Jupman

A template manager for online books made with Jupyter notebooks and NBSphinx doc generator

People That Write a Lot

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About

A template for online books made with Jupyter[1] notebooks and NBSphinx[2] doc generator.

Features:

- inherits generation of static websites from NBSphinx[3], with search, PDF, EPUB
- builds with ReadTheDocs, Github Actions[4], or local Docker emulating ReadTheDocs
- exercises generation from solution templates (both .ipynb and .py)
- chapter zips
- code sharing among chapters (so students don't need to install dependencies)
- Python Tutor integration (offline, doesn't need dependencies)
- supports hundreds pages and deep nesting
- decent PDF layout
- basic exam management
- comes with *documentation* and tests[5]
- requires Python 3.7+
- Apache License v2.0, open source code on Github[6]

Currently lacking:

- generated PDF always displays solutions
- Python Tutor doesn't work in JupyterLab
- more testing, especially for EPUB support and exam management

Used by:

- SoftPython book (english)[7]
- SoftPython book (italian)[8]
- Scientific Programming Lab at University of Trento, Data Science Master[9] (english)

[1] http://jupyter.org
[2] http://nbsphinx.readthedocs.io/
[3] http://nbsphinx.readthedocs.io/
[4] https://github.com/DavidLeoni/readthedocs-to-actions
[5] https://github.com/DavidLeoni/jupman/tree/master/_test
[6] https://github.com/DavidLeoni/jupman
[7] https://en.softpython.org/
[8] https://it.softpython.org/
[9] https://sciprog.davidleoni.it/

Preface

This book is the result of ... We thank this and that ...

Revisions

- **16 October 2020**: Released v3.2
- **16 January 2020**: Released v3.1
- **29 December 2019**: Released v3.0
- **24 September 2018**: Released v2.0
- **3 August 2018**: Released v0.8
- *Change log*

CHAPTER

ONE

OVERVIEW

1.1 Contents

1. *JUPMAN USAGE*
2. Chapter examples
    1. *Python example*
    2. *Jupyter example*
    3. *Jupyter and python example*
    4. Challenge example solution
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3. Templates
    1. *Past exams*
    2. *Changelog*

1.2 Menu tests

1. One line test: *1. intro* *2. operators* *3. methods*

1.3 Credits

- This site was made with Jupyter using NBSphinx extension[10] and Jupman template[11].

[10] http://nbsphinx.readthedocs.io/
[11] http://jupman.readthedocs.io/

CHAPTER

TWO

JUPMAN USAGE

Jupyter Python 3 worksheets build system and exam manager. See Jupman manual at jupman.readthedocs.io[12]

Jupman uses NbSphinx[13] and either ReadTheDocs[14] or Github Actions[15]

2.1 Installation

(Instructions are for Ubuntu, on Windows may differ)

First, on Github, fork as a template jupman project[16] to create yours, for example `my-project`.

Then, on your computer, clone the `my-project` from Github

You can choose to build either on:

- ReadTheDocs
- Github Actions
- locally with plain Sphinx
- locally with RTD Docker[17]

(Note Jupman itself is building on both ReadTheDocs and Github Actions only for testing purposes, one is enough)

2.1.1 Building with ReadTheDocs:

IMPORTANT: choose a name which is NOT already on ReadTheDocs[18]

Create a ReadTheDocs account[19] **using the same name as in Github** so the address in readthedocs will be something like *my-project.readthedocs.org*.

- Use ReadTheDocs panels to link the project to your Github repository.
- In *Admin-> Advanced settings panel*, set:
  - *Python interpreter* to *CPython 3.x*
  - *Requirements* to `requirements-build.txt`

[12] http://jupman.readthedocs.io
[13] http://nbsphinx.readthedocs.io/
[14] https://readthedocs.org
[15] https://github.com/features/actions
[16] https://github.com/DavidLeoni/jupman
[17] https://github.com/DavidLeoni/readthedocs-to-actions
[18] http://readthedocs.org
[19] http://readthedocs.org

2.1.2 Building with Github Actions:

Configure .github/workflows/main.yml[20] on your computer to your needs - you will need to:

1. at the beginning there is an `if` which makes the workflow only work in `DavidLeoni/jupman` repository, change it with your names
2. set RTD_PRJ_NAME
3. If you want to publish to Github Pages[21]: everything is set, just create an empty branch `gh-pages` in an new HTML_FOLDER **before** committing - from some other folder in your file system:

```
git clone  YOUR_REPO_ADDRESS  HTML_FOLDER
cd HTML_FOLDER
git checkout --orphan gh-pages
git rm -rf .
touch bla
git add .
git commit -m "init"
git push origin gh-pages
```

2.1.3 Local build with Sphinx

1. Install Python 3.7+
2. Install Jupyter[22]
3. Install Python modules -from the root of the project, run:

   ```
   python3 -m pip install --user -r requirements-build.txt
   ```

   This will install required modules in your home directory

2.1.4 Optional - Running tests

To check everything is working, you may want to run the tests.

1. Install test dependencies:

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

2. Run the tests:

```
python3 -m pytest _test/*_test.py
```

[20] https://github.com/DavidLeoni/jupman/blob/master/.github/workflows/main.yml
[21] https://pages.github.com/
[22] http://jupyter.org/install.html

2.1.5 Optional - Install Jupyter contrib extensions

For a better editing experience like having Table of contents and other things, do the following:

1. install the Jupyter contrib extensions[23] package:

If you have Anaconda:

```
conda install -c conda-forge jupyter_contrib_nbextensions
```

If you don't have Anaconda:

```
python3 -m pip install --user jupyter_contrib_nbextensions
```

2. Install in Jupyter:

```
jupyter contrib nbextension install --user
```

3. Enable extension:

For being able to view table of contents while editing notebooks, install `toc2` extension:

```
jupyter nbextension enable toc2/main
```

For tocs to appear when in a document you will need to press a list button at the right-end of the toolbar.

(since Jupman 0.8 custom injected tocs are disabled by default)

4. For a nice GUI to install extensions, install the Jupyter Nbextensions configurator[24]:

If you have Anaconda:

From Anaconda Prompt:

```
conda install -c conda-forge jupyter_nbextensions_configurator
```

If you don't have Anaconda:

```
python3 -m pip install --user jupyter_nbextensions_configurator
```

After installing, enable it:

```
jupyter nbextensions_configurator enable --user
```

and then start Jupyter, in file browser look for a `Nbextensions` tab

2.2 Getting Started

1. Edit conf.py[25] as needed, which is the configuration file for Sphinx. In particular, you **MUST** edit the sections marked with **TODO**
2. Try launching build:

```
python3 build.py
```

[23] https://github.com/ipython-contrib/jupyter_contrib_nbextensions
[24] https://github.com/Jupyter-contrib/jupyter_nbextensions_configurator
[25] https://github.com/DavidLeoni/jupman/blob/master/conf.py

For more info, see *related section*

3. If everything works fine on your computer, push changes back to Github
4. Go back to ReadTheDocs and try to run a build. Hopefully your project will become available on something like *my-project.readthedocs.org*
5. If you want to grade exams, see *Exams* section.

You should now be ready to create your notebooks by launching from the project root:

```
jupyter notebook
```

6. If you wish your notebooks to appear in the generated manual, you have to add them in the `toc.rst` file.

   NOTE: the page toc-page.rst[26], which is set to be the `master_doc` of Sphinx, will just load the actual Table of Contents which is in toc.rst[27]. It looks a bit convoluted because when it comes to indexes Sphinx is not much reliable, see this issue[28] . We strongly advise *not* to change these settings !

7. edit the home, which is in the index.ipynb[29] file

2.3 Building the manual

For quick build that only produces html:

```
python3 build.py -q
```

Site will be created in `_build/` folder.

