Data Visualization with Tableau

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Digital Integration Teaching Initiative
HIST 1357: Data, Surveillance, and Society
Prof. Jess Parr
Spring 2026

Workshop agenda

- Discuss Big Data and data privacy.
- Introduce the Boston Area Research Initiative (BARI) Data Portal.
- Learn about Tableau.
- Understand how to import and modify data in Tableau.
- Learn how to filter data in a variety of ways to produce custom visualizations.

Find all of the course materials at: https://bit.ly/sp26-parr-hist1357-multi

Big Data, Online Presence, & Data Privacy

Data Privacy

- It’s important to pay attention to data privacy when using digital resources.
- At its simplest, **data privacy** is a person’s ability to control what of their personal information is shared and with whom.
- To help you make informed decisions about interacting with digital tools in ways that honor your boundaries with your data and/or personal information, the DITI has prepared a handout on **Data Privacy**.

How do we contribute to Big Data?

- Entertainment and social media
- Healthcare and medical services
- Shopping and marketing
- News and information
- Travel and transportation
- Education and employment
- Public policy and safety
- How else?

Personal information can be collected by digital platforms and tools, causing data privacy issues as well as concerns of using personal data for company profit.

How does Big Data impact our daily lives?

AWARENESS | SCIENCE & TECH | AUG 3, 2019 AT 11:08 AM.

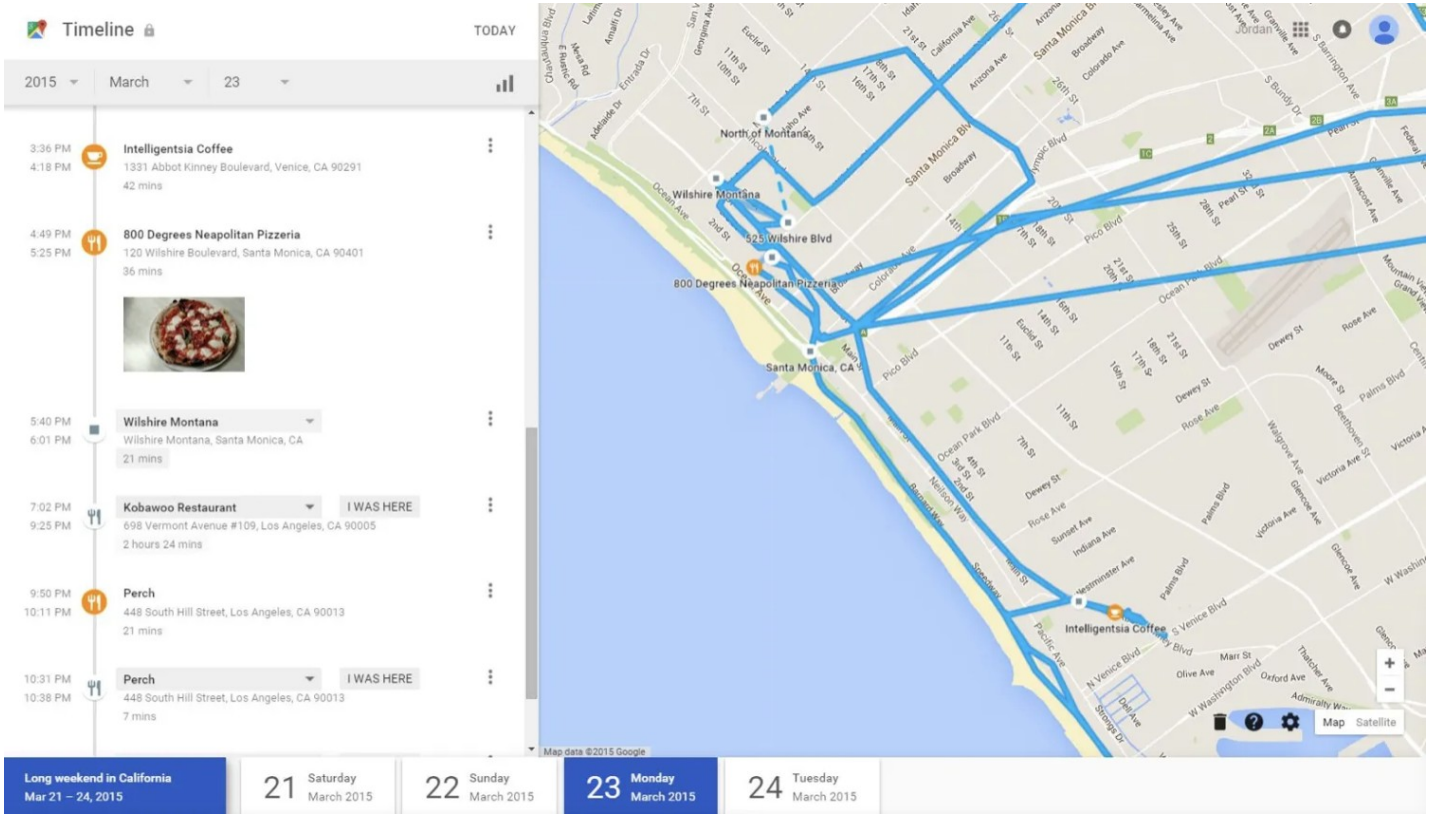
Google's File on You is 10 Times Bigger Than Facebook's — Here's How to View It

Google, Amazon, Apple, and Microsoft are all central players in "surveillance capitalism" and prey on our data.

THE ANTI-MEDIA

If you have **location services** turned on for Google (for instance, if you use Google maps), Google can track your every move. Go to: **Google Maps Timeline**

Example of Google Maps' Timeline



How Do We Know When We Are Being Tracked?

- There are ways to identify what information websites collect about their users.
- Be sure to access the Terms and Conditions offered by a website to see what the site is disclosing about how they track you.
- Blacklight is a “real-time website privacy inspector” developed by *The Markup*, a nonprofit publication that investigates data misconduct. You can use it to scan and reveal the specific user-tracking technologies on any site.

Terms & Conditions: TikTok

Image and Audio Information

We may collect information about the images and audio that are a part of your User Content, such as identifying the objects and scenery that appear, the existence and location within an image of face and body features and attributes, the nature of the audio, and the text of the words spoken in your User Content. We may collect this information to enable special video effects, for content moderation, for demographic classification, for content and ad recommendations, and for other non-personally-identifying operations. We may collect biometric identifiers and biometric information as defined under US laws, such as faceprints and voiceprints, from your User Content. Where required by law, we will seek any required permissions from you prior to any such collection.

Terms & Conditions: Google

Categories of information we collect

Identifiers and similar information such as your name and password, phone number, and address, as well as unique identifiers tied to the browser, application, or device you're using. Some Google services like YouTube Studio provide the option to submit a valid ID (such as a passport or driver's license) to verify your identity to use additional features.

Demographic information, such as your age, gender and language. If you choose to use optional features like YouTube Creator Demographics, you can also provide additional information, like your gender identity or race and ethnicity.

Commercial information such as your payment information and a history of purchases you make on Google's services.

Biometric information if you choose to provide it, such as fingerprints in Google's product development studies.

Internet, network, and other activity information such as your search terms; views and interactions with content and ads; Chrome browsing history you've synced with your Google Account; information about the interaction of your apps, browsers, and devices with our services (like IP address, crash reports, and system activity); and activity on third-party sites and apps that use our services. You can review and control activity data stored in your Google Account in My Activity.

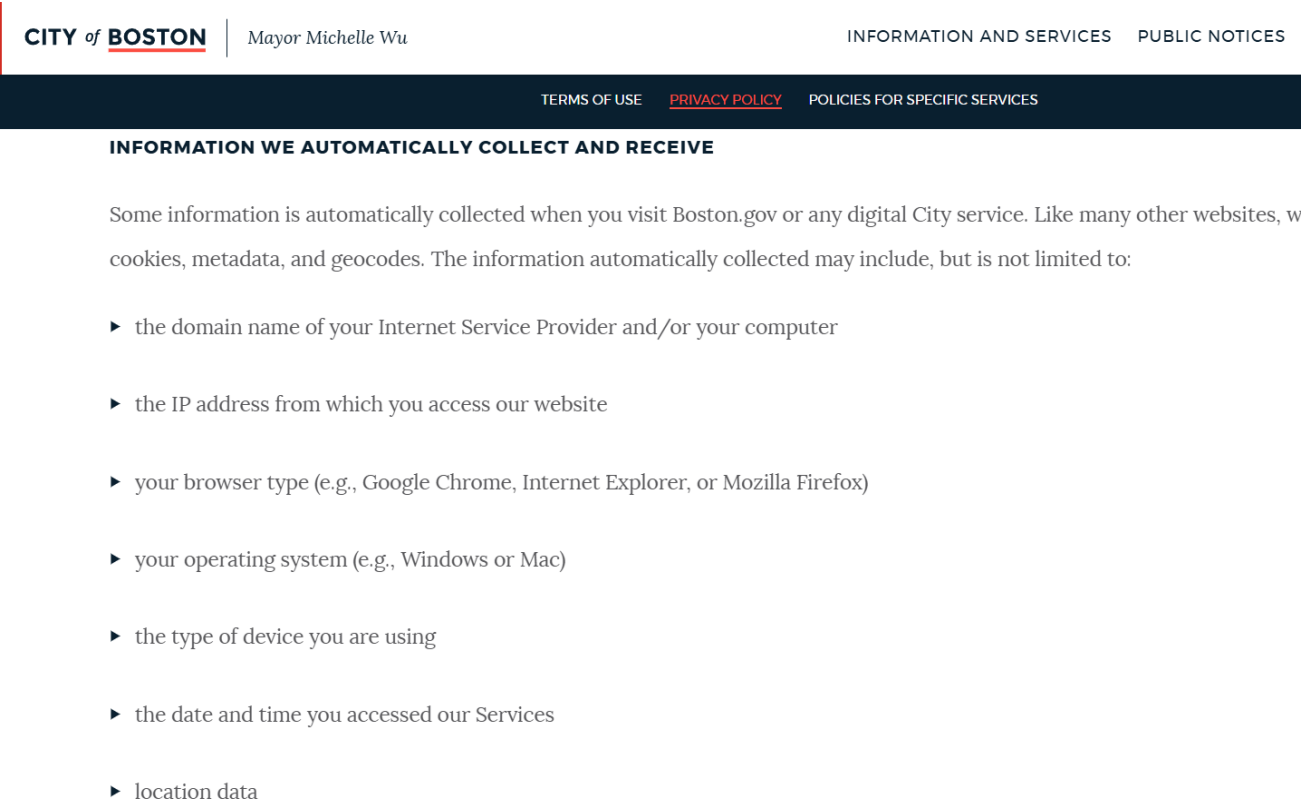
Geolocation data, such as may be determined by GPS, IP address, and other data from sensors on or around your device, depending in part on your device and account settings. Depending on these settings, this may include **precise location data**, for example GPS data for Android features like navigation or finding your phone. Learn more about Google's use of location information.

