

**19AIE213**

# **ROBOTICS OPERATING SYSTEMS AND SIMULATION**

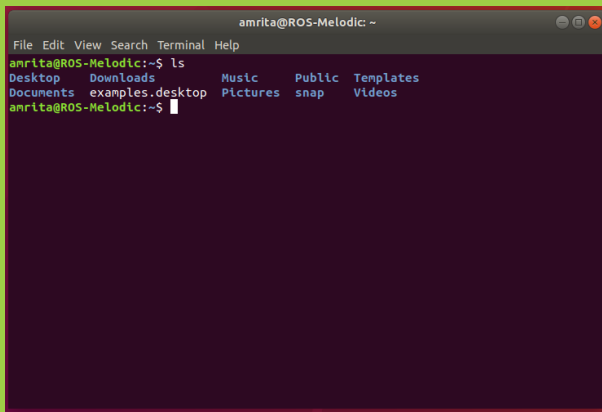


# SETTING UP CATKIN WORKSPACE

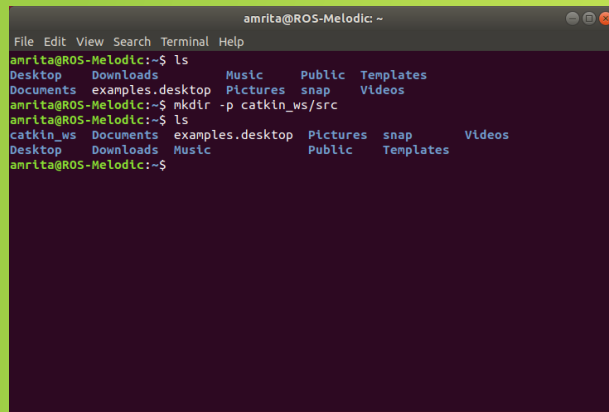
- A catkin workspace is a folder where you modify, build, and install catkin packages.
- It contains four different spaces for different role:
  - Source space
  - Build space
  - Development (Devel) space
  - Install space

# SETTING UP CATKIN WORKSPACE

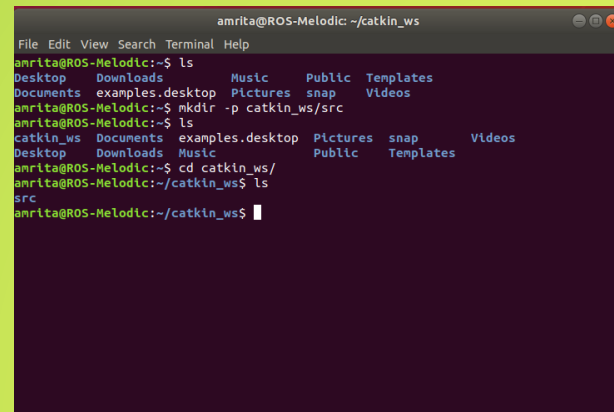
- Open the Terminal, and run the following to create a catkin\_workspace
- ```
$ mkdir -p catkin_ws/src
```
- mkdir is make directory command.
  - -p attribute is used to create sub-directory.



```
amrita@ROS-Melodic: ~  
File Edit View Search Terminal Help  
amrita@ROS-Melodic:~$ ls  
Desktop  Downloads  Music      Public    Templates  
Documents examples.desktop Pictures snap      Videos  
amrita@ROS-Melodic:~$
```



```
amrita@ROS-Melodic: ~  
File Edit View Search Terminal Help  
amrita@ROS-Melodic:~$ ls  
Desktop  Downloads  Music      Public    Templates  
Documents examples.desktop Pictures snap      Videos  
amrita@ROS-Melodic:~$ mkdir -p catkin_ws/src  
amrita@ROS-Melodic:~$ ls  
catkin_ws Documents examples.desktop Pictures snap      Videos  
Desktop  Downloads  Music      Public    Templates  
amrita@ROS-Melodic:~$
```



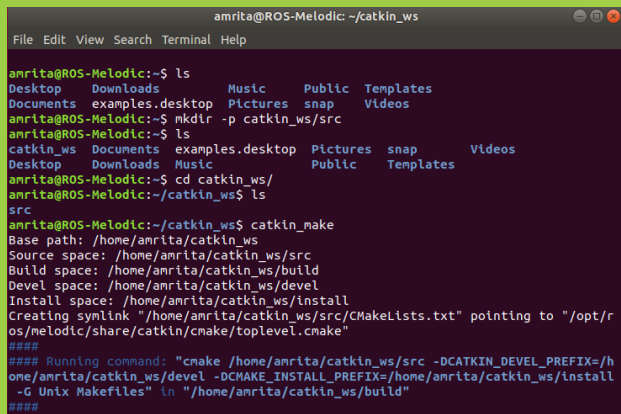
```
amrita@ROS-Melodic: ~/catkin_ws  
File Edit View Search Terminal Help  
amrita@ROS-Melodic:~$ ls  
Desktop  Downloads  Music      Public    Templates  
Documents examples.desktop Pictures snap      Videos  
amrita@ROS-Melodic:~$ mkdir -p catkin_ws/src  
amrita@ROS-Melodic:~$ ls  
catkin_ws Documents examples.desktop Pictures snap      Videos  
Desktop  Downloads  Music      Public    Templates  
amrita@ROS-Melodic:~$ cd catkin_ws/  
amrita@ROS-Melodic:~/catkin_ws$ ls  
src  
amrita@ROS-Melodic:~/catkin_ws$
```

