

**Below are the set of packages
installed at SYSTEM level**

(Outside Virtual Environment)

\$ sudo apt-get update

\$ sudo apt-get upgrade

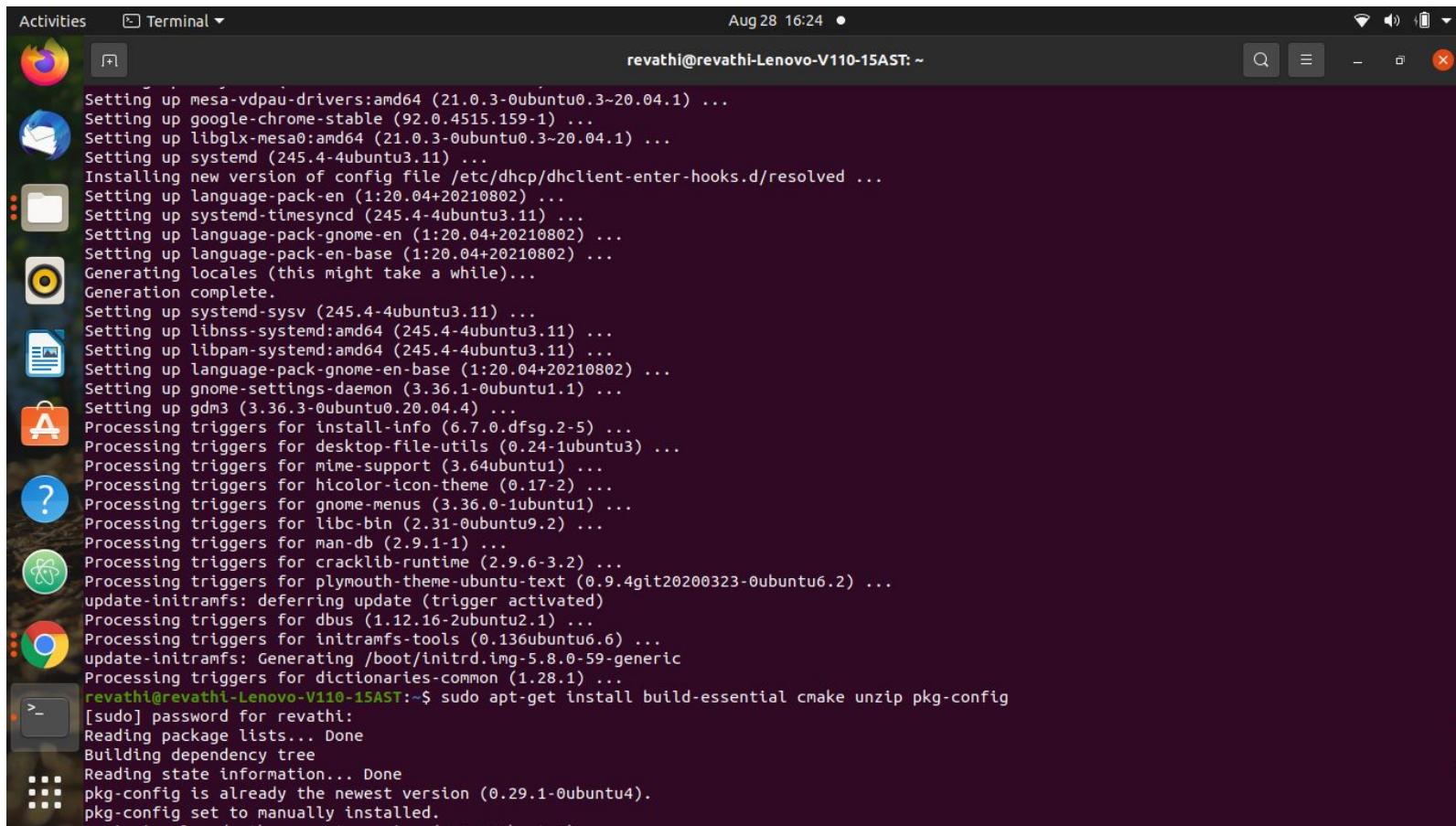
Activities Terminal Aug 28 15:55 •

revathi@revathi-Lenovo-V110-15AST: ~

```
bash: /home/revathi/.local/bin/virtualwrapper.sh: No such file or directory
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get update
[sudo] password for revathi:
Hit:1 http://in.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://dl.google.com/linux/chrome/deb stable InRelease
Get:3 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:4 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu focal-updates/main i386 Packages [522 kB]
Get:7 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [27.6 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1,169 kB]
Get:9 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [61.0 kB]
Get:10 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [2,468 B]
Get:11 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [282 kB]
Get:12 http://in.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [848 kB]
Get:13 http://in.archive.ubuntu.com/ubuntu focal-updates/universe i386 Packages [629 kB]
Get:14 http://in.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [351 kB]
Get:15 http://in.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [944 B]
Get:16 http://in.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 Metadata [10.3 kB]
Fetched 4,234 kB in 7s (631 kB/s)
Reading package lists... Done
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
  libllvm11 shim
Use 'sudo apt autoremove' to remove them.
The following packages have been kept back:
  fwupd fwupd-signed gnome-shell-extension-desktop-icons libfwupd2 libfwupdplugin1 linux-generic-hwe-20.04 linux-headers-generic-hwe-20.04
  linux-image-generic-hwe-20.04
The following packages will be upgraded:
  alsu-ucm-conf aspell base-files distro-info-data firefox firefox-locale-en gdm3 gir1.2-gdm-1.0 gir1.2-javascriptcoregtk-4.0
  gir1.2-webkit2-4.0 gnome-settings-daemon gnome-settings-daemon-common google-chrome-stable grub-common grub-pc grub-pc-bin grub2-common
  language-pack-en language-pack-en-base language-pack-gnome-en language-pack-gnome-en-base libaspell15 libcurl3-gnutls libcurl4
  libdvdnav4 libdvdread4 libfdisk1 libgirepository1.0-1 libgnome-characters-0.27 libgnome-characters-0.27 libgnome-characters-1 libgnome-characters-1.0-1 libgnome-characters-dbg
```

\$ sudo apt-get install build-essential cmake unzip pkg-config

tools



A screenshot of a Linux desktop environment, likely Ubuntu, showing a terminal window. The terminal window title is "revathi@revathi-Lenovo-V110-15AST: ~". The window contains a log of package installations, starting with mesa-vdpau-drivers:amd64 and ending with pkg-config. The terminal shows the user running "sudo apt-get install build-essential cmake unzip pkg-config" and entering their password. The desktop background is dark, and the Unity interface is visible with its characteristic icons.

```
Setting up mesa-vdpau-drivers:amd64 (21.0.3-0ubuntu0.3~20.04.1) ...
Setting up google-chrome-stable (92.0.4515.159-1) ...
Setting up libglx-mesa0:amd64 (21.0.3-0ubuntu0.3~20.04.1) ...
Setting up systemd (245.4-4ubuntu3.11) ...
Installing new version of config file /etc/dhcp/dhclient-enter-hooks.d/resolved ...
Setting up language-pack-en (1:20.04+20210802) ...
Setting up systemd-timesyncd (245.4-4ubuntu3.11) ...
Setting up language-pack-gnome-en (1:20.04+20210802) ...
Setting up language-pack-en-base (1:20.04+20210802) ...
Generating locales (this might take a while)...
Generation complete.
Setting up systemd-sysv (245.4-4ubuntu3.11) ...
Setting up libnss-systemd:amd64 (245.4-4ubuntu3.11) ...
Setting up libpam-systemd:amd64 (245.4-4ubuntu3.11) ...
Setting up language-pack-gnome-en-base (1:20.04+20210802) ...
Setting up gnome-settings-daemon (3.36.1-0ubuntu1.1) ...
Setting up gdm3 (3.36.3-0ubuntu0.20.04.4) ...
Processing triggers for install-info (6.7.0.dfsg.2-5) ...
Processing triggers for desktop-file-utils (0.24-1ubuntu3) ...
Processing triggers for mime-support (3.64ubuntu1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for gnome-menus (3.36.0-1ubuntu1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for cracklib-runtime (2.9.6-3.2) ...
Processing triggers for plymouth-theme-ubuntu-text (0.9.4git20200323-0ubuntu6.2) ...
update-initramfs: deferring update (trigger activated)
Processing triggers for dbus (1.12.16-2ubuntu2.1) ...
Processing triggers for initramfs-tools (0.136ubuntu6.6) ...
update-initramfs: Generating /boot/initrd.img-5.8.0-59-generic
Processing triggers for dictionaries-common (1.28.1) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install build-essential cmake unzip pkg-config
[sudo] password for revathi:
Reading package lists... Done
Building dependency tree
Reading state information... Done
pkg-config is already the newest version (0.29.1-0ubuntu4).
pkg-config set to manually installed.
```

\$ sudo apt-get install gcc-6 g++-6 (compiler tools)

```
Activities Terminal Aug 28 16:25 • revathi@revathi-Lenovo-V110-15AST: ~
Get:2 http://in.archive.ubuntu.com/ubuntu focal/main amd64 libjsoncpp1 amd64 1.7.4-3.1ubuntu2 [75.6 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu focal/main amd64 librhash0 amd64 1.3.9-1 [113 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu focal/main amd64 cmake amd64 3.16.3-1ubuntu1 [3,669 kB]
Fetched 5,470 kB in 6s (871 kB/s)
Selecting previously unselected package cmake-data.
(Reading database ... 191800 files and directories currently installed.)
Preparing to unpack .../cmake-data_3.16.3-1ubuntu1_all.deb ...
Unpacking cmake-data (3.16.3-1ubuntu1) ...
Selecting previously unselected package libjsoncpp1:amd64.
Preparing to unpack .../libjsoncpp1_1.7.4-3.1ubuntu2_amd64.deb ...
Unpacking libjsoncpp1:amd64 (1.7.4-3.1ubuntu2) ...
Selecting previously unselected package librhash0:amd64.
Preparing to unpack .../librhash0_1.3.9-1_amd64.deb ...
Unpacking librhash0:amd64 (1.3.9-1) ...
Selecting previously unselected package cmake.
Preparing to unpack .../cmake_3.16.3-1ubuntu1_amd64.deb ...
Unpacking cmake (3.16.3-1ubuntu1) ...
Setting up librhash0:amd64 (1.3.9-1) ...
Setting up cmake-data (3.16.3-1ubuntu1) ...
Setting up libjsoncpp1:amd64 (1.7.4-3.1ubuntu2) ...
Setting up cmake (3.16.3-1ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install gcc-6 g++-6
Reading package lists... Done
Building dependency tree
Reading state information... Done
Package gcc-6 is not available, but is referred to by another package.
This may mean that the package is missing, has been obsoleted, or
is only available from another source

Package g++-6 is not available, but is referred to by another package.
This may mean that the package is missing, has been obsoleted, or
is only available from another source

E: Package 'gcc-6' has no installation candidate
E: Package 'g++-6' has no installation candidate
revathi@revathi-Lenovo-V110-15AST:~$
```

To Resolve gcc installation error - open ~/.bashrc profile

```
Activities Terminal Aug 28 17:21 revathi@revathi-Lenovo-V110-15AST: ~
Get:4 http://in.archive.ubuntu.com/ubuntu focal/main amd64 cmake amd64 3.16.3-1ubuntu1 [3,669 kB]
Fetched 5,470 kB in 6s (871 kB/s)
Selecting previously unselected package cmake-data.
(Reading database ... 191800 files and directories currently installed.)
Preparing to unpack .../cmake-data_3.16.3-1ubuntu1_all.deb ...
Unpacking cmake-data (3.16.3-1ubuntu1) ...
Selecting previously unselected package libjsoncpp1:amd64.
Preparing to unpack .../libjsoncpp1_1.7.4-3.1ubuntu2_amd64.deb ...
Unpacking libjsoncpp1:amd64 (1.7.4-3.1ubuntu2) ...
Selecting previously unselected package librhash0:amd64.
Preparing to unpack .../librhash0_1.3.9-1_amd64.deb ...
Unpacking librhash0:amd64 (1.3.9-1) ...
Selecting previously unselected package cmake.
Preparing to unpack .../cmake_3.16.3-1ubuntu1_amd64.deb ...
Unpacking cmake (3.16.3-1ubuntu1) ...
Setting up librhash0:amd64 (1.3.9-1) ...
Setting up cmake-data (3.16.3-1ubuntu1) ...
Setting up libjsoncpp1:amd64 (1.7.4-3.1ubuntu2) ...
Setting up cmake (3.16.3-1ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install gcc-6 g++-6
Reading package lists... Done
Building dependency tree
Reading state information... Done
Package gcc-6 is not available, but is referred to by another package.
This may mean that the package is missing, has been obsoleted, or
is only available from another source
Package g++-6 is not available, but is referred to by another package.
This may mean that the package is missing, has been obsoleted, or
is only available from another source
E: Package 'gcc-6' has no installation candidate
E: Package 'g++-6' has no installation candidate
revathi@revathi-Lenovo-V110-15AST:~$ sudo nano /etc/apt/sources.list
[sudo] password for revathi:
revathi@revathi-Lenovo-V110-15AST:~$ 
```

Updating ~/.bashrc to install gcc

Activities Terminal Aug 28 17:23 revathi@revathi-Lenovo-V110-15AST: ~ Modified

```
GNU nano 4.8 /etc/apt/sources.list
# deb-src http://in.archive.ubuntu.com/ubuntu/ focal multiverse
deb http://in.archive.ubuntu.com/ubuntu/ focal-updates multiverse
# deb-src http://in.archive.ubuntu.com/ubuntu/ focal-updates multiverse

## N.B. software from this repository may not have been tested as
## extensively as that contained in the main release, although it includes
## newer versions of some applications which may provide useful features.
## Also, please note that software in backports WILL NOT receive any review
## or updates from the Ubuntu security team.
deb http://in.archive.ubuntu.com/ubuntu/ focal-backports main restricted universe multiverse
# deb-src http://in.archive.ubuntu.com/ubuntu/ focal-backports main restricted universe multiverse

## Uncomment the following two lines to add software from Canonical's
## 'partner' repository.
## This software is not part of Ubuntu, but is offered by Canonical and the
## respective vendors as a service to Ubuntu users.
# deb http://archive.canonical.com/ubuntu focal partner
# deb-src http://archive.canonical.com/ubuntu focal partner

deb http://security.ubuntu.com/ubuntu focal-security main restricted
# deb-src http://security.ubuntu.com/ubuntu focal-security main restricted
deb http://security.ubuntu.com/ubuntu focal-security universe
# deb-src http://security.ubuntu.com/ubuntu focal-security universe
deb http://security.ubuntu.com/ubuntu focal-security multiverse
# deb-src http://security.ubuntu.com/ubuntu focal-security multiverse

# This system was installed using small removable media
# (e.g. netinst, live or single CD). The matching "deb cdrom"
# entries were disabled at the end of the installation process.
# For information about how to configure apt package sources,
# see the sources.list(5) manual.

#to handle candidate error while installing gcc-6 and gcc++-6 - 28/08/2021
deb http://in.archive.ubuntu.com/ubuntu trusty main restricted
```

