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SI649W18 Lab-5-D3 -2 (transition/update)

- Please refer to the programming lab guideline for uploading, late policy and other general rules.
- Please upload lab4_D3_2.html to canvas by next Monday midnight.
- Even if you worked in groups, please upload individually.
- We are using D3.js version 4. Some tutorials and examples that you find online and in this lab might still use d3.v3. If you run into an error that says something is not defined in d3, you can check with the v4 document, or you can search in this document to see if there's been some updates: https://iros.github.io/d3-v4-whats-new/#103
- If you need additional tutorials on D3, check out this link: https://github.com/d3/d3/wiki/Tutorials

Introduction

Today, we are working with the movie dataset again. You will set up a server to load the dataset (abridged version, called movies_lab5.json), plot a bar charts with axis and add some interaction. Before you start writing anything, it is highly recommended that you go through the following documentations/tutorials/examples:
For update, enter, exit pattern:

- https://medium.com/@c_behrens/enter-update-exit-6cafc6014c36 (tutorial on enter, update, and exit. **IMPORTANT**)
- https://bl.ocks.org/mbostock/3808218 (code demonstrates enter, update, and exit)
- https://bl.ocks.org/mbostock/3808234 (easiest to see)
- http://bl.ocks.org/alansmithy/e984477a741bc56db5a5 (update code example with a button)

For events

- http://bl.ocks.org/WilliamQLiu/76ae20060e19bf42d774 (mouse event)
- https://bl.ocks.org/mbostock/5247027 (mouse event)

For transition:

- http://bl.ocks.org/Kcnarf/9e4813ba03ef34beac6e

Overview:

We are going to create a bar chart with the following settings:

- Basic layout:
  - The x-axis is director name
  - The y-axis is director's average IMDB rating (IMDB means Internet Movie Database).

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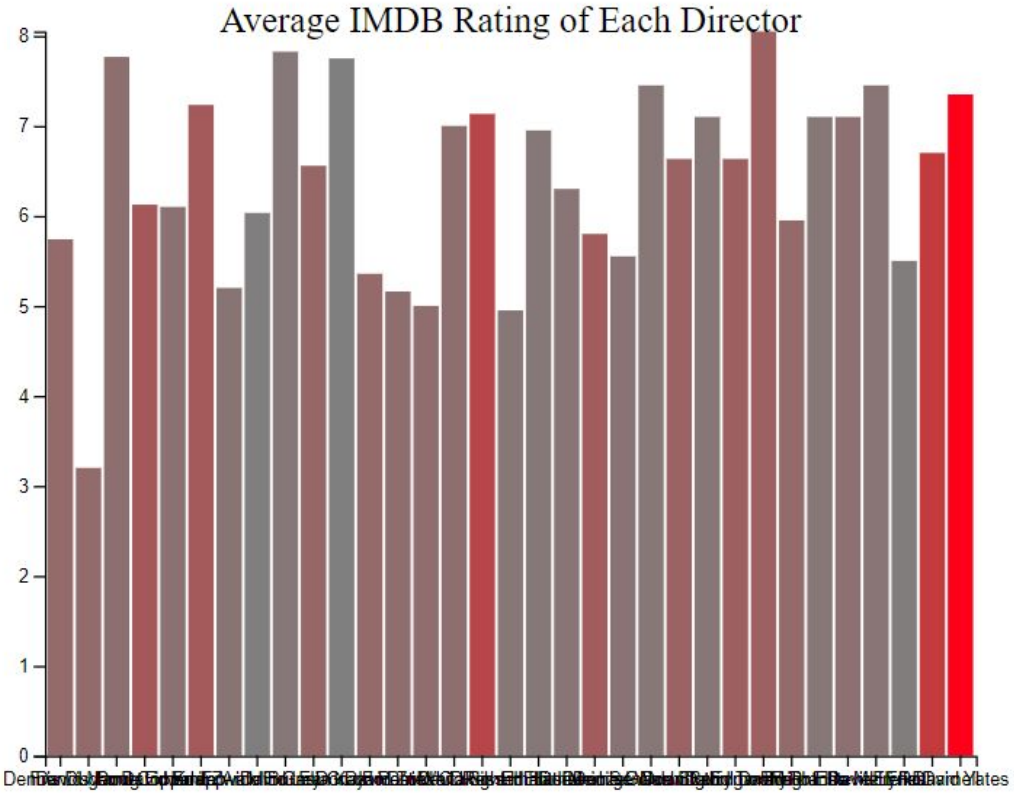
    - Use color to encode the average Production Budget
- Interactivities:
    - Bars are sortable by director's name, avg IMDB, avg. Production Budget and number of movies.
    - When you hover over a particular director's bar, that director's information is displayed in an "infobox".
    - There is a drop down menu where we can use to filter directors by Major Genre.

Section 1: Create a bar chart to display each director's average IMDB rating.

Question 1: create the bar chart.

Just like last time, creating such bar chart involves creating a data structure where each "row" is the information of one director. Please refer to last lab if you have question about this part.

- We recommend using d3.nest() as your data structure, because we will use several parameters other than avg IMDB and avg Parameter in the later part of the lab. d3.nest() creates a structure that are easily reusable.
- You can select your own color encoding, adjust padding, width, and height.



