Academic Year: 2025-26 **Semester: V**

Class / Branch: TEIT

Subject: DevOps Lab

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Experiment No. 2

Aim: To perform installation of Git and work on local and remote Git repositories.

GIT is a Version Control System (VCS) (aka Revision Control System (RCS), Source Code Manager (SCM)). A VCS serves as a Repository (or repo) of program codes, including all the historical revisions. It records changes to files at so-called commits in a log so that you can recall any file at any commit point.

To issue a command, start a "Terminal" (for Ubuntu/Mac) or "Git Bash" (for Windows):

```
$ git <command> <arguments>
```

The commonly-used commands are:

1. **init**, **clone**, **config**: for starting a Git-managed project.
2. **add**, **mv**, **rm**: for staging file changes.
3. **commit**, **rebase**, **reset**, **tag**:
4. **status**, **log**, **diff**, **grep**, **show**: show status
5. **checkout**, **branch**, **merge**, **push**, **fetch**, **pull**

Getting Started with Local Repo

There are 2 ways to start a Git-managed project:

1. Starting your own project;
2. Cloning an existing project from a GIT host.

Git uses two stages to commit file changes:

1. "git add <file>" to stage file changes into the staging area, and
2. "git commit" to commit ALL the file changes in the staging area to the local repo.

You need to setup Git on your local machine, as follows:

To update all local package index for ubuntu:

$sudo apt update

```
sujata@Ubuntu:~$ sudo apt update
[sudo] password for sujata:
sujata is not in the sudoers file.  This incident will be reported.
```

```
sujata@Ubuntu:~$ su root
Password:
root@Ubuntu:/home/sujata#
```

```
root@Ubuntu:/home/sujata# sudo apt update
Hit:1 http://in.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://security.ubuntu.com/ubuntu focal-security InRelease
Hit:3 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:4 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease
Reading package lists... Done
Building dependency tree
Reading state information... Done
312 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

Step1: Download & Install:

- For Ubuntu, issue command "sudo apt-get install git".
- #apt install git

```
root@Ubuntu:/home/sujata# apt install git
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  git-man liberror-perl
Suggested packages:
```

To check version of git:
#git –version

```
root@Ubuntu:/home/sujata# git --version
git version 2.25.1
```

Step 2: Customize and configure your Git Account:

#git config --global user.name "sujataoak799"

