

TABLEAU

BEGINNER

BOOTCAMP

A DATA DOZEN WORKSHOP

BUILT FOR THE OLIN BUSINESS SCHOOL AT WASHU

DATA DOZEN

a visual analytics studio

LET'S GET STARTED

This engaging, hands-on workshop will demystify Tableau Software, introduce key data visualization fundamentals, and jumpstart your ability to create interactive dashboards with your data. With an emphasis on Tableau's key functionalities and practical applications, we'll progress from basic charts to dynamic dashboards that incorporate interactive filters and design theory. We'll use a data set about the 2019 Fortune 500 companies and Tableau Public (which is completely free!) to explore the very best of what this data visualization tool has to offer.

WELCOME

- ▶ [Companion Website](#)
We move quickly during the workshop. There's a lot to cover in just a few hours. If you miss a step or link, don't worry. Everything we cover today is available on the workshop's companion website. This resources include:
 - ▷ Data set
 - ▷ Complete Tableau Workbook
 - ▷ This step-by-step guide
- ▶ Laptop Check: Be sure to [download Tableau Public](#) and download the data set.
- ▶ Our agenda has four major sections, all of which will last about 30-45 minutes:
 - ▷ Building Blocks
 - ▷ Data + Tableau
 - ▷ Dashboard 1
 - ▷ Dashboard 2
- ▶ We have three primary goals today:
 - ▷ Play, alot. This is like art class. It's all about progress, not perfection.
 - ▷ Set you up to keep learning. You won't be a jedi master at the end of the class, but you'll be on your way.
 - ▷ Breakdown the qualitative v. quantitative division. Lean into the direction that's new to you.
- ▶ Why Tableau:
 - ▷ Doesn't require coding
 - ▷ Exploratory and explanatory
 - ▷ Dynamic Output
 - ▷ Free Version

DATA + TABLEAU

WHAT MAKES A VISUALIZATION

When we distill visualizations down to their basic form, we get two things: some type of mark and some way to tell multiple marks apart.

- ▶ There are three basic types of marks we use to represent our data:
 - ▷ Points: scatter plots, box plots, dot maps
 - ▷ Lines: bar chart, histograms, line chart, gantt chart
 - ▷ Area: treemap, area chart, filled maps,
- ▶ Then we tell these marks apart by leveraging:
 - ▷ Position: up, down, left, right
 - ▷ Size: length, width, angle
 - ▷ Color: categorical, saturation
 - ▷ Shape: icons, polygons

CONNECT TO DATA

Before we can build any visualizations, we need to connect our data to Tableau. (Well actually before that, we need to gather and structure our data, which is easily 95% of the work, but we'll set that aside for today and enjoy the last 5%.) We will open a new Tableau Public workbook, connect it to the data set we've downloaded, and then go to our first Tableau worksheet.

- ▶ Connect to Data
 - ▷ Launch Tableau Public.
 - ▷ Under Connect and To a File, click Excel Workbook.
 - ▷ Find the Fortune 500 - 2019 data set you've downloaded and click Open.
 - ▷ The data will load in the preview area, starting with the column Rank and ending with the column Ticker.
- ▶ Click the orange tab labeled Sheet 1 to go to Tableau's building environment.

TABLEAU WORKSHEET ENVIRONMENT

Welcome to Tableau's worksheet environment! This is where we build all our visualizations. On the left side of the screen, you'll see all of your variables are now data pills sitting in the data pane. There are three things to note about these data pills and three places we'll talk about dragging and dropping them in order to create visualizations. (If the Show Me menu is showing on the right hand side, just click the words to collapse the menu. That will make everything easier to see.)

