K. NOYSENA

Intro to Python and DS9

ASTRO 101

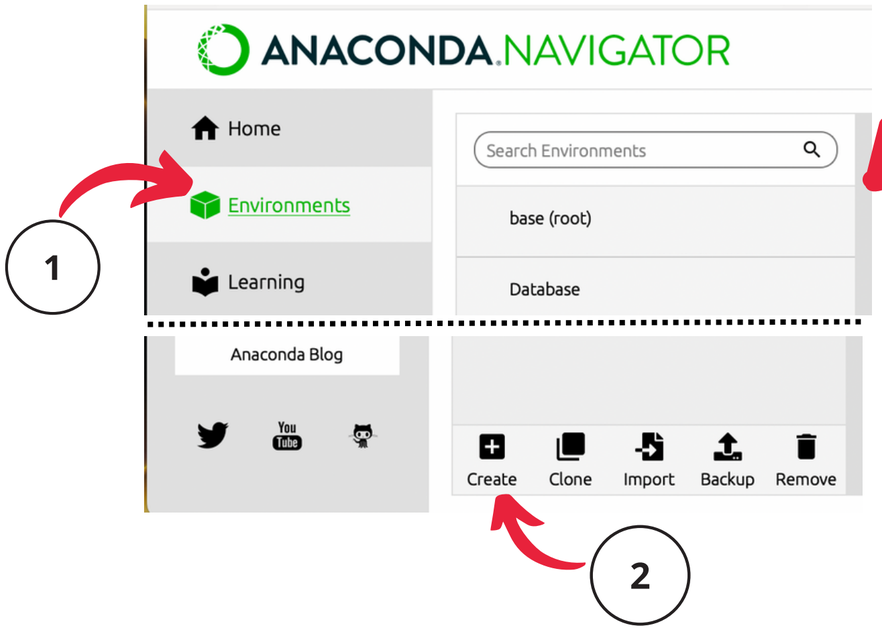
28 August 2023

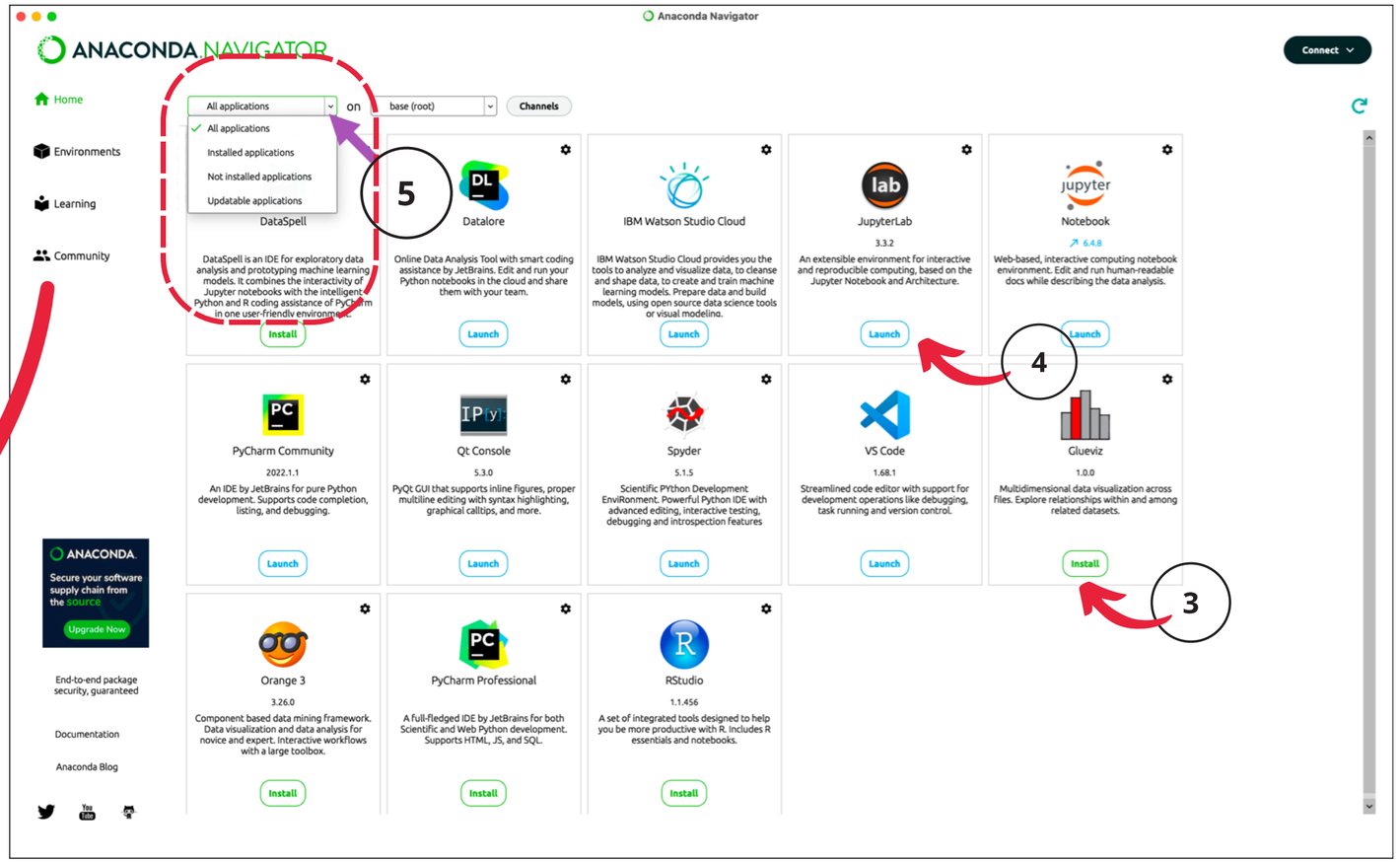
www.astronu.com/cv.html

Anaconda Navigator

Anaconda interface

1 & 2 Create Environment
3 & 4 install & run main application
5 install other application