```
root@Ubuntu:/home/sujata# git config --global user.name "sujataoak799"
```

#git config --global user.email sujataoak2021@gmail.com

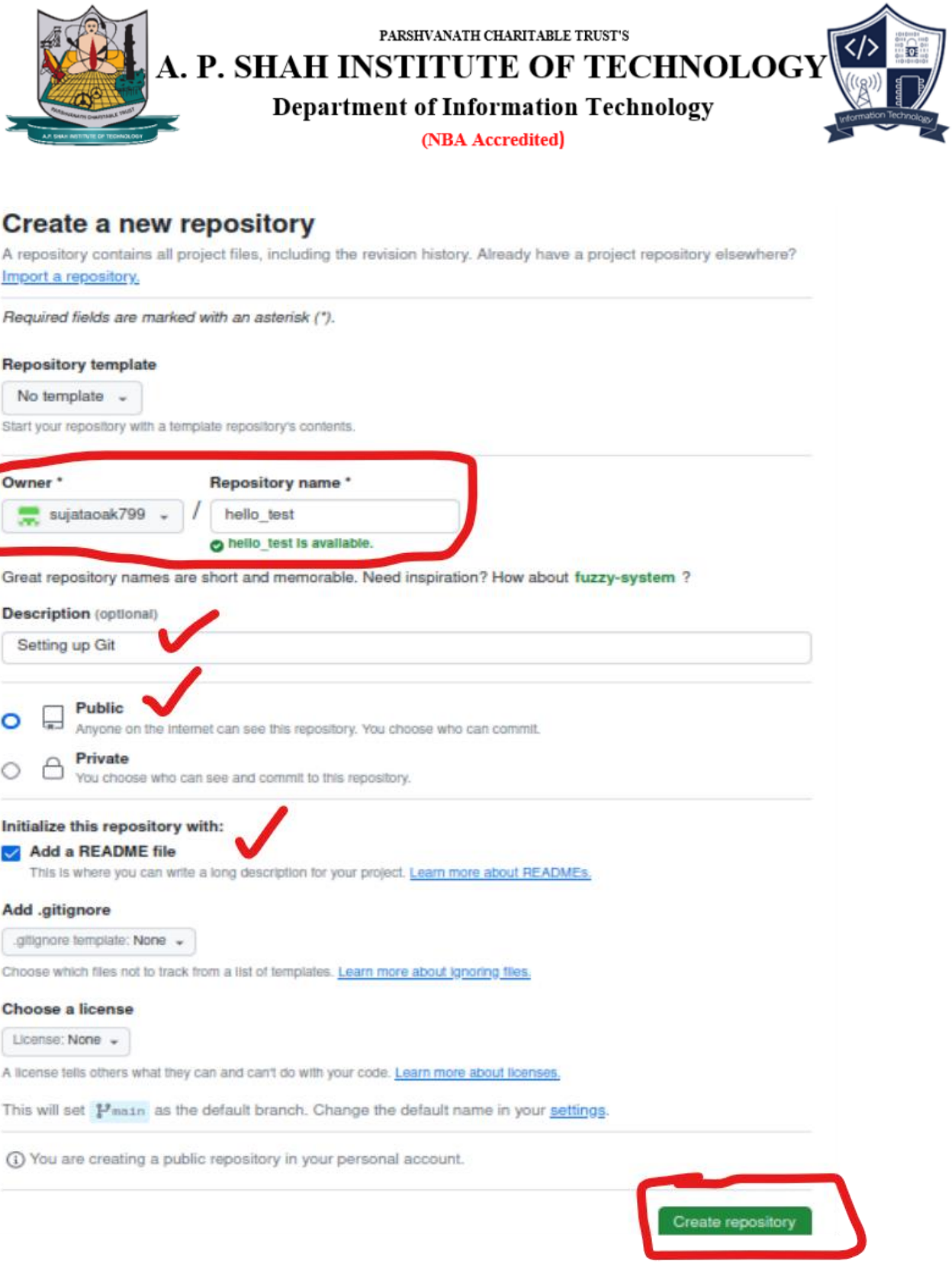
```
root@Ubuntu:/home/sujata# git config --global user.email "sujataoak2021@gmail.com"
```

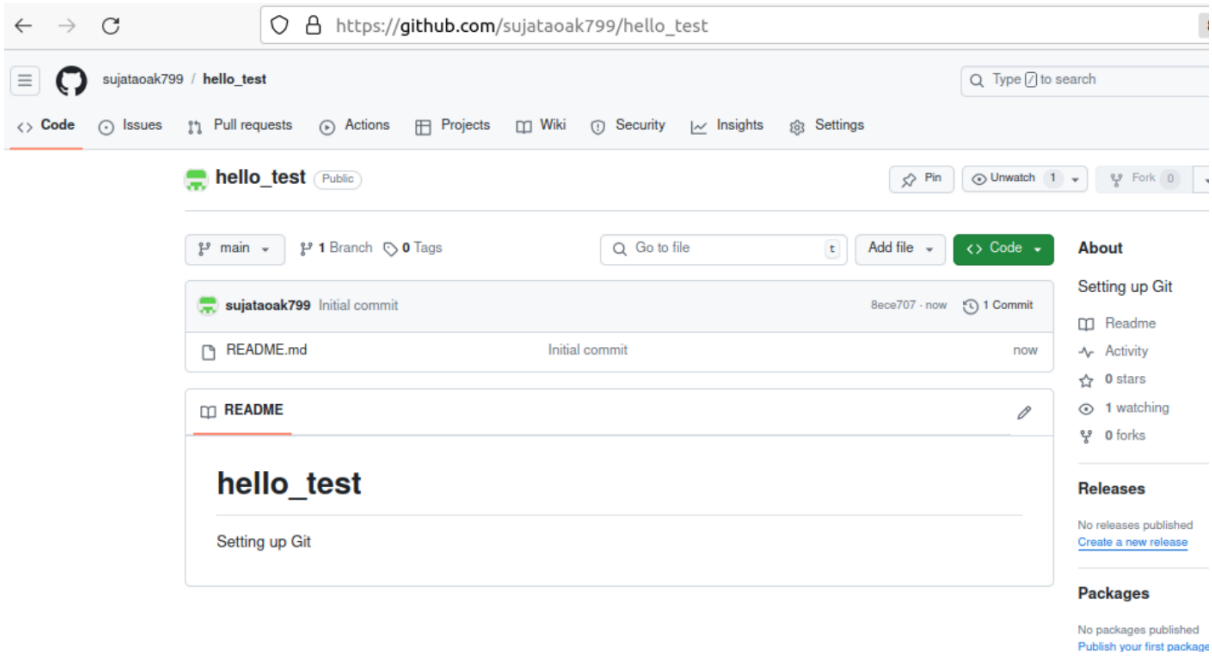
To List Global configuration for Git:

#git config --list

