

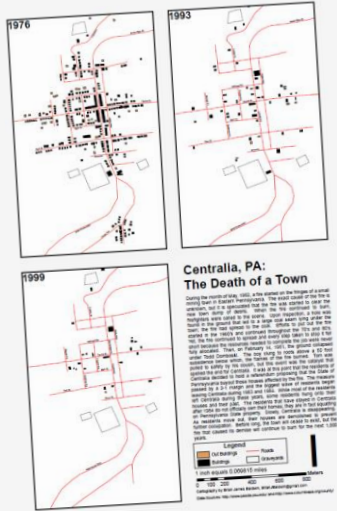
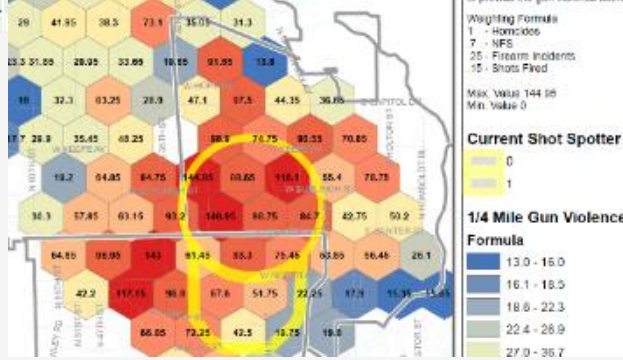


Teaching Introductory GIS Using ArcGIS Online

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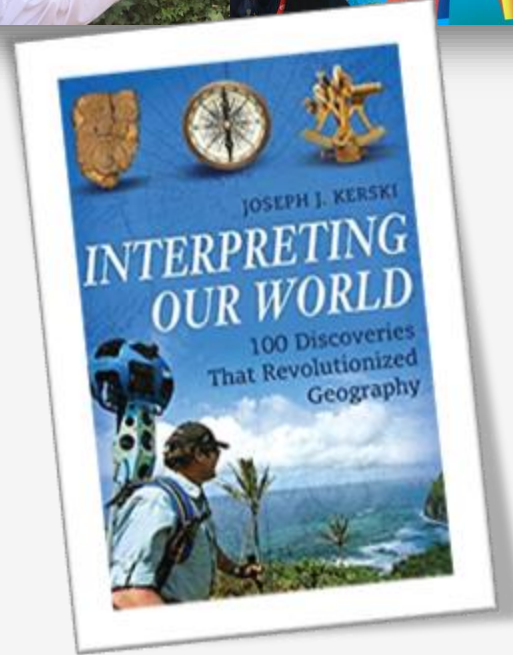


GENESEO
THE STATE UNIVERSITY OF NEW YORK



THE UNIVERSITY of
NEW ORLEANS





Esri's Education Program

Enabling, Encouraging, and Equipping

... future decision makers to think spatially and critically, solve problems, and use geotechnologies effectively to build a resilient world and become the change agents of tomorrow.

- 7,000+ universities globally
- Free licenses for all K-12 (Esri Schools)
- Education, research, and operations



Goals for this session

- Discuss how GIS has changed
- Strategies for teaching with ArcGIS Online
 - Field work
 - Spatial analysis
 - Sharing & collaborating
 - Common geographic themes
- Discuss methods for assessing student work
- Review sources of content (textbooks, readings, lessons, etc.)





...GIS has changed.

Software products	→	Platforms and APIs
2D	→	2D/3D/4D AR/VR
Client/server	→	Web Services and apps
Standalone desktop	→	Connected devices
Printed maps	→	Web maps, dashboards, other apps
Static data	→	Data services, live streams, big data
Custom applications	→	Interoperable packages, libraries
Single, all-purpose application	→	Focused apps
Proprietary data	→	Open Data & Shared Services
Using data created by others	→	Combining others' data with our own
Limited sharing	→	Many ways to share
Niche technology	→	Ties to larger IT community: GitHub
Some attention to societal concerns	→	Much attention to societal concerns
Mapping department	→	Integrated across the business

...GIS has changed.

What is the goal of an intro GIS course?

- Given these changes:
- What content should we teach in introductory GIS courses?
- What tools should we use?
- What approaches should we use?
- What are our goals in "Intro to GIS"?
- Who is our audience?
- Should we even call it "Intro to GIS"?

Considerations: Introductory GIS

- **Audience:** GIScience, geography, environmental science, general elective course, other?
- **Goals:** Cultivate GIS/Geo majors? Retention at the university? Other?
 - Do all the foundations need to be covered in your intro course?
- **Content:** Can we teach everything in ArcGIS Online that we did in ArcMap and ArcGIS Pro?
- **Approaches:** Field, lecture, discussion, hands-on activities, reflect on each others' work, presentations.
- **Lessons:** How should we structure the lessons?
- **Assessment:** How should we assess student progress in the Web GIS paradigm?
- **Tools:** Which tools should you use? What tools are available. Brian will lead us!

Needs to build StoryMaps for Art History

Creating map layouts for a conference poster presentation

Building a dashboard to share public health data

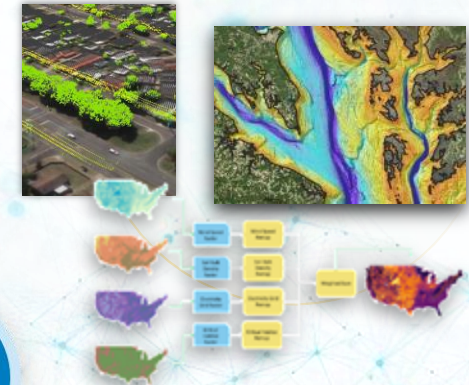
Needs to capture & analyze water quality data



