



ESRI EUROPEAN DEVELOPER SUMMIT 2023

Spatial Data Science with Notebooks in ArcGIS Pro

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Product Marketing Engineer for Developer tools & ArcGIS Experience Builder

Esri France

```
const routeParams = new RouteParam.  
  stops: new FeatureSet({  
    features: view.graphics.toArray(  
    }},  
    returnDirections: true  
  }));
```

What are Notebooks ?

```
var mapView =  
  container: "v_.  
  map: map,  
  zoom: 10,  
  center: [-73.95, 40.,  
  ]));
```

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1.3.3 Fourier Domain OCT (FDOCT)

In FDOCT, the different wavelengths are collected on a spectrometer, with N_{pix} pixels, and spectral resolution δ_r .

Returning again to Eq. (8) (see, e.g., Izatt and Choma (Izatt J.A., Choma M.A. (2008) Theory of Optical Coherence Tomography. In: Drexler W., Fujimoto J.G. (eds) Optical Coherence Tomography. Biological and Medical Physics, Biomedical Engineering. Springer, Berlin, Heidelberg; doi: https://doi.org/10.1007/978-3-540-77550-8_2; alternate link: https://www.researchgate.net/publication/226178102_Theory_of_Optical_Coherence_Tomography/download)).

$$I_D(k) = \frac{Q}{4} S(k) \left[R_R + \sum_{n=1}^N R_n \right] \quad \text{" DC terms "}$$

$$+ \frac{Q}{2} S(k) \left[\sum_{n=1}^N \sqrt{R_R R_n} \cos [2k(z_R - z_n)] \right] \quad \text{" Cross - correlation terms "}$$

$$+ \frac{Q}{2} S(k) \left[\sum_{n \neq m=1}^N \sqrt{R_n R_m} \cos [2k(z_n - z_m)] \right] . \quad \text{" Autocorrelation terms "}$$

In the FDOCT configuration, z_R is held fixed.

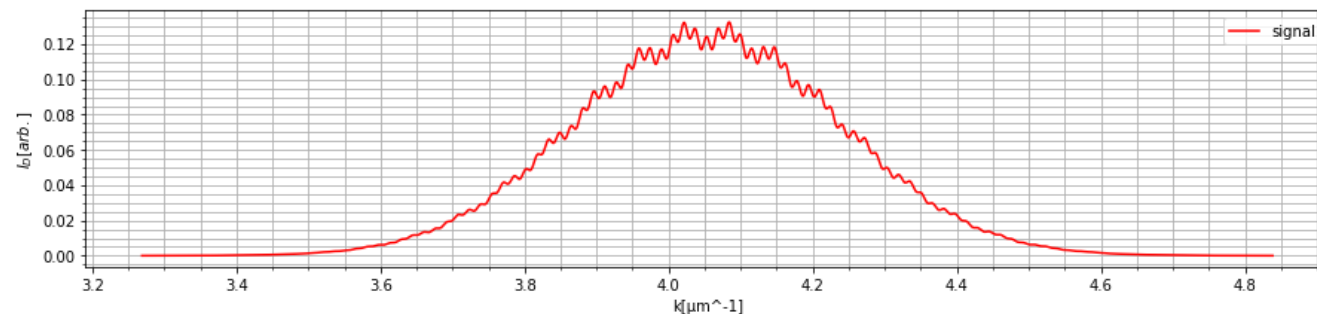
```
In [23]: lambda_0 = 1.5500
k_0 = 2.0*np.pi/lambda_0
Dlambda_0 = 0.100
Dk = 2.0*np.pi*Dlambda_0/lambda_0**2.0

k_range = np.linspace(-3.0*Dk+k_0, +3.0*Dk+k_0, 10000)

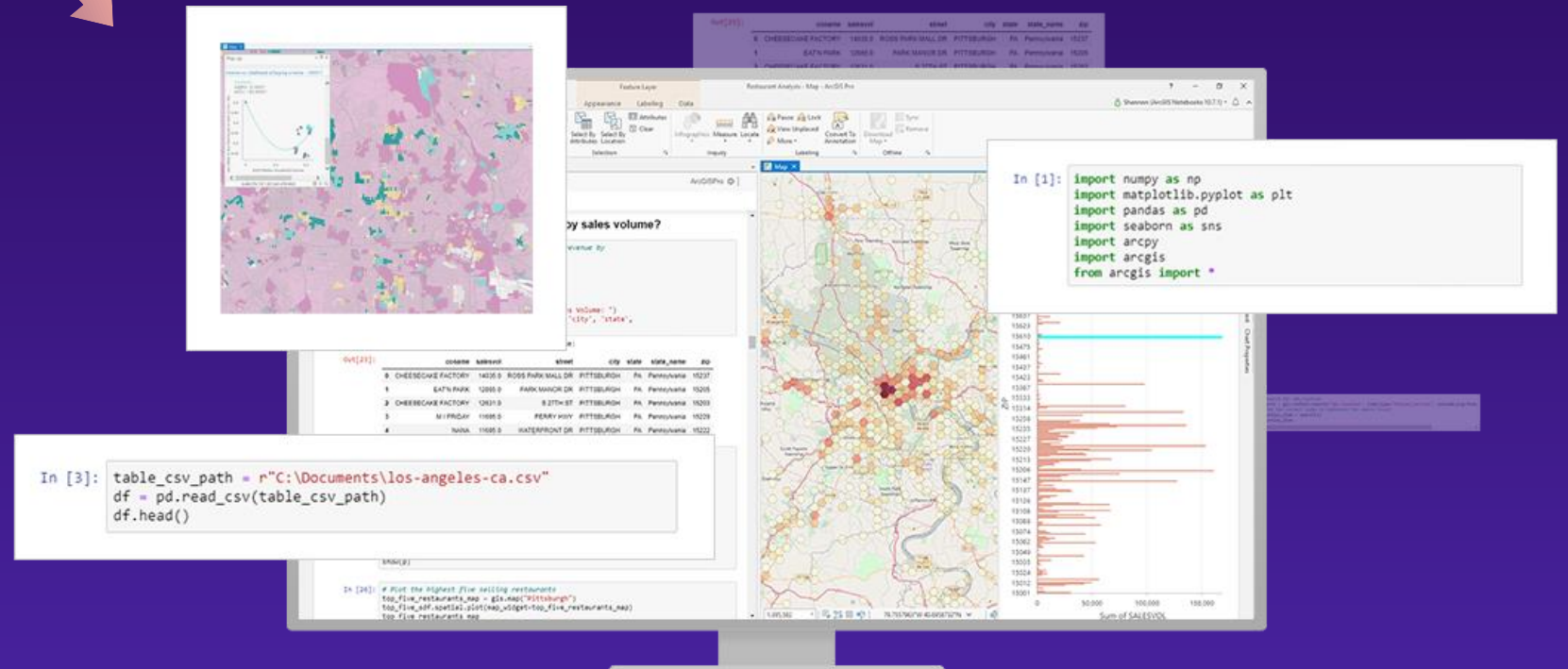
TD_OCT_signal = 0.25*0.5*(np.exp(-((k_range - k_0)/Dk)**2.0)) \
+ 0.5*np.sqrt(0.5*2.0E-4)*(np.exp(-((k_range - k_0)/Dk)**2.0)) \
*np.cos(2.0*k_range*(50.0)) \
+ 0.5*np.sqrt(0.5*1.5E-4)*(np.exp(-((k_range - k_0)/Dk)**2.0)) \
*np.cos(2.0*k_range*(200.0))
```

In [26]: fig_disp

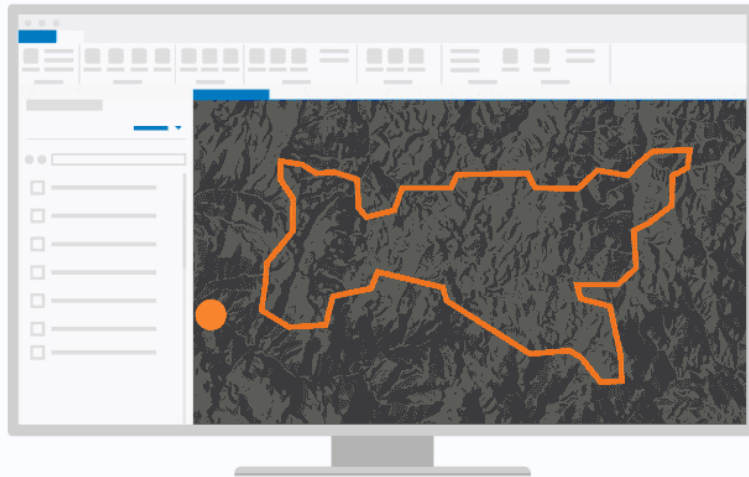
Out[26]:



