

# Basics of Spatial Visualization

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Coffee & Code | September 19, 2018

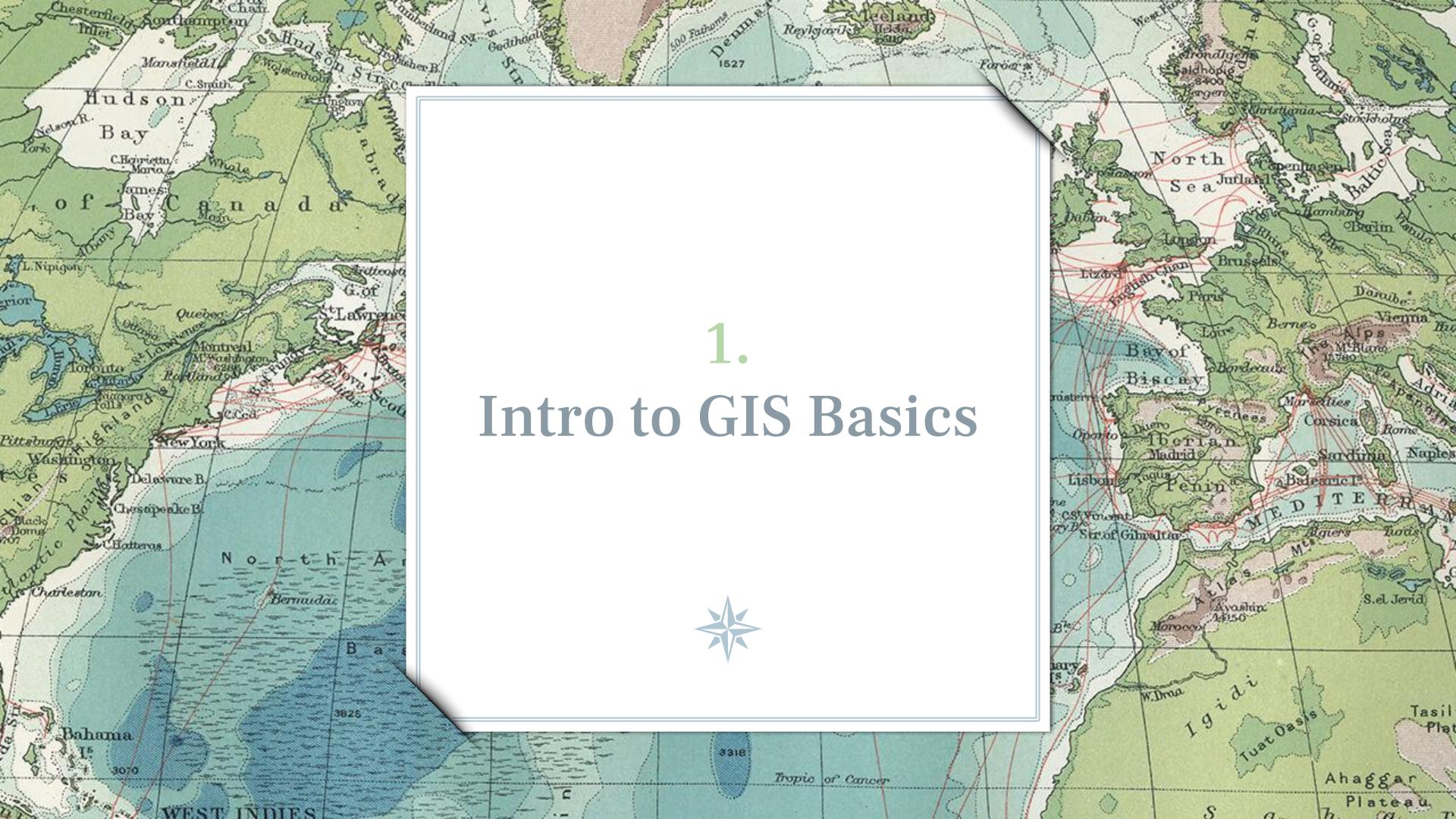


# Overview



All materials for this workshop can be found at [bit.ly/spatialvizbasics](https://bit.ly/spatialvizbasics)

- Intro to GIS Basics
- Types of Maps
- Exercise 1
- Working with Data
- Data Resources
- Exercise 2
- Q&A



# 1. Intro to GIS Basics



# Vector VS. Raster

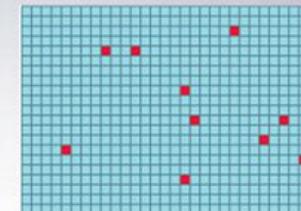
Two major types of spatial data are vector and raster data in GIS.

**Vector points** are simply XY coordinates. Generally, they are a latitude and longitude with a spatial reference frame.