For help:

```
python3 build.py -h
```

To build everything (html + pdf + epub), go to the console and from the root directory run:

```
python3 build.py
```

NOTE: to generate PDFs you will need to install Latex environment

2.4 Publishing

For publishing, the system uses ReadTheDocs so it's enough to push to master and ReadTheDocs will do the rest (for example, for jupman is available at address jupman.readthedocs.io[30]

IMPORTANT: ReadTheDocs WILL *NOT* execute Jupyter notebooks because of this bug[31]

[26] https://github.com/DavidLeoni/jupman/blob/master/toc-page.rst
[27] https://github.com/DavidLeoni/jupman/blob/master/toc.rst
[28] https://github.com/DavidLeoni/jupman/issues/11
[29] https://github.com/DavidLeoni/jupman/blob/master/index.ipynb
[30] http://jupman.readthedocs.io
[31] https://github.com/DavidLeoni/softpython/issues/2

2.5 Editing the worksheets

Here we give an overview of how to edit worksheets. More info can be found in *Jupman tests notebook*

2.5.1 Common files

There are a bunch of files common to all worksheets and possibly website

You do not need to change them (except maybe my_lib.py)

File	Description	Jupyter	Website
jupman.py[32]	utilities for worksheets	X	
my_lib.py[33]	custom utilities for worksheets (you can change the name)	X	
_static/js/jupman.js[34]	Javascript code	X	X
_static/css/jupman.css[35]	CSS	X	
_static/css/jupman-web.css[36]	CSS		X

2.5.2 Running Jupyter

First of all, run Jupyter from the root directory:

```
jupyter notebook
```

2.5.3 Source code for chapters

Put chapters one per folder, in the root. Any folder which doesn't start with underscore _ or `exam/` will be considered a chapter.

During build, each chapter gets automatically zipped and zip goes to `_static/generated`. So for example, `python-example/` produces a zip called `_static/generated/python-example.zip`, which will have these contents:

```
python-example
    _static
       js
          jupman.js
          toc.js
       css
          jupman.css
       img
          cc-by.png
    python-example.ipynb
    lab.py
    lab_test.py
    lab_sol.py
    jupman.py
    my_lib.py
```

[32] https://github.com/DavidLeoni/jupman/blob/master/jupman.py
[33] https://github.com/DavidLeoni/jupman/blob/master/jupman.py
[34] https://github.com/DavidLeoni/jupman/blob/master/_static/js/jupman.js
[35] https://github.com/DavidLeoni/jupman/blob/master/_static/css/jupman.css
[36] https://github.com/DavidLeoni/jupman/blob/master/_static/css/jupman-web.css

The zip folder structure will be a merge of chapter files and files shared by all chapters which are specified in `exercises_common_files` variable in conf.py. Since the root in the zip becomes the chapter itself, jupman will process `.py` and `.ipynb` files for fixing eventual relative imports. Markdown and HTML links in ipynb will also be adjusted.

Exercise files can be automatically generated from solutions, as we will see next.

2.5.4 Exercise types

There can be three kinds of exercises: exercises in Python files, exercises in Jupyter files and mixed jupyter and Python exercises.

You can automatically generate an exercise from a solution file by stripping text marked with special tags. You can inspect generated files in `_build/jupman/` directory

On the website, students will be able to see solutions by clicking on appropriate buttons.

In the zips to download, two versions of files will provided, one without solution and one with solutions (in exam modality of course no solution will be shipped)

Exercises in Python files

See *python-example/python-example.ipynb*

In this type of exercises, typically you have a Jupyter file (like `python-example.ipynb`) that describes the exercise and then the actual exercises are in Python files.

If there is a solution file `FILE_sol.py` ending in `_sol.py` but no corresponding exercise file `FILE.py` without the `_sol`:

then Jupman will try to generate `FILE.py` one from `FILE_sol.py`. To do so, it will look for tags to strip inside the solution file.

If there is already an exercise file like this:

- `python_intro.py`
- `python_intro_sol.py`

Jupman will just copy the existing file.

Exercises in Jupyter files

See example: *jupyter-example/jupyter-example-sol.ipynb*

This type of exercises stay in a Jupyter notebook itself.

If there is a notebook ending in `-sol.ipynb`, the following applies (**WARNING**: for `ipynb` files we use dash `-`, *not* the underscore _):

- the notebook must contain tags to strip
- exercises derived will have 'EXERCISES' appended to the title (the word can be customized in `conf.py` - you might need to translate it)

Mixed exercises in Jupyter and Python files

See *jup-and-py-example/jup-and-py-example-sol.ipynb*

Challenges

> This is an experimental feature, current implementation is subject to change.

Challenges are solutions which remain unpublished and from which exercises are generated **in the same original older** where the solution resides (not only in the zip!). Challenge files can be both Jupyter notebooks or Python files, ending in `-chal-sol.ipynb` or `_chal_sol.py`.

The idea is that challenges solutions are gitignored, and exercises are manually generated by calling `jupman.generate_exercise()` inside a Jupyter notebook like this:

```
#jupman-purge
import sys; sys.path.append('../'); from conf import jm;
jm.generate_exercise('great_chal_sol.py')
#/jupman-purge
```

It is a bit laborious but the idea is that typically you will also want to run and see tests results in Jupyter notebook so you can do it in the same final cell, which you will also probably want to set in cell metadata `"nbsphinx":"hidden"`

- the solution notebook must contain tags to strip and have SOLUTIONS at the end of the title (the word can be customized in `conf.py` - you might need to translate it)

2.5.5 Solution tags

Presence of these tags marks a cell as a solution.

Start tags begin with a `#` while end tags begin with a `#\`

jupman-raise

Replaces code inside with an Exception (text is customizable in `conf.py`). Be careful to position the comment exactly with the indentation yuoi want the raise to appear. For example:

```
def add(x,y):
    #jupman-raise
    return x + y
    #/jupman-raise
```

becomes

```
def add(x,y):
    raise Exception('TODO IMPLEMENT ME !')
```

jupman-strip

Just strips code inside exercises

```
def f(x):
    print(x)

#jupman-strip
def help_func(x,y):
    return x - y
#/jupman-strip

def g(y):
    return y
```

becomes

```
def f(x):
    print(x)

def g(y):
    return y
```

write here

This special tag for python code erases whatever is found afterwards the `# write here` **line**

- you can put how many spaces you want in the comment
- phrase can be customized in `conf.py`

```
w = 5

#  write  here  fast please

x = 5 + w
y = 2 + x
```

becomes

```
w = 5

#  write  here  fast please
```

SOLUTION

In a code cell, if you put `# SOLUTION` at the beginning the whole cell cell content gets deleted (`# SOLUTION` string included).

- Word can be customized in `conf.py`

```
# SOLUTION

def f():
    print('hello')
```

becomes nothing:

```
[ ]:
```

QUESTION - ANSWER

In a markdown cell, everything in a cell with `**ANSWER**:` inside will be stripped.

- Markdown can be customized in `conf.py`

QUESTION: Describe why iPhone n+1 is better than iPhone n

ANSWER: it costs more

Becomes:

QUESTION: Describe why iPhone n+1 is better than iPhone n

```
[ ]:
```

2.5.6 Directive tags

Some tags change the preprocessor behaviour. They are applied before solution tags.

jupman-purge

Eliminate content both from exercises AND solutions. Can be helpful when you have code which creates expected output, like images or python data - the idea is to completely remove code so so students don't accidentally copy-paste it or uncomment it.