Audio, electronic, visual, and similar information, such as voice and audio information.

Communications data, such as emails, if you use our services to send and receive messages.

Health information if you choose to provide it, such as your medical history, vital signs and health metrics (like blood glucose levels), and other similar information related to your physical or mental health, in the course of using Google services that offer health-related features, such as the Google Health Studies app, Fitbit, or Pixel devices..

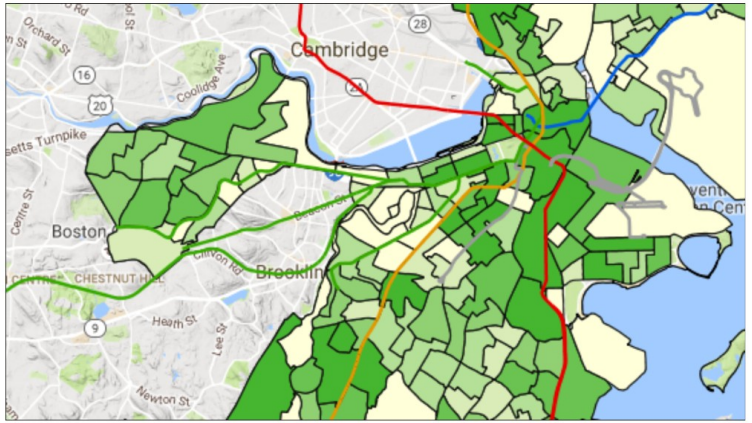
Terms & Conditions: Boston Digital Services



What information are you comfortable with being collected and shared by companies, governments, and third-party services?

Datasets and Maps

BARI Boston Data Portal



Boston Data Portal

The Boston Data Portal makes publicly available the data products from BARI projects. The Data Portal is a key part of BARI's efforts to collect and disseminate information that foster policy/research collaborations.

The Data Portal has two components: the Data Library and the Research Map.

BARI offers Data Portal trainings for community organizations. If you or your organization would like to attend or host a training, please email us at bari@northeastern.edu.

- Boston Data Library →
- Boston Area Research Map →

Image credit: Boston Area Research Initiative

BARI's Boston Data Portal

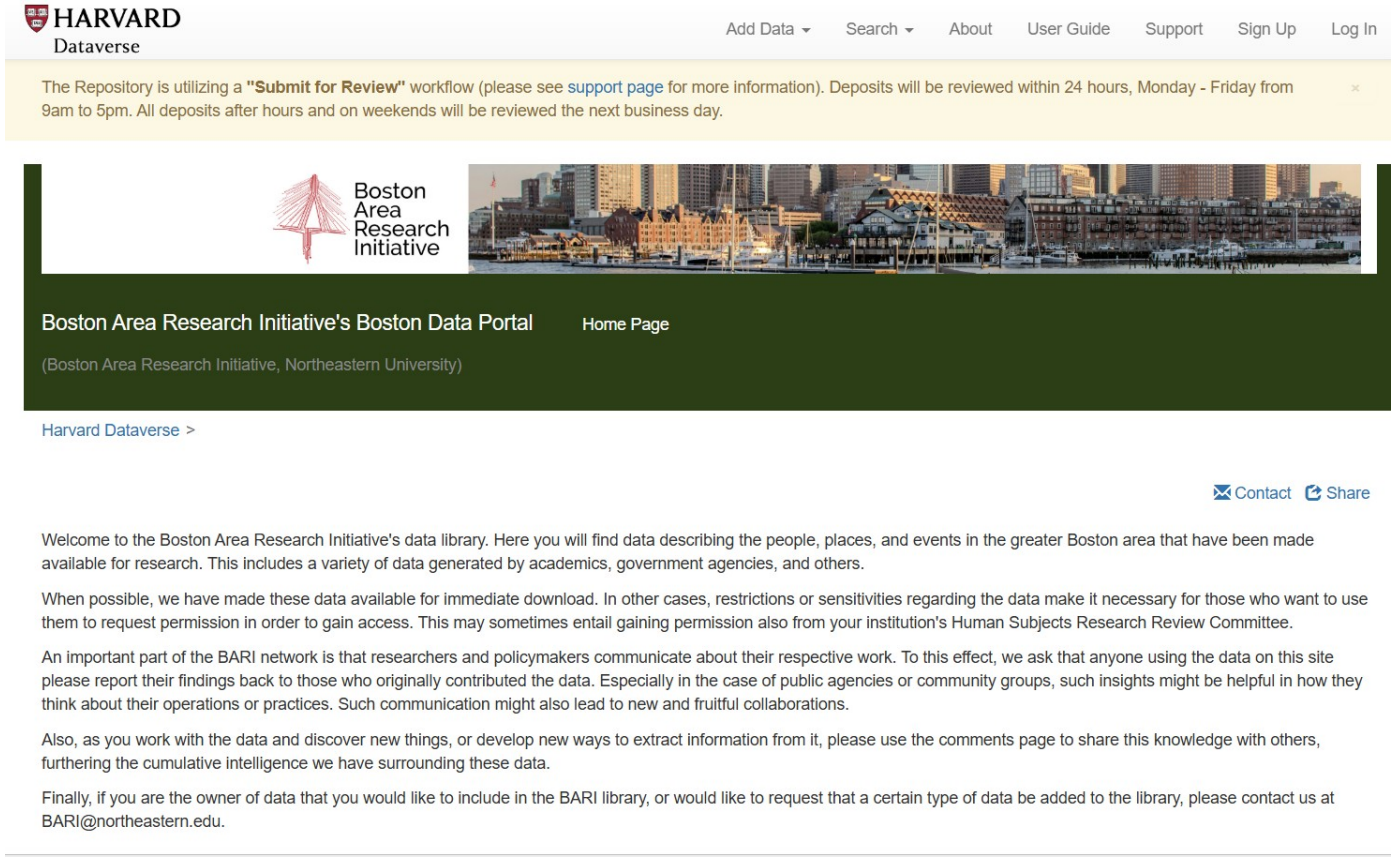


Image credit: [BARI Data Portal]

Boston Area Research Map

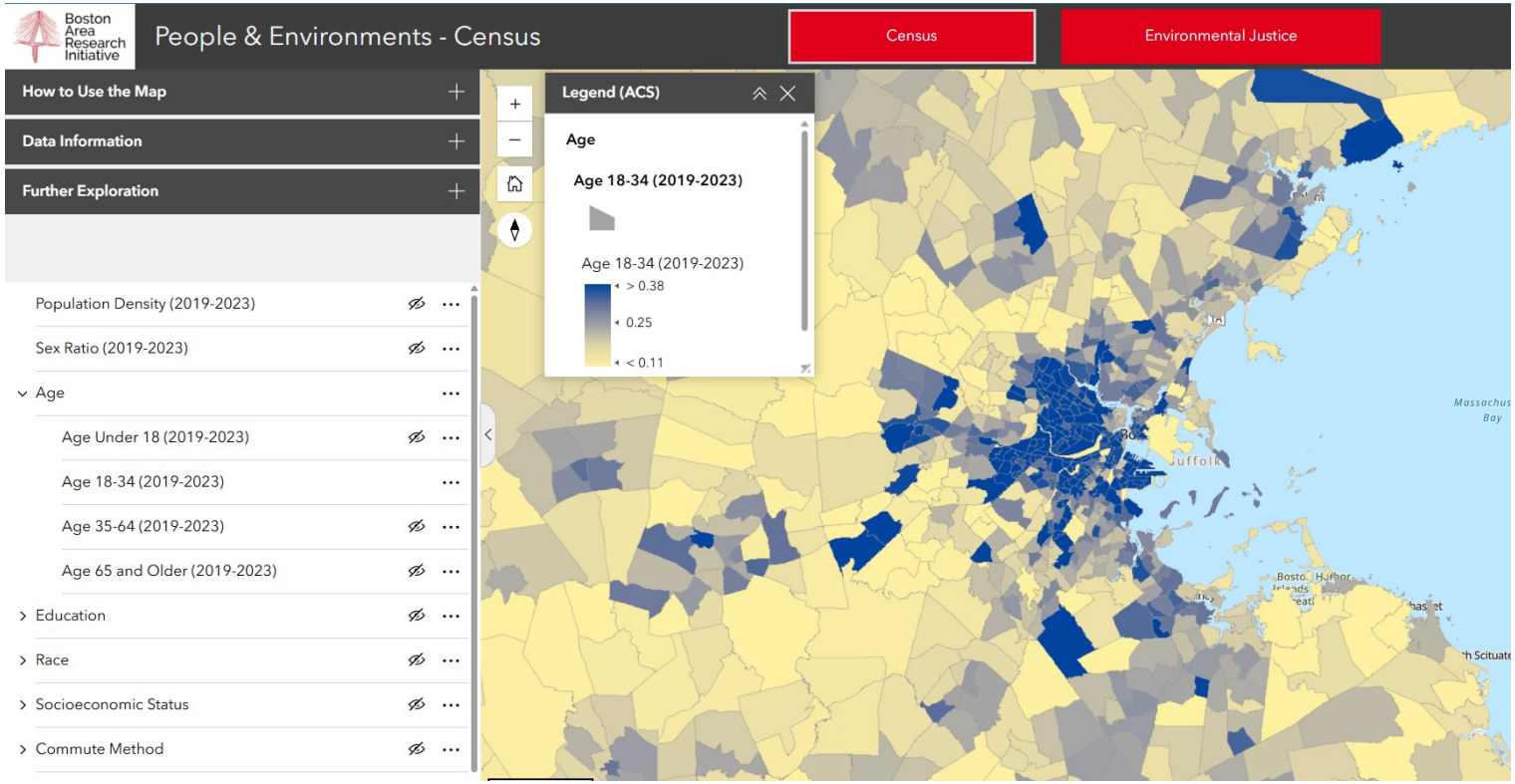


Image credit: BARI Research Map

Tableau

Tableau basics

Tableau for students: Tableau is a powerful tool for different types of data visualizations, including mapping.

A Tableau license is available for free to students with a .edu email address. You can use the key on two different devices.

