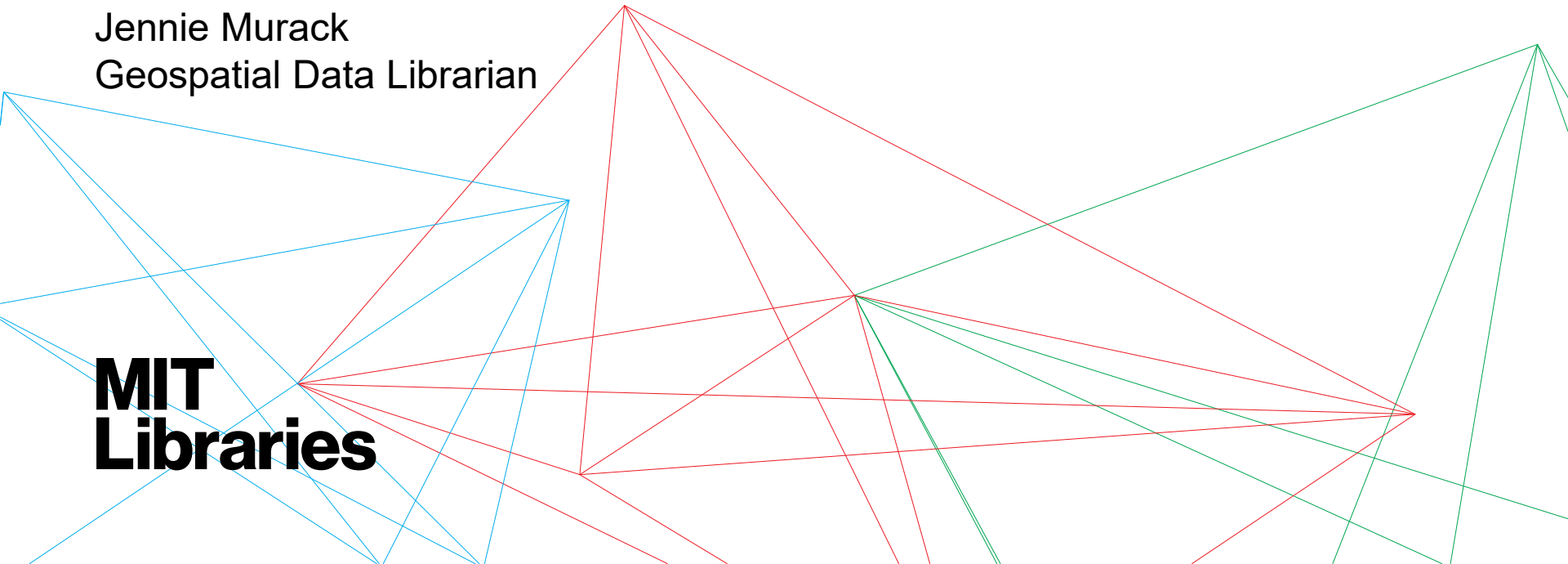
Creating Critical Thinkers in GIS Workshops

Jennie Murack
Geospatial Data Librarian

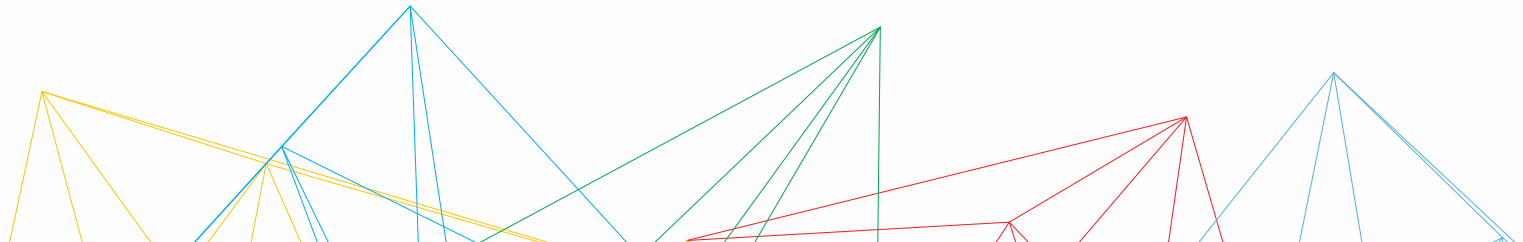


MIT Libraries

Outline

- About MIT & GIS Services
- Introduction to GIS workshop
- Workshop development process
- Teaching methods and theories
- Workshop content
- Future plans & tips

