ArcGIS Insights: Scripting with Python and R

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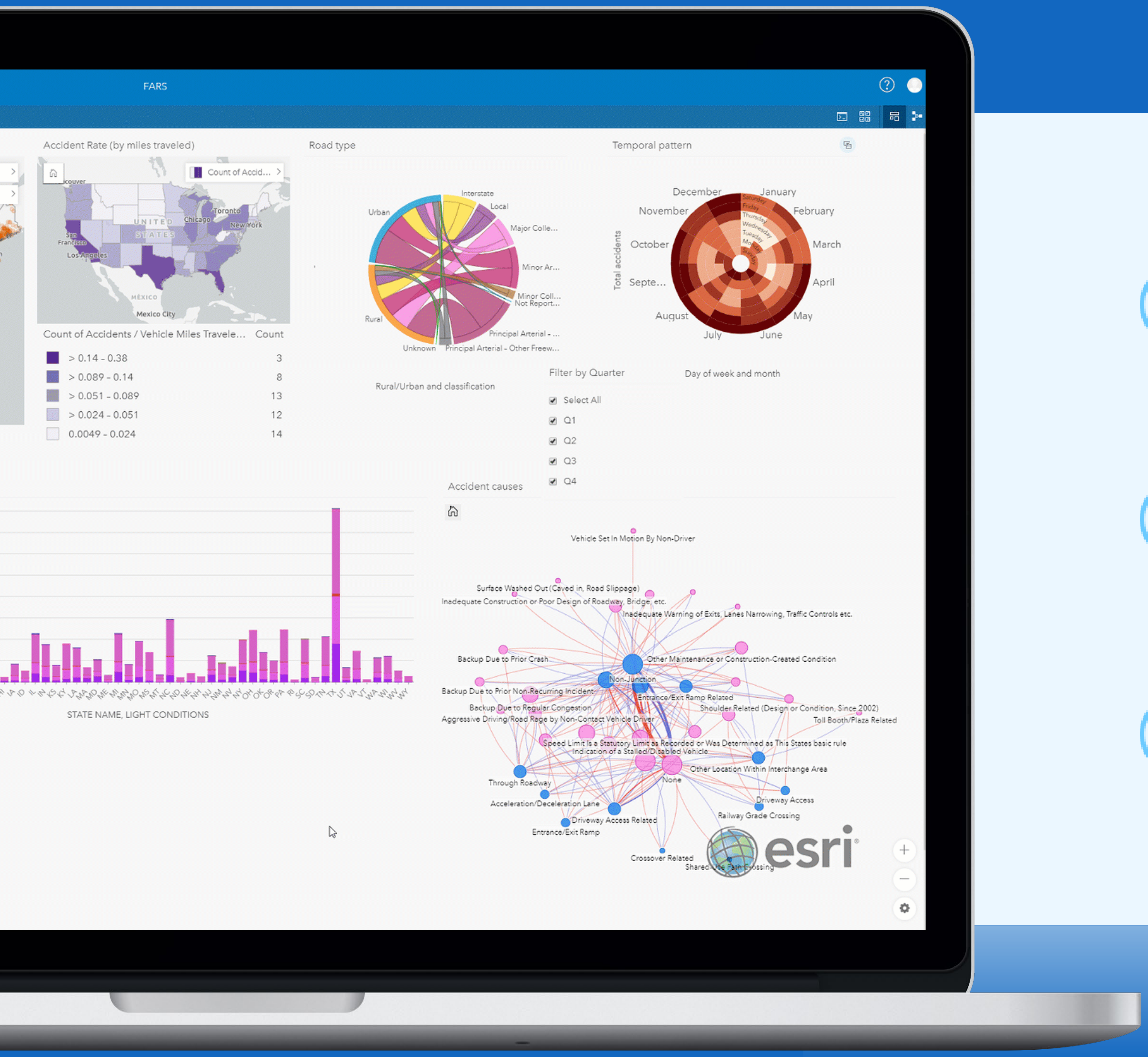
2021 ESRI
DEVELOPER SUMMIT


