

# Combining ArcGIS, R, and Jupyter Notebook

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# Goal

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

# ArcGIS Pro

- Will eventually replace ArcGIS Desktop

## ArcGIS Desktop Product Life Cycle

Version	Release Date	General Availability	Extended Support	Mature Support	Retired	Release Notes
10.6	January 17, 2018	Jan 2018 - Dec 2019	Jan 2020 - Dec 2021	Jan 2022 - Dec 2023	January 01, 2024	<a href="#">View</a>
10.5.1	June 29, 2017	Jun 2017 - Nov 2018	Dec 2018 - Nov 2020	Dec 2020 - Nov 2022	December 01, 2022	<a href="#">View</a>
10.5	December 15, 2016	Dec 2016 - Nov 2018	Dec 2018 - Nov 2020	Dec 2020 - Nov 2022	December 01, 2022	<a href="#">View</a>
10.4.1	May 31, 2016	May 2016 - Jan 2018	Feb 2018 - Jan 2020	Feb 2020 - Jan 2022	February 01, 2022	<a href="#">View</a>
10.4	February 18, 2016	Feb 2016 - Jan 2018	Feb 2018 - Jan 2020	Feb 2020 - Jan 2022	February 01, 2022	<a href="#">View</a>

<https://support.esri.com/en/Products/Desktop/arcgis-desktop/arcmap#product-support>

# ArcGIS Pro

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- 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

# ArcGIS Pro

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- ◉ Designed for web GIS

- Client application for ArcGIS Online | Enterprise Portal
- Consistent experience across apps

# ArcGIS Pro

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## ○ Improved Python integration

- Python 3
- Includes conda for package management
- The conda environment name: “arcgispro-py3”

# ArcGIS Pro

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- ◉ 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\

# Python Package Manager

**Python Package Manager**

**Project Environment**  
arcgispro-py3 [C:\Program Files\ArcGIS\Pro\bin\Python\envs\arcgispro-py3]  
Manage Environments

**Installed Packages**

The following list of Python packages are installed with ArcGIS Pro.  
[Learn more about Conda packages](#)

Installed: 69

Name	Version
arcgis	1.2.5
bleach	1.5.0
certifi	2016.2.28
colorama	0.3.9
cyder	0.10.0
decorator	4.1.2
entrypoints	0.2.3
et_xmlfile	1.0.1
freetype	2.7
future	0.16.0
html5lib	0.9999999
ipykernel	4.6.1
ipython	6.1.0
ipython_genutils	0.2.0

**arcgis** Uninstall

Version: 1.2.5  
ArcGIS API for Python

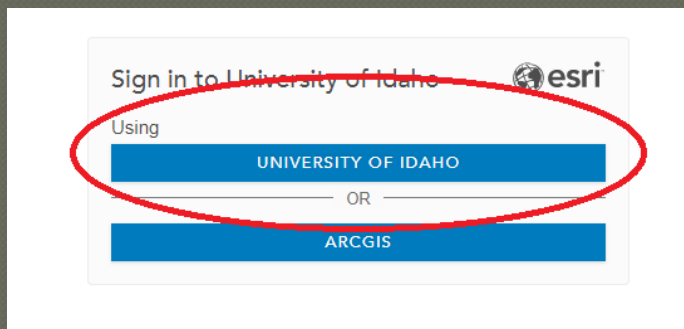
Homepage License: Esri Master License Agreement (MLA)

**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.

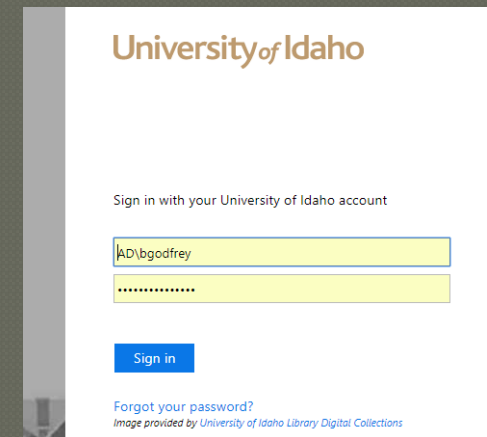


# Connecting ArcGIS Pro and R

- 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](mailto:bgodfrey@uidaho.edu) for ArcGIS Pro license