MIT Libraries



MIT

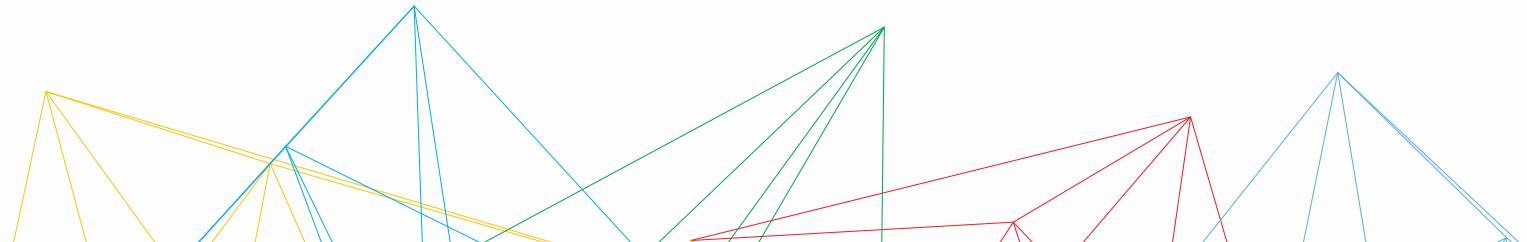
GIS Services

- GIS lab
- Data purchasing
- GIS data repository, GeoWeb
- One-on-one help
- Workshops

Introduction to GIS workshop

- Held in the summer, fall, and winter
- 2 ½ to 3 hours
- Open to entire MIT community

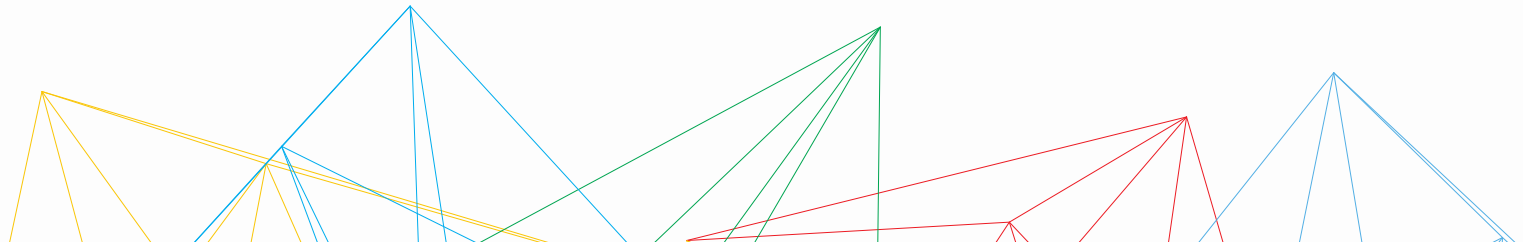
MIT Libraries



Why revise it?

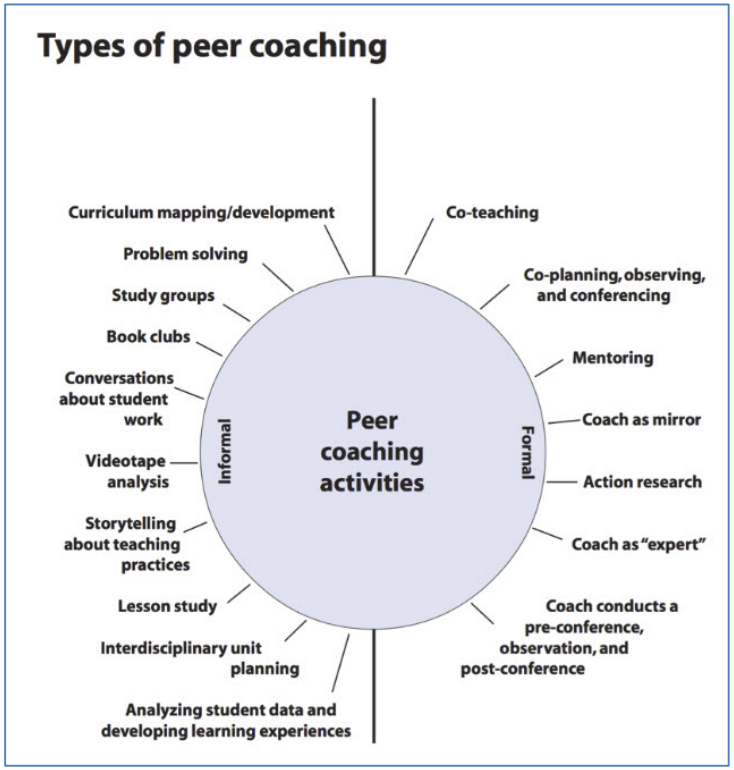
- Increase understanding of GIS concepts and provide more transferable skills
- Align with Libraries-wide DISJ goals
- Work toward the strategic plan for the Libraries

