Short Introduction to Jupyter and Python for Numerical Operations

Why use Python? How does it work?

- Compared to Excel and Matlab, Python has several advantages
  - it is free and developed by a very active community (not a company)
  - it has a large number of specific modules (“packages”) that have been developed for specific applications (like numpy and scipy for numerical calculations)
  - it is easy to learn thanks to many available tutorials

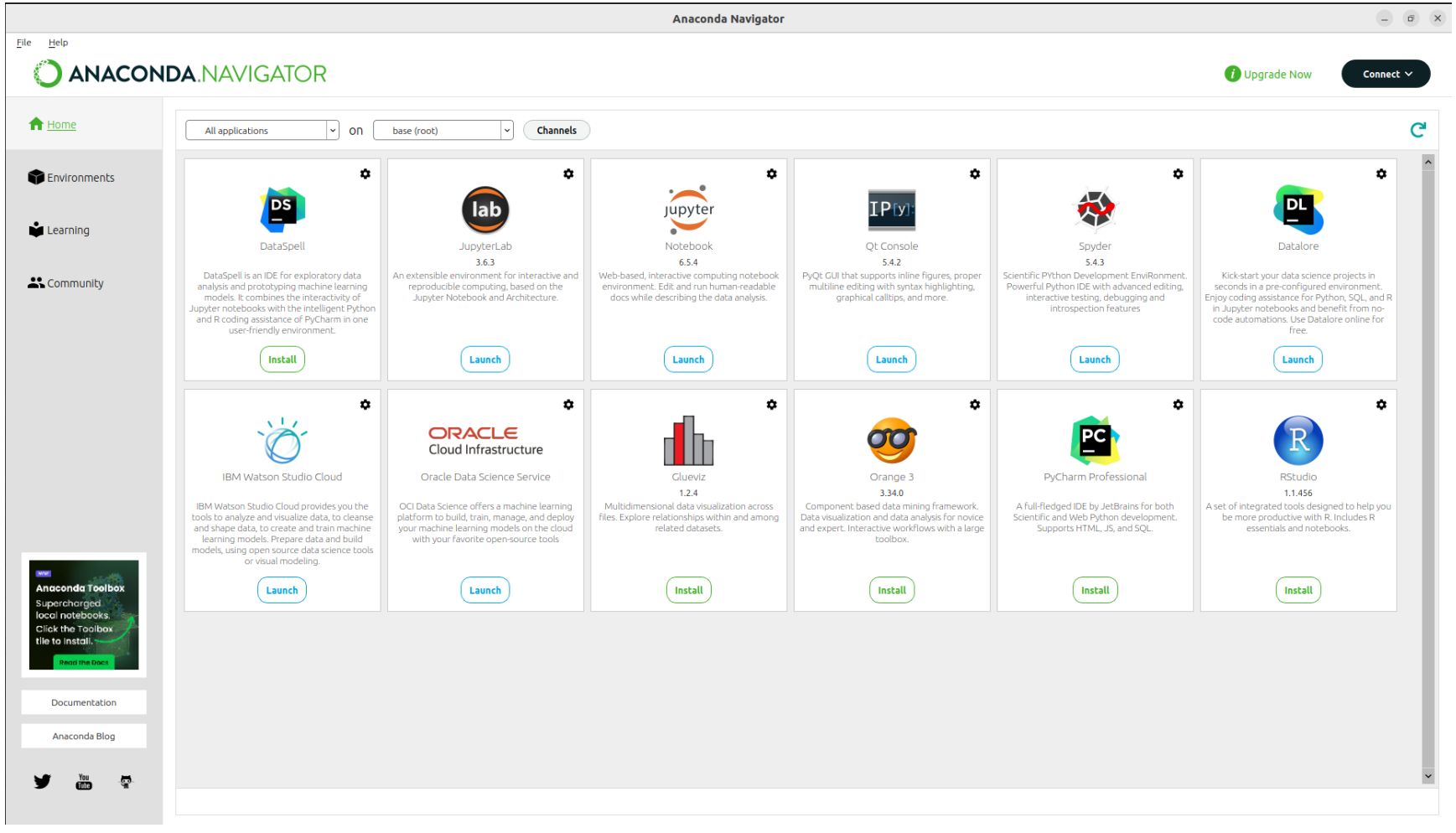
- Python is a programming language that relies on “scripts”, that are text files with code written in successive lines
  - typical Python scripts end with suffix “.py”

- Anaconda is convenient to install Python on any computer (with Linux, Windows, Mac-OS) and handle packages (and dependencies when installing them)

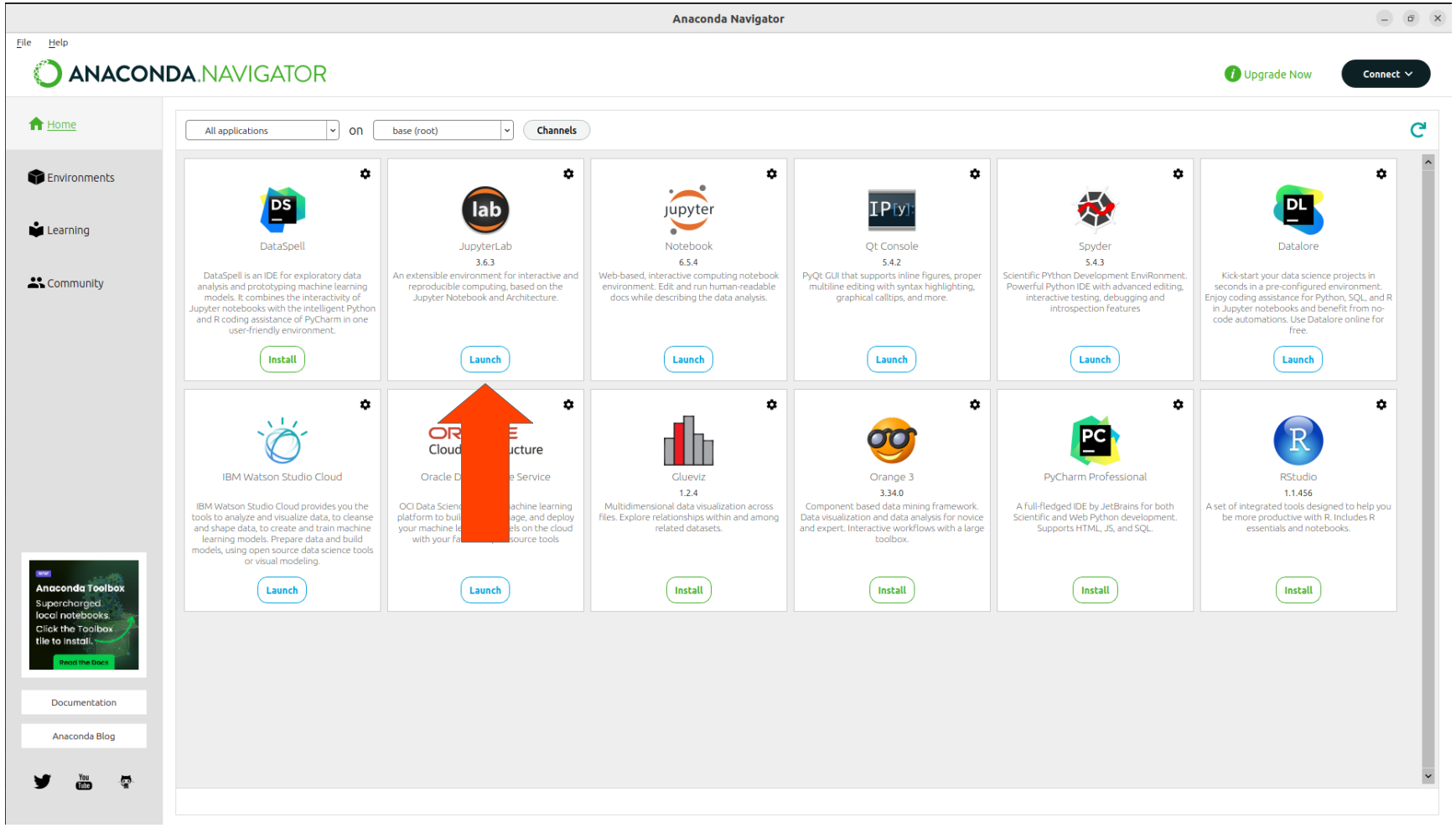
Install Anaconda

- Go to https://www.anaconda.com/download or https://docs.conda.io/projects/miniconda/en/latest/miniconda-install.html
- Follow the instructions to install Anaconda or Miniconda on your computer
  - you may have to go to the folder where conda is installed to run in command line `conda init` for the system to know where conda is located
- Launch anaconda-navigator
- Launch jupyter-lab
  - notebooks are a mixture of code (like Python) and text / images that is very useful to didactic presentations
  - let’s first see how to manipulate the notebook cells, then let’s write Python code