# Connecting ArcGIS Pro and R

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- ◉ Download & install ArcGIS Pro
  - <https://support.uidaho.edu/TDClient/KB/ArticleDet?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

Sign In 



Username  
|


Password

[Forgot password?](#) [Forgot username?](#)

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Sign in with

Sign in with  

Sign In 

Enter your ArcGIS organization's URL below.


.maps.arcgis.com

Sign in to University of Idaho 

Using

OR

ArcGIS Sign In



University of Idaho

Sign in with your University of Idaho account

[Forgot your password?](#)  
Image provided by University of Idaho Library Digital Collections

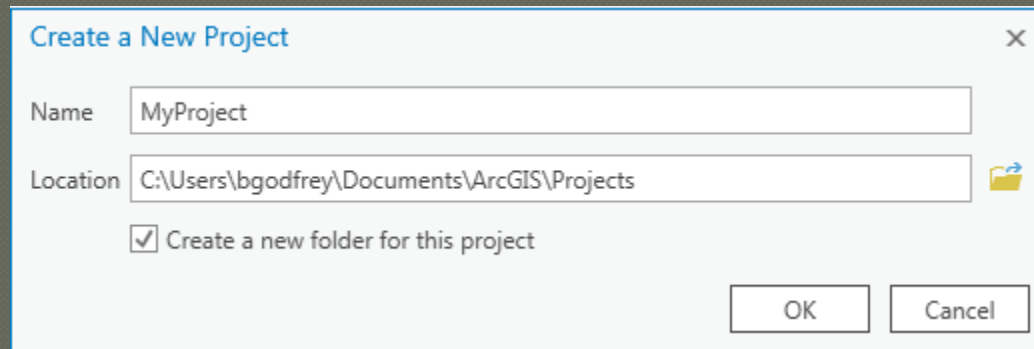
[Home](#) [Help](#)

Sign me in automatically [Configure your licensing options](#)

# Connecting ArcGIS Pro and R

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- Create an ArcGIS project



The screenshot shows a dialog box titled "Create a New Project" with a close button (X) in the top right corner. It contains two text input fields: "Name" with the value "MyProject" and "Location" with the value "C:\Users\bgodfrey\Documents\ArcGIS\Projects". To the right of the "Location" field is a folder icon with a blue arrow. Below the fields is a checked checkbox labeled "Create a new folder for this project". At the bottom right are "OK" and "Cancel" buttons.

Create a New Project

Name MyProject

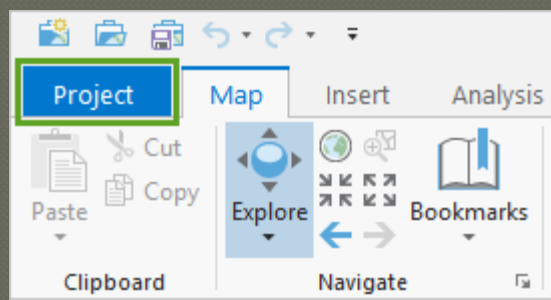
Location C:\Users\bgodfrey\Documents\ArcGIS\Projects

