

R-ArcGIS Bridge and the Microsoft DSVM

Shaun Walbridge

<https://github.com/scw/r-ms-uc-2017>



High Quality PDF (2MB)

Related Sessions

- Data Science Made Easy in ArcGIS Using Python and R
 - Tomorrow, 8:30–9:45a, Room 07 A
 - ArcGIS + Python + R + Jupyter Notebooks for analysis
- Bridging the Gap: Integrating R and ArcGIS for Advanced Analysis
 - Tomorrow, 10:00–10:30a, Tech Theater 17
 - **Deeper dive into using R with ArcGIS**

Data Science

Data Science Languages

-  Python (SciPy stack, Jupyter, scikit-learn, ...)
- C++ (CNTK, Tensorflow)
-  R ([AI task view](#))
- Many workflows require combining components from multiple environments



- Continuum Analytics — open data science company
- Initially Python — expanded to many languages
- Supported in:
 - ArcGIS Pro 1.3+
 - Microsoft DSVM

Conda in ArcGIS Pro

←

New

Open

Save

Save As

Portals

Licensing

Options

Python

Add-In Manager

Help

About

Exit

Python Package Manager

Project Environment

arcgispro-py3

Installed Packages

Update Packages

Add Packages

Installed Packages

The following list of Python packages are installed with ArcGIS Pro.

[Learn more about Conda packages](#)

Installed: 30

Name	Version
colorama	0.3.7
cycler	0.10.0
freetype	2.6.3
future	0.15.2
libpng	1.6.22
matplotlib	1.5.3
mpmath	0.19
netcdf4	1.2.4
nose	1.3.7
numexpr	2.6.1
numpy	1.11.2
pandas	0.19.0
pip	8.1.2
py	1.4.31
pyparsing	2.1.4
pypdf2	1.26.0
pytest	2.9.2
python	3.5.2
python-dateutil	2.5.3

pandas

Version: 0.19.0

Powerful data structures for data analysis, time series, and statistics

[Homepage](#) License: BSD

Description

pandas is an open source, BSD-licensed library providing high-performance, easy-to-use data structures and data analysis tools for the Python programming language.

Uninstall



NumPy



pandas
 $y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$



ArcPy

- Python module for accessing all the capabilities of ArcGIS Pro from within Python
- Chaining tools together, form models and scripts
- Primary mechanism for extending the software for desktop users

ArcGIS API for Python

- Jupyter: Python, R and remote data sources

```
In [ ]: import arcgis
from arcgis.gis import GIS
# Create a GIS object, as an anonymous user for this example
gis = GIS()
```

```
In [ ]: # Create a map widget
map1 = gis.map('Paris') # Passing a place name to the constructor
# will initialize the extent of the map.

map1
```



The map widget has several properties that you can query and set, such as its zoom level, basemap, height, etc:



R

Esri and ?

- Integration via ArcGIS–R bridge, last two years
- Joined R Consortium and R Foundation