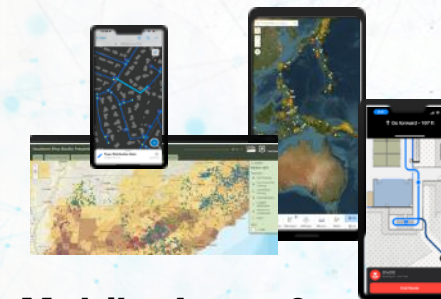
Web-based Mapping & Cartography



Advanced Spatial Analytics & AI



Imagery & Remote Sensing



Mobile Apps & Workflows

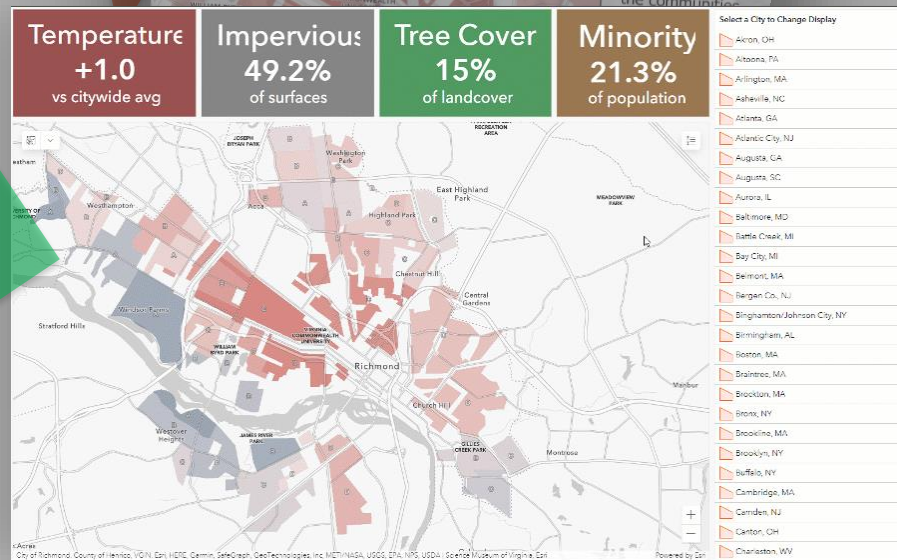
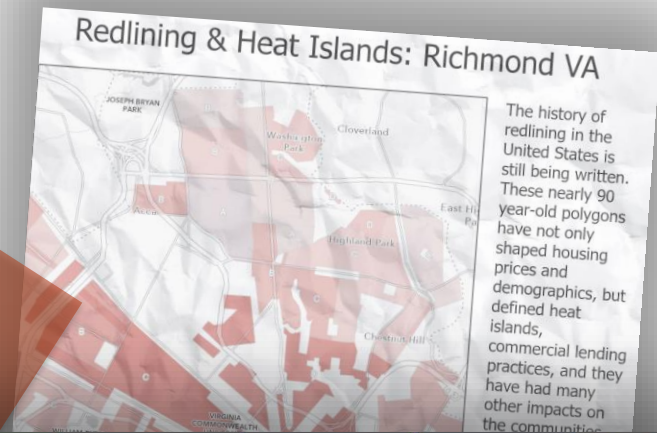
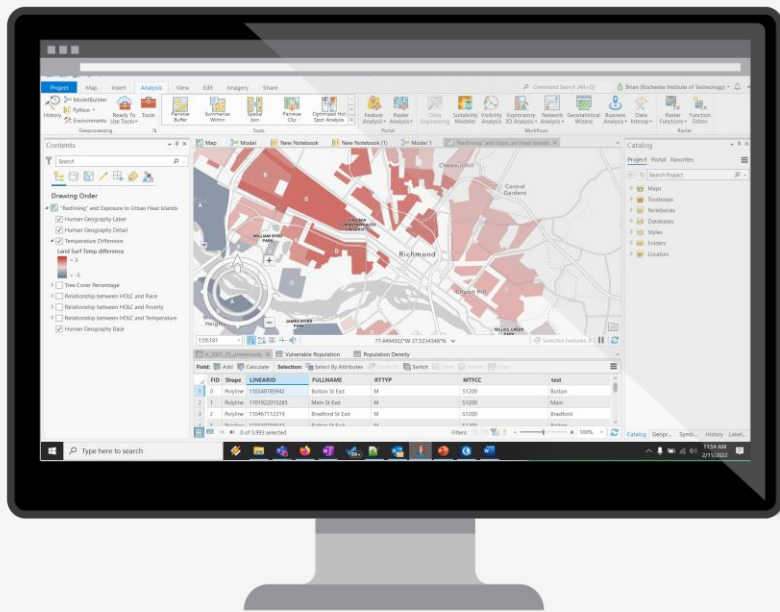
Sharing & Presenting

ArcGIS is used across multiple disciplines, from Architecture to Zoology



Themes: Introductory GIS

- Spatial problem solving: Investigation. Begins with asking meaningful questions.
- Maps are more than reference documents: They are analytical tools.
- Build data fluency, including awareness of societal issues. Develop a healthy critical view of data and tech.
- Scale matters.
- Spatial patterns, relationships, trends.
- Understanding past, present, and planning for the future: Change over space and time.
- Space and place.
- Addressing relevant 21st Century issues, including the UN SDGs and current events.
- The entire inquiry process: Asking questions, collecting, mapping, analyzing, and communicating the results of spatial issues.
- Build engagement, excitement, and community.



MAR 2 5 PM

NOISE



TOTAL REQUESTS

1,047

REQUESTS BY HOUR

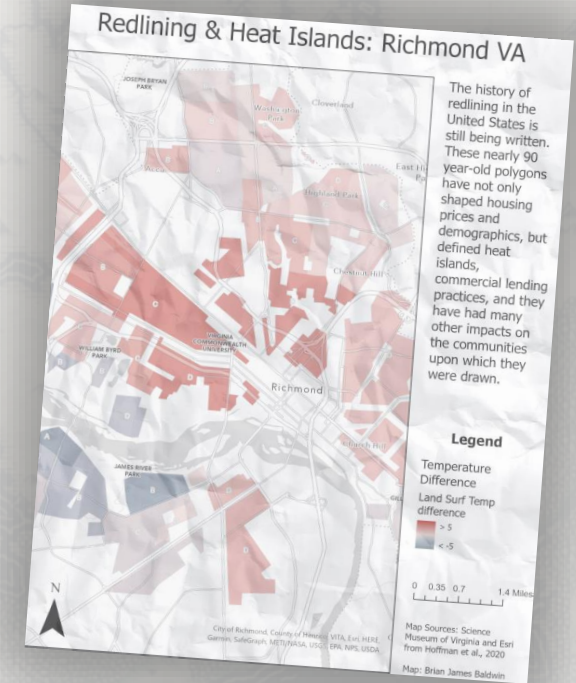


PORTION OF REQUESTS



Clinton	Central Harlem North-Polo Grounds	Crown Heights North	Claremont-Bathgate	Prospect Lefferts Gardens-Wingate	Washington Heights South	Mott Haven-Port Morris	DUMBO-Vinegar Hill-Downtown Brooklyn-Boerum Hill	Bushwick No
29	23	22	20	19	18	18	17	16

Have the necessary
knowledge & skills
changed significantly
with the advent of
'web' cartography?

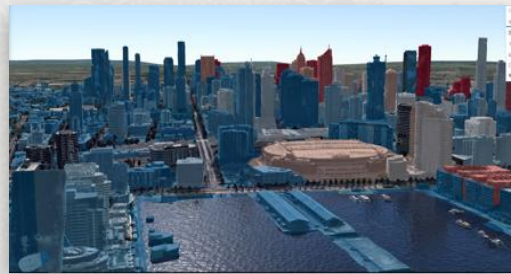


Discussion

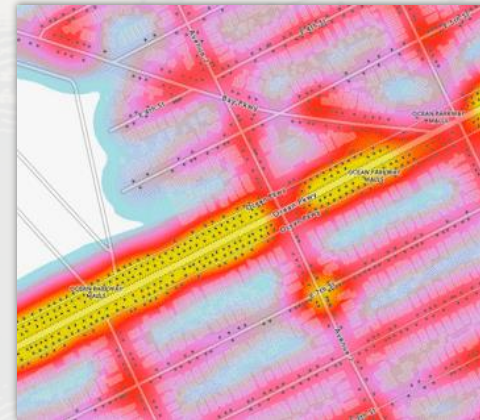
Web Mapping & Cartography

- 3D/2D
- time-enabled
- charts
- dynamic
- feature rich
- pop-ups
- basemaps

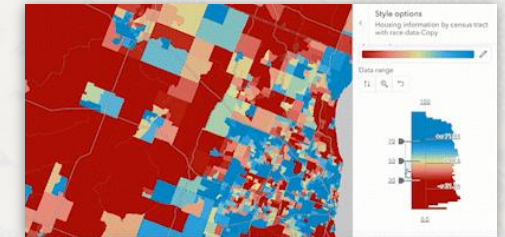
3D



Dynamic Heat Maps



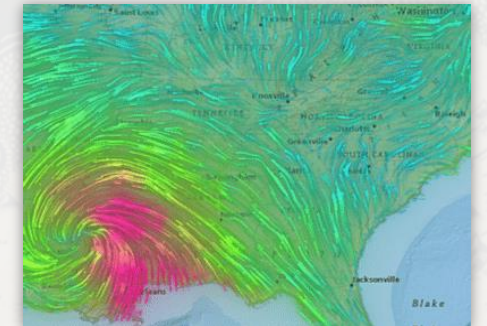
Interactive Maps / Charts



Accessible for
Vision Deficiency



Pie or Donut Charts



Flow Style

Shifts...?