Notebooks in ArcGIS Pro



```
var mapView = new MapView({  
  container: "viewDiv",  
  map: map,  
  zoom: 10,  
  center: [-73.95, 40.73]  
});
```



Access Notebooks in ArcGIS Pro

```
const r = new RouteParameters({  
  stops: stops,  
  featureSet: featureSet,  
  returnGeometry: true  
});
```

```
const routeParams = new RouteParam.  
  stops: new FeatureSet({  
    features: view.graphics.toArray()  
  }),  
  returnDirections: true  
});
```

Notebooks in ArcGIS Pro throughout the building blocks of spatial data science

```
var mapView =  
  container: "v_  
  map: map,  
  zoom: 10,  
  center: [-73.95, 40.,  
  ]);
```

Spatial Analysis and Data Science Framework



**Data
Engineering**



**Visualization
&
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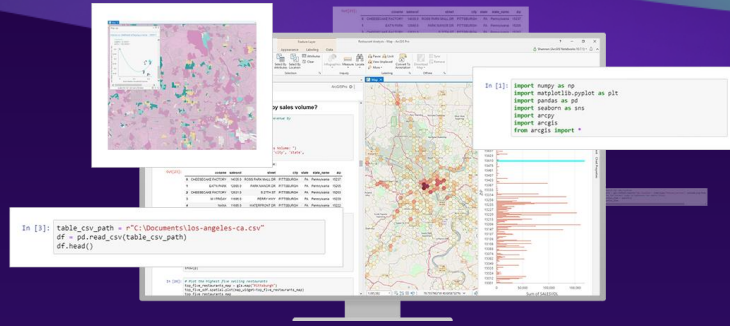
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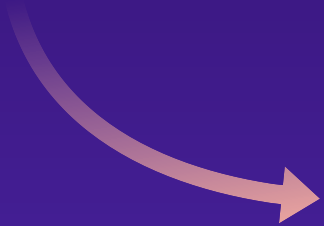
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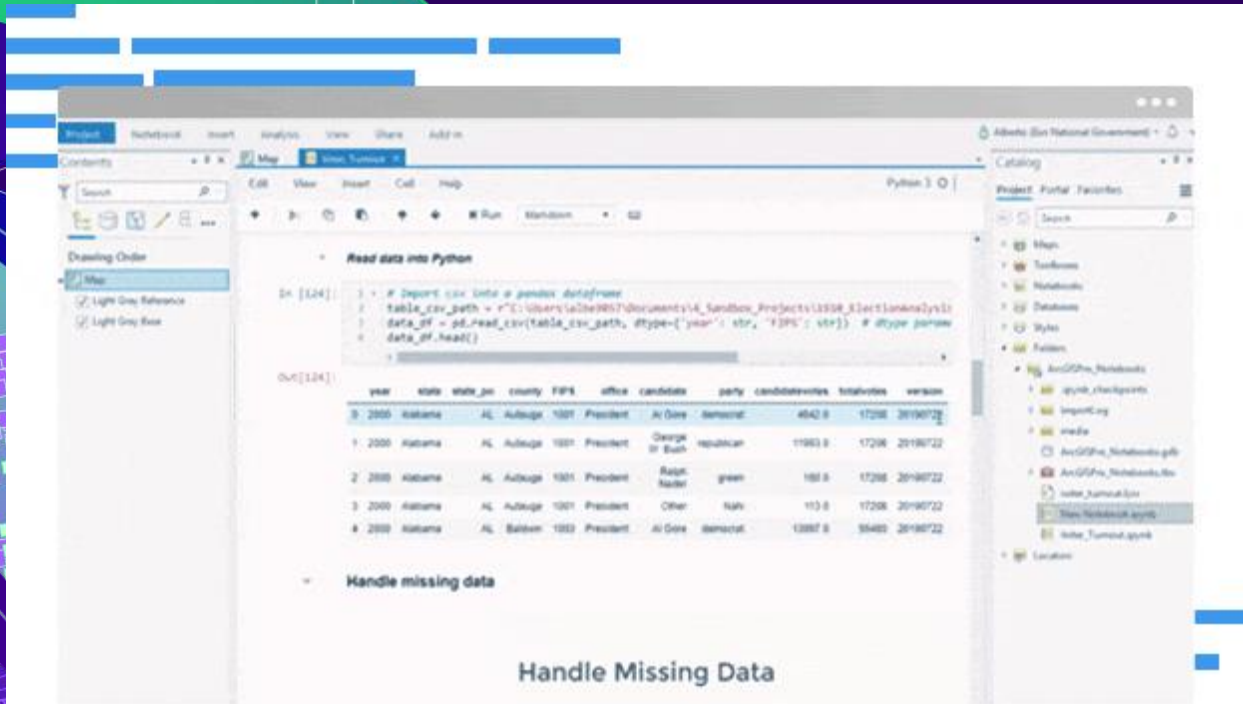


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Collaboration**



**Use Pandas and rest of the python
ecosystem to manage data**


```
var mapView = new MapView({
  container: "viewDiv",
  map: map,
  zoom: 10,
  center: [-73.95, 40.73]
});
```



The screenshot shows a Jupyter Notebook interface. The top part displays a map of a city area with a grid of colored squares. Below the map, there is a section titled "Read data into Python" which contains a code cell. The code cell shows the following code:

```
In [124]: 1 # Import csv into a pandas dataframe
          2 table_csv_path = r"C:\Users\albert\Documents\albert\Projects\1508_ElectionAnalysis\
          3 data_gf = pd.read_csv(table_csv_path, dtype={'year': str, 'FIPS': str}) # dtype pandas
          4 data_gf.head()
```

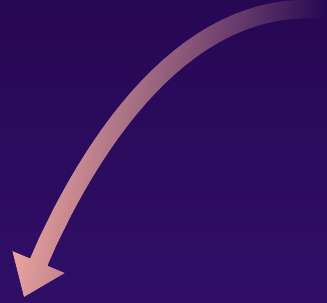
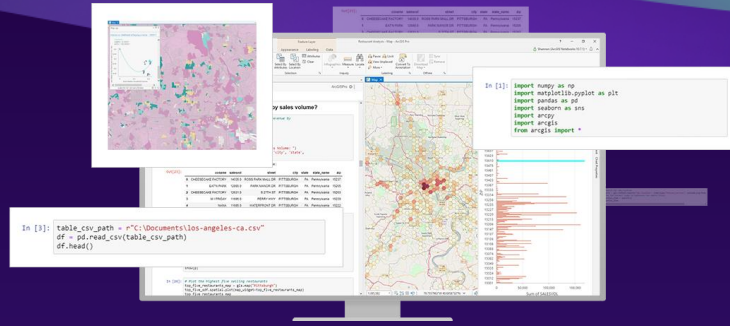
The output of the code cell is a table with the following columns: year, state, state_fips, county, FIPS, office, candidate, party, candidatevotes, totalvotes, and version. The table contains 5 rows of data.

	year	state	state_fips	county	FIPS	office	candidate	party	candidatevotes	totalvotes	version
0	2000	Alabama	AL	Autauga	1001	President	George W. Bush	Republican	4642	8	17208 20190722
1	2000	Alabama	AL	Autauga	1001	President	George W. Bush	Republican	11983	8	17208 20190722
2	2000	Alabama	AL	Autauga	1001	President	Ralph Nader	Green	188	8	17208 20190722
3	2000	Alabama	AL	Autauga	1001	President	Other	N/A	113	8	17208 20190722
4	2000	Alabama	AL	Baldwin	1003	President	Al Gore	Democrat	13887	8	95480 20190722

Below the table, there is a section titled "Handle missing data".

