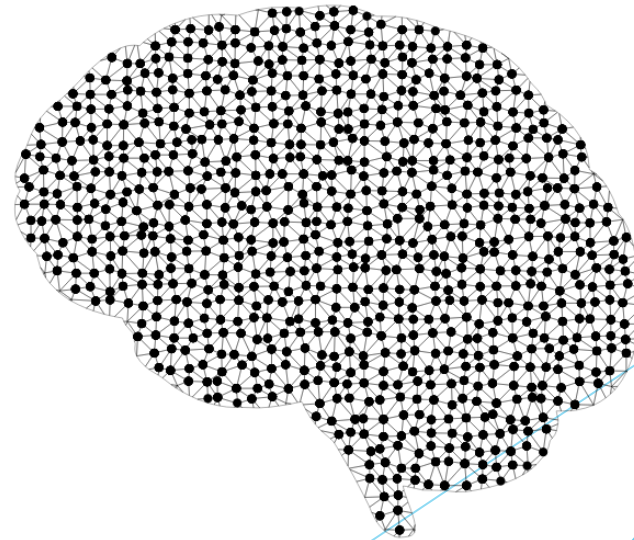


Plotting Data in MATLAB

ENGAGED QUALITY INSTRUCTION THROUGH PROFESSIONAL DEVELOPMENT

EQuIPD

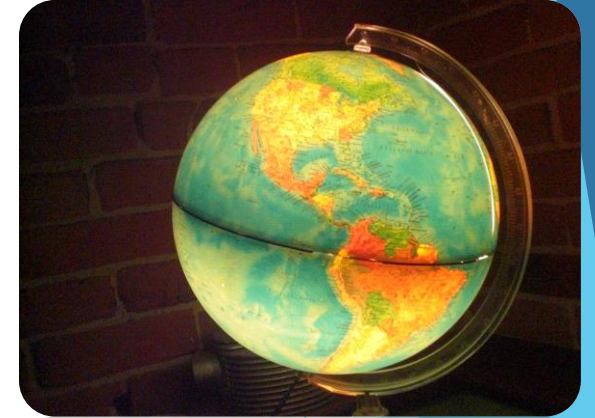
UF Herbert Wertheim
College of Engineering
UNIVERSITY of FLORIDA



Plotting Data in MATLAB

Maps

- You may have heard there is no way to truly correct way to represent our Earth on a flat image. It is impossible to unwrap the spherical dimensions of the globe to perfectly portray the layout and shapes of our globe on a 2D surface.
- This has posed a fundamental challenge from the inception of their tradition. Mapmakers have had to decide what information to preserve and what information to distort to communicate the important information their maps need to convey. As a result, there are many **projections** or techniques of flattening the globe that have proven useful.

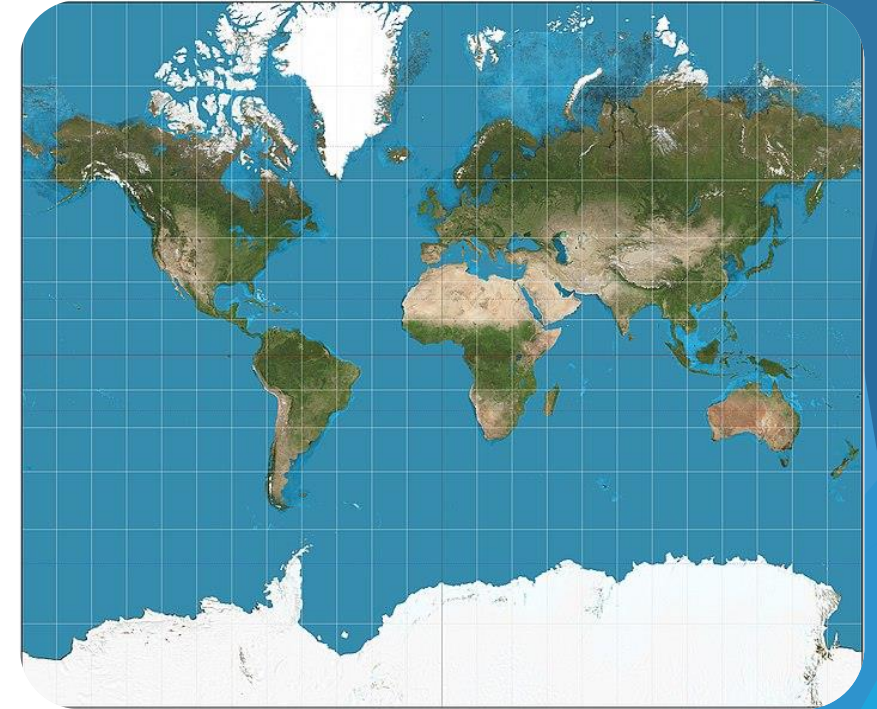
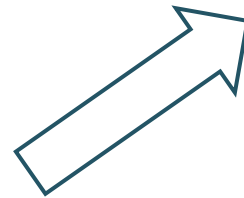


