nbsphinx

Release 0.7.0

Matthias Geier

2020-05-08

Contents

1 Installation **4**
- 1.1 nbsphinx Packages . . . 4
- 1.2 nbsphinx Prerequisites . . . 6
  - 1.2.1 Python . . . 6
  - 1.2.2 Sphinx . . . 6
  - 1.2.3 pip . . . 7
  - 1.2.4 pandoc . . . 7
  - 1.2.5 Pygments Lexer for Syntax Highlighting . . . 7
  - 1.2.6 Jupyter Kernel . . . 8

2 Usage **8**
- 2.1 Sphinx Setup . . . 8
  - 2.1.1 Sphinx Configuration Values . . . 9
    - 2.1.1.1 `exclude_patterns` . . . 9
    - 2.1.1.2 `extensions` . . . 9
    - 2.1.1.3 `highlight_language` . . . 9
    - 2.1.1.4 `html_css_files` . . . 10
    - 2.1.1.5 `html_scaled_image_link` . . . 10
    - 2.1.1.6 `html_sourcelink_suffix` . . . 10
    - 2.1.1.7 `latex_additional_files` . . . 10
    - 2.1.1.8 `mathjax_config` . . . 10
    - 2.1.1.9 `suppress_warnings` . . . 10
  - 2.1.2 `nbsphinx` Configuration Values . . . 11
    - 2.1.2.1 `nbsphinx_allow_errors` . . . 11
    - 2.1.2.2 `nbsphinx_codecell_lexer` . . . 11
    - 2.1.2.3 `nbsphinx_custom_formats` . . . 11
    - 2.1.2.4 `nbsphinx_epilog` . . . 11
    - 2.1.2.5 `nbsphinx_execute` . . . 11
    - 2.1.2.6 `nbsphinx_execute_arguments` . . . 11
    - 2.1.2.7 `nbsphinx_input_prompt` . . . 12
    - 2.1.2.8 `nbsphinx_kernel_name` . . . 12
    - 2.1.2.9 `nbsphinx_output_prompt` . . . 12
    - 2.1.2.10 `nbsphinx_prolog` . . . 12
    - 2.1.2.11 `nbsphinx_prompt_width` . . . 12
    - 2.1.2.12 `nbsphinx_requirejs_options` . . . 12
    - 2.1.2.13 `nbsphinx_requirejs_path` . . . 12
    - 2.1.2.14 `nbsphinx_responsive_width` . . . 13
    - 2.1.2.15 `nbsphinx_thumbnails` . . . 13

2.1.2.16 nbsphinx_timeout . . . 13
2.1.2.17 nbsphinx_widgets_options . . . 13
2.1.2.18 nbsphinx_widgets_path . . . 13
2.2 Running Sphinx . . . 13
2.3 Watching for Changes with sphinx-autobuild . . . 14
2.4 Automatic Creation of HTML and PDF output on readthedocs.org . . . 15
2.4.1 Using requirements.txt . . . 15
2.4.2 Using conda . . . 15
2.5 HTML Themes . . . 16
2.5.1 Sphinx's Built-In Themes . . . 16
2.5.2 3rd-Party Themes . . . 17
2.6 Using Notebooks with Git . . . 19

3 Markdown Cells **19**
3.1 Equations . . . 20
3.1.1 Automatic Equation Numbering . . . 20
3.1.2 Manual Equation Numbering . . . 21
3.2 Citations . . . 21
3.3 Code . . . 22
3.4 Tables . . . 22
3.5 Images . . . 22
3.5.1 Using the HTML <img> tag . . . 23
3.5.2 SVG support for LaTeX . . . 23
3.6 Cell Attachments . . . 24
3.7 HTML Elements (HTML only) . . . 24
3.8 Info/Warning Boxes . . . 25
3.9 Links to Other Notebooks . . . 26
3.10 Links to *.rst Files (and Other Sphinx Source Files) . . . 26
3.11 Links to Local Files . . . 27
3.12 Links to Domain Objects . . . 27

4 Code Cells **27**
4.1 Code, Output, Streams . . . 27
4.2 Cell Magics . . . 28
4.3 Special Display Formats . . . 28
4.3.1 Local Image Files . . . 29
4.3.2 Image URLs . . . 29
4.3.3 Math . . . 30
4.3.4 Plots . . . 31
4.3.5 Pandas Dataframes . . . 33
4.3.6 YouTube Videos . . . 34
4.3.7 Interactive Widgets (HTML only) . . . 35
4.3.8 Arbitrary JavaScript Output (HTML only) . . . 36
4.3.9 Unsupported Output Types . . . 36
4.4 ANSI Colors . . . 36

5 Raw Cells **38**
5.1 Usage . . . 38
5.2 Available Raw Cell Formats . . . 38
5.2.1 None . . . 39
5.2.2 reST . . . 39
5.2.3 Markdown . . . 39
5.2.4 HTML . . . 39
5.2.5 LaTeX . . . 39
5.2.6 Python . . . 39

6 Hidden Cells **39**

7 Controlling Notebook Execution **40**
7.1 Pre-Executing Notebooks . . . 40
7.1.1 Long-Running Cells . . . 40
7.1.2 Rare Libraries . . . 40
7.1.3 Exceptions . . . 41
7.1.4 Client-specific Outputs . . . 41
7.2 Explicitly Dis-/Enabling Notebook Execution . . . 41
7.3 Ignoring Errors . . . 42
7.4 Ignoring Errors on a Per-Cell Basis . . . 43
7.5 Configuring the Kernels . . . 43
7.5.1 Kernel Name . . . 43
7.5.2 Kernel Arguments . . . 44
7.5.3 Environment Variables . . . 44
7.6 Cell Execution Timeout . . . 45

8 Prolog and Epilog **45**
8.1 Examples . . . 46

9 Custom Notebook Formats **47**
9.1 Example: Jupytext . . . 47

10 Notebooks in Sub-Directories **48**
10.1 A Sub-Section . . . 49

11 Creating Thumbnail Galleries **49**
11.1 Using a Cell Tag to Select a Thumbnail . . . 50
11.2 Using Cell Metadata to Select a Thumbnail . . . 51
11.3 Choosing from Multiple Outputs . . . 52
11.4 A Notebook without Thumbnail . . . 53
11.5 Specifying Thumbnails in `conf.py` . . . 53

12 Using `toctree` In A Notebook **54**
12.1 Yet Another Notebook . . . 55

13 Custom CSS **55**
13.1 For All Pages . . . 55
13.2 For All RST files . . . 55
13.3 For All Notebooks . . . 56
13.4 For a Single Notebook . . . 56

14 Normal reStructuredText Files **56**
14.1 Links to Notebooks (and Other Sphinx Source Files) . . . 57
14.2 Links to Notebooks, Ye Olde Way . . . 57
14.3 Sphinx Directives for Info/Warning Boxes . . . 58
14.4 Domain Objects . . . 59
14.5 Citations . . . 59
14.6 References . . . 59
14.7 Thumbnail Galleries . . . 59
14.7.1 Dummy Notebook 1 for Gallery . . . 60
14.7.2 Dummy Notebook 2 for Gallery . . . 60

15 External Links **61**

16 Contributing **63**
16.1 Development Installation . . . 63

16.2 Building the Documentation 64
16.3 Testing 64

17 Version History **64**

References **67**

`nbsphinx` is a Sphinx[1] extension that provides a source parser for `*.ipynb` files. Custom Sphinx directives are used to show Jupyter Notebook[2] code cells (and of course their results) in both HTML and LaTeX output. Un-evaluated notebooks – i.e. notebooks without stored output cells – will be automatically executed during the Sphinx build process.

Quick Start:

1. Install `nbsphinx`
2. Edit your `conf.py` and add `'nbsphinx'` to `extensions`.
3. Edit your `index.rst` and add the names of your `*.ipynb` files to the `toctree`.
4. Run Sphinx!

Online documentation (and example of use): http://nbsphinx.readthedocs.io/

Source code repository (and issue tracker): https://github.com/spatialaudio/nbsphinx/

License: MIT – see the file `LICENSE` for details.

All content shown below – except for the sections *Normal reStructuredText Files* (page 56), *Contributing* (page 63) and *Version History* (page 64) – was generated from Jupyter notebooks.

The following section was generated from `doc/installation.ipynb`

1 Installation

Note that some packages may be out of date. You can always get the newest `nbsphinx` release from PyPI[3] (using `pip`). If you want to try the latest development version, have a look at the section *Contributing* (page 63).

1.1 nbsphinx Packages

[4]

If you are using the `conda` package manager (e.g. with Anaconda[5] for Linux/macOS/Windows), you can install `nbsphinx` from the conda-forge[6] channel:

```
conda install -c conda-forge nbsphinx
```

If you are using Linux, there are packages available for many distributions.

[1] https://www.sphinx-doc.org/
[2] https://jupyter.org/
[3] https://pypi.org/project/nbsphinx
[4] https://anaconda.org/conda-forge/nbsphinx
[5] https://www.anaconda.com/distribution/
[6] https://conda-forge.org/

Packaging status	
ALT Linux p9	0.2.15
ALT Sisyphus	0.2.15
AUR	0.6.1
Debian Oldstable	0.2.9
Debian Stable	0.4.2
Debian Testing	0.4.3
Debian Unstable	0.4.3
Deepin	0.3.1
Devuan 2.0 (ASCII)	0.2.9
Devuan 3.0 (Beowulf)	0.4.2
Devuan 4.0 (Chimaera)	0.4.3
Devuan Unstable	0.4.3
Fedora 26	0.2.13
Fedora 27	0.2.13
Fedora 28	0.2.17
Fedora 29	0.2.17
Fedora 30	0.4.2
Fedora 31	0.4.2
Fedora 32	0.4.2
Fedora Rawhide	0.4.2
Funtoo 1.4	0.4.1
Gentoo	0.4.1
Kali Linux Rolling	0.4.3
nixpkgs stable	0.5.0
nixpkgs unstable	0.5.1
openSUSE Leap 15.0	0.3.3
openSUSE Leap 15.1	0.3.3
openSUSE Leap 15.2	0.5.1
openSUSE Tumbleweed	0.5.1
Pardus	0.2.9
Parrot	0.4.3
PureOS Amber	0.4.2
PureOS landing	0.4.3
Raspbian Oldstable	0.2.9
Raspbian Stable	0.4.2
Raspbian Testing	0.4.3
Ubuntu 18.04	0.3.1
Ubuntu 19.10	0.4.2
Ubuntu 20.04	0.4.3
Ubuntu 20.10	0.4.3

[7] https://repology.org/project/python:nbsphinx/versions

[8]

On any platform, you can also install `nbsphinx` with `pip`, Python's own package manager:

```
python3 -m pip install nbsphinx --user
```

If you want to install it system-wide for all users (assuming you have the necessary rights), just drop the `--user` flag.

To upgrade an existing `nbsphinx` installation to the newest release, use the `--upgrade` flag:

```
python3 -m pip install nbsphinx --upgrade --user
```

If you suddenly change your mind, you can un-install it with:

```
python3 -m pip uninstall nbsphinx
```

Depending on your Python installation, you may have to use `python` instead of `python3`.

1.2 nbsphinx Prerequisites

Some of the aforementioned packages will install some of these prerequisites automatically, some of the things may be already installed on your computer anyway.

1.2.1 Python

Of course you'll need Python, because both Sphinx and `nbsphinx` are implemented in Python. There are many ways to get Python. If you don't know which one is best for you, you can try Anaconda[9].

1.2.2 Sphinx

You'll need Sphinx[10] as well, because `nbsphinx` is just a Sphinx extension and doesn't do anything on its own.

If you use `conda`, you can get Sphinx from the conda-forge channel[11]:

```
conda install -c conda-forge sphinx
```

Alternatively, you can install it with `pip` (see below):

```
python3 -m pip install Sphinx --user
```

[8] https://pypi.org/project/nbsphinx
[9] https://www.anaconda.com/distribution/
[10] https://www.sphinx-doc.org/
[11] https://anaconda.org/conda-forge/sphinx

1.2.3 pip

Recent versions of Python already come with `pip` pre-installed. If you don't have it, you can install it manually[12].

1.2.4 pandoc

The stand-alone program pandoc[13] is used to convert Markdown content to something Sphinx can understand. You have to install this program separately, ideally with your package manager. If you are using `conda`, you can install pandoc from the conda-forge channel[14]:

```
conda install -c conda-forge pandoc
```

If that doesn't work out for you, have a look at `pandoc`'s installation instructions[15].

Note

The use of `pandoc` in `nbsphinx` is temporary, but will likely stay that way for a long time, see issue #36[16].

1.2.5 Pygments Lexer for Syntax Highlighting

To get proper syntax highlighting in code cells, you'll need an appropriate *Pygments lexer*. This of course depends on the programming language of your Jupyter notebooks (more specifically, the `pygments_lexer` metadata of your notebooks).

For example, if you use Python in your notebooks, you'll have to have the `IPython` package installed, e.g. with

```
conda install -c conda-forge ipython
```

or

```
python3 -m pip install IPython --user
```

Note

If you are using Anaconda with the default channel and syntax highlighting in code cells doesn't seem to work, you can try to install IPython from the `conda-forge` channel or directly with `pip`, or as a work-around, add `'IPython.sphinxext.ipython_console_highlighting'` to `extensions` in your `conf.py`.

For details, see Anaconda issue #1430[17] and nbsphinx issue #24[18].

---

[12] https://pip.pypa.io/en/latest/installing/
[13] https://pandoc.org/
[14] https://anaconda.org/conda-forge/pandoc
[15] https://pandoc.org/installing.html
[16] https://github.com/spatialaudio/nbsphinx/issues/36
[17] https://github.com/ContinuumIO/anaconda-issues/issues/1430
[18] https://github.com/spatialaudio/nbsphinx/issues/24

1.2.6 Jupyter Kernel

If you want to execute your notebooks during the Sphinx build process (see *Controlling Notebook Execution* (page 40)), you need an appropriate Jupyter kernel[19] installed.

For example, if you use Python, you should install the `ipykernel` package, e.g. with

```
conda install -c conda-forge ipykernel
```

or

```
python3 -m pip install ipykernel --user
```

If you created your notebooks yourself with Jupyter, it's very likely that you have the right kernel installed already.

`doc/installation.ipynb` ends here.

The following section was generated from `doc/usage.ipynb`

2 Usage

2.1 Sphinx Setup

In the directory with your notebook files, run this command (assuming you have Sphinx[20] installed already):

```
python3 -m sphinx.cmd.quickstart
```

Answer the questions that appear on the screen. In case of doubt, just press the `<Return>` key repeatedly to take the default values.

After that, there will be a few brand-new files in the current directory. You'll have to make a few changes to the file named `conf.py`. You should at least check if this variable contains the right things:

```
extensions = [
    'nbsphinx',
    'sphinx.ext.mathjax',
]
```

For an example, see this project's conf.py file.

Once your `conf.py` is in place, edit the file named `index.rst` and add the file names of your notebooks (without the `.ipynb` extension) to the toctree[21] directive. For an example, see this project's `doc/index.rst` file.

Alternatively, you can delete the file `index.rst` and replace it with your own notebook called `index.ipynb` which will serve as main page. In this case you can create the main *toctree* (page 54) in `index.ipynb`.

[19] https://jupyter.readthedocs.io/en/latest/projects/kernels.html
[20] https://www.sphinx-doc.org/
[21] https://www.sphinx-doc.org/en/master/usage/restructuredtext/directives.html#directive-toctree

2.1.1 Sphinx Configuration Values

All configuration values are described in the Sphinx documentation[22], here we mention only the ones which may be relevant in combination with `nbsphinx`.

2.1.1.1 exclude_patterns

Sphinx builds all potential source files (reST files, Jupyter notebooks, ...) that are in the source directory (including any sub-directories), whether you want to use them or not. If you want certain source files not to be built, specify them in exclude_patterns[23]. For example, you might want to ignore source files in your build directory:

```
exclude_patterns = ['_build']
```

Note that the directory `.ipynb_checkpoints` is automatically added to `exclude_patterns` by `nbsphinx`.