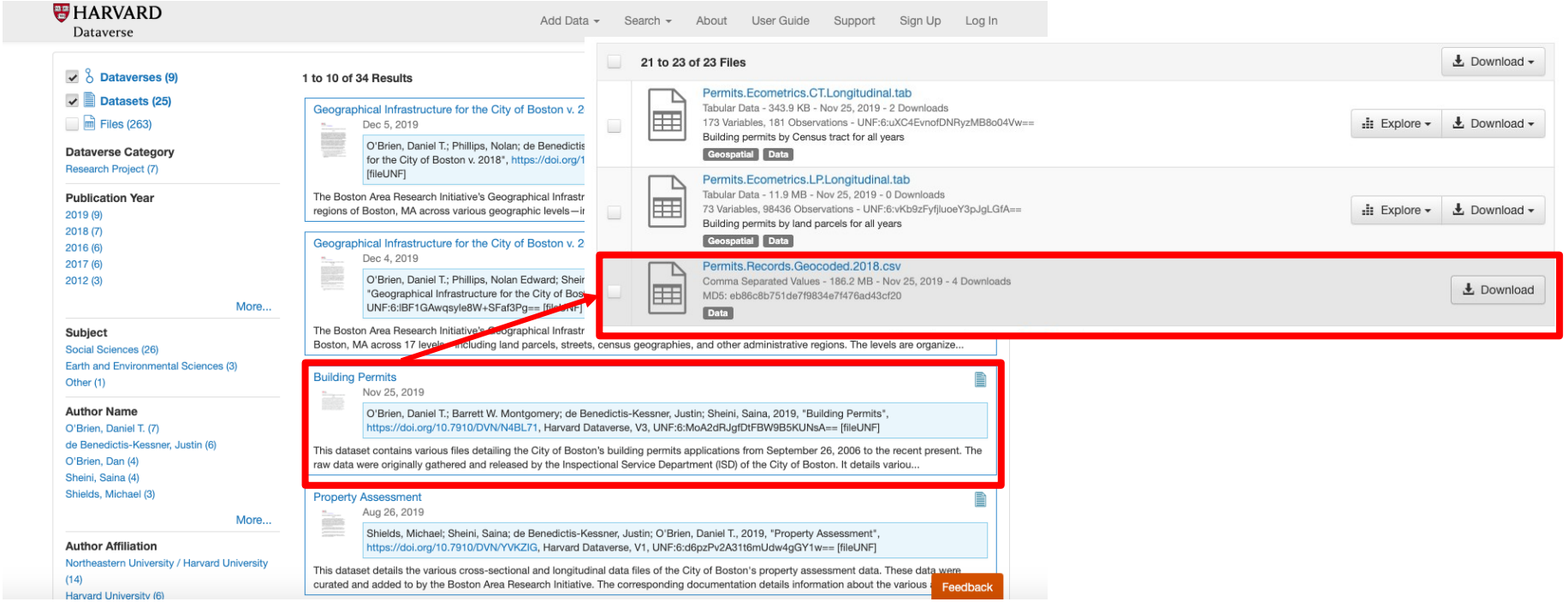
Key terminology

- **X/Y Coordinates**: Numerical values that allow every location on earth to be pinpointed.
- **Latitude:** The north/south coordinate of a location based upon its distance from the equator.
- **Longitude:** The west/east coordinate of a location based upon its distance from the standard meridian.

Key terminology continued

- **Dimension:** Qualitative values (such as names, dates, or geographical data). You can use dimensions to categorize or segment your data.
- **Measure:** Numeric, quantitative values that you can measure. Measures can be aggregated. When you drag a measure into the view, Tableau applies an aggregation to that measure (by default).
- **Basemap:** The type of map that your coordinates are plotted on. Options include streets and satellite images, just like Google Maps.

Our dataset


HARVARD Dataverse
Add Data
Search
About
User Guide
Support
Sign Up
Log In
Dataverses (9)
Datasets (25)
Files (263)
Dataverse Category
Research Project (7)
Publication Year
2019 (9)
2018 (7)
2016 (6)
2017 (6)
2012 (3)
More...
Subject
Social Sciences (26)
Earth and Environmental Sciences (3)
Other (1)
Author Name
O'Brien, Daniel T. (7)
de Benedictis-Kessner, Justin (6)
O'Brien, Dan (4)
Sheini, Saina (4)
Shields, Michael (3)
More...
Author Affiliation
Northeastern University / Harvard University (14)
Harvard University (6)
1 to 10 of 34 Results
Geographical Infrastructure for the City of Boston v. 2
Dec 5, 2019
Geographical Infrastructure for the City of Boston v. 2
Dec 4, 2019
Building Permits
Nov 25, 2019
O'Brien, Daniel T.; Barrett W. Montgomery; de Benedictis-Kessner, Justin; Sheini, Saina, 2019, "Building Permits", https://doi.org/10.7910/DVN/N4BL71, Harvard Dataverse, V3, UNF:6:MoA2dRJgfDtFBW9B5KUNsA== [fileUNF]
This dataset contains various files detailing the City of Boston's building permits applications from September 26, 2006 to the recent present. The raw data were originally gathered and released by the Inspectional Service Department (ISD) of the City of Boston. It details variou...
Property Assessment
Aug 26, 2019
Shields, Michael; Sheini, Saina; de Benedictis-Kessner, Justin; O'Brien, Daniel T., 2019, "Property Assessment", https://doi.org/10.7910/DVN/YVKZIG, Harvard Dataverse, V1, UNF:6:d6pzPv2A31t6mUdw4gGY1w== [fileUNF]
This dataset details the various cross-sectional and longitudinal data files of the City of Boston's property assessment data. These data were curated and added to by the Boston Area Research Initiative. The corresponding documentation details information about the various
Feedback
21 to 23 of 23 Files
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Permits.Ecometrics.CT.Longitudinal.tab
Tabular Data - 343.9 KB - Nov 25, 2019 - 2 Downloads
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MD5: eb86c8b751de7f9834e7f476ad43cf20
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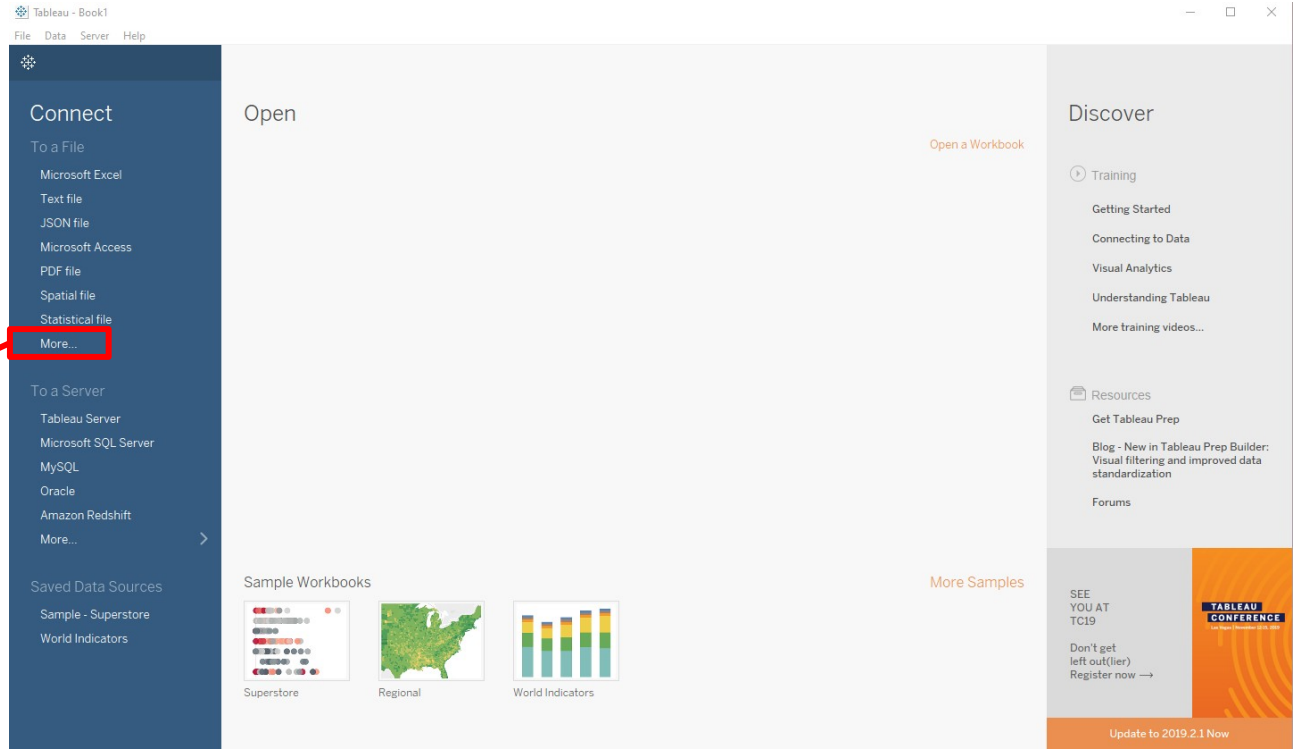
Our dataset continued

- Boston's 2018 Permit and Record Spreadsheet, which tracks construction permits.
- Includes information such as
  - Type of permit (addition, renovation, etc.).
  - Address of permit (including geographic coordinates) and neighborhood name.
  - Permit holder and fee information.

Tableau Walkthrough

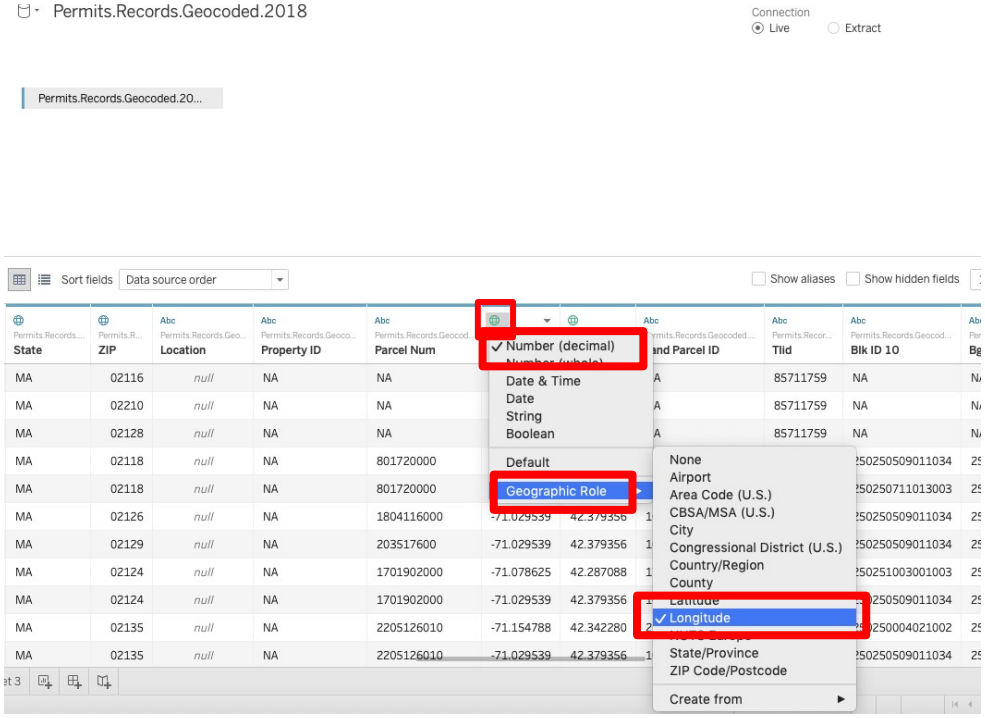
Step One: Connecting to data

- First, we need to connect to our data.
- We will be using building permit data for the City of Boston in .csv format.
- Select **More…** and navigate to the data file



