## Instructions

There are four parts for this assignment. Undergraduate students should complete the first three; graduate students should complete all four. You may complete the assignment in a single HTML file or use multiple files (e.g. one for CSS, one for HTML, and one for JavaScript). **You must use D3 for this assignment.** All visualization should be done using D3 calls. You may use other libraries (e.g. underscore.js or jQuery), but you must credit them in the HTML file you turn in. Extensive [documentation for D3](https://github.com/mbostock/d3/wiki) is available, and [Vadim Ogievetsky's example-based introduction](http://vadim.ogievetsky.com/IntroD3) that we went through in class is also a useful reference. In addition, Scott Murray has written a great book named [Interactive Data Visualization for the Web](http://chimera.labs.oreilly.com/books/1230000000345). Finally, the examples we developed in class are available for reference: categorical color mapping example ([html](http://www.cis.umassd.edu/~dkoop/cis467/lectures/lecture23/food.html), [js](http://www.cis.umassd.edu/~dkoop/cis467/lectures/lecture23/food.js)); sequential color mapping example ([html](http://www.cis.umassd.edu/~dkoop/cis467/lectures/lecture23/census.html), [js](http://www.cis.umassd.edu/~dkoop/cis467/lectures/lecture23/census.js)); brushing example ([html](http://www.cis.umassd.edu/~dkoop/cis467/lectures/lecture26/games.html), [js](http://www.cis.umassd.edu/~dkoop/cis467/lectures/lecture26/games.js)).

1. Colormapping

In this part of the assignment, we will be encoding attributes in visualizations using color channels. For each visualization, you should encode the specified attribute using an appropriate colormap and add a **legend** to it. You may use the provided [a4map.html](http://www.cis.umassd.edu/~dkoop/cis467/a4map.html) and [a4map.js](http://www.cis.umassd.edu/~dkoop/cis467/a4map.js) files as a starting point. The data you will need are [US States TopoJSON](http://www.cis.umassd.edu/~dkoop/cis467/us-states.json) and [Vehicle Theft](http://www.cis.umassd.edu/~dkoop/cis467/vehicle-theft.json). This data was compiled from the FBI's [Crime in the U.S. reports](http://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s) and the NICB's [Hot Wheels reports](https://www.nicb.org/newsroom/nicb_campaigns/hot%E2%80%93wheels). In your scripts, access these files directly from the specified URLs:

* <http://www.cis.umassd.edu/~dkoop/cis467/us-states.json>
* <http://www.cis.umassd.edu/~dkoop/cis467/vehicle-theft.json>

You may use the NAME property for each state in the usStates list to match the appropriate entires in the vehicle theft data. For an entry d, this can be accessed viad.properties.NAME.

A. Top-Stolen Car Model by State

Encode the top-stolen car model by state on map using color. The model name is stored in the model subfield of the rankings field, and the top-stolen model is indicated when therank subfield is **1**. Note that rankings is an array of objects that exists for entry (one per state) in the provided vehicle theft file. Provide a legend for the colormap in the lower-right corner.

B. Change in Motor Vehicle Theft from 2012 to 2013 by State

Encode the change in motor vehicle theft by state from 2012 to 2013 using color. This attribute is stored in the change field for each entry in the provided vehicle theft file. Provide a legend for the colormap in the lower-right corner.

Hints:

* Remember to identify the type of the attribute and the way the values are distributed.
* Legends should use the same color scales you define for the data.

2. Multiple Views

In this part of the assignment, you will implement brushing between two visualizations. We will use the same data as before, but now we will display it using a bar chart and a map. When a user moves the mouse over a particular state, the selected state should be highlighted and the bar chart should also highlight any of the vehicles that are in that state's top ten most-stolen vehicles. You may begin your solution from the provided [a4brush.html](http://www.cis.umassd.edu/~dkoop/cis467/a4brush.html) and [a4brush.js](http://www.cis.umassd.edu/~dkoop/cis467/a4brush.js) files that define both the map and bar chart visualization. Use a highly-saturated highlight color. For this part of the assignment, you only need to implement brushing in one direction (map highlights bars); the other direction is extra credit.

Hints:

* You will need to use a .on handler for the states. Consider handling "mouseenter" and "mouseleave" events with functions that update highlighting.
* The lodash or underscore contains function will be useful in determining whether a list contains a particular model.
* The classed method from D3 allows you to set the highlighting style using CSS and trigger changes by switching that class on (true) or off (false).
* d3.nest may be useful to be able to more easily lookup data for a particular state.