

# Spatial Analysis of NYC Open Data using ArcGIS

Tim Calabrese

Jim Barry



[nycsodata24.sched.com](https://nycsodata24.sched.com) #nycSOdata #opendataweek

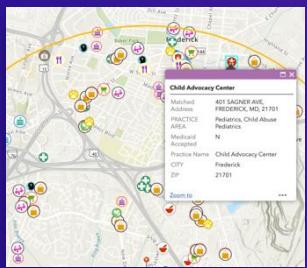


# ArcGIS is...

- a system for...
  - managing
  - analyzing
  - visualizing
- ...spatial data, most often on a map.
- a system of...
  - record
  - insight
  - engagement
- ...spatial data, most often on a map.

# Health and Human Services

## Resources for Victims of Domestic Violence



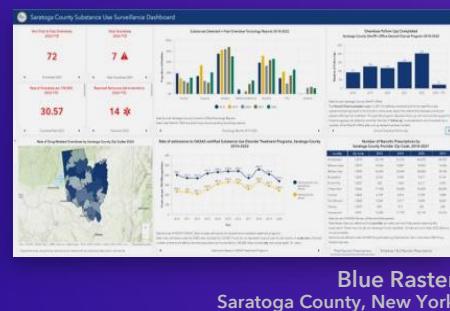
## Mid-Shore Council on Family Violence Maryland

## Community Profile



## YMCA of the USA Dallas, Texas

## Substance Abuse

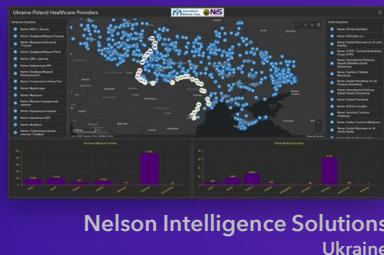


## Hospital Capacity Assessment



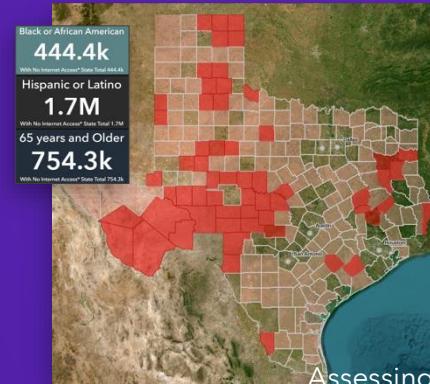
## GeoMarvel Texas

## Monitoring Humanitarian Assistance and Health Care



# Equity and Social Justice

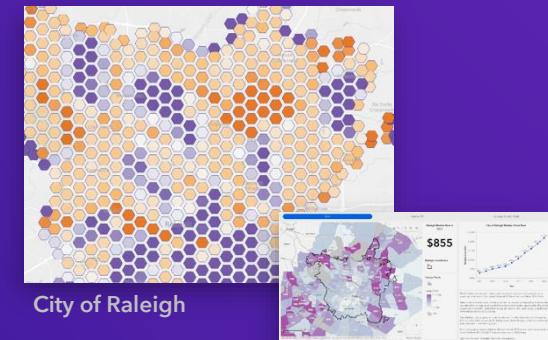
## Access to Legal Services and the Digital Divide



## Self-Represented Litigation Network Texas



## Racial Equity & Social Justice Mapping

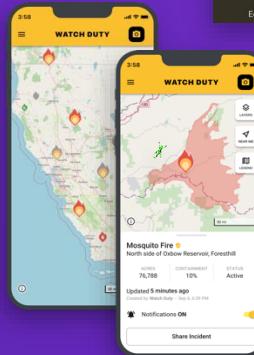


# Public Engagement and Collaboration

## Election Transparency

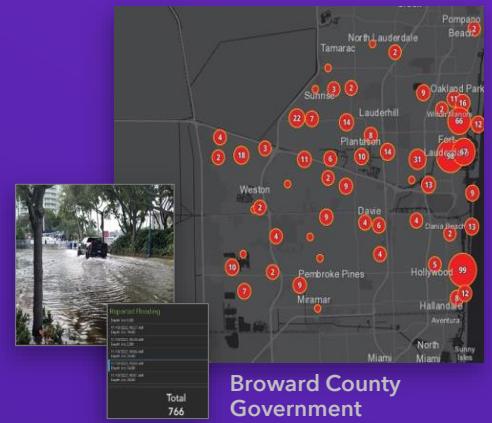


## Crowdsourced Fire Awareness



## Watch Duty California

## Crowdsourcing Flood Damage



## Broward County Government Florida

# NYC Departments

## Cultural Affairs

The screenshot shows the NYC Percent for Art Collection website. It features a prominent red banner with the text "Percent for Art Collection". Below the banner is a map of New York City with several green dots indicating the locations of public artworks. A callout box highlights a specific artwork: "Jeyifous, Ongoing Project Shirley Chisholm Monument". The website includes a sidebar with information about the program and a footer with social media links.

## Education

The screenshot shows the School Kitchens Dashboard. It features a map of New York City with green dots representing school buildings. A callout box highlights a specific building: "P.S. 001 The Berger". Below the map are three charts: "Meals Served" (Breakfast: 150, Lunch: 600), "Provided Services" (Salad Bar: 1, Halal: 0), and "Kitchen Type" (Fully Operational: 100%). The dashboard also includes a sidebar with details about the building and a footer with various statistics.

