Requirements: For each homework assignment you must create and submit a homework lab notebook. The notebook must include your name, the course (CPSC 324), and the assignment number (HW-3). Your notebook must be organized by step (see below), with each step number clearly marked (e.g., Step 1, Step 2, and so on). You may create your lab notebook in any editor/tool you like (e.g., google docs, microsoft word, latex, etc.), however, you must submit your notebook as a single PDF file named hw3-lab-notebook.pdf. Specific information to add to your notebook will be asked for in each step of the instructions. Additional details are provided below. Your notebook and any additional work (e.g., program files) must be submitted on or before the due date using the homework GitHub classroom repository provided via Piazza.

Instructions: Do the following steps and add the information requested to your lab notebook. Your lab notebook should be organized and well formatted. Note: You can (and should) look through the Google Cloud Skills Labs (part of some steps below) prior to starting them, which can help you get a sense for what the tasks are and each lab’s scope. You can also go back over the lab as well after you complete them and/or do them multiple times as needed (but watch out for those that require credits).

STEP 0: For this assignment you can either create a new project, e.g., named user-name-cpsc324-hw3 (replacing username with your username), or reuse your HW-1 or HW-2 projects. To create a new project, look back at HW-1 for the steps you used.

STEP 1: Log in to Google Cloud Skills Boost and complete the Looker Studio: Qwik Start Lab. This is a free lab that shows you how to create a new report in Looker Studio, connect to a BigQuery public dataset, and create a simple chart and title. As you go through the lab, note and do the following.

(a). The report will initially open with a table component. You can delete this.

(b). Take a screen shot of the finished report and add it with any additional notes you think are relevant to your lab notebook for this step.

STEP 2: Within Google Cloud Skills Boost, complete the Explore and Create Reports with Looker Studio Lab. This is a free lab that is similar to the one in Step 1, but has you add and modify a Table visualization. As you go through the lab, do the following.

(a). You can resize columns by selecting a data row. Note you can also click the three dots on the top-right of the table and resize columns automatically (e.g., by selecting fit to data).
(b). Take a screen shot of the finished report and add it with any additional notes you think are relevant to your lab notebook for this step.

**STEP 3:** Within Google Cloud Skills Boost, complete the Visualizing Billing Data with Looker Studio Lab. This is a free lab that walks you through how to create Looker Studio Explores using BigQuery custom queries. As you go through the lab, do the following.

(a). Write down the general steps you followed to create the custom Explore visualizations (note you do this twice in the lab, but you only need to write down the steps once).

(b). Take a screen shot of the second pie chart you created in Looker Studio and add it to your notebook for this step.

(c). Note that the idea of Explores in Looker Studio are that they provide a mechanism to explore data through a single visualization. It is also possible to add an Explore to a Report as described here: About the Looker Studio Explorer

**STEP 4:** Within Google Cloud Skills Boost, complete the How to Build a BI Dashboard Using Google Looker Studio and BigQuery Lab. This lab costs 5 credits. The lab is similar to the previous ones in that it walks through creating a Looker Studio report using BigQuery data. It also demonstrates how to build an initial table from a view query as well as how to schedule a query to update data in the table. It also has you create a somewhat more involved report in terms of the different visualizations. As you go through the lab, do the following.

(a). Write down the steps you used to create the table and make it dynamic (with hourly updates) in your notebook.

(b). Create a report that is similar to the one shown at the end of the Lab. Your report should use a different color scheme and be formatted slightly differently (your choosing).

(c). Include a screenshot of your finalized report and place it in your notebook.

(d). Write down any issues you had in creating the report and what you found to be useful in terms of the report editor.

**Step 5:** Follow the Visualize BigQuery Geography polygons with Looker Studio tutorial. As you go through the tutorial, do the following.

(a). Once you create the visualization, play around with different color schemes and add a tooltip to the map.
(b). Include a screen shot of your map and place it in your notebook.

**Step 6:** Go through the Looker Studio “How-To” resources **How to use Looker Studio.** In particular, browse (skim) the How-To guide sections, but more carefully read items you don’t already know from the above steps or that seem interesting and/or new to you. As you go through the How-Tos, do the following.

