Introduction to Jupyter Notebooks for Spatial Analysis

In this tutorial, we are going to be using the Jupyter Notebooks to analyse spatial data

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Installing ArcGIS API for Python

Following the steps below, you will be able to install the API on your machine and get to work with this Rich Python Library for Spatial Data Science

Download Anaconda

- Navigate to Anaconda Website (https://www.anaconda.com/products/individual#Downloads) and get to downlaod the *Anaconda* application which is going to download all the python libraries and install **Jupyter Notebooks** which are much needed for this tutorial
- Run the installation file to install it on your machine

Run Commands

- click on the Start Menu,
- find **Anaconda** folder,
- click on it to expand it
- Right Click the Jupyter NoteBook icon and Open file location
- Right click on the Command Prompt and *Run as Administrator*

The command line tool will open and input the following code:

- installing the ArcGIS Python Libraries onto your machine

```
conda install -c esri arcgis
```

- Type **y** to accept the packages listed to install on your machine
- that's it. Python API is installed

Open Jupyter NoteBooks

Now we need to start working and we just need to run one more command in the command prompt. Type and run,

```
jupyter notebook
```

- the environment opens
- navigate to a Folder in which you want to work in
- create a *Python 3* Notebook by clicking on **New** which is on the tool bar
- a new tab opens and you are ready to begin

CONGRATULATIONS ON YOUR FIRST STEP

Creating Maps & Adding Layers

Importing the Python Libraries into our project.

- call the ArcGIS library
- import the GIS capabilities
- declare a variable and assign the GIS Methods to it

In [5]:
```
from arcgis.gis import GIS
gis = GIS()
```

We just imported the ArcGIS API for Python by calling it from the **arcgis** library for the Python language.

Let's create a simple map using a named location

- create a variable named **map** or any other name you might give it
- call the variable in order to display an out

If you do not call the variable after declaring it, then no output is displayed

In [6]:
```
map = gis.map("Africa")
map
```

Styling The Map

We can edit attributes like **Centering** and **Zooming** among others which we will touch on in future tutorials

In [7]:
```
map.center = [-19.0154, 29.1549]
map.zoom = 7
```

Get the JSON feedback for all available Basemaps to use within the map display

In [8]:
```
map.basemaps
```

Out[8]:
```
['dark-gray',
 'dark-gray-vector',
 'gray',
 'gray-vector',
 'hybrid',
 'national-geographic',
 'oceans',
 'osm',
 'satellite',
 'streets',
 'streets-navigation-vector',
 'streets-night-vector',
 'streets-relief-vector',
 'streets-vector',
 'terrain',
 'topo',
 'topo-vector']
```

Change the basemap to the original map.

Take note that the *map* variable is still the one in use and it will just change the map displayed above

In [9]:
```
map.basemap = 'dark-gray-vector'
```

Searching and Retrieving OpenData

- create a *variable* to store results
- define the *search terms*
- define the *item types* you want to search
- if you don't want to flood your screen with results, define the maximum items to display
- call the variable to display the results

In [11]:
```
display_content = gis.content.search("Zimbabwe COVID-19", item_type="Feature Layer", max_items=10)
display_content
```

Out[11]:
```
[<Item title:"CASES IN ZIMBABWE" type:Feature Layer Collection owner:mohcccovid19>,
 <Item title:"SexDistrubution" type:Table Layer owner:surveyor_jr>,
 <Item title:"Vaccine Distribution Program" type:Feature Layer Collection owner:surveyor_jr>,
 <Item title:"CaseFatalityRateByAgeGroup" type:Table Layer owner:surveyor_jr>,
 <Item title:"CasesAndDeathsPerAgeGroup" type:Table Layer owner:surveyor_jr>,
 <Item title:"CASES IN ZIMBABWE" type:Feature Layer Collection owner:yona@esri_southernafrica>,
 <Item title:"POSITIVE CASES IN ZIMBABWE" type:Feature Layer Collection owner:yona@esri_southernafrica>,
 <Item title:"case_distribution_by_district_WFL1" type:Feature Layer Collection owner:surveyor_jr>]
```

display the results in a pleasing way than just text format

Using the same **variable** declared above.

