



ESRI MID-ATLANTIC USER CONFERENCE

Using Python Across the Platform

Jim Barry – Solution Engineer
Esri-NYC @JimBarry



So, what is Python?



- Free scripting language
- Syntax that is easy to learn and understand

Benefits:

1. Scalability
2. Integrated packages
3. Open source and community development

How do I get Python?

- Get Python - <https://www.anaconda.com/distribution/>
- Install Python - <https://docs.anaconda.com/anaconda/install/>
- Verify install - <https://docs.anaconda.com/anaconda/install/verify-install/>

Where do I write my Python Scripts?

- Terminal, **Notepad++**, Sublime, Idle, Visual Studio, PyCharm, Python window in Pro, **Jupyter notebooks**
- Notepad / Sublime / Idle – Stand alone script
- Visual Studio / PyCharm – Projects in Python
- Jupyter Notebooks – Stand alone scripts, Projects, Tutorials

Python is Everywhere



ANACONDA™

arcpy

Python package, provides
scripting interface for
desktop GIS:

ArcMap

ArcGIS Pro

*Use, automate, and extend
Desktop GIS*

arcgis

Python package, provides
scripting interface for Web
GIS:

ArcGIS Online

ArcGIS Enterprise (Portal)

*Use, automate, and extend
Web GIS*

arcpy

- Automatic geoprocessing tasks
- Create, edit, and manage data, vector and raster
- Integrate other Python packages into your work
- Work with ArcGIS Pro interactively
- Author Geoprocessing Services
- Map automation
- Write add-ins

› Data Access module

› Image Analyst module

› Mapping module

› Network Analyst module

› Sharing module

› Spatial Analyst module

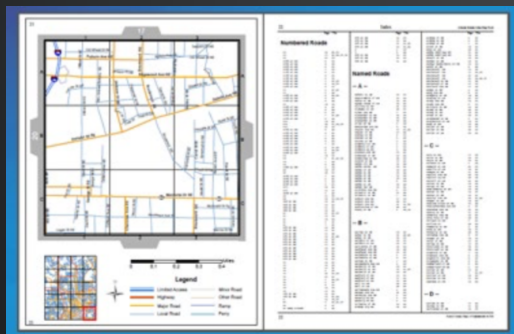
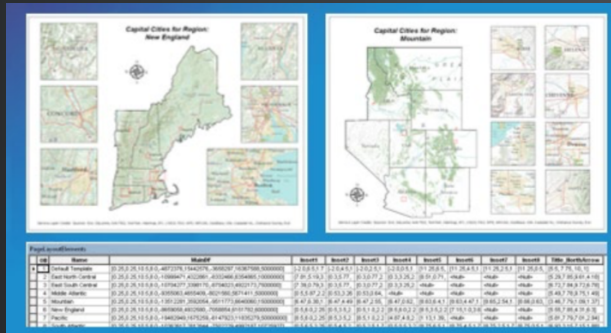
› Workflow Manager module

Alaska

Alaska's map shows the percentage of the population aged 65 and older by county. The legend indicates four age groups: 65-69 (light blue), 70-74 (medium blue), 75-79 (dark blue), and 80+ (darkest blue). The bar chart shows the percentage of the population aged 65 and older, with a value of 12.5%.

Pennsylvania

Pennsylvania's map shows the percentage of the population aged 65 and older by county. The legend indicates four age groups: 65-69 (light blue), 70-74 (medium blue), 75-79 (dark blue), and 80+ (darkest blue). The bar chart shows the percentage of the population aged 65 and older, with a value of 12.5%.



ArcGIS
Pricing
Map
Scene
Help

Python Map Automation / arcpy.m(a)p(ping)

OverviewContentMembers

Search group content

ListDate ModifiedFilter

Filters

Item Type

- Maps
- Layers
- Scenes
- Apps
- Tools
- Files

Location

Date Modified

Tags

1 - 10 of 10

MapSeries_LayoutManager_Pro24

Code Sample by [MapAutomationTeam](#)

Manage layout elements (inset maps, text, north arrows) on different pages in a map series using a single layout that has map series enabled.

Created: Oct 24, 2019 Updated: Oct 24, 2019 Number of Downloads: 151

GenerateMapBookWithIndexPages_10_v2

Code Sample by [MapAutomationTeam](#)

This sample combines the use of Data Driven Pages, arcpy.mapping, and a 3rd party PDF design toolkit called ReportLab all together to create a final map book product with index pages.

Created: Jun 26, 2012 Updated: Apr 27, 2016 Number of Downloads: 4,392

Local Government Basemaps for Basic Web Map Printing/Exporting Using arcpy.mapping Tutorial (v 10.1+)

Map Template by [MapAutomationTeam](#)

This data is used for the basic web map printing/exporting using arcpy.mapping tutorial.

Created: Mar 19, 2015 Updated: Mar 19, 2015 Number of Downloads: 317

MapBooksInPro_Pro1.0_v1

Code Sample by [MapAutomationTeam](#)

Uses arcpy.mp in ArcGIS Pro to simulate many of the Data Driven Pages capabilities in ArcMap to produce a mapbook.

Created: Mar 6, 2015 Updated: Mar 9, 2015 Number of Downloads: 659

DDPwithDynamicTablesAndGraphs_10.1_v1

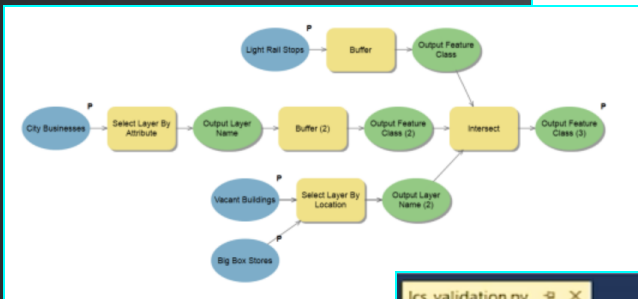
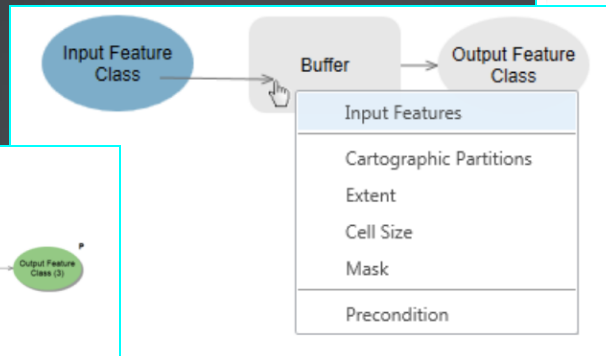
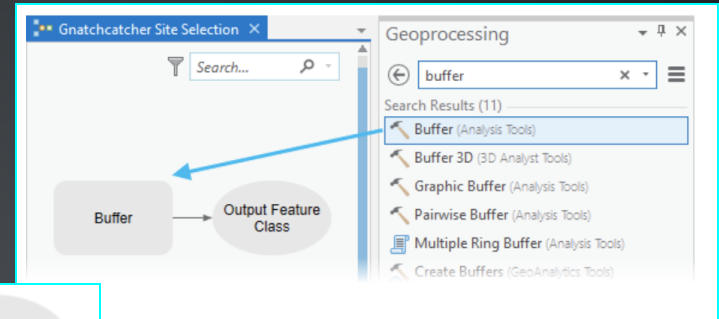
Code Sample by [MapAutomationTeam](#)