- `jupman-purge-input`: purges only cell source
- `jupman-purge-output`: purges only cell output
- `jupman-purge-io` : purges both input and output

`jupman-purge` purges only a span:

```
x=5
#jupman-purge
plt.savefig('expected_image.png')
jupman.save_py('expected_output_db.py', ['big', 'data', 'structure']*1000)
#/jupman-purge
x=6
```

becomes

```
x=5
x=6
```

jupman-preprocess

By default only notebooks solutions (ending in `-sol.ipynb`) are preprocessed before html conversion begins. If you want to force preprocessing on a particular non-solution notebook, add this in the first cell:

```
#jupman-preprocess
```

2.5.7 Utilities and custom js and css

If you need custom js and/or css in a notebook, you can inject it by running `jupman.init()` in the first cell

NOTE: it is not really mandatory, it's mostly intended to tweak notebooks downloaded locally. It should be avoided for notebooks meant for students, as it is more likely it will mess their configurations - also, they might copy the notebooks without knowing they contain the custom js and use weird extensions which could generate conflicts (such as double toc)

For notebooks in the root folder:

```
import jupman
jupman.init()
```

Worksheets in in subfolders can use `sys.path` to locate the module

```
import sys
sys.path.append('../')
import jupman
jupman.init()
```

If you think it looks ugly, see this issue[37] for why we don't use alternatives such as modules and relative imports.

Show table of contents: Since 0.8, toc is disabled. If you want it, try to *install toc2 extension*, otherwise you can still enable jupman toc with `jupman_init(toc=True)`. Running it will create the sidebar even when editing in Jupyter. If you want to refresh the sidebar, just run again the cell. It is not recommended, though, especially in notebooks meant to be shipped to students (see considerations above).

2.5.8 Hiding cells

To hide cells (like for example the `import jupman` code), click `View->Cell toolbar -> Edit metadata` and add `"nbsphinx": "hidden"` to the JSON (see also original NBSphinx docs[38] and *Togglable cells in Jupman tests*).

NOTE: As of NBSphinx 2.17, it is not possible to hide only cell text but not the output.

Implications of hiding 'import jupman'

Only in the HTML version, hiding the `import jupman` code, will also prevent `jupman.py` to embed inside the page the Javascript file `jupman.js`: this is perfectly fine as it is fetched separately thanks to the `app.add_javascript('js/jupman.js')` command in `conf.py`

[37] https://github.com/DavidLeoni/jupman/issues/12
[38] https://nbsphinx.readthedocs.io/en/0.2.14/hidden-cells.html#Hidden-Cells

2.5.9 Launch unit tests

Inside worksheets you can run `unittest` tests.

To run all the tests of a test class, write like this

```
jupman.run(NameOfTheTestClass)
```

To run a single method, write like this:

```
jupman.run(NameOfTheTestClass.nameOfTheMethod)
```

2.5.10 Python Tutor

Among the various ways to embed Python Tutor, we decided to implement a special `jupman.pytut()` method. First you need to import the jupman module:

[2]:
```
import jupman
```

Then you can put a call to `jupman.pytut()` at the end of a cell, and the cell code will magically appear in python tutor in the output (except the call to `pytut()` of course). To see Python Tutor you don't need to be online

[3]:
```
x = [5,8,4]
y= {3:9}
z = [x]

jupman.pytut()
```

[3]:
```
<IPython.core.display.HTML object>
```

Beware of variables which were initialized in previous cells, they won't be available in Python Tutor and you will get an error:

[4]:
```
w = 8
```

[5]:
```
x =  w + 5
jupman.pytut()
```

```
Traceback (most recent call last):
  File "/home/da/Da/prj/jupman/prj/jupman.py", line 2428, in _runscript
    self.run(script_str, user_globals, user_globals)
  File "/usr/lib/python3.7/bdb.py", line 578, in run
    exec(cmd, globals, locals)
  File "<string>", line 2, in <module>
NameError: name 'w' is not defined
```

[5]:
```
<IPython.core.display.HTML object>
```

2.5.11 Pandas

Correctly rendering pandas in PDFs is not so easy (see issue[39]), so far we created this little function which sometimes is handy:

[6]:
```
import pandas as pd


lista = [['Rosanna', 'Gippalanda', 26, 100, 500, 300, 600, 600, 100, 300, 600, 300,␣
↪200, 400, 200, 300, 400, 500],
         ['Matilda', 'Zampola',    10, 500, 200, 300, 500, 400, 300, 200, 500, 300,␣
↪200, 400, 200, 300, 400, 500],
         ['Mario', 'Cipolli',      25, 300, 500, 100, 500, 300, 500, 100, 500, 300,␣
↪200, 400, 200, 300, 400, 500],
         ['Ugo', 'Sgarapirri',     30, 100, 400, 200, 500, 300, 200, 600, 300, 300,␣
↪200, 400, 200, 300, 400, 500]
        ]

df = pd.DataFrame(lista, columns =['Name', 'Surname', 'Age', *['Par'+str(i) for i in␣
↪range(1,16)]])
df # web
```

[6]:
```
      Name     Surname  Age  Par1  Par2  Par3  Par4  Par5  Par6  Par7  Par8  \
0  Rosanna  Gippalanda   26   100   500   300   600   600   100   300   600
1  Matilda     Zampola   10   500   200   300   500   400   300   200   500
2    Mario     Cipolli   25   300   500   100   500   300   500   100   500
3      Ugo  Sgarapirri   30   100   400   200   500   300   200   600   300

   Par9  Par10  Par11  Par12  Par13  Par14  Par15
0   300    200    400    200    300    400    500
1   300    200    400    200    300    400    500
2   300    200    400    200    300    400    500
3   300    200    400    200    300    400    500
```

[7]:
```
import jupman
jupman.draw_df(df)  # image for pdf
```

	Name	Surname	Age	Par1	Par2	Par3	Par4	Par5	Par6	Par7	Par8	Par9	Par10	Par11	Par12	Par13	Par14	Par15
0	Rosanna	Gippalanda	26	100	500	300	600	600	100	300	600	300	200	400	200	300	400	500
1	Matilda	Zampola	10	500	200	300	500	400	300	200	500	300	200	400	200	300	400	500
2	Mario	Cipolli	25	300	500	100	500	300	500	100	500	300	200	400	200	300	400	500
3	Ugo	Sgarapirri	30	100	400	200	500	300	200	600	300	300	200	400	200	300	400	500

2.5.12 Showing function help

Python help is already quite good, but adds two useless extra lines and only works as a print, so we defined `jupman.get_doc`:

[12]:
```
print(jupman.get_doc(jupman.get_doc))
```

```
def get_doc(fun):
    """ Returns the help of a function formatted in a faithful manner

        @since 3.3
    """
```

[39] https://github.com/DavidLeoni/jupman/issues/69

2.6 Website

2.6.1 Customize theme

If you want to change site colors and other changes, copy/edit _static/css/jupman-web.css[40] and set it in conf `html_css_files`:

```
html_css_files = [
    'css/jupman.css',       # shared among jupyter and website
    'css/jupman-web.css',   # only on website
    #'css/softpython-theme.css',  # uncomment to activate
    #'css/scifi-theme.css',
]
```

2.6.2 Fonts

Fonts are a bit of a complex topic

TODO this part is just a collection of personal notes

- The missing guide to font formats[41]
- https://docs.readthedocs.io/en/latest/guides/adding-custom-css.html
- RTD Code font issue on github[42]

Tools:

Comprehensive article: https://www.useragentman.com/blog/2011/02/20/converting-font-face-fonts-quickly-in-any-os/ and https://www.useragentman.com/blog/the-css3-font-converter/

https://github.com/zoltan-dulac/css3FontConverter

woff2

https://github.com/google/woff2

sfnt2woff

```
sudo apt-get install  libbrotli-dev
sfnt2woff  SomeFont.otf
```

mkeot

```
sudo apt-get install eot-utils
mkeot SomeFont.otf > SomeFont.eot
```

or https://github.com/wget/ttf2eot

FontForge (GUI and scriptable)

```
sudo apt-get install fontforge
```

[40] https://github.com/DavidLeoni/jupman/blob/master/_static/css/jupman-web.css
[41] https://creativemarket.com/blog/the-missing-guide-to-font-formats
[42] https://github.com/readthedocs/sphinx_rtd_theme/issues/524

2.6.3 font sizes

https://www.24a11y.com/2019/pixels-vs-relative-units-in-css-why-its-still-a-big-deal/

https://chiamakaikeanyi.dev/sizing-in-css-px-vs-em-vs-rem/

2.6.4 Warning about old versions

ReadTheDocs has a mechanism[43] to warn the user if he's looking at an old version of the site, but we found it doesn't work much for course-based documentation. So for versioning we think it's better to adopt a mixed git branch / tags devlopment model, and we added a template warning to show in old branches. To enable it in an old branch, just rename _templates/breadcrumbs.html.bak into `_templates/breadcrumbs.html` and edit as needed.