## Parks & Recreation

The screenshot shows the "Tree Canopy Change" section of the Parks & Recreation website. It features a map of New York City with green and red areas representing tree canopy growth and loss. A callout box states: "New York City's tree canopy increased overall by 1.7%". The page also includes a sidebar with information about trees and a footer with navigation links.

## Finance

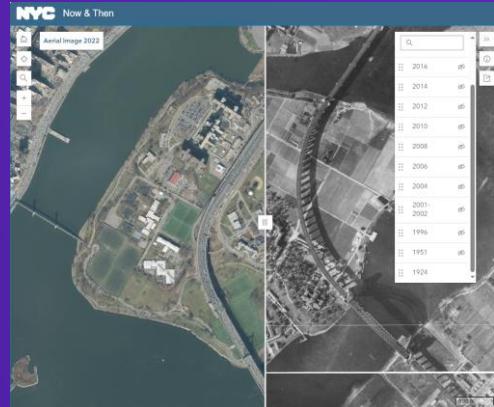
The screenshot shows the Property Information Portal. It features a 3D model of a building with various rooms and floor levels highlighted in different colors. To the left, there is a sidebar with "Property Details" and "Building Information" sections, including fields for "Schedule Appointment", "Pay Online", and "Property Tax Account". The main interface includes a search bar and a map view.

## Environmental Protection

The screenshot shows the History of the NYC Sewer System website. It features a large map of Manhattan with a timeline on the right side showing historical sewer system developments from 1924 to 2022. A callout box highlights "Mannahatta: A Green Landscape". Below the map are three charts: "Meals Served" (Breakfast: 150, Lunch: 600), "Provided Services" (Salad Bar: 1, Halal: 0), and "Kitchen Type" (Fully Operational: 100%).

History of the NYC Sewer System

## Technology & Innovation



## Social Services

The screenshot shows the Food Help NYC website. It features a map of New York City with yellow dots representing food pantry locations. A callout box asks: "What is Food Help NYC?". Below the map are "Important Links" for "ACCESS HRA" and "Help Now NYC".

## City Planning

The screenshot shows the "Where is housing being added in New York City" website. It features a map of New York City with blue dots representing construction sites. A callout box asks: "Where is housing being added in New York City?". Below the map is a section titled "Explore the data." with a link to "New York City Department of City Planning | Housing and Economic Development Division January 6, 2022".

# Visualizing NYC in unique ways

Collection

## Deaf New York City Spaces

This collection contains six story-maps on Deaf N.Y.C. spaces; (1) introduction, (2) clubs, (3) places of worship-religious/cultural spaces, (4) education, (5) social spaces & service facilities, and (6) appendix: additional content & research.

[Get started](#)

1 Deaf New York City Spaces  
2 Deaf Clubs of New York City  
3 Deaf Places of Worship ...  
4 Deaf Education Spaces of New York...  
5 Deaf Social Spaces & Service Facilities i...  
6 Appendix: Maps, Timelines, &...

Collection

## Browse All StoryMaps

Here you can browse the full list of NYC H2O StoryMaps.

NYC H2O HUB SCHEDULE A LESSON BROWSE ALL STORYMAPS ABOUT More [Instagram](#) [X](#) [Facebook](#)

NYC H2O HUB

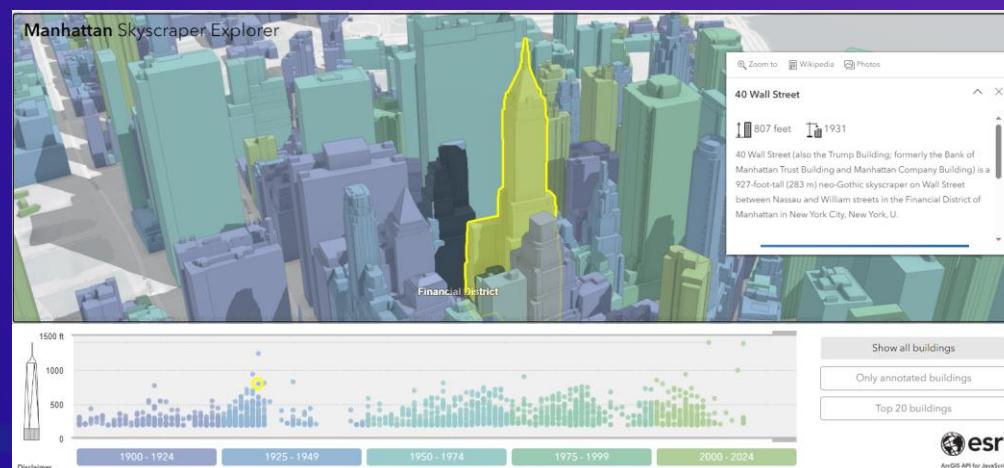
Search, Visualize, Download, Create

Search...

