Biological data analysis (2)
GIT, Text editors

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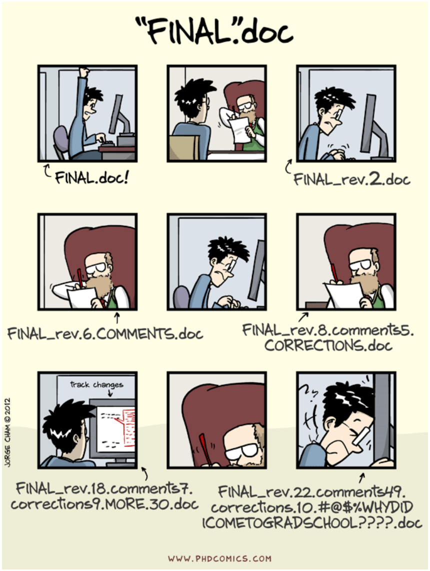
GIT



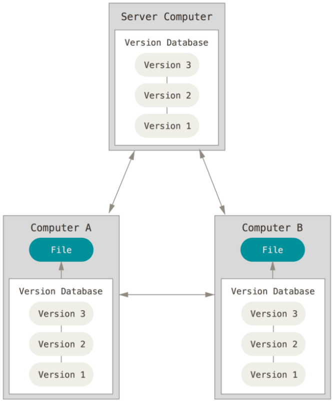
https://git-scm.com/

Why git

- Revert files to previous state
- Revert the entire project
- Compare changes over time
- See who last modified something
- Synchronization among different devices
- Backup
- Teamwork
- Reproducible work

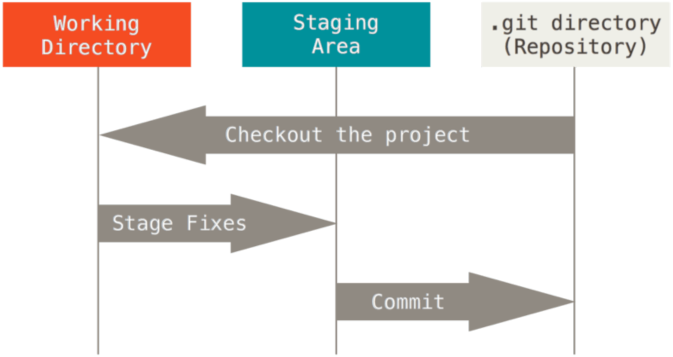
- https://github.com/customer-stories?type=enterprise
- https://www.frontiersin.org/journals/systems-neuroscience#author-guidelines

Git History



- Local version control (RCS)
- Centralized Local version control (subversion, CVS)
- Distributed version control (Git, Mercurial)

Git workflow



- Snapshots not changes
- Modify, stage, commit

Git: usage

- Command line
- GUI
- From editor

Git: installing

- https://git-scm.com/download/
- git config
- git config - -global user.name ”Vardas Pavarde”
- git config - -global user.email pastas@domain.com
- git config - -global core.editor vim
- git config - -global core.editor ”’C:/Program Files/Notepad++/notepad++.exe’ -multiInst -notabbar -nosession -noPlugin”
- ~/.gitconfig stores all settings

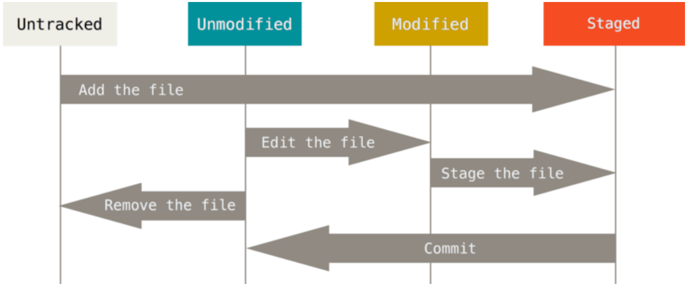
Repository creation

- git init
- git clone url optionalNewName

Clone course material

- git clone https://aaleks@bitbucket.org/aaleks/bioa.git
- https://, git:// (ssh)

