

documentation building

$\gamma\pi$ notebooks

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*Gammapy Coding Sprint
23rd – 27th November 2020*

notebooks for developers

live with the code

git  gammapy / gammapy

.github
dev
docs
examples
gammapy
licenses
.codacy.yml
.gitignore
.travis.yml
CHANGES.rst
LONG_DESCRIPTION.rst
MANIFEST.in
Makefile
README.rst
azure-pipelines.yml
environment-dev.yml
lgtm.yml
notebooks.yaml
pyproject.toml
setup.cfg
setup.py

_static
_templates/autosummary
analysis
astro
catalog
data
datasets
development
estimators
install
irf
makers
maps
modeling
overview
scripts
stats
tutorials
utils
visualization
Makefile
changelog.rst
conf.py
getting-started.rst
howto.rst
index.rst
make.bat
nitpick-exceptions
overview.rst
references.rst
references.txt

images
analysis_1.ipynb
analysis_2.ipynb
analysis_3d.ipynb
analysis_mwl.ipynb
astro_dark_matter.ipynb
background_model.ipynb
catalog.ipynb
cta.ipynb
cta_data_analysis.ipynb
cta_sensitivity.ipynb
detect.ipynb
event_sampling.ipynb
exclusion_mask.ipynb
extended_source_spectral_analysis.ip...
fermi_lat.ipynb
hess.ipynb
index.rst
light_curve.ipynb
light_curve_flare.ipynb
light_curve_simulation.ipynb
maps.ipynb
mcmc_sampling.ipynb
modeling.ipynb
modeling_2D.ipynb
models.ipynb
overview.ipynb
pulsar_analysis.ipynb
ring_background.ipynb
sed_fitting.ipynb
simulate_3d.ipynb
spectrum_analysis.ipynb
spectrum_simulation.ipynb
survey_map.rst

...but they may be anywhere else !!

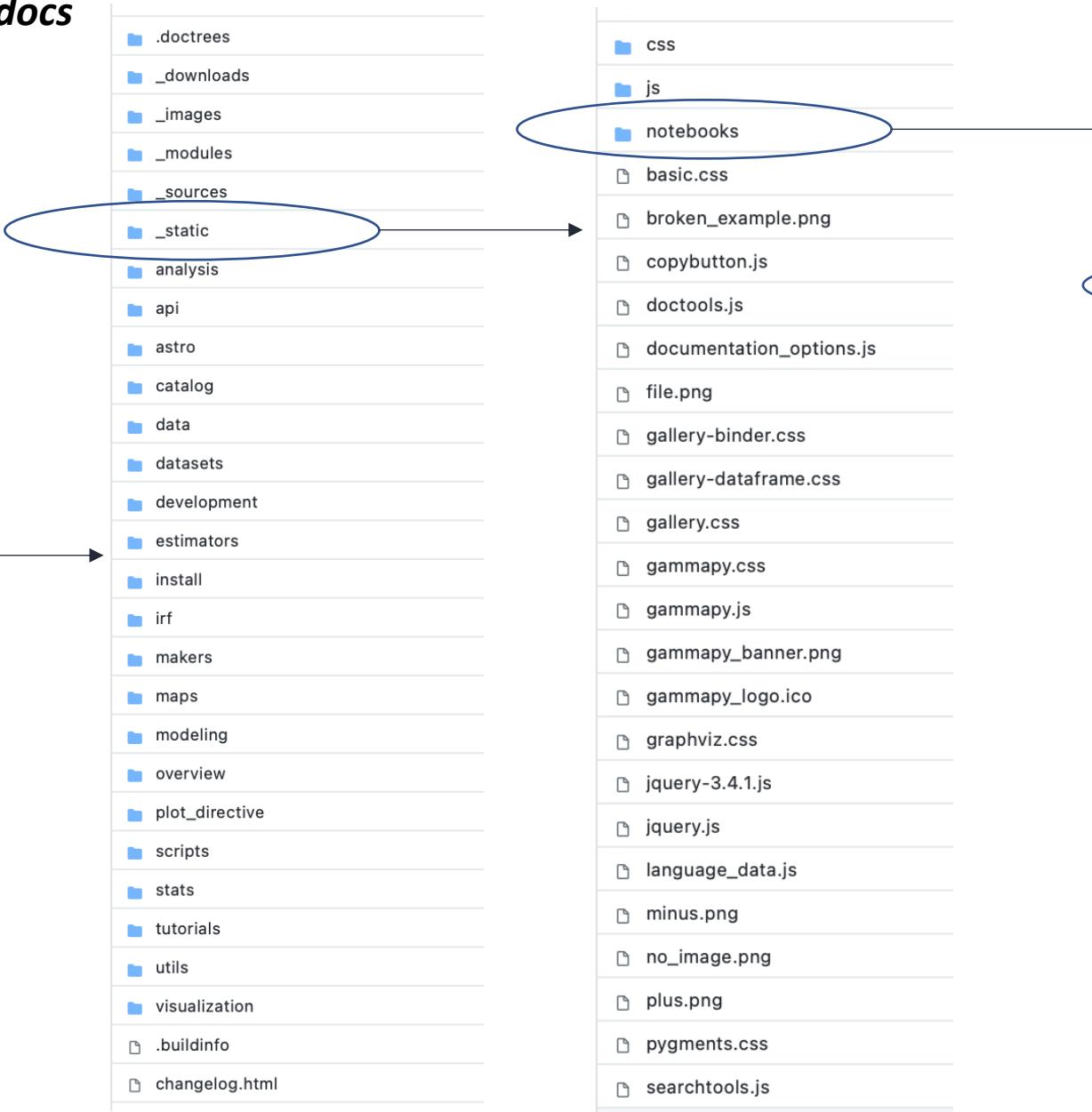
DC1_3d.png
gammapy_maps.png
gammapy_mcmc.png