- Write down the How-Tos that you focused on (i.e., that you read more carefully). Again, you can skim through the ones that don’t provide new information to you.
- Write down for each How-To that you focused on and the specifics of what you learned. Write these notes to help you for when you need to go back to them later to apply what you’ve learned.

**Step 7:** Looker Studio has a number of prebuilt templates and examples that can be used to build reports from. For this step, look through the various examples and templates available in Looker Studio. Do the following.

- Go to the **Looker Studio Report Gallery.** Browse through the featured reports, the marketing templates, and the community sections. Note that you don’t need to look at every single report. Instead, focus on 8–10 or so of the ones that look interesting to you. The goal is to get a sense of what is available and what makes for a professional looking and/or useful report.

- Within Looker Studio, click on “Templates” on the left-hand pane. In a similar way as (a), browse through 3–4 or so of the templates that look interesting to you.

- As you browse in (a) and (b), take notes on any of the reports that look impressive and/or especially useful. In particular, jot down the reports you looked at, and what stood out to you generally across the ones you looked at.

- Once you have finished the above, write down what you found to be general design principles that you think make for a professional quality report. Your principles should be reminders for you as you create your own reports.

**STEP 8:** Use the Jobs in Data Science table (**jobs_in_data.csv**) provided with HW-2 to create a professional-looking report. Note that you will need to load the table using the same approach as in HW-2, i.e., into cloud storage, then BigQuery, from which you can then use as the data source for the report.
(a). Your report only needs to consist of a single page, but must contain multiple charts including multiple types of charts, must contain at least one data table visualization, must contain text labels, must have user-friendly names throughout, must contain multiple controls, and must be professionally looking. In addition, your table visualization must have drill-down actions (for details see Drill into your data and Add drill actions to charts).

(b). Your report must be designed to answer a set of high-level analytical questions regarding the dataset (i.e., trends in the data, information that could be useful for decision making, relationships between features in the dataset, and so on). Write down the analytical questions your report addresses in your lab notebook and which visualizations help address each question. You will likely need to do some basic exploratory work (e.g., using SQL queries) before you formalize the questions that you want to address in your report. Implement your report only after you have done this step.

(c). Provide a screen shot and a link to your report in your lab notebook. To create a link, select “Share”, select “Restricted”, and then copy and paste the link into your lab notebook.

(d). Evaluate your report using the criteria you outlined in Step 7. As part of your evaluation, note what you would improve or how you would extend it given more time.

**Step 9:** Create a useful report in Looker Studio for the Amazon Video Game reviews dataset from HW-2 (Video_Games_10000). Note you will need to load the table in the same way as you did for Step 8.

(a). Similar to Step 8, your report must have multiple visualizations, must have text labels, must have at least one control, and must have useful names.

(b). Write down in your lab notebook what the goal of each visualization is in the report.

(c). Provide a screen shot and a link to your report in your lab notebook. To create a link, select “Share”, select “Restricted”, and then copy and paste the link into your lab notebook.

**Step 10:** Create a “fun” report in Looker Studio for the UFO Sightings dataset from HW-2 (ufo_sightings). Again, you will need to load this table into Cloud Storage, then from Cloud Storage to BigQuery.

(a). Similar to above, your report must have multiple visualizations, must use text labels, and must use useful names. You must also use at least one control component and/or have a table with drill-down options.

(b). One of the visualizations for this step must be to use a Google “Bubble Map” component—see Google Maps reference for details. For this, you will need to add a calculated field
that is defined using a `CONCAT()` function to create a latitude-longitude field call `lat_lon` based on the `latitude` and `longitude` fields of the table. The combined `lat_lon` field should have the latitude, followed by a comma (i.e., a string ","), followed by a longitude. You can then use this field for locations in the map. For details on creating a calculated field see **Using table calculations**.

(c). You must format the report, using color and formatting options. The goal is to let your creative side out and create a report that looks really good (or just fun or entertaining) to you.

(d). Write down in your lab notebook what the goal of each visualization is in the report.

(e). Provide a screen shot and a link to your report in your lab notebook. To create a link, select “Share”, select “Restricted”, and then copy and paste the link into your lab notebook.