File life cycle



Changing file status

- git status — get information about current state of files
- git add filename — add file to staged group
- git add -A — adds all files in .git repository
- git add . — adds all files from current directory and deeper

Ignoring files and directories

- .gitignore
- https://www.gitignore.io/
- Glob pattern rules: ? * [abc] [0-9]
- # comments are ignored

```
# Ignore files ending with o or a
*.[oa]

# Ignore files ending wiht ~ (temorary files marked by many editros)
*~

# ignore all .a files
*.a

# but do track lib.a, even though you're ignoring .a files above
!lib.a

# ignore all files in any directory named build
build/

# ignore doc/notes.txt
doc/*.txt

# ignore all .pdf files in the doc/ directory and any of its subdirectories
doc/**/*.pdf
```

Changing files

- git diff –> see changes made
- git diff - - staged –> see differences with last commit
- git commit –> commit files to local repository (-m, -v, -a flags)
- git rm - -cached fileName –> remove file from repository

Viewing commits

- git log
- git log - -stat
- git log -p -2
- git log - -pretty=oneline
- git log - -pretty=format:”

Undo

- git commit - -amend –> redo commit add new stuff
- git reset HEAD filename –> unstage fileName
- git checkout - - filename –> remove changes

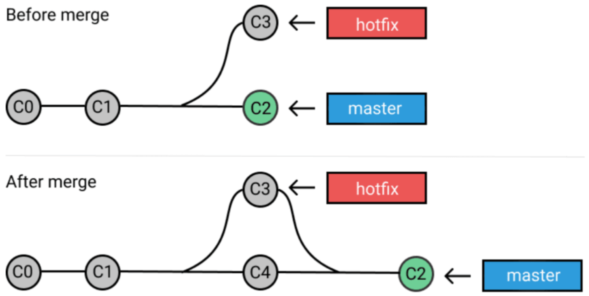
Remote repository

- git remote -v –> show the remote url
- git remote add shortname URL –> add remote url
- git fetch remoteName –> git fetch origin
- git pull –> fetches and merges automatically

Aliases

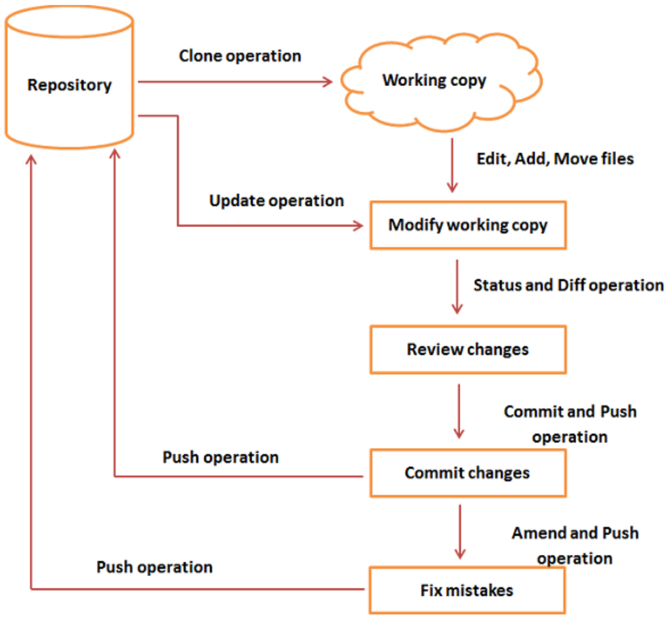
- git config - -global alias.last ’log -1 HEAD’
- git last –> will show last commit from log

Branching



- git branch branchName
- git checkout master
- git merge branchName
- git branch -d branchName –> delete after merge
- git branch –> lists all branches
- git pull –> does fetch and merge

Workflow



Repository
Clone operation
Working copy
Edit, Add, Move files
Update operation
Modify working copy
Status and Diff operation
Review changes
Commit and Push operation
Push operation
Commit changes
Amend and Push operation
Push operation
Fix mistakes