Launch Jupyter Lab



Launch Jupyter Lab



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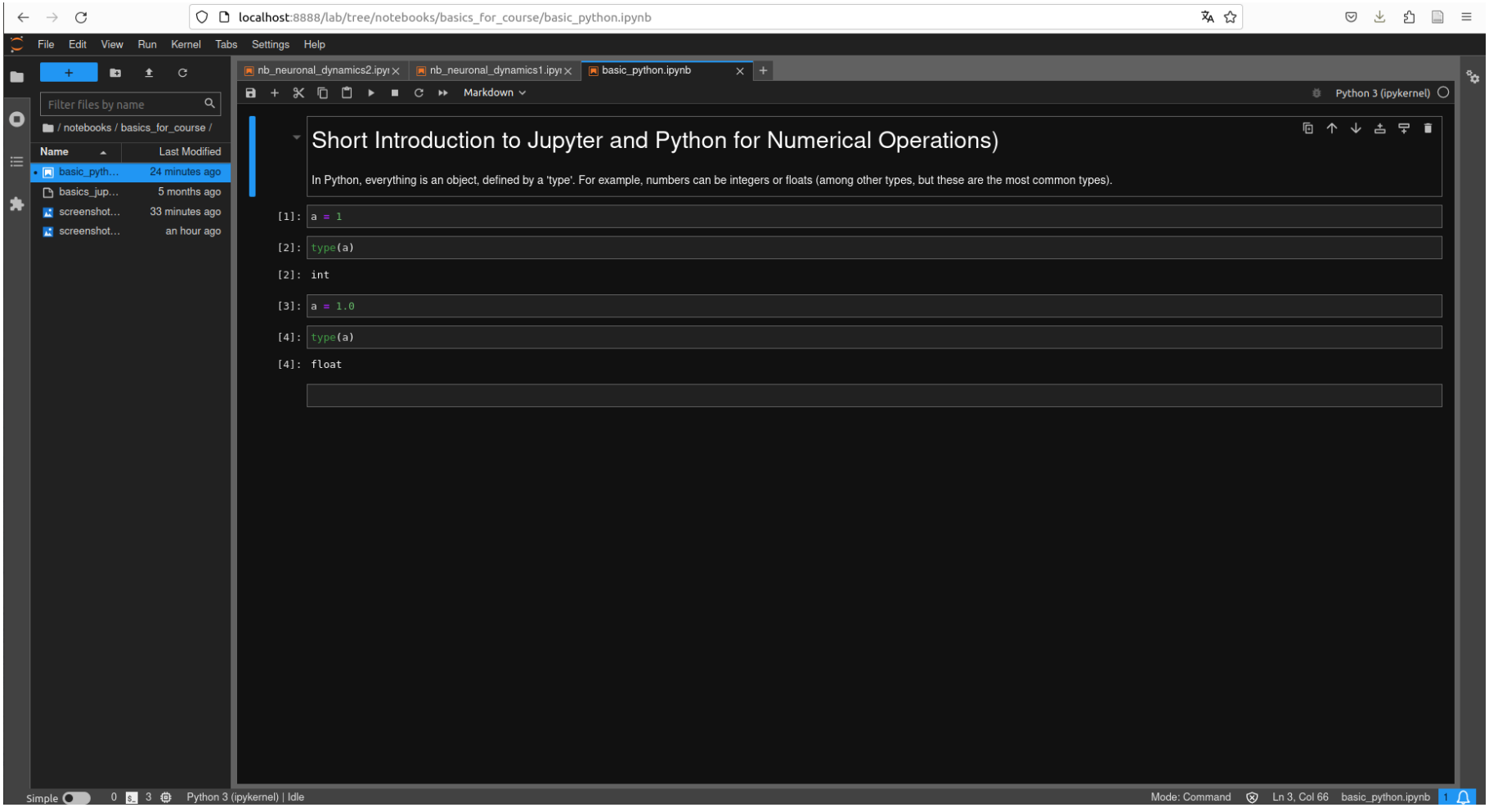

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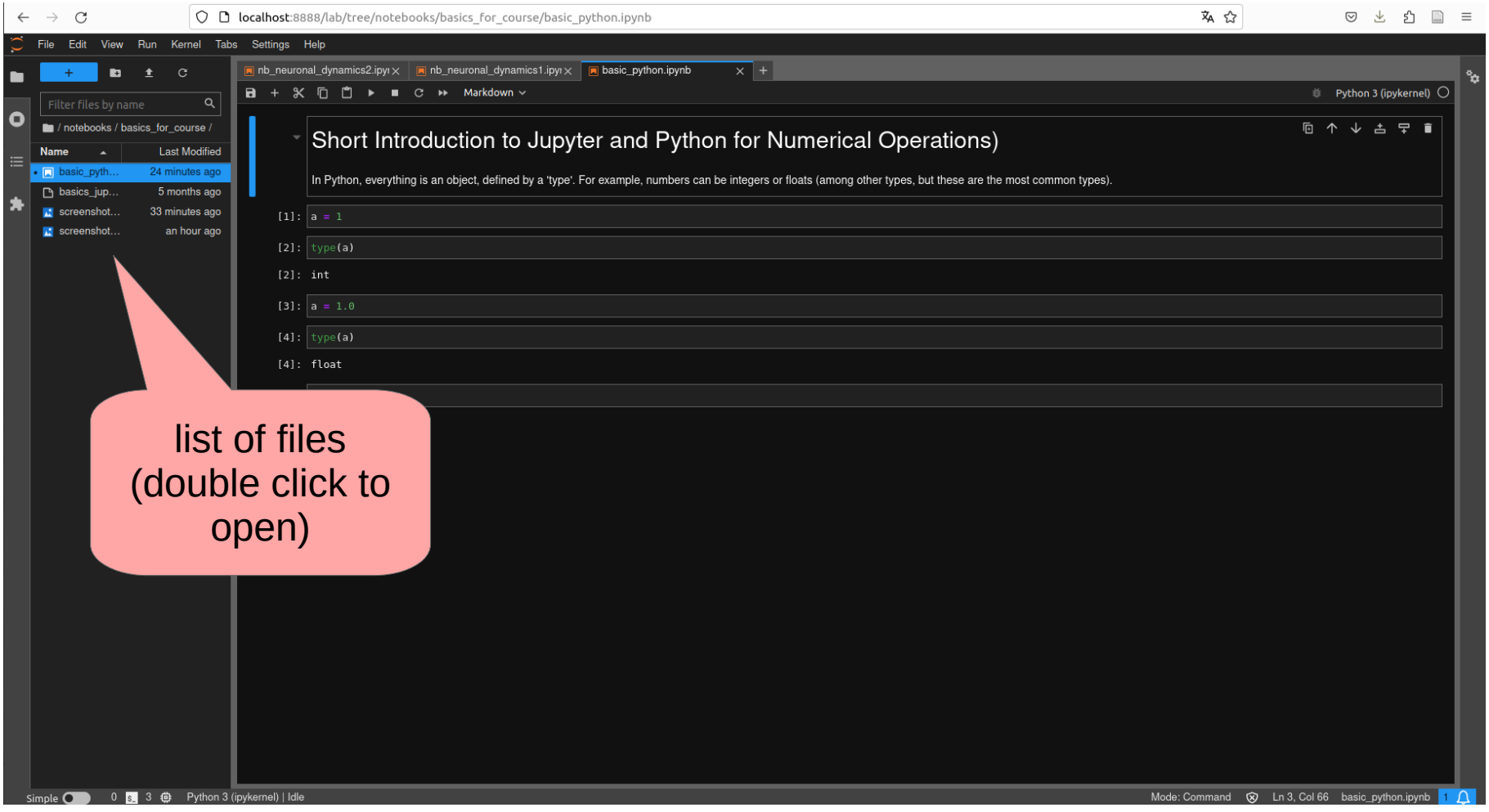

