Source code : https://goo.gl/DUVbF5

SI649W18 Lab-3-Vega-lite

- Please refer to the programming lab guideline for uploading, late policy and other general rules.
- Please upload lab3_vegalite.html to canvas by next Monday midnight.
- Even if you worked in groups, please upload individually.
- “Steps” mark things that you might need to go through in order to answer questions. No submission or coding required. “Questions” mark the places where you need to submit code/answers.
- The Vega-Lite documentation utilized multiple datasets that are available in here: https://github.com/vega/vega-datasets

Throughout the entire lab, you will read and search in the vega-lite documentation multiple times. If you are not sure about a particular parameter /function, please go to https://vega.github.io/vega-lite/docs/ for reference.

Section 1: Loading data

For today’s lab, we are going to load external data, which requires a testing server. There various ways and tools you can use to start a testing server. In this tutorial, we are going to include steps for setting up server with python

(**optional additional reading:**
https://developer.mozilla.org/en-US/docs/Learn/Common_questions/set_up_a_local_testing_server)

Step 1.1: Start a terminal

If you are on Mac, you can start a terminal.
If you are on Windows, start your anaconda prompt (Figure 1).

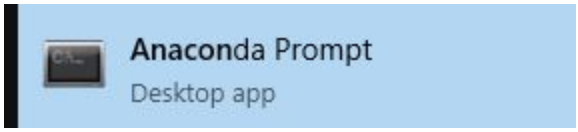


Figure 1

Source code : https://goo.gl/DUVbF5

Step 1.2: Change to the lab directory

Move into the directory where you store your lab using the 'cd' (change directory) command.

(**optional additional reading:** If this is your first time using command line or you need more information about command prompt, this short tutorial might be useful: https://www.digitalcitizen.life/command-prompt-how-use-basic-commands)

If I stored my lab files under *"C:\licia\si649\18Wlabs\vegalite*", this command will take me to the this directory (Figure 2):

```
cd C:\licia\si649\18Wlabs\vegalite
```

Figure 2

Step 1.3: Start python server

If you don't know your python version, in your prompt/terminal, type:

```
python -V
```

This will tell you what version of python (version 2 or version 3) you are using.

If you are using python 3, in your prompt/terminal, type

```
python -m http.server
```

If you are on python 2, type:

```
python -m SimpleHTTPServer
```

If the server is started successfully, you should see a log like this (Figure 3):

```
(C:\Program Files\Anaconda3) C:\licia\si649\18Wlabs\vegalite>python -m http.server
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
```

Figure 3

Step 1.4 Open browser

After starting the server, you can go to your browser and open ***localhost:8000***. You will see a list of files under the lab directory that you started the webserver in. (Figure 4):

Source code : https://goo.gl/DUVbF5

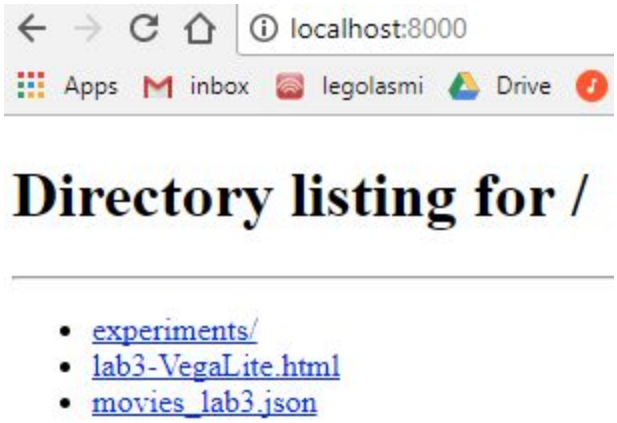
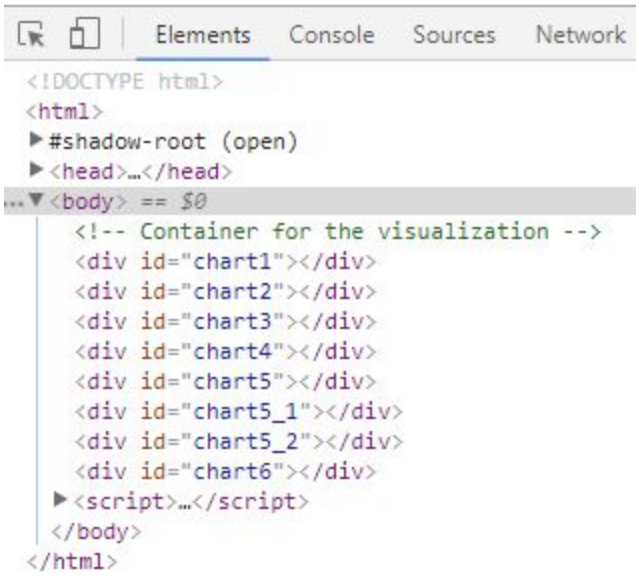


