Scatterplot Example

We have provided a "scatterindex.html", "scatterstylesheet.css", and a "scatterplot.js" file linked together so that the html file displays a scatter plot with "GDP (in Trillions of US Dollars) in 2010" along the x-axis, "Energy Consumption per Capita (in Million BTUs per person) along the y-axis and 15 countries shown in various colors with circles whose areas are proportional to the "Total Energy Consumption in 2010". In addition, the names of the countries are shown. Finally, a legend is displayed associated with circle sizes.

Download this scatterindex.html file, preview it in brackets, and hopefully it works beautifully. Enjoy it!

We, now visit the code in **D3 V3** which is similar to the code for bargraph.

Read Data

Data for 15 countries is embedded within the scatterplot.js file. Please note that "epc" stands for energy consumption per capita, and "total" stands for total energy consumption expressed in units described above.

Define Margin

Declare the Margin (top, right, bottom, left), width, and height. Define SVG's width (width + margin.left + margin.right) and height(height + margin.top + margin.bottom)

```
// Define Margin
var margin = {top: 50, right: 80, bottom: 50, left: 80},
    width = 960 - margin.left - margin.right,
    height = 500 - margin.top - margin.bottom;
```

Define Colors

```
var colors = d3.scale.category20();
```

Define SVG

Recall that SVG is like a canvas. It is where we "draw" our graph on to.

```
// Define SVG
var svg = d3.select("body")
    .append("svg")
    .attr("width", width + margin.left + margin.right)
    .attr("height", height + margin.top + margin.bottom)
    .append("g")
    .attr("transform", "translate(" + margin.left + "," + margin.top + ")");
```

Define Range of X-Y Scale

Use **d3.scale** to define the RANGE of X-Y SCALE accordingly. The range of width is [0,width] and the range of height is [height,0]. We cheat and roughly choose domains based on the data set

where the gdp values range from 0 to 15 and the epc values range from 0 to 316. For your assignment, we expect you to read the data and use d3 commands to define domains for xScale and yScale.

```
// Define Domains and Ranges of X-Y Axis Scale
var xScale = d3.scaleLinear().range([0,width]),
    yScale = d3.scaleLinear().range([height,0]);
```

Use **d3 axis** to define the AXIS X-Y. Orient the X-Axis to the bottom and orient the Y-Axis to the left.

```
var xAxis = d3.axisBottom(xScale),
  yAxis = d3.axisLeft(yScale);
```

Draw Scatterplot

Now we draw the scatter plot. First, append "circle" element to represent the data. Then use attributes "r", "cx", "cy" to define the radius ("r"), the x-position ("cx), and the y-position ("cy").

```
// draw scatterplot
  svg.selectAll(".dot")
      .data(scatterdataset)
      .enter().append("circle")
      .attr("class", "dot")
      .attr("r", function(d) { return Math.sqrt(d.total/2); })
      .attr("cx", function(d) { return xScale(d.gdp);})
      .attr("cy", function(d) { return yScale(d.epc);})
      .style("fill",function (d) {return colors(d.country);});
      // Later insert the mouseover, tooltip and mouseout code here
      });
```

Draw Country Names

We then display country names by appending text. Look at the code.

Draw X and Y axes

We display X and Y axes as follows.

```
// x-axis
    svg.append("g")
        .attr("class", "x axis")
        .attr("transform", "translate(0," + height + ")")
        .call(xAxis)
       .append("text")
        .attr("class", "label")
        .attr("x", width/2)
        .attr("y", 50)
        .style("text-anchor", "end")
        .text("GDP (in Trillions of US Dollars) in 2010");

  // y-axis
```

```
  svg.append("g")
      .attr("class", "y axis")
      .call(yAxis)
      .append("text")
      .attr("class", "label")
      .attr("transform", "rotate(-90)")
      .attr("x", -50)
      .attr("y", -50)
      .attr("dy", ".71em")
      .style("text-anchor", "end")
      .text("Energy Consumption per Capita (in Million BTUs per
Person ");
```

Legends

We have also provided the code to add legends.
Steps to create Legend are:

- Append a rectangle to SVG and position the legend box.
- Add three circles and position them accordingly
- Append text to denote the value of each circle size
- Append text to display the legend title

Programming Assignment 5

Due Date: May 7, Monday, 11:59pm (5 points)

The assignment requires you to make following changes:

1. Read the Data from "scatterdata.csv" file
2. Add Tooltip
3. Add Pan+Zoom behavior (most of the credit will be awarded for this step)
4. Submit the assignment using D3 V4 (no credit whatsoever will be provided for D3 V3 code)
5. Gain an excellent understanding of the code provided to you.

Read the Data

Currently, the data is hard coded inside the javascript file.
For the assignment, you are required to read the data from "scatterdata.csv".
Along the x-axis is GDP in Trillions of US Dollars (2nd column). Along the y-axis is EPC (Energy Consumption per Capita) in Million BTUs per person (4th column). The population of the 15 countries are shown in 3rd column. The scatterplot itself is a (x,y) placement of 15 countries (1st column), where each country is drawn as a circle with area proportional to total (total energy consumption) in Trillion BTUs (5th column) obtained by multiplying EPC with Population. All the data pertains to the year 2010.

You will also need to redefine the domains of xScale and yScale.

Add Tooltip

This requires 3 changes in the "scatterplot.js" code:

1. make changes to scatterstyle.css to add the style for tooltip
2. insert var tooltip
3. insert .on("mouseover") command to activate the tooltip with appropriate transition, placement, background, and labels as shown below. Finally, make sure to de-activate the tooltip using .on("mouseout") command.

After addition of tooltip, the label should appear next to the country circles. Labels should disappear when you move away from the dots.

When the cursor lands on the data point, the tooltip gets activated and should displays the following five pieces of information as shown below: Name of the country, Population, GDP, EPC, and TEC as follows. You will need to use tooltip.html to display this label.

```
Here is an example of the label:
```
China
Population: 1359 Million
GDP: $5.93 Trillion
EPC: 75 Million BTUs
Total: 101 Trillion BTUs

Add Pan+Zoom

Add the functionality of pan+zoom as demonstrated in the following code by Mike Bostock on Pan+Zoom (the code is in D3 V3): bl.ocks.org/mbostock/3892919

There is discussion of Pan+Zoom in Scott Murray's book Chapter 14 on Geospatial mapping where he discusses d3.pan command, d3.drag, and d3.zoom commands. For further assistance, please visit http://www.puzzlr.org/zoom-in-d3-v4/
You may also find tutorials on zoom on the following website helpful:

https://www.dashingd3js.com/lessons/

Pan
After addition of this feature, you should be able to click on a country name and pan the display left-right, up-down , or diagonally by holding one finger on the mouse and moving the mouse to the left-right or up-down or diagonally. The axes and their scaling should move automatically after adding this functionality.

Zoom
Moreover, you should also be able to zoom in and out. Keep the cursor on a country name and then, by sliding away the finger, you zoom out, and by sliding the finger in, you zoom in with respect to that country creating spaces in between to view the details.

Exact mechanism needed to pan+zoom may depend upon whether you are using a touchpad or a mouse and whether you are working on a PC or Mac, etc.

It may be a bit more difficult to figure out how to make the static country names associated with circles move with the zoom function. If you continue to encounter this challenge, you can remove the code associated with "drawing country names" for loss of 1 point.

Files to be submitted

You will submit four separate files:

- scatterindex.html
- scatterstylesheet.css
- scatterplot.js
- scatterdata.csv (Yes, you will resubmit exactly the same data file that we supplied so that we can quickly run your code)