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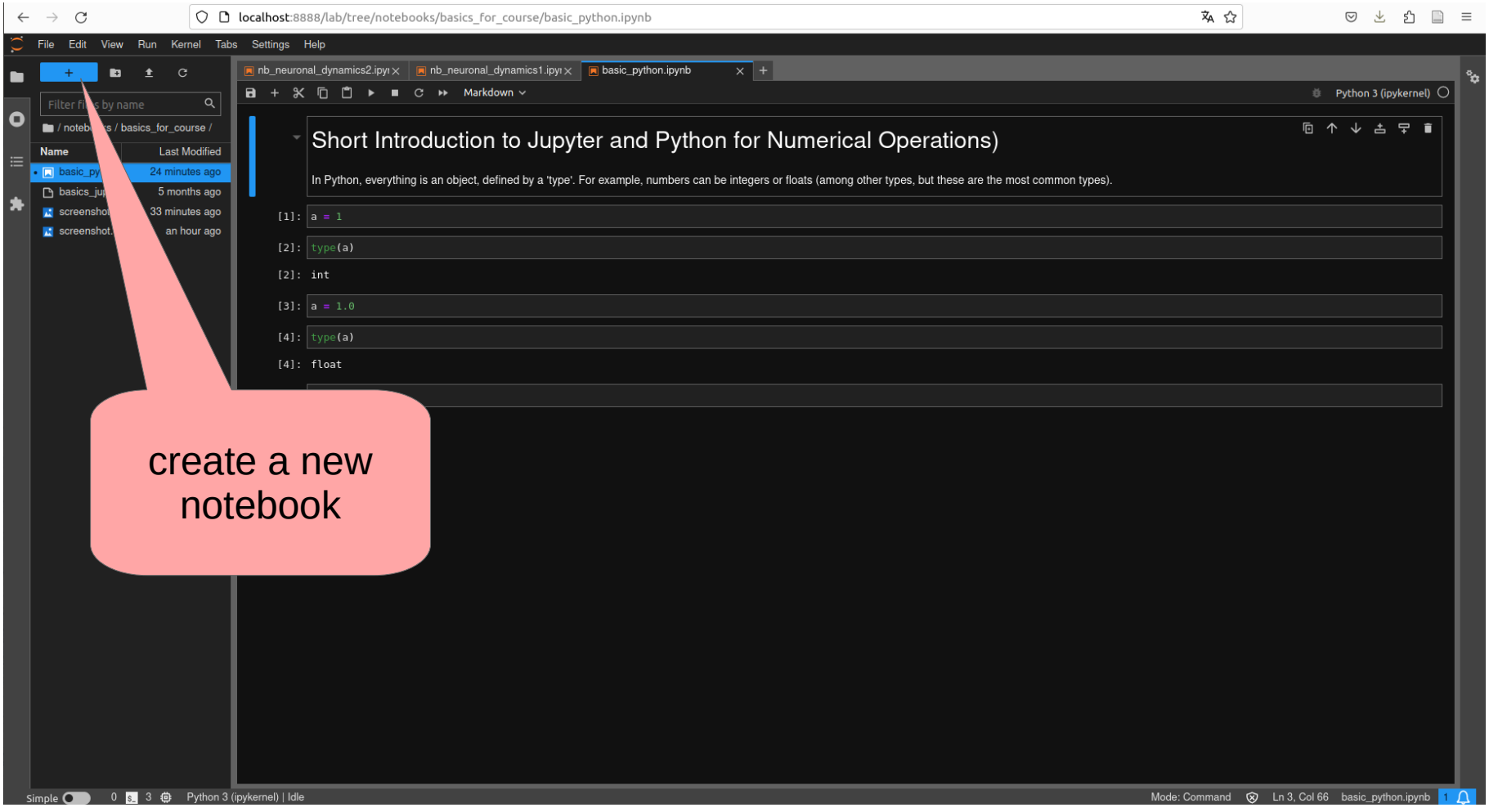

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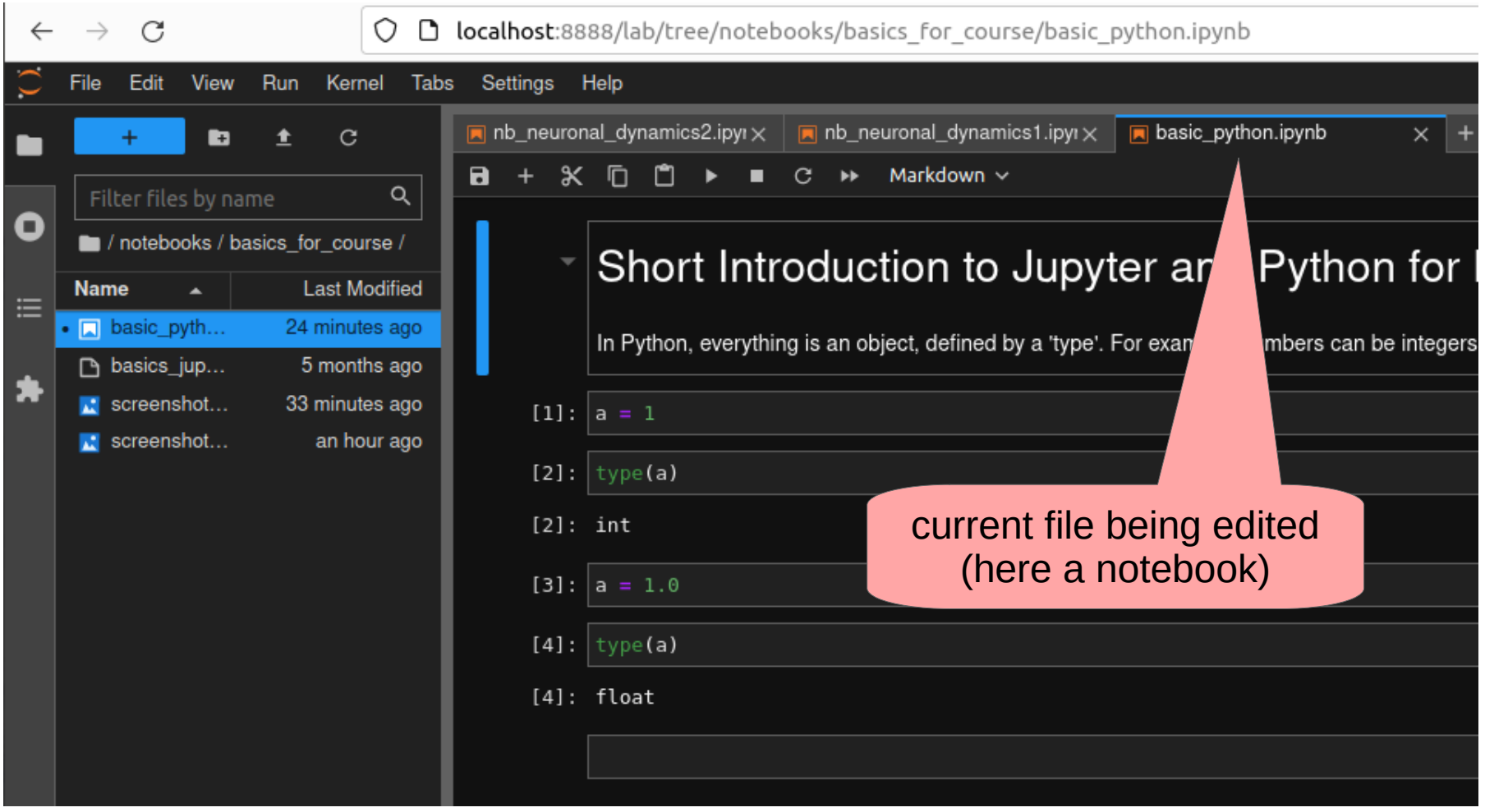