Plotting Data in MATLAB

Maps

- The Mercator projection is a popular map style for use in navigation. It represents lines of straight travel on a constant course, which proved useful for planning trips across the sea. To convey course properly, the size of landmasses is greatly distorted. This is why Greenland is often mistaken for being over 500 times larger than it really is.

Mercator Projection



Plotting Data in MATLAB

Maps

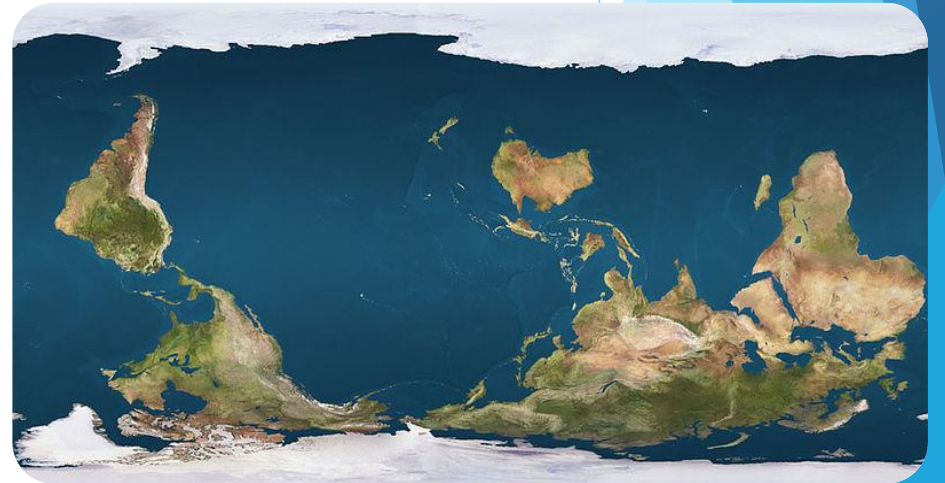
- Even the positioning of landmasses is a result of decisions made by the mapmakers. Europe might not have been positioned in the top-center if the mapmakers were raised somewhere else. There is no up or down or left or right in space, and these decisions do not represent objective truth.
- When we communicate data, we are -in a way- **mapmakers**, charting informational territory and placing emphasis on aspects of data we are trying to emphasize. This comes with a lot of decision-making and utilization of different techniques

Get into groups and search the web for different types of maps.

Consider the following:

What do each of them emphasize or distort?

Discuss your findings with your classmates!



Plotting Data Activity

Please copy over the files for Section 04 from the MATLAB Drive

Section 4: Plotting Data in MATLAB

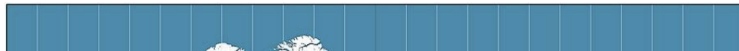
“What is the best way for me to visually communicate my data in MATLAB?”

In this section we will develop familiarity with plots in MATLAB. Cover how to create, resize, label, and adjust plots to desired specifications.

Maps

You may have heard there is no way to truly correct way to represent our Earth on a flat image. It is impossible to unwrap the spherical dimensions of the globe to perfectly portray the layout and shapes of our globe on a 2D surface. This has posed a fundamental challenge from the inception of their tradition. Mapmakers have had to decide what information to preserve and what information to distort to communicate the important information their maps need to convey. As a result, there are many “projections” or techniques of flattening the globe that have proven useful.

The Mercator projection is a popular map style for use in navigation. It represents lines of straight travel on a constant course, which proved useful for planning trips across the sea. To convey course properly, the size of landmasses is greatly distorted. This is why Greenland is often mistaken for being over 500 times larger than it really is.