Create a new folder for this project

OK Cancel

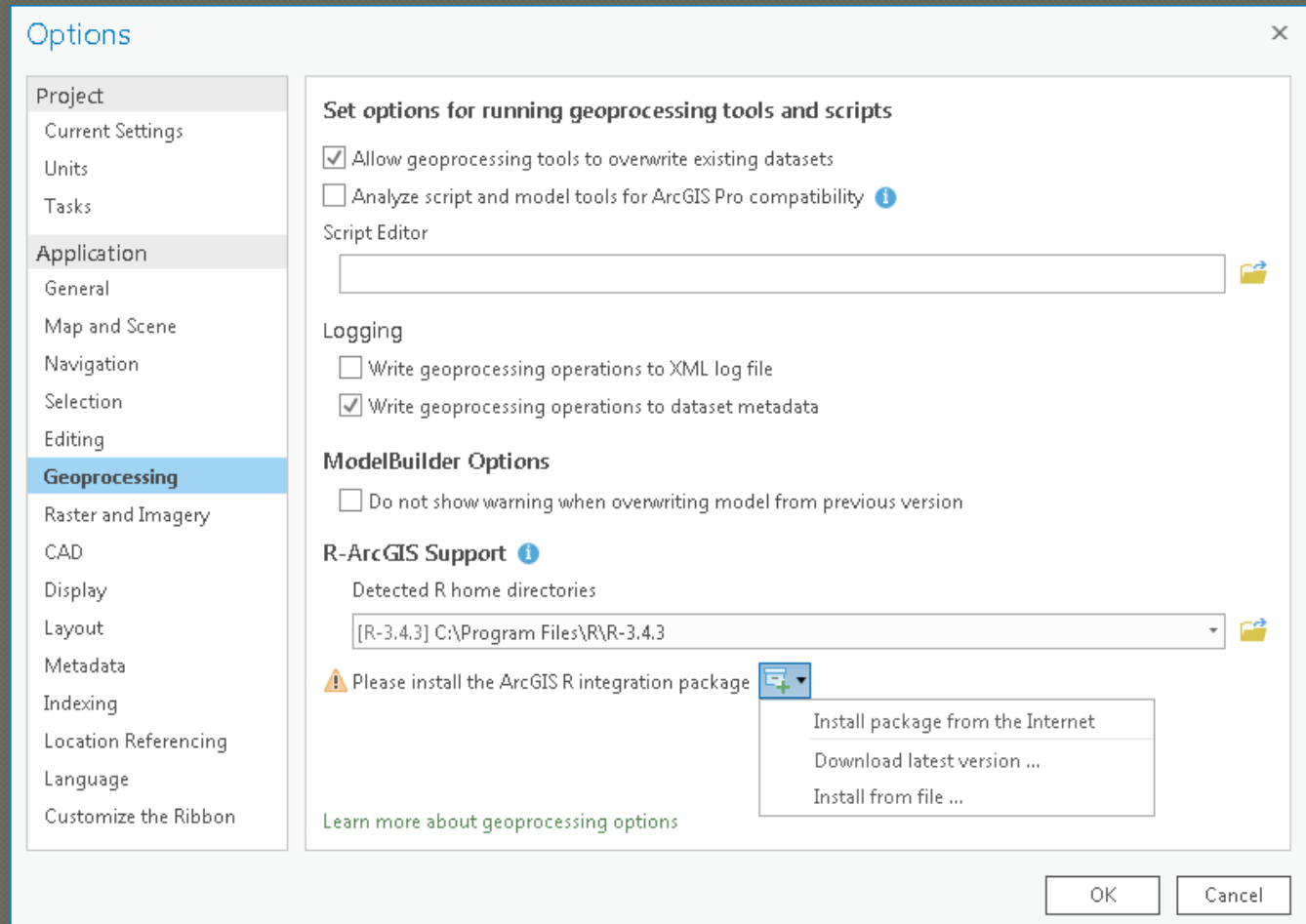
# Connecting ArcGIS Pro and R

- ◉ Set R home directory & Install the R-ArcGIS bridge\*
  - On the ribbon, click the Project tab.