NYC H2O's mission is to inspire and educate New Yorkers of all ages to learn about, enjoy and protect their city's local water ecology. Our lessons are presented as "StoryMaps," using ArcGIS technology, that

Building New

High Bridge



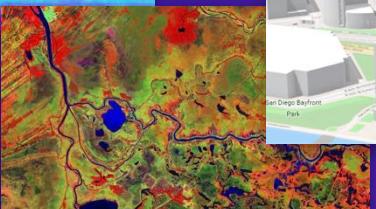
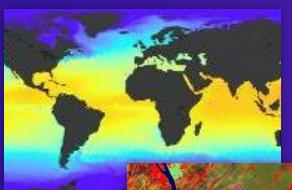
Citizens' Water Quality Testing

Citizens' Water Quality Testing

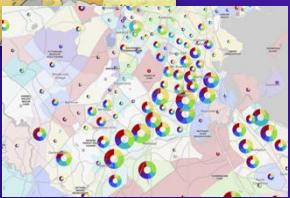
A student-led collaboration to test NYC waterways for indicators of sewage pollution

# ArcGIS Online GIS as SaaS

Image Hosting & Raster Analytics



Mapping



Advanced Visualization

2D / 3D Basemaps



3D Visualization



Analysis

ArcGIS Online  
& Extensions



Growing Rapidly (30%+)

- Millions of Users
- 60 Million+ Items
- 14 Million+ Feature Layers

## New & Improved (October)

- Map Viewer
- 3D Scene Viewer
- Instant Apps
- Analysis in Map Viewer
- Data Management
- Improved Administration
- Editing Related Records
- Image Hosting
- Raster Analytics

## Coming

- Restore Items
- Enhanced Editing
- Item Relationships
- FedRAMP Moderate 2024
- ISO 27001
- Data Pipelines
- Oriented Imagery
- Web Editor

## Extensions

- Hub  
(Engagement / Collaboration)
- Velocity
- Image (Hosted Imagery)
- Workflow Manager
- Premium Feature Data Store

# Storytelling with Maps

## Communicating Geographic Knowledge Widely

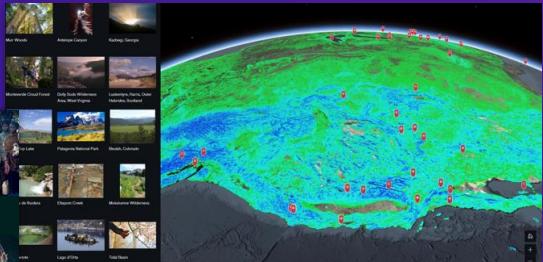
### Common Uses

- Sharing Maps & Reports
- Public Engagement
- Presentations
- Education
- ....and More!

### Map Choreography

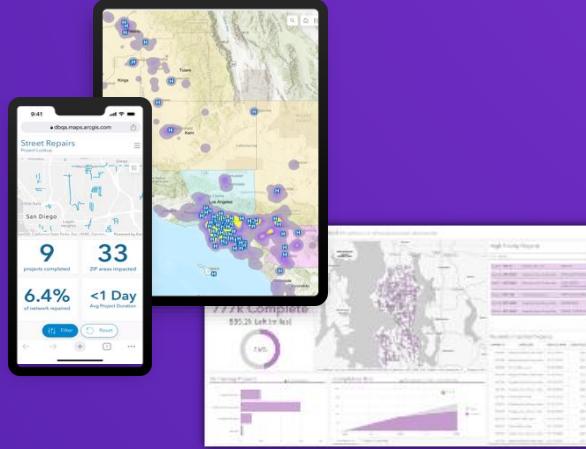


### Interactive Maps, Multimedia Content and Text



Collections—Group Stories,  
Briefings and More

### Simple Map Editing & Markup



### Monitor Status



### Visualize Trends

# ArcGIS Is Open and Interoperable



# ArcGIS Developer

APIs and SDKs for Automating, Extending & Creating Apps

Creating

## New & Improved

- SDKs
- Arcade Profiles
- UI Components
- Editing Capabilities
- Services
  - Places (POIs)
  - Basemap Styles
  - Data Hosting

## Automating



## Extending

SOIs & SOEs  
Custom Data Feeds  
Webhooks

Add-Ins  
Configurations

Pro SDK

Enterprise SDK

Python API

Scripts &  
Notebooks

JavaScript  
SDK

Web Apps

Open-Source  
APIs

Device Apps

Native  
SDKs

Game Engine  
SDKs

Embedded  
Services

Location Services  
(PaaS)

