

Bringing GIS Analysis to Life using Python Notebooks

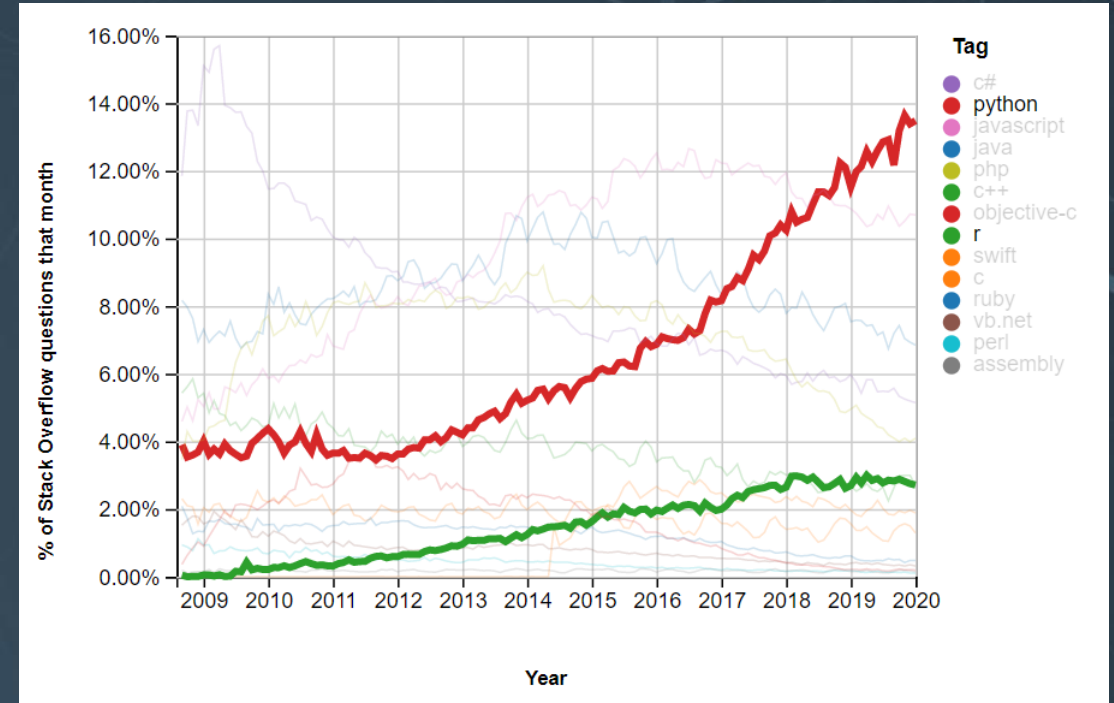
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Workshop Agenda

- Introduction: Jupyter Notebooks -> ArcGIS Notebooks
 - Why? What?
- Getting Started:
 - Basics of working with Jupyter Notebooks
 - Notebooks in ArcGIS Pro
 - Hosted Notebooks in ArcGIS Enterprise, ArcGIS Online
- Geospatial Data Science Notebook samples:
 - Data wrangling
 - Data exploration
 - Data analysis

Python

- Arguably the most popular programming language today
- Why?
 - Active/supportive community
 - Big Data, ML/DL/AI
 - Many high-quality libraries
 - Reliable and efficient
 - Highly accessible (easy to learn and use)



<https://insights.stackoverflow.com/trends>

Jupyter Notebook

- A popular way to compose documents that include:
 - Rich formatted text
 - Embedded images
 - Multimedia
 - Math formulas
 - All interlaced with live executable code and visualization of outputs

- Why?
 - Everything in one place
 - Sharable
 - Language independent
 - Customizable
 - Reproducibility & Transparency
 - Teaching
 - Iterative exploration
- Python!

ArcGIS Notebooks

- Notebooks – around since '80s
 - > IPython (2001)
 - > Jupyter (2014, multi-language)
- ArcGIS:
 - Geoprocessing with Python since ArcGIS 9.0 (2004)
- 2016: ArcGIS Notebooks =
 - Jupyter Notebook server
 - + Python
 - + ArcGIS API for Python (2016)
 - + ArcPy
- 2019: Hosted Notebooks =
 - ArcGIS Notebook
 - + ArcGIS Enterprise 10.7.1+
 - + Notebook Server for ArcGIS (or simply ArcGIS Online ... soon)
- 2020: ArcGIS Pro Notebooks =
 - ArcGIS Pro 2.5+ (2020)
 - + ArcGIS Notebooks



What can ArcGIS Notebooks do?