**Raster data** is made up of pixels (also referred to as grid cells). Each pixel has its own value.



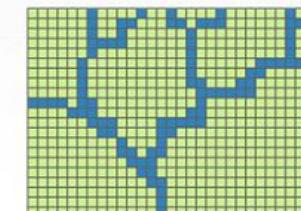
Point features



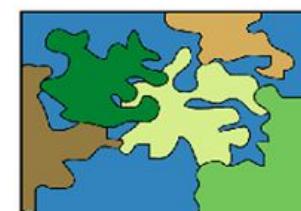
Raster point features



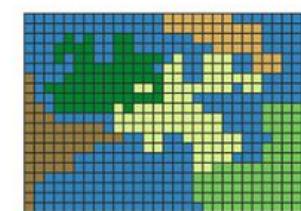
Line features



Raster line features

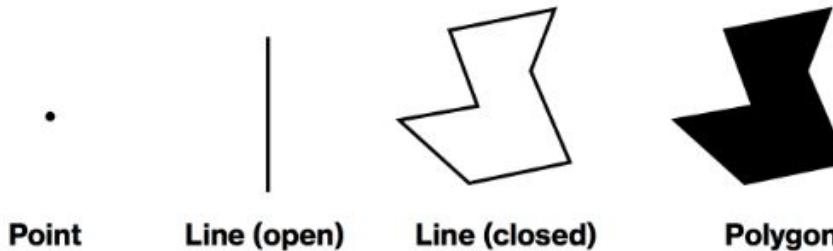


Polygon features



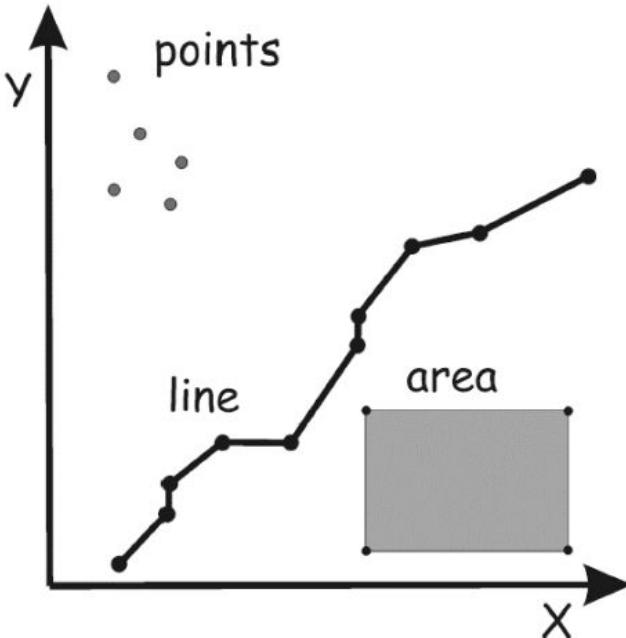
Raster polygon features

# Vector Data

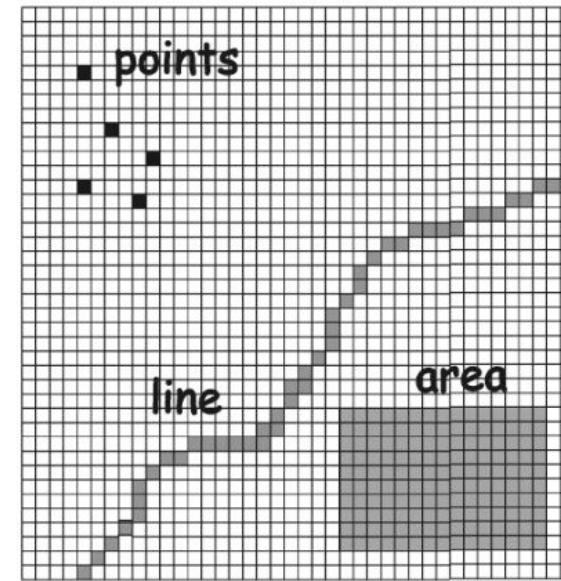


- **Point:** A point is composed of one coordinate pair representing a specific location in a coordinate system. ([Example](#): Prohibition Raids in New Orleans, 1919-1933)
- **Line (connection):** A polyline is composed of a sequence of two or more coordinate pairs. ([Example](#): Which Flight Will Get You There Fastest?)
- **Polygon:** A polygon is composed of one or more lines whose starting and ending coordinate pairs are the same. ([Example](#): Mapping Poverty in America)

## Vector



## Raster



# Raster Data

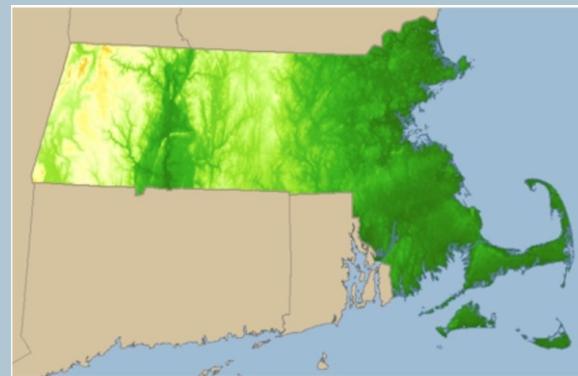
Raster data can usually be seen as 2 main types:

**Imagery**



(ex. Satellite Imagery of Boston Area)

**Elevation models**

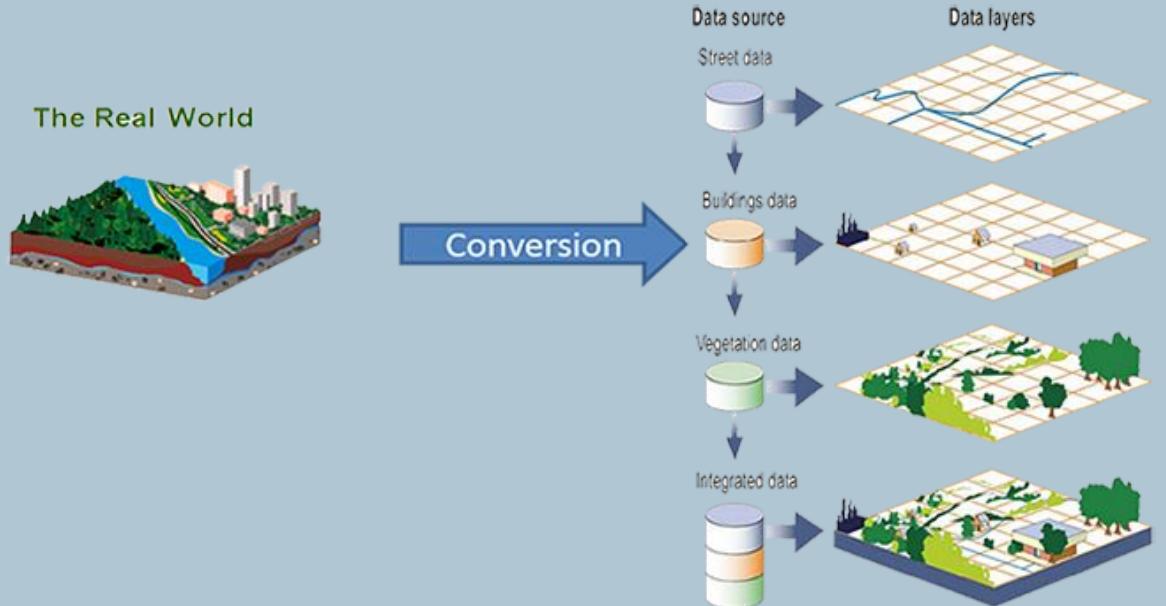


(ex. Surface elevation of Massachusetts)

# Layers

Layers may be represented in two ways: in vector format as points and lines or in raster (or image) format as pixels.

