# Spatial Analysis and Data Science Webinar

**Get Answers:** Questions will be answered at the end.

You can submit them at anytime through the Q&A module.

**On-Demand:** The recording will be posted shortly after the webinar.

You'll receive an email with the link to view or download.

**Start time:** The webinar will start at 10:00 am PDT

**Contact us:** For anything else, please email us:

**Kelleymoreno@esri.com**

# Spatial Analysis and Data Science

## National Government Webinar Series

# Today's Presenters

**Hannah Shumway**
Solution Engineer, Intel
Esri National Government Team

**Parker Hornstein**
Sr. Solution Engineer, Defense
Esri National Government Team

**Linda Peters**
Global Business Development Manager
Esri National Government Team

# Agenda

- Introduction to Spatial Analysis and Data Science in ArcGIS
- ArcGIS Pro
- ArcGIS Insights
- ArcGIS Notebook Server
- Resources and Q&A

# ArcGIS

## A Comprehensive Geospatial Platform

Open

Services Based

Extendable

Distributed

SaaS & Software

*Supporting Individuals, Teams and Organizations*

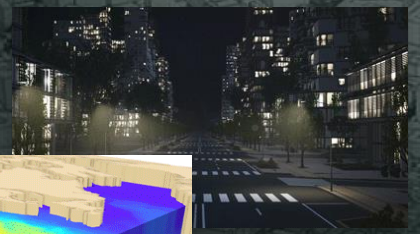
# Spatial Modeling and Analytics

## Advancing Science and Creating New Insights

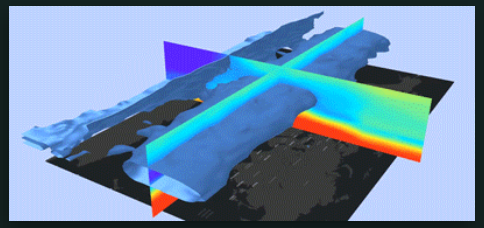
Vehicle Tracking

Real-Time / IoT

3D Cities



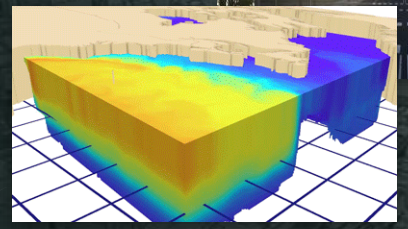
Atmospheric Temperature



Big Data Modeling

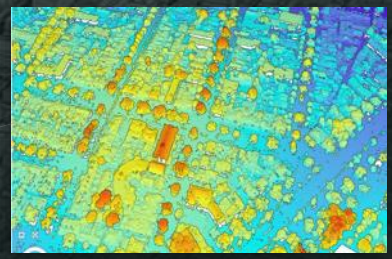
GeoOptics

Ocean Temperature



Multidimensional Data

Object Detection



AI and Machine Learning

Sea Surface Temperature

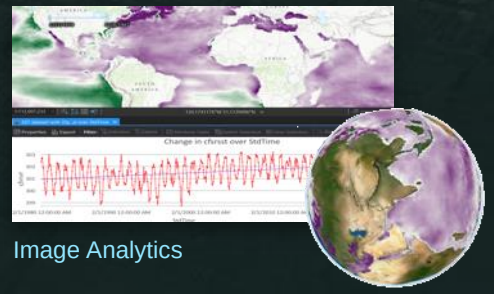


Image Analytics

Integrating Open Data Science and Tools

TensorFlow

jupyter

Leveraging Technical and Scientific Innovations

# ArcGIS Is Integrating Many Innovations

Drones

Big Data

Sensors & IoT

Multidimensional

Imagery & Remote Sensing

**Imagery in the Cloud**

Real-Time Streaming

Lidar

**GeoBIM**

Unstructured

**Reality Capture**

*Data Measurement*

HD Mapping

Crowdsourcing

Cloud

Network Architecture