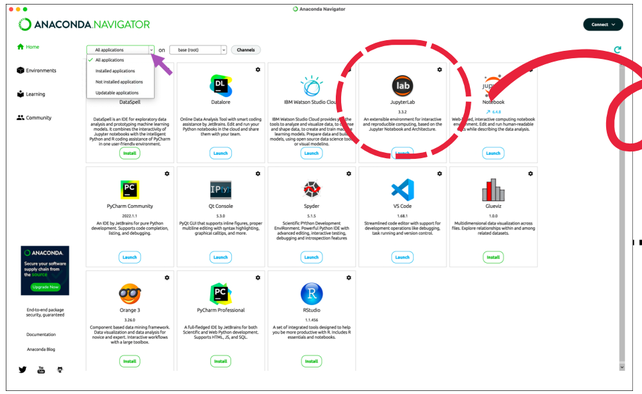


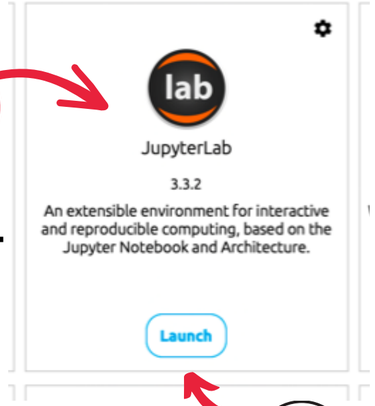


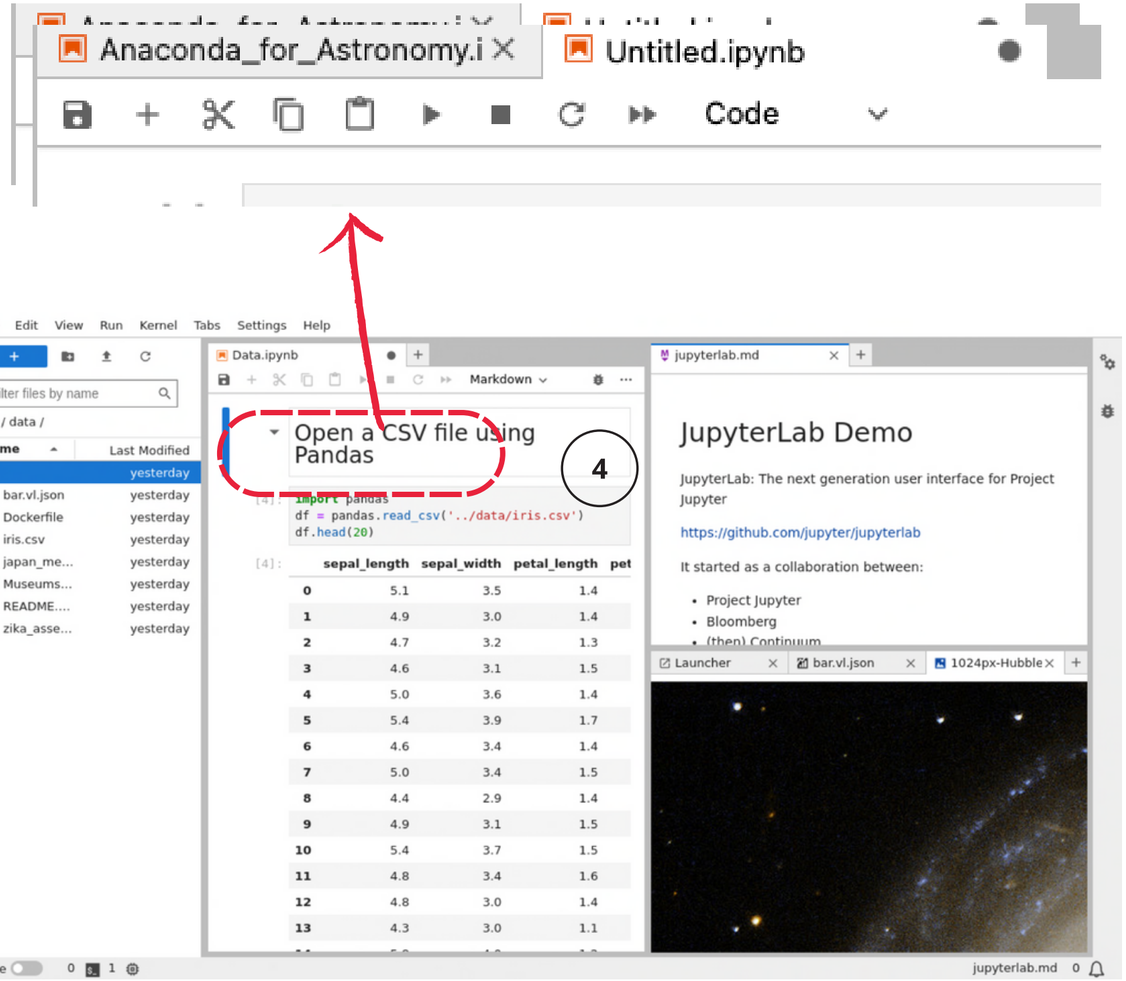
JupyterLab

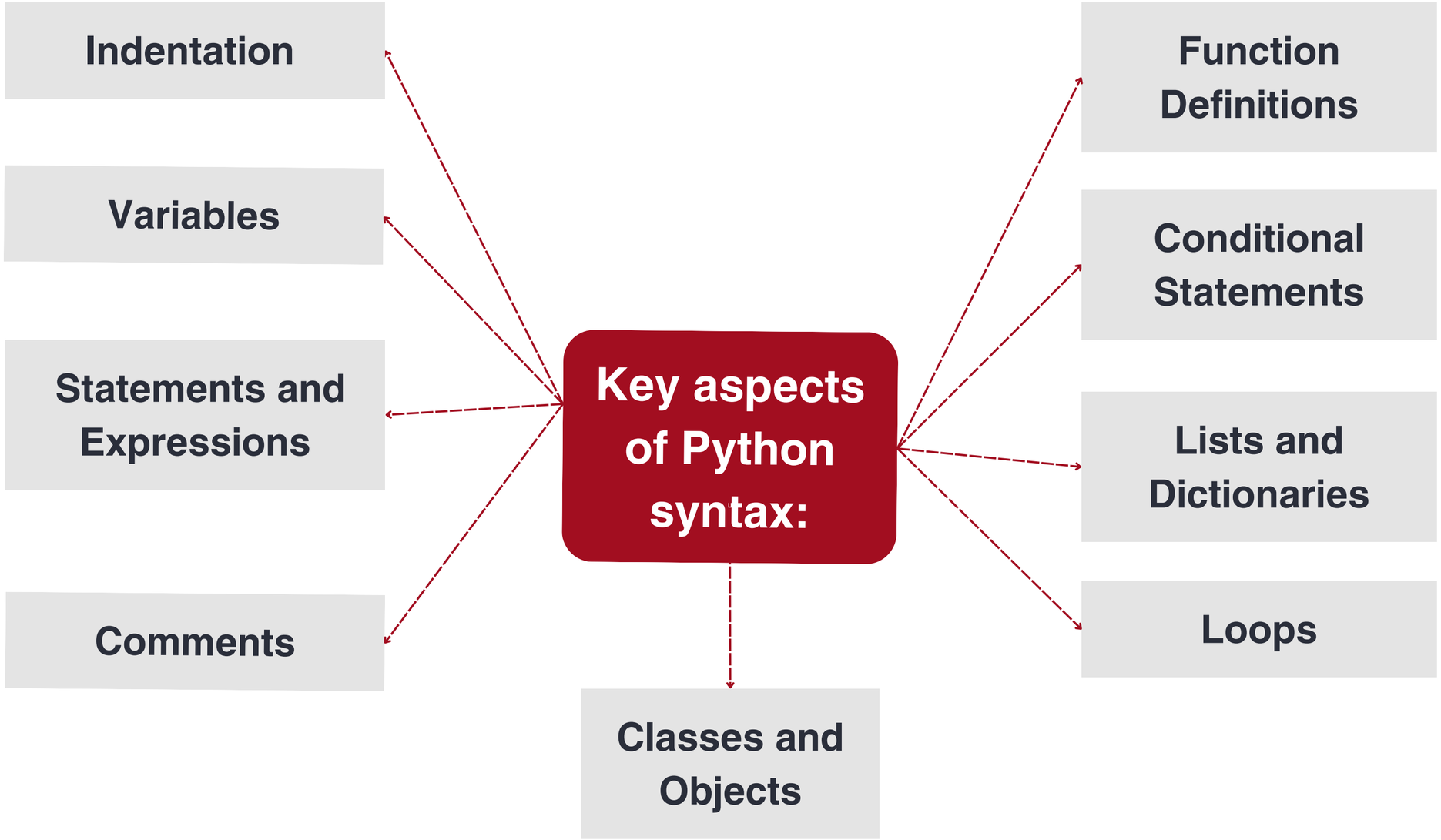
JupyterLab for coding

1 run JupyterLab
2 working space and menu
3 Browser, terminal, table, extension
4 Cell on Notebook where we will work

