Software Development Environment & Tools

Day #1

Wholeness

- In this lesson 1a, we will focus on setting up our software development environment, with the essential tools.
- Having a well set-up development environment, with the tools correctly configured and ready for use, is important for effective software development process.
- Science of Consciousness: *The field of all possibilities is the source of all solutions.*

Outline

- Java Platform, Standard Edition (Java SE):
- Integrated Development Environment (IDE):
  - Jetbrains IntelliJ IDEA
  - Spring Tools Suite (Eclipse-based IDE for Spring)
- Version Control System: Git and Github
- DevOps and Build Automation Tools:
  - Apache Maven
  - Gradle

Java SE Development Kit (JDK)

- JDK 23 is the latest release of the Java SE Platform.
- JDK 21 is the latest Long-Term Support (LTS) release of the Java SE Platform.
- Obtain, install and configure the Java JDK for your OS. Minimum required version is JDK17
  - Oracle JDK: https://www.oracle.com/java/technologies/downloads/
- If required, consider using SDKMAN (https://sdkman.io/) for managing multiple versions of software development kits (SDKs).

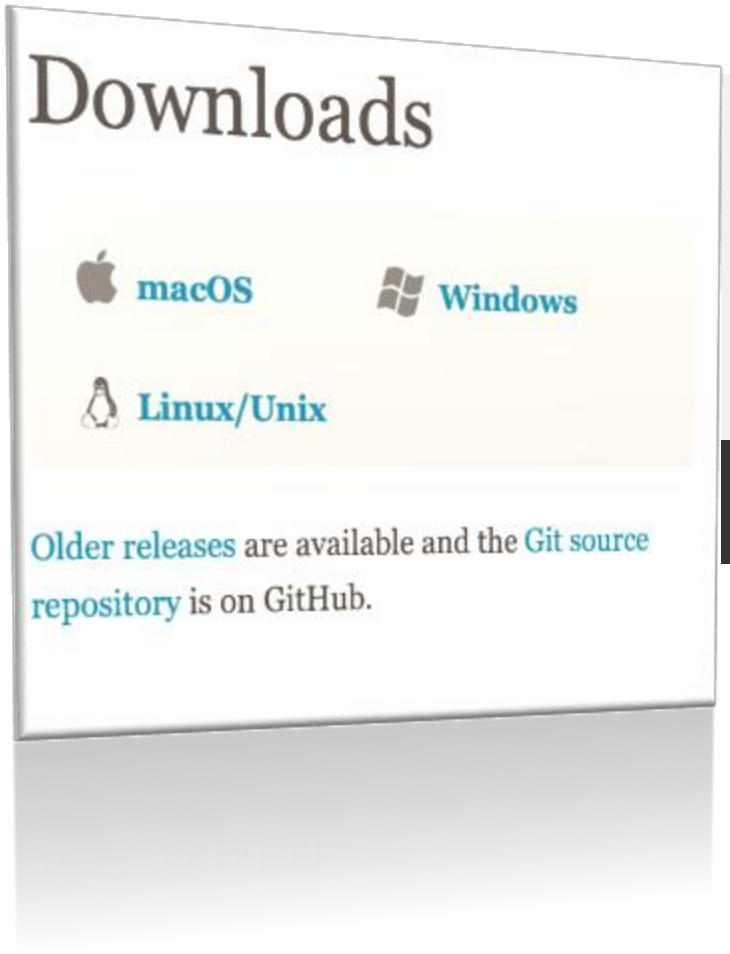
Git & GitHub

Unlocking the Power of Git and GitHub

Git

What does Git do?

- Manage projects with Repositories
- Clone a project to work on a local copy
- Control and track changes with Staging and Committing
- Branch and Merge to allow for work on different parts and versions of a project
- Pull the latest version of the project to a local copy
- Push local updates to the main project



