

Jupyter Introduction

INFO-F-208

14/10/2016

Outline

1. What is Jupyter?
2. Create your first notebook
3. Minimum requirements for portfolio

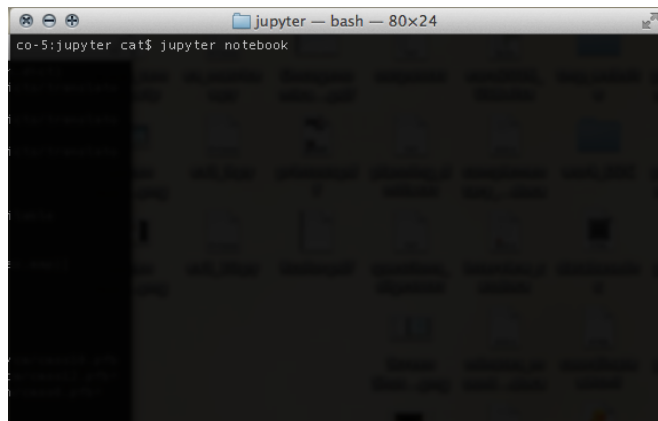
What is Jupyter

- ▶ Way to combine text (& math) and code (that can be run) in one document that is rendered in a browser.
- ▶ Notebook is stored as text file in ¹JSON format
- ▶ Jupyter can run over 40 different languages, originally conceived for *Julia*, *Python* and *R*

¹<http://json.org/>

Launch notebook

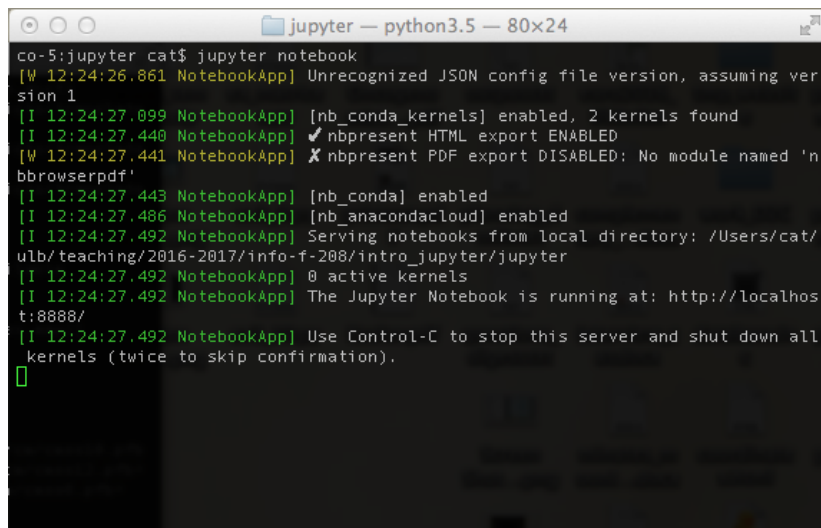
`/serveur/logiciels/anaconda3/bin/jupyter notebook`



A terminal window titled "jupyter — bash — 80x24" is shown. The prompt is "co-5:jupyter cat\$". The command "jupyter notebook" has been entered and executed. The background of the terminal is dark with a grid pattern.

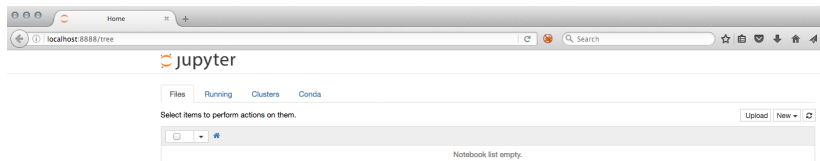
```
co-5:jupyter cat$ jupyter notebook
```