```
root@Ubuntu:/home/sujata# git config --list
user.name=sujataoak799
user.email=sujataoak2021@gmail.com
```

Step . 3
To Integrate Git account with Github:
Goto www.github.com
Sign-in to your account
Create a Repository


Create a new repository
A repository contains all project files, including the revision history. Already have a project repository elsewhere?
Import a repository.
Required fields are marked with an asterisk (*).
Repository template
No template
Start your repository with a template repository's contents.
Owner *
Repository name *
sujataoak799
/
hello_test
hello_test is available.
Great repository names are short and memorable. Need inspiration? How about fuzzy-system ?
Description (optional)
Setting up Git
Public
Anyone on the internet can see this repository. You choose who can commit.
Private
You choose who can see and commit to this repository.
Initialize this repository with:
Add a README file
This is where you can write a long description for your project. Learn more about READMEs.
Add .gitignore
.gitignore template: None
Choose which files not to track from a list of templates. Learn more about ignoring files.
Choose a license
License: None
A license tells others what they can and can't do with your code. Learn more about licenses.
This will set main as the default branch. Change the default name in your settings.
You are creating a public repository in your personal account.
Create repository



Step . 3
Now Clone the Remote Repository into your Local Repository ie; Ubuntu Operating System:
Firstly create a workspace:

```
root@Ubuntu:/home/sujata# mkdir workspace
root@Ubuntu:/home/sujata# cd workspace/
root@Ubuntu:/home/sujata/workspace#
```

- Initiate that directory to make it a git repository (.git file must be added inside that folder after initiation)

#git init

```
root@Ubuntu:/home/sujata/workspace# git init
Initialized empty Git repository in /home/sujata/workspace/.git/
```

```
root@Ubuntu:/home/sujata/workspace# ls
root@Ubuntu:/home/sujata/workspace# git clone https://github.com/sujataoak799/hello_test.git
Cloning into 'hello_test'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 881 bytes | 881.00 KiB/s, done.
```

```
root@Ubuntu:/home/sujata/workspace# ls
hello_test
```

```
root@Ubuntu:/home/sujata/workspace# cd hello_test/
root@Ubuntu:/home/sujata/workspace/hello_test# ls
README.md
root@Ubuntu:/home/sujata/workspace/hello_test# cat README.md
# hello_test
Setting up Git
```

Now Create a python file hello.py in Local Repository:

```
root@Ubuntu:/home/sujata/workspace/hello_test# touch hello.py
root@Ubuntu:/home/sujata/workspace/hello_test# ls
hello.py  README.md
```

```
root@Ubuntu:/home/sujata/workspace/hello_test# gedit hello.py
```

```python
# factorial of given number
def factorial(n):
    if n < 0:
        return 0
    elif n == 0 or n == 1:
```

```
        return 1
    else:
        fact = 1
        while(n > 1):
            fact *= n
            n -= 1
        return fact

# Driver Code
num = 5
print("Factorial of",num,"is",
factorial(num))
```

Step 4: Now we will apply some git commands to add, commit and push hello.py file to remote repository: Firstly To View Uncommitted File:

#git status

```
root@Ubuntu:/home/sujata/workspace/hello_test# git status
On branch main
Your branch is up to date with 'origin/main'.