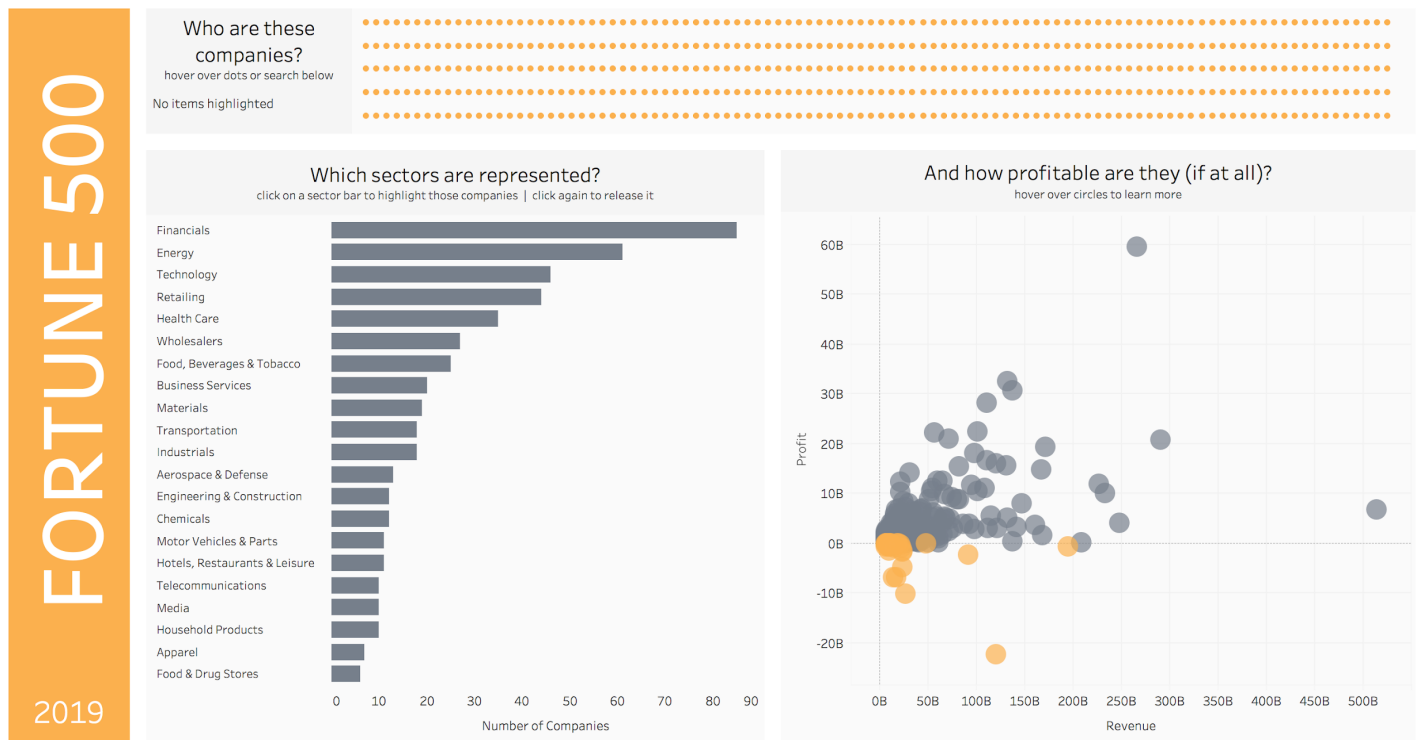
- ▶ Data Pane

- ▷ Dimensions vs. Measures: Tableau has split up your variables into dimensions, which are descriptive pieces of data, and measures, which are the numbers that you would do math on.
 - ▷ Discrete vs. Continuous: You'll notice some of the data pills are blue, indicating they're discrete pieces of data, think categorical boxes, as opposed to the green pills, which represent continuous data, or data that exists on some sort of pre-existing spectrum, like numbers do.
 - ▷ Data Types: Tableau has made it's best guess about each variable's correct data type: number (decimal), number (whole), date and time, date, string, or geographic data.
- ▶ Where to Drag-and-Drop
 - ▷ Columns and Rows: Placing data pills here function as your typical x and y axes.
 - ▷ Filters Card: Placing data pills here allow you to filter your visualization by different variables.
 - ▷ Marks Card: This is Tableau's secret sauce. By adding variables to color, size, text, detail, and tooltips, Tableau enables you to layer additional information on top of your standard x and y axes.
- ▶ Data Pane Clean Up
 - ▷ Data Type
 - Drag Rank, Founder Is CEO, and Woman CEO from Measures to Dimensions in the data pane.

WARM UP: DATA VALIDATION WITH BAR CHARTS

First things first. We want to be sure that all of our data has been pulled into Tableau correctly. Let's start by verifying some large scale aggregates from the Fortune 500 summary directly.

- ▶ Number of Records = 500 (one row per company)
 - ▷ Drag Number of Records to Text
- ▶ Revenues and Profit Bar Chart
 - ▷ Number Check: Revenues = 13.7 trillion; Profits = 1.1 trillion
 - ▷ Drag Revenues to Columns
 - ▷ Drag Company to Rows
 - ▷ Sort by Revenues
 - ▷ Drag Profits to Columns
- ▶ Market Value Bar Chart
 - ▷ Create a new worksheet to check Market Value = 22.6 trillion
 - ▷ Add Market Value to Columns
 - ▷ Drag Company to Rows
 - ▷ Why 28 Nulls? (These are privately held companies).
 - ▷ Click the Null indicator and filter out those data points.
- ▶ Add Filter
 - ▷ Add Founder is CEO to the filters card (only 13 companies 2.6%)
 - ▷ Add CEO to Tooltip



DASHBOARD 1

BAR CHART

Bar charts are the workhorse of the data visualization world for a reason. Our eyes have a very easy time comparing length, which makes them an especially effective chart.