(Figure 1)

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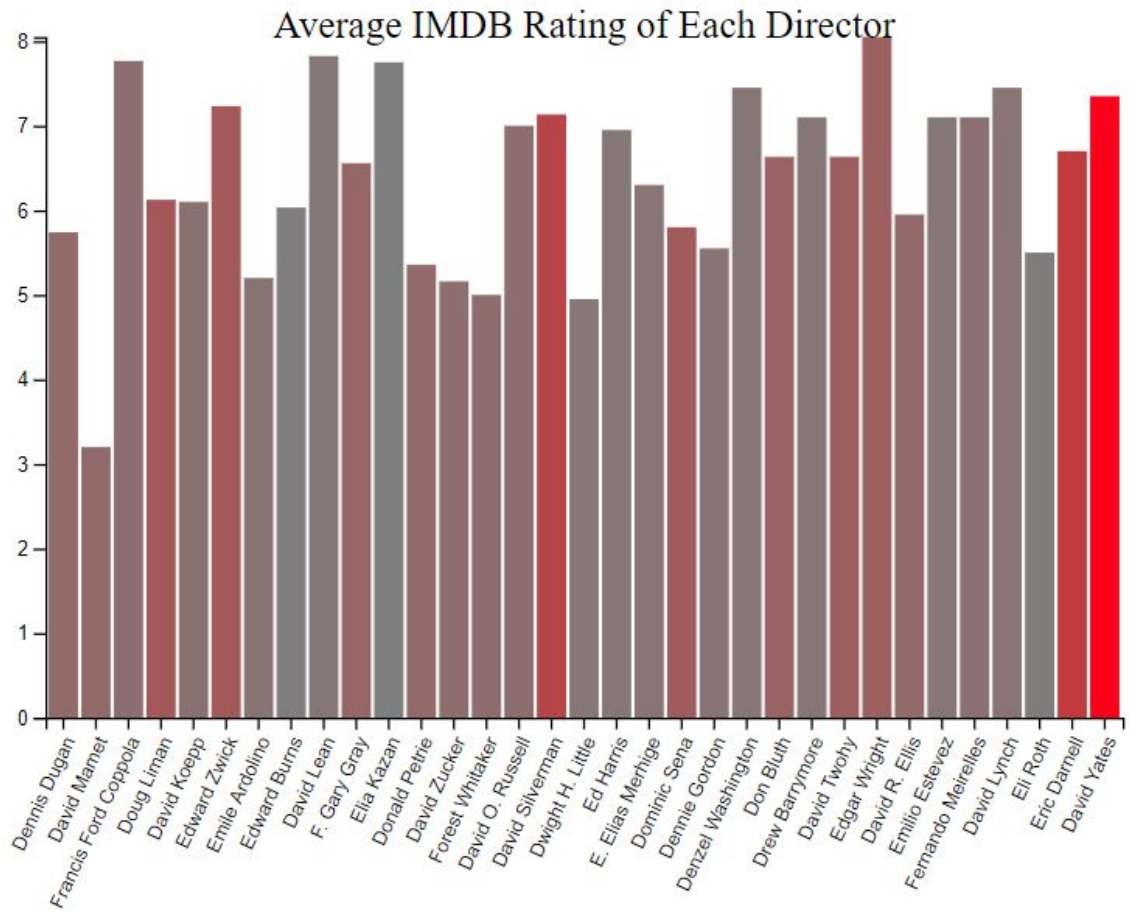
- We **strongly recommend** binding your data with a key function that returns the director name. It won't change your output in this questions, but it will allow your enter/exit/update selections later in this lab to be written **much** more easily. See this tutorial for an example (pay attention to the second argument of the data() function): https://bl.ocks.org/mbostock/3808234
- We also recommend splitting all of the code you use to draw the bars and the x axis into a function separate from the rest of your code. E.g., a "drawYAxis()" function and a "drawBarsAndXAxis()" function. This is because later on you will want to be able to call "drawBarsAndXAxis()" to update your bars and your x axis when you change the data.

Figure 1 displays an example of what the chart might look like initially. The director labels are overlapping and the color encoding is not obvious without a legend. In the next step, we are going to adjust the text rotation and add the legend.

Question 2 text direction

The rotation for tick labels are done through transformation. Take a look at the following example and adjust your director labels:

- https://bl.ocks.org/d3noob/3c040800ff6457717cca586ae9547dbf



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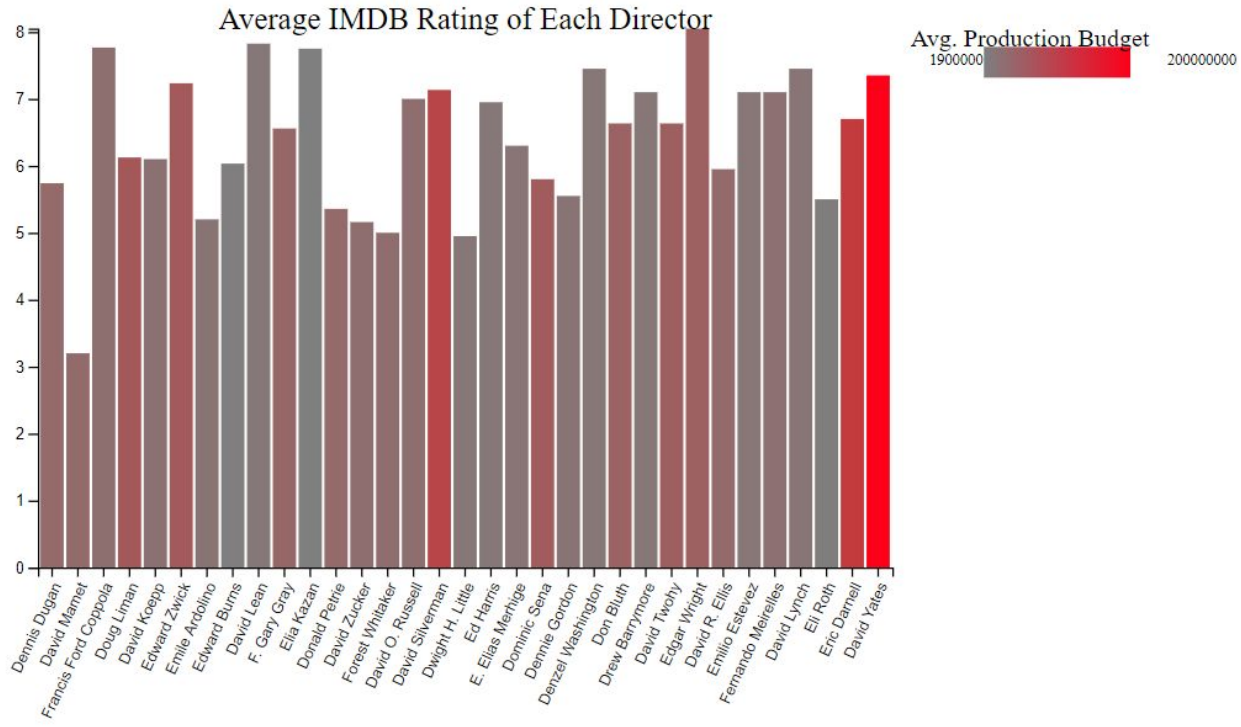
(Figure 3)