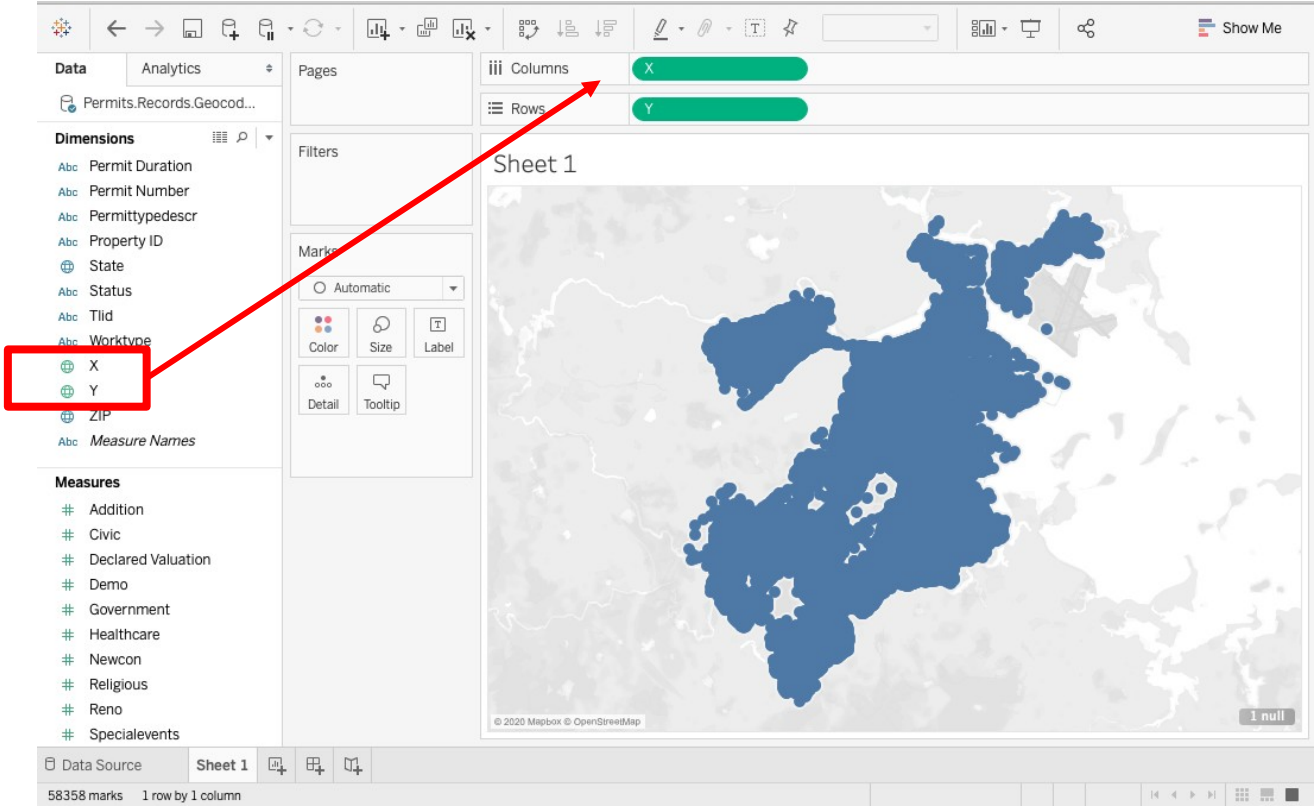
Step Two: Convert coordinate column to geo data

- To map our data, we have to first convert the X/Y data into coordinates.
- Click on the **Abc**, and change the data type from **String** to **Number (decimal)**.
- Click on the # and select over **Geographic role**, and then select **Latitude** or **Longitude**. Convert:
  - **X -> Longitude**
  - **Y -> Latitude**



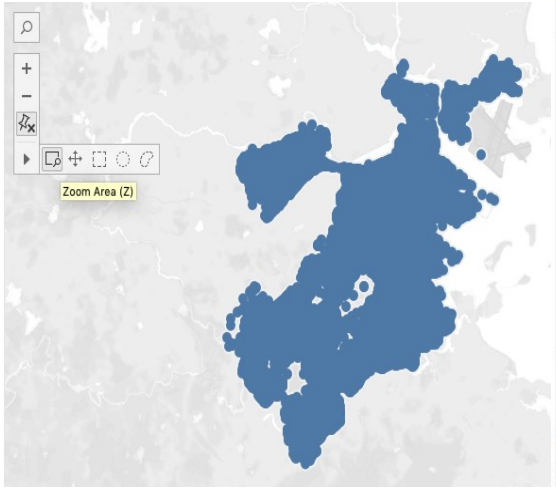
Step Three: Plotting points

- To map the data points, drag the Y data into the **Columns** area, and the X data into the **Rows** area.
- Tableau will automatically plot points based upon those X/Y coordinates.



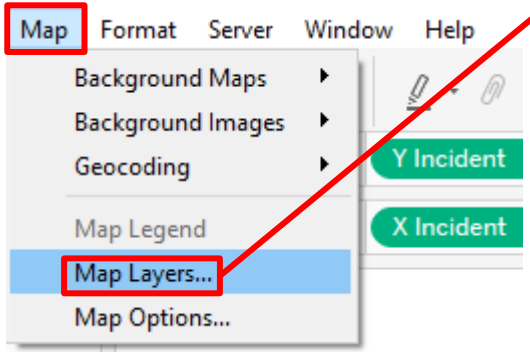
Step Four: Zoom controls

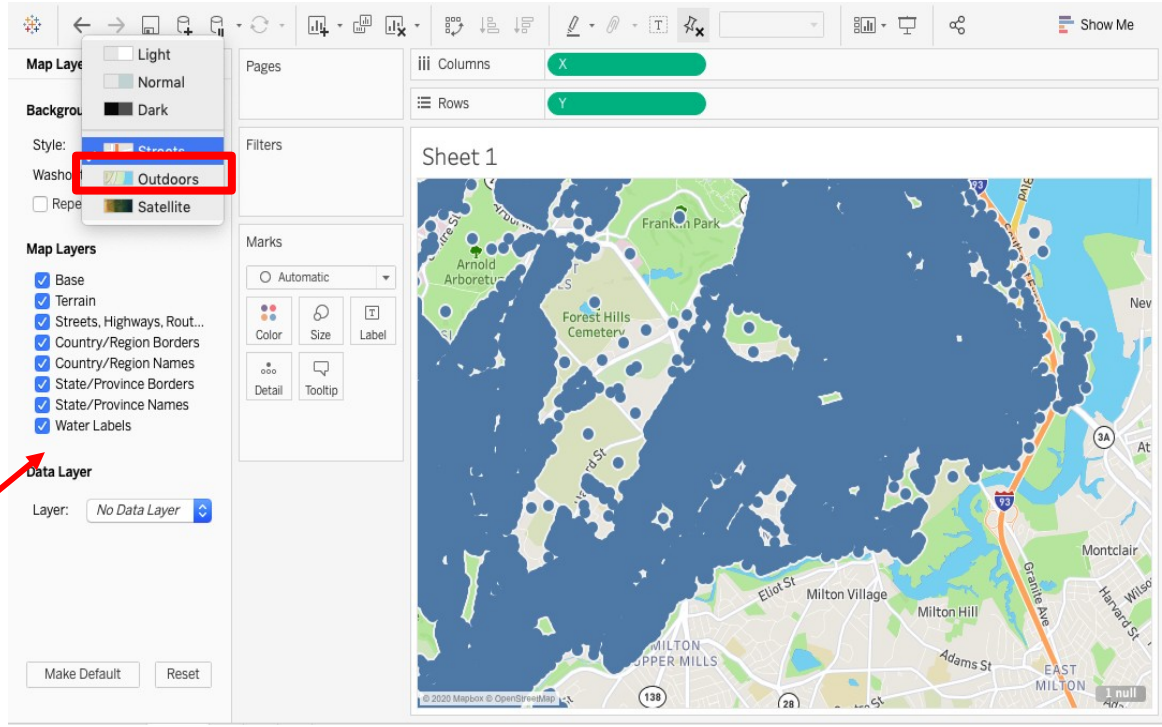
- The navigation and zoom controls are in the top left of the plot area.
- We have zoomed into the Downtown Boston, Fenway/Kenmore, Jamaica Plain, Roxbury areas.



Step Five: Modifying the basemap

- Select **Map** on the toolbar and go to **Map Layers…** to modify the basemap.
- Select a new style, e.g. **Streets**.
- When you are happy, click the **X** at the top of the map layers sidebar.



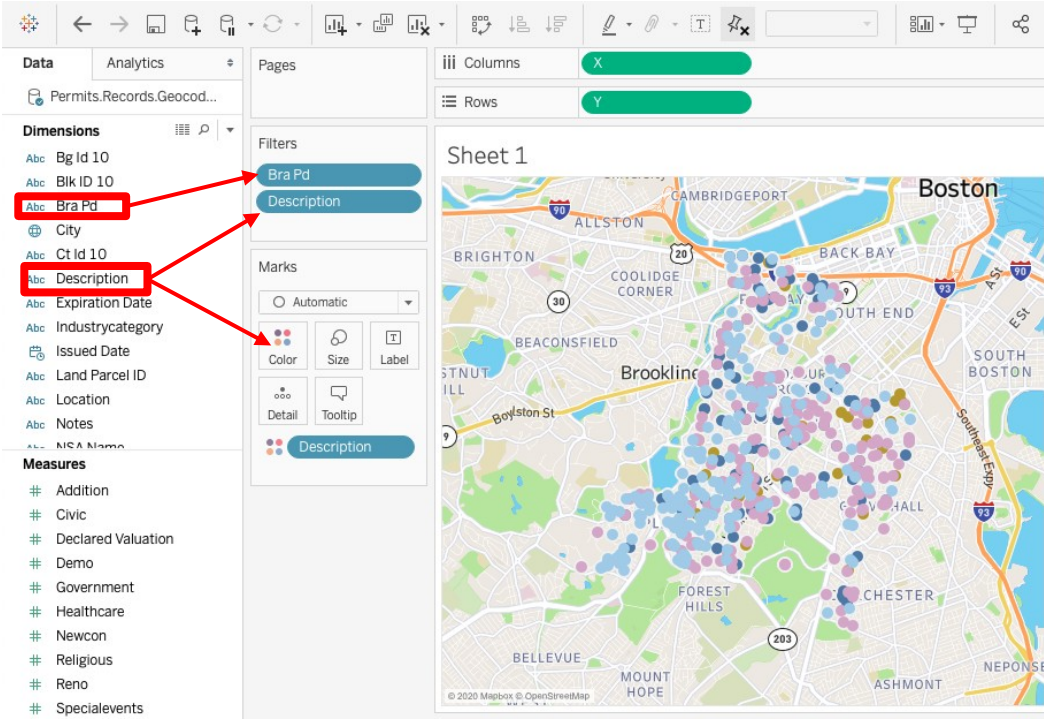


Hypothesis: Gentrification will look different in each neighborhood of study.