AI & ML

Edge Devices

**Kubernetes**

High Performance

Microservices

Mesh Networks

Distributed

Mobile

Cloud Native

*Computing*

Ultra High Bandwidth – 5G

Interoperability & Standards

**Game Engines**

**PaaS**

GPU

Open Science

Data Science

*Science*

Real-Time

Visualization

Modeling

**Big Data Spatial Analytics**

Digital Exploration

**Knowledge Graphs**

Voxels

Spatiotemporal Analytics

# The Building Blocks of Spatial Data Science

Data Engineering

Visualization
& Exploration

Spatial Analysis,
Machine Learning
& AI

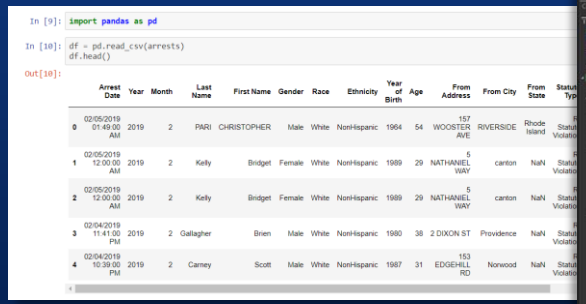
Big Data Analytics

Modeling
& Scripting

Sharing
& Collaboration

# Data Engineering

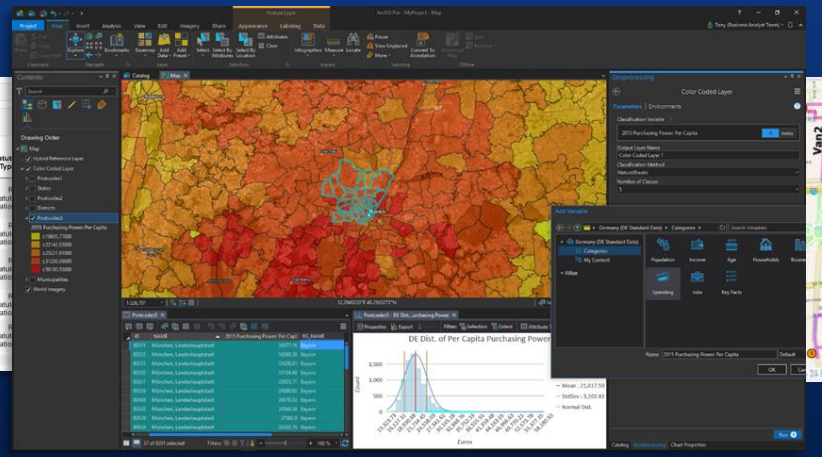
- **The process of cleaning, enriching, and manipulating data for analysis**
- **Where most analysts and data scientists spend most of their time**



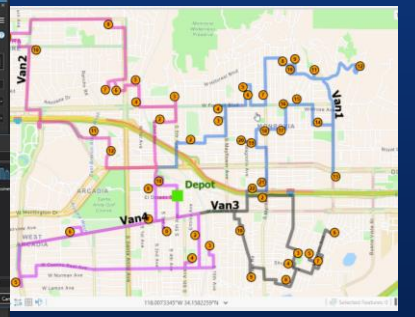
```
In [9]: import pandas as pd

In [10]: df = pd.read_csv(arrests)
         df.head()

Out[10]:
```

| | Arrest Date | Year | Month | Last Name | First Name | Gender | Race | Ethnicity | Year of Birth | Age | From Address | From City | From State | Statute Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 02/05/2019 01:49:00 AM | 2019 | 2 | PARI | CHRISTOPHER | Male | White | NonHispanic | 1964 | 54 | 157 WOOSTER AVE | RIVERSIDE | Rhode Island | Statute Violation |
| 1 | 02/05/2019 12:00:00 AM | 2019 | 2 | Kelly | Bridget | Female | White | NonHispanic | 1989 | 29 | 5 NATHANIEL WAY | canton | NaN | Statute Violation |
| 2 | 02/05/2019 12:00:00 AM | 2019 | 2 | Kelly | Bridget | Female | White | NonHispanic | 1989 | 29 | 5 NATHANIEL WAY | canton | NaN | Statute Violation |
| 3 | 02/04/2019 11:41:00 PM | 2019 | 2 | Gallagher | Brien | Male | White | NonHispanic | 1980 | 38 | 2 DIXON ST | Providence | NaN | Statute Violation |
| 4 | 02/04/2019 10:39:00 PM | 2019 | 2 | Carney | Scott | Male | White | NonHispanic | 1987 | 31 | 153 EDGEHILL RD | Norwood | NaN | Statute Violation |