Figure 3 displays the adjusted labels. Note that if your bottom padding is not big enough, some texts might go out of your svg element. Make sure that you adjust that.

Question 3 **(bonus, optional)** add color legend

Legends are often important for charts. There are multiple ways to create legends. For example, adding a colored bar, adding small rectangle for each area. In the tutorial below, you will find instructions for creating a continuous color scale legend (Figure 4).

- https://www.visualcinnamon.com/2016/05/smooth-color-legend-d3-svg-gradient.html



(Figure 4)

Section 2: Make the bar chart sortable

The bar chart is providing lots of interesting information. For example, David Yates has a very high production budget, whereas Edgar Wright has the highest average rating in our movie selections. We can make these comparisons easier if we can sort the bar chart.

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In this section, we are going to add a drop down menu and a button. We are going to use the update pattern.

Question 1: Add dropdown menu and button.

We want to enable 4 sorting options:

1. Sort by director's name (alphabetically)
2. Sort by average IMDB rating
3. Sort by average production budget
4. Sort by number of movies in the dataset

The instruction for creating dropdown menu and button is included in the second lab (answer posted).

In the second lab, you are using either pure javascript or jquery to select the <body> element and append <select> or <button> elements. D3 can do the same selecting and appending operations easily. You can even use d3's data binding to append <option> elements. Figure 5 shows how you can use the d3 syntax to append all 4 options at once (**note that the code for creating <select> element is not included here, you must do that**). You are not required to use this method, and feel free to include jquery if you need it:

```
            .selectAll("option")
            .data(["Director Name","Average IMDB Rating","Average Production
Budget","Movie Count"])
            .enter()
            .append("option")
            .attr("value",function (d) {
                return d
            })
            .text(function (d) {
                return d
            });
```

(Figure 5)

You will also need to create code to add a "Sort" button. At this time, you haven't written the function that would be called when you click the button. You can put a placeholder function (e.g. sortBars()) there and we are going to write it in the next step.

After creating the dropdown menu and the button, it will look similar to Figure 6.

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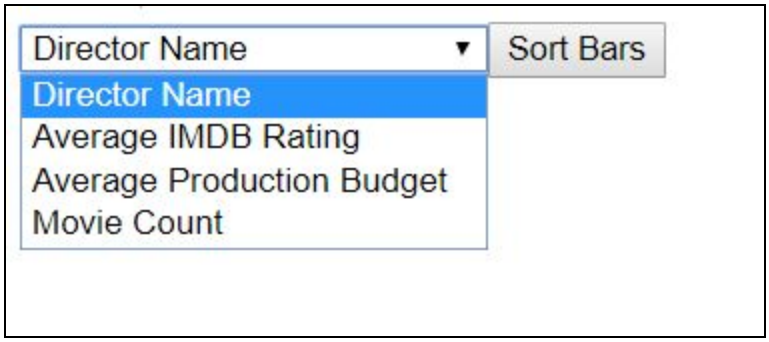

(Figure 6)

Question 2: Write the sorting function and modify your drawBarsAndXAxis() function

First, write the function that would be called when the “Sort” button is clicked. This function has to do two major things: 1) sort the dataset according to the selected option 2) re-call drawBarsAndXAxis() to update the bar chart.

In the sort function, you would need to:

1. Determine what is the current selected option
    a. Hint: We have done this in lab2. You can use pure javascript, jquery, and d3 to extract the value. The solutions to lab 2 are posted on Canvas.
2. Sort the data according to the selected value
    a. Many of you have done this in Lab 2 as a bonus question. Please refer to the tutorials linked in the Lab2. Basically, you need to have a generic sorting function that can sort any given fieldName in the data. You will probably pass a comparator (a function that determines how to sort) in your Array.sort() method. Read more here: https://www.w3schools.com/js/js_array_sort.asp
    b. You can also use the d3.ascending() or d3.descending() function to make a comparator function. See https://github.com/d3/d3-array#ascending
3. Adjust the bar chart after sorting the dataset
    a. This should involve calling your exisitng function to draw the bars and x axis, which you will modify below

In your existing drawBarsAndXAxis() function (or whatever you called it), you will need to:

1. Re-calculate your x scale due to the new sort order
2. Split your bar-drawing code into four pieces according to the JOIN/EXIT/UPDATE/ENTER pattern, similar to how this code on this page does: https://bl.ocks.org/mbostock/3808234
    a. Your ENTER section should probably look very similar to your original bar drawing code

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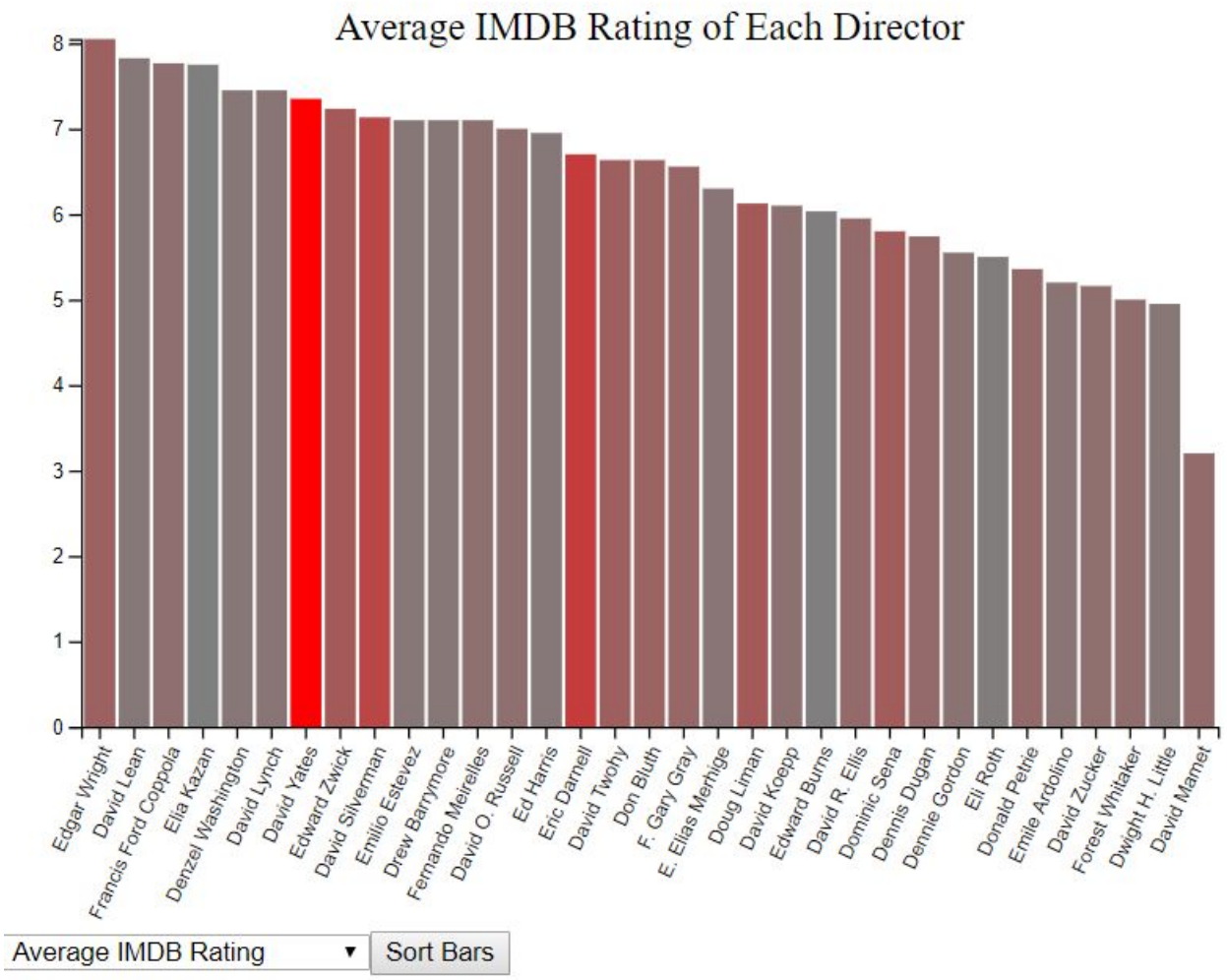
   b. Your UPDATE section will have to update one or two attributes of your bars (which attribute(s) will have changed due to the sort?)
   c. Your EXIT section does not have to do anything yet
3. Re-draw your x axis labels.
4. Make sure your changes animate by adding transition() where appropriate to animate your sorting procedure.



(Figure 7)

Figure 7 demonstrates your potential result. Here's another example if you want to see a similar procedure: https://bl.ocks.org/jalapic/acb4b8b6523e73394c86