**Examples** of map layers include streams and lakes, terrain, roads, political boundaries, parcels, building footprints, utility lines, an orthophoto imagery. Each map layer is used to display and work with a specific GIS dataset.

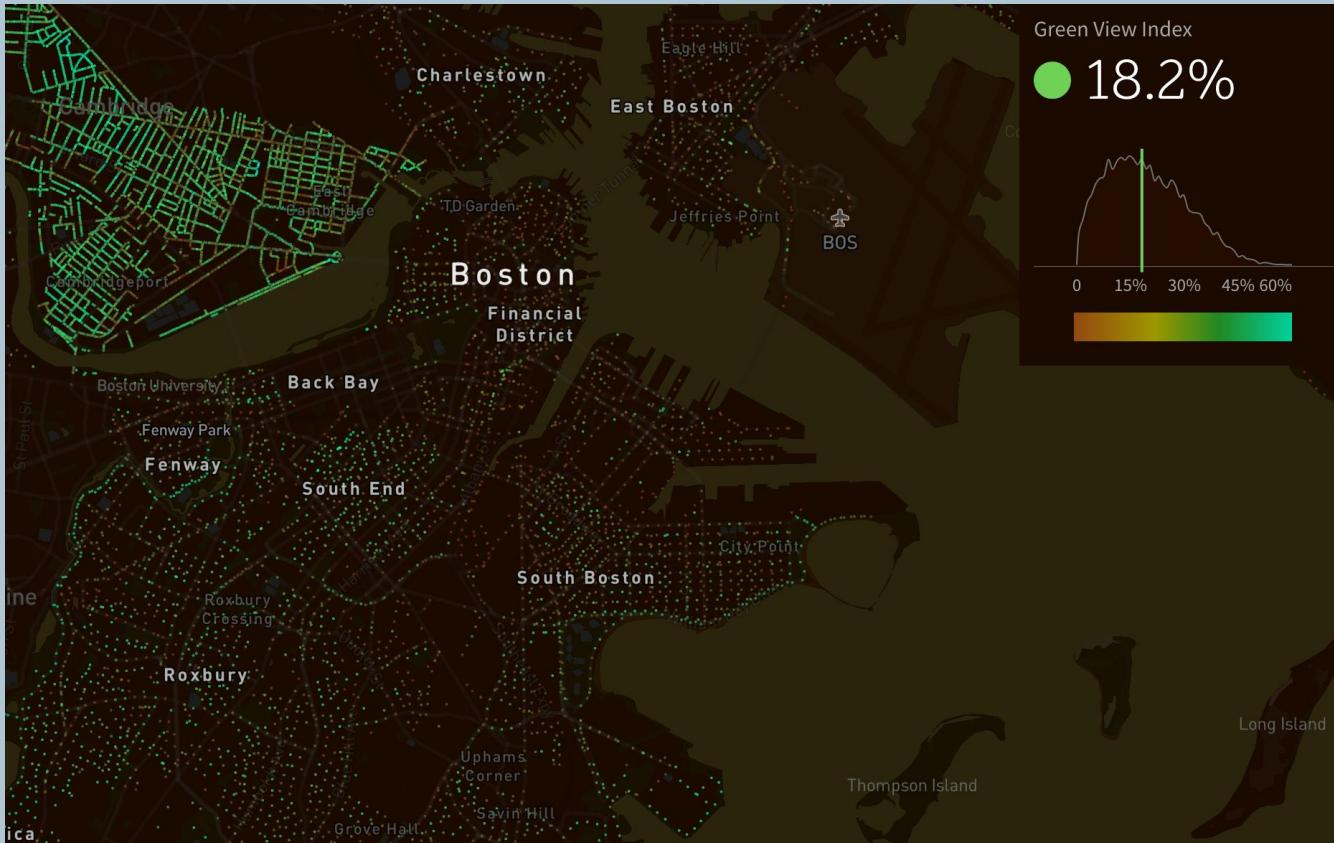




## 2. Types of Maps

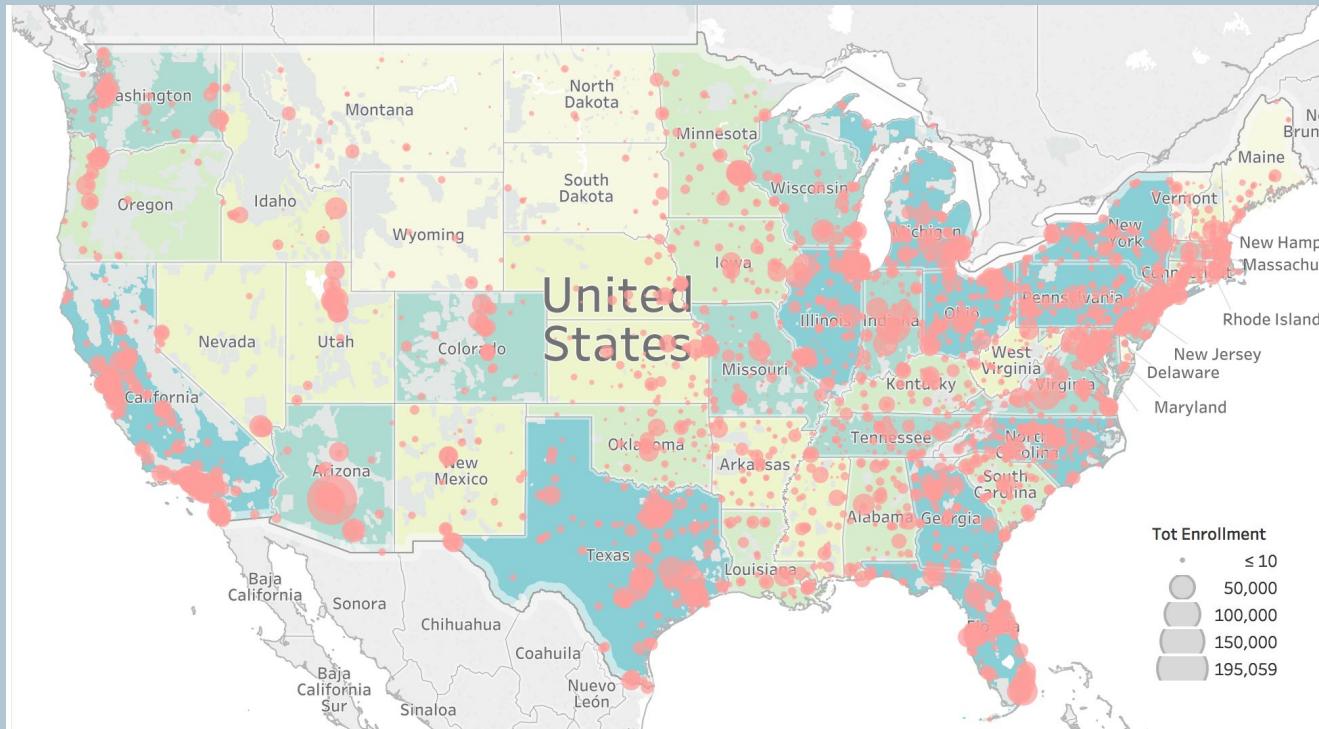