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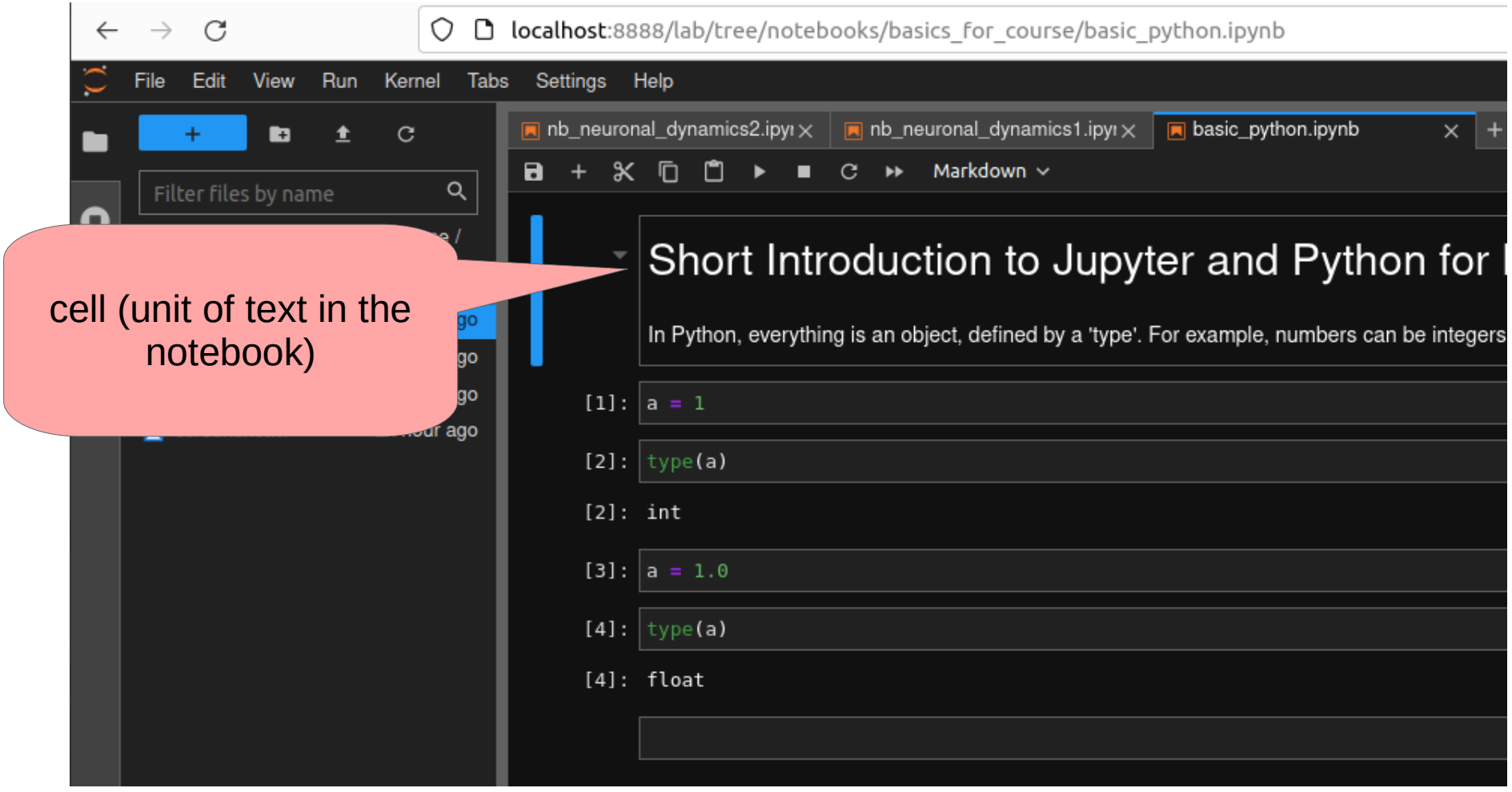

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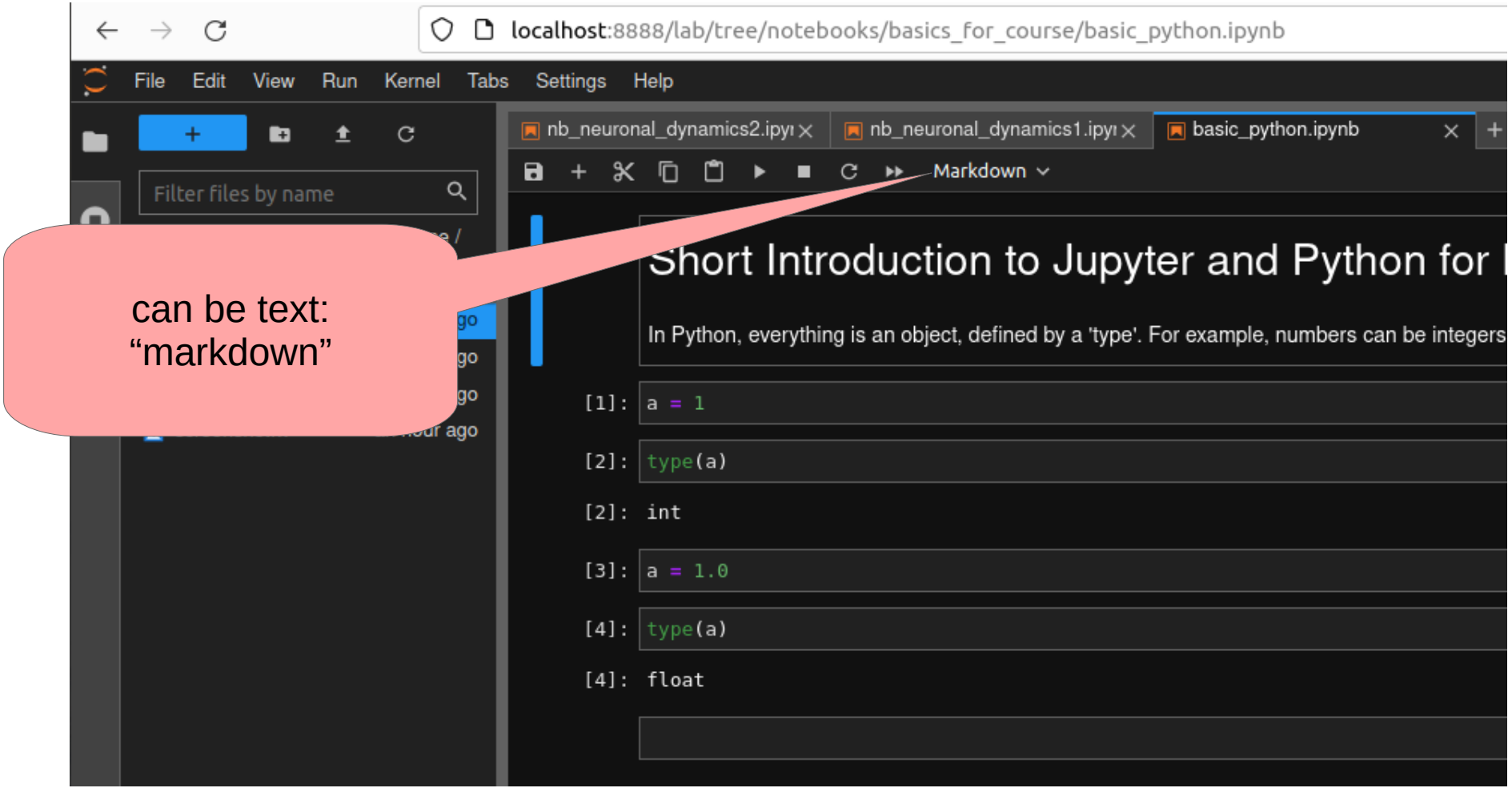

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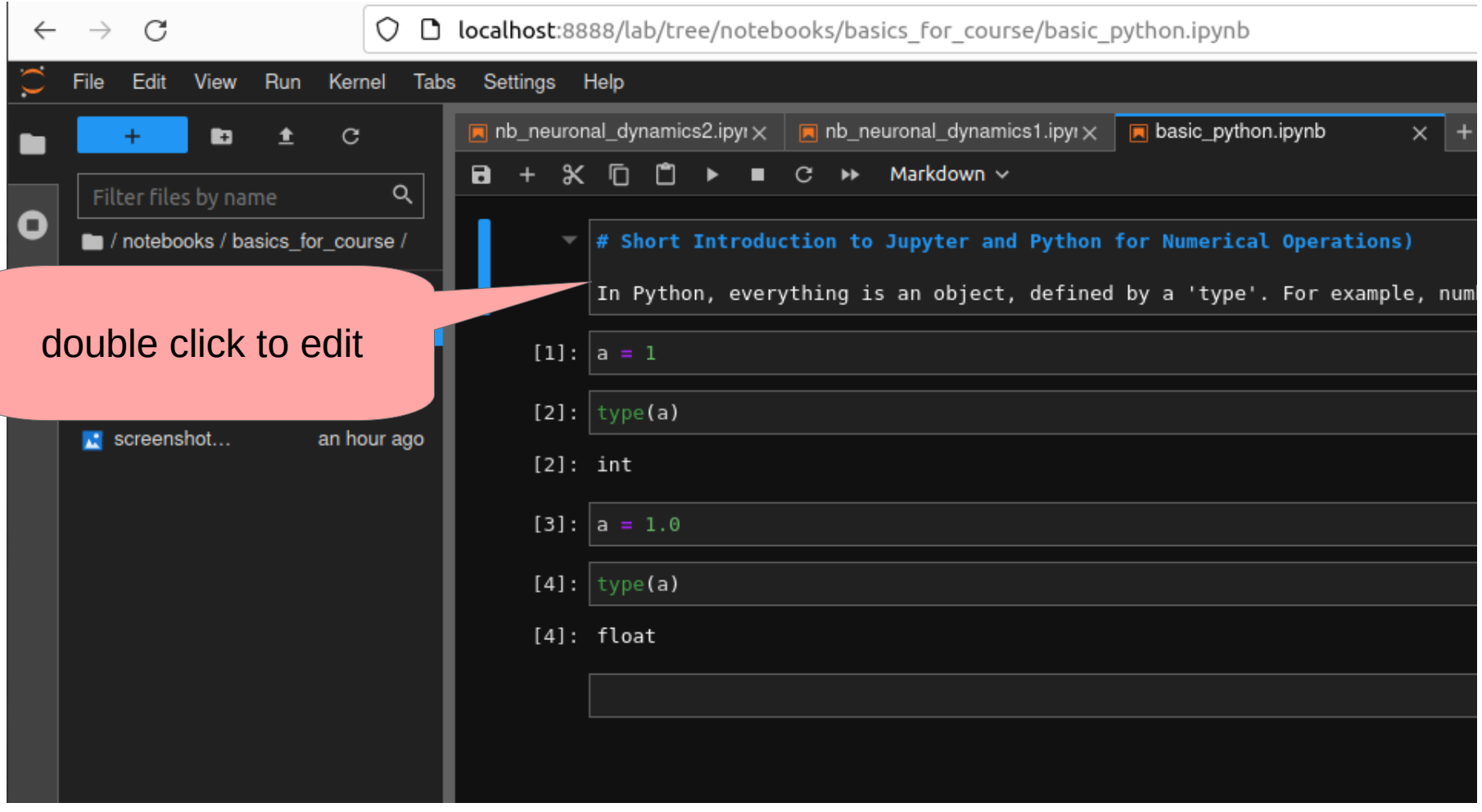