[The MATLAB files for this section can be found at this link.](#)

Plotting Data in MATLAB

Importing your Data

To start, you can clear your **Command Window** and **Workspace** to keep it organized

The "**clc**" function clears the **Command Window**, and the "**clear**" function clears the **Workspace**

1

```
clc; clear; %clean up the workspace
```

Plotting Data in MATLAB

Importing your Data

In order to plot our data, first we have to be able to access it from the excel file

We want to assign the file's location to a variable so that you can import your data. Right click the file in your **Files** tab located on the left hand side and select **Copy Path**. Paste that as your filename.

The following code gives an example of this as well as how to read and the display the data file.

```
filename = "/MATLAB Drive/MATLAB - Section 04 (Student - File Share)/Data/datatest.xlsx"; %locate our data  
spreadsheet = readmatrix(filename); %read our data file  
disp(spreadsheet); %show off our new variable
```

1	10
2	4
3	25
4	6
5	20

Run

Plotting Data in MATLAB

Plotting Functions

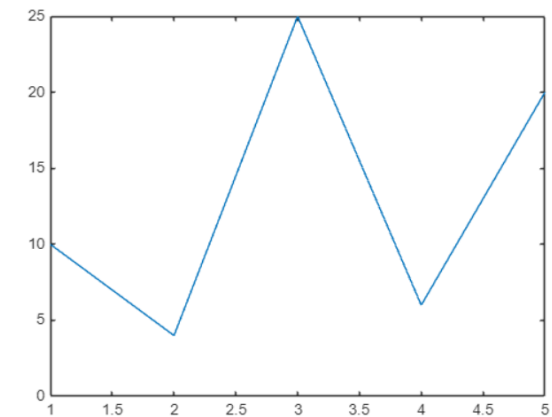
Here's how to plot a simple line graph!

Take data in the form of columns from your spreadsheet and assign them to two different variables.

Using the "**plot()**" function you can create a simple line graph! For this function, the inputs are listed as your x data followed by your y data.

Simple Line graph

```
col1 = spreadsheet(:,1); %assign first column to var col1  
col2 = spreadsheet(:,2); %assign second column to var col2  
  
%plot(x,y) function used to display data  
plot(col1,col2);
```