Data Engineering

```
const routeParameters = new RouteParameters({
  stops: stops,
  features: features,
  return: true
});
```



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Modeling
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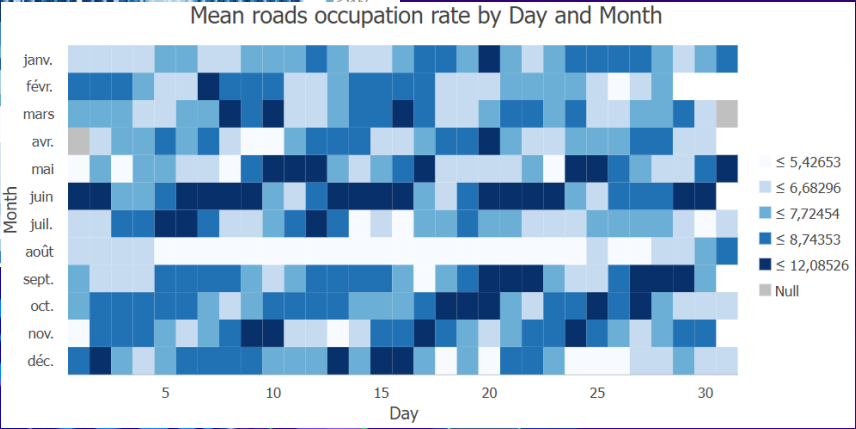
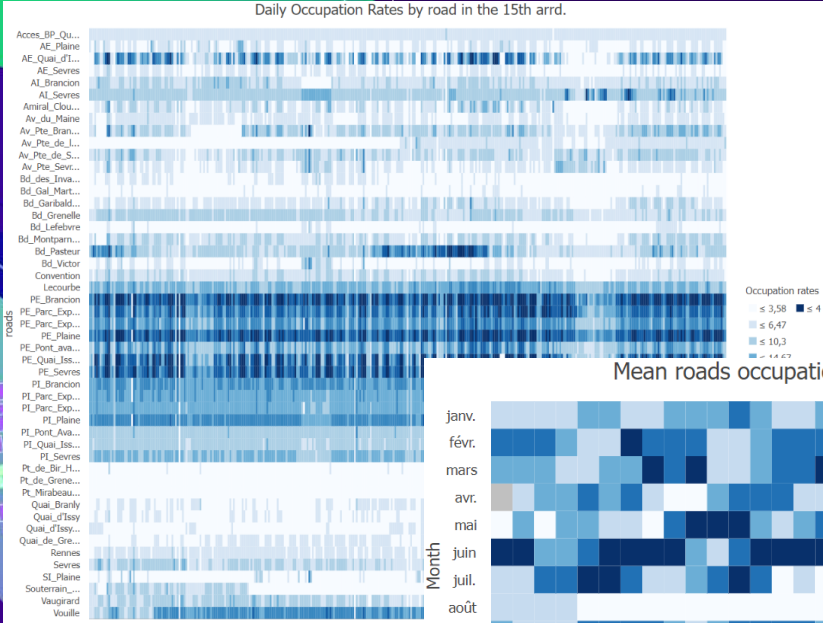


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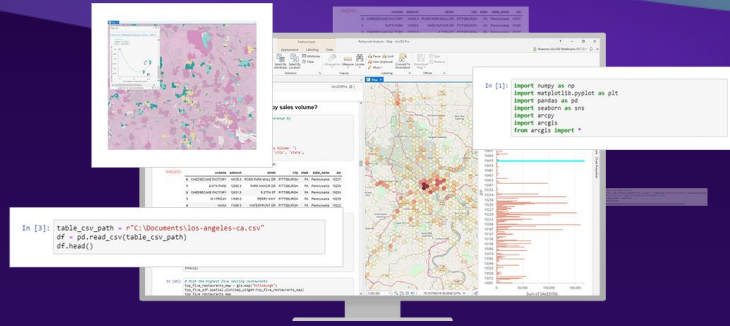
Use the robust data visualization
capabilities of ArcGIS Pro in conjunction
with your code

```
var mapView = new MapView({
  container: "viewDiv",
  map: map,
  zoom: 10,
  center: [-73.95, 40.73]
});
```



Data Visualization

```
const r = new RouteParameters({
  stops: new FeatureSet({
    features: graphics.toArray()
  }),
  return: true
});
```



Data
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Visualization
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Spatial
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Use ArcGIS Pro's rich suite of spatial data
science tools

[illegible]

Spatial Analysis

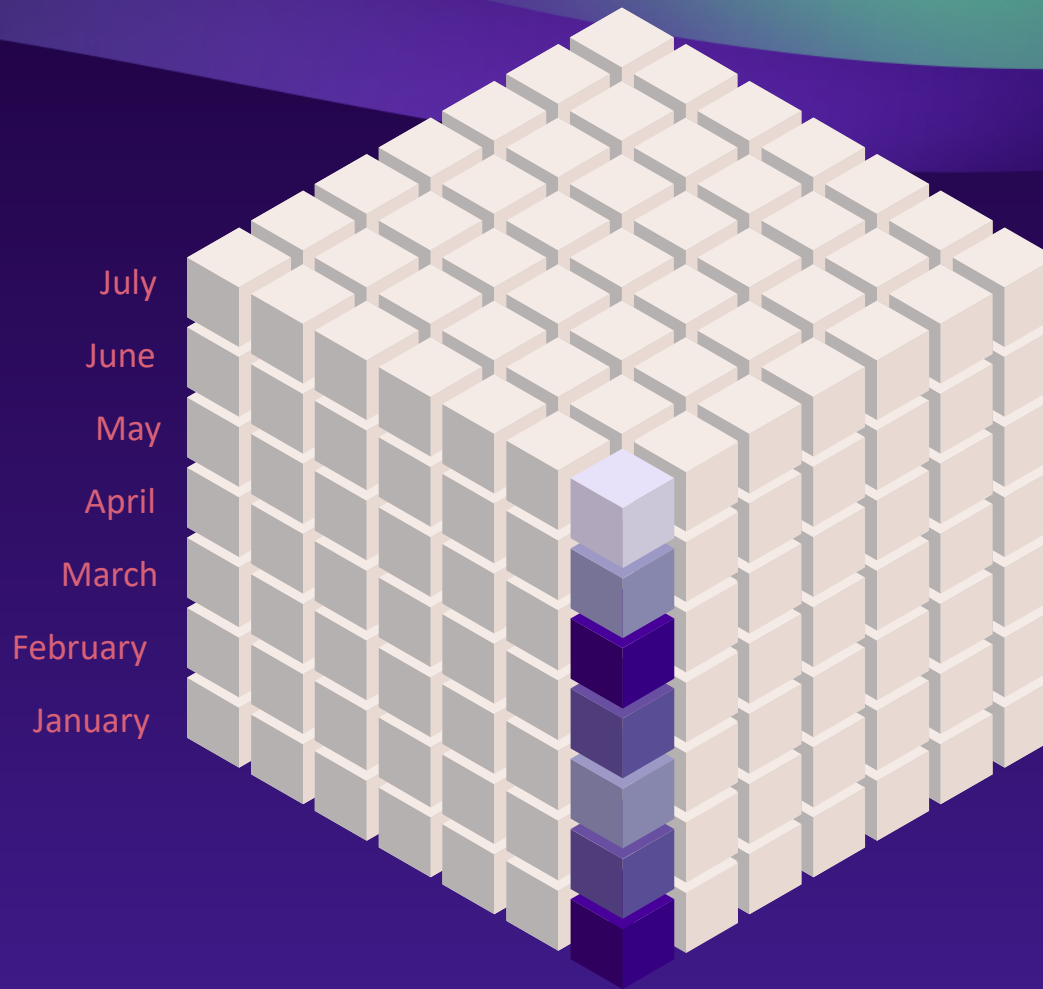


```
const routeParameters = new RouteParameters({
  stops: routeParameters.stops,
  features: routeParameters.features.toArray(),
  return: true
});
```