# Point Map/Dot Map



MIT Senseable  
City Lab.  
*Exploring the  
Green Canopy.*  
[http://senseable.  
mit.edu/treepedi  
a/cities/boston](http://senseable.mit.edu/treepedi/a/cities/boston)

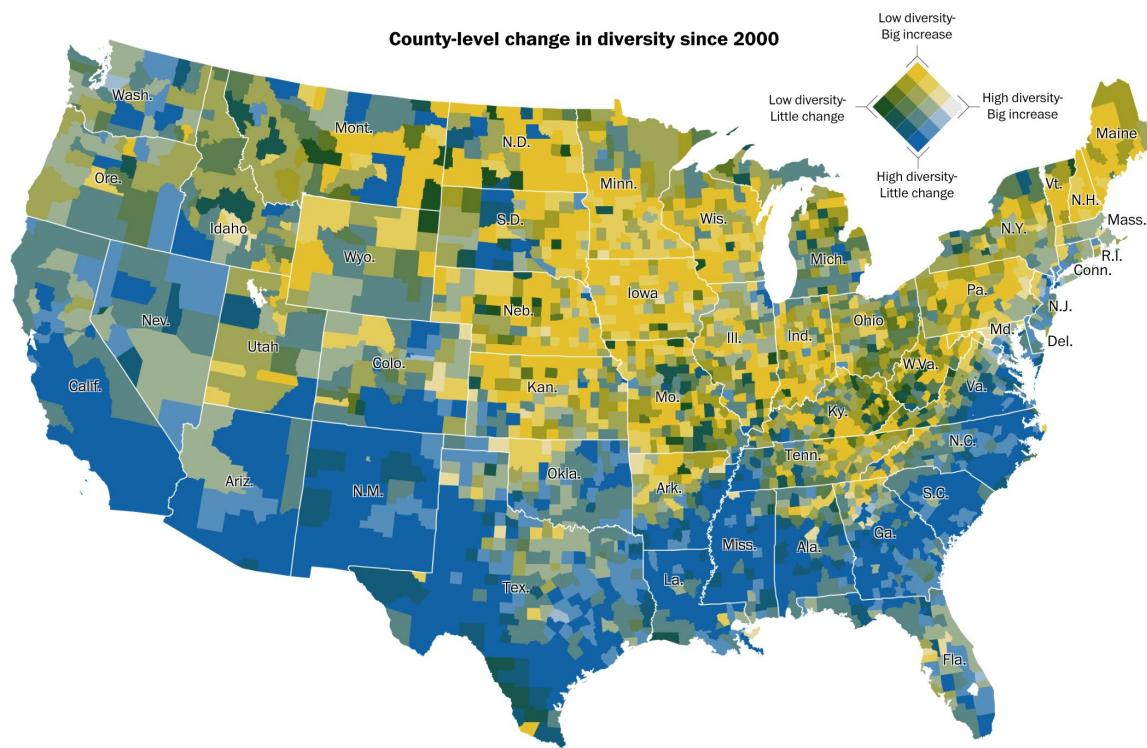
# Bubble Map



Allison Xu, "University Enrollment in the United States."