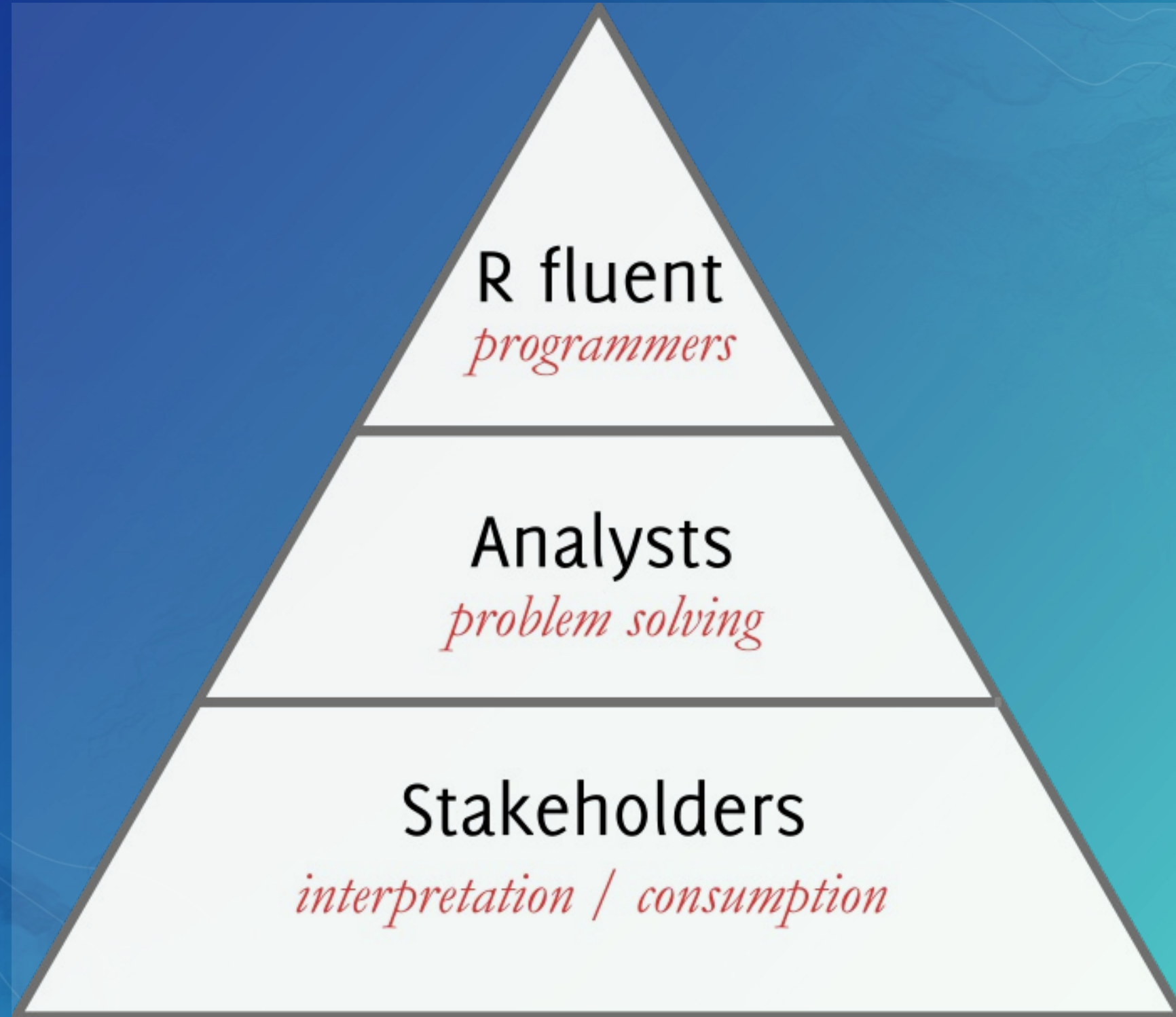
Why ?

- Powerful core data structures and operations
 - Data frames, functional programming
- Unparalleled breadth of statistical routines
 - The *de facto* language of Statisticians
- **CRAN**: 6400 packages for solving problems
- Versatile and powerful plotting

R — ArcGIS Bridge

A silhouette of a person's head and shoulders is centered in the frame, looking out over a vast night sky. The sky is filled with numerous stars and the bright, glowing band of the Milky Way galaxy stretches across the background. The person's silhouette is dark against the bright, starry sky.

R — ArcGIS Bridge



R — ArcGIS Bridge



- ArcGIS developers can *create tools and toolboxes* that integrate ArcGIS and R
- ArcGIS users can *access R* code through geoprocessing scripts
- R users can *access organizations GIS' data*, managed in traditional GIS ways



<https://r-arcgis.github.io>


R — ArcGIS Bridge

- Store data with ArcGIS, access it in R, return R objects back to ArcGIS native data types (e.g. geodatabase feature classes)
- Knows how to convert spatial data to `sp` objects, R native spatial data type


Building R Script Tools




 Semiparametric Regression 

Parameters | Environments 

* Input Features




* Locations To Predict





* Dependent Variable


* Output Prediction Feature Class




Linear Explanatory Variables

Select All 


 Nonlinear Explanatory Variables


Select All 

Input Knot Features



Output Graphs



Run 

R: Demo

What's next?

- Raster support (come see it in action tomorrow)
- Simple features (`sf` package)
- Scaling with Azure

DSVM Integration

DSVM Integration

- ArcGIS Pro in Azure
- Data Science and Deep Learning machines (high performance)
- *A unified environment* for AI problem solving —
- Provides an in-depth solution – the latest data science code, Microsoft's Cognitive Toolkit (CNTK), ArcGIS Pro, ArcPy, R-ArcGIS Bridge, and Microsoft R Open

DSVM Integration

- We're excited to see how this can be used. The great work that the Chesapeake Conservancy is doing, extended to your own projects
- R-ArcGIS bridge works seamlessly with Microsoft R Open
- Shared Backbone of Conda (Continuum Analytics) to create a consistent environment for analysis