Surpassing the R vs Python dogma

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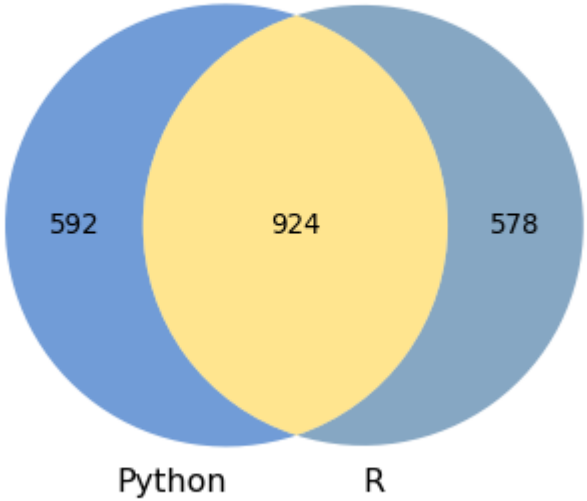
Background

* There is an argument in the data science space
* Can be observed by countless articles / blog posts etc on R vs Python
* **BUT**: this argument is not very helpful and divisive
* Focus should be on the task at hand, not the tools
* you can drill a hole with a hammer, but it won't be elegant
* Both tools have strengths and weaknesses (not part of this talk)
* You are here to solve a problem, not to have a favourite algorithm or tool

Reality check

KD Nuggets Poll 2018: most of the people who use Python or R use both



	Total	Percent
R or Python Users	2094	100 %
R and Python	924	44.13 %
R only	578	27.6 %
Python only	592	28.27%

What Python and R have in common

* A lot of data science teams use both
* both languages have rich interfaces to C / C++
* most of under-the-hood coding is done in C / C++

Would it not make sense to aim for interoperability?

Feather

* Python and R use data frames as a fundamental data structure
* Pandas data frame are based on the idea of R's data frames
* Implemented after the announcement of Apache Arrow
* Aim: share data between Python and R
* Use a binary file format for data frames
* bridge time until Apache Arrow is implemented
* Uses the Apache Arrow columnar specification to represent binary data **on disk** (zero-copy access)
* Fast, lightweight, and easy-to-use binary file format for storing data frames.
* High read and write performance.

Limitations of Feather

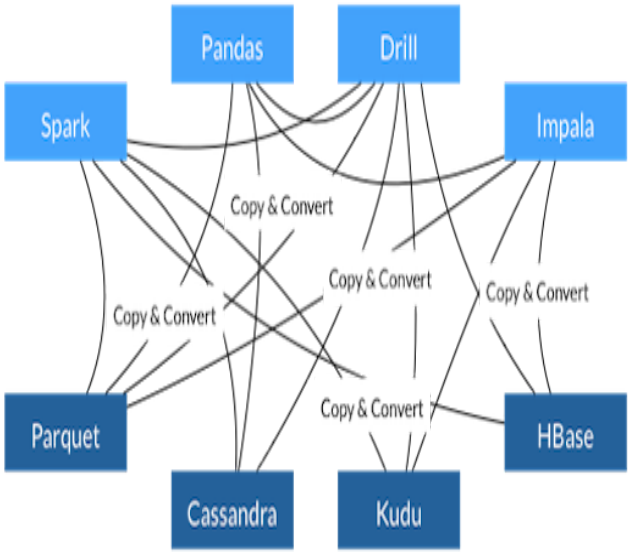
* Quickly exchange data between Python and R code, however it's not designed for long-term data storage.
* Supports limited scalar value types, adequate only for representing typical data found in R and pandas
* Supports only a single batch of rows (no ability to append to existing files)
* Only non-nested data types and categorical (dictionary-encoded) types are supported

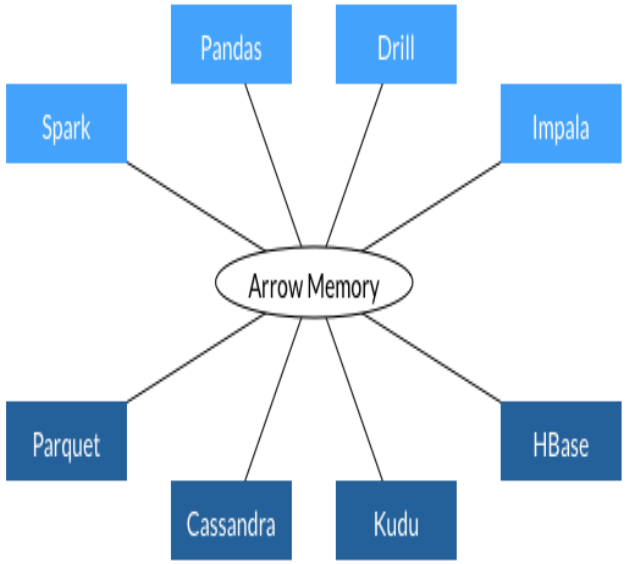
Apache Arrow

A standarised, language-independent representation of in-memory columnar data

* Exchange data without conversion between the different languages including python and R (also C, C++, C#, Go, Java, JavaScript, MATLAB, Ruby, and Rust.)
* Zero-copy dataflow
* Optimised for analytic purposes
* Supports flat and nested format and conveniently many native data types
* Backed by key developers of 13 major open source projects (including Cassandra, Hadoop, HBase, Parquet, Spark, …)

