**Assignment 3**

**Question 1 (30 points in total)**

**Find two examples of maps online and describe how spatial autocorrelation influences what you see in the map (roughly 250 words each. Please include the references in your writeup)**

Spatial autocorrelation is a phenomenon that the values for nearby things tend to be more related than distant things.

Map

Description automatically generated

These are the 2 maps I have used for this question. The first map depicts the Air Pollution in USA. The second map at the bottom showing COVID-19 cases in USA. The spatial autocorrelation is quite strong in both the maps. I have considered the top of the map as North.

***First map :***Throughout the first map, we can clearly see the color difference. The west side of USA is blue in color, then from the middle to the right the color changes from yellow to sand color. Since this map illustrates air pollution, it is kind of obvious that if the air in city A has PM value of 3, then the neighboring city B can not have PM value 12. Air flows along the cities and thus, the values can not change drastically. The PM value can grow or decrease gradually, which is what the map depicts, hence – spatial autocorrelation is present. There is an increase as we go from West to East and then a little decrease again as we go further towards east end. The only thing weird where spatial autocorrelation is different than the entirety of the map is in the south-west region. The value changes from 5 to 12+ suddenly between change of few cities. The map has positive spatial autocorrelation throughout the map – spatial autocorrelation is isot, that means same in every direction.

This spatial autocorrelation however can have a negative influence too. For instance, in the western USA region, there is a variation from blue to yellow color in small regions. This will disturb the assumptions in values independently. Independent assumption would be difficult to take because of the sudden and big changes.

***Second map :***The second map demonstrates COVID-19 cases throughout USA. Now the spatial autocorrelation on this map is both positive and negative. At one glance, on the map, we can see a lot of blue color, and a few variations in yellow color at certain patches. COVID-19 is a curse that has spread crazily everywhere. Being a primary airborne virus, the neighboring cities are excepted to have similar and close value of cases. However, this spatial autocorrelation has a little negative influence. Some cities might have taken quarantine and lockdown measures which can not be extracted correctly from this map. For example, there is a small yellowish sand color in between blue region. Now this is weird, because how is it possible that such a small region has higher cases while the surrounding ones do not. This negative spatial autocorrelation messes up the understanding of this sensitive case. Another way the spatial autocorrelation influences this map is – eve though we can not trust the accuracy for small regions, we can at least understand the gravity of the situation by noticing what areas have larger number of cases.

**References :**

<https://advances.sciencemag.org/content/6/45/eabd4049>

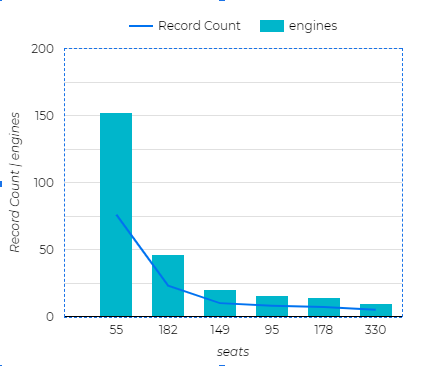
<https://ibis.geog.ubc.ca/courses/geob479/notes/spatial_analysis/spatial_autocorrelation.htm>

**Question 2 (20 points)**

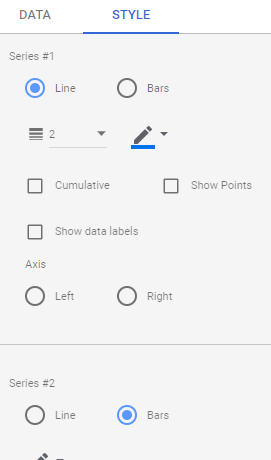
**Choose one free tool for visualization on the web. Try to visualize a dataset of your choice and describe your experience with the tool. What worked well and what did not? Find two things to criticize from a design viewpoint. Include screenshots. (roughly 500 words)**

For this question, the free visualization web tool I used was - “data studio”. It is a Google product and I found about it on the link I have attached in References below. The dataset visualised by me was *Plane metadata* that includes the Talinum, Plane type, Year manufactured in, Manufacturer, Model, Engine type, Number of seats, and number of engines. The link for the dataset is included in the references below.

Now onto describing the experience with the tool, I would say it was adequate, but I would not recommend it to a person trying to visualize a data one day before an important meeting! One observation I made is that the importing of the data is better done using Google Sheets rather than dropping the csv file directly. Data Studio seemed to cause a lot of errors and lagging when I tried simply uploading the excel (.csv) file from my device. Data Studio is a software tool with the main functions of building a graph for a provided data. There are many different types of graphs. Under the “Add a Chart” dropdown, the basic and the most used graphs are available – bar chart, pie chart, Table, Score Card, Time Series, Scatter Plot, Tree Map, Google Map. There is another option to create a more complicated and enhanced graphs used for community visualization. For example, Candlestick, Sunburst, Funnel chart, radar chart and many more. There are a variety of graph types that Data Studio provides, however, using and editing them is not so user friendly. Unless and until user studied or spent enough time on Data Studio, the software can prove to be difficult to use.



This is a line graph demonstrating number of seats in a plane with respect to the record count. Now when I click on the graph (it gets selected), I can see two options on the right panel – *Data* and *Style*.



The *style* option contains all the options for formatting the graph. For example, I can change the color legend of the graph to adapt to the color blindness conditions. Also, there is an option of choosing a theme which automatically assigns some default colors to the charts. For instance, there is a dark theme, where the background would be black and the chart will have only shades of blue – this looks pretty however, it is not a good practice for multiple attributes since differentiating between only shades of blue can be difficult. This also violates pre-attentive features and Miller’s number 7.

