Introduction to branches

INTERMEDIATE GIT

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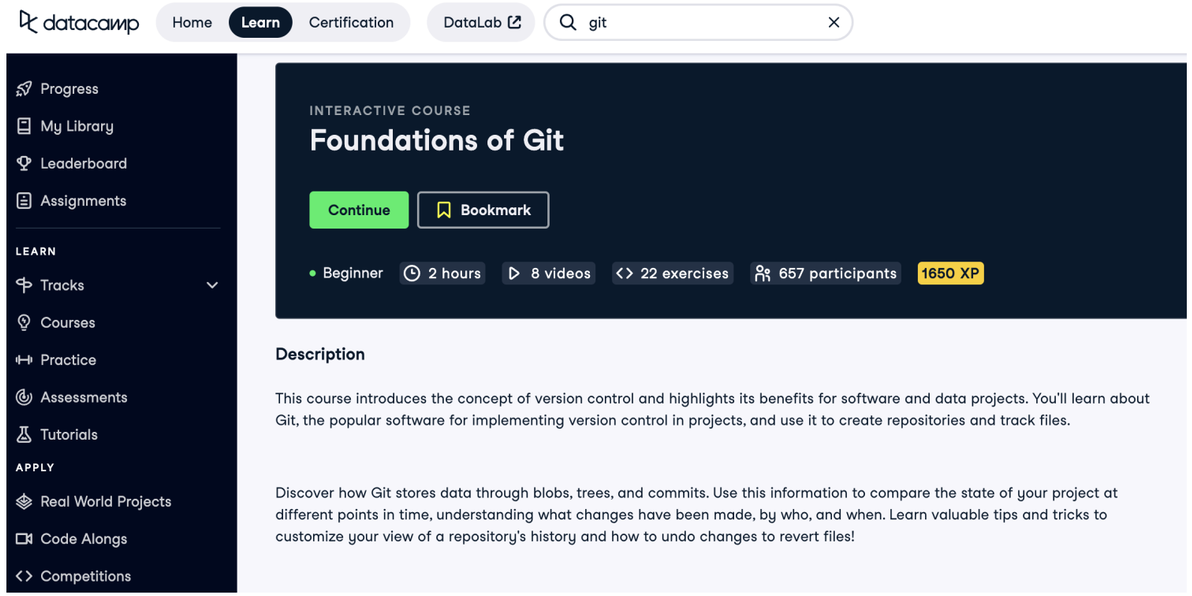
What we will cover