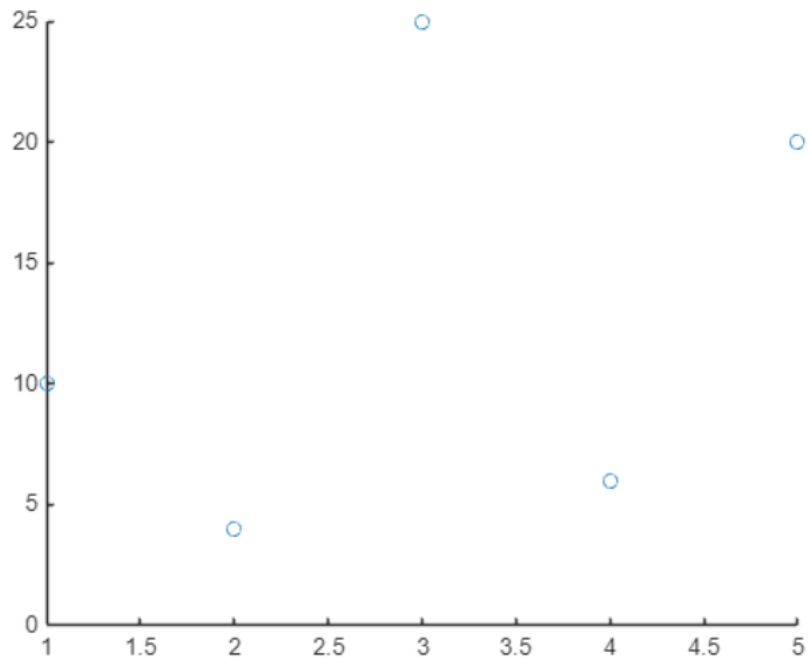
Run

Plotting Data in MATLAB

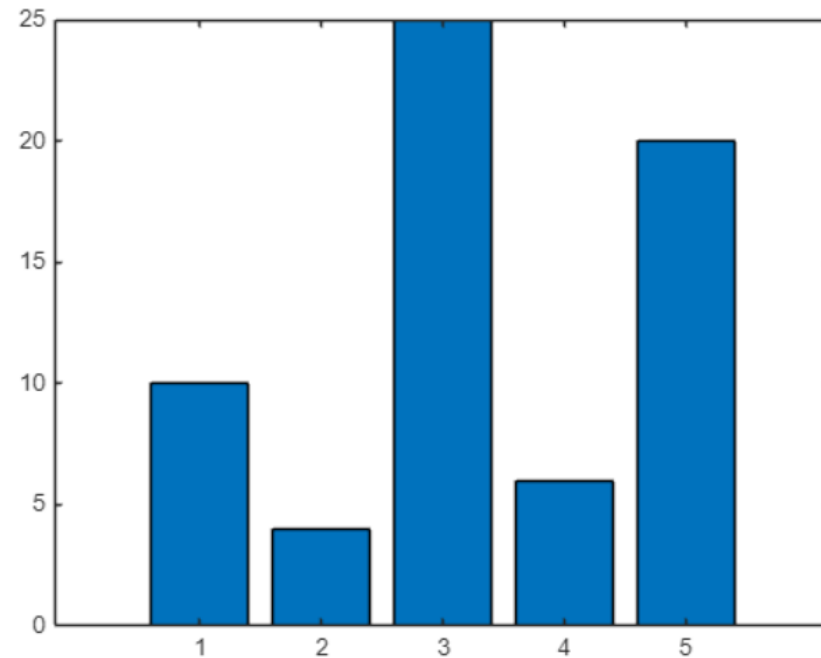
Plotting Functions

Here are two more types of graphs you can create. They both follow the same input format as **plot**.

```
scatter(col1,col2); %scatter plot
```



```
bar(col1,col2); %bar graph
```

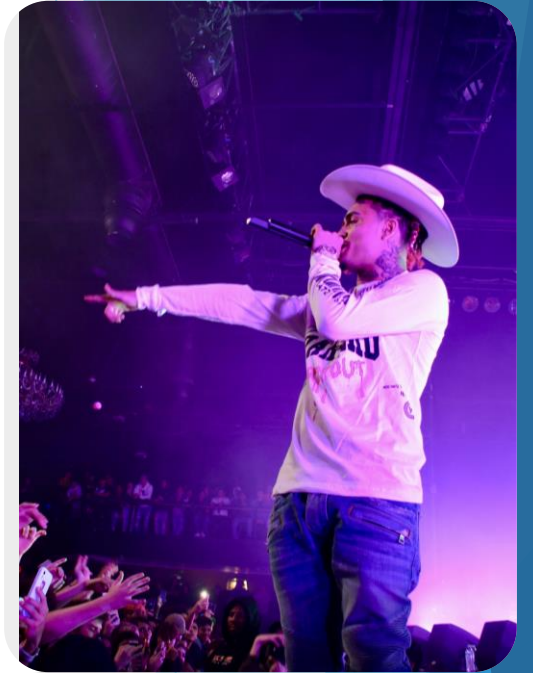


Plotting Data in MATLAB

Lil Pump: Importing Data

Now let's take a look at how we can use plots in action. A few years ago, Lil Pump was the talk of the town. The question is: what is he up to now? Let's look into the current status of the once world-famous Gucci Gang artist.

The following code introduces a new function, "**readcell()**". This function takes each element from a text file and turns them into a cell. **Use it to import data about Lil Pump from excel.**



```
clc;clear;  
data = readcell("/MATLAB Drive/MATLAB - Section 04 (Student - File Share)/Data/lilpumpdata.xlsx");
```

Run

Plotting Data in MATLAB

Lil Pump: Importing Data

Take a look at the data. Which columns are most important for tracking popularity over time?

Chart_week and **rank_score_sum** are the best columns to track popularity over time. **Rank_score_sum** is an aggregate data point ranking an artist's popularity with a score representing streams, downloads, radio time, etc.

Now create two arrays named 'rank' and 'date' containing the data of columns 5 and 3, respectively. (Hint: make sure to exclude the titles in the first row)

```
rank = data(2:end,5);  
date = data(2:end,3);
```

Plotting Data in MATLAB

Lil Pump: Importing Data

Now we need to organize our data so that we can plot! Begin by combining your two columns into a new array.

Use the "**cell2table()**" function to convert the data type from cell to table. Once you do this you can convert the table type to a timetable using the "**table2timetable()**" function. A **timetable** is a type of table that associates a time with each row. This is useful for plotting popularity over time!

