

# I. Configure Environment

## I-a. Install Ipython

```
jovi@laptop-lenovo-ubuntu-jovi: ~/Desktop
File Edit View Search Terminal Help
jovi@laptop-lenovo-ubuntu-jovi:~/Desktop$ sudo apt-get install ipython
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
dh-python fonts-mathjax gir1.2-geocodeglib-1.0 jupyter-client jupyter-console jupyter-core
jupyter-nbconvert jupyter-nbextension jupyter-js-widgets jupyter-nbformat jupyter-notebook
libegl1-mesa libfwup1 libjs-backbone libjs-bootstrap libjs-bootstrap-tour libjs-codemirror
libjs-es6-promise libjs-jed libjs-jquery-typeahead libjs-marked libjs-mathjax libjs-moment
libjs-requirejs libjs-requirejs-text libjs-text-encoding libjs-xterm libllvm8 libllvm9
libllvm9:1386 liblua5.1-0 liblua5.1-2 liblua5.1-common libpython3-dev libpython3.6-dev
pandoc pandoc-data python3-bleach python3-decorator python3-dev python3-entrypoints
python3-html5lib python3-lpykernel python3-lpython python3-lpython-genutils python3-lpywidgets
python3-jinja2 python3-jsonschema python3-jupyter-client python3-jupyter-console
python3-jupyter-core python3-mistune python3-nbconvert python3-nbformat python3-notebook
python3-pandocfilters python3-pickleshare python3-pip python3-prompt-toolkit python3-pygments
python3-simplegeneric python3-terminado python3-testpath python3-tornado python3-traitlets
python3-wcwidth python3-webencodings python3-wheel python3-zmq python3.6-dev
ubuntu-web-launchers
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
python-backports-shutil-get-terminal-size python-chardet python-decorator python-ipython
python-ipython-genutils python-pathlib2 python-pexpect python-pickleshare python-prompt-toolkit
python-ptyprocess python-pygments python-scandir python-simplegeneric python-traitlets
python-wcwidth
Suggested packages:
python-pexpect-doc
The following NEW packages will be installed:
ipython python-backports-shutil-get-terminal-size python-chardet python-decorator python-ipython
python-ipython-genutils python-pathlib2 python-pexpect python-pickleshare python-prompt-toolkit
```

Figure 1: Download from apt source

By the way, I have already installed python 3.6 before.

## I-b. Install Jupyter

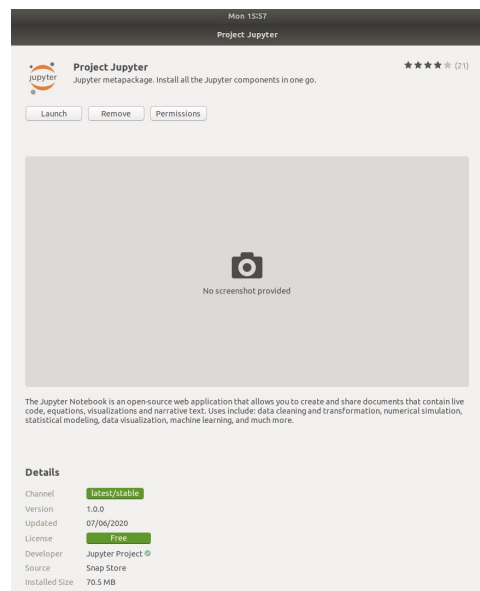


Figure 2: Download from ubuntu software center

But I have some troubles on adding the kernel of octave into this editor, so I determine not to use it.