FARS
Accident Rate (by miles traveled)
Road type
Temporal pattern
Count of Accidents / Vehicle Miles Travele... Count
> 0.14 - 0.38 3
> 0.089 - 0.14 8
> 0.051 - 0.089 13
> 0.024 - 0.051 12
0.0049 - 0.024 14
Rural/Urban and classification
Filter by Quarter
Select All
Q1
Q2
Q3
Q4
Day of week and month
December
January
February
March
April
May
June
July
August
Septe...
October
November
Total accidents
Accident causes
STATE NAME, LIGHT CONDITIONS
Vehicle Set In Motion By Non-Driver
Surface Washed Out (Caved in, Road Slippage)
Inadequate Construction or Poor Design of Roadway, Bridge, etc.
Inadequate Warning of Exits, Lanes Narrowing, Traffic Controls etc.
Backup Due to Prior Crash
Other Maintenance or Construction-Created Condition
Non-Junction
Backup Due to Prior Non-Recurring Incident
Entrance/Exit Ramp Related
Backup Due to Regular Congestion
Shoulder Related (Design or Condition, Since 2002)
Aggressive Driving/Road Rage by Non-Contact Vehicle Driver
Toll Booth/Plaza Related
Speed Limit Is a Statutory Limit as Recorded or Was Determined as This States basic rule
Indication of a Stalled/Disabled Vehicle
Other Location Within Interchange Area
None
Through Roadway
Driveway Access
Acceleration/Deceleration Lane
Railway Grade Crossing
Driveway Access Related
Entrance/Exit Ramp
Crossover Related
esri

- ✓ Provides self-service visual analytics for multiple data types and sources

- ✓ Visualizations can be quantified using the accompanying descriptive statistics

- ✓ Exploratory analysis can be extended with graph analysis, predictive modeling and open data science

Deployment and data options

ENTERPRISE

ONLINE

DESKTOP

DATA

Feature layers

GeoDatabases

Shapefiles

GeoJson

Excel

CSV

DATABASES (spatial or non-spatial tables)