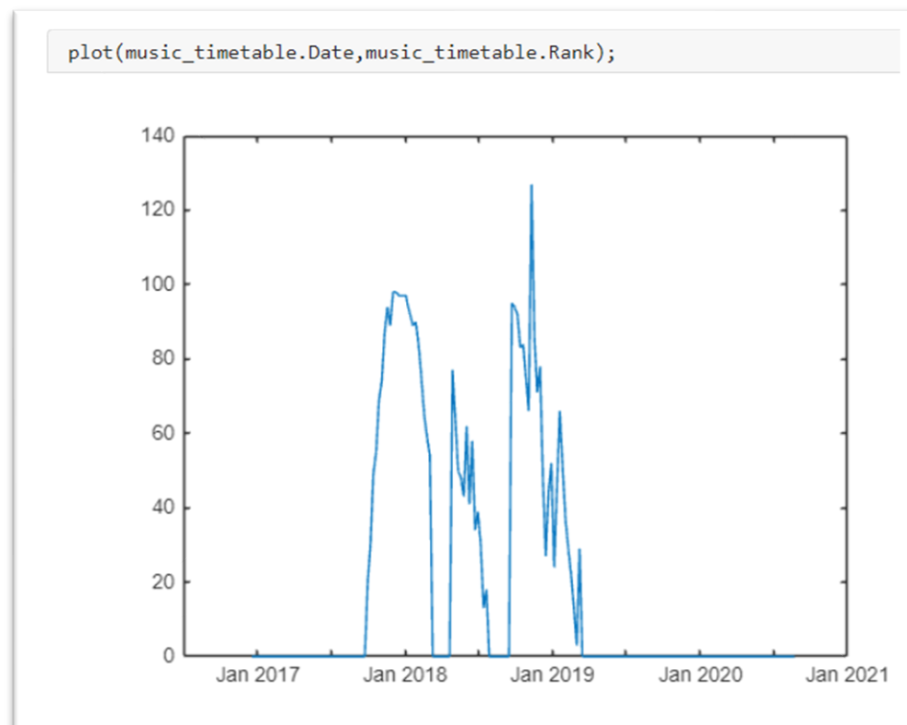
```
%combine rank and date into a 2D array
cell_array = [date, rank];
%convert from type 'cell' to type 'table'
data_table = cell2table(cell_array, 'VariableNames', {'Date', 'Rank'});
%convert to timetable
music_timetable = table2timetable(data_table);
```

Run

Plotting Data in MATLAB

Lil Pump: Simple Plot

Now that you have a timetable containing Date and Rank information, try plotting the data!



***Congrats! You just
plotted your first simple
plot using real
world data!***

Plotting Data in MATLAB

Lil Pump: Simple Plot

That chart showed us a standardized measurement of Lil Pump's popularity over the course of a few years. Let's zoom in and look at his rank in the charts over his first major peak in popularity.

Access the Date and Rank columns. We want to zoom into items 78 through 102 for both, so select these.