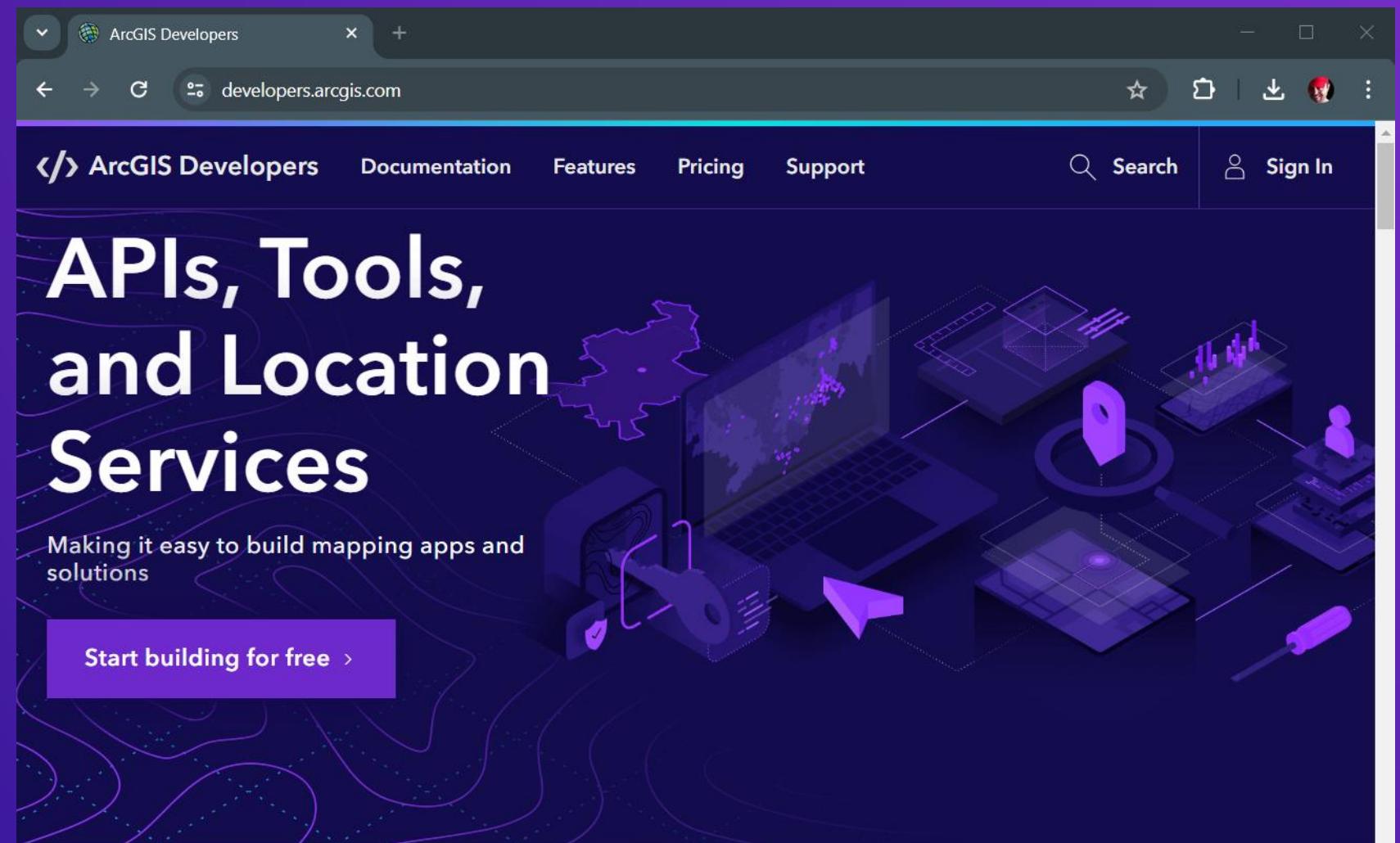
Available as Part of ArcGIS . . .  
. . . And Independently for App Developers

# What is ArcGIS?

- a system for...
  - Mapping
  - 3D Modeling
  - Remote Sensing
  - Spatial analysis
  - Data Collection
  - Field operations

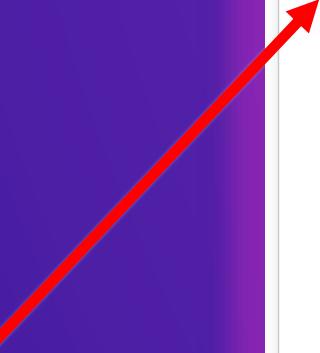
- a system of...
  - Apps
  - Data and Maps
  - Developer Tools
  - Training
  - Support
  - Security
  - Community

# Developer account



# DEMO – sign up

Start building for free >



## Sign up for a free ArcGIS Developer account

GitHub    Facebook    Google    Apple

We will require you to share your email address with us, [learn why](#).

OR

First name  Last name

Email

ⓘ You will be required to confirm your email after signing up.

Organization name (optional)

Username

ⓘ 6 to 24 characters. Letters, numbers and '@.\_' only.

Password

ⓘ At least 8 characters. At least 1 letter and 1 number. Cannot match username.

Confirm password

Start building with ArcGIS Platform.

Signing up gives you an ArcGIS Developer Subscription (Essentials Plan) with generous monthly free tiers of services:

- 2,000,000 Basemap tiles
- 500 Places searches
- 100 Place attributes
- 100 Address attributes
- 100 Details attributes
- 100 Location attributes
- 20,000 Geocode searches (not stored)
- 20,000 Simple routes
- 5,000 Service areas
- 15 MB Hosted feature query bandwidth
- 5 MB Hosted feature edit bandwidth
- 25 MB Hosted vector tile bandwidth
- 25 MB Hosted map tile bandwidth
- 25,000 Tiles published
- 100 MB Feature service storage
- 100 MB Tile, file, and attachment storage
- Community support

Learn more about [pricing](#).