# SETTING UP CATKIN WORKSPACE

- To make the catkin workspace run the following commands in terminal

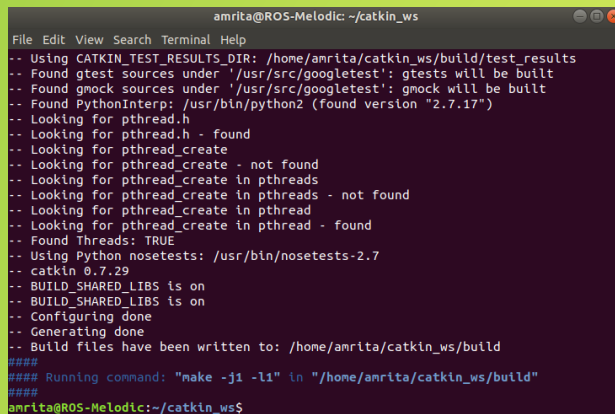
```
$ cd catkin_ws/
```

```
$ catkin_make
```



```
amrita@ROS-Melodic: ~/catkin_ws
File Edit View Search Terminal Help

amrita@ROS-Melodic:~$ ls
Desktop  Downloads  Music      Public  Templates
Documents examples.desktop Pictures snap    Videos
amrita@ROS-Melodic:~$ mkdir -p catkin_ws/src
amrita@ROS-Melodic:~$ ls
catkin_ws  Desktop  Downloads  Music      Pictures  snap    Templates  Videos
amrita@ROS-Melodic:~$ cd catkin_ws/
amrita@ROS-Melodic:~/catkin_ws$ ls
src
amrita@ROS-Melodic:~/catkin_ws$ catkin_make
Base path: /home/amrita/catkin_ws
Source space: /home/amrita/catkin_ws/src
Build space: /home/amrita/catkin_ws/build
Devel space: /home/amrita/catkin_ws/devel
Install space: /home/amrita/catkin_ws/install
Creating symlink "/home/amrita/catkin_ws/src/CMakeLists.txt" pointing to "/opt/ros/melodic/share/catkin/cmake/toplevel.cmake"
####
#### Running command: "cmake /home/amrita/catkin_ws/src -DCATKIN_DEVEL_PREFIX=/home/amrita/catkin_ws/devel -DCMAKE_INSTALL_PREFIX=/home/amrita/catkin_ws/install -G Unix Makefiles" in "/home/amrita/catkin_ws/build"
####
```



```
amrita@ROS-Melodic: ~/catkin_ws
File Edit View Search Terminal Help

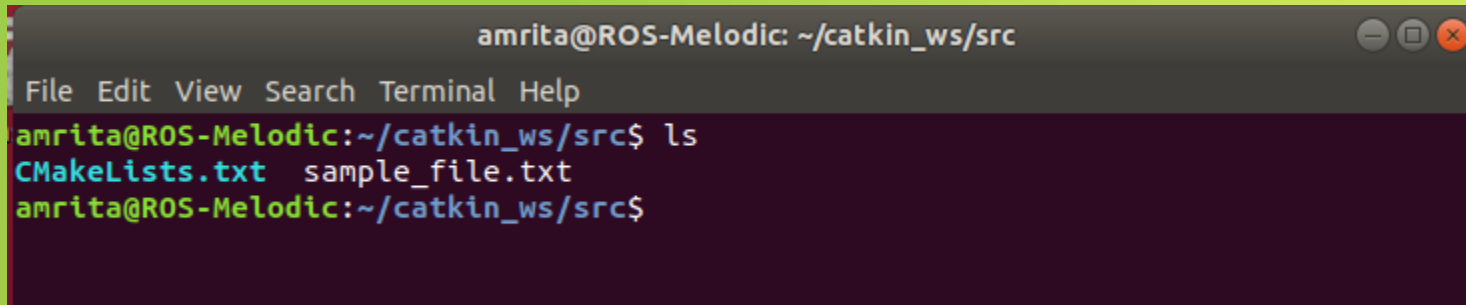
-- Using CATKIN_TEST_RESULTS_DIR: /home/amrita/catkin_ws/build/test_results
-- Found gtest Sources under '/usr/src/gtest': gTests will be built
-- Found gmock sources under '/usr/src/gtest': gmock will be built
-- Found PythonInterp: /usr/bin/python2 (found version "2.7.17")
-- Looking for pthread.h
-- Looking for pthread.h - found
-- Looking for pthread_create
-- Looking for pthread_create - not found
-- Looking for pthread_create in pthreads
-- Looking for pthread_create in pthreads - not found
-- Looking for pthread_create in pthread
-- Looking for pthread_create in pthread - found
-- Found Threads: TRUE
-- Using Python nosetests: /usr/bin/nosetests-2.7
-- catkin 0.7.29
-- BUILD_SHARED_LIBS is on
-- BUILD_SHARED_LIBS is on
-- Configuring done
-- Generating done
-- Build files have been written to: /home/amrita/catkin_ws/build
####
#### Running command: "make -j1 -l1" in "/home/amrita/catkin_ws/build"
####
amrita@ROS-Melodic:~/catkin_ws$
```

# UNIX BASICS FOR ROS

## Command “ls”

- ls is a Linux shell command that lists directory contents of files and directories.

\$ ls

A terminal window titled 'amrita@ROS-Melodic: ~/catkin\_ws/src' with standard window controls. The terminal shows the command 'ls' being executed, which lists 'CMakeLists.txt' and 'sample\_file.txt'.