Launch notebook

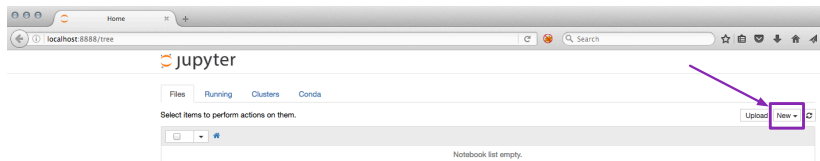
A terminal window titled "jupyter — python3.5 — 80x24" with standard macOS window controls. The terminal shows the command "jupyter notebook" being executed. The output consists of several log messages from the "NotebookApp" process, including warnings about unrecognized JSON config file version, information about enabling conda kernels and anacondacloud, and a confirmation that the server is running at http://localhost:8888/. The prompt returns to "co-5:jupyter cat\$".

```
co-5:jupyter cat$ jupyter notebook
[W 12:24:26.861 NotebookApp] Unrecognized JSON config file version, assuming ver
sion 1
[I 12:24:27.099 NotebookApp] [nb_conda_kernels] enabled, 2 kernels found
[I 12:24:27.440 NotebookApp] ✓ nbpresent HTML export ENABLED
[W 12:24:27.441 NotebookApp] ✗ nbpresent PDF export DISABLED: No module named 'n
bbrowserpdf'
[I 12:24:27.443 NotebookApp] [nb_conda] enabled
[I 12:24:27.486 NotebookApp] [nb_anacondacloud] enabled
[I 12:24:27.492 NotebookApp] Serving notebooks from local directory: /Users/cat/
ulb/teaching/2016-2017/info-f-208/intro_jupyter/jupyter
[I 12:24:27.492 NotebookApp] 0 active kernels
[I 12:24:27.492 NotebookApp] The Jupyter Notebook is running at: http://localhos
t:8888/
[I 12:24:27.492 NotebookApp] Use Control-C to stop this server and shut down all
kernels (twice to skip confirmation).
█
```