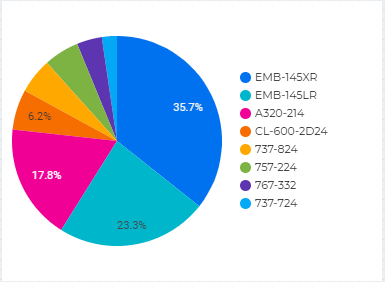
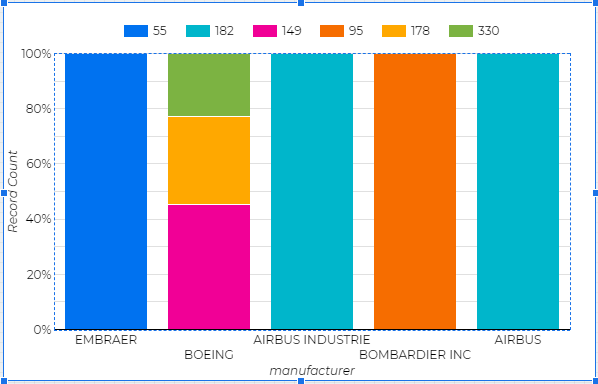
![Graphical user interface, application

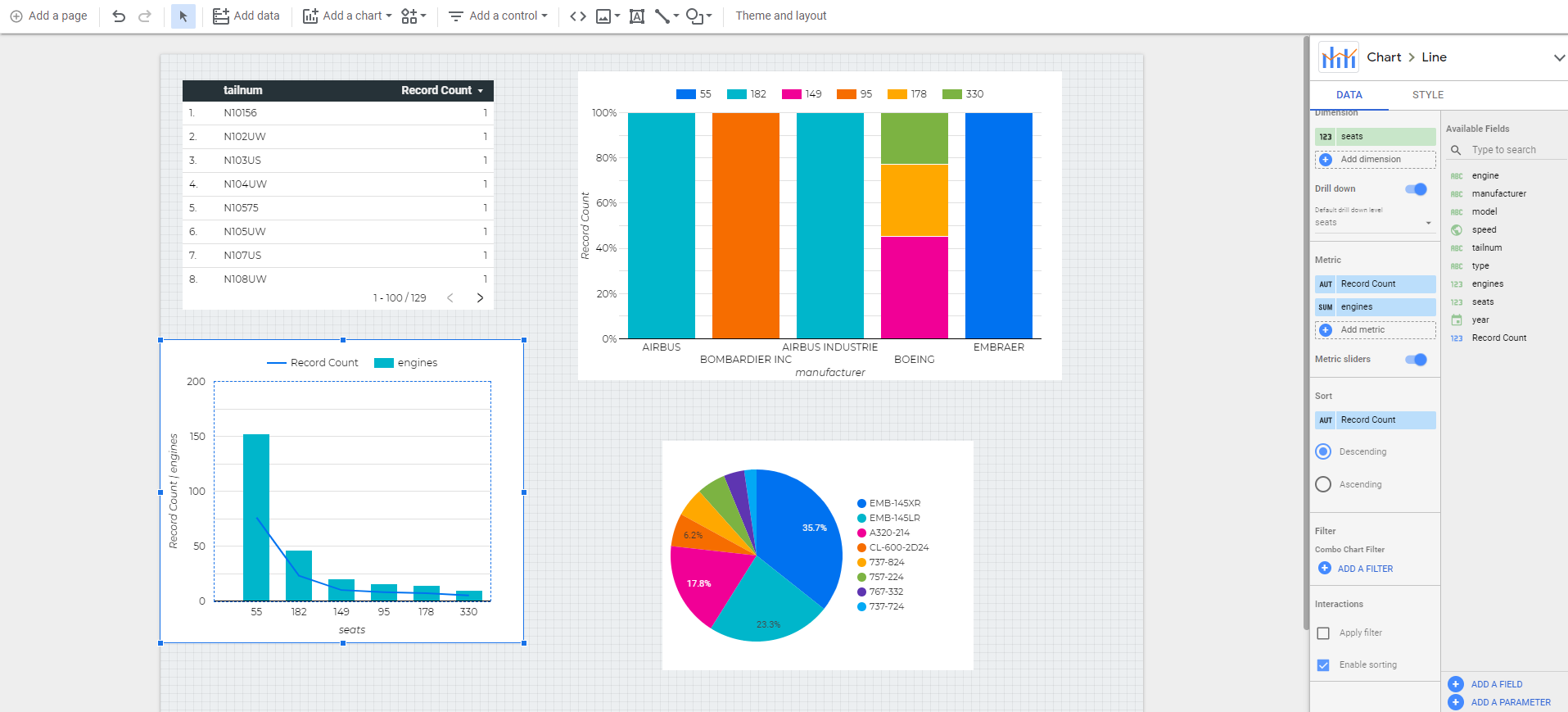
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The *Data* option is the one that the user manipulates to get a different graph. For instance, if instead of manufacturer on the x-axis in the above graph I want to put seats. I can do that by changing the *Dimension* value under the *Data* option.

This description and steps may sound easy. However, I faced a lot of problems with Data Studio. I agree, there are many types of graph that I can build using the software, and also change the color, theme to enhance the presentation of the data. Nevertheless, Data Studio seems to not have a very good interface in terms of design. The two things especially are : Tools for editing the graph – this includes changing scale, legend, x and y axes components, and second – Tools for formatting the graph. Finding the right section to manage the graph seems to be a trouble with the software. Another challenge is changing the graph components – for instance I wanted to change the y-axis from record count to seats, but Data Studio did not give any result, neither did it state any error or message explaining why no graph could not be formed.

I think after a good practice and sufficient time spent on Data Studio, one can learn to use Data Studio perfectly. Here are few other graphs I made along with the interface of the software.





**References :**

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