Extract and prep




Enrich



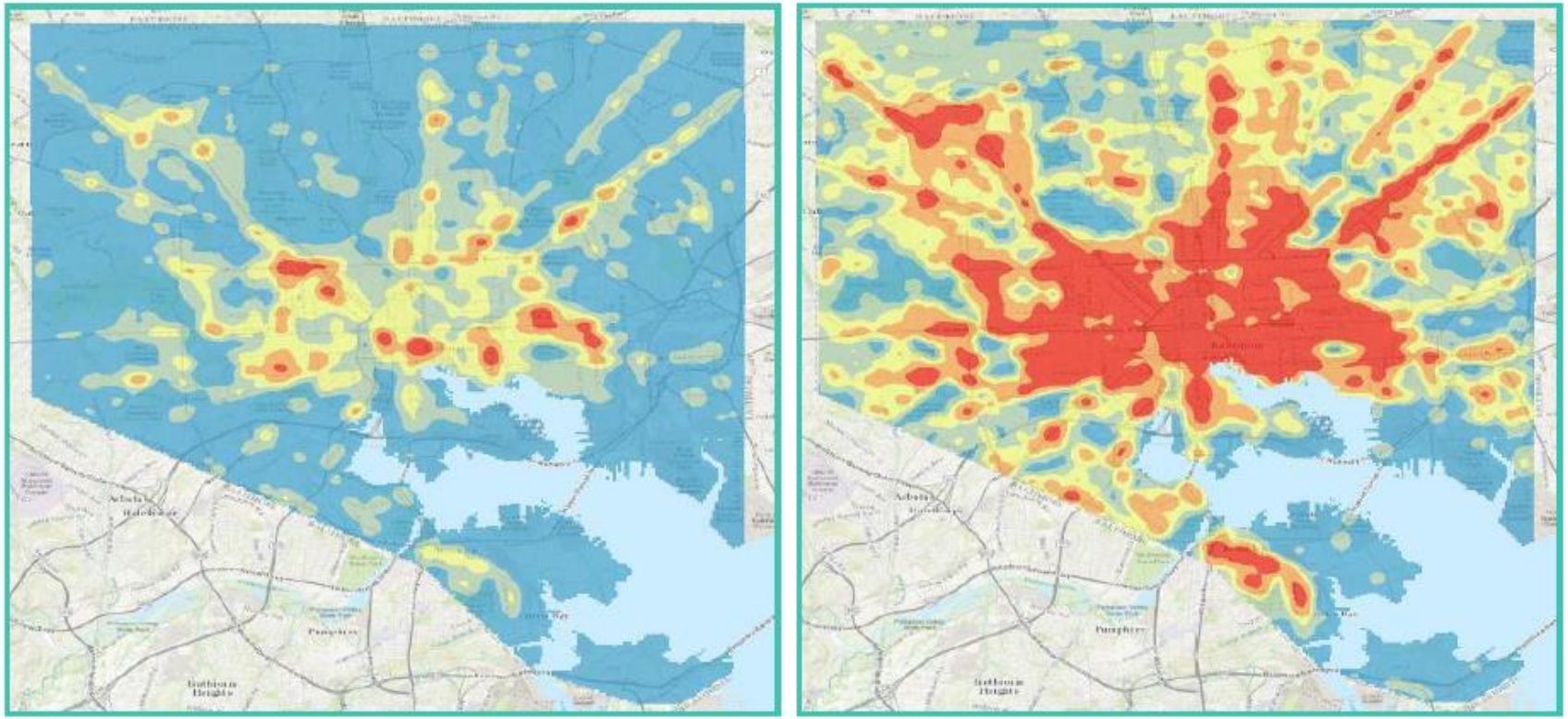

Location-enable

*Access ready to use content in the Living Atlas…*

# Visualization and Exploration