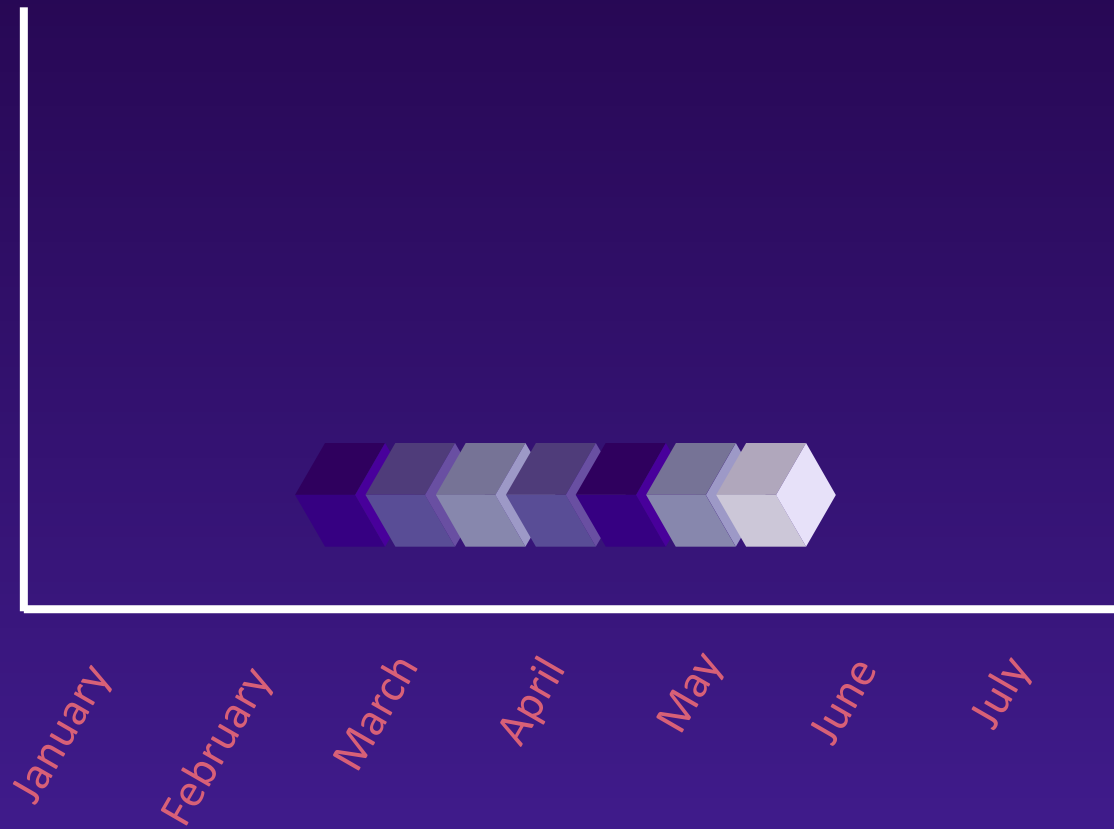
Time Series Clustering

Partitions the time series in the cube based on the similarity of either value or profile