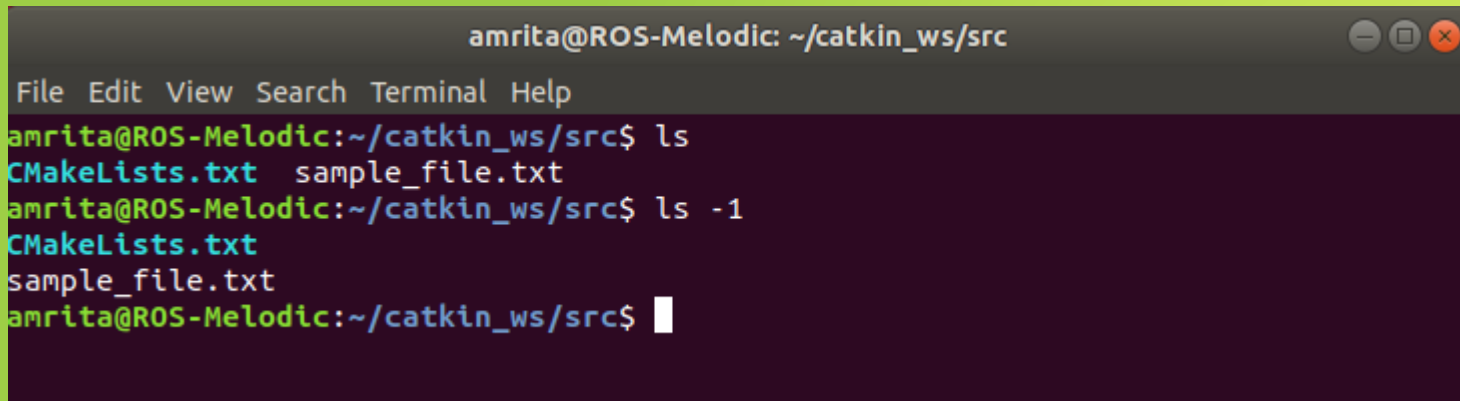
```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ ls
CMakeLists.txt  sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

# UNIX BASICS FOR ROS

Command “ls”

- Display One File Per Line Using ls -1

\$ ls -1

A terminal window titled 'amrita@ROS-Melodic: ~/catkin\_ws/src' with standard window controls. The terminal shows the following commands and output:

```
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ ls
CMakeLists.txt  sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -1
CMakeLists.txt
sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

# UNIX BASICS FOR ROS

## Command “ls”

- Display Hidden Files Using ls -a (or) ls -A

\$ ls -a

A terminal window titled 'amrita@ROS-Melodic: ~/catkin\_ws/src' with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal shows the following commands and output:

```
amrita@ROS-Melodic:~/catkin_ws/src$ ls
CMakeLists.txt  sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
CMakeLists.txt
sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 0
lrwxrwxrwx 1 amrita amrita 50 Jan 31 11:38 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 0 Feb  1 23:36 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -a
.  ..  CMakeLists.txt  sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

# UNIX BASICS FOR ROS

## Command “ls”

- Display All Information About Files/Directories Using ls -l

\$ ls -l

A terminal window titled "amrita@ROS-Melodic: ~/catkin\_ws/src" with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal shows the following commands and output:

```
amrita@ROS-Melodic:~/catkin_ws/src$ ls
CMakeLists.txt  sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
CMakeLists.txt
sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 0
lrwxrwxrwx 1 amrita amrita 50 Jan 31 11:38 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 0 Feb  1 23:36 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -a
.  ..  CMakeLists.txt  sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```