Same same.

- Defined audience
- **Map purpose**
- **Data selection**
- Abstract / classify
- Color theory
- Harmony, composition, clarity
- Map critiques
- Scale

Less important?

- Map layouts
- Format
- Printing
- **Map elements**

New

- Data-driven cartography
- Storage / performance / optimization
- “Map wrapper” (UI/UX)
- Basemap modification/ customization
- **Challenge the defaults**

The tools evolve!

Pay the most attention to the most important tool of all—your brain.



**Don't just "put your data on the map" >> Analyze:
Then >> Take action?**

AI, ML & DL Mapping Image & Raster Analytics

Data Engineering Vector Analytics Advanced Visualization

Spatiotemporal Statistics 3D Analysis Modeling

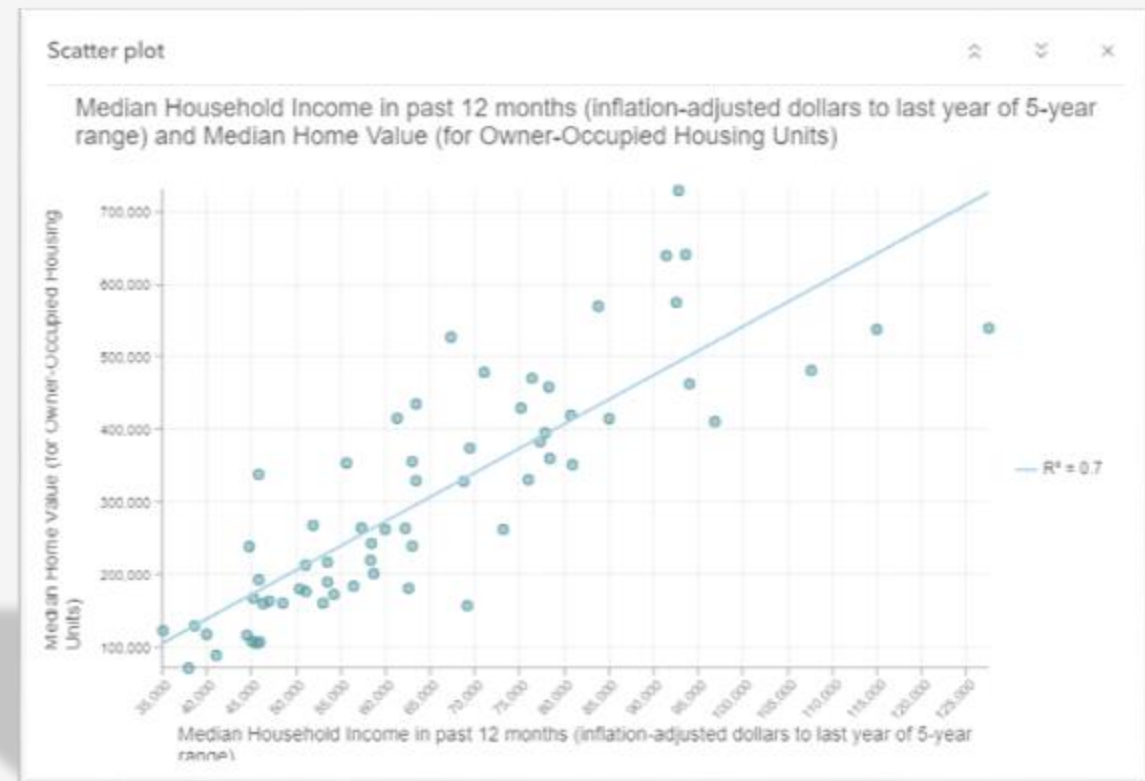
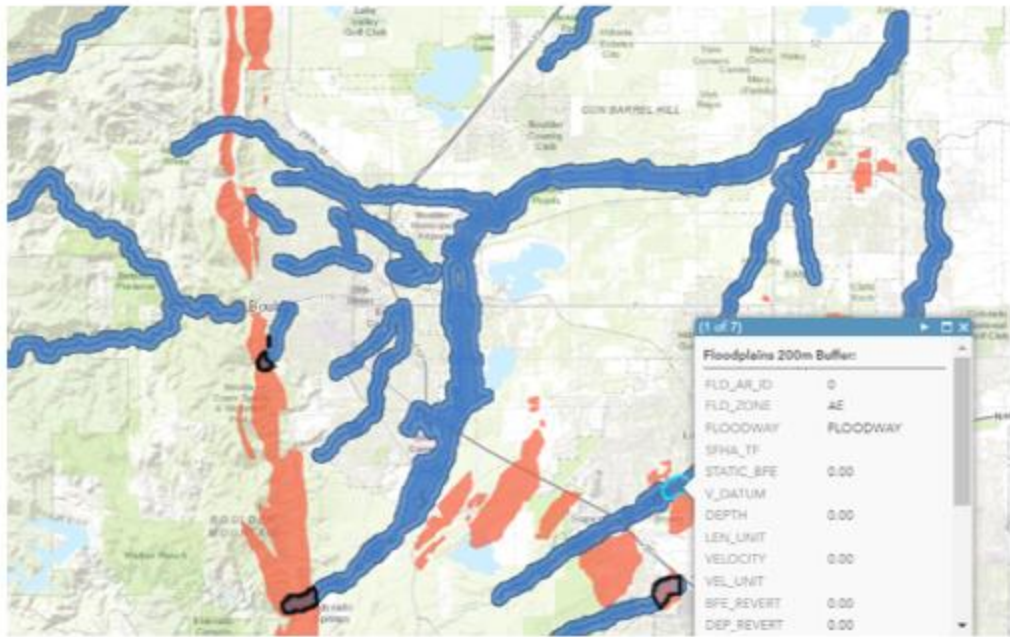
GeoAI Big Data Python Scripting Statistical Modeling

