

Module three

# Project Version Control with Git

## Implementing a feature request

A feature request is a requirement to modify or add functionality to an application or website. Suppose that you have received a requirement to add the letter D to the Phonetic Website. To implement it you need to modify the three HTML files located in the working directory of the project.

**Adding "Delta", "Detroit" and "David" to pilots.html, cities.html and names.html.**

**Use an editor to make the changes.**

```
<h1>Pilot's Alphabet</h1>
<ul id="pilot">
  <!-- ALPHABET START -->
  <li>Alpha</li>
  <li>Bravo</li>
  <li>charlie</li>
  <li>Delta</li>
  <!-- ALPHABET END -->
```

```
<h1>Cities' Alphabet</h1>
<ul id="city">
  <!-- ALPHABET START -->
  <li>Atlanta</li>
  <li>Boston</li>
  <li>Chicago</li>
  <li>Detroit</li>
  <!-- ALPHABET END -->
```

```
<h1>Names' Alphabet</h1>
<ul id="name">
  <!-- ALPHABET START -->
  <li>Andrew</li>
  <li>Brigitte</li>
  <li>Charles</li>
  <li>David</li>
  <!-- ALPHABET END -->
```

**Let's take a picture using GitKraken to show us the process.**

---

The screenshot shows the GitKraken interface with the following details:

- File Menu:** File, Edit, View, Help
- Workspaces:** simple-website (selected)
- Branch:** main
- Commit Graph:** Shows two commits: "Source code added" (linduarte, 19/09/2...) and "Initial commit" (linduarte, 19/09/2...). The "Initial commit" is the parent of "Source code added".
- Terminal:**
  - Output:

```
05:52:06 simple-website main ~3 448ms
→git status
On branch main
Your branch is up to date with 'origin/main'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
    modified:   cities.html
    modified:   names.html
    modified:   pilots.html

no changes added to commit (use "git add" and/or "git commit -a")
05:52:28 simple-website main ~3 469ms
→
```
- Staging Area:** Shows 3 file changes on main. The files are cities.html, names.html, and pilots.html. There is a "Stage all changes" button.
- Commit Message:** Summary and Description fields are present.
- Side Navigation:** PULL REQUESTS (0), ISSUES, TEAMS, TAGS (0/0), and SUBMODULES (0).

# After adding all html files

The screenshot shows the GitKraken interface with the following details:

- File Menu:** File, Edit, View, Help
- Workspaces:** simple-website (selected)
- Branch:** main
- Commit Graph:** Shows two commits: "Source code added" (linduarte, 19/09/2...) and "Initial commit" (linduarte, 19/09/2...). A tooltip indicates "3 file changes on main".
- Terminal:** Output of `git status` showing:
  - On branch main
  - Your branch is up to date with 'origin/main'.
  - Changes not staged for commit:
    - (use "git add <file>..." to update what will be committed)
    - (use "git restore <file>..." to discard changes in working directory)
    - modified: cities.html
    - modified: names.html
    - modified: pilots.html
  - no changes added to commit (use "git add" and/or "git commit -a")
- Staging Area:** Shows "Unstaged Files (3)" with "Stage all changes" button. Files listed: cities.html, names.html, pilots.html.
- Commit Message:** Summary and Description fields.
- Side Navigation:** PULL REQUESTS (0), ISSUES, TEAMS, TAGS (0/0), SUBMODULES (0).

**Let's see the committing of the html files in GitKraken**

GitKraken

File Edit View Help

Workspaces simple-website +

workspace repository branch Undo Redo Pull Push Branch Stash Pop Terminal

Viewing 2/2 Show All Filter (Ctrl + Alt + f) LOCAL 1/1 main

BRANCH / TAG GRAPH COMMIT MESSAGE AUTHOR COMMIT DATE

main L Added letter D linduarte 19/09/2...  
main L Source code added linduarte 19/09/2...  
main L Initial commit linduarte 19/09/2...

commit: 8f1749  
Added letter D  
linduarte authored 19/09/2023 @ 06:07  
parent: e999df  
3 modified  
cities.html  
names.html  
pilots.html

REMOTE 1/1 origin main

Terminal

```
On branch main
Your branch is up to date with 'origin/main'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
    modified:   cities.html
    modified:   names.html
    modified:   pilots.html

no changes added to commit (use "git add" and/or "git commit -a")
  ↵ 05:52:28 simple-website main ~3 469ms
→ 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)
    modified:   cities.html
    modified:   names.html
    modified:   pilots.html
```

PULL REQUESTS 0 ISSUES TEAMS TAGS 0/0 SUBMODULES 0

## Viewing from Git bash the final status

```
06:20:52 simple-website main 236ms
→ 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
```

# Viewing Project History

```
06:25:32 simple-website main 383ms
git log
commit 8f1749f2bcf9a915cda47191da40305f43b0d9ac (HEAD -> main)
Author: linduarte <clldscotti@gmail.com>
Date:   Tue Sep 19 06:07:03 2023 -0300

    Added letter D

commit e999df570eddb019d4460fde0a57c8fef01de4f8 (origin/main, origin/HEAD)
Author: linduarte <140444382+linduarte@users.noreply.github.com>
Date:   Tue Sep 19 04:45:02 2023 -0300

    Source code added

commit a3f34eff07bb02bfa723baf6477eefe1689412bd
Author: linduarte <140444382+linduarte@users.noreply.github.com>
Date:   Tue Sep 19 04:24:29 2023 -0300

    Initial commit
```

# **Viewing Git log from GitKraken**

GitKraken

File Edit View Help

Workspaces simple-website

simple-website main

undo redo pull push branch stash pop terminal

Viewing 2/2 Show All

Filter (Ctrl + Alt + f)

LOCAL 1/1

main

BRANCH / TAG GRAPH COMMIT MESSAGE AUTHOR COMMIT DATE

main Added letter D linduarte 19/09/2...

main Source code added linduarte 19/09/2...

main Initial commit linduarte 19/09/2...

Terminal

Date: Tue Sep 19 06:07:03 2023 -0300

Added letter D

commit e999df570eddb019d4460fde0a57c8fef01de4f8 (origin/main, origin/HEAD)  
Author: linduarte <140444382+linduarte@users.noreply.github.com>  
Date: Tue Sep 19 04:45:02 2023 -0300

Source code added

commit a3f34eff07bb02bfa723baf6477eefe1689412bd  
Author: linduarte <140444382+linduarte@users.noreply.github.com>  
... skipping...

commit 8f1749f2bcf9a915cda47191da40305f43b0d9ac (HEAD -> main)  
Author: linduarte <clldscotti@gmail.com>  
Date: Tue Sep 19 06:07:03 2023 -0300

Added letter D

PULL REQUESTS 0

commit e999df570eddb019d4460fde0a57c8fef01de4f8 (origin/main, origin/HEAD)  
Author: linduarte <140444382+linduarte@users.noreply.github.com>  
Date: Tue Sep 19 04:45:02 2023 -0300

Source code added

commit a3f34eff07bb02bfa723baf6477eefe1689412bd  
Author: linduarte <140444382+linduarte@users.noreply.github.com>  
Date: Tue Sep 19 04:24:29 2023 -0300

SUBMODULES 0

GITHUB ACTIONS 0

commit 8f1749f2bcf9a915cda47191da40305f43b0d9ac (HEAD -> main)  
Author: linduarte <clldscotti@gmail.com>  
Date: Tue Sep 19 06:07:03 2023 -0300