# UNIX BASICS FOR ROS

## User permissions

- The first column represents different access modes, i.e., the permission associated with a file or a directory.



```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help

amrita@ROS-Melodic:~/catkin_ws/src$ ls
CMakeLists.txt  sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
CMakeLists.txt
sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 0
lrwxrwxrwx 1 amrita amrita 50 Jan 31 11:38 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 0 Feb  1 23:36 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -a
.  ..  CMakeLists.txt  sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

# UNIX BASICS FOR ROS

## User permissions

- Every file or directory in Unix has the following attributes –
  - Owner permissions – The owner's permissions determine what actions the owner of the file can perform on the file.
  - Group permissions – The group's permissions determine what actions a user, who is a member of the group that a file belongs to, can perform on the file.
  - Other (world) permissions – The permissions for others indicate what action all other users can perform on the file.

# UNIX BASICS FOR ROS

## User permissions

- The permissions are broken into groups of threes, and each position in the group denotes a specific permission, in this order: read (r), write (w), execute (x)
- The first three characters (2-4) represent the permissions for the file's owner.
  - For example, -r----- represents that the owner has read (r) permission on the file.
  - For example, -rw----- represents that the owner has read (r), write (w) permission on the file.
  - For example, -rwx----- represents that the owner has read (r), write (w) and execute (x) permission.

# UNIX BASICS FOR ROS

## User permissions

- The second group of three characters (5-7) consists of the permissions for the group to which the file belongs.
  - For example, `-rwxr-x---` represents that the owner has read (r), write (w) and execute (x) permission and group has read (r) and execute (x) permission, but no write permission.
- The last group of three characters (8-10) represents the permissions for everyone else.
  - For example, `-rwxr-xr--` represents that the owner has read (r), write (w) and execute (x) permission and group has read (r) and execute (x) permission, but no write permission and there is read (r) only permission for the world.

# UNIX BASICS FOR ROS

File access modes:

## Read

Grants the capability to read, i.e., view the contents of the file.

## Write

Grants the capability to modify, or remove the content of the file.

## Execute

User with execute permissions can run a file as a program. **Python script files need to have execute permission.** Regular text file need to only have read and write permission on the file.

# UNIX BASICS FOR ROS

Directory access modes:

## **Read**

Access to a directory means that the user can read the contents. The user can look at the filenames inside the directory.

## **Write**

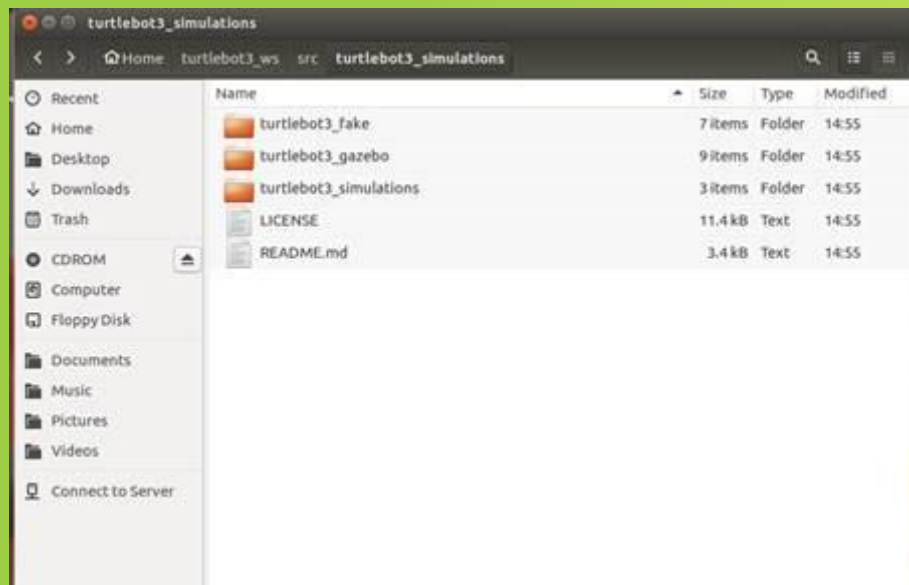
Access means that the user can add or delete files from the directory.

## **Execute**

Executing a directory doesn't really make sense, so think of this as a traverse permission i.e. permission to cd into that directory

# UNIX BASICS FOR ROS

- Just like windows, a directory is a location for storing files on your computer. Directories are found in a hierarchical file system

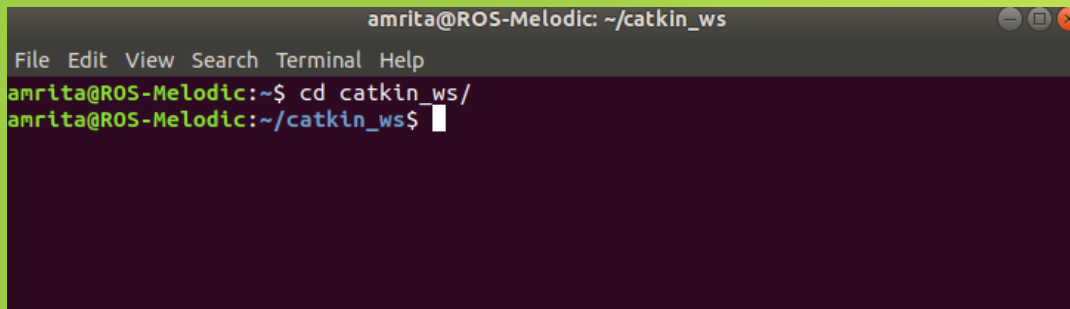


# UNIX BASICS FOR ROS

## Command “cd”

- Lets go to the catkin\_ws folder with the command cd typing the following line into the shell.

```
$ cd catkin_ws/
```

A terminal window titled "amrita@ROS-Melodic: ~/catkin\_ws" with a menu bar (File, Edit, View, Search, Terminal, Help). The prompt is "amrita@ROS-Melodic:~\$". The command "cd catkin\_ws/" is entered and executed, changing the prompt to "amrita@ROS-Melodic:~/catkin\_ws\$".

```
amrita@ROS-Melodic: ~/catkin_ws
File Edit View Search Terminal Help
amrita@ROS-Melodic:~$ cd catkin_ws/
amrita@ROS-Melodic:~/catkin_ws$
```

- Now you're inside the folder catkin\_ws. You already have been noticed that you have the folder in blue text, it means that you're in that directory , "  
~/catkin\_ws".

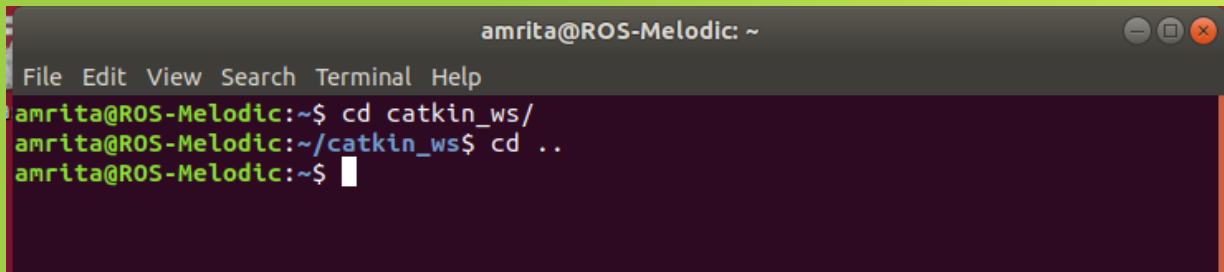


# UNIX BASICS FOR ROS

## Command “cd”

- Now lets return from catkin\_ws to home with the command cd typing the following line into the shell.

```
$ cd ..
```

A screenshot of a terminal window titled 'amrita@ROS-Melodic: ~'. The window has a menu bar with 'File', 'Edit', 'View', 'Search', 'Terminal', and 'Help'. The terminal shows a sequence of commands: first, 'amrita@ROS-Melodic:~\$ cd catkin\_ws/' which changes the directory to '/catkin\_ws'; then, 'amrita@ROS-Melodic:~/catkin\_ws\$ cd ..' which returns to the home directory. The final prompt is 'amrita@ROS-Melodic:~\$' with a cursor. The terminal background is dark purple, and the text is green.