2.1.1.2 extensions

This is the only required value. You have to add `'nbsphinx'` to the list of extensions[24], otherwise it won't work.

Other interesting extensions are:

- `'sphinx.ext.mathjax'` for *math formulas* (page 20)
- `'sphinxcontrib.bibtex'` for *bibliographic references* (page 59)
- `'sphinxcontrib.rsvgconverter'` for *SVG->PDF conversion in LaTeX output* (page 23)
- `'sphinx_copybutton'` for adding "copy to clipboard" buttons[25] to all text/code boxes
- `'sphinx_gallery.load_style'` to load CSS styles for *thumbnail galleries* (page 49)

2.1.1.3 highlight_language

Default language for syntax highlighting in reST and Markdown cells, when no language is specified explicitly.

By default, this is `'python3'`, while Jupyter doesn't have a default language. Set highlight_language[26] to `'none'` to get the same behavior as in Jupyter:

```
highlight_language = 'none'
```

See also *nbsphinx_codecell_lexer* (page 11).

[22] http://www.sphinx-doc.org/en/master/usage/configuration.html
[23] http://www.sphinx-doc.org/en/master/usage/configuration.html#confval-exclude_patterns
[24] http://www.sphinx-doc.org/en/master/usage/configuration.html#confval-extensions
[25] https://sphinx-copybutton.readthedocs.io/
[26] http://www.sphinx-doc.org/en/master/usage/configuration.html#confval-highlight_language

2.1.1.4 html_css_files

See *Custom CSS* (page 55) and html_css_files[27].

2.1.1.5 html_scaled_image_link

As a work-around – until https://github.com/sphinx-doc/sphinx/issues/4229 is solved – you should set html_scaled_image_link[28] to `False`:

```
html_scaled_image_link = False
```

2.1.1.6 html_sourcelink_suffix

By default, a `.txt` suffix is added to source files. This is only relevant if the chosen HTML theme supports source links and if html_show_sourcelink[29] is `True`.

Jupyter notebooks with the suffix `.ipynb.txt` are normally not very useful, so if you want to avoid the additional suffix, set html_sourcelink_suffix[30] to the empty string:

```
html_sourcelink_suffix = ''
```

2.1.1.7 latex_additional_files

latex_additional_files[31] can be useful if you are using BibTeX files, see *References* (page 59).

2.1.1.8 mathjax_config

The configuration value mathjax_config[32] can be useful to enable *Automatic Equation Numbering* (page 20).

2.1.1.9 suppress_warnings

Warnings can be really helpful to detect small mistakes, and you should consider invoking Sphinx with the -W[33] option, which turns warnings into errors. However, warnings can also be annoying, especially if you are fully aware of the "problem", but you simply don't care about it for some reason. In this case, you can use suppress_warnings[34] to silence specific types of warnings.

If you want to suppress all warnings from `nbsphinx`, use this:

```
suppress_warnings = [
    'nbsphinx',
]
```

You can also be more specific:

[27] https://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_css_files
[28] http://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_scaled_image_link
[29] http://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_show_sourcelink
[30] http://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_sourcelink_suffix
[31] http://www.sphinx-doc.org/en/master/usage/configuration.html#confval-latex_additional_files
[32] https://www.sphinx-doc.org/en/master/usage/extensions/math.html#confval-mathjax_config
[33] https://www.sphinx-doc.org/en/master/man/sphinx-build.html#cmdoption-sphinx-build-W
[34] https://www.sphinx-doc.org/en/master/usage/configuration.html#confval-suppress_warnings

```
suppress_warnings = [
    'nbsphinx.localfile',
    'nbsphinx.gallery',
    'nbsphinx.thumbnail',
    'nbsphinx.notebooktitle',
    'nbsphinx.ipywidgets',
]
```

2.1.2 nbsphinx Configuration Values

2.1.2.1 nbsphinx_allow_errors

If `True`, the build process is continued even if an exception occurs.

See *Ignoring Errors* (page 42).

2.1.2.2 nbsphinx_codecell_lexer

Default Pygments lexer for syntax highlighting in code cells. If available, this information is taken from the notebook metadata instead.

Please note that this is not the same as *highlight_language* (page 9), which is used for formatting code in Markdown cells!

2.1.2.3 nbsphinx_custom_formats

See *Custom Notebook Formats* (page 47).

2.1.2.4 nbsphinx_epilog

See *Prolog and Epilog* (page 45).

2.1.2.5 nbsphinx_execute

Whether to execute notebooks before conversion or not. Possible values: `'always'`, `'never'`, `'auto'` (default).

See *Explicitly Dis-/Enabling Notebook Execution* (page 41).

2.1.2.6 nbsphinx_execute_arguments

Kernel arguments used when executing notebooks.

If you *use Matplotlib for plots* (page 31), this setting is recommended:

```
nbsphinx_execute_arguments = [
    "--InlineBackend.figure_formats={'svg', 'pdf'}",
    "--InlineBackend.rc={'figure.dpi': 96}",
]
```

If you don't use LaTeX/PDF output, you can drop the `'pdf'` figure format.

See *Configuring the Kernels* (page 44).

2.1.2.7 nbsphinx_input_prompt

Input prompt for code cells. %s is replaced by the execution count.

To get a prompt similar to the Classic Notebook, use

```
nbsphinx_input_prompt = 'In [%s]:'
```

2.1.2.8 nbsphinx_kernel_name

Use a different kernel than stored in the notebook metadata, e.g.:

```
nbsphinx_kernel_name = 'python3'
```

See *Configuring the Kernels* (page 43).

2.1.2.9 nbsphinx_output_prompt

Output prompt for code cells. %s is replaced by the execution count.

To get a prompt similar to the Classic Notebook, use

```
nbsphinx_output_prompt = 'Out[%s]:'
```

2.1.2.10 nbsphinx_prolog

See *Prolog and Epilog* (page 45).

2.1.2.11 nbsphinx_prompt_width

Width of input/output prompts (HTML only).

If a prompt is wider than that, it protrudes into the left margin.

Any CSS length can be specified.

2.1.2.12 nbsphinx_requirejs_options

Options for loading RequireJS. See *nbsphinx_requirejs_path* (page 12).

2.1.2.13 nbsphinx_requirejs_path

URL or local path to override the default URL for RequireJS[35].

If you use a local file, it should be located in a directory listed in html_static_path[36].

Set to empty string to disable loading RequireJS.

[35] https://requirejs.org/

[36] http://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_static_path

2.1.2.14 nbsphinx_responsive_width

If the browser window is narrower than this, input/output prompts are on separate lines (HTML only).

Any CSS length can be specified.

2.1.2.15 nbsphinx_thumbnails

A dictionary mapping from a document name (i.e. source file without suffix but with subdirectories) – optionally containing wildcards – to a thumbnail path to be used in a *thumbnail gallery* (page 49).

See *Specifying Thumbnails* (page 53).

2.1.2.16 nbsphinx_timeout

Controls when a cell will time out. The timeout is given in seconds. Given `-1`, cells will never time out, which is also the default.

See *Cell Execution Timeout* (page 45).

2.1.2.17 nbsphinx_widgets_options

Options for loading Jupyter widgets resources. See *nbsphinx_widgets_path* (page 13).

2.1.2.18 nbsphinx_widgets_path

URL or local path to override the default URL for Jupyter widgets resources. See *Interactive Widgets (HTML only)* (page 35).

If you use a local file, it should be located in a directory listed in html_static_path[37].

For loading the widgets resources, RequireJS is needed, see *nbsphinx_requirejs_path* (page 12).

If `nbsphinx_widgets_path` is not specified, widgets resources are only loaded if at least one notebook actually uses widgets. If you are loading the relevant JavaScript code by some other means already, you can set this option to the empty string to avoid loading it a second time.

2.2 Running Sphinx

To create the HTML pages, use this command:

```
python3 -m sphinx <source-dir> <build-dir>
```

If you have many notebooks, you can do a parallel build by using the `-j` option:

```
python3 -m sphinx <source-dir> <build-dir> -j<number-of-processes>
```

For example, if your source files are in the current directory and you have 4 CPU cores, you can run this:

```
python3 -m sphinx . _build -j4
```

[37] http://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_static_path

Afterwards, you can find the main HTML file in `_build/index.html`.

Subsequent builds will be faster, because only those source files which have changed will be re-built. To force re-building all source files, use the `-E` option.

Note

By default, notebooks will be executed during the Sphinx build process only if they do not have any output cells stored. See *Controlling Notebook Execution* (page 40).

To create LaTeX output, use:

```
python3 -m sphinx <source-dir> <build-dir> -b latex
```

If you don't know how to create a PDF file from the LaTeX output, you should have a look at Latexmk[38] (see also this tutorial[39]).

Sphinx can automatically check if the links you are using are still valid. Just invoke it like this:

```
python3 -m sphinx <source-dir> <build-dir> -b linkcheck
```

2.3 Watching for Changes with `sphinx-autobuild`

If you think it's tedious to run the Sphinx build command again and again while you make changes to your notebooks, you'll be happy to hear that there is a way to avoid that: sphinx-autobuild[40]!

It can be installed with

```
python3 -m pip install sphinx-autobuild --user
```

You can start auto-building your files with

```
python3 -m sphinx_autobuild <source-dir> <build-dir>
```

This will start a local webserver which will serve the generated HTML pages at http://localhost:8000/. Whenever you save changes in one of your notebooks, the appropriate HTML page(s) will be re-built and when finished, your browser view will be refreshed automagically. Neat!

You can also abuse this to auto-build the LaTeX output:

```
python3 -m sphinx_autobuild <source-dir> <build-dir> -b latex
```

However, to auto-build the final PDF file as well, you'll need an additional tool. Again, you can use `latexmk` for this (see *above* (page 13)). Change to the build directory and run

```
latexmk -pdf -pvc
```

If your PDF viewer isn't opened because of LaTeX build errors, you can use the command line flag `-f` to *force* creating a PDF file.

[38] http://personal.psu.edu/jcc8//software/latexmk-jcc/
[39] https://mg.readthedocs.io/latexmk.html
[40] https://pypi.org/project/sphinx-autobuild

2.4 Automatic Creation of HTML and PDF output on readthedocs.org

There are two different methods, both of which are described below.

In both cases, you'll first have to create an account on https://readthedocs.org/ and connect your GitLab/Github/Bitbucket/... account. Instead of connecting, you can also manually add any publicly available Git/Subversion/Mercurial/Bazaar/... repository.

After doing the steps described below, you only have to "push" to your repository, and the HTML pages and the PDF file of your stuff are automagically created on readthedocs.org. Awesome!

You can even have different versions of your stuff, just use Git tags and branches and select in the readthedocs.org settings[41] which of those should be created.

Note

If you want to execute notebooks (see *Controlling Notebook Execution* (page 40)), you'll need to install the appropriate Jupyter kernel. In the examples below, the IPython kernel is installed from the packet `ipykernel`.

2.4.1 Using `requirements.txt`

1. Create a file named `.readthedocs.yml` in the main directory of your repository with the following contents:

```
version: 2
formats: all
python:
  version: 3
  install:
    - requirements: doc/requirements.txt
  system_packages: true
```

   For further options see https://docs.readthedocs.io/en/latest/config-file/.

2. Create a file named `doc/requirements.txt` (or whatever you chose in the previous step) containing the required `pip` packages:

```
ipykernel
nbsphinx
```

   You can also install directly from Github et al., using a specific branch/tag/commit, e.g.

```
git+https://github.com/spatialaudio/nbsphinx.git@master
```

2.4.2 Using `conda`

1. Create a file named `.readthedocs.yml` in the main directory of your repository with the following contents:

```
version: 2
formats: all
conda:
  file: doc/environment.yml
```

   For further options see https://docs.readthedocs.io/en/latest/config-file/.

[41] https://readthedocs.org/dashboard/

2. Create a file named `doc/environment.yml` (or whatever you chose in the previous step) describing a conda environment[42] like this:

```
channels:
  - conda-forge
dependencies:
  - python>=3
  - pandoc
  - ipykernel
  - pip
  - pip:
    - nbsphinx
```

It is up to you if you want to install `nbsphinx` with `conda` or with `pip` (but note that the `conda` package might be outdated). And you can of course add further `conda` and `pip` packages. You can also install packages directly from Github et al., using a specific branch/tag/commit, e.g.

```
- pip:
  - git+https://github.com/spatialaudio/nbsphinx.git@master
```

Note

The specification of the `conda-forge` channel is recommended because it tends to have more recent package versions than the default channel.

2.5 HTML Themes

The `nbsphinx` extension does *not* provide its own theme, you can use any of the available themes or create a custom one[43], if you feel like it.

The following (incomplete) list of themes contains up to three links for each theme:

1. The documentation (or the official sample page) of this theme (if available; see also the documentation of the built-in Sphinx themes[44])
2. How the `nbsphinx` documentation looks when using this theme
3. How to enable this theme using either `requirements.txt` or `readthedocs.yml` and theme-specific settings (in some cases)

2.5.1 Sphinx's Built-In Themes

- `agogo`: example[45], usage[46]
- alabaster[47]: example[48], usage[49]
- `bizstyle`: example[50], usage[51]

[42] https://docs.conda.io/projects/conda/en/latest/user-guide/tasks/manage-environments.html
[43] https://www.sphinx-doc.org/en/master/theming.html#creating-themes
[44] https://www.sphinx-doc.org/en/master/usage/theming.html#builtin-themes
[45] https://nbsphinx.readthedocs.io/en/agogo-theme/
[46] https://github.com/spatialaudio/nbsphinx/compare/agogo-theme%5E...agogo-theme
[47] https://alabaster.readthedocs.io/
[48] https://nbsphinx.readthedocs.io/en/alabaster-theme/
[49] https://github.com/spatialaudio/nbsphinx/compare/alabaster-theme%5E...alabaster-theme
[50] https://nbsphinx.readthedocs.io/en/bizstyle-theme/
[51] https://github.com/spatialaudio/nbsphinx/compare/bizstyle-theme%5E...bizstyle-theme

- `classic`: example[52], usage[53]
- `haiku`: example[54], usage[55]
- `nature`: example[56], usage[57]
- `pyramid`: example[58], usage[59]
- `scrolls`: example[60], usage[61]
- `sphinxdoc`: example[62], usage[63]
- `traditional`: example[64], usage[65]

2.5.2 3rd-Party Themes

- alabaster_jupyterhub[66]: example[67], usage[68]
- basicstrap[69]: example[70], usage[71]
- better[72]: example[73], usage[74]
- bootstrap[75]: example[76], usage[77]
- bootstrap-astropy[78]: example[79], usage[80]
- cloud/redcloud/greencloud[81]: example[82], usage[83]
- dask_sphinx_theme[84]: example[85], usage[86]
- guzzle_sphinx_theme[87]: example[88], usage[89]