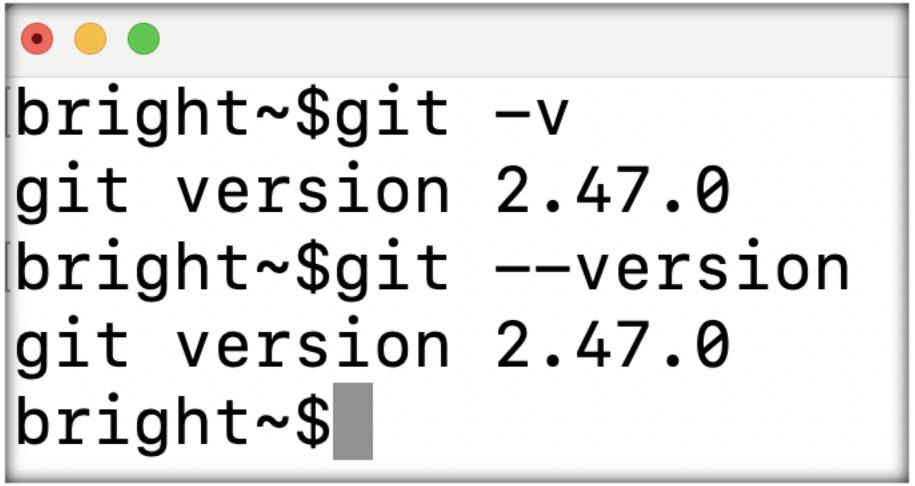
Getting Started With Git

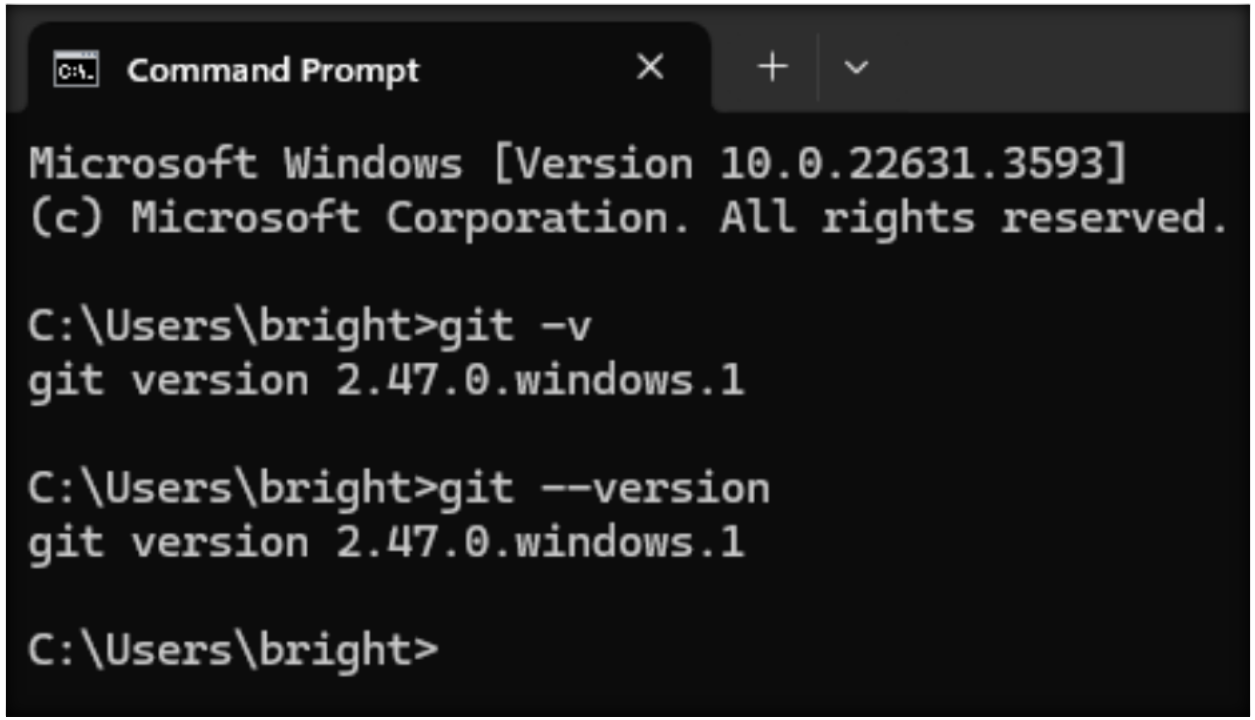
Install Git

https://git-scm.com

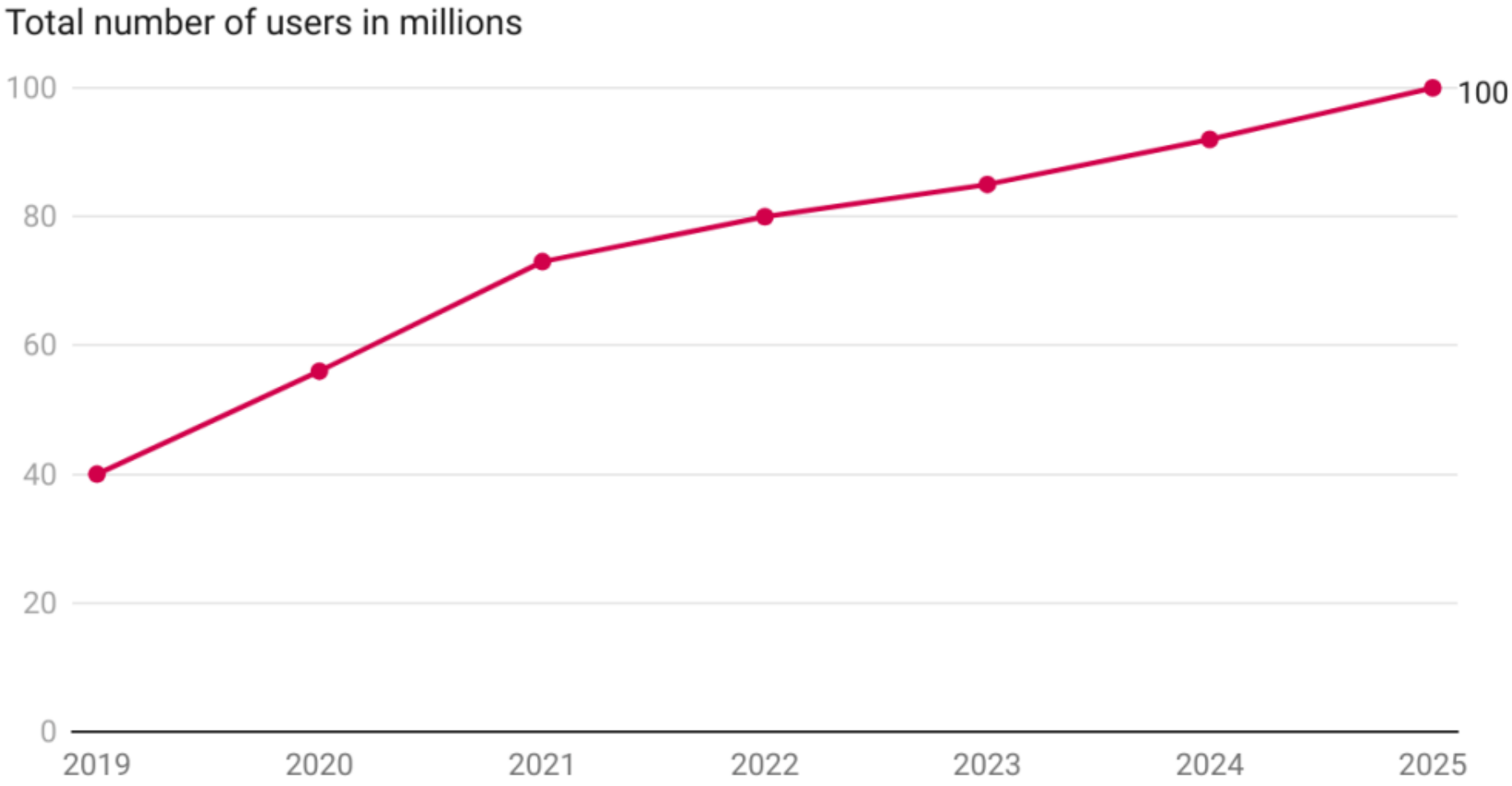
Using Git

Command line

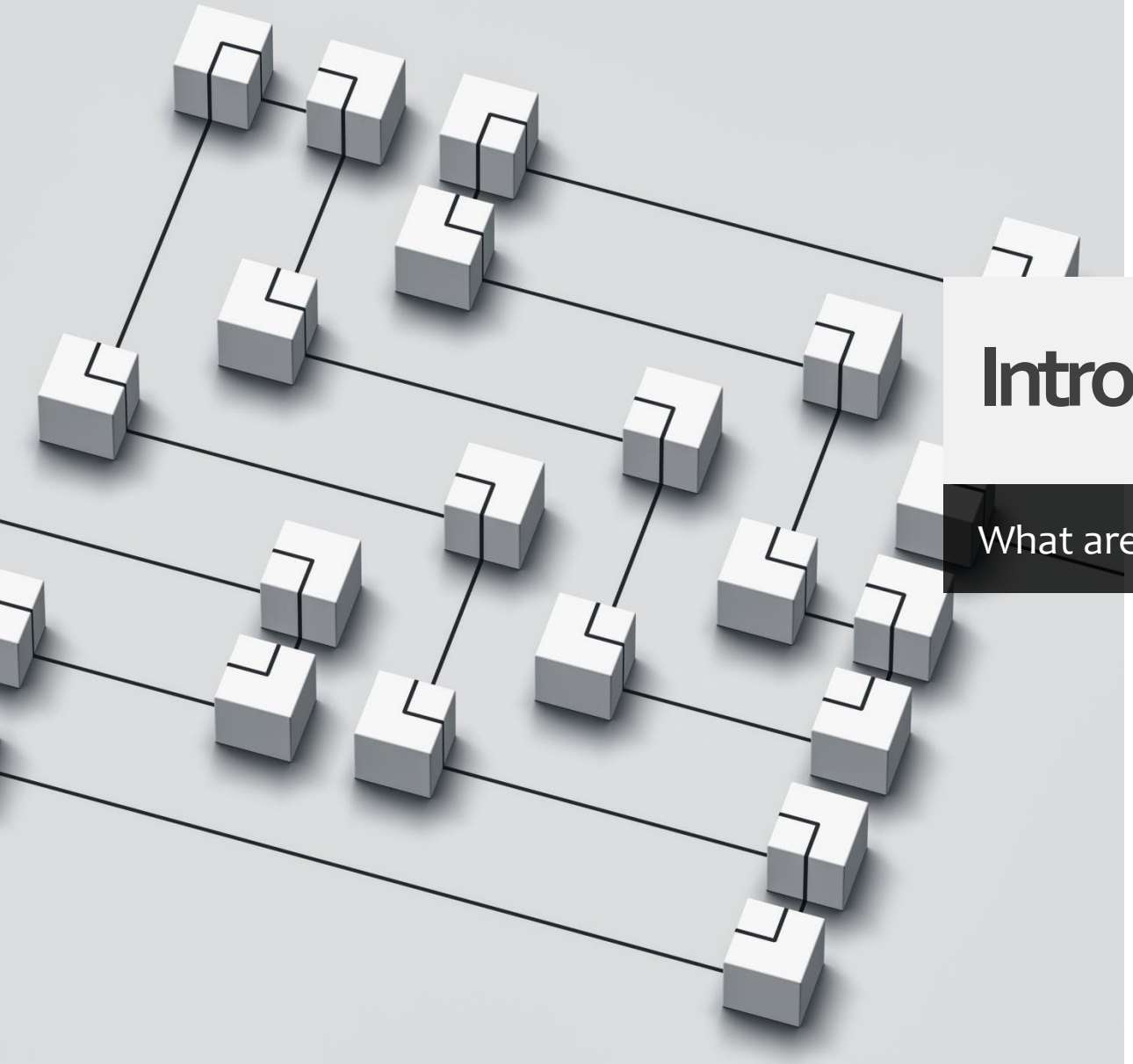




The GitHub community is set to hit 100 million users by 2025



Source: Enterprise Apps Today



Introduction to Git Configurations

What are Git Configurations?

- Settings that control Git's behavior.
- Can be set at three levels:
  - local
  - global
  - system

Config levels and files

Git

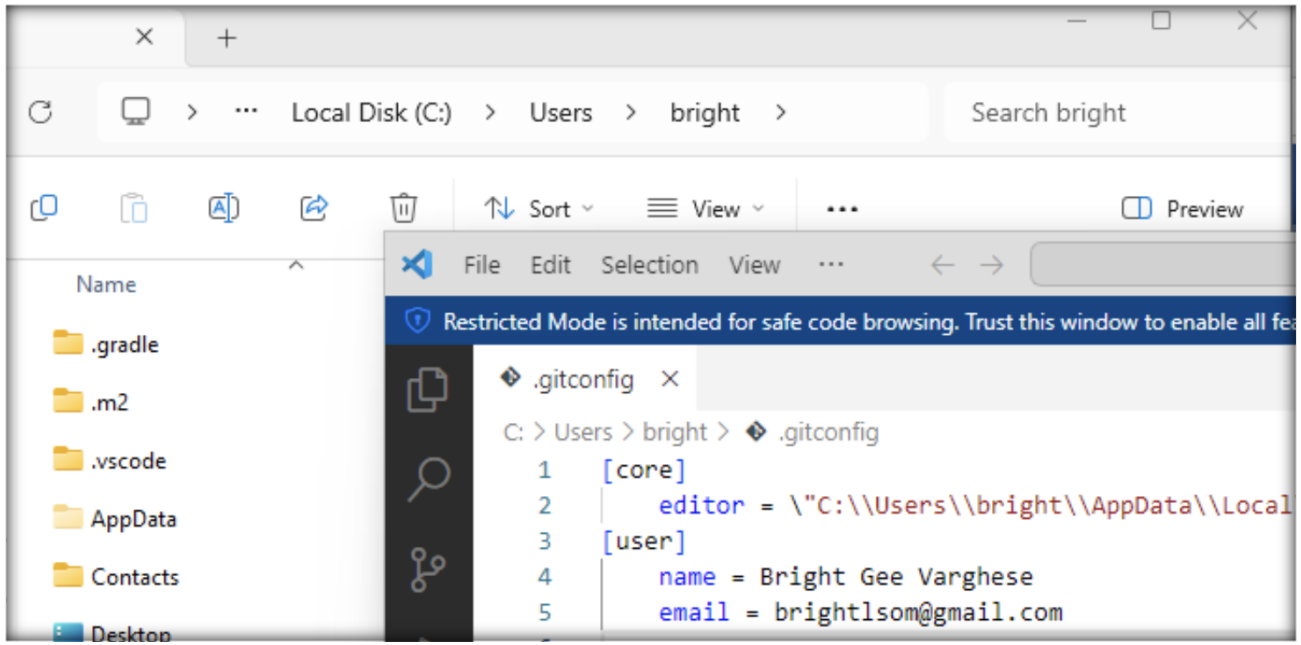
```
bright~$pwd
/Users/bright/Documents/June 2024/git-demo
bright~$ls -a
.               ..              .git            welcome.txt
bright~$cd .git
bright~$ls -a
.               HEAD            hooks           logs
..              config          index           objects
COMMIT_EDITMSG  description     info            refs
bright~$cat config
[core]
        repositoryformatversion = 0
        filemode = true
        bare = false
        logallrefupdates = true
        ignorecase = true
        precomposeunicode = true
[remote "origin"]
        url = https://github.com/brightgeevarghese/git-demo.git
        fetch = +refs/heads/*:refs/remotes/origin/*
[branch "main"]
        remote = origin
        merge = refs/heads/main
bright~$
```

- --local
  - Local configuration values are stored in a file that can be found in the repo's .git directory: .git/config

Config levels and files

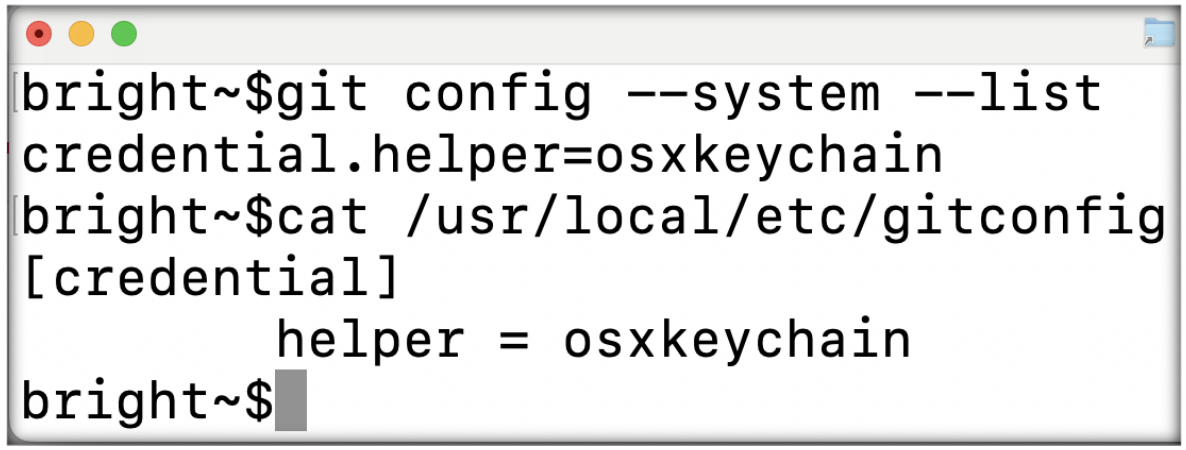
```
bright~$cat ~/.gitconfig
[user]
        name = Bright Gee Varghese
        email = brightlsom@gmail.com
[filter "lfs"]
        clean = git-lfs clean -- %f
        smudge = git-lfs smudge -- %f
        process = git-lfs filter-process
        required = true
[safe]
        directory = /Volumes/HD II
[init]
        defaultBranch = main
[pull]
        ff = only
[core]
        editor = nano
[credential]
        helper = osxkeychain
bright~$
```

- - -global
  - Global level configuration is user-specific, meaning it is applied to an operating system user.
  - Global configuration values are stored in a file that is located in a user's home directory.
    - ~/.gitconfig on unix systems
    - C:\Users\\.gitconfig on windows

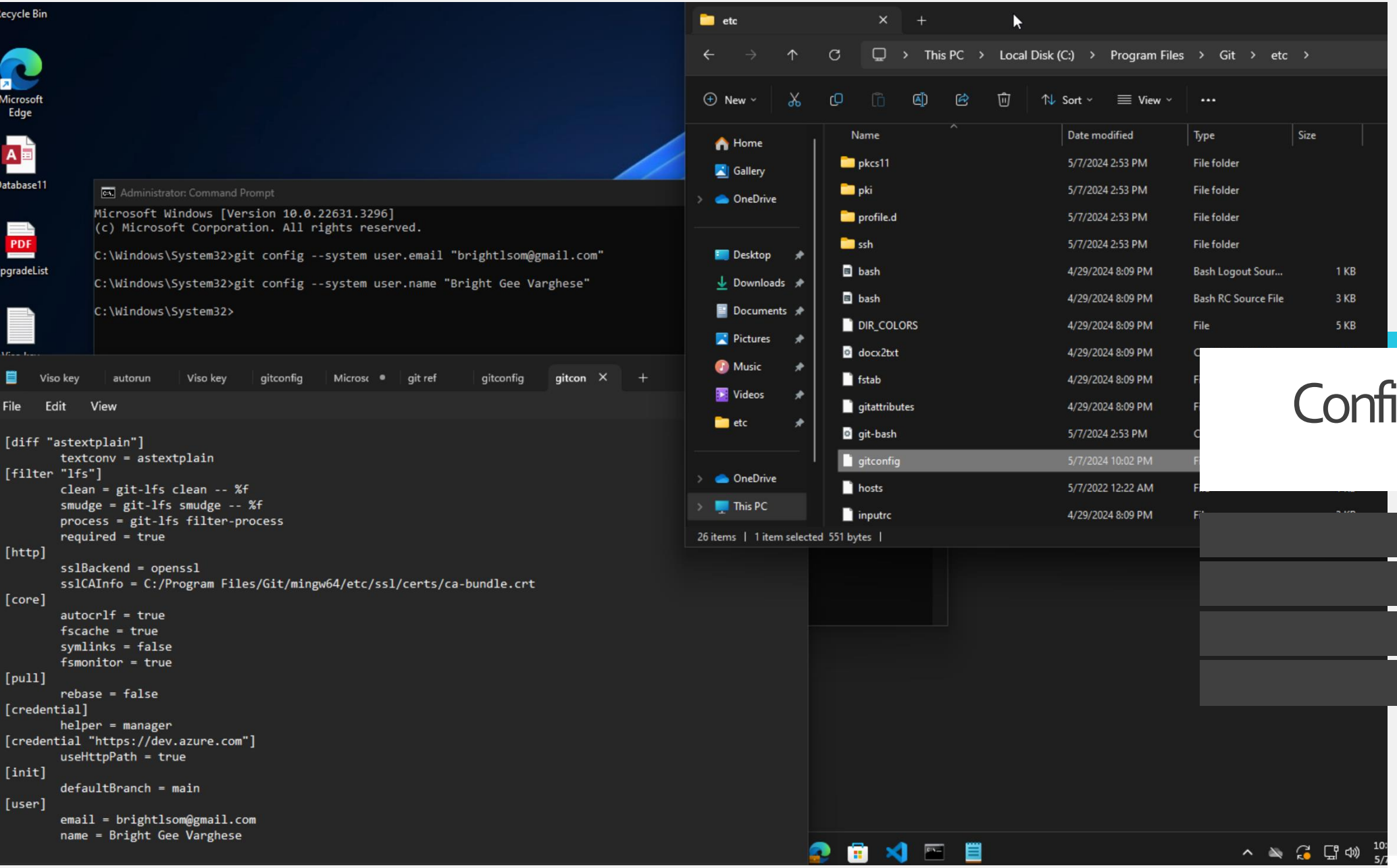


Config levels and files

Git



- --system
  - System-level configuration is applied across an entire machine.
  - This covers all users on an operating system and all repos.
  - The system level configuration file lives in a gitconfig file off the system root path. $(prefix)/etc/gitconfig on unix systems. On windows this file can be found at C:\ProgramFiles\Git\etc\gitconfig on Windows 11.