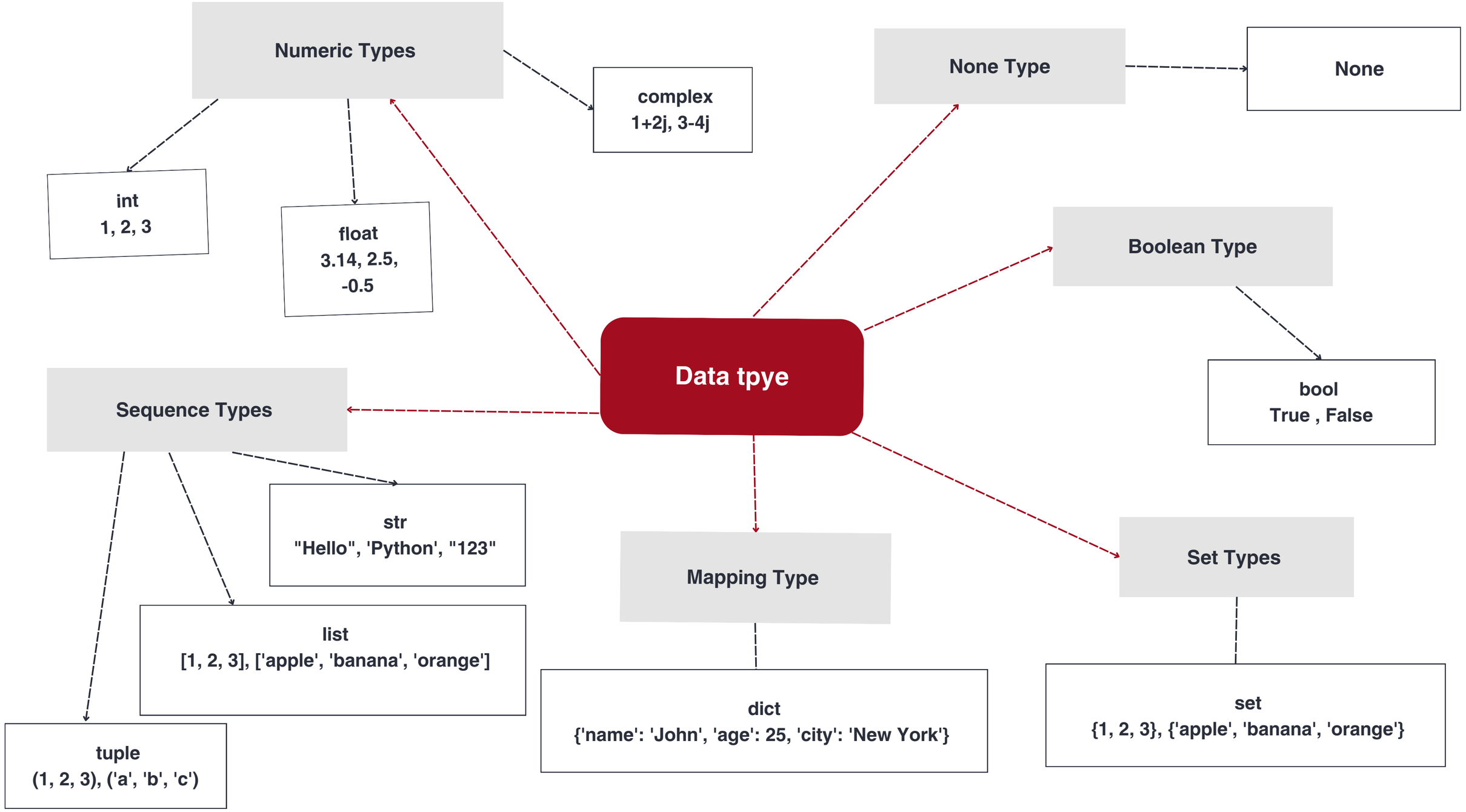








Can't use reserved words
There are built-in functions


Numeric Types
complex
1+2j, 3-4j
int
1, 2, 3
float
3.14, 2.5,
-0.5
None Type
None
Boolean Type
bool
True , False
Data tpye
Sequence Types
str
"Hello", 'Python', "123"
list
[1, 2, 3], ['apple', 'banana', 'orange']
tuple
(1, 2, 3), ('a', 'b', 'c')
Mapping Type
dict
{'name': 'John', 'age': 25, 'city': 'New York'}
Set Types
set
{1, 2, 3}, {'apple', 'banana', 'orange'}