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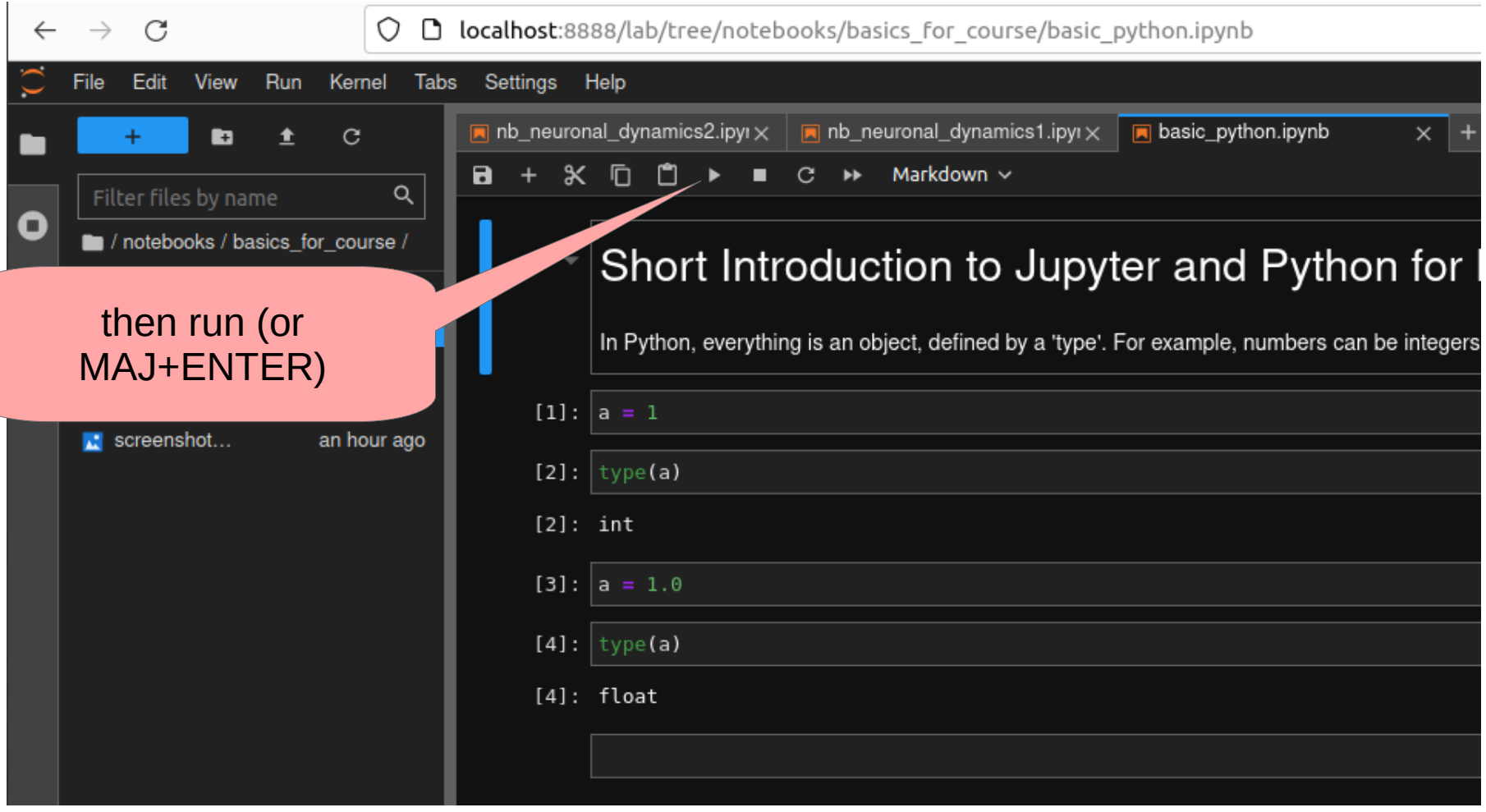

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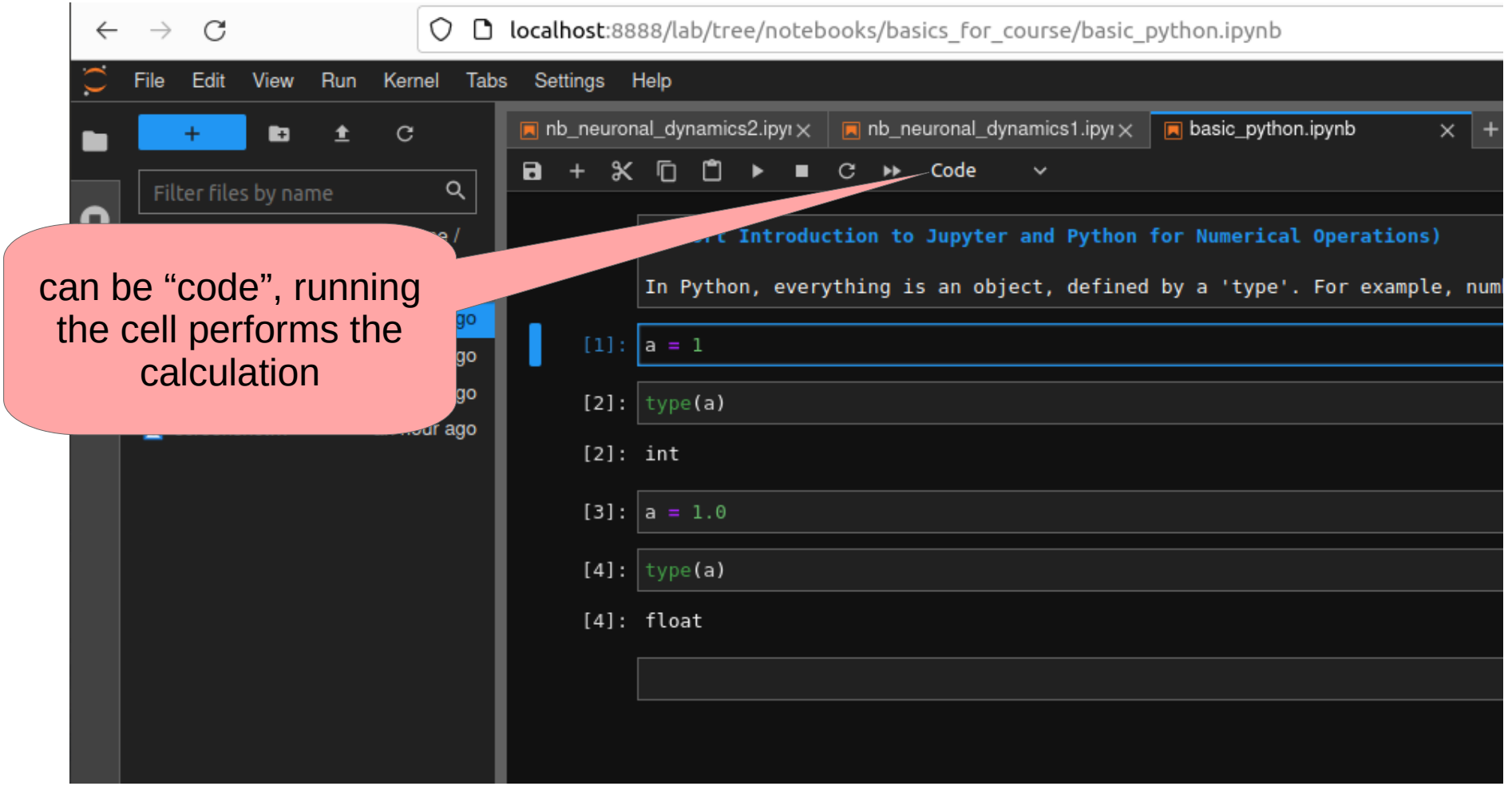