# Voucher Code for Cloud Credit

ArcGIS Developers Documentation Features Pricing Support

Search Jim Barry jimbarry.geonyc

Dashboard / Billing

Current billing cycle (February 28, 2024 - March 27, 2024) | See usage information

Next billing date	Amount owed	Bill last calculated
March 28th, 2024	\$0.00 ⓘ	March 21st, 2024 11:13 PM (GMT-04:00)

Type	Cost	Totals	Usage
Basemap tiles	\$0.00	258 tiles	<a href="#">View usage</a>
Features (storage)	\$0.00		<a href="#">View usage</a>
Tiles, files and attachments (storage)	\$0.00		<a href="#">View usage</a>
Place attributes	\$0.00	4 places	<a href="#">View usage</a>
Address attributes	\$0.00	4 places	<a href="#">View usage</a>
Details attributes	\$0.00	4 places	<a href="#">View usage</a>

Payment method

N/A valid thru \*\*\*/\*\*

+ Add ⓘ

Location services

Pay-as-you-go ⓘ Disabled

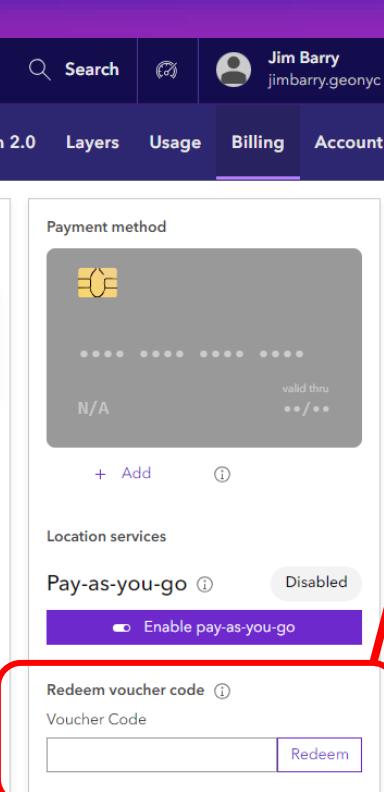
Enable pay-as-you-go

Redeem voucher code ⓘ

Voucher Code

NYCSOD2024

Redeem



Redeem voucher code ⓘ

Voucher Code

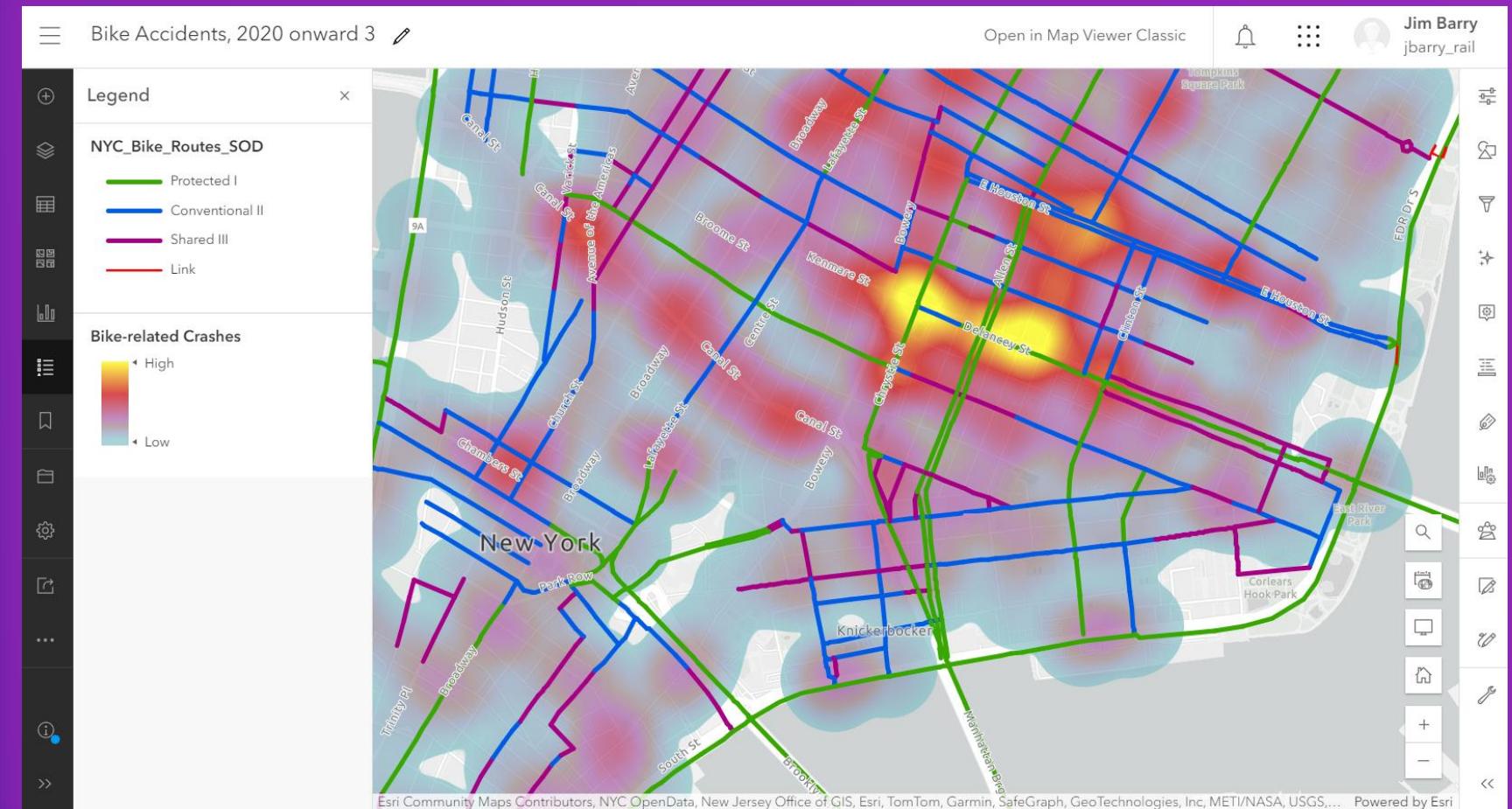
NYCSOD2024

Redeem

\$20 credit:

NYCSOD2024

# DEMO - search, find, use open data on a map



# The Language of Spatial Analysis



## Understanding where

- 1 Understanding where things are (location maps).
- 2 Understanding where the variations and patterns in values are (comparative maps).
- 3 Understanding where and when locations and values change.



## Measuring size, shape, and distribution

- 4 Calculating individual feature geometries.
- 5 Calculating geometries and distributions of feature collections.



## Determining how places are related

- 6 Determining what is nearby or coincident.
- 7 Determining and summarizing what is within an area(s).
- 8 Determining what is closest.
- 9 Determining what is visible from a given location(s).
- 10 Determining overlapping relationships in space and time.