MIT Libraries



Workshop Development Process

- Peer coaching model
- Literature review & sharing
- Identify learning goals & skills
- Brainstorm lecture topics & activities
- Construct the workshop
- Lots of practice



From: http://acrlog.org/2017/06/19/peer-coaching-for-professional-learning/

MIT Libraries

Goals

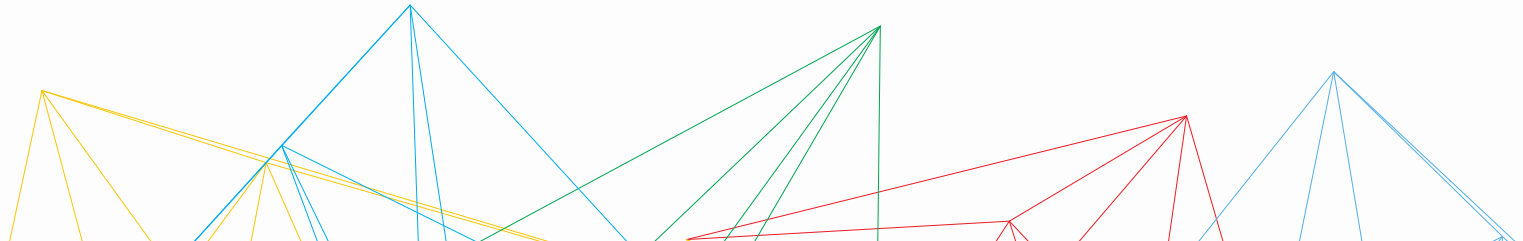
Attendees will:

- **Evaluate maps and data critically in order to understand potential biases caused by the creator, collection method, vizualization techniques, etc.**

- **Document their research processes so that others clearly understand and interpret the methods, tools and data used.**

- **Learn the technical skills necessary to choose the appropriate software and use it to accomplish their task.**