>_

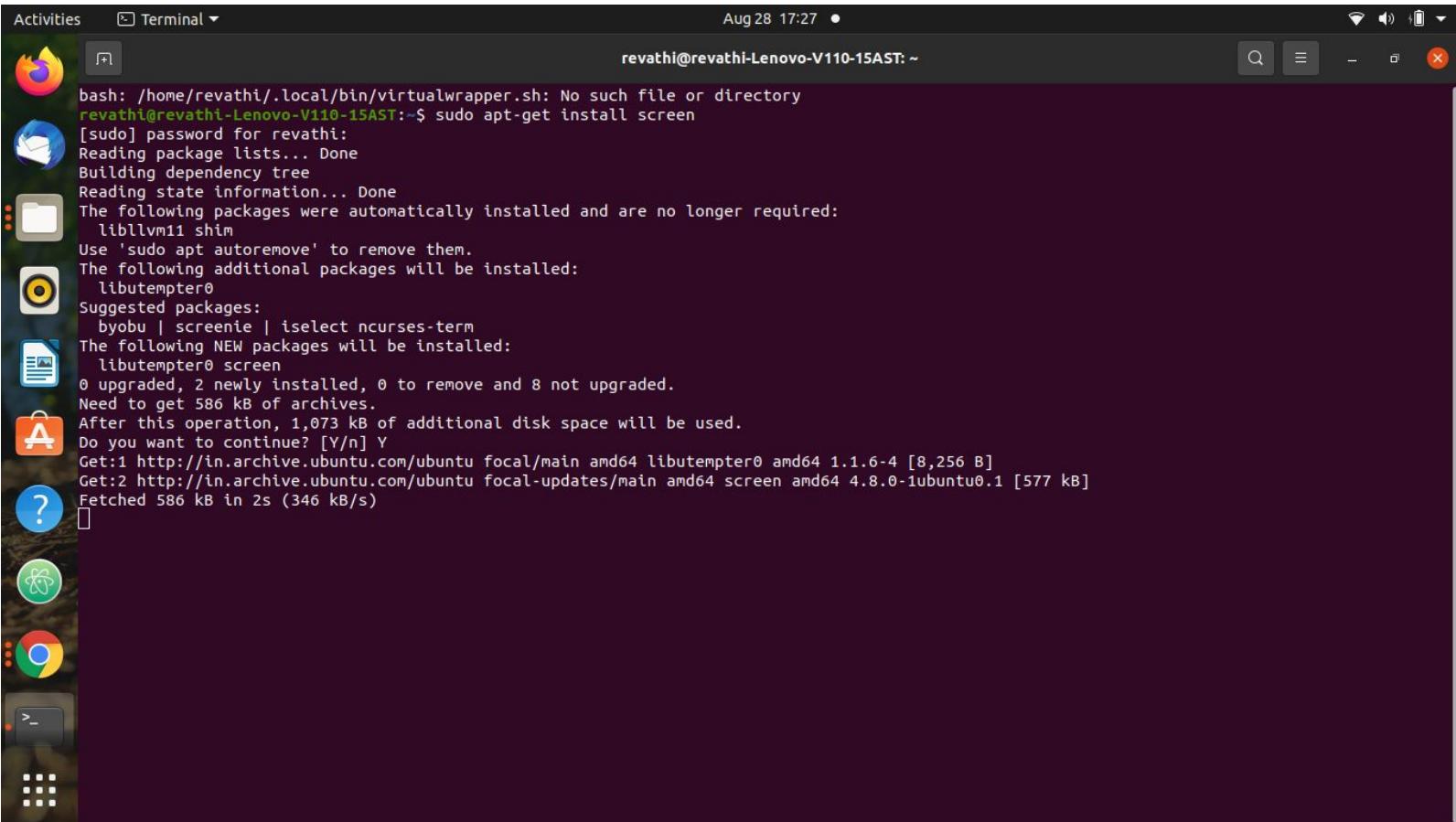
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos M-U Undo M-A Mark Text M-] To Bracket
^X Exit ^R Read File ^\ Replace ^U Paste Text ^T To Spell ^_ Go To Line M-E Redo M-6 Copy Text ^Q Where Was

Install gcc - \$ sudo apt-get install gcc

```
Activities Terminal Aug 28 17:24 • revathi@revathi-Lenovo-V110-15AST: ~
revathi@revathi-Lenovo-V110-15AST:~$ sudo nano /etc/apt/sources.list
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get update
Hit:1 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:2 http://in.archive.ubuntu.com/ubuntu focal InRelease
Get:3 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:4 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Ign:6 http://in.archive.ubuntu.com/ubuntu trusty InRelease
Get:7 http://in.archive.ubuntu.com/ubuntu trusty Release [58.5 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu trusty Release.gpg [933 B]
Get:9 http://in.archive.ubuntu.com/ubuntu focal-updates/main i386 Packages [522 kB]
Get:10 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1,169 kB]
Get:11 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [27.6 kB]
Get:12 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [61.1 kB]
Get:13 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [2,468 B]
Get:14 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [282 kB]
Get:15 http://in.archive.ubuntu.com/ubuntu focal-updates/universe i386 Packages [629 kB]
Get:16 http://in.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [848 kB]
Get:17 http://in.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [351 kB]
Get:18 http://in.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [940 B]
Get:19 http://in.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 Metadata [10.3 kB]
Get:20 http://in.archive.ubuntu.com/ubuntu trusty/main amd64 Packages [1,350 kB]
Get:21 http://in.archive.ubuntu.com/ubuntu trusty/main i386 Packages [1,348 kB]
Get:22 http://in.archive.ubuntu.com/ubuntu trusty/restricted amd64 Packages [13.0 kB]
Get:23 http://in.archive.ubuntu.com/ubuntu trusty/restricted i386 Packages [13.4 kB]
Fetched 7,018 kB in 9s (797 kB/s)
Reading package lists... Done
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install gcc
Reading package lists... Done
Building dependency tree
Reading state information... Done
gcc is already the newest version (4:9.3.0-1ubuntu2).
gcc set to manually installed.
The following packages were automatically installed and are no longer required:
  libllvm11 shim
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 8 not upgraded.
revathi@revathi-Lenovo-V110-15AST:~$
```

```
$ sudo apt-get install screen
```

screen, a tool used for multiple terminals in the same window

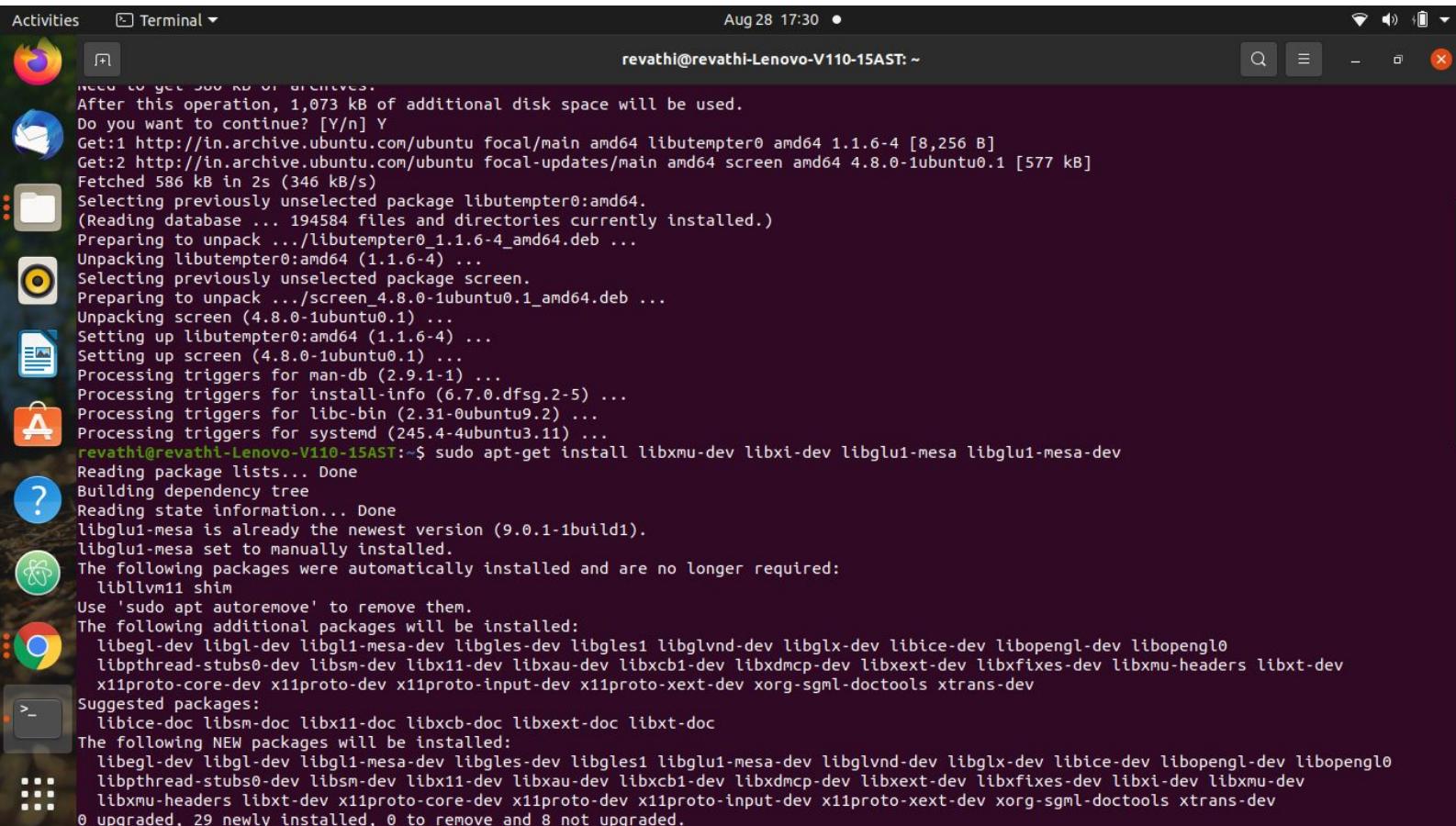


The screenshot shows a Linux desktop environment with a dark theme. A terminal window is open in the center, displaying the command `sudo apt-get install screen` and its execution. The terminal window has a title bar showing the date and time (Aug 28 17:27) and the user's name (revathi@revathi-Lenovo-V110-15AST). The desktop background features a grid of icons for various applications like the Dash, Home, and System settings.

```
revathi@revathi-Lenovo-V110-15AST: ~
bash: /home/revathi/.local/bin/virtualwrapper.sh: No such file or directory
[sudo] password for revathi:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  liblvm1 shim
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libutempter0
Suggested packages:
  byobu | screenie | iselect ncurses-term
The following NEW packages will be installed:
  libutempter0 screen
0 upgraded, 2 newly installed, 0 to remove and 8 not upgraded.
Need to get 586 kB of archives.
After this operation, 1,073 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 libutempter0 amd64 1.1.6-4 [8,256 B]
Get:2 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 screen amd64 4.8.0-1ubuntu0.1 [577 kB]
Fetched 586 kB in 2s (346 kB/s)
```

```
$ sudo apt-get install libxmu-dev libxi-dev libglu1-mesa libglu1-mesa-dev
```

