Combining ArcGIS, R, and Jupyter Notebook

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Goal

To provide enough information so that you can determine if utilizing ArcGIS Pro with R and Jupyter Notebook will be advantageous to your work.
## ArcGIS Pro

- Will eventually replace ArcGIS Desktop

## ArcGIS Desktop Product Life Cycle

<table>
<thead>
<tr>
<th>Version</th>
<th>Release Date</th>
<th>General Availability</th>
<th>Extended Support</th>
<th>Mature Support</th>
<th>Retired</th>
<th>Release Notes</th>
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<tr>
<td>10.6</td>
<td>January 17, 2018</td>
<td>Jan 2018 - Dec 2019</td>
<td>Jan 2020 - Dec 2021</td>
<td>Jan 2022 - Dec 2023</td>
<td>January 01, 2024</td>
<td>View</td>
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</tbody>
</table>

ArcGIS Pro

- Can install Desktop & Pro side-by-side
  - Requires 64-bit Windows operating system
- 64-bit, multi-threaded
- Software updates built in
  - Check on startup
- ArcGIS Pro is project-centric
Designed for web GIS

- Client application for ArcGIS Online | Enterprise Portal
  - Consistent experience across apps
Improved Python integration
- Python 3
- Includes conda for package management
- The conda environment name: “arcgispro-py3”
Install for “all users”, arcgispro-py3 found here:
  • C:\Program Files\ArcGIS\Pro\bin\Python\envs\arcgispro-py3

Install “only for me”, arcgispro-py3 found here:
  • C:\Users\<username>\appdata\local\Programs\ArcGis\Pro\bin\Python\envs\arcgispro-py3
Python Package Manager

Project Environment

Installed Packages
The following list of Python packages are installed with ArcGIS Pro.
Learn more about Conda packages

<table>
<thead>
<tr>
<th>Name</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>arcgis</td>
<td>1.2.5</td>
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<td>bleach</td>
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</tr>
</tbody>
</table>

arcgis
Version: 12.5
ArcGIS API for Python

Homepage: License: Erni Master License Agreement (MLA)

Description
Script and automate ArcGIS Online and ArcGIS Enterprise, completing tasks ranging from performing big data analysis to content management and administration. The API integrates directly with the Jupyter Notebook and the Scipy stack.
Connecting ArcGIS Pro and R

Sign in to the ArcGIS Online UI Portal
- https://uidaho.maps.arcgis.com/home/signin.html
- Click on “UNIVERSITY OF IDAHO” button

- Enter your UI NetID and password
- Send email to bgodfrey@uidaho.edu for ArcGIS Pro license
Connecting ArcGIS Pro and R

- Download & install ArcGIS Pro
  - [https://support.uidaho.edu/TDClient/KB/Article Det?ID=229](https://support.uidaho.edu/TDClient/KB/Article Det?ID=229)

- Download & install R and Rstudio
  - R 3.2.2 or later (Accept all defaults)
  - RStudio Desktop. (Accept all defaults)
Connecting ArcGIS Pro and R

- Start ArcGIS Pro & sign in with your Enterprise Account
Connecting ArcGIS Pro and R

- Create an ArcGIS project
Set R home directory & Install the R-ArcGIS bridge*

• On the ribbon, click the Project tab.

• *'ArcGIS R Integration Package’ and/or ’arcgisbinding’ package
Connecting ArcGIS Pro and R
Load the arcgisbinding package into RStudio workspace

- library(arcgisbinding)

Initialize connection from R to ArcGIS Pro

- arc.check_product()
Data from your ArcGIS Pro project are ready to be loaded into RStudio workspace

- Use `arc.open()` function to load shapefiles, geodatabase feature classes, tables.

```r
> enrich_df <- arc.open(path = 'C:/Users/bgodfrey/Documents/ArcGIS/Projects/san-francisco/San_Francisco_Crime_Enrich_Subset.shp')
```

- Open function returns a new `arc.dataset` class object (stored in the variable `enrich_df`). The object contains the ArcGIS data (spatial & attributes) and can now be used in other functions.
Subset attributes from enrich_df to using arc.select() function to use in analysis

```r
> enrich_select_df <- arc.select(object = enrich_df, fields = c('FID', 'SUM_VALUE', 'TOTPOP10'))
```

Enrich_select_df now contains enrich_df object with attributes you selected
Convert R data frame into a spatial data frame object using `arc.data2sp()`

```
> #install.packages("sp")
> library(sp)
Error in library(sp) : there is no package called ‘sp’
> enrich_spdf <- arc.data2sp(enrich_select_df)
Error in arc.data2sp(enrich_select_df) :
  This function requires the sp package.
```

- A spatial data frame object is one of the spatial data classes contained in the sp package. The sp package offers classes and methods for working with spatial data such as points, lines, polygons, pixels, rings, and grids. With this function, you can transfer all of the spatial attributes from your data, including projections, from ArcGIS into R without worrying about a loss of information.
Bridge Your Data Into R

- Your data are bridged
- Perform analysis
- Lastly, use `arc.write()` function to write data frame object back to ArcGIS project as shapefile, feature class, table

```R
> arc.write('C:/Users/bgodfrey/Documents/ArcGIS/Projects/san-francisco/SF_Crime.gdb/San_Francisco_Crime_Rates_From_R', arcgis_df, shape_info = arc.shapeinfo(enrich_df))
```
R-ArcGIS Learning Opportunities

- Installing the R-ArcGIS Bridge for ArcGIS Pro [2-minute video]
  - [https://community.esri.com/videos/4136-installing-the-r-arcgis-bridge-for-arcgis-pro-20](https://community.esri.com/videos/4136-installing-the-r-arcgis-bridge-for-arcgis-pro-20)

- Analyze Crime Using Statistics and the R-ArcGIS Bridge [4 lessons totaling 2 hours]

- Go Deeper with Data Analytics Using ArcGIS Pro and R [1-hour video training seminar]

- Using the R-ArcGIS Bridge [2 hour web course]
  - [https://www.esri.com/training/catalog/58b5e417b89b7e000d8bfe45/using-the-r-arcgis-bridge/](https://www.esri.com/training/catalog/58b5e417b89b7e000d8bfe45/using-the-r-arcgis-bridge/)
Open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text.

http://jupyter.org/
For the purposes of this session, assuming you have installed ArcGIS Pro 2.1
• At 2.1 get a shortcut to local Jupyter Notebook
ArcGIS API for Python installed with ArcGIS Pro

- [https://developers.arcgis.com/python/](https://developers.arcgis.com/python/)
- Distributed as the ‘arcgis’ conda package
Contact Information

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