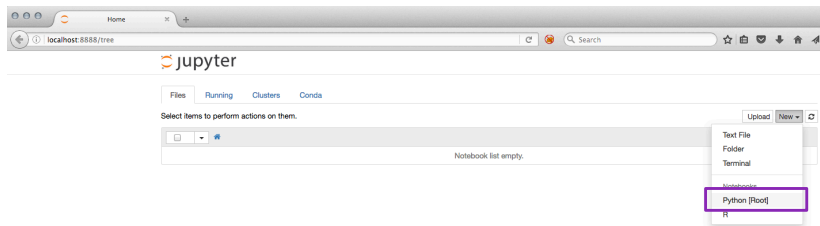
Notebook in browser



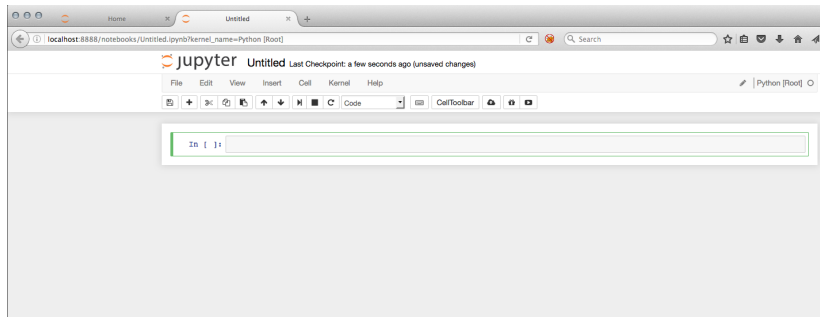
Start new notebook



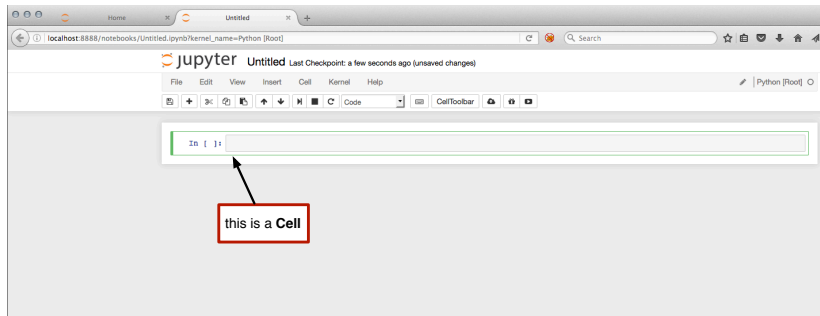
Start new notebook



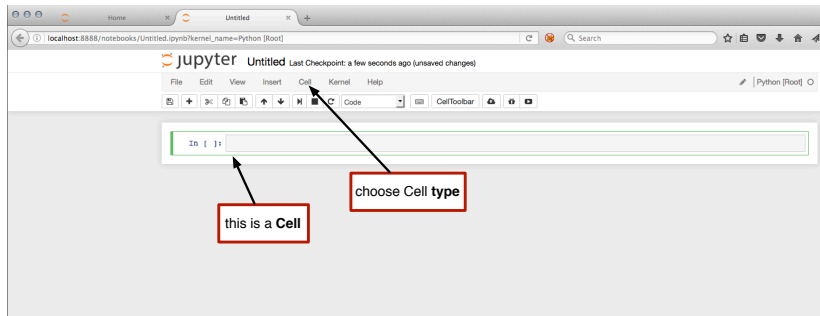
Start new notebook



New notebook



Notebook – content



Notebook – content

Markdown cells

The screenshot shows the Jupyter Notebook web interface. The browser address bar indicates the URL is `localhost:8888/notebooks/Untitled.ipynb?kernel_name=Python [Root]`. The Jupyter logo and "Untitled" title are visible, along with a status message: "Last Checkpoint: a few seconds ago (unsaved changes)".

The top menu bar includes File, Edit, View, Insert, Cell, Kernel, and Help. The "Cell" menu is open, showing options: Code, Markdown, Raw NBConvert, and Heading. The "Code" option is highlighted.

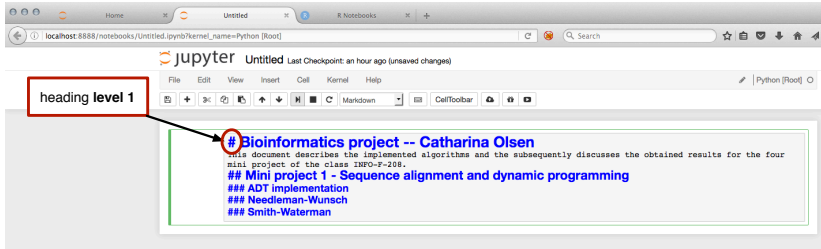
Annotations with arrows point to specific elements:

- An arrow points to the "Cell" menu with the text "choose Cell type".
- An arrow points to the "Code" option in the menu with the text "this is a Cell".
- An arrow points to the "Code" option in the menu with the text "mainly use".
- A red box contains the text: "Code: run python code", "Markdown: text".

The main workspace shows a code cell with the prompt `In []:`.

