Using Python in R with *reticulate* : : CHEAT SHEET

Getting Started

Reticulate makes it very easy to get started with Python in R. Simply use **py_require()** to let Reticulate know which Python version and packages you will need:

```
library(reticulate)
py_require("polars", python_version="3.12")
pl <- import("polars")
```

An isolated Python virtual environment that you will not need to manage is created, this eliminates the risk of the environment becoming unstable overtime.

Reticulate uses an extremely fast Python package manager called **uv**. Some features of this system are::

- 10x–100x faster than **pip** at setting up virtual environments
- Downloads, installs and manages Python versions
- Supports macOS, Linux and **Windows**

Reticulate will automatically download and install **uv** for you in a location that does not make system changes to your machine.

Manage environments

Manage Virtualenv and Conda environments. Use if **py_require()** is not an option, or if using an existing Python virtual environment.

Create new	virtualenv_create() / conda_create() *virtualenv_create("my-env")*
Use in R session	use_virtualenv() / use_condaenv() / use_python() *use_virtualenv("my-env")*
List available	virtualenv_list() / conda_list()
Install packages	py_install() / virtualenv_install() / conda_install() *py_install("polars", "my-env")*
Delete from disk	virtualenv_remove() / conda_remove() *virtualenv_remove("my-env")*

Calling Python

IMPORT PYTHON MODULES

Import any Python module into R, and access the attributes of a module with **$**.

import(module, as = NULL, convert = TRUE, delay_load = FALSE**)** - Import a Python module. If convert = TRUE, Python objects are converted to their equivalent R types. Access the attributes of a module with $.

import_from_path(module, path = "." **)** - Import module from an arbitrary filesystem path.

import_main(convert = TRUE**)** - Import the main module, where Python executes code by default.

import_builtins(convert = TRUE**)** - Import Python's built-in functions.

SOURCE PYTHON FILES

Source a Python script and make the Python functions and objects it creates available in R

source_python(file, envir = parent.frame(), convert = TRUE**)** - Run a Python script, assigning objects to a specified R environment.
source_python("file.py")

RUN PYTHON CODE

Execute Python code into the **main** Python module. Access the results, and anything else in Python's **main** module, with **py$**.

py_run_file(file, local = FALSE, convert = TRUE**)** - Run Python file in the main module.
py_run_file("my-script.py")

py_eval(code, convert = TRUE**)** - Run a Python expression, return the result.
py_eval("1 + 1")

py_run_string(code, local = FALSE, convert = TRUE**)** - Run Python code (passed as a string) in the main module.
py_run_string("x = 10"); py$x

IN A NOTEBOOK

Call Python as a code chunk in **Quarto** and **R Markdown**

Begin Python chunks with ```` ```{python} ```` *(Chunk options like echo, include, etc. all work as expected)*

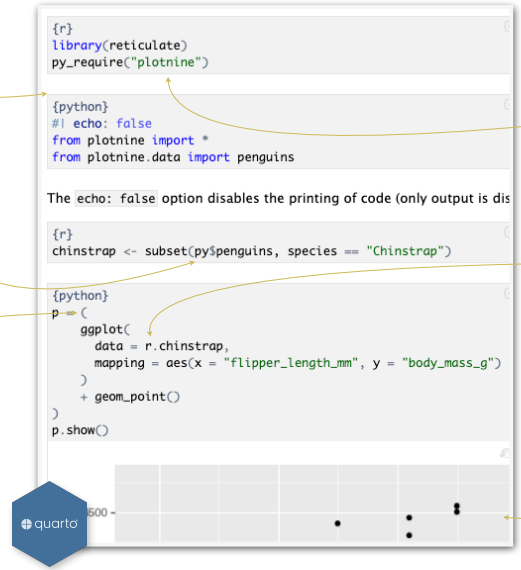
With **py_require()**, define which Python libraries will be used in the notebook

Use the **py** object to access objects created in Python chunks from R chunks.

Use the **r** object to access objects created in R chunks from Python chunks

Python chunks all execute within a **single** Python session so you have access to all objects created, and modules loaded, in previous chunks.

Output displays below chunk, including plots.