Apache Arrow





* Each system has its own internal memory format
* 70-80% computation wasted on serialization and deserialization
* Similar functionaltiy implemented in multiple projects

* All systems utilize the same memory format
* No overhead for cross-system communication
* Projects can share functionality

source: arrow.apache.org

Ursa Labs

When to comes to the most fundamental tasks (data access, data manipulation, data analysis, …….), data science tools are not optimised to make use of state-of-the-art hardware, as the efforts has been mainly focused on machine learning problems.

* Ursa Labs is an organisation founded
* by Wes McKinney (and Hadley Wickham as advisor for R)
* with the goal of advancing open source, cross-language software for data scientists
* Focuses on the data science tools of the Apache Arrow Project (Arrow has a broader application scope)
* May expand to create software artifacts focused more specifically on the data science domain

Rstudio 1.2 / reticulated python

The package: reticulate

* Reticulate is an R package that makes it possible to embed a Python session within an R process.
* Provides wrapper functions to use python modules and scripts
    - import, python_source, repl_python, use_python, py_install, ……
* Data conversion back and forth between the two languages happens through C++
* R and Python variables are accessible from both environments
    - The objects py and r provide this access

Type conversion

R	Python	Examples
Single-element vector	Scalar	1, 1L, TRUE, "foo"
Multi-element vector	List	c(1.0, 2.0, 3.0), c(1L, 2L, 3L)
List of multiple types	Tuple	list(1L, TRUE, "foo")
Named list	Dict	list(a = 1L, b = 2.0), dict(x = x_data)
Matrix/Array	NumPy ndarray	matrix(c(1,2,3,4), nrow = 2, ncol = 2)
Data Frame	Pandas DataFrame	data.frame(x = c(1,2,3), y = c("a", "b", "c"))
Function	Python function	function(x) x + 1
NULL, TRUE, FALSE	None, True, False	NULL, TRUE, FALSE

source: https://rstudio.github.io/reticulate/

Rstudio 1.2 / reticulated python

The IDE: Rstudio 1.2

* Automatic access to a python REPL when stepping into a python script
* read–eval–print loop
* interactive language shell
* simple, interactive computer programming environment
* Line-by-line execution of Python code
* Support for Python syntax highlighting
* Autocompletion and Inline help for Python …… HOOORAY!!!
* R notebooks with Python code chunks
* Automatic switch in the code history pane between Python and R
* Sourcing full Python scripts
* Display of matplotlib plots within the plots pane in RStudio and inline in the notebooks

R Notebooks

````
## Python Code
```{python include=TRUE, echo=TRUE, fig.height = 3, fig.width = 5}
import matplotlib.pyplot as plt
import pandas as pd

# get data from R
iris_groups = r.iris.groupby('Species')
# and plot with python
fig, ax = plt.subplots()
for name, group in iris_groups:
    ax.plot(group['Sepal.Width'], group['Petal.Width'], 'o', label=name)
ax.legend()
plt.show()
```

```{python}
diamonds = pd.read_csv('https://raw.githubusercontent.com/mwaskom/seaborn-data/master/diamonds.csv')
```

## R Code
```{r include=TRUE, echo=TRUE, fig.height = 4, fig.width = 7}
library(reticulate)
library(ggplot2)
# get data from Python and plot with R
ggplot(py$diamonds, aes(cut, carat)) +
  geom_boxplot(aes(color = cut), na.rm = TRUE, show.legend = FALSE)+
  theme(axis.text.x = element_text(angle = 45, hjust = 1))

```
````