Read and Write

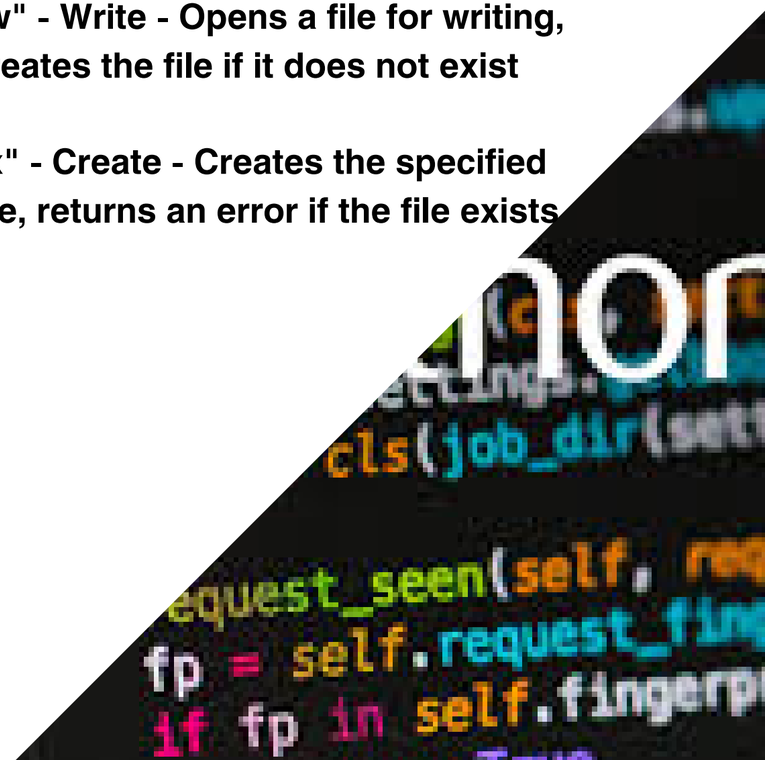
```python
# Writing to a text file
with open('example.txt', 'w') as file:
    file.write("Hello, this is some text that we're writing to the file.\n")
    file.write("Writing multiple lines.\n")
    file.write("Goodbye!")

# Reading from a text file
with open('example.txt', 'r') as file:
    content = file.read()
    print(content)

# Reading line by line
with open('example.txt', 'r') as file:
    lines = file.readlines()
    for line in lines:
        print(line.strip())  # Using strip() to remove newline characters
```

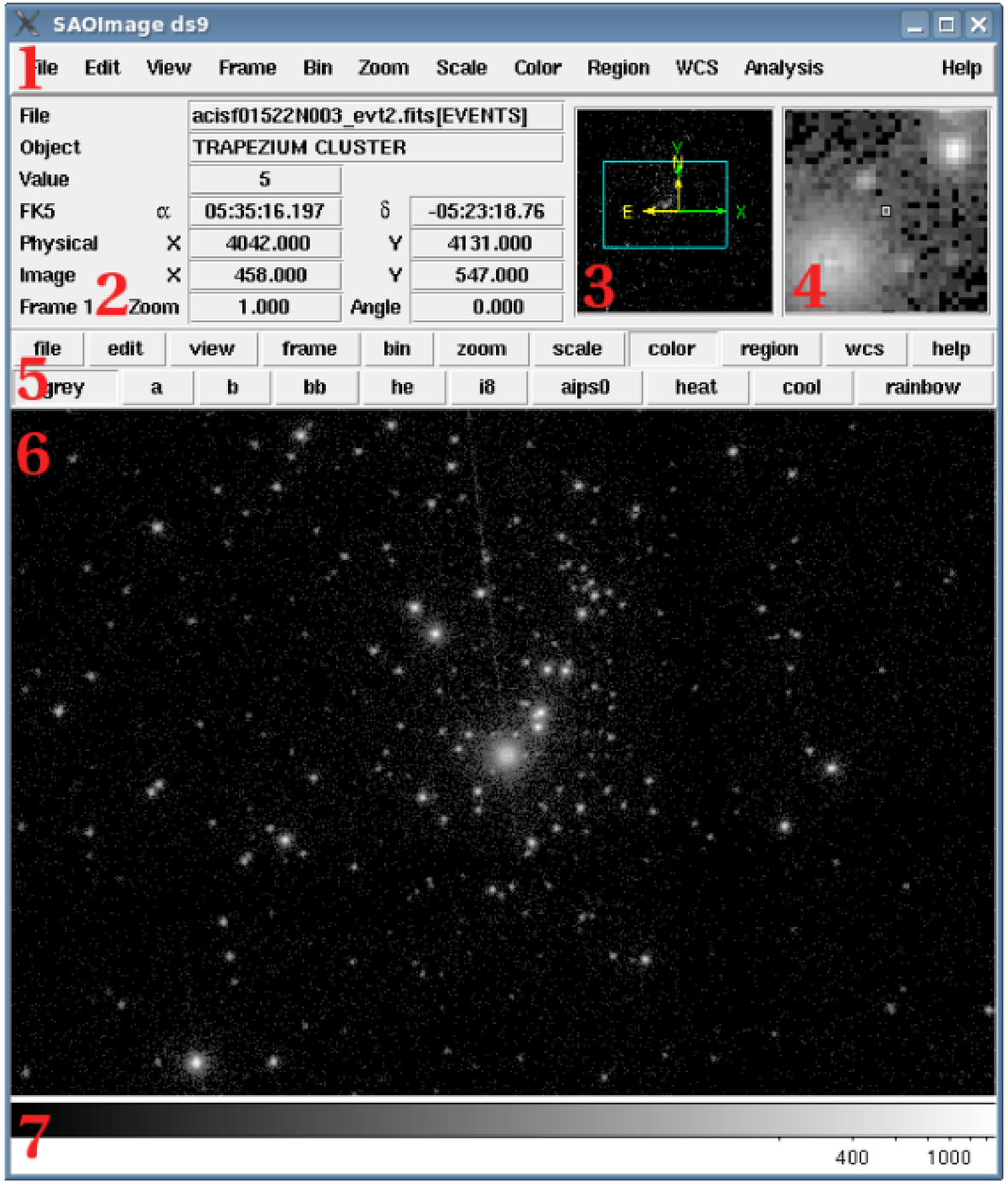
"r" - Read - Default value. Opens a file for reading, error if the file does not exist