[https://public.tableau.com/views/U\\_S\\_CollegesandUniversitiesEnrollmentandPopulationbyState/Dashboard1](https://public.tableau.com/views/U_S_CollegesandUniversitiesEnrollmentandPopulationbyState/Dashboard1)

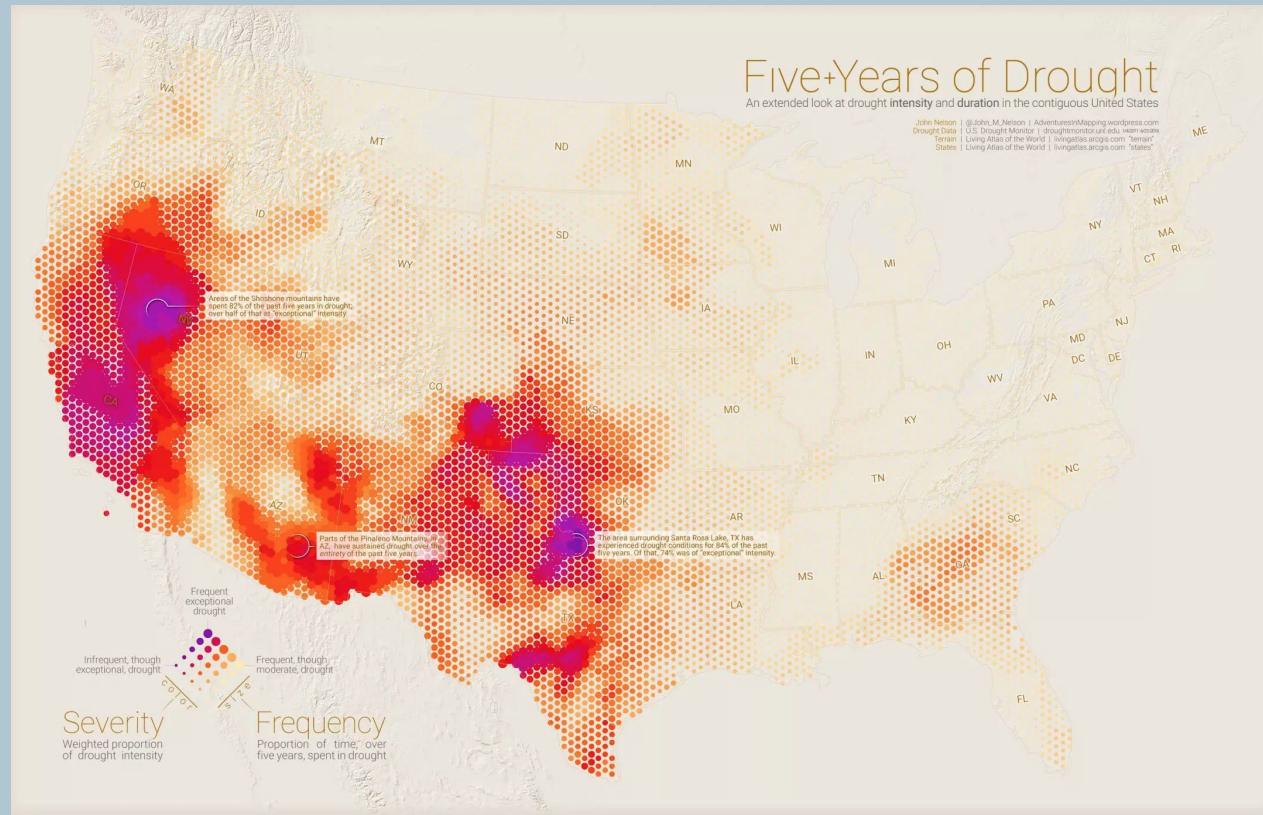
# Choropleth Map



Dan Keating and Laris Karklis, "The Increasingly Diverse United States of America," *The Washington Post*, 2016.

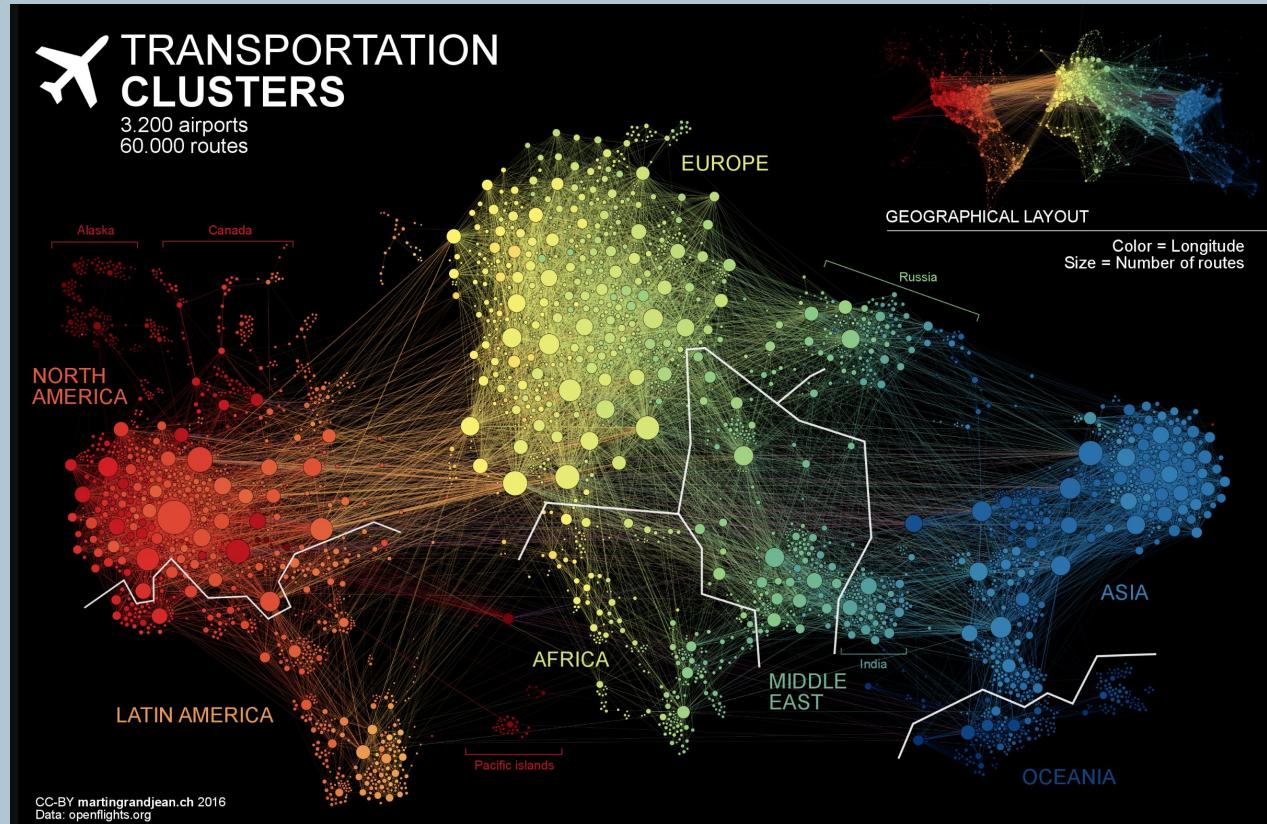
<https://www.washingtonpost.com/graphics/national/how-diverse-is-america/>

