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Sphinx

Sphinx is a python library to create beautiful documentation pages for Python software projects. It was written for the Python doc itself and became number one tool for many other packages. Some examples of the Sphinx's output are:

- the Python documentation (https://docs.python.org/),
- scikit-learn (https://scikit-learn.org/stable/index.html),
- numpy (https://numpy.org/).

Please find here an extensive list of projects using Sphinx: https://www.sphinx-doc.org/en/master/examples.html (https://www.sphinx-doc.org/en/master/examples.html).

Why care about documentation?

There are good reasons to work continuously on documentation. New developers need to know about the "mechanics" of the software, users want to know how to apply the software and also want to know some background information,...

The list of reasons for documentation is actually very long and you see that different people are addressed.

This is the reason why it is recommended to split the documentation into four parts:

1. Tutorials (learning-oriented),
2. How-to guides (goal-oriented),
3. Explanation (understanding-oriented),
4. Reference (information-oriented),

please read this great blog post: "What nobody tells you about documentation" (https://www.divio.com/blog/documentation/).

Sphinx getting started

Sphinx is available as conda and pip package and there is a quickstart command which sets up the required folder structure, options and files.

Sphinx docu is written with reStructuredText (https://docutils.sourceforge.io/rst.html) markup language in `.rst` files. The syntax is explained in the previous link and easy to learn.

Let us start with a small Sphinx documentation.

Exercise: `sphinx-quickstart` (10 minutes)

- Install Sphinx.
- Create a folder `doc` and change your terminal path to it.
- Run `sphinx-quickstart` from a terminal and answer the questions.
- The files `make.bat`, `Makefile`, `conf.py`, `index.rst` and folders `build`, `static` and `templates` should show up.
- Now build this documentation with `make html`.
- To see the result open the file `build/html/index.html` in your browser.
- Take a look at the `conf.py` file, which contains the configuration and the `index.rst` file which contains the text of the main docu page.

Short intro to reStructuredText

Here some short comments on reStructuredText syntax.

Headers

Can be generated with

```
Chapter 1 Title
===============

Section 1.1 Title
-----------------

Subsection 1.1.1 Title
~~~~~~~~~~~~~~~~~~~~~~
```

Lists

Bullets use stars.

```
* bullet one
* bullet two
  - sub bullet
    + subsub bullet
```

And enumerated lists use numbers or letters.

```
A. bullet one
B. bullet two
  1. sub bullet
    a. subsub bullet
```

Text styles

`*italics*`, `**bold**`, and back ticks are used for `fixed spaced text`

Images

```
.. image:: some_image.png
```

Hyperlinks

```
google.com <http://google.com>_
```

Try reStructuredText online

There is a website where you can paste and try reStructured text interactively http://rst.ninjs.org/ (http://rst.ninjs.org/).

Please find more details in the reStruckturedText docu (https://docutils.sourceforge.io/rst.html), cheat sheet (https://docutils.sourceforge.io/docs/user/rst/cheatsheet.txt), and Sphinx page about reStructuredText (https://www.sphinx-doc.org/en/master/usage/restructuredtext/index.html).

Sphinx extension autodoc

Sphinx autodoc (https://www.sphinx-doc.org/en/master/usage/quickstart.html#autodoc) is an extension to generate documentation out of doc strings in Python code. Hence, you can document your code directly in the doc string with this extension.

You can configure this extension with

`extensions = ['sphinx.ext.autodoc']` in the `conf.py` file.

An autodoc example

Assume this file and folder structure of a project,

```
|___ doc
|___ conv.py
|___ index.rst
|___ make.bat
|___ Makefile
    |___src
        |___ __init__.py
        |___ matrix_comp.py
```

where the `matrix_comp.py` file contains

```
"""
.. module:: matrix_comp

The :py:mod:`matrix_comp` module provides ...
"""

def matrix_multiply(a, b):
    """ The :py:func:`matrix_algebra.matrix_multiply` function computes
    the product of two matrices.

    Args:
        a (numpy.ndarray): first matrix
        b (numpy.ndarray): second matrix