Config levels and files

- --system
- Git
- system
- Windows

How to edit git configurations?

```
bright~$git config --system --list
credential.helper=osxkeychain

bright~$git config --system user.name "Bright Gee Varghese"
bright~$git config --system user.email "brightlsom@gmail.com"
bright~$git config --system --list
credential.helper=osxkeychain
user.name=Bright Gee Varghese
user.email=brightlsom@gmail.com
bright~$
```

```
git config --global --unset user.name
git config --global --unset user.email
```

Commands to See all configurations

bright~$~~git config --local --list~~ fatal: --local can only be used inside a git repository

bright~$git config --global --list

bright~$git config --system --list

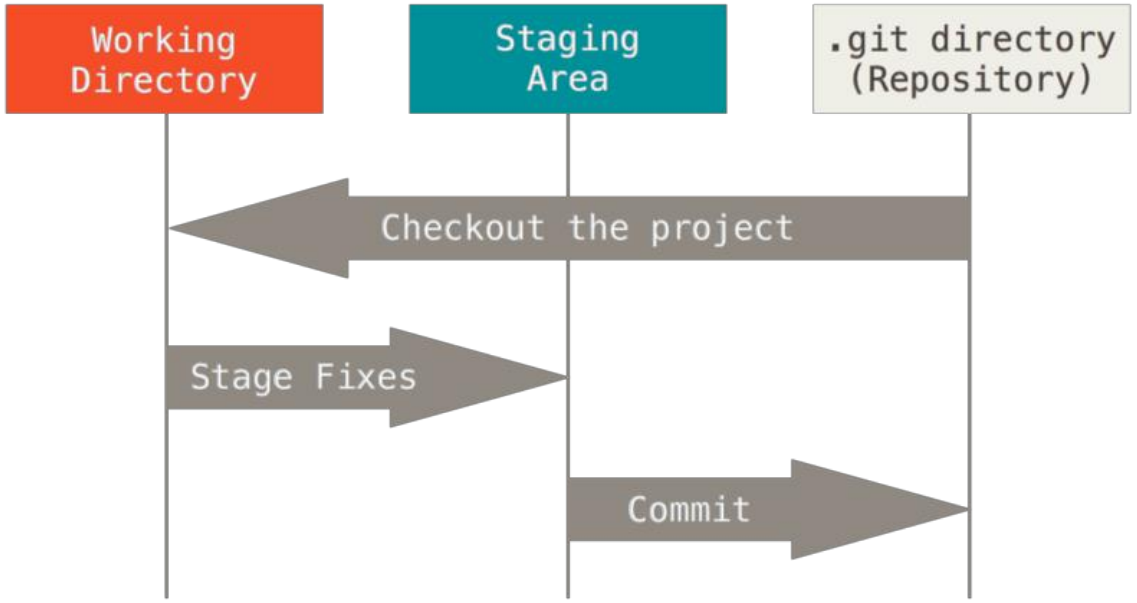
Order of Priority

Git

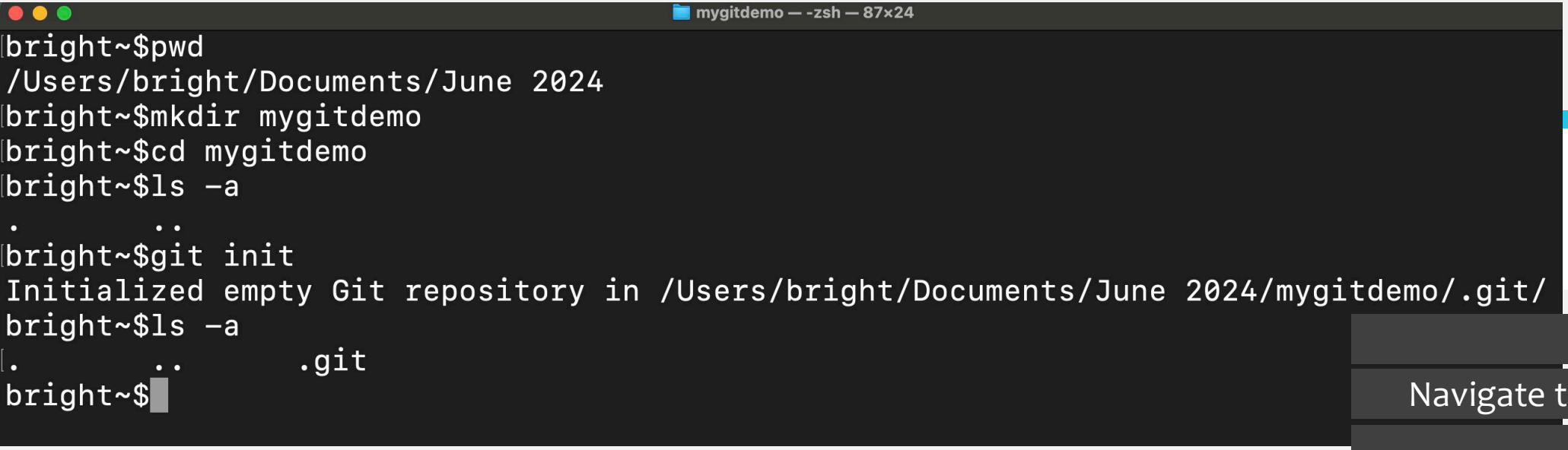
- The order of priority for configuration levels are:
  - local
  - global
  - system
- This means when looking for a configuration value, Git will start at the local level and bubble up to the system level.

States

Git



1. **Working Directory:** Where you work on your files locally.
2. **Staging Area (Index):** A temporary holding area where you choose changes to include in the next commit.
3. **Repository:** Where all committed changes and project history are stored.



Initialize

Git

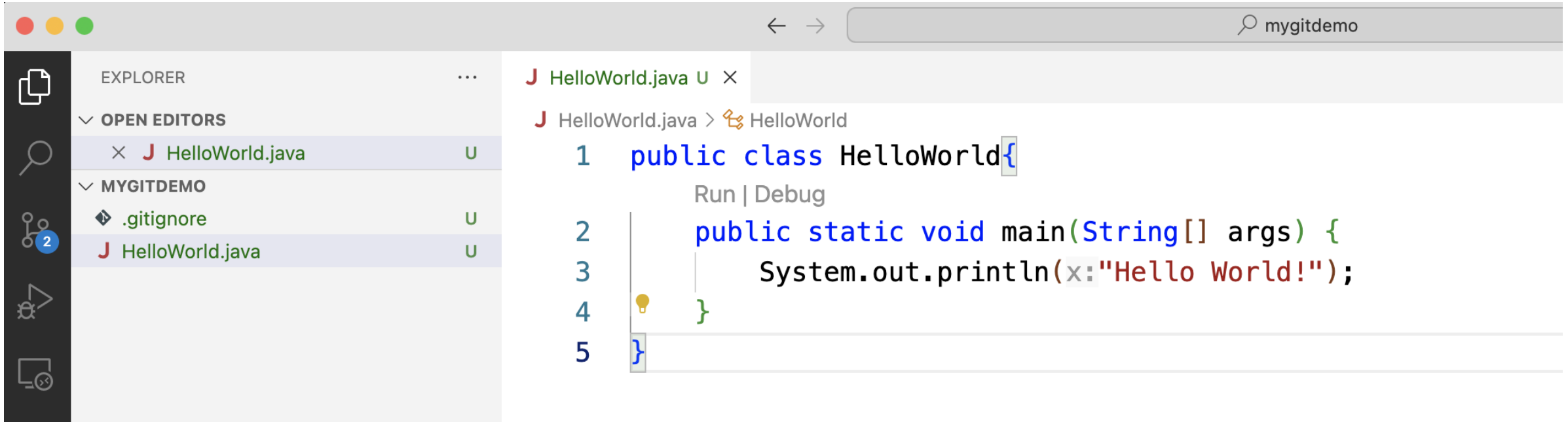
Navigate to project folder

git init

.git folder is created

Add New File

Git



Add New File & Commit

Git

bright~$**touch .gitignore**

bright~$**nano .gitignore**

mygitdemo — nano .gitignore — 86×24

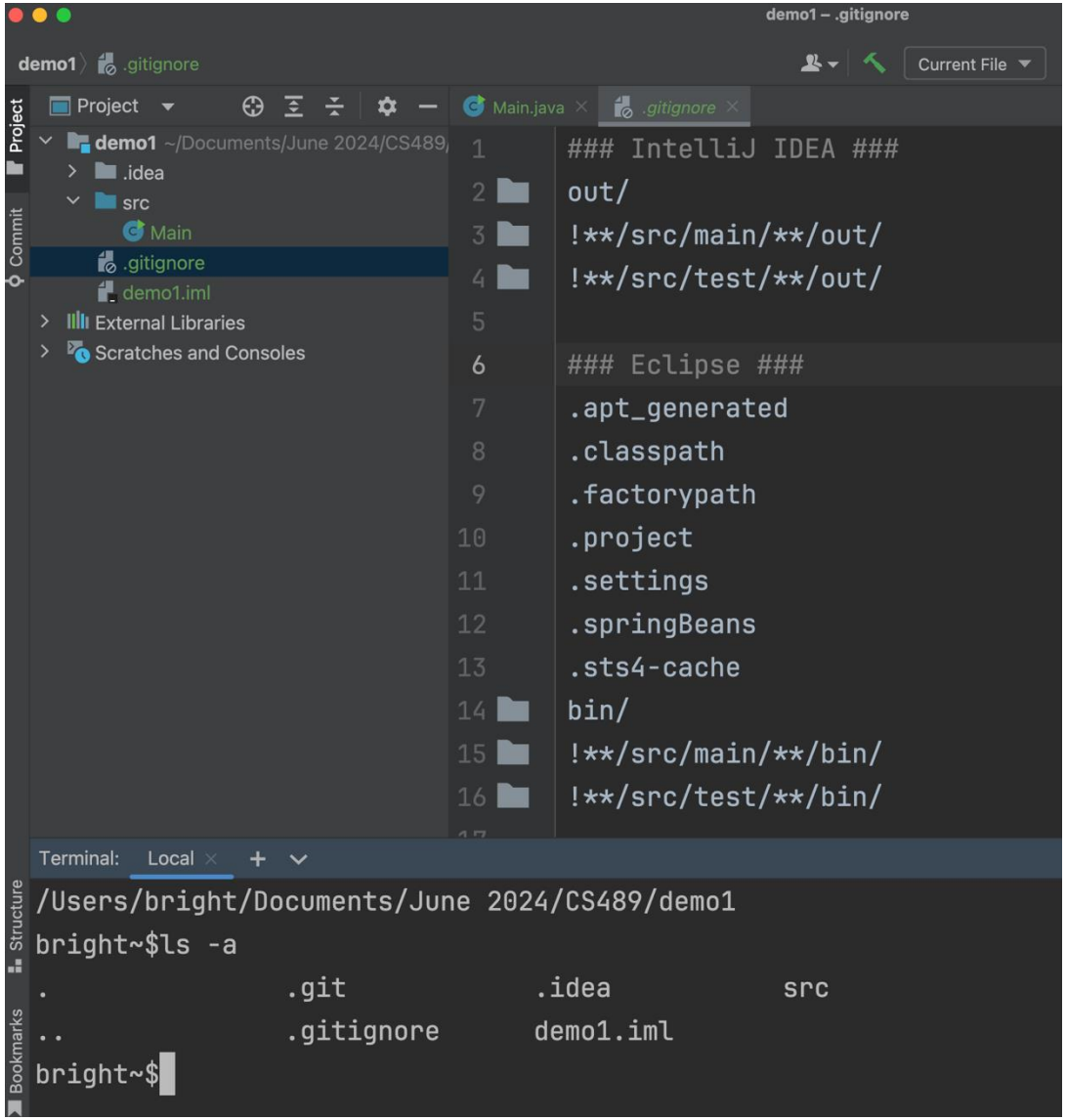
```
  UW PICO 5.09                                File: .gitignore

.DS_Store
*.class
```

```
bright~$git add .
bright~$git status
On branch main

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
        new file:   .gitignore
        new file:   HelloWorld.java

bright~$git commit -m "Added HelloWorld.java and .gitignore"
[main (root-commit) 74d2436] Added HelloWorld.java and .gitignore
 2 files changed, 7 insertions(+)
 create mode 100644 .gitignore
 create mode 100644 HelloWorld.java
bright~$
```