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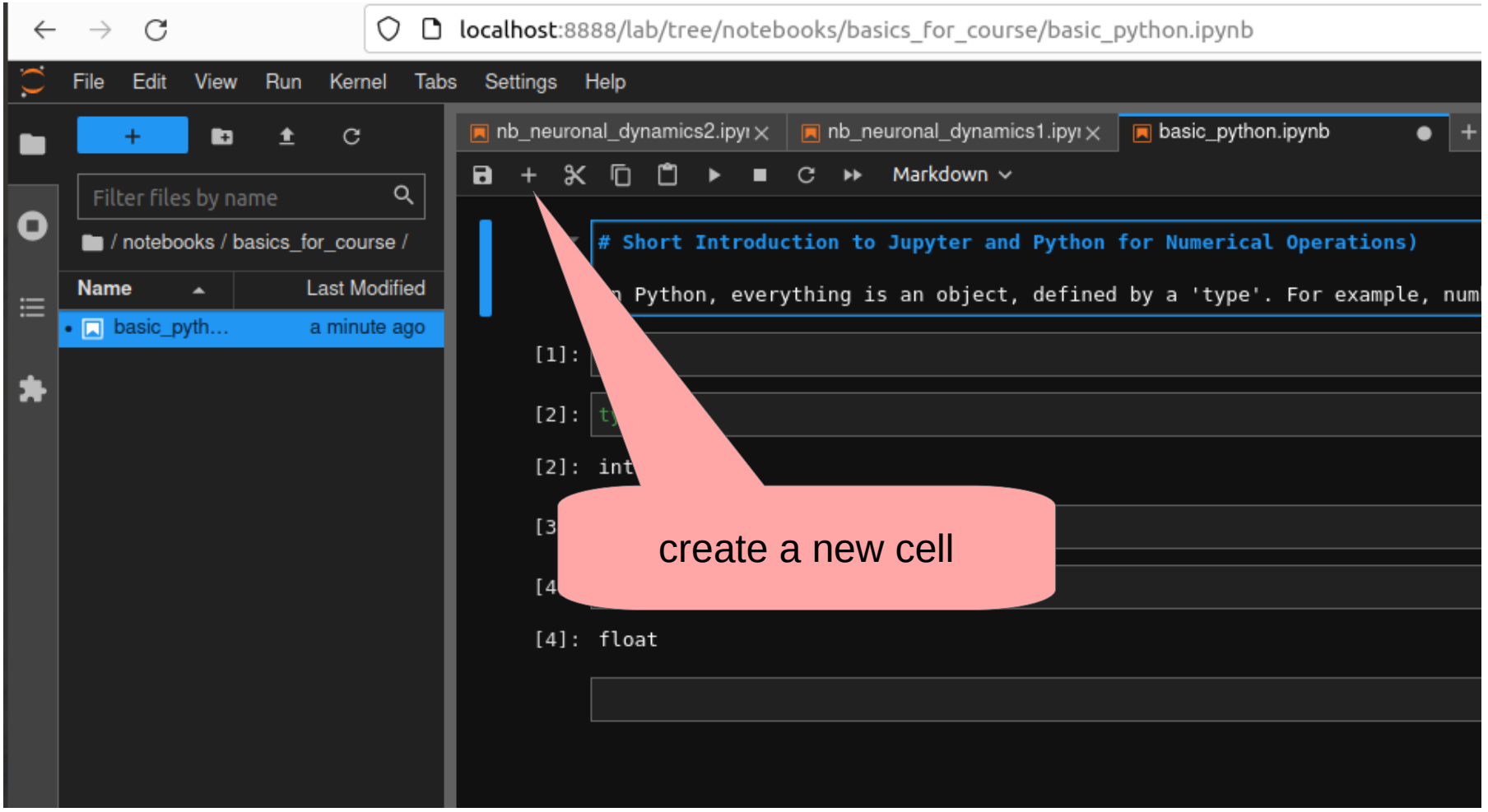

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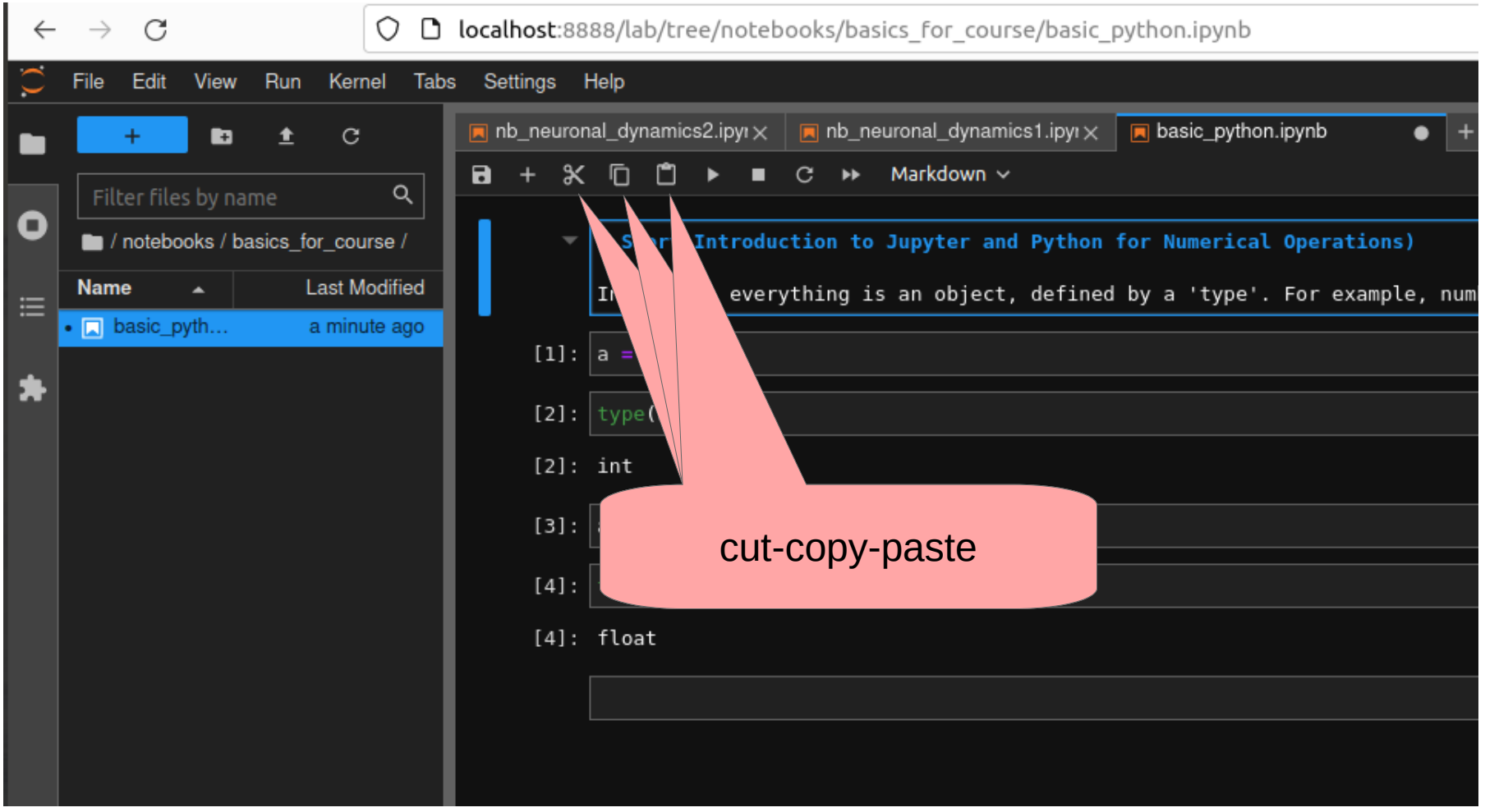