Initial commit

commit: 8f1749

Added letter D

linduarte authored 19/09/2023 @ 06:07

3 modified

Path Tree View all files

cities.html  
names.html  
pilots.html

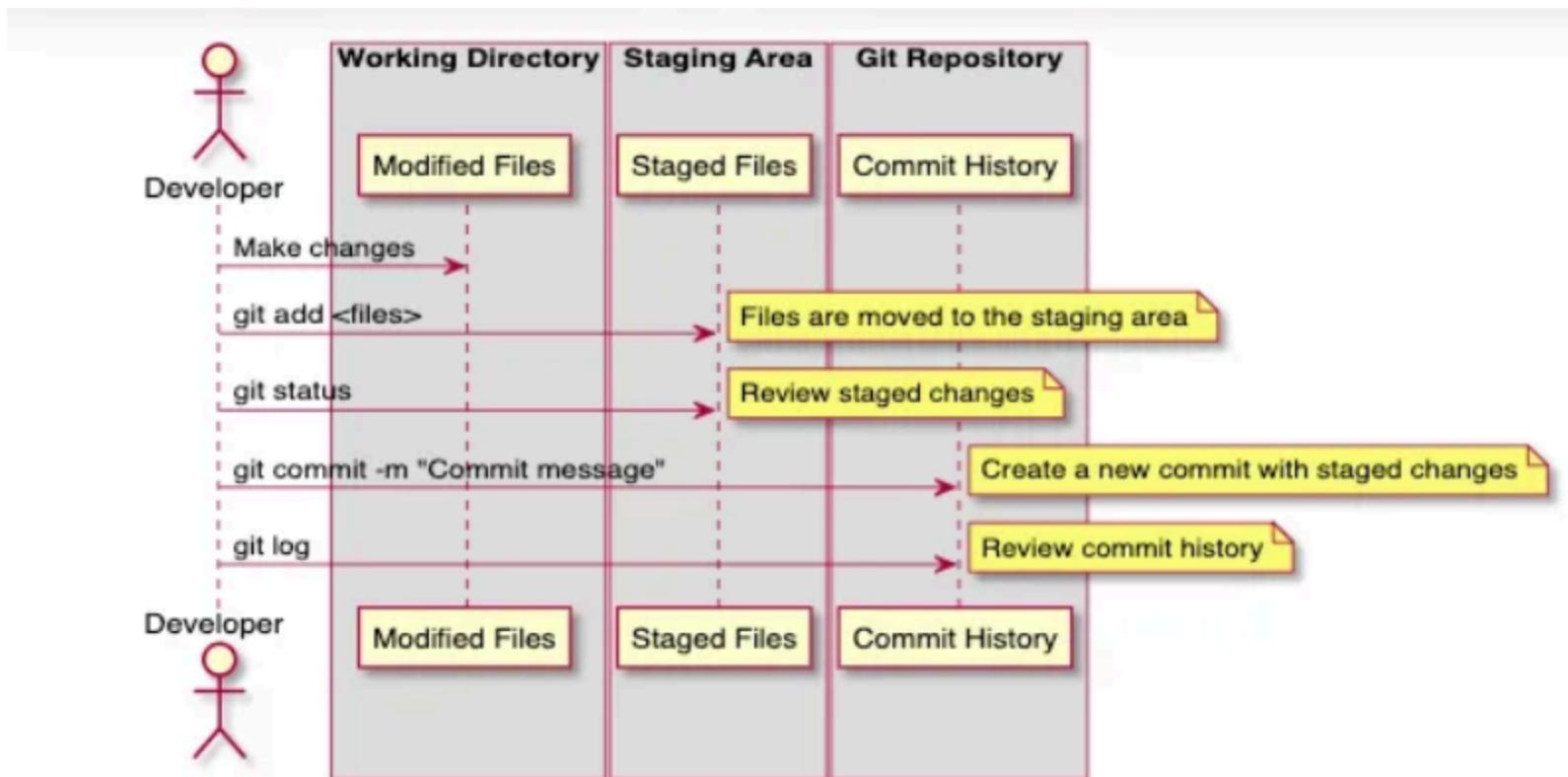
A commit is a central concept in Git. Each commit represents a version of your project. You can also think of a commit as a snapshot of your project at a specific point in time. Commits allow users to undo changes in a project and go back to previous versions. We will shortly explore these features.

It is also possible to apply switches to the git log command to output information in a more compact format.

```
06:39:05 simple-website main 400ms
→ git log --oneline --decorate
8f1749f (HEAD -> main) Added letter D
e999df5 (origin/main, origin/HEAD) Source code added
a3f34ef Initial commit
```

# A graphical vision of Git commit

## git commit process



# Git Kraken give us a full log up to now

Activity Logs	
	Application
[04:41:47]	Stage 7 files for commit: started.
[04:41:47]	Stage 7 files for commit: finished. 76ms
[04:45:01]	Commit: started.
[04:45:03]	Commit: successfully created commit e999df570eddb019d4460fde0a57c8fef01de4f8
[04:45:03]	Commit: finished 1.944s
[04:51:30]	Push main: started.
[04:51:33]	Push main: finished. 3.517s
[06:04:05]	Unstage 3 files: started.
[06:04:05]	Unstage 3 files: finished. 31ms
[06:04:19]	Stage 3 files for commit: started.
[06:04:19]	Stage 3 files for commit: finished. 64ms
[06:04:22]	Unstage 3 files: started.
[06:04:22]	Unstage 3 files: finished. 31ms
[06:06:31]	Stage 3 files for commit: started.
[06:06:31]	Stage 3 files for commit: finished. 60ms
[06:07:03]	Commit: started.
[06:07:04]	Commit: successfully created commit 8f1749f2bcf9a915cda47191da40305f43b0d9ac
[06:07:04]	Commit: finished 1.376s

# A vision from Sourcetree app

---

The screenshot shows a Git client interface with the following details:

**File Menu:** File, Edit, View, Repository, Actions, Tools, Help

**Repository:** alphabet\_website (selected), simple-website

**Toolbar:** Commit, Pull, Push (1), Fetch, Branch, Merge, Stash, Discard, Tag, Git-flow, Remote, Terminal, Explorer, Settings

**Left Sidebar:**

- WORKSPACE: File Status, History (selected), Search
- BRANCHES: main (selected)
- TAGS
- REMOTES
- STASHES

**Commit History:**

Description	Date	Author	Commit
Added letter D	19 set 2023 6:07	linduarte <cldscott>	8f1749f
origin/main	19 set 2023 4:45	linduarte <140444>	e999df5
origin/HEAD	19 set 2023 4:24	linduarte <140444>	a3f34ef
Initial commit			

**Bottom Panel:**

Sorted by file status

Commit: 8f1749f2bcf9a915cda47191da40305f43b0d9ac [8f1749f]  
Parents: e999df570e  
Author: linduarte <cldscotti@gmail.com>  
Date: terça-feira, 19 de setembro de 2023 06:07:03  
Committer: linduarte

Added letter D

**Diff View:** cities.html

Hunk 1 : Lines 20-26

20	20	.....<li>Atlanta</li>
21	21	.....<li>Boston</li>
22	22	.....<li>Chicago</li>
23	23	+<li>Detroit</li>
24	24	...<!-- ALPHABET-END -->
25	25	...</ul>
26	26	...</div>

Reverse hunk

cities.html  
names.html  
pilots.html

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# A vision from GitHub Desktop

The screenshot shows the GitHub Desktop application interface. At the top, the menu bar includes File, Edit, View, Repository, Branch, and Help. The title bar displays "Current repository simple-website" and "Current branch main". A status bar at the top right indicates "Push origin" and "Last fetched 7 hours ago".

The main area has two tabs: "Changes" and "History", with "History" being the active tab. The history pane shows a single commit titled "Added letter D" by user "linduarte" (commit hash: 8f1749f). The commit message is "Added letter D". The commit details show three changed files: cities.html, names.html, and pilots.html.

**cities.html**

	20	21	22	23	24	25	26
↑				+			
...							
	@@ -20,6 +20,7 @@						
	<li>Atlanta</li>						
	<li>Boston</li>						
	<li>Chicago</li>						
	+ <li>Detroit</li>						
	<!-- ALPHABET END -->						
	<ul>						
	</div>						

**names.html**

	20	21	22	23	24	25	26
↑				+			
...							
	@@ -20,6 +20,7 @@						
	<li>Atlanta</li>						
	<li>Boston</li>						
	<li>Chicago</li>						
	+ <li>Detroit</li>						
	<!-- ALPHABET END -->						
	<ul>						
	</div>						

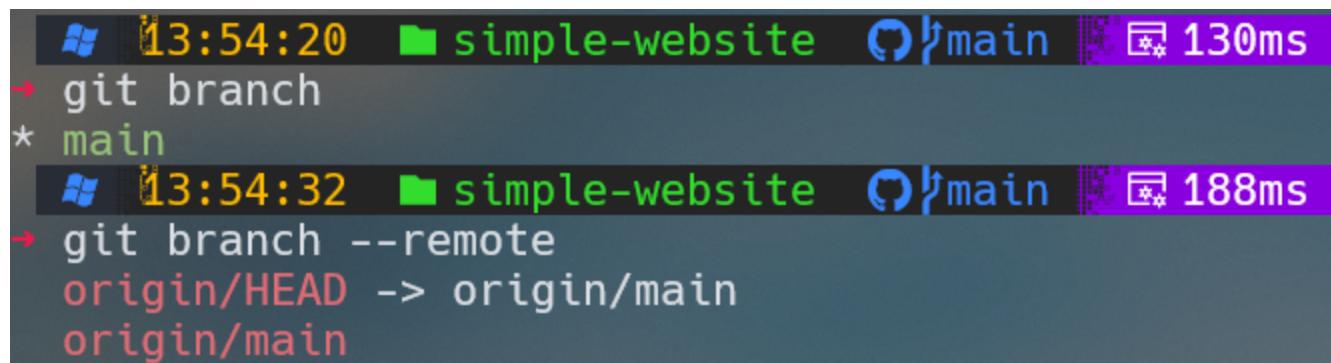
**pilots.html**

	20	21	22	23	24	25	26
↑				+			
...							
	@@ -20,6 +20,7 @@						
	<li>Atlanta</li>						
	<li>Boston</li>						
	<li>Chicago</li>						
	+ <li>Detroit</li>						
	<!-- ALPHABET END -->						
	<ul>						
	</div>						