Python Code

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import matplotlib.pyplot as plt
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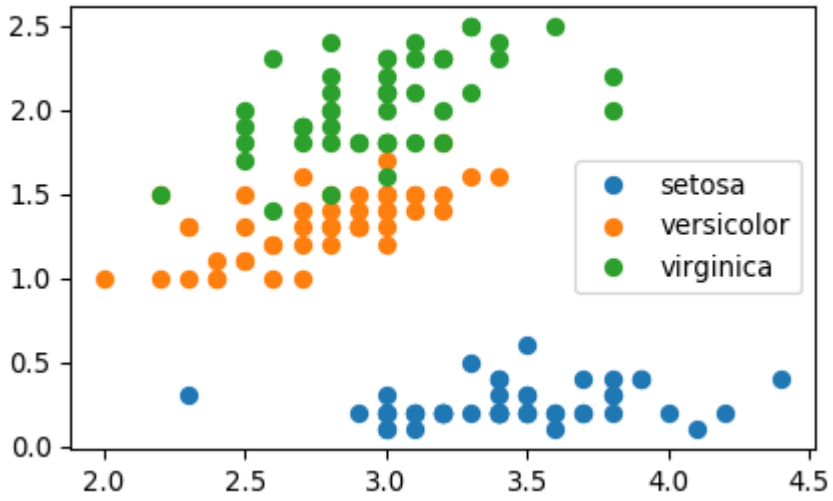

R Code

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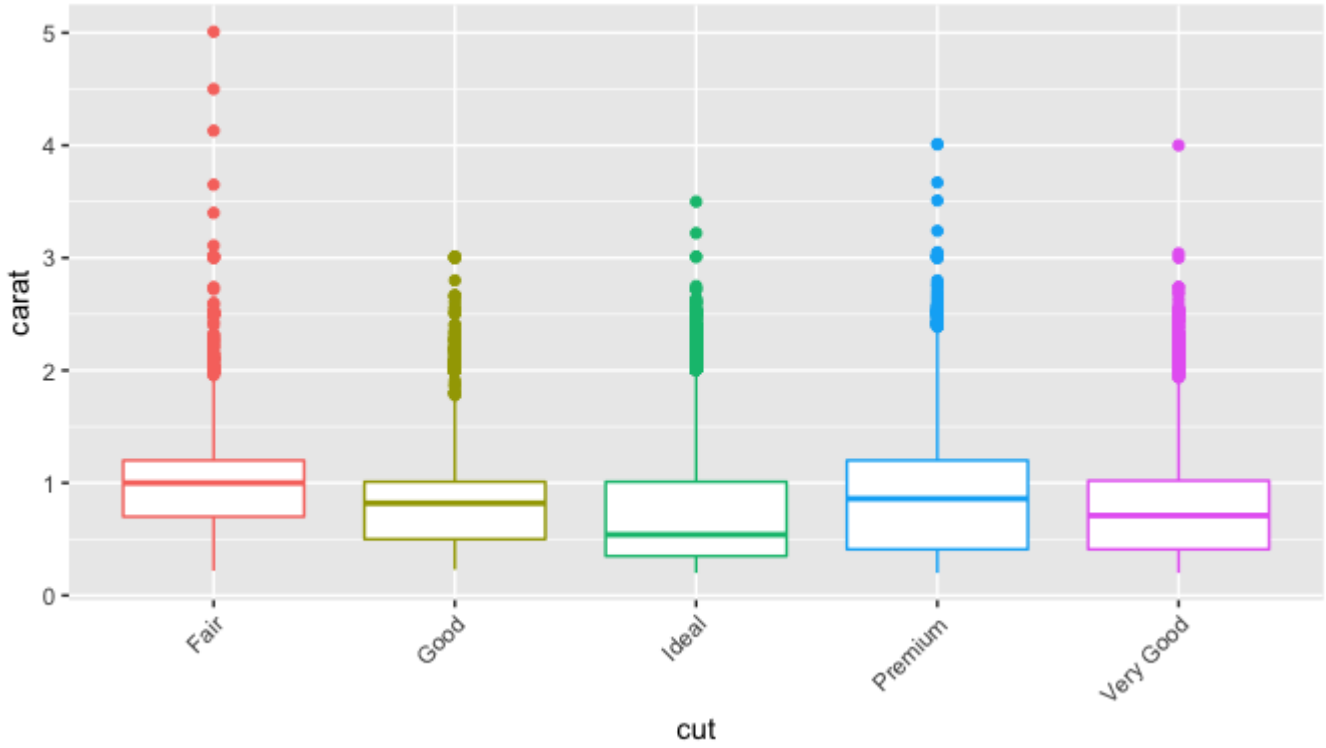

Is RStudio a good alternative as a Python IDE?

* It makes switching from R to Python certainly easier
* It supports syntax highlighting and autocomplete
* It is not intended as a Python IDE (yet?)
* Since it's slightly painful, it's probably a Python IDE for data science though ;)

Conclusion

* R ***vs*** Python is now R ***and*** Python
    - It's not about the tool, it's about the task at hand
* There are many initiatives to bring the tools closer together
    - Ursa labs => Apache Arrow
    - RStudio => Python integration
* The dogmatic war was boring before it started
* This is the time to start to embrace the strengths of the tools and to collaborate

Questions?

Sources

* https://towardsdatascience.com/from-r-vs-python-to-r-and-python-aa25db33ce17
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* http://ursalabs.org/tech/
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* https://arrow.apache.org/