Operationalization: Gentrification can be tracked by filtering out **Addition**, **Erection**, **New Construction**, and **Removal of Structure** building permits.

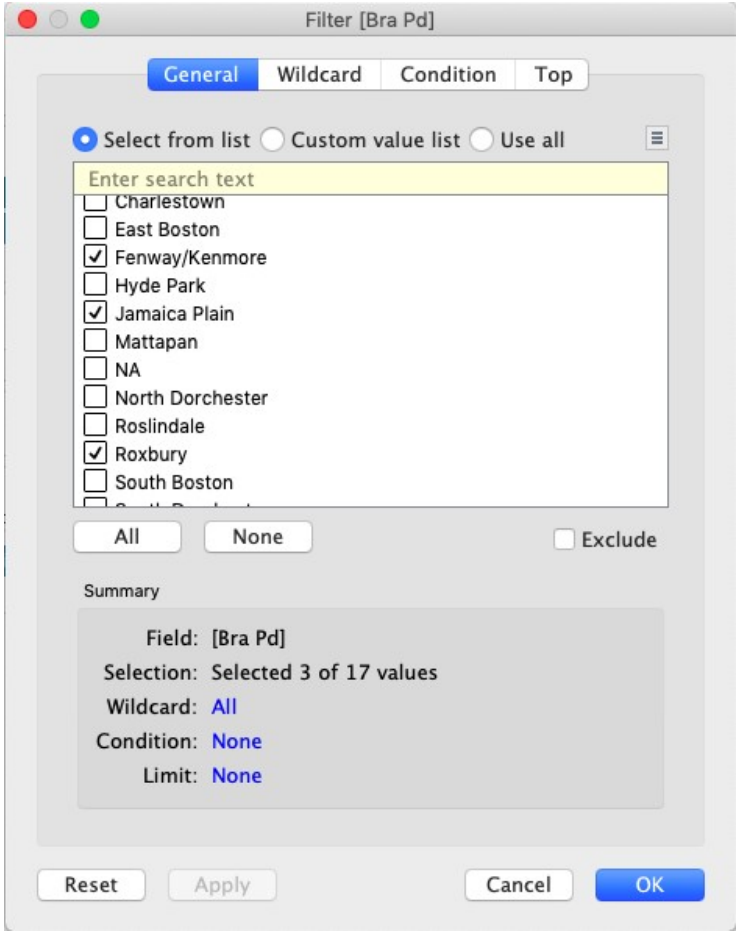
Step Six: Creating filters

- To create different filters and visualization parameters, drag a dimension or measure into the **Marks** box. Change marks to **Map**.
- To specify a type of visualization, drag the parameter of choice onto **Color**, **Size**, etc.
- We have mapped **Description of Permit Type** as a color, and filtered by neighborhood and description of permit type (which will appear as a tooltip).



Step Seven: Choosing filters

- We want to filter our neighborhood data parameter to only display Fenway/Kenmore, Jamaica Plain and Roxbury.
- Click on **Filter...** to bring up the filter box.
- Deselect all and then check the boxes for Fenway/Kenmore, Jamaica Plain and Roxbury.
- Do the same thing for permit description type, selecting the boxes for **Addition**, **Erect**, **New Construction**, and **Removal of Structure**.



Step Seven: Filter results

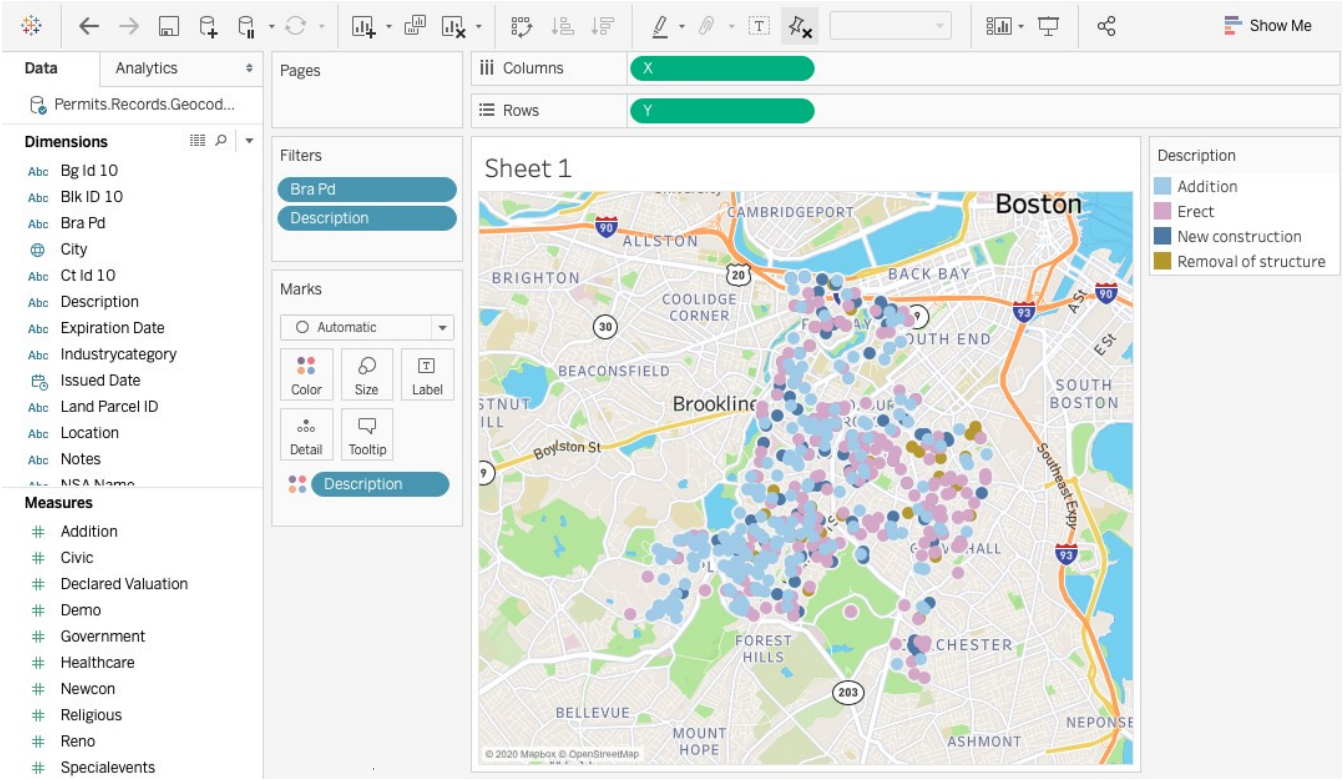
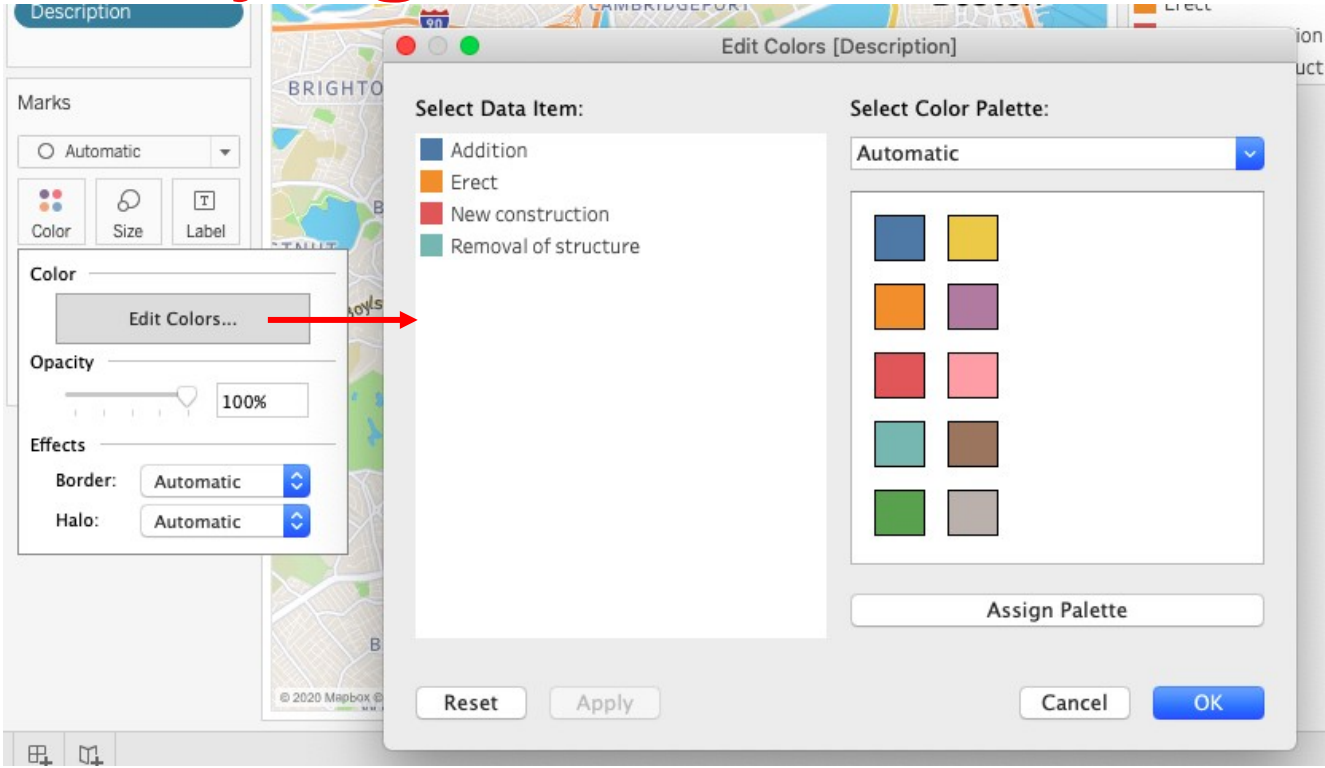