## What is a Branch?

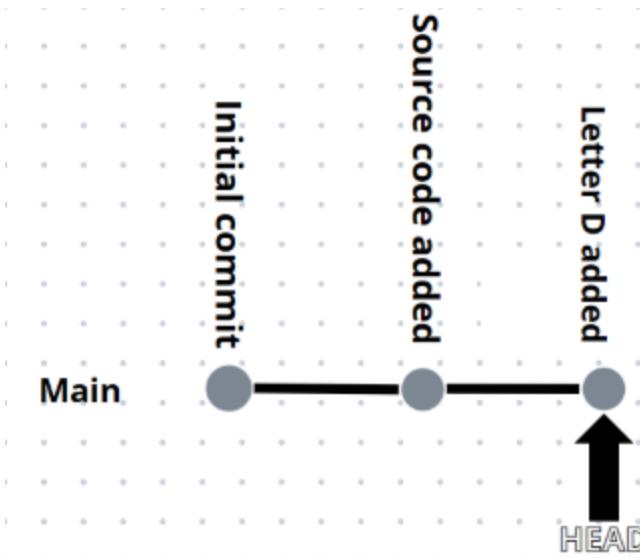
A branch represents an *independent line of development* in a project with its own *separate history of commits*. You can list the branches in the local repository by running the git branch command. The --remote switch shows the local copy of the branches in the remote repository on GitHub.

You can list the branches in the local repository by running the **git branch** command. The --remote switch shows the local copy of the branches in the remote repository on GitHub.

A screenshot of a Windows terminal window titled "simple-website". The title bar shows the time as 13:54:20 and the repository name as simple-website. The main area of the terminal shows the output of the git branch command. The first run of the command shows the local branch "main" with a green asterisk (\*). The second run of the command, using the --remote switch, shows the local copy of the branch "main" in the remote repository "origin", indicated by the red text "origin/main".

```
13:54:20 simple-website main 130ms
git branch
* main
13:54:32 simple-website main 188ms
git branch --remote
origin/HEAD -> origin/main
origin/main
```

Right now your repository has only a single branch called main both locally and remotely. When you first setup a repository Git creates the main branch automatically for you. All Git projects have a main branch by default. If your Git project were a tree the main branch would be the trunk. From the trunk it is possible to manually create separate lines of development as independent branches with their own separate commits.



## Comparing Versions

It is important at this point to note that there are several versions of a file in a Git project:

- 1 - The **working directory** version (the one that you use for editing)
- 2 - The **staged** version (after you run `git add <file>` to add the file to the index for the next commit)
- 3 - The **committed** versions (one version for each commit)

The **git diff** command shows changes between the working directory, index and commit versions.

To explore the capabilities of the `git diff` command we need to create some additional versions.

Implement the following feature request: add the letter E to the Phonetic Website.

```
<h1>Pilot's Alphabet</h1>
<ul id="pilot">
<!-- ALPHABET START --&gt;
&lt;li&gt;Alpha&lt;/li&gt;
&lt;li&gt;Bravo&lt;/li&gt;
&lt;li&gt;Charlie&lt;/li&gt;
&lt;li&gt;Delta&lt;/li&gt;
&lt;li&gt;Echo&lt;/li&gt;
<!-- ALPHABET END --&gt;</pre>
```

```
<h1>Cities' Alphabet</h1>
<ul id="city">
<!-- ALPHABET START --&gt;
&lt;li&gt;Atlanta&lt;/li&gt;
&lt;li&gt;Boston&lt;/li&gt;
&lt;li&gt;Chicago&lt;/li&gt;
&lt;li&gt;Detroit&lt;/li&gt;
&lt;li&gt;Eldorado&lt;/li&gt;
<!-- ALPHABET END --&gt;</pre>
```

```
<h1>Names' Alphabet</h1>
<ul id="name">
<!-- ALPHABET START --&gt;
&lt;li&gt;Andrew&lt;/li&gt;
&lt;li&gt;Brigitte&lt;/li&gt;
&lt;li&gt;Charles&lt;/li&gt;
&lt;li&gt;David&lt;/li&gt;
&lt;li&gt;Eva&lt;/li&gt;
<!-- ALPHABET END --&gt;</pre>
```

Pilots	Cities	Names
--------	--------	-------

## Pilot's Alphabet

- Alpha
- Bravo
- Charlie
- Delta
- Echo

Pilots	Cities	Names
--------	--------	-------

## Cities' Alphabet

- Atlanta
- Boston
- Chicago
- Detroit
- Eldorado

Pilots	Cities	Names
--------	--------	-------

## Names' Alphabet

- Andrew
- Brigitte
- Charles
- David
- Eva

## Check status and add files to the index (staging area)

```
14:35:57 simple-website main ~3 168ms
→ git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
    modified:   cities.html
    modified:   names.html
    modified:   pilots.html

no changes added to commit (use "git add" and/or "git commit -a")
14:36:02 simple-website main ~3 206ms
→ git add *.html
```

Now implement another feature request: **add the letter F to the Phonetic Website.** For example you can add the words "Foxtrot" to pilots.html,"Fillmore" to cities.html and "Fred" to names.html.

This time **do not stage**.

As you can see from the output of `git status` we have now two different versions of the HTML files. One version contains the staged changes in the first exercise. The second one contains the unstaged changes we did in the second exercise. And of course we also have the committed versions as shown by `git log`:

```
14:47:47 simple-website main ~3 | ~3 190ms
→ git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
    modified:   cities.html
    modified:   names.html
    modified:   pilots.html

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
    modified:   cities.html
    modified:   names.html
    modified:   pilots.html
```

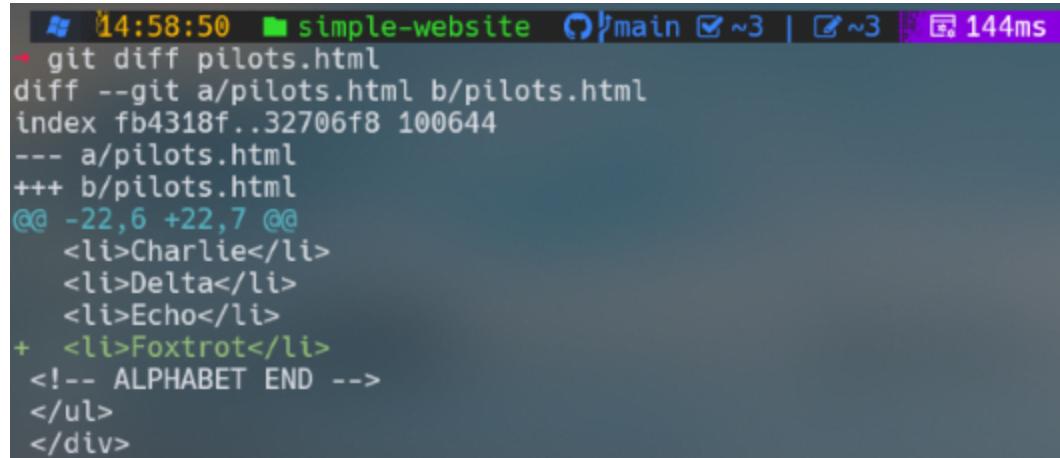
Let's check with git log the committed versions

```
14:52:28 simple-website main ~3 | ~3 108ms
→ git log --oneline --decorate
8f1749f (HEAD -> main) Added letter D
e999df5 (origin/main, origin/HEAD) Source code added
a3f34ef Initial commit
```

We can now use `git diff` to view the differences between the various versions. We will take the `pilots.html` file as an example.