Network Analysis



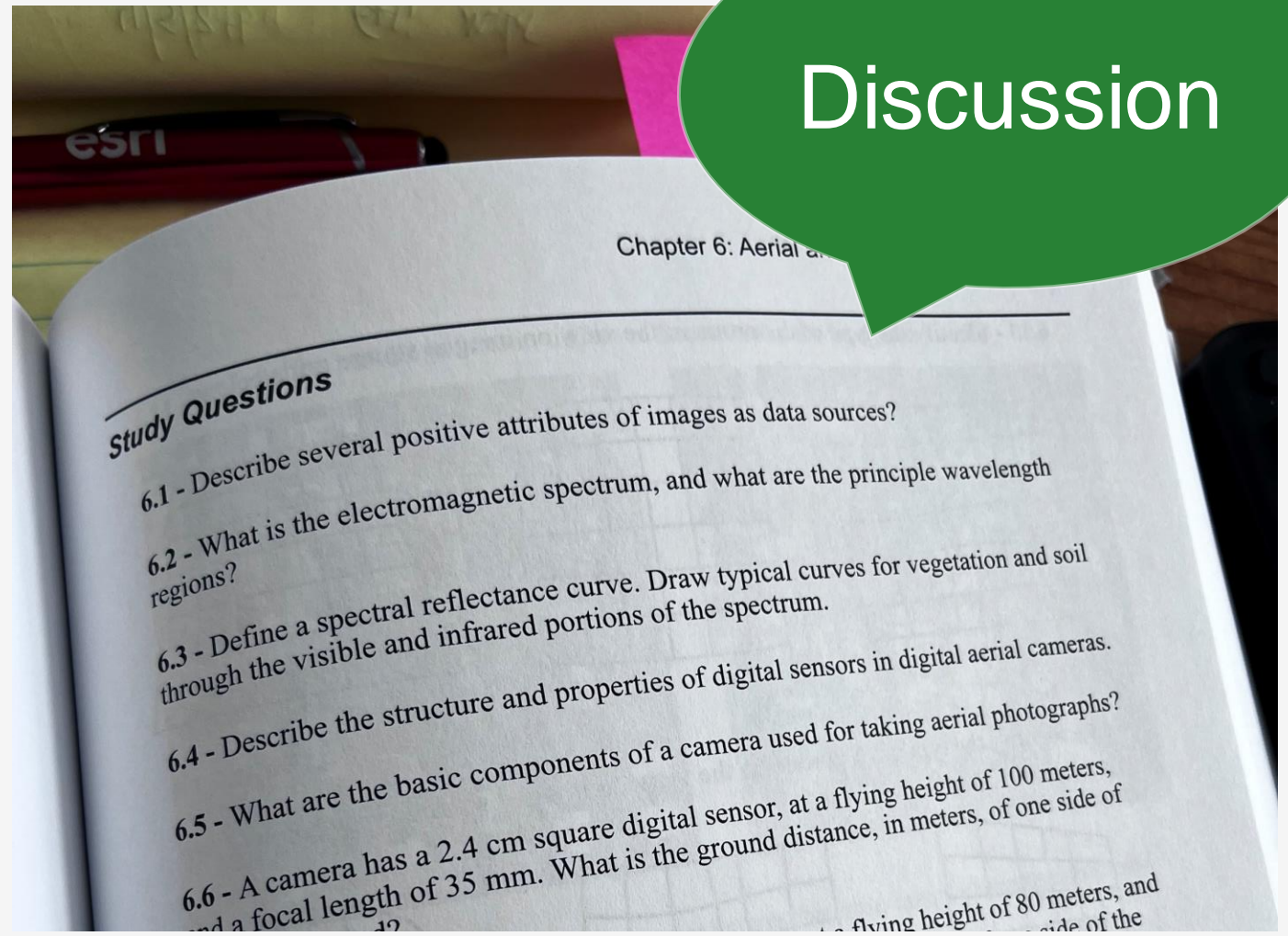
What does "intro analysis" look like?

1. Asking questions while using the ArcGIS Living Atlas of the World [apps](#).
2. Simple [overlays in ArcGIS Online](#).
3. Creating [scatterplots and bivariate maps in ArcGIS Online](#).



Imagery & remote sensing

What are the goals & objectives within an introductory GIS course?



(Bolstad & Manson, 2022)

Imagery & Remote Sensing

Rich Content

- Landsat
- Sentinel
- ArcGIS Living Atlas



Visualization

- Image Interpretation
- Map & Image Space
- Oriented Imagery



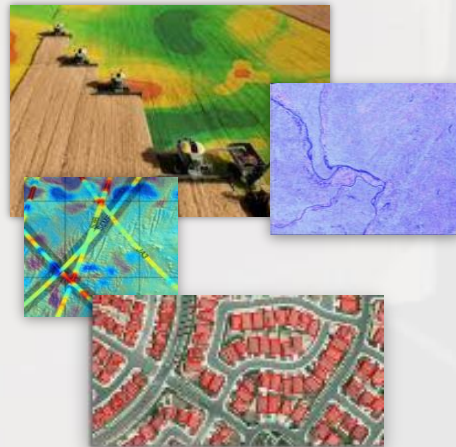
Data Management

- All Formats & Types
- Cached, Tiled & Dynamic
- Massively Scalable



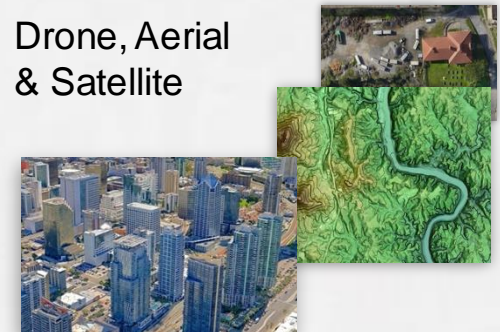
Analysis

- Classification
- Change Detection
- Feature Extraction



Reality Mapping

- Drone, Aerial & Satellite





Shifts...?

Same same.

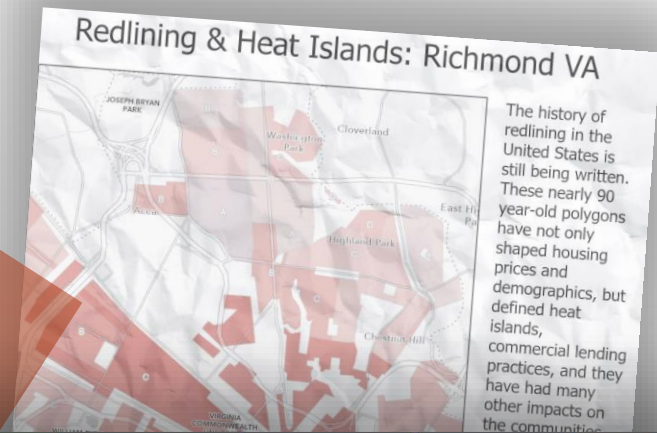
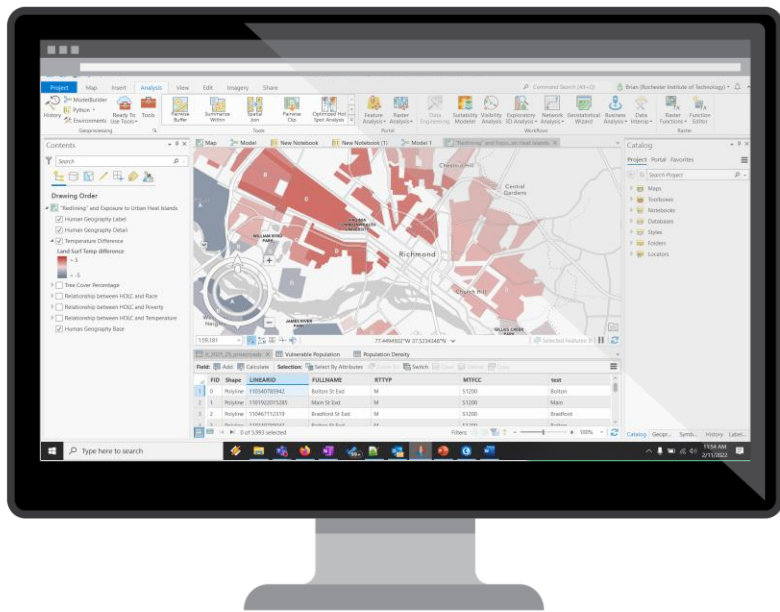
- The 'how'?
- **Imagery sources**
- Fundamentals (control, resolution, cameras, etc.)
- Data management

Less important?