Tableau and Accessibility

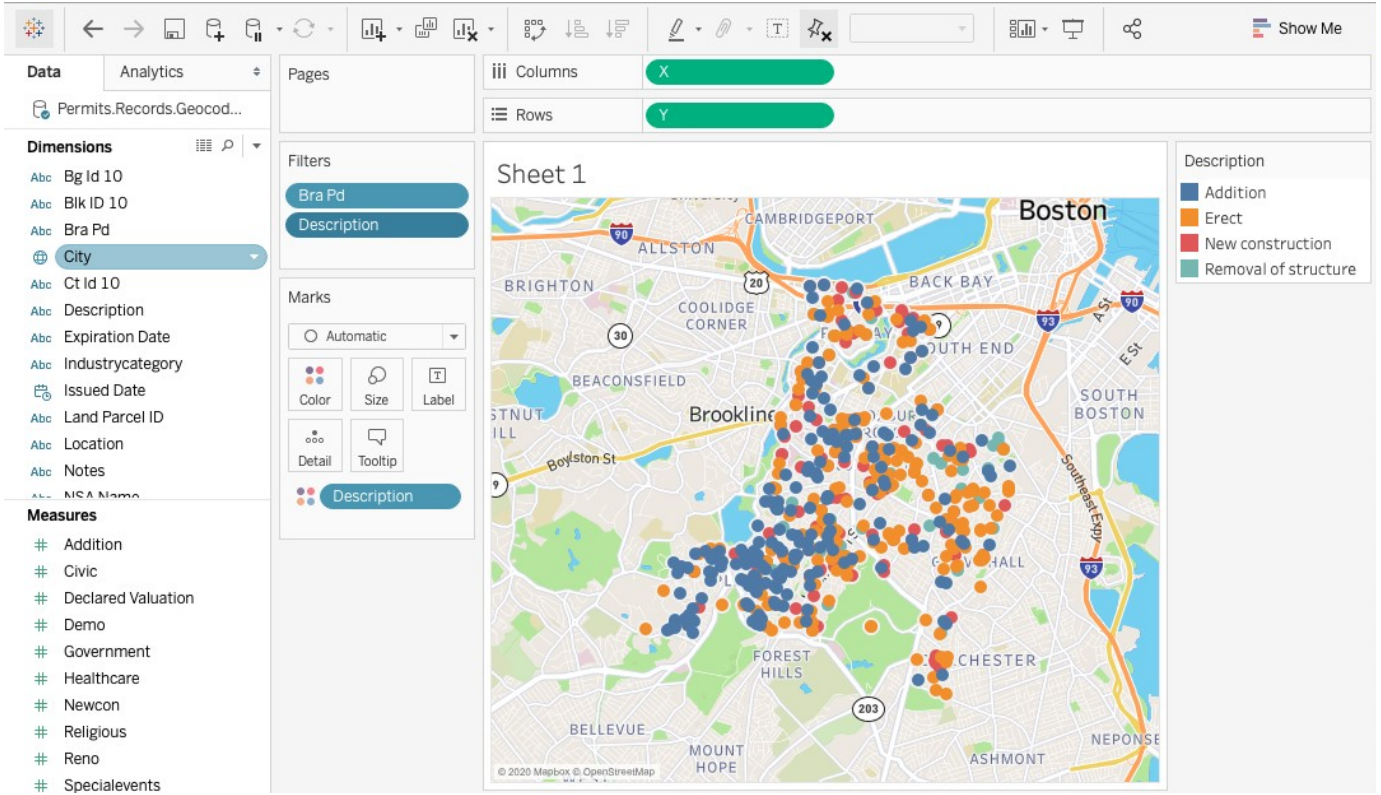
- Tableau lets you *modify* and *customize* how your maps and graphs look.
- Keep accessibility concerns in mind when choosing fonts and colors.
  - Colors with higher contrast from the background are easier to distinguish.
  - Larger, bolder fonts stand out and designate importance.
  - Overcrowding text makes the information harder to read.

Step Eight: Modifying colors

- The standard map colors don't contrast very well.
- On the **Bra Pd (neighborhoods)** sidebar, click the dropdown arrow, then click on **Edit Colors….**
- We can now change our colors and improve the contrast.

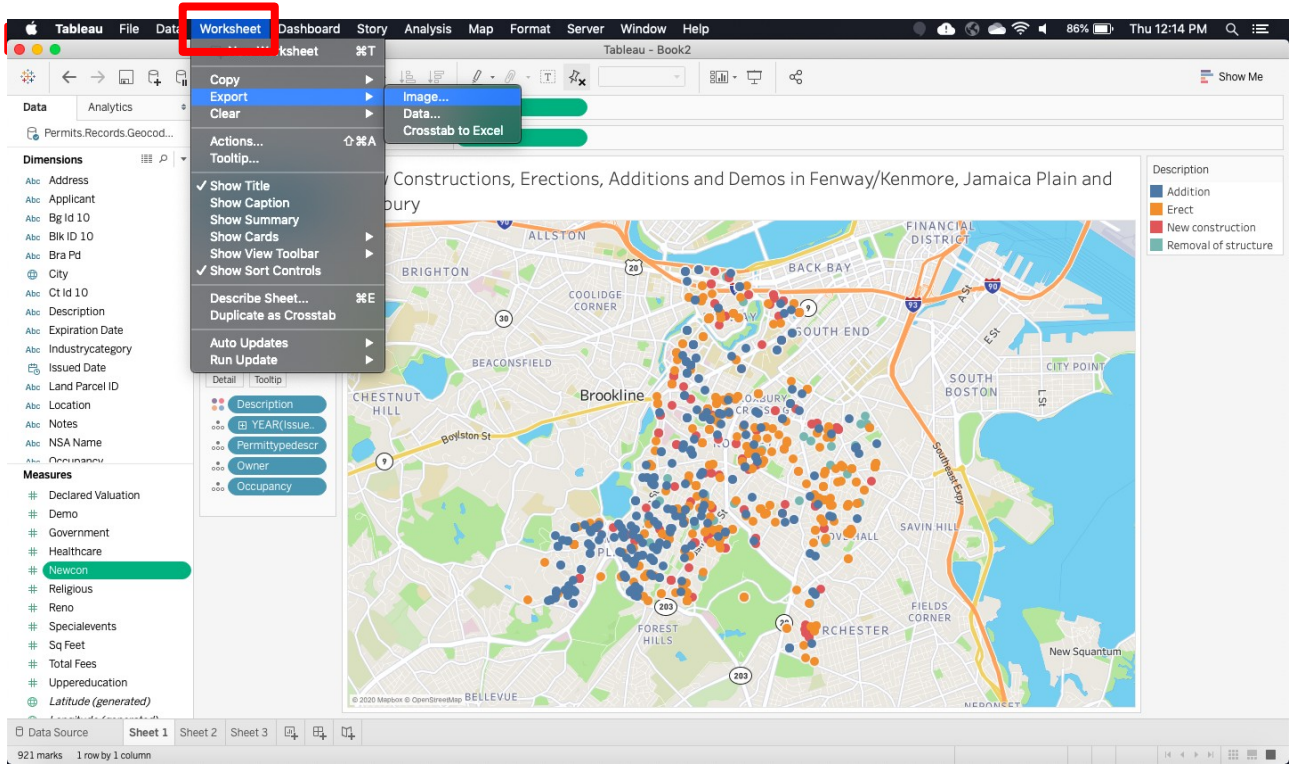


Step Eight: Modifying colors results



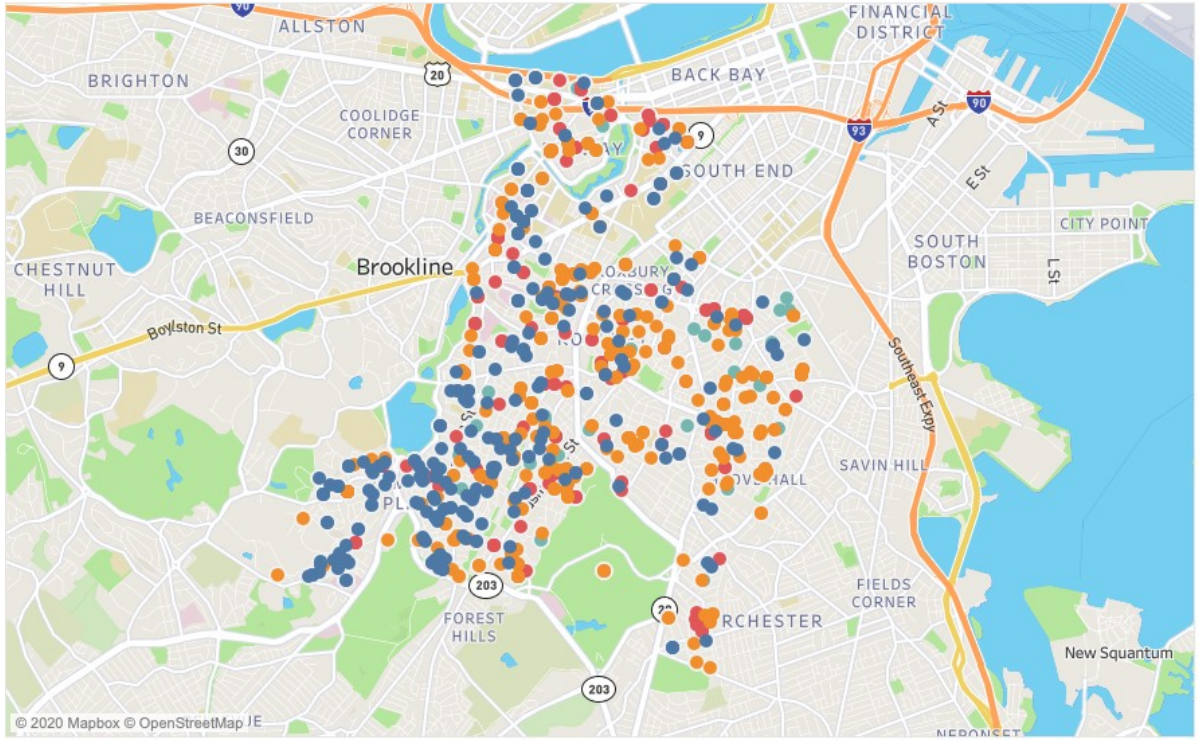
Step Nine: Exporting images

- From the **Worksheet** drop-drop down menu, select **Export**, then click on **Image….**
- You can select the type of export then click **Save.**



Step Nine: Exported image

New Constructions, Erections, Additions and Demos in Fenway/Kenmore, Jamaica Plain and Roxbury