## Viewing Unstaged Changes

To view the changes in `pilots.html` that have not been staged type:



```
14:58:50 simple-website main ~3 | ~3 144ms
git diff pilots.html
diff --git a/pilots.html b/pilots.html
index fb4318f..32706f8 100644
--- a/pilots.html
+++ b/pilots.html
@@ -22,6 +22,7 @@
<li>Charlie</li>
<li>Delta</li>
<li>Echo</li>
+<li>Foxtrot</li>
<!-- ALPHABET END -->
</ul>
</div>
```

The output shows that the line containing the word Foxtrot has been added as indicated by the plus (+) sign. That is expected as we have added the word Foxtrot without staging the change in the second exercise.

## Let's check git log and viewing unstaged changes by git diff

```
15:00:24  simple_website  main ~3 | ~3  114ms
→ git log --oneline --decorate
aaabd6b (HEAD -> main) Added letter D
7cdb449 (origin/main, origin/HEAD) Source code added
0af44e4 Initial commit
15:00:50  simple_website  main ~3 | ~3  186ms
→ # Using git diff to view the differences between the various versions
15:04:37  simple_website  main ~3 | ~3
→ git diff pilots.html
diff --git a/pilots.html b/pilots.html
index fb4318f..32706f8 100644
--- a/pilots.html
+++ b/pilots.html
@@ -22,6 +22,7 @@
<li>Charlie</li>
<li>Delta</li>
<li>Echo</li>
+ <li>Foxtrot</li>
<!-- ALPHABET END -->
</ul>
```

Interpreting the output of the `git diff pilots.html` command line by line.

1. `diff --git a/pilots.html b/pilots.html`: This line indicates that the `git diff` command is comparing two versions of the file `pilots.html`. The `a/pilots.html` represents the original file, while `b/pilots.html` represents the modified file.
2. `index fb4318f..32706f8 100644`: This line provides information about the file index. It shows the commit hashes (`fb4318f` and `32706f8`) of the original and modified versions of `pilots.html`. The `100644` represents the file mode, which is typically associated with regular files.

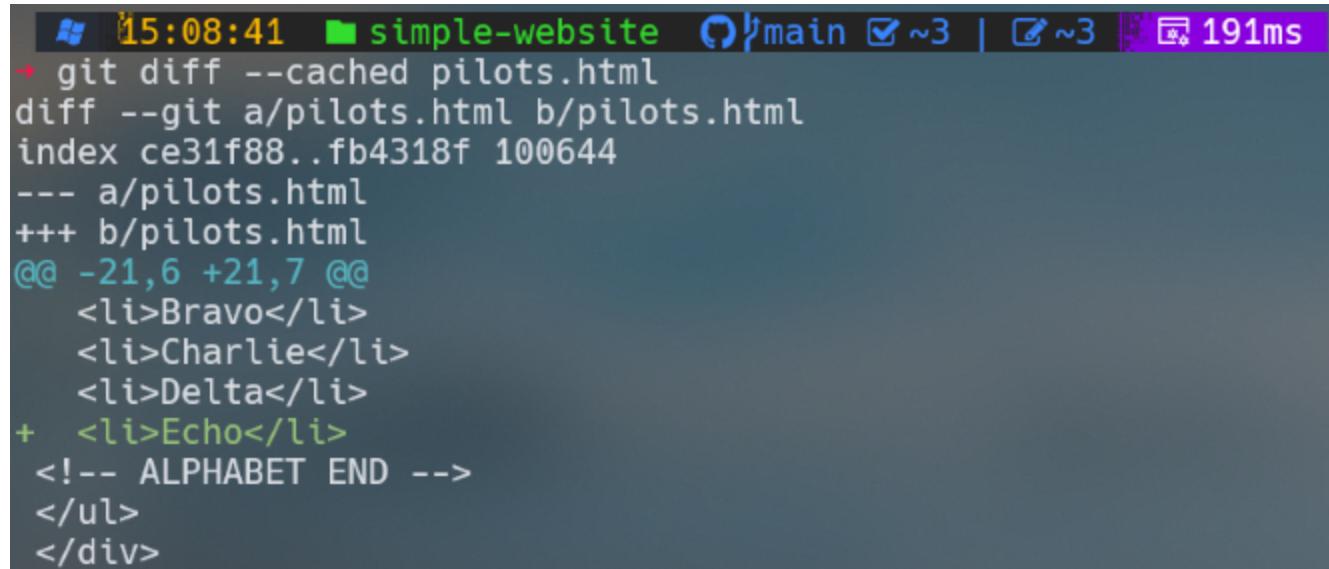
3. **---** `a/pilots.html`: This line indicates the start of the section related to the original version of the file (`a/pilots.html`).
4. **+++** `b/pilots.html`: This line indicates the start of the section related to the modified version of the file (`b/pilots.html`).
5. **@@ -22,6 +22,7 @@**: This line is the unified diff header. It provides information about the line numbers and context for the changes that follow:
  - **-22,6**: This means that the change begins at line 22 in the original file and affects 6 lines.
  - **+22,7**: This means that the change begins at line 22 in the modified file and affects 7 lines. The **+** indicates that a line has been added.

So, in summary, the git diff output indicates that a single line "

- "Foxtrot"
- " was added at line 22 in the modified pilots.html file compared to the original version.

## Viewing Changes Between the Index and the Last Commit

To view the changes in `pilots.html` between the index (staging area) and the last commit use the `--cached` switch:

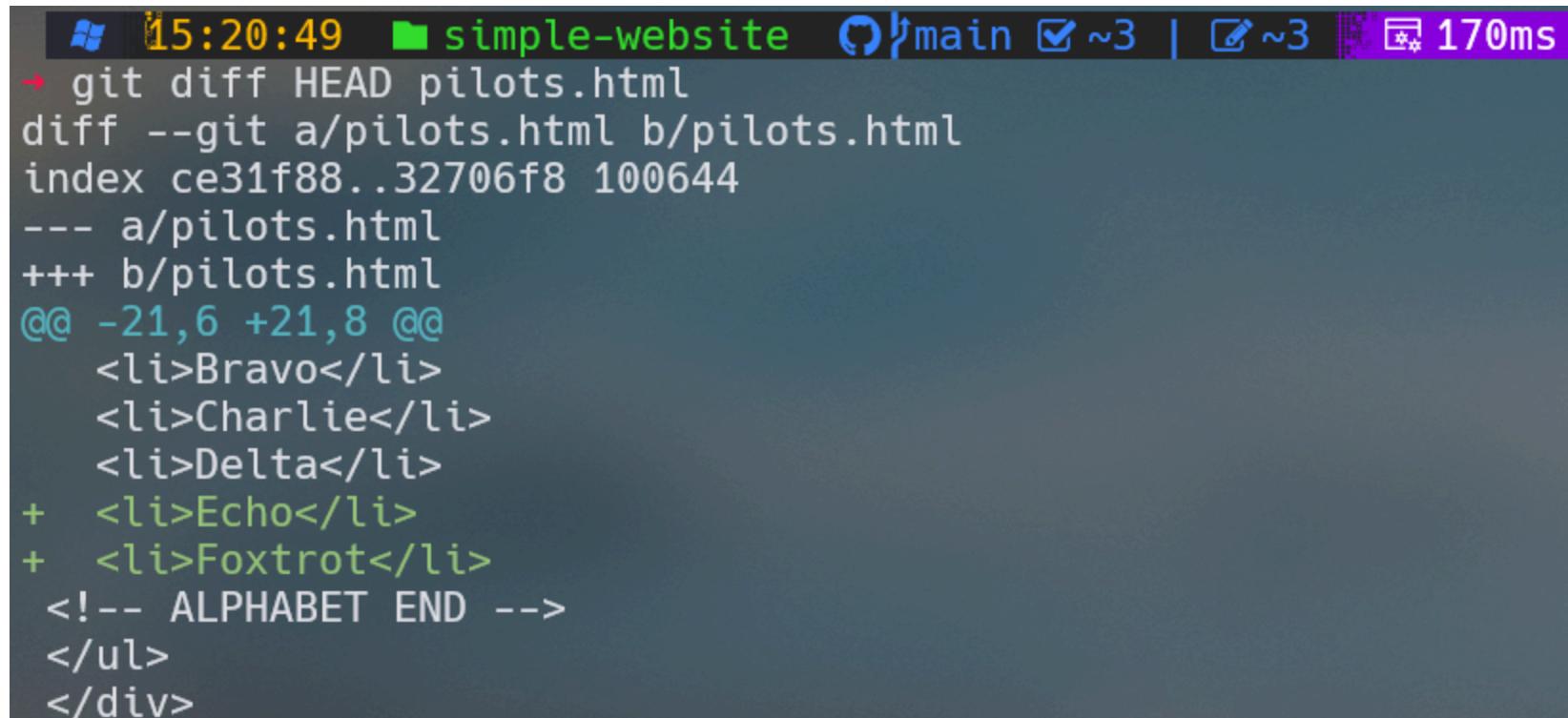


```
15:08:41 simple-website main ~3 | ~3 191ms
→ git diff --cached pilots.html
diff --git a/pilots.html b/pilots.html
index ce31f88..fb4318f 100644
--- a/pilots.html
+++ b/pilots.html
@@ -21,6 +21,7 @@
<li>Bravo</li>
<li>Charlie</li>
<li>Delta</li>
+ <li>Echo</li>
<!-- ALPHABET END -->
</ul>
</div>
```

The output shows that the line containing the word Echo has been added as indicated by the plus (+) sign. That is expected since we have staged this change in the first exercise.