## I-c. Install Octave

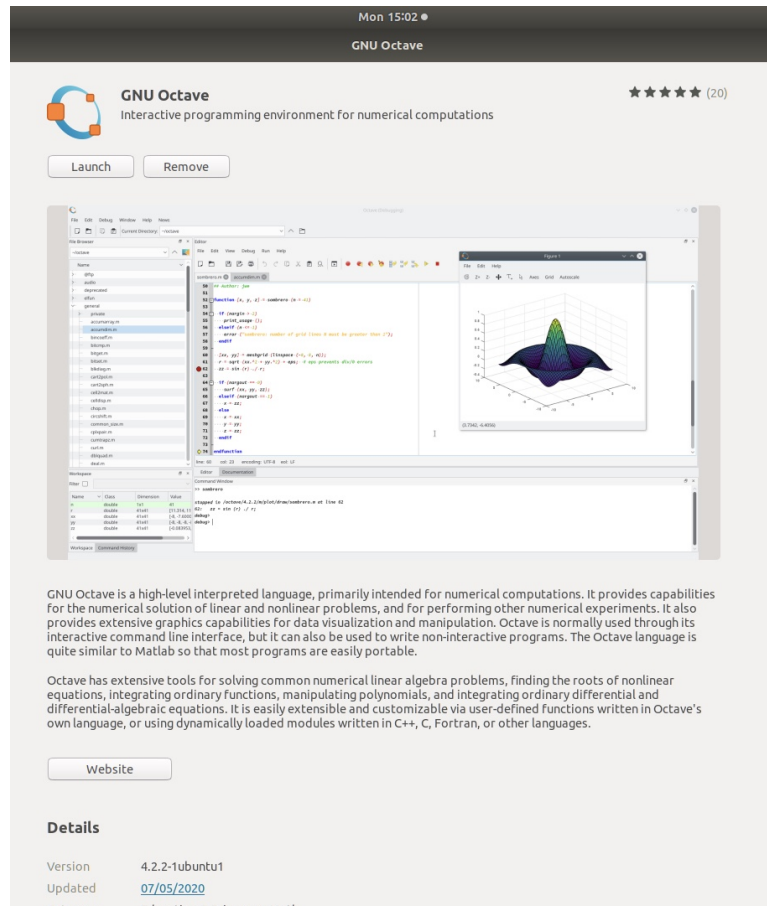


Figure 3: Download from ubuntu software center

Then I install packages such as symbolic, image, optim and statistics via command line in Octave.

## II. Problems and Examples

### Test Package Symbolic

INPUT:  $x+3=3x$

CODE: `root = solve(x+3 == 3*x)`

OUTPUT:  $\text{root} = \frac{3}{2}$

### Matrix Multiply

INPUT:

$a = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$

$b = \begin{bmatrix} 3 & 2 & 1 \end{bmatrix}$

CODE: `vm = a'*b`

OUTPUT:

$vm =$

$\begin{bmatrix} 3 & 2 & 1 \\ 6 & 4 & 2 \\ 9 & 6 & 3 \end{bmatrix}$

**Vector Product**

INPUT:

 $a = [1 \ 2 \ 3]$  $b = [3 \ 2 \ 1]$ 

CODE

 $ip = \text{dot}(a,b)$  $op = \text{cross}(a,b)$ 

OUTPUT

 $ip = 10$  $op = -4 \quad 8 \quad -4$ **Initialize Matrix**

INPUT

 $A = \text{rand}(3,3)$  $B = A(2:3, 1:2)$  $I = \text{ones}(4,4)$  $O = \text{zeros}(2,2)$ 

OUTPUT

 $A =$ 

0.868694705363510      0.431413827463545      0.136068558708664

0.084435845510910      0.910647594429523      0.869292207640089

0.399782649098896      0.181847028302852      0.579704587365570

 $B =$ 

0.084435845510910      0.910647594429523

0.399782649098896      0.181847028302852

 $I =$ 

1      1      1      1

1      1      1      1

1      1      1      1

1      1      1      1

 $O =$ 

0      0

0      0

**Newton Iteration**INPUT:  $f$ ,  $df$ ,  $err=1$ ,  $x_0 = 2$ 

CODE

 $iter = 0;$  $err = 1;$  $x0 = 2.0;$  $x = x0;$ 

format long;

while( $err > 1e-8$  and  $iter \leq 20$ )

```

x0 = x;
x = x0 - df(x0)/f(x0);
err = norm(x - x0);
iter = iter +1;
fprintf('iter %d: x = %18.15f, f(x) = %28.15f', iter, x, f(x))
end

```

### OUTPUT

```

iter 1: x = 1.000000000000000, f(x) = 0.281718171540954
iter 2: x = 0.914155281832543, f(x) = 0.012372566882760
iter 3: x = 0.910017665783406, f(x) = 0.000030034837378
iter 4: x = 0.910007572548888, f(x) = 0.000000000179075
iter 5: x = 0.910007572488709, f(x) = 0.000000000000000

```

### Define Function and Plot

INPUT: `t = linspace(0,20,40);`

### CODE

```

plot(t, besselj(0.5, t), 'r*-')
hold on
plot(t,besselj(1.5, t), 'b*-')
plot(t,besselj(5.5,t), 'cs-')
plot(t, besselj(10.5,t), 'mo-')
hold off
function y = myfunc(x)
y = 3 * x.^2 + 2 * x + 18;
end

```

```

function y = df(x)
y = 6 * x - exp(x);
end

```

```

function y = f(x)
y = 3 * x.^2 - exp(x);
end

```

### OUTPUT

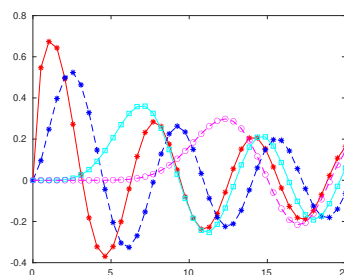


Figure 4: bessell fuction