# Application requirement:

Any text editing software (recommended: Sublime Text http://www.sublimetext.com)
Any browser (recommended firefox)

# Basics:

1. **HTML (Hypertext Markup Language):** structure content for web browsers
   - **DOM (Document Object Model):** the hierarchical structure of HTML
   - **More html tags:** http://www.w3schools.com/tags/

lab1.html

```
<HTML>
<HEAD>
</HEAD>
<BODY>
        I love Dr. Hsiao!
</BODY>
</HTML >
```

2. **CSS (Cascading Style Sheets):** style the visual presentation of HTML pages

- File extension is *.css (For example: **lab1.css**)
- Two ways to style your webpages.

```
<HTML>
<HEAD>
      <style type="text/css">
            body {
                  color: white;
                  background-color: purple;
            }
      </style>
</HEAD>
<BODY>
     I love Data Visualization!
</BODY>
</ HTML >
```

```
<HTML>
<HEAD>
    <link rel="stylesheet" type="text/css"
href="css/lab1.css">
</HEAD>
<BODY>
   I love Data Visualization!
</BODY>
</HTML>
```

Create **lab2.css** separately:

```
body {
        color: white;
        background-color: purple;
        }
```

**3. JavaScript (dynamic scripting language): tell our browsers to make changes to a page after it has already loaded**

- File extension is *.js (For example: http://d3js.org/**d3.v3.min.js**)
- Two ways to incorporate javascripts to your webpages.

```
<HTML>
<HEAD>
    <link rel="stylesheet" type="text/css" href="css/lab2.css">
    <script language="JavaScript">
function processClick() {
        var buttonValue = document.getElementById('clickButton1').value;
        alert(buttonValue);
}
     </script>
</HEAD>
<BODY>
   I love Data Visualization!
<FORM NAME="myForm">
        <INPUT TYPE="button" id="clickButton1" VALUE="this button is clicked!"
onClick="processClick();">
</FORM>
</BODY>
</HTML>
```

```
<HTML>
<HEAD>
    <link rel="stylesheet" type="text/css" href="lab1.css">
    <script src="js/lab1.js"></script>
    <script src="http://d3js.org/d3.v3.min.js"></script>
</HEAD>
<BODY>
   I love Data Visualization!
<FORM NAME="myForm">
        <INPUT TYPE="button" id="clickButton1" VALUE="this button is clicked!"
onClick="processClick();">
</FORM>
</BODY>
</HTML>
```

**4. SVG (Scalable Vector Graphics)**

More shapes and http://www.w3schools.com/svg/

```
<BODY>
…
<svg >
  <line x1="50" y1="50" x2="100" y2="100"  stroke-width="10" stroke="red" />
  <line x1="100" y1="100" x2="200" y2="0"  stroke-width="10" stroke="black" />
```

```
</svg>
…

</BODY>
```

Practice to draw a smiley face in SVG (submit it with assignment#1 due for 1 pt bonus)
Practice to draw a ASU logo in SVG (submit it with assignment#1 due for 2 pt bonus)


# Finally…

**5. D3 (Data Driven Documents)**

- Basic web (programming)
- Graph basics
- Data binding

```
<HEAD>
…
   <script src="http://d3js.org/d3.v3.min.js"></script>  //include d3 javascript before lab1.js
   <script src="lab2.js"></script>
…
</HEAD>
```

**Control a document object by d3 selector:** when the button is clicked, change background color (modify lab1.js)

```
d3.select("body").style("background-color","#FFFFCC");
```

**Simple interaction:** mouse over effect

```
<BODY>
<div id="viz"></div>
<script type="text/javascript">
   var svgCircle = d3.select("#viz")
      .append("svg")
      .attr("width", 200)
      .attr("height", 200);

   svgCircle.append("circle")
      .style("stroke", "gray")
      .style("fill", "white")
      .attr("r", 40)
      .attr("cx", 50)
```

```
      .attr("cy", 50)
      .on("mouseover", function(){d3.select(this).style("fill", "blue");}  )
      .on("mouseout", function(){d3.select(this).style("fill", "white");}   );
 </script>
</BODY>
```

- **Try to use d3 selector to manipulate other html attributes**
  https://github.com/mbostock/d3/wiki/Selections#wiki-d3_select
  - mouseover with same color, but opacity set to 0.2
  - mouseover show some text (tooltip)

```
//draw another circle, mouseover show the tooltip
   var svgCircle2  = d3.select("#viz")
      .append("svg")
      .attr("width", 200)
      .attr("height", 200);

   svgCircle2.append("circle")
      .style("stroke", "yellow")
      .style("fill", "white")
      .style("fill-opacity","0.2")
      .attr("r", 40)
      .attr("cx", 50)
      .attr("cy", 50)
      .on("mouseover", function(){return tooltip.style("visibility", "visible");} )
      .on("mouseout", function(){return tooltip.style("visibility", "hidden");}) ;

   //tooltip object
   var tooltip = d3.select("body")
            .append("div")
            .style("position", "relative")
            .style("visibility", "hidden")
            .text("I drew something");
```