## Viewing Changes Since the Last Commit

To view the changes in `pilots.html` since the last commit type:

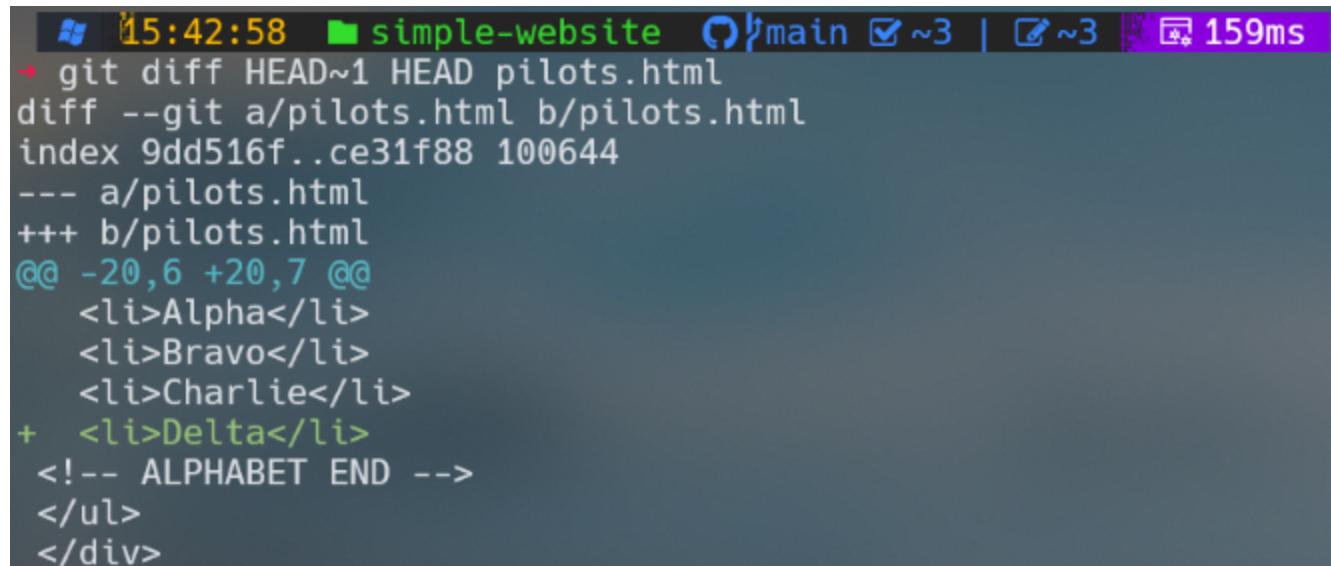


```
15:20:49 simple-website main ~3 | ~3 170ms
git diff HEAD pilots.html
diff --git a/pilots.html b/pilots.html
index ce31f88..32706f8 100644
--- a/pilots.html
+++ b/pilots.html
@@ -21,6 +21,8 @@
    <li>Bravo</li>
    <li>Charlie</li>
    <li>Delta</li>
+   <li>Echo</li>
+   <li>Foxtrot</li>
    <!-- ALPHABET END -->
</ul>
</div>
```

The output shows that the lines containing the words Echo and Foxtrot have been added as indicated by the plus (+) signs. The git diff command interprets HEAD as the hash of the last commit. The result is expected since the last commit occurred before we made the changes in the previous two exercises.

## Viewing Changes Between Any Two Commits

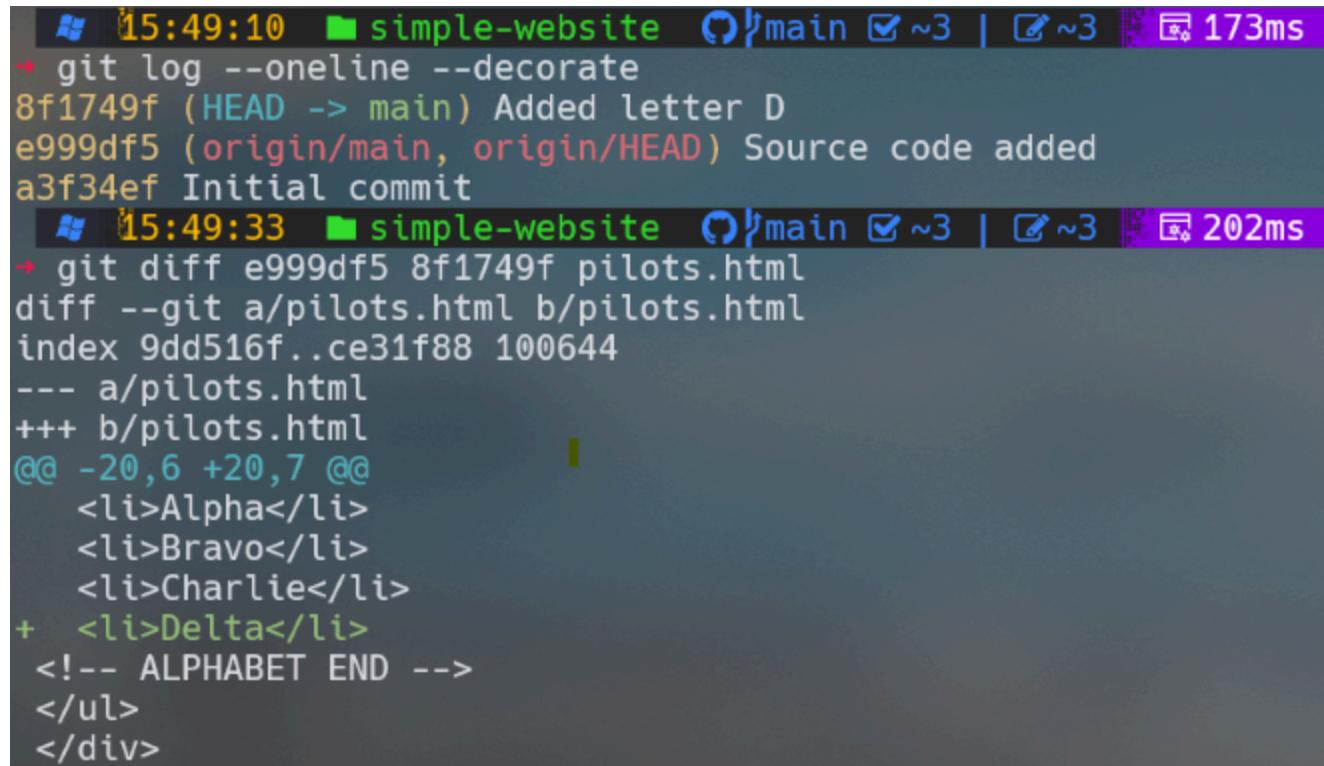
To view the changes between the last commit and the commit before last type:



```
15:42:58 simple-website main ~3 | ~3 159ms
→ git diff HEAD~1 HEAD pilots.html
diff --git a/pilots.html b/pilots.html
index 9dd516f..ce31f88 100644
--- a/pilots.html
+++ b/pilots.html
@@ -20,6 +20,7 @@
 <li>Alpha</li>
 <li>Bravo</li>
 <li>Charlie</li>
+ <li>Delta</li>
 <!-- ALPHABET END -->
 </ul>
 </div>
```

The output shows that the line containing the word Delta has been added as indicated by the plus (+) sign. The `git diff` command interprets `HEAD~1` as the hash of the commit before last.