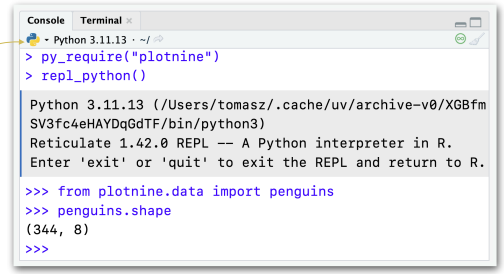


AS A PYTHON CONSOLE (REPL)

A **REPL** (Read, Eval, Print Loop) is a command line where you can run Python code and view the results.

repl_python(module = NULL, quiet = getOption("reticulate.repl.quiet", default = FALSE), input = NULL**)**

1. Use **py_require()** to define libraries and Python version to use
2. Open in the console with **repl_python()**, or by running code in a Python script with **Cmd + Enter** (Windows: **Ctrl + Enter**). Click on the language logo to toggle between R and Python.
3. Type commands at the **>>>** prompt.
4. Press **Enter** to run code.
5. Type **exit** to close and return to R console.



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Object Conversion

AUTOMATIC CONVERSIONS

Reticulate provides **automatic** built-in conversion between Python and R for many Python types.

py_to_r(x**)** Convert a Python object to an R object. Also **r_to_py()**.

R	Python
Single-element vector	Scalar
Multi-element vector	List
List of multiple types	Tuple
Named list	Dict
Matrix/Array	NumPy ndarray
Data Frame	Pandas DataFrame
Function	Python function
NULL, TRUE, FALSE	None, True, False

MANUAL CONVERSIONS

Specify how the objects will be converted

tuple(..., convert = FALSE**)** - Create a Python tuple.
tuple("a", "b", "c")

dict(..., convert = FALSE**)** - Create a Python dictionary.
dict(foo = "bar", index = 42L)

py_dict() - A dictionary that uses Python objects as keys.
py_dict("foo", "bar")

np_array(data, dtype = NULL, order = "C"**)** - Create NumPy arrays.
np_array(c(1:8), dtype = "float16")

array_reshape(x, dim, order = c("C", "F")**)** - Reshape a Python array.
x <- 1:4; array_reshape(x, c(2, 2))

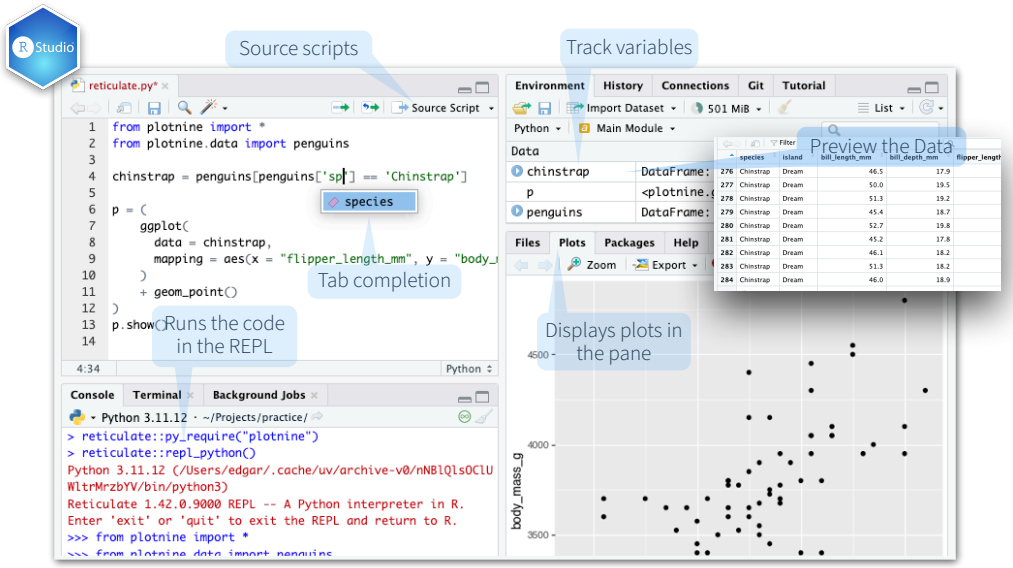
py_func(f**)** - Wrap an R function in a Python function with the same signature.
py_func(xor)