- Branches
- Remotes
- Conflicts

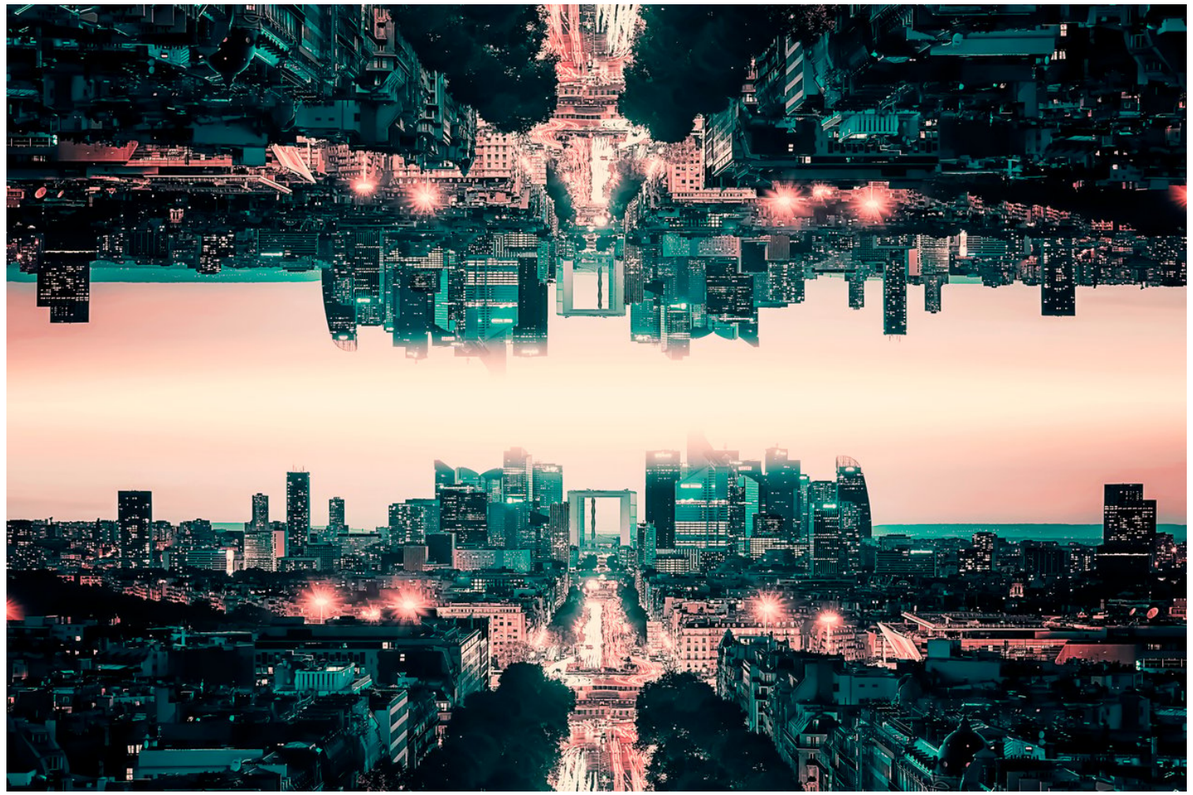
What you should know

- How Git stores data
- How to create repos
- How to make commits
- How to compare versions
- How to revert versions



Branches

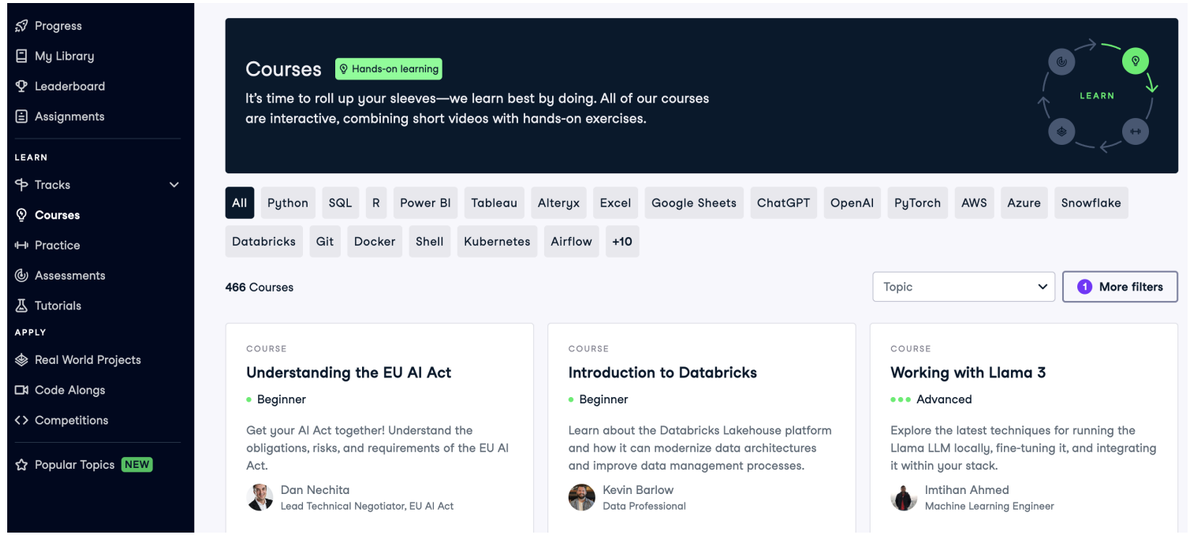
- Branch = an individual **version** of a repo
- Git uses **branches** to systematically track multiple versions of files



- In each branch:
  - Some files might be the same
  - Others might be different
  - Some may not exist at all