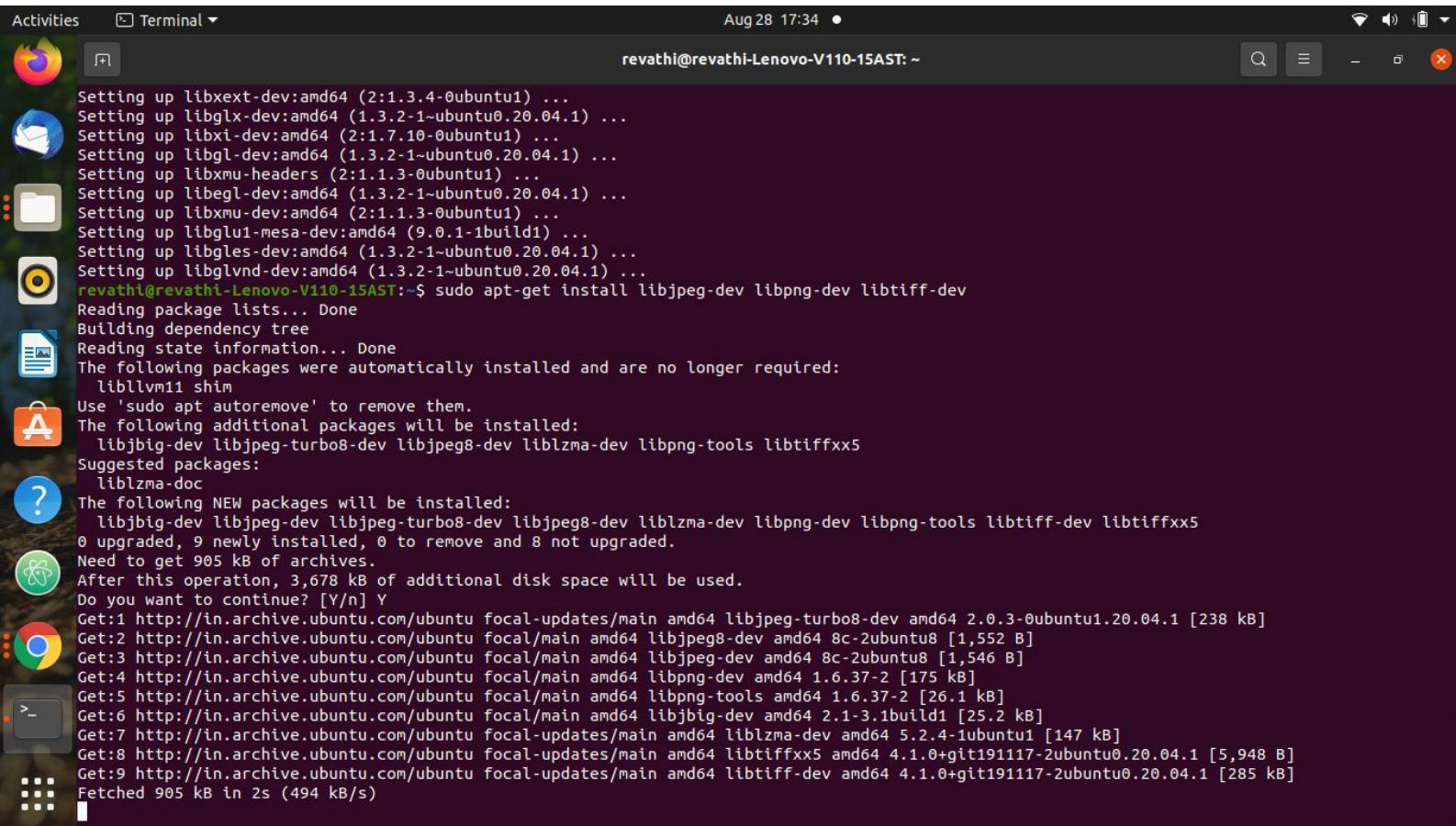
install X windows libraries and OpenGL libraries



```
Activities Terminal Aug 28 17:30 revathi@revathi-Lenovo-V110-15AST: ~
revathi@revathi-Lenovo-V110-15AST: ~
Need to get 500 kB of archives.
After this operation, 1,073 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 libutempter0 amd64 1.1.6-4 [8,256 B]
Get:2 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 screen amd64 4.8.0-1ubuntu0.1 [577 kB]
Fetched 586 kB in 2s (346 kB/s)
Selecting previously unselected package libutempter0:amd64.
(Reading database ... 194584 files and directories currently installed.)
Preparing to unpack .../libutempter0_1.1.6-4_amd64.deb ...
Unpacking libutempter0:amd64 (1.1.6-4) ...
Selecting previously unselected package screen.
Preparing to unpack .../screen_4.8.0-1ubuntu0.1_amd64.deb ...
Unpacking screen (4.8.0-1ubuntu0.1) ...
Setting up libutempter0:amd64 (1.1.6-4) ...
Setting up screen (4.8.0-1ubuntu0.1) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for install-info (6.7.0.dfsg.2-5) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Processing triggers for systemd (245.4-4ubuntu3.11) ...
revathi@revathi-Lenovo-V110-15AST: ~$ sudo apt-get install libxmu-dev libxi-dev libglu1-mesa libglu1-mesa-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
libglu1-mesa is already the newest version (9.0.1-1build1).
libglu1-mesa set to manually installed.
The following packages were automatically installed and are no longer required:
  liblvm1 shim
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libegl-dev libgl-dev libgl1-mesa-dev libgles-dev libgles1 libglvnd-dev libglx-dev libice-dev libopengl-dev libopengl0
  libpthread-stubs0-dev libsm-dev libxi1-dev libxau-dev libxcb1-dev libxdmcp-dev libxext-dev libxfixes-dev libxmu-headers libxt-dev
  x11proto-core-dev x11proto-dev x11proto-input-dev x11proto-xext-dev xorg-sgml-doctools xtrans-dev
Suggested packages:
  libice-doc libsm-doc libxcb-doc libxext-doc libxt-doc
The following NEW packages will be installed:
  libegl-dev libgl-dev libgl1-mesa-dev libgles-dev libgles1 libglu1-mesa-dev libglvnd-dev libglx-dev libice-dev libopengl-dev libopengl0
  libpthread-stubs0-dev libsm-dev libxi1-dev libxau-dev libxcb1-dev libxdmcp-dev libxext-dev libxfixes-dev libxi-dev libxmu-dev
  libxmu-headers libxt-dev x11proto-core-dev x11proto-dev x11proto-input-dev x11proto-xext-dev xorg-sgml-doctools xtrans-dev
0 upgraded, 29 newly installed, 0 to remove and 8 not upgraded.
```

```
$ sudo apt-get install libjpeg-dev libpng-dev libtiff-dev
```

Image and video I/O libraries

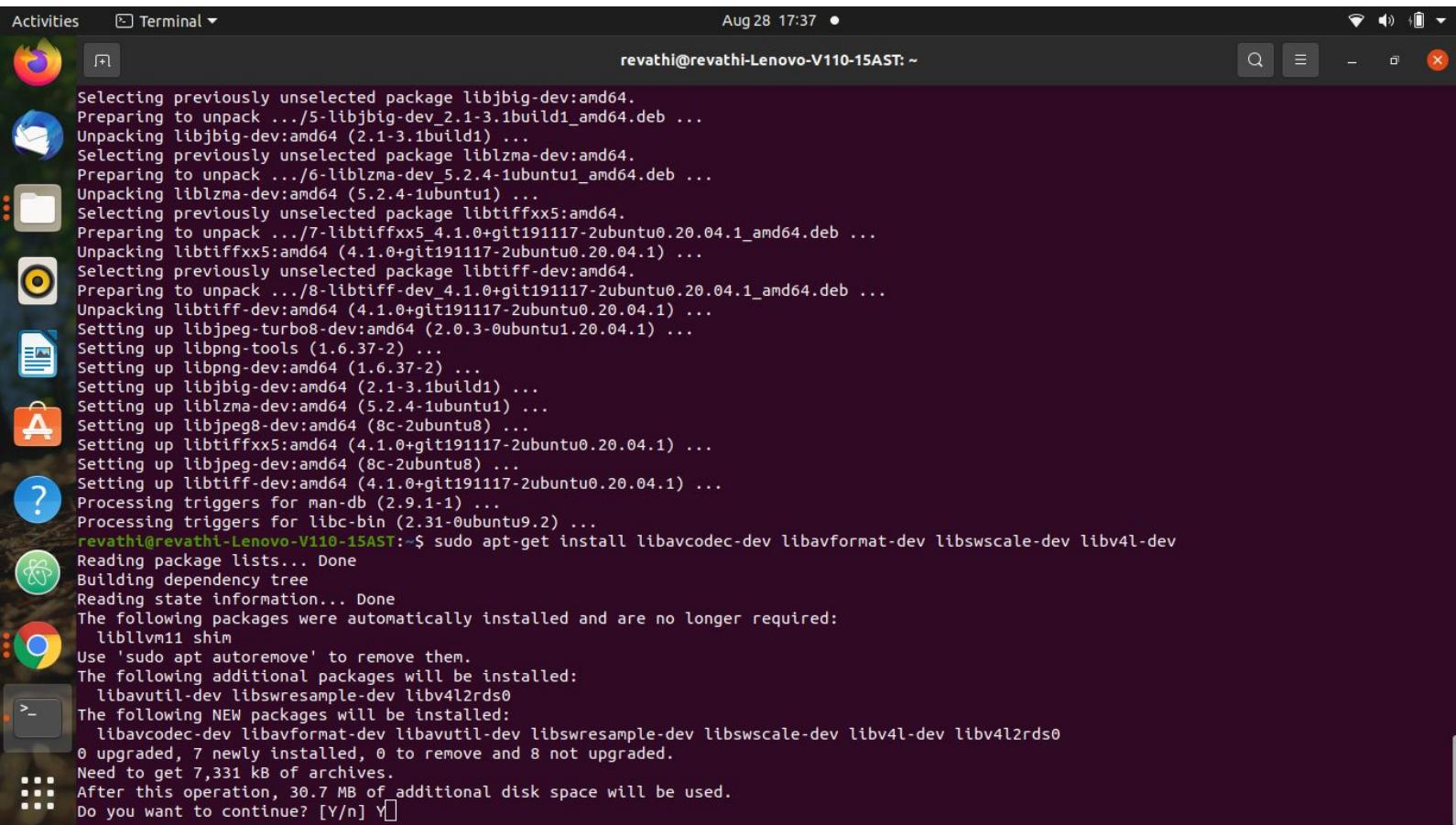


The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "revathi@revathi-Lenovo-V110-15AST: ~". The terminal content displays the output of the command \$ sudo apt-get install libjpeg-dev libpng-dev libtiff-dev. The output includes dependency resolution, package selection, and download details.

```
Setting up libxext-dev:amd64 (2:1.3.4-0ubuntu1) ...
Setting up libglx-dev:amd64 (1.3.2-1~ubuntu0.20.04.1) ...
Setting up libxi-dev:amd64 (2:1.7.10-0ubuntu1) ...
Setting up libgl-dev:amd64 (1.3.2-1~ubuntu0.20.04.1) ...
Setting up libxml2-headers (2:1.1.3-0ubuntu1) ...
Setting up libegl-dev:amd64 (1.3.2-1~ubuntu0.20.04.1) ...
Setting up libxml2-dev:amd64 (2:1.1.3-0ubuntu1) ...
Setting up libglu1-mesa-dev:amd64 (9.0.1-1build1) ...
Setting up libgles-dev:amd64 (1.3.2-1~ubuntu0.20.04.1) ...
Setting up libglvnd-dev:amd64 (1.3.2-1~ubuntu0.20.04.1) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install libjpeg-dev libpng-dev libtiff-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  liblvm1 shim
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libjbig-dev libjpeg-turbo8-dev libjpeg8-dev liblzma-dev libpng-tools libtiffxx5
Suggested packages:
  liblzma-doc
The following NEW packages will be installed:
  libjbig-dev libjpeg-dev libjpeg-turbo8-dev libjpeg8-dev liblzma-dev libpng-dev libpng-tools libtiff-dev libtiffxx5
0 upgraded, 9 newly installed, 0 to remove and 8 not upgraded.
Need to get 905 kB of archives.
After this operation, 3,678 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 libjpeg-turbo8-dev amd64 2.0.3-0ubuntu1.20.04.1 [238 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal/main amd64 libjpeg8-dev amd64 8c-2ubuntu8 [1,552 B]
Get:3 http://in.archive.ubuntu.com/ubuntu focal/main amd64 libjpeg-dev amd64 8c-2ubuntu8 [1,546 B]
Get:4 http://in.archive.ubuntu.com/ubuntu focal/main amd64 libpng-dev amd64 1.6.37-2 [175 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu focal/main amd64 libpng-tools amd64 1.6.37-2 [26.1 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu focal/main amd64 libjbig-dev amd64 2.1-3.1build1 [25.2 kB]
Get:7 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 liblzma-dev amd64 5.2.4-1ubuntu1 [147 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 libtiffxx5 amd64 4.1.0+git191117-2ubuntu0.20.04.1 [5,948 B]
Get:9 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 libtiff-dev amd64 4.1.0+git191117-2ubuntu0.20.04.1 [285 kB]
Fetched 905 kB in 2s (494 kB/s)
```

```
$ sudo apt-get install libavcodec-dev libavformat-dev libswscale-dev libv4l-dev
```

Image and video I/O libraries



The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "revathi@revathi-Lenovo-V110-15AST: ~". The window contains the output of a terminal command to install development packages for image and video processing. The log includes messages about selecting previously unselected packages like libjbig-dev, liblzma-dev, libtiff-dev, libjpeg-turbo8-dev, libpng-tools, and libavcodec-dev, among others. It also lists dependencies being installed such as libavutil-dev, libswresample-dev, and libv4l2rds0. The terminal concludes with a prompt asking if the user wants to continue the operation.

```
Selecting previously unselected package libjbig-dev:amd64.  
Preparing to unpack .../5-libjbig-dev_2.1-3.1build1_amd64.deb ...  
Unpacking libjbig-dev:amd64 (2.1-3.1build1) ...  
Selecting previously unselected package liblzma-dev:amd64.  
Preparing to unpack .../6-liblzma-dev_5.2.4-1ubuntu1_amd64.deb ...  
Unpacking liblzma-dev:amd64 (5.2.4-1ubuntu1) ...  
Selecting previously unselected package libtiffxx5:amd64.  
Preparing to unpack .../7-libtiffxx5_4.1.0+git191117-2ubuntu0.20.04.1_amd64.deb ...  
Unpacking libtiffxx5:amd64 (4.1.0+git191117-2ubuntu0.20.04.1) ...  
Selecting previously unselected package libtiff-dev:amd64.  
Preparing to unpack .../8-libtiff-dev_4.1.0+git191117-2ubuntu0.20.04.1_amd64.deb ...  
Unpacking libtiff-dev:amd64 (4.1.0+git191117-2ubuntu0.20.04.1) ...  
Setting up libjpeg-turbo8-dev:amd64 (2.0.3-0ubuntu1.20.04.1) ...  
Setting up libpng-tools (1.6.37-2) ...  
Setting up libpng-dev:amd64 (1.6.37-2) ...  
Setting up libjbig-dev:amd64 (2.1-3.1build1) ...  
Setting up liblzma-dev:amd64 (5.2.4-1ubuntu1) ...  
Setting up libjpeg8-dev:amd64 (8c-2ubuntu8) ...  
Setting up libtiffxx5:amd64 (4.1.0+git191117-2ubuntu0.20.04.1) ...  
Setting up libjpeg-dev:amd64 (8c-2ubuntu8) ...  
Setting up libtiff-dev:amd64 (4.1.0+git191117-2ubuntu0.20.04.1) ...  
Processing triggers for man-db (2.9.1-1) ...  
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...  
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install libavcodec-dev libavformat-dev libswscale-dev libv4l-dev  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following packages were automatically installed and are no longer required:  
  liblvm1 shim  
Use 'sudo apt autoremove' to remove them.  
The following additional packages will be installed:  
  libavutil-dev libswresample-dev libv4l2rds0  
The following NEW packages will be installed:  
  libavcodec-dev libavformat-dev libavutil-dev libswresample-dev libswscale-dev libv4l-dev libv4l2rds0  
0 upgraded, 7 newly installed, 0 to remove and 8 not upgraded.  
Need to get 7,331 kB of archives.  
After this operation, 30.7 MB of additional disk space will be used.  
Do you want to continue? [Y/n] Y
```

```
$ sudo apt-get install libxvidcore-dev libx264-dev
```