"a" - Append - Opens a file for appending, creates the file if it does not exist

"w" - Write - Opens a file for writing, creates the file if it does not exist

"x" - Create - Creates the specified file, returns an error if the file exists





1. **Menu bar**
2. **Information panel**
3. **Panner**
4. **Magnifier**
5. **Buttons**
6. **Display frame**
7. **Colorbar**

DS9

SAOImageDS9 is an astronomical imaging and data visualization application. DS9 supports FITS images and binary tables, multiple frame buffers, region manipulation, and many scale algorithms and colormaps.

https://ds9.si.edu/doc/user/index.html

https://www.jb.man.ac.uk/~gbendo/Sci/Pict/DS9guide.pdf

Header

```
SIMPLE  =                    T / Written by IDL:  Mon Jul 16 15:06:45 2012
BITPIX  =                  -32 / IEEE single precision floating point
NAXIS   =                    2 /Number of data axes
NAXIS1  =                 1080 /Length of data axis 1
NAXIS2  =                 2040 /Length of data axis 2
DATE    = '2012-03-21'         /File creation date (yyyy-mm-dd)
OBJECT  = 'NGC 3031'           /Title of the dataset
TELESCOP= 'Spitzer '           /Telescope name
INSTRUME= 'MIPS    '           /Instrument name
CHNLNUM =                    1 /MIPS channel number (1=24um,2=70um,3=160um)
WAVELEN =          2.36800E-05 /Wavelength of the observation (m)
FREQ    =          1.26689E+13 /Frequency of the observations (Hz)
AORKEY1 = '5554688 '           /Spitzer AOR key 1
AORKEY2 = '5554944 '           /Spitzer AOR key 2
AORKEY3 = '7864576 '           /Spitzer AOR key 3
RA      = '09:55:33.1'         /Right ascension (hh:mm:ss)
DEC     = '+69:03:55.0'        /Declination (dd:mm:ss)
EQUINOX =               2000.00 /Equinox of RA and DEC
```