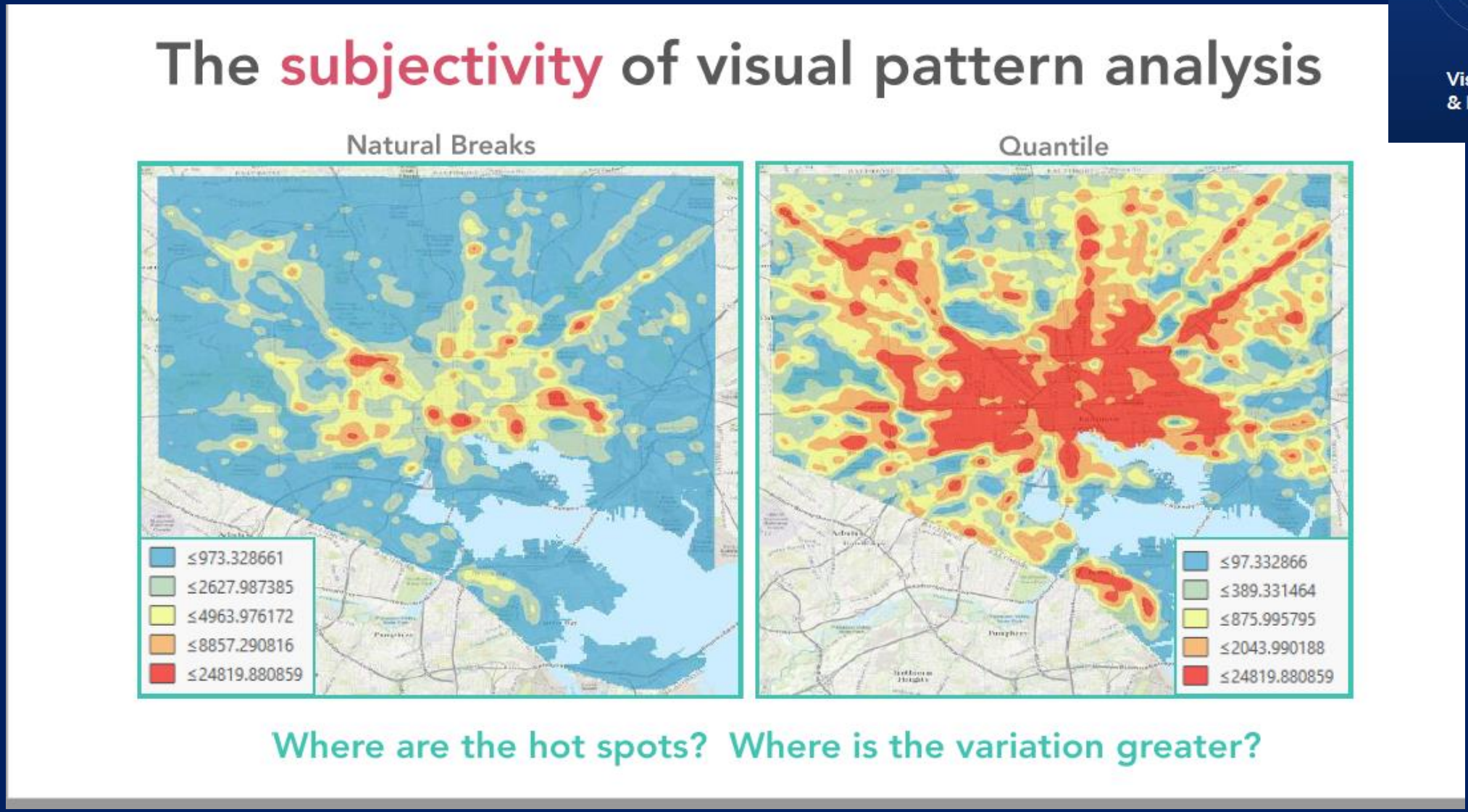
## The map as data

High Priority 911 Calls in Baltimore



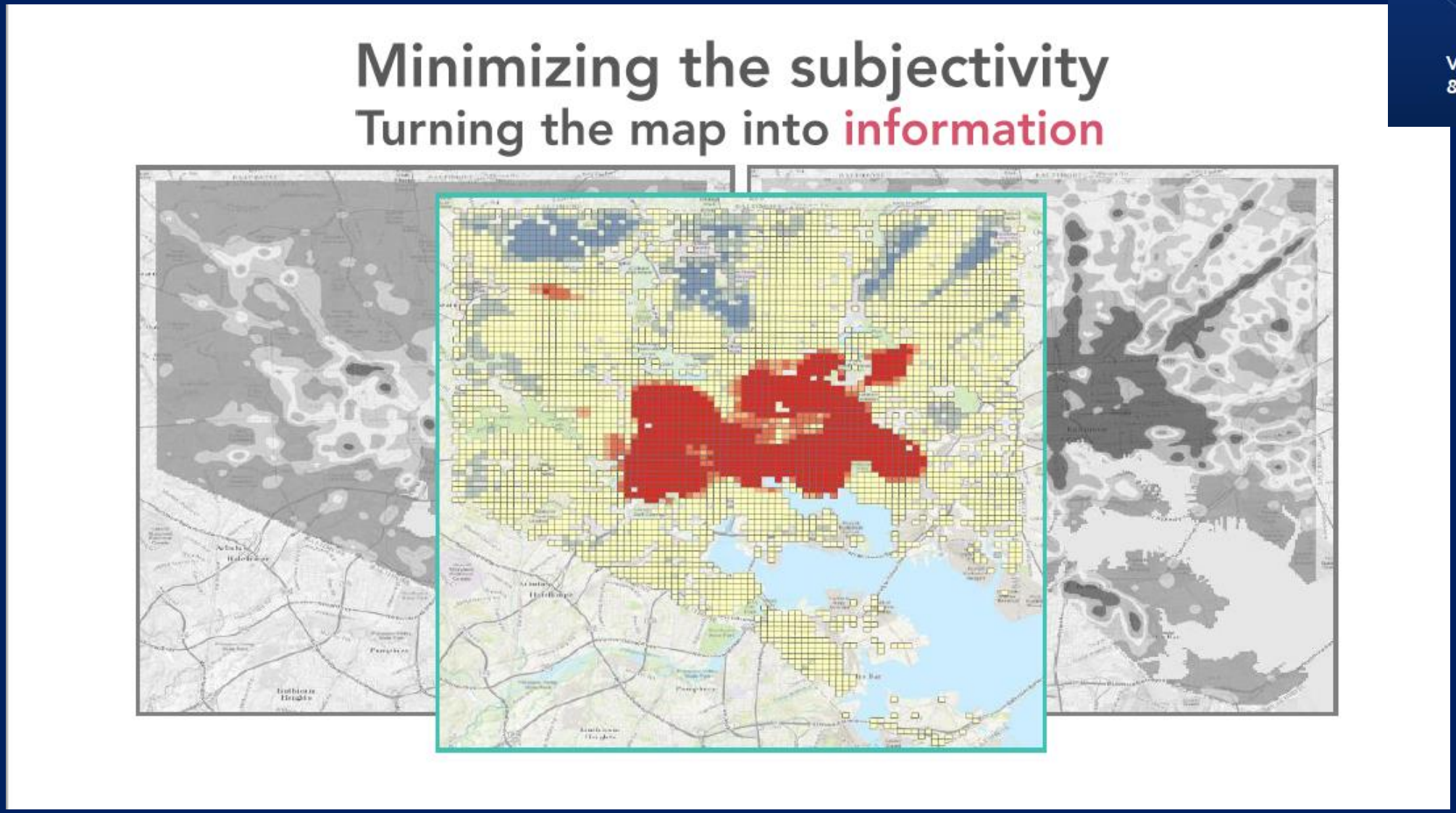
Where are the hot spots? Where is the variation greater?