# Heat Map



John Nelson. "Adventures in Mapping."  
<https://adventuresinmapping.com/2016/07/12/five-years-of-drought/>

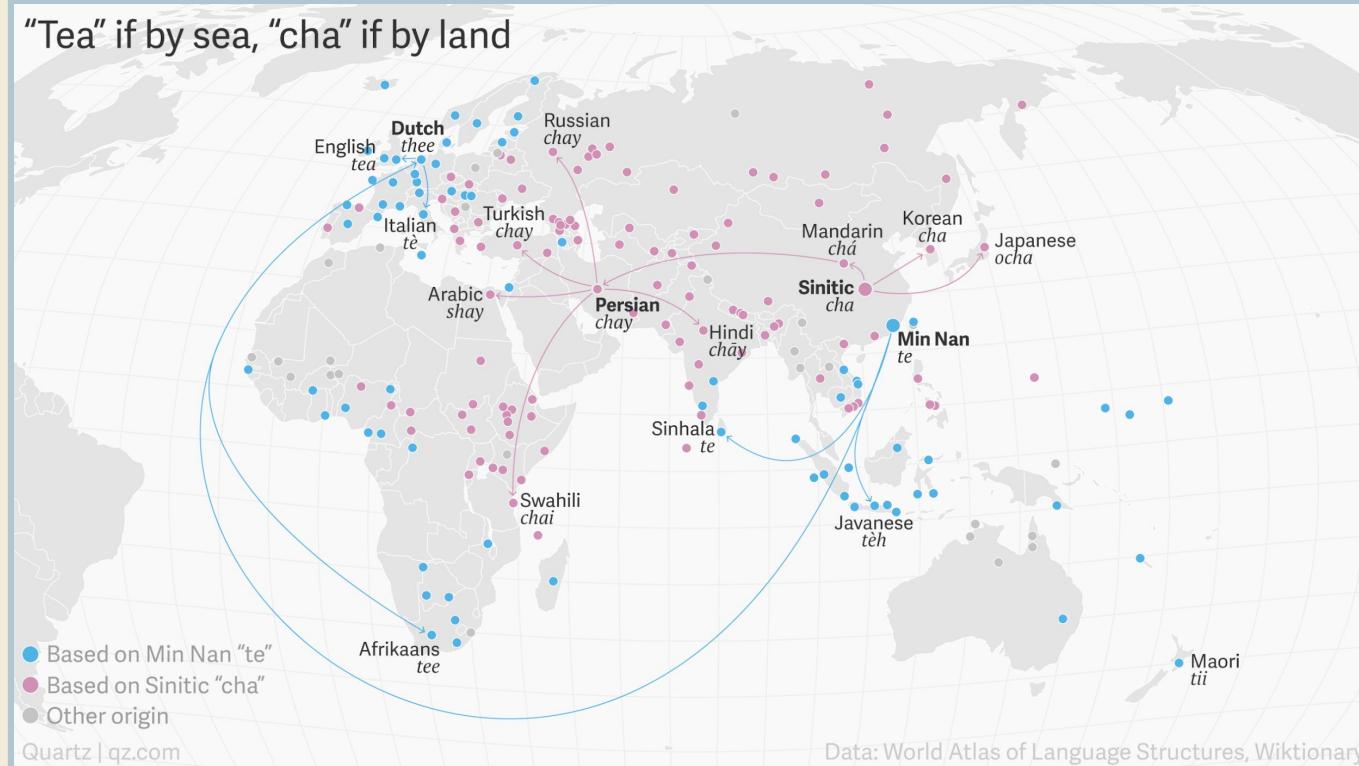
# Connection Map



Randy Krum, "The Global Air Transportation Network."  
<http://coolinfographics.com/blog/2016/6/3/the-global-air-transportation-network.html>

# Flow Map

“Tea” if by sea, “cha” if by land



Nikhil Sonnad, “Tea if by sea, cha if by land,”  
*Quartz*, 2018.  
[https://qz.com/1176962/  
map-how-the-word-tea-spread-over-land-and  
-sea-to-conquer-the-world/](https://qz.com/1176962/map-how-the-word-tea-spread-over-land-and-sea-to-conquer-the-world/)

# 3. Exercise 1

Go to [bit.ly/spatialvizbasics](https://bit.ly/spatialvizbasics)



# Exercise 1: Projects



- Alexander, Madi. [Oklahoma Earthquakes](#)
- Esri. [Males and Females without health insurance in the United States](#)
- Kijas, Anna. [IMLS Discretionary Grant Funding 1996-2014](#)
- Knightlab. [Arya's Journey](#)
- MIT Senseable City Lab. [Treepedia](#)

# Exercise 1: Discussion Questions



- What type of map is it?
- What is the underlying data source?
- What goal or research question does this map addresses? Is it clear?
- Is it interactive, if so, how?
- How was the map created? Do you know which software, tools, methods, etc. were used?
- Is it user-friendly? If not, why not? What would you improve?
- Any other observations?