Figure 4

Click on *lab3-VegaLite.html* to display it in your browser, and open the debug console. The page should look blank, and contain a number of empty elements, like this:



Section 2: Plot Worldwide_Gross and Major_Genre

In this section, we will create 3 basic vega-lite charts with a smaller version of the movie dataset. It is important that you go through these two basic tutorials and understand steps within them:

- https://vega.github.io/vega-lite/tutorials/getting_started.html
- https://vega.github.io/vega-lite/tutorials/explore.html

Source code : https://goo.gl/DUVbF5

Step 2.0: Basic setup

In your starter code, we have initiated some code for you:

- We set up a block of elements as containers for your visualizations (Figure 5)

```
<!-- Container for the visualization -->
<div id="chart1"></div>
<div id="chart2"></div>
<div id="chart3"></div>
<div id="chart4"></div>
<div id="chart5"></div>
<div id="chart5_1"></div>
<div id="chart5_2"></div>
<div id="chart6"></div>
```

Figure 5

- We initiated a variable called “opt” (Figure 6). This variable stores options for the vega-embed and instruct the vega-embed library to render our visualizations in SVG format.

```
//initiate renderer, use it for all vega-embed.
var opt = {"renderer": "svg", mode: "vega-lite"};
```

Figure 6

- In each question that follows, when you finish writing the visualization for that question and are ready to embed it into your html, you can use the command `vegaEmbed` and pass in your desired container ID, your vegalite variable, and the opt variable we provided. E.g. Figure 7:

```
vegaEmbed("#divId", myVisSpec, opt);
```

Figure 7

For a complete example of vegaEmbed, see the *Publish Your Visualization Online* section at the end of this page.

Question 2.1 Chart 1: Worldwide Gross by Major Genre

Visualize the Worldwide Gross of each Major Genre, without any aggregation:

- Encode worldwide gross in y axis
- Encode Major genre in x axis

Source code : https://goo.gl/DUVbF5

- Set the width of the chart using the width variable provided
- You can decide the type of mark you want to use.
    - You can read more about different types of marks here: https://vega.github.io/vega-lite/docs/mark.html
    - Note that not every type of mark would work here. E.g. encoding with “bar” would not be a good idea. Think about why that might be the case.

Your visualization might look similar to Figure 8. Depending on the mark that you selected, you might have different looks.