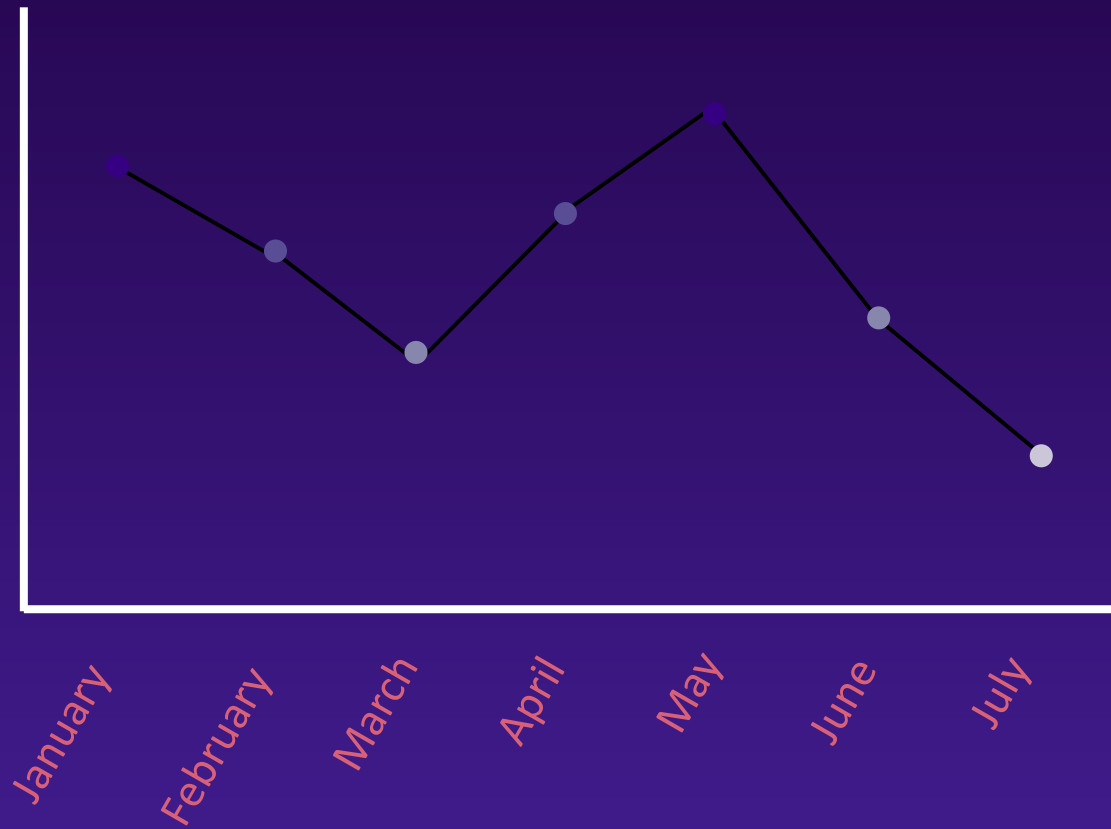
every
location has a
time series



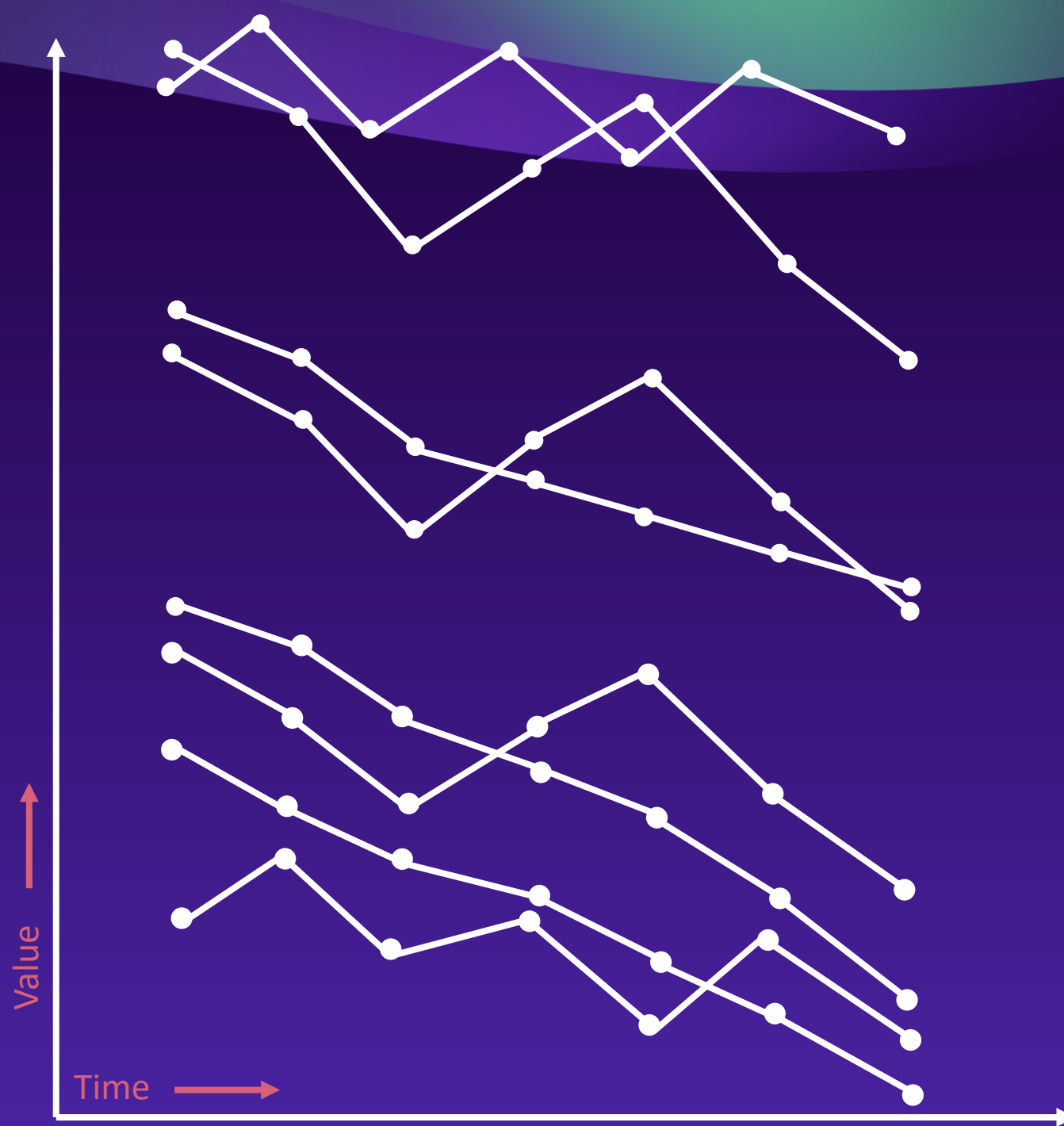
every
location has a
time series



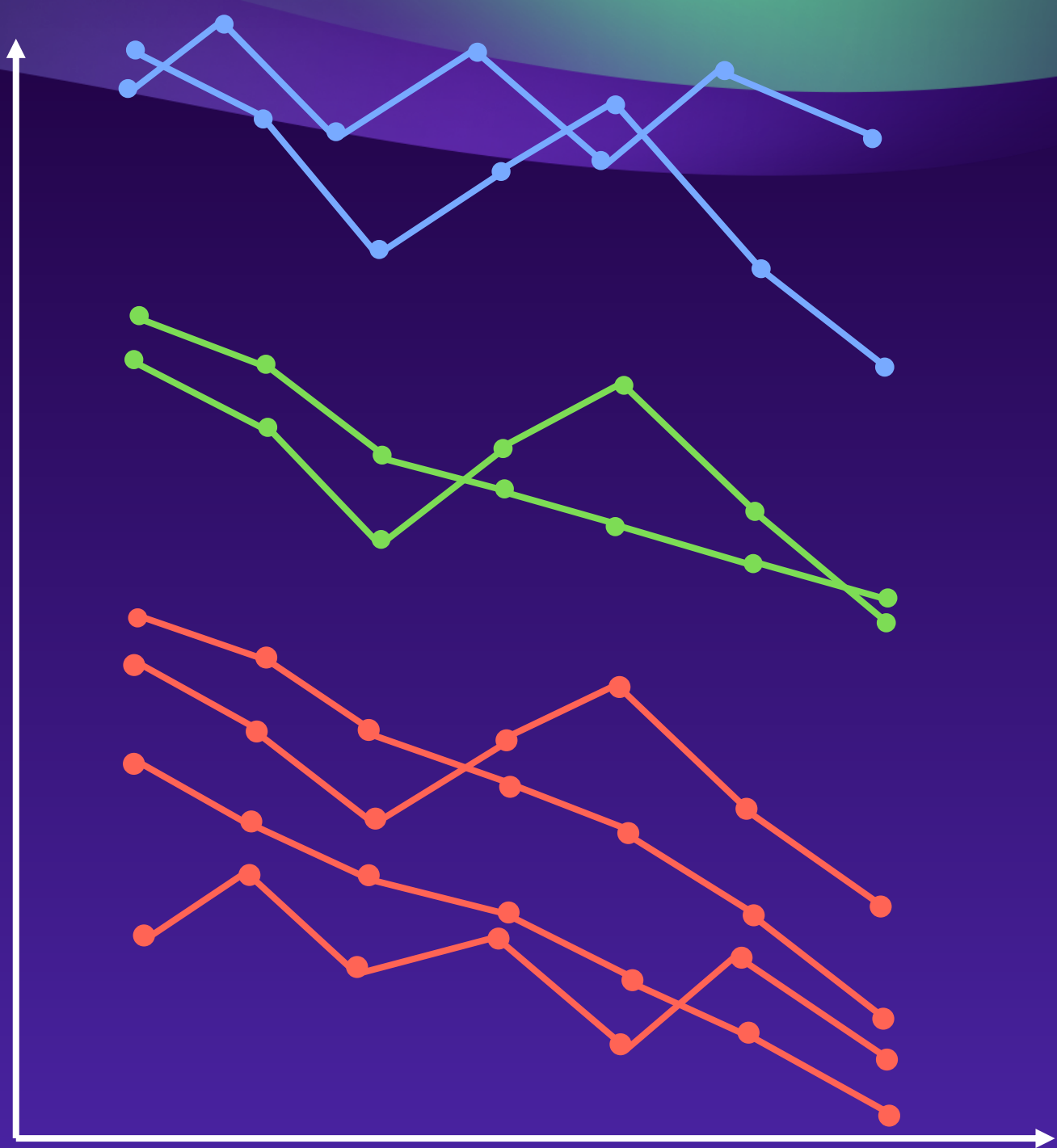
every
location has a
time series



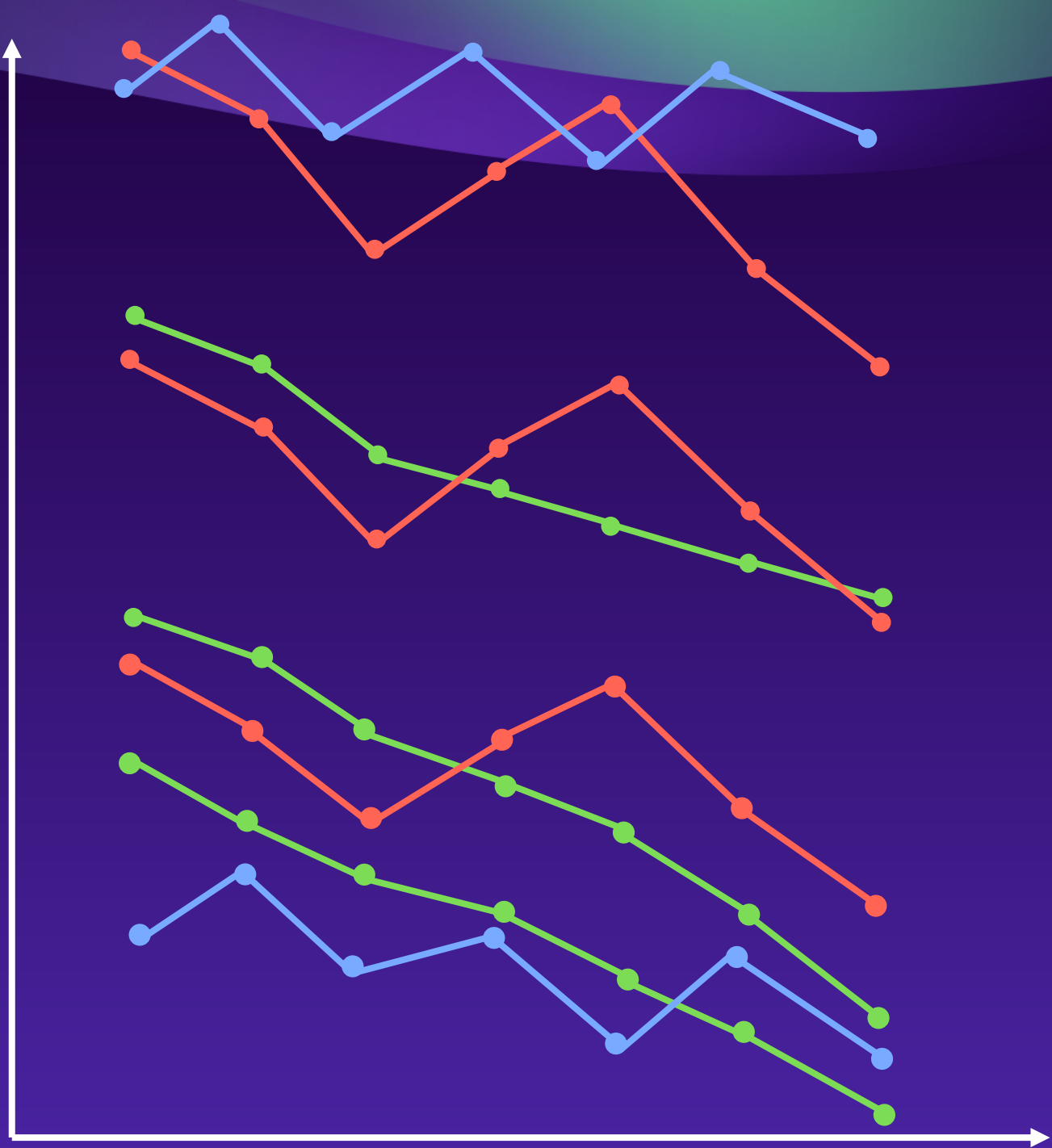
time series



similar values