Image and video I/O libraries

```
Activities Terminal Aug 28 17:39 • revathi@revathi-Lenovo-V110-15AST: ~ Q - X

Preparing to unpack .../2-libavcodec-dev_7%3a4.2.4-1ubuntu0.1_amd64.deb ...
Unpacking libavcodec-dev:amd64 (7:4.2.4-1ubuntu0.1) ...
Selecting previously unselected package libavformat-dev:amd64.
Preparing to unpack .../3-libavformat-dev_7%3a4.2.4-1ubuntu0.1_amd64.deb ...
Unpacking libavformat-dev:amd64 (7:4.2.4-1ubuntu0.1) ...
Selecting previously unselected package libswscale-dev:amd64.
Preparing to unpack .../4-libswscale-dev_7%3a4.2.4-1ubuntu0.1_amd64.deb ...
Unpacking libswscale-dev:amd64 (7:4.2.4-1ubuntu0.1) ...
Selecting previously unselected package libv4l2rds0:amd64.
Preparing to unpack .../5-libv4l2rds0_1.18.0-2build1_amd64.deb ...
Unpacking libv4l2rds0:amd64 (1.18.0-2build1) ...
Selecting previously unselected package libv4l-dev:amd64.
Preparing to unpack .../6-libv4l-dev_1.18.0-2build1_amd64.deb ...
Unpacking libv4l-dev:amd64 (1.18.0-2build1) ...
Setting up libavutil-dev:amd64 (7:4.2.4-1ubuntu0.1) ...
Setting up libswresample-dev:amd64 (7:4.2.4-1ubuntu0.1) ...
Setting up libavcodec-dev:amd64 (7:4.2.4-1ubuntu0.1) ...
Setting up libavformat-dev:amd64 (7:4.2.4-1ubuntu0.1) ...
Setting up libswscale-dev:amd64 (7:4.2.4-1ubuntu0.1) ...
Setting up libv4l2rds0:amd64 (1.18.0-2build1) ...
Setting up libv4l-dev:amd64 (1.18.0-2build1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install libxvidcore-dev libx264-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  liblvm11 shim
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  libx264-dev libxvidcore-dev
0 upgraded, 2 newly installed, 0 to remove and 8 not upgraded.
Need to get 913 kB of archives.
After this operation, 4,123 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 libx264-dev amd64 2:0.155.2917+git0a84d98-2 [569 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 libxvidcore-dev amd64 2:1.3.7-1 [344 kB]
Fetched 913 kB in 2s (489 kB/s)
```

```
$ sudo apt-get install libopenblas-dev libatlas-base-dev liblapack-dev gfortran
```

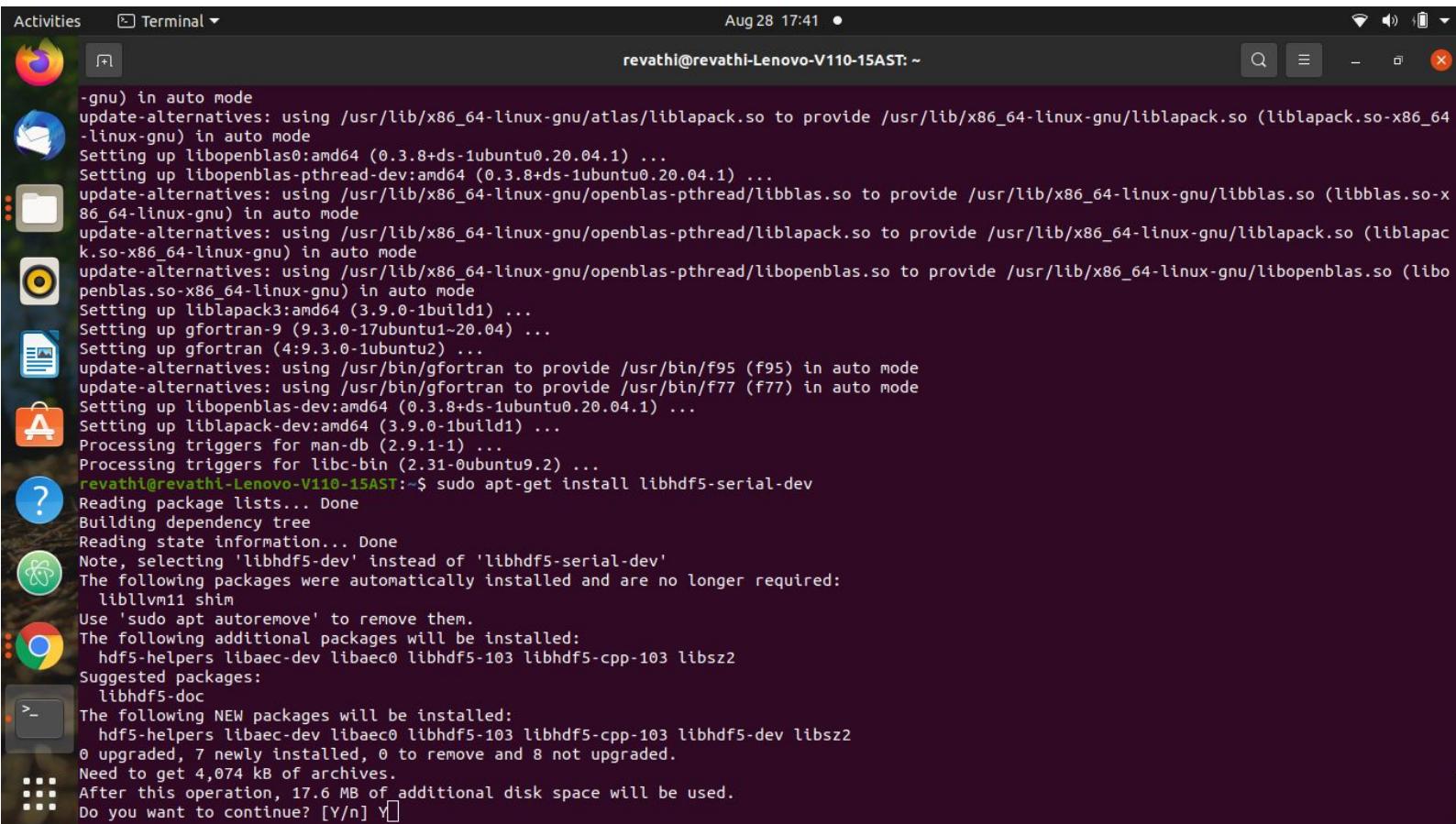
Optimization libraries

```
Activities Terminal Aug 28 17:39 • revathi@revathi-Lenovo-V110-15AST: ~ Q - X

The following packages were automatically installed and are no longer required:
  libllvm11 shim
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  libx264-dev libxvidcore-dev
0 upgraded, 2 newly installed, 0 to remove and 8 not upgraded.
Need to get 913 kB of archives.
After this operation, 4,123 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 libx264-dev amd64 2:0.155.2917+git0a84d98-2 [569 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 libxvidcore-dev amd64 2:1.3.7-1 [344 kB]
Fetched 913 kB in 2s (489 kB/s)
Selecting previously unselected package libx264-dev:amd64.
(Reading database ... 195928 files and directories currently installed.)
Preparing to unpack .../libx264-dev_2%3a0.155.2917+git0a84d98-2_amd64.deb ...
Unpacking libx264-dev:amd64 (2:0.155.2917+git0a84d98-2) ...
Selecting previously unselected package libxvidcore-dev:amd64.
Preparing to unpack .../libxvidcore-dev_2%3a1.3.7-1_amd64.deb ...
Unpacking libxvidcore-dev:amd64 (2:1.3.7-1) ...
Setting up libxvidcore-dev:amd64 (2:1.3.7-1) ...
Setting up libx264-dev:amd64 (2:0.155.2917+git0a84d98-2) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install libopenblas-dev libatlas-base-dev liblapack-dev gfortran
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libllvm11 shim
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  gfortran-9 libatlas3-base libgfortran-9-dev libgfortran5 liblapack3 libopenblas-pthread-dev libopenblas0 libopenblas0-pthread
Suggested packages:
  gfortran-multilib gfortran-doc gfortran-9-multilib gfortran-9-doc libcoarrays-dev libatlas-doc liblapack-doc
The following NEW packages will be installed:
  gfortran gfortran-9 libatlas-base-dev libatlas3-base libgfortran-9-dev libgfortran5 liblapack-dev liblapack3 libopenblas-dev
  libopenblas-pthread-dev libopenblas0 libopenblas0-pthread
0 upgraded, 12 newly installed, 0 to remove and 8 not upgraded.
Need to get 37.2 MB of archives.
After this operation, 270 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
```

```
$ sudo apt-get install libhdf5-serial-dev
```

HDF5 for working with large datasets

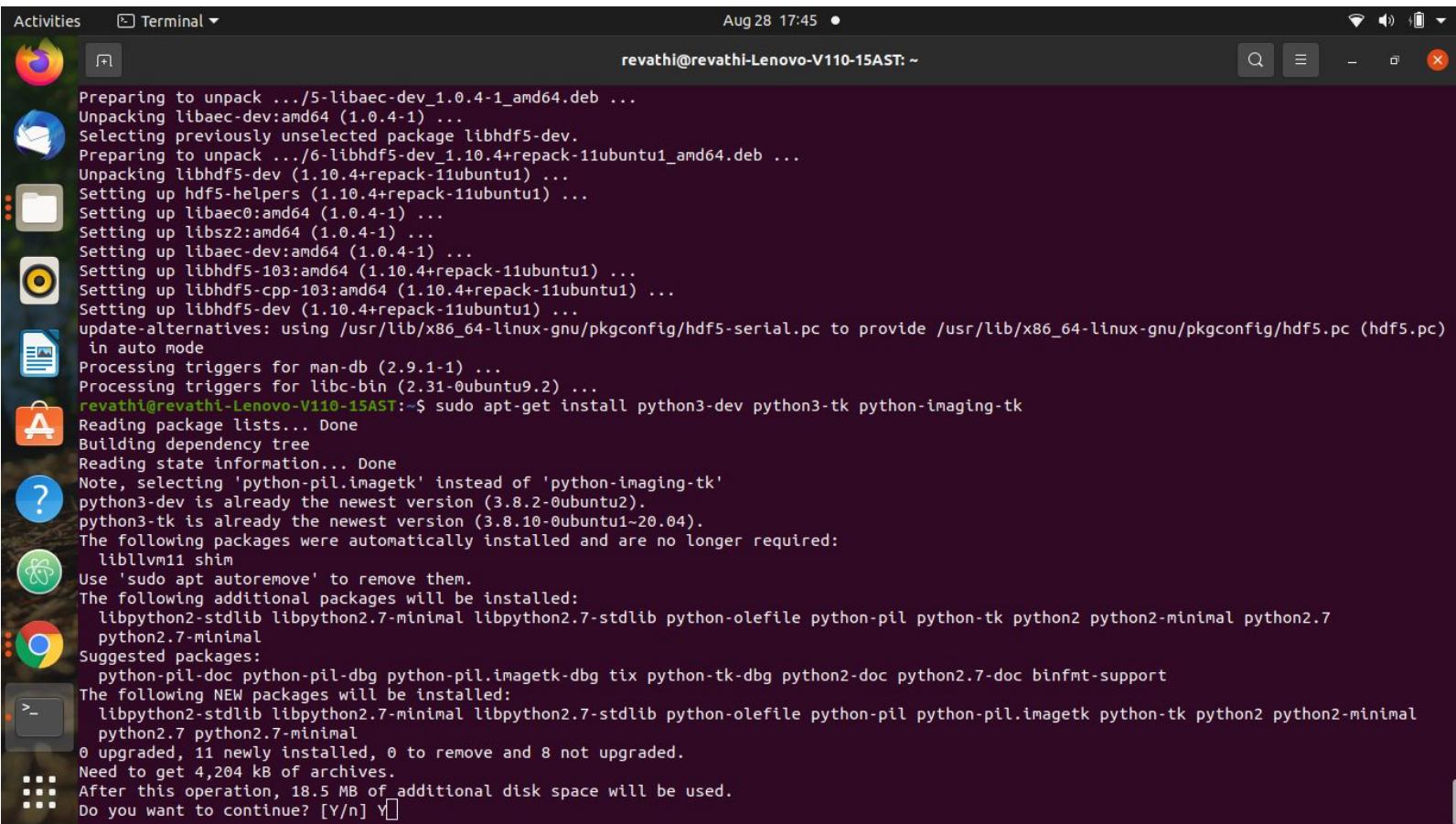


The screenshot shows a terminal window in an Ubuntu desktop environment. The terminal window has a dark purple background and contains the output of a command-line session. The session starts with the command \$ sudo apt-get install libhdf5-serial-dev, followed by a series of dependency resolution messages from apt-get. It includes notes about selecting libhdf5-dev instead of libhdf5-serial-dev, lists of automatically installed packages, suggested packages like libhdf5-doc, and a summary of new packages to be installed. The terminal window is titled revathi@revathi-Lenovo-V110-15AST: ~ and is located in the Activities overview. The desktop interface includes icons for various applications like a browser, file manager, and system settings.

```
Activities Terminal Aug 28 17:41 • revathi@revathi-Lenovo-V110-15AST: ~
-gnu) in auto mode
update-alternatives: using /usr/lib/x86_64-linux-gnu/atlas/liblapack.so to provide /usr/lib/x86_64-linux-gnu/liblapack.so (liblapack.so-x86_64-linux-gnu) in auto mode
Setting up libopenblas0:amd64 (0.3.8+ds-1ubuntu0.20.04.1) ...
Setting up libopenblas-pthread-dev:amd64 (0.3.8+ds-1ubuntu0.20.04.1) ...
update-alternatives: using /usr/lib/x86_64-linux-gnu/openblas-pthread/libblas.so to provide /usr/lib/x86_64-linux-gnu/libblas.so (libblas.so-x86_64-linux-gnu) in auto mode
update-alternatives: using /usr/lib/x86_64-linux-gnu/openblas-pthread/liblapack.so to provide /usr/lib/x86_64-linux-gnu/liblapack.so (liblapack.so-x86_64-linux-gnu) in auto mode
update-alternatives: using /usr/lib/x86_64-linux-gnu/openblas-pthread/libopenblas.so to provide /usr/lib/x86_64-linux-gnu/libopenblas.so (libopenblas.so-x86_64-linux-gnu) in auto mode
Setting up liblapack3:amd64 (3.9.0-1build1) ...
Setting up gfortran-9 (9.3.0-17ubuntu1~20.04) ...
Setting up gfortran (4:9.3.0-1ubuntu2) ...
update-alternatives: using /usr/bin/gfortran to provide /usr/bin/f95 (f95) in auto mode
update-alternatives: using /usr/bin/gfortran to provide /usr/bin/f77 (f77) in auto mode
Setting up libopenblas-dev:amd64 (0.3.8+ds-1ubuntu0.20.04.1) ...
Setting up liblapack-dev:amd64 (3.9.0-1build1) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install libhdf5-serial-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'libhdf5-dev' instead of 'libhdf5-serial-dev'
The following packages were automatically installed and are no longer required:
  liblvm11 shim
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  hdf5-helpers libaec-dev libaec0 libhdf5-103 libhdf5-cpp-103 libs2z
Suggested packages:
  libhdf5-doc
The following NEW packages will be installed:
  hdf5-helpers libaec-dev libaec0 libhdf5-103 libhdf5-cpp-103 libhdf5-dev libs2z
0 upgraded, 7 newly installed, 0 to remove and 8 not upgraded.
Need to get 4,074 kB of archives.
After this operation, 17.6 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
```

```
$ sudo apt-get install python3-dev python3-tk python-imaging-tk
```