# Visualization and Exploration



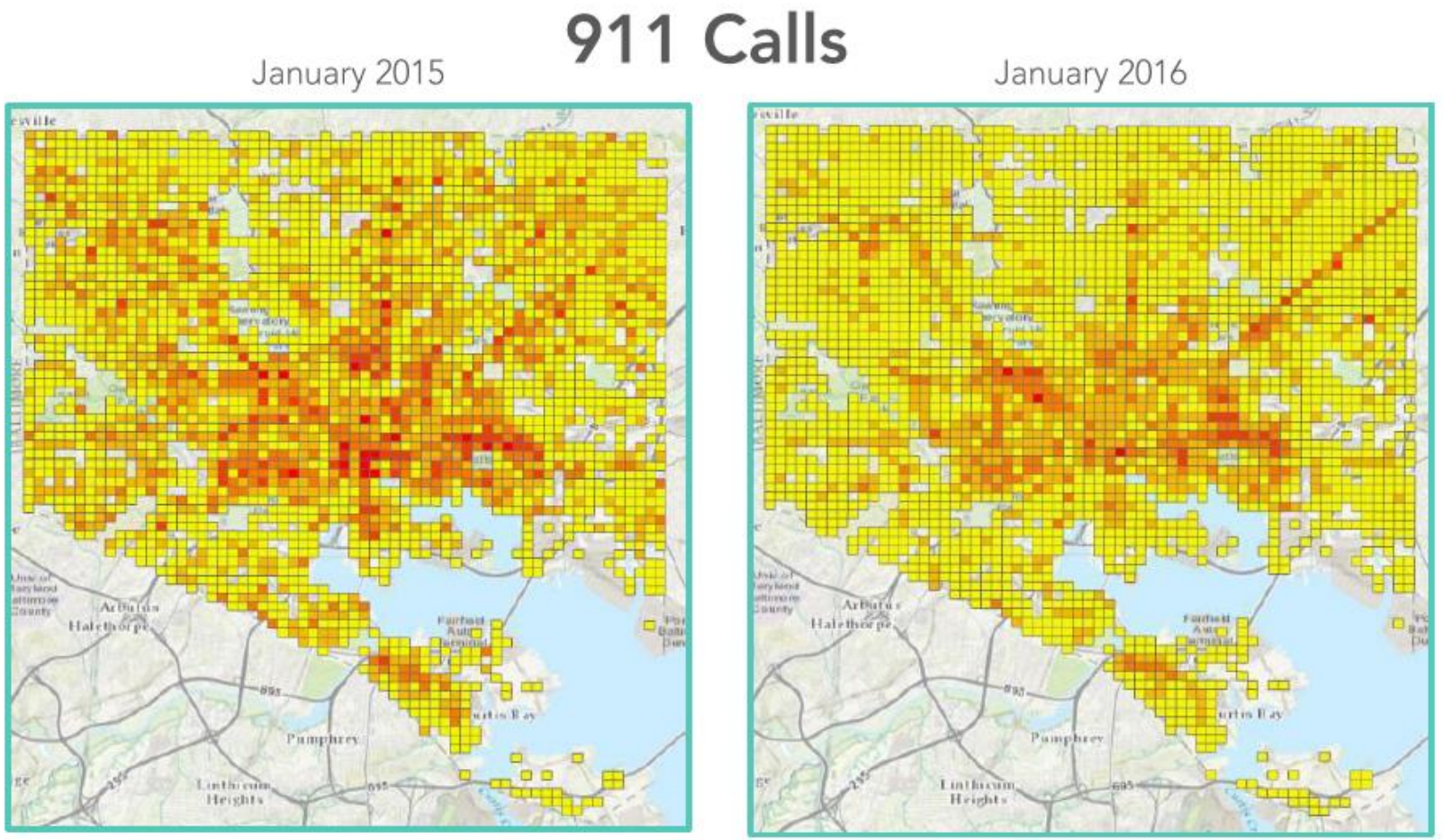

Visualization & Exploration

# Visualization and Exploration




Visualization
& Exploration

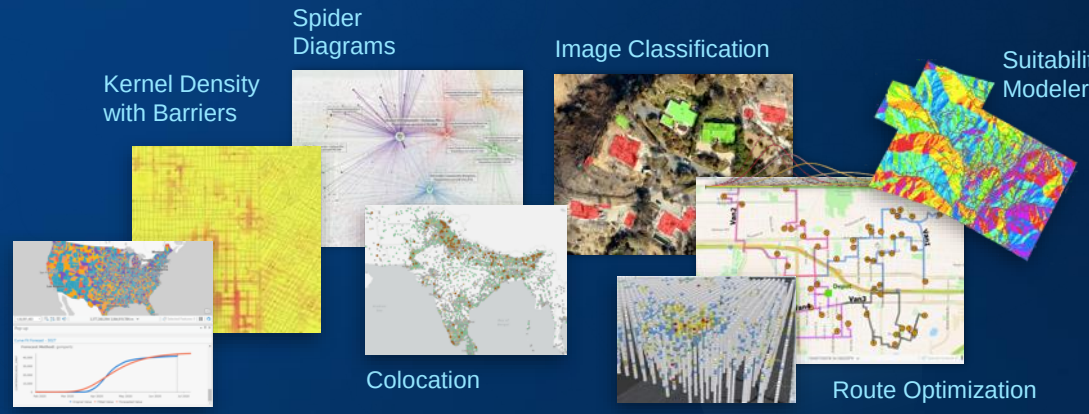
# Visualization and Exploration



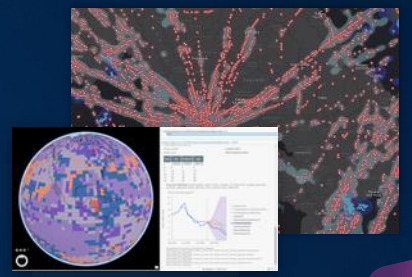

Visualization
& Exploration

# Spatial Analysis and Data Science

## Solving Problems & Advancing Science



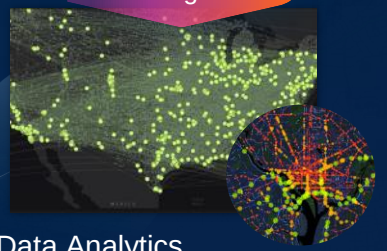

Spatial Analysis



Machine Learning & AI

Visualization & Exploration

Big Improveents Coming in H2

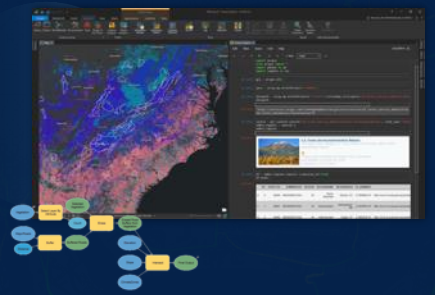


Big Data Analytics

Data Engineering

2,000+ Tools

Modeling & Scripting



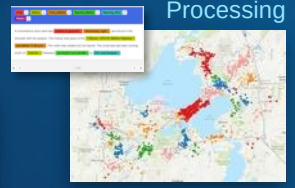
Spatial Analysis, Machine Learning & AI

# AI, Machine Learning and Deep Learning New Opportunities for Innovation

AI, ML DL
Tools & Models

Spatial Machine Learning

Natural Language Processing

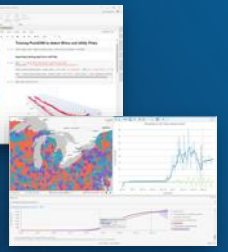


Object Extraction

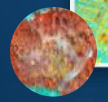
Object Detection

Georeferenced Features

3D Object Classification



Multi-Spectral



Time-Series Forecasting

ArcGIS

Pro

Enterprise

Online

Notebooks

Python & R

Open Source
Data Science Ecosystem

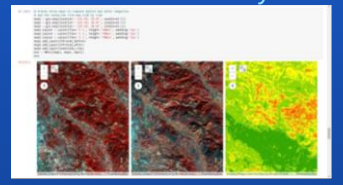
*Automating Processes & Making GIS Smarter*