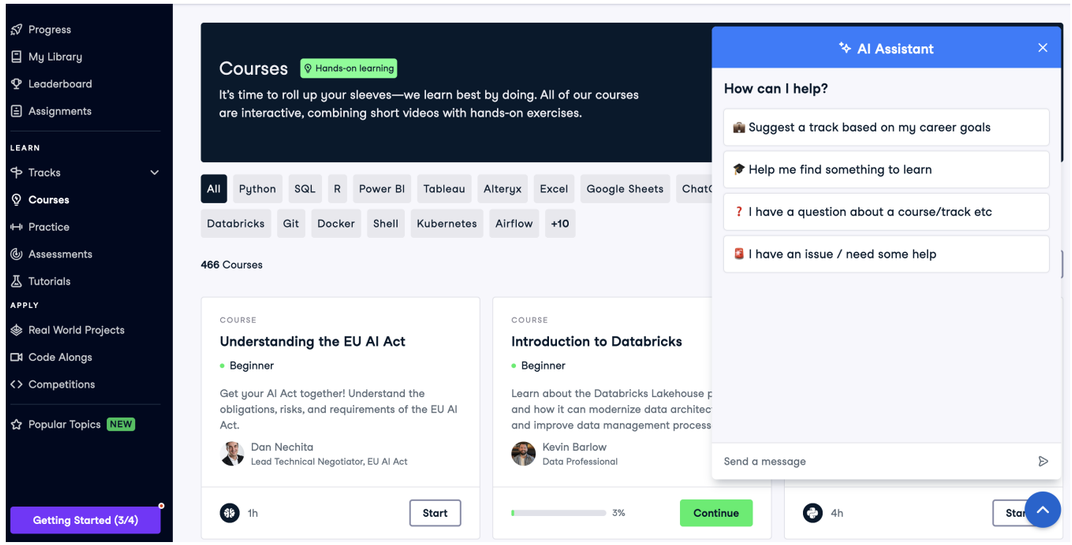
Why use branches?

Live system



- Works as expected
- Default branch = `main`

Feature development

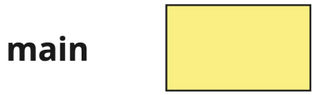


- Might encounter issues during development and testing
- Doesn't affect the live system

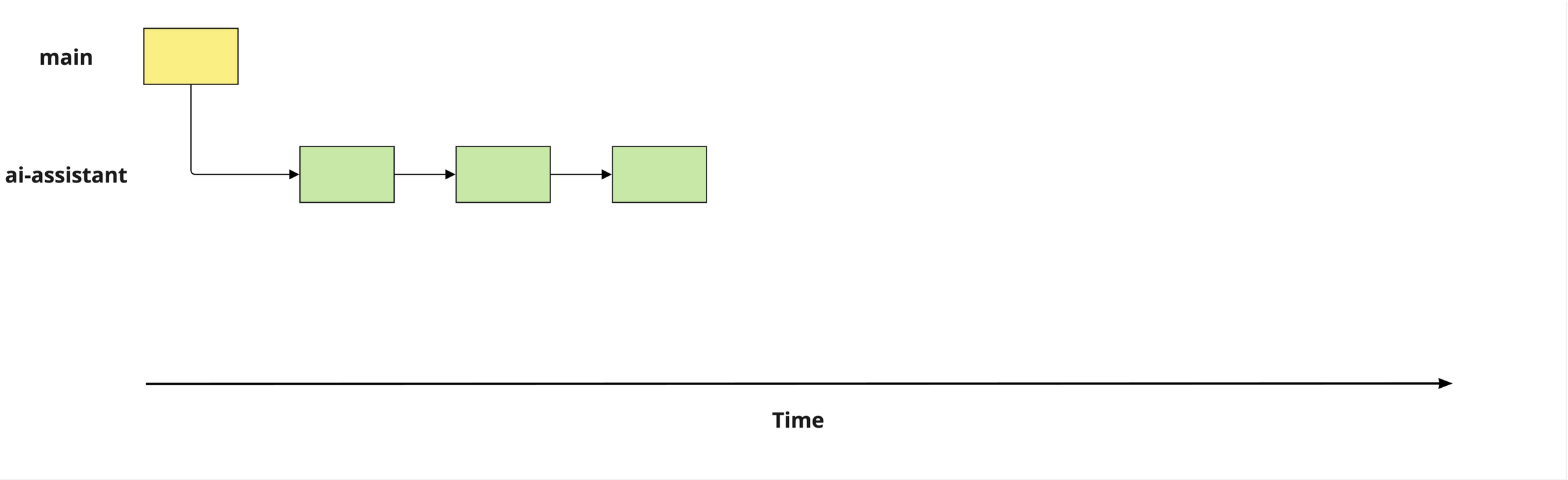
Why use branches?