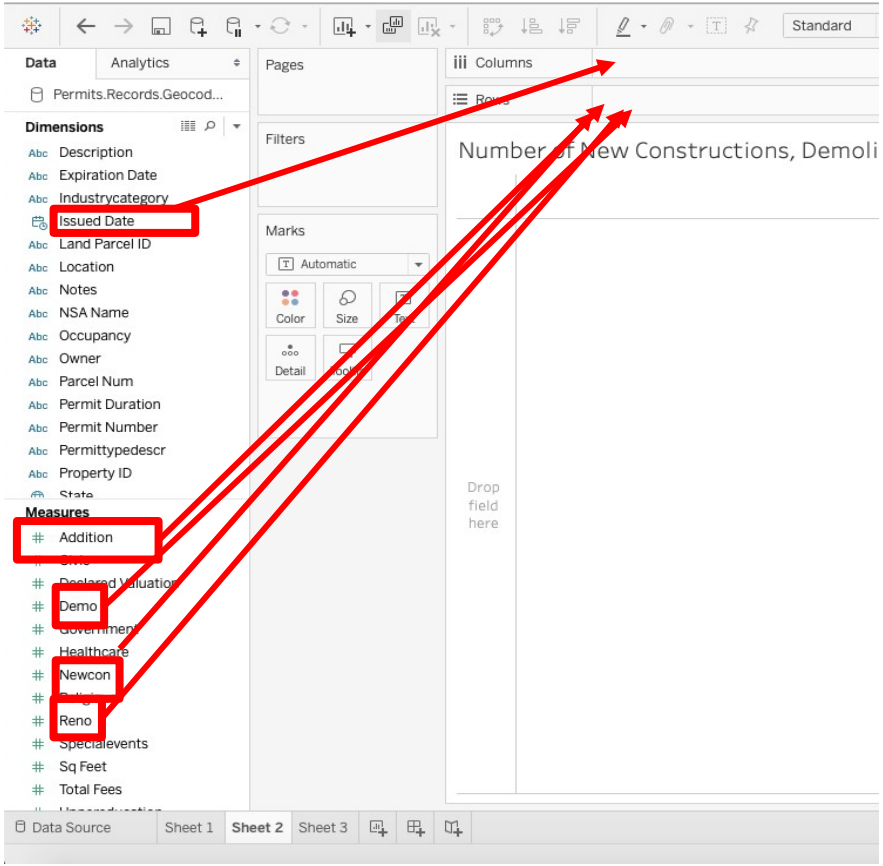


Description
- Addition
- Erect
- New construction
- Removal of structure

Map based on X and Y. Color shows details about Description. Details are shown for various dimensions. The data is filtered on Bra Pd and Worktype. The Bra Pd filter keeps Fenway/Kenmore, Jamaica Plain and Roxbury. The Worktype filter keeps ADDITION, ERECT, NEWCON and RAZE.

Graphs with Tableau: Drag & drop

- As with mapping, creating a graph can be accomplished by dragging and dropping our dimensions and measures.
- To map the number of records over time according to permit type, first create a new sheet (click the **+** sign next to **Sheet 1** at the bottom).
- Next, drag and drop the **Issued Date** dimension to the columns, and the **Addition**, **Demo**, **Newcon** and **Reno** measures to the rows.

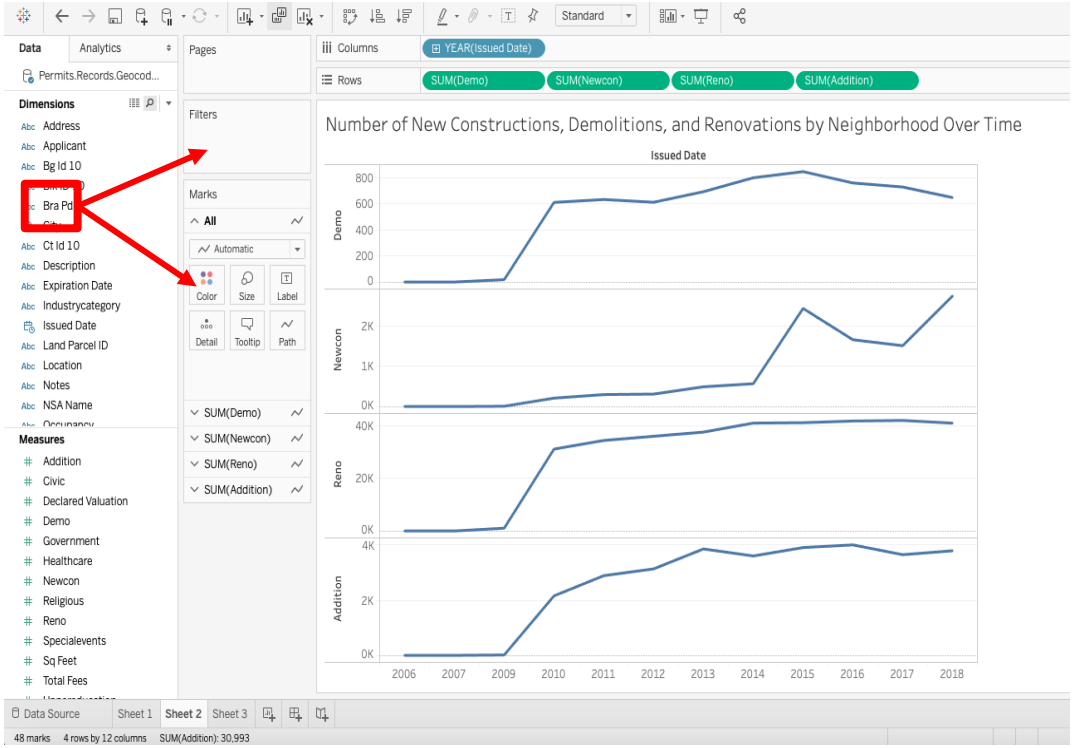


Graphs with Tableau continued

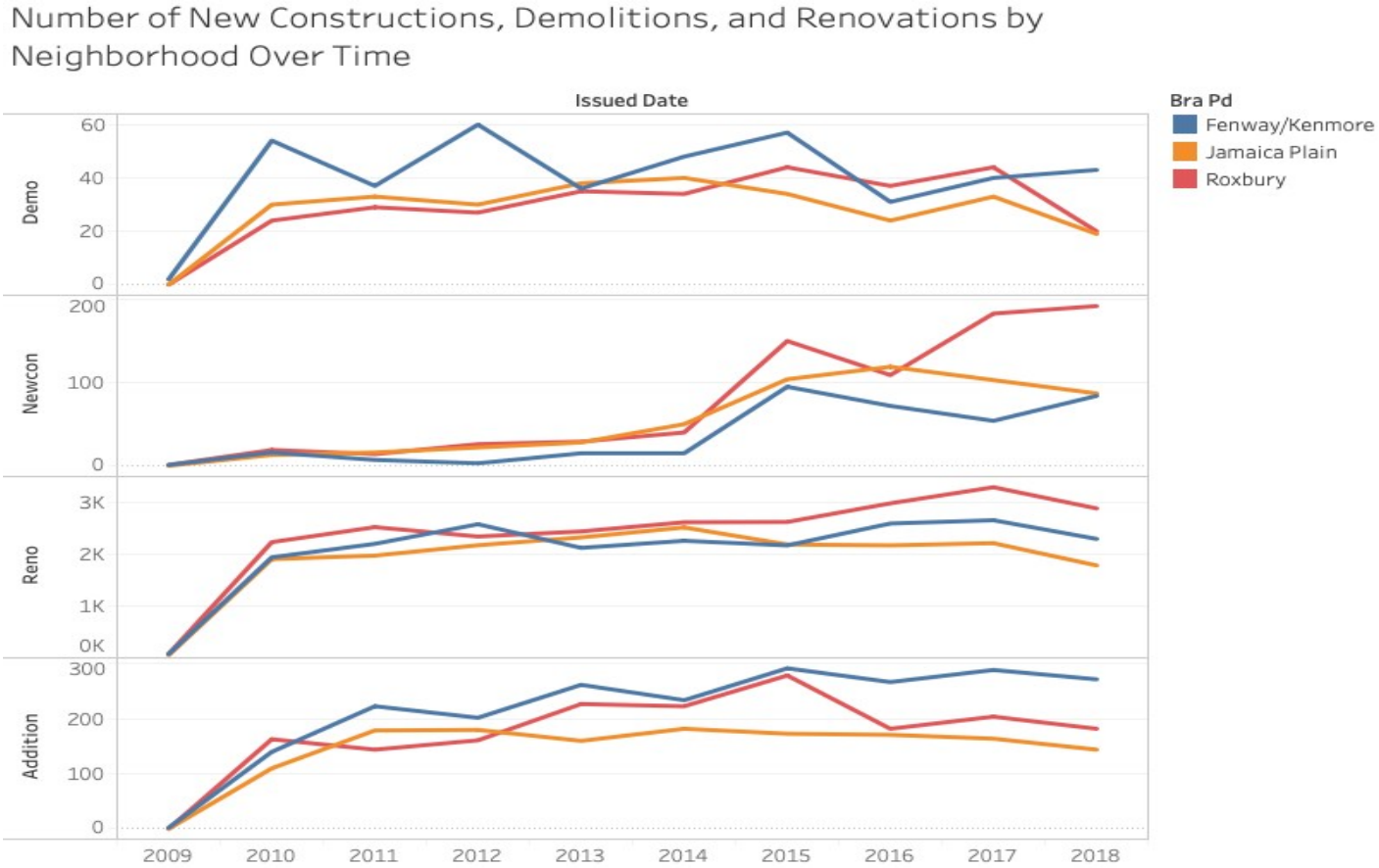
We now have a graph of different building permit records over time.

To see specific neighborhoods:

- Drag and drop the **Bra Pd** measure onto both the filter box and the colors in the marks box to the left of our new graph. Filter your neighborhoods to include only Fenway/Kenmore, Jamaica Plain and Roxbury.
- Tableau will automatically set each neighborhood to a different color and redraw our graph.



Graphs with Tableau results



AI in Tableau

Tableau's AI tools offer different functions to users:

- Data preparation: Reviewing, cleaning, and mapping data
- Data organization: Providing suggestions to change data syntax and semantics
- Prompting exploration: Provides users with suggestions to explore and analyze data
- Many more features as AI is integrated across Tableau. As a result, users should be aware that AI may be difficult to avoid in Tableau.