Git ignore

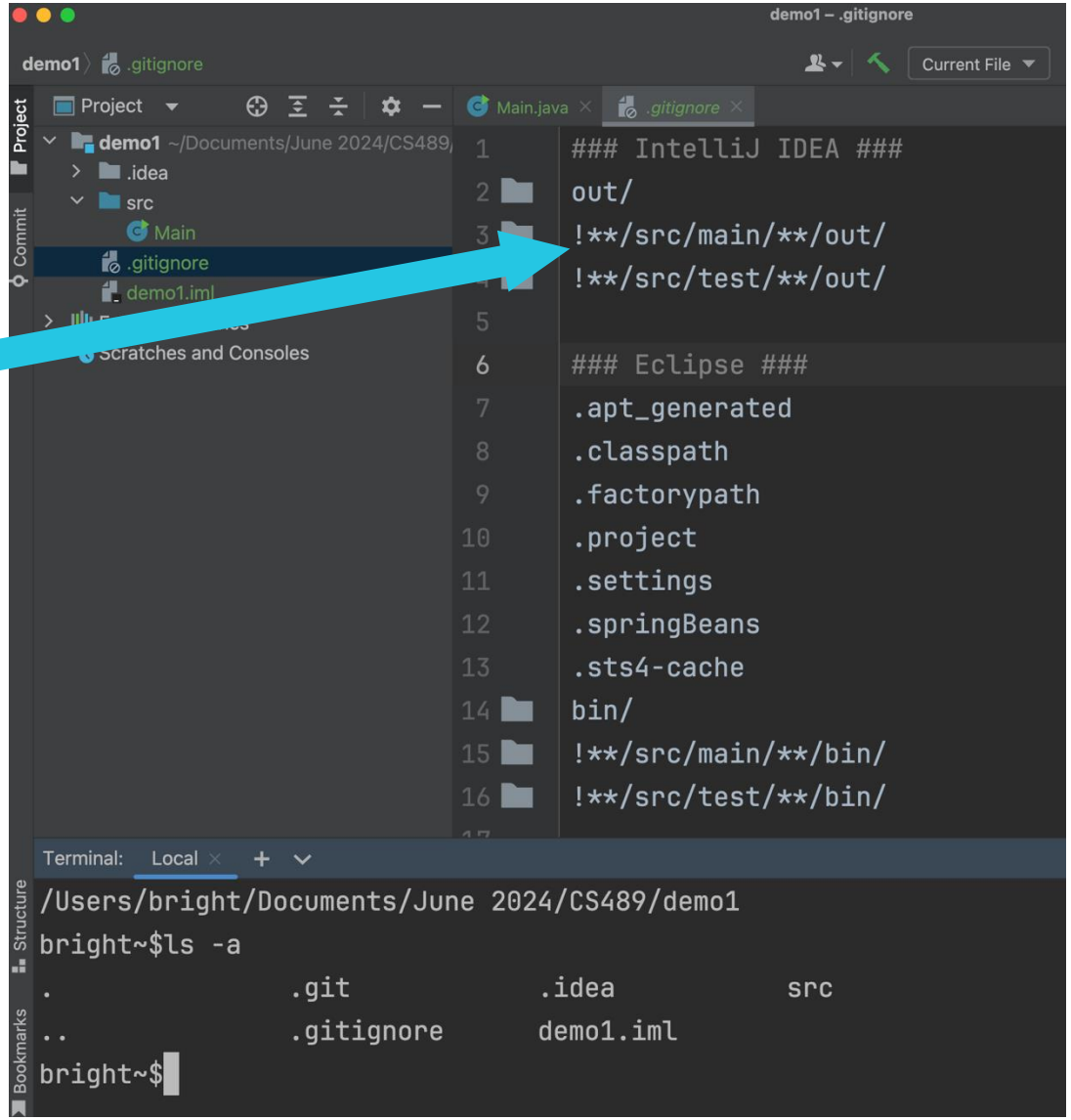
Ignored files are usually build artifacts and machine generated files that can be derived from your repository source or should otherwise not be committed. Some common examples are:

- dependency caches, such as the contents of /node_modules or /packages
- compiled code, such as .o, .pyc, and .class files
- build output directories, such as /bin, /out, or /target
- files generated at runtime, such as .log, .lock, or .tmp
- hidden system files, such as .DS_Store or Thumbs.db
- personal IDE config files, such as .idea/workspace.xml



Git ignore

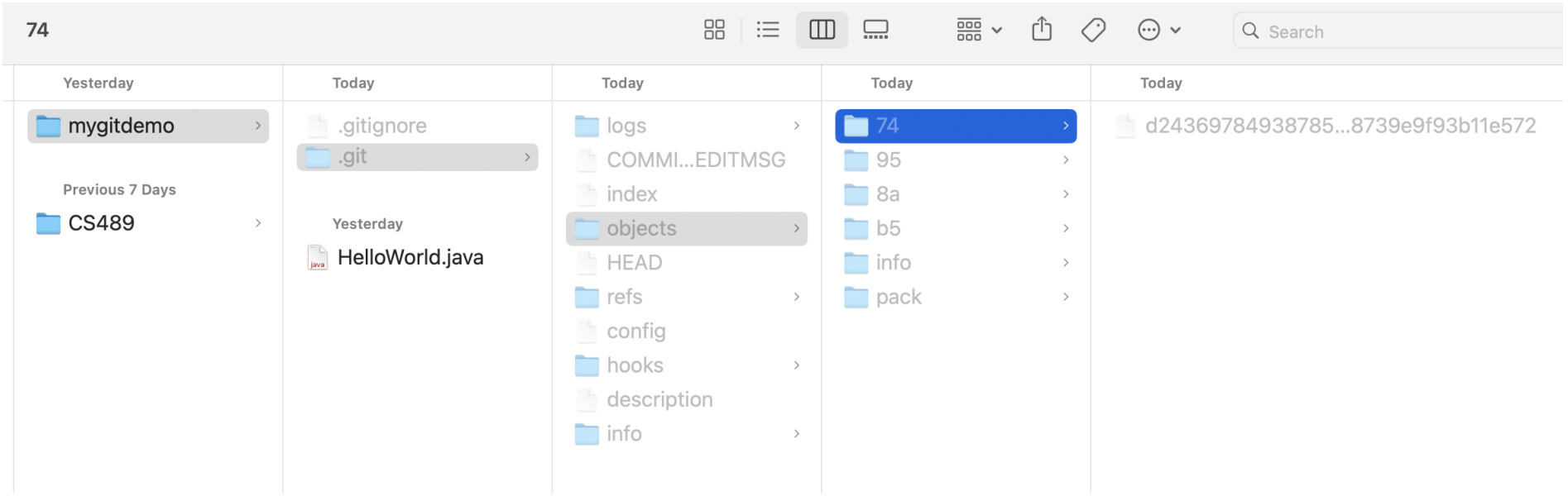
These lines tell IntelliJ IDEA to ignore all "out" directories within the src/main and src/test folders and their subfolders.



Commit

Git

```
bright~$git commit -m "Added HelloWorld.java and .gitignore"
[main (root-commit) 74d2436] Added HelloWorld.java and .gitignore
 2 files changed, 7 insertions(+)
 create mode 100644 .gitignore
 create mode 100644 HelloWorld.java
bright~$
```



tree .git

Git

```
bright~$tree .git
.git
├── COMMIT_EDITMSG
├── HEAD
├── config
├── description
├── hooks
│   ├── applypatch-msg.sample
│   ├── commit-msg.sample
│   ├── fsmonitor-watchman.sample
│   ├── post-update.sample
│   ├── pre-applypatch.sample
│   ├── pre-commit.sample
│   ├── pre-merge-commit.sample
│   ├── pre-push.sample
│   ├── pre-rebase.sample
│   ├── pre-receive.sample
│   ├── prepare-commit-msg.sample
│   ├── push-to-checkout.sample
│   ├── sendemail-validate.sample
│   └── update.sample
├── index
├── info
│   └── exclude
├── logs
│   ├── HEAD
│   └── refs
│       └── heads
│           └── main
├── objects
│   ├── 74
│   │   └── d2436978493878525 9c28a8739e9f93b11e572
│   ├── 8a
│   │   └── 98ec140d01d0a92df55614a10f827ee91e1d0f
│   ├── 95
│   │   └── f6061257cb18342dfacc6df204a29d731bcc00
│   ├── b5
│   │   └── 4392da52039f22673a868d09b704f37e377667
│   ├── info
│   └── pack
└── refs
    ├── heads
    │   └── main
    └── tags

16 directories, 27 files
bright~$
```

Install tree

- Mac
  - brew install tree
- Linux
  - sudo apt-get install tree
- Windows
  - https://gnuwin32.sourceforge.net/packages/tree.htm

tree .git

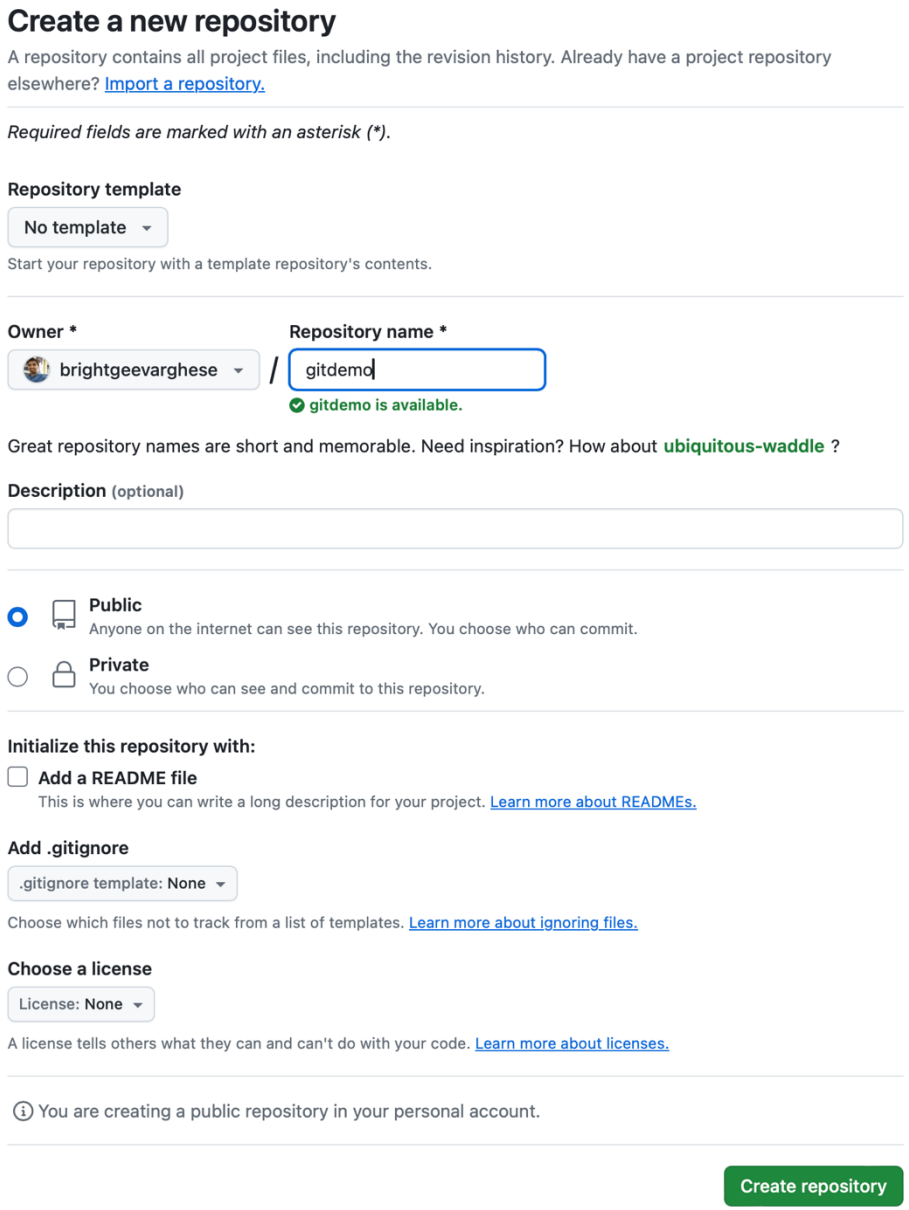
Git

```
bright~$tree .git
.git
├── COMMIT_EDITMSG
├── HEAD
├── config
├── description
├── hooks
│   ├── applypatch-msg.sample
│   ├── commit-msg.sample
│   ├── fsmonitor-watchman.sample
│   ├── post-update.sample
│   ├── pre-applypatch.sample
│   ├── pre-commit.sample
│   ├── pre-merge-commit.sample
│   ├── pre-push.sample
│   ├── pre-rebase.sample
│   ├── pre-receive.sample
│   ├── prepare-commit-msg.sample
│   ├── push-to-checkout.sample
│   ├── sendemail-validate.sample
```