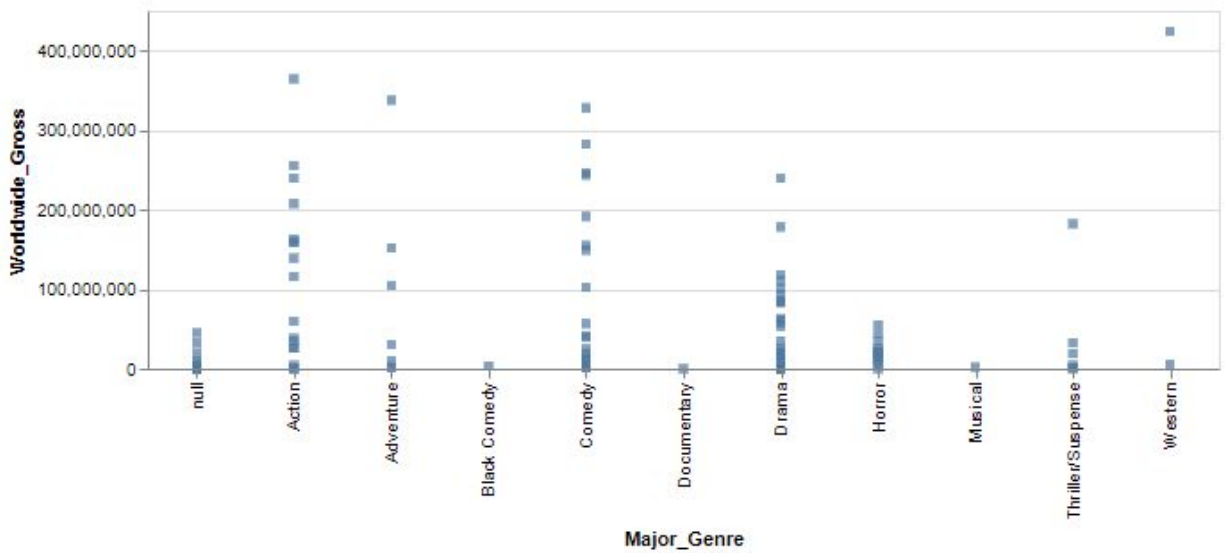


Figure 8

Question 2.2 Chart 2: **Mean of** Worldwide Gross by Major Genre

Visualize the **mean of** worldwide gross of each major genre, i.e.:

- Encode mean worldwide gross in y axis (use aggregate)
    - If you need help with calculating the mean of worldwide gross, take a look here: https://vega.github.io/vega-lite/docs/aggregate.html
- Encode Major genre in x axis
- Again, for all the visualizations you are making in this lab, you can play with different types of marks as long as the choice of mark is not misleading.

Figure 9 displays an example of chart 2.

Source code : https://goo.gl/DUVbF5

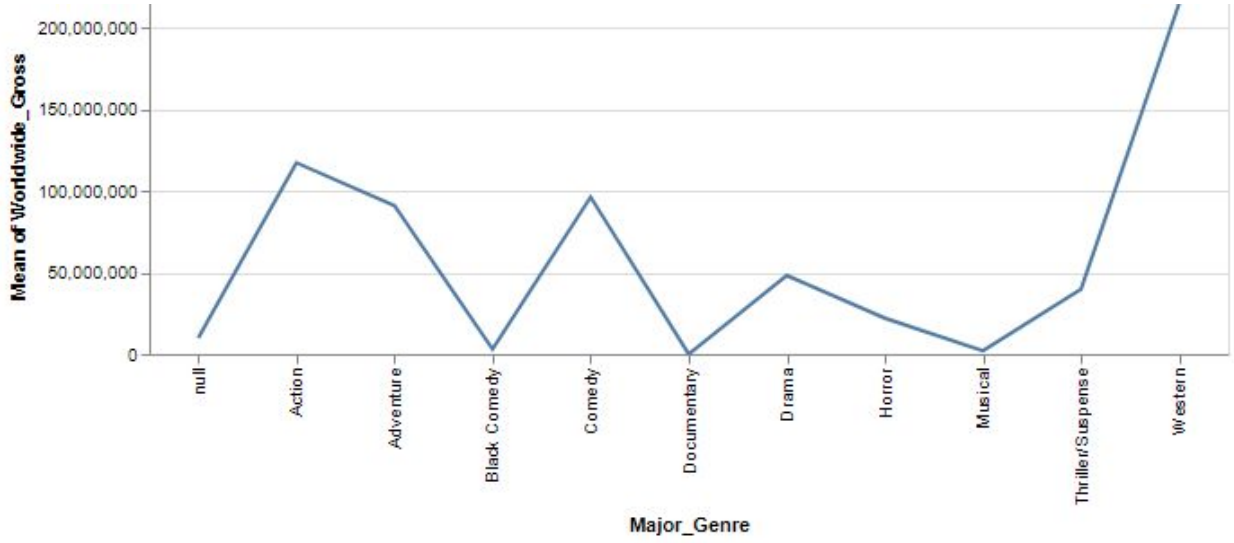


Figure 9

Question 2.3 Chart 3: Combine chart 1 and chart 2 using layer.

In real practice, instead of having two charts that share the same x and y axis, we might want to combine them by overlaying the two charts together.

This documentation on layering may help: https://vega.github.io/vega-lite/docs/layer.html

Create chart 3, which combines the previous two charts. Depending on the marks you selected, your chart 3 might look like Figure 10.