- Data preparation (orthorectification, etc.)
- **Image interpretation**
- Iso cluster (unsupervised)

New

- Time-enabled
- AI (ML & DL)
- Drones, lidar, 3D, meshes
- Hosted analysis tools
- Esri advancements allow for integrated workflow (Pro & Online)
- Python (automation)



Temperature
+1.0
vs citywide avg

Impervious
49.2%
of surfaces

Tree Cover
15%
of landcover

Minority
21.3%
of population

Select a City to Change Display

- Akron, OH
- Albans, PA
- Arlington, MA
- Asheville, NC
- Atlanta, GA
- Atlantic City, NJ
- Augusta, GA
- Augusta, SC
- Aurora, IL
- Baltimore, MD
- Battle Creek, MI
- Bay City, MI
- Belmont, MA
- Bergen Co., NJ
- Binghamton/Johnson City, NY
- Birmingham, AL
- Boston, MA
- Braintree, MA
- Brookline, MA
- Bronx, NY
- Brooklyn, MA
- Buffalo, NY
- Cambridge, MA
- Camden, NJ
- Canton, OH
- Charleston, WV



When Rains Fell in Winter

A decade ago, heavy winter rains washed over the Yamal Peninsula in Northwest Russia, killing 60,000 reindeer and ruining livelihoods.

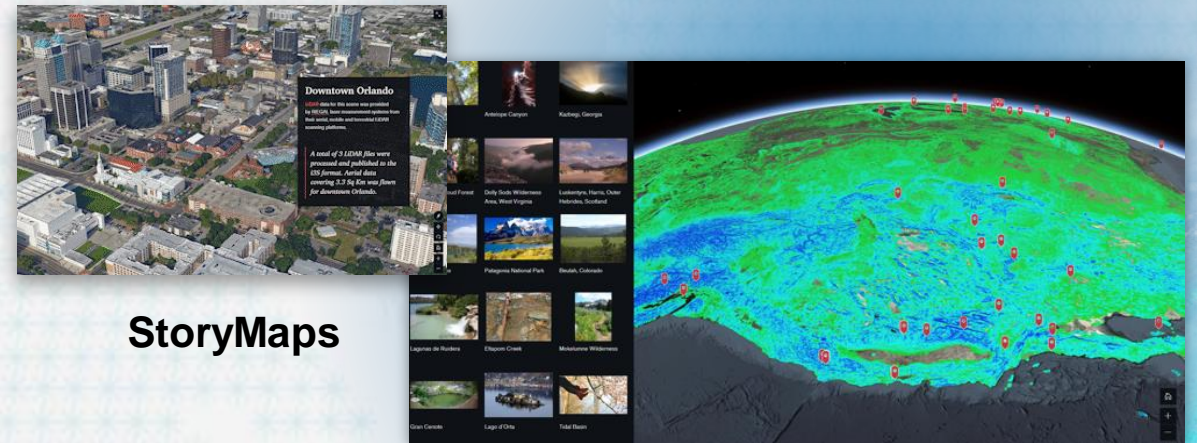
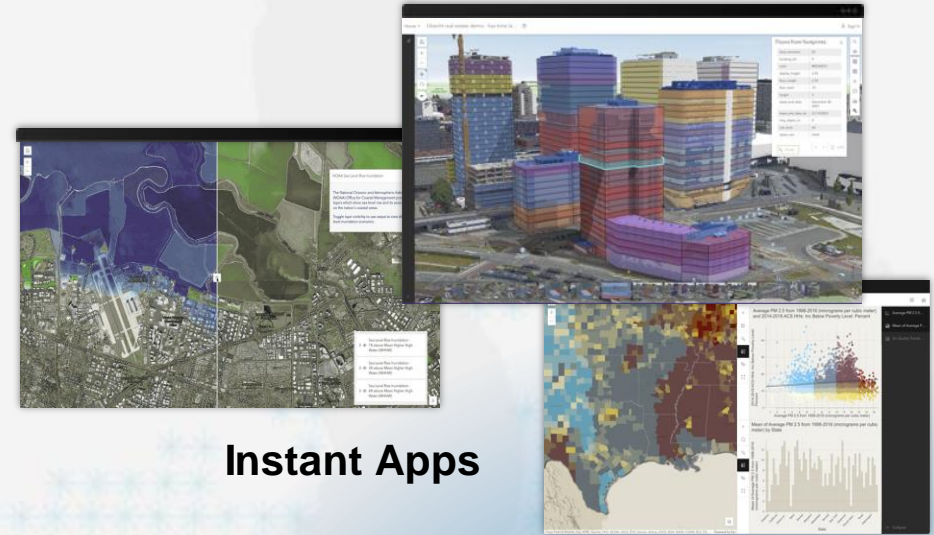
Philip Burgess & Irina Wang

March 9, 2023

Sharing & Presenting



Dashboards



StoryMaps

Shifts...?

Same same.

- Clear communication
- **Accessibility**

Less important?

- Print

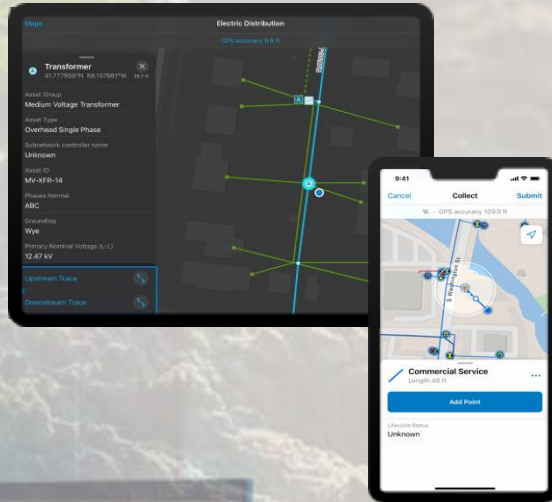
New

- Story-telling / narrative
- Display / data performance
- UI/UX
- Arcade (JS, programming)
- Challenging the defaults