6.
Ref: http://prcweb.co.uk/lab/what-makes-us-happy/
**Plot Roger Federer's 5years us open winning streak (winners & errors ratio)**
(create a new html page named: Roger.html)

```
<HTML>
   <head>
      <title>lab1 - interactive viz</title>
      <link rel="stylesheet" type="text/css" href="css/Roger.css">
      <script type="text/javascript" src="http://d3js.org/d3.v3.min.js"></script>
   </head>
<BODY>
```

```
    <div class='content'></div>
    <script>
//Roger's Winners vs. Errors stats
var data = [[40,26],[69,37],[69,19],[42,34],[36,33]];
//Opponent's winners/errors stats
var data2 = [[12,23],[34,28],[33,23],[32,40],[16,28]];

//Opponent's winners/errors stats, and image path
//var data2 =
[[12,23,"images/roddick.png"],[34,28,"images/roddick.png"],[33,23,"images/novak.png"],[
32,40,"images/roddick.png"],[16,28,"images/roddick.png"]];

  var margin = {top: 20, right: 20, bottom: 60, left: 60}
    , width = 760 - margin.left - margin.right
    , height = 500 - margin.top - margin.bottom;

  var x = d3.scale.linear()
          .domain([0, d3.max(data, function(d) { return d[0]; })])
          .range([ 0, width ]);

  var y = d3.scale.linear()
        .domain([0, d3.max(data2, function(d) { return d[1]; })])
        .range([ height, 0 ]);

  var chart = d3.select('body')
.append('svg:svg')
.attr('width', width + margin.right + margin.left)
.attr('height', height + margin.top + margin.bottom)
.attr('class', 'chart')

  var main = chart.append('g')
.attr('transform', 'translate(' + margin.left + ',' + margin.top + ')')
.attr('width', width)
.attr('height', height)
.attr('class', 'main')

  // draw the x axis
  var xAxis = d3.svg.axis().scale(x).orient('bottom');
  main.append('g')
.attr('transform', 'translate(0,' + height + ')')
.attr('class', 'main axis date')
.call(xAxis);

  // draw the y axis
```

```
    var yAxis = d3.svg.axis().scale(y).orient('left');
    main.append('g')
  .attr('transform', 'translate(0,0)')
  .attr('class', 'main axis date')
  .call(yAxis);
//start appending data as svg to page
    var g = main.append("svg:g");

    g.selectAll("dots")
      .data(data)
      .enter().append("svg:circle")
          .attr("cx", function (d) { return x(d[0]); } )
          .attr("cy", function (d) { return y(d[1]); } )
          .attr("r", 10);

    var red = d3.rgb(255, 0, 0);
    g.selectAll("dots")
      .data(data2)
      .enter().append("svg:circle")
          .attr("cx", function (d) { return x(d[0]); } )
          .attr("cy", function (d) { return y(d[1]); } )
          .attr("r", 10)
          .style("fill", red.darker(1))
          .style("opacity", 0.6) // opacity of circle
          .on("mouseover", function(d) {
              d3.select(this).style("fill", "orange");
              d3.select(this).attr("r", 20);

              //mouseover opponent
              /*
              main.append("svg").append("image")
                .attr('xlink:href',d[2])
                .attr('transform', 'translate(' + 50 + ',' + 160 + ')')
                .attr("width",250)
                .attr("height",300)
                .attr("opacity","0.1")
                .style("display","inline")
                .transition()
                .delay(400)
                .remove();
              */

          })
          .on("mouseout",  function(d) {
```

```
            d3.select(this).style("fill", red.darker(1));
            d3.select(this).attr("r", 10);
          });

  // text label for the x axis
  g.append("text")
       .attr("x", 330 ).attr("y",  460 ).style("text-anchor", "middle").text("Winners");

  // text label for the y axis
  g.append("text")
       .attr("x", -45 ).attr("y",  230 ).style("text-anchor", "middle").text("Errors");

//6-1. animation
//d3.selectAll("circle").transition().duration(1500).style("fill", "green");

//6-2. display image
/*
main.append("svg").append("image")
.attr('xlink:href',"roger.png")
.attr('transform', 'translate(' + 350 + ',' + margin.top + ')')
.attr("width",350)
.attr("height",400)
.attr("opacity","0.1");
*/
       </script>
</BODY></HTML>
```

6.1 Try transition() for animation http://bost.ocks.org/mike/transition/
6.2 How to display an image?
6.3 Mouseover data point and display different images?

7. More tutorials
   - d3 tutorial http://alignedleft.com/tutorials/d3
   - d3 tutorial https://www.dashingd3js.com/table-of-contents
   - Using JSON to simplify code
     - convert csv to json http://www.convertcsv.com/csv-to-json.htm
   - Advanced:
     - http://raphaeljs.com/reference.html another powerful animation javascript library
     - http://code.shutterstock.com/rickshaw/

**After class:**

- **https://github.com/mbostock/d3/wiki/Gallery**
  **Select a d3 datavis example as template, plug in your datasets.**
  **Steal like an Artist (Kleon, 2012)**

- explore **tableau** http://www.tableausoftware.com