2.7 Exams

Jupman comes with a script to manage exams called exam.py, which allows to manage the full cycle of an exam.

2.7.1 What is an exam

Exam text is represented as Jupyter notebooks, which are taken from _templates/exam/solutions/exam-yyyy-mm-dd.ipynb

Exercises for students: they are supposed to be the exam notebook itself and / or plain python files (or the notebook itself) plus unittests and relative solutions.

Marks spreadsheet: By default there is also an LibreOffice spreadsheet to give marks, in case you need it.

When you initialize an exam with the `init` command, for example for date `2000-12-31`, all the presets in `_templates/exam/` are copied to `private/2000-12-31/` and `private/2000-12-31/solutions`. Presets can be changed at will to suit your needs. When packaging, student zip is assembled in `private/2000-12-31/student-zip`

System is flexible enough so you can privately work on next exams in `private/` folder and still being able to publish modifications to main website. After an exam, you can copy the private exam to the public folders in `past-exams/`.

2.7.2 Exam commands

To see the help:

```
python3 exam.py -h
```

To see help for a particular subcommand, like i.e. `init`, type the subcommand followed by `-h` :

```
python3 exam.py init -h
```

Running commands should be quite self-explanatory.

NOTE: as of today (Dec 2019) software may contain bugs, but at least we check for major misuses (like trying to overwrite existing exams).

[43] https://docs.readthedocs.io/en/latest/versions.html

In the file create-exam-example.sh there is a typical run of the script, which creates the example exam for date `2000-12-31`. Notice it might ask you to delete the existing 2000-12-31 exam, if it does just follow the instructions. Here's the output:

```
> ./create-exam-example.sh
python3 exam.py init 2000-12-31
  Detected release from git: 3.2.0-3-g30a995c
No GOOGLE_ANALYTICS environment variable was found, skipping it

  You can now edit Python solutions, tests, exercises and exam notebook here  :

     _private/2000-12-31/solutions

  DONE.

python3 exam.py package 2000-12-31
  Detected release from git: 3.2.0-3-g30a995c
No GOOGLE_ANALYTICS environment variable was found, skipping it
  Cleaning _private/2000-12-31/server/jupman  ...
  Copying exercises to _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-
↪LASTNAME-ID/
  Copying code
    from  _private/2000-12-31/solutions
    to    _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-LASTNAME-ID/
    Writing (patched) _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-
↪LASTNAME-ID/exam-2000-12-31.ipynb
    Generating _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-LASTNAME-
↪ID/trees.py
    Writing _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-LASTNAME-ID/
↪example.txt
    Generating _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-LASTNAME-
↪ID/lists.py
    Writing (patched) _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-
↪LASTNAME-ID/trees_test.py
    Writing (patched) _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-
↪LASTNAME-ID/lists_test.py
  Creating dir _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-LASTNAME-
↪ID/img
    Writing _private/2000-12-31/student-zip/jupman-2000-12-31-FIRSTNAME-LASTNAME-ID/
↪img/mountains.jpg
  Building pdf ..
  Creating student exercises zip:  _private/2000-12-31/server/jupman-2000-12-31-exam.
↪zip
  Writing jupman.py
  Writing my_lib.py
  Writing _static/img/cc-by.png
  Writing _static/js/jupman.js
  Writing _static/css/jupman.css
  Writing _static/js/toc.js
  Writing _static/js/pytutor-embed.bundle.min.js
  Wrote _private/2000-12-31/server/jupman-2000-12-31-exam.zip

  DONE.


------- Simulating some shipped exams...
mkdir -p _private/2000-12-31/shipped/john-doe-112233
cp _templates/exam/solutions/lists_sol.py _templates/exam/solutions/lists_test.py _
↪templates/exam/solutions/trees_sol.py _templates/exam/solutions/trees_test.py _
↪private/2000-12-31/shipped/john-doe-112233
```

(continues on next page)

(continued from previous page)

```
mkdir -p _private/2000-12-31/shipped/jane-doe-445566
cp _templates/exam/solutions/lists_sol.py _templates/exam/solutions/lists_test.py _
↪templates/exam/solutions/trees_sol.py _templates/exam/solutions/trees_test.py _
↪private/2000-12-31/shipped/jane-doe-445566
------- Done with shipped exams simulation, time to grade ...

python3 exam.py grade 2000-12-31
  Detected release from git: 3.2.0-3-g30a995c
No GOOGLE_ANALYTICS environment variable was found, skipping it
  Copying Python files to execute and eventually grade in _private/2000-12-31/graded/
↪john-doe-112233/graded
  Copying original shipped files (don't touch them!) in _private/2000-12-31/graded/
↪john-doe-112233/shipped
  Copying Python files to execute and eventually grade in _private/2000-12-31/graded/
↪jane-doe-445566/graded
  Copying original shipped files (don't touch them!) in _private/2000-12-31/graded/
↪jane-doe-445566/shipped

  DONE.

python3 exam.py zip-grades 2000-12-31
  Detected release from git: 3.2.0-3-g30a995c
No GOOGLE_ANALYTICS environment variable was found, skipping it

  You can now find zips to send to students in _private/2000-12-31/graded


  DONE.

python3 exam.py publish 2000-12-31
  Detected release from git: 3.2.0-3-g30a995c
No GOOGLE_ANALYTICS environment variable was found, skipping it
  Copying solutions to exams/2000-12-31/solutions
  Copying exam PDF text

  Exam Python files copied.

  You can now manually build and run the following git instructions to publish the␣
↪exam.
    ./build.py
    git status  # just to check everything is ok
    git add .
    git commit -m 'published 2000-12-31 exam'
    git push


  DONE.


  Finished example exam run !!
```

2.8 Developer notes

2.8.1 Fix nbsphinx to create rst files

Sometimes nbsphinx does not report properly RST conversion errors (see bug[44]). As a hacky workaround, you might take the `nbsphinx.py` from `~/.local/lib/python3.5/site-packages/` , make a copy of it in your project home and patch it like this[45] When you call sphinx, it will generate RST files in `_build/jupman-rst/`.

Of course, things can be cleaner using a virtual env with venv[46]

2.8.2 Git performance notes

Current suggested setup for hosting on Github is creating branch gh-pages and using Github Actions to populate it with html, zips, pdf and epub files. While keeping all that stuff versioned may seem pretty inefficient, apparently git is pretty good[47] at compressing binary files

The size of `.git` repo for a 1000 pdf page project SoftPython with 300 commits and 100 MB of code is:

```
.git: 183 MB
```

By truncating gh-pages to last commit and garbage collecting, we get:

```
.git: 139 MB
```

If we completely remove gh-pages branch, we get:

```
.git: 68.7 MB
```

So gh-pages size is:

- one commit: 70.3 MB
- 300 commits: 114.3 MB

which is not even double than source code git size.

If the repo gets really huge, in order to to shrink it some git knowledge is required.