Use the new arcpy.mapping cloning capabilities to build dynamic tables in a layout

Created: Jul 9, 2012 Updated: Apr 16, 2013 Number of Downloads: 5,307

MultipleElementLayoutManager_10.0_v1

Model Builder - export to Python



```
lcs_validation.py x

if self.params[0].valueAsText and self.params[1].valueAsText:

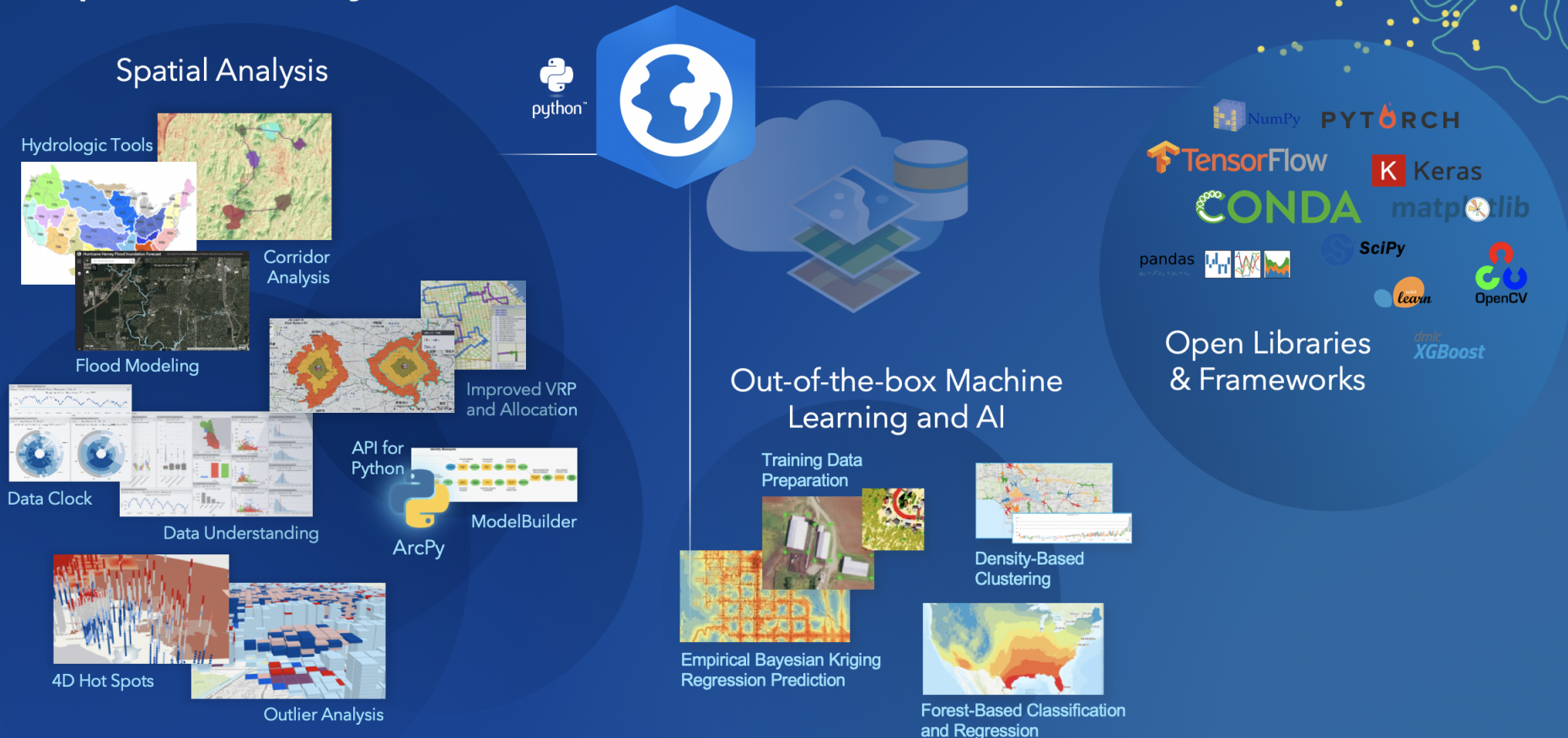
    input_boundary = arcpy.Describe(self.params[0]).extent.polygon
    clip_boundary = arcpy.Describe(self.params[1]).extent.polygon

    disjoint = input_boundary.disjoint(clip_boundary)

    #if disjoint: # right
    if not disjoint: # wrong
        self.params[1].setErrorMessage('Clip area outside raster boundary')

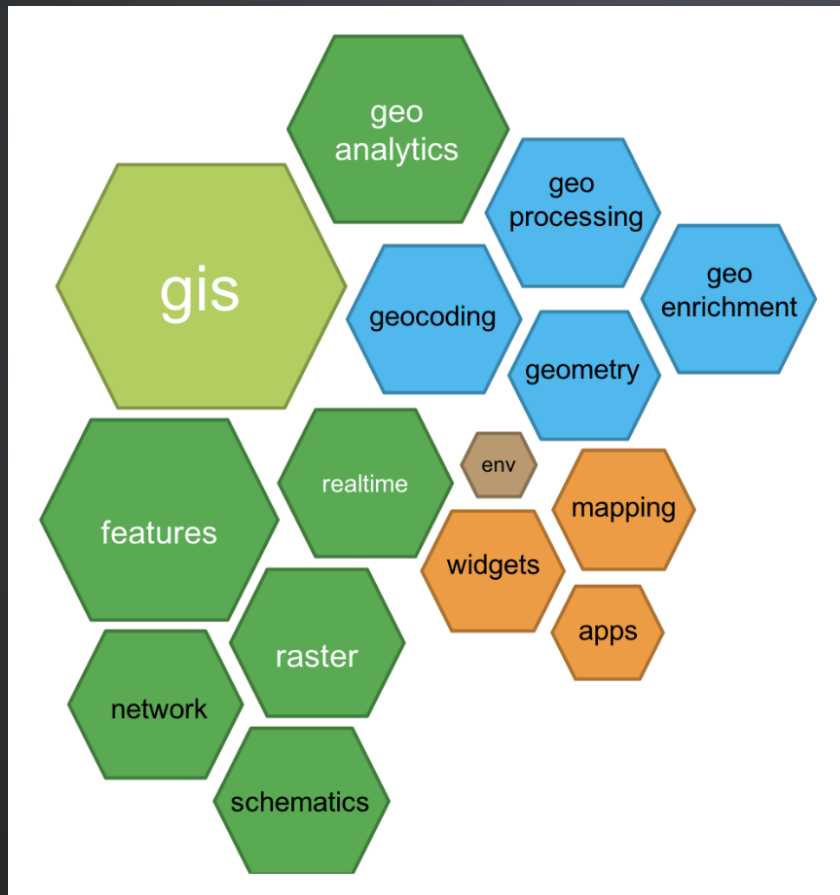
return
```

Spatial Analysis & Data Science in ArcGIS Pro



arcgis *[python module]*

ArcGIS API for Python



- > Feature data and analysis
- > Working with the Spatially Enabled DataFrame
- > Imagery and raster analysis
- > Working with big data
- > Using geoprocessing tools
- > Finding places with geocoding
- > Performing network analyses
- > Enriching GIS data with thematic information
- > Mapping and visualization
- > Managing ArcGIS applications
- > Deep Learning with ArcGIS



ArcGIS API for Python

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

[Get Started](#)



Get started

Use tutorials to add the ArcGIS API for Python to your Jupyter notebook.

