



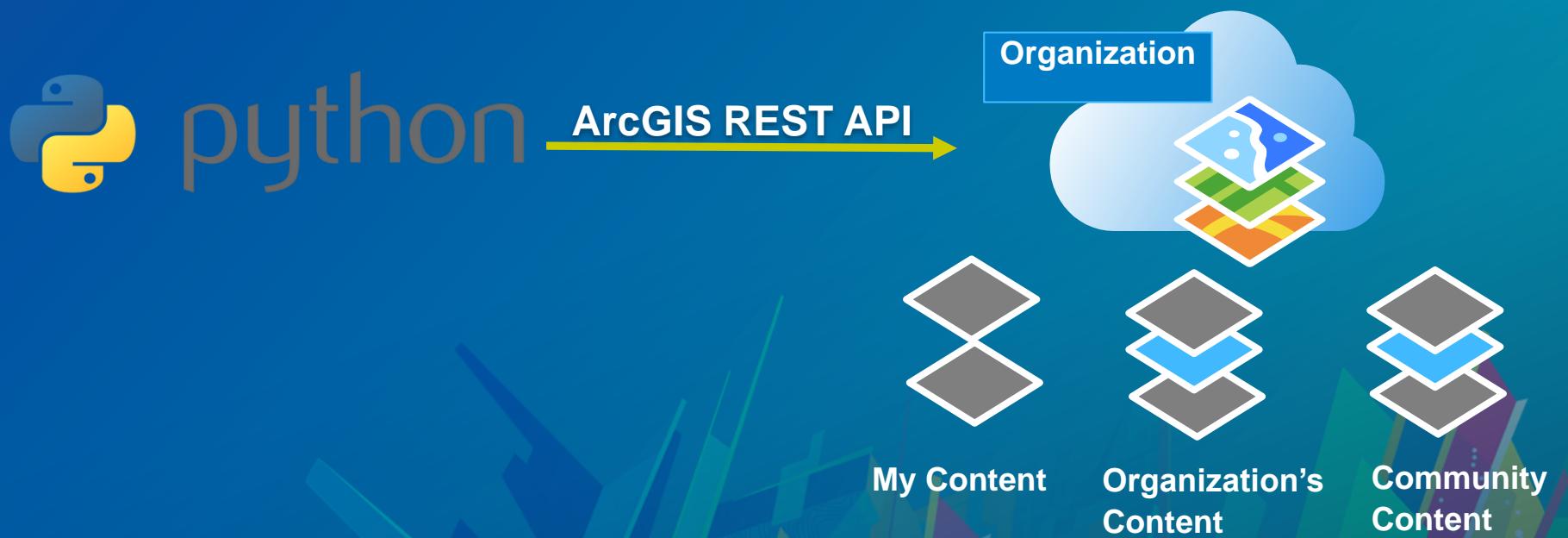
# ArcGIS API for Python: Introduction to Scripting your Web GIS

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2019 ESRI DEVELOPER SUMMIT

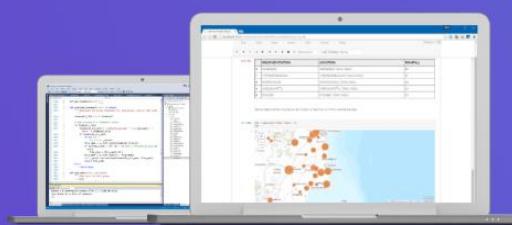
# What is the ArcGIS API for Python



# ArcGIS API for Python

[Install the API](#)

Version 1.6.0 · February 28, 2019

[Home](#) | [Guide](#) | [Sample Notebooks](#) | [API Reference](#) | [Community](#)

## A powerful Python library for spatial analysis, mapping and GIS

ArcGIS API for Python is a Python library for working with maps and geospatial data, powered by web GIS. It provides simple and efficient tools for sophisticated vector and raster analysis, geocoding, map making, routing and directions, as well as for organizing and managing a GIS with users, groups and information items. In addition to working with your own data, the library enables access to ready to use maps and curated geographic data from Esri and other authoritative sources. It also integrates well with the scientific Python ecosystem and includes rich support for Pandas and Jupyter notebook.

[Install the API](#) | [Get started](#) | [View samples](#)

### Understand your GIS

This "hello world" style notebook shows how to get started with the GIS and visualize its contents.