MIT Libraries



Teaching Methods & Theories

Scaffolding

- Break task into smaller parts
- Focus on prior knowledge

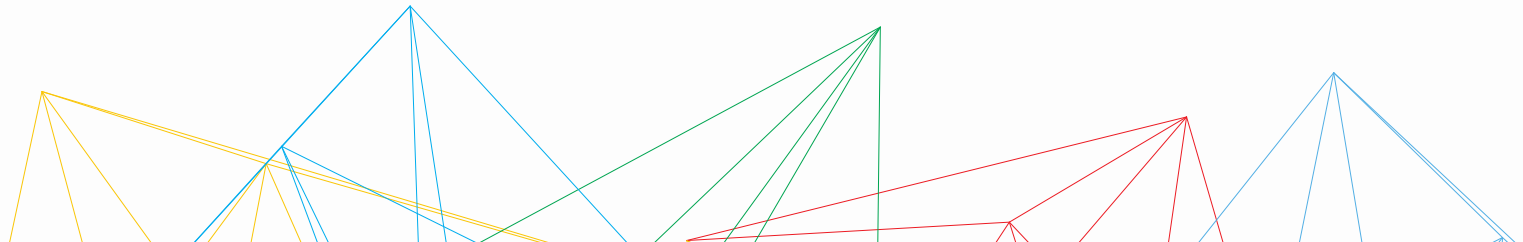
Segmented learning & retrieval

- Short activity or quiz after each section

Self-paced learning

- Hands-on tutorials

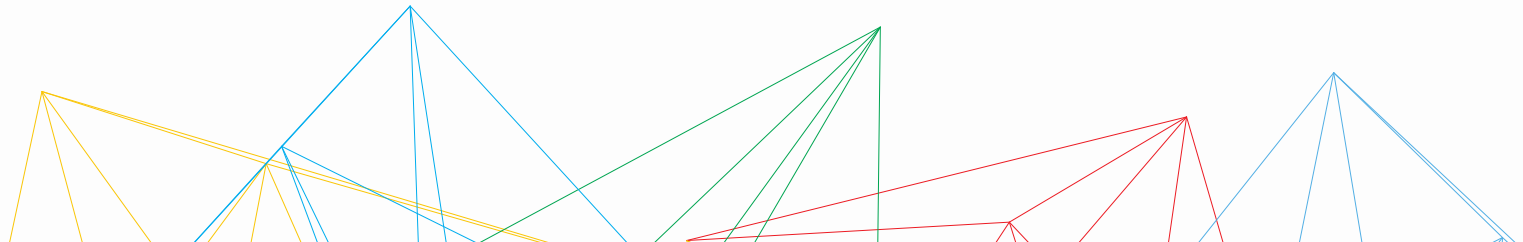
Use software to teach critical thinking skills



Workshop Content

- Overview of GIS & applications
- Understanding Maps & Data
- Designing Maps
- Software
- Exercise
- Discussion

MIT Libraries



Overview of GIS

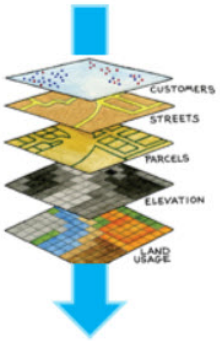
Theoretical Overview

GIS takes real world spatial data

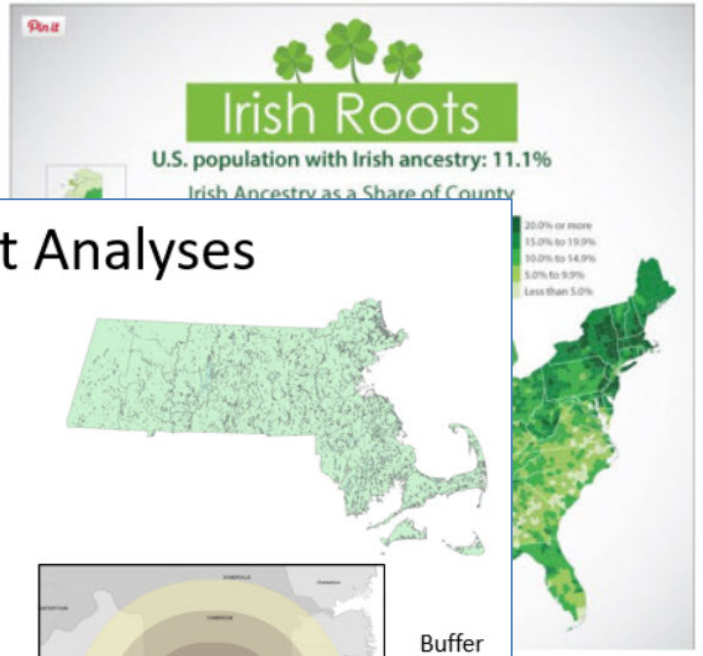
and treats different spatial features as individual “layers”

