Being Bilingual: Coding in Both R and Python

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Introduction

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- Why choose only one? Why not wrap one in the other?
- Build more seamless data science pipelines & leverage strengths of both
- Objective: introduce how to work with R and Python in the R interface using the `reticulate` package
- I will assume minimal knowledge of Python

library(reticulate)

- First author and maintainer Kevin Ushey, RStudio
- Can use Python already on your system, a virtual environment, specific versions, or Miniconda
- Works with Python versions ≥ 2.7
- "The package enables you to *reticulate* Python code into R, creating a new breed of project that weaves together the two languages."

Setting up Python

- Some systems come downloaded with Python
- If not, many ways to download (one option: Anaconda)
- Anaconda loads Python and some well known packages vs. Miniconda which loads Python and tools to install more packages (lighter weight)
- First time installing and loading library, option to install Miniconda
  - Happens if you don't specify Python source explicitly to use
  - Creates an `r-reticulate` Conda environment with Python 3.6.10 with numpy version 1.18.15

Install package

```
# Install the package
install.packages("reticulate")
```

```
# Load the library
library(reticulate)

# and check the package version
packageVersion("reticulate")
```

```
## [1] '1.16'
```

Check python version

```
# Check what Python source it's using
py_config()
```

```
python:         /Users/haema/Library/r-miniconda/envs/r-reticulate/bin/python
libpython:      /Users/haema/Library/r-miniconda/envs/r-reticulate/lib/libpython3.6m.dylib
pythonhome:     /Users/haema/Library/r-miniconda/envs/r-reticulate:/Users/haema/Library/r-miniconda/envs/r
version:        3.6.10 | packaged by conda-forge | (default, Apr 24 2020, 16:27:41)  [GCC Clang 9.0.1 ]
numpy:          /Users/haema/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages/numpy
numpy_version:  1.18.5
```

Translation "dictionary"

Purpose	R	Python
Load packages	`library(name)`	`import name`
Data wrangling	`base` or `dplyr`	`pandas`
Computations	`base`	`numpy`
Graphics	`ggplot2`	`matplotlib`
...	...	...

Interacting with Python

1. Interactive Python (REPL)
2. Import Python packages
3. Load external Python scripts

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Interactive Python

Can work with Python in the console itself (REPL = Read–Eval–Print Loop)

```
# Start an interactive session
repl_python()
Python 3.6.10
(/Users/haema/Library/r-miniconda/envs/r-reticulate/
    bin/python)
Reticulate 1.16 REPL -- A Python interpreter in R.
>>>
```

- The ">>>" indicates Python environment
- To exit session, type `exit` and hit enter
- Whatever is defined in this session will remain in Python session (coding version of Vegas)

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Import packages

As with R, you may need functions available in other packages. Sometimes these packages are already installed (e.g., numpy and os)

```
# Load the os (operating system) package
os = import("os")

# print current working directory.
# In python keep () to run the function
os$getcwd()
```

```
## [1] "/Users/haema/Documents/noRth_reticulate_20200714"
```

```
# notice how it matches
getwd()
```

```
## [1] "/Users/haema/Documents/noRth_reticulate_20200714"
```

Import packages

For packages that are not pre-installed, specify the environment you want to install it to

```
# scipy popular Python scientific computing package
conda_install("r-reticulate", "scipy")

# another approach
# sklearn holds many machine learning functions
py_install('sklearn', pip = TRUE)

# tensorflow popular package for deep-learning modules
# reticulate designed to install package from CRAN
install.packages("tensorflow")
```

Then we can import the packages as before

```
scipy = import("scipy")
library(tensorflow)
```

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Read in Python files

Similarly, we can read in a Python file (e.g., load a function). Consider the following function stored in logitfunc.py to compute $logit(x) = \frac{e^x}{1+e^x}$.

```
import numpy as np

def logit_py(x):
  return np.exp(x)/(1+np.exp(x))
```

Load file with

```
source_python("logitfunc.py")
logit_py(0.5)
```

```
## [1] 0.6224593
```

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Example with Natural Language Processing (NLP)

Run through example if time permits

Conclusion

- Work with Python in R using library(reticulate)
- Build more seamless pipelines and leverage both systems
- Some more resources (clickable links):
  - Rstudio Reticulate
  - CRAN reticulate
  - Tutorial Rshiny + Python (virtual env)

Thank You!

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