Guide

Learn how to do mapping, geocoding, routing, and spatial analysis.

Sample Notebooks

Get Jupyter notebooks for mapping, visualization, and spatial analysis (Available on GitHub).

API Reference

Documentation for all ArcGIS API for Python classes, methods, and properties.

Version 1.7.0 · Oct 31, 2019



[Install the API](#)



[Get started](#)



[View Sample Notebooks](#)



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](#)

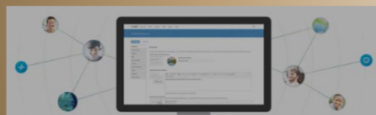
ArcGIS API for Python

What can it do for you?

Platform API
**Power Users
Developers**

Enterprise Integration

Users, Roles & Group management

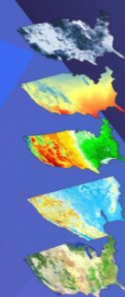


**Administrators
DevOps**

Analysts

Spatial Analysis
Imagery
Location Analytics

Big Data



Raster Analytics

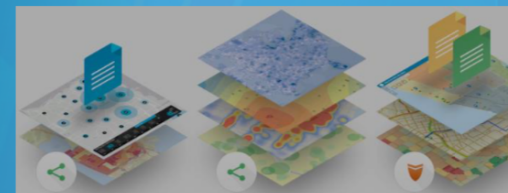


Feature Analytics

Data Scientists

Your Web GIS

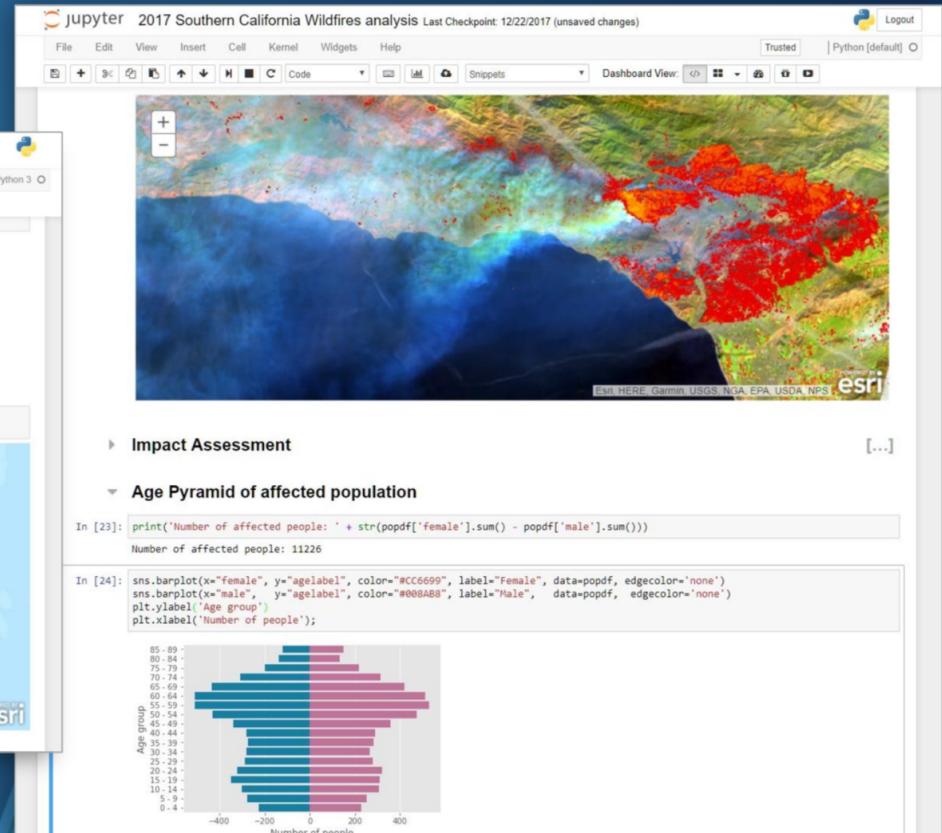
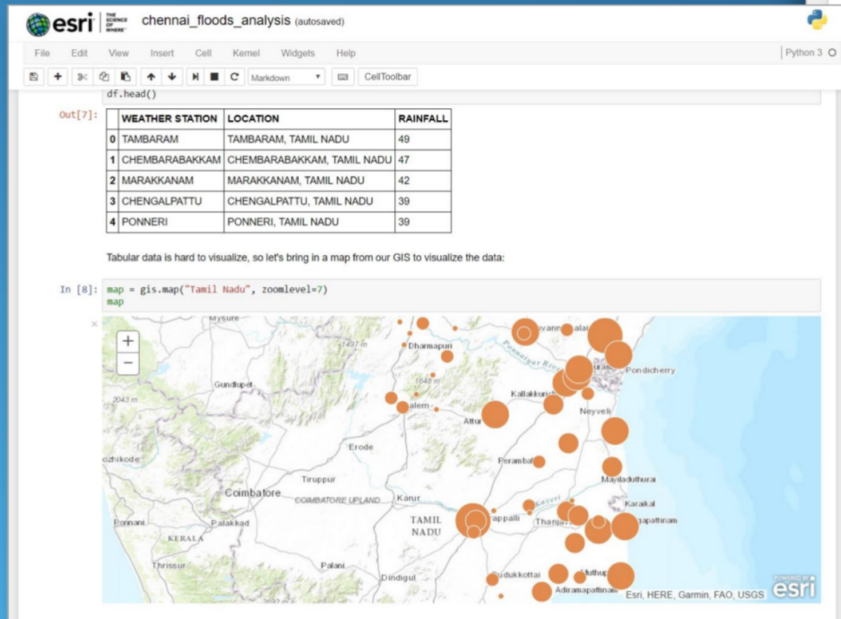
Content Publishers