AI Impacts and Workarounds

Some of the harmful impacts of AI:

- Environmental damage: high energy, land, and water use
- Critical thinking and psychological damage for users
- Political misuses and data surveillance of users
- User liability of violating copyright laws
- Issue of companies collecting personal data for profit
- Biased and hallucinated outputs
- Many more

Workarounds for AI in Tableau:

- Note: workarounds reduce, but do not eliminate, harmful impacts of AI. It may be simpler to avoid AI use (if possible)
- Pre-plan the number of prompts you need and design prompts for unbiased output
- Check AI output with human review

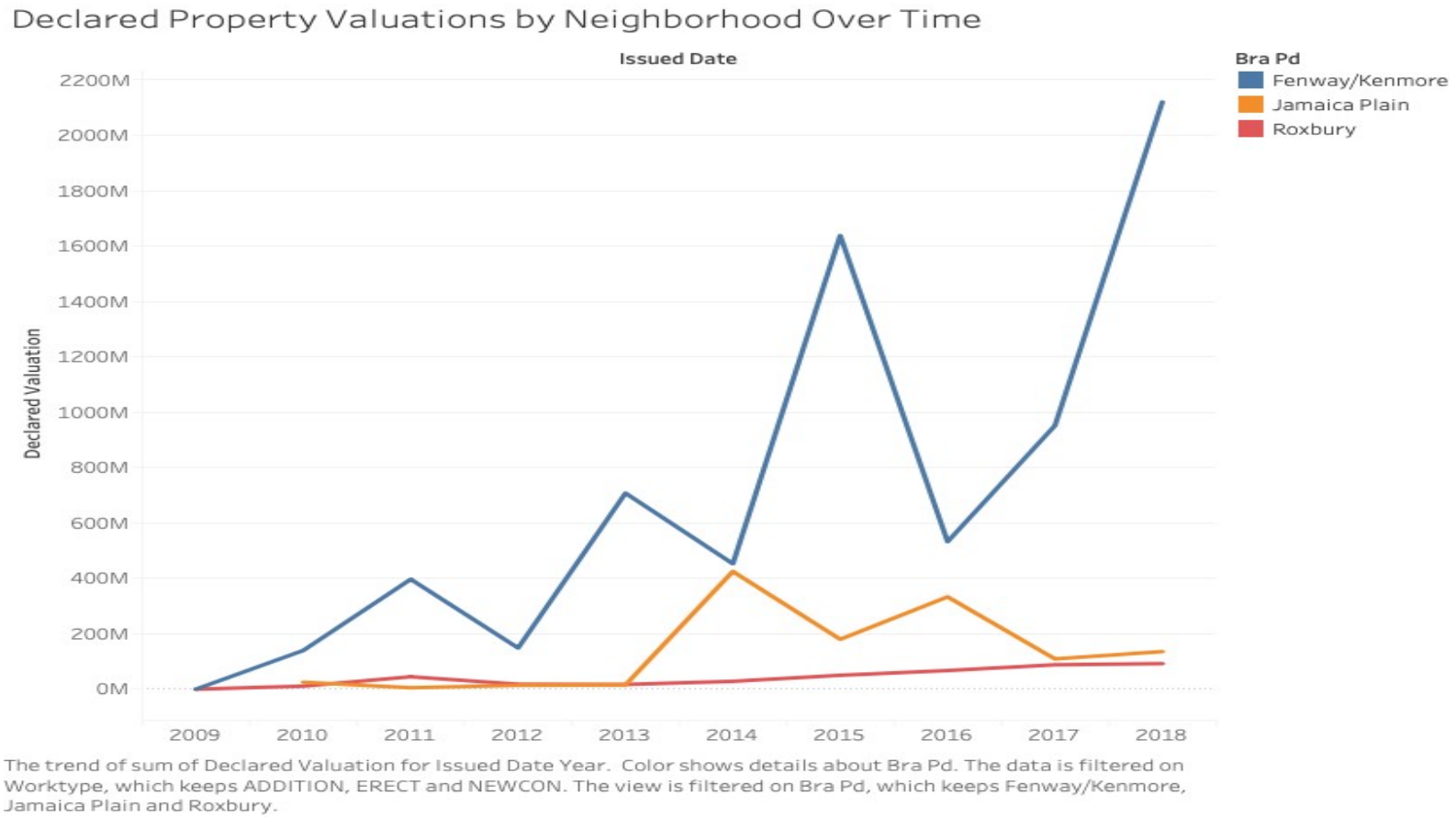
How can Tableau help us to answer research questions?

Example research questions

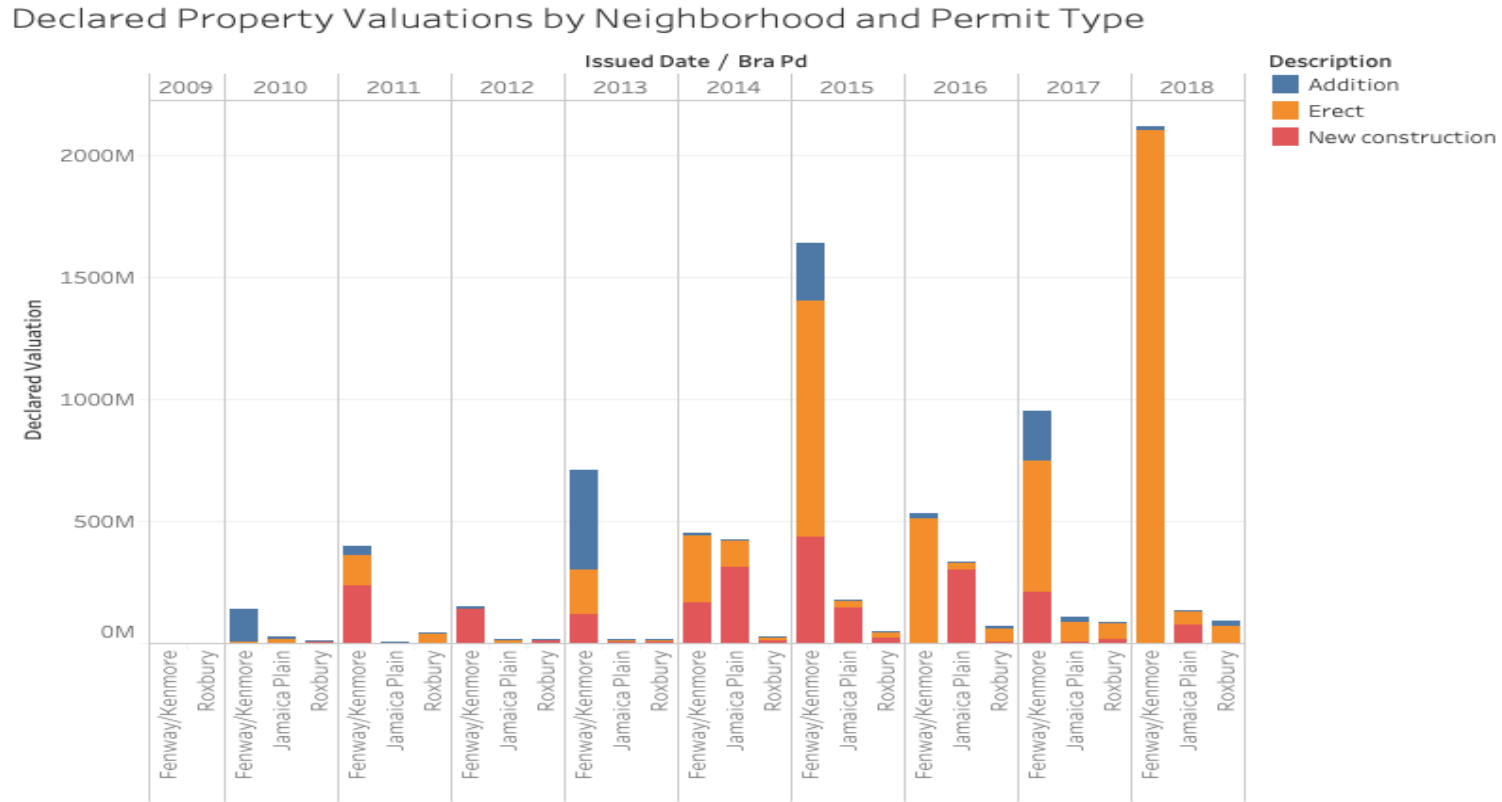
- How much value are new constructions and renovations adding to their neighborhood over time?
- How much value does each type of construction add to each neighborhood's overall valuation?
- What different types of industry are building in these neighborhoods?

Consider: What kinds of data are important or useful for governments, companies, and other powerful actors to keep track of?

How much value are new constructions and renovations adding to their neighborhoods over time?



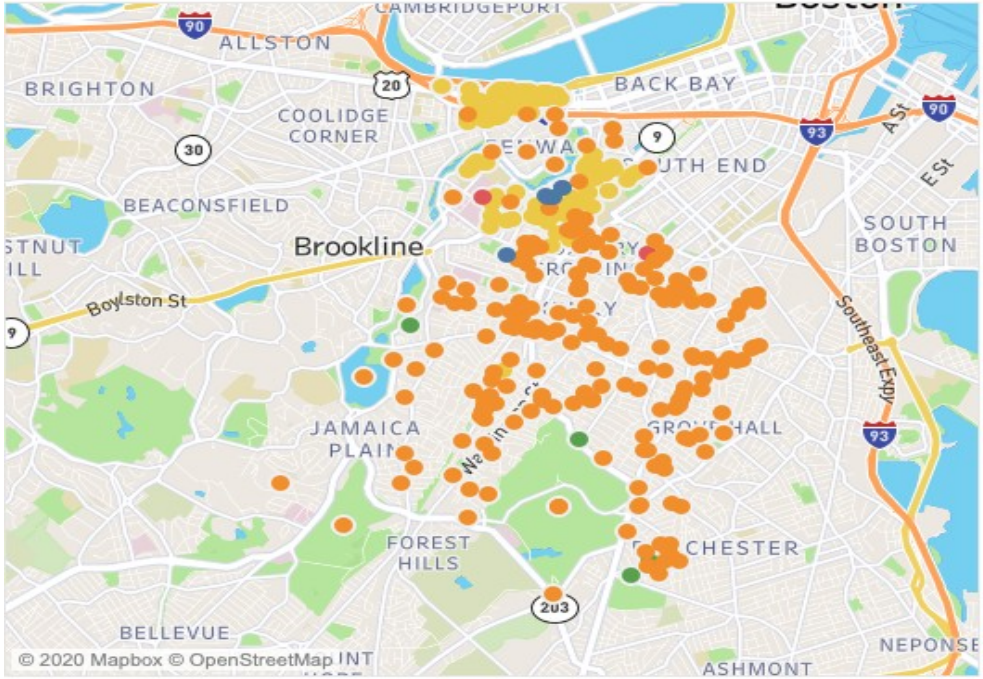
How much value does each type of construction add to each neighborhood's overall valuation?



Sum of Declared Valuation for each Bra Pd broken down by Issued Date Year. Color shows details about Description. The data is filtered on Worktype, which keeps ADDITION, ERECT and NEWCON. The view is filtered on Bra Pd, which keeps Fenway/Kenmore, Jamaica Plain and Roxbury.

What different types of industry are building in these neighborhoods?

Permits by Industry Type for Fenway/Kenmore, Jamaica Plain and Roxbury



Industrycategory
- Civic
- Government
- HealthCare
- Religious
- UpperEd

Map based on X and Y. Color shows details about Industrycategory. The data is filtered on Bra Pd, which keeps Fenway/Kenmore, Jamaica Plain and Roxbury. The view is filtered on Industrycategory, which keeps Civic, Government, HealthCare, Religious and UpperEd.

For Further Exploration

Installing Tableau handout

Copyright and fair use handout

Data Ethics handout

Data Privacy handout

Thank you!

—Developed by Ana Abraham, Chris McNulty, Sean P. Rogers, and Dipa Desai.

- For more information on DITI, please see: https://bit.ly/diti-about
- Schedule an appointment with us! https://bit.ly/diti-meeting
- If you have any questions, contact us at: nulab.info@gmail.com
- We'd love your feedback! Please fill out a short survey: https://bit.ly/diti-feedback
- Find all of the course materials at: https://bit.ly/sp26-parr-hist1357-multi