## Finding the best locations and paths

- 11 Finding the best locations that satisfy a set of criteria.
- 12 Finding the best allocation of resources to geographic areas.
- 13 Finding the best route, path, or flow along a network.
- 14 Finding the best route, path, or corridor across open terrain.
- 15 Finding the best supply locations given known demand and a travel network.



## Detecting and quantifying patterns

- 16 Where are the significant hot spots, anomalies, and outliers?
- 17 What are the local, regional, and global spatial trends?
- 18 Which features/pixels are similar, and how can they be clustered, classified, and identified?
- 19 Are spatial patterns changing over time?



## Making predictions

- 20 Given a success case, identifying, ranking, and predicting similar locations.
- 21 Finding the factors that explain observed spatial patterns and making predictions.
- 22 Interpolating a continuous surface and trends from discrete sample observations.
- 23 Predicting how and where objects spatially interact (attraction and decay).
- 24 Predicting how and where objects affect wave propagation.
- 25 Predicting where phenomena will move, flow, or spread.
- 26 Predicting what-if.

# Spatial Analysis and Data Science

## Many New Tools & Methods

**Analytics (Vector, Raster & Graph)**

Analysis in Map Viewer

Knowledge Graph

Geomorphon

**Visualization & Exploration**

Multi-series Grids

Charts in Map Viewer

**Spatial Statistics**

Neighborhood Explorer

Causal Inference

3D Inverse Distance Weighting

**Modeling & Scripting**

Notebooks Drag and Drop

Python Environment Upgrades

ModelBuilder: Iterate Time Slices

**GeoAI**

Many Pretrained Models

Multiscale GWR

XGBoost

**Big Data Analytics**

Network Analysis & Geocoding

Cloud Native Tools and Functions

GeoAnalytics Engine (Spark)