[52] https://nbsphinx.readthedocs.io/en/classic-theme/
[53] https://github.com/spatialaudio/nbsphinx/compare/classic-theme%5E...classic-theme
[54] https://nbsphinx.readthedocs.io/en/haiku-theme/
[55] https://github.com/spatialaudio/nbsphinx/compare/haiku-theme%5E...haiku-theme
[56] https://nbsphinx.readthedocs.io/en/nature-theme/
[57] https://github.com/spatialaudio/nbsphinx/compare/nature-theme%5E...nature-theme
[58] https://nbsphinx.readthedocs.io/en/pyramid-theme/
[59] https://github.com/spatialaudio/nbsphinx/compare/pyramid-theme%5E...pyramid-theme
[60] https://nbsphinx.readthedocs.io/en/scrolls-theme/
[61] https://github.com/spatialaudio/nbsphinx/compare/scrolls-theme%5E...scrolls-theme
[62] https://nbsphinx.readthedocs.io/en/sphinxdoc-theme/
[63] https://github.com/spatialaudio/nbsphinx/compare/sphinxdoc-theme%5E...sphinxdoc-theme
[64] https://nbsphinx.readthedocs.io/en/traditional-theme/
[65] https://github.com/spatialaudio/nbsphinx/compare/traditional-theme%5E...traditional-theme
[66] https://github.com/jupyterhub/alabaster-jupyterhub
[67] https://nbsphinx.readthedocs.io/en/alabaster-jupyterhub-theme/
[68] https://github.com/spatialaudio/nbsphinx/compare/alabaster-jupyterhub-theme%5E...alabaster-jupyterhub-theme
[69] https://pythonhosted.org/sphinxjp.themes.basicstrap/
[70] https://nbsphinx.readthedocs.io/en/basicstrap-theme/
[71] https://github.com/spatialaudio/nbsphinx/compare/basicstrap-theme%5E...basicstrap-theme
[72] https://sphinx-better-theme.readthedocs.io/
[73] https://nbsphinx.readthedocs.io/en/better-theme/
[74] https://github.com/spatialaudio/nbsphinx/compare/better-theme%5E...better-theme
[75] https://sphinx-bootstrap-theme.readthedocs.io/
[76] https://nbsphinx.readthedocs.io/en/bootstrap-theme/
[77] https://github.com/spatialaudio/nbsphinx/compare/bootstrap-theme%5E...bootstrap-theme
[78] https://github.com/astropy/astropy-sphinx-theme
[79] https://nbsphinx.readthedocs.io/en/astropy-theme/
[80] https://github.com/spatialaudio/nbsphinx/compare/astropy-theme%5E...astropy-theme
[81] https://cloud-sptheme.readthedocs.io/
[82] https://nbsphinx.readthedocs.io/en/cloud-theme/
[83] https://github.com/spatialaudio/nbsphinx/compare/cloud-theme%5E...cloud-theme
[84] https://github.com/dask/dask-sphinx-theme
[85] https://nbsphinx.readthedocs.io/en/dask-theme/
[86] https://github.com/spatialaudio/nbsphinx/compare/dask-theme%5E...dask-theme
[87] https://github.com/guzzle/guzzle_sphinx_theme
[88] https://nbsphinx.readthedocs.io/en/guzzle-theme/
[89] https://github.com/spatialaudio/nbsphinx/compare/guzzle-theme%5E...guzzle-theme

- julia[90]: example[91], usage[92]
- jupyter[93]: example[94], usage[95]
- maisie_sphinx_theme[96]: example[97], usage[98]
- pangeo[99]: example[100], usage[101]
- pydata_sphinx_theme[102]: example[103], usage[104]
- pytorch_sphinx_theme[105]: example[106], usage[107]
- sizzle[108]: example[109], usage[110]
- sphinx_material[111]: example[112], usage[113]
- sphinx_py3doc_enhanced_theme[114]: example[115], usage[116]
- sphinx_pyviz_theme[117]: example[118], usage[119]
- sphinx_rtd_theme[120]: example[121], usage[122]
- typlog[123]: example[124], usage[125]

If you know of another Sphinx theme that should be included here, please open an issue on Github[126]. An overview of many more themes can be found at https://sphinx-themes.org/.

[90] https://github.com/JuliaLang/JuliaDoc
[91] https://nbsphinx.readthedocs.io/en/julia-theme/
[92] https://github.com/spatialaudio/nbsphinx/compare/julia-theme%5E...julia-theme
[93] https://github.com/jupyter/jupyter-sphinx-theme/
[94] https://nbsphinx.readthedocs.io/en/jupyter-theme/
[95] https://github.com/spatialaudio/nbsphinx/compare/jupyter-theme%5E...jupyter-theme
[96] https://github.com/maisie-dev/maisie-sphinx-theme
[97] https://nbsphinx.readthedocs.io/en/maisie-theme/
[98] https://github.com/spatialaudio/nbsphinx/compare/maisie-theme%5E...maisie-theme
[99] https://github.com/pangeo-data/sphinx_pangeo_theme/
[100] https://nbsphinx.readthedocs.io/en/pangeo-theme/
[101] https://github.com/spatialaudio/nbsphinx/compare/pangeo-theme%5E...pangeo-theme
[102] https://pydata-sphinx-theme.readthedocs.io/
[103] https://nbsphinx.readthedocs.io/en/pydata-theme/
[104] https://github.com/spatialaudio/nbsphinx/compare/pydata-theme%5E...pydata-theme
[105] https://github.com/shiftlab/pytorch_sphinx_theme
[106] https://nbsphinx.readthedocs.io/en/pytorch-theme/
[107] https://github.com/spatialaudio/nbsphinx/compare/pytorch-theme%5E...pytorch-theme
[108] https://docs.red-dove.com/sphinx_sizzle_theme/
[109] https://nbsphinx.readthedocs.io/en/sizzle-theme/
[110] https://github.com/spatialaudio/nbsphinx/compare/sizzle-theme%5E...sizzle-theme
[111] https://github.com/bashtage/sphinx-material
[112] https://nbsphinx.readthedocs.io/en/material-theme/
[113] https://github.com/spatialaudio/nbsphinx/compare/material-theme%5E...material-theme
[114] https://github.com/ionelmc/sphinx-py3doc-enhanced-theme
[115] https://nbsphinx.readthedocs.io/en/py3doc-enhanced-theme/
[116] https://github.com/spatialaudio/nbsphinx/compare/py3doc-enhanced-theme%5E...py3doc-enhanced-theme
[117] https://github.com/pyviz-dev/sphinx_pyviz_theme
[118] https://nbsphinx.readthedocs.io/en/pyviz-theme/
[119] https://github.com/spatialaudio/nbsphinx/compare/pyviz-theme%5E...pyviz-theme
[120] https://github.com/readthedocs/sphinx_rtd_theme
[121] https://nbsphinx.readthedocs.io/en/rtd-theme/
[122] https://github.com/spatialaudio/nbsphinx/compare/rtd-theme%5E...rtd-theme
[123] https://github.com/typlog/sphinx-typlog-theme
[124] https://nbsphinx.readthedocs.io/en/typlog-theme/
[125] https://github.com/spatialaudio/nbsphinx/compare/typlog-theme%5E...typlog-theme
[126] https://github.com/spatialaudio/nbsphinx/issues

2.6 Using Notebooks with Git

Git[127] is extremely useful for managing source code and it can and should also be used for managing Jupyter notebooks. There is one caveat, however: Notebooks can contain output cells with rich media like images, plots, sounds, HTML, JavaScript and many other types of bulky machine-created content. This can make it hard to work with Git efficiently, because changes in those bulky contents can completely obscure the more interesting human-made changes in text and source code. Working with multiple collaborators on a notebook can become very tedious because of this.

It is therefore highly recommended that you remove all outputs from your notebooks before committing changes to a Git repository (except for the reasons mentioned in *Pre-Executing Notebooks* (page 40)).

If there are no output cells in a notebook, `nbsphinx` will by default execute the notebook, and the pages generated by Sphinx will therefore contain all the output cells. See *Controlling Notebook Execution* (page 40) for how this behavior can be customized.

In the Jupyter Notebook application, you can manually clear all outputs by selecting "Cell" → "All Output" → "Clear" from the menu. In JupyterLab, the menu items are "Edit" → "Clear All Outputs".

There are several tools available to remove outputs from multiple files at once without having to open them separately. You can even include such a tool as "clean/smudge filters" into your Git workflow, which will strip the output cells automatically whenever a Git command is executed. For details, have a look at those links:

- https://github.com/kynan/nbstripout
- https://github.com/toobaz/ipynb_output_filter
- https://tillahoffmann.github.io/2017/04/17/versioning-jupyter-notebooks-with-git.html
- http://timstaley.co.uk/posts/making-git-and-jupyter-notebooks-play-nice/
- https://pascalbugnion.net/blog/ipython-notebooks-and-git.html
- https://github.com/choldgraf/nbclean
- https://jamesfolberth.org/articles/2017/08/07/git-commit-hook-for-jupyter-notebooks/

`doc/usage.ipynb` ends here.

The following section was generated from `doc/markdown-cells.ipynb`

3 Markdown Cells

We can use *emphasis*, **boldface**, `preformatted text`.

> It looks like strike-out text is not supported: [STRIKEOUT:strikethrough].

- Red
- Green
- Blue

---

1. One
2. Two
3. Three

Arbitrary Unicode characters should be supported, e.g. ɬßõ. Note, however, that this only works if your HTML browser and your LaTeX processor provide the appropriate fonts.

[127] https://git-scm.com/

3.1 Equations

Inline equations like $e^{i\pi} = -1$ can be created by putting a LaTeX expression between two dollar signs, like this: `$\text{e}^{i\pi} = -1$`.

Note

Avoid leading and trailing spaces around math expressions, otherwise errors like the following will occur when Sphinx is running:

```
ERROR: Unknown interpreted text role "raw-latex".
```

See also the pandoc docs[128]:

> Anything between two $ characters will be treated as TeX math. The opening $ must have a non-space character immediately to its right, while the closing $ must have a non-space character immediately to its left, and must not be followed immediately by a digit.

Equations can also be displayed on their own line like this:

$$\int_{-\infty}^{\infty} f(x)\delta(x - x_0)dx = f(x_0). \tag{1}$$

This can be done by simply using one of the LaTeX math environments, like so:

```
\begin{equation}
\int\limits_{-\infty}^\infty f(x) \delta(x - x_0) dx = f(x_0)
\end{equation}
```

Note

For equations to be shown in HTML output, you have to specify a math extension[129] in your *extensions* (page 9) setting, e.g.:

```
extensions = [
    'nbsphinx',
    'sphinx.ext.mathjax',
    # ... other useful extensions ...
]
```

3.1.1 Automatic Equation Numbering

This is not automatically enabled in Jupyter notebooks, but you can install a notebook extension in order to enable equation numbering: https://jupyter-contrib-nbextensions.readthedocs.io/en/latest/nbextensions/equation-numbering/readme.html.

Automatic Equation Numbering is enabled on https://nbviewer.jupyter.org/, see e.g. the latest version of this very notebook at the link https://nbviewer.jupyter.org/github/spatialaudio/nbsphinx/blob/master/doc/markdown-cells.ipynb#Automatic-Equation-Numbering.

When using `nbsphinx`, you can use the following `mathjax_config` setting in your `conf.py` file to enable automatic equation numbering in HTML output. In LaTeX output, the equations are numbered by default.

[128] https://pandoc.org/MANUAL.html#math
[129] https://www.sphinx-doc.org/en/master/usage/extensions/math.html

```
mathjax_config = {
    'TeX': {'equationNumbers': {'autoNumber': 'AMS', 'useLabelIds': True}},
}
```

You can use `\label{...}` to give a unique label to an equation:

$$\phi = \frac{1 + \sqrt{5}}{2} \tag{2}$$

```
\begin{equation}
\phi = \frac{1 + \sqrt{5}}{2}
\label{golden-mean}
\end{equation}
```

If automatic equation numbering is enabled, you can later reference that equation using its label. You can use `\eqref{golden-mean}` for a reference with parentheses: (2), or `\ref{golden-mean}` for a reference without them: 2.

In HTML output, these equation references only work for equations within a single HTML page. In LaTeX output, equations from other notebooks can be referenced, e.g. (08.15).

3.1.2 Manual Equation Numbering

If you prefer to assign equation numbers (or some kind of names) manually, you can do so with `\tag{...}`:

$$a^2 + b^2 = c^2 \tag{99.4}$$

```
\begin{equation}
a^2 + b^2 = c^2
\tag{99.4}
\label{pythagoras}
\end{equation}
```

The above equation has the number 99.4.

3.2 Citations

According to https://nbconvert.readthedocs.io/en/latest/latex_citations.html, `nbconvert` supports citations using a special HTML-based syntax. `nbsphinx` supports the same syntax.

Example: [KRKP+16].

```
<cite data-cite="kluyver2016jupyter">Kluyver et al. (2016)</cite>
```

You don't actually have to use `<cite>`, any inline HTML tag can be used, e.g. `<strong>`: [PGH11].

```
<strong data-cite="perez2011python">Python: An Ecosystem for Scientific Computing</strong>
```

You'll also have to define a list of references, see *the section about references* (page 59).

There is also a Notebook extension which may or may not be useful: https://github.com/takluyver/cite2c.

3.3 Code

We can also write code with nice syntax highlighting:

```
print("Hello, world!")
```

3.4 Tables

A	B	A and B
False	False	False
True	False	False
False	True	False
True	True	True

3.5 Images

Local image: 


```
![Jupyter notebook icon](images/notebook_icon.png)
```

Remote image:

```
![Python logo (remote)](https://www.python.org/static/img/python-logo-large.png)
```

3.5.1 Using the HTML <img> tag

The aforementioned Markdown syntax for including images doesn't allow specifying the image size.

If you want to control the size of the included image, you can use the HTML <img>[130] element with the `width` attribute like this:

```
<img src="images/notebook_icon.png" alt="Jupyter notebook icon" width="300">
```

In addition to the `src`, `alt`, `width` and `height` attributes, you can also use the `class` attribute, which is simply forwarded to the HTML output (and ignored in LaTeX output). All other attributes are ignored.

3.5.2 SVG support for LaTeX

LaTeX doesn't support SVG images, but there are Sphinx extensions that can be used for automatically converting SVG images for inclusion in LaTeX output.

Just include one of the following options in the list of *extensions* (page 9) in your `conf.py` file.

- `'sphinxcontrib.inkscapeconverter'` or `'sphinxcontrib.rsvgconverter'`: See https://github.com/missinglinkelectronics/sphinxcontrib-svg2pdfconverter for installation instructions.

  The external programs `inkscape` or `rsvg-convert` (Debian/Ubuntu package `librsvg2-bin`) are needed, respectively.

- `'sphinx.ext.imgconverter'`: This is a built-in Sphinx extension, see https://www.sphinx-doc.org/en/master/usage/extensions/imgconverter.html.

  This needs the external program `convert` from *ImageMagick*.

  The disadvantage of this extension is that SVGs are converted to bitmap images.

If one of those extensions is installed, SVG images can be used even for LaTeX output:

[130] https://www.w3.org/TR/html52/semantics-embedded-content.html#the-img-element

```
![Python logo](images/python_logo.svg)
```

Remote SVG images can also be used (and will be shown in the LaTeX output):

```
![Jupyter logo](https://jupyter.org/assets/main-logo.svg)
```

3.6 Cell Attachments

Images can also be embedded in the notebook itself. Just drag an image file into the Markdown cell you are just editing or copy and paste some image data from an image editor/viewer.

The generated Markdown code will look just like a "normal" image link, except that it will have an `attachment:` prefix:

```
![a stick figure](attachment:stickfigure.png)
```

This is a cell attachment: 

In the Jupyter Notebook, there is a speciall "Attachments" cell toolbar which you can use to see all attachments of a cell and delete them, if needed.

3.7 HTML Elements (HTML only)

It is allowed to use plain HTML elements within Markdown cells. Those elements are passed through to the HTML output and are ignored for the LaTeX output. Below are a few examples.

HTML5 audio[131] elements can be created like this:

```
<audio src="https://example.org/audio.ogg" controls>alternative text</audio>
```

Example:

The HTML audio element is not supported!

HTML5 video[132] elements can be created like this:

[131] https://developer.mozilla.org/en-US/docs/Web/HTML/Element/audio
[132] https://developer.mozilla.org/en-US/docs/Web/HTML/Element/video

```
<video src="https://example.org/video.ogv" controls>alternative text</video>
```

Example:

The HTML video element is not supported!

The alternative text is shown in browsers that don't support those elements. The same text is also shown in Sphinx's LaTeX output.

Note: You can also use local files for the `<audio>` and `<video>` elements, but you have to create a link to the source file somewhere, because only then are the local files copied to the HTML output directory! You should do that anyway to make the audio/video file accessible to browsers that don't support the `<audio>` and `<video>` elements.

3.8 Info/Warning Boxes

> Warning
>
> This is an *experimental feature*! Its usage will probably change in the future or it might be removed completely!