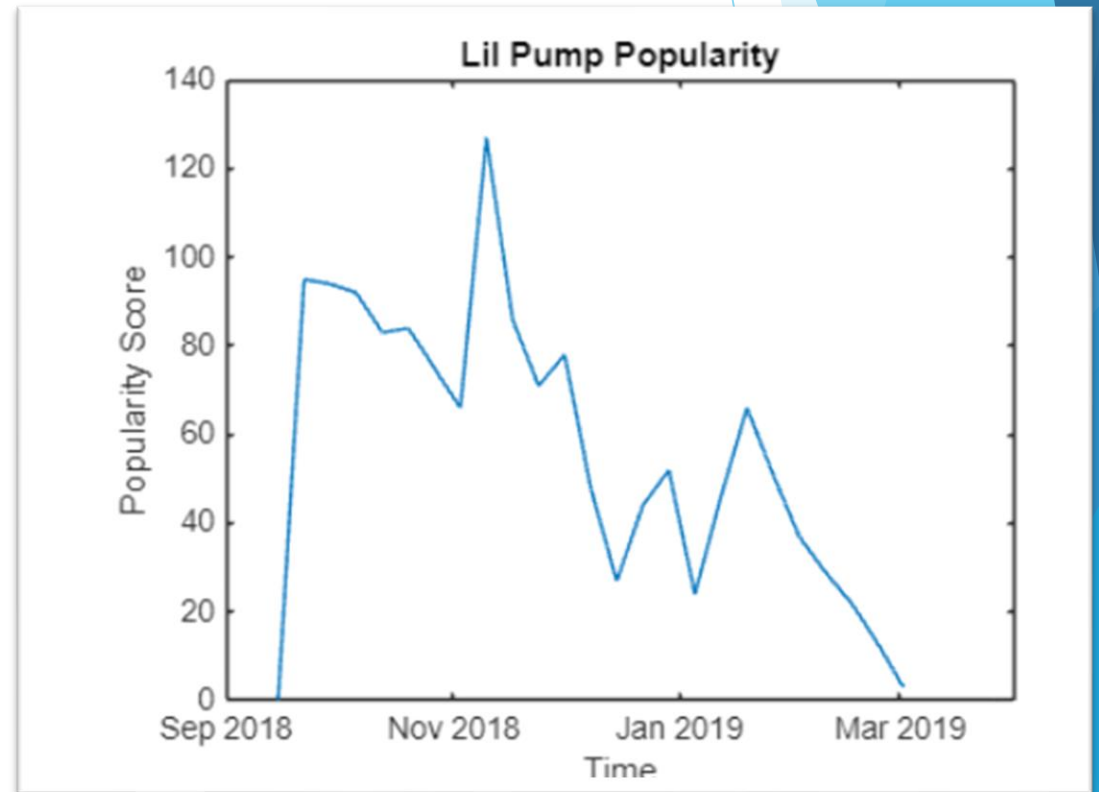
```
%access Date and Rank columns and select items 78 through 102  
% (as this is where we would like to zoom)  
plot(music_timetable.Date(78:102), music_timetable.Rank(78:102));
```


Plotting Data in MATLAB

Let's add a title and axis for clarity. We can do this using the `title()`, `xlabel()`, and `ylabel()` functions. When using these functions, make sure you are writing the inputs in quotations marks, and that you're writing these functions after the `plot()` function.

```
%lets add a title for clarity  
title("Lil Pump Popularity");  
%label axes  
xlabel("Time");  
ylabel("Popularity Score");
```

Lil Pump: Simple Plot



Popularity Plotting

The file for this assignment is also in the MATLAB Drive, as “Part 2”, please open and complete the activity.

Popularity Plotting

Now that we've looked at the different ways MATLAB allows us to communicate data in the form of various plots and walked through creating a plot by importing data into MATLAB, you're going to try it on your own! See if you can make a plot using a different popularity index from the LilPump data file.

Run the cell below to see the plot from the previous notebook detailing Lil Pump's popularity:

```
%this will clear the workspace and import the Lil Pump Data
clc;clear;
data = readcell("/MATLAB Drive/MATLAB - Section 04 (Student - File Share)/Data/lilpumpdata.xlsx");

%this will grab the popularity rank and the dates from the data file that
%we imported
rank = data(2:end,5);
date = data(2:end,3);

%combine rank and date into a 2D array
cell_array = [date, rank];
%convert from type 'cell' to type 'table'
data_table = cell2table(cell_array,'VariableNames',{'Date','Rank'});
%convert to timetable
music_timetable = table2timetable(data_table);
```



[The MATLAB files for this section can be found at this link.](#)

Popularity Plotting

Lil Pump

Now that we've looked at the different ways MATLAB allows us to communicate data in the form of various plots and walked through creating a plot by importing data into MATLAB, you're going to try it on your own!

Follow the instructions in the notebook and run the cell so you can see the previous plot.



Popularity Plotting

Problem 1

Now see if you can make a plot using a different popularity index from the LilPump data file, how does your chart compare with the original? Another popularity index would be something else that might affect or measure popularity, such as danceability.

Try double clicking the "**data**" variable in your workspace to look at the different features in each column! Type your code in the space provided.

```
%%YOUR CODE GOES HERE%%
```

Run

Drawing Conclusions on Data Plotting

Let's think about the lesson and activity we just did:

In this lesson, we learned about plotting and visualization techniques in MATLAB and practiced creating our own plot. We also learned visualization techniques to present data in an efficient and appropriate manner.

Thinking about this (and the Lil Pump Popularity data we just analyzed) discuss and write down your ideas for the following in groups :

- Compare the two plots created using the various popularity indices from the data file linked in the assignment.
- What can we infer from these graphs?

Hint: When may Gucci Gang have been released? When was Lil Pump in his peak popularity?