Data Management

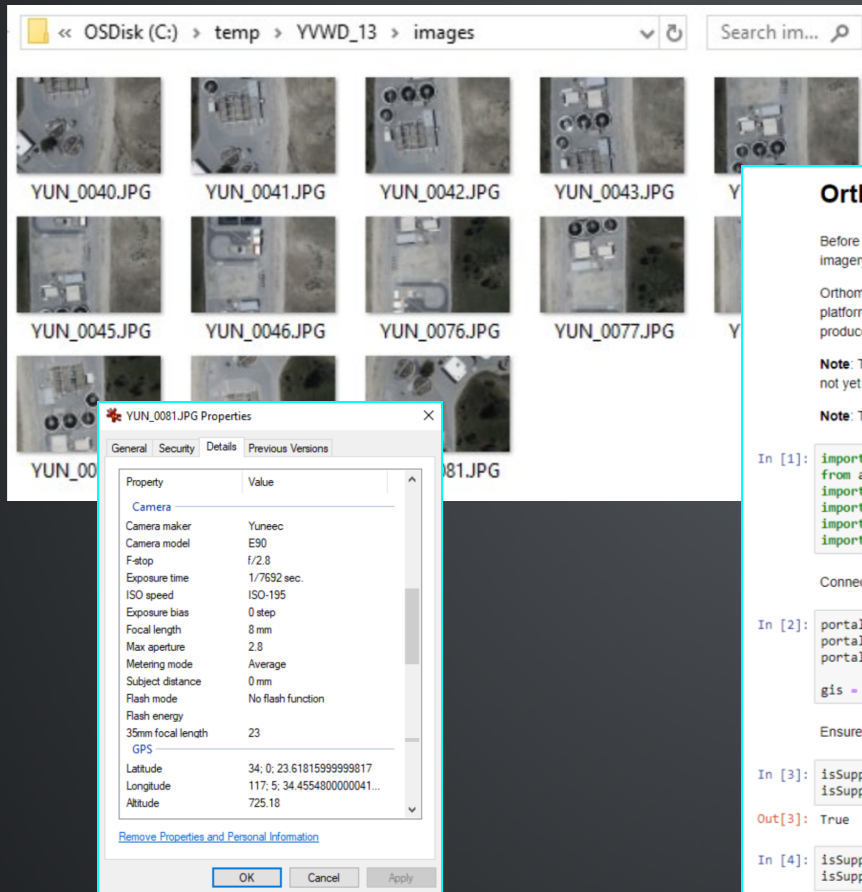
A Pythonic representation of GIS

ArcGIS + Jupyter = ♥



Drone2Map for ArcGIS

arcgis.raster.orthomapping module



Orthomapping for Drone Imagery

Before geospatial information can be digitized from imagery, the imagery needs to be corrected for different types of errors and distortions inherent in the way imagery is collected.

Orthomapping is a combined process of orthorectification and mapping. Orthorectification refers to the removal of geometric distortion introduced by the platform, sensor, and especially terrain displacement. Mapping refers to the edgematching, seamlines generation, and color balancing of multiple images to produce an orthomosaic dataset.

Note: The ability to perform Orthomapping with ArcGIS Python API is available at ArcGIS Enterprise 10.6.1 through ArcGIS API for Python version 1.4.2. It is not yet available on ArcGIS Online.

Note: The ArcGIS Enterprise needs to be configured with a raster analysis server, which requires an Image Server license.

```
In [1]: import arcgis
        from arcgis.gis import GIS
        import os
        import json
        import glob
        import ntpath
```

Connect to our GIS.

```
In [2]: portalUrl = "https://zzhou2.esri.com/portal/home"
        portalUN = "admin"
        portalPW = "admin123"

        gis = GIS(url=portalUrl, username=portalUN, password=portalPW, verify_cert=False)
```

Ensure that Orthomapping and Raster Analytics are supported in our ArcGIS Enterprise.

```
In [3]: isSupport_orthomapping = arcgis.raster.orthomapping.is_supported(gis)
        isSupport_orthomapping
```

```
Out[3]: True
```

```
In [4]: isSupport_rasteranalytics = arcgis.raster.analytics.is_supported(gis)
        isSupport_rasteranalytics
```

```
Out[4]: True
```

What is Ortho Mapping?

A technology used to process remote sensing images and produce ortho imagery products

Satellite, Drone, and aerial photograph

Mapping and analysis with imagery in GIS



Raw images

Ortho Mapping



Ortho Mosaic/DSM/DTM

arcgis.raster.orthomapping module

```
jupyter Demo_DevSummit Part 1 Last Checkpoint: 2 hours ago (autosaved)
File Edit View Insert Cell Kernel Widgets Help Notebook saved Trusted Python 3
1.1.2 Upload images into the project folder
In [10]: imageFolderPath = r"c:\temp\VVWD_13\images"
imageList = glob.glob(os.path.join(imageFolderPath, '*.JPG'))
imageItemList = []
itemPropTemplate = {"type": "Image"}
for imageFullPath in imageList:
    imageName = ntpath.split(imageFullPath)[1]
    itemPropTemplate["title"] = imageName
    itemPropTemplate["tags"] = imageName
    itemPropTemplate["description"] = imageName
    imageItem = gis.content.add(item_properties=itemPropTemplate, data=imageFullPath, owner=portalUN,
    imageItemList.append(imageItem)
```

Construct the GPS array structure - [[imageName1, gpsLatitude1, gpsLongitude1, gpsAltitude1]...]

```
In [15]: gps = [[ntpath.split(image)[1],
                find_lat_long_alt(image, 'GPS GPSLatitude'),
                find_lat_long_alt(image, 'GPS GPSLongitude'),
                find_lat_long_alt(image, 'GPS GPSAltitude')] for image in imageList]
```

Construct the camera properties dictionary structure - {"maker", "model", "focallength", "columns", "rows", "pixelsize"}. We can query camera database with [arcgis.raster.orthomapping.query_camera_info\(\)](#)

```
In [13]: arcgis.raster.orthomapping.query_camera_info(camera_query="Make='Yuneec'")
cameraProperties = {"maker": "Yuneec", "model": "E90", "focallength": 8, "columns": 5472, "rows": 3648, "pixelsize": 0.0024}
```

	Maker	Model	Focal Length	Columns	Rows	Pixel Size
0	Yuneec	E90	8.0	5472	3648	0.0024