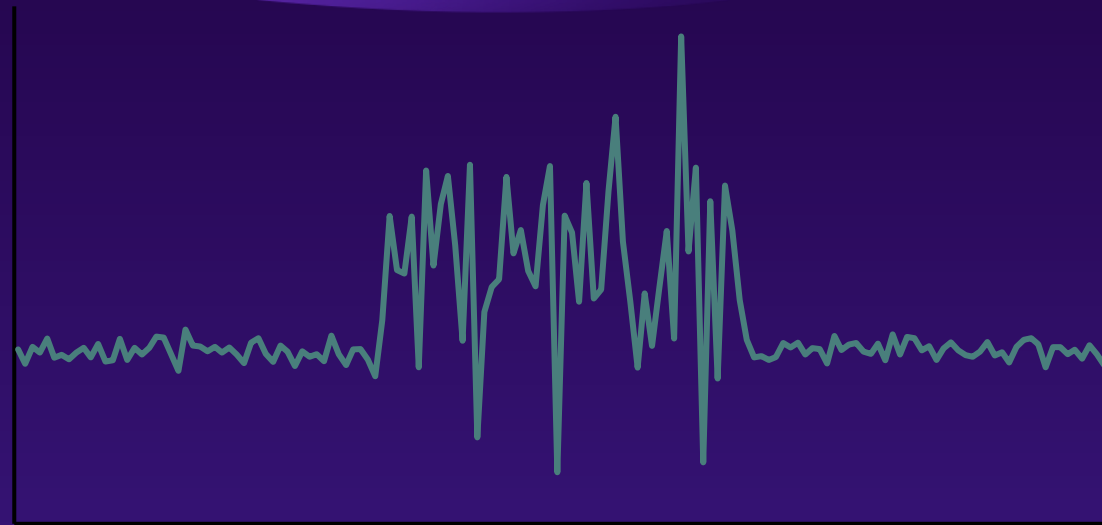
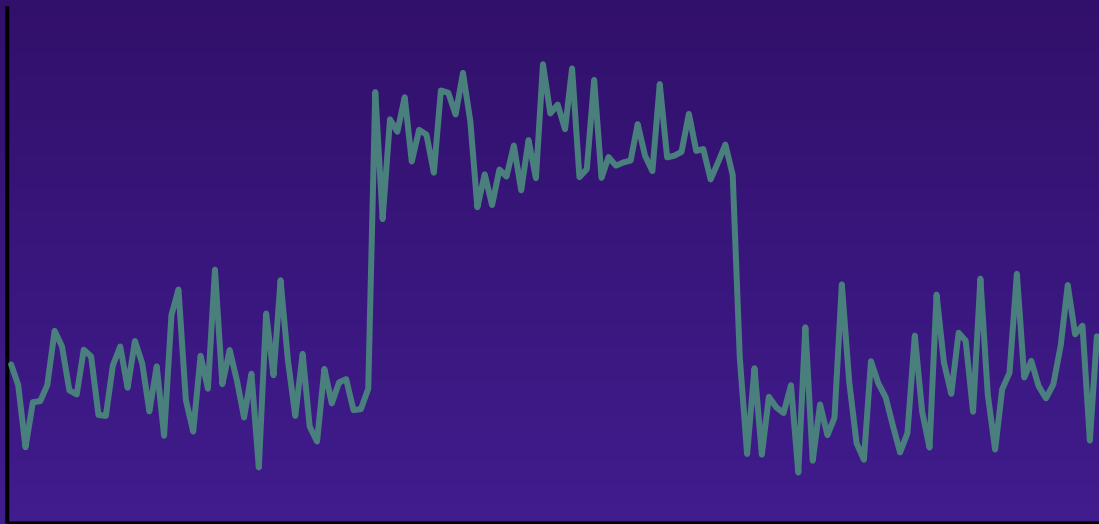


similar
profiles

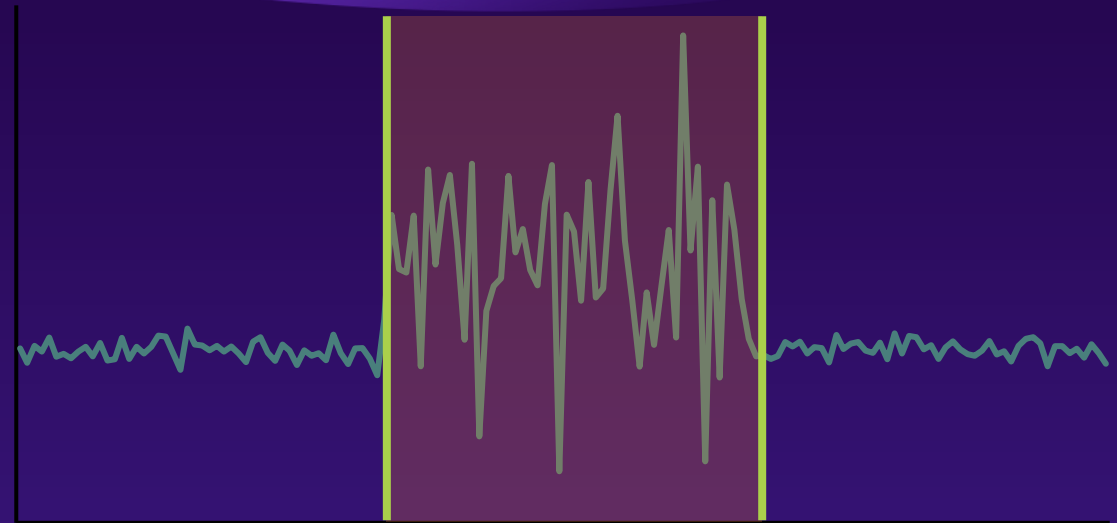
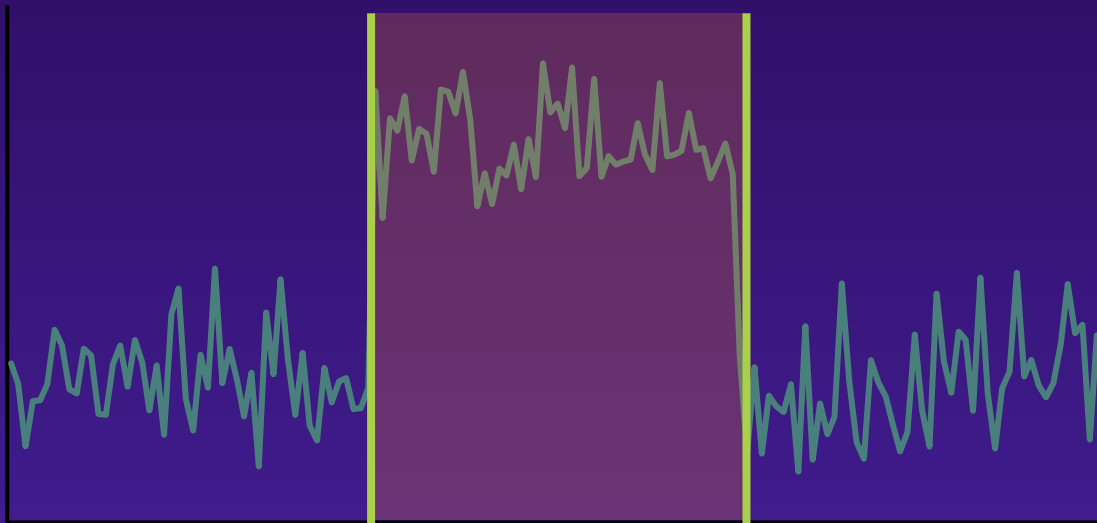


Change Point Detection

Detects time steps when a statistical property of the time series changes for each location of a space-time cube.