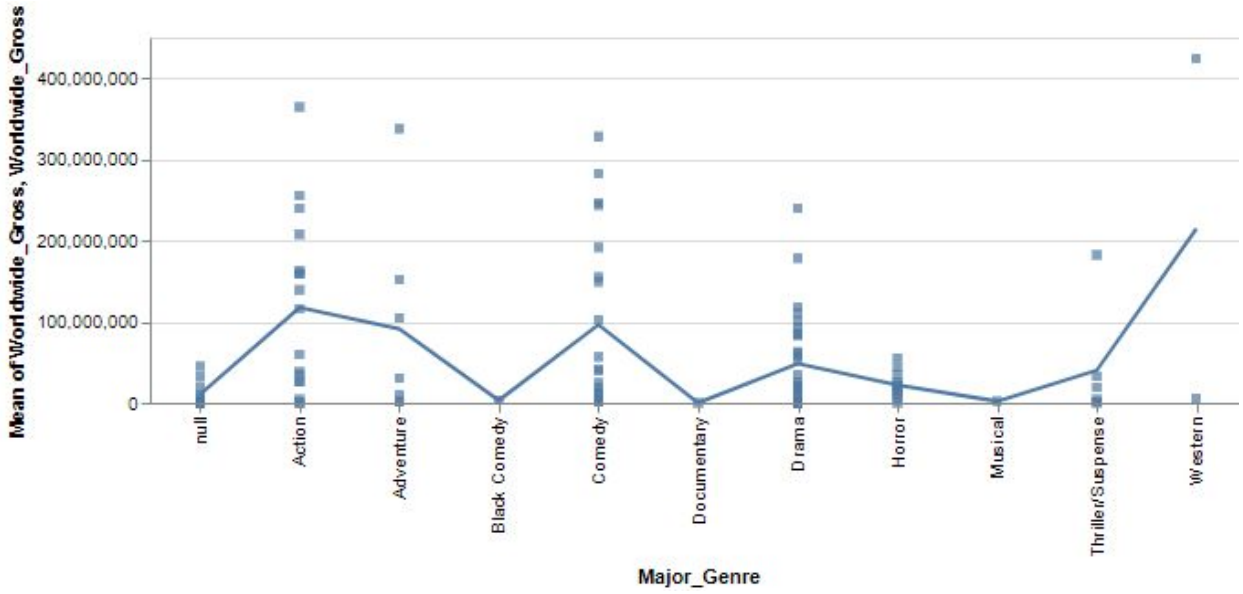


Figure 10

Source code : https://goo.gl/DUVbF5

Question 2.4 Add color in Chart 3

We want to color code the Major_Genre information. This is done through the “color” parameter. You have already seen an example of this in the https://vega.github.io/vega-lite/tutorials/explore.html tutorial.

If you want additional examples and information on how to customize color scales, read this documentation (not necessary to complete this step): https://vega.github.io/vega-lite/docs/scale.html#scheme

When you are done, you will see something similar to Figure 11:

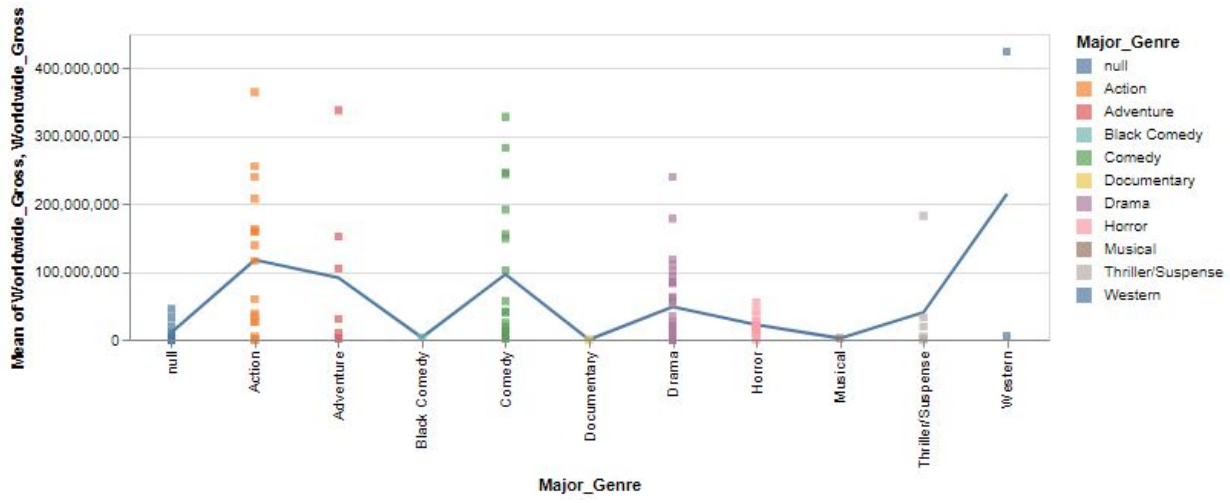


Figure 11

Question 2.5: Add Movie title tooltip to Chart 3

Add a tooltip to Chart 3 containing the movie title, so that when the mouse hovers over a movie, its title is displayed.

There are two ways to add tooltips to vega-lite chart.

1. Use the default “tooltip” channel. This works like any other channel, is easy and quick, yet it is hard to customize these tooltips.
2. Use the vega-tooltip library. This is not required for this lab, but if you want fancy/customizable tooltips, feel free to use this.

Read the tooltip documentation here:

Source code : https://goo.gl/DUVbF5

https://vega.github.io/vega-lite/docs/tooltip.html

Add the Title of the movie as a tooltip to chart 3
.i.e.. When you hover over a mark corresponding to a movie (e.g. a point), you should see a tooltip displaying that movie's title.

Section 3: Transformation

Question 3.1: Chart 4: Revenue by Genre

Create Chart 4 to visualize each movie's **revenue** (the difference between worldwide gross and production budget), genre, and average revenue in each genre.

In this question, you will create a chart similar to your worldwide gross chart, but showing revenue instead of worldwide gross. To do this, create a vega-lite chart with the following specs:

- Has two layers
    - The first layer visualizes each movie's revenue against genre
        - To calculate the revenue field, you need to create a calculation transformation (read https://vega.github.io/vega-lite/docs/calculate.html)
    - The second layer visualizes the average revenue against genre
- Genre is color-coded
- Has tooltip to display movie title

You may want to start by copying your spec for Chart 3 and modifying it. Example output:

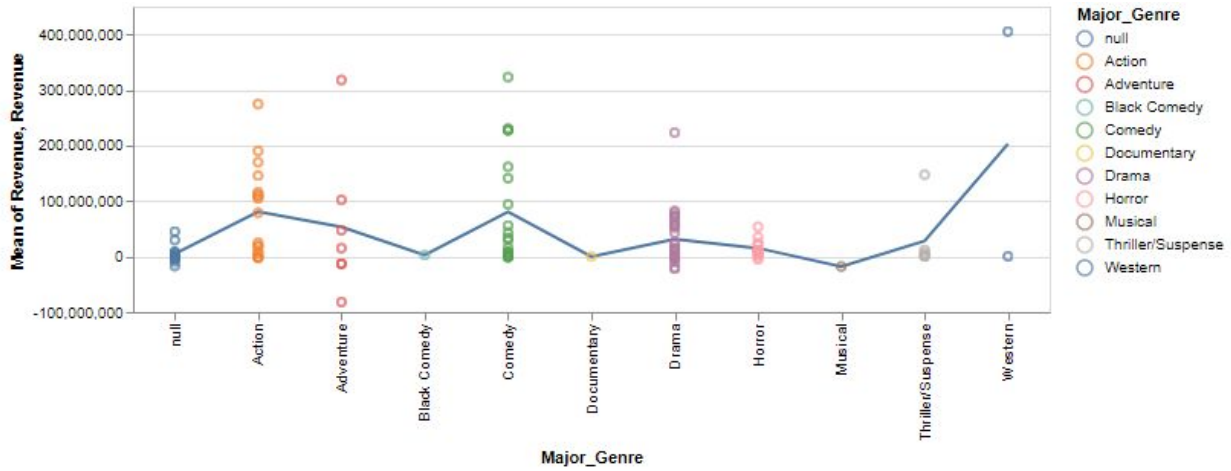


Figure 12

Source code : https://goo.gl/DUVbF5

Section 4: Dates, chart concatenation, selections

Question 4.1: Chart 5_1 and Chart 5_2

In this question, we are going to **plot revenue against release date**. Vega-lite, just like tableau, provides you handy functions to parse and visualize temporal information (e.g. breaking down years to months).

