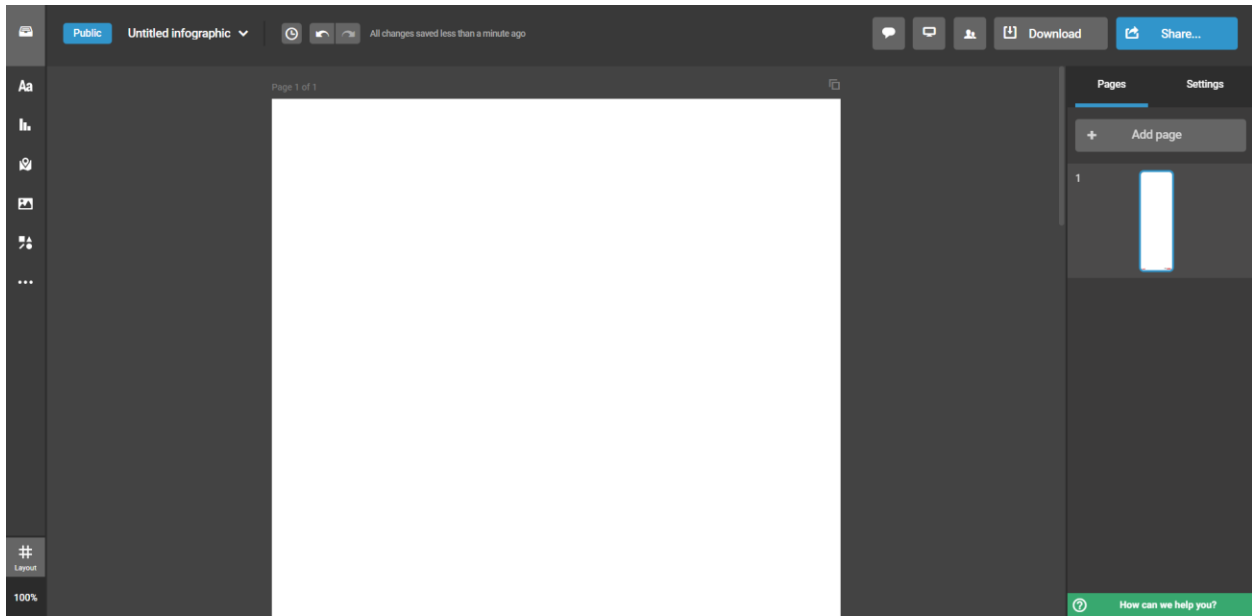
By clicking "Sign up with work email", you agree to Infogram's [Terms of Use](#) and [Privacy Policy](#)



[Already have an account? Log in here.](#)

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After a series of basic setup questions, students will be directed to a webpage that has a collection of templates for infographics, charts, and even reports. Ask them to navigate to the “Infographics” and “Charts” section and choose a template for their chart. Then, the students will be directed to a page that looks like the one below.



To create a chart, ask the students to click the graph icon under the text icon (“Aa”) and pick a graph from the menu.



After the students have selected a chart, ask the students to click the “Edit data” tab of the chart menu and edit the data. While the students are putting their data into the spreadsheet, you can inform the students there are a lot of features that the students can still explore.

Review of Plotly Basics (10 minutes)

Purpose:

This activity will be used to help students remember information taught from the last module.

Materials:

Computers (Plotly)

Directions:

Show the students cool visualizations using plotly and also use Lucy's and other acronym articles as examples.

From Lucy's article:

<https://sites.imsa.edu/acronym/2017/12/15/get-schooled-gender-disparities-in-imsa-academics/>

From Shubhi's article: <https://sites.imsa.edu/acronym/2018/09/14/the-state-of-mental-health-at-imsa/>

From Henry's articles:

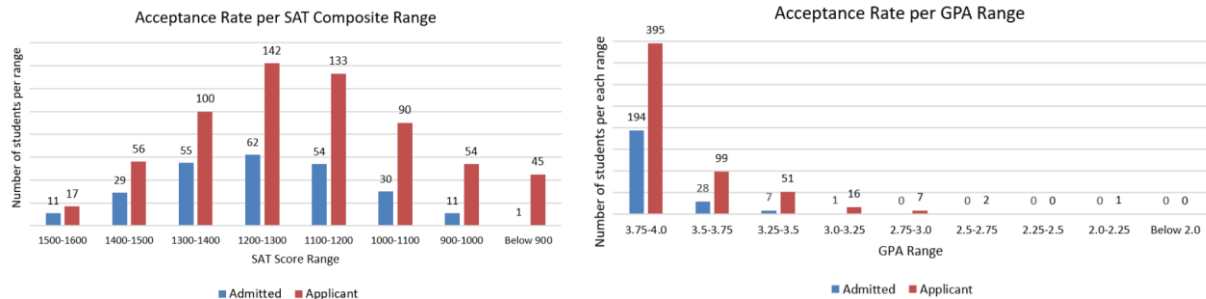
<https://sites.imsa.edu/acronym/2018/04/20/music-tastes-of-imsa/>

<https://sites.imsa.edu/acronym/2017/10/10/imsa-demographics-by-the-numbers/>

<https://help.plot.ly/tutorials/> - where all the tutorials are

1. First have them create an account on the website <https://help.plot.ly/how-to-sign-up-to-plotly/>
2. Then go to this website to learn how to upload data to plotly <https://help.plot.ly/add-data-to-the-plotly-grid/>
3. Then tell them to browse the various tutorials on making simple graphs/charts <https://help.plot.ly/tutorials/>

Give them Lucy's data set and challenge them to make a couple of different simple visualizations. A couple examples of them are (taken from Grace Yue's Acronym post)



Discussion:

1. Do you like plotly? Why or why not?
2. What are some challenges you faced using plotly and how did you overcome them?
3. What else can plotly do besides what we've done so far?
4. What are some visualizations you would want to see that you could make with plotly?
5. What are some visualizations you would want to see that are beyond plotly's ability?