Until there is an info/warning extension for Markdown/CommonMark (see this issue[133]), such boxes can be created by using HTML `<div>` elements like this:

```
<div class="alert alert-info">

Note

This is a note!

</div>
```

For this to work reliably, you should obey the following guidelines:

- The `class` attribute has to be either `"alert alert-info"` or `"alert alert-warning"`, other values will not be converted correctly.
- No further attributes are allowed.
- For compatibility with CommonMark, you should add an empty line between the `<div>` start tag and the beginning of the content.

Note

The text can contain further Markdown formatting. It is even possible to have nested boxes:

> ... but please don't *overuse* this!

---

[133] https://github.com/jupyter/notebook/issues/1292

3.9 Links to Other Notebooks

Relative links to local notebooks can be used: *a link to a notebook in a subdirectory* (page 48), a link to an orphan notebook (latter won't work in LaTeX output, because orphan pages are not included there).

This is how a link is created in Markdown:

```
[a link to a notebook in a subdirectory](subdir/a-notebook-in-a-subdir.ipynb)
```

Markdown also supports *reference-style* links: *a reference-style link* (page 48), *another version of the same link* (page 48).

These can be created with this syntax:

```
[a reference-style link][mylink]

[mylink]: subdir/a-notebook-in-a-subdir.ipynb
```

Links to sub-sections are also possible, e.g. *this subsection* (page 49).

This link was created with:

```
[this subsection](subdir/a-notebook-in-a-subdir.ipynb#A-Sub-Section)
```

You just have to remember to replace spaces with hyphens!

BTW, links to sections of the current notebook work, too, e.g. *beginning of this section* (page 26).

This can be done, as expected, like this:

```
[beginning of this section](#Links-to-Other-Notebooks)
```

It's also possible to create a *link to the beginning of the current page* (page **??**), by simply using a `#` character:

```
[link to the beginning of the current page](#)
```

3.10 Links to `*.rst` Files (and Other Sphinx Source Files)

Links to files whose extension is in the configuration value source_suffix[134], will be converted to links to the generated HTML/LaTeX pages. Example: *A reStructuredText file* (page 56).

This was created with:

```
[A reStructuredText file](a-normal-rst-file.rst)
```

Links to sub-sections are also possible. Example: *Sphinx Directives* (page 58).

This was created with:

```
[Sphinx Directives](a-normal-rst-file.rst#sphinx-directives-for-info-warning-boxes)
```

Note

Sphinx section anchors are different from Jupyter section anchors! To create a link to a subsection in an `.rst` file (or another non-notebook source file), you not only have to replace spaces with hyphens, but also slashes and some other characters. In case of doubt, just check the target HTML page generated by Sphinx.

---

[134] https://www.sphinx-doc.org/en/master/config.html#confval-source_suffix

3.11 Links to Local Files

Links to local files (other than Jupyter notebooks and other Sphinx source files) are also possible, e.g. requirements.txt.

This was simply created with:

```
[requirements.txt](requirements.txt)
```

The linked files are automatically copied to the HTML output directory. For LaTeX output, links are created, but the files are not copied to the target directory.

3.12 Links to Domain Objects

Links to Sphinx domain objects[135] (such as a Python class or JavaScript function) are also possible. For example: *example_python_function()* (page 59).

This was created with:

```
[example_python_function()](a-normal-rst-file.rst#example_python_function)
```

This is especially useful for use with the Sphinx autodoc[136] extension!

doc/markdown-cells.ipynb ends here.

The following section was generated from doc/code-cells.ipynb

4 Code Cells

4.1 Code, Output, Streams

An empty code cell:

[ ]:

Two empty lines:

[ ]:

Leading/trailing empty lines:

[1]:
```
# 2 empty lines before, 1 after
```

A simple output:

[2]:
```
6 * 7
```

[2]:
```
42
```

The standard output stream:

[3]:
```
print('Hello, world!')
```

[135] https://www.sphinx-doc.org/en/master/usage/restructuredtext/domains.html
[136] https://www.sphinx-doc.org/en/master/ext/autodoc.html

```
Hello, world!
```

Normal output + standard output

[4]:
```
print('Hello, world!')
6 * 7
```

```
Hello, world!
```

[4]:
```
42
```

The standard error stream is highlighted and displayed just below the code cell. The standard output stream comes afterwards (with no special highlighting). Finally, the "normal" output is displayed.

[5]:
```
import sys

print("I'll appear on the standard error stream", file=sys.stderr)
print("I'll appear on the standard output stream")
"I'm the 'normal' output"
```

```
I'll appear on the standard output stream
```

```
I'll appear on the standard error stream
```

[5]:
```
"I'm the 'normal' output"
```

Note

Using the IPython kernel, the order is actually mixed up, see https://github.com/ipython/ipykernel/issues/280.

4.2 Cell Magics

IPython can handle code in other languages by means of cell magics[137]:

[6]:
```
%%bash
for i in 1 2 3
do
    echo $i
done
```

```
1
2
3
```

4.3 Special Display Formats

See IPython example notebook[138].

[137] https://ipython.readthedocs.io/en/stable/interactive/magics.html#cell-magics
[138] https://nbviewer.jupyter.org/github/ipython/ipython/blob/master/examples/IPython%20Kernel/Rich%20Output.ipynb

4.3.1 Local Image Files

[7]:
```
from IPython.display import Image
i = Image(filename='images/notebook_icon.png')
i
```

[7]:

[8]:
```
display(i)
```

See also *SVG support for LaTeX* (page 23).

[9]:
```
from IPython.display import SVG
SVG(filename='images/python_logo.svg')
```

[9]:

4.3.2 Image URLs

[10]:
```
Image(url='https://www.python.org/static/img/python-logo-large.png')
```

[10]:
```
<IPython.core.display.Image object>
```

[11]:
```
Image(url='https://www.python.org/static/img/python-logo-large.png', embed=True)
```

[11]:

[12]:
```
Image(url='https://jupyter.org/assets/nav_logo.svg')
```

[12]:
```
<IPython.core.display.Image object>
```

4.3.3 Math

[13]:
```
from IPython.display import Math
eq = Math(r'\int\limits_{-\infty}^\infty f(x) \delta(x - x_0) dx = f(x_0)')
eq
```

[13]:
$$\int_{-\infty}^{\infty} f(x)\delta(x-x_0)dx = f(x_0)$$

[14]:
```
display(eq)
```

$$\int_{-\infty}^{\infty} f(x)\delta(x-x_0)dx = f(x_0)$$

[15]:
```
from IPython.display import Latex
Latex(r'This is a \LaTeX{} equation: $a^2 + b^2 = c^2$')
```

[15]:
This is a LaTeX equation: $a^2 + b^2 = c^2$

[16]:
```
%%latex
\begin{equation}
\int\limits_{-\infty}^\infty f(x) \delta(x - x_0) dx = f(x_0)
\end{equation}
```

$$\int_{-\infty}^{\infty} f(x)\delta(x-x_0)dx = f(x_0) \tag{3}$$

4.3.4 Plots

The output formats for Matplotlib plots can be customized. You'll need separate settings for the Jupyter Notebook application and for `nbsphinx`.

If you want to use SVG images for Matplotlib plots, add this line to your IPython configuration file:

```
c.InlineBackend.figure_formats = {'svg'}
```

If you want SVG images, but also want nice plots when exporting to LaTeX/PDF, you can select:

```
c.InlineBackend.figure_formats = {'svg', 'pdf'}
```

If you want to use the default PNG plots or HiDPI plots using `'png2x'` (a.k.a. `'retina'`), make sure to set this:

```
c.InlineBackend.rc = {'figure.dpi': 96}
```

This is needed because the default `'figure.dpi'` value of 72 is only valid for the Qt Console[139].

If you are planning to store your SVG plots as part of your notebooks, you should also have a look at the `'svg.hashsalt'` setting.

For more details on these and other settings, have a look at Default Values for Matplotlib's "inline" Backend[140].

The configuration file `ipython_kernel_config.py` can be either in the directory where your notebook is located (see the ipython_kernel_config.py in this directory), or in your profile directory (typically `~/.ipython/profile_default/ipython_kernel_config.py`). To find out your IPython profile directory, use this command:

```
python3 -m IPython profile locate
```

A local `ipython_kernel_config.py` in the notebook directory also works on https://mybinder.org/. Alternatively, you can create a file with those settings in a file named `.ipython/profile_default/ipython_kernel_config.py` in your repository.

To get SVG and PDF plots for `nbsphinx`, use something like this in your `conf.py` file:

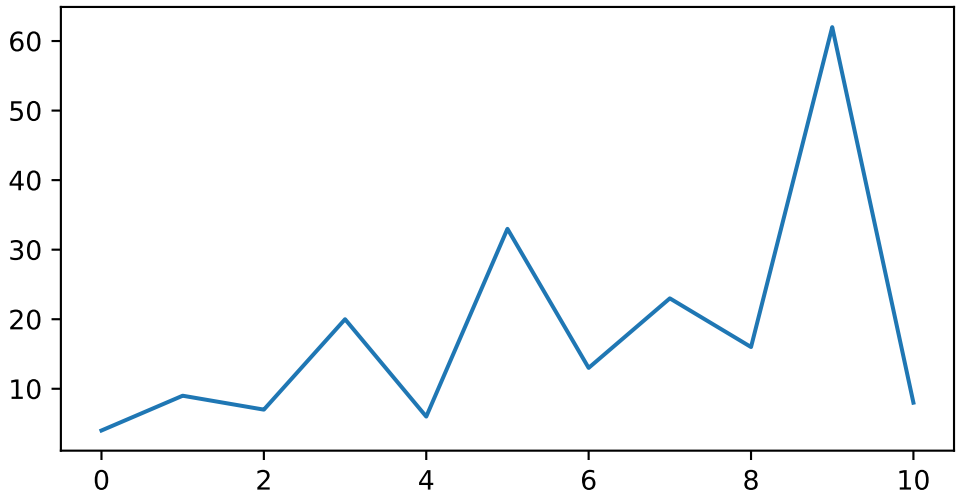
```
nbsphinx_execute_arguments = [
    "--InlineBackend.figure_formats={'svg', 'pdf'}",
    "--InlineBackend.rc={'figure.dpi': 96}",
]
```

In the following example, `nbsphinx` should use an SVG image in the HTML output and a PDF image for LaTeX/PDF output.

[17]:
```
import matplotlib.pyplot as plt
```

[18]:
```
fig, ax = plt.subplots(figsize=[6, 3])
ax.plot([4, 9, 7, 20, 6, 33, 13, 23, 16, 62, 8]);
```

[139] https://qtconsole.readthedocs.io/
[140] https://nbviewer.jupyter.org/github/mgeier/python-audio/blob/master/plotting/matplotlib-inline-defaults.ipynb

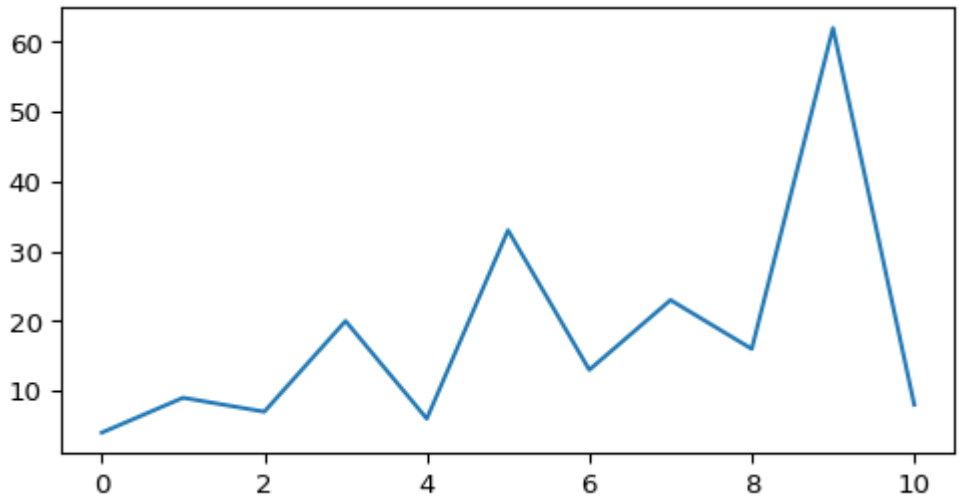


Alternatively, the figure format(s) can also be chosen directly in the notebook (which overrides the setting in `nbsphinx_execute_arguments` and in the IPython configuration):

[19]:
```
%config InlineBackend.figure_formats = ['png']
```

[20]:
```
fig
```

[20]:

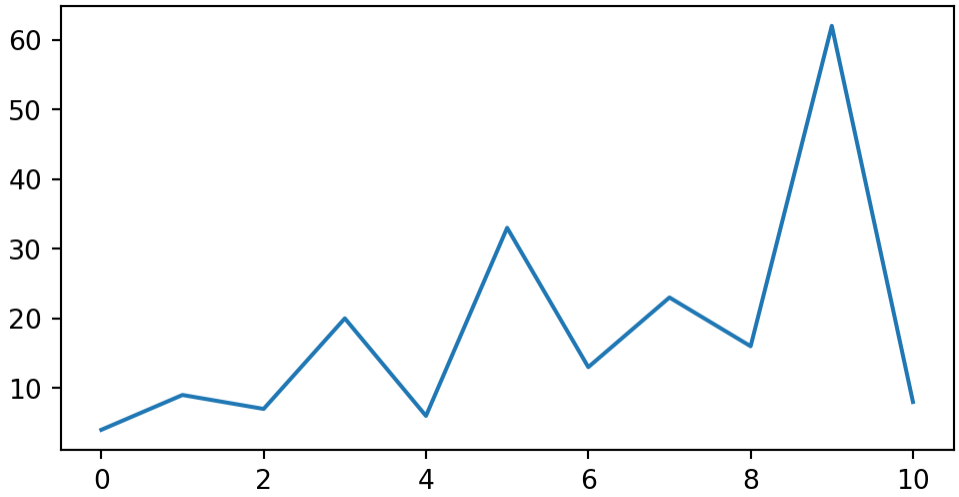


If you want to use PNG images, but with HiDPI resolution, use the special `'png2x'` (a.k.a. `'retina'`) format (which also looks nice in the LaTeX output):

[21]:
```
%config InlineBackend.figure_formats = ['png2x']
```

[22]:
```
fig
```

[22]:



4.3.5 Pandas Dataframes

Pandas dataframes[141] should be displayed as nicely formatted HTML tables (if you are using HTML output).

[23]:
```
import numpy as np
import pandas as pd
```

[24]:
```
df = pd.DataFrame(np.random.randint(0, 100, size=[5, 4]),
                  columns=['a', 'b', 'c', 'd'])
df
```

[24]:

	a	b	c	d
0	23	22	34	63
1	32	16	21	36
2	58	71	47	15
3	5	14	50	8
4	88	43	40	64

For LaTeX output, however, the plain text output is used by default.

To get nice LaTeX tables, a few settings have to be changed:

[25]:
```
pd.set_option('display.latex.repr', True)
```

This is not enabled by default because of Pandas issue #12182[142].

The generated LaTeX tables utilize the `booktabs` package, so you have to make sure that package is loaded in the preamble[143] with:

```
\usepackage{booktabs}
```

In order to allow page breaks within tables, you should use:

[26]:
```
pd.set_option('display.latex.longtable', True)
```

The `longtable` package is already used by Sphinx, so you don't have to manually load it in the preamble.

[141] https://pandas.pydata.org/pandas-docs/stable/getting_started/dsintro.html#dataframe
[142] https://github.com/pandas-dev/pandas/issues/12182
[143] https://www.sphinx-doc.org/en/master/latex.html

Finally, if you want to use LaTeX math expressions in your dataframe, you'll have to disable escaping:

[27]:
```
pd.set_option('display.latex.escape', False)
```

The above settings should have no influence on the HTML output, but the LaTeX output should now look nicer:

[28]:
```
df = pd.DataFrame(np.random.randint(0, 100, size=[10, 4]),
                  columns=[r'$\alpha$', r'$\beta$', r'$\gamma$', r'$\delta$'])
df
```

[28]:

	α	β	γ	δ
0	13	10	77	46
1	57	91	33	31
2	50	43	96	3
3	6	43	66	17
4	86	12	78	58
5	2	50	68	5
6	59	64	41	53
7	89	90	96	83
8	24	45	78	83
9	8	28	81	11

4.3.6 YouTube Videos

[29]:
```
from IPython.display import YouTubeVideo
YouTubeVideo('WAikxUGbomY')
```

[29]:

4.3.7 Interactive Widgets (HTML only)

The basic widget infrastructure is provided by the ipywidgets[144] module. More advanced widgets are available in separate packages, see for example https://jupyter.org/widgets.

