Programming Assignment 4

Creating an Animated Multi-Line Chart (11 points + 5 Points+ Bonus Points)

Due Date: October 20, 2022, Wednesday, 6:55pm

Your task is to create an animated multi-line chart for 6 countries (BRICS – Brazil, Russia, India, China, South Africa, and USA) from the data that we have provided: *EPCSmallMillionBTU.csv*. This data file contains Energy Consumption per Capita in Million BTUs per person from 1971 to 2015 for a large number of countries. Your task is to visualize the data for the six countries above for a period of 15 years from 2000 to 2014.

Your visualization must be clear (neat and elegant without clutter) and understandable. This means that x-axis and y-axis be properly labeled with appropriate tickmarks. The graph must have a title. A sample similar (but not identical) output is enclosed. An example of the final output *with animation* is presented in Web Resources III listed below.

As before, solution to a similar problem (animated line chart of stock prices of Apple from July 213 to July 2014) is provided. Solutions to problems similar to this assignment are available on the web links described below. Some of these links take the input data where rows and columns appear in a transposed position in comparison to the data that we have provided. Therefore, your task *may* be simplified if you prepare a **new dataset** by *deleting the extraneous data* and *transposing rows and columns* to create a new data set in csv format with 7 columns and 12 rows creating a format similar to the ones used in Web Resources [II,III] where the top row is reserved for country names and the leftmost column stores the years. *Call this new data set BRICSdata.csv.*

In order to create this visualization, you may have to learn and utilize a few new features of D3 utilized in Resources/References:

(i) *d3.extent* (compute domains) used in [2]
(ii) *d3.line* (display line shape) used in [2]
(iii) *d3.scaleTime* (encoding time along x-axis) used in [2]
(iv) *d3.timeParse* (parse date) used in [2]
(v) *d3.curveBasis* (to interpolate the curve) used in [4]
(vi) *d3.map* (copies properties from an object into a map) used in [4]
(vii) *d3.columns.slice* (allows you to take a slice of columns) used in [4]

In addition, your visualization should have the following features:

1. Names of countries must appear next to the lines on the right as shown in the output.
2. Each line should be interpolated using “curveBasis” or some other interpolation mechanism appropriate to the data.

3. Color associated with each of the six lines must be different (Solution in [4] utilizes *d3.schemeCategory10*; you may utilize this or any other categorical color scheme) to define color scale.
4. Thin grid line (as shown in line graph of Apple's stock prices shown at the end of this document). This can be achieved by creating style sheet associated with grids, creating new functions gridXaxis, gridYAxis, and then calling these functions with appropriate parameters. (an example of grid lines using D3 V4 is available at https://bl.ocks.org/d3noob/c506ac45617cf9ed39337f99f8511218
5. Add animation/**transition** to the lines as shown in the class similar to Reference [III] on "Animate path in D3".
6. Comments and console.log() commands: It is important that you insert lots of conolse.log() commands and comments in your code. Later, you will be asked to explain your code to the teaching team in a 1-1 meeting.

Resources/References (concepts/code needed to complete the assignment):
Canvas Solutions:

1. Line Chart in D3V3 (LineChartV3)
2. Line Chart in D3V4 (LineChartV4)
   (discusses d3.extent, d3.line, d3.scaleTime, d3.timeParse)
3. MultiLineChart in D3V3 (MultiLineV3)
4. MultiLineChart in D3V4 (MultiLineV4)

(discusses,in addition, d3.map, d3.columns.slice, d3.curveBasis, and d3.schemeCategory10)

Web Resources on Line Chart:
Resources/References (concepts/code needed to complete the assignment):

I. Line Chart by Mike Bostock http://bl.ocks.org/mbostock/3883245
II. Multi-Series Line Chart by Mike Bostock
   http://bl.ocks.org/mbostock/3884955
III. Animate Path in D3 http://bl.ocks.org/duopixel/4063326
   (This code has a mechanism for animating paths in D3. Although the link for this code is broken, a working version is provided on Canvas under the title MarkMckayAnimationV2.html)[1]