which can be assembled in any number or combination

and overlaid for analysis

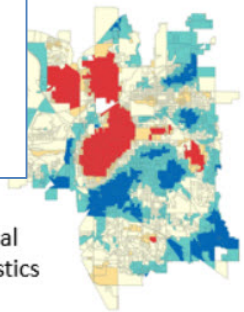


Create Maps

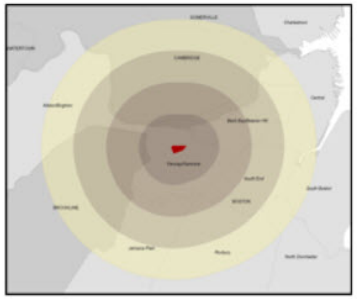


Conduct Analyses

Clip



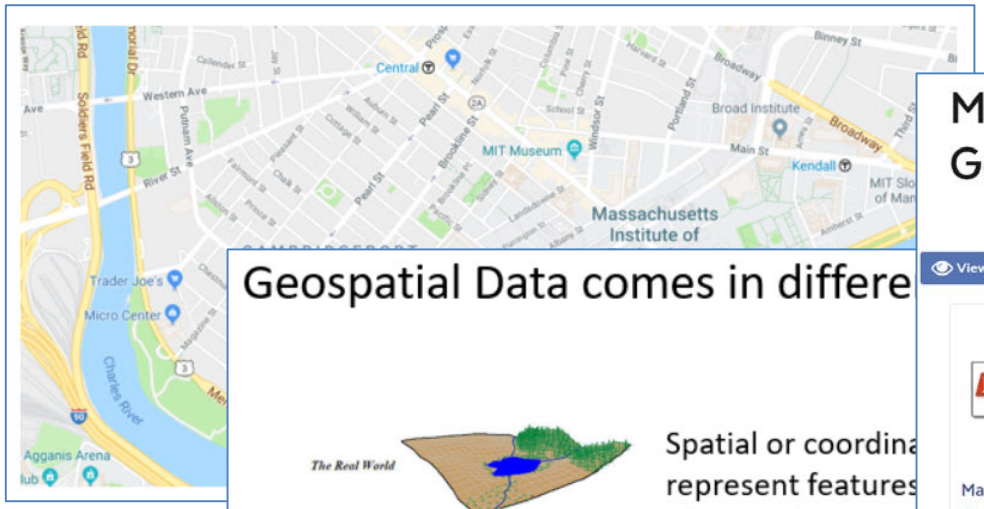
Spatial Statistics



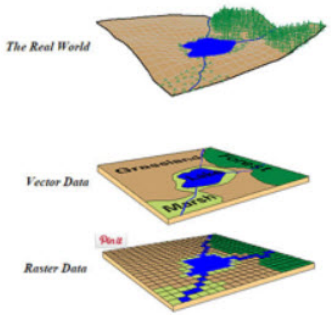
Buffer

MIT Libraries

Understanding Maps & Data



Geospatial Data comes in differe



Spatial or coordina
represent features
a known location

Vector:

Points, lines, an

Raster:

Row and column matrix

MassGIS Data: Licensed
Google Ortho Imagery

View | Revisions

MassGIS Data: Licensed Google Ortho Imagery

December 2017

Google Imagery available as a web service for all Massachusetts state government agencies, and to the public in OLIVER and other MassGIS web maps.

View imagery and index

This is a licensed product with limited availability to non-government users.

New! (12/12/17) -- Spring and summer 2017 imagery for the Cape Cod, Boston, Worcester and Springfield areas

MassGIS (Bureau of Geographic Information)

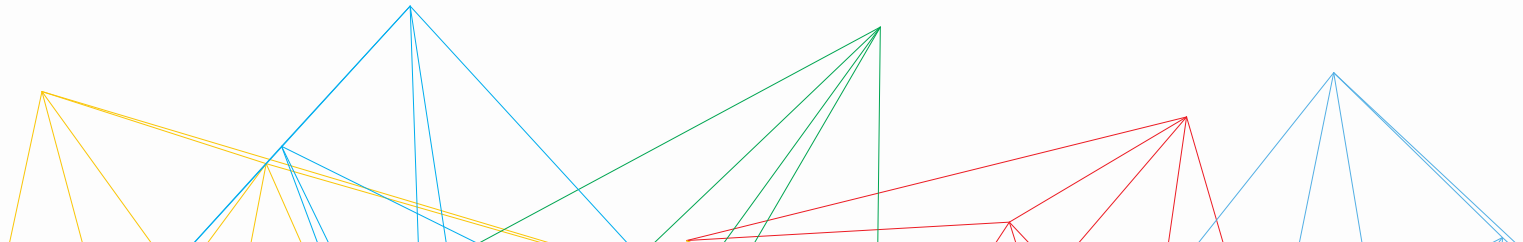
MassGIS maintains a comprehensive, statewide database of