The JavaScript code which is needed to display Jupyter widgets is loaded automatically (using RequireJS). If you want to use non-default URLs or local files, you can use the *nbsphinx_widgets_path* (page 13) and *nbsphinx_requirejs_path* (page 12) settings.

[30]:
```
import ipywidgets as w
```

[31]:
```
slider = w.IntSlider()
slider.value = 42
slider
```

```
IntSlider(value=42)
```

A widget typically consists of a so-called "model" and a "view" into that model.

If you display a widget multiple times, all instances act as a "view" into the same "model". That means that their state is synchronized. You can move either one of these sliders to try this out:

[32]:
```
slider
```

```
IntSlider(value=42)
```

You can also link different widgets.

Widgets can be linked via the kernel (which of course only works while a kernel is running) or directly in the client (which even works in the rendered HTML pages).

Widgets can be linked uni- or bi-directionally.

Examples for all 4 combinations are shown here:

[33]:
```
link = w.IntSlider(description='link')
w.link((slider, 'value'), (link, 'value'))
jslink = w.IntSlider(description='jslink')
w.jslink((slider, 'value'), (jslink, 'value'))
dlink = w.IntSlider(description='dlink')
w.dlink((slider, 'value'), (dlink, 'value'))
jsdlink = w.IntSlider(description='jsdlink')
w.jsdlink((slider, 'value'), (jsdlink, 'value'))
w.VBox([link, jslink, dlink, jsdlink])
```

```
VBox(children=(IntSlider(value=42, description='link'), IntSlider(value=0, description=
↪'jslink'), IntSlider(va...
```

Other Languages

The examples shown here are using Python, but the widget technology can also be used with different Jupyter kernels (i.e. with different programming languages).

---

[144] https://ipywidgets.readthedocs.io/

4.3.8 Arbitrary JavaScript Output (HTML only)

[34]:
```
%%javascript

var text = document.createTextNode("Hello, I was generated with JavaScript!");
// Content appended to "element" will be visible in the output area:
element.appendChild(text);
```

```
<IPython.core.display.Javascript object>
```

4.3.9 Unsupported Output Types

If a code cell produces data with an unsupported MIME type, the Jupyter Notebook doesn't generate any output. `nbsphinx`, however, shows a warning message.

[35]:
```
display({
    'text/x-python': 'print("Hello, world!")',
    'text/x-haskell': 'main = putStrLn "Hello, world!"',
}, raw=True)
```

Data type cannot be displayed: text/x-python, text/x-haskell

4.4 ANSI Colors

The standard output and standard error streams may contain ANSI escape sequences[145] to change the text and background colors.

[36]:
```
print('BEWARE: \x1b[1;33;41mugly colors\x1b[m!', file=sys.stderr)
print('AB\x1b[43mCD\x1b[35mEF\x1b[1mGH\x1b[4mIJ\x1b[7m'
      'KL\x1b[49mMN\x1b[39mOP\x1b[22mQR\x1b[24mST\x1b[27mUV')
```

```
ABCDEFGHIJKLMNOPQRSTUV
```

```
BEWARE: ugly colors!
```

The following code showing the 8 basic ANSI colors is based on http://tldp.org/HOWTO/Bash-Prompt-HOWTO/x329.html. Each of the 8 colors has an "intense" variation, which is used for bold text.

[37]:
```
text = ' XYZ '
formatstring = '\x1b[{}m' + text + '\x1b[m'

print('    ' + '  ' * len(text) +
      ''.join('{:^{}}'.format(bg, len(text)) for bg in range(40, 48)))
for fg in range(30, 38):
    for bold in False, True:
        fg_code = ('1;' if bold else '') + str(fg)
        print(' {:>4} '.format(fg_code) + formatstring.format(fg_code) +
              ''.join(formatstring.format(fg_code + ';' + str(bg))
                      for bg in range(40, 48)))
```

```
          40   41   42   43   44   45   46   47
  30  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
1;30  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
```

(continues on next page)

[145] https://en.wikipedia.org/wiki/ANSI_escape_code

(continued from previous page)

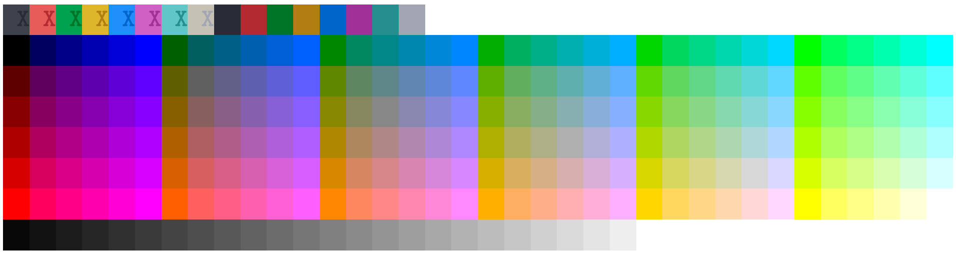
```
  31  XYZ  XYZ       XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
1;31  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
  32  XYZ  XYZ  XYZ       XYZ  XYZ  XYZ  XYZ  XYZ
1;32  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
  33  XYZ  XYZ  XYZ  XYZ       XYZ  XYZ  XYZ  XYZ
1;33  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
  34  XYZ  XYZ  XYZ  XYZ  XYZ       XYZ  XYZ  XYZ
1;34  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
  35  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ       XYZ  XYZ
1;35  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
  36  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ       XYZ
1;36  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
  37  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
1;37  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ  XYZ
```

ANSI also supports a set of 256 indexed colors. The following code showing all of them is based on http://bitmote.com/index.php?post/2012/11/19/Using-ANSI-Color-Codes-to-Colorize-Your-Bash-Prompt-on-Linux[146].

[38]:
```
formatstring = '\x1b[38;5;{0};48;5;{0}mX\x1b[1mX\x1b[m'

print('  + ' + ''.join('{:2}'.format(i) for i in range(36)))
print('  0 ' + ''.join(formatstring.format(i) for i in range(16)))
for i in range(7):
    i = i * 36 + 16
    print('{:3} '.format(i) + ''.join(formatstring.format(i + j)
                                  for j in range(36) if i + j < 256))
```

```
  +  0 1 2 3 4 5 6 7 8 9101112131415161718192021222324252627282930313233435
  0  X X X X X X X X
 16
 52
 88
124
160
196
232
```



You can even use 24-bit RGB colors:

[39]:
```
start = 255, 0, 0
end = 0, 0, 255
length = 79
out = []

for i in range(length):
    rgb = [start[c] + int(i * (end[c] - start[c]) / length) for c in range(3)]
    out.append('\x1b['
               '38;2;{rgb[2]};{rgb[1]};{rgb[0]};'
               '48;2;{rgb[0]};{rgb[1]};{rgb[2]}mX\x1b[m'.format(rgb=rgb))
print(''.join(out))
```

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

.... doc/code-cells.ipynb ends here.

146 https://web.archive.org/web/20190109005413/http://bitmote.com/index.php?post/2012/11/19/Using-ANSI-Color-Codes-to-Colorize-Your-Bash-Prompt-on-Linux

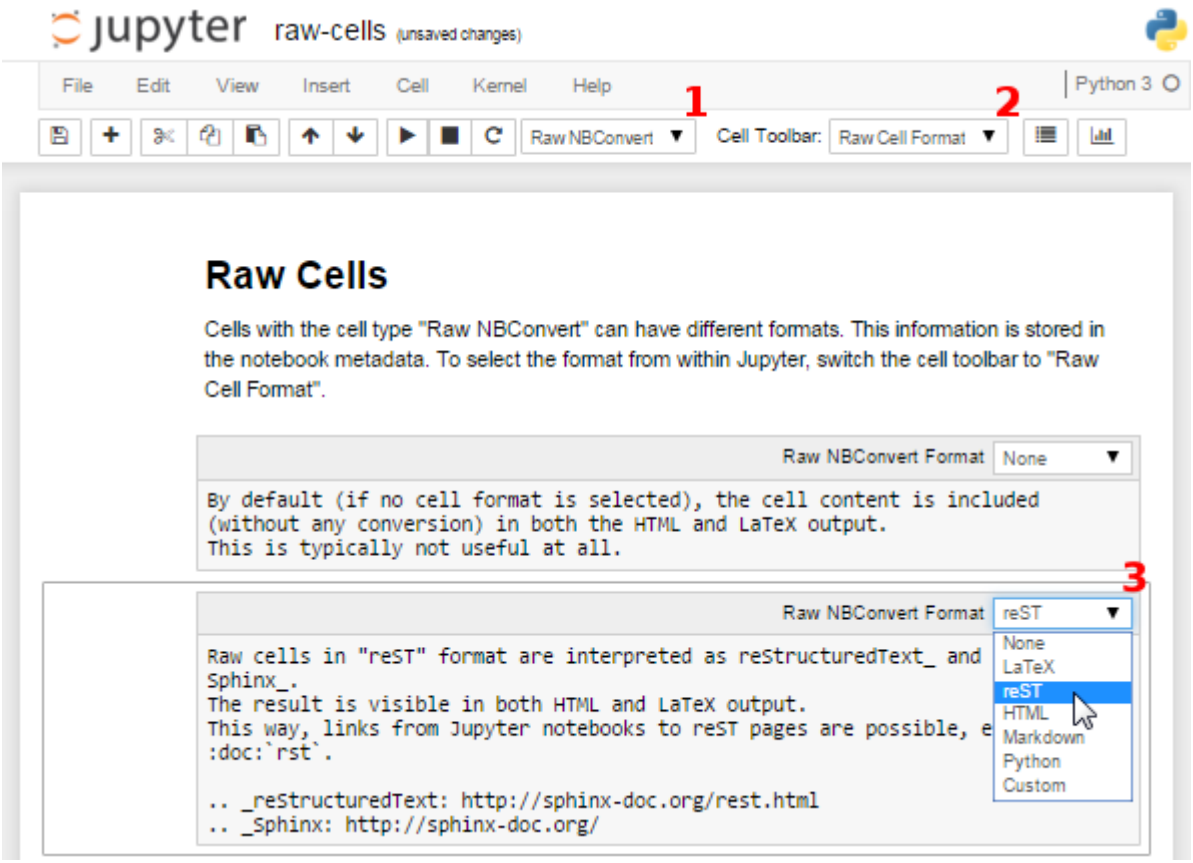
5 Raw Cells

The “Raw NBConvert” cell type can be used to render different code formats into HTML or LaTeX by Sphinx. This information is stored in the notebook metadata and converted appropriately.

5.1 Usage

To select a desired format from within Jupyter, select the cell containing your special code and choose options from the following dropdown menus:

1. Select “Raw NBConvert”
2. Switch the Cell Toolbar to “Raw Cell Format”
3. Chose the appropriate “Raw NBConvert Format” within the cell



5.2 Available Raw Cell Formats

The following examples show how different Jupyter cell formats are rendered by Sphinx.

5.2.1 None

By default (if no cell format is selected), the cell content is included (without any conversion) in both the HTML and LaTeX output. This is typically not useful at all.

"I'm a raw cell with no format."

5.2.2 reST

Raw cells in "reST" format are interpreted as reStructuredText and parsed by Sphinx. The result is visible in both HTML and LaTeX output.

"**I'm** a *raw cell* in reST[147] format."

5.2.3 Markdown

Raw cells in "Markdown" format are interpreted as Markdown, and the result is included in both HTML and LaTeX output. Since the Jupyter Notebook also supports normal Markdown cells, this might not be useful *at all*.

"**I'm** a *raw cell* in Markdown[148] format."

5.2.4 HTML

Raw cells in "HTML" format are only visible in HTML output. This option might not be very useful, since raw HTML code is also allowed within normal Markdown cells.

5.2.5 LaTeX

Raw cells in "LaTeX" format are only visible in LaTeX output.

I'm a *raw cell* in LaTeX format.

5.2.6 Python

Raw cells in "Python" format are not visible at all (nor executed in any way).

`doc/raw-cells.ipynb` ends here.

The following section was generated from `doc/hidden-cells.ipynb`

6 Hidden Cells

You can remove cells from the HTML/LaTeX output by adding this to the cell metadata:

```
"nbsphinx": "hidden"
```

Hidden cells are still executed but removed afterwards.

For example, the following hidden cell defines the variable `answer`.

This is the cell after the hidden cell. Although the previous cell is not visible, its result is still available:

[2]:
```
answer
```

[147] https://www.sphinx-doc.org/rest.html
[148] https://daringfireball.net/projects/markdown/

[2]:
```
42
```

Don't overuse this, because it may make it harder to follow what's going on in your notebook.

Also Markdown cells can be hidden. The following cell is hidden.

This is the cell after the hidden cell.

doc/hidden-cells.ipynb ends here.

The following section was generated from doc/executing-notebooks.ipynb

7 Controlling Notebook Execution

Notebooks with no outputs are automatically executed during the Sphinx build process. If, however, there is at least one output cell present, the notebook is not evaluated and included as is.

The following notebooks show how this default behavior can be used and customized.

The following section was generated from doc/pre-executed.ipynb

7.1 Pre-Executing Notebooks

Automatically executing notebooks during the Sphinx build process is an important feature of `nbsphinx`. However, there are a few use cases where pre-executing a notebook and storing the outputs might be preferable. Storing any output will, by default, stop `nbsphinx` from executing the notebook.

7.1.1 Long-Running Cells

If you are doing some very time-consuming computations, it might not be feasible to re-execute the notebook every time you build your Sphinx documentation.

So just do it once – when you happen to have the time – and then just keep the output.

[1]:
```
import time
```

[2]:
```
%time time.sleep(60 * 60)
6 * 7
```

```
CPU times: user 160 ms, sys: 56 ms, total: 216 ms
Wall time: 1h 1s
```

[2]:
```
42
```

7.1.2 Rare Libraries

You might have created results with a library that's hard to install and therefore you have only managed to install it on one very old computer in the basement, so you probably cannot run this whenever you build your Sphinx docs.

[3]:
```
from a_very_rare_library import calculate_the_answer
```

[4]:
```
calculate_the_answer()
```

[4]:
```
42
```

7.1.3 Exceptions

If an exception is raised during the Sphinx build process, it is stopped (the build process, not the exception!). If you want to show to your audience how an exception looks like, you have two choices:

1. Allow errors – either generally or on a per-notebook or per-cell basis – see *Ignoring Errors* (page 42) (*per cell* (page 43)).
2. Execute the notebook beforehand and save the results, like it's done in this example notebook:

[5]:
```
1 / 0
```

```
---------------------------------------------------------------------------
ZeroDivisionError                         Traceback (most recent call last)
<ipython-input-5-b710d87c980c> in <module>()
----> 1 1 / 0

ZeroDivisionError: division by zero
```

7.1.4 Client-specific Outputs

When `nbsphinx` executes notebooks, it uses the `nbconvert` module to do so. Certain Jupyter clients might produce output that differs from what `nbconvert` would produce. To preserve those original outputs, the notebook has to be executed and saved before running Sphinx.

For example, the JupyterLab help system shows the help text as cell outputs, while executing with `nbconvert` doesn't produce any output.

[6]:
```
sorted?
```

```
Signature: sorted(iterable, /, *, key=None, reverse=False)
Docstring:
Return a new list containing all items from the iterable in ascending order.

A custom key function can be supplied to customize the sort order, and the
reverse flag can be set to request the result in descending order.
Type:      builtin_function_or_method
```

..... doc/pre-executed.ipynb ends here.

The following section was generated from doc/never-execute.ipynb .....

7.2 Explicitly Dis-/Enabling Notebook Execution

If you want to include a notebook without outputs and yet don't want `nbsphinx` to execute it for you, you can explicitly disable this feature.