- ▶ Build Bar Chart
 - ▷ Create a new worksheet
 - ▷ Sector to Rows
 - ▷ Revenues to Columns
 - ▷ Sort by Revenue
- ▶ Add Hierarchy
 - ▷ In the data pane, drag Industry over Sector until a blue rectangle appears, then release.
 - ▷ A Create Hierarchy box will pop up. Click OK.
 - ▷ Add Company to the hierarchy by dragging Company below Industry in the data pane. A black line will pop up to guide you.
 - ▷ Test out your hierarchy by expanding the new plus sign that's been added to Sector on the rows shelf.
- ▶ Name your sheet "Bar Chart"

SCATTER PLOT

When we want to compare two continuous measures at a fine granularity, it's time for a scatter plot. This will be a great way to compare companies by not just their revenue, but their profit as well.

- ▶ Build Scatter Plot
 - ▷ Create a new worksheet
 - ▷ Revenues to Columns
 - ▷ Profits to Rows (ask yourself what this single dot represents)
 - ▷ Company to Detail
- ▶ Profitable? Calculation
 - ▷ Right click in the data pane and create a new calculated field
 - ▷ Title your new field CALC: Profitable?
 - ▷ Type `[Profit] > 0` in the editor (Remember that just because a calculation is “valid”, doesn’t mean that it’s accurate. Always test your calculations first.)
 - ▷ Drag CALC: Profitable on to Color
 - ▷ Click on Color on the marks card to edit the colors. Remember, color is the first thing the eye sees, so we want to use color intentionally. Here are a few things to keep in mind.
 - Legibility (easy to distinguish)
 - Associations (red equals bad, green equals good)
 - Color blindness (about 10% of the male population; orange and blue is often a better option than red and green)
- ▶ Mark Type
 - ▷ Click the dropdown menu on the Marks card and change it from Automatic to a circle.
 - ▷ Click on Size and make the marks a bit bigger.
 - ▷ Click on Color and change the opacity to 50%.
- ▶ Highlighter
 - ▷ Click the carrot dropdown on Company on the Marks cards and select Show Highlighter
 - ▷ Why do we want a highlighter and not a filter here?
 - ▷ Use the new text box to highlight different companies.
- ▶ Tooltips
 - ▷ Bigger fonts are easier to read, especially with presentations.
 - ▷ Use bold fonts sparingly, like on the values that change when you hover from one mark to the next.
 - ▷ Use sentences! Explain each mark like you would explain it in conversations with a colleague.
- ▶ Name your sheet “Scatter Plot”

DOTS

Finally, we want to give our audience a fun and easy way to explore all of the companies that are included in the Fortune 500 rankings in 2019. We’ll create a very simple worksheet that simply creates one dot per company and adjust the tooltip for easy hovering.