    Returns:
        (numpy.ndarray): product of a and b

    """
    return a @ b
```

The autodoc extension needs these settings in `conf.py`.

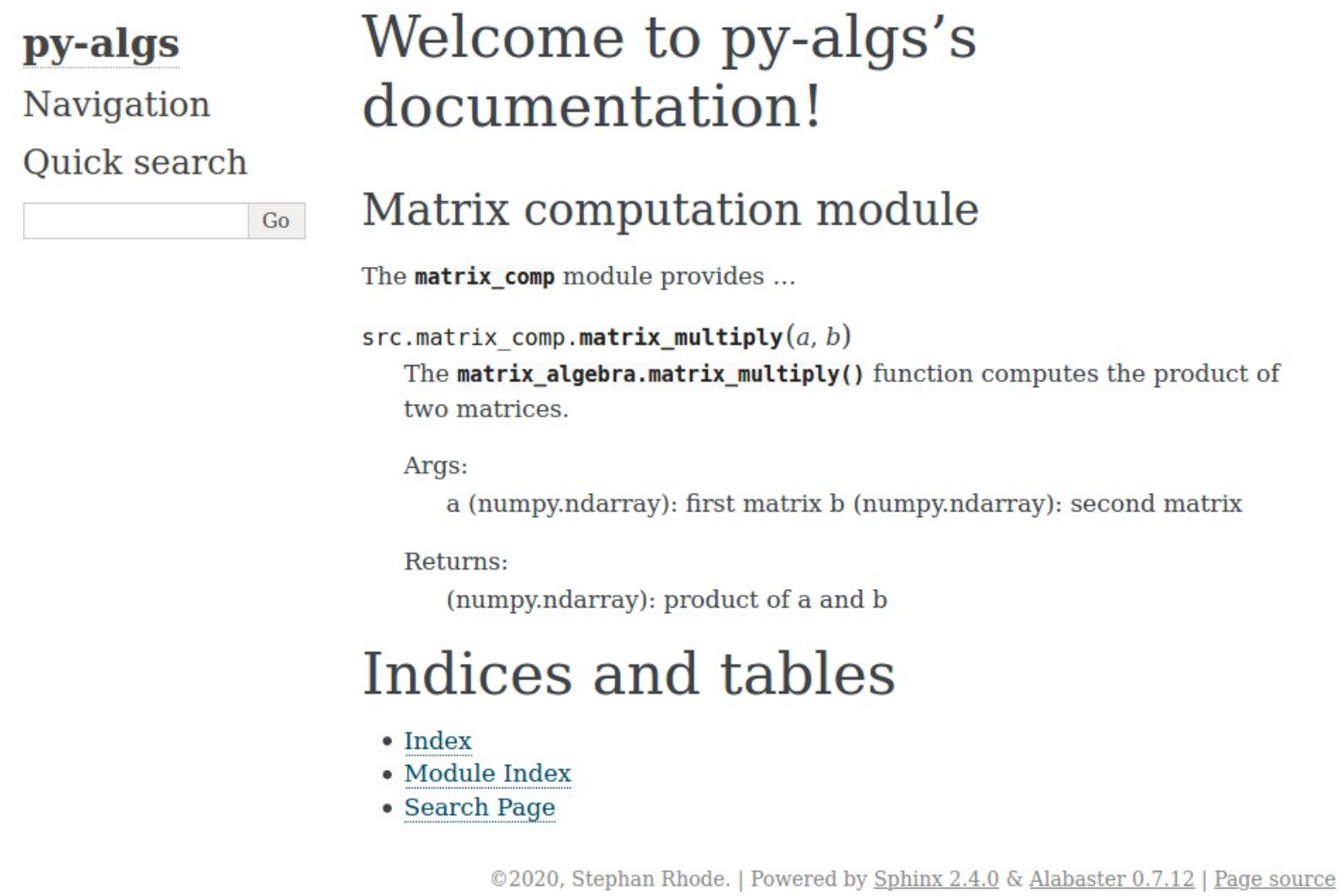
```
import os
import sys
sys.path.insert(0, os.path.abspath('.'))

extensions = ['sphinx.ext.autodoc']
```

To include the module in your documentation, call `automodule` in `index.rst` file like this.

```
Matrix computation module
-------------------------
.. automodule:: src.matrix_comp
    :members:
```

If you run `make html`, documentation start page will result in.



Sphinx-Gallery extension

Sphinx-Gallery (https://sphinx-gallery.github.io/stable/index.html) renders Python files as notebooks and is ideal if you want to write tutorials for your software.

Sphinx gallery must be installed as conda or pip package and must be called in `conf.py` with

```
extensions = [...
    'sphinx_gallery.gen_gallery',
    ]
```

Many popular packages like scikit-learn use Sphinx gallery to present tutorials, see also who uses Sphinx-Gallery (https://sphinx-gallery.github.io/stable/projects_list.html).

In the next cell some gallery examples from Sphinx-Gallery page are linked.

In [2]:
```
IFrame(src='https://sphinx-gallery.github.io/stable/auto_examples/index.html',
       width=1000, height=600)
```

Out[2]:

Gallery of Examples

This page consists of the 'General example' gallery and a sub-gallery, 'No image output examples'. This sub-gallery is generated from a sub-directory within the general examples directory. The file structure of this gallery looks like this:

```
examples/           # base 'Gallery of Examples' directory
├── README.txt
├── <.py files>
└── no_output/      # generates the 'No image output examples' sub-gallery
    ├── README.txt
    └── <.py files>
```

General examples

This gallery consists of introductory examples and examples demonstrating specific features of Sphinx-Gallery.

References

- There are many more extensions for Sphinx available. This was just a short introduction.
- There is one German book called Software-Dokumentation mit Sphinx (http://www.worldcat.org/oclc/889425279), but best is to look at github projects which have good documentation.
- It is very common to store the Sphinx files in a `doc` folder on root level. You can learn from open source best how to create more advanced documents with Sphinx.