Microsoft SQL Server

ORACLE

PostgreSQL

SAP HANA

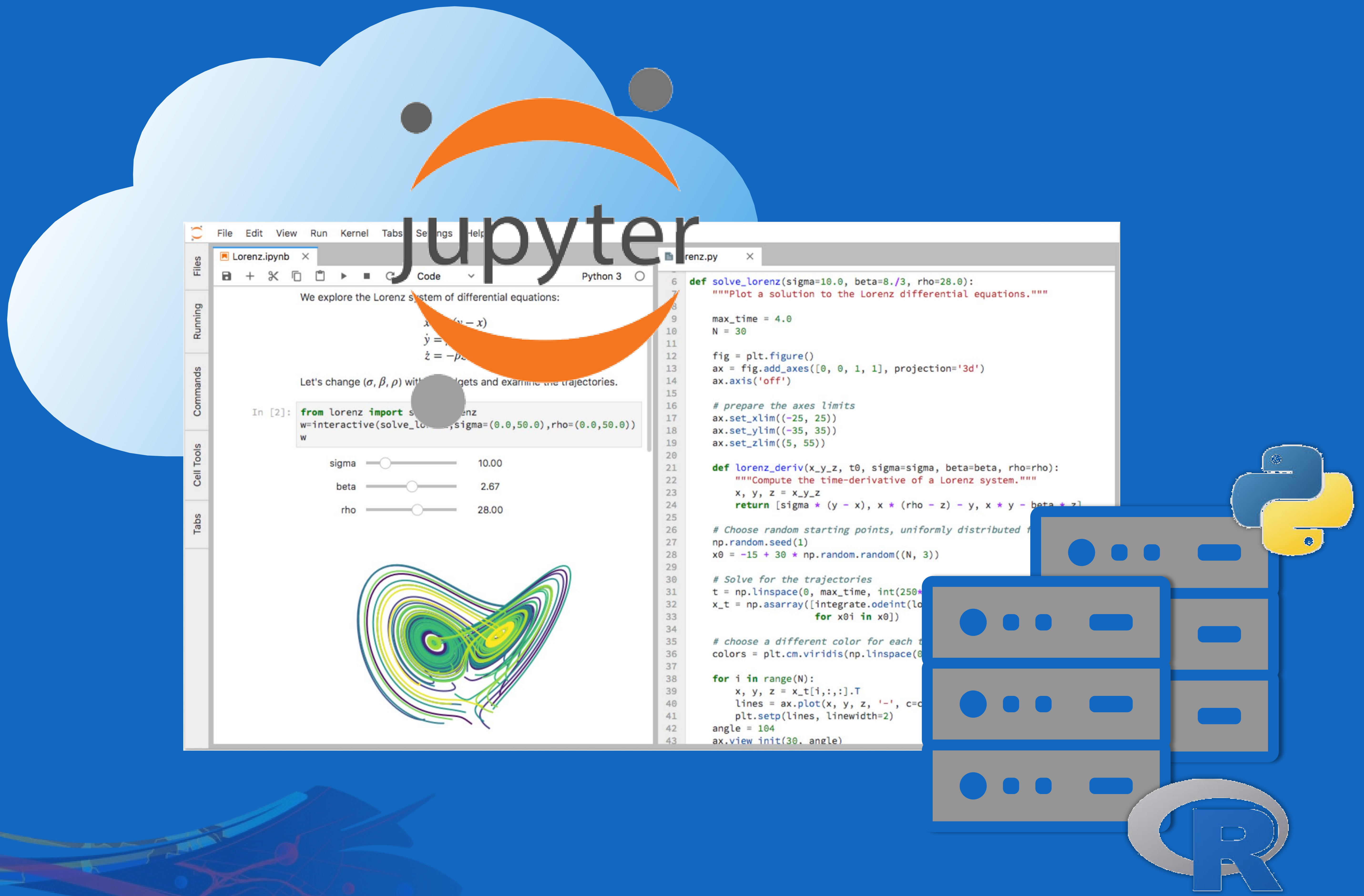
OPEN SOURCE

Python scripts

Python notebooks

R scripts

ArcGIS Insights and data science



We explore the Lorenz system of differential equations:

Let's change (σ, β, ρ) with widgets and examine the trajectories.

```
In [2]: from lorenz import solve_lorenz
        w=interactive(solve_lorenz,sigma=(0.0,50.0),rho=(0.0,50.0))
        w
```