- Multiple developers can work on a project **simultaneously**
- **Compare the state** of a repo **between branches**
- **Combine contents**, pushing new features to a live system
- Each branch should have a **specific purpose**

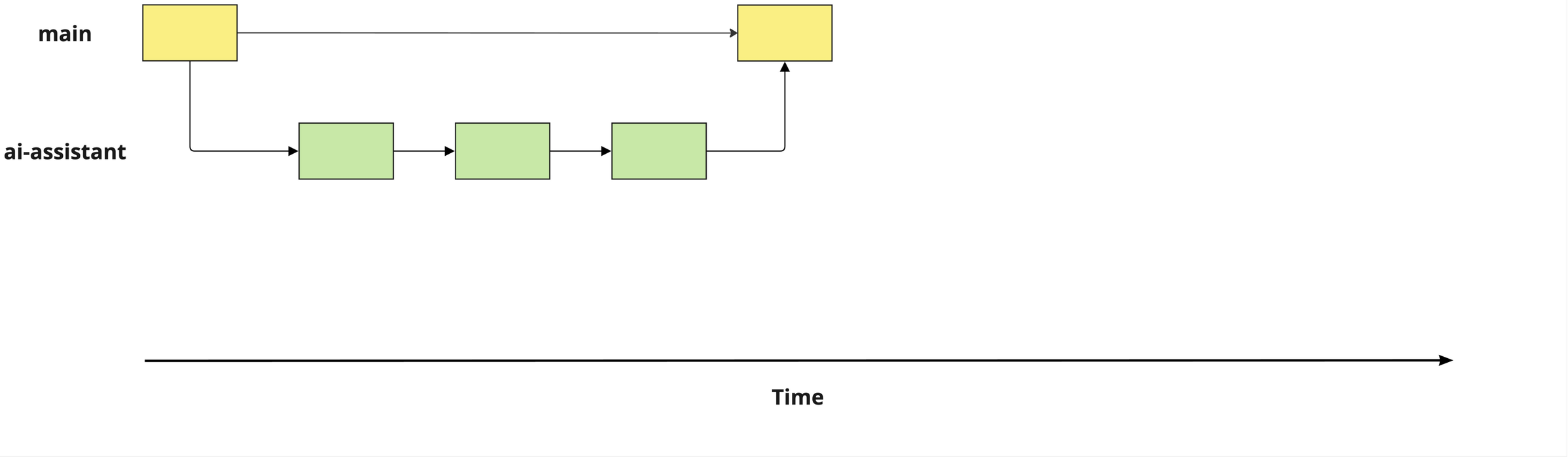
Visualizing branches



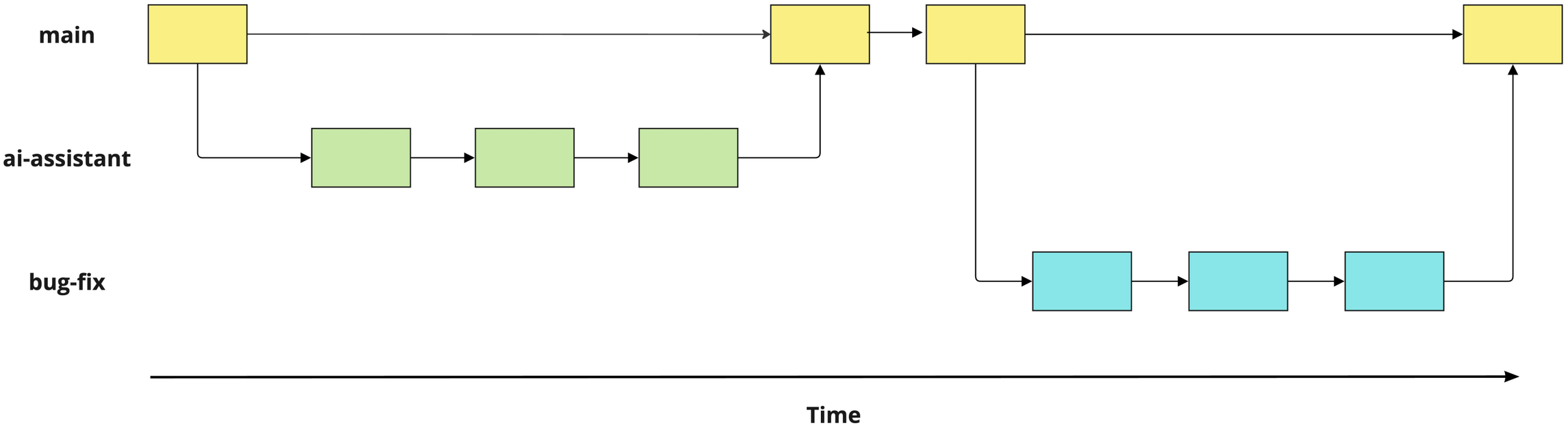
Branching off



Merging back into main



Fixing a bug



Identifying branches

- Listing all branches

```
git branch
```

```
  main
* ai-assistant
```

- `*` = current branch

Switching between branches

```
git switch main
```

```
Switched to branch 'main'
```