[Get started with the GIS class](#)

### Manage your GIS

The ArcGIS API for Python provides APIs and samples for ArcGIS Online administrators to manage their online organization.

[Clone a portal](#)

### Perform Spatial Analysis

Call sophisticated spatial analysis tools that work with online content, using a few lines of code.

[Chennai floods analysis](#)

# ArcGIS API for Python and ArcPy

## ArcGIS API for Python

- Script against a portal
  - ArcGIS Online or ArcGIS Enterprise
  - Python 3.x
- Analysis, Portal Admin, Content Creation, Big Data Analysis

## ArcPy

- ArcGIS Desktop
  - ArcMap – Python 2.x
  - ArcGIS Pro – 3.x
- Mostly geoprocessing
- Some map automation

# **Four different groups working with the ArcGIS API for Python**

- Org Administrators
- Content Publishers
- GIS Analysts and Data Scientists
- Power Users/Developers

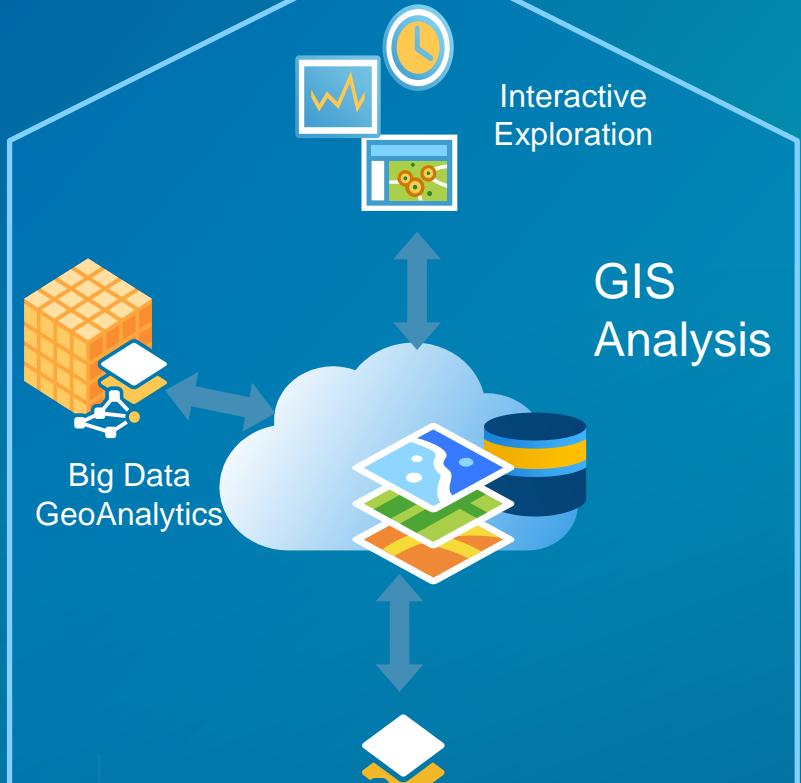
# Whom is it for?



Desktop  
Apps



Content  
Publishing



Interactive  
Exploration  
GIS  
Analysis

Developers

ArcGIS



## Automate Web GIS management

- Populate portal with users, groups
- Clone portals
- Re assign user content
- Perform comprehensive content search
- Determine item relationship
- Create reports of users, their items

## Automate content creation

- Automate content publishing during off peak hours
- Update tiles and features from a known database
- Replicate development environment content to production
- Inspect and update items with broken service links

## Reproducible research

- Access big data tools programmatically
- Utilize rich 3<sup>rd</sup> party Python packages for data analysis
- Create rich charts, graphs, embed 2D and 3D maps in Jupyter Notebook environment
- Share your research with data and notes with peers

# ArcGIS + Jupyter = ❤

esri THE SCIENCE OF WHERE chennai\_floods\_analysis (autosaved)