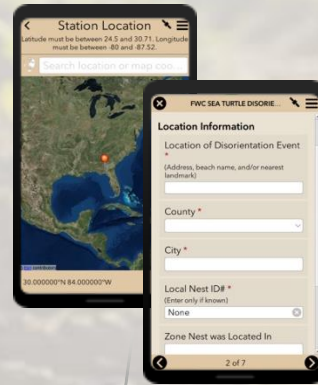


Mobile Workflows

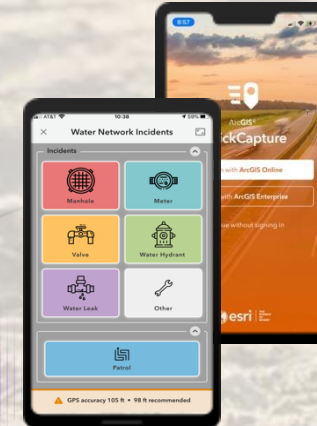
Field Maps
(Map Centric)



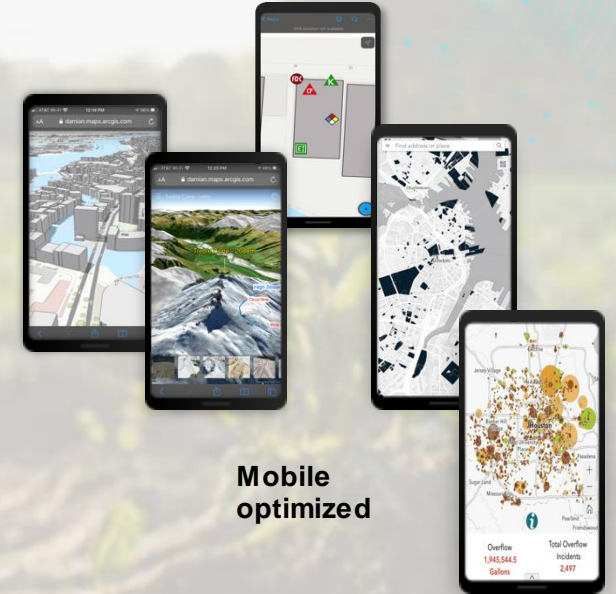
Survey123
(Form Centric)



QuickCapture



Mobile optimized

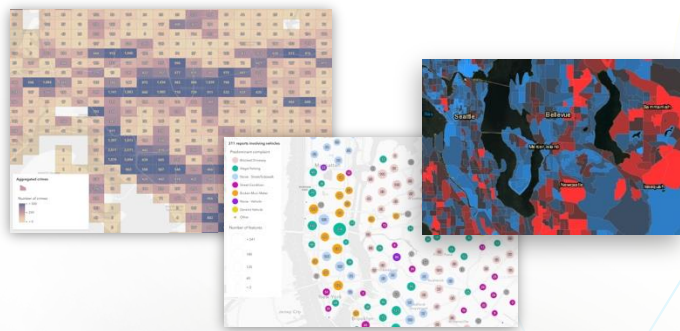


Connected &
Disconnected

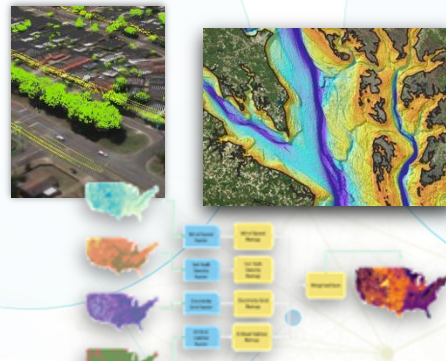


Change also looks like this...