Untracked files:
  (use "git add <file>..." to include in what will be committed)
        hello.py

nothing added to commit but untracked files present (use "git add" to track)
```

The file hello.py shown in red color is untracked (it means not tracked by git till now). So to add to the git versioning : git add <filename>

```
root@Ubuntu:/home/sujata/workspace/hello_test# git add hello.py
```

```
root@Ubuntu:/home/sujata/workspace/hello_test# git status
On branch main
Your branch is up to date with 'origin/main'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        new file:   hello.py
```

Once file is added to git, the color changes to green color. But it says changes to be committed

Step 5: To start first commit

git commit -m "First Python File"

```
root@Ubuntu:/home/sujata/workspace/hello_test# git commit -m " First Python File"
[main e19123e]  First Python File
 1 file changed, 10 insertions(+)
 create mode 100644 hello.py
```

```
root@Ubuntu:/home/sujata/workspace/hello_test# git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
```

Step 6: To Push your changes to Github Repository:

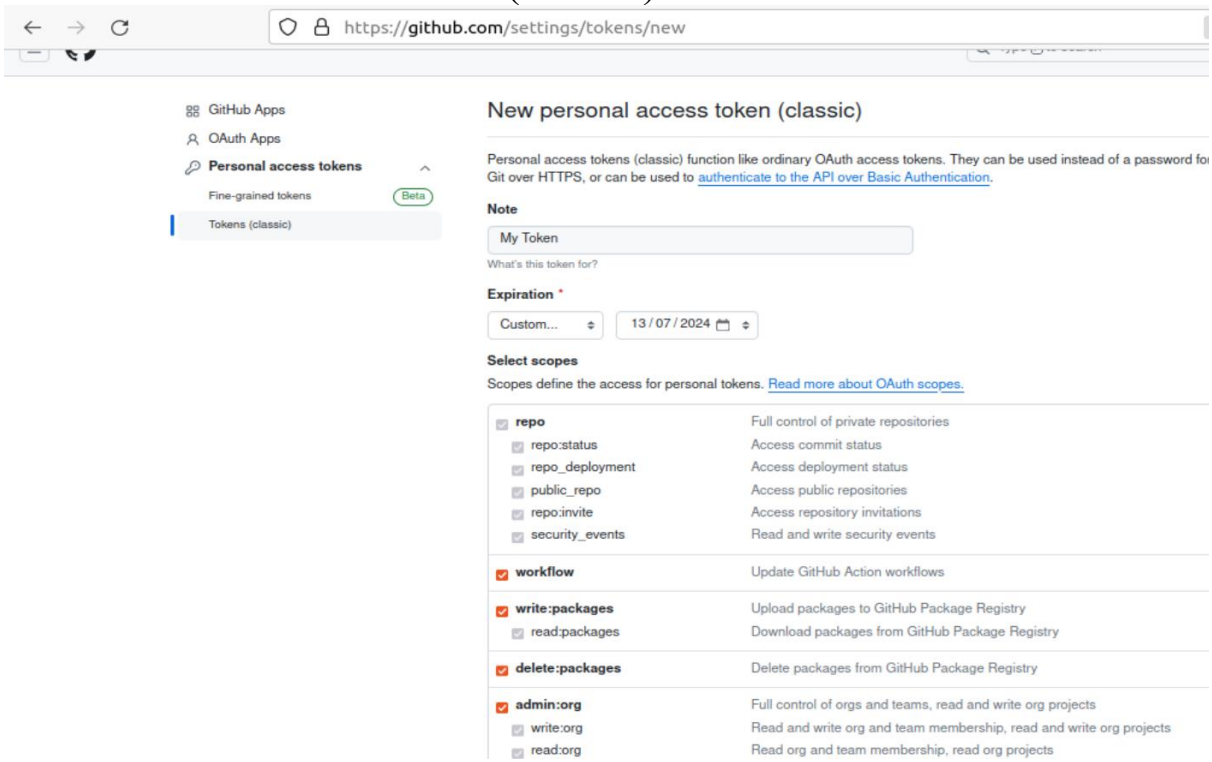
git push origin master or **git push origin main**

#git push origin main
Enter username and password