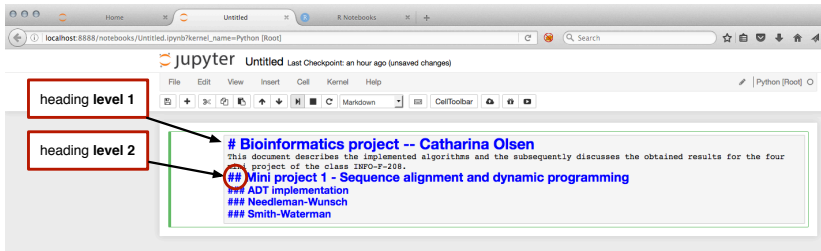
Notebook – content

Markdown cells



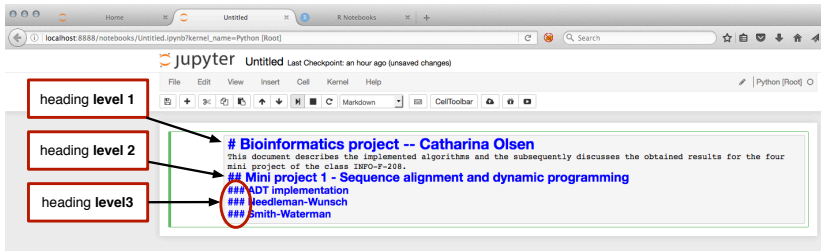
Notebook – content

Markdown cells



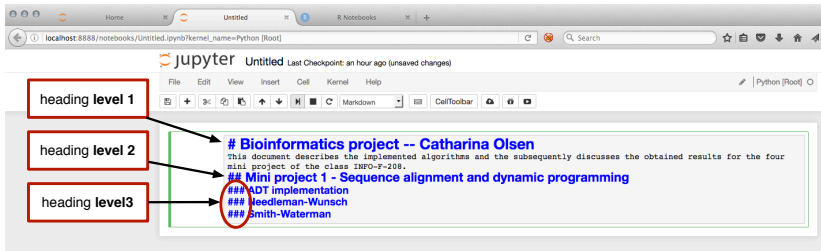
Notebook – content

Markdown cells



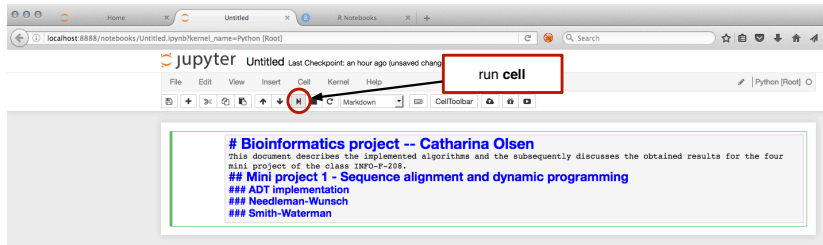
Notebook – content

Markdown cells



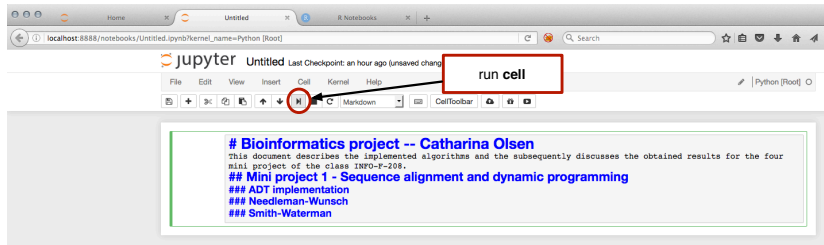
Notebook – content

Run cells



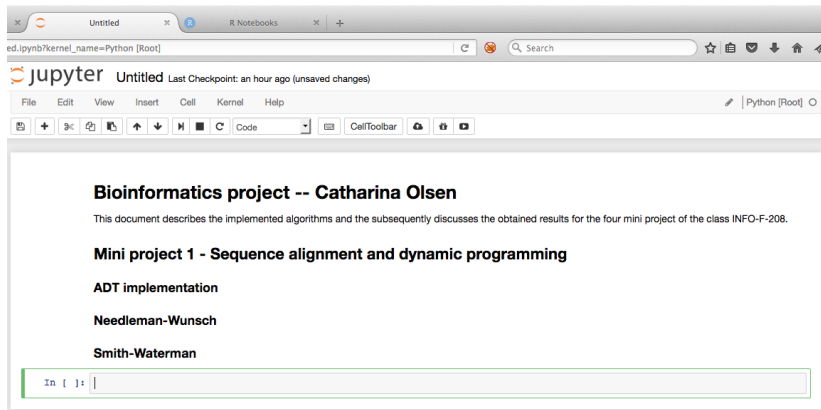
Notebook – content

Run cells



Notebook – content

Run cells



The screenshot displays a Jupyter Notebook interface in a web browser. The browser's address bar shows the URL `ed.ipynb?kernel_name=Python [Root]`. The Jupyter interface includes a top bar with the title "Untitled" and a status message "Last Checkpoint: an hour ago (unsaved changes)". Below this is a menu bar with options: File, Edit, View, Insert, Cell, Kernel, and Help. A toolbar contains various icons for file operations, cell execution, and viewing. The main content area shows the following text:

Bioinformatics project -- Catharina Olsen

This document describes the implemented algorithms and the subsequently discusses the obtained results for the four mini project of the class INFO-F-208.

Mini project 1 - Sequence alignment and dynamic programming

ADT implementation

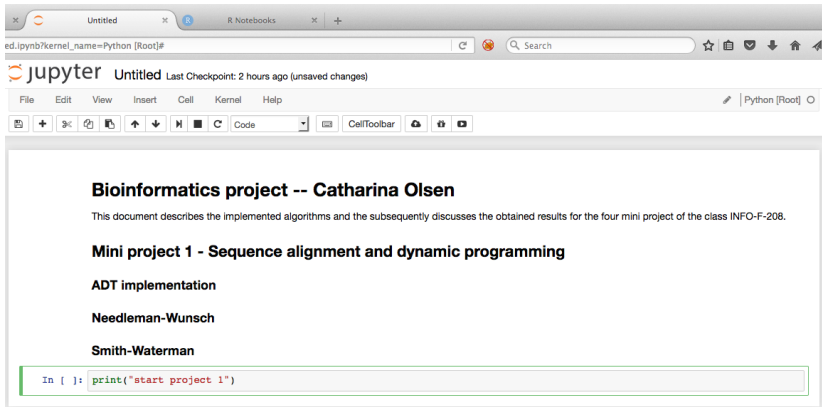
Needleman-Wunsch

Smith-Waterman

At the bottom, there is an input cell with the prompt `In []:` and a cursor.