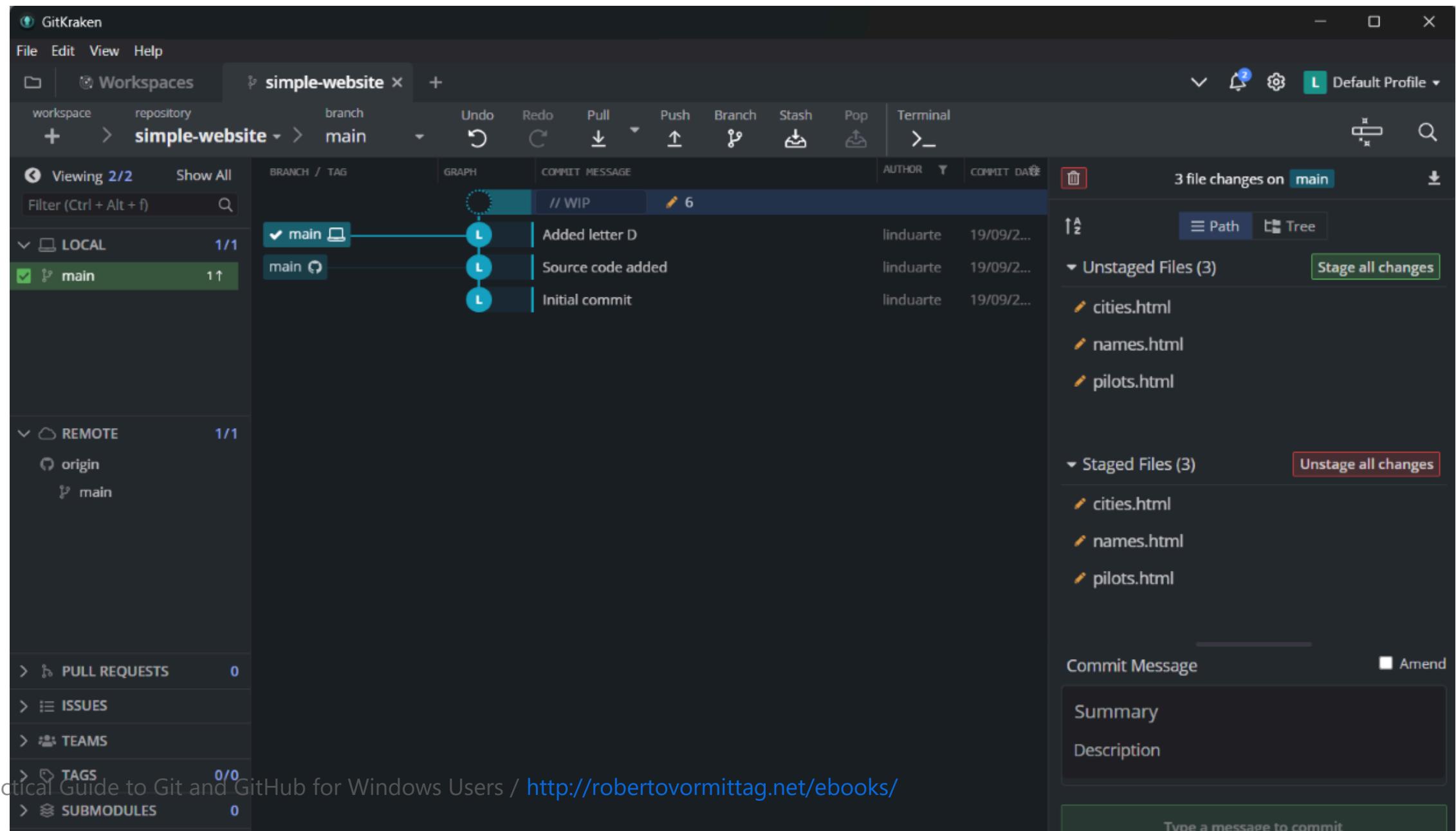
You can also use the short hash obtained from `git log` to view the difference between any two commits:



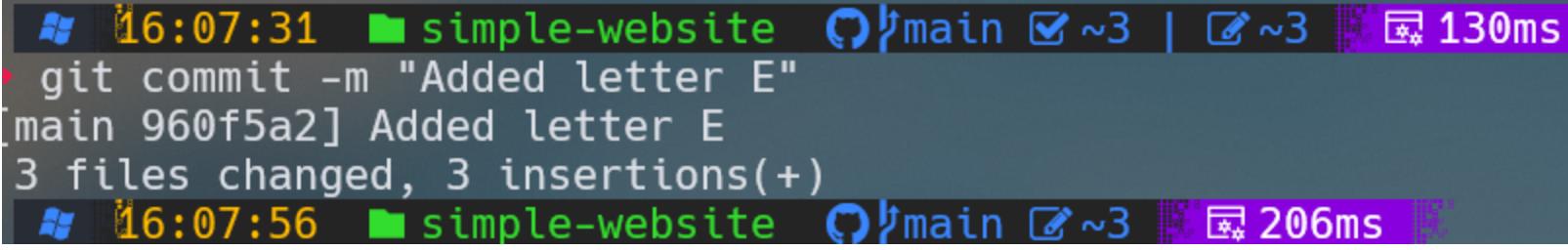
The screenshot shows a Windows terminal window with two command-line sessions. The top session runs `git log --oneline --decorate` on a branch named `main`. It lists three commits: `8f1749f` (HEAD), `e999df5` (origin/main), and `a3f34ef` (initial commit). The bottom session runs `git diff e999df5 8f1749f` to compare the files `pilots.html` between these two commits. The diff output shows the addition of a new list item `<li>Delta</li>` in the `b/pilots.html` file.

```
15:49:10 simple-website ⚡ main ✘ ~3 | 🖍~3 173ms
→ git log --oneline --decorate
8f1749f (HEAD -> main) Added letter D
e999df5 (origin/main, origin/HEAD) Source code added
a3f34ef Initial commit
15:49:33 simple-website ⚡ main ✘ ~3 | 🖍~3 202ms
→ git diff e999df5 8f1749f pilots.html
diff --git a/pilots.html b/pilots.html
index 9dd516f..ce31f88 100644
--- a/pilots.html
+++ b/pilots.html
@@ -20,6 +20,7 @@
  <li>Alpha</li>
  <li>Bravo</li>
  <li>Charlie</li>
+ <li>Delta</li>
<!-- ALPHABET END -->
</ul>
</div>
```

In the example above the hashes `e999df5` and `8f1749f` identify the before last and last commits.



We have now covered all the basic use cases. Before moving to the next section let's commit the pending changes. First commit the letter E change request which is already staged:



```
16:07:31 simple-website main ~3 | ~3 130ms
git commit -m "Added letter E"
[main 960f5a2] Added letter E
 3 files changed, 3 insertions(+)
16:07:56 simple-website main ~3 206ms
```

A screenshot of a Windows terminal window. The title bar says 'simple-website'. The command 'git commit -m "Added letter E"' is being typed. After the commit, the output shows a new commit hash '960f5a2' and a message 'Added letter E'. It also indicates '3 files changed, 3 insertions(+)'.

Now stage and commit the letter F change request:

```
16:11:15 simple-website main ~3 184ms
git add *.html
16:11:30 simple-website main ~3 224ms
git commit -m "Added letter F"
[main 6589910] Added letter F
 3 files changed, 3 insertions(+)
16:11:49 simple-website main 237ms
```

You should now have a clean working directory and a longer history log:

```
16:15:54 simple-website main 220ms
→ git status
On branch main
Your branch is ahead of 'origin/main' by 3 commits.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
16:16:00 simple-website main 209ms
→ git log --oneline --decorate
6589910 (HEAD -> main) Added letter F
960f5a2 Added letter E
8f1749f Added letter D
e999df5 (origin/main, origin/HEAD) Source code added
a3f34ef Initial commit
```

Comparing what has changed between different versions of a source code file is very useful, but what if we want to **undo** a change?

### *Undoing Changes*

One of the reasons to track a project's history is to have the ability to undo changes. It is a common situation in software development: you change something, you test the change and it does not quite work the way you expected. You then decide to revert the code back to the previous version. With Git you can easily accomplish that.