File Edit View Insert Cell Kernel Widgets Help Python 3

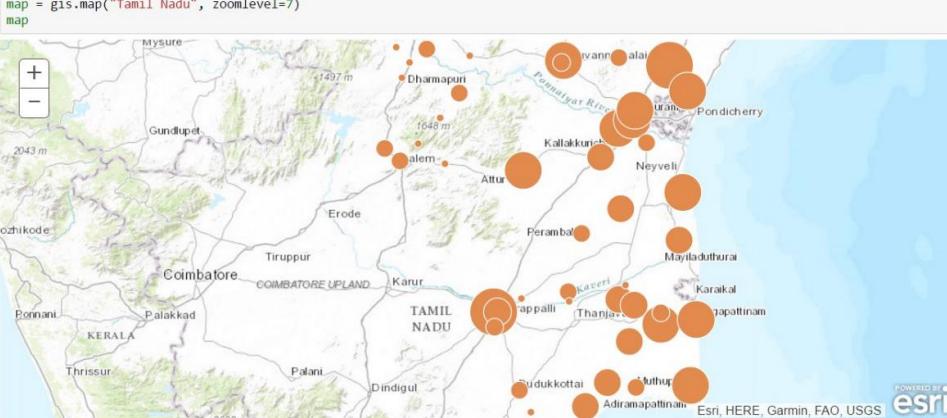
df.head()

WEATHER STATION LOCATION RAINFALL

0	TAMBARAM	TAMBARAM, TAMIL NADU	49
1	CHEMBARBAKKAM	CHEMBARBAKKAM, TAMIL NADU	47
2	MARAKKANAM	MARAKKANAM, TAMIL NADU	42
3	CHENGALPATTU	CHENGALPATTU, TAMIL NADU	39
4	PONNERI	PONNERI, TAMIL NADU	39

Tabular data is hard to visualize, so let's bring in a map from our GIS to visualize the data:

In [8]: map = gis.map("Tamil Nadu", zoomlevel=7)  
map



## Southern California Wildfires analysis

jupyter Trusted | Python [default] O Dashboard View: </> Python

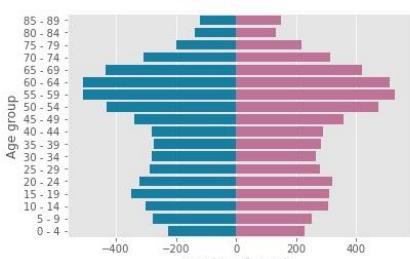


### Impact Assessment

#### Age Pyramid of affected population

In [23]: print('Number of affected people: ' + str(popdf['female'].sum() - popdf['male'].sum()))  
Number of affected people: 11226

In [24]: sns.barplot(x="female", y="agelabel", color="#CC6699", label="Female", data=popdf, edgecolor='none')  
sns.barplot(x="male", y="agelabel", color="#008AB8", label="Male", data=popdf, edgecolor='none')  
plt.ylabel('Age group')  
plt.xlabel('Number of people');



# It all starts with your GIS

```
In [1]: from arcgis.gis import GIS
```

```
In [2]: gis = GIS('https://deldev.maps.arcgis.com', 'demo_deldev')
```

```
In [3]: enterprise = GIS('https://python.playground.esri.com/portal', 'arcgis_python',
```

## Search for content

```
In [34]: rest_content = gis.content.search("DC Restaurants", item_type= "Feature Layer", max_items=10)
rest_content
```

```
out[34]: [<Item title:"Restaurants (Washington DC) HeatMap" type:Feature Layer Collection owner:cgabris_blueaster>,
<Item title:"DC_TapIt" type:Feature Layer Collection owner:mbass6_GISandData>,
<Item title:"Sidewalk Cafe" type:Feature Layer Collection owner:DCGISopendata>,
<Item title:"restaurants_dc" type:Feature Layer Collection owner:sfoss_solutions>,
<Item title:"Restaurants CSUSM AT_fieldworker" type:Feature Layer Collection owner:tanou001>,
<Item title:"Commercial Kitchen Food Incubator Space" type:Feature Layer Collection owner:DCGISopendata>,
<Item title:"restaurant" type:Feature Layer Collection owner:lkt_151119_lktmc>,
<Item title:"Parking Meters" type:Feature Layer Collection owner:Justin.Mank@SMGOV.NET_smgov>,
<Item title:"Restaurants (Washington DC)" type:Feature Layer Collection owner:cgabris_blueaster>,
<Item title:"New Business Openings in DC (2013)" type:Feature Layer Collection owner:wdcep>]
```

```
In [36]: from IPython.display import display
for item in rest_content:
    display(item)
```

### [Restaurants \(Washington DC\) HeatMap](#)



Feature Layer Collection by cgabris\_blueaster  
Last Modified: October 23, 2017  
0 comments, 1,167 views

### [DC\\_TapIt](#)

Tap It is a DC program identifying restaurants and other establishments that allow individuals to refill their water bottles for free.