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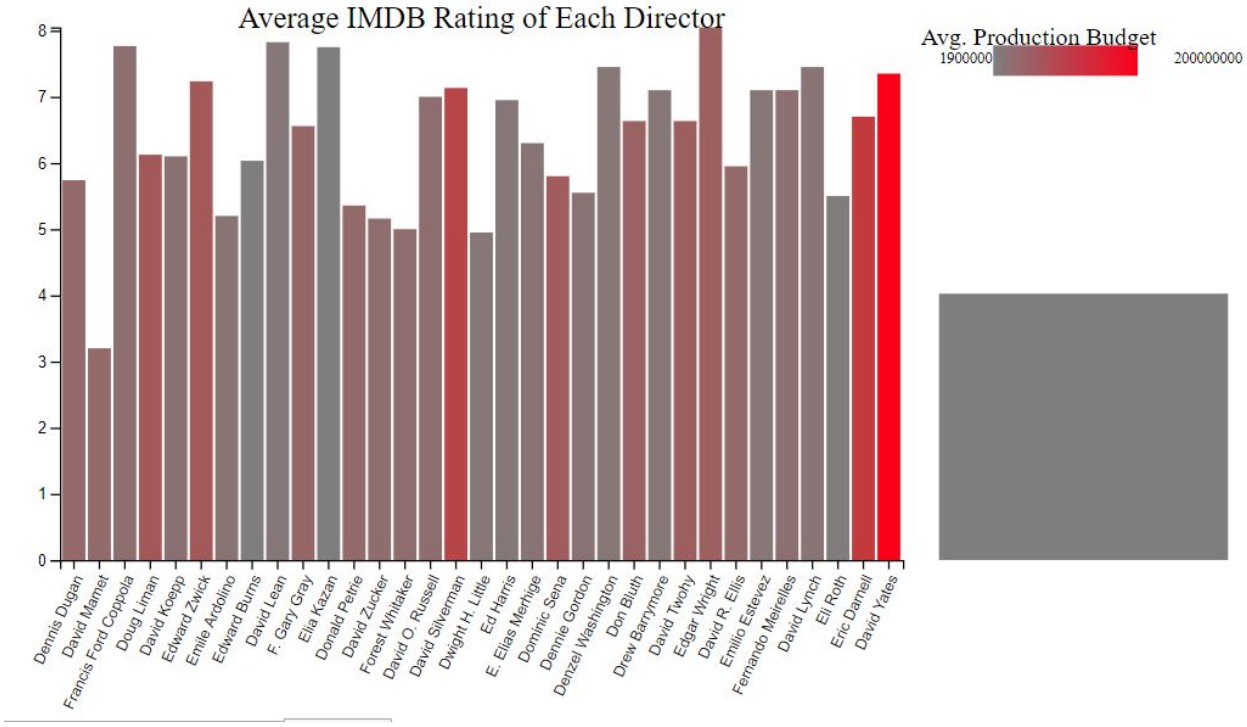
Section 3: Add an infobox

When we hover over a particular bar, we want to display more information about the director. Normally this is done through tooltips. D3 and other tooltip-supporting libraries(such as bootstrap) can do this easily. Today we mainly want you to practice different mouse events. Therefore we are going to display the information as text in a selected area.

Question 3.1 Make a rectangle to display your movie information

If you haven't already done so, make some room on the right of the chart and put a rectangle there as the "information box".(See Figure 8)



(Figure 8)

In this information box, we want to display the director name, movie count, avg IMDB rating, and the avg. production budget for the bar that we are hovering over.
Let's put in some place holders that are displayed when no bar is hovered over (e.g. Figure 9).

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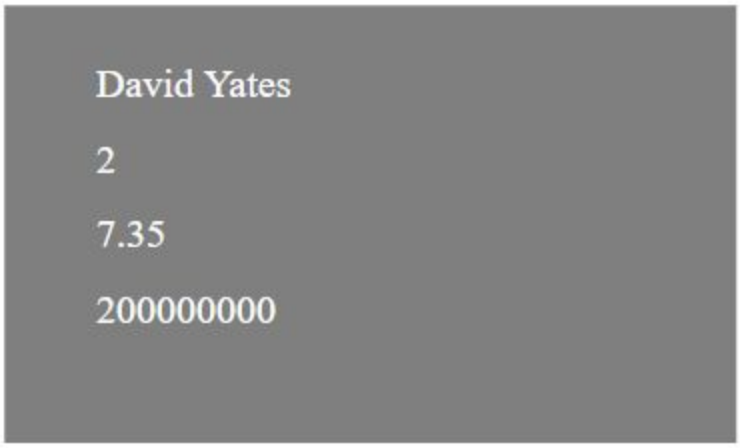
(Figure 9)
Our goal is to display something like Figure 10 when we hover over the David Yates bar.



(Figure 10)

You can break down this task into the following steps:

1. You will need two functions. The first is triggered when your mouse enters the bar. The second is triggered when the mouse leaves the bar.
2. When the mouse enters the bar, you will 1) get information about the bar: which director is it representing? How to access the avg IMDB of this director? 2) select the infobox and replace (or append) the placeholder information with the bar's information.
3. When the mouse leaves the bar, you restore the placeholder information in the information box.

Figure 11 displays a possible example:

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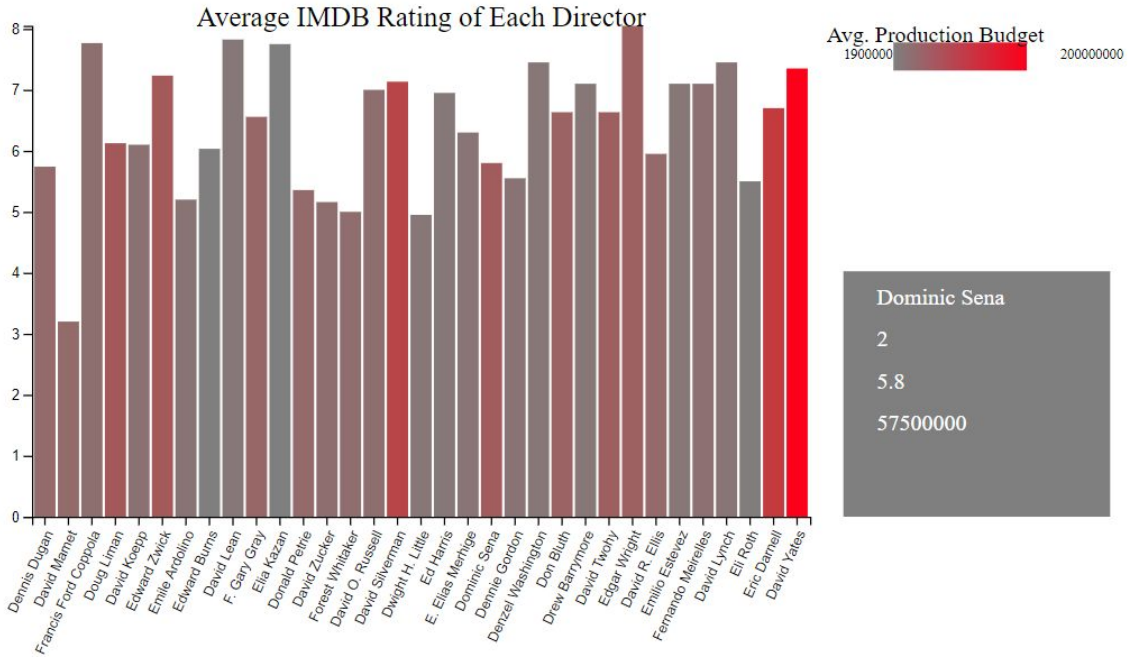