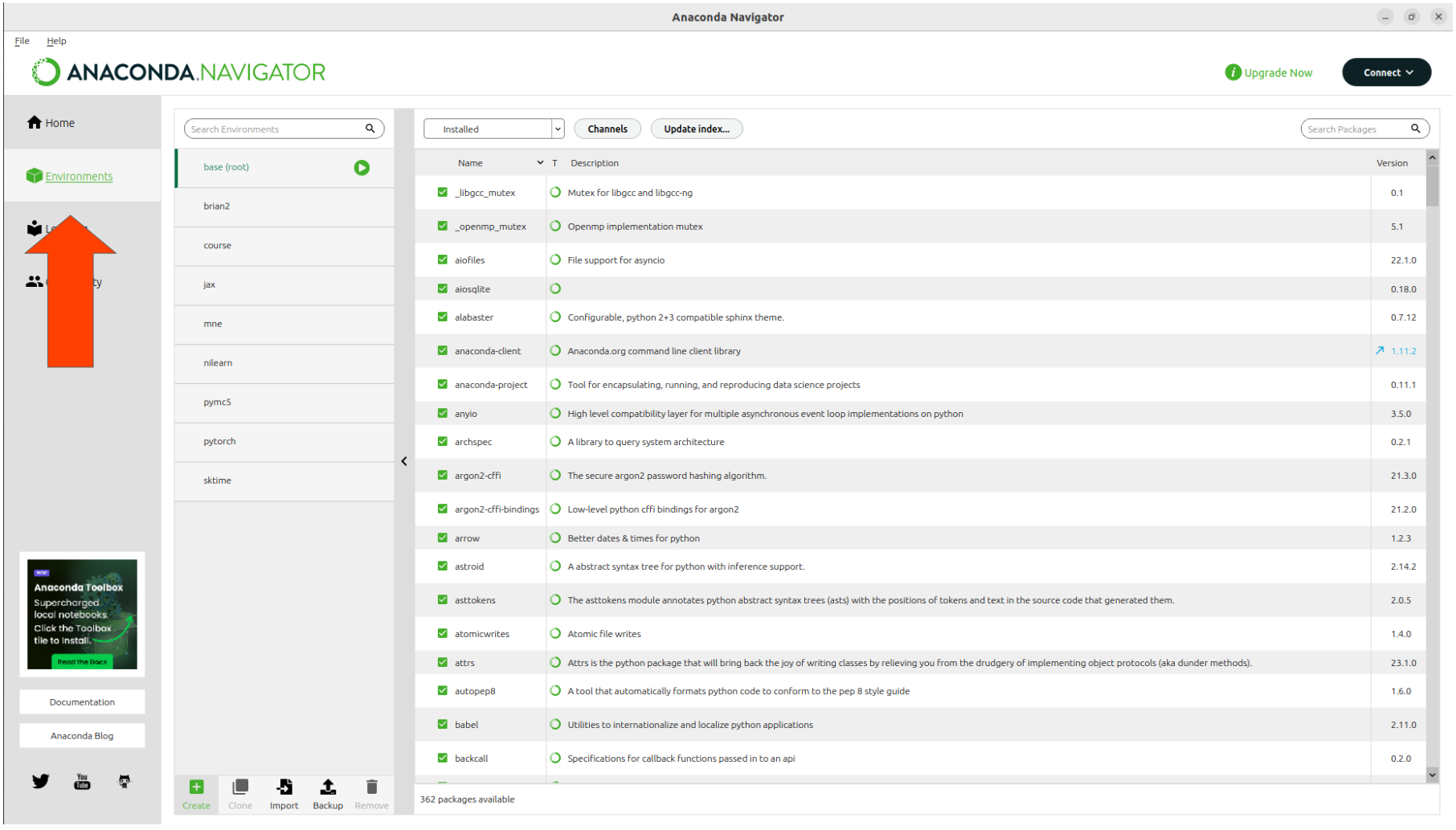
Useful Tips

- Shortcut MAJ+ENTER to run current cell
- Menu ‘Cells’: ‘Run All Cells’ to run the whole notebook
  - the memory is updated by the execution of each cell, so if you don’t run cells in order (or just go to a cell after opening the notebook), the variables in memory may not be what you think…
- Restart the kernel when something went wrong in the notebook (like no cell output although there should be...)

Create Environment with Selected Packages

- Back to anaconda-navigator: follow the following steps described in the following slides
- Go to ‘Environments’ tab and create a new environment
  - name it for example ‘env1’ and go with the latest version of Python as proposed
- Search packages that we are going to use and install them:
  - ‘numpy’ and ‘scipy’ for calculation
  - ‘matplotlib’ for visualization
  - ‘jupyter lab’

Create Environment and Select Packages Manually



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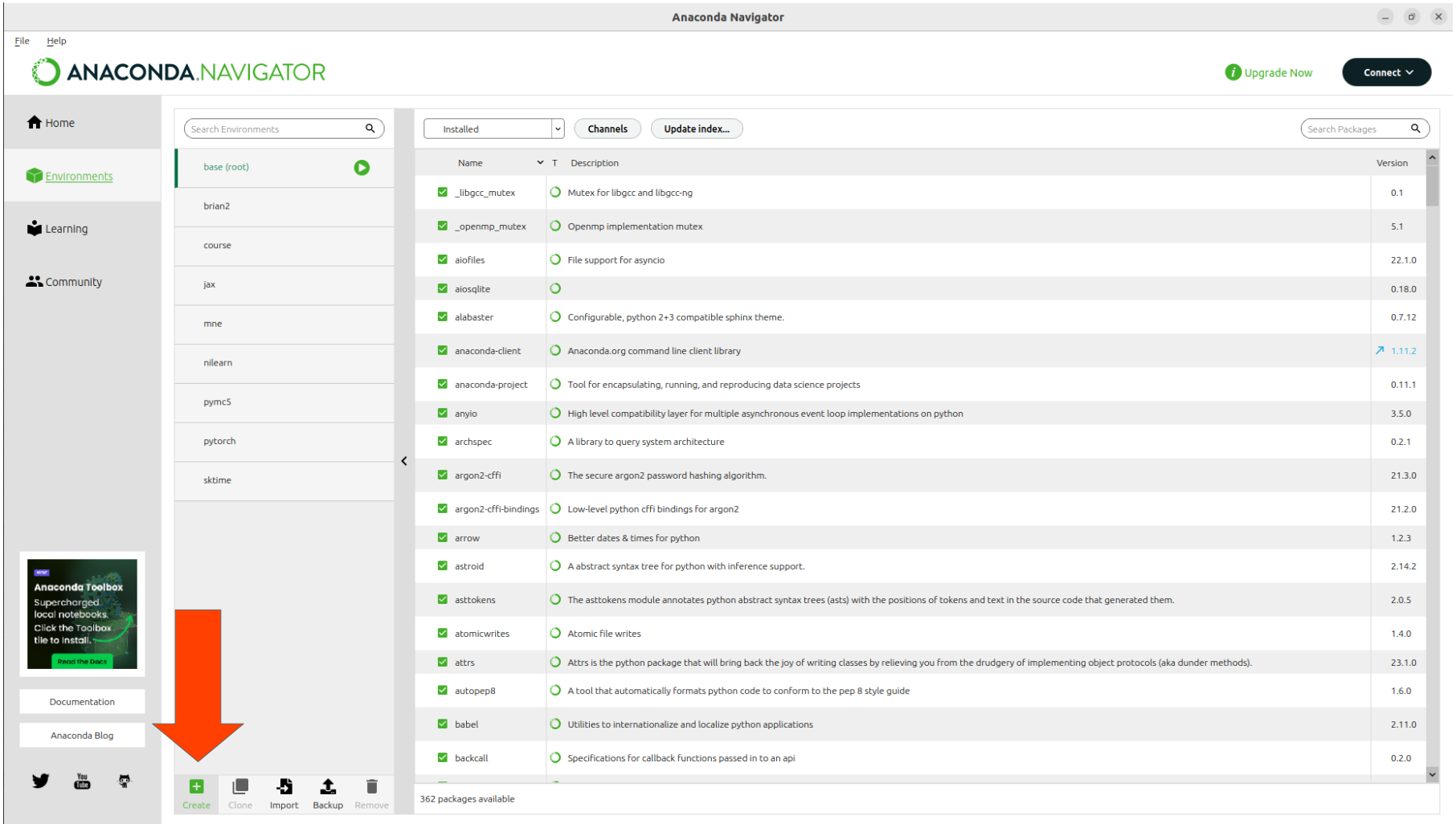