- config is a text file that contains your git configuration for the current repo.
- HEAD contains the current head of the repo.
- hooks contain any scripts that can be run before/after git does anything.
- objects contains the git objects, ie the data about the files, commits etc in your repo.
- refs stores references(pointers).
  - refs/heads contains pointers to branches and refs/tags contains pointers to tags.

Create a new repository

GitHub



Add a remote repository

Git

This command adds a remote repository named origin to your local Git repository, and the remote repository's URL points to the GitHub repository specified.

Rename your current branch

Git

bright~$git branch -M main

It tells Git that you want to manage branches, which are pointers to specific commits in your Git repository.

-M flag will actually rename your current branch to main.

It is used in Git to rename your current branch to main.

Push the local main branch to a remote repository named origin

Git

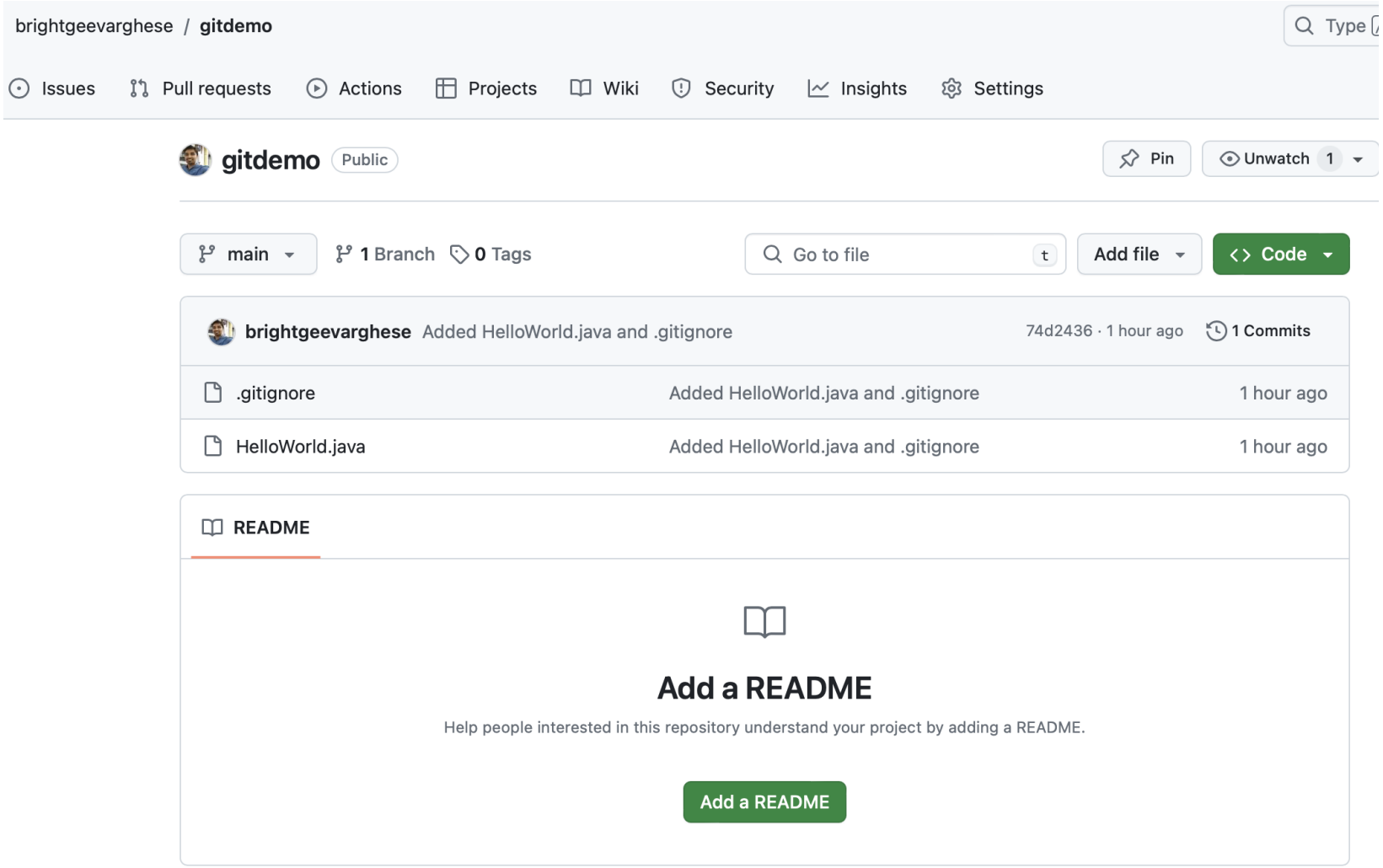
This is the name of the remote repository you want to push your commits to.

This specifies the local branch you want to push. In this case, you're pushing the main branch.

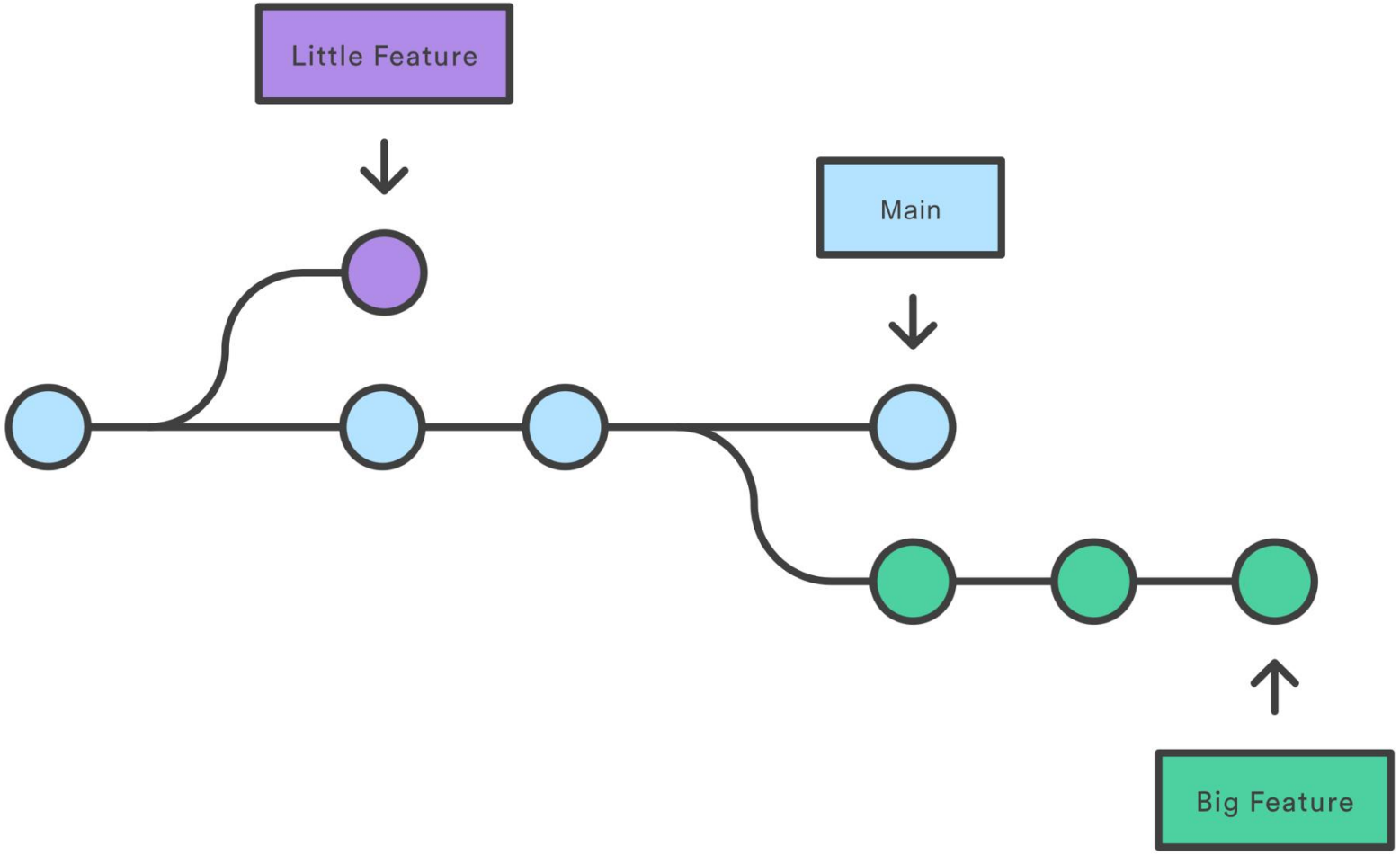
bright~$git push -u origin main

It tells Git that you want to push your local commits to a remote repository.

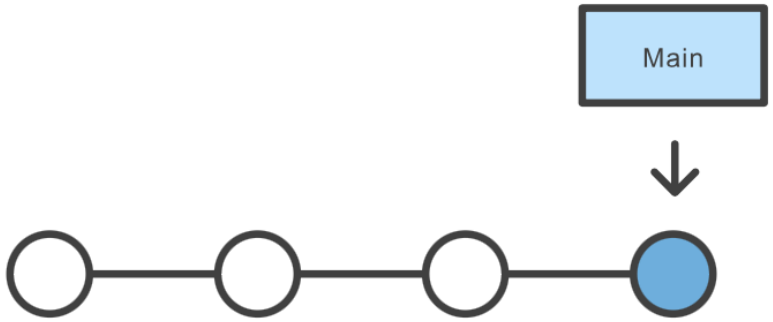
It establishes a connection (upstream) between your local main branch and the remote main branch on origin. This simplifies future push operations, as Git will remember where to push subsequent changes made to your main branch. You can then simply use git push without specifying the remote and branch name each time.