(Figure 11)

Section 4: Making a data filter for Major Genre

Filters are very useful when you want to focus on a particular part of the data. In this section, you are going to create a data filter for Major_Genre that dynamically changes your visualization. We mainly want you to practice select, update, exit and enter in this part.

This is probably the most challenging part of the whole lab. Give yourself plenty of time and make sure you truly understand the select, enter, exit, update pattern in the tutorials above. Also, this task might involve many steps, do one step at a time and test (using console.log, inspect and etc.) your results before moving on.

We want to

- Create another dropdown list (i.e. <select>) that contains all major genres in the data.
    - There should be an “All Genre” option you can use to restore the original view.

- Create a button that triggers the filtering process.
    - We only want to display directors who have done **at least one** movie in that Genre.
        - For example, the director `"Francis Ford Coppola"` has 6 movies in our dataset. Out of these 6 movies, there’s one Horror, one Thriller/suspense,

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two Drama and two movies without genre. Therefore, when users select “Horror”, Francis Ford Coppola should appear. In fact, if any Genre in the list [Horror, Thriller, Drama, N/A] is selected, we should see a bar for Coppola. However, if “Comedy” is selected, we will not see Coppola.

- Directors without any movie in the selected genre would be removed from the view.
- Since there are fewer or more bars remaining in the chart now, you need to adjust the x axis scale function so that
  - The width of the remaining bars are adjusted.
  - The x-axis labels are adjusted

Here are some steps that you can do to break this task down.

Question 4.1 How to create the dropdown and button

This is almost the same as previous section. You need to prepare a list of genres in the dataset, populate this list as options for the <select> element. Then, you will create a button that calls some function (e.g. filterGenre()).
Please don’t hard code the genre list. Instead, loop through or use d3.map to get a list (or set) of unique genres.

Question 4.2 How to create the filtered dataset.

In your filter function(e.g. filterGenre()), try to generate a filtered dataset according to your selection.

For example, if you have selected “Horror”, your dataset should be filtered to contain information for the following 5 directors: “Francis Ford Coppola”, “Dwight H. Little” ,”David Twohy”,”David R. Ellis”, and ”Eli Roth”. The .filter() method will be useful here:
https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Array/filter

If you are unsure about your results or you need more test cases, it might be good to go back to the data and confirm. For example, we have included the same data for you in .csv format, and you can use it to verify your filtering result.

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A	B	C	D	E	F	G	H
Title	Productio	Distributo	Major G	Director	Rotten To	IMDB Rati	IMDB Votes
The Final I	40000000	Warner Br	Horror	David R. Ellis	27	4.9	20319
Final Dest	26000000	New Line	Horror	David R. Ellis	47	6.4	35737
Pitch Blacl	23000000	USA Films	Horror	David Twohy	55	7	55217
Anaconda	25000000	Sony Pictu	Horror	Dwight H. Little		4.3	9565
Halloweer	5000000	Universal	Horror	Dwight H. Little	23	5.6	11079
Cabin Fev	1500000	Lionsgate	Horror	Eli Roth		5.4	28417
Hostel: Pa	7500000	Lionsgate	Horror	Eli Roth	45	5.4	31511
Hostel	4800000	Lionsgate	Horror	Eli Roth		5.7	64642
Dracula	40000000	Sony Pictu	Horror	Francis Ford Coppola		6.4	136

(Figure 12)

Make sure you get the correct filtering results first **before** coding anything related to the actual binding, enter, exit part.

Also, when you are “filtering” data out, it’s probably **not** a good idea to filter on the original copy of your data because you might need to access information that was filtered previously. E.g. when someone select “All Genre”, you would need to have a data with all directors. One approach is to keep a variable that holds the full dataset (maybe “fullData”) and then call the filter method on that data and store the result in a different variable (maybe “data”).

Question 4.3 How to update the xScale and x-axis?

Now, you already have an updated dataset. Go ahead and adjust your xScale. You can also adjust your x-axis here (i.e., select where you stored your axis and call the d3.axisBottom(xScale) again) .

If you followed the approach we suggested for the sorting function, you should not have to do anything for this step except call your drawBarsAndXAxis() function again.

Question 4.4 How to change bars using enter, append, exit, remove?

You should have already split your drawBarsAndXAxis function into ENTER, EXIT, and UPDATE sections. For this step, you should:

1. Make sure that your EXIT section is correct to remove old bars.
2. Make sure your UPDATE section is correct (you may need to update more attributes of your bars here than for the sorting question).