You can do this globally by setting the following option in conf.py:

```
nbsphinx_execute = 'never'
```

Or on a per-notebook basis by adding this to the notebook's JSON metadata:

```
"nbsphinx": {
  "execute": "never"
},
```

There are three possible settings, `"always"`, `"auto"` and `"never"`. By default (= `"auto"`), notebooks with no outputs are executed and notebooks with at least one output are not. As always, per-notebook settings take precedence over the settings in `conf.py`.

This very notebook has its metadata set to `"never"`, therefore the following cell is not executed:

[ ]:
```
6 * 7
```

..... doc/never-execute.ipynb ends here.

The following section was generated from doc/allow-errors.ipynb .....

7.3 Ignoring Errors

Normally, if an exception is raised while executing a notebook, the Sphinx build process is stopped immediately.

If a notebook contains errors on purpose (or if you are too lazy to fix them right now), you have four options:

1. Manually execute the notebook in question and save the results, see *the pre-executed example notebook* (page 40).
2. Allow errors in all notebooks by setting this option in conf.py: `nbsphinx_allow_errors = True`
3. Allow errors on a per-notebook basis by adding this to the notebook's JSON metadata: `"nbsphinx": { "allow_errors": true },`
4. Allow errors on a per-cell basis using the `raises-exception` tag, see *Ignoring Errors on a Cell-by-Cell Basis* (page 43).

This very notebook is an example for the third option. The results of the following code cells are not stored within the notebook, therefore it is executed during the Sphinx build process. Since the above-mentioned `allow_errors` flag is set in this notebook's metadata, all cells are executed although most of them cause an exception.

[1]:
```
nonsense
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-1-7dd4c0df649c> in <module>
----> 1 nonsense

NameError: name 'nonsense' is not defined
```

[2]:
```
42 / 0
```

```
---------------------------------------------------------------------------
ZeroDivisionError                         Traceback (most recent call last)
<ipython-input-2-52cebea8b64f> in <module>
----> 1 42 / 0

ZeroDivisionError: division by zero
```

[3]:
```
print 'Hello, world!'
```

```
  File "<ipython-input-3-653b30cd70a8>", line 1
    print 'Hello, world!'
                        ^
SyntaxError: Missing parentheses in call to 'print'. Did you mean print('Hello, world!')?
```

[4]:
```
6 ~ 7
```

```
  File "<ipython-input-4-8300b2622db3>", line 1
    6 ~ 7
      ^
SyntaxError: invalid syntax
```

[5]:
```
6 * 7
```

[5]:
```
42
```

doc/allow-errors.ipynb ends here.

The following section was generated from doc/allow-errors-per-cell.ipynb

7.4 Ignoring Errors on a Per-Cell Basis

Instead of ignoring errors for all notebooks or for some selected notebooks (see *the previous notebook* (page 42)), you can be more fine-grained and just allow errors on certain code cells by tagging them with the `raises-exception` tag.

[1]:
```
'no problem'
```

[1]:
```
'no problem'
```

The following code cell has the `raises-exception` tag.

[2]:
```
problem
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-2-526ab3a89ffc> in <module>
----> 1 problem

NameError: name 'problem' is not defined
```

The following code cell is executed even though the previous cell raised an exception.

[3]:
```
'no problem'
```

[3]:
```
'no problem'
```

Note

The behavior of the `raises-exception` tag doesn't match its name. While it does *allow* exceptions, it does not check if an exception is actually raised!

This will hopefully be fixed at some point, see https://github.com/jupyter/nbconvert/issues/730.

doc/allow-errors-per-cell.ipynb ends here.

The following section was generated from doc/configuring-kernels.ipynb

7.5 Configuring the Kernels

7.5.1 Kernel Name

If we have multiple kernels installed, we can choose to override the kernel saved in the notebook using *nbsphinx_kernel_name* (page 12):

```
nbsphinx_kernel_name = 'python-upstream-dev'
```

which uses the kernel named `python-upstream-dev` instead of the kernel name stored in the notebook.

7.5.2 Kernel Arguments

We can also pass options to the kernel by setting *nbsphinx_execute_arguments* (page 11) in `conf.py`. These work the same way as `ipython_kernel_config.py`. For example, using

```
nbsphinx_execute_arguments = [
    "--InlineBackend.rc={'figure.dpi': 96}",
]
```

to set *plot options* (page 31) is the same as writing:

```
c.InlineBackend.rc = {'figure.dpi': 96}
```

in `ipython_kernel_config.py` or using:

```
%config InlineBackend.rc={'figure.dpi': 96}
```

at the top of a notebook:

```
[1]: get_ipython().config.InlineBackend.rc
```

```
[1]: {'figure.dpi': 96}
```

7.5.3 Environment Variables

The contents of `os.environ` after the execution of `conf.py` will be passed as environment variables to the kernel. As an example, `MY_DUMMY_VARIABLE` has been set in conf.py like this:

```
import os
os.environ['MY_DUMMY_VARIABLE'] = 'Hello from conf.py!'
```

... and it can be checked in the notebook like this:

```
[2]: import os
     os.environ['MY_DUMMY_VARIABLE']
```

```
[2]: 'Hello from conf.py!'
```

This is useful if we want to edit `PYTHONPATH` in order to compile the documentation without installing the project:

```
import os

src = os.path.abspath('../src')
os.environ['PYTHONPATH'] = src
```

If you are using https://mybinder.org/ and you want to define environment variables, you should create a file `.binder/start` in your repository (see Binder docs[149]) containing definitions like this:

[149] https://mybinder.readthedocs.io/en/latest/config_files.html#start-run-code-before-the-user-sessions-starts

```
#!/bin/bash
export MY_DUMMY_VARIABLE="Hello from .binder/start!"
exec "$@"
```

doc/configuring-kernels.ipynb ends here.

The following section was generated from doc/timeout.ipynb

7.6 Cell Execution Timeout

By default, code cells will be executed until they are finished, even if that takes a very long time. In some cases they might never finish.

If you would like to only use a finite amount of time per cell, you can choose a timeout length for all notebooks by setting the following option in conf.py:

```
nbsphinx_timeout = 60
```

Or change the timeout length on a per-notebook basis by adding this to the notebook's JSON metadata:

```
"nbsphinx": {
  "timeout": 60
},
```

The timeout is given in seconds, use `-1` to disable the timeout (which is the default).

Alternatively, you can manually execute the notebook in question and save the results, see *the pre-executed example notebook* (page 40).

doc/timeout.ipynb ends here.

doc/executing-notebooks.ipynb ends here.

The following section was generated from doc/prolog-and-epilog.ipynb

8 Prolog and Epilog

When including notebooks in your Sphinx documentation, you can choose to add some generic content before and after each notebook. This can be done with the configuration values `nbsphinx_prolog` and `nbsphinx_epilog` in the file `conf.py`.

The prolog and epilog strings can hold arbitrary reST[150] markup. Particularly, the only[151] and raw[152] directives can be used to have different content for HTML and LaTeX output.

Those strings are also processed by the Jinja2[153] templating engine. This means you can run Python-like code within those strings. You have access to the current Sphinx build environment[154] via the variable `env`. Most notably, you can get the file name of the current notebook with

```
{{ env.doc2path(env.docname, base=None) }}
```

Have a look at the Jinja2 template documentation[155] for more information.

> Warning
>
> If you use invalid syntax, you might get an error like this:

[150] https://www.sphinx-doc.org/rest.html
[151] https://www.sphinx-doc.org/en/master/usage/restructuredtext/directives.html#directive-only
[152] https://docutils.readthedocs.io/en/sphinx-docs/ref/rst/directives.html#raw-data-pass-through
[153] http://jinja.pocoo.org/
[154] https://www.sphinx-doc.org/en/master/extdev/envapi.html
[155] http://jinja.pocoo.org/docs/latest/templates/

```
jinja2.exceptions.TemplateSyntaxError: expected token ':', got '}'
```

This is especially prone to happen when using raw LaTeX, with its abundance of braces. To avoid clashing braces you can try to insert additional spaces or LaTeX macros that don't have a visible effect, like e.g. `\strut{}`. For example, you can avoid three consecutive opening braces with something like that:

```
\texttt{\strut{}{{ env.doc2path(env.docname, base=None) }}}
```

NB: The three consecutive closing braces in this example are not problematic.

An alternative work-around would be to surround LaTeX braces with Jinja braces like this:

```
{{ '{' }}
```

The string within will not be touched by Jinja.

Another special Jinja syntax is {%, which is also often used in fancy TeX/LaTeX code. A work-around for this situation would be to use

```
{{ '{%' }}
```

8.1 Examples

You can include a simple static string, using reST[156] markup if you like:

```
nbsphinx_epilog = """
----

Generated by nbsphinx_ from a Jupyter_ notebook.

.. _nbsphinx: https://nbsphinx.readthedocs.io/
.. _Jupyter: https://jupyter.org/
"""
```

Using some additional Jinja2 markup and the information from the `env` variable, you can create URLs that point to the current notebook file, but located on some other server:

```
nbsphinx_prolog = """
Go there: https://example.org/notebooks/{{ env.doc2path(env.docname, base=None) }}

----
"""
```

You can also use separate content for HTML and LaTeX output, e.g.:

```
nbsphinx_prolog = r"""
{% set docname = env.doc2path(env.docname, base=None) %}

.. only:: html

    Go there: https://example.org/notebooks/{{ docname }}

.. raw:: latex

    \nbsphinxstartnotebook{The following section was created from
    \texttt{\strut{}{{ docname }}}:}
"""
```

(continues on next page)

[156] https://www.sphinx-doc.org/rest.html

(continued from previous page)

```
nbsphinx_epilog = r"""
.. raw:: latex

    \nbsphinxstopnotebook{\hfill End of notebook.}
"""
```

Note the use of the `\nbsphinxstartnotebook` and `\nbsphinxstopnotebook` commands. Those make sure there is not too much space between the "prolog" and the beginning of the notebook and, respectively, between the end of the notebook and the "epilog". They also avoid page breaks, in order for the "prolog"/"epilog" not to end up on the page before/after the notebook.

For a more involved example for different HTML and LaTeX versions, see the file conf.py of the `nbsphinx` documentation.

doc/prolog-and-epilog.ipynb ends here.

The following section was generated from `doc/custom-formats.pct.py`

9 Custom Notebook Formats

By default, Jupyter notebooks are stored in files with the suffix `.ipynb`, which use the JSON format for storage.

However, there are libraries available which allow storing notebooks in different formats, using different file suffixes.

To use a custom notebook format in `nbsphinx`, you can specify the `nbsphinx_custom_formats` option in your `conf.py` file. You have to provide the file extension and a conversion function that takes the contents of a file (as a string) and returns a Jupyter notebook object.

```
nbsphinx_custom_formats = {
    '.mysuffix': 'mylibrary.converter_function',
}
```

The converter function can be given as a string (recommended) or as a function object.

If a conversion function takes more than a single string argument, you can specify the function name plus a dictionary with keyword arguments which will be passed to the conversion function in addition to the file contents.

```
nbsphinx_custom_formats = {
    '.mysuffix': ['mylibrary.converter_function', {'some_arg': 42}],
}
```

You can of course use multiple formats by specifying multiple conversion functions.

9.1 Example: Jupytext

One example for a library which provides a custom conversion function is jupytext[157], which allows storing the contents of Jupyter notebooks in Markdown and R-Markdown, as well as plain Julia, Python and R files.

Since its conversion function takes more than a single string argument, we have to pass a keyword argument, e.g.:

[157] https://github.com/mwouts/jupytext

```
nbsphinx_custom_formats = {
    '.Rmd': ['jupytext.reads', {'fmt': 'Rmd'}],
}
```

This very page is an example of a notebook stored in the `py:percent` format (see docs[158]):

[1]:
```
!head -20 custom-formats.pct.py
```

```
# %% [markdown]
# # Custom Notebook Formats
#
# By default, Jupyter notebooks are stored in files with the suffix `.ipynb`,
# which use the JSON format for storage.
#
# However, there are libraries available which allow storing notebooks
# in different formats, using different file suffixes.
#
# To use a custom notebook format in `nbsphinx`, you can specify the
# `nbsphinx_custom_formats` option in your `conf.py` file.
# You have to provide the file extension
# and a conversion function that takes the contents of a file (as a string)
# and returns a Jupyter notebook object.
#
# ```python
# nbsphinx_custom_formats = {
#     '.mysuffix': 'mylibrary.converter_function',
# }
# ```
```

To select a suitable conversion function, we use the following setting in `conf.py`:

```
nbsphinx_custom_formats = {
    '.pct.py': ['jupytext.reads', {'fmt': 'py:percent'}],
}
```

Another example is *this gallery example page* (page 60).

`doc/custom-formats.pct.py` ends here.

The following section was generated from `doc/subdir/a-notebook-in-a-subdir.ipynb`

10 Notebooks in Sub-Directories

You can organize your notebooks in subdirectories and `nbsphinx` will take care that relative links to other notebooks, images and other files still work.

Let's see if links to local images work:

[1]:
```
from IPython.display import Image
Image(filename='../images/notebook_icon.png')
```

[158] https://jupytext.readthedocs.io/en/latest/formats.html#the-percent-format

[1]:

Warning

There may be problems with images in output cells if your source directory contains symbolic links, see issue #49[159].

A link to a notebook in the same sub-directory: *link* (page 54).

A link to a notebook in the parent directory: *link* (page 19).

A link to a local file: link.

A random equation:

$$F_n = F_{n-1} + F_{n-2} \tag{08.15}$$

10.1 A Sub-Section

This is just for testing inter-notebook links, see *this section* (page 26).

`doc/subdir/a-notebook-in-a-subdir.ipynb` ends here.

The following section was generated from `doc/subdir/gallery.ipynb`

11 Creating Thumbnail Galleries

Inspired by Sphinx-Gallery[160], you can create thumbnail galleries from a list of Jupyter notebooks (or other Sphinx source files).

`nbsphinx` does *not* provide any gallery styles, but you can easily use the styles from Sphinx-Gallery by installing it:

```
python3 -m pip install sphinx-gallery --user
```

... and loading the styles in your `conf.py` with:

```
extensions = [
    'nbsphinx',
    'sphinx_gallery.load_style',
    # more extensions, if needed ...
]
```

You'll need Sphinx-Gallery version 0.6 or higher.

However, you can also create your own CSS styles if you prefer (then you don't need to install Sphinx-Gallery). You can load your CSS files with html_css_files[161].

[159] https://github.com/spatialaudio/nbsphinx/issues/49
[160] https://sphinx-gallery.github.io/
[161] https://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_css_files

You can create *Thumbnail Galleries in reST Files* (page 59) and you can create galleries by adding the `"nbsphinx-gallery"` cell tag or metadata to notebooks, which is used just like the *"nbsphinx-toctree"* (page 54) cell tag/metadata.

For possible options, see the *toctree* (page 54) notebook.

Note

In LaTeX output this behaves just like `toctree`, i.e. no thumbnail gallery is shown, but the linked files are included in the document.

Like with `toctree` you should avoid adding content after a gallery (except other toctrees and galleries) because this content would appear in the LaTeX output *after* the content of all included source files, which is probably not what you want.

The following cell has the `"nbsphinx-gallery"` tag, which creates a thumbnail gallery. The *first* section title in that cell (if available) is used as `"caption"` (unless it's given in the metadata).

The notebooks in the following gallery describe different ways how to select which images are used as thumbnails.

The following section was generated from `doc/gallery/cell-tag.ipynb`

11.1 Using a Cell Tag to Select a Thumbnail

You can select any code cell (with appropriate output) by tagging it with the `nbsphinx-thumbnail` tag.