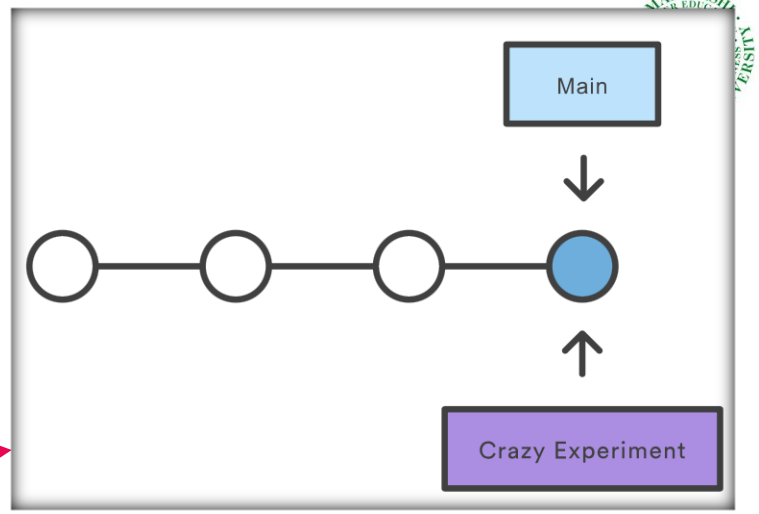

brightgeevarghese / gitdemo
Type
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings
gitdemo
Public
Pin
Unwatch 1
main
1 Branch
0 Tags
Go to file
t
Add file
Code
brightgeevarghese Added HelloWorld.java and .gitignore
74d2436 · 1 hour ago
1 Commits
.gitignore
Added HelloWorld.java and .gitignore
1 hour ago
HelloWorld.java
Added HelloWorld.java and .gitignore
1 hour ago
README
Add a README
Help people interested in this repository understand your project by adding a README.
Add a README

Git Branches

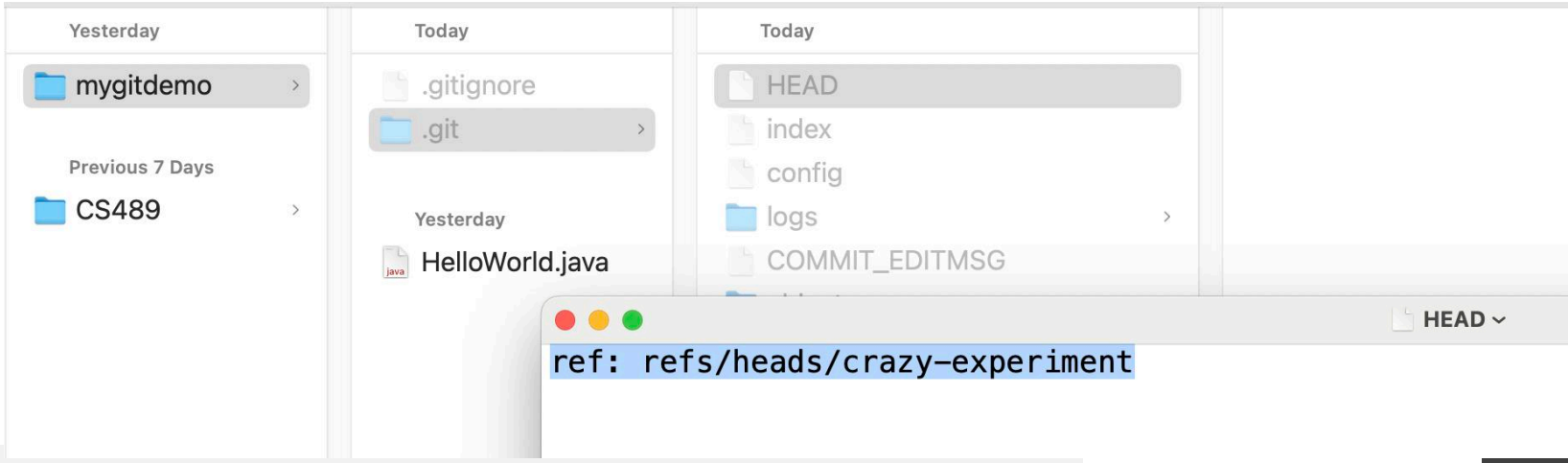


Creating Branches






```
bright~$git branch crazy-experiment
bright~$git branch
  crazy-experiment
* main
bright~$git checkout crazy-experiment
Switched to branch 'crazy-experiment'
bright~$git branch
* crazy-experiment
  main
bright~$
```



Checkout to the new branch

crazy-experiment

```
bright~$git branch
* crazy-experiment
  main
bright~$
```

```
//Add a new line
public class HelloWorld{
    public static void main(String[] args) {
        System.out.println("Hello World!");
        System.out.println("Second line in our file");
    }
}
```

Checkout to the new branch

crazy-experiment

bright~$**git add --all**
bright~$**git status**
On branch crazy-experiment
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
modified: HelloWorld.java

bright~$**git commit -m "Added second line to HelloWorld.java"**
[crazy-experiment 7bc2fbc] Added second line to HelloWorld.java
 1 file changed, 1 insertion(+)

Checkout to the new branch

crazy-experiment

```
bright~$git branch
* crazy-experiment
  main
bright~$git checkout main
Switched to branch 'main'
Your branch is up to date with 'origin/main'.
bright~$cat HelloWorld.java
public class HelloWorld{
    public static void main(String[] args) {
        System.out.println("Hello World!");
    }
}                                   bright~$
```

```
bright~$git checkout crazy-experiment
Switched to branch 'crazy-experiment'
bright~$cat HelloWorld.java
public class HelloWorld{
    public static void main(String[] args) {
        System.out.println("Hello World!");
        System.out.println("Second line in our file");
    }
}                                                   bright~$
```

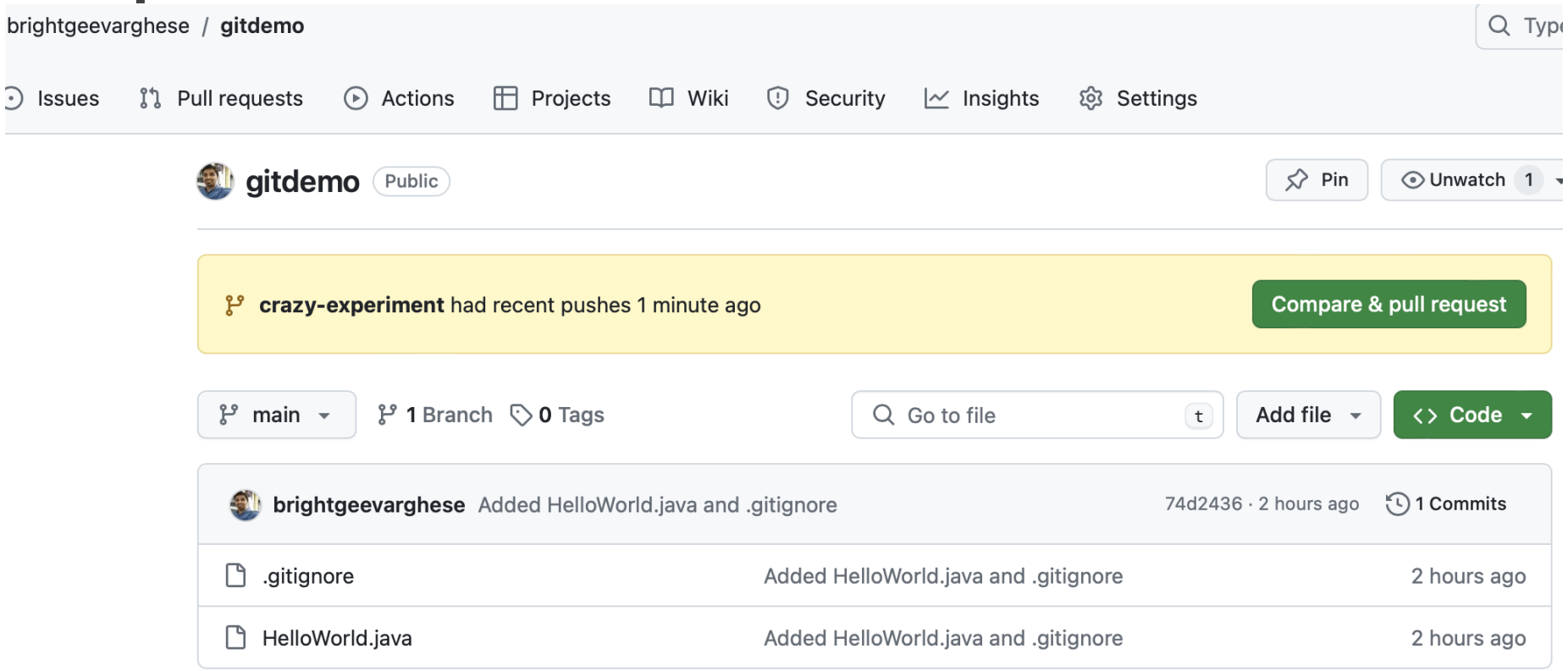
Push Your Work to the Remote Branch

crazy-experiment

```
bright~$git branch
* crazy-experiment
  main
bright~$git push origin crazy-experiment
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 12 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 380 bytes | 380.00 KiB/s, done.
Total 3 (delta 1), reused 0 (delta 0), pack-reused 0 (from 0)
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
remote:
remote: Create a pull request for 'crazy-experiment' on GitHub by visiting:
remote:      https://github.com/brightgeevarghese/gitdemo/pull/new/crazy-experiment
remote:
To https://github.com/brightgeevarghese/gitdemo.git
 * [new branch]      crazy-experiment -> crazy-experiment
bright~$
```