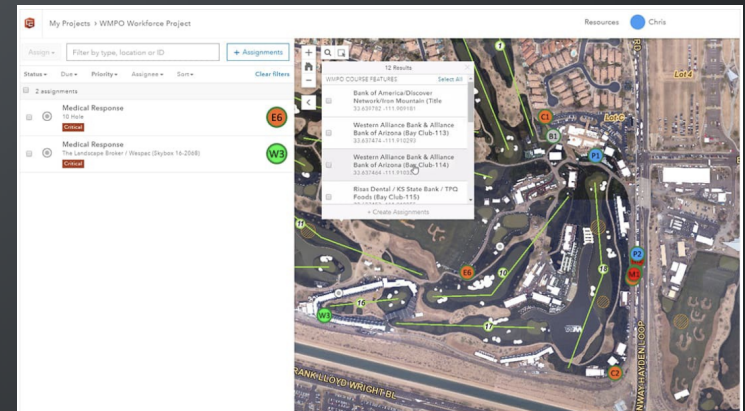
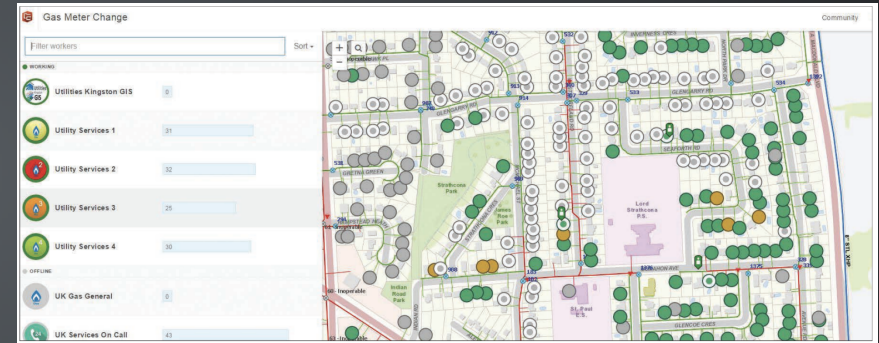
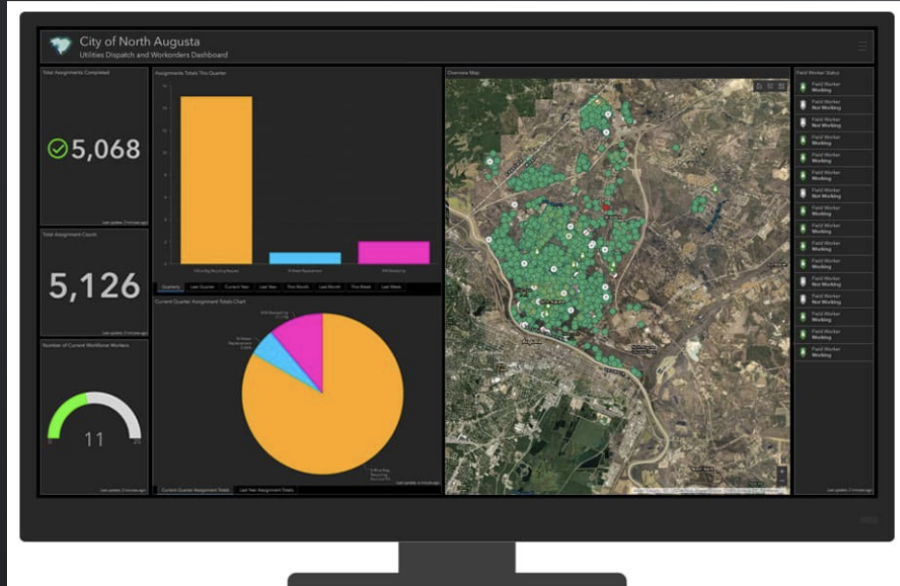
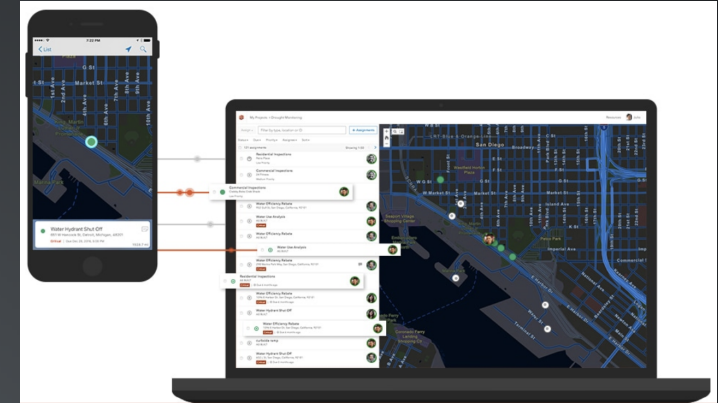
```
In [20]: imagecollectionItem.layers[0]
```

Out[20]:



Workforce for ArcGIS

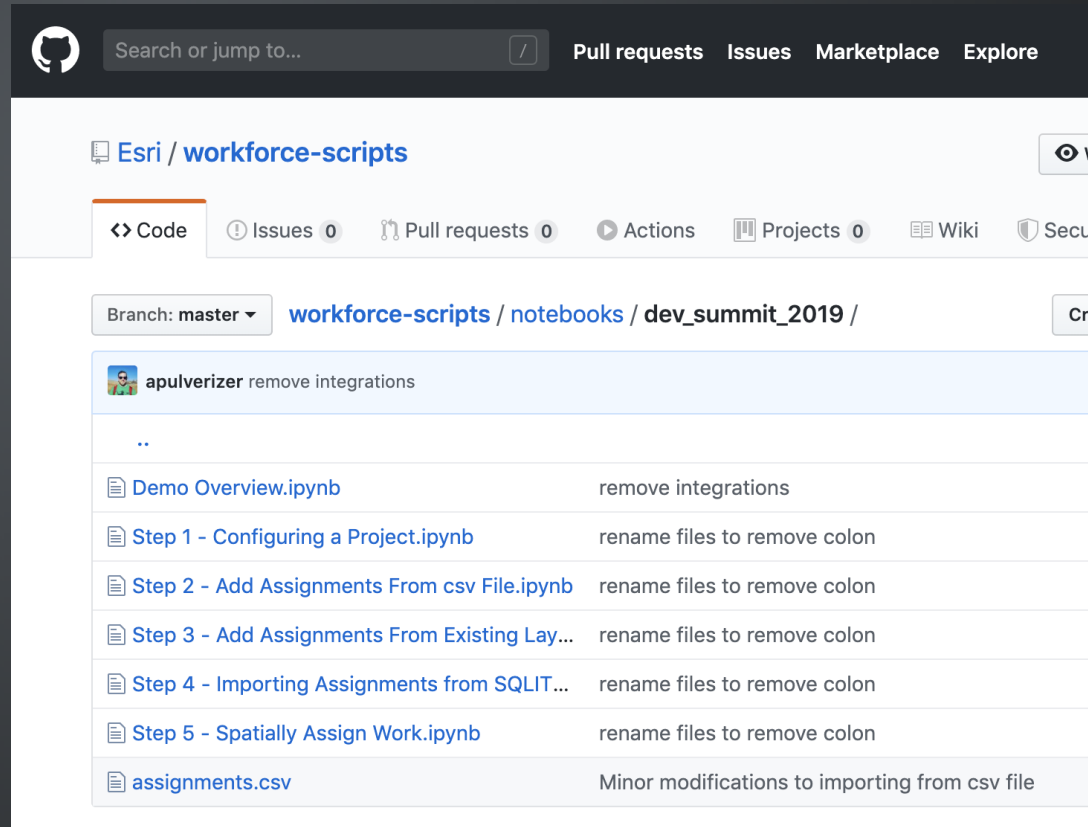
Field workforce coordination



Import ArcGIS API for Python

Import the `arcgis` library and some modules within it.

```
In [ ]: import arcgis
        from arcgis.apps import workforce
        from arcgis.gis import GIS
```