Data
Engineering
(Wrangling)



(Spatial)
Data Analysis



ML / DL / AI



Automation



Collaboration

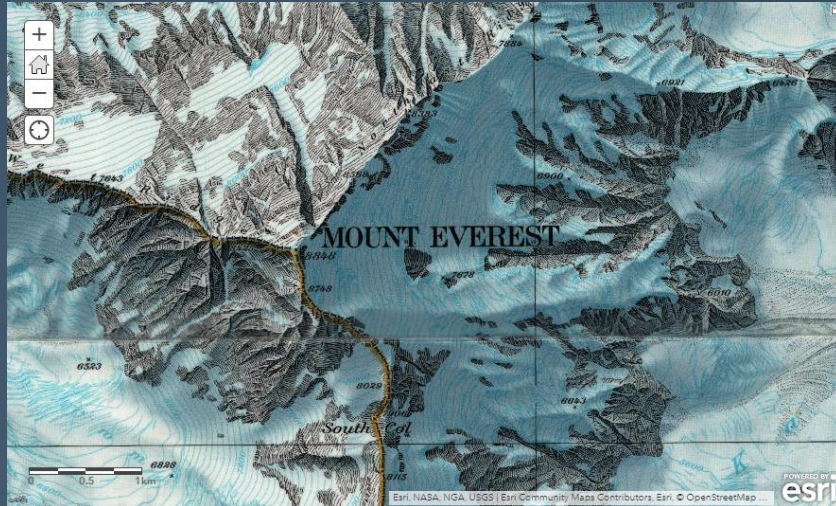


Storytelling



Iteration &
Experimentation
(Learning)

ArcGIS StoryMaps...



help you turn this...
(simple web maps)