```
root@Ubuntu:/home/sujata/workspace/hello_test# git push origin main
Username for 'https://github.com': sujataoak799
Password for 'https://sujataoak799@github.com':
remote: Support for password authentication was removed on August 13, 2021.
remote: Please see https://docs.github.com/get-started/getting-started-with-git/about-remote-repositories#cloning-with-https-ur
ls for information on currently recommended modes of authentication.
fatal: Authentication failed for 'https://github.com/sujataoak799/hello_test.git/'
```

It says support for password authentication was removed on August 13, 2021.
So we need a new kind of method:
Goto your Github Account→User Profile→Settings→Developer Settings→Personal Access Token→Token(classic)→ Generate New

token→Generate New Token(Classic)



Click on Generate Token
Copy the token and paste it some location:
#git remote set-url origin https://tokenhere@github.com/user_name/repo_name

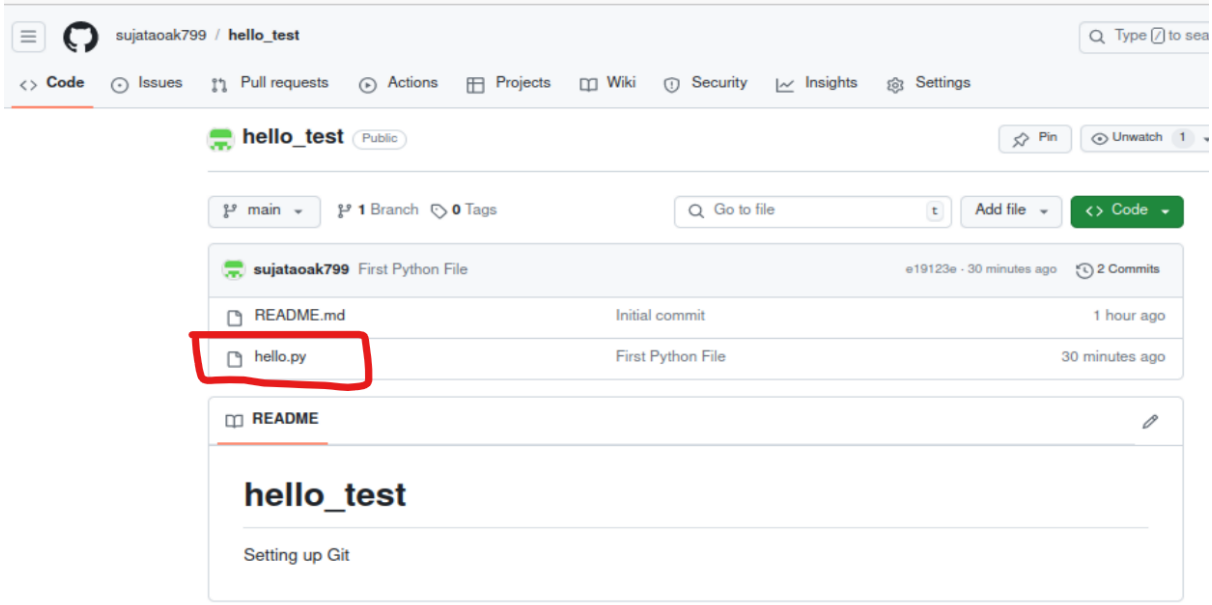
```
root@Ubuntu:/home/sujata/workspace/hello_test# git remote set-url origin https://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@github.com/sujataoak799/hello_test
```

Again try to Push your changes to Github Repository:

#git push origin main