If the repo is served from another server and you want to truncate that server git repo:

On that server console:

1. first make sure you are on `gh-pages` branch:

```
git checkout gh-pages
```

2. truncates previous commits:

```
git fetch --depth=1 origin gh-pages
```

3. removes various links around which may still point to old commits:

```
git reflog expire --expire-unreachable=now --all
```

[44] https://github.com/DavidLeoni/jupman/issues/9
[45] https://github.com/DavidLeoni/jupman/commit/0f332629ce4e2b0186c954c55aea7fa67992ace9#diff-bd3d9c4d2e80ed83fd2443d1301aa65bR649
[46] https://docs.python.org/3/library/venv.html
[47] https://stackoverflow.com/a/48305739

4. actually deletes from disk old commits:

```
git gc --aggressive --prune=all
```

Note the result of truncation cannot be pushed back to origin as git would complain it is a *shallow* branch.

[ ]:

CHAPTER

THREE

JUPMAN TESTS

Tests and cornercases.

The page Title has one sharp, the Sections always have two sharps.

3.1 Sezione 1

bla bla

3.2 Sezione 2

Subsections always have three sharps

3.2.1 Subsection 1

bla bla

3.2.2 Subsection 2

bla bla

3.3 Quotes

> I'm quoted with **greater than** symbol on multiple lines Am I readable?

```
I'm quoted with **spaces**
on multiple lines
Am I readable?
```

3.4 Download links

Files manually put in `_static` :

- Download trial.odt
- Download trial.pdf

Files in arbitrary folder position :

- Download requirements.txt

NOTE: download links are messy, see issue 8[48]

3.5 Links to HTML

- Link to trial.html

3.6 Info/Warning Boxes

Until there is an info/warning extension for Markdown/CommonMark (see this issue), such boxes can be created by using HTML

elements like this:

Note: This is an info!

Note: This is a warn!

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

  start tag and the beginning of the content.

[48] https://github.com/DavidLeoni/jupman/issues/8

3.7 Math

For math stuff, see npshpinx docs[49]

Here we put just some equation to show it behaves fine in Jupman

This is infinity: ∞

3.8 Unicode

Unicode characters should display an HTML, but with latex you might have problems, and need to manually map characters in conf.py

You should see a star in a black circle: ⊛

You should see a check: ✓

table characters: │ ├ └ ─

3.9 Image

3.9.1 SVG Images

SVG images work in notebook, but here it is commented since it breaks Latex, see issue[50]

```
![An image](img/cc-by.svg)
```

This one also doesn't works (and shows ugly code in the notebook anyway)

```
from IPython.display import SVG
SVG(filename='img/cc-by.svg')
```

3.9.2 PNG Images

[49] https://nbsphinx.readthedocs.io/en/0.2.14/markdown-cells.html#Equations
[50] https://github.com/DavidLeoni/jupman/issues/1

3.9.3 Inline images - pure markdown

```
Bla ![A PNG image md](_static/img/notebook_icon.png)  bli blo
```

Bla  bli blo

3.9.4 Inline images - markdown and img

```
bla <img alt="markimg84545" style="display:inline" src="_static/img/notebook_icon.png
↪"> bli blo
```

bla  bli blo

3.9.5 Img class

If we pass a class, it will to be present in the website:

```
<img alt="markimg7325" class="jupman-inline-img" src="_static/img/notebook_icon.png">
```

This  should be inline

3.10 Expressions list

Highlighting **does** work both in Jupyter and Sphinx

Three quotes, multiple lines - Careful: put **exactly 4 spaces** indentation

1. ```
   [2,3,1] != "[2,3,1]"
   ```
2. ```
   [4,8,12] == [2*2,"4*2",6*2]
   ```
3. ```
   [][:] == []
   ```

Three quotes, multiple lines, more compact - works in Jupyter, **doesn't** in Sphinx

1. `python [2,3,1] != "[2,3,1]"`
2. `python [4,8,12] == [2*2,"4*2",6*2]`
3. `python [][:] == []`

Highlighting **doesn't** work in Jupyter neither in Sphinx:

Three quotes, single line

1. `python [2,3,1] != ["2",3,1]`
2. `python [4,8,12] == [2*2,"4*2",6*2]`
3. `python [][:] == "[]"`

Single quote, single line

1. `python [2,3,1] != ["2",3,1]`
2. `python [4,8,12] == [2*2,"4*2",6*2]`
3. `python [][:] == "[]"`

3.11 Togglable cells

There are various ways to have togglable cells.

3.11.1 Show/hide exercises (PREFERRED)

If you need clickable show/hide buttons for exercise solutions , see here: Usage - Exercise types[51]. It manages comprehensively use cases for display in website, student zips, exams, etc

If you have other needs, we report here some test we made, but keep in mind this sort of hacks tend to change behaviour with different versions of jupyter.

[51] https://jupman.softpython.org/en/latest/usage.html#Type-of-exercises
   ```

3.11.2 Toggling with Javascript

- Works in MarkDown
- Works while in Jupyter
- Works in HTML
- Does not show in Latex (which might be a good point, if you intend to put somehow solutions at the end of the document)
- NOTE: after creating the text to see the results you have to run the initial cell with jupman.init (as for the toc)
- NOTE: you can't use Markdown block code since of Sept 2017 doesn't show well in HTML output

3.11.3 HTML details in Markdown, code tag

- Works while in Jupyter
- Doesn't work in HTML output
- as of Sept Oct 2017, not yet supported in Microsoft browsers

Click here to see the code

```
question = raw_input("What?")
answers = random.randint(1,8)
if question == "":
    sys.exit()
```

3.11.4 HTML details in Markdown, Markdown mixed code

- Works while in Jupyter
- Doesn't work in HTML output
- as of Sept Oct 2017, not yet supported in Microsoft browsers

Click here to see the code

```
question = raw_input("What?")
answers = random.randint(1,8)
if question == "":
    sys.exit()
```

3.11.5 HTML details in HTML, raw NBConvert Format

- Doesn't work in Jupyter
- Works in HTML output
  - NOTE: as of Sept Oct 2017, not yet supported in Microsoft browsers
- Doesn't show at all in PDF output

Some other Markdown cell afterwards ….

3.12 Files in templates

Since Dec 2019 they are not accessible see issue 10[52], but it is not a great problem, you can always put a link to Github, see for example exam-yyyy-mm-dd.ipynb[53]

3.13 Python tutor

There are various ways to embed Python tutor, first we put the recommended one.

3.13.1 jupman.pytut

RECOMMENDED: You can put a call to `jupman.pytut()` at the end of a cell, and the cell code will magically appear in python tutor in the output (except the call to `pytut()` of course). Does not need internet connection.

[2]:
```
x = [5,8,4,10,30,20,40,50,60,70,20,30]
y= {3:9}
z = [x]

jupman.pytut()
```

[2]:
```
<IPython.core.display.HTML object>
```

jupman.pytut scope: BEWARE of variables which were initialized in previous cells, they WILL NOT be available in Python Tutor:

[3]:
```
w = 8
```

[4]:
```
x =  w + 5
jupman.pytut()
```

```
Traceback (most recent call last):
  File "/home/da/Da/prj/jupman/prj/jupman.py", line 2305, in _runscript
    self.run(script_str, user_globals, user_globals)
  File "/usr/lib/python3.5/bdb.py", line 431, in run
    exec(cmd, globals, locals)
  File "<string>", line 2, in <module>
NameError: name 'w' is not defined
```

[4]:
```
<IPython.core.display.HTML object>
```

jupman.pytut window overflow: When too much right space is taken, it might be difficult to scroll:

[5]:
```
x = [3,2,5,2,42,34,2,4,34,2,3,4,23,4,23,4,2,34,23,4,23,4,23,4,234,34,23,4,23,4,23,4,2]

jupman.pytut()
```