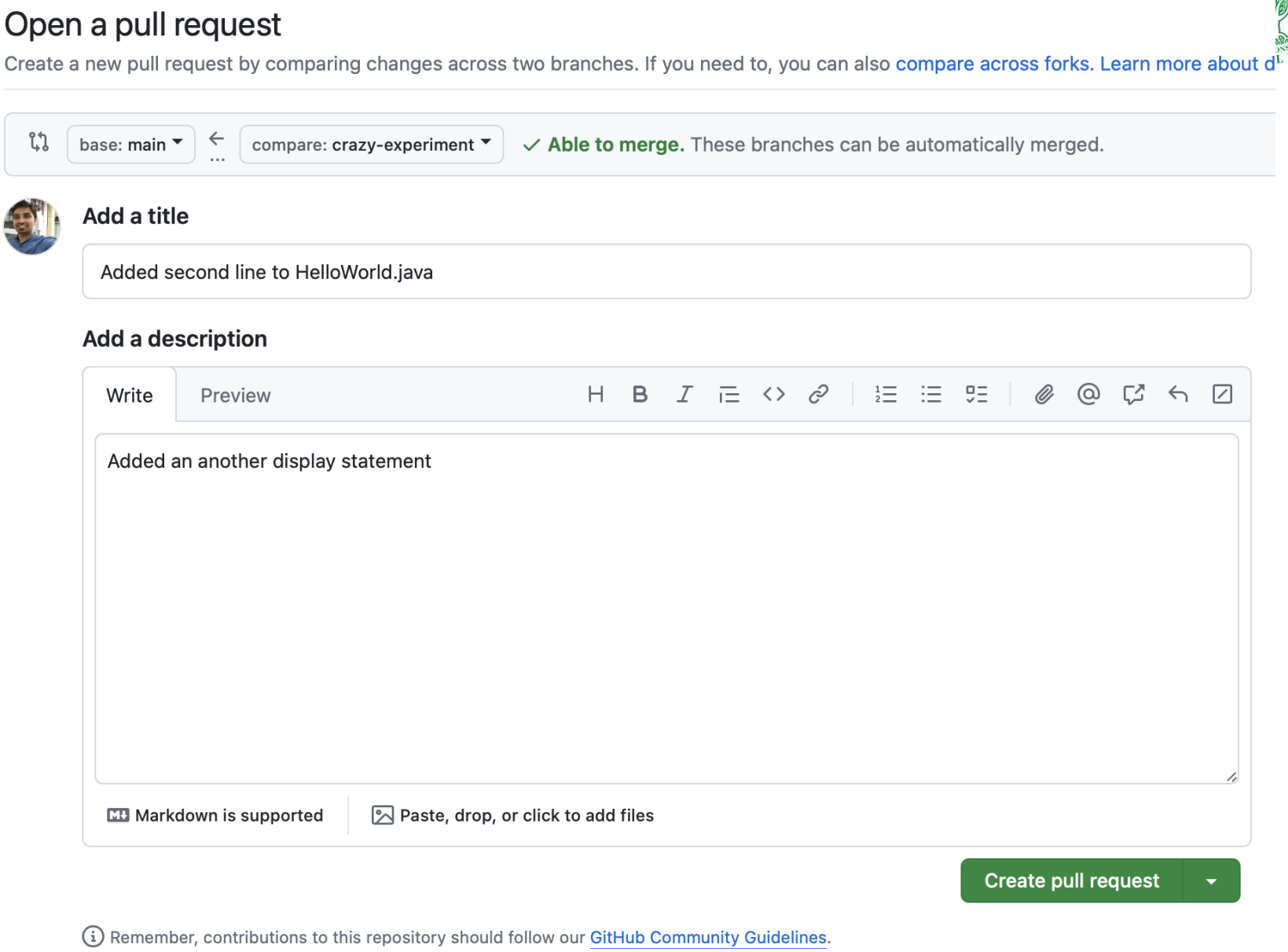
Compare and pull request

crazy-experiment

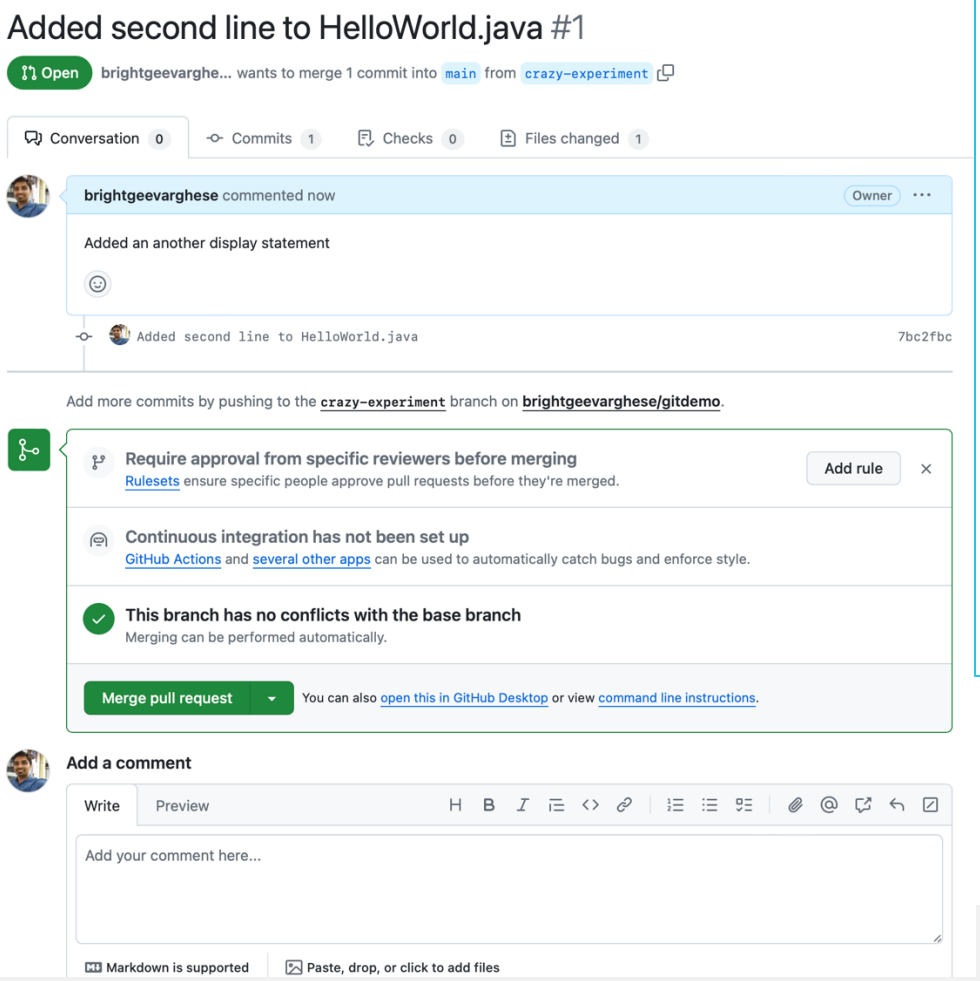


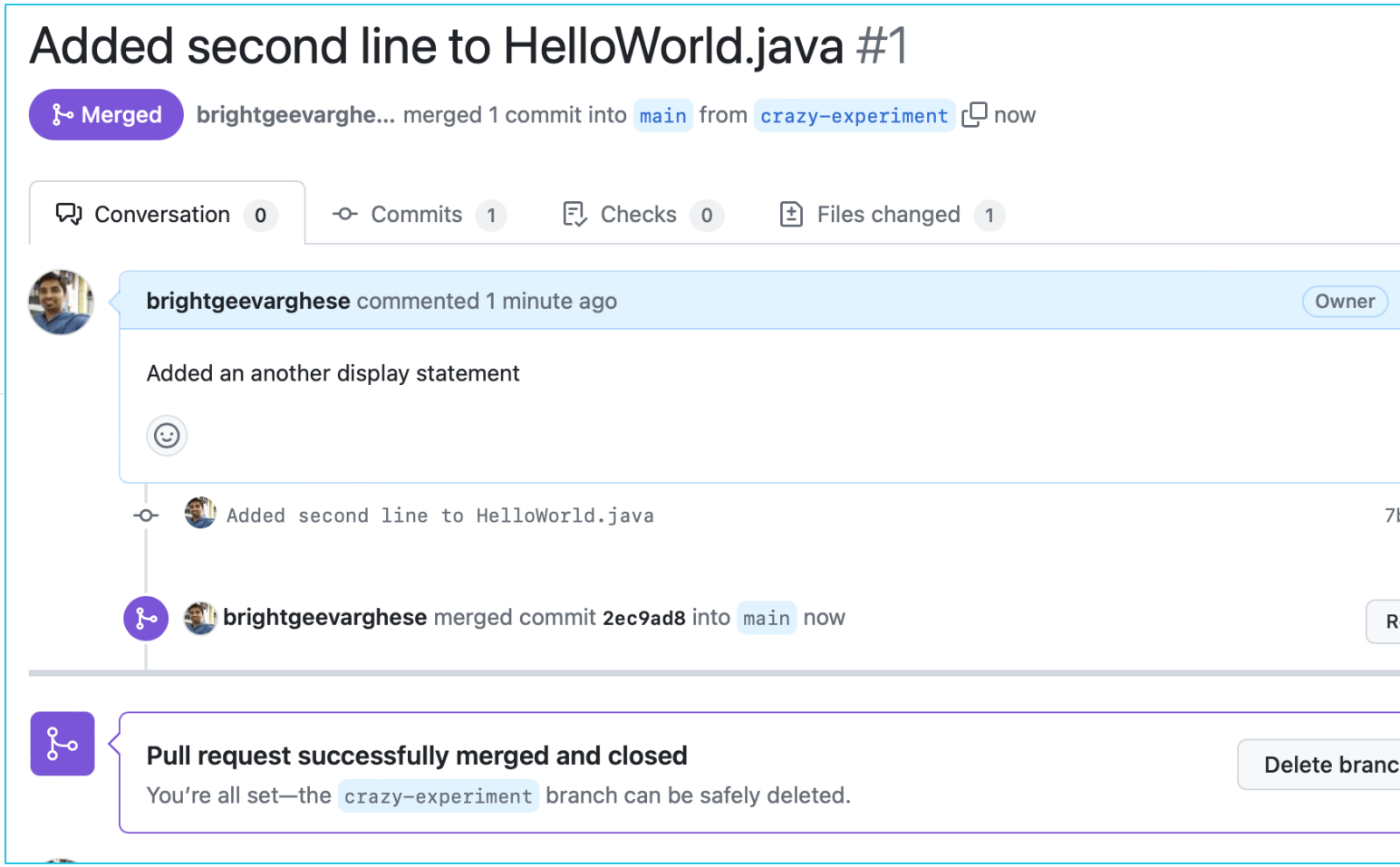
Open a pull request

crazy-experiment



Merge

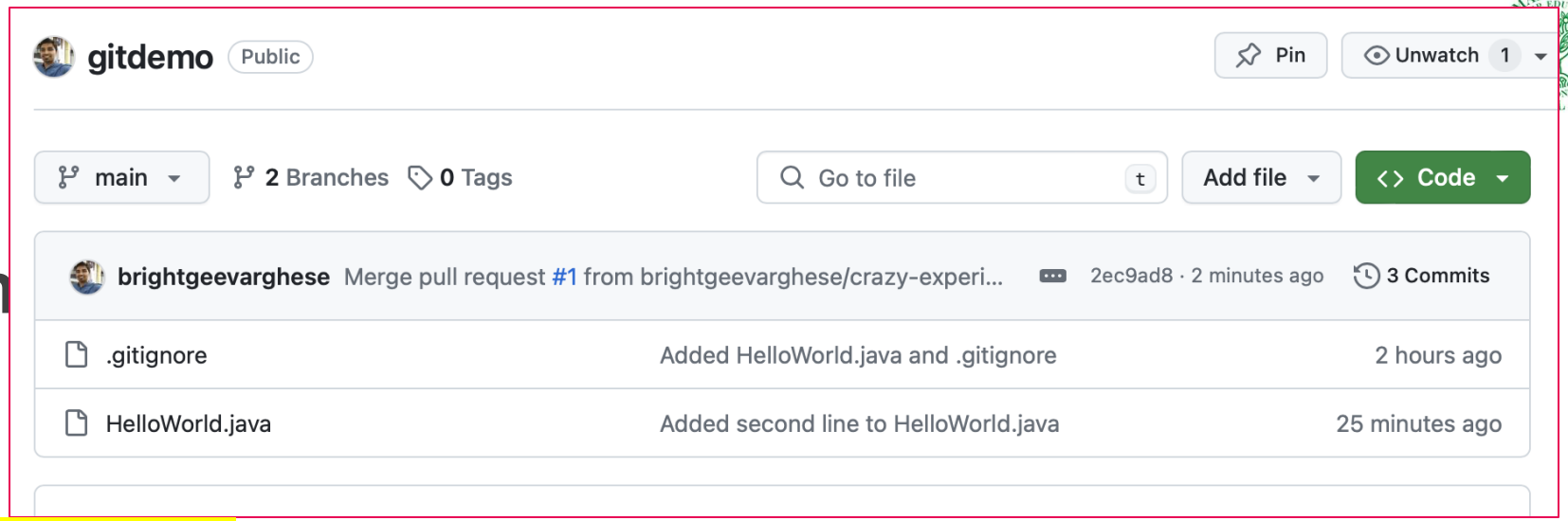

Added second line to HelloWorld.java #1
Open
brightgeevarghe... wants to merge 1 commit into main from crazy-experiment
Conversation 0
Commits 1
Checks 0
Files changed 1
brightgeevarghese commented now
Owner
Added an another display statement
Added second line to HelloWorld.java
7bc2fbc
Add more commits by pushing to the crazy-experiment branch on brightgeevarghese/gitdemo.
Require approval from specific reviewers before merging
Rulesets ensure specific people approve pull requests before they're merged.
Add rule
Continuous integration has not been set up
GitHub Actions and several other apps can be used to automatically catch bugs and enforce style.
This branch has no conflicts with the base branch
Merging can be performed automatically.
Merge pull request
You can also open this in GitHub Desktop or view command line instructions.
Add a comment
Write
Preview
Add your comment here...
Markdown is supported
Paste, drop, or click to add files

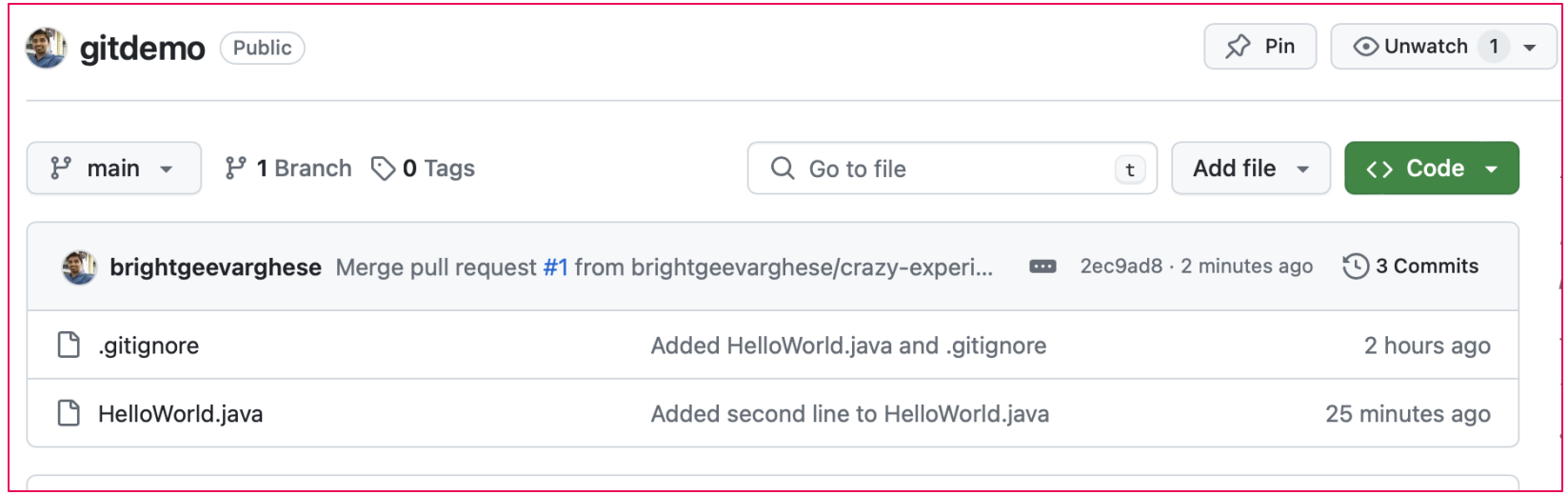

Added second line to HelloWorld.java #1
Merged
brightgeevarghe... merged 1 commit into main from crazy-experiment now
Conversation 0
Commits 1
Checks 0
Files changed 1
brightgeevarghese commented 1 minute ago
Owner
Added an another display statement
Added second line to HelloWorld.java
brightgeevarghese merged commit 2ec9ad8 into main now
Pull request successfully merged and closed
You're all set—the crazy-experiment branch can be safely deleted.
Delete branc

Delete Remote Branch

crazy-experiment

```
bright~$git push origin --delete crazy-experiment
To https://github.com/brightgeevarghese/gitdemo.git
 - [deleted]         crazy-experiment
bright~$
```





Delete Remote Branch

crazy-experiment

bright~$git **push origin --delete crazy-experiment**

This flag tells Git that you want to delete the branch on the remote repository **after** pushing.