MIT Libraries

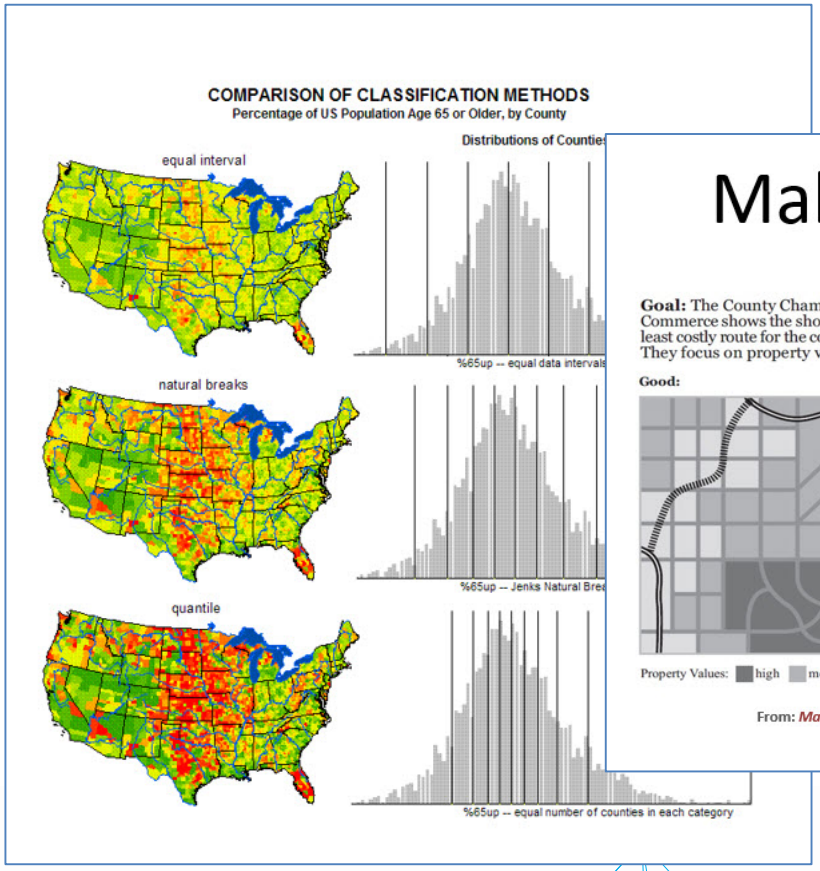
Understanding Maps & Data

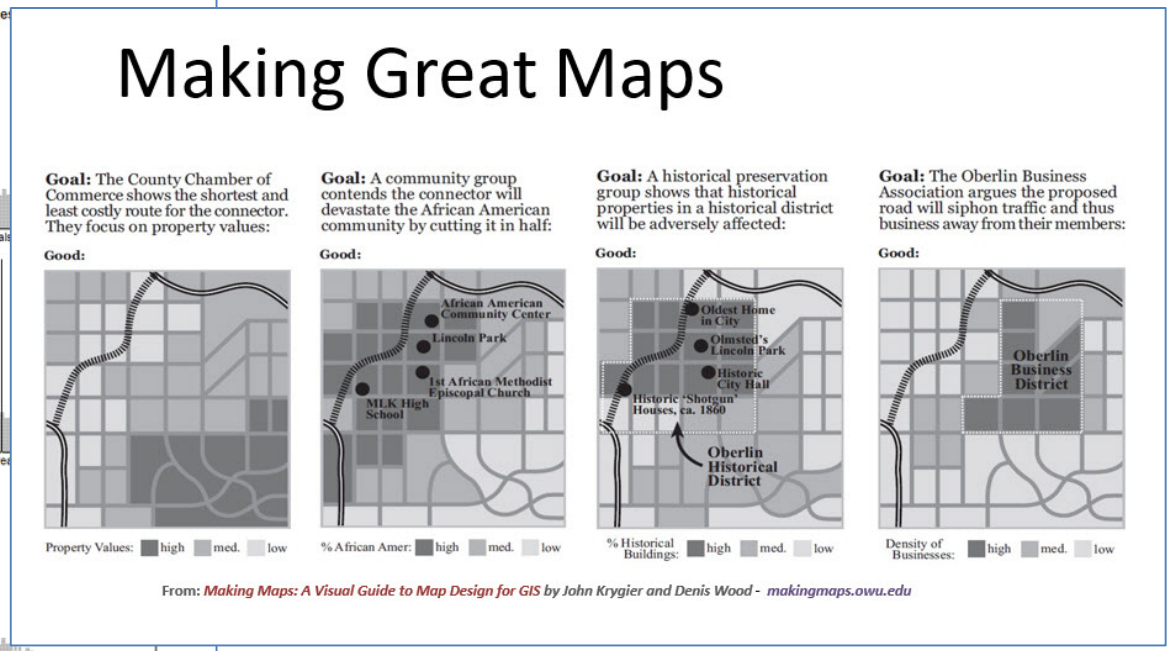
Concept	Activity
Data layers	Examine Google Maps, Use data layers in ArcMap
Characteristics and types of spatial data	Identify types of data layers in ArcMap
Tips for finding spatial data and metadata	Look at examples of metadata on websites, metadata “quiz”