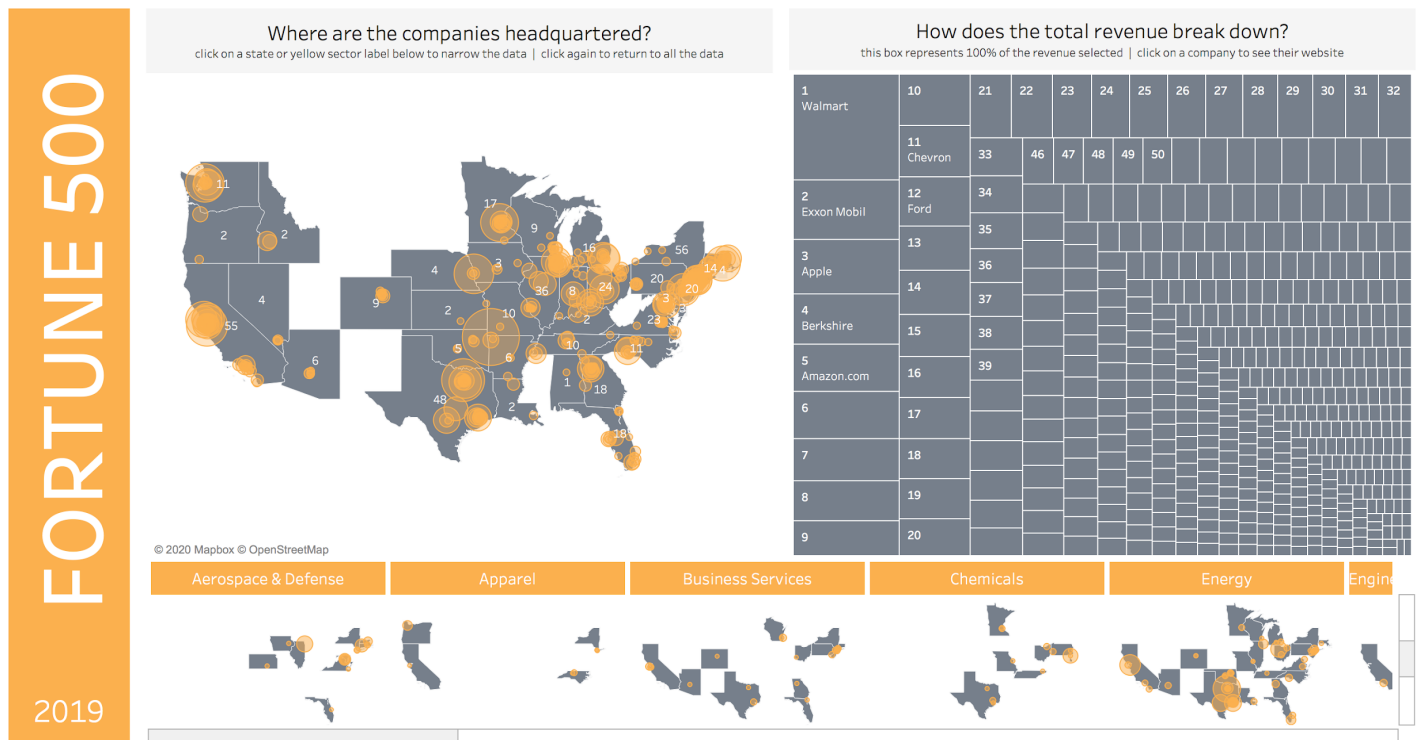
- ▶ Create Dots
 - ▷ Create a new worksheet and name it “Dots.”
 - ▷ Drag Company to detail on the marks card.

- Click the dropdown on the Company pill on the Marks card, and click sort.
- Change the Sort By option to Field and select rank from the Field Name options.
- Change the mark type from automatic to a circle.
- Adjust the color and the size as you like.
- Adjust Tooltips
 - Add Rank and Sector to the tooltip
 - Click on Tooltip on the marks card and adjust the formatting as you see fit.

DASHBOARD

Nick Desbarats has a great analogy about dashboards. He says the word dashboard is as nebulous as the term document. Contract and a movie script are both documents, but we don't talk about applying document best practices to all of them. How we design our dashboard depends on what we want the dashboard to do. In Tableau more specifically, I like to think of a dashboard in restaurant terms. The worksheets are the back of the house, where we make the food. The dashboards are the polished up front of the house, where we create an enjoyable experience for our guests. Whether we have multiple visualizations or just one beautiful chart, we always want to create a dashboard that makes it easy for our audience to interact with our work.

- Layout
 - Create a new dashboard (the icon looks like a window)
 - Change the Size to Automatic
 - Drag the Bar Chart sheet on to the dashboard
 - Drag Scatter Plot sheet on to the dashboard
 - Drag the Dots sheet above both
 - Click on each sheet and change the size from Standard to Entire view.
- Actions
 - Highlight
 - To add a dashboard action, click Dashboard > Actions > Add Action > Highlight
 - Set the following options:
 - Source Sheets : Bar Chart only
 - Run on : Click
 - Target Sheets: Dots
 - Clearing the selection will: show all values
 - Filter
 - To add a dashboard action, click Dashboard > Actions > Add Action > Filter
 - Set the following options:
 - Source Sheets : Bar Chart only
 - Run on : Click
 - Target Sheets: Scatter Plot
 - Clearing the selection will: show all values



DASHBOARD 2

With our second dashboard, let's work with the location data we have in this data set. We'll start by building the treemap on the right side of the screen, and then build out our maps of where each company is headquartered.

TREEMAP

Since we're going to be creating maps for our end user to explore, we'd like for them to be able to easily see the companies in a given state or sector. Since many of these companies cluster on the maps, we'll tease them out using a tree map, which does an excellent job of showing categorical data when we've got more categories than we could easily display with a bar chart. And finally, if they see a company they want to learn more about, we'll set them up to be able to click on that company's box and go directly to their website.