# 4. Working with Data



# Data Types



- Spatial Data: coordinate and projection data
- Attribute Data: characteristics about spatial data

Branch: master ▾
NolaProhibitionDataset / Prohibition raids, New Orleans 1919-1933 - Sheet1.csv
Find file
Copy path

 hcgridds Added .csv and .xlsx
d6514ca on Nov 7, 2016

1 contributor

1088 lines (1066 sloc) | 280 KB
Raw
Blame
History




 Search this file...

| 1  | Name                                | Type              | Date | Latitude  | Longitude  | Address   |
|----|-------------------------------------|-------------------|------|-----------|------------|---|
| 2  | Saloon at 116 Exchange Place        | bar               | 1919 | 29.953311 | -90.068361 | 116 Exchange Place, New Orleans, LA                 |
| 3  | Saloon of Anthony Bevinette         | bar               | 1919 | 29.946148 | -90.076776 | 1241 Howard Street, New Orleans, LA                 |
| 4  | Grocery and Barroom of John Ciolino | grocery           | 1919 | 29.966387 | -90.044567 | North Rampart and Cloutier Streets, New Orleans, LA |
| 5  | Paul DiMaggio's saloon              | bar               | 1919 | 29.946498 | -90.074157 | Baronne and Julia streets, New Orleans, LA          |
| 6  | John Duffy's Establishment          | bar               | 1920 | 29.966563 | -90.086616 | Iberville and Broad, New Orleans, LA                |
| 7  | Lea Dunn                            | private residence | 1920 | 29.945465 | -90.071834 | 819 St. Charles Street, New Orleans, LA             |
| 8  | Harry Brown                         | private residence | 1920 | 29.941751 | -90.071597 | 1067 Camp Street, New Orleans, LA                   |
| 9  | Harry Long                          | private residence | 1920 | 29.958205 | -90.069467 | 1016 St. Louis Street, New Orleans, LA              |
| 10 | Theodore Peters                     | private residence | 1920 | 29.966545 | -90.086616 | 201 North Broad Street, New Orleans, LA             |
| 11 | Abeb Hellan                         | private residence | 1920 | 29.957618 | -90.067943 | 889 St. Louis Street, New Orleans, LA               |

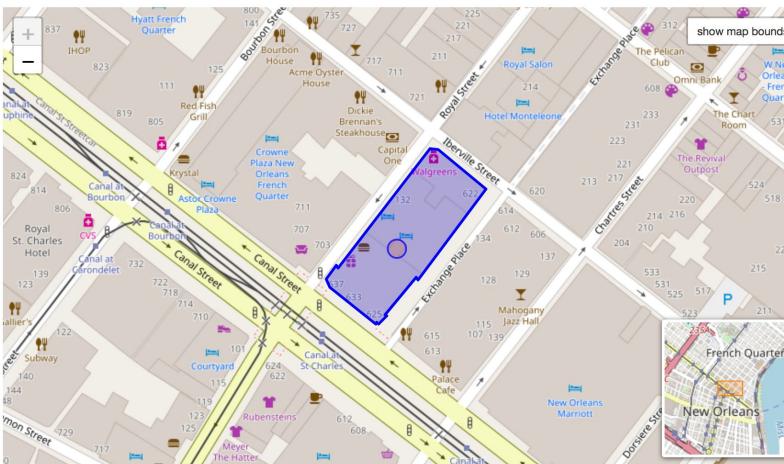
Hannah Griggs, “Nola Prohibition Dataset.” <https://github.com/hcgridds/NolaProhibitionDataset>

# Common File Formats

| <b>Format</b>                             | <b>Standard</b> | <b>Features</b>  | <b>Examples of Supported Software</b>                     |
|---|-----------------|--|---|
| <b>GeoJSON</b>                            | Open            | Vector<br>Non-spatial attributes                       | ArcGIS, QGIS, OpenLayers, Leaflet, Carto, PostGIS, Google |
| <b>CSV</b>                                | Open            | Vector<br>Non-spatial attributes                       | ArcGIS, QGIS, OpenLayers, Leaflet, Carto, Google, Tableau |
| <b>KML (Keyhole Markup Language)</b>      | Proprietary     | Vector<br>Media, text, links<br>Non-spatial attributes | ArcGIS, QGIS, Leaflet, Google Earth, Carto, Tableau       |
| <b>KMZ (zipped KML file)</b>              |                 |  |   |
| <b>Shapefile</b> (multiple related files) | Proprietary     | Vector<br>Non-spatial attributes                       | ArcGIS, QGIS, Leaflet, Carto, Tableau                     |

# Geocoding

The process of converting a description of an address (street name, city, state, country, postal code) into geographic coordinates.