sigma 10.00

beta 2.67

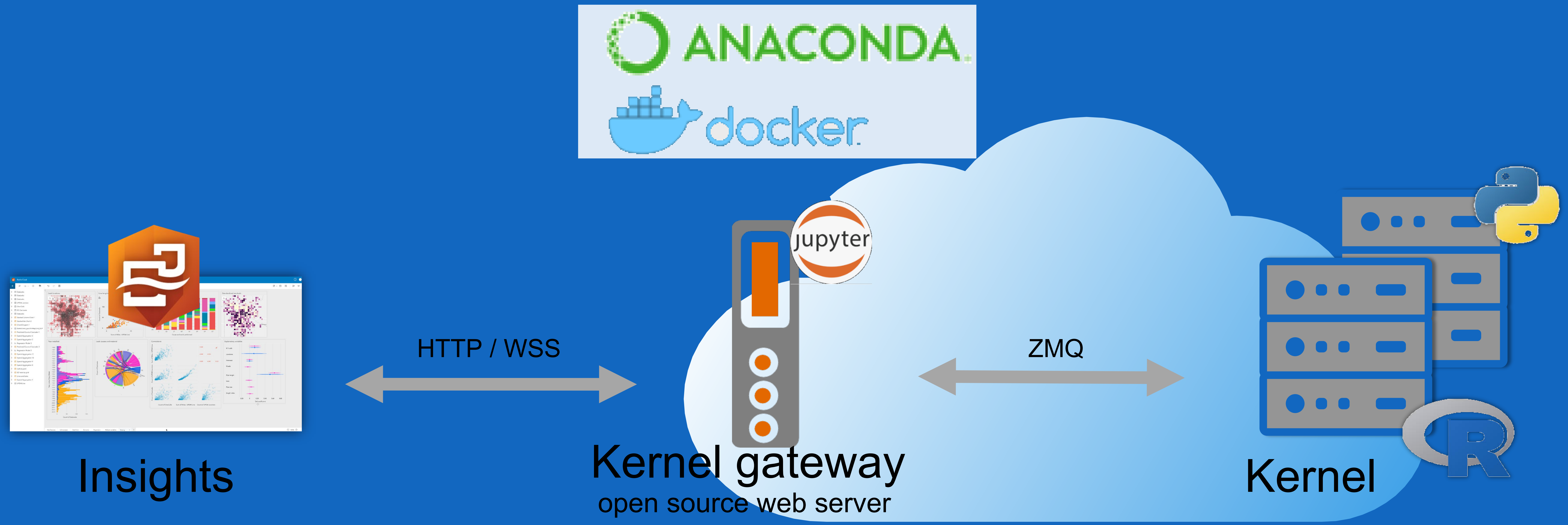
rho 28.00

```
def solve_lorenz(sigma=10.0, beta=8./3, rho=28.0):
    """Plot a solution to the Lorenz differential equations."""

    max_time = 4.0
    N = 30

    fig = plt.figure()
    ax = fig.add_axes([0, 0, 1, 1], projection='3d')
    ax.axis('off')

    # prepare the axes limits
    ax.set_xlim((-25, 25))
    ax.set_ylim((-35, 35))
    ax.set_zlim((5, 55))

    def lorenz_deriv(x_y_z, t0, sigma=sigma, beta=beta, rho=rho):
        """Compute the time-derivative of a Lorenz system."""
        x, y, z = x_y_z
        return [sigma * (y - x), x * (rho - z) - y, x * y - beta * z]

    # Choose random starting points, uniformly distributed f
    np.random.seed(1)
    x0 = -15 + 30 * np.random.random((N, 3))

    # Solve for the trajectories
    t = np.linspace(0, max_time, int(250*
    x_t = np.asarray([integrate.odeint(lo
                      for x0i in x0])

    # choose a different color for each t
    colors = plt.cm.viridis(np.linspace(0

    for i in range(N):
        x, y, z = x_t[i,:,:].T
        lines = ax.plot(x, y, z, '-', c=c
        plt.setp(lines, linewidth=2)
    angle = 104
    ax.view_init(30, angle)
```

Kernel

Connecting to Python/R

Connect to your own Python and R kernels to extend analysis and visualization using both open-source software platforms.



Extend your analysis using Python and/or R. Incorporate visualizations as cards. Manage your data.

Use the scripting editor to add scripts to models, save sessions and more…

Uses of scripting in Insights

01
DATA ENGINEERING

Prepare and manipulate data easily. Connect to databases an APIs.