notebooks for users

live with the versioned built docs

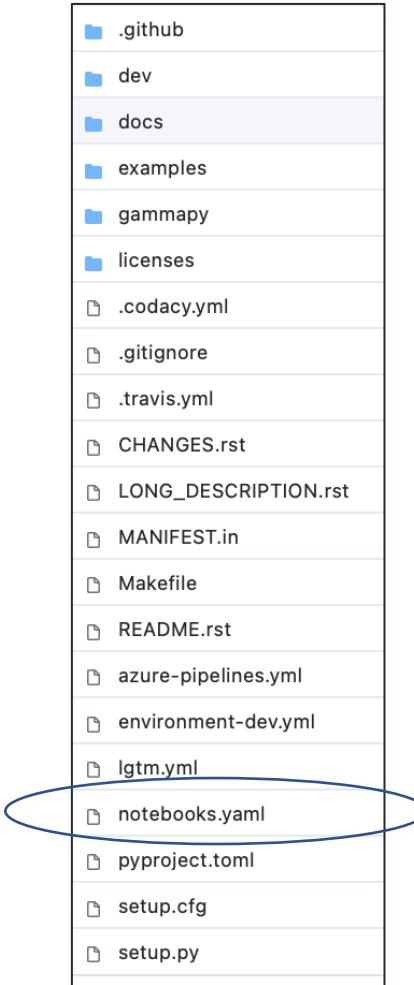
gammify / gammify-docs

0.10
0.11
0.12
0.13
0.14
0.15
0.16
0.17
0.18.1
0.18.2
0.18
0.6
0.7
0.8
0.9
dev
stable
.nojekyll
404.html
CNAME
index.html
style.css



images
analysis_1.ipynb
analysis_1.py
analysis_2.ipynb
analysis_2.py
analysis_3.ipynb
analysis_3d.py
analysis_mwl.ipynb
analysis_mwl.py
astro_dark_matter.ipynb
astro_dark_matter.py
background_model.ipynb
background_model.py
catalog.ipynb
catalog.py
cta.ipynb
cta.py
cta_data_analysis.ipynb
cta_data_analysis.py
cta_sensitivity.ipynb
cta_sensitivity.py
detect.ipynb
detect.py
event_sampling.ipynb
event_sampling.py
exclusion_mask.ipynb
exclusion_mask.py