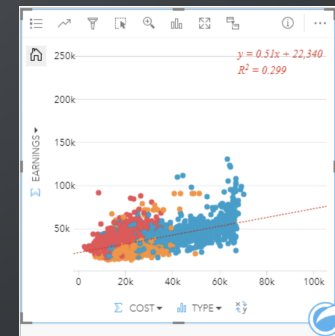
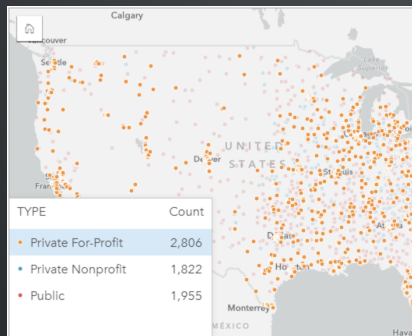
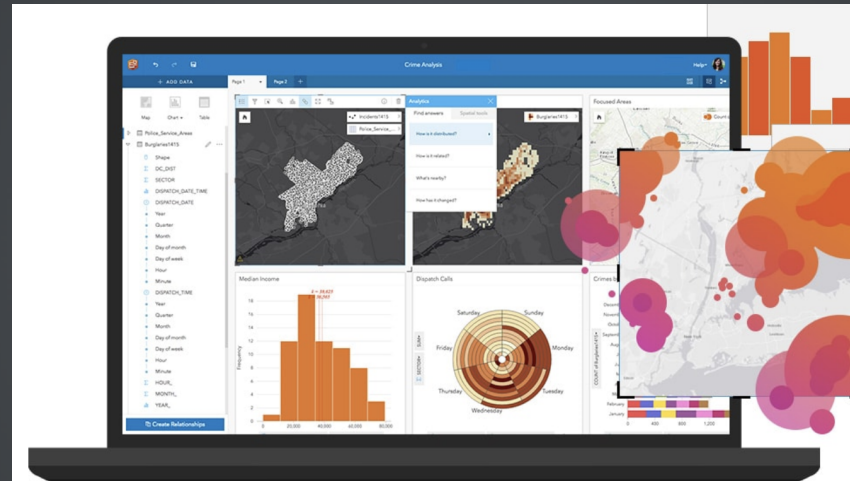
The screenshot shows the GitHub repository page for `Esri / workforce-scripts`. The repository is on the `master` branch. The file structure is as follows:

File Name	Change Description
..	remove integrations
Demo Overview.ipynb	remove integrations
Step 1 - Configuring a Project.ipynb	rename files to remove colon
Step 2 - Add Assignments From csv File.ipynb	rename files to remove colon
Step 3 - Add Assignments From Existing Lay...	rename files to remove colon
Step 4 - Importing Assignments from SQLIT...	rename files to remove colon
Step 5 - Spatially Assign Work.ipynb	rename files to remove colon
assignments.csv	Minor modifications to importing from csv file

ArcGIS Insights

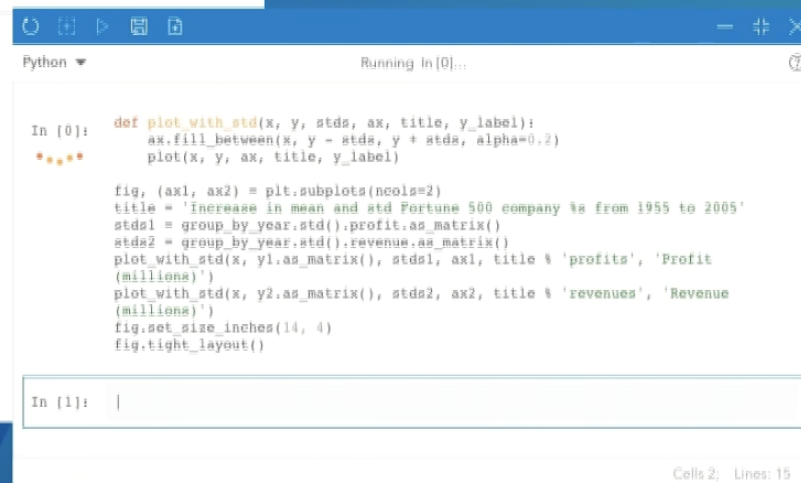
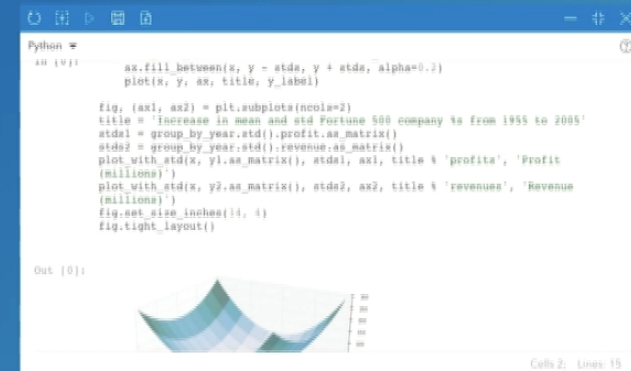
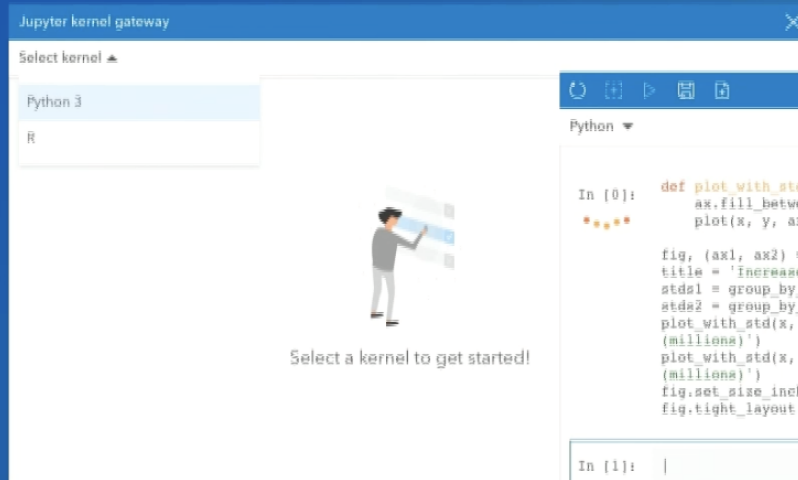
analysis software:

fuses location analytics with open data science and business intelligence workflows



Python and R with Insights

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





+ ADD

Introduction

Regional Overview

State Patterns

Python

R

Sharing results



Map

Chart

Table

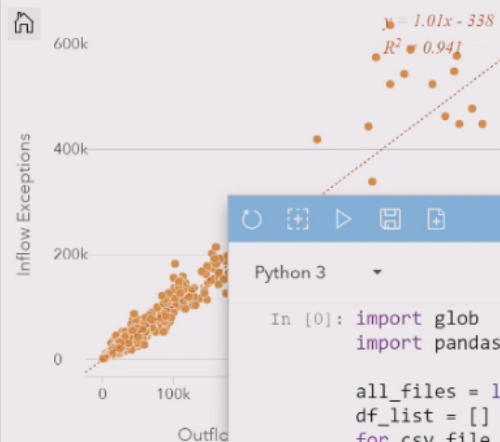
Widget

▼ % years of data

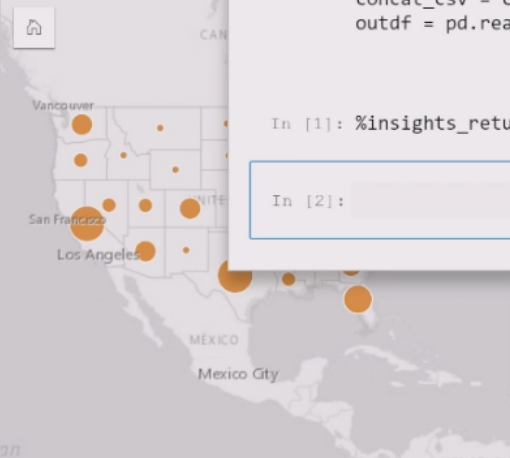


- Σ State FIPS
- ▮ State Abbr
- ▮ State Name
- ▮ Years
- Σ Adjusted gross income
- Σ Total Returns
- Σ Total Exceptions
- Σ Total Returns Adj Gross Incom...
- Σ Total Returns Adj Gross Incom...
- Σ Non Migrant Returns
- Σ Non Migrant Exceptions
- Σ Outflow Returns
- Σ Outflow Exceptions
- Σ Inflow Returns
- Σ Inflow Exceptions
- Σ Same State Returns
- Σ Same State Exceptions