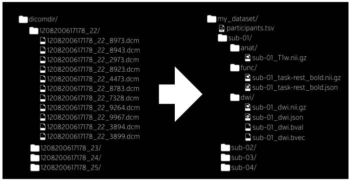
Setting up github repository

- github.com
- bitbucket.org
- gitlab.com
- https://guides.github.com/activities/hello-world/
- https://www.atlassian.com/git/tutorials/learn-git-with-bitbucket-cloud

Folder structure

- Recommended neuroimaging data structure bids.neuroimaging.io
- Usual structure in git repositories:

File	purpose
README.md	project description
LICENSE	choosealicense.com
setup.py	distribution control
requirements.txt	requirements for program to function
sample/__init__.py	
sample/core.py	core program
sample/helpers.py	
docs/conf.py	documentation
docs/index.md	
tests/test_basic.py	tests



```
dicomdir/
  1208200617178_22/
    1208200617178_22_8973.dcm
    1208200617178_22_8943.dcm
    1208200617178_22_2973.dcm
    1208200617178_22_8923.dcm
    1208200617178_22_4473.dcm
    1208200617178_22_8783.dcm
    1208200617178_22_7328.dcm
    1208200617178_22_9264.dcm
    1208200617178_22_9967.dcm
    1208200617178_22_3894.dcm
    1208200617178_22_3899.dcm
  1208200617178_23/
  1208200617178_24/
  1208200617178_25/
```

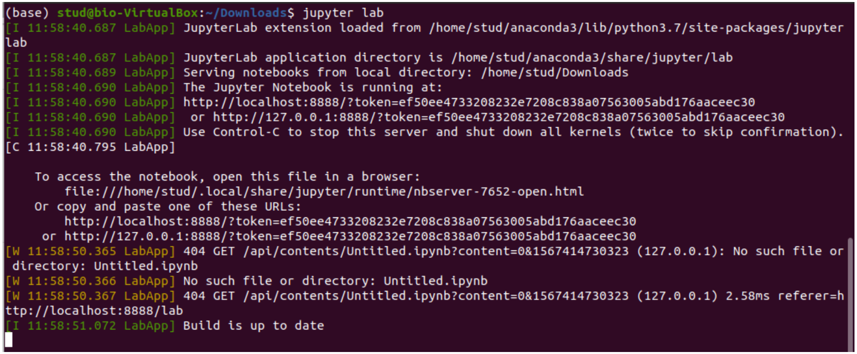
```
my_dataset/
  participants.tsv
  sub-01/
    anat/
      sub-01_T1w.nii.gz
    func/
      sub-01_task-rest_bold.nii.gz
      sub-01_task-rest_bold.json
    dwi/
      sub-01_dwi.nii.gz
      sub-01_dwi.json
      sub-01_dwi.bval
      sub-01_dwi.bvec
  sub-02/
  sub-03/
  sub-04/
```

Directory/File	Purpose
Code/	Code storage
Data/	Data storage, usually excluded from git
Text/	Articles, reviews, summary of work
Text/README.md	Documentation
Text/Figures/	Figures used in texts
.gitignore	version control
.git/	git main structure