the notebooks.yaml index file is not a tutorials.yaml file



```
1 # This is a list of available notebooks.
2 # It's used for automatic testing and downloading of datasets notebooks.
3 # Dataset ebl declared in overview notebook is used in some Sphinx docs examples.
4 # Names of notebooks should be unique. Let's keep it alphabetical.
5 - name: analysis_1
6   url: https://raw.githubusercontent.com/gammipy/gammipy/master/docs/tutorials/analysis_1.ipynb
7   datasets:
8     - hess-dl3-dr1
9     tutorial: True
10  - name: analysis_2
11    url: https://raw.githubusercontent.com/gammipy/gammipy/master/docs/tutorials/analysis_2.ipynb
12    datasets:
13      - hess-dl3-dr1
14      tutorial: True
15    - name: analysis_3d
16      url: https://raw.githubusercontent.com/gammipy/gammipy/master/docs/tutorials/analysis_3d.ipynb
17      datasets:
18        - cta-1dc
19        - fermi-3fhl-gc
20      images:
21        - DC1_3d
22      tutorial: True
23    - name: analysis_mwl
24      url: https://raw.githubusercontent.com/gammipy/gammipy/master/docs/tutorials/analysis_mwl.ipynb
25      datasets:
26        - crab-3datasets
27      tutorial: True
28    - name: astro_dark_matter
29      url: https://raw.githubusercontent.com/gammipy/gammipy/master/docs/tutorials/astro_dark_matter.ipynb
30      datasets:
31        - dark_matter_spectra
32      tutorial: True
33    - name: catalog
34      url: https://raw.githubusercontent.com/gammipy/gammipy/master/docs/tutorials/catalog.ipynb
35      datasets:
```

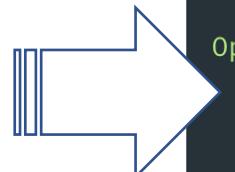
- *31 notebooks declared*
- *the content of this file is edited manually*

the notebooks.yaml index file is not a tutorials.yaml file

```
15 - name: analysis_3d  
16   url: https://raw.githubusercontent.com/gammapy/gammapy/master/docs/tutorials/analysis_3d.ipynb  
17   datasets:  
18     - cta-1dc  
19     - fermi-3fhl-gc  
20   images:  
21     - DC1_3d  
22   tutorial: True ← included when gammapy download tutorials  
  
80 - name: fermi_lat  
81   url: https://raw.githubusercontent.com/gammapy/gammapy/master/docs/tutorials/fermi_lat.ipynb  
82   requires: healpy  
83   datasets:  
84     - fermi_3fhl  
85     - fermi-3fhl-gc  
86   tutorial: True
```

may be skipped when tested with **make test-nb**

- ***notebook***
- ***datasets***
- ***images***



download notebook files

```
● ● ●  
$ gammapy download notebooks --help  
Usage: gammapy download notebooks [OPTIONS]  
  
Download notebooks
```

```
● ● ●  
$ gammapy download tutorials --help  
Usage: gammapy download tutorials [OPTIONS]  
  
Download notebooks, scripts and datasets  
  
Options:  
  --src TEXT      Specific tutorial to download.  
  --out TEXT      Path where notebooks and datasets folders will be copied.  
                  [default: gammapy-tutorials]  
  
  --release TEXT  Number of release - ex: 0.12  
  -h, --help       Show this message and exit.
```

files will be copied.

tutorials

the not versioned datasets folders

```
15 - name: analysis_3d
16 url: https://raw.githubusercontent.com/gammapy/gammapy/master/docs/tutorials/analysis_3d.ipynb
17 datasets:
18   - cta-1dc
19   - fermi-3fhl-gc
20 images:
21   - DC1_3d
22 tutorial: True
```

The screenshot shows a GitHub repository page for 'gammapy / gammapy-data'. The repository has 1 branch and 0 tags. The 'Code' tab is selected. A list of files and their descriptions is shown:

File	Description	Last Commit
catalogs	upload datasets	8 months ago
cta-1dc	upload datasets	8 months ago
dark_matter_spectra	upload datasets	8 months ago
ebl	upload datasets	8 months ago
fermi-3fhl-crab	Introduce BackgroundIRFModel	26 days ago
fermi-3fhl-gc	upload datasets	8 months ago
fermi_3fhl	upload datasets	8 months ago
figures	upload datasets	8 months ago
hawc_crab	upload datasets	8 months ago
hess-dl3-dr1	upload datasets	8 months ago
joint-crab/spectra	upload datasets	8 months ago
tests	Merge pull request #5 from AtreyeeS/bkg_ex	25 days ago
README.md	update README.md	8 months ago

*the **versioned** list of folders within the dataset pack*

master ➔ **gammapy / dev / datasets /**

adonath Update dataset index

..