Feature Layer Collection by mbass6\_GISandData  
Last Modified: October 26, 2014  
0 comments, 112 views

### [Business & Economic Development](#)



### [Sidewalk Cafe](#)

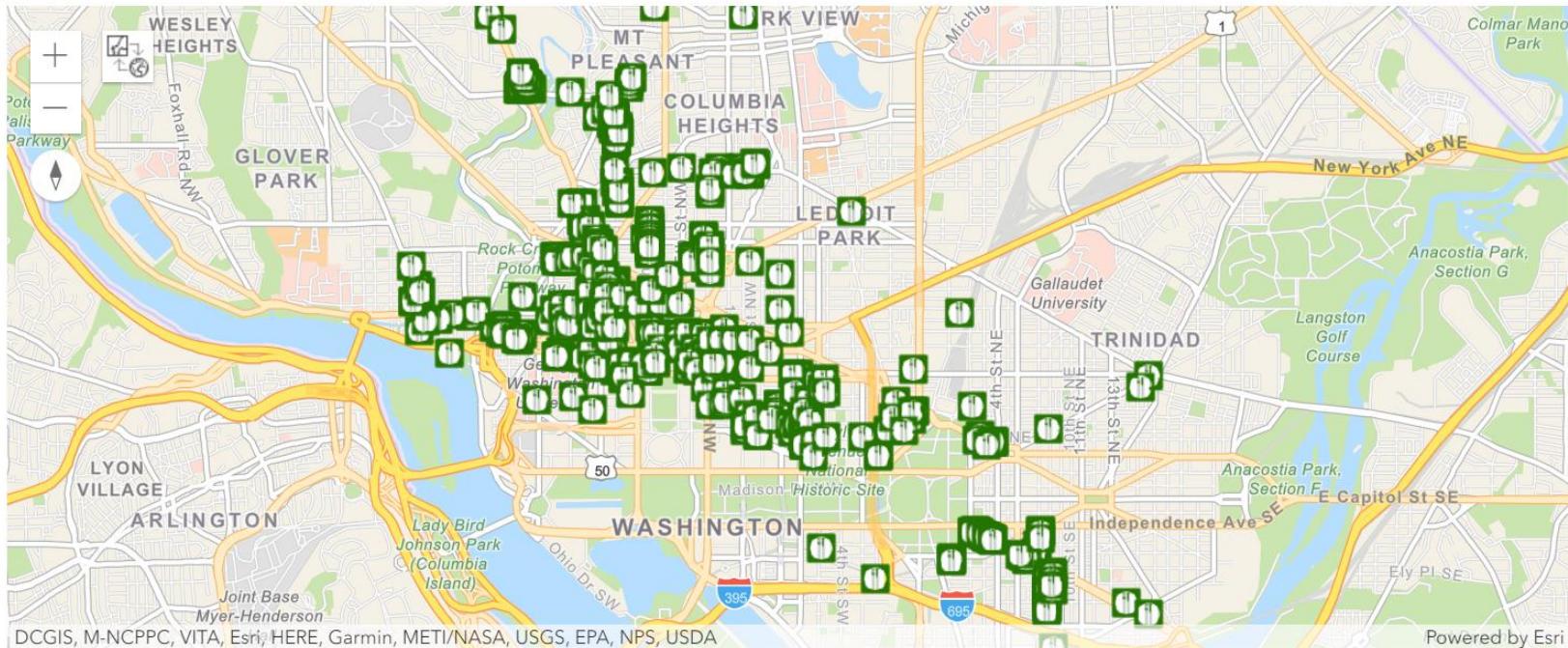
This data is used for the planning and management of Washington, D.C. by local government agencies.