**There are three possible undo scenarios in Git:**

- 1 - Undoing changes in the working directory before staging**
- 2 - Undoing changes after staging and before committing**
- 3 - Undoing committed changes**

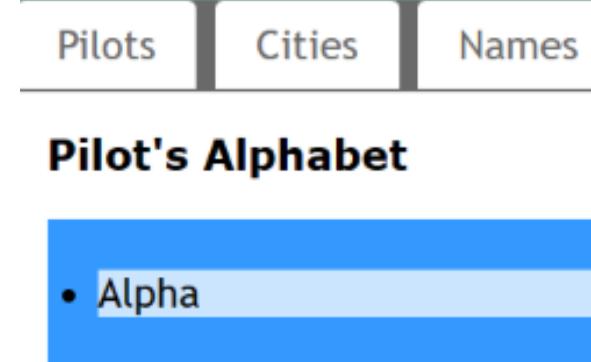
## Unwanted Change

To demonstrate each of the above scenarios we will need an unwanted change to undo. We will again use the Phonetic Website project to experiment with. If you have followed all the exercises in the previous sections you should now have a clean working directory without any uncommitted changes.

Open `pilots.html` in a text editor and delete all the words except "Alpha" so that the alphabet ends up looking like this:

```
<h1>Pilot's Alphabet</h1>
<ul id="pilot">

| <li>Alpha</li>
<!-- ALPHABET END --&gt;</pre>
```



Save the change and test how the page looks now when browsing the website. You should have only the letter A left in the Pilot's Alphabet. We will learn how to recover the lost words using Git undo features. In this simple case you could just manually add the lost words again to fix the problem. Suppose however the change involved editing dozens of lines of code in various parts of the source file. In that case it would be impossible to correct it manually. In such a situation Git undo features become invaluable.

## Undoing Changes Before Staging

To recover the lost words in `pilots.html` (following the "Unwanted Change Exercise" at the beginning of this section) all you have to do is to revert the file back to its last committed version using the [git checkout](#) command as follows:

```
 16:51:52 simple-website main ~1 153ms
→ git checkout pilots.html
Updated 1 path from the index
 16:52:25 simple-website main 177ms
→ git status
On branch main
Your branch is ahead of 'origin/main' by 3 commits.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
```

Pilots      Cities      Names

### Pilot's Alphabet

- Alpha
- Bravo
- Charlie
- Delta
- Echo
- Foxtrot

# Undoing Changes After Staging

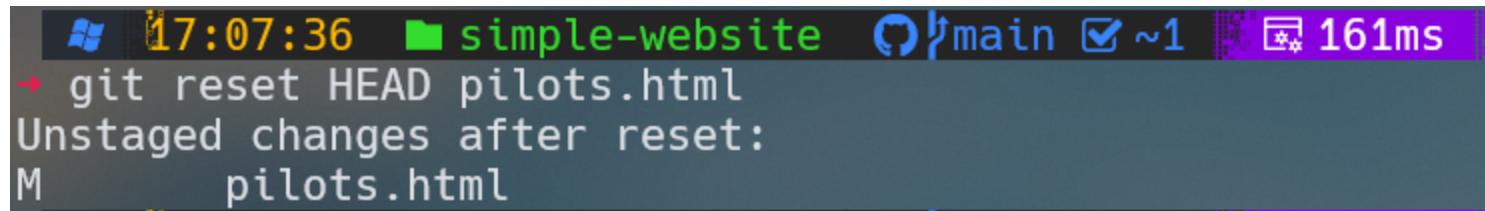
Repeat the "Unwanted Change Exercise" at the beginning of this section. Now stage the change:

```
<h1>Pilot's Alphabet</h1>
<ul id="pilot">
<!-- ALPHABET START --&gt;
| &lt;li&gt;Alpha&lt;/li&gt;
&lt;!-- ALPHABET END --&gt;</pre>
```

```
17:03:04  simple-website  main ~1  191ms
→ git add pilots.html
17:03:24  simple-website  main ~1  170ms
→ git status
On branch main
Your branch is ahead of 'origin/main' by 3 commits.
  (use "git push" to publish your local commits)

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
    modified:   pilots.html
```

Run `git status`. It shows that `pilots.html` is ready to be committed. It also suggests to run `git reset HEAD <file>` to un-stage the change. And that is what we need to do first:



```
17:07:36 simple-website main ~1 161ms
→ git reset HEAD pilots.html
Unstaged changes after reset:
M     pilots.html
```

The `git reset` command has removed the file from the index (staging area) however the unwanted change is still in the working directory. To recover the lost words, you still need to repeat the process for undoing un-staged changes and run `git checkout` to restore the last committed version:

## Git restore x Git reset

Both `git restore` and `git reset` are used to undo changes in your repository. However, they work differently.

`git restore` is used for restoring files in the working tree from the index or another commit. This doesn't update the branch. On the other hand, `git reset` is used to update your branch.

So, if you want to undo changes that you have made to a file in your working directory but haven't staged yet, you can use `git restore`. If you want to undo changes that you have made to a file and have already staged it, you can use `git reset`.

```
17:14:27 simple-website main ~1 175ms
→ git checkout pilots.html
Updated 1 path from the index
17:14:39 simple-website main 209ms
→ git status
On branch main
Your branch is ahead of 'origin/main' by 3 commits.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
```

Pilots Cities Names

### Pilot's Alphabet

- Alpha
- Bravo
- Charlie
- Delta
- Echo
- Foxtrot

# Undoing Committed Changes

Repeat the "Unwanted Change Exercise" at the beginning of this section. This time we are going to commit the unwanted change:

```
<h1>Pilot's Alphabet</h1>
<ul id="pilot">
<!-- ALPHABET START --&gt;
| &lt;li&gt;Alpha&lt;/li&gt;
&lt;!-- ALPHABET END --&gt;</pre>
```

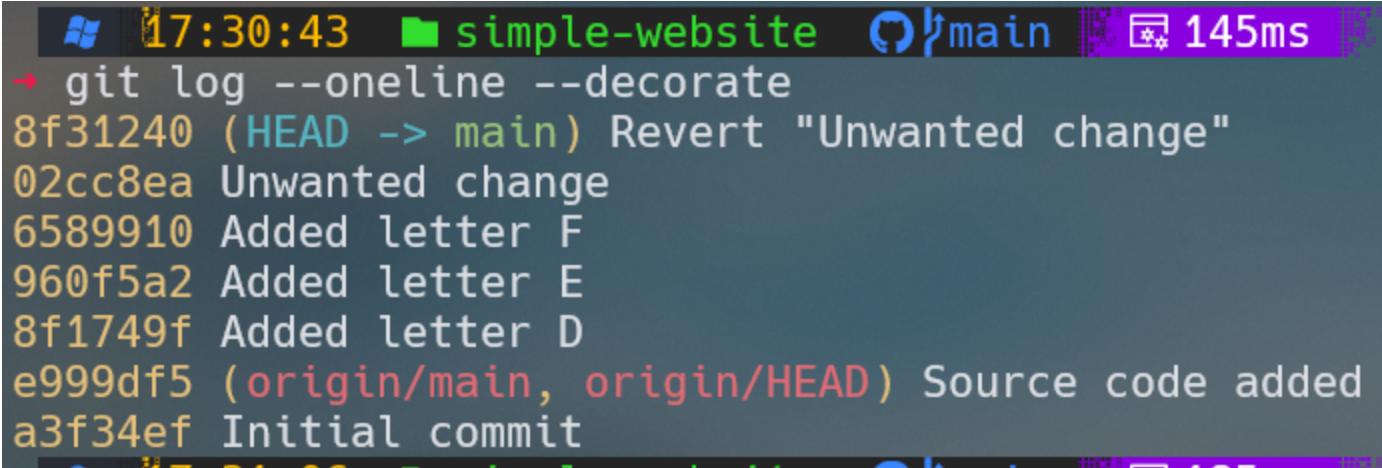
```
17:22:28 simple-website main ~1 171ms
→ git add pilots.html
17:22:42 simple-website main ~1 191ms
→ git commit -m "Unwanted change"
[main 02cc8ea] Unwanted change
 1 file changed, 5 deletions(-)
17:23:12 simple-website main 216ms
→ git log --oneline --decorate
02cc8ea (HEAD -> main) Unwanted change
6589910 Added letter F
960f5a2 Added letter E
8f1749f Added letter D
e999df5 (origin/main, origin/HEAD) Source code added
a3f34ef Initial commit
```

To undo the committed change you need to run the `git revert` command specifying the hash of the unwanted commit as shown in your git log output.

```
17:23:36 simple-website main 211ms
→ git revert 02cc8ea --no-edit
[main 8f31240] Revert "Unwanted change"
Date: Tue Sep 19 17:27:18 2023 -0300
1 file changed, 5 insertions(+)
```

The `--no-edit` flag prevents the commit editor to popup.