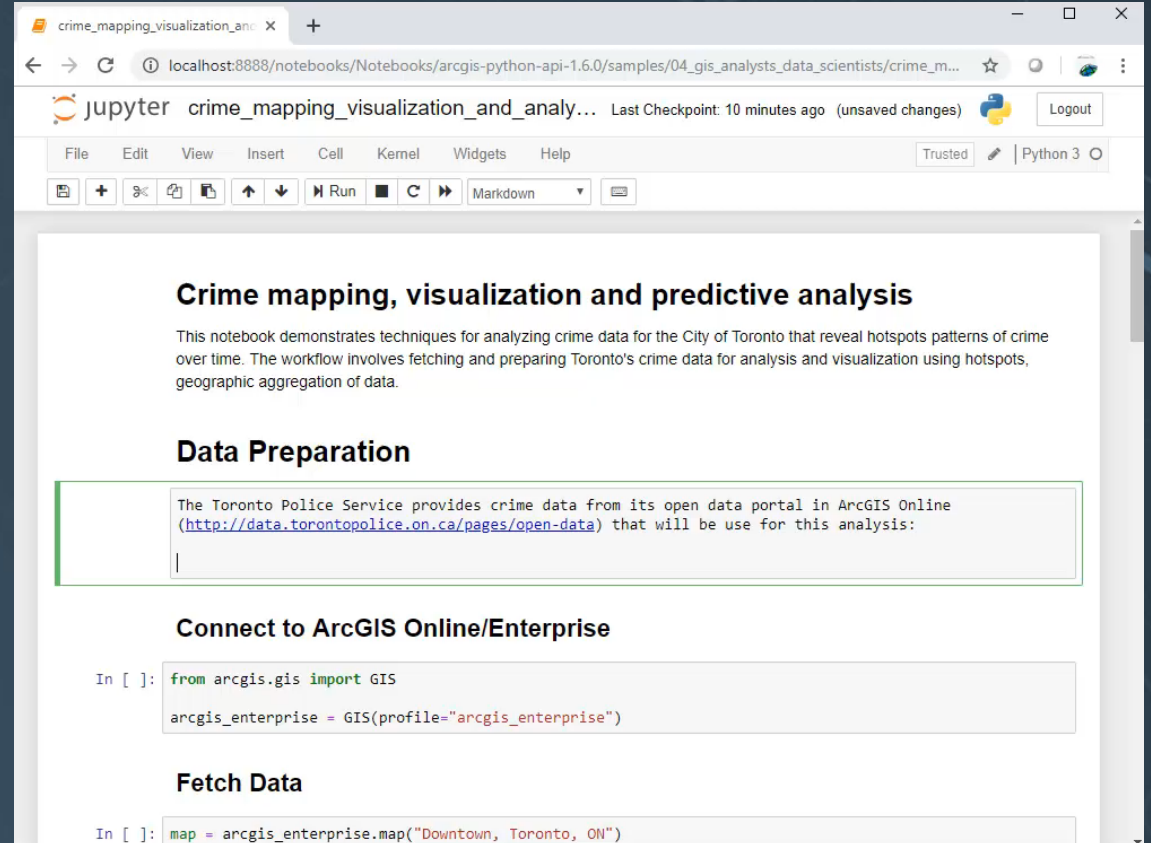


...into this.

ArcGIS Notebooks...

```
1 crime_mapping_visualization_and_analysis_toronto.py
2 # Load the layer as a spatial data frame, and save to disk for use with arcpy analysis:
3 from arcgis.features import SpatialDataFrame
4 mci_sdf = SpatialDataFrame.from_layer(mci_layer.layers[0])
5
6 # Load the arcpy module, and create a Space Time Cube from the crime data
7 import arcpy
8 arcpy.env.overwriteOutput = True
9
10 # Using downloaded copy of data: D:\ScratchFiles\MCI_2014_to_2017.shp
11 arcpy.stpm.CreateSpaceTimeCube(r"D:\ScratchFiles\MCI_2014_to_2017.shp",
12 r"D:\ScratchFiles\MCI_2014_to_2017.nc", "Date", None, "1 Months", "END_TIME", None, "500
13 Meters", None, "HEXAGON_GRID", None, None)
14
15 # Execute Emerging Hotspot Analysis
16 arcpy.stpm.EmergingHotSpotAnalysis(r"D:\ScratchFiles\MCI_2014_to_2017.nc", "COUNT",
17 r"D:\ScratchFiles\MCI_2014_to_2017_hotspots.shp", None, 1, None, "FIXED_DISTANCE", None,
18 "ENTIRE_CUBE")
19
20 from arcgis.features import FeatureLayerCollection
21
22 # Upload shapfile as zip archive, and publish new layer:
23 hotspots_shp = arcgis.enterprise.content.add([{"type": "Shapefile"}],
24 r"D:\ScratchFiles\MCI_2014_to_2017_hotspots.zip")
25 hotspots_layer = hotspots_shp.publish()
26
27 # Update symbology of layer from an existing item used as a template:
28 template_layer = arcgis.enterprise.content.get("a86e128a1e5b472ca326be0ead7e0b10").layers[0]
29 flc = FeatureLayerCollection.fromitem(hotspots_layer)
30 flc.layers[0].manager.update_definition({"drawingInfo": template_layer.properties["drawingInfo"]})
31
```

help you turn this...
(python scripts)



crime_mapping_visualization_and_analy... +

localhost:8888/notebooks/Notebooks/arcgis-python-api-1.6.0/samples/04_gis_analysts_data_scientists/crime_m...

jupyter crime_mapping_visualization_and_analy... Last Checkpoint: 10 minutes ago (unsaved changes) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3

Crime mapping, visualization and predictive analysis

This notebook demonstrates techniques for analyzing crime data for the City of Toronto that reveal hotspots patterns of crime over time. The workflow involves fetching and preparing Toronto's crime data for analysis and visualization using hotspots, geographic aggregation of data.

Data Preparation

The Toronto Police Service provides crime data from its open data portal in ArcGIS Online (<http://data.torontopolice.on.ca/pages/open-data>) that will be use for this analysis:

Connect to ArcGIS Online/Enterprise

```
In [ ]: from arcgis.gis import GIS
        arcgis_enterprise = GIS(profile="arcgis_enterprise")
```

Fetch Data

```
In [ ]: map = arcgis_enterprise.map("Downtown, Toronto, ON")
```

...into this.

Getting Started...

QUESTIONS?

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