## New & Improved

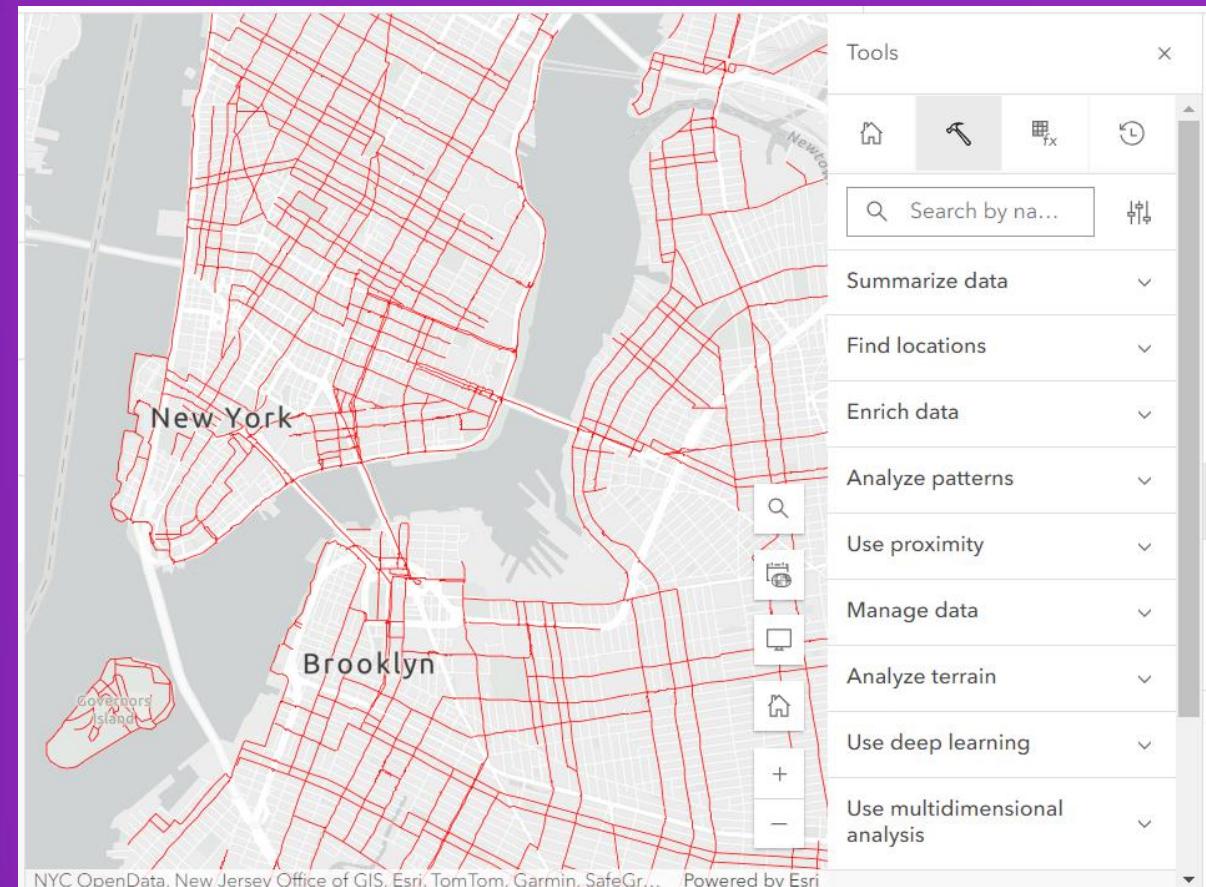
- 60+ New Tools
- GeoAI Models
- Analysis in Map Viewer
- Time Series Forecasting
- Predictive Modeling
- Causal Analysis
- Composite Indices
- Multi-series Grids
- Big Data Tools
- ... Quality, Performance & Productivity

## Coming

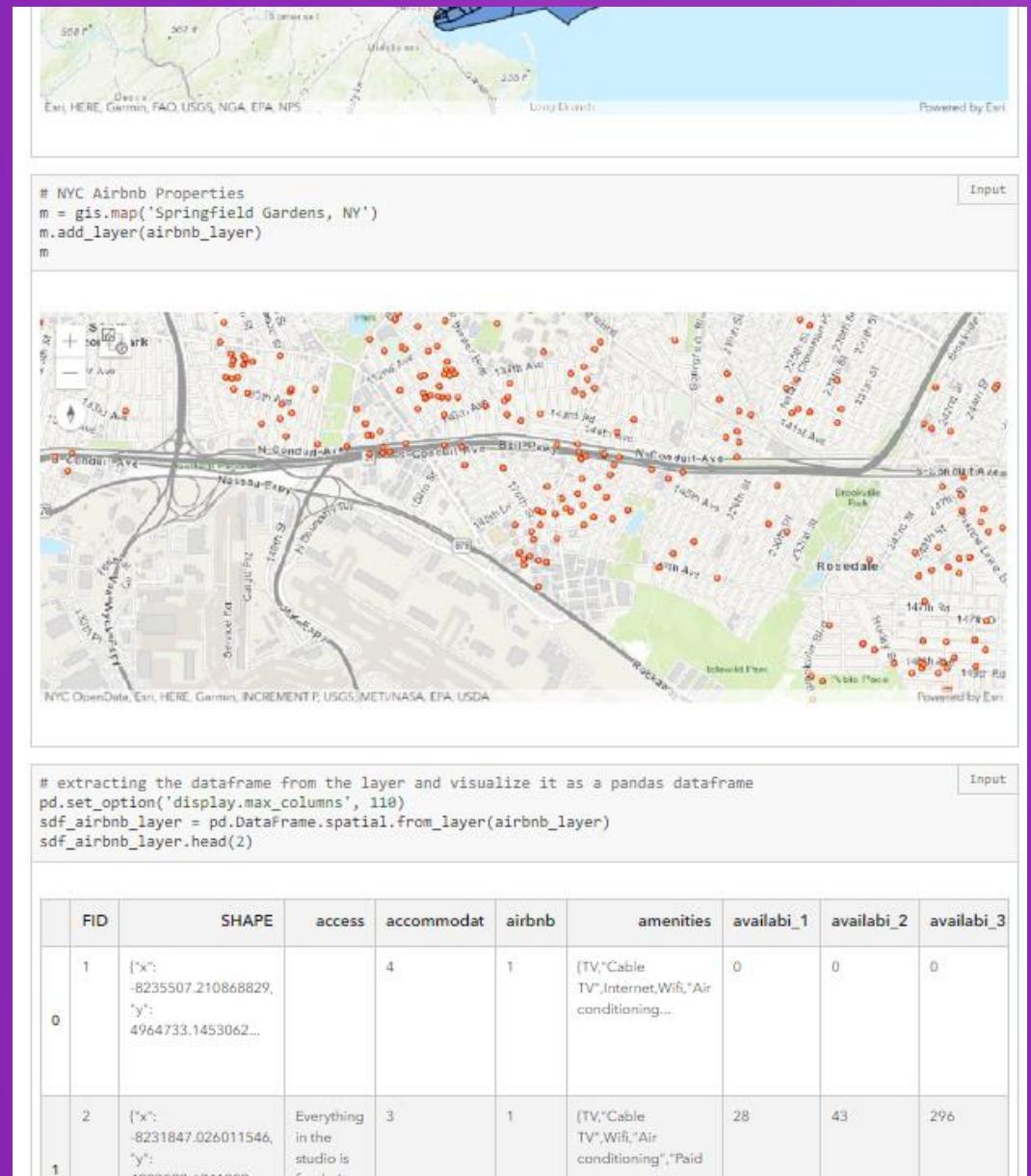
- **ModelBuilder on the Web**
- R Location Services Package
- New Spatiotemporal Algorithms