Inflow and Outflow



Gross income by state



People who remained in the same state (top values)



Python 3

Beta version

```
In [0]: import glob
import pandas as pd

all_files = list(glob.glob('./demo_data/*.csv'))
df_list = []
for csv_file in all_files:
    df = pd.read_csv(csv_file)
    df_list.append(df)
concat_df = pd.concat(df_list, ignore_index=True, sort=False)
concat_csv = concat_df.to_csv('./allfiles.csv', index=False)
outdf = pd.read_csv('./allfiles.csv')
```

```
In [1]: %insights_return(df)
```

```
In [2]:
```

Create Relationships

ArcGIS Runtime Local Server

- ArcGIS Runtime SDKs
 - Create native apps, mobile, desktop
- Desktop apps
 - Leverage Local Server for running offline GP tasks
- Perform analysis and geoprocessing that's not natively supported in the Runtime core.
- Requires a GP Package (.gpkx or .gpk file), authored in ArcMap or Pro, with Model Builder or Python.

Learning Resources

- W3Schools - <https://www.w3schools.com/python/>
- Python Tutorial - <https://docs.python.org/3/tutorial/>
- Books
 - Head First Python (O'Reilly)
 - Think Python: How to think like a Computer Scientist (O'Reilly)
- Arcpy
 - <https://www.esri.com/training/>
 - Python Scripting for ArcGIS (Esri Press)
- ArcGIS Python API - <https://developers.arcgis.com/python/>
- Exercises for practice - <https://www.practicepython.org/>

ArcGIS Tutorials

Find a tutorial for the exact project

Overview

What is ArcGIS?

Graphics and Data

Search and Directions

All Tutorials

Find Tutorials by API or SDK

Find Tutorials by Topic

All Products	JavaScript	Android	iOS	Java	.NET
Qt	Python	REST API	Pro SDK	AppStudio	ArcGIS Online

Download data ⌚ 10 minutes
Automate downloading data from the cloud using ArcGIS API for Python.
Python [Start Tutorial](#)

Create data ⌚ 15 minutes
Add features to your own service using the ArcGIS API for Python.
Python [Start Tutorial](#)

Display a web map ⌚ 10 minutes
Build an app to load and display a web map from ArcGIS Online.
JavaScript Android iOS Java NET Qt Python AppStudio [Start Tutorial](#)

Share maps and layers ⌚ 10 minutes
Automate sharing your layers or keeping them private.
Python ArcGIS Online [Start Tutorial](#)

Find places ⌚ 5 minutes
Build an app to search for coffee shops, gas stations, restaurants, and other nearby places.
JavaScript Android iOS Python REST API [Start Tutorial](#)


Import data ⌚ 10 minutes
Automate loading data into the ArcGIS Online cloud using ArcGIS API for Python.
Python ArcGIS Online [Start Tutorial](#)

Add a layer from an item ⌚ 10 minutes
Build an app that loads and displays a layer from ArcGIS Online.
JavaScript Android iOS Java NET Qt Python AppStudio [Start Tutorial](#)

Display a web scene ⌚ 10 minutes
Build an app to load and display a 3D web scene from ArcGIS Online.
JavaScript Android iOS NET Python [Start Tutorial](#)

Search for an address ⌚ 10 minutes
Build an app to find addresses and places with the ArcGIS World Geocoding Service.
JavaScript Android iOS Java NET Qt Python REST API [Start Tutorial](#)

Load Spatial Data Frame ⌚ 10 minutes
Load a spatial data frame from a feature layer for analytic workflows.
Python [Start Tutorial](#)



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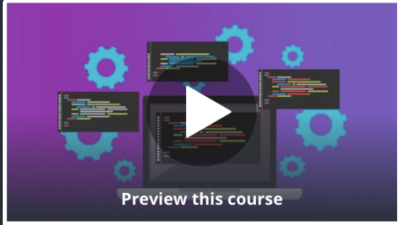
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Created by Colt Steele Last updated 7/2019 English English [Auto-generated]



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What you'll learn

- ✓ Learn all the coding fundamentals in Python!
- ✓ Learn about all of the latest features in Python 3.6
- ✓ Make complex HTTP requests to APIs using Python
- ✓ Really Really Understand Object Oriented programming in Python
- ✓ Write your own Decorators and higher order functions
- ✓ Confidently work with Lambdas!
- ✓ Build games with Python
- ✓ Work with all the Python data structures: lists, dictionaries, sets, tuples, and more!
- ✓ Master built-in python functions like zip and filter
- ✓ Write your own custom modules
- ✓ Work through nearly 200 exercises and quizzes!
- ✓ Use Python to create an automated web crawler and scraper
- ✓ Master the quirks of Python style and conventions
- ✓ Learn testing and TDD (Test Driven Development) with Python
- ✓ Write your own Generators and other Iterators
- ✓ Master tricky topics like Multiple Inheritance and Polymorphism
- ✓ Build larger projects that span across multiple files
- ✓ Become an expert at list and dictionary comprehensions
- ✓ Handle errors and debug code
- ✓ Work with files, including CSV

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All Content (1025)
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Type to filter by text [Filter by tag](#) **Sort by latest activity: newest first** 1 2

Title	Author	Latest activity	Views				
? PermissionError	Lino Sun	December 11, 2019 2:31:18 AM	26	1	0	5	?
Python API vs Python based GP Tools for Analysis?	Zachary Hart	December 10, 2019 3:43:00 AM					
? How to update layer properties in FeatureLayerCollection?	Trace Stanford	December 10, 2019 2:37:00 PM					
? Find Topology layers in Feature Dataset	Jose Sanchez	December 10, 2019 6:44:00 AM					
? Updating Data Source in ArcGIS PRO project with arcpy	Arne Gelfert	December 10, 2019 6:43:00 PM					
How to enable map series using python in ArcGIS Pro?	Aaron Laver	December 10, 2019 6:30:00 PM					
? complex Stage Service	Clive Swan	December 10, 2019 4:32:00 PM					

[f](#) [t](#) [+](#) 0

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All Content (52)
Filter by action: **None** [Filter by shared content](#)
Type to filter by text [Filter by tag](#) **Sort by latest activity: newest first** 1 2

Title	Author	Latest activity	Views				
? Created Feature Class temporary by default, need to save the mxd to keep it from being gone...	Pier-Philippe Labrie	September 2, 2019 2:17:54 PM	81	1	0	3	?
? Setup Crowdsourcing send email tool	Seth Jetland	July 30, 2019 7:02:46 AM	17	0	0	0	?
? Building Python Add ins TOOL on Rectangle ?	Genevieve Simard	June 25, 2019 4:34:35 PM	56	0	0	0	?
? Building Python Add ins - enable/disable tool when a condition is met?	Genevieve Simard	June 25, 2019 4:34:35 PM	45	0	0	0	?
Building Python Addin TOOLS on Rectangle	Genevieve Simard	June 25, 2019 3:33:25 AM	78	0	0	0	?
Python Add-ins TOOL enable/disable on a given condition	Genevieve Simard	June 25, 2019 3:33:25 AM	74	0	0	0	?
NameError: global name is not defined when	Dale Shearer	May 13, 2019 9:00:46 AM	1688	0	0	3	?