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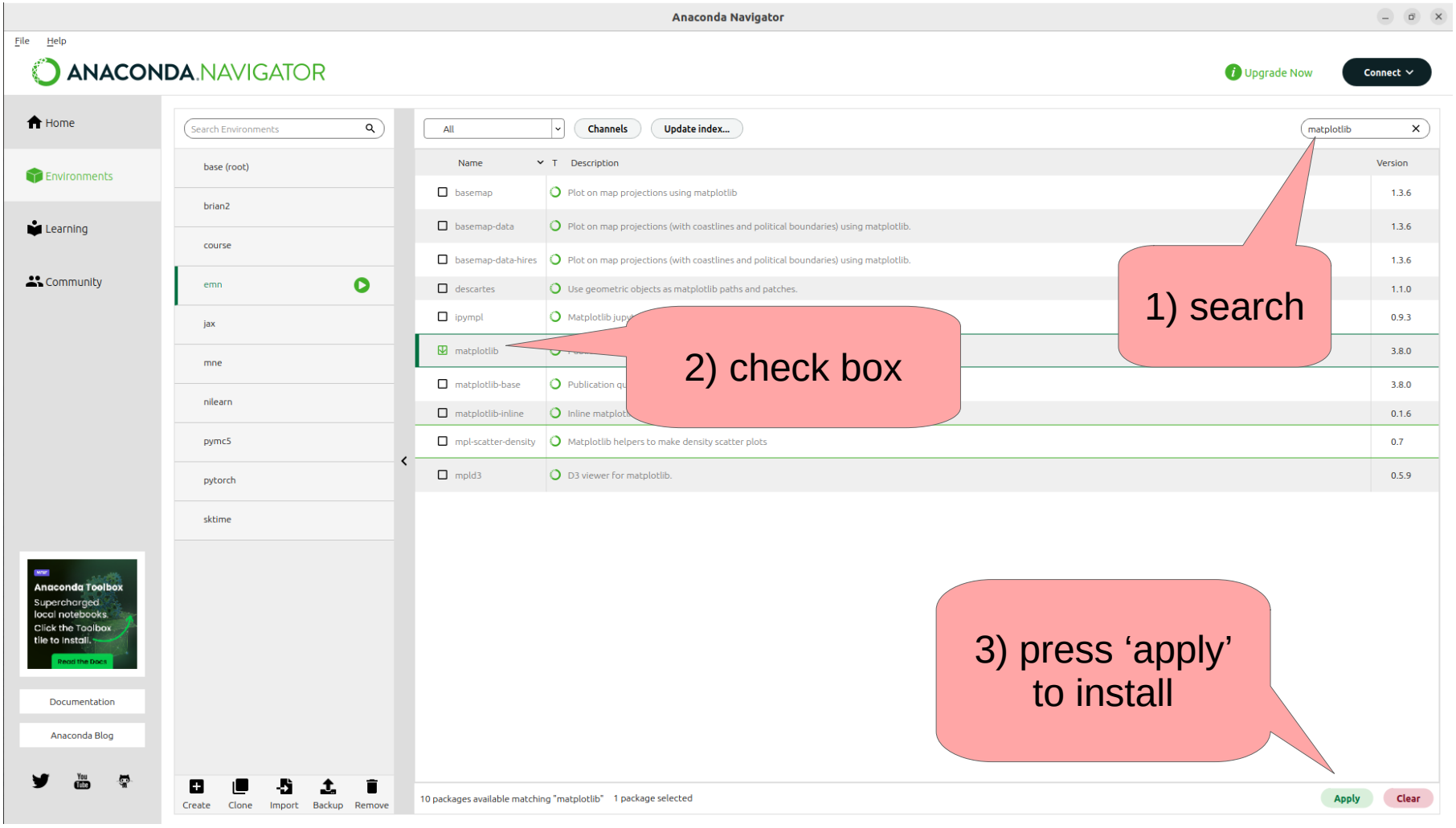
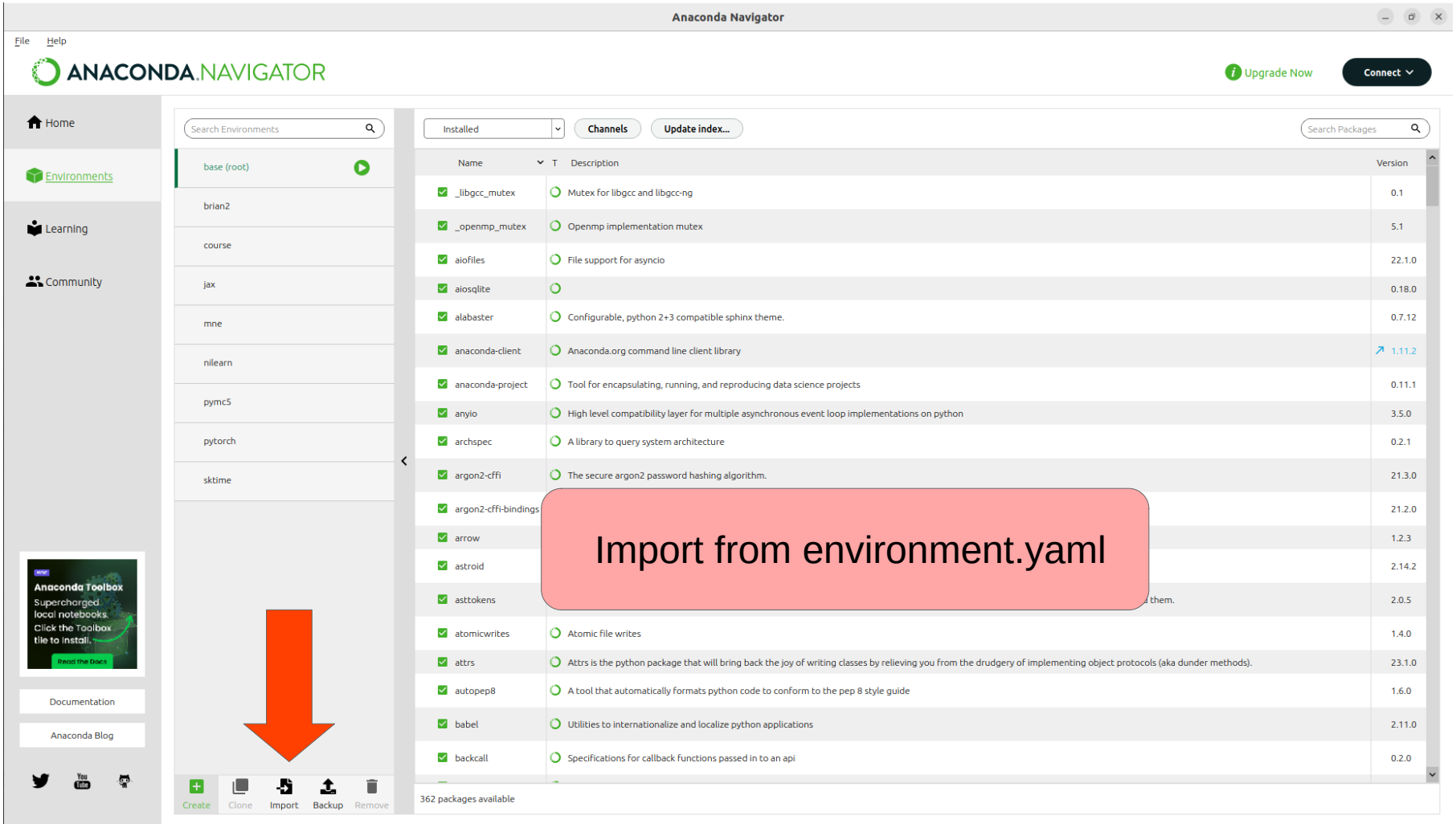


Create Environment Using YAML File



Now to Practice with Python Programming

- Download and open the notebook ‘basic_python.ipynb’ in folder ‘basics/python/’
- For further information about notebooks, check https://docs.jupyter.org/en/latest/
  - markdown syntax: https://fr.wikipedia.org/wiki/Markdown
- Numpy documentation: https://numpy.org/doc/stable/reference/
  - tutorial: https://numpy.org/devdocs/user/absolute_beginners.html
- Scipy documentation: https://docs.scipy.org/doc/scipy/reference/index.html
- Matplotlib tutorial: https://matplotlib.org/stable/users/explain/quick_start.html