116 Exchange Place, New Orleans => 29.953311, -90.068361

# How do you geocode?



## Web-based Services

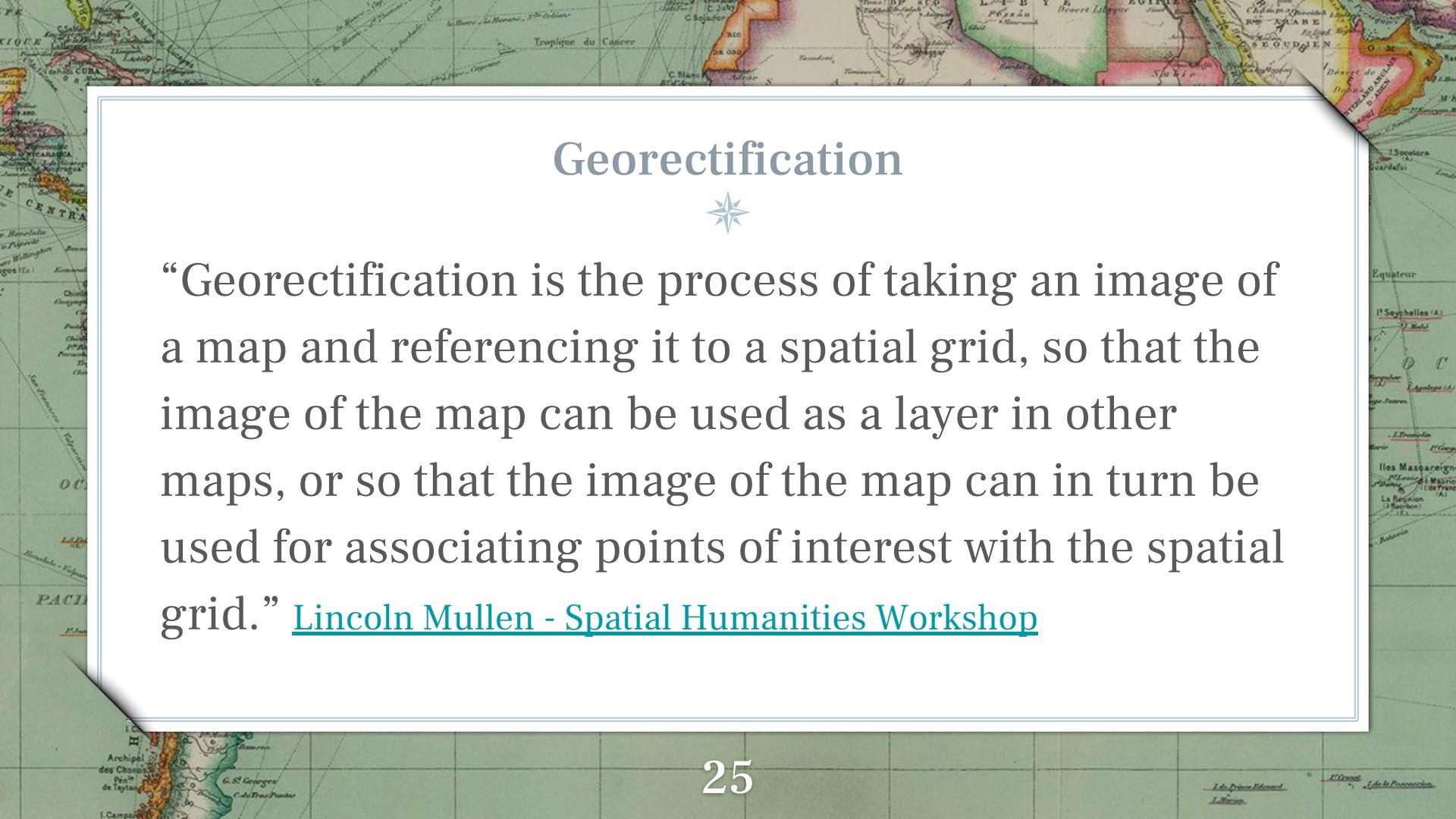
- [OpenStreetMap Nominatim tool](#)
- [Census geocoder](#) (specific to Census or survey data)
- [BatchGeo](#)

## Software Apps

- [QGIS \(tutorial\)](#)
- [ArcGIS](#)
- [Carto](#)

## API/Programming Languages

- [OpenCage Geocoder](#) (via OpenRefine)
- [MapBox Geocoding API](#)
- [Google Maps API](#) (read restrictions)
- [Ruby Geocoder](#)
- [Geocoder in Python](#)



# Georectification



“Georectification is the process of taking an image of a map and referencing it to a spatial grid, so that the image of the map can be used as a layer in other maps, or so that the image of the map can in turn be used for associating points of interest with the spatial grid.” [Lincoln Mullen - Spatial Humanities Workshop](#)



NYPL Map Warper:  
<http://maps.nypl.org/warper/maps/32555>

# A Few Georectification Tools



- [MapWarper](#)
- [David Rumsey Historical Map Collection](#)
- [ArcGIS](#)
- [QGIS](#)
- [WorldMap Warp](#)



## 5. Data Resources



# Resources: Where to Find Data



- [Social Explorer\\*](#)
- [Census - American Fact Finder](#)
- [City of Boston - Analyze Boston](#)
- [Data.gov](#)
- [Mass GIS](#)
- [Mento, Barbara. LibGuide: Finding Geospatial Data](#)
- [Wikipedia. GIS Data for Global Datasets](#)
- Data libraries connected to platforms (Tableau, Carto, WorldMap)

\*Check with your institution for subscription access

# 6. Exercise 2

Go to [bit.ly/spatialvizbasics](https://bit.ly/spatialvizbasics)



## Exercise 2



Consider your own research or pedagogical needs. What type of question(s) or arguments can you make with a spatial visualization? Reflect on these and other questions while drawing or sketching out a dataset, map, or other visualization.

- What type of map would help you answer this question?
- How could you use spatial visualization in a class setting?
- What type of data source(s) would you need?
- Would you create your own data or require an existing dataset?
- What kind of resources might you need access to?

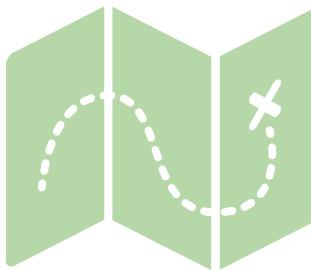
# Upcoming Events



More workshops focused on visualization

- Intro to Tableau (Sept. 25 or Oct. 16)
- Intro to Spatial Visualization & Analysis (Sept. 27)
- Georectifying Historical Maps (Nov. 14)

Visit <https://ds.bc.edu/2018-fall-events/> to register and view all upcoming workshops during the Fall semester.



THANKS!

Any questions?

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# CREDITS



Special thanks to all the people who made and released these awesome resources for free:

- Presentation template by [SlidesCarnival](#)
- Slide Background Maps from [David Rumsey Map Collection](#)