[5]:
```
<IPython.core.display.HTML object>
```

[6]:
```
x =  w + 5
jupman.pytut()
```

[52] https://github.com/DavidLeoni/jupman/issues/10
[53] https://github.com/DavidLeoni/jupman/tree/master/_templates/exam/exam-yyyy-mm-dd.ipynb

```
Traceback (most recent call last):
  File "/home/da/Da/prj/jupman/prj/jupman.py", line 2305, in _runscript
    self.run(script_str, user_globals, user_globals)
  File "/usr/lib/python3.5/bdb.py", line 431, in run
    exec(cmd, globals, locals)
  File "<string>", line 2, in <module>
NameError: name 'w' is not defined
```

[6]:
```
<IPython.core.display.HTML object>
```

jupman.pytut execution: Some cells might execute in Jupyter but not so well in Python Tutor, due to its inherent limitations[54]:

[7]:
```
x = 0
for i in range(10000):
    x += 1
print(x)
jupman.pytut()
```

```
10000
```

[7]:
```
<IPython.core.display.HTML object>
```

jupman.pytut infinite loops: Since execution occurs first in Jupyter and then in Python tutor, if you have an infinite loop no Python Tutor instance will be spawned:

```
while True:
    pass

jupman.pytut()
```

jupman.pytut() resizability: long vertical and horizontal expansion should work:

[8]:
```
x = {0:'a'}
for i in range(1,30):
    x[i] = x[i-1]+str(i*10000)
jupman.pytut()
```

[8]:
```
<IPython.core.display.HTML object>
```

jupman.pytut cross arrows: With multiple visualizations, arrows shouldn't cross from one to the other even if underlying script is loaded multiple times (relates to visualizerIdOverride)

[9]:
```
x = [1,2,3]


jupman.pytut()
```

[9]:
```
<IPython.core.display.HTML object>
```

jupman.pytut print output: With only one line of print, Print output panel shouldn't be too short:

[10]:
```
print("hello")

jupman.pytut()
```

```
hello
```

[54] https://github.com/pgbovine/OnlinePythonTutor/blob/master/unsupported-features.md

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

[11]:
```
y = [1,2,3,4]


jupman.pytut()
```

[11]:
```
<IPython.core.display.HTML object>
```

3.13.2 HTML magics

Another option is to directly paste Python Tutor iframe in the cells, and use Jupyter `%%HTML` magics command.

HTML should be available both in notebook and website - of course, requires an internet connection.

Beware: you need the HTTP**S** !

[12]:
```
%%HTML

<iframe width="800" height="300" frameborder="0"
        src="https://pythontutor.com/iframe-embed.html#code=x+%3D+5%0Ay+%3D+10%0Az+
↪%3D+x+%2B+y&cumulative=false&py=2&curInstr=3">
</iframe>
```

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

3.13.3 NBTutor

To show Python Tutor in notebooks, there is already a jupyter extension called NBTutor[55] , afterwards you can use magic `%%nbtutor` to show the interpreter.

Unfortunately, it doesn't show in the generated HTML :-/

[13]:
```
%reload_ext nbtutor
```

[14]:
```
%%nbtutor

for x in range(1,4):
    print("ciao")
x=5
y=7
x +y
```

```
ciao
ciao
ciao
```

[14]:
```
12
```

[55] https://github.com/lgpage/nbtutor

3.14 Stripping answers

For stripping answers examples, see *jupyter-example/jupyter-example-sol*. For explanation, see usage

3.15 Metadata to HTML classes

3.16 Formatting problems

3.16.1 Characters per line

Python standard for code has limit to 79, many styles have 80 (see Wikipedia[56])

We can keep 80:

```
--------------------------------------------------------------------------------
```

```
--------------------------------------------------------------------------------
```

Errors hold 75 dashes:

Plain:

```
---------------------------------------------------------------------------
ZeroDivisionError                         Traceback (most recent call last)
<ipython-input-15-9e1622b385b6> in <module>()
----> 1 1/0

ZeroDivisionError: division by zero
```

As Python markup:

```
---------------------------------------------------------------------------
ZeroDivisionError                         Traceback (most recent call last)
<ipython-input-15-9e1622b385b6> in <module>()
----> 1 1/0

ZeroDivisionError: division by zero
```

[15]:
```
len('---------------------------------------------------------------------------')
```

[15]:
```
75
```

On website this **may** display a scroll bar, because it will actually print ' apexes plus the dashes

[16]:
```
'-'*80
```

[16]:
```
'--------------------------------------------------------------------------------'
```

This should **not** display a scrollbar:

[17]:
```
'-'*78
```

[56] https://en.wikipedia.org/wiki/Characters_per_line

[17]:
```
'--------------------------------------------------------------------------------'
```

This should **not** display a scrollbar:

[18]:
```
print('-'*80)
```

```
--------------------------------------------------------------------------------
```

3.16.2 Very large input

In Jupyter: default behaviour, show scrollbar

On the website: should expand in horizontal as much as it wants, the rationale is that for input code since it may be printed to PDF you should always manually put line breaks.

[19]:
```
# line with an exceedingly long comment line with an exceedingly long comment line␣
↪with an exceedingly long comment line with an exceedingly long comment line with an␣
↪exceedingly long comment line with an exceedingly long comment

# line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
↪long comment line with an an out-of-this-world long comment line with an an out-of-
↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
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↪this-world long comment line with an an out-of-this-world long comment line with an␣
↪an out-of-this-world long comment line with an an out-of-this-world long comment␣
↪line with an an out-of-this-world long comment line with an an out-of-this-world␣
```

(continues on next page)

(continued from previous page)

Very long HTML (and long code line)

Should expand in vertical as much as it wants.

[20]:
```
%%HTML

<iframe width="100%" height="1300px" frameBorder="0" src="https://umap.openstreetmap.
↪fr/en/map/mia-mappa-agritur_182055?scaleControl=false&miniMap=false&
↪scrollWheelZoom=false&zoomControl=true&allowEdit=false&moreControl=true&
↪searchControl=null&tilelayersControl=null&embedControl=null&datalayersControl=true&
↪onLoadPanel=undefined&captionBar=false#11/46.0966/11.4024"></iframe><p><a href=
↪"http://umap.openstreetmap.fr/en/map/mia-mappa-agritur_182055">See full screen</a></
↪p>
```

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

3.16.3 Very long output

In Jupyter: by clicking, you can collapse

On the website: a scrollbar should appear

[21]:
```
for x in range(150):
    print('long output ...', x)
```

```
long output … 0
long output … 1
long output … 2
long output … 3
long output … 4
long output … 5
long output … 6
long output … 7
long output … 8
long output … 9
long output … 10
long output … 11
long output … 12
long output … 13
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long output … 15
long output … 16
long output … 17
long output … 18
long output … 19
long output … 20
long output … 21
long output … 22
long output … 23
long output … 24
long output … 25
```

(continues on next page)

(continued from previous page)

```
long output … 26
long output … 27
long output … 28
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long output … 79
long output … 80
long output … 81
long output … 82
```

(continues on next page)

(continued from previous page)

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long output … 135
long output … 136
long output … 137
long output … 138
long output … 139
```

(continues on next page)

(continued from previous page)

```
long output … 140
long output … 141
long output … 142
long output … 143
long output … 144
long output … 145
long output … 146
long output … 147
long output … 148
long output … 149
```

```
[ ]:
```

CHAPTER

FOUR

CHAPTER EXAMPLES

4.1 Python example

Example of notebook for exercises in Python files

4.1.1 Download exercises zip

Browse files online[57]

4.1.2 What to do

- unzip exercises in a folder, you should get something like this:

```
python-example
   python-example.ipynb
   lab1.py
   lab1_test.py
   lab1_sol.py
   lab2.py
   lab2_test.py
   lab2_sol.py
   jupman.py
   my_lib.py
```

- open the editor of your choice (for example Visual Studio Code, Spyder or PyCharme), you will edit the files `lab1.py` and `lab2.py`
- Go on reading this notebook, and follow instuctions inside.

[57] https://github.com/DavidLeoni/jupman/tree/master/python-example

Let's begin

You are going to program a simulator of bouncing clowns. To do so, we are going to load this module:

[2]:
```
import local
```

[3]:
```
local.gimme(5)
```

```
It was a 5 indeed
```

Download test data

Local file:

- example.txt
- example.csv

4.1.3 Global image

4.1.4 Local exercise image

4.1.5 Python tutor

[4]:
```
x = [1,2,3]
y = 6

jupman.pytut()
```

[4]:
```
<IPython.core.display.HTML object>
```

[5]:
```
y = [1,2,3]

jupman.pytut()
```

[5]:
```
<IPython.core.display.HTML object>
```

Start editing `lab1.py` in text editor

[6]:
```
from lab1_sol import *
```

4.1.6 add

Implement `add` function:

[7]:
```
add(3,5)
```

[7]:
```
8
```

4.1.7 sub

Implement sub function

[8]:
```
sub(7,4)
```

[8]:
```
3
```

[ ]:
```

```

4.2 Jupyter example

4.2.1 Download exercises zip

Browse files online[58]

Example of notebook for exercises in Jupyter files.

For python files based example and more, see *Python example*

[58] https://github.com/DavidLeoni/jupman/tree/master/jupyter-example

4.2.2 What to do

- unzip exercises in a folder, you should get something like this:

```
jupyter-example
     jupyter-example.ipynb
     jupyter-example-sol.ipynb
     jupman.py
     my_lib.py
```

WARNING: to correctly visualize the notebook, it MUST be in an unzipped folder !

- open Jupyter Notebook from that folder. Two things should open, first a console and then browser. The browser should show a file list: navigate the list and open the notebook `jupyter-example/jupyter-example.ipynb`
- Go on reading that notebook, and follow instuctions inside.

Shortcut keys:

- to execute Python code inside a Jupyter cell, press `Control + Enter`
- to execute Python code inside a Jupyter cell AND select next cell, press `Shift + Enter`
- to execute Python code inside a Jupyter cell AND a create a new cell aftwerwards, press `Alt + Enter`
- If the notebooks look stuck, try to select `Kernel -> Restart`

[2]:
```
# REMEMBER TO  IMPORT jupman !
# This cell needs to be executed only once, you can usually find it at the beginning␣
↪of the worksheets

import jupman
```

[3]:
```
x = [1,2,3]
y = x
jupman.pytut()
```

[3]:
```
<IPython.core.display.HTML object>
```

[4]:
```
y = [1,2,3]
w  = y[0]
jupman.pytut()
```

[4]:
```
<IPython.core.display.HTML object>
```

4.2.3 Exercise 1

Implement `inc` function:

Show solution

[5]:
```


def helper(x):
```

(continues on next page)

(continued from previous page)

```
    return x + 1


def inc(x):

    return helper(x)
```

[5]:
```
def inc(x):
    raise Exception('TODO IMPLEMENT ME !')
```

4.2.4 Exercise 2

Implement `upper` function

Show solution

[6]:
```
def helper2(x):
    return x.upper()


def upper(x):

    return helper2(x)
```

[6]:
```
def upper(x):
    raise Exception('TODO IMPLEMENT ME !')
```

Exercise 3

Note everything *after* the 'write here' comment will be discarded. Note you can put how many spaces you want in the comment

Show solution

[7]:
```


w = 5

#  write here

x = 5 + 6
y = 6.4
z = x / y
```

[7]:
```
w = 5

#  write here
```

Exercise 4

Shows how to completely remove the content of a solution cell (including the solution comment)

EXERCISE: write a function that prints 'hello'

Show solution

[8]:
```
# SOLUTION

def f():
    print('hello')
```

[8]:
```

```

Exercise 5

Shows the QUESTION / ANSWER feature. All content in '**ANSWER**:' cell will be stripped

QUESTION: Describe why iPhone n + 1 is better than iPhone n

Show answer

ANSWER: it costs more

4.2.5 Conclusion

bla bla

Relative image test, Markdown format:

Relative image test, HTML `img` tag:

Relative link test, Markdown format:

Back to index

Relative link test, HTML `a` tag:

Back to index

[ ]:

4.3 Jupyter and Python example

Most complex example of a notebook with exercises both in Jupyter and Python files, and 'advanced' features

4.3.1 Download exercises zip

Browse files online[59]

4.3.2 What to do

- unzip exercises in a folder, you should get something like this:

```
jup-and-py-example
   jup-and-py-example.ipynb
   jup-and-py-example_sol.ipynb
   lab.py
   lab_test.py
   lab_sol.py
```

- open the editor of your choice (for example Visual Studio Code, Spyder or PyCharme), and edit `lab.py` file
- Go on reading this notebook, and follow instuctions inside.

Let's begin

You are going to program a simulator of bouncing clowns. To do so, we are going to load this module:

[2]:
```
import local
```

[3]:
```
local.gimme(5)
```

```
It was a 5 indeed
```

Download test data

Local file:

- example.txt
- example.csv

[59] https://github.com/DavidLeoni/jupman/tree/master/jup-and-py-example

4.3.3 Global image

4.3.4 Local exercise image

4.3.5 Python tutor

[4]:
```
x = 5
y = 6
z = x + y

jupman.pytut()
```

[4]:
```
<IPython.core.display.HTML object>
```

4.3.6 Exercise in Jupyter

Implement this function:

Show solution

[5]:
```
def hello(s):

    return ['hello',s]*1000


hello_db = hello("Guybrush")
```

(continues on next page)

(continued from previous page)

```
hello_db[:10]
```

[5]:
```
['hello',
 'Guybrush',
 'hello',
 'Guybrush',
 'hello',
 'Guybrush',
 'hello',
 'Guybrush',
 'hello',
 'Guybrush']
```

[5]:
```
def hello(s):
    raise Exception('TODO IMPLEMENT ME !')

hello_db = hello("Guybrush")

hello_db[:10]
```

[5]:
```
['hello',
 'Guybrush',
 'hello',
 'Guybrush',
 'hello',
 'Guybrush',
 'hello',
 'Guybrush',
 'hello',
 'Guybrush']
```

Full expected output is in file `expected_output_db.py`, if you can't manage to solve the exercise, as a last resort you can type: `from expected_hello_db import *` (DO NOT copy-paste file content, it would probably mess Jupyter up)

[6]:
```
from expected_hello_db import *
expected_hello_db[:10]
```

[6]:
```
['hello',
 'Guybrush',
 'hello',
 'Guybrush',
 'hello',
 'Guybrush',
 'hello',
 'Guybrush',
 'hello',
 'Guybrush']
```

Other example:

[7]:
```
hello_db2 = hello("Threepwood")

hello_db2[:10]
```

[7]:
```
['hello',
 'Threepwood',
 'hello',
 'Threepwood',
 'hello',
 'Threepwood',
 'hello',
 'Threepwood',
 'hello',
 'Threepwood']
```

4.3.7 Exercise using previous output

Write some code which says hello 3 times using previous functionand

[8]:
```
print(hello('Guybrush')[:6])
```

```
['hello', 'Guybrush', 'hello', 'Guybrush', 'hello', 'Guybrush']
```

4.3.8 Question in Jupyter

QUESTION: Why learn coding?

Show answer

ANSWER: So they pay me more

```
x + 1
```

Some other comment

```
Some nasty formatting

even more formatting
```

4.3.9 Exercise in Python

Start editing `lab.py` in text editor

[9]:
```
from lab_sol import *
```

4.3.10 add

Implement `add` function:

[10]:
```
add(3,5)
```

[10]:
```
8
```

4.3.11 sub

Implement sub function

[11]:
```
sub(7,4)
```

[11]:
```
3
```

4.3.12 Fine grained purging