CENTER FOR ASTROPHYSICS
HARVARD & SMITHSONIAN

THANKS

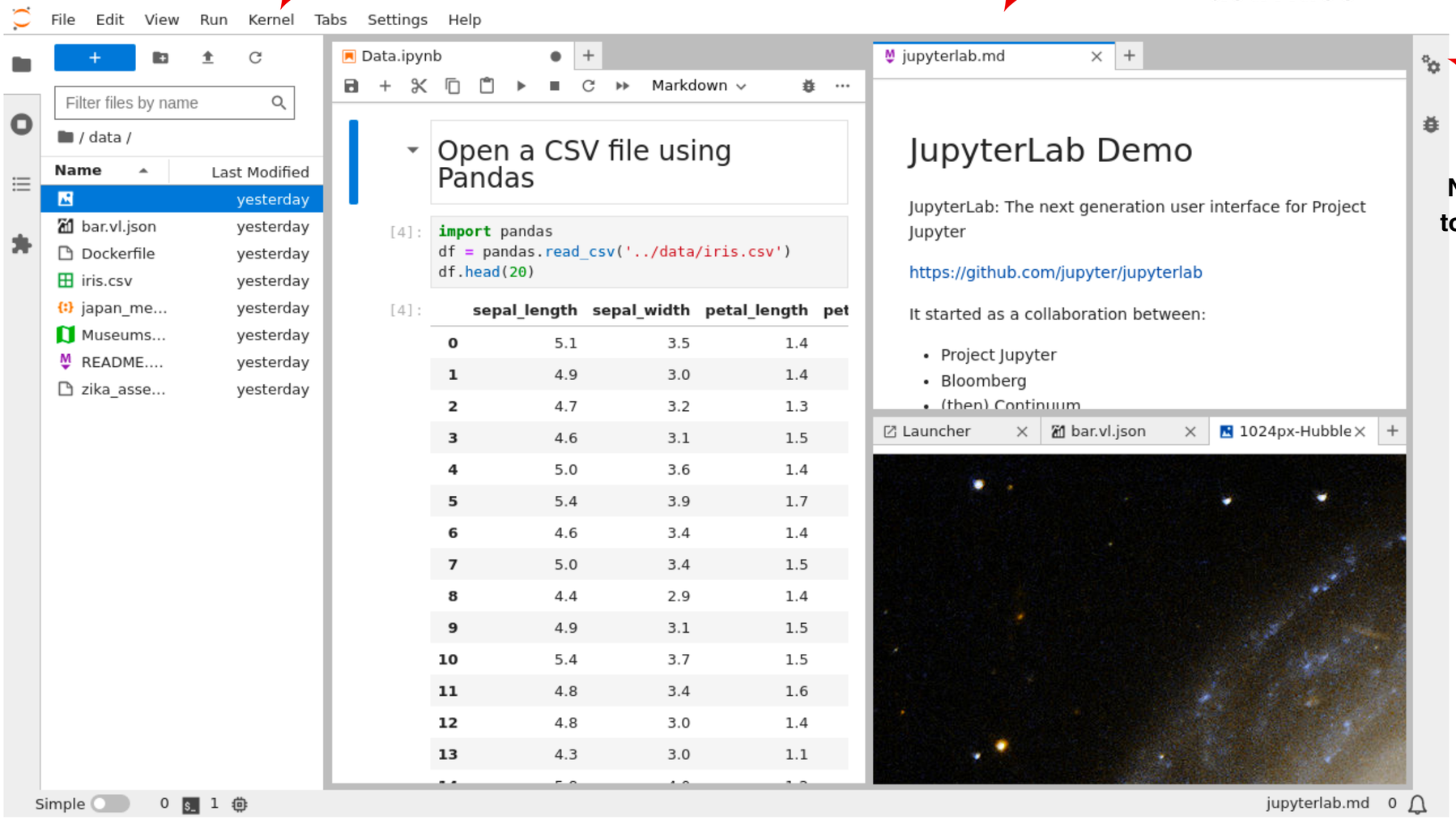
JupyterLab Interface

main work area containing tabs of documents and activities

Menu bar and Tabs

Left sidebar

1. **File browser**
2. **List of tabs: running kernels and terminals**
3. **Table of contents**
4. **Extension manager.**



Notebook cell tools inspector

https://jupyterlab.readthedocs.io/en/latest/user/interface.html

List is a collection which is ordered and changeable. Allows duplicate members.
Tuple is a collection which is ordered and unchangeable. Allows duplicate members.
Set is a collection which is unordered, unchangeable*, and unindexed. No duplicate members.
Dictionary is a collection which is ordered** and changeable. No duplicate members.