Feature Layer Collection by DCGISopendata  
Last Modified: January 29, 2018  
0 comments, 150 views

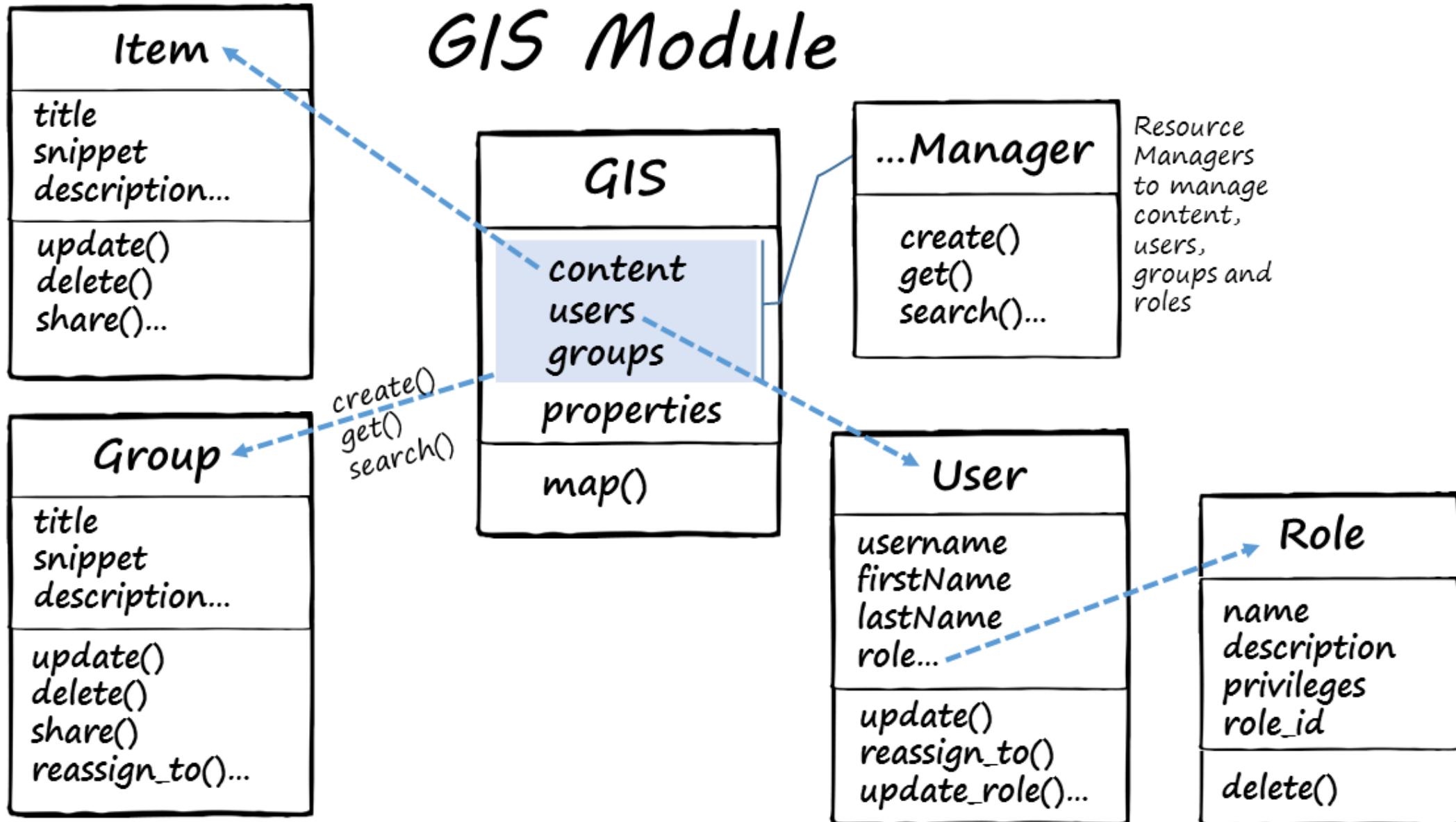
## Visualize layers on map widget

```
In [44]: map=gis.map("Washington, DC, USA")
map
```



```
In [51]: rest=rest_content[2]
map.add_layer(rest)
```

# GIS Module



# How do I get it?

- Try it Live! – <https://notebooks.esri.com>
- ArcGIS Pro 2.3 – included
- **pip install arcgis**
- **conda install -c esri arcgis**
- **docker pull esridocker/arcgis-api-python-notebook**



<hello-map/>

# Different authentication schemes

- anonymous users
- built-in users
- users using LDAP, via
  - Basic authentication
  - Portal tier authentication
- users using Integrated Windows Authentication (IWA) through NTLM or Kerberos
- smart card users / PKI authentication using certificate and key files
- users connected to an ArcGIS Enterprise instance using ArcGIS Pro