- \*'ArcGIS R Integration Package' and/or 'arctgisbinding' package

# Connecting ArcGIS Pro and R



# Bridge Your Data Into R

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- Load the `arcgisbinding` package into RStudio workspace
  - `library(arcgisbinding)`
- Initialize connection from R to ArcGIS Pro
  - `arc.check_product()`

```
> library(arcgisbinding)
*** Please call arc.check_product() to define a desktop license.
> arc.check_product()
product: ArcGIS Pro ( 12.1.0.10257 )
license: Advanced
version: 1.0.1.229
> |
```

# Bridge Your Data Into R

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- 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.

```
> 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.



# Bridge Your Data Into R

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- ◉ Subset attributes from `enrich_df` to using `arc.select()` function to use in analysis

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

- ◉ `enrich_select_df` now contains `enrich_df` object with attributes you selected

# Bridge Your Data Into R

- 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

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- ◉ 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

```
> 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

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- 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>
- Analyze Crime Using Statistics and the R-ArcGIS Bridge [4 lessons totaling 2 hours]
  - <https://learn.arcgis.com/en/projects/analyze-crime-using-statistics-and-the-r-arcgis-bridge/>
- Go Deeper with Data Analytics Using ArcGIS Pro and R [1-hour video training seminar]
  - <https://www.esri.com/training/catalog/596e5ab6b826875993ba4fd9/go-deeper-with-data-analytics-using-arcgis-pro-and-r/>
- Using the R-ArcGIS Bridge [2 hour web course]
  - <https://www.esri.com/training/catalog/58b5e417b89b7e000d8bfe45/using-the-r-arcgis-bridge/>

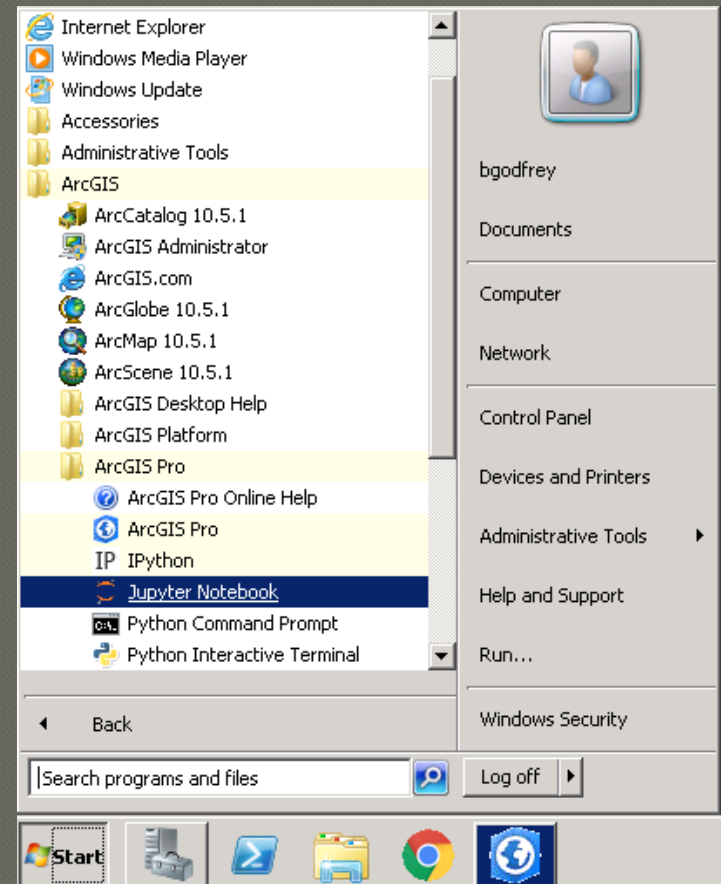
# Jupyter Notebook

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- ⦿ Open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text.
- ⦿ <http://jupyter.org/>

# Jupyter Notebook

- For the purposes of this session, assuming you have installed ArcGIS Pro 2.1
- At 2.1 get a shortcut to local Jupyter Notebook



# Jupyter Notebook

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- ◉ ArcGIS API for Python installed with ArcGIS Pro
  - <https://developers.arcgis.com/python/>
  - Distributed as the 'arcgis' conda package

# Contact Information

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