MIT Libraries



Designing Maps





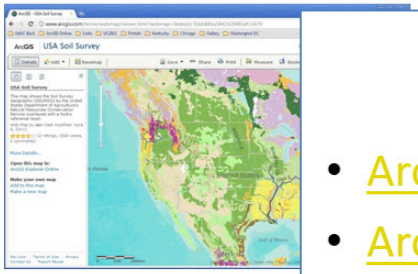
MIT Libraries

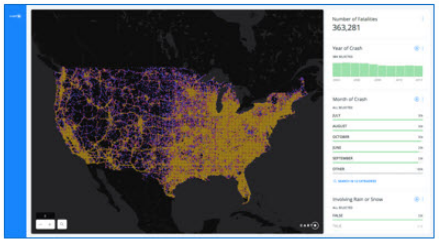
Software

Web-based

- ArcGIS Online*
- Carto*
- Mapbox
- Google MyMaps
- ESRI StoryMaps*

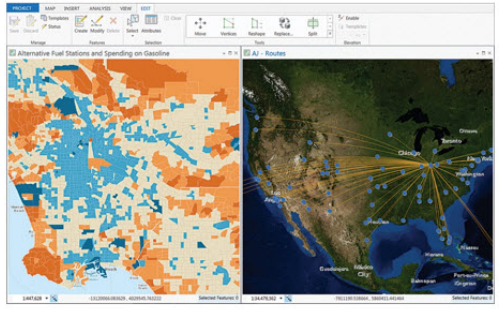
*use an MIT account for more storage

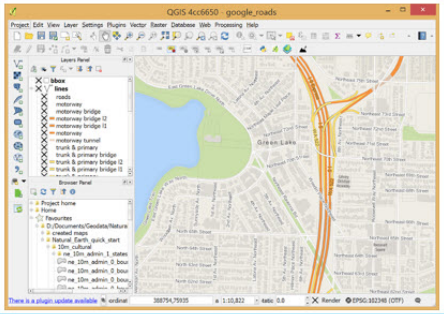




Desktop

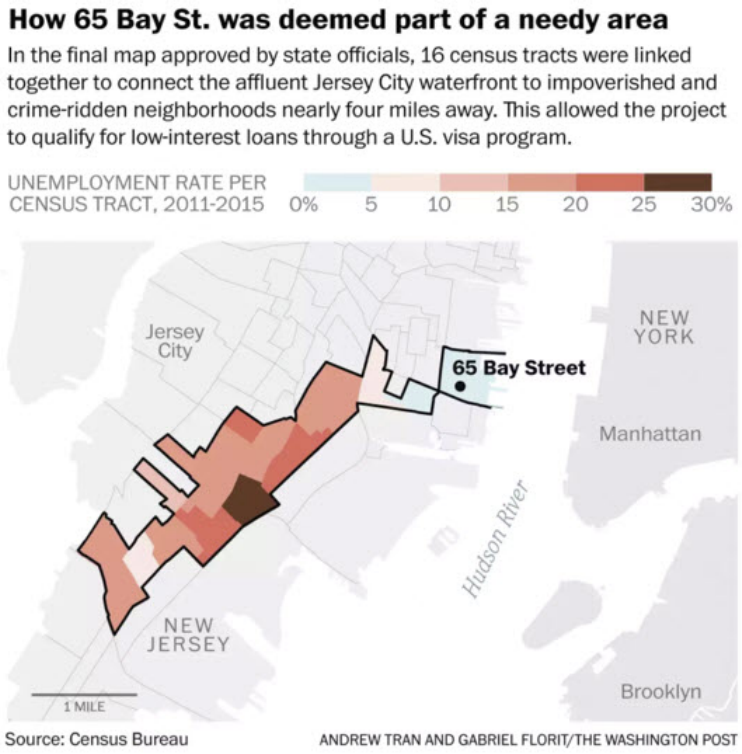
- ArcGIS Desktop (MIT only)
- ArcGIS Pro (MIT only)
- QGIS (Public)
- Specialized (Geoda, ENVI, CrimeStat, etc)