README.rst

gammapy-data-index.json →

make_dataset_index.py

```
{  
    "name": "joint-crab",  
    "description": "tbd",  
    "files": [  
        {  
            "path": "joint-crab/spectra/hess/arf_obs23523.fits",  
            "url": "https://github.com/open-gamma-ray-astro/joint-crab/raw/master/results/spectra/hess/arf_obs23523.fits",  
            "filesize": 8640,  
            "hashmd5": "26ed95b824b56ee4631b9063b2316b7a"  
        },  
        {  
            "path": "joint-crab/spectra/hess/arf_obs23559.fits",  
            "url": "https://github.com/open-gamma-ray-astro/joint-crab/raw/master/results/spectra/hess/arf_obs23559.fits",  
            "filesize": 8640,  
            "hashmd5": "cf7087a9f7cac11767036501bc6d43de"  
        },  
    ]  
}
```

- *the gammapy-data-index.json is a list of **datasets** folders*
- *a dataset folder contains a list of **data files***
- *the list of datasets folders may be different for every release*
- *A specific dataset for a specific release may be downloaded*
- *the data files are not versioned*

- *the content of the gammapy-data-index.json is declared and generated with make_dataset_index.py*

```
gammapy download datasets --help  
Usage: gammapy download datasets [OPTIONS]  
  
Download datasets  
  
Options:  
  --src TEXT      Specific dataset to download.  
  --out TEXT      Destination folder. [default: gammapy-datasets]  
  --release TEXT  Number of release - ex: 0.12  
  -h, --help       Show this message and exit.
```

*last but not least: we do also have an index to download **versioned scripts***



master ➔ **gammapy / examples /**

adonath Make polish

..

models

README.rst

example_2_gauss.py

scripts.yaml

survey_map.py

12 lines (11 sloc) | 421 Bytes

```
1 # This is a list of available example scripts.
2 # It's used for downloading of scripts with gammapy download.
3 # Let's keep it alphabetical.
4 - name: example_2_gauss
5   url: https://raw.githubusercontent.com/gammapy/gammapy/v0.18.2/examples/example_2_gauss.py
6   datasets:
7     - cta-1dc
8 - name: survey_map
9   url: https://raw.githubusercontent.com/gammapy/gammapy/v0.18.2/examples/survey_map.py
10  datasets:
11    - hess-dl3-dr1
12
```

- *a specific script for a specific release may be downloaded*
- *the content of the scripts.yaml is edited manually*

```
$ gammapy download scripts --help
Usage: gammapy download scripts [OPTIONS]

Download scripts

Options:
  --src TEXT      Specific script to download.
  --out TEXT      Path where the versioned python scripts will be copied.
                  [default: gammapy-scripts]

  --release TEXT  Number of release - ex: 0.12
  --silent
  -h, --help       Show this message and exit.
```

the release publishing *manual* process

1. Update the dataset index file by running `make dataset-index` and copy it over to `gammapy-0.14-data-index.json` in the webpage repo.
2. Copy over `notebooks.yaml` to `gammapy-0.14-tutorials.yml` and adapt the links contained in the file to point to https://docs.gammapy.org/0.14/_static/notebooks.
3. Copy the script index file from the last release to `gammapy-0.14-scripts.yml` and add new examples by hand if needed.
4. Copy the environment file from the last release to `gammapy-0.14-environment.yml` and adapt dependency versions as required.
5. Mention release on the front page and on the news page of the Gammapy webpage (update `index.html` and `news.html` in the [gammapy webpage repo](#)).
6. Update the version number in `docs/install/index.rst`
7. Follow the instructions how to release an Astropy affiliated package [here](#).
8. Checkout the git tag v0.14 and build the release documentation and publish it in `gammapy-docs` [Github repository](#) Adapt `stable/index.html` to point to v0.14 in the gammapy docs repo.
9. Update the Gammapy conda-forge package at <https://github.com/conda-forge/gammapy-feedstock>
10. Encourage the Gammapy developers to try out the new stable version (update and run tests) via the Github issue for the release and wait a day or two for feedback.

Update version number in Binder `Dockerfile` in [gammapy webpage repo](#) master branch and tag the release for Binder.