*Enabling Insights . . .  
... Supporting Decision-Making*

# DEMO - find and analyze spatial patterns



# DEMO - Jupyter Notebook as a data science tool



# Resources

- [community.esri.com](https://community.esri.com)
- [mediaspaces.esri.com](https://mediaspaces.esri.com)



Community All Communities ArcGIS Ideas GIS Life Community Resource

## Spatial Data Science Questions

Search This board

Home > All Communities > Products > Spatial Data Science > Spatial Data Science Questions

Other Boards in This Place ▾

### Latest Activity Sort/Filter : Newest ▾

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**Point density analysis**  
I have a point layer and each of the points is either category A or B. I want to find out if proximity to category B ...  
by dtonel • New Contributor  
POST in Spatial Data Science Questions • Last Updated 2 weeks ago

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**Creating Maps with R – LinkedIn Learning Course**  
I thought I'd share this LinkedIn Learning course I came across, in case it's of interest: Creating Maps with R <https://>...  
by Bud • Notable Contributor  
POST in Spatial Data Science Questions • Last Updated 12-22-2023

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**Creating a Composite Index in ArcGIS | Webinar**  
When: Tuesday, December 5, 2023 | 9:00 a.m.–10:00 a.m. (PT) Why register: Metrics such as equity, vulnerability, sustai...  
by MalloryDelgadillo esri • Esri Contributor  
POST in Spatial Data Science Questions • Last Updated 11-21-2023

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**Transform Text Using Deep Learning doesn't include special characters**  
by [User] • Esri Contributor  
POST in Spatial Data Science Questions • Last Updated 11-21-2023

# Resources

- Hackathon Kick Starter



 Community All Communities ArcGIS Ideas GIS Life Community Resources    

## Hackathon Kickstarter Video: ArcGIS Platform for Developers

1735 0 03-22-2021 09:21 AM Share Message Status Unsubscribe

by JimBarry  Esri Regular Contributor Post Options ▾

When you're at a hackathon, you tend to use the tools that you know. That way you can put all of your effort and time into the app you're trying to build, and not into having to learn a new tool that might set you back.

But what if you want to use ArcGIS but don't have much experience with it?

Well, [here's a video](#) that in just 30 minutes will give you everything you need to get going and get productive with [ArcGIS Platform](#) and [ArcGIS Online](#) for hosting data, making maps, using location services, and making apps. Even during a fast-paced hackathon you may find that spinning up on a few key skills could be a great investment when you see what kinds of capabilities you can bring to your project.

In this video, we cover all 10 of these topics:

1. Who is Esri and What is ArcGIS?
2. Sign up for a free ArcGIS Online for Developers account
3. Search, find, import, create, and host map data on the cloud
4. Make, style, and share a web map
5. Use API Keys for activating content, location services, and interactive data analysis tools
6. Create custom web mapping apps without code: *StoryMaps, Dashboards, app builders and templates*
7. Create custom web mapping apps with code: *REST API, JavaScript API, Runtime SDKs*
8. Use ArcGIS along with other commercial and open source mapping tools
9. Data science with ArcGIS: *ArcGIS Python packages*
10. Community tools and resources: *online forums, open source projects*

Here is a link to the video: [https://tiny.cc/ArcGISHacksVideo\\_v2](https://tiny.cc/ArcGISHacksVideo_v2)

(edited 2022-01-07, to fix broken links)

Add tags apis developer hackathon javascript platform sdks

 3 Kudos Comment

About the Author  
<https://x.com/jimbarry>  
<https://github.com/jimbarry>

# Review

- What is ArcGIS?
- Perpetually free developer license
- Search, find, download, upload, publish NYC Open Data on ArcGIS Online
- Visualize open data on a map with attribute-based symbology
- What is “spatial analysis”?
- Online analytical tools
- ArcGIS API for Python
- Analyzing data using Jupyter Notebooks
  - Merging ArcGIS analysis tools with industry standard statistical packages
- Resources for your success

Questions?

# Thank you!

Stay in touch  
at [beta.nyc/links](http://beta.nyc/links)

BetaNYC



[nycsodata24.sched.com](https://nycsodata24.sched.com)

#nycSOdata #opendataweek