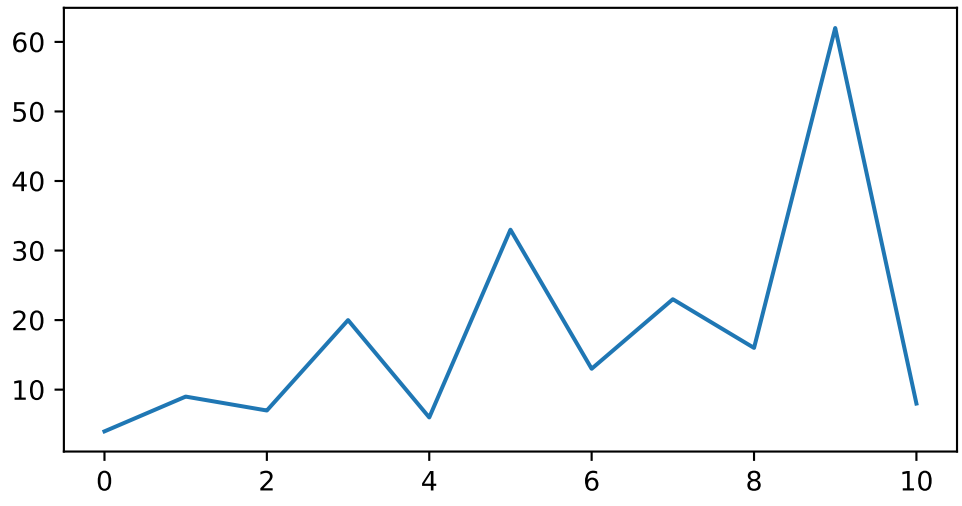
If there are multiple outputs in the selected cell, the last one is used. See *Choosing from Multiple Outputs* (page 52) for how to select a specific output. If you want to show a tooltip, have a look at *Using Cell Metadata to Select a Thumbnail* (page 51).

[1]:
```
import matplotlib.pyplot as plt
```

The following cell has the `nbsphinx-thumbnail` tag:

[2]:
```
fig, ax = plt.subplots(figsize=[6, 3])
ax.plot([4, 9, 7, 20, 6, 33, 13, 23, 16, 62, 8])
```

[2]:
```
[<matplotlib.lines.Line2D at 0x7f3ae2923a58>]
```



`doc/gallery/cell-tag.ipynb` ends here.

11.2 Using Cell Metadata to Select a Thumbnail

If the *nbsphinx-thumbnail* (page 50) cell tag is not enough, you can use cell metadata to specify more options.

The last cell in this notebook has this metadata:

```
{
    "nbsphinx-thumbnail": {
        "tooltip": "This tooltip message was defined in cell metadata"
    }
}
```

If there are multiple outputs in the selected cell, the last one is used. See *Choosing from Multiple Outputs* (page 52) for how to select a specific output.

[1]:
```
import matplotlib.pyplot as plt
import numpy as np
```

[2]:
```
plt.rcParams['image.cmap'] = 'coolwarm'
plt.rcParams['image.origin'] = 'lower'
```

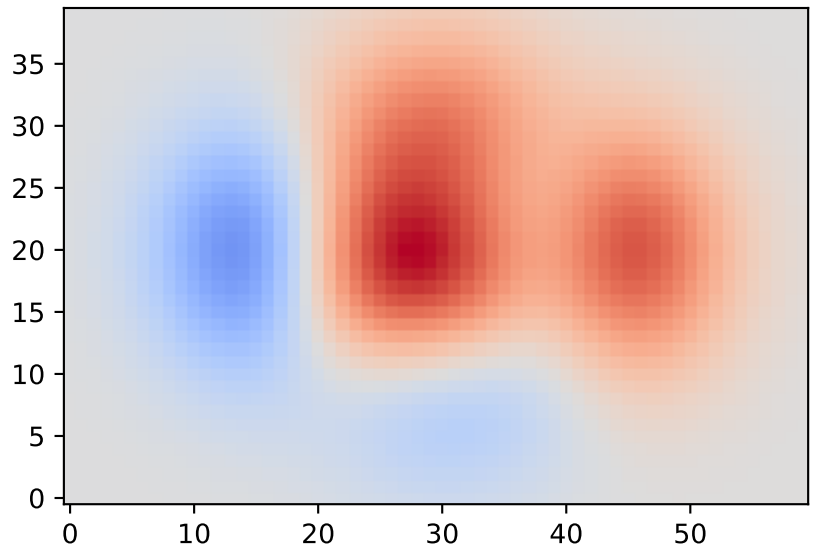
Some example data stolen from https://matplotlib.org/examples/pylab_examples/pcolor_demo.html:

[3]:
```
x, y = np.meshgrid(np.arange(-3, 3, 0.1), np.arange(-2, 2, 0.1))
z = (1 - x / 2 + x ** 5 + y ** 3) * np.exp(-x ** 2 - y ** 2)
```

[4]:
```
zmax = np.max(np.abs(z))
```

[5]:
```
fig, ax = plt.subplots(figsize=[5, 3.5])
ax.imshow(z, vmin=-zmax, vmax=zmax)
```

[5]:
```
<matplotlib.image.AxesImage at 0x7faf8eb27940>
```



11.3 Choosing from Multiple Outputs

By default, the last output of the selected cell is used as a thumbnail. If that's what you want, you can simply use the *nbsphinx-thumbnail* (page 50) cell tag.

If you want to specify one of multiple outputs, you can add a (zero-based) `"output-index"` to your `"nbsphinx-thumbnail"` cell metadata.

The following cell has this metadata, selecting the third output to be used as thumbnail in *the gallery* (page 49).

```
{
    "nbsphinx-thumbnail": {
        "output-index": 2
    }
}
```

[1]:
```
from IPython.display import Image

display(Image(url='https://jupyter.org/assets/nav_logo.svg'))
print('Hello!')
display(Image(filename='../images/notebook_icon.png'))
display(Image(url='https://www.python.org/static/img/python-logo-large.png', embed=True))
```

```
<IPython.core.display.Image object>
```

```
Hello!
```

The following section was generated from doc/gallery/no-thumbnail.ipynb

11.4 A Notebook without Thumbnail

This notebook doesn't contain any thumbnail metadata.

It should be displayed with the default thumbnail image in the *gallery* (page 49).

doc/gallery/no-thumbnail.ipynb ends here.

The following section was generated from doc/gallery/thumbnail-from-conf-py.ipynb

11.5 Specifying Thumbnails in `conf.py`

This notebook doesn't contain any thumbnail metadata.

But in the file conf.py, a thumbnail is specified (via the *nbsphinx_thumbnails* (page 13) option), which will be used in the *gallery* (page 49).

The keys in the `nbsphinx_thumbnails` dictionary can contain wildcards, which behave very similarly to the html_sidebars[162] option.

The thumbnail files can be local image files somewhere in the source directory, but you'll need to create at least one *link* (page 27) to them in order to copy them to the HTML output directory.

You can also use files from the `_static` directory (which contains all files in your html_static_path[163]).

If you want, you can also use files from the `_images` directory, which contains all notebook outputs.

To demonstrate this feature, we are creating an image file here:

[1]:
```
%matplotlib agg
```

[2]:
```
import matplotlib.pyplot as plt
```

[3]:
```
fig, ax = plt.subplots()
ax.plot([4, 8, 15, 16, 23, 42])
fig.savefig('a-local-file.png')
```

Please note that the previous cell doesn't have any outputs, but it has generated a file named `a-local-file.png` in the notebook's directory.

We have to create a link to this file (which is a good idea anyway): a-local-file.png.

Now we can use this file in our conf.py like this:

```
nbsphinx_thumbnails = {
    'gallery/thumbnail-from-conf-py': 'gallery/a-local-file.png',
}
```

Please note that the notebook name does *not* contain the `.ipynb` suffix.

doc/gallery/thumbnail-from-conf-py.ipynb ends here.

doc/subdir/gallery.ipynb ends here.

[162] https://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_sidebars

[163] https://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_static_path

12 Using toctree In A Notebook

In Sphinx-based documentation, there is typically a file called `index.rst` which contains one or more toctree[164] directives. Those can be used to pull in further source files (which themselves can contain further `toctree` directives).

With `nbsphinx` it is possible to get a similar effect within a Jupyter notebook using the `"nbsphinx-toctree"` cell tag or cell metadata. Markdown cells with `"nbsphinx-toctree"` tag/metadata are not converted like "normal" Markdown cells. Instead, they are only scanned for links to other notebooks (or `*.rst` files and other Sphinx source files) and those links are added to a `toctree` directive. External links can also be used, but they will not be visible in the LaTeX output.

If there is a section title in the selected cell, it is used as `toctree` caption (but it also works without a title).

Note

All other content of such a cell is *ignored*!

If you are satisfied with the default settings, you can simply use `"nbsphinx-toctree"` as a cell tag.

Alternatively, you can store `"nbsphinx-toctree"` cell metadata. Use ...

```
{
  "nbsphinx-toctree": {}
}
```

... for the default settings, ...

```
{
  "nbsphinx-toctree": {
    "maxdepth": 2
  }
}
```

... for setting the `:maxdepth:` option, or...

```
{
  "nbsphinx-toctree": {
    "hidden": true
  }
}
```

... for setting the `:hidden:` option.

Of course, multiple options can be used at the same time, e.g.

```
{
  "nbsphinx-toctree": {
    "maxdepth": 3,
    "numbered": true
  }
}
```

For more options, have a look a the Sphinx documentation[165]. All options can be used – except `:glob:`, which can only be used in *rst files* (page 56) and in *raw reST cells* (page 39).

[164] https://www.sphinx-doc.org/en/master/usage/restructuredtext/directives.html#directive-toctree
[165] https://www.sphinx-doc.org/en/master/usage/restructuredtext/directives.html#directive-toctree

Note

In HTML output, a `toctree` cell generates an in-line table of contents (containing links) at its position in the notebook, whereas in the LaTeX output, a new (sub-)section with the actual content is inserted at its position. All content below the `toctree` cell will appear after the table of contents/inserted section, respectively. If you want to use the LaTeX output, it is recommended that you don't add further cells below a `toctree` cell, otherwise their content may appear at unexpected places. Multiple `toctree` cells in a row should be fine, though.

The following cell is tagged with `"nbsphinx-toctree"` and contains a link to the notebook *yet-another.ipynb* (page 55) and an external link (which will only be visible in the HTML output). It also contains a section title which will be used as `toctree` caption (which also will only be visible in the HTML output).

The following section was generated from `doc/yet-another.ipynb`

12.1 Yet Another Notebook

This notebook is only here to show how (sub-)toctrees can be created with Markdown cell metadata. See *there* (page 54).

`doc/yet-another.ipynb` ends here.

`doc/subdir/toctree.ipynb` ends here.

The following section was generated from `doc/custom-css.ipynb`

13 Custom CSS

If you are not satisfied with the CSS styles provided by `nbsphinx` and by your Sphinx theme, don't worry, you can add your own styles easily.

13.1 For All Pages

Just create your own CSS file, e.g. `my-own-style.css`, and put it into the `_static/` sub-directory of your source directory.

You'll also have to set the config values html_static_path[166] and html_css_files[167] in your `conf.py`, e.g. like this:

```
html_static_path = ['_static']
html_css_files = ['my-own-style.css']
```

13.2 For All RST files

If you want your style to only apply to `*.rst` files (and not Jupyter notebooks or other source files), you can use rst_prolog[168] with the raw[169] directive in your `conf.py` like this:

```
rst_prolog = """
.. raw:: html
```

(continues on next page)

[166] https://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_static_path
[167] https://www.sphinx-doc.org/en/master/usage/configuration.html#confval-html_css_files
[168] https://www.sphinx-doc.org/en/master/usage/configuration.html#confval-rst_prolog
[169] https://docutils.sourceforge.io/docs/ref/rst/directives.html#raw-data-pass-through

(continued from previous page)

```
    <style>
        h1 {
            color: fuchsia;
        }
    </style>
"""
```

13.3 For All Notebooks

Similarly, if you want your style to only apply to notebooks, you can use *nbsphinx_prolog* (page 45) like this:

```
nbsphinx_prolog = """
.. raw:: html

    <style>
        h1 {
            color: chartreuse;
        }
    </style>
"""
```

13.4 For a Single Notebook

For styles that should affect only the current notebook, you can simply insert `<style>` tags into Markdown cells like this:

```
<style>
    .nbinput .prompt,
    .nboutput .prompt {
        display: none;
    }
</style>
```

This CSS example removes the input and output prompts from code cells, see the following cell:

[1]:
```
6 * 7
```

[1]:
```
42
```

doc/custom-css.ipynb ends here.

14 Normal reStructuredText Files

This is a normal RST file.

Note: Those still work!

14.1 Links to Notebooks (and Other Sphinx Source Files)

Links to Sphinx source files can be created like normal Sphinx hyperlinks[170], just using a relative path to the local file: *link* (page 48).

```
using a relative path to the local file: link_.

.. _link: subdir/a-notebook-in-a-subdir.ipynb
```

If the link text has a space (or some other strange character) in it, you have to surround it with backticks: *a notebook link* (page 48).

```
surround it with backticks: `a notebook link`_.

.. _a notebook link: subdir/a-notebook-in-a-subdir.ipynb
```

You can also use an anonymous hyperlink target[171], like this: *link* (page 48). If you have multiple of those, their order matters!

```
like this: link__.

__ subdir/a-notebook-in-a-subdir.ipynb
```

Finally, you can use Embedded URIs[172], like this *link* (page 48).

```
like this `link <subdir/a-notebook-in-a-subdir.ipynb>`_.
```

Note: These links should also work on Github and in other rendered reStructuredText pages.

Links to subsections are also possible by adding a hash sign (#) and the section title to any of the above-mentioned link variants. You have to replace spaces in the section titles by hyphens. For example, see this *subsection* (page 49).

```
For example, see this subsection_.

.. _subsection: subdir/a-notebook-in-a-subdir.ipynb#A-Sub-Section
```

14.2 Links to Notebooks, Ye Olde Way

In addition to the way shown above, you can also create links to notebooks (and other Sphinx source files) with :ref:[173]. This has some disadvantages:

- It is arguably a bit more clunky.
- Because `:ref:` is a Sphinx feature, the links don't work on Github and other rendered reStructuredText pages that use plain old `docutils`.

It also has one important advantage:

- The link text can automatically be taken from the actual section title.

A link with automatic title looks like this: *Notebooks in Sub-Directories* (page 48).

[170] https://www.sphinx-doc.org/en/master/usage/restructuredtext/basics.html#external-links
[171] http://docutils.sourceforge.net/docs/ref/rst/restructuredtext.html#anonymous-hyperlinks
[172] http://docutils.sourceforge.net/docs/ref/rst/restructuredtext.html#embedded-uris-and-aliases
[173] https://www.sphinx-doc.org/en/master/usage/restructuredtext/roles.html#role-ref

```
:ref:`/subdir/a-notebook-in-a-subdir.ipynb`
```

But you can also provide *your own link title* (page 48).

```
:ref:`your own link title </subdir/a-notebook-in-a-subdir.ipynb>`
```

However, if you want to use your own title, you are probably better off using the method described above in *Links to Notebooks (and Other Sphinx Source Files)* (page 57).

Links to subsections are also possible, e.g. *A Sub-Section* (page 49) (the subsection title is used as link text) and *alternative text* (page 49).

These links were created with:

```
:ref:`/subdir/a-notebook-in-a-subdir.ipynb#A-Sub-Section`
:ref:`alternative text </subdir/a-notebook-in-a-subdir.ipynb#A-Sub-Section>`
```

Note:

- The paths have to be relative to the top source directory and they have to start with a slash (/).
- Spaces in the section title have to be replaced by hyphens!

14.3 Sphinx Directives for Info/Warning Boxes

> Warning
>
> This is an experimental feature! Its usage may change in the future or it might disappear completely, so don't use it for now.

With a bit of luck, it will be possible (some time in the future) to create info/warning boxes in Markdown cells, see https://github.com/jupyter/notebook/issues/1292. If this ever happens, `nbsphinx` will provide directives for creating such boxes. For now, there are two directives available: `nbinfo` and `nbwarning`. This is how an info box looks like:

Note

This is an info box.

It may include nested formatting, even another info/warning box:

> **Warning:** You should probably not use nested boxes!

14.4 Domain Objects

`example_python_function`(*foo*)

This is just for testing domain object links. See *this section* (page 27).