Web-based Mapping & Cartography



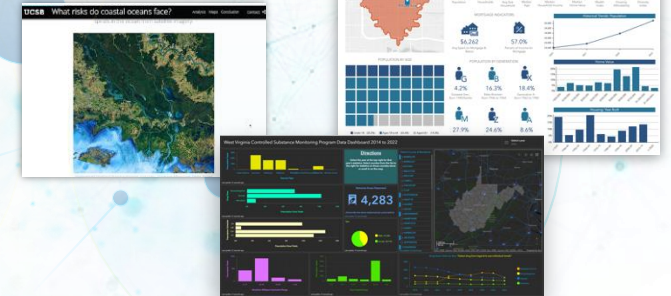
Advanced Spatial Analytics & AI



Mobile Apps & Workflows



Sharing & Presenting

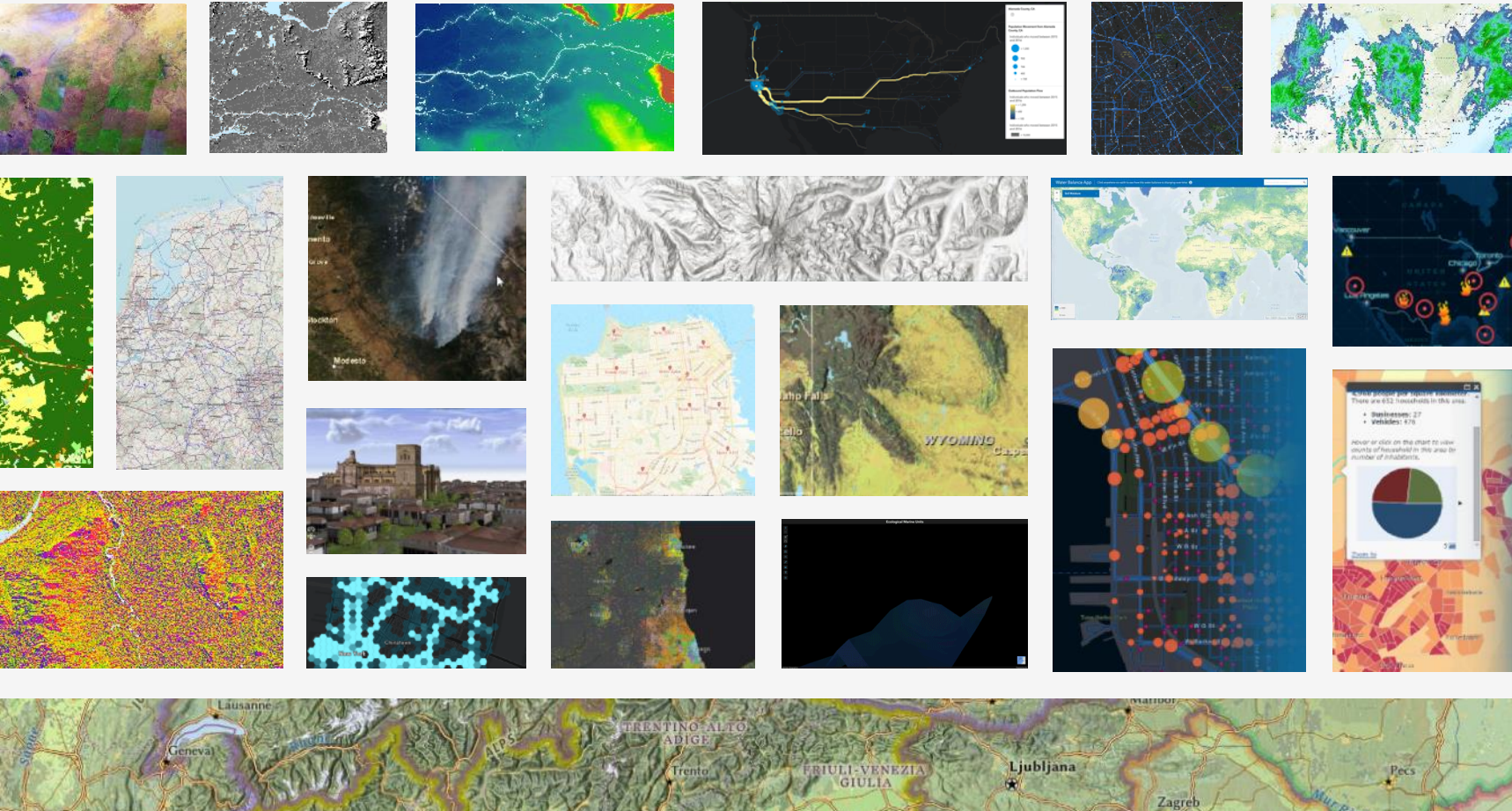


Imagery & Remote Sensing



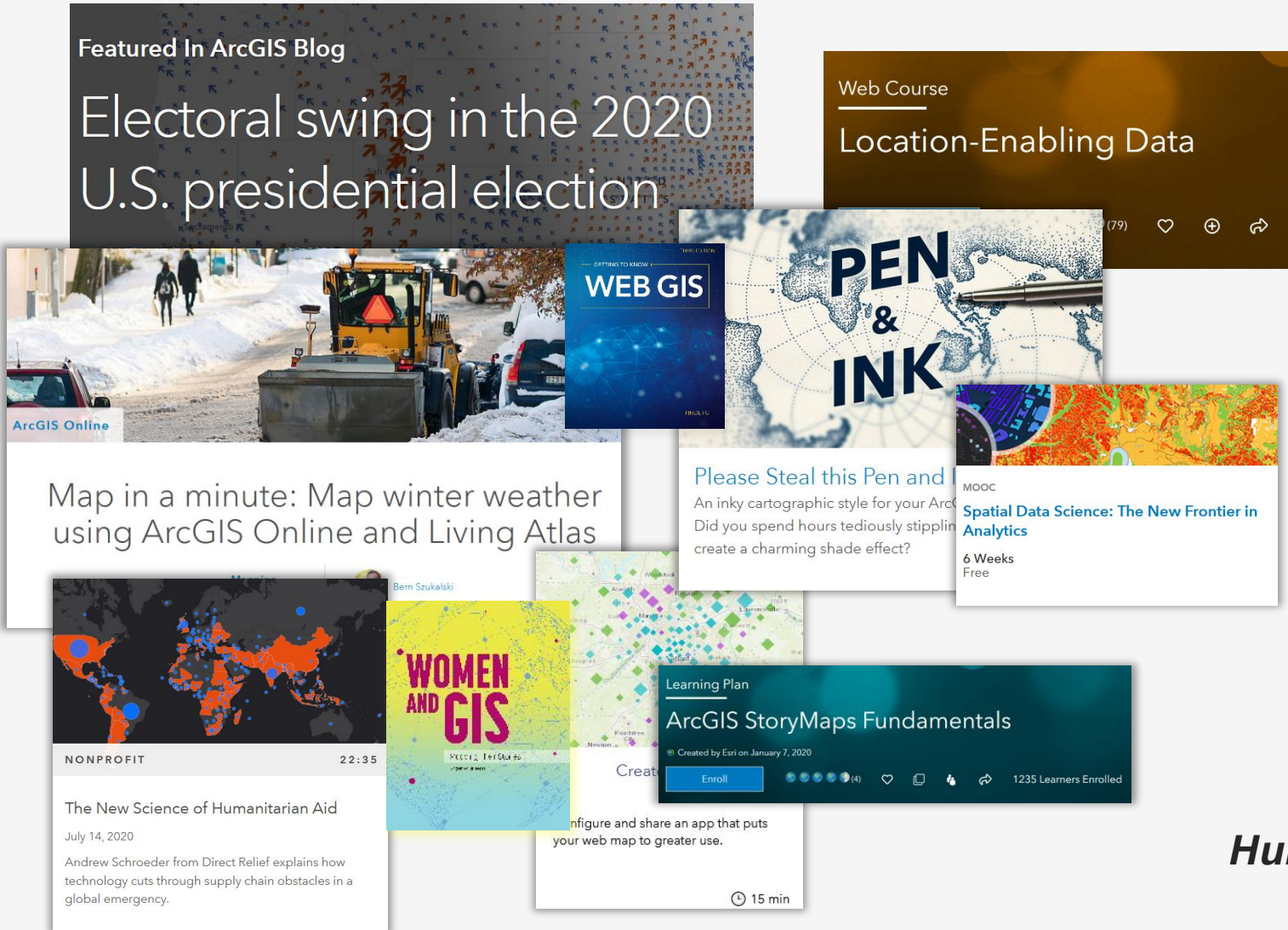
ArcGIS Includes Content

Over 10,000 Ready-to-Use
Maps and Datasets



Trending
Transportation
Environment
Weather
Landscape
Infrastructure
Basemaps
Boundaries
Land Cover
Oceans
Historical
Demographics
Habitats
Traffic
Utilities
Soils
Imagery
Observations
People
Hazards
Elevation
Hydro

Learning Resources



Unlimited E-Learning

Blogs

Podcasts

MOOCs

Young Professionals Network

Esri Community

Learning Plans

Your Campus!

Esri Academy

Hundreds of resources for all skill levels

Model Courses

Web-Based GIS, Environmental GIS, Cartographic Design, and Data and Society with readings, short and in-depth activities, quizzes, quiz answers, final projects (Joseph)

GeoTech Center's Model Courses.

Future: UCSB Curriculum initiative.