Python 3 development libraries including TK and GTK GUI support

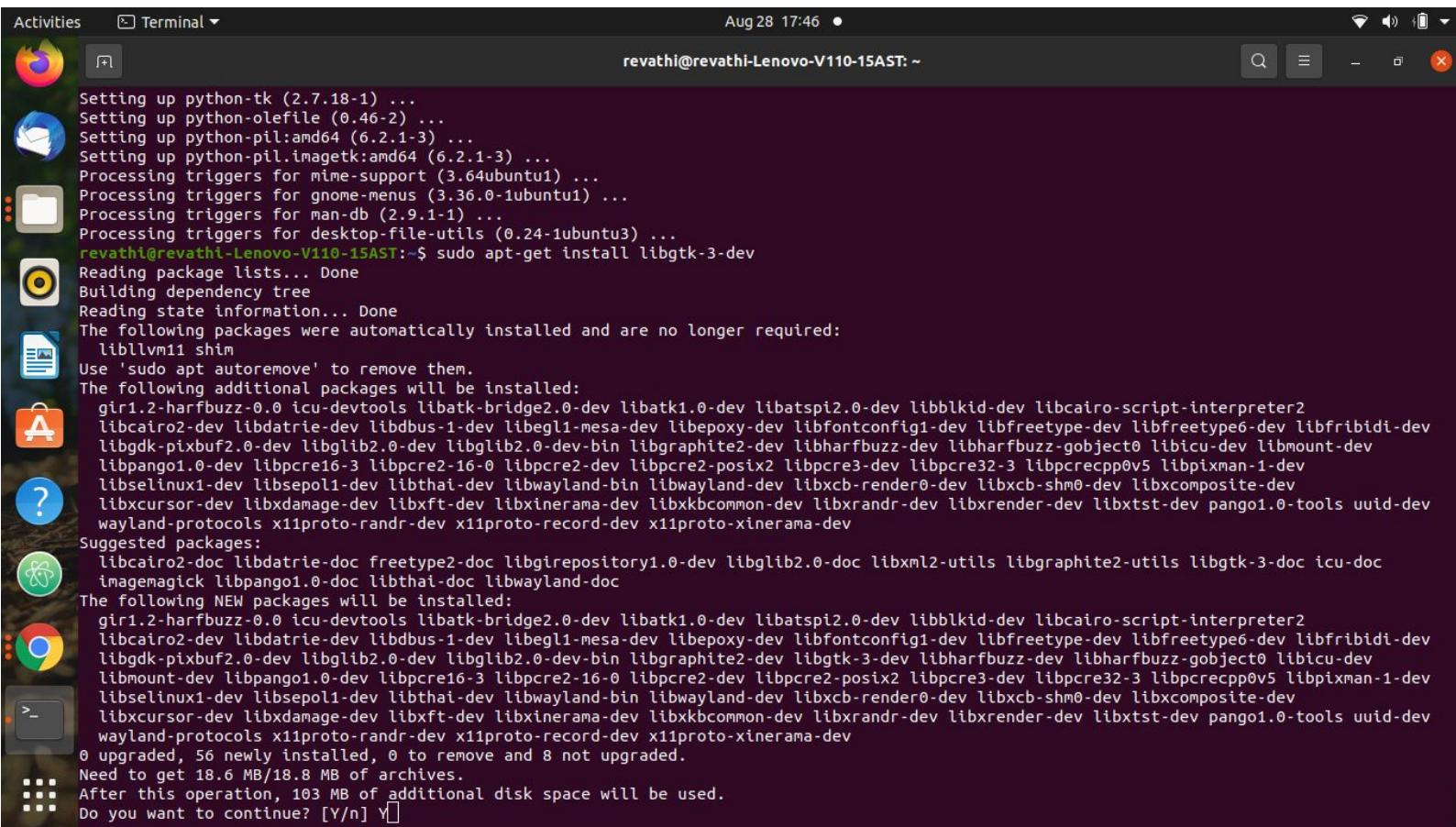


The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "revathi@revathi-Lenovo-V110-15AST: ~". The terminal content displays the output of the command \$ sudo apt-get install python3-dev python3-tk python-imaging-tk. The output includes package unpacking, dependency resolution, and upgrade information. The desktop interface features a dock with icons for various applications like a browser, file manager, and system tools.

```
Preparing to unpack .../5-libaec-dev_1.0.4-1_amd64.deb ...
Unpacking libaec-dev:amd64 (1.0.4-1) ...
Selecting previously unselected package libhdf5-dev.
Preparing to unpack .../6-libhdf5-dev_1.10.4+repack-11ubuntu1_amd64.deb ...
Unpacking libhdf5-dev (1.10.4+repack-11ubuntu1) ...
Setting up hdf5-helpers (1.10.4+repack-11ubuntu1) ...
Setting up libaec0:amd64 (1.0.4-1) ...
Setting up libsz2:amd64 (1.0.4-1) ...
Setting up libaec-dev:amd64 (1.0.4-1) ...
Setting up libhdf5-103:amd64 (1.10.4+repack-11ubuntu1) ...
Setting up libhdf5-cpp-103:amd64 (1.10.4+repack-11ubuntu1) ...
Setting up libhdf5-dev (1.10.4+repack-11ubuntu1) ...
update-alternatives: using /usr/lib/x86_64-linux-gnu/pkgconfig/hdf5-serial.pc to provide /usr/lib/x86_64-linux-gnu/pkgconfig/hdf5.pc (hdf5.pc)
in auto mode.
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install python3-dev python3-tk python-imaging-tk
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'python-pil.imagetk' instead of 'python-imaging-tk'
python3-dev is already the newest version (3.8.2-0ubuntu2).
python3-tk is already the newest version (3.8.10-0ubuntu1~20.04).
The following packages were automatically installed and are no longer required:
  liblvm1 shim
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libpython2.7-dev libpython2.7-minimal libpython2.7-stdlib python-olefile python-pil python-tk python2 python2-minimal python2.7
  python2.7-minimal
Suggested packages:
  python-pil-doc python-pil-dbg python-pil.imagetk-dbg tix python-tk-dbg python2-doc python2.7-doc binfmt-support
The following NEW packages will be installed:
  libpython2.7-dev libpython2.7-minimal libpython2.7-stdlib python-olefile python-pil python-pil.imagetk python-tk python2 python2-minimal
  python2.7 python2.7-minimal
0 upgraded, 11 newly installed, 0 to remove and 8 not upgraded.
Need to get 4,204 kB of archives.
After this operation, 18.5 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
```

```
$ sudo apt-get install libgtk-3-dev
```

Python 3 development libraries including TK and GTK GUI support



The screenshot shows a terminal window in an Ubuntu desktop environment. The terminal is titled "revathi@revathi-Lenovo-V110-15AST: ~". The output of the command \$ sudo apt-get install libgtk-3-dev is displayed, showing the installation of various Python development libraries including tk, olefile, pil, pil.imagetk, mime-support, gnome-menus, man-db, desktop-file-utils, and libgtk-3-dev. It also lists packages being automatically removed (liblvm11 shim) and additional packages being installed (gir1.2-harfbuzz, libatk1.0, libatspi2.0, libblkid, libcairo-script-interpreter2, libcairo2, libdatrie, libdbus, libegl1-mesa, libepoxy, libfontconfig, libfreetype, libfreetype6, libfribidi, libgdk-pixbuf2.0, libglib2.0, libgraphite2, libharfbuzz, libharfbuzz-gobject0, libicu, libmount, libpango1.0, libpcre16-3, libpcre2, libpcre2-posix2, libpcre3, libpcre32-3, libpcrecpp0v5, libpixman, libselinux1, libsepolicy, libthai, libwayland-bin, libwayland-dev, libxcb-render, libxcb-shm, libxcomposite, libxcursor, libxdamage, libxft, libxinerama, libxkbcommon, libxrandr, libxrender, libxtst, pango1.0-tools, uuid, wayland-protocols, x11proto-randr, x11proto-record, x11proto-xinerama). Suggested packages listed include libcairo2-doc, libdatrie-doc, freetype2-doc, libgirepository1.0-dev, libglib2.0-doc, libxml2-utils, libgraphite2-utils, libgtk-3-doc, icu-doc, imagemagick, libpango1.0-doc, libthai-doc, libwayland-doc. The output also indicates that 0 upgraded, 56 newly installed, 0 to remove, and 8 not upgraded. A message at the bottom asks if the user wants to continue with [Y/n] Y.

```
Setting up python-tk (2.7.18-1) ...
Setting up python-olefile (0.46-2) ...
Setting up python-pil:amd64 (6.2.1-3) ...
Setting up python-pil.imagetk:amd64 (6.2.1-3) ...
Processing triggers for mime-support (3.64ubuntu1) ...
Processing triggers for gnome-menus (3.36.0-1ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for desktop-file-utils (0.24-1ubuntu3) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo apt-get install libgtk-3-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  liblvm11 shim
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  gir1.2-harfbuzz-0.0  icu-devtools  libatk1.0-dev  libatspi2.0-dev  libblkid-dev  libcairo-script-interpreter2
  libcairo2-dev  libdatrie-dev  libdbus-1-dev  libegl1-mesa-dev  libepoxy-dev  libfontconfig1-dev  libfreetype-dev  libfreetype6-dev  libfribidi-dev
  libgdk-pixbuf2.0-dev  libglib2.0-dev  libglib2.0-dev-bin  libgraphite2-dev  libharfbuzz-dev  libharfbuzz-gobject0  libicu-dev  libmount-dev
  libpango1.0-dev  libpcre16-3  libpcre2-16-0  libpcre2-dev  libpcre2-posix2  libpcre3-dev  libpcre32-3  libpcrecpp0v5  libpixman-1-dev
  libselinux1-dev  libsepolicy-dev  libthai-dev  libwayland-bin  libwayland-dev  libxcb-render0-dev  libxcb-shm0-dev  libxcomposite-dev
  libxcursor-dev  libxdamage-dev  libxft-dev  libxinerama-dev  libxkbcommon-dev  libxrandr-dev  libxrender-dev  libxtst-dev  pango1.0-tools  uuid-dev
  wayland-protocols  x11proto-randr-dev  x11proto-record-dev  x11proto-xinerama-dev
Suggested packages:
  libcairo2-doc  libdatrie-doc  freetype2-doc  libgirepository1.0-dev  libglib2.0-doc  libxml2-utils  libgraphite2-utils  libgtk-3-doc  icu-doc
  imagemagick  libpango1.0-doc  libthai-doc  libwayland-doc
The following NEW packages will be installed:
  gir1.2-harfbuzz-0.0  icu-devtools  libatk1.0-dev  libatspi2.0-dev  libblkid-dev  libcairo-script-interpreter2
  libcairo2-dev  libdatrie-dev  libdbus-1-dev  libegl1-mesa-dev  libepoxy-dev  libfontconfig1-dev  libfreetype-dev  libfreetype6-dev  libfribidi-dev
  libgdk-pixbuf2.0-dev  libglib2.0-dev  libglib2.0-dev-bin  libgraphite2-dev  libgtk-3-dev  libharfbuzz-dev  libharfbuzz-gobject0  libicu-dev
  libmount-dev  libpango1.0-dev  libpcre16-3  libpcre2-16-0  libpcre2-dev  libpcre2-posix2  libpcre3-dev  libpcre32-3  libpcrecpp0v5  libpixman-1-dev
  libselinux1-dev  libsepolicy-dev  libthai-dev  libwayland-bin  libwayland-dev  libxcb-render0-dev  libxcb-shm0-dev  libxcomposite-dev
  libxcursor-dev  libxdamage-dev  libxft-dev  libxinerama-dev  libxkbcommon-dev  libxrandr-dev  libxrender-dev  libxtst-dev  pango1.0-tools  uuid-dev
  wayland-protocols  x11proto-randr-dev  x11proto-record-dev  x11proto-xinerama-dev
0 upgraded, 56 newly installed, 0 to remove and 8 not upgraded.
Need to get 18.6 MB/18.8 MB of archives.
After this operation, 103 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
```

Ready pip

Activities Terminal Aug 28 17:49 • revathi@revathi-Lenovo-V110-15AST: ~

```
Setting up libegl1-mesa-dev:amd64 (21.0.3-0ubuntu0.3~20.04.1) ...
Setting up libblkid-dev:amd64 (2.34-0.1ubuntu9.1) ...
Setting up libpcre2-dev:amd64 (10.34-7) ...
Setting up libselinux1-dev:amd64 (3.0-1build2) ...
Setting up libpcre3-dev:amd64 (2:8.39-12build1) ...
Setting up libxcursor-dev:amd64 (1:1.2.0-2) ...
Setting up libpoxy-dev:amd64 (1.5.4-1) ...
Setting up libwayland-dev:amd64 (1.18.0-1) ...
Setting up libfreetype6-dev:amd64 (2.10.1-2ubuntu0.1) ...
Setting up libxrandr-dev:amd64 (2:1.5.2-0ubuntu1) ...
Setting up libthai-dev:amd64 (0.1.28-3) ...
Setting up libmount-dev:amd64 (2.34-0.1ubuntu9.1) ...
Setting up libfontconfig1-dev:amd64 (2.13.1-2ubuntu3) ...
Setting up libglib2.0-dev:amd64 (2.64.6-1~ubuntu20.04.4) ...
Setting up libxft-dev:amd64 (2.3.3-0ubuntu1) ...
Processing triggers for libglib2.0-0:amd64 (2.64.6-1~ubuntu20.04.4) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Processing triggers for man-db (2.9.1-1) ...
Setting up libgdk-pixbuf2.0-dev:amd64 (2.40.0+dfsg-3ubuntu0.2) ...
Processing triggers for sgml-base (1.29.1) ...
Setting up libcairo2-dev:amd64 (1.16.0-4ubuntu1) ...
Setting up libatk1.0-dev:amd64 (2.35.1-1ubuntu2) ...
Setting up libatspi2.0-dev:amd64 (2.36.0-2) ...
Setting up libharfbuzz-dev:amd64 (2.6.4-1ubuntu4) ...
Setting up libatk-bridge2.0-dev:amd64 (2.34.2-0ubuntu2-20.04.1) ...
Setting up libpango1.0-dev:amd64 (1.44.7-2ubuntu4) ...
Setting up libgtk-3-dev:amd64 (3.24.20-0ubuntu1) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo -H pip3 install --upgrade pip
Collecting pip
  Downloading pip-21.2.4-py3-none-any.whl (1.6 MB)
    |██████████| 1.6 MB 250 kB/s
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 20.0.2
    Not uninstalling pip at /usr/lib/python3/dist-packages, outside environment /usr
    Can't uninstall 'pip'. No files were found to uninstall.
Successfully installed pip-21.2.4
revathi@revathi-Lenovo-V110-15AST:~$
```