MIT Libraries

Exercise and Discussion



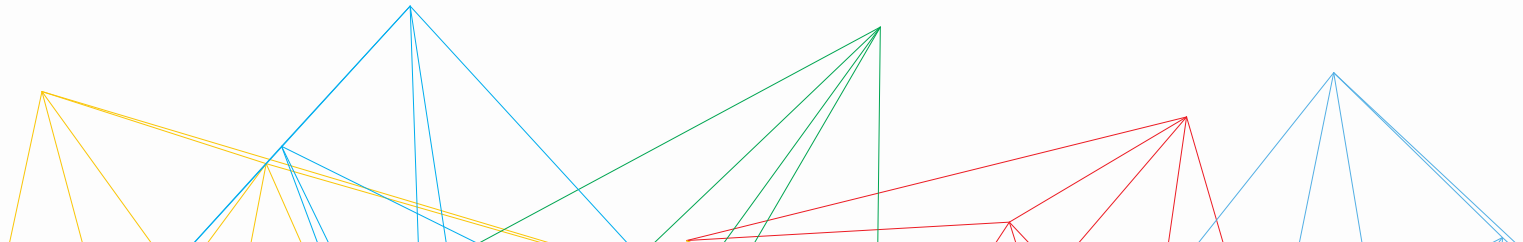
- Retrieval activity
- Self-paced
- Choice of ArcGIS or QGIS
- Open-ended: no “right” answer
- Shared some maps to reinforce critical thinking skills learned during workshop

MIT Libraries

Implementation and Feedback

- Two workshops were held in January 2018 with 39 total attendees
- Attendees were emailed a survey after the workshops. Respondents reported:
  - an increase in knowledge of all GIS concepts, with knowledge of GIS software options increasing the most
  - a better understanding of the data literacy and critical thinking skills that we were trying to teach, especially, “I understand how my map design can be used to influence the map audience.”

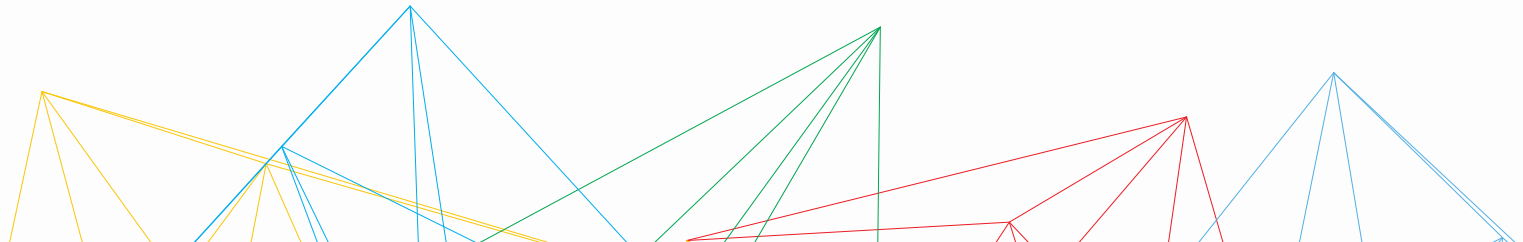
MIT Libraries



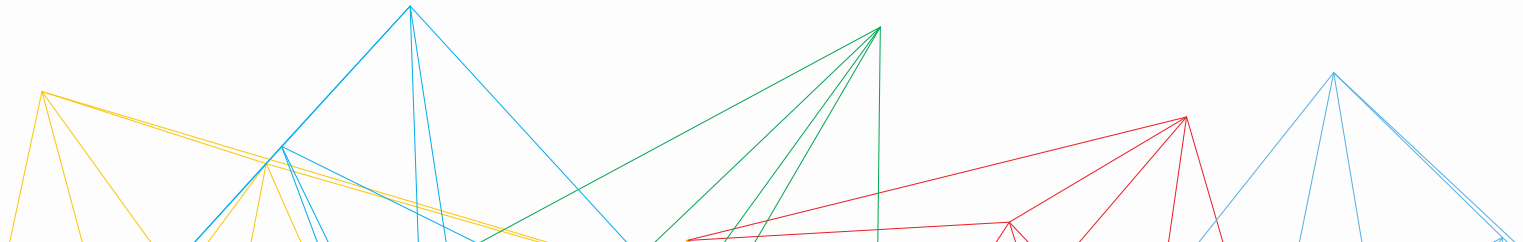
Looking ahead

- More retrieval activities & integration of critical thinking skills
- Plan ways to integrate other software
- Focus on documenting the research process in other GIS workshops
- Re-design more workshops, starting with GIS Level 2
- Provide activities that attendees can do on their own after the workshop to reinforce learning
- Review the workshops on an annual basis

MIT Libraries



Tips & Tricks

- Allocate and schedule lots of time for planning.
- Use the software as a way to teach concepts, rather than trying to teach how to use the software.
- Start with maps and mapping tools that attendees may already be familiar with and build on that knowledge.
- Integrate retrieval and testing activities frequently.
- Keep activities open-ended.
- Collect examples of maps and mapping stories.
- Allow for flexibility of activities, depending on time, the ability of participants, room set-up, etc.

MIT Libraries