```
root@Ubuntu:/home/sujata/workspace/hello_test# git push origin main
Enumerating objects: 4, done.
Counting objects: 100% (4/4), done.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 449 bytes | 449.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/sujataoak799/hello_test
   8ece707..e19123e  main -> main
```

This time it is successfully implemented.
Goto Remote Repository and see the file hello.py



Step7 : To see the logs in oneline like username, email -id, date, time of creation.

git log
or
git log –oneline

```
root@Ubuntu:/home/sujata/workspace/hello_test# git log
commit e19123efabe5c27c0ad82109b2cc1e14be02074d (HEAD -> main, origin/main, origin/HEAD)
Author: sujataoak799 <sujataoak2021@gmail.com>
Date:   Tue Jul 9 23:36:03 2024 +0530

    First Python File

commit 8ece7077e5801bfceaae96270dff81d3f4a4efdb
Author: sujataoak799 <79905110+sujataoak799@users.noreply.github.com>
Date:   Tue Jul 9 22:51:50 2024 +0530

    Initial commit
```

Step 8: To show repository id and other detail

#git show

```
root@Ubuntu:/home/sujata/workspace/hello_test# git show
commit e19123efabe5c27c0ad82109b2cc1e14be02074d (HEAD -> main, origin/main, origin/HEAD)
Author: sujataoak799 <sujataoak2021@gmail.com>
Date:   Tue Jul 9 23:36:03 2024 +0530

    First Python File

diff --git a/hello.py b/hello.py
new file mode 100644
index 0000000..50d5ba4
--- /dev/null
+++ b/hello.py
@@ -0,0 +1,10 @@
+    num = int(input("Enter a number: "))
+    factorial = 1
+    if num < 0:
+       print(" Factorial does not exist for negative numbers")
+    elif num == 0:
+       print("The factorial of 0 is 1")
+    else:
+       for i in range(1,num + 1):
+           factorial = factorial*i
+       print("The factorial of",num,"is",factorial)
```

Step 09: To see the difference in the content of file between first and second commit.

#git diff

```
root@Ubuntu:/home/sujata/workspace/hello_test# git diff 8ece707 e19123e
diff --git a/hello.py b/hello.py
new file mode 100644
index 0000000..50d5ba4
--- /dev/null
+++ b/hello.py
@@ -0,0 +1,10 @@
+    num = int(input("Enter a number: "))
+    factorial = 1
+    if num < 0:
+       print(" Factorial does not exist for negative numbers")
+    elif num == 0:
+       print("The factorial of 0 is 1")
+    else:
+       for i in range(1,num + 1):
+           factorial = factorial*i
+       print("The factorial of",num,"is",factorial)
```

Step 10: Creating a latter commit and reverting back to see the initial/original content

git revert<secondcommitID>

```
  GNU nano 4.8                  /home/sujata/workspace/hello_test/.git/C
Revert "Initial commit"

This reverts commit 8ece7077e5801bfceaae96270dff81d3f4a4efdb.

# Please enter the commit message for your changes. Lines starting
# with '#' will be ignored, and an empty message aborts the commit.
#
# On branch main
# Your branch is up to date with 'origin/main'.
#
# Changes to be committed:
#       deleted:    README.md
#
Reverted Initial commit
```

Save it

```
root@Ubuntu:/home/sujata/workspace/hello_test# git revert 8ece707
Removing README.md
[main f1bdb1c] Revert "Initial commit"
 1 file changed, 2 deletions(-)
 delete mode 100644 README.md
```

Conclusion:

In this experiment, we understood the use case of Version Control System, its benefits in real time scenario which provides a application of reverting the changes when people are in working in acollaborating environment. Different commands were used for the same such as revert(by using its id),diff for displaying the changes between the initial and latter texts.