02
ANALYTICS

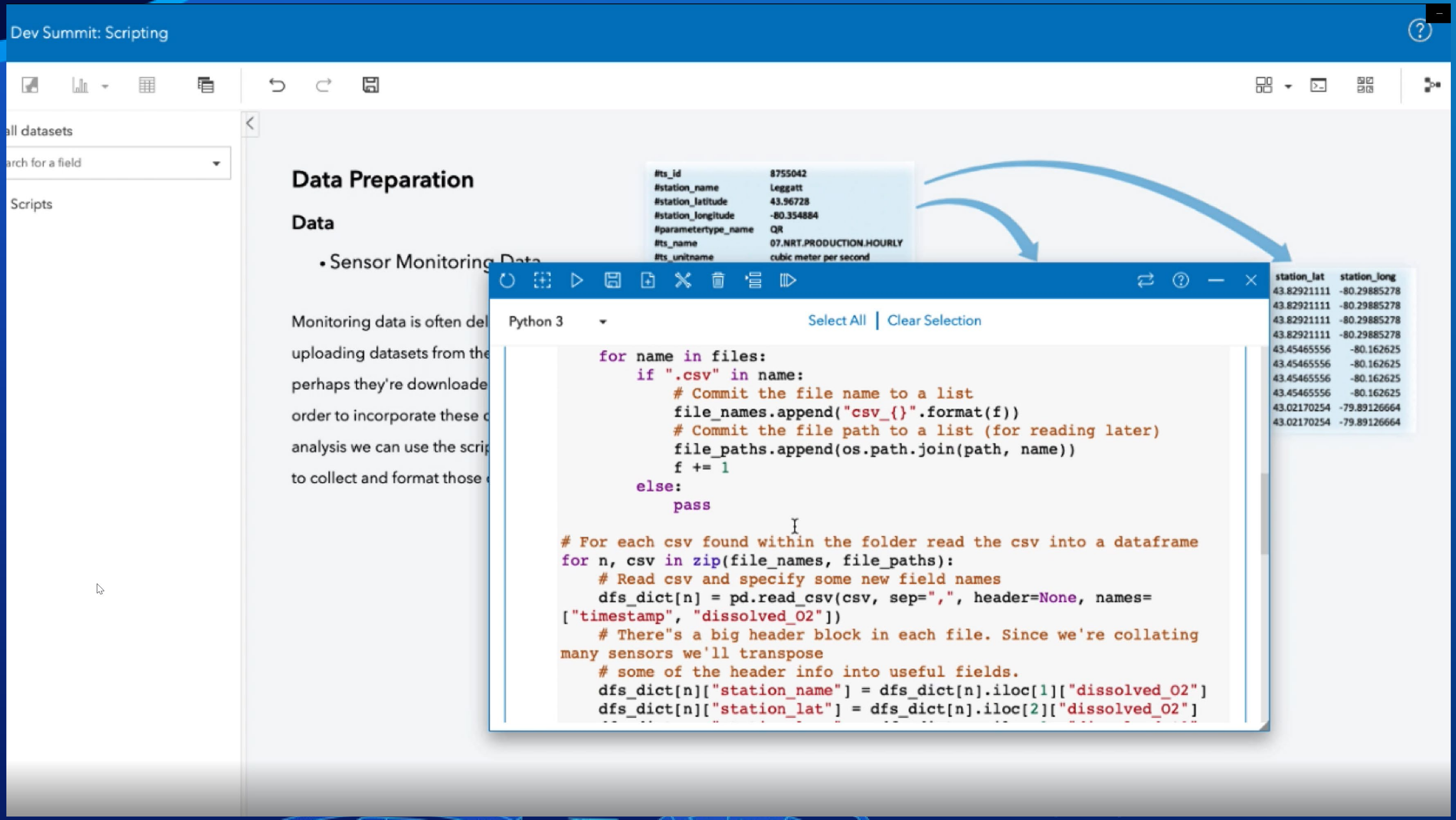
Use specific functions in python and or R to extend Insight's analytics