Parameters `foo` (*str*) – Example string parameter

14.5 Citations

You could use standard Sphinx citations[174], but it might be more practical to use the sphinxcontrib.bibtex[175] extension.

If you install and enable this extension, you can create citations like [PGH11]:

```
:cite:`perez2011python`
```

You can create similar citations in Jupyter notebooks with a special HTML syntax, see the section about *citations in Markdown cells* (page 21).

For those citations to work, you also need to specify a BibTeX file, as explained in the next section.

14.6 References

After installing and *enabling* (page 9) the sphinxcontrib.bibtex[176] extension, you can create a list of references from a BibTeX file like this:

```
.. bibliography:: references.bib
```

Have a look at the documentation for all the available options.

The list of references may look something like this (in HTML output):

However, in the LaTeX/PDF output the list of references will not appear here, but at the end of the document. For a possible work-around, see https://github.com/mcmtroffaes/sphinxcontrib-bibtex/issues/156.

There is an alternative Sphinx extension for creating bibliographies: https://bitbucket.org/wnielson/sphinx-natbib/. However, this project seems to be abandoned (last commit in 2011).

14.7 Thumbnail Galleries

With `nbsphinx` you can create thumbnail galleries in notebook files as described in *Creating Thumbnail Galleries* (page 49).

If you like, you can also create such galleries in reST files using the `nbgallery` directive.

It takes the same parameters as the toctree[179] directive.

Note: The notes regarding LaTeX in *Creating Thumbnail Galleries* (page 49) and *Using toctree In A Notebook* (page 54) also apply here!

The following example gallery was created using:

[174] https://www.sphinx-doc.org/en/master/usage/restructuredtext/basics.html#citations
[175] https://sphinxcontrib-bibtex.readthedocs.io/
[176] https://sphinxcontrib-bibtex.readthedocs.io/
[179] https://www.sphinx-doc.org/en/master/usage/restructuredtext/directives.html#directive-toctree

```
.. nbgallery::
    :caption: This is a thumbnail gallery:
    :name: rst-gallery
    :glob:
    :reversed:

    gallery/*-rst
```

The following section was generated from doc/gallery/uno-rst.ipynb

14.7.1 Dummy Notebook 1 for Gallery

This is a dummy file just to fill *the gallery in the reST file* (page 59).

The thumbnail image is assigned in conf.py.

doc/gallery/uno-rst.ipynb ends here.

The following section was generated from doc/gallery/due-rst.pct.py

14.7.2 Dummy Notebook 2 for Gallery

This is a dummy file just to fill *the gallery in the reST file* (page 59).

The thumbnail image is assigned in conf.py.

The source file is, for no particular reason, a Python script adhering to the `py:percent` format. It is parsed with the help of Jupytext[180], see *Custom Notebook Formats* (page 47).

[1]:
```
from pathlib import Path
```

[2]:
```
filename = 'due-rst.pct.py'

print(Path(filename).read_text())
```

```
# %% [markdown]
# # Dummy Notebook 2 for Gallery
#
# This is a dummy file just to fill
# [the gallery in the reST file](../a-normal-rst-file.rst#thumbnail-galleries).
#
# The thumbnail image is assigned in [conf.py](../conf.py).

# %% [markdown]
# The source file is, for no particular reason,
# a Python script adhering to the `py:percent` format.
# It is parsed with the help of [Jupytext](https://jupytext.readthedocs.io/),
# see [Custom Notebook Formats](../custom-formats.ipynb).

# %%
from pathlib import Path

# %%
filename = 'due-rst.pct.py'

print(Path(filename).read_text())
```

doc/gallery/due-rst.pct.py ends here.

[180] https://jupytext.readthedocs.io/

15 External Links

nbconvert

The official conversion tool of the Jupyter project. It can be used to convert notebooks to HTML, LaTeX and many other formats.

Its `--execute` flag can be used to automatically execute notebooks before conversion.

https://nbconvert.readthedocs.io/

https://github.com/jupyter/nbconvert

RunNotebook (notebook_sphinxext.py)

Notebooks can be included in `*.rst` files with a custom `notebook` directive. Uses `nbconvert` to execute notebooks and to convert the result to HTML.

No LaTeX support.

https://github.com/ngoldbaum/RunNotebook

There are some forks:

- https://bitbucket.org/yt_analysis/yt-doc/src/default/extensions/notebook_sphinxext.py
- https://github.com/matthew-brett/perrin-academy/blob/master/sphinxext/notebook_sphinxext.py

nbsite

Build a tested, sphinx-based website from notebooks.

https://nbsite.pyviz.org/

ipypublish

A workflow for creating and editing publication ready scientific reports and presentations, from one or more Jupyter Notebooks, without leaving the browser!

https://ipypublish.readthedocs.io/

https://github.com/chrisjsewell/ipypublish

jupyterbook

Jupyter Book is an open source project for building beautiful, publication-quality books and documents from computational material.

https://jupyterbook.org/

https://github.com/executablebooks/jupyter-book

Previous tagline: "Create an online book with Jupyter Notebooks and Jekyll": https://legacy.jupyterbook.org/

MyST-NB

A collection of tools for working with Jupyter Notebooks in Sphinx.

The primary tool this package provides is a Sphinx parser for `ipynb` files. This allows you to directly convert Jupyter Notebooks into Sphinx documents. It relies heavily on the `MyST parser <https://github.com/ExecutableBookProject/myst_parser>`__.

https://myst-nb.readthedocs.io/

https://github.com/ExecutableBookProject/MyST-NB

nbinteract

Create interactive webpages from Jupyter Notebooks

https://www.nbinteract.com/

https://github.com/SamLau95/nbinteract

nb_pdf_template

An extended `nbconvert` template for LaTeX output.

https://github.com/t-makaro/nb_pdf_template

nb2plots

Notebook to reStructuredText converter which uses a modified version of the matplotlib `plot` directive.

https://github.com/matthew-brett/nb2plots

brole

A Sphinx role for IPython notebooks

https://github.com/matthew-brett/brole

Sphinx-Gallery

https://sphinx-gallery.readthedocs.io/

sphinx-nbexamples

https://sphinx-nbexamples.readthedocs.io/

https://github.com/Chilipp/sphinx-nbexamples

nbsphinx-link

https://github.com/vidartf/nbsphinx-link

Uses `nbsphinx`, but supports notebooks outside the Sphinx source directory.

See https://github.com/spatialaudio/nbsphinx/pull/33 for some limitations.

bookbook

Uses `nbconvert` to create a sequence of HTML or a concatenated LaTeX file from a sequence of notebooks.

https://github.com/takluyver/bookbook

jupyter-sphinx

Jupyter Sphinx is a Sphinx extension that executes embedded code in a Jupyter kernel, and embeds outputs of that code in the output document. It has support for rich output such as images, Latex math and even javascript widgets.

https://jupyter-sphinx.readthedocs.io/

https://github.com/jupyter/jupyter-sphinx

DocOnce

http://hplgit.github.io/doconce/doc/web/index.html

Converting Notebooks to reStructuredText

https://github.com/perrette/dimarray/blob/master/docs/scripts/nbconvert_to_rst.py

`https://gist.github.com/hadim/16e29b5848672e2e497c` (not available anymore)

https://sphinx-ipynb.readthedocs.io/

Converting reStructuredText to Notebooks

https://github.com/nthiery/rst-to-ipynb

https://github.com/QuantEcon/sphinxcontrib-jupyter

Converting Notebooks to HTML for Blog Posts

http://dongweiming.github.io/divingintoipynb_nikola/posts/nbconvert.html

https://github.com/getpelican/pelican-plugins/blob/master/liquid_tags/notebook.py

Further Posts and Issues

https://github.com/ipython/ipython/issues/4936

`https://mail.scipy.org/pipermail/ipython-user/2013-December/013490.html` (not available anymore)

`doc/links.ipynb` ends here.

16 Contributing

If you find bugs, errors, omissions or other things that need improvement, please create an issue or a pull request at http://github.com/spatialaudio/nbsphinx/. Contributions are always welcome!

16.1 Development Installation

Instead of pip-installing the latest release from PyPI[181], you should get the newest development version (a.k.a. "master") from Github[182]:

```
git clone https://github.com/spatialaudio/nbsphinx.git
cd nbsphinx
python3 -m pip install -e . --user
```

This way, your installation always stays up-to-date, even if you pull new changes from the Github repository. If you have only Python 3 installed, you might have to use the command `python` instead of `python3`. When installing `nbsphinx` this way, you can also quickly check other Git branches (in this example the branch is called "another-branch"):

```
git checkout another-branch
```

When you run Sphinx now, it automatically uses the version "another-branch" of `nbsphinx`. If you want to go back to the "master" branch, use:

```
git checkout master
```

To get the latest changes from Github, use:

```
git pull --ff-only
```

[181] https://pypi.org/project/nbsphinx/
[182] https://github.com/spatialaudio/nbsphinx/

16.2 Building the Documentation

If you make changes to the documentation, you should create the HTML pages locally using Sphinx and check if they look OK.

Initially, you might need to install a few packages that are needed to build the documentation:

```
python3 -m pip install -r doc/requirements.txt --user
```

To (re-)build the HTML files, use:

```
python3 setup.py build_sphinx
```

If you want to check the LaTeX output, use:

```
python3 setup.py build_sphinx -b latex
```

Again, you'll probably have to use `python` instead of `python3`. The generated files will be available in the directories `build/sphinx/html/` and `build/sphinx/latex/`, respectively.

16.3 Testing

Unfortunately, the currently available automated tests are very limited. Contributions to improve the testing situation are of course also welcome!

The `nbsphinx` documentation also serves as a test case. However, the resulting HTML/LaTeX/PDF files have to be inspected manually to check whether they look as expected.

Sphinx's warnings can help spot problems, therefore it is recommended to use the `-W` flag to turn Sphinx warnings into errors while testing:

```
python3 setup.py build_sphinx -W
```

This flag is also used for continuous integration on Travis-CI (see the file `.travis.yml`) and CircleCI (see the file `.circleci/config.yml`).

Sphinx has a `linkcheck` builder that can check whether all URLs used in the documentation are still valid. This is also part of the continuous integration setup on CircelCI.

17 Version History

Version 0.7.0 (2020-05-08):

- Warnings can be suppressed with `suppress_warnings`.
- `<img>` tags are handled in Markdown cells; the `alt`, `width`, `height` and `class` attributes are supported.
- CSS: prompts protrude into left margin if `nbsphinx_prompt_width` is too small. If you want to hide the prompts, use custom CSS[183].

Version 0.6.1 (2020-04-18):

- `.ipynb_checkpoints` is automatically added to `exclude_patterns`

Version 0.6.0 (2020-04-03):

- Thumbnail galleries (inspired by https://sphinx-gallery.github.io/)

[183] https://nbsphinx.readthedocs.io/en/0.7.0/custom-css.html

- `nbsphinx-toctree` as cell tag
- Keyword arguments in `nbsphinx_custom_formats`
- Python 2 support has been dropped

Version 0.5.1 (2020-01-28):

- This will be the last release supporting Python 2.x!
- Support for https://github.com/choldgraf/sphinx-copybutton
- Executed notebooks are now saved in the HTML output directory

Version 0.5.0 (2019-11-20):

- Automatic support for Jupyter widgets, customizable with `nbsphinx_widgets_path` (and `nbsphinx_widgets_options`)

Version 0.4.3 (2019-09-30):

- Add option `nbsphinx_requirejs_path` (and `nbsphinx_requirejs_options`)

Version 0.4.2 (2019-01-15):

- Re-establish Python 2 compatibility (but the clock is ticking . . .)

Version 0.4.1 (2018-12-16):

- Fix issue #266

Version 0.4.0 (2018-12-14):

- Support for "data-cite" HTML tags in Markdown cells
- Add option `nbsphinx_custom_formats`
- LaTeX macros `\nbsphinxstartnotebook` and `\nbsphinxstopnotebook`
- Support for cell attachments
- Add options `nbsphinx_input_prompt` and `nbsphinx_output_prompt`
- Re-design LaTeX output of code cells, fix image sizes

Version 0.3.5 (2018-09-10):

- Disable `nbconvert` version 5.4 to avoid issue #878[184]

Version 0.3.4 (2018-07-28):

- Fix issue #196 and other minor changes

Version 0.3.3 (2018-04-25):

- Locally linked files are only copied for Jupyter notebooks (and not anymore for other Sphinx source files)

Version 0.3.2 (2018-03-28):

- Links to local files are rewritten for all Sphinx source files (not only Jupyter notebooks)

Version 0.3.1 (2018-01-17):

- Enable notebook translations (NB: The use of reST strings is temporary!)

Version 0.3.0 (2018-01-02):

- Add options `nbsphinx_prolog` and `nbsphinx_epilog`
- Links from `*.rst` files to notebooks have to start with a slash

[184] https://github.com/jupyter/nbconvert/issues/878

Version 0.2.18 (2017-12-03):

- Fix issue #148

Version 0.2.17 (2017-11-12):

- Fix issue #146

Version 0.2.16 (2017-11-07):

- Fix issue #142

Version 0.2.15 (2017-11-03):

- Links to subsections are now possible in all source files

Version 0.2.14 (2017-06-09):

- Add option `nbsphinx_kernel_name`

Version 0.2.13 (2017-01-25):

- Minor fixes

Version 0.2.12 (2016-12-19):

- Basic support for widgets
- CSS is now "responsive", some new CSS classes

Version 0.2.11 (2016-11-19):

- Minor fixes

Version 0.2.10 (2016-10-16):

- Enable JavaScript output cells

Version 0.2.9 (2016-07-26):

- Add option `nbsphinx_prompt_width`

Version 0.2.8 (2016-05-20):

- Add options `nbsphinx_execute` and `nbsphinx_execute_arguments`
- Separate "display priority" for HTML and LaTeX

Version 0.2.7 (2016-05-04):

- Special CSS tuning for `sphinx_rtd_theme`
- Replace info/warning `<div>` elements with `nbinfo/nbwarning`

Version 0.2.6 (2016-04-12):

- Support for LaTeX math environments in Markdown cells
- Add options `nbsphinx_timeout` and `nbsphinx_codecell_lexer`

Version 0.2.5 (2016-03-15):

- Add option `nbsphinx_allow_errors` to globally ignore exceptions
- Separate class *nbsphinx.Exporter*

Version 0.2.4 (2016-02-12):

- Support for "nbsphinx-toctree" cell metadata

Version 0.2.3 (2016-01-22):

- Links from notebooks to local files can now be used

Version 0.2.2 (2016-01-06):

- Support for links to sub-sections in other notebooks

Version 0.2.1 (2016-01-04):

- No need to mention `source_suffix` and `source_parsers` in `conf.py`

Version 0.2.0 (2015-12-27):

- Add support for `allow_errors` and `hidden` metadata
- Add custom reST template
- Add nbinput and nboutput directives with HTML+CSS and LaTeX formatting
- Turn nbsphinx into a Sphinx extension

Version 0.1.0 (2015-11-29): Initial release

References

[KRKP+16] Thomas Kluyver, Benjamin Ragan-Kelley, Fernando Pérez, Brian Granger, Matthias Bussonnier, Jonathan Frederic, Kyle Kelley, Jessica Hamrick, Jason Grout, Sylvain Corlay, Paul Ivanov, Damián Avila, Safia Abdalla, Carol Willing, and Jupyter Development Team. Jupyter Notebooks—a publishing format for reproducible computational workflows. In Fernando Loizides and Birgit Schmidt, editors, *Positioning and Power in Academic Publishing: Players, Agents and Agendas*, pages 87–90. IOS Press, 2016. doi:10.3233/978-1-61499-649-1-87[177].

[PGH11] Fernando Pérez, Brian E. Granger, and John D. Hunter. Python: an ecosystem for scientific computing. *Computing in Science Engineering*, 13(2):13–21, 2011. doi:10.1109/MCSE.2010.119[178].

[177] https://doi.org/10.3233/978-1-61499-649-1-87
[178] https://doi.org/10.1109/MCSE.2010.119