1

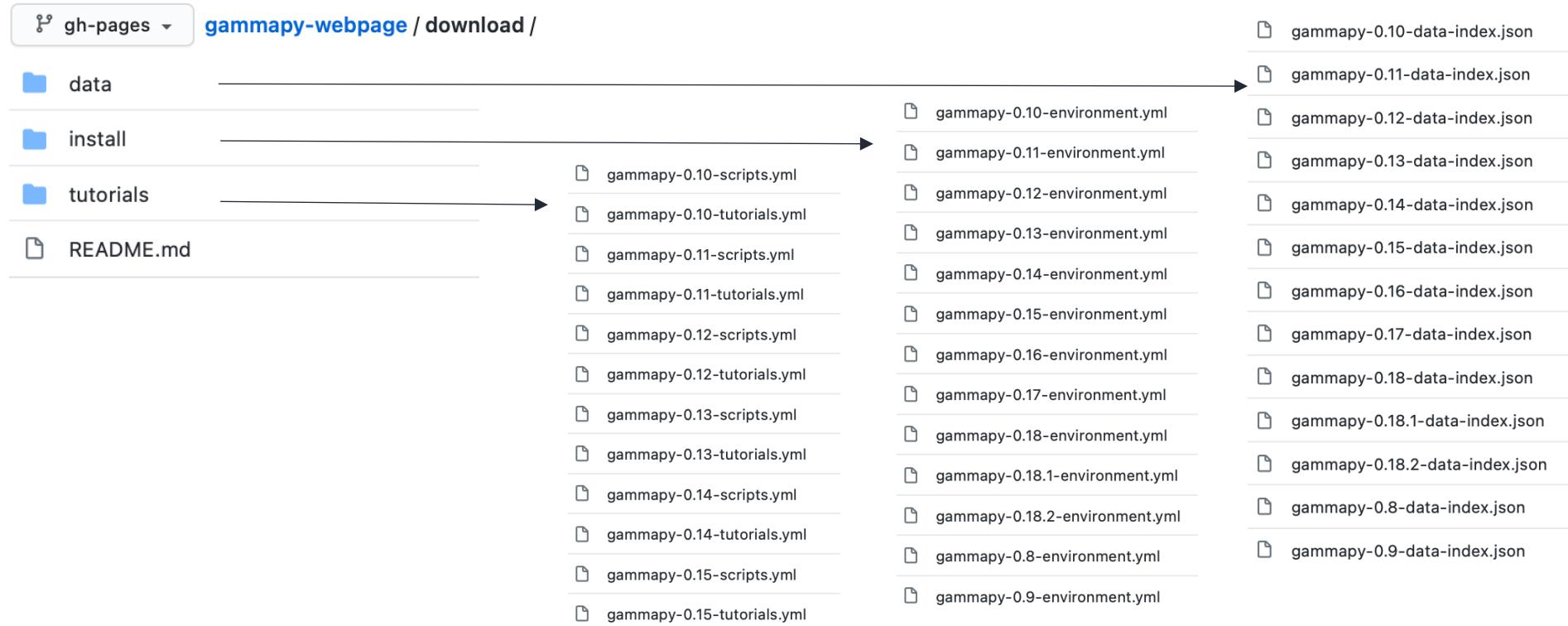
2

3

the release publishing *manual* process

<https://docs.gammapy.org/0.18.2/development/release.html>

1. Update the dataset index file by running `make dataset-index` and copy it over to `gammapy-0.14-data-index.json` in the webpage repo.
2. Copy over `notebooks.yaml` to `gammapy-0.14-tutorials.yml` and adapt the links contained in the file to point to https://docs.gammapy.org/0.14/_static/notebooks.
3. Copy the script index file from the last release to `gammapy-0.14-scripts.yml` and add new examples by hand if needed.



the doc building automated process

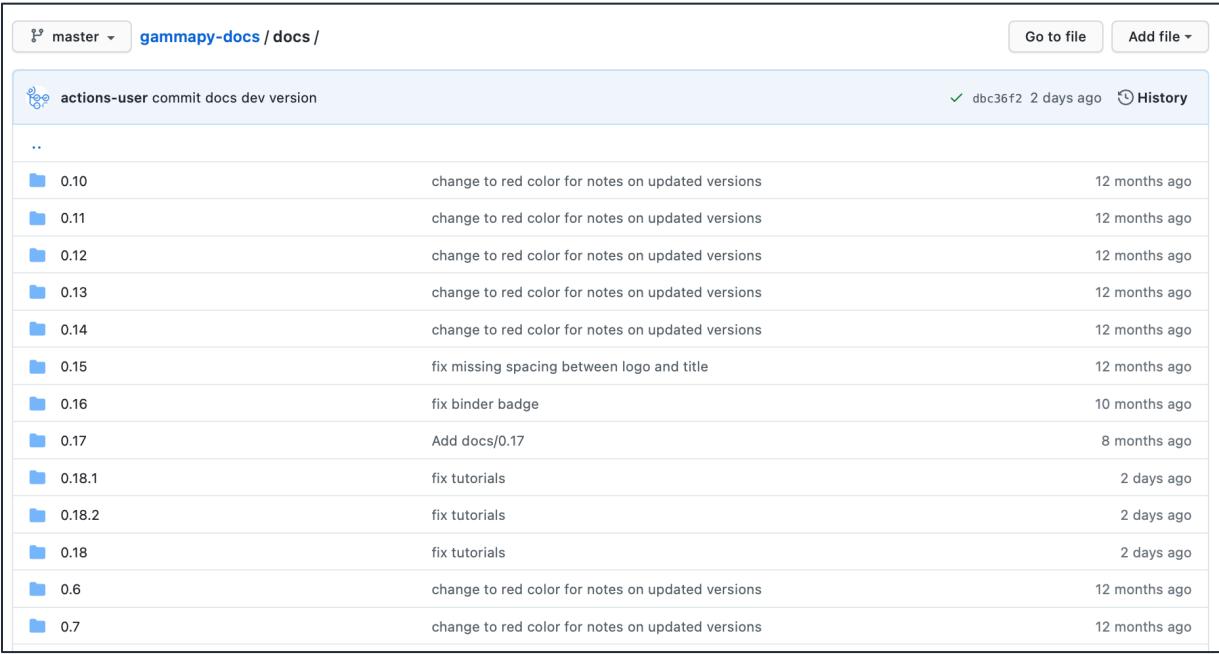
Building the `/dev` documentation is a matter of a click in Github actions interface