In [12]:
```
from IPython.display import display
for item in display_content:
    display(item)
```

CASES IN ZIMBABWE
(https://www.arcgis.com/home/item.html?id=d112ddacabad409b8445ac83a24d9262)

Feature Layer Collection by mohcccovid19
Last Modified: April 14, 2020
0 comments, 23 views

(https://www.arcgis.com/home/item.html?id=d112ddacabad409b8445ac83a24d9262)

SexDistrubution (https://www.arcgis.com/home/item.html?id=8164760f08cc43b3b9ddb4f859bc6f0f)

Table Layer by surveyor_jr
Last Modified: December 07, 2020
0 comments, 4 views

(https://www.arcgis.com/home/item.html?id=8164760f08cc43b3b9ddb4f859bc6f0f)

Vaccine Distribution Program
(https://www.arcgis.com/home/item.html?id=339f0b31dfbb49cf892e82bb5c2f94e4)
A collection of the Coronavirus Vaccination roll-out and progress in Zimbabwe

Feature Layer Collection by surveyor_jr
Last Modified: February 18, 2021
2 comments, 345 views

(https://www.arcgis.com/home/item.html?id=339f0b31dfbb49cf892e82bb5c2f94e4)

CaseFatalityRateByAgeGroup
(https://www.arcgis.com/home/item.html?id=840f7e659f2c489fa15ec74d94626cb0)

Table Layer by surveyor_jr
Last Modified: December 07, 2020
0 comments, 3 views

(https://www.arcgis.com/home/item.html?id=840f7e659f2c489fa15ec74d94626cb0)

CasesAndDeathsPerAgeGroup
(https://www.arcgis.com/home/item.html?id=ee90be1777c645a3a60efa30ab5adbe9)

Table Layer by surveyor_jr
Last Modified: December 07, 2020
0 comments, 2 views
(https://www.arcgis.com/home/item.html?id=ee90be1777c645a3a60efa30ab5adbe9)

CASES IN ZIMBABWE
(https://www.arcgis.com/home/item.html?id=3644158e79004237a7d66bf000df53f6)

Feature Layer Collection by yona@esri_southernafrica
Last Modified: December 18, 2020
0 comments, 946 views
(https://www.arcgis.com/home/item.html?id=3644158e79004237a7d66bf000df53f6)

POSITIVE CASES IN ZIMBABWE
(https://www.arcgis.com/home/item.html?id=6da5d152daff47c8bdbc550ffe2ff807)

Feature Layer Collection by yona@esri_southernafrica
Last Modified: April 01, 2020
0 comments, 332 views
(https://www.arcgis.com/home/item.html?id=6da5d152daff47c8bdbc550ffe2ff807)

case_distribution_by_district_WFL1
(https://www.arcgis.com/home/item.html?id=3eeef7a80c1a496b943bb16c0f69fe65)

Feature Layer Collection by surveyor_jr
Last Modified: January 31, 2021
0 comments, 154 views
(https://www.arcgis.com/home/item.html?id=3eeef7a80c1a496b943bb16c0f69fe65)

Adding Content to Map

In [13]:
```
poi = display_content
map.add_layer(poi)
```

```
Token Required
Token Required
(Error Code: 499)

Item.layers is a 'NoneType' object: nothing to be added to map

Token Required
Token Required
(Error Code: 499)
Token Required
Token Required
(Error Code: 499)

Item.layers is a 'NoneType' object: nothing to be added to map

Token Required
Token Required
(Error Code: 499)
```

*Some Layers not added to the map, because they do not belong to us and for that we need access tokens which we can get in the **ArcGIS Developers Dashboard** meaning, if you haven't already you need to create an account for that*

In [ ]:
```

```