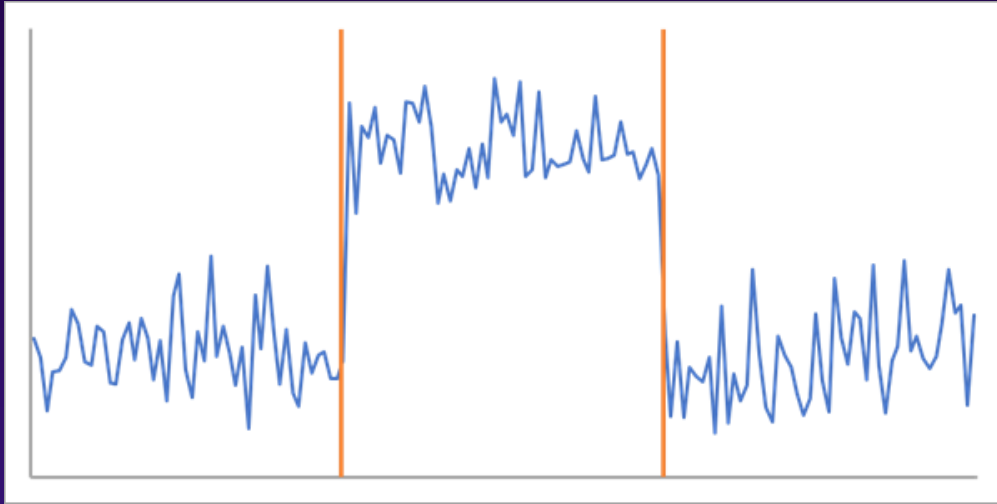


change in the statistical
properties of a time
series

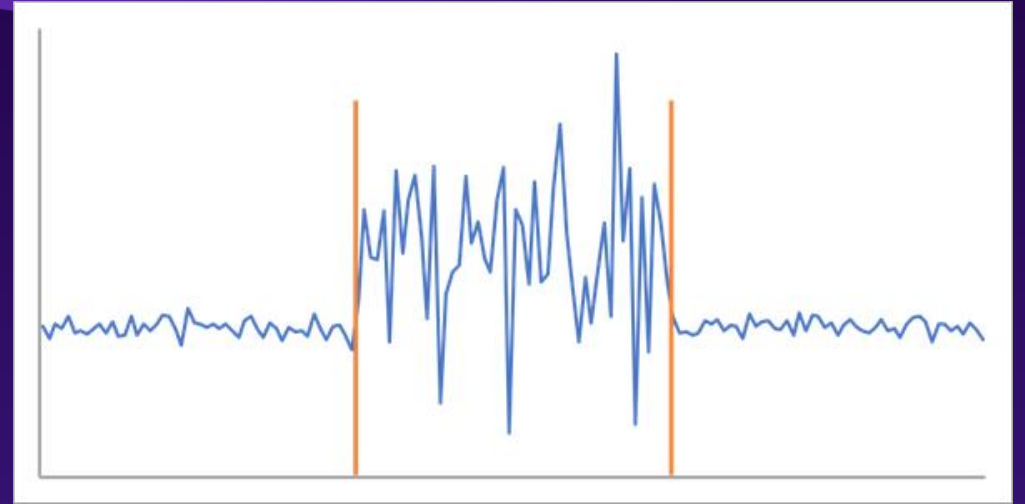


change in the statistical
properties of a time
series

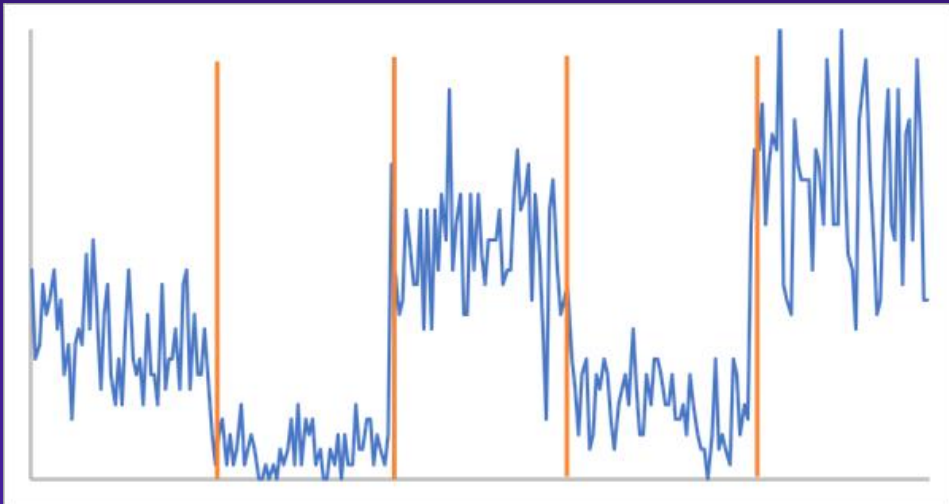
mean



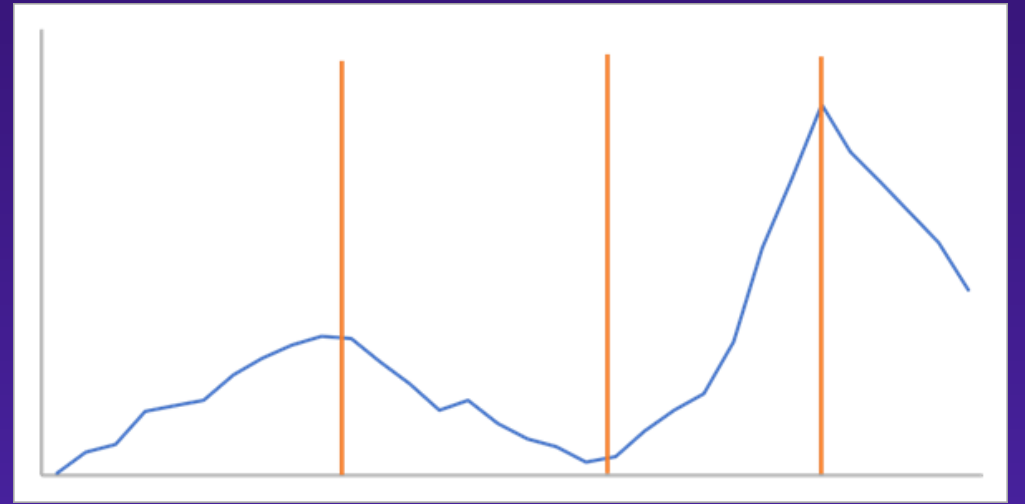
standard deviation

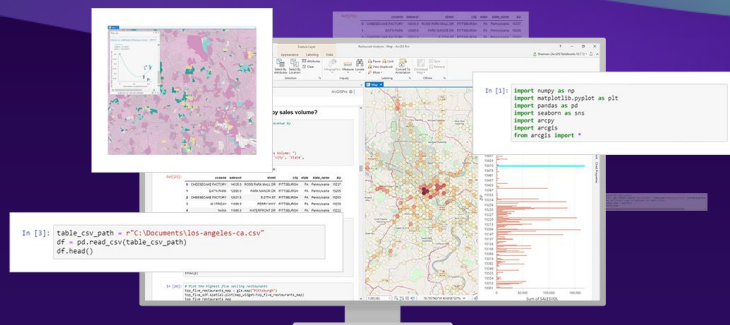


count



slope





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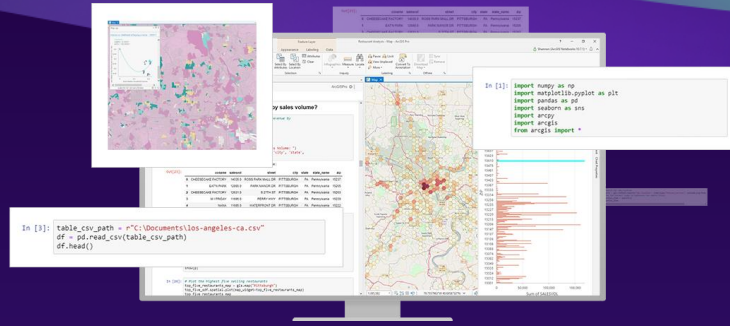


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& Scripting**



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**The reproducible set of instructions that
makes it all possible**