[f](#) [t](#) [+](#) 0

VIEW THE BLOG
[Python AddIns](#)

#python theSpatialCommunity.slack.com

The screenshot shows a Slack interface with a sidebar on the left and a main chat area on the right. The sidebar includes a search bar, a 'Jump to...' dropdown, and a list of channels. The main chat area shows a conversation in the #python channel, dated Monday, December 9th. A user named gisdev-km has posted a list of steps to create a local Python environment. Another user, ted_chapin, has responded with a code snippet for settings.json and launch.json. A third user, charles.rudder, has commented on the issue of cloning the environment.

The Spatial Co... jimbarry

Jump to...

All Unreads

Threads

Channels

- # admin-announcements
- # analysis
- # arcgis
- # arcgis-desktop
- # arcgis-web
- # blockchain-spatial
- # boundless
- # db
- # devsummit
- # geocoding
- # gistribe
- # git
- # job
- # loc-nyc
- # mapbox
- # maptime
- # mobile
- # openstreetmap
- # python**
- # random
- # startups

#python 984 | 4 | <https://www.youtube.com/watch?v=MAW1zLVTrkQ> Search @ ☆ ⋮

Monday, December 9th

You could hard code the path to make vscode see it. I clone my arcpro envs outside of the user profile dir and haven't had any issues

1 reply 20 hours ago

gisdev-km 17:51

1. Create your new local repo folder
2. With ArcGIS Python Command Prompt...
3. cd <parent repo folder>
4. conda create --prefix .\<env name> --clone arcgispro-py3
5. activate <env name>

Yesterday

ted_chapin 14:04

@charles.rudder My cloned ArcGIS Pro Python environment is `arcgispro-py3-clone` and in VSCode I use

this in my settings.json:

```
"python.pythonPath": "C:\\Users\\TedChapin\\AppData\\Local\\ESRI\\conda\\envs\\arcgispro-py3-clone\\python.exe",
```

and this in my launch.json:

```
{
  // Use IntelliSense to learn about possible attributes.
  // Hover to view descriptions of existing attributes.
  // For more information, visit: https://go.microsoft.com/fwlink/?linkid=830387
  "version": "0.2.0",
  "configurations": [
    {
      "name": "Python 3.6",
      "type": "python",
      "request": "launch",
      "program": "${file}",
      "console": "internalConsole",
      "pythonPath": "C:\\Users\\TedChapin\\AppData\\Local\\ESRI\\conda\\envs\\arcgispro-py3-clone\\python.exe"
    }
  ]
}
```

charles.rudder 14:04

my biggest issue is actually getting it to clone

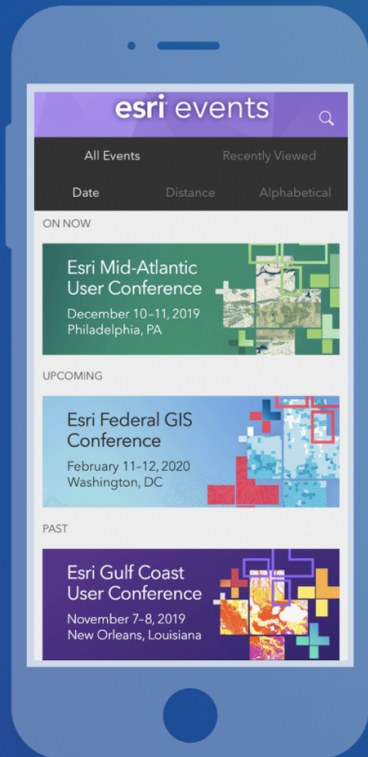
ted_chapin 14:04

one is for the IDE and one is for the interpreter

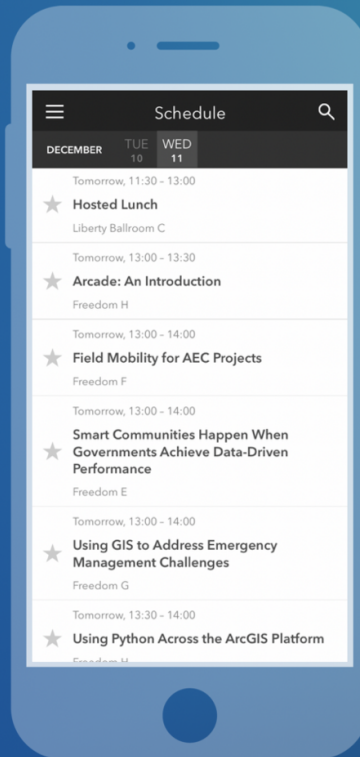
Message #python

Please Take Our Survey on the App

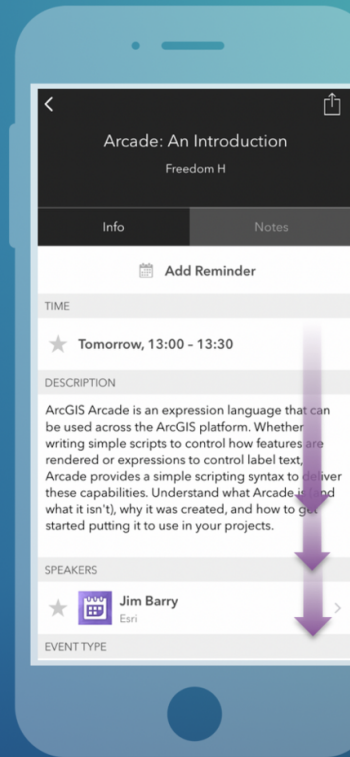
Download the Esri Events app and find your event



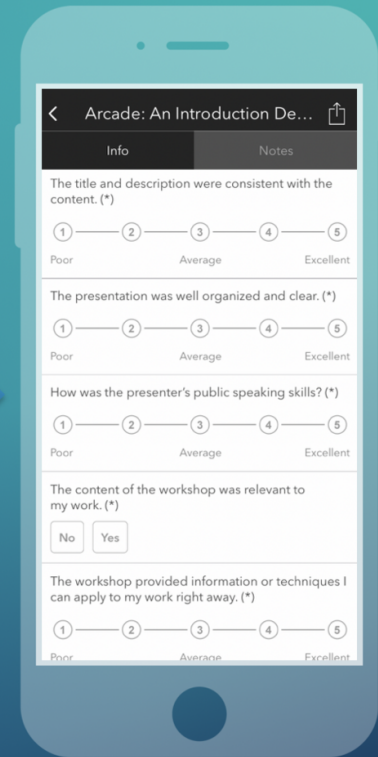
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