## Let's check the project history



```
17:30:43 simple-website main 145ms
→ git log --oneline --decorate
8f31240 (HEAD -> main) Revert "Unwanted change"
02cc8ea Unwanted change
6589910 Added letter F
960f5a2 Added letter E
8f1749f Added letter D
e999df5 (origin/main, origin/HEAD) Source code added
a3f34ef Initial commit
```

As you can see from the git log output a revert commit was added to cancel the effect of the unwanted change. Git is designed to never loose history so it keeps the commit you want to revert and overrides it with a new one.

We have covered in this section three basic undo change scenarios for a single file. Later in the sequence of slides we will learn how to navigate history and get the whole project back to a previous version. In the next section we will learn how to give a meaningful name to stable versions of a project

## Tagging Versions

You can use Git to attach a tag to easily identify a stable version of a project with the `git tag` command. The tag can be any arbitrary string but traditional versioning schemes assign a number sequence starting with zero.

For instance, suppose you want to assign the tag v0.1 to the version (commit) where you added the letter F to the Phonetic Website project. First you need to find out what the short hash is for the corresponding commit from the history log.

```
17:30:43 simple-website main 145ms
→ git log --oneline --decorate
8f31240 (HEAD -> main) Revert "Unwanted change"
02cc8ea Unwanted change
6589910 Added letter F
960f5a2 Added letter E
8f1749f Added letter D
e999df5 (origin/main, origin/HEAD) Source code added
a3f34ef Initial commit
17:31:06 simple-website main 185ms
→ git tag -a v0.1 6589910 -m "v0.1"
17:40:53 simple-website main 131ms
→ git log --oneline --decorate
8f31240 (HEAD -> main) Revert "Unwanted change"
02cc8ea Unwanted change
6589910 (tag: v0.1) Added letter F
960f5a2 Added letter E
8f1749f Added letter D
e999df5 (origin/main, origin/HEAD) Source code added
a3f34ef Initial commit
```

# Tagging Versions

You can use Git to attach a tag to easily identify a stable version of a project with **git tag** command.

## 1- Create a Tag:

To create a tag, you can use the git tag command followed by a tag name. For example, if you want to tag a version 1.0 of your Python project, you can do:

```
git tag 1.0
```

## 2- List Tags:

To see a list of tags in your repository, you can use:

```
git tag
```

### 3- Tagging Commits:

You can also tag specific commits by specifying the commit's SHA-1 hash:

```
git tag -a v1.1 <commit-SHA-1>
```

This creates an annotated tag with a message. Annotated tags are recommended for versioning.

## Tag - Continue

### 4 - Push Tags:

Tags are not automatically pushed to remote repositories when you push changes. To push tags, you can use:

```
git push origin --tags
```

This sends your tags to the remote repository.

### 5 - Checkout Tags:

You can check out a specific tag to view the code at that version:

```
git checkout v1.0
```

## 6 - Delete Tags:

To delete a tag, use the -d option:

```
git tag -d 1.0
```

## 7 - To delete a tag on the remote repository:

```
git push origin --delete 1.0
```

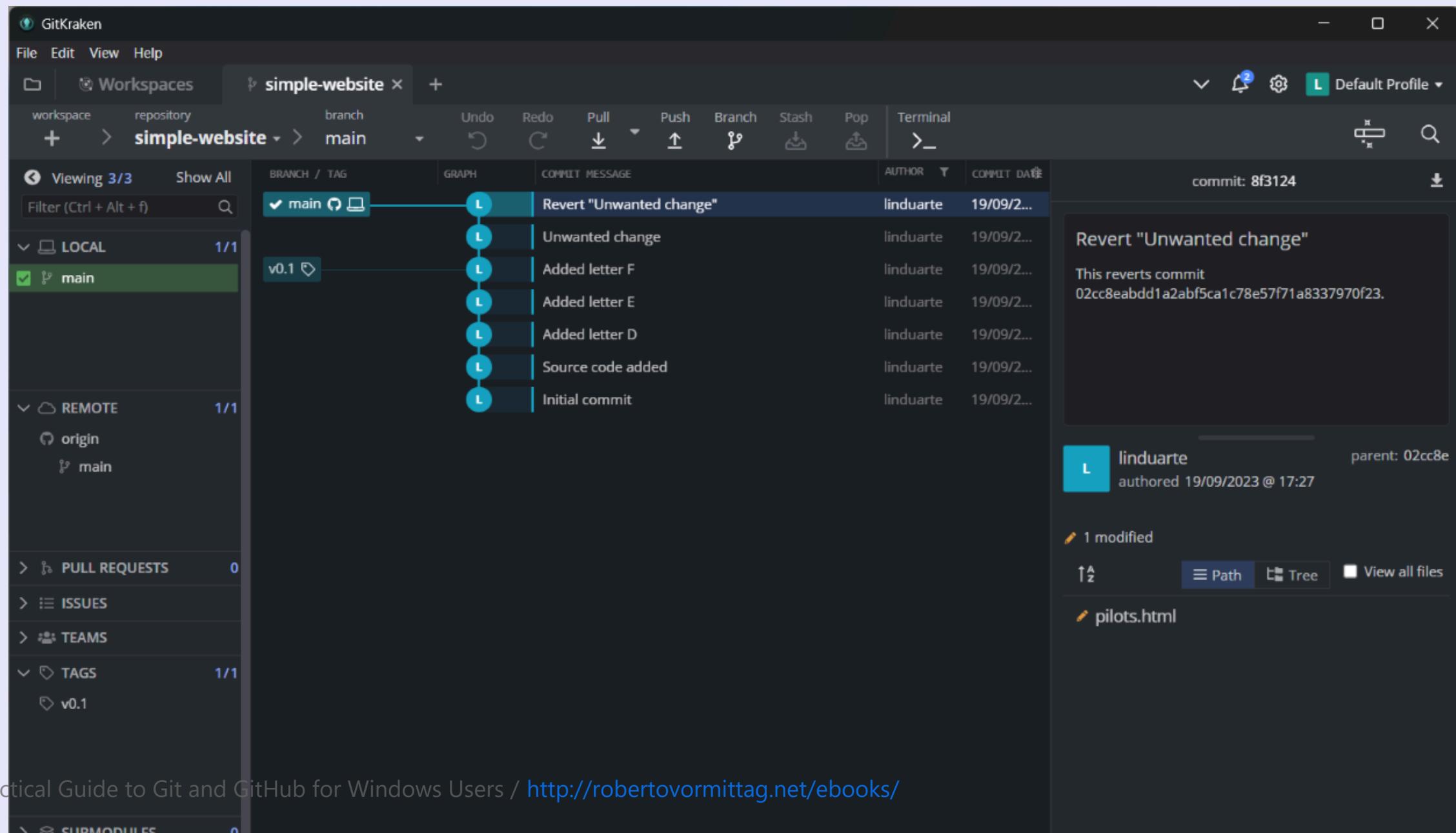
Let's checking the status of the working tree:

```
17:44:13 simple-website main 182ms
→ git status
On branch main
Your branch is ahead of 'origin/main' by 5 commits.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
```

The working directory is clean but the remote repository on GitHub is behind by 5 commits. It is time to synchronize:

```
17:47:09 simple-website main 159ms
→ git push origin main
Enumerating objects: 23, done.
Counting objects: 100% (23/23), done.
Delta compression using up to 16 threads
Compressing objects: 100% (19/19), done.
Writing objects: 100% (19/19), 1.71 KiB | 876.00 KiB/s, done.
Total 19 (delta 12), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (12/12), completed with 3 local objects.
To https://github.com/linduarte/simple-website
  e999df5..8f31240 main -> main
```



## Commits

main ▾

-o- Commits on Sep 19, 2023

Revert "Unwanted change" ...

 linduarte committed 30 minutes ago

 8f31240 

Unwanted change

 linduarte committed 34 minutes ago

 02cc8ea 

Added letter F

 linduarte committed 1 hour ago

 6589910 

Added letter E

 linduarte committed 1 hour ago

 960f5a2 

Added letter D

 linduarte committed 11 hours ago

 8f1749f 

Source code added

 linduarte committed 13 hours ago

 e999df5 

Initial commit

 linduarte committed 13 hours ago

  a3f34ef 

 This commit was created on GitHub.com and signed with GitHub's **verified signature**.

GPG key ID: 4AEE18F83AFDEB23

[Learn about vigilant mode](#)