Creating a new branch

- Create a new branch called `speed-test`

```
git branch speed-test
```

- Move to the `speed-test` branch

```
git switch speed-test
```

```
Switched to branch 'speed-test'
```

- Create a new branch called `speed-test` **and** switch to it

```
git switch -c speed-test
```

```
Switched to a new branch 'speed-test'
```

Terminology

- Creating a new branch = "branching off"
- Creating `speed-test` from `main` = "branching off `main`"

Let's practice!

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Modifying and comparing branches

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Diff recap

Command	Function
`git diff`	Show changes between all unstaged files and the latest commit
`git diff report.md`	Show changes between an unstaged file and the latest commit
`git diff --staged`	Show changes between all staged files and the latest commit
`git diff --staged report.md`	Show changes between a staged file and the latest commit
`git diff 35f4b4d 186398f`	Show changes between two commits using hashes
`git diff HEAD~1 HEAD~2`	Show changes between two commits using `HEAD` instead of commit hashes

Comparing branches

```
git diff main summary-statistics
```

git diff output

```
diff --git a/bin/summary b/bin/summary
new file mode 100755
index 0000000..9d6e2fa
--- /dev/null
+++ b/bin/summary
@@ -0,0 +1,44 @@
+Summary statistics
+
+Age:
+Yes: 25
+No: 24
+
+treatment:
+Yes: 31
+No: 18
+
+work_interfere:
+Sometimes: 17
```

git diff output

```
+
+benefits:
+Don't know: 17
+Yes: 17
+No: 15
+
+mental_health_interview:
+No: 41
+Maybe: 7
+No: 1
+
+mental_vs_physical:
+Don't know: 24
+Yes: 15
+No: 10
diff --git a/results/summary.txt b/results/summary.txt
new file mode 100644
index 0000000..e69de29
```

Navigating large git outputs

- Can produce large outputs!
- Press `space` to progress through and `q` to exit

Modifying branches

```
git branch
```

```
  main
* feature_dev
```

- `feature_dev`
- Need another branch for a second new feature being developed
- Solution - rename `feature_dev`
- Renaming a branch

```
git branch -m
```

Renaming a branch

```
git branch
```

```
  main
* feature_dev
```

- `feature_dev`
- Need another branch for a second new feature being developed
- Solution - rename `feature_dev`
- Renaming a branch

```
git branch -m feature_dev chatbot
```

Checking our branches

```
git branch
```

```
  main
* chatbot
```

Deleting a branch

- Large projects can have many branches
- Delete branches once we are finished with them
- Delete the `chatbot` branch with `-d` flag

```
git branch -d chatbot
```

```
Deleted branch chatbot (was 3edb989).
```

Deleting a branch that hasn't been merged

- If `chatbot` hasn't been merged to `main`, `git branch -d chatbot` will produce an error

```
error: The branch 'chatbot' is not fully merged.
If you are sure you want to delete it, run 'git branch -D chatbot'.
```

- Delete with `-D` flag

```
git branch -D chatbot
```

```
Deleted branch chatbot (was 3edb989).
```

- Difficult, but not impossible, to recover deleted branches
- Be sure we don't need the branch any more before deleting!

Summary

Command	Function
`git diff main chatbot`	Compare the state of the `main` and `chatbot` branches
`git branch`	List all branches
`git branch -m old_name new_name`	Rename branch called `old_name` to `new_name`
`git branch -d chatbot`	Delete `chatbot` branch, which **has** been merged
`git branch -D chatbot`	Delete `chatbot` branch, which **has not** been merged

Let's practice!