Ready virtual environments

Activities Terminal Aug 28 17:53 • revathi@revathi-Lenovo-V110-15AST: ~

```
Setting up libblkid-dev:amd64 (2.34-0.1ubuntu9.1) ...
Setting up libpcre2-dev:amd64 (10.34-7) ...
Setting up libselinux1-dev:amd64 (3.0-1build2) ...
Setting up libpcre3-dev:amd64 (2:8.39-12build1) ...
Setting up libxcursor-dev:amd64 (1:1.2.0-2) ...
Setting up libepoxy-dev:amd64 (1.5.4-1) ...
Setting up libwayland-dev:amd64 (1.18.0-1) ...
Setting up libfreetype6-dev:amd64 (2.10.1-2ubuntu0.1) ...
Setting up libxrandr-dev:amd64 (2:1.5.2-0ubuntu1) ...
Setting up libthai-dev:amd64 (0.1.28-3) ...
Setting up libmount-dev:amd64 (2.34-0.1ubuntu9.1) ...
Setting up libfontconfig1-dev:amd64 (2.13.1-2ubuntu3) ...
Setting up libglib2.0-dev:amd64 (2.64.6-1~ubuntu20.04.4) ...
Setting up libxft-dev:amd64 (2.3.3-0ubuntu1) ...
Processing triggers for libglib2.0-0:amd64 (2.64.6-1~ubuntu20.04.4) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Processing triggers for man-db (2.9.1-1) ...
Setting up libgdk-pixbuf2.0-dev:amd64 (2.40.0+dfsg-3ubuntu0.2) ...
Processing triggers for sgml-base (1.29.1) ...
Setting up libcairo2-dev:amd64 (1.16.0-4ubuntu1) ...
Setting up libatk1.0-dev:amd64 (2.35.1-1ubuntu2) ...
Setting up libatspi2.0-dev:amd64 (2.36.0-2) ...
Setting up libharfbuzz-dev:amd64 (2.6.4-1ubuntu4) ...
Setting up libatk-bridge2.0-dev:amd64 (2.34.2-0ubuntu2-20.04.1) ...
Setting up libpango1.0-dev:amd64 (1.44.7-2ubuntu4) ...
Setting up libgtk-3-dev:amd64 (3.24.20-0ubuntu1) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo -H pip3 install --upgrade pip
Collecting pip
  Downloading pip-21.2.4-py3-none-any.whl (1.6 MB)
    |██████████| 1.6 MB 250 kB/s
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 20.0.2
    Not uninstalling pip at /usr/lib/python3/dist-packages, outside environment /usr
    Can't uninstall 'pip'. No files were found to uninstall.
Successfully installed pip-21.2.4
revathi@revathi-Lenovo-V110-15AST:~$ nano ~/.bashrc
revathi@revathi-Lenovo-V110-15AST:~$ nano ~/.bashrc
```

Activate virtual environment

```
Activities Terminal ▾ Aug 28 17:54 •
revathi@revathi-Lenovo-V110-15AST: ~/environments
Setting up libpcre3-dev:amd64 (2:8.39-12build1) ...
Setting up libxcursor-dev:amd64 (1:1.2.0-2) ...
Setting up libepoxy-dev:amd64 (1.5.4-1) ...
Setting up libwayland-dev:amd64 (1.18.0-1) ...
Setting up libfreetype6-dev:amd64 (2.10.1-2ubuntu0.1) ...
Setting up libxrandr-dev:amd64 (2:1.5.2-0ubuntu1) ...
Setting up libthai-dev:amd64 (0.1.28-3) ...
Setting up libmount-dev:amd64 (2.34-0.1ubuntu9.1) ...
Setting up libfontconfig1-dev:amd64 (2.13.1-2ubuntu3) ...
Setting up libglib2.0-dev:amd64 (2.64.6-1~ubuntu20.04.4) ...
Setting up libbft-dev:amd64 (2.3.3-0ubuntu1) ...
Processing triggers for libglib2.0-0:amd64 (2.64.6-1~ubuntu20.04.4) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Processing triggers for man-db (2.9.1-1) ...
Setting up libgdk-pixbuf2.0-dev:amd64 (2.40.0+dfsg-3ubuntu0.2) ...
Processing triggers for sgml-base (1.29.1) ...
Setting up libcairo2-dev:amd64 (1.16.0-4ubuntu1) ...
Setting up libatk1.0-dev:amd64 (2.35.1-1ubuntu2) ...
Setting up libatspi2.0-dev:amd64 (2.36.0-2) ...
Setting up libharfbuzz-dev:amd64 (2.6.4-1ubuntu4) ...
Setting up libatk-bridge2.0-dev:amd64 (2.34.2-0ubuntu2-20.04.1) ...
Setting up libpango1.0-dev:amd64 (1.44.7-2ubuntu4) ...
Setting up libgtk-3-dev:amd64 (3.24.20-0ubuntu1) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo -H pip3 install --upgrade pip
Collecting pip
  Downloading pip-21.2.4-py3-none-any.whl (1.6 MB)
    |██████████| 1.6 MB 250 kB/s
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 20.0.2
    Not uninstalling pip at /usr/lib/python3/dist-packages, outside environment /usr
    Can't uninstall 'pip'. No files were found to uninstall.
Successfully installed pip-21.2.4
revathi@revathi-Lenovo-V110-15AST:~$ nano ~/.bashrc
revathi@revathi-Lenovo-V110-15AST:~$ nano ~/.bashrc
revathi@revathi-Lenovo-V110-15AST:~$ cd environments
revathi@revathi-Lenovo-V110-15AST:~/environments$ source environ1/bin/activate
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ 
```

Check numpy & tensorflow in virtual environment

```
Activities Terminal Aug 28 17:58 • revathi@revathi-Lenovo-V110-15AST: ~/environments
Setting up libatspi2.0-dev:amd64 (2.36.0-2) ...
Setting up libharfbuzz-dev:amd64 (2.6.4-1ubuntu4) ...
Setting up libatk-bridge2.0-dev:amd64 (2.34.2-0ubuntu2-20.04.1) ...
Setting up libpango1.0-dev:amd64 (1.44.7-2ubuntu4) ...
Setting up libgtk-3-dev:amd64 (3.24.20-0ubuntu1) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo -H pip3 install --upgrade pip
Collecting pip
  Downloading pip-21.2.4-py3-none-any.whl (1.6 MB)
    |██████████| 1.6 MB 250 kB/s
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 20.0.2
    Not uninstalling pip at /usr/lib/python3/dist-packages, outside environment /usr
    Can't uninstall 'pip'. No files were found to uninstall.
Successfully installed pip-21.2.4
revathi@revathi-Lenovo-V110-15AST:~$ nano ~/.bashrc
revathi@revathi-Lenovo-V110-15AST:~$ nano ~/.bashrc
revathi@revathi-Lenovo-V110-15AST:~$ cd environments
revathi@revathi-Lenovo-V110-15AST:~/environments$ source environ1/bin/activate
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ python3
Python 3.8.10 (default, Jun  2 2021, 10:49:15)
[GCC 9.4.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import numpy
>>> import tensorflow as tf
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
ModuleNotFoundError: No module named 'tensorflow'
>>> exit()
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install tensorflow==2.0.0
ERROR: Could not find a version that satisfies the requirement tensorflow==2.0.0 (from versions: 2.2.0rc1, 2.2.0rc2, 2.2.0rc3, 2.2.0rc4, 2.2.0, 2.2.1, 2.2.2, 2.2.3, 2.3.0rc0, 2.3.0rc1, 2.3.0rc2, 2.3.0, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.4.0rc0, 2.4.0rc1, 2.4.0rc2, 2.4.0rc3, 2.4.0rc4, 2.4.0, 2.4.1, 2.4.2, 2.4.3, 2.5.0rc0, 2.5.0rc1, 2.5.0rc2, 2.5.0rc3, 2.5.0, 2.5.1, 2.6.0rc0, 2.6.0rc1, 2.6.0rc2, 2.6.0)
ERROR: No matching distribution found for tensorflow==2.0.0
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install tensorflow==2.4.2
Collecting tensorflow==2.4.2
  Downloading tensorflow-2.4.2-cp38-cp38-manylinux2010_x86_64.whl (394.5 MB)
    |██████████| 29.9 MB 1.4 MB/s eta 0:04:30
```

Install tensorflow==2.4.2 in designated virtual environment

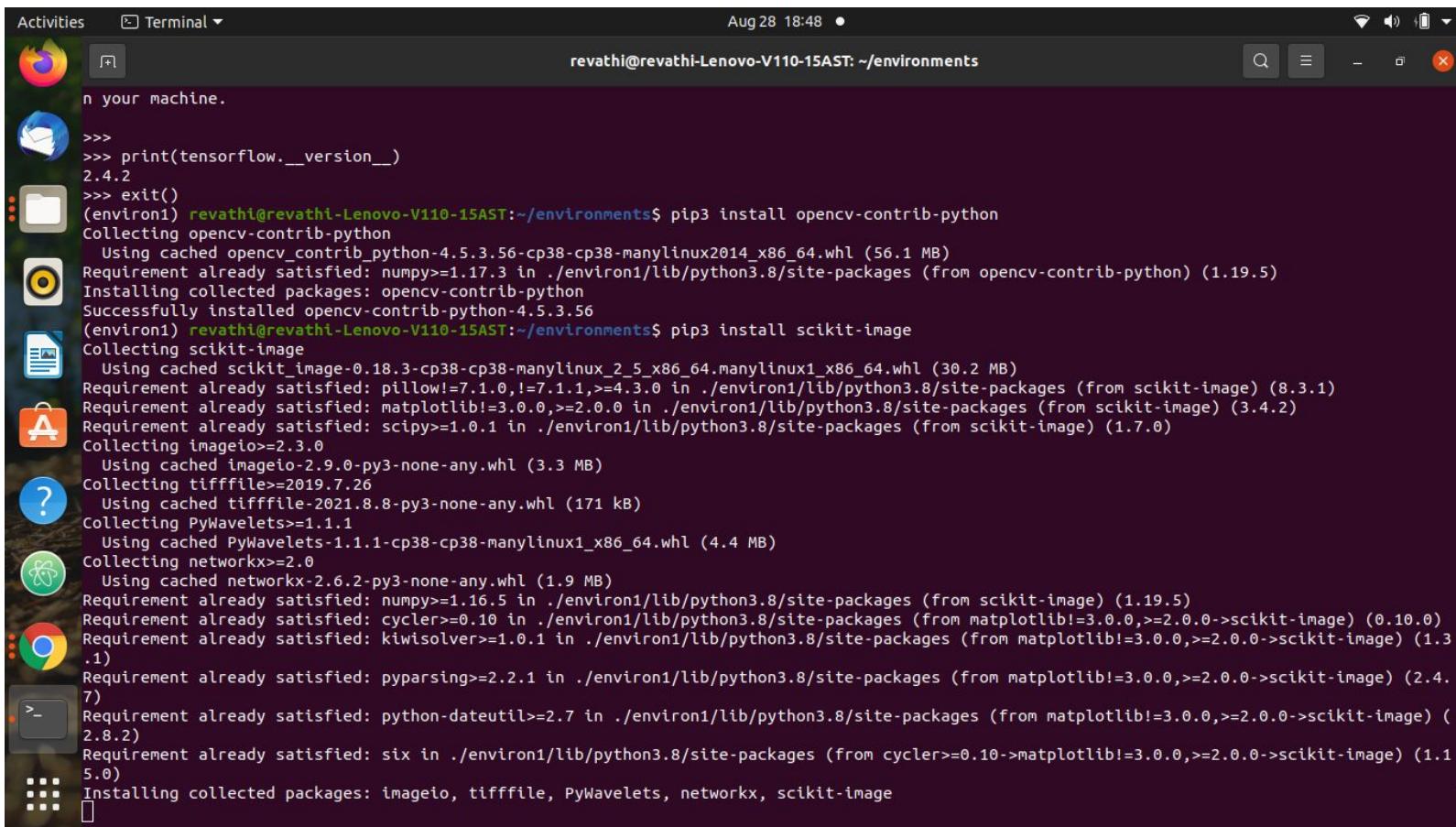
```
Activities Terminal ▾ revathi@revathi-Lenovo-V110-15AST: ~/environments Aug 28 17:58 •
Setting up libatspi2.0-dev:amd64 (2.36.0-2) ...
Setting up libharfbuzz-dev:amd64 (2.6.4-1ubuntu4) ...
Setting up libatk-bridge2.0-dev:amd64 (2.34.2-0ubuntu2-20.04.1) ...
Setting up libpango1.0-dev:amd64 (1.44.7-2ubuntu4) ...
Setting up libgtk-3-dev:amd64 (3.24.20-0ubuntu1) ...
revathi@revathi-Lenovo-V110-15AST:~$ sudo -H pip3 install --upgrade pip
Collecting pip
  Downloading pip-21.2.4-py3-none-any.whl (1.6 MB)
    |██████████| 1.6 MB 250 kB/s
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 20.0.2
    Not uninstalling pip at /usr/lib/python3/dist-packages, outside environment /usr
    Can't uninstall 'pip'. No files were found to uninstall.
Successfully installed pip-21.2.4
revathi@revathi-Lenovo-V110-15AST:~$ nano ~/.bashrc
revathi@revathi-Lenovo-V110-15AST:~$ nano ~/.bashrc
revathi@revathi-Lenovo-V110-15AST:~$ cd environments
revathi@revathi-Lenovo-V110-15AST:~/environments$ source environ1/bin/activate
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ python3
Python 3.8.10 (default, Jun  2 2021, 10:49:15)
[GCC 9.4.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import numpy
>>> import tensorflow as tf
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
ModuleNotFoundError: No module named 'tensorflow'
>>> exit()
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install tensorflow==2.0.0
ERROR: Could not find a version that satisfies the requirement tensorflow==2.0.0 (from versions: 2.2.0rc1, 2.2.0rc2, 2.2.0rc3, 2.2.0rc4, 2.2.0, 2.2.1, 2.2.2, 2.2.3, 2.3.0rc0, 2.3.0rc1, 2.3.0rc2, 2.3.0, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.4.0rc0, 2.4.0rc1, 2.4.0rc2, 2.4.0rc3, 2.4.0rc4, 2.4.0, 2.4.1, 2.4.2, 2.4.3, 2.5.0rc0, 2.5.0rc1, 2.5.0rc2, 2.5.0rc3, 2.5.0, 2.5.1, 2.6.0rc0, 2.6.0rc1, 2.6.0rc2, 2.6.0)
ERROR: No matching distribution found for tensorflow==2.0.0
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install tensorflow==2.4.2
Collecting tensorflow==2.4.2
  Downloading tensorflow-2.4.2-cp38-cp38-manylinux2010_x86_64.whl (394.5 MB)
    |██████████| 29.9 MB 1.4 MB/s eta 0:04:30
```