The screenshot shows the GitHub Actions interface for the repository `gammapy/gammapy-docs`. The `Actions` tab is selected, indicated by a blue oval. A search bar at the top right contains the query `workflow:building`. Below the search bar, there are 21 results for the `building` workflow. The first result is a green checkmark next to the word `building`, followed by the text `building #21: Manually run by Bultako`. To the right of this item is a dropdown menu titled `Use workflow from` with the option `Branch: master` selected. Below this is a green `Run workflow` button. The second result is a red X next to the word `building`, followed by the text `building #20: Manually run by Bultako`. To its right is another green `Run workflow` button. The third result is a green checkmark next to the word `building`, followed by the text `building #19: Manually run by adonath`. To its right is a timestamp `4 days ago` and a duration `24m 44s`. At the bottom right of the results area is a blue oval around the `Run workflow` button for the third result. The entire screenshot is framed by a large blue oval.

*the doc building **manual** process – versioned and executable docs*

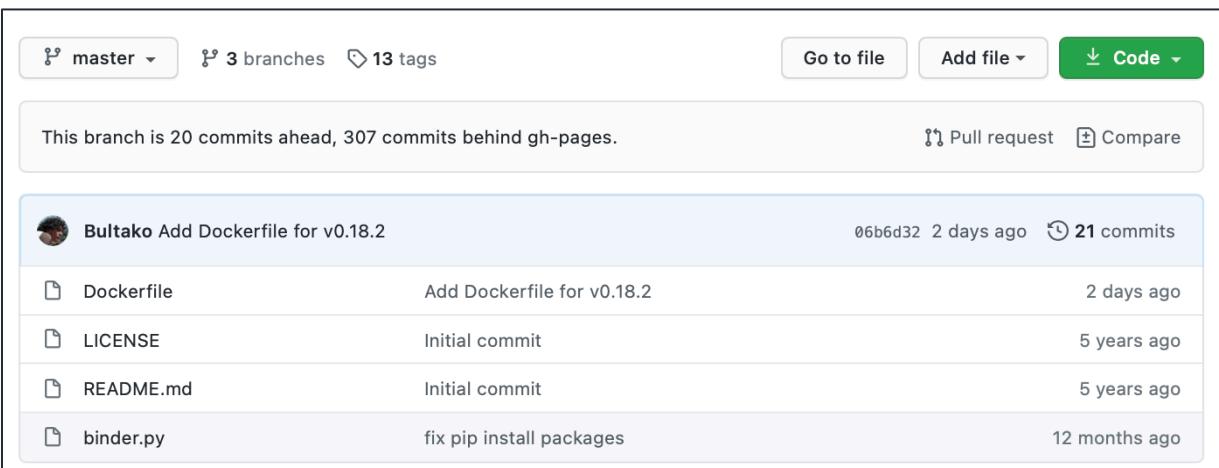
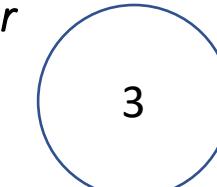
2