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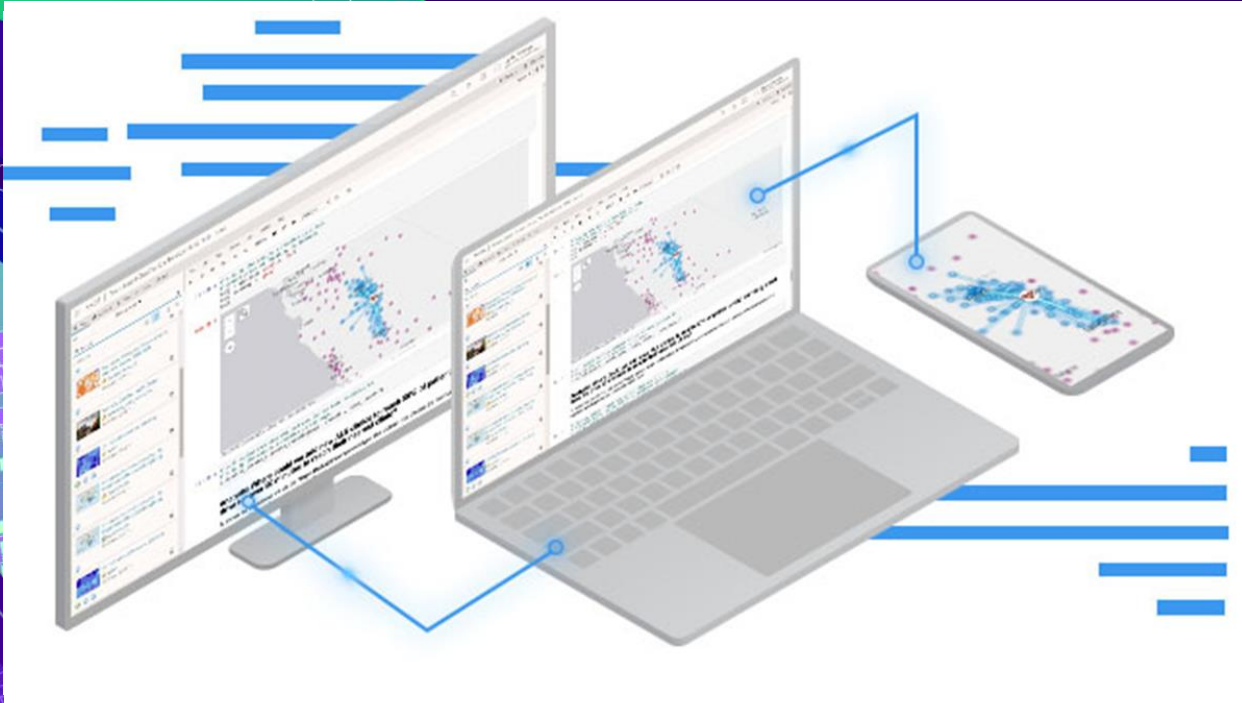
**Modeling
& Scripting**



**Sharing
&
Collaboration**

**Share Notebooks & accompanying data in an
ArcGIS Pro package**

```
var mapView = new MapView({  
  container: "viewDiv",  
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  zoom: 10,  
  center: [-73.95, 40.73]  
});
```



Sharing & Collaboration

```
const r  
stops  
fea  
(-),  
return  
= new RouteParameters({  
  featureSet({  
    graphics.toArray()  
  },  
  true
```

```
const routeParams = new RouteParam  
stops: new FeatureSet({  
  features: view.graphics.toArray(  
  }},  
  returnDirections: true  
});
```

Download the Notebook :



Any question ? Please reach out !



[linkedin.com/in/pauline-louis/](https://www.linkedin.com/in/pauline-louis/)



plouis@esrifrance.fr

Want more Python ?

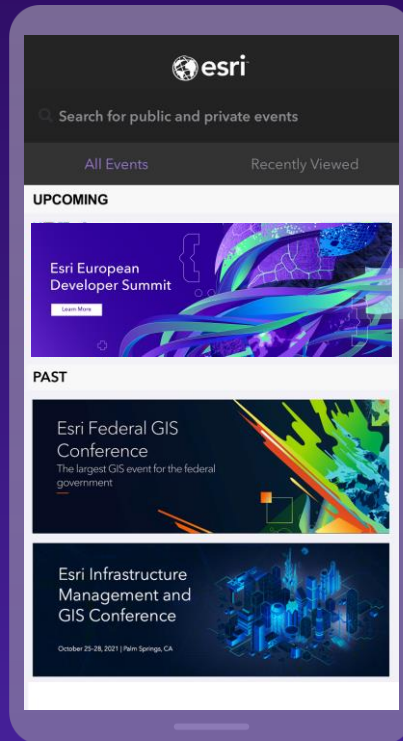


github.com/JapaLenos/Python-in-ArcGIS

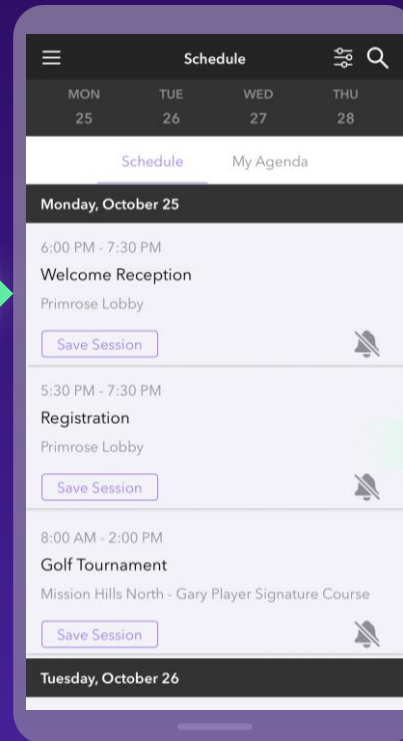
```
var mapView =  
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  center: [-73.95, 40.,  
  ]));
```


Please Share Your Feedback in the App

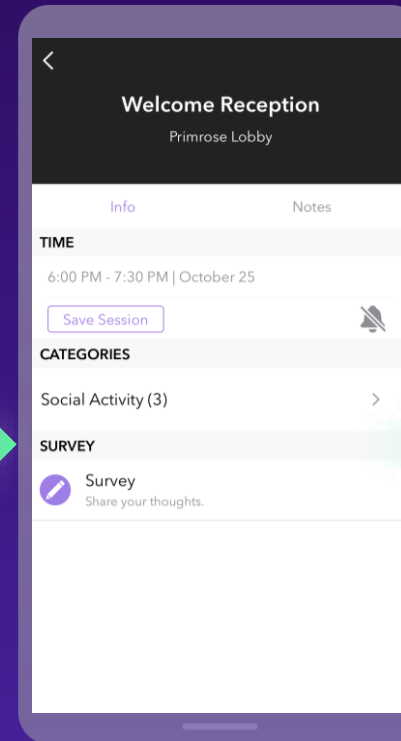
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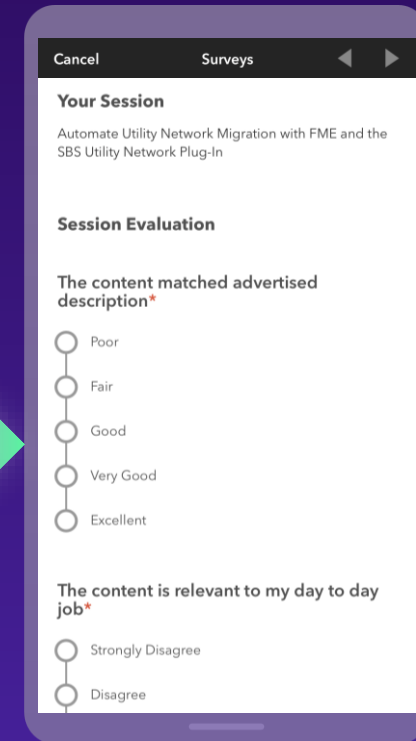
Select the session you attended



Scroll down to "Survey"



Log in to access the survey




```
const routeParams = new RouteParam.  
  stops: new FeatureSet({  
    features: view.graphics.toArray(  
    }},  
    returnDirections: true  
  }));
```

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```
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  container: "v_  
  map: map,  
  zoom: 10,  
  center: [-73.95, 40.,  
  ]));
```



```
const routeParams = new RouteParams({
  stops: new FeatureSet({
    features: view.graphics
  }),
  returnDirections: true
});
```



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```
var mapView = new MapView({
  container: "view",
  map: map,
  zoom: 10,
  center: [
  ]
});
```

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BY
THE
CODE**