Submission Requirements
Submit a zip file containing five separate files titled:

- MultiLineindex.html
- MultiLinestylesheet.css
- MultilineChart.js
- BRICSdata.csv or any other data files
- MultiLineOutput.pdf

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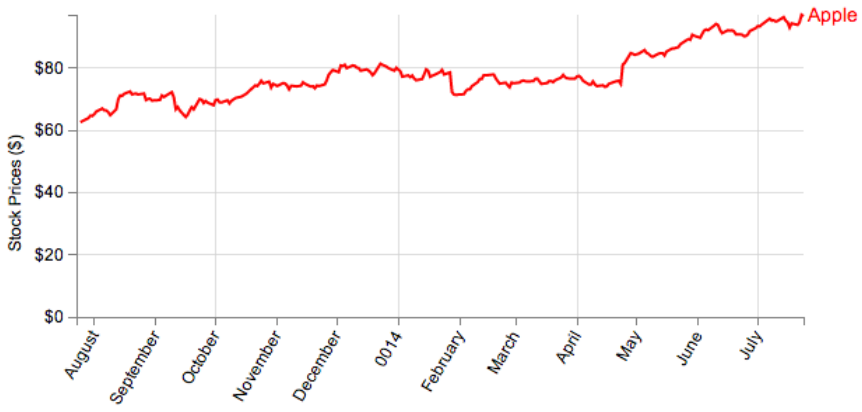
[1] Additional Reference on Animation: This reference is older and uses D3 V3 version (so, you may have to translate this to D3 V4 version if you use these ideas)
Notes on Animating Line Charts with D3 http://big-elephants.com/2014-06/unrolling-line-charts-d3js/

Please make sure that you use the following script command in your html file to link to D3:

<script type="text/javascript" src=http://d3js.org/d3.v5.min.js></script>

Please submit structured well organized code and insert comments generously.

Example of Thin grid lines:



This may be a non-trivial assignment and requires learning a few new commands. It is strongly recommended that you get started on this assignment as soon as possible!

You may want to download Canvas Solutions 1, 2, 3, 4 and Web Solutions I, II, III, and ensure that they all work with the correctly aligned D3 versions.

A+/A/A- Points (5 points++):
Students striving to receive an A+, A, or A- grade should attempt one (or more) of the following additional features to be added *without peer assistance*. These points will be recorded separately on canvas.

1. User-choice in selecting the countries: Use radio-buttons as implemented in the weblink listed below so that the user can choose the countries. The default display should still show only the 6 BRICS countries chosen. (3 points)

2. A moving vertical line that displays the data associated with each country as implemented in the weblink listed below (possibly with some additional effort to reduce the clutter due to overlapping of displayed data). (3 points)
https://sureshlodha.github.io/CMPS263_Winter2018/CMPS263FinalProjects/PrescriptionDrugs/index.html
(This is pdf file. Copy and paste may not work. You may have to type out this link to access this example)

3. Additional features may also qualify. Best to check with the instructor.

4. Although you may create the solution in any version of D3, we encourage you to use D3 V4 or later versions. Solutions in D3 V3 will lose 1 points and Solutions in d3 V5 or later versions will earn extra credit points.

Superbonus (1 point)
1. If you read the dataset as it is without transposing rows and columns, then you receive extra superbonus points.

Data Source:
https://data.worldbank.org/indicator/eg.use.pcap.kg.oe
Data is available at this website for many more countries for a longer period of time in *kg of oil* per capita. The data set that has been provided is a subset of this dataset. Furthermore a conversion has been applied from *kg of oil* per capita to *Million BTUs*[2] per capita. Ambitious students could do much more with this larger dataset.

[2] 1 kg of oil = 0.039652608749183 Million BTU