Check numpy & tensorflow installation

```
Activities Terminal Aug 28 18:47 • revathi@revathi-Lenovo-V110-15AST: ~/environments
+ revathi@revathi-Lenovo-V110-15AST: ~/environments
Created wheel for termcolor: filename=termcolor-1.1.0-py3-none-any.whl size=4829 sha256=824f7de8a4c8c2cab7226a1a85776475f8f451acd61efbbd4aad
ca73970ba757
Stored in directory: /home/revathi/.cache/pip/wheels/a0/16/9c/5473df82468f958445479c59e784896fa24f4a5fc024b0f501
Successfully built wrapt termcolor
Installing collected packages: typing-extensions, six, protobuf, numpy, opt-einsum, absl-py, tensorboard-plugin-wit, pyasn1, rsa, cachetools,
pyasn1-modules, google-auth, grpcio, idna, charset-normalizer, certifi, urllib3, requests, oauthlib, requests-oauthlib, google-auth-oauthlib,
markdown, tensorboard-data-server, tensorboard, flatbuffers, keras-preprocessing, wrapt, astunparse, tensorflow-estimator, gast, google-pasta,
termcolor, h5py, tensorflow
Attempting uninstall: six
  Found existing installation: six 1.16.0
  Uninstalling six-1.16.0:
    Successfully uninstalled six-1.16.0
Attempting uninstall: numpy
  Found existing installation: numpy 1.21.1
  Uninstalling numpy-1.21.1:
    Successfully uninstalled numpy-1.21.1
Successfully installed absl-py-0.13.0 astunparse-1.6.3 cachetools-4.2.2 certifi-2021.5.30 charset-normalizer-2.0.4 flatbuffers-1.12 gast-0.3.3
google-auth-1.35.0 google-auth-oauthlib-0.4.5 google-pasta-0.2.0 grpcio-1.32.0 h5py-2.10.0 idna-3.2 keras-preprocessing-1.1.2 markdown-3.3.4
numpy-1.19.5 oauthlib-3.1.1 opt-einsum-3.3.0 protobuf-3.17.3 pyasn1-0.4.8 pyasn1-modules-0.2.8 requests-2.26.0 requests-oauthlib-1.3.0 rsa-4.7
.2 six-1.15.0 tensorboard-2.6.0 tensorboard-data-server-0.6.1 tensorboard-plugin-wit-1.8.0 tensorflow-2.4.2 tensorflow-estimator-2.4.0 termcol
or-1.1.0 typing-extensions-3.7.4.3 urllib3-1.26.6 wrapt-1.12.1
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ python3
Python 3.8.10 (default, Jun 2 2021, 10:49:15)
[GCC 9.4.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import numpy
>>> print(numpy.__version__)
1.19.5
>>> import tensorflow
2021-08-28 18:47:01.190363: W tensorflow/stream_executor/platform/default/dso_loader.cc:60] Could not load dynamic library 'libcudart.so.11.0'
; dlerror: libcudart.so.11.0: cannot open shared object file: No such file or directory
2021-08-28 18:47:01.190489: I tensorflow/stream_executor/cuda/cudart_stub.cc:29] Ignore above cudart dlerror if you do not have a GPU set up o
n your machine.

>>>
>>> print(tensorflow.__version__)
2.4.2
>>> 
```

\$ pip install opencv-contrib-python \$ pip install scikit-image (Standard image processing libraries)



The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "revathi@revathi-Lenovo-V110-15AST: ~/environments". The terminal content displays the command-line session for installing Python packages:

```
n your machine.  
->>> print(tensorflow.__version__)  
2.4.2  
->>> exit()  
(envir0n1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install opencv-contrib-python  
Collecting opencv-contrib-python  
  Using cached opencv_contrib_python-4.5.3.56-cp38-cp38-manylinux2014_x86_64.whl (56.1 MB)  
Requirement already satisfied: numpy>=1.17.3 in ./envir0n1/lib/python3.8/site-packages (from opencv-contrib-python) (1.19.5)  
Installing collected packages: opencv-contrib-python  
Successfully installed opencv-contrib-python-4.5.3.56  
(envir0n1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install scikit-image  
Collecting scikit-image  
  Using cached scikit_image-0.18.3-cp38-cp38-manylinux_2_5_x86_64.manylinux1_x86_64.whl (30.2 MB)  
Requirement already satisfied: pillow!=7.1.0,!>=7.1.1,>=4.3.0 in ./envir0n1/lib/python3.8/site-packages (from scikit-image) (8.3.1)  
Requirement already satisfied: matplotlib!=3.0.0,>=2.0.0 in ./envir0n1/lib/python3.8/site-packages (from scikit-image) (3.4.2)  
Requirement already satisfied: scipy>=1.0.1 in ./envir0n1/lib/python3.8/site-packages (from scikit-image) (1.7.0)  
Collecting imageio>=2.3.0  
  Using cached imageio-2.9.0-py3-none-any.whl (3.3 MB)  
Collecting tifffile>=2019.7.26  
  Using cached tifffile-2021.8.8-py3-none-any.whl (171 kB)  
Collecting PyWavelets>=1.1.1  
  Using cached PyWavelets-1.1.1-cp38-cp38-manylinux1_x86_64.whl (4.4 MB)  
Collecting networkx>=2.0  
  Using cached networkx-2.6.2-py3-none-any.whl (1.9 MB)  
Requirement already satisfied: numpy>=1.16.5 in ./envir0n1/lib/python3.8/site-packages (from scikit-image) (1.19.5)  
Requirement already satisfied: cycler>=0.10 in ./envir0n1/lib/python3.8/site-packages (from matplotlib!=3.0.0,>=2.0.0->scikit-image) (0.10.0)  
Requirement already satisfied: kiwisolver>=1.0.1 in ./envir0n1/lib/python3.8/site-packages (from matplotlib!=3.0.0,>=2.0.0->scikit-image) (1.3.1)  
Requirement already satisfied: pyparsing>=2.2.1 in ./envir0n1/lib/python3.8/site-packages (from matplotlib!=3.0.0,>=2.0.0->scikit-image) (2.4.7)  
Requirement already satisfied: python-dateutil>=2.7 in ./envir0n1/lib/python3.8/site-packages (from matplotlib!=3.0.0,>=2.0.0->scikit-image) (2.8.2)  
Requirement already satisfied: six in ./envir0n1/lib/python3.8/site-packages (from cycler>=0.10->matplotlib!=3.0.0,>=2.0.0->scikit-image) (1.1.5.0)  
Installing collected packages: imageio, tifffile, PyWavelets, networkx, scikit-image
```

\$ pip install pillow \$ pip install imutils

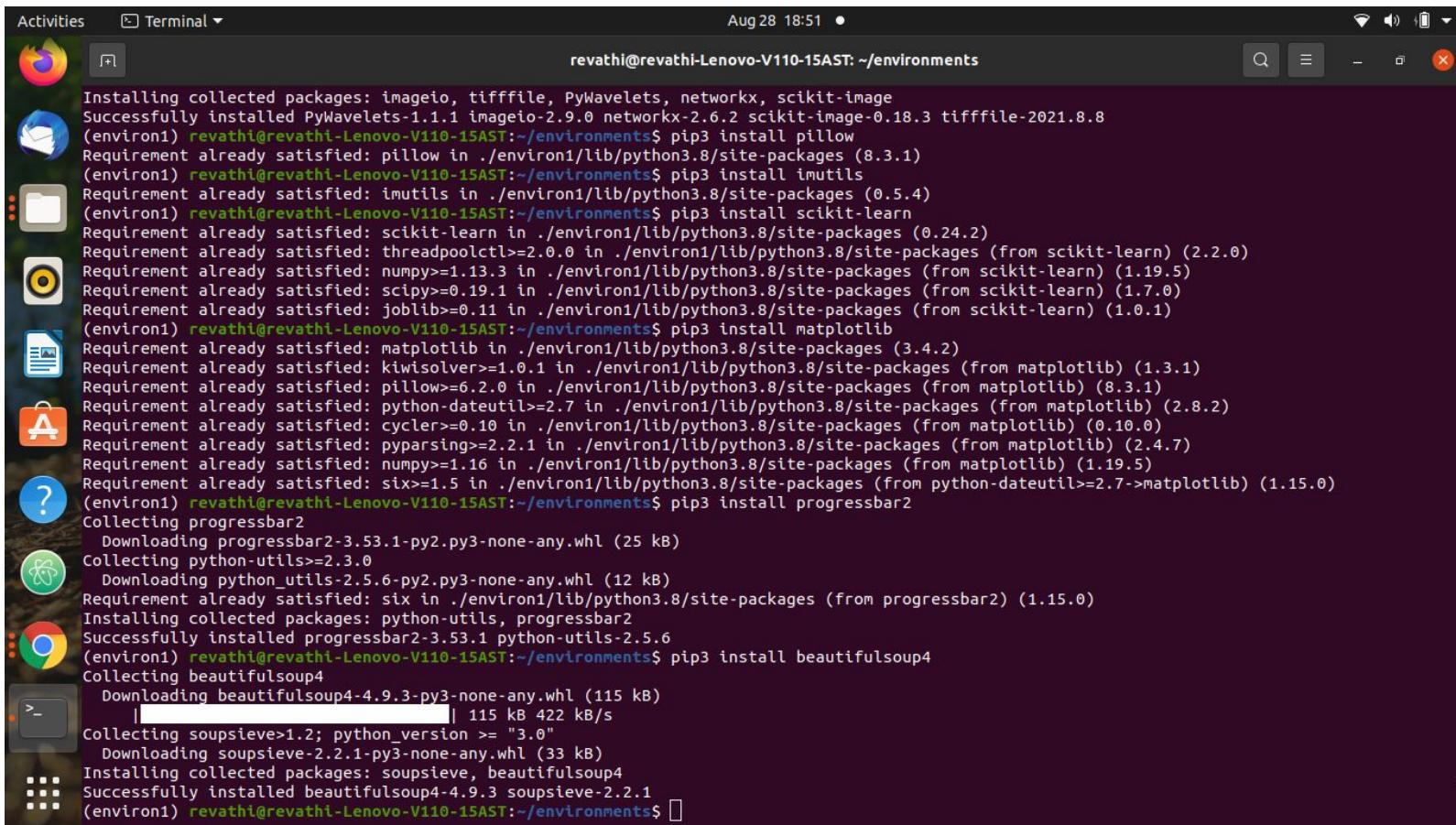
(Standard image processing libraries)

Activities Terminal ▾ revathi@revathi-Lenovo-V110-15AST: ~/environments Aug 28 18:51 •

```
Installing collected packages: imageio, tifffile, PyWavelets, networkx, scikit-image
Successfully installed PyWavelets-1.1.1 imageio-2.9.0 networkx-2.6.2 scikit-image-0.18.3 tifffile-2021.8.8
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install pillow
Requirement already satisfied: pillow in ./environment1/lib/python3.8/site-packages (0.3.1)
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install imutils
Requirement already satisfied: imutils in ./environment1/lib/python3.8/site-packages (0.5.4)
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install scikit-learn
Requirement already satisfied: scikit-learn in ./environment1/lib/python3.8/site-packages (0.24.2)
Requirement already satisfied: threadpoolctl>=2.0.0 in ./environment1/lib/python3.8/site-packages (from scikit-learn) (2.2.0)
Requirement already satisfied: numpy>=1.13.3 in ./environment1/lib/python3.8/site-packages (from scikit-learn) (1.19.5)
Requirement already satisfied: scipy>=0.19.1 in ./environment1/lib/python3.8/site-packages (from scikit-learn) (1.7.0)
Requirement already satisfied: joblib>=0.11 in ./environment1/lib/python3.8/site-packages (from scikit-learn) (1.0.1)
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install matplotlib
Requirement already satisfied: matplotlib in ./environment1/lib/python3.8/site-packages (3.4.2)
Requirement already satisfied: kiwisolver>=1.0.1 in ./environment1/lib/python3.8/site-packages (from matplotlib) (1.3.1)
Requirement already satisfied: pillow>=6.2.0 in ./environment1/lib/python3.8/site-packages (from matplotlib) (8.3.1)
Requirement already satisfied: python-dateutil>=2.7 in ./environment1/lib/python3.8/site-packages (from matplotlib) (2.8.2)
Requirement already satisfied: cycler>=0.10 in ./environment1/lib/python3.8/site-packages (from matplotlib) (0.10.0)
Requirement already satisfied: pyparsing>=2.2.1 in ./environment1/lib/python3.8/site-packages (from matplotlib) (2.4.7)
Requirement already satisfied: numpy>=1.16 in ./environment1/lib/python3.8/site-packages (from matplotlib) (1.19.5)
Requirement already satisfied: six>=1.5 in ./environment1/lib/python3.8/site-packages (from python-dateutil>=2.7->matplotlib) (1.15.0)
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install progressbar2
Collecting progressbar2
  Downloading progressbar2-3.53.1-py2.py3-none-any.whl (25 kB)
Collecting python-utils>=2.3.0
  Downloading python_utils-2.5.6-py2.py3-none-any.whl (12 kB)
Requirement already satisfied: six in ./environment1/lib/python3.8/site-packages (from progressbar2) (1.15.0)
Installing collected packages: python-utils, progressbar2
Successfully installed progressbar2-3.53.1 python-utils-2.5.6
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install beautifulsoup4
Collecting beautifulsoup4
  Downloading beautifulsoup4-4.9.3-py3-none-any.whl (115 kB)
|██████████| 115 kB 422 kB/s
Collecting soupsieve>1.2; python_version >= "3.0"
  Downloading soupsieve-2.2.1-py3-none-any.whl (33 kB)
Installing collected packages: soupsieve, beautifulsoup4
Successfully installed beautifulsoup4-4.9.3 soupsieve-2.2.1
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$
```

```
$ pip install scikit-learn $ pip install matplotlib $ pip install progressbar2 $ pip install beautifulsoup4
```