Editors

- PyCharm
- Spyder
- Idle
- Visual Studio Code
- VIM
- JupyterLab

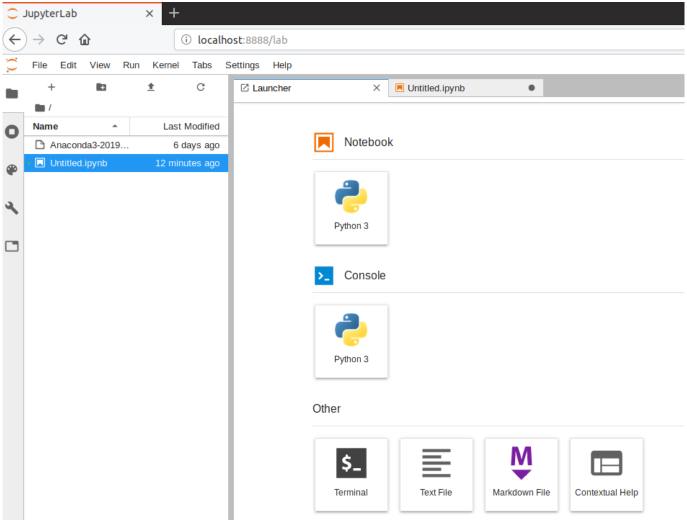
JupyterLab



```
(base) stud@bio-VirtualBox:~/Downloads$ jupyter lab
[I 11:58:40.687 LabApp] JupyterLab extension loaded from /home/stud/anaconda3/lib/python3.7/site-packages/jupyter
lab
[I 11:58:40.687 LabApp] JupyterLab application directory is /home/stud/anaconda3/share/jupyter/lab
[I 11:58:40.689 LabApp] Serving notebooks from local directory: /home/stud/Downloads
[I 11:58:40.690 LabApp] The Jupyter Notebook is running at:
[I 11:58:40.690 LabApp] http://localhost:8888/?token=ef50ee4733208232e7208c838a07563005abd176aaceec30
[I 11:58:40.690 LabApp]  or http://127.0.0.1:8888/?token=ef50ee4733208232e7208c838a07563005abd176aaceec30
[I 11:58:40.690 LabApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 11:58:40.795 LabApp]

    To access the notebook, open this file in a browser:
        file:///home/stud/.local/share/jupyter/runtime/nbserver-7652-open.html
    Or copy and paste one of these URLs:
        http://localhost:8888/?token=ef50ee4733208232e7208c838a07563005abd176aaceec30
     or http://127.0.0.1:8888/?token=ef50ee4733208232e7208c838a07563005abd176aaceec30
[W 11:58:50.365 LabApp] 404 GET /api/contents/Untitled.ipynb?content=0&1567414730323 (127.0.0.1): No such file or
 directory: Untitled.ipynb
[W 11:58:50.366 LabApp] No such file or directory: Untitled.ipynb
[W 11:58:50.367 LabApp] 404 GET /api/contents/Untitled.ipynb?content=0&1567414730323 (127.0.0.1) 2.58ms referer=h
ttp://localhost:8888/lab
[I 11:58:51.072 LabApp] Build is up to date
```

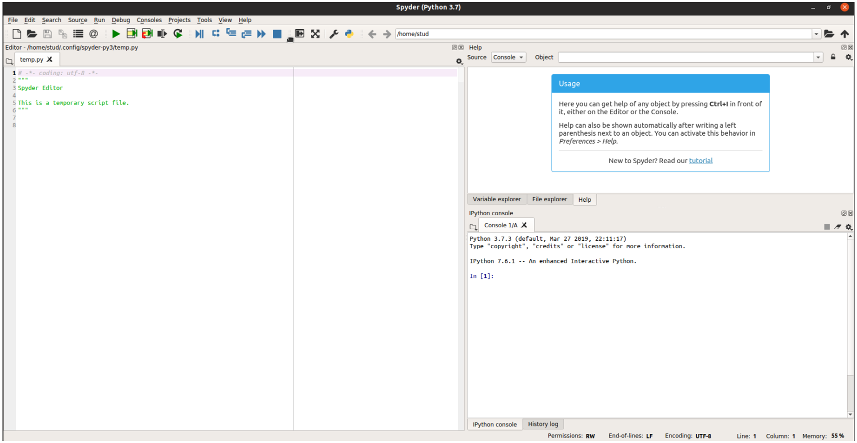
- Start in a project root directory
- Command to start: jupyter lab
- Start from Anaconda GUI