Texts

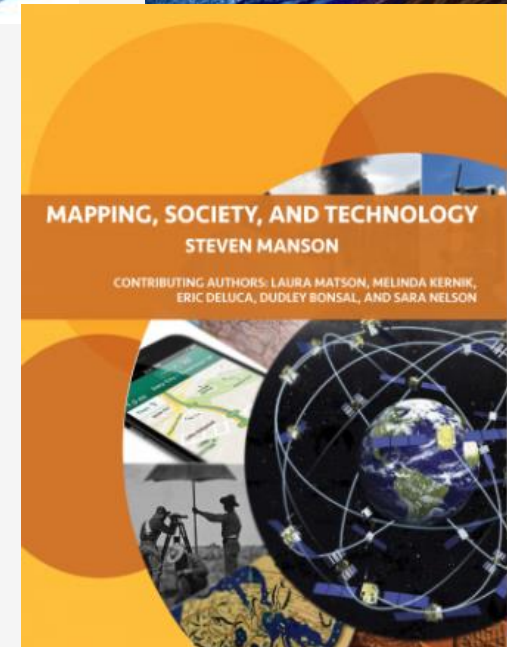
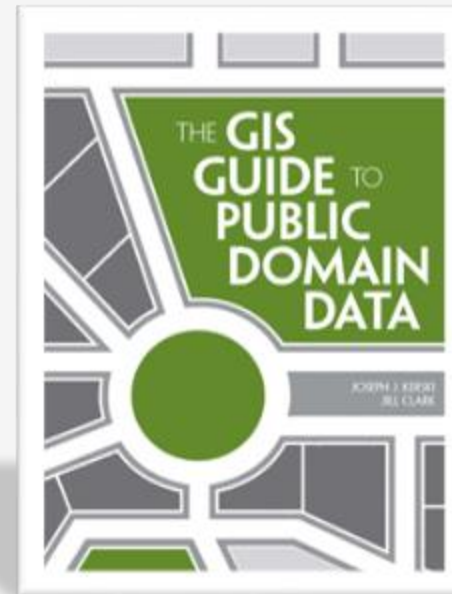
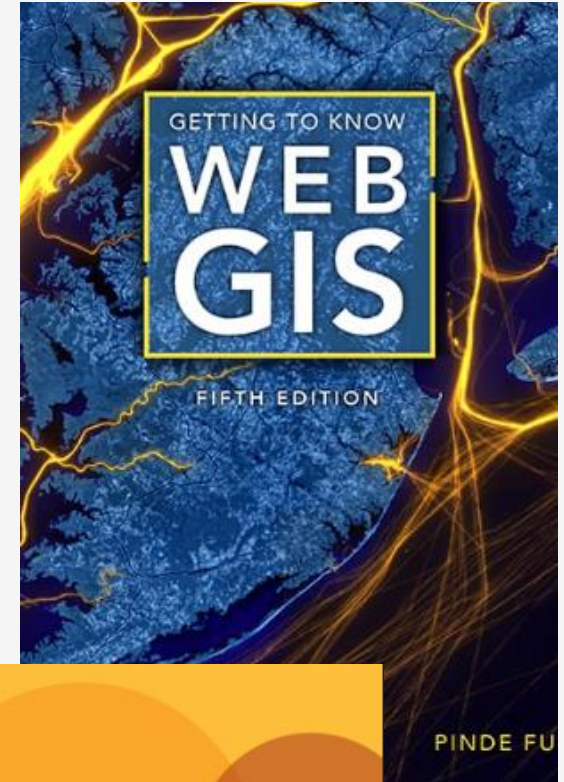
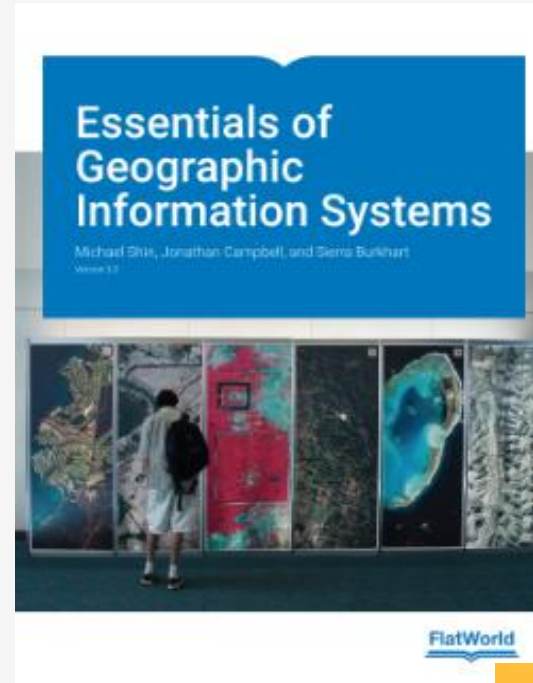
Still relevant? In what contexts?

Shin et al. Essentials of GIS Version 3.0. Flatworld Pub.

Pinde Fu – Getting to Know Web GIS. Upcoming: Mobile GIS.

Steven Manson – Mapping, Society, Technology.

Kerski & Clark – The GIS Guide to Public Domain Data.



Learn Paths

- Modern GIS
- Intro to Imagery & Remote Sensing
- Health GIS
- Cartography
- Official Statistics
- Climate Resilience
- Collaborative Communities
- Community Mapping for Racial Equity and Social Justice

Explore curriculum & tutorial collections

Browse curated curricula for a variety of topics.

1 **Modern GIS**
Discover how GIS technology has adapted to a mobile, cloud-based, inter-connected, and configurable world and learn how to leverage solutions to visualize and analyze data, and ultimately make better, data-driven decisions.
🕒 25 hr
📁 Course & Curriculum

2 **Introduction to Imagery and Remote Sensing**
Understand remote sensing fundamentals, learn to prepare and render imagery, work with lidar and drone data, analyze multidimensional and temporal data, extract information from remote sensed data, and more.

LEARNING MODULES

MODULE 1
Intro to GIS

MODULE 2
Mapping & Cartography

MODULE 3
Data Management

MODULE 4
Imagery

MODULE 5
Mobile GIS

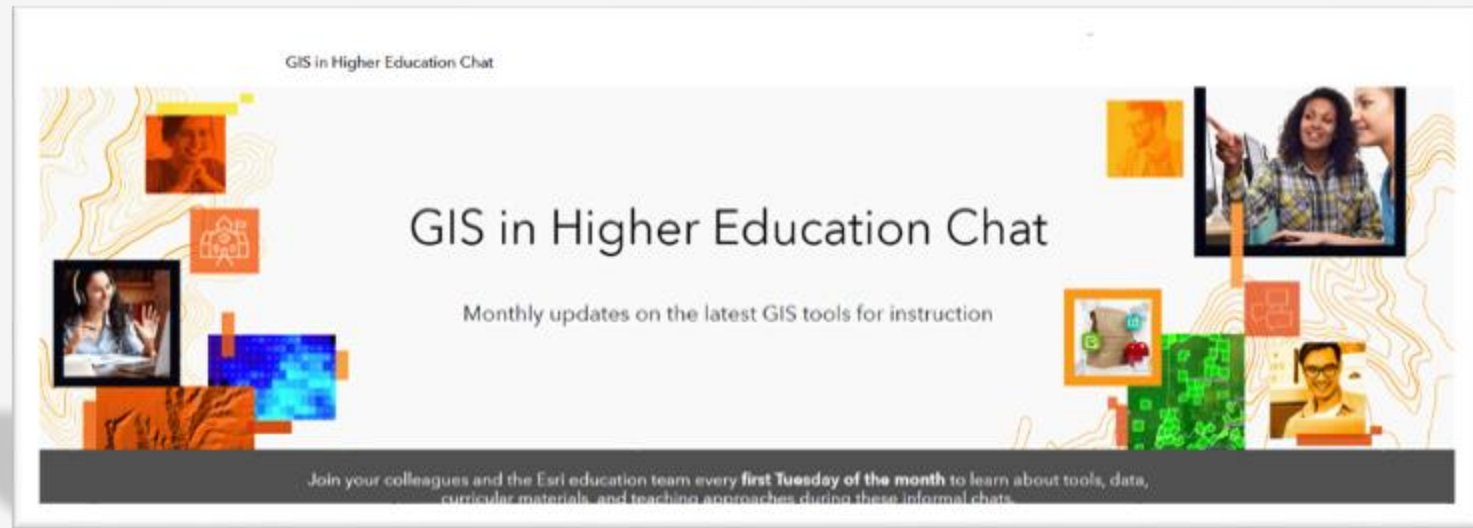
MODULE 6
Spatial Analysis

MODULE 7
Scripting

MODULE 8
Sharing and Presenting

Here to Help

- Modern GIS - landing page
- Esri Academy
- Esri Press
- Learn Tutorials
- Esri Community – blogs, tips, tricks, etc.
- Higher Ed Chats – monthly webinars





Thanks so much!
Any Questions?