```
This cell input will be completely removed
```

[13]:
```


print("This cell output will be completely removed")
```

[ ]:
```

```

4.4 Big sub chapter 1

4.4.1 Big docs example 1

reasonable paragraph

Bla bla

reasonable sub paragraph

Bla bla

Reasonable subsub paragraph

Bla bla

reasonable paragraph

Bla bla

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Reasonable subsub paragraph

Bla bla

paragraph with long title

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4.4.2 Big docs example 2

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4.4.3 Big docs example 3

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4.4.4 Big docs example 4

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4.4.5 Big docs example 5

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4.4.6 Big docs example 6

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4.4.7 Big docs example 1

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4.4.8 Big docs example 9

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4.4.9 Big docs example 1

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4.4.10 Big docs example 10

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4.5 Big sub chapter 2

4.5.1 Big docs example 1

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4.5.2 Big docs example 2

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4.5.3 Big docs example 3

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4.5.4 Big docs example 4

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4.5.5 Big docs example 5

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4.5.7 Big docs example 1

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4.5.8 Big docs example 9

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4.5.9 Big docs example 1

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4.6 Example Challenge

4.6.1 Download exercises zip

Browse files online[60]

This notebook has no solution!

We published solution on Github[61] **only for example purposes**, but normally all other files ending in `-chal-sol` or `_chal_sol` will be ignored

[3]:
```
from example_chal_sol import f
f(3)
```

[3]:
```
3
```

[4]:
```
def wow(x):
    raise Exception('TODO IMPLEMENT ME !')
```

[ ]:

[60] https://github.com/DavidLeoni/jupman/tree/master/challenge-example
[61] https://github.com/DavidLeoni/jupman/blob/master/challenge-example/example-chal-sol.ipynb

CHAPTER

FIVE

TEMPLATES

5.1 Changelog

Jupman Jupyter Manager

jupman.softpython.org[62]

5.1.1 IN PROGRESS - 3.3

- added optional parameter conf to jmt.init

5.1.2 October 17th 2020 - 3.2

- added optional build on Github Actions
- solutions are finally hidden on the website, with a click-to-show button!
- introduced generic jupman-togglable and specific jupman-sol CSS classes
- improved menu navigation
- added softpython theme
- images are now shown centered in HTML
- moved to jupman.softpython.org
- fixed write here tag not preserving the line
- deprecated jupman_tools.ignore_spaces in favor of tag_regex
- updated nbsphinx to 0.7.1
- updated sphinx_rtd_theme to 0.4.3
- updated sphinx to 2.3.1
- updated pygments to 2.7.1

[62] https://jupman.softpython.org

5.1.3 January 16th 2020 - 3.1

- removed jupman.init root parameter
- bugfixes
- upgraded nbsphinx from 0.3.4 to 0.5.0
- upgraded sphinx_rtd_theme from 0.2.5b1 to 0.4.3
- upgraded sphinx from 1.7.6 to 2.3.1
- upgraded recommonmark from 0.4.0 to 0.6.0

5.1.4 December 29th 2019 - 3.0

- much simplified folder structure
  - Issue 33[63]
- removed solutions from header requirement
  - Issue 32[64]
- introduced tests (pytest, hypothesis)
- removed old_news in favor of changelog.md
- Latex:
  - much better PDF cover
  - using xelatex
  - set up unicode mappings
- several fixes

5.1.5 September 24th 2018 - 2.0

- now using index.ipynb as home. Hurray !

5.1.6 September 19th 2018 - 1.0

- fixed build.py
- added html templates examples
- cleaned toc (was showing too much when loading)

[63] https://github.com/DavidLeoni/jupman/issues/33
[64] https://github.com/DavidLeoni/jupman/issues/32

5.1.7 August 26th 2018 - 0.9

- implemented generation of exercises from solutions [Issue 14(https://github.com/DavidLeoni/jupman/issues/14)
- reverted to old jupman.init() code Issue 12[65]

5.1.8 August 12th 2018 - 0.8

- Prepended all functions in jupman.py with `jupman_`
- replaced index with proper homepage. see Issue 11[66]
  - from now on you need home.ipynb file, because replacing index.rst is a nightmare!
  - new index.rst is just a placeholder which simply redirects to home.html. Do not modify it.
  - put the toctree in toc.rst
- exercises ipynb can now stay in exercises/ folder; when exercises are zipped, jupman automatically adds to the zip the required site files. see Issue 12[67]
- Tried %run at beginning of notebooks, without much satisfaction (see discussion in Issue 12[68]):
- disabled toc by default in html files. To enable it, in python use `%run -i ../../jupman --toc`
- renamed past-exams directory from 'past-exams' to 'exams'
- created `info`, `error`, `warn`, `fatal` functions to `conf.py`
- introduced new variable `exercise_common_files` in `conf.py` for common files to be zipped
- added pages `exam-project` , `markdown` , `project-ideas`,
- added `cc-by.png`
- renamed `changelog.txt` to `changelog.md`
- now using templates with curly brackets in in templating, like `_JM_{some_property}`
- jupman.js : now when manually saving html in Jupyter, resulting html correctly hides cells
- Fixes https://github.com/DavidLeoni/jupman/issues/2 : now toc is present in local build for pdfs

5.1.9 August 3rd 2018 - 0.7

- added jupman.py pytut() for displaying Python tutor in the cells
- added jupman.py toc=False option to jupman.py init to disable toc
- removed jupman.pyuseless networkx import from
- fixed usage indentation
- added changelog.txt

[65] https://github.com/DavidLeoni/jupman/issues/12
[66] https://github.com/DavidLeoni/jupman/issues/11
[67] https://github.com/DavidLeoni/jupman/issues/12
[68] https://github.com/DavidLeoni/jupman/issues/12

5.2 Past Exams

```
[ ]:
```

5.3 Exam project

For general (credits, attendance), see course description at section Evaluation and exams

Delivery times

Ideas for possible projects: *See here*

Last update: TODO

In short:

5.3.1 What to do

First of all: send by email to TODO@TODO.COM a brief description of the project, to decide what to do. I will create a Google doc to keep track of progresses and / or problems found.

Once the project is defined, go on like this:

1 - Download zip with template (view online files TODO[69])

After unzipped, you will find a folder named `NAME-SURNAME-ID`, with these files inside:

```
- NAME-SURNAME-ID
    - project.ipynb
    - markdown.ipynb
    - requirements.txt
    - img
        - example.png
```

2 - Rename the folder `NAME-SURNAME-ID` with your data

3 - run Jupyter from the folder you just renamed

4 - edit file `project.ipynb` , **closely following the indications** *in the following technical requirements*

5 - Once done, send project by email to TODO@TODO.COM

5.3.2 Technical requirements

Write in *Markdown*

[69] https://www.GITHUB.TODO

Python code

`requirements.txt` file

Graphical interfaces

Be careful to

5.4 Project ideas

5.4.1 TODO

Last update: TODO

5.4.2 Introduction

[ ]:

5.5 Jupman Project

PUT:

TITLE

NAME - ID

DATAE

5.5.1 Introduction

Bla bla

5.5.2 Data sources

Bla bla

5.5.3 Data cleaning and integration

Bla bla

5.5.4 Analysis

Bla bla

5.5.5 Problems found

Bla bla

5.5.6 Conclusioni

Bla bla

[ ]:

5.6 Markdown

Briefly explain why markdown is so great ..

[ ]:

CHAPTER

SIX

REFERENCES

Shows how to put a single page at the bottom of the sidebar, visible without being inside a section. See this issue[70]

[70] https://github.com/DavidLeoni/jupman/issues/70