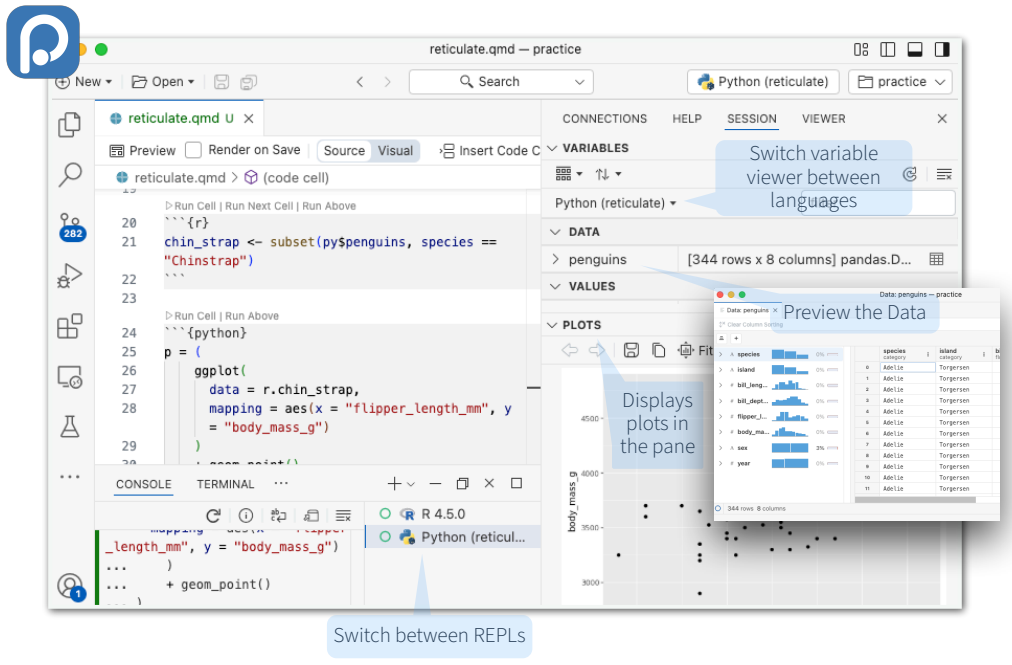
iterate(it, f = base::identity, simplify = TRUE**)** - Apply an R function to each value of a Python iterator or return the values as an R vector, draining the iterator as you go. Also **iter_next()** and **as_iterator()**.

py_iterator(fn, completed = NULL**)** - Create a Python iterator from an R function.
seq_gen <- function(x){*n <- x; function() {n <<- n + 1; n}}; py_iterator(seq_gen(9))*

Python in the IDE

The RStudio and Positron IDE's provide first-class integration with Reticulate.





Helpers

py_capture_output(expr, type = c("stdout", "stderr")**)** Capture and return Python output. Also **py_suppress_warnings()**.

py_get_attr(x, name, silent = FALSE**)** Get an attribute of a Python object. Also **py_set_attr()**, **py_has_attr()**, and **py_list_attributes()**.

py_help(object**)** Open the documentation page for a Python object.
py_help(sns)

py_last_error() Get the last Python error encountered. Also **py_clear_last_error()** to clear the last error.

py_save_object(object, filename, pickle = "pickle", ...**)** Save and load Python objects with pickle. Also **py_load_object()**.
py_save_object(x, "x.pickle")

with(data, expr, as = NULL, ...**)** Evaluate an expression within a Python context manager.
py <- import_builtins();
with(py$open("output.txt", "w") %as% file,
{ file$write("Hello, there!")})

Choosing Python

Reticulate follows a specific order to discover and choose the Python environment to use

1. **RETICULATE_PYTHON** or **RETICULATE_PYTHON_ENV**
2. **use_python()** or **use_virtualenv()**, if called before **import()**.
3. Working directory contains a virtual env: **./.venv**
4. Environments named after the imported module. e.g. **~/.virtualenvs/r-scipy/** for **import("scipy")**
5. **RETICULATE_PYTHON_FALLBACK**
6. The default virtualenv: **r-reticulate**
7. Specifications from **py_require() ***
8. OS' default Python (PATH or Windows registry)

* To have **py_require()** take more precedence, set **RETICULATE_PYTHON="managed".** It will become number 1 on the list.

This is a partial list of the order of discover, to see the full list visit: *rstudio.github.io/reticulate/articles/versions.html#order-of-discovery*