Read about the time unit here: https://vega.github.io/vega-lite/docs/timeunit.html

Create two visualizations of average revenue by release date

- **Chart 5_1**: by month (Figure 13)

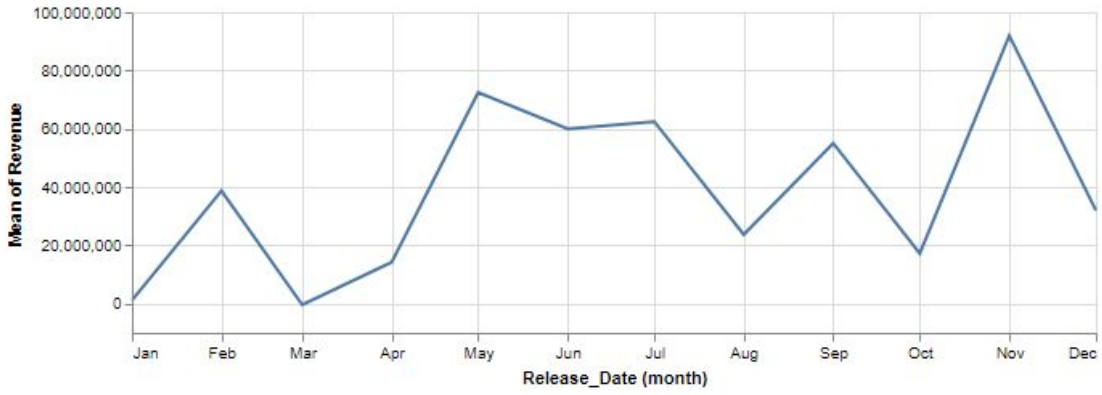


Figure 13

- **Chart 5_2:** by day (Figure 14)

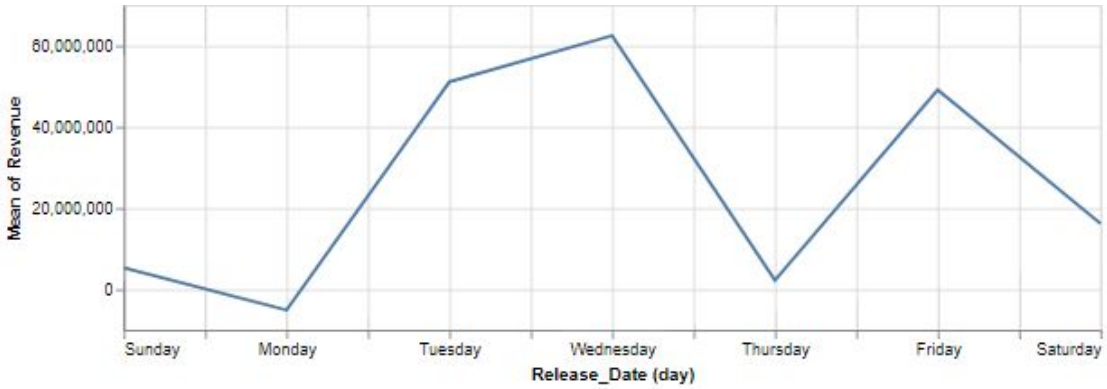


Figure 14

Source code : https://goo.gl/DUVbF5

Question 4.2: Concat Chart 5_1 and Chart 5_2 to be one object.

In the next step, we are going to link chart 5_1 and chart 5_2 together using interactions (similar to Tableau's "Actions"). To do that, **we need to first merge (concatenate) these two charts into one vega-lite chart.**

We can do so by using the `vconcat` ("vertical concatenation") operation, which is specified here: https://vega.github.io/vega-lite/docs/concat.html#vertical-concatenation

Concat Chart 5_1 and Chart 5_2 into one chart using vconcat. You will not see much change in your web except that both charts are rendered in one (Figure 15).
You can delete chart 5_1 and chart 5_2.

Figure 15

Source code : https://goo.gl/DUVbF5

Question 4.3 Create a filter selection on chart 5.