Machine learning libraries and support libraries



The screenshot shows a terminal window in a Linux desktop environment. The terminal title is "revathi@revathi-Lenovo-V110-15AST: ~/environments". The window contains the command-line output of several pip installations:

```
Installing collected packages: imageio, tifffile, PyWavelets, networkx, scikit-image
Successfully installed PyWavelets-1.1.1 imageio-2.9.0 networkx-2.6.2 scikit-image-0.18.3 tifffile-2021.8.8
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install pillow
Requirement already satisfied: pillow in ./environ1/lib/python3.8/site-packages (8.3.1)
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install imutils
Requirement already satisfied: imutils in ./environ1/lib/python3.8/site-packages (0.5.4)
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install scikit-learn
Requirement already satisfied: scikit-learn in ./environ1/lib/python3.8/site-packages (0.24.2)
Requirement already satisfied: threadpoolctl>=2.0.0 in ./environ1/lib/python3.8/site-packages (from scikit-learn) (2.2.0)
Requirement already satisfied: numpy>=1.13.3 in ./environ1/lib/python3.8/site-packages (from scikit-learn) (1.19.5)
Requirement already satisfied: scipy>=0.19.1 in ./environ1/lib/python3.8/site-packages (from scikit-learn) (1.7.0)
Requirement already satisfied: joblib>=0.11 in ./environ1/lib/python3.8/site-packages (from scikit-learn) (1.0.1)
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install matplotlib
Requirement already satisfied: matplotlib in ./environ1/lib/python3.8/site-packages (3.4.2)
Requirement already satisfied: kiwisolver>=1.0.1 in ./environ1/lib/python3.8/site-packages (from matplotlib) (1.3.1)
Requirement already satisfied: pillow>=6.2.0 in ./environ1/lib/python3.8/site-packages (from matplotlib) (8.3.1)
Requirement already satisfied: python-dateutil>=2.7 in ./environ1/lib/python3.8/site-packages (from matplotlib) (2.8.2)
Requirement already satisfied: cycler>=0.10 in ./environ1/lib/python3.8/site-packages (from matplotlib) (0.10.0)
Requirement already satisfied: pyparsing>=2.2.1 in ./environ1/lib/python3.8/site-packages (from matplotlib) (2.4.7)
Requirement already satisfied: numpy>=1.16 in ./environ1/lib/python3.8/site-packages (from matplotlib) (1.19.5)
Requirement already satisfied: six>=1.5 in ./environ1/lib/python3.8/site-packages (from python-dateutil>=2.7->matplotlib) (1.15.0)
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install progressbar2
Collecting progressbar2
  Downloading progressbar2-3.53.1-py2.py3-none-any.whl (25 kB)
Collecting python-utils>=2.3.0
  Downloading python_utils-2.5.6-py2.py3-none-any.whl (12 kB)
Requirement already satisfied: six in ./environ1/lib/python3.8/site-packages (from progressbar2) (1.15.0)
Installing collected packages: python-utils, progressbar2
Successfully installed progressbar2-3.53.1 python-utils-2.5.6
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install beautifulsoup4
Collecting beautifulsoup4
  Downloading beautifulsoup4-4.9.3-py3-none-any.whl (115 kB)
Collecting soupsieve>1.2; python_version >= "3.0"
  Downloading soupsieve-2.2.1-py3-none-any.whl (33 kB)
Installing collected packages: soupsieve, beautifulsoup4
Successfully installed beautifulsoup4-4.9.3 soupsieve-2.2.1
(environ1) revathi@revathi-Lenovo-V110-15AST:~/environments$
```

\$ pip install pandas (Machine learning libraries and support libraries)

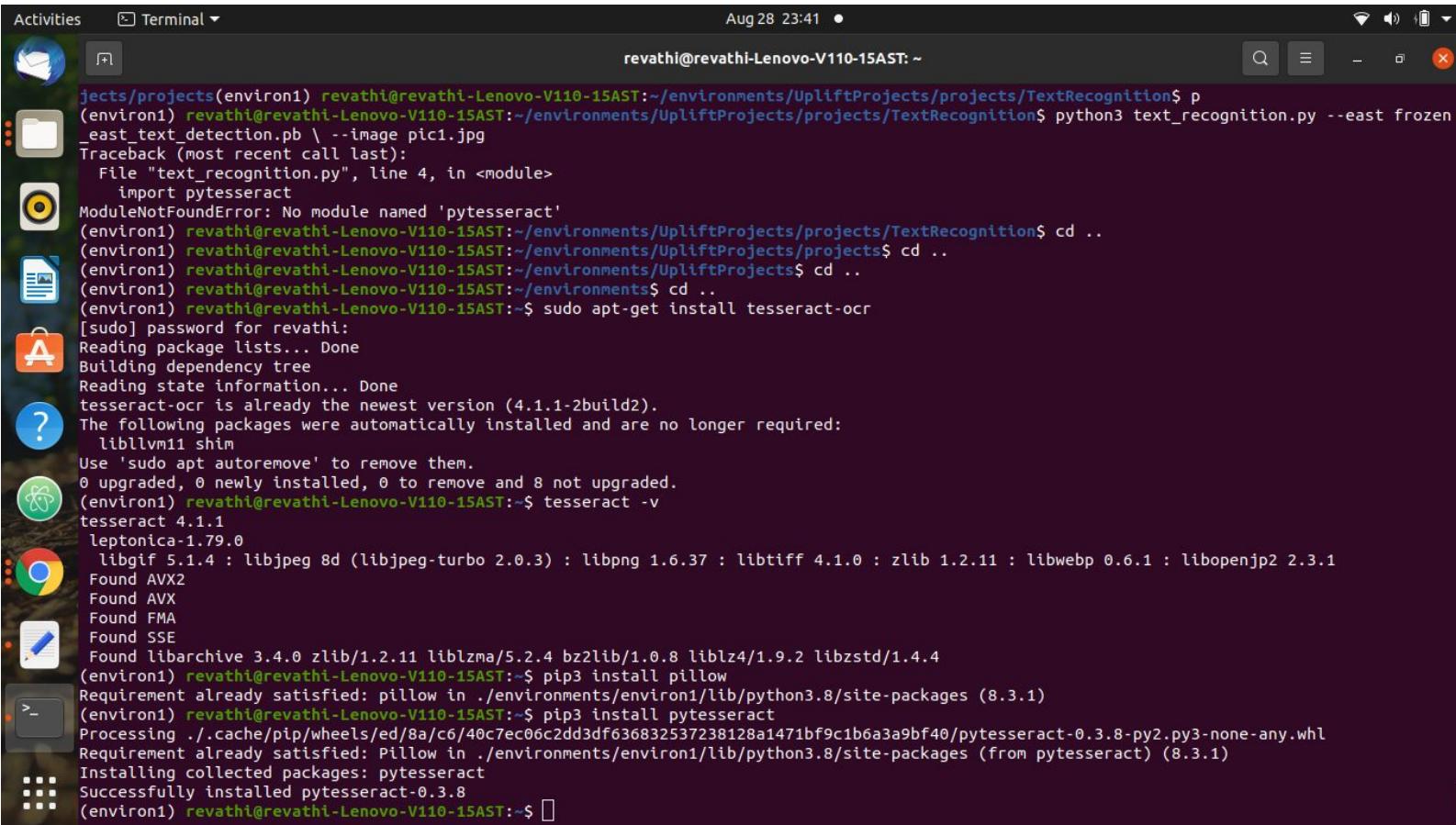
Check tensorflow and openCV

```
Activities Terminal Aug 28 18:54 • revathi@revathi-Lenovo-V110-15AST: ~/environments Requirement already satisfied: pyparsing>=2.2.1 in ./environment1/lib/python3.8/site-packages (from matplotlib) (2.4.7) Requirement already satisfied: numpy>=1.16 in ./environment1/lib/python3.8/site-packages (from matplotlib) (1.19.5) Requirement already satisfied: six>=1.5 in ./environment1/lib/python3.8/site-packages (from python-dateutil>=2.7->matplotlib) (1.15.0) (environment1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install progressbar2 Collecting progressbar2 Downloading progressbar2-3.53.1-py2.py3-none-any.whl (25 kB) Collecting python-utils>=2.3.0 Downloading python_utils-2.5.6-py2.py3-none-any.whl (12 kB) Requirement already satisfied: six in ./environment1/lib/python3.8/site-packages (from progressbar2) (1.15.0) Installing collected packages: python-utils, progressbar2 Successfully installed progressbar2-3.53.1 python-utils-2.5.6 (environment1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install beautifulsoup4 Collecting beautifulsoup4 Downloading beautifulsoup4-4.9.3-py3-none-any.whl (115 kB) | 115 kB 422 kB/s Collecting soupsieve>1.2; python_version >= "3.0" Downloading soupsieve-2.2.1-py3-none-any.whl (33 kB) Installing collected packages: soupsieve, beautifulsoup4 Successfully installed beautifulsoup4-4.9.3 soupsieve-2.2.1 (environment1) revathi@revathi-Lenovo-V110-15AST:~/environments$ pip3 install pandas Requirement already satisfied: pandas in ./environment1/lib/python3.8/site-packages (1.3.0) Requirement already satisfied: numpy>=1.17.3 in ./environment1/lib/python3.8/site-packages (from pandas) (1.19.5) Requirement already satisfied: pytz>=2017.3 in ./environment1/lib/python3.8/site-packages (from pandas) (2021.1) Requirement already satisfied: python-dateutil>=2.7.3 in ./environment1/lib/python3.8/site-packages (from pandas) (2.8.2) Requirement already satisfied: six>=1.5 in ./environment1/lib/python3.8/site-packages (from python-dateutil>=2.7.3->pandas) (1.15.0) (environment1) revathi@revathi-Lenovo-V110-15AST:~/environments$ python3 Python 3.8.10 (default, Jun 2 2021, 10:49:15) [GCC 9.4.0] on linux Type "help", "copyright", "credits" or "license" for more information. >>> import tensorflow.keras 2021-08-28 18:53:05.106508: W tensorflow/stream_executor/platform/default/dso_loader.cc:60] Could not load dynamic library 'libcudart.so.11.0'; dlerror: libcudart.so.11.0: cannot open shared object file: No such file or directory 2021-08-28 18:53:05.106577: I tensorflow/stream_executor/cuda/cudart_stub.cc:29] Ignore above cudart dlerror if you do not have a GPU set up on your machine. >>> >>> import cv2 >>> 
```

**Below are the set of packages installed
at Virtual Environment**

```
$ sudo apt-get install tesseract-ocr      $ pip3 install pillow      $ pip3 install pytesseract
```

(tesseract - OCR engine pytesseract - python wrapper for tesseract)



The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "revathi@revathi-Lenovo-V110-15AST: ~". The terminal content displays the following command history and output:

```
Activities Terminal Aug 28 23:41 •
revathi@revathi-Lenovo-V110-15AST: ~
revathi@revathi-Lenovo-V110-15AST: ~/environments/UpliftProjects/projects/TextRecognition$ p
(revathi@revathi-Lenovo-V110-15AST: ~/environments/UpliftProjects/projects/TextRecognition$ python3 text_recognition.py --east frozen
_east_text_detection.pb \ --image pic1.jpg
Traceback (most recent call last):
  File "text_recognition.py", line 4, in <module>
    import pytesseract
ModuleNotFoundError: No module named 'pytesseract'
(revathi@revathi-Lenovo-V110-15AST: ~/environments/UpliftProjects/projects/TextRecognition$ cd ..
(revathi@revathi-Lenovo-V110-15AST: ~/environments/UpliftProjects/projects$ cd ..
(revathi@revathi-Lenovo-V110-15AST: ~/environments/UpliftProjects$ cd ..
(revathi@revathi-Lenovo-V110-15AST: ~/environments$ cd ..
(revathi@revathi-Lenovo-V110-15AST: ~$ sudo apt-get install tesseract-ocr
[sudo] password for revathi:
Reading package lists... Done
Building dependency tree
Reading state information... Done
tesseract-ocr is already the newest version (4.1.1-2build2).
The following packages were automatically installed and are no longer required:
  liblvm11 shim
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 8 not upgraded.
(revathi@revathi-Lenovo-V110-15AST: ~$ tesseract -v
tesseract 4.1.1
leptonica-1.79.0
  libgif 5.1.4 : libjpeg 8d (libjpeg-turbo 2.0.3) : libpng 1.6.37 : libtiff 4.1.0 : zlib 1.2.11 : libwebp 0.6.1 : libopenjp2 2.3.1
Found AVX2
Found AVX
Found FMA
Found SSE
Found libarchive 3.4.0 zlib/1.2.11 liblzma/5.2.4 bz2lib/1.0.8 liblz4/1.9.2 libzstd/1.4.4
(revathi@revathi-Lenovo-V110-15AST: ~$ pip3 install pillow
Requirement already satisfied: pillow in ./environments/environment1/lib/python3.8/site-packages (8.3.1)
(revathi@revathi-Lenovo-V110-15AST: ~$ pip3 install pytesseract
Processing ./cache/pip/wheels/ed/8a/c6/40c7ec06c2dd3df636832537238128a1471bf9c1b6a3a9bf40/pytesseract-0.3.8-py2.py3-none-any.whl
Requirement already satisfied: Pillow in ./environments/environment1/lib/python3.8/site-packages (from pytesseract) (8.3.1)
Installing collected packages: pytesseract
Successfully installed pytesseract-0.3.8
(revathi@revathi-Lenovo-V110-15AST: ~$ )
```

Other Downloads

EAST Detector for Text Detection

OpenCV's EAST(Efficient and Accurate Scene Text Detection) text detector is a deep learning model. OpenCV's text detector implementation of EAST is quite robust, capable of localizing text even when it's blurred, reflective, or partially obscured.

Pre-trained model can be downloaded at:

https://raw.githubusercontent.com/oyyd/frozen_east_text_detection.pb/master/frozen_east_text_detection.pb