18 – API-documentation

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Scientific Programming in Python (2025)

https://atticlectures.net/scipro/python-2025/

Prerequisites

- Sphinx (documentation system)
- Sphinx-book-theme (documentation style template)
- make (build tool)

```
conda install sphinx sphinx-book-theme make
```

API documentation

Application Programming Interface (API)

- All **public routines** of your project
- Called by other projects by importing modules from your project (reusability!)

API-documentation

- Description of the **purpose** and **input/output** arguments of the API
- In Python the module/function **doc-strings** should be used to contain the API-documentation

Extracting API-documentation

- Documentation is **extracted from** the **source** code
- Generated documentation independent from source code (e.g. HTML-pages)
- Modules can be (re)used without knowing the internal code details

Extracting API documentation

Sphinx documentation system

- Suitable for simple code related documents (e.g. user manual, reference manual, etc.)
- Can be used to extract API-documentation from doc-strings
- De-facto standard tool in the Python-world (all documentation on python.org is written using Sphinx)
- It uses the **reStructured Text** (RST) format

ReStructured Text in a nutshell (1)

- HTML/TeX-like formatting language using mostly picturesque notation

```
**********
Some chapter
**********
```

```
First section
=============
```

```
First subsection
----------------
```

Decorator must be as long as title

```
This is *emphasized (italic)* and **bold**.

Here we use a TeX equation: :math:`E = mc^2`
```

```
Bulleted list:

* First bullet item

* Second bullet item
```

```
Enumerated list:

1. First enumerated item

2. Second enumerated item
```

ReStructured Text in a nutshell (2)

- Similar to Python, indentation is part of the ReST-language semantics

```
.. toctree::
   :maxdepth: 2

   api
```

Watch out for correct indentation!

```
We include a code example::

    print("Hello, World!")

Snippet above will be rendered as code
```

Special environment for specifying table of content (toc)

Includes **api.rst** into the document and lists its sections in the toc

- Read the documentation for all available feature of ReST (very powerful)

See also

- Quick reStructuredText
- The reStructuredText Cheat Sheet
- A ReStructuredText Primer

Extracting API documentation

- Create a subfolder **docs/** in the project directory
- Set up a sphinx documentation project in it

```
mkdir docs
cd docs
sphinx-quickstart
```

Take default value wherever possible

- Edit generated **conf.py** file

```
from pathlib import Path
import sys
sys.path.insert(0, str(Path.cwd().parent))
```

List of folders to look up for Python modules

Ensures that sphinx finds Python module files in parent folder when extracting API-documentation

```
extensions = [
    'sphinx.ext.autodoc',
    'sphinx.ext.napoleon',
    'sphinx.ext.mathjax',
]
```

Automated API-extraction

Doc-strings in Google/Numpy-format

Render TeX in HTML with MathJax

Activate some extensions

```
html_theme = 'sphinx_book_theme'
```

Use the more modern sphinx-book-theme

Extracting API documentation

- Edit generated file **index.rst** and create new file **api.rst** in the docs folder:

index.rst

```
#########
Linsolver
#########

.. toctree::
   :maxdepth: 2

   api
```

api.rst

```
**************
Linsolver API
**************

.. automodule:: solvers
   :members:
```

Generates automatic documentation for all members of the solvers module

- Extract documentation and convert to HTML-format

Linux

```
make html
```

Windows

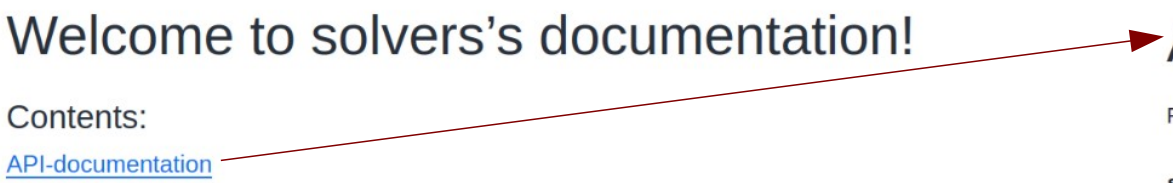
```
./make.bat html
```

```
Build finished. The HTML pages are in _build/html.
```

Visualizing API documentation

- Open the _build/index.html file in a web-browser

```
firefox _build/html/index.html      Linux
```



API-documentation

Routines for solving a linear system of equations.

solvers.backward_substitute(*lu: ndarray[Any, dtype[float64]], bb: ndarray[Any, dtype[float64]]*) → ndarray[Any, dtype[float64]]

Solves $Ux = b$ for an upper triangle matrix via backward substitution.

Parameters:

- **lu** – LU-decomposed matrix (as returned by lu_decompose()) containig upper triangle matrix U.
- **bb** – Right hand side of the equation.

Returns:

The solution vector x.

solvers.forward_substitute(*lu: ndarray[Any, dtype[float64]], bb: ndarray[Any, dtype[float64]]*) → ndarray[Any, dtype[float64]]

Solves $Ly = b$ for a lower triangle matrix via forward substitution.

Parameters:

- **lu** – LU-decomposed matrix (as returned by lu_decompose()) containig lower triangle matrix L.
- **bb** – Right hand side of the equation.

Returns:

The solution vector y.

Some Sphinx-notes

- Sphinx is optimal for **small and middle size** documents, where type setting is not too complicated
- Sphinx has several output format beside html (LaTeX, PDF, etc.)

- Put the Sphinx source and configuration files of your project under **version control**, but not the **_build** folder

```
cd docs
git add api.rst conf.py index.rst make.bat Makefile _static/
_templates/
```

- Add the Sphinx build folder to the projects **.gitignore** file

.gitignore

```
__pycache__
docs/_build
```