One common problem is to make the chain too long. Remember when you are chaining, it’s only keeping the returned value of the last line. Breaking these four steps

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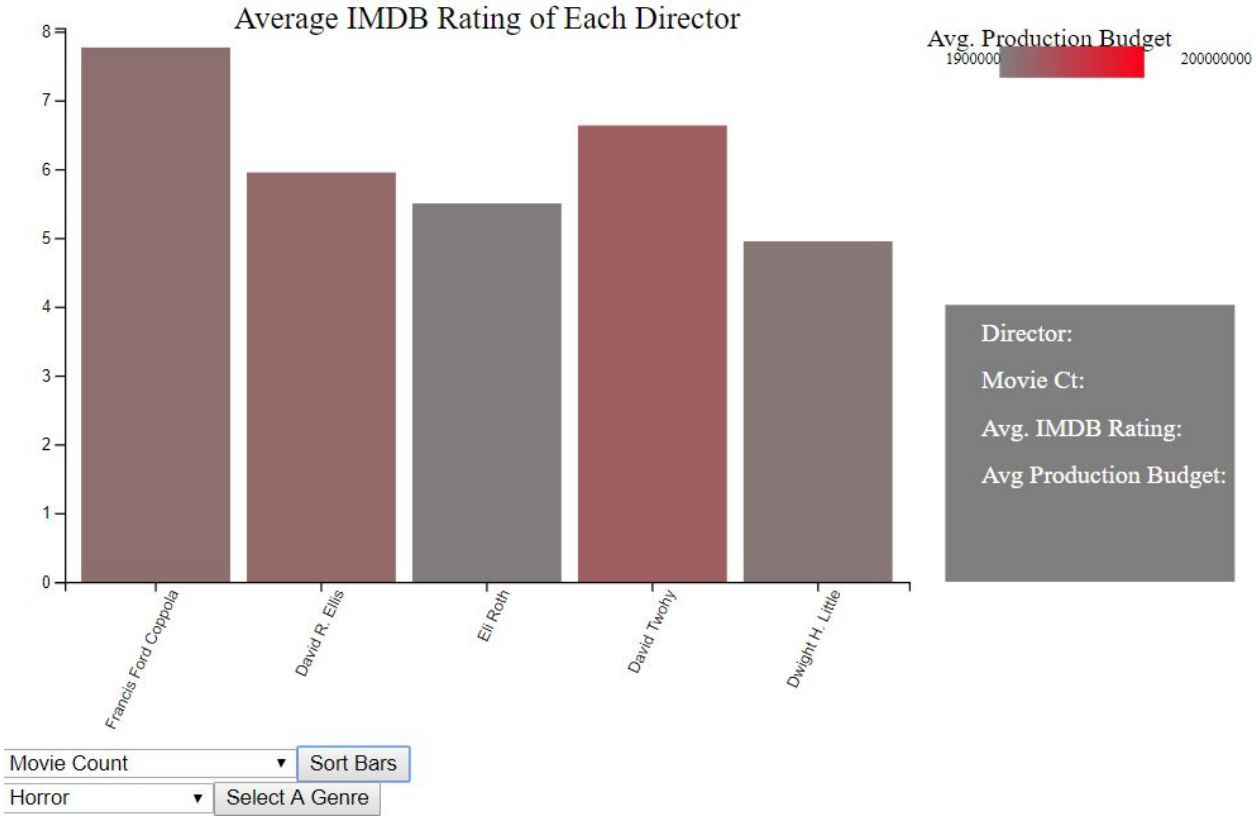
(JOIN/EXIT/UPDATE/ENTER) into separate chains will help you understand the process, and also give you lots of space to console.log and inspect (in case anything goes wrong). See the example again: https://bl.ocks.org/mbostock/3808234

If all things are working, you should see something similar to Figure 12 and 13.



(Figure 12)

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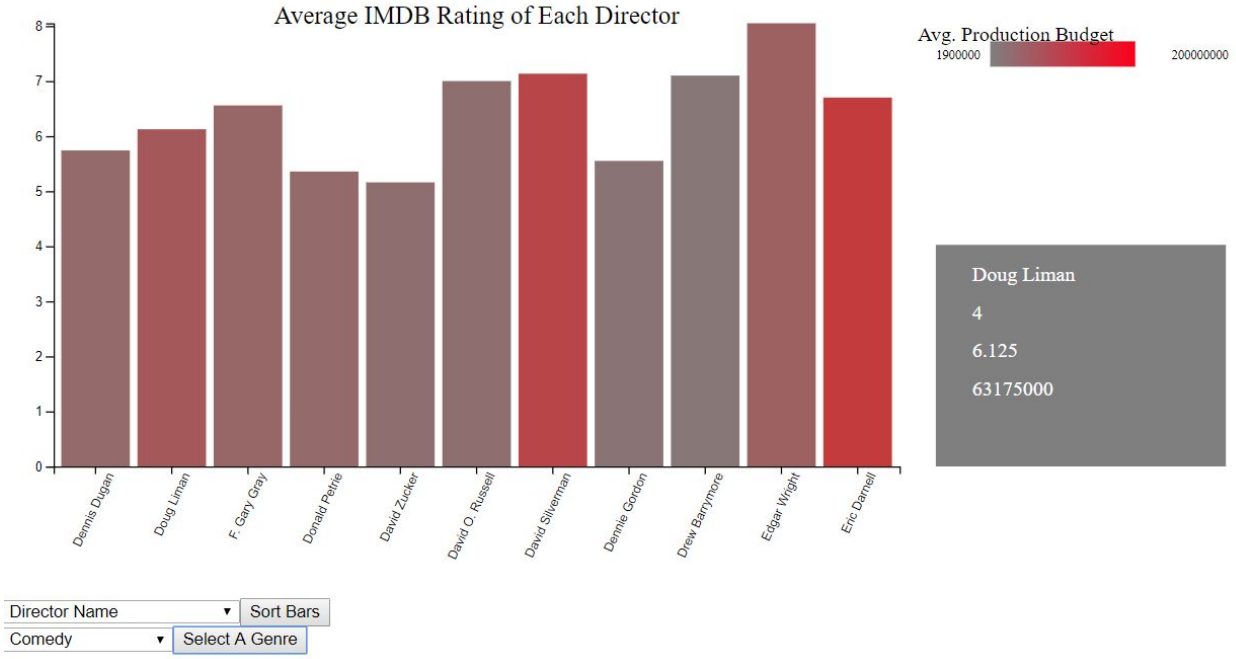