```
amrita@ROS-Melodic: ~  
File Edit View Search Terminal Help  
amrita@ROS-Melodic:~$ cd catkin_ws/  
amrita@ROS-Melodic:~/catkin_ws$ cd ..  
amrita@ROS-Melodic:~$
```

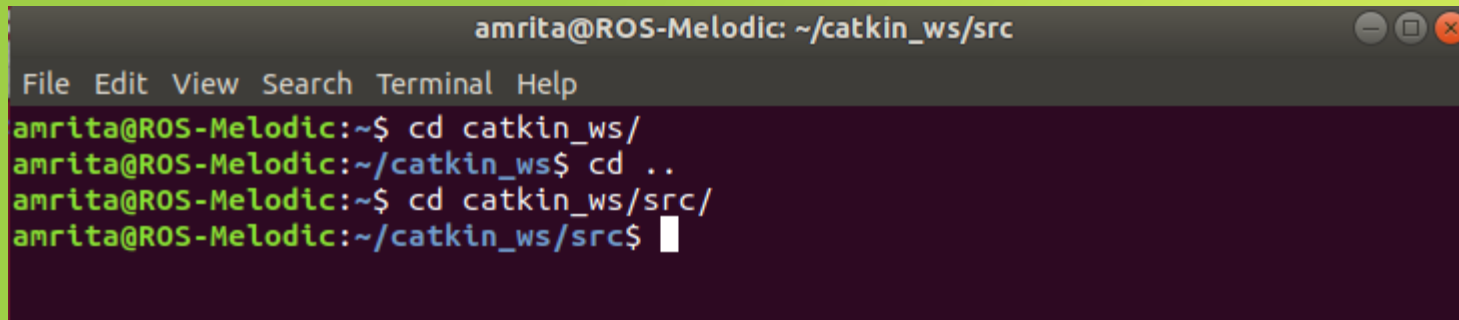
- This is used to move to the parent directory of current directory, or the directory one level up from the current directory. “..” represents parent directory.

# UNIX BASICS FOR ROS

## Command “cd”

- Now lets try to navigate to sub-directories type the following command in the terminal

\$ cd catkin\_ws/src/

A terminal window titled 'amrita@ROS-Melodic: ~/catkin\_ws/src' with standard window controls. The menu bar includes 'File', 'Edit', 'View', 'Search', 'Terminal', and 'Help'. The terminal shows a sequence of commands: 'cd catkin\_ws/' followed by 'cd ..' followed by 'cd catkin\_ws/src/'. The prompt changes from '~\$' to '~/catkin\_ws\$' and finally to '~/catkin\_ws/src\$'.

```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~$ cd catkin_ws/
amrita@ROS-Melodic:~/catkin_ws$ cd ..
amrita@ROS-Melodic:~$ cd catkin_ws/src/
amrita@ROS-Melodic:~/catkin_ws/src$
```

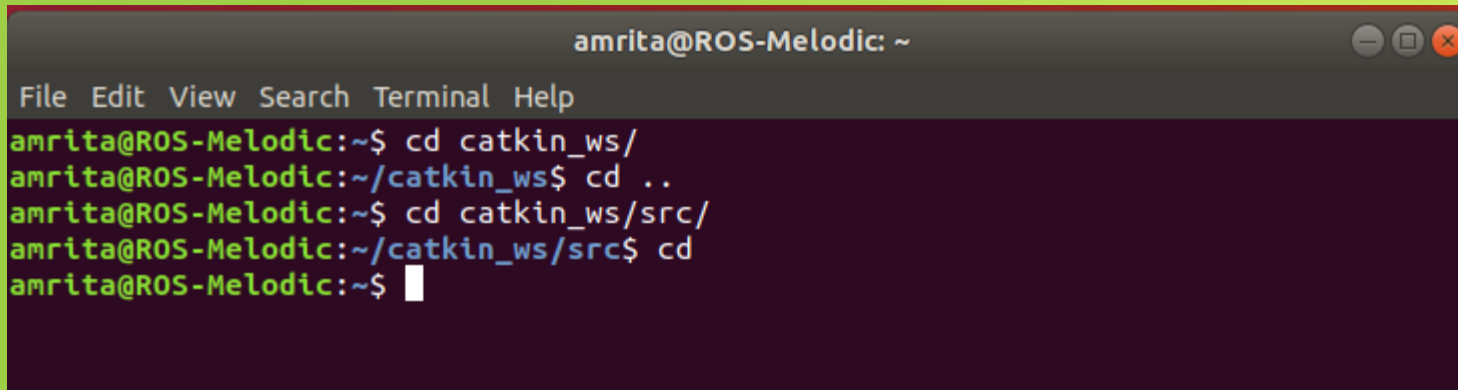
# UNIX BASICS FOR ROS

## Command “cd”

- Now to go back to home directory run the following command

\$ cd

\$ cd ~

A terminal window titled "amrita@ROS-Melodic: ~" with standard window controls. The terminal shows a sequence of directory navigation commands and their outputs. The prompt is green, and the commands are in blue. The output of the first three commands is in green, while the last two are in blue.

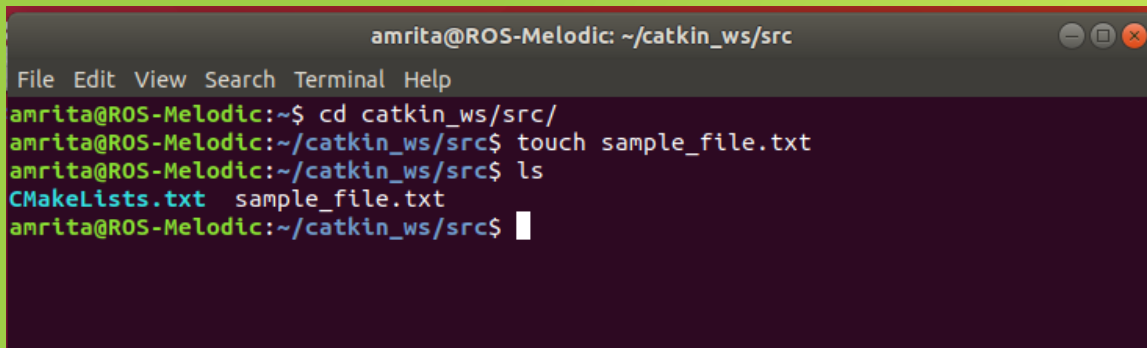
```
File Edit View Search Terminal Help
amrita@ROS-Melodic:~$ cd catkin_ws/
amrita@ROS-Melodic:~/catkin_ws$ cd ..
amrita@ROS-Melodic:~$ cd catkin_ws/src/
amrita@ROS-Melodic:~/catkin_ws/src$ cd
amrita@ROS-Melodic:~$
```

# UNIX BASICS FOR ROS

## Create a text file

- Run the following command to create a txt file in src folder of catkin\_ws

\$ touch sample\_file.txt

A terminal window titled 'amrita@ROS-Melodic: ~/catkin\_ws/src' with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal shows the following commands and output:

```
amrita@ROS-Melodic:~$ cd catkin_ws/src/  
amrita@ROS-Melodic:~/catkin_ws/src$ touch sample_file.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ ls  
CMakeLists.txt  sample_file.txt  
amrita@ROS-Melodic:~/catkin_ws/src$
```

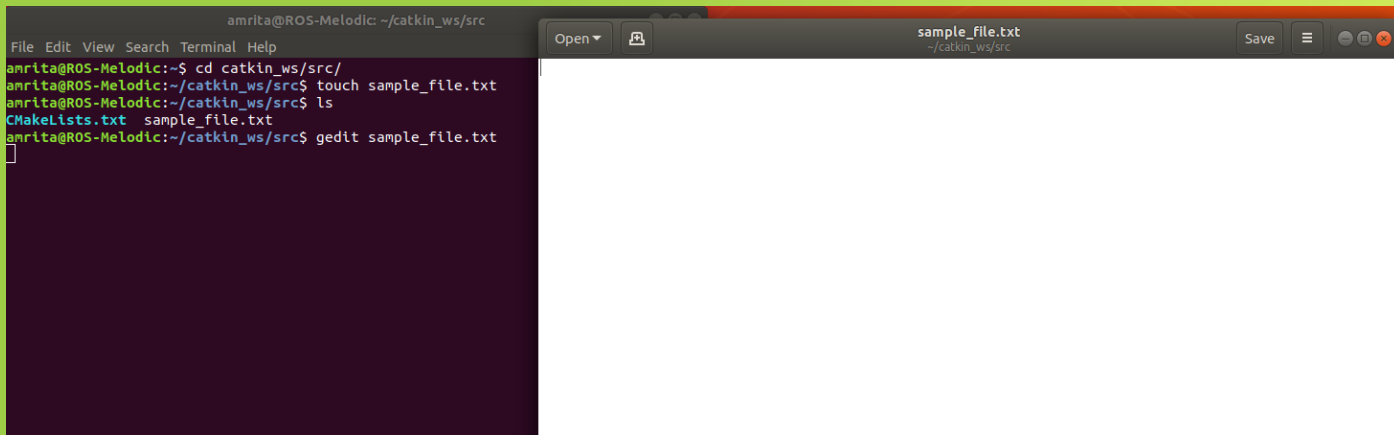
- You can see the file when you type “ls”

# UNIX BASICS FOR ROS

## Create a text file

- We will edit the file using gedit, from the terminal itself run the following command

```
$ gedit sample_file.txt
```



# UNIX BASICS FOR ROS

Create a text file

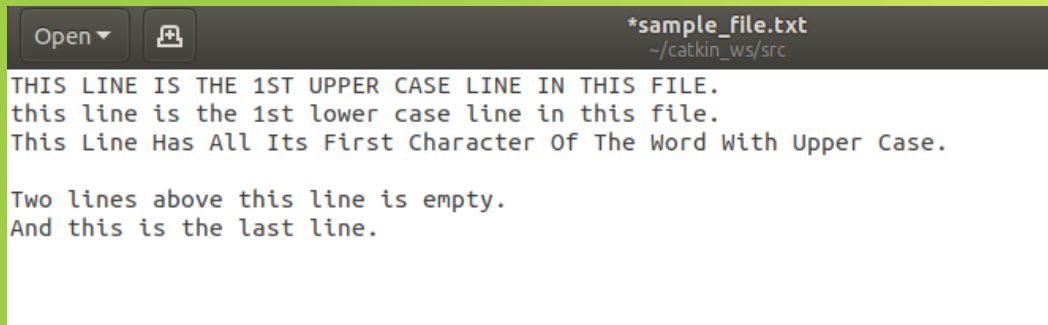
- Now copy the following into the text file

THIS LINE IS THE 1ST UPPER CASE LINE IN THIS FILE.

this line is the 1st lower case line in this file.

This Line Has All Its First Character Of The Word With Upper Case.

Two lines above this line is empty. And this is the last line.



The screenshot shows a text editor window with a dark title bar. The title bar contains an 'Open' button with a dropdown arrow, a file icon, and the text '\*sample\_file.txt' and '~/catkin\_ws/src'. The editor area has a white background and contains the following text in a monospaced font:

```
THIS LINE IS THE 1ST UPPER CASE LINE IN THIS FILE.  
this line is the 1st lower case line in this file.  
This Line Has All Its First Character Of The Word With Upper Case.  
  