JupyterLab



Markdown quick tutorial

Spyder


Spyder (Python 3.7)
File Edit Search Source Run Debug Consoles Projects Tools View Help
/home/stud
Editor - /home/stud/.config/spyder-py3/temp.py
temp.py
Help
Source Console Object
Variable explorer File explorer Help
IPython console
Console 1/A
IPython console History log
Permissions: RW End-of-lines: LF Encoding: UTF-8 Line: 1 Column: 1 Memory: 55 %

```
# -*- coding: utf-8 -*-
"""
Spyder Editor

This is a temporary script file.
"""
```

Usage

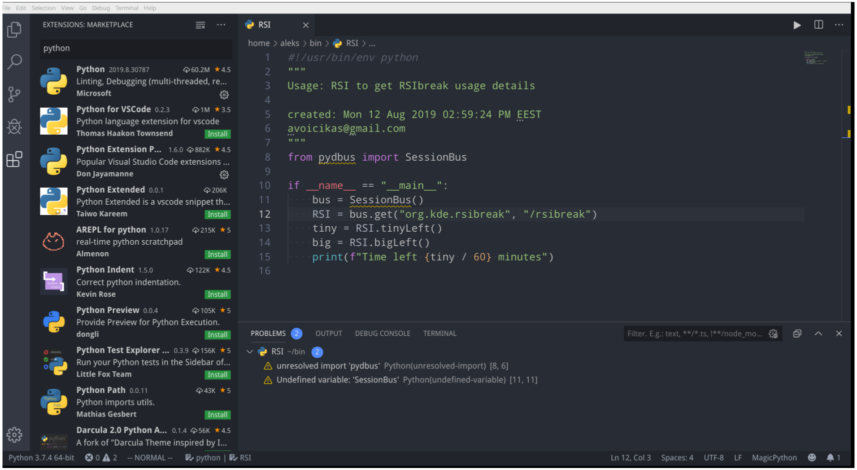
Here you can get help of any object by pressing **Ctrl+I** in front of it, either on the Editor or the Console.

Help can also be shown automatically after writing a left parenthesis next to an object. You can activate this behavior in *Preferences > Help.*

New to Spyder? Read our tutorial

```
Python 3.7.3 (default, Mar 27 2019, 22:11:17)
Type "copyright", "credits" or "license" for more information.

IPython 7.6.1 -- An enhanced Interactive Python.

In [1]:
```