# Modeling and Scripting

***Why?***

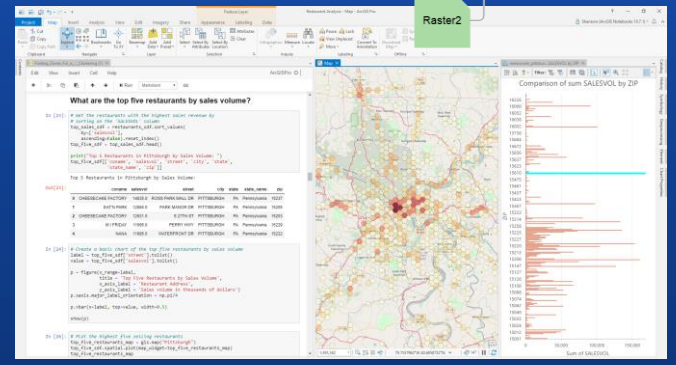
- Save time on repetitive tasks and minimize errors
- Train models to solve complex or time consuming problems quickly
- Extend and customize the available functionality

ArcGIS API for Python



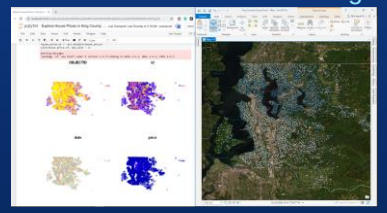
Raster Functions

ArcGIS Notebooks

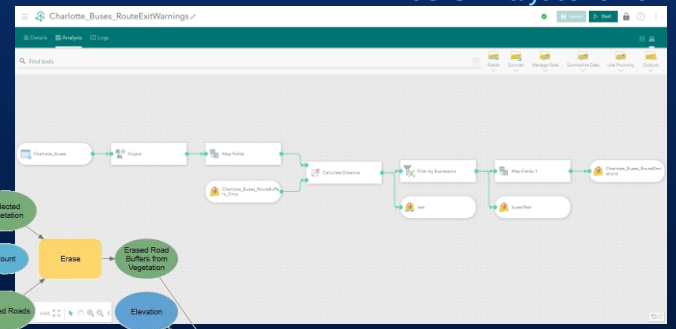


ArcPy

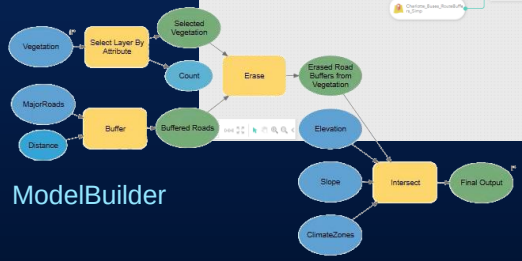
R-ArcGIS Bridge



ArcGIS Analytics for IoT



ModelBuilder



# Analysis driving action through storytelling

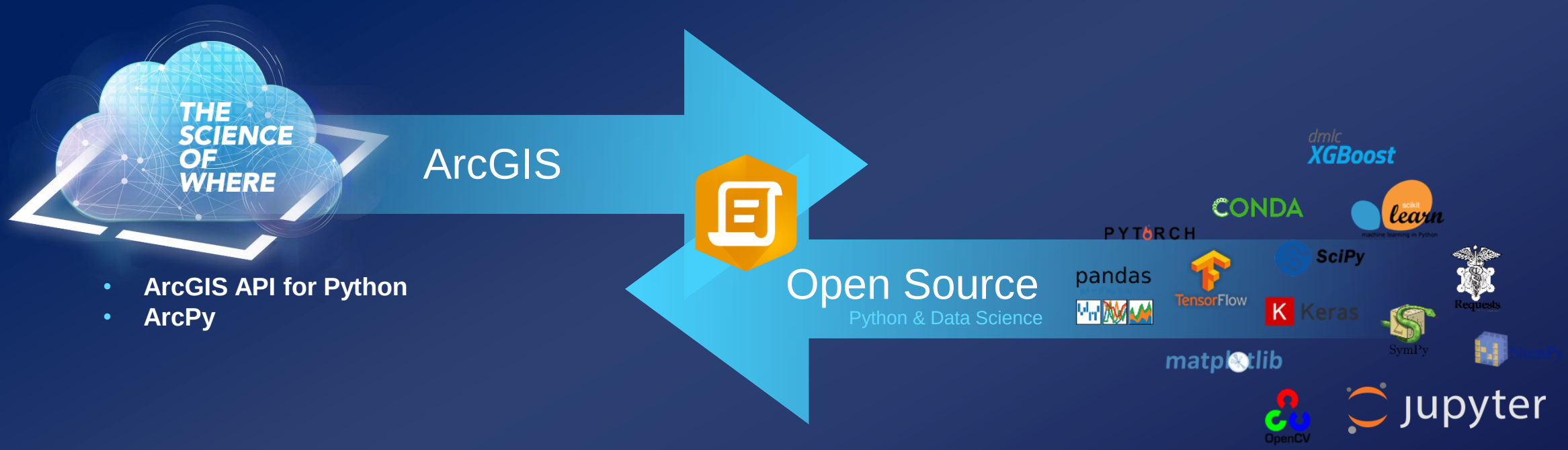
## Data Storytelling

- Dashboards
- StoryMaps
- Infographics
- Notebooks

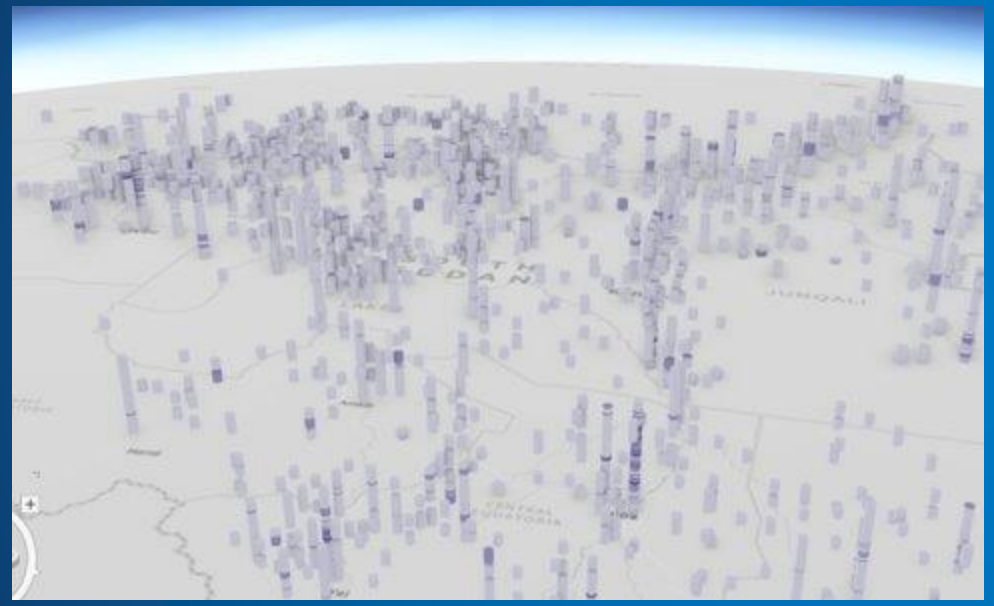
Sharing & Collaboration

*Interactive, Immersive, Inspiring…*

# ArcGIS Notebooks sits at the intersection of ArcGIS and open data science




- ArcGIS API for Python
- ArcPy



# Hannah Shumway

# Poll Question

Please Tick the Boxes that Apply to Your Organization

# Parker Hornstein

# Poll Question

Please Tick the Boxes that Apply to Your Organization

# Challenges for National Government Organizations

- Expanding Stakeholder Expectations
- Escalating Demand for Broader Range of Information Products
- Delivering Near Real Time Information
- Increasing Demand for Better Resolution and Higher Quality Data
- Growing Data Privacy Concerns

- Smaller Budgets and Revenues