Two lines above this line is empty.  
And this is the last line.
```

# UNIX BASICS FOR ROS

## Command “cp”

- cp stands for copy. This command is used to copy files or group of files or directory. It creates an exact image of a file on a disk with different file name. cp command require at least two filenames in its arguments.

\$ cp sample\_file.txt sample\_file1.txt

```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ cp sample_file.txt sample_file1.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls
CMakeLists.txt sample_file1.txt sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

# UNIX BASICS FOR ROS

## Command “cp”

- To create a hidden copy of the file run the same command but in the destination filename add a . Before the filename.

```
$ cp sample_file.txt .sample_file1.txt
```

```
amrita@ROS-Melodic: ~/catkin_ws/src  
File Edit View Search Terminal Help  
amrita@ROS-Melodic:~/catkin_ws/src$ cp sample_file.txt sample_file1.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ ls  
CMakeLists.txt  sample_file1.txt  sample_file.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ cp sample_file.txt .sample_file1.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ ls  
CMakeLists.txt  sample_file1.txt  sample_file.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ ls -a  
.  ..  CMakeLists.txt  .sample_file1.txt  sample_file1.txt  sample_file.txt  
amrita@ROS-Melodic:~/catkin_ws/src$
```



# UNIX BASICS FOR ROS

## Command “cat”

- The command cat is used to look at the content of a file.

\$ cat sample\_file.txt

```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ cat sample_file.txt
THIS IS THE 1ST UPPER CASE LINE IN THIS FILE.
this is the 1st lower case line in this file.
This Line Has All Its First Character Of The Word With Upper Case.

Two lines abaove this line is empty.
And this is the last line.
amrita@ROS-Melodic:~/catkin_ws/src$
```

# UNIX BASICS FOR ROS

## Command “rm”

- The command rm is used for delete elements using the shell.

```
$ rm .sample_file1.txt
```

```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ cp sample_file.txt sample_file1.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls
CMakeLists.txt sample_file1.txt sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ cp sample_file.txt .sample_file1.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls
CMakeLists.txt sample_file1.txt sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -a
. . . CMakeLists.txt .sample_file1.txt sample_file1.txt sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ rm .sample_file1.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -a
. . . CMakeLists.txt sample_file1.txt sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

# UNIX BASICS FOR ROS

## Command “rm -rf”

- The command `rm -rf` is used to delete a folder and all the files and sub-folders inside the folder – it will recursively delete the files and sub-folders.

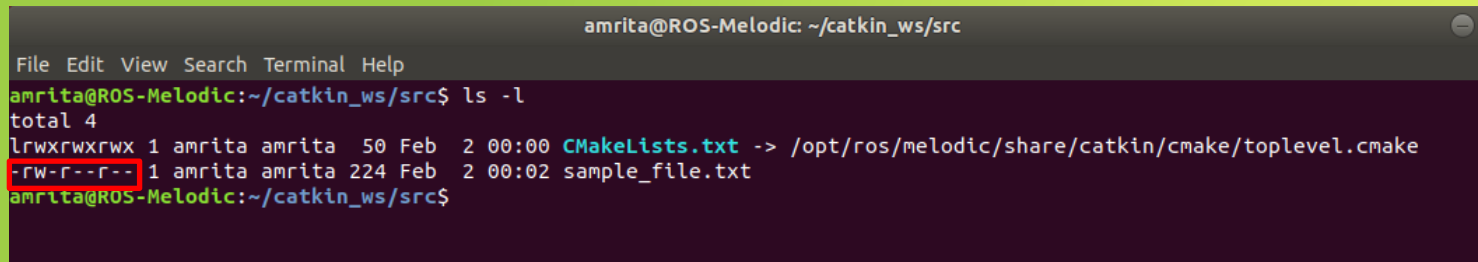
\$ `rm -rf catkin_ws/`

```
amrita@ROS-Melodic: ~  
File Edit View Search Terminal Help  
amrita@ROS-Melodic:~/catkin_ws/src$ cp sample_file.txt sample_file1.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ ls  
CMakeLists.txt sample_file1.txt sample_file.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ cp sample_file.txt .sample_file1.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ ls  
CMakeLists.txt sample_file1.txt sample_file.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ ls -a  
. .. CMakeLists.txt .sample_file1.txt sample_file1.txt sample_file.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ rm .sample_file1.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ ls -a  
. .. CMakeLists.txt sample_file1.txt sample_file.txt  
amrita@ROS-Melodic:~/catkin_ws/src$ cd  
amrita@ROS-Melodic:~$ rm -rf catkin_ws/  
amrita@ROS-Melodic:~$ ls  
Desktop Documents Downloads examples.desktop Music Pictures Public snap Templates Videos  
amrita@ROS-Melodic:~$
```

# UNIX BASICS FOR ROS

## Command “chmod”

- To change the file or the directory permissions, you use the chmod (change mode) command.
- If you create a python file and need to make it to an executable file so that ROS can run it, you have to run `chmod +x <filename>`
- Lets assume `demo_file` is a python file and you want to execute it. If you run  
`$ ls -l`



```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 4
lrwxrwxrwx 1 amrita amrita 50 Feb  2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 224 Feb  2 00:02 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

The screenshot shows a terminal window with the command `ls -l` executed. The output lists two files: `CMakeLists.txt` with permissions `lrwxrwxrwx` and `sample_file.txt` with permissions `-rw-r--r--`. The permissions for `sample_file.txt` are highlighted with a red box.