We want to link the top part of the chart 5 with the bottom part using a “selection”. Selection is a way to create interactions (just like the ‘action’ in Tableau). Read (and try out!) different selection methods in: https://vega.github.io/vega-lite/docs/selection.html

In this question, **create a filter selection in chart 5. When you are brushing through the top chart (month), the bottom chart (day) should adjust its view. (Figure 16)**

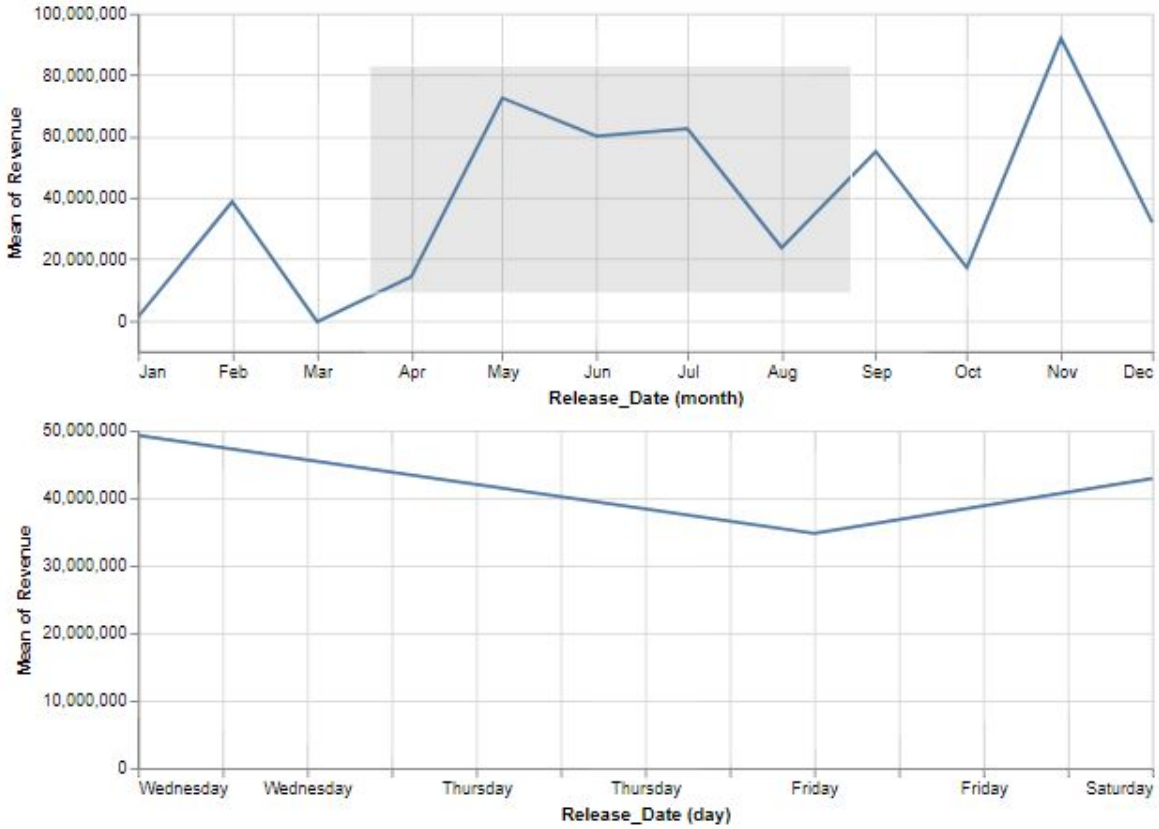


Figure 16

Hint: Check out the “Filteing Data” section:
https://vega.github.io/vega-lite/docs/selection.html#filtering-data

Source code : https://goo.gl/DUVbF5

Once you have your selection working, modify it so that it only acts along the x axis (i.e. so that it restricts the months but not the revenue):

Figure 17

(BONUS) Section 5 Open-ended Visualization

Question 5.1: Chart 6: Insight visualization

Create one insight visualization (chart 6) for this dataset. An insight visualization is a visualization where you (and your audience) can immediately spot a particular insight. For example, you can modify Chart_5_1 to show that “March is probably not a good time to release your movie.”

- You can use any fields and chart type you want to
- It should be well constructed and labeled that readers can immediately get the insight
- For additional format and annotation tutorials, see https://vega.github.io/vega-lite/docs/encoding.html