Notebook – content

Code cells



The screenshot shows a Jupyter Notebook interface in a web browser. The browser tabs include 'Untitled' and 'R Notebooks'. The address bar shows 'ed.ipynb?kernel_name=Python [Root]#'. The Jupyter logo and 'Untitled' are visible, along with a message 'Last Checkpoint: 2 hours ago (unsaved changes)'. The menu bar includes 'File', 'Edit', 'View', 'Insert', 'Cell', 'Kernel', and 'Help'. The toolbar contains various icons for file operations and cell execution. The main content area displays the following text:

Bioinformatics project -- Catharina Olsen

This document describes the implemented algorithms and the subsequently discusses the obtained results for the four mini project of the class INFO-F-208.

Mini project 1 - Sequence alignment and dynamic programming

ADT implementation

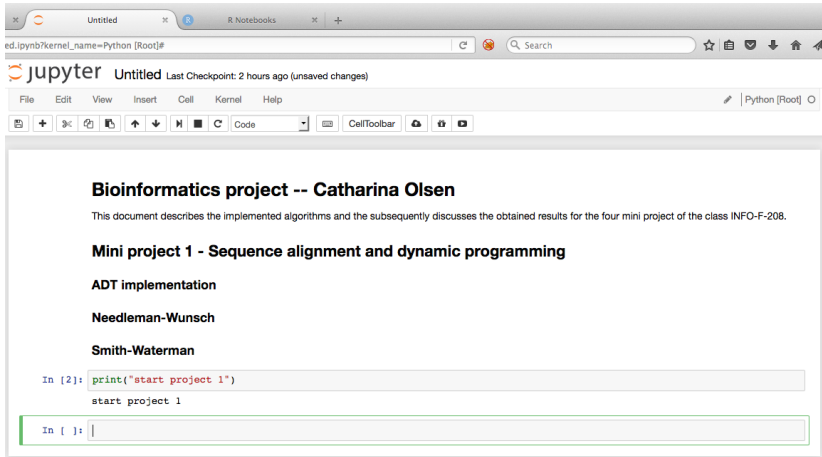
Needleman-Wunsch

Smith-Waterman

```
In [ ]: print("start project 1")
```

Notebook – content

Run code cells



The screenshot shows a Jupyter Notebook interface in a web browser. The browser tabs include 'Untitled', 'R Notebooks', and a plus sign for more tabs. The address bar shows 'ed.ipynb?kernel_name=Python [Root]#'. The Jupyter logo and 'Untitled' title are visible, along with a message 'Last Checkpoint: 2 hours ago (unsaved changes)'. The menu bar includes File, Edit, View, Insert, Cell, Kernel, and Help. The toolbar contains various icons for file operations, cell execution, and output viewing. The notebook content area displays a document titled 'Bioinformatics project -- Catharina Olsen'. The text describes implemented algorithms and discusses results for a mini project. The document includes sections for 'Mini project 1 - Sequence alignment and dynamic programming', 'ADT implementation', 'Needleman-Wunsch', and 'Smith-Waterman'. There are two code cells: the first contains a print statement and the text 'start project 1', and the second is an empty code cell.

ed.ipynb?kernel_name=Python [Root]#

jupyter Untitled Last Checkpoint: 2 hours ago (unsaved changes)

File Edit View Insert Cell Kernel Help Python [Root]

Bioinformatics project -- Catharina Olsen

This document describes the implemented algorithms and the subsequently discusses the obtained results for the four mini project of the class INFO-F-208.