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Merging branches

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The purpose of branches

- Each branch should have a particular purpose
  - Developing a new feature
  - Debugging an error
- Once the task is complete, we incorporate the changes into production
  - Typically the `main` branch - "ground truth"

Source and destination

- When merging two branches:
  - the last commits from each branch are called **parent commits**
  - `source` —the branch we want to merge **from**
  - `destination` —the branch we want to merge **into**
- When merging `ai-assistant` into `main`:
  - `ai-assistant` = `source`
  - `main` = `destination`

Merging branches

- Move to the destination branch:

```
git switch main
```

- `git merge source`
- From `main`, to merge `ai-assistant` into `main`:

```
git merge ai-assistant
```

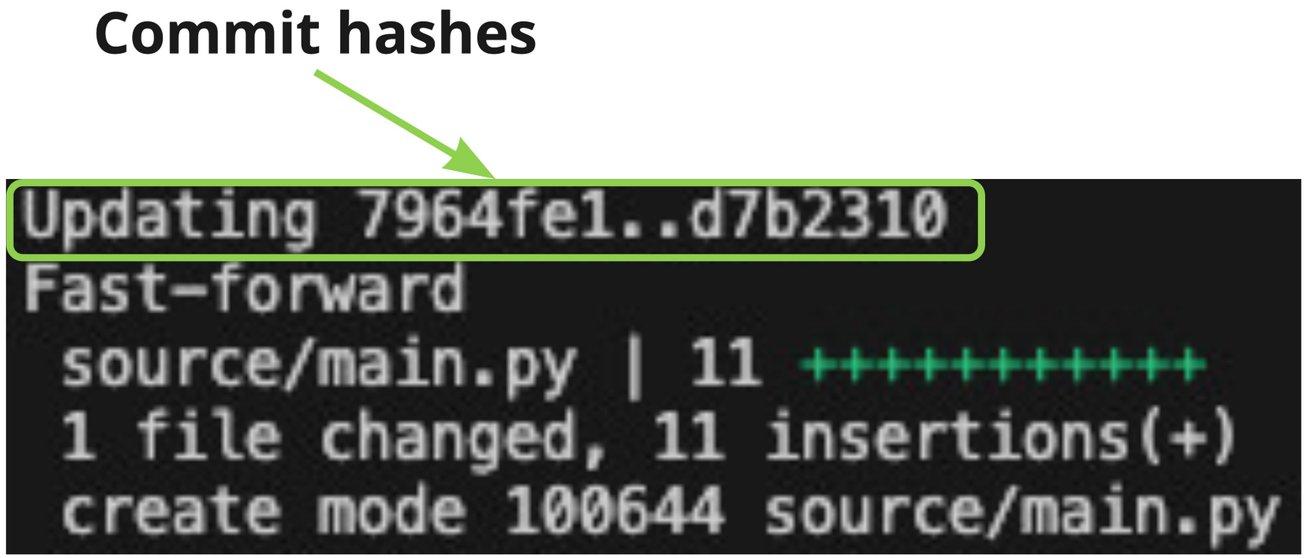
- From another branch: `git merge source destination`

```
git merge ai-assistant main
```

Git merge output

```
Updating 7964fe1..d7b2310
Fast-forward
 source/main.py | 11 ++++++++++
 1 file changed, 11 insertions(+)
 create mode 100644 source/main.py
```