03
REPORTING

Extending visualizations using others from Python and or R

Using Python and R for engineering

Warren Davison



Data Preparation

Data

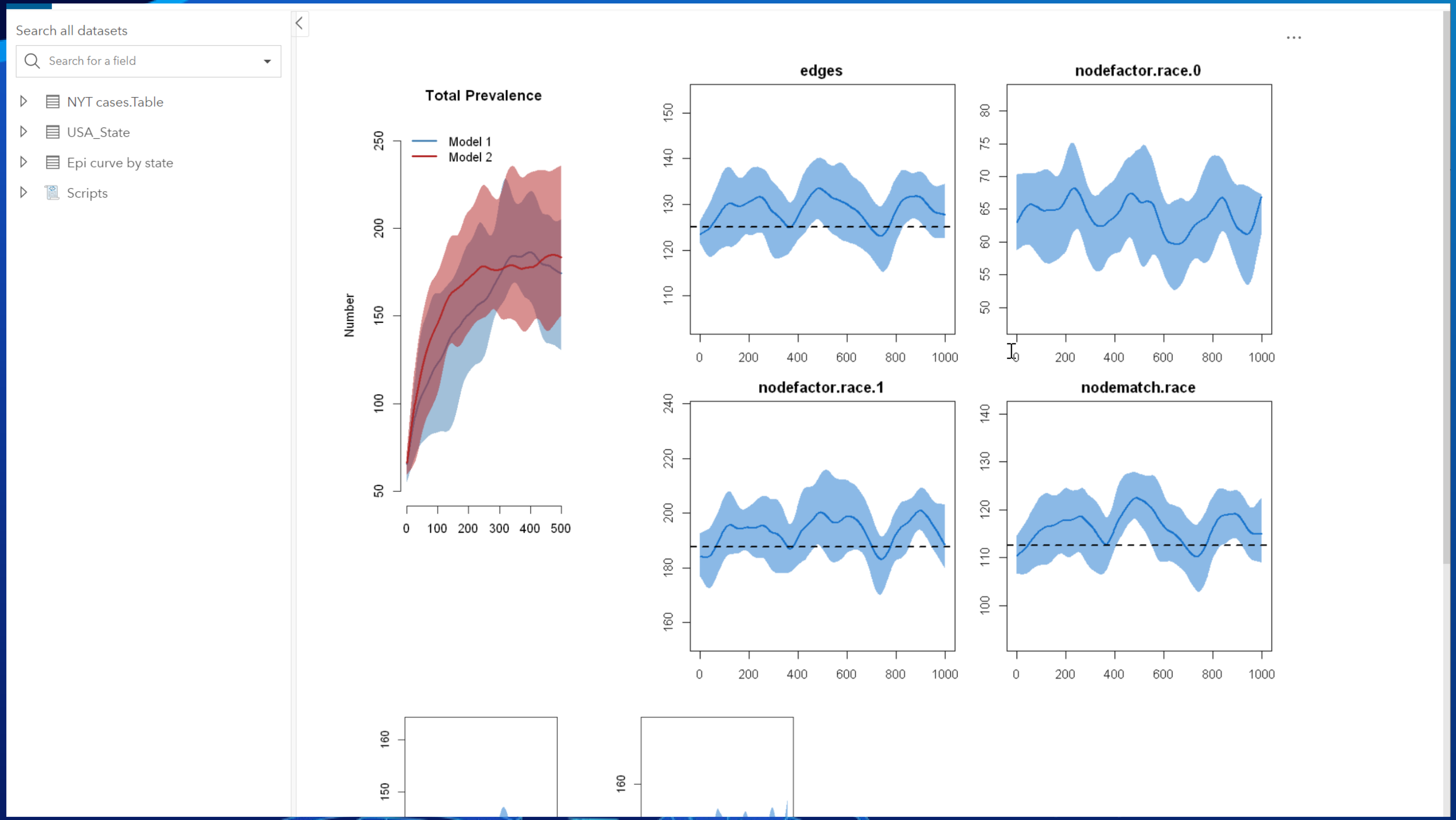
- Sensor Monitoring Data

Monitoring data is often del
uploading datasets from the
perhaps they're downloade
order to incorporate these
analysis we can use the scrip
to collect and format those

#ts_id	8755042
#station_name	Leggatt
#station_latitude	43.96728
#station_longitude	-80.354884
#parametertype_name	QR
#ts_name	07.NRT.PRODUCTION.HOURLY
#ts_unitname	cubic meter per second