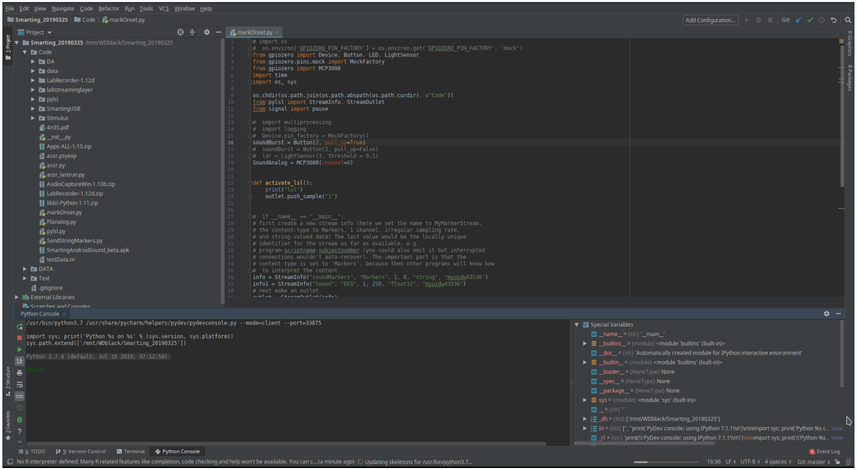
Visual Studio Code


File Edit Selection View Go Debug Terminal Help
EXTENSIONS: MARKETPLACE
python
Python 2019.8.30787 60.2M 4.5
Linting, Debugging (multi-threaded, re...
Microsoft
Python for VSCode 0.2.3 1M 3.5
Python language extension for vscode
Thomas Haakon Townsend Install
Python Extension P... 1.6.0 882K 4.5
Popular Visual Studio Code extensions ...
Don Jayamanne
Python Extended 0.0.1 206K
Python Extended is a vscode snippet th...
Taiwo Kareem Install
AREPL for python 1.0.17 215K 5
real-time python scratchpad
Almenon Install
Python Indent 1.5.0 122K 4.5
Correct python indentation.
Kevin Rose Install
Python Preview 0.0.4 105K 5
Provide Preview for Python Execution.
dongli Install
Python Test Explorer ... 0.3.9 156K 5
Run your Python tests in the Sidebar of...
Little Fox Team Install
Python Path 0.0.11 43K 5
Python imports utils.
Mathias Gesbert Install
Darcula 2.0 Python A... 0.1.4 56K 4.5
A fork of "Darcula Theme inspired by I...
RSI
home > aleks > bin > RSI > ...
PROBLEMS 2 OUTPUT DEBUG CONSOLE TERMINAL
Filter. E.g.: text, **/*.ts, !**/node_mo...
RSI ~/bin 2
Python 3.7.4 64-bit ⊗ 0 ⚠ 2 -- NORMAL -- python | RSI Ln 12, Col 3 Spaces: 4 UTF-8 LF MagicPython 1

```python
#!/usr/bin/env python
"""
Usage: RSI to get RSIbreak usage details

created: Mon 12 Aug 2019 02:59:24 PM EEST
avoicikas@gmail.com
"""
from pydbus import SessionBus

if __name__ == "__main__":
    bus = SessionBus()
    RSI = bus.get("org.kde.rsibreak", "/rsibreak")
    tiny = RSI.tinyLeft()
    big = RSI.bigLeft()
    print(f"Time left {tiny / 60} minutes")

```

```
⚠ unresolved import 'pydbus' Python(unresolved-import) [8, 6]
⚠ Undefined variable: 'SessionBus' Python(undefined-variable) [11, 11]
```

PyCharm



```
Smarting_20190325 /mnt/WDblack/Smarting_20190325
  Code
    DA
    data
    LabRecorder-1.12d
    labstreaminglayer
    pylsl
    SmartingUSB
    Stimulus
    4n35.pdf
    __init__.py
    Apps-ALL-1.10.zip
    assr.psyexp
    assr.py
    assr_lastrun.py
    AudioCaptureWin-1.10b.zip
    LabRecorder-1.12d.zip
    liblsl-Python-1.11.zip
    markOnset.py
    Planalog.py
    pylsl.py
    SendStringMarkers.py
    SmartingAndroidSound_beta.apk
    testData.m
  DATA
  Text
  .gitignore
External Libraries
Scratches and Consoles
```