- ▶ Create a new worksheet
- ▶ Company to Detail
- ▶ Revenue to Size
- ▶ Rank and Company Name to Label
- ▶ Add Website to the tooltip (this will be important for one of our dashboard actions later.)

MAP

Now on to our dashboard's central maps. First we'll build a filled map with the states colored in, and then we'll layer points on top for each company's location. This will allow us to see both the number of companies in a state while also the zip codes where they're actually headquartered.

- ▶ Filled Map
 - ▷ Double click State
 - ▷ Change the mark type from automatic to map
 - ▷ Add Company to Label
 - ▷ Change Company to a Count Distinct measure
 - ▷ Change Company to Label (white font)
 - ▷ Color Adjustments for the marks
 - Dark blue
 - White borders
 - ▷ Adjust Map Layers
 - In the main menu, click Map > Map Layers
 - 100% washout
- ▶ Dot Map
 - ▷ Now let's add our dots. We'll do this by essentially duplicating the map and layering them on top of one another.
 - ▷ Drag a new longitude data pill onto the worksheet and set it next to the existing one on the columns shelf. (You'll see two maps appear.)
 - ▷ Notice that you now have three marks cards. The top controls both maps. The middle controls the map on the left, and the bottom marks card controls the map on the right.
 - ▷ Click on the bottom marks cards and change the mark type from a map to a circle.
 - ▷ Remove the CNTD(Company) pill from Label.
 - ▷ Replace the State pill on the detail with the Zip Code.
 - ▷ Add the Company to Detail as well.
 - ▷ Add Revenue to the Size of the circle.
 - ▷ Adjust these circles to be orange, with an opacity around 50% and add a border that's the same color as the mark.
 - ▷ Now let's layer the circles on top of the maps. Click the dropdown menu on the second longitude pill on the Columns shelf and select Dual Axis.
 - ▷ Name this sheet "Big Map".

SMALL MULTIPLES

Now we'll make a series of small multiple maps to see each sector individually.

- ▶ Right click on the Big Map sheet and duplicate the worksheet.
- ▶ On the new sheet, add Sector to Columns
- ▶ You'll see all the little maps appear. Adjust the sizing of the columns width as necessary.
- ▶ Right click on the Sector labels and select format.

- ▶ Make the shading yellow, the text white, and the font a bit bigger.
- ▶ With the formatting pane still up, click on the Borders icon (looks like a window).
- ▶ Scroll down to the column dividers and add thick white borders between the columns.

DASHBOARD

Now let's put our big map, our treemap, and our little maps together on a dashboard.

- ▶ Create a new dashboard and change the size to automatic.
- ▶ Add the Big Map on the left and the Treemap on the right side of the screen.
- ▶ Add Small Maps below and adjust for legibility.
- ▶ Last but not least, we'll add three dashboard actions.
 - ▷ Small Map to Big Map Filter: Dashboard > Actions > Add Action > Filter
 - Source Sheets : Small Maps
 - Run on : Select
 - Target Sheets: Big Map
 - Clearing the selection will: show all values
 - NEW: Change Selected Fields to only filter on Sector
 - ▷ Big Map to Treemap Filter: Dashboard > Actions > Add Action > Filter
 - Source Sheets : Big Map
 - Run on : Select
 - Target Sheets: Treemap
 - Clearing the selection will: show all values
 - NEW: Change Selected Fields to only filter on State
 - ▷ Treemap to URL: Dashboard > Actions > Add Action > URL
 - Source Sheets : Treemap
 - Run on : Select
 - URL (click tiny arrow to the right of the open text box): Website
 - Give it a try! Filter the treemap to just Missouri and click on the Olin box.

WRAP UP

SAVE YOUR WORKBOOK

The final step is to save your workbook! If you haven't already created a Tableau Public account, [return to Tableau Public](#), click Sign In, and create a new account. Once you've done that, here's how you save your workbook.

- ▶ Go to File, Save to Tableau Public As, and then enter your Tableau Public account credentials.
- ▶ Name your workbook.
- ▶ Edit the workbook details on your Tableau Public page. You can control whether the workbook appears on your profile page and whether someone else can download the workbook and data.
- ▶ Note that you should NEVER save anything private on Tableau Public. This is a place to only save work you've done with public data, like we've done here. To save your work locally, you will need [Tableau Desktop, which is completely free for students and instructors](#). If you're an administrator, it will run approximately \$70 a month.

TAKE THE SURVEY

Now that you're all done with the workshop, we'd so appreciate your feedback so that we can continue to improve our workshops for future attendees. [Just click here](#) to answer a few quick questions. Thank you!