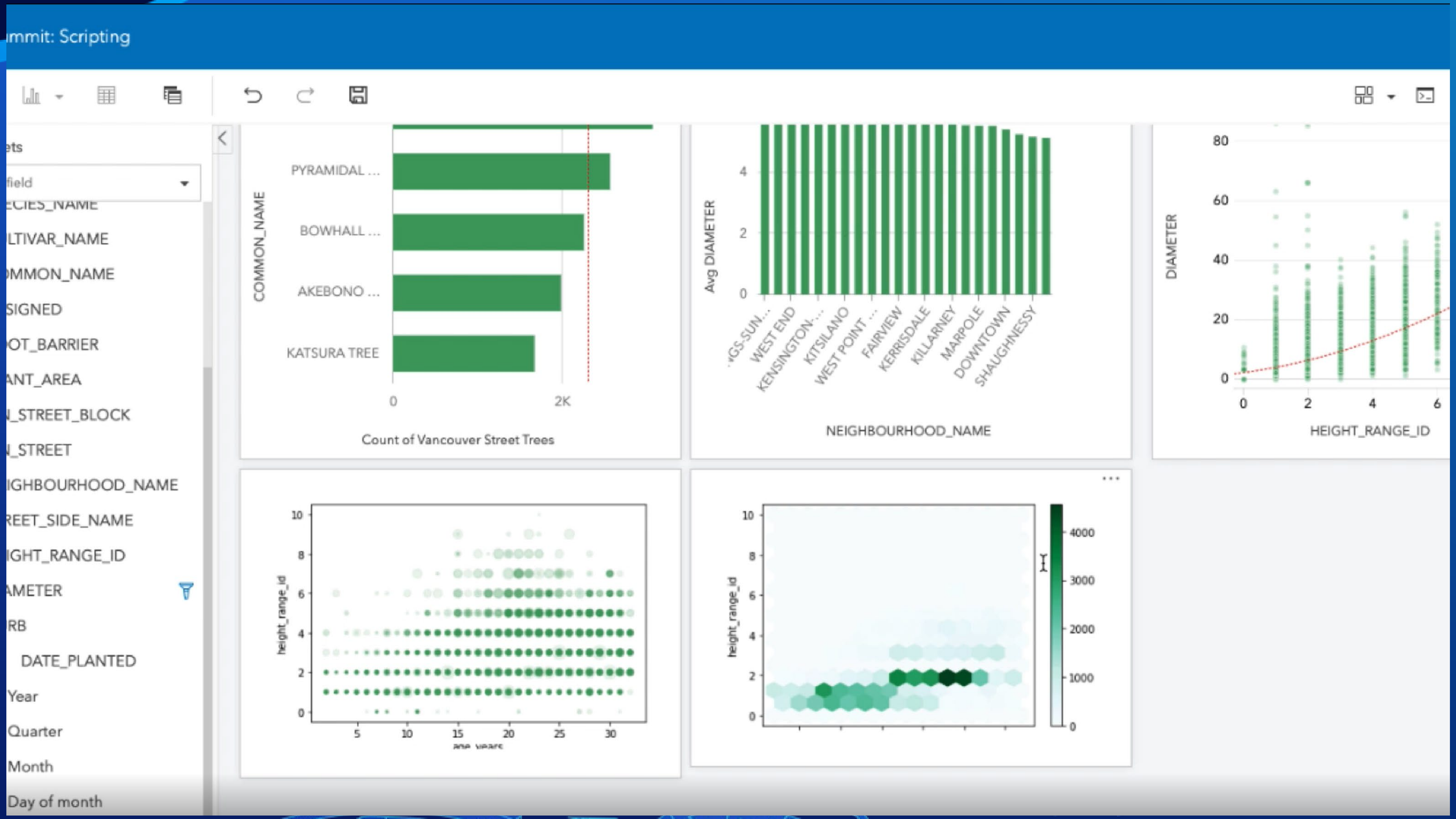
station_lat	station_long
43.82921111	-80.29885278
43.82921111	-80.29885278
43.82921111	-80.29885278
43.82921111	-80.29885278
43.45465556	-80.162625
43.45465556	-80.162625
43.45465556	-80.162625
43.45465556	-80.162625
43.02170254	-79.89126664
43.02170254	-79.89126664

```python
    for name in files:
        if ".csv" in name:
            # Commit the file name to a list
            file_names.append("csv_{}".format(f))
            # Commit the file path to a list (for reading later)
            file_paths.append(os.path.join(path, name))
            f += 1
        else:
            pass

# For each csv found within the folder read the csv into a dataframe
for n, csv in zip(file_names, file_paths):
    # Read csv and specify some new field names
    dfs_dict[n] = pd.read_csv(csv, sep=",", header=None, names=
["timestamp", "dissolved_O2"])
    # There"s a big header block in each file. Since we're collating
many sensors we'll transpose
    # some of the header info into useful fields.
    dfs_dict[n]["station_name"] = dfs_dict[n].iloc[1]["dissolved_O2"]
    dfs_dict[n]["station_lat"] = dfs_dict[n].iloc[2]["dissolved_O2"]
```



Using Python and R for analytics

Linda Beale



Using cards and sharing

Warren Davison

INSIGHTS SCRIPTING GUIDE
https://github.com/Esri/insights-scripting-guide

INSIGHTS RESOURCE SITE
https://www.esri.com/en-us/arcgis/products/arcgis-insights/resources

INSIGHTS DOCUMENTATION
https://doc.arcgis.com/en/insights/latest/get-started/get-started.htm

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