# Workflows for Org Administrators

```
from IPython.display import display
for group in source_groups:
    target_group = copy_group(target, source, group)
    if target_group:
        display(target_group)
```

<b>Central Services</b>
<b>Summary:</b> The authoritative service catalog.
<b>Description:</b> This Group contains an inventory of map services for our organization. These map services serve as building blocks for all maps and apps throughout the organization.
<b>Owner:</b> admin
<b>Created:</b> April 04, 2017
<b>Compliance</b>
<b>Summary:</b> Regulatory compliance tracking & reporting.
<b>Description:</b> A group dealing with government and industry association regulatory compliance and reporting.
<b>Owner:</b> admin
<b>Created:</b> April 04, 2017
<b>Customer Service, Finance, Billing and Accounting</b>
<b>Summary:</b> The Water & Sewer Billing and Collection Division manage the water and sewer accounts for residents.
<b>Description:</b> Typical types of users and roles that part of this group:Human Resources/Payroll/Administrative Services Officer I, II/Administrative Aide/Accountant/Account Clerk/Payroll Clerk/Department Analyst/Risk Management Analyst, I.II.III/Accounting Technician/Engineering Technician/Common Task or Responsibilities of the users in this group:Customer Service/Real Estate Services/Budgets/Accounting/Long Range Financial Planning/Safety/Risk Management/Financing/Records Management/Clerical Services/Auditing/Bill Collection and payment/Connections/Disconnects/Reduced Rates / Leak Adjustments/Pool Adjustment/Irrigation and Hydrant Meters/Employee Development
<b>Owner:</b> admin
<b>Created:</b> April 04, 2017
<b>Demographic Content</b>
<b>Summary:</b> Esri demographic data with national coverage
<b>Description:</b> A catalog of Esri provided demographic content for use at the utility.
<b>Owner:</b> admin
<b>Created:</b> April 04, 2017

# Workflows for Content Publishers

```
In [4]: #read the initial csv
csv1 = 'C:/Users/davis5720/Downloads/usa_capitals_1.csv'
cities_df_1 = pd.read_csv(csv1)
cities_df_1
```

	Name	Capital	Year	Population	Area	City_ID	longitude	latitude
0	Alabama	Montgomery	1819	4447100	51609	1	-86.30008	32.38015
1	Alaska	Juneau	1959	626932	589757	2	-134.40679	58.29973
2	Arizona	Phoenix	1912	5130632	113909	3	-112.07580	33.44825
3	Arkansas	Little Rock	1836	2673400	53104	4	-92.27485	34.74870
4	California	Sacramento	1850	33971648	156983	5	-121.49090	38.57933
5	Colorado	Denver	1876	4301261	104247	6	-104.99202	39.74001
6	Connecticut	Hartford	1788	3405656	5009	7	-72.67402	41.76349
7	Delaware	Dover	1787	78360	2057	8	-75.52473	39.15803
8	Florida	Tallahassee	1845	15982378	58560	9	-84.28065	30.43977
9	Georgia	Atlanta	1788	8186453	58876	10	-84.39111	33.74831
10	Hawaii	Honolulu	1959	1211537	6450	11	-157.85788	21.30493
11	Idaho	Boise	1890	1293953	83597	12	-116.19340	43.60761
12	Illinois	Springsfield	1818	12419293	56400	13	-89.64360	39.80105

```
In [5]: #print the number of records in this csv
cities_df_1.shape
```

```
Out[5]: (13, 8)
```

```
In [6]: #add the initial csv file and publish that as a web layer
item_prop = {'title': 'USA Capitals spreadsheet'}
csv_item = gis.content.add(item_properties=item_prop, data=csv1)
csv_item
```

```
Out[6]: USA Capitals spreadsheet
CSV by dmart23
Last Modified: May 21, 2018
0 comments, 0 views
```

```
In [7]: #publish the csv item in a feature layer
cities_item = csv_item.publish()
cities_item
```

# Workflows for Analysts



# Resources

- Website - <https://developers.arcgis.com/python/>
- GitHub repo - <https://github.com/Esri/arcgis-python-api>
- Try it Live! - <https://notebooks.esri.com>
- API Reference - <https://esri.github.io/arcgis-python-api/apidoc/html/>
- Community - <https://community.esri.com/groups/arcgis-python-api/>
- Samples shown today - <https://git.io/fjToR>