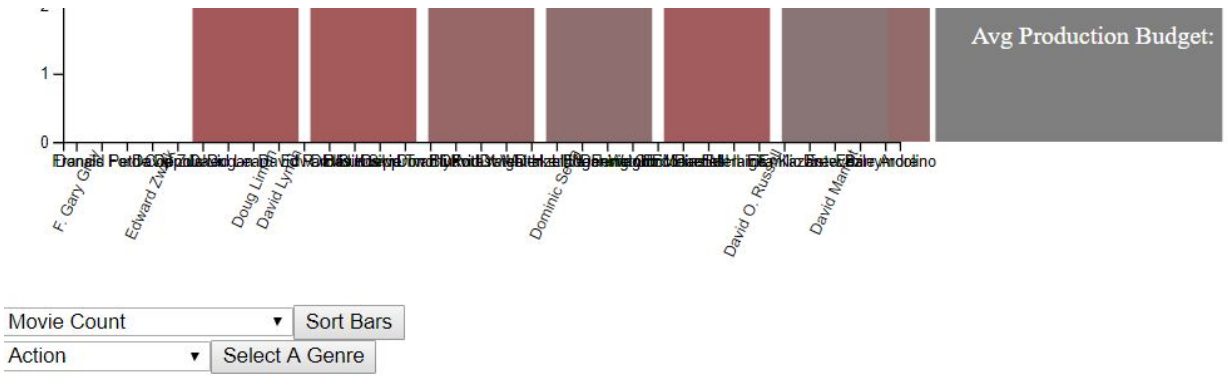
(Figure 13)

If you get to this point, you will receive full mark for this lab.

Question 4.5**(BONUS OPTIONAL)** How to fix the sorting after filter?

It's great now we can focus on some directors. However, it's possible that your sorting button is broken because of the filter action. Figure 14 demonstrates what may happen if you filter directors first, then try to sort by movie Count.

You will receive bonus point if you can fix your sorting function so that it would work on a filtered bar chart (Figure 15).



(Figure 14)

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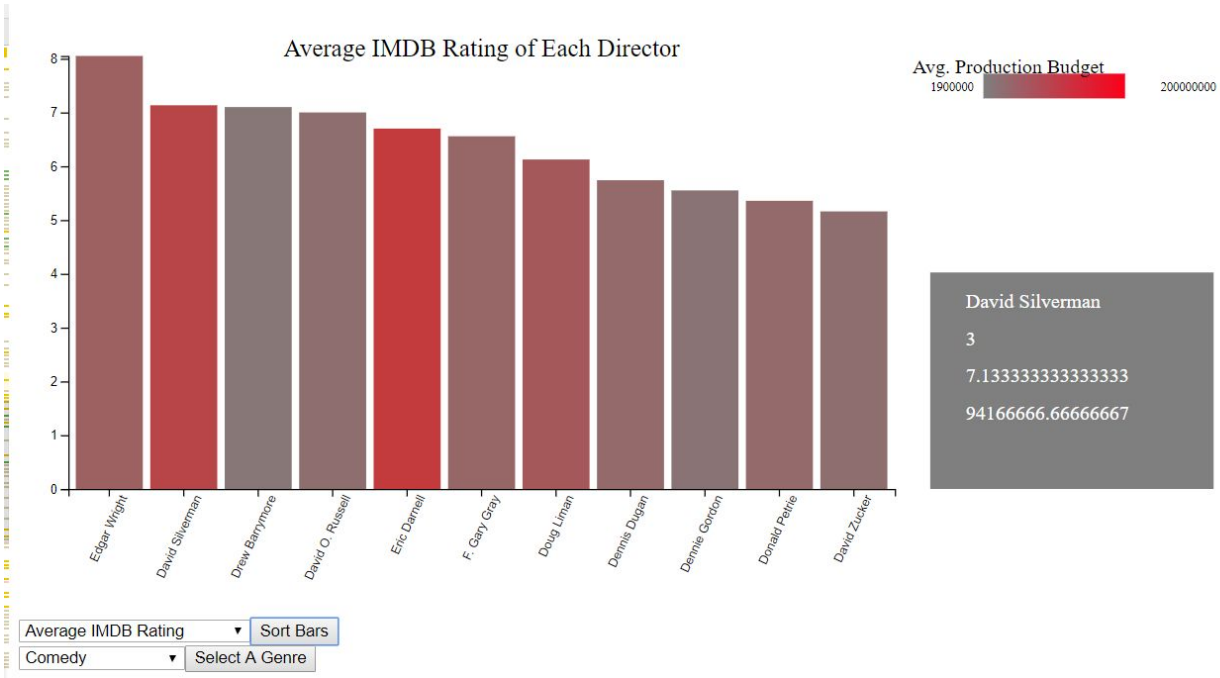

(Figure 15)