# UNIX BASICS FOR ROS

## Command “chmod”

- You will see that it has only ‘r’ or read permission and ‘w’ or write permission. It does not have ‘x’ or execute permission. Now run

```
$ chmod +x sample_file.txt
```

```
$ ls -l
```

```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 4
lrwxrwxrwx 1 amrita amrita 50 Feb 2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 224 Feb 2 00:02 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ chmod +x sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 4
lrwxrwxrwx 1 amrita amrita 50 Feb 2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rwxr-xr-x 1 amrita amrita 224 Feb 2 00:02 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

- You can see that execute permission is added to the file

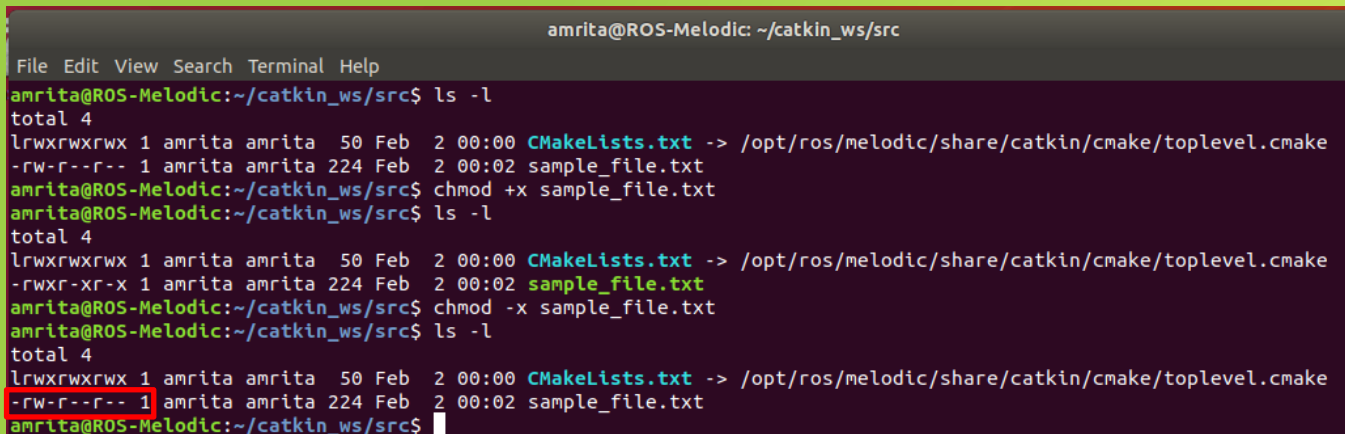
# UNIX BASICS FOR ROS

## Command “chmod”

- To remove the execute permission run

```
$ chmod -x sample_file.txt
```

```
$ ls -l
```



```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 4
lrwxrwxrwx 1 amrita amrita 50 Feb 2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 224 Feb 2 00:02 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ chmod +x sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 4
lrwxrwxrwx 1 amrita amrita 50 Feb 2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rwxr-xr-x 1 amrita amrita 224 Feb 2 00:02 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ chmod -x sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 4
lrwxrwxrwx 1 amrita amrita 50 Feb 2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 224 Feb 2 00:02 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

- You can see that execute permission removed from the file

# UNIX BASICS FOR ROS

## Command “mv”

- mv stands for move. mv is used to move one or more files or directories from one place to another in file system like UNIX. It has two distinct functions:
  - It rename a file or folder.
  - It moves group of files to different directory.
- No additional space is consumed on a disk during renaming.

# UNIX BASICS FOR ROS

## Command “mv”

- Run the following command

```
$ mv sample_file.txt new_file.txt
```

```
$ ls -l
```

```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 8
lrwxrwxrwx 1 amrita amrita 50 Feb  2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 224 Feb  2 00:30 sample_file1.txt
-rw-r--r-- 1 amrita amrita 224 Feb  2 00:02 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ mv sample_file.txt new_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 8
lrwxrwxrwx 1 amrita amrita 50 Feb  2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 224 Feb  2 00:02 new_file.txt
-rw-r--r-- 1 amrita amrita 224 Feb  2 00:30 sample_file1.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```



# UNIX BASICS FOR ROS

## Command “mv”

- Run the following command

```
$ mv new_file.txt ..
```

```
$ ls -l
```

```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 8
lrwxrwxrwx 1 amrita amrita 50 Feb 2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 224 Feb 2 00:30 sample_file1.txt
-rw-r--r-- 1 amrita amrita 224 Feb 2 00:02 sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ mv sample_file.txt new_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 8
lrwxrwxrwx 1 amrita amrita 50 Feb 2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 224 Feb 2 00:02 new_file.txt
-rw-r--r-- 1 amrita amrita 224 Feb 2 00:30 sample_file1.txt
amrita@ROS-Melodic:~/catkin_ws/src$ mv new_file.txt ..
amrita@ROS-Melodic:~/catkin_ws/src$ ls -l
total 4
lrwxrwxrwx 1 amrita amrita 50 Feb 2 00:00 CMakeLists.txt -> /opt/ros/melodic/share/catkin/cmake/toplevel.cmake
-rw-r--r-- 1 amrita amrita 224 Feb 2 00:30 sample_file1.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

# UNIX BASICS FOR ROS

## Command “mv”

- Run the following command

\$ ls -l ..

```
total 16
drwxr-xr-x 8 amrita amrita 4096 Feb  2 00:00 build
drwxr-xr-x 3 amrita amrita 4096 Feb  2 00:00 devel
-rw-r--r-- 1 amrita amrita  224 Feb  2 00:02 new_file.txt
drwxr-xr-x 2 amrita amrita 4096 Feb  2 00:33 src
amrita@ROS-Melodic:~/catkin_ws/src$
```

# UNIX BASICS FOR ROS

## Command “mv”

- Run the following command, to bring the file back to the directory

```
$ mv ../new_file.txt sample_file.txt
```

```
$ ls -l
```

```
amrita@ROS-Melodic: ~/catkin_ws/src
File Edit View Search Terminal Help
amrita@ROS-Melodic:~/catkin_ws/src$ mv ../new_file.txt sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$ ls
CMakeLists.txt  sample_file1.txt  sample_file.txt
amrita@ROS-Melodic:~/catkin_ws/src$
```

# PYTHON BASICS FOR ROS

- Data Types and Variables
- Conditional Statements and Loops
- Functions
- Python Classes

# Thank You