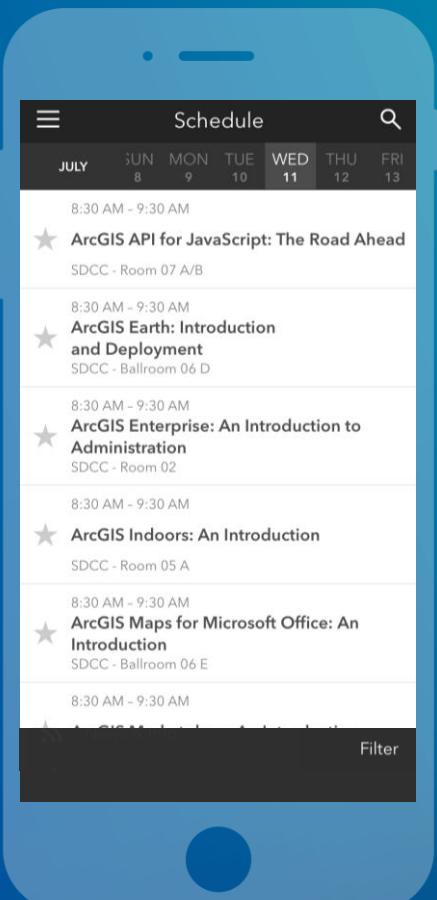
# Questions?

# Please Take Our Survey on the App

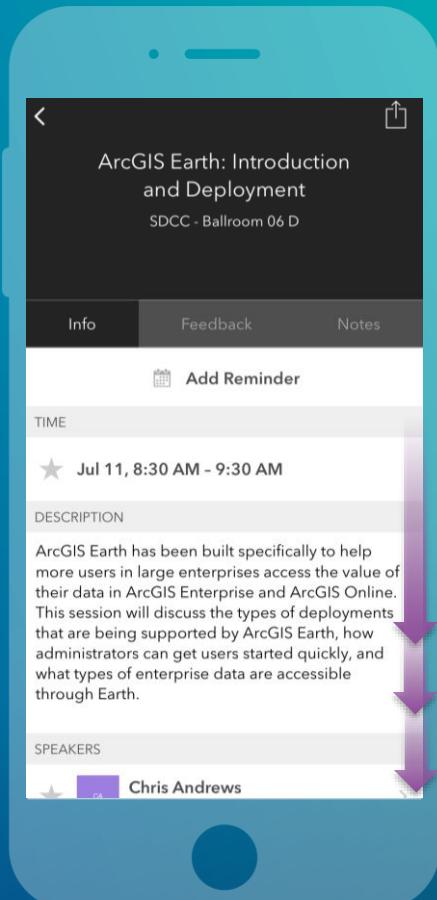
Download the Esri Events app and find your event



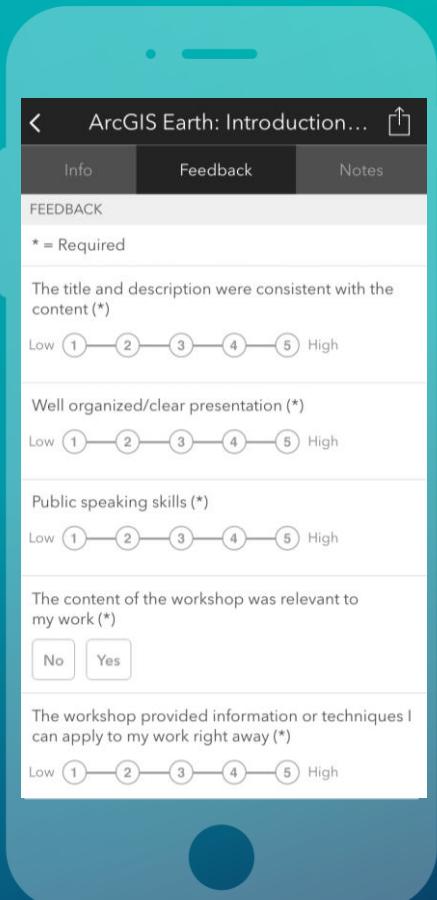
Select the session you attended



Scroll down to find the feedback section



Complete answers and select "Submit"





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