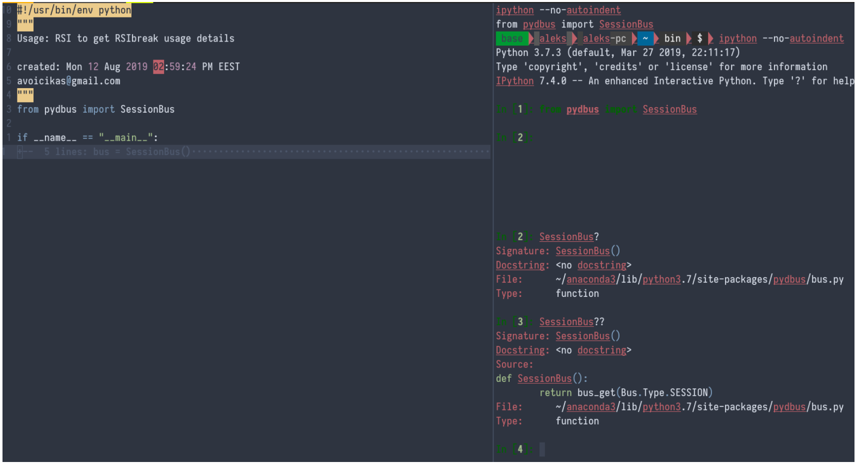
```python
# import os
#  os.environ['GPIOZERO_PIN_FACTORY'] = os.environ.get('GPIOZERO_PIN_FACTORY', 'mock')
from gpiozero import Device, Button, LED, LightSensor
from gpiozero.pins.mock import MockFactory
from gpiozero import MCP3008
import time
import os, sys

os.chdir(os.path.join(os.path.abspath(os.path.curdir), u"Code"))
from pylsl import StreamInfo, StreamOutlet
from signal import pause

#  import multiprocessing
#  import logging
#  Device.pin_factory = MockFactory()
soundBurst = Button(2, pull_up=True)
#  soundBurst = Button(2, pull_up=False)
#  ldr = LightSensor(3, threshold = 0.1)
SoundAnalog = MCP3008(channel=0)


def activate_lsl():
    print("lsl")
    outlet.push_sample("1")


#  if __name__ == "__main__":
# first create a new stream info (here we set the name to MyMarkerStream,
# the content-type to Markers, 1 channel, irregular sampling rate,
# and string-valued data) The last value would be the locally unique
# identifier for the stream as far as available, e.g.
# program-scriptname-subjectnumber (you could also omit it but interrupted
# connections wouldn't auto-recover). The important part is that the
# content-type is set to 'Markers', because then other programs will know how
#  to interpret the content
info = StreamInfo("soundMarkers", "Markers", 1, 0, "string", "myuidw43536")
infol = StreamInfo("Sound", "EEG", 1, 250, "float32", "myuidw43536")
# next make an outlet
```

```
/usr/bin/python3.7 /usr/share/pycharm/helpers/pydev/pydevconsole.py --mode=client --port=33875

import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['/mnt/WDblack/Smarting_20190325'])

Python 3.7.4 (default, Jul 16 2019, 07:12:58)

In[2]:
```

```
Special Variables
  __name__ = {str} '__main__'
  __builtins__ = {module} <module 'builtins' (built-in)>
  __doc__ = {str} 'Automatically created module for IPython interactive environment'
  __builtin__ = {module} <module 'builtins' (built-in)>
  __loader__ = {NoneType} None
  __spec__ = {NoneType} None
  __package__ = {NoneType} None
  sys = {module} <module 'sys' (built-in)>
  _ = {str} ''
  _dh = {list} ['/mnt/WDblack/Smarting_20190325']
  In = {list} ['', "print('PyDev console: using IPython 7.1.1\\n')\n\nimport sys; print('Python %s c... View
  _i1 = {str} 'print(\\'PyDev console: using IPython 7.1.1\\n\\')\n\nimport sys; print(\\'Python %s... View
```

```
No R interpreter defined: Many R related features like completion, code checking and help won't be available. You can s... (a minute ago)   Updating skeletons for /usr/bin/python3.7...   16:36  LF ÷  UTF-8 ÷  4 spaces ÷  Git: master ÷
```

vim



```
#!/usr/bin/env python
"""
Usage: RSI to get RSIbreak usage details

created: Mon 12 Aug 2019 02:59:24 PM EEST
avoicikas@gmail.com
"""
from pydbus import SessionBus

if __name__ == "__main__":
+--  5 lines: bus = SessionBus()·····················································
```

```
ipython --no-autoindent
from pydbus import SessionBus
 base  aleks  aleks-pc  ~  bin  $  ipython --no-autoindent
Python 3.7.3 (default, Mar 27 2019, 22:11:17)
Type 'copyright', 'credits' or 'license' for more information
IPython 7.4.0 -- An enhanced Interactive Python. Type '?' for help

In [1]: from pydbus import SessionBus

In [2]:





In [2]: SessionBus?
Signature: SessionBus()
Docstring: <no docstring>
File:      ~/anaconda3/lib/python3.7/site-packages/pydbus/bus.py
Type:      function

In [3]: SessionBus??
Signature: SessionBus()
Docstring: <no docstring>
Source:
def SessionBus():
        return bus_get(Bus.Type.SESSION)
File:      ~/anaconda3/lib/python3.7/site-packages/pydbus/bus.py
Type:      function

In [4]:
```