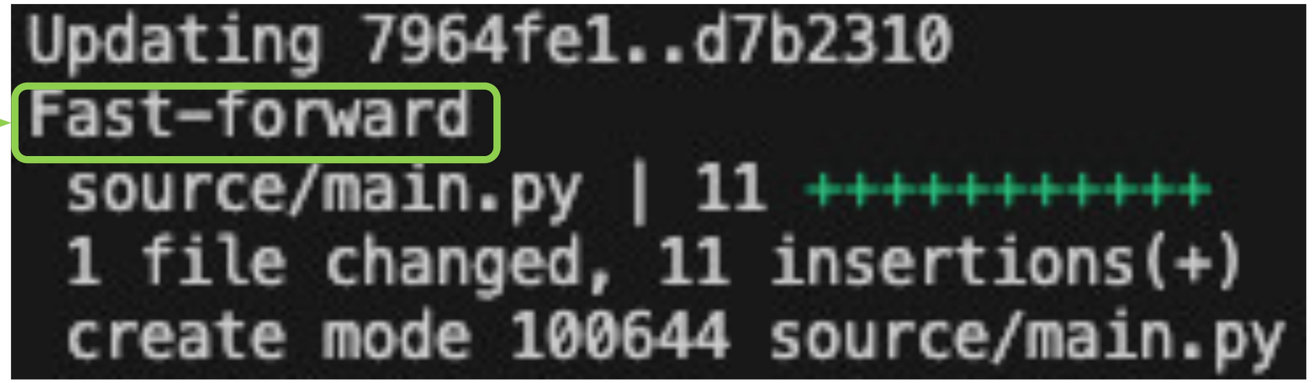
Git merge output



- Parent commits

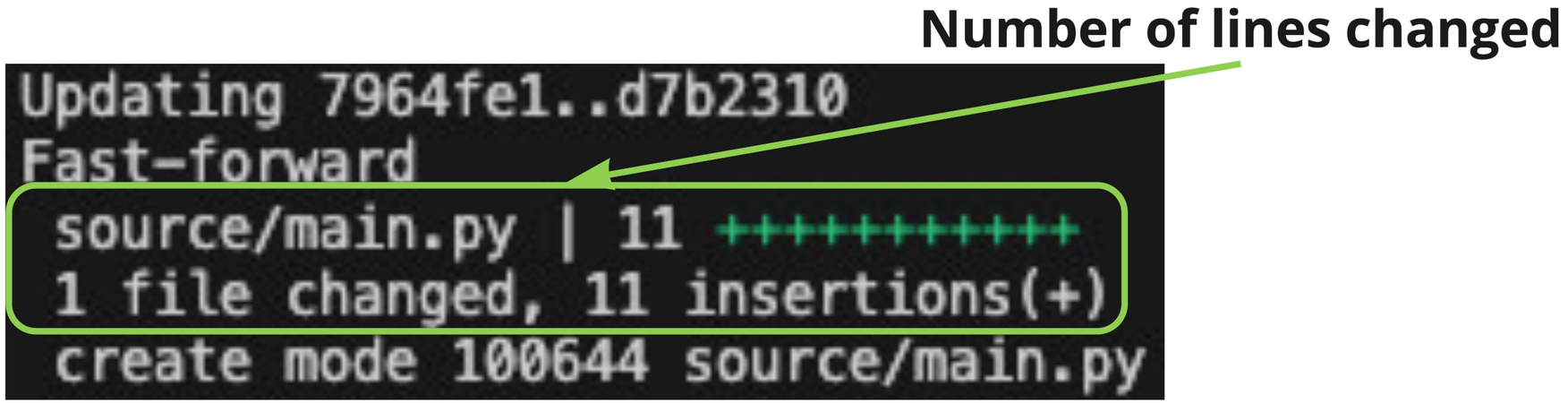
Git merge output

Type of merge



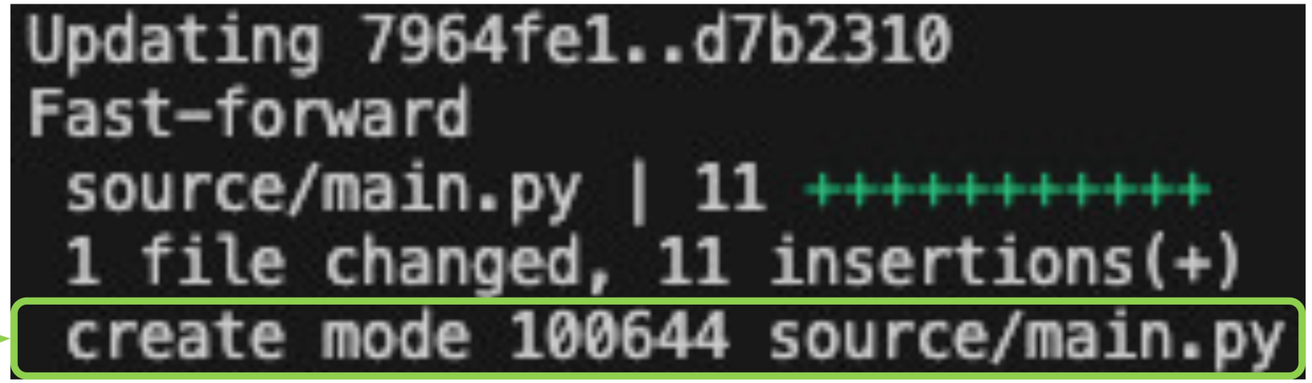
- Linear commit history: branched off `main` to create `ai-assistant`
- Fast-forward: point `main` to the last commit in the `ai-assistant` branch

Git merge output



Git merge output

Files modified



Let's practice!

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