Building the /release documentation



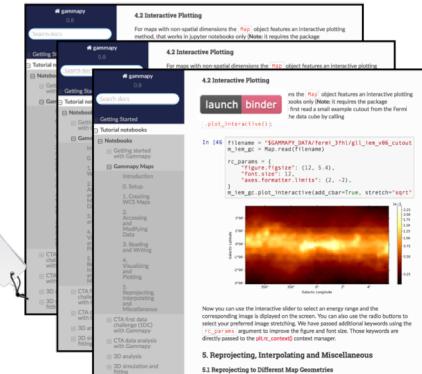
versioned

- *tag release in [gammapy](#) repository*
 - *go to [gammapy / gammapy-docs](#)*
 - *build the dev version with github actions interface*
 - *duplicate the dev folder and rename it after release number*
 - *edit index.html file to redirect to last release folder*



executable launch binder

- *go to master branch in  [gammappy](#) / [gammappy-webpage](#)*
 - *edit Dockerfile to install last release in binder*
 - *tag the repository after the release number*
 - *launch binder and check everything works*



rebuilding and old version

- *git checkout to version tag*
 - *build docs locally with make docs-all*

docs and notebooks processing commands

build documentation processing the notebooks

make docs-all

- *nbs* *bool* *process notebooks (default True)*
- *src* *string* *path to process notebooks (default "")*
- *fmt* *bool* *black code-style (default False)*

clean notebooks

make clean-nb

- *code style with black app and strip the output cells*
- *notebooks are stored with outputs cells stripped to ease code review in diffs*

test notebooks

make test-nb

- *run notebooks if requirements are satisfied*
- *provide clean error tracebacks*

test scripts

make test-scripts

- *execute scripts collection sequentially*

build documentation processing only rst files

make docs-sphinx

display built documentation

make docs-show

notebooks processing needs the notebooks.yaml file

internals mechanisms in docs building with notebooks processing – make docs-all

```
docs-all:  
    python -m gammappy.utils.notebooks_process --src="$(src)" --nbs="$(nbs)" --fmt="$(fmt)"  
    cd docs && python -m sphinx . _build/html -b html  
    python -m gammappy.utils.notebooks_links --src="$(src)" --nbs="$(nbs)"
```

gammappy.utils.notebooks_process.py

- *read the list in notebooks.yaml file*
- *clean the notebooks - code style with black app and strip the output cells*
- *convert cleaned notebooks into .py scripts version*
- *copy cleaned empty notebooks and .py scripts into downloadable path docs/_static/notebooks*
- *execute notebooks in source docs path to produce filled notebooks with outputs*
- *add upper box with right version links to binder and downloadable files*

sphinx . _build/html -b html

- *build the html documentation in docs/_build/html*
- *processing the .rst files with sphinx*
- *processing the filled notebooks with nbsphinx*

internals mechanisms in docs building with notebooks processing – make docs-all

```
docs-all:  
  python -m gammappy.utils.notebooks_process --src="$(src)" --nbs="$(nbs)" --fmt="$(fmt)"  
  cd docs && python -m sphinx . _build/html -b html  
  python -m gammappy.utils.notebooks_links --src="$(src)" --nbs="$(nbs)"
```

gammappy.utils.notebooks_links

- convert API syntax labels into relative links into the generated API docs
- convert urls in absolute links found in nbs and pointing to the /dev docs website into its release url
- convert urls in absolute links found in html and pointing to the /dev docs into relative links
- check broken links in notebooks and raise warnings

★ bring back cleaned notebooks from downloadable path into source docs path

consistent syntax to make links to documentation **within MD cells of notebooks**

- to notebooks: [Maps in first steps with Gammappy](first_steps.ipynb#Maps)
- to RST doc files: [Help](../getting-started.rst#help)
- to API ref docs:

- `~gammappy.maps`
- `~gammappy.maps.G geom`
- `~gammappy.maps.G geom.is_image`
- `~gammappy.maps.G geom.is_image()`

notebooks review process

- notebooks are stored empty / without outputs cells to ease code review in diffs
- you may also use ReviewNB

The screenshot shows a GitHub pull request interface for a Jupyter Notebook. At the top, a comment from the bot "review-notebook-app" encourages checking out the pull request on ReviewNB. Below this, there are tabs for "DISCUSSION" (3), "COMMITS" (2), and "CHANGES" (4), with "CHANGES" being the active tab. The changes are displayed in a tree view, allowing users to expand and collapse sections. The notebook file shown is "docs/tutorials/cta_data_analysis.ipynb". The changes are as follows:

- Line 1:** `1 %%time` (unchanged)
- Line 2:** `2 images_ts = ts_image_estimator.run(stacked)` (unchanged)
- Line 3:** `1 sources = find_peaks(` (new line)
- Line 4:** `2 images_ts["sqrt_ts"].get_image_by_idx(0,))` (highlighted in red)
- Line 5:** `3 threshold=5,` (highlighted in green)
- Line 6:** `4 min_distance="0.2 deg",` (highlighted in pink)
- Line 7:** `5)` (new line)
- Line 8:** `6 sources` (new line)
- Line 9:** `1 source_pos = SkyCoord(sources["ra"], sources["dec"])` (new line)
- Line 10:** `2 source_pos` (new line)

versioned executable user documentation

<https://github.com/gammify/adass2018-gammify-poster>

```
gammify jupyter run  
gammify jupyter test  
gammify jupyter strip
```

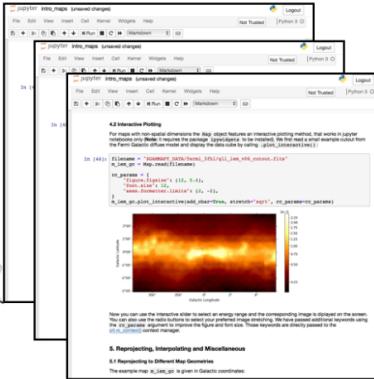


Travis CI



Datasets
Lookup files

The Jupyter logo consists of three orange dots arranged in a circle.



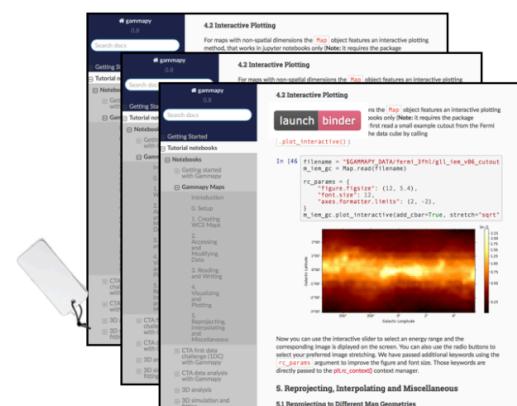
make docs



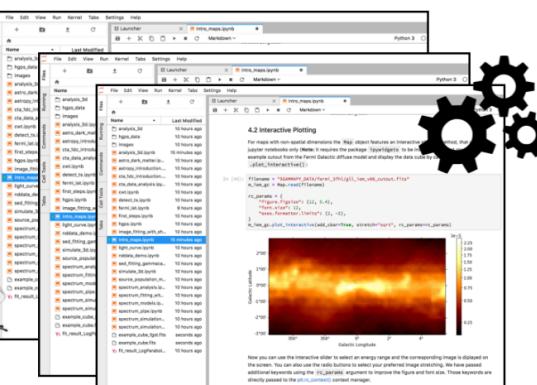
gammify download



```
gammify-tutorials  
datasets  
gammify-0.7-environment.yml  
gammify-0.8-environment.yml  
gammify-0.9.dev7598-environment.yml  
notebooks-0.7  
notebooks-0.8  
notebooks-0.9.dev7598
```



launch binder



$\gamma\pi$ notebooks - now

- ✓ may be *placed anywhere* in the docs folder structure
- ✓ may be part of a tutorial *triplet* (notebook, dataset, image)
- ✓ may be *downloaded individually as tutorial* and also as a file
- ✓ may be *tested* and skipped if required libraries are missing
- ✓ provide clear error *tracebacks* when tested
- ✓ versioned release *links to binder* and downloadable files are created during doc built-in
- ✓ versioned release *links to API docs* are created from API short syntax during doc built-in
- ✓ absolute links to dev docs website are translated into relative links in the html files
- ✓ absolute links to docs website are translated into versioned release links in nbs
- ✓ are output *stripped* to ease code review when diffing
- ✓ may be *styled code formatted* with black

$\gamma\pi$ notebooks - improvements

- ✓ *simplify the release process*
 - remove versioned index files for scripts, notebooks, tutorials and datasets
 - `scripts.yaml`
 - `notebooks.yaml`
 - `gammapy-data-index.json`
 - remove binder links?
 - simplify/speed notebooks execution
 - tests takes more than 15min, while the whole docs building process takes a bit more than 20min.
- ✓ *storage*
 - use [jupytext](#) paired filled notebooks and .md files instead of empty notebooks?
 - [nbsphinx](#) allows to build html notebooks stored in .md format
 - still some processing needed (tests, links conversion, upper box)
 - developers working methodology changes
- ✓ *display and layout*
 - display notebooks collection in a gallery view
- ✓ *user contribution*
 - provide an easy way for users to contribute with their own notebooks
 - <https://github.com/Bultako/tutorials>
 - <https://www.iaa.csic.es/~jer/recipes>