- Less Staff and Resources
- Shrinking Timelines from Data Collection to Delivery
- Reduced Perception of Relevance

# Data Science Benefits to National Government Organizations

## Enabling Us to Do More with Less

- Responsiveness - Speeding Timely Information to Decision Makers
- Expanding use of Technology, Data Analysis & Information Delivery
- Saving Time, Money, Labor and Environmental Impact
- Increasing Efficiency and Expanding Capacity
- Improving Accuracy and Engagement with User Community

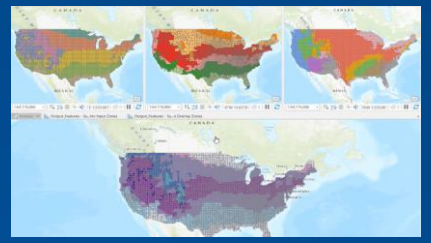
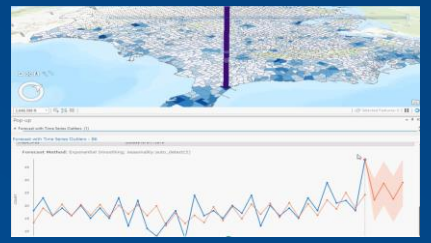
# Resources

- **https://esriurl.com/spatialdatascience**
- **https://esri.com/pythonlibraries**
- **https://www.esri.com/rarcgisbridge**
- **https://esriurl.com/spatialstats**
- **https://learn.arcgis.com/en/**
- ArcGIS.Learn Documentation: **https://developers.arcgis.com/python/api-reference/arcgis.learn.html**
- Sample Notebooks **https://developers.arcgis.com/python/sample-notebooks/**
- Spatial Data Science MOOC **https://go.esri.com/explore-sds**
- Courses **https://www.esri.com/training/mooc-spatial-data-science/#!**

# Spatial Analysis and Data Science Webinar

## Question & Answer

Please Enter Questions in the Questions Window

# Thank You for Your Time and Please Take a Minute to Complete the Survey!

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SCIENCE
OF
WHERE