Mini project 1 - Sequence alignment and dynamic programming

ADT implementation

Needleman-Wunsch

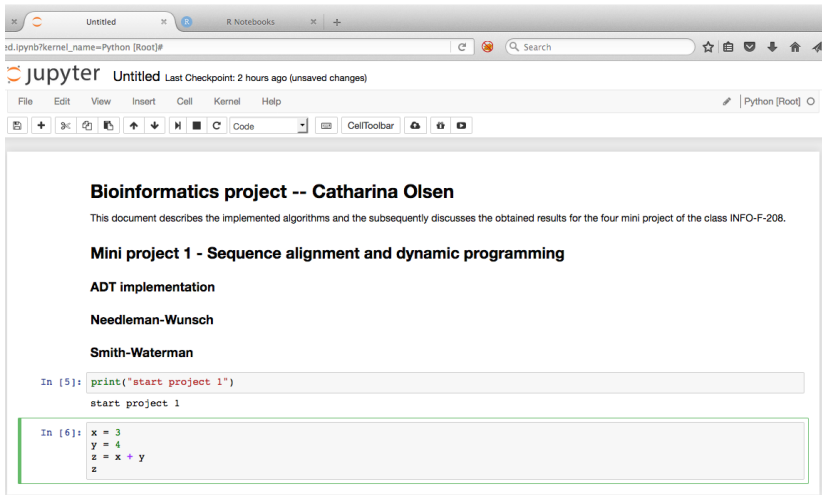
Smith-Waterman

```
In [2]: print("start project 1")
        start project 1
```

```
In [ ]: |
```

Notebook – content

More code cells



The screenshot shows a Jupyter Notebook interface in a web browser. The browser tabs include 'Untitled' and 'R Notebooks'. The address bar shows 'td.ipynb?kernel_name=Python [Root]#'. The Jupyter logo and 'Untitled' are visible, along with a message 'Last Checkpoint: 2 hours ago (unsaved changes)'. The menu bar includes File, Edit, View, Insert, Cell, Kernel, and Help. The toolbar contains various icons for file operations and cell execution. The notebook content includes a title, a paragraph, and two code cells.

Bioinformatics project -- Catharina Olsen

This document describes the implemented algorithms and the subsequently discusses the obtained results for the four mini project of the class INFO-F-208.

Mini project 1 - Sequence alignment and dynamic programming

ADT implementation

Needleman-Wunsch

Smith-Waterman

```
In [5]: print("start project 1")
start project 1
```

```
In [6]: x = 3
        y = 4
        z = x + y
        z
```

Notebook – content

Run code cells

The screenshot shows a Jupyter Notebook interface in a web browser. The browser tab is titled "Untitled" and the address bar shows "ed.ipynb?kernel_name=Python [Root]#". The Jupyter logo and "Untitled" are visible in the top left of the interface. Below the logo, it says "Last Checkpoint: 2 hours ago (unsaved changes)". The top menu bar includes "File", "Edit", "View", "Insert", "Cell", "Kernel", and "Help". On the right of the menu bar, there is a "Python [Root]" button. Below the menu bar is a toolbar with various icons for file operations, cell manipulation, and execution. The main content area of the notebook contains the following text:

Bioinformatics project -- Catharina Olsen

This document describes the implemented algorithms and the subsequently discusses the obtained results for the four mini project of the class INFO-F-208.

Mini project 1 - Sequence alignment and dynamic programming

ADT implementation

Needleman-Wunsch

Smith-Waterman

```
In [5]: print("start project 1")
start project 1
```

```
In [7]: x = 3
        y = 4
        z = x + y
        z
```

Out[7]: 7

At the bottom, there is an empty input cell for the next code entry.

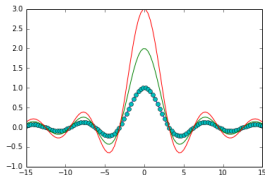
Notebook – content

Include plots

```
In [8]: %matplotlib inline
```

```
In [9]: # code from http://glowingpython.blogspot.be/2011/04/how-to-plot-function-using-matplotlib.html
import pylab
import numpy
x = numpy.linspace(-15,15,100) # 100 linearly spaced numbers
y = numpy.sin(x)/x # computing the values of sin(x)/x

# compose plot
pylab.plot(x,y) # sin(x)/x
pylab.plot(x,y,'co') # same function with cyan dots
pylab.plot(x,2*y,x,3*y) # 2*sin(x)/x and 3*sin(x)/x
pylab.show() # show the plot
```



```
In [ ]:
```


Notebook – content

Latex formula

The following code computes the result of the sum $\sum_{i=1}^n x_i^2$.

The following code computes the result of the sum $\sum_{i=1}^n x_i^2$.

Cell formatting

- ▶ keep cells simple
- ▶ do not exceed width of code cell
- ▶ max. few related functions per cell
- ▶ comment code, add descriptive doc strings to functions
- ▶ import in the first code cell
- ▶ display graphics inline

Do **not** to forget to

- ▶ provide code in your notebook, all **results** must be **reproducible!**
- ▶ answers **all** questions, just the code will not suffice!
- ▶ **discuss results** you obtained