This is the name of the branch you want to delete on the remote repository.

This tells Git that you want to push something to a remote repository.

This specifies the name of the remote repository you want to push to.

Delete local new branch and update the local main

crazy-experiment

```
bright~$git checkout main
Switched to branch 'main'
Your branch is up to date with 'origin/main'.
bright~$git branch -d crazy-experiment
error: the branch 'crazy-experiment' is not fully merged
hint: If you are sure you want to delete it, run 'git branch -D crazy-experiment'
hint: Disable this message with "git config advice.forceDeleteBranch false"
bright~$git branch -D crazy-experiment
Deleted branch crazy-experiment (was 7bc2fbc).
bright~$git pull origin main
remote: Enumerating objects: 6, done.
remote: Counting objects: 100% (6/6), done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 4 (delta 2), reused 2 (delta 1), pack-reused 0
Unpacking objects: 100% (4/4), 1.14 KiB | 53.00 KiB/s, done.
From https://github.com/brightgeevarghese/gitdemo
 * branch            main       -> FETCH_HEAD
   74d2436..2ec9ad8  main       -> origin/main
Updating 74d2436..2ec9ad8
Fast-forward
 HelloWorld.java | 1 +
 1 file changed, 1 insertion(+)
bright~$
```

Delete local new branch and update the local main

crazy-experiment

```
bright~$git branch
* main
bright~$cat HelloWorld.java
public class HelloWorld{
    public static void main(String[] args) {
        System.out.println("Hello World!");
        System.out.println("Second line in our file");
    }
}%
bright~$
```

Merge branches locally

emergency-fix

Let us assume, we have two branches

1. main
2. emergency-fix

Change to *main*

- **git checkout main**

Merge the current branch (*main*) with *emergency-fix*

- **git merge emergency-fix**

Delete the branch, *emergency-fix*

git branch -d emergency-fix

Merge branches locally

emergency-fix

```
bright~$git pull origin main

//Adding a for loop
public class HelloWorld{
   public static void main(String[] args) {
      System.out.println("Hello World!");
      System.out.println("Second line in our file");
      for (int i = 0; i < args.length; i++) {
         System.out.println(i);
      }
   }
}

bright~$git add HelloWorld.java

bright~$git commit -m "Added a for loop"
[main a9bde92] Added a for loop
 1 file changed, 3 insertions(+)
```

Merge branches locally

When you've pulled changes from the remote repository and started working on your local code, it's possible that someone else has pushed changes to the remote repository in the meantime. In this scenario, it's crucial to ensure that your local changes are in sync with the latest changes from the remote repository before pushing your code.

```
bright~$git pull origin main

//Adding a for loop
public class HelloWorld{
   public static void main(String[] args) {
      System.out.println("Hello World!");
      System.out.println("Second line in our file");
      for (int i = 0; i < args.length; i++) {
         System.out.println(i);
      }
   }
}

bright~$git add HelloWorld.java

bright~$git commit -m "Added a for loop"
[main a9bde92] Added a for loop
 1 file changed, 3 insertions(+)
```

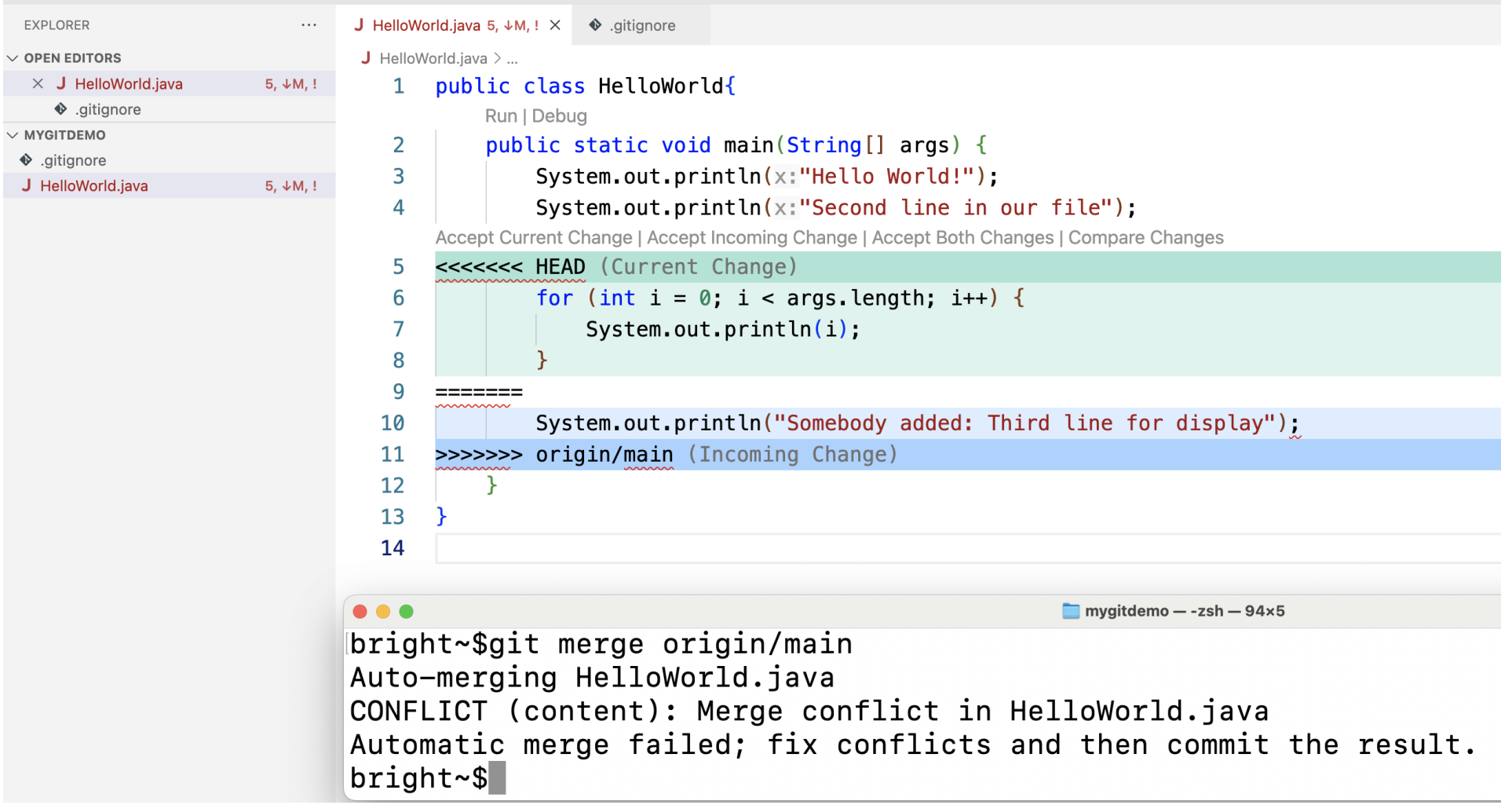
Pull latest changes from GitHub Repository

Diverging means both your local branch and the remote branch have new commits that are not present in each other's history.

```
bright~$git pull origin main
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 1.01 KiB | 257.00 KiB/s, done.
From https://github.com/brightgeevarghese/gitdemo
 * branch            main       -> FETCH_HEAD
   2ec9ad8..179bc0b  main       -> origin/main
hint: Diverging branches can't be fast-forwarded, you need to either:
hint:
hint: git merge --no-ff
hint:
hint: or:
hint:
hint: git rebase
hint:
hint: Disable this message with "git config advice.diverging false"
fatal: Not possible to fast-forward, aborting.
bright~$
```

Pull latest changes from GitHub Repository

git merge origin/main



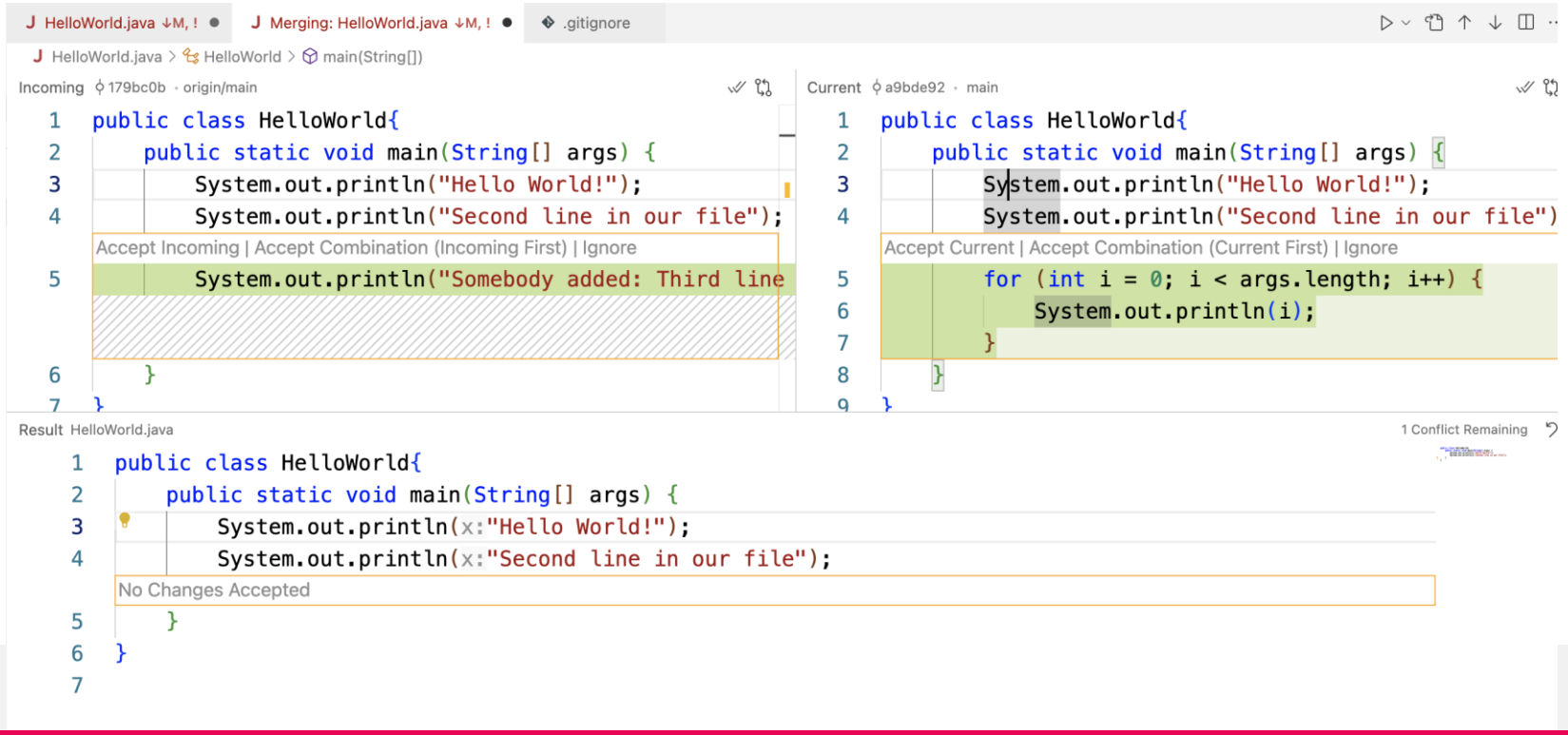
Pull latest changes from GitHub Repository

git merge origin/main

HelloWorld.java > ...

```java
public class HelloWorld{
    public static void main(String[] args) {
        System.out.println(x:"Hello World!");
        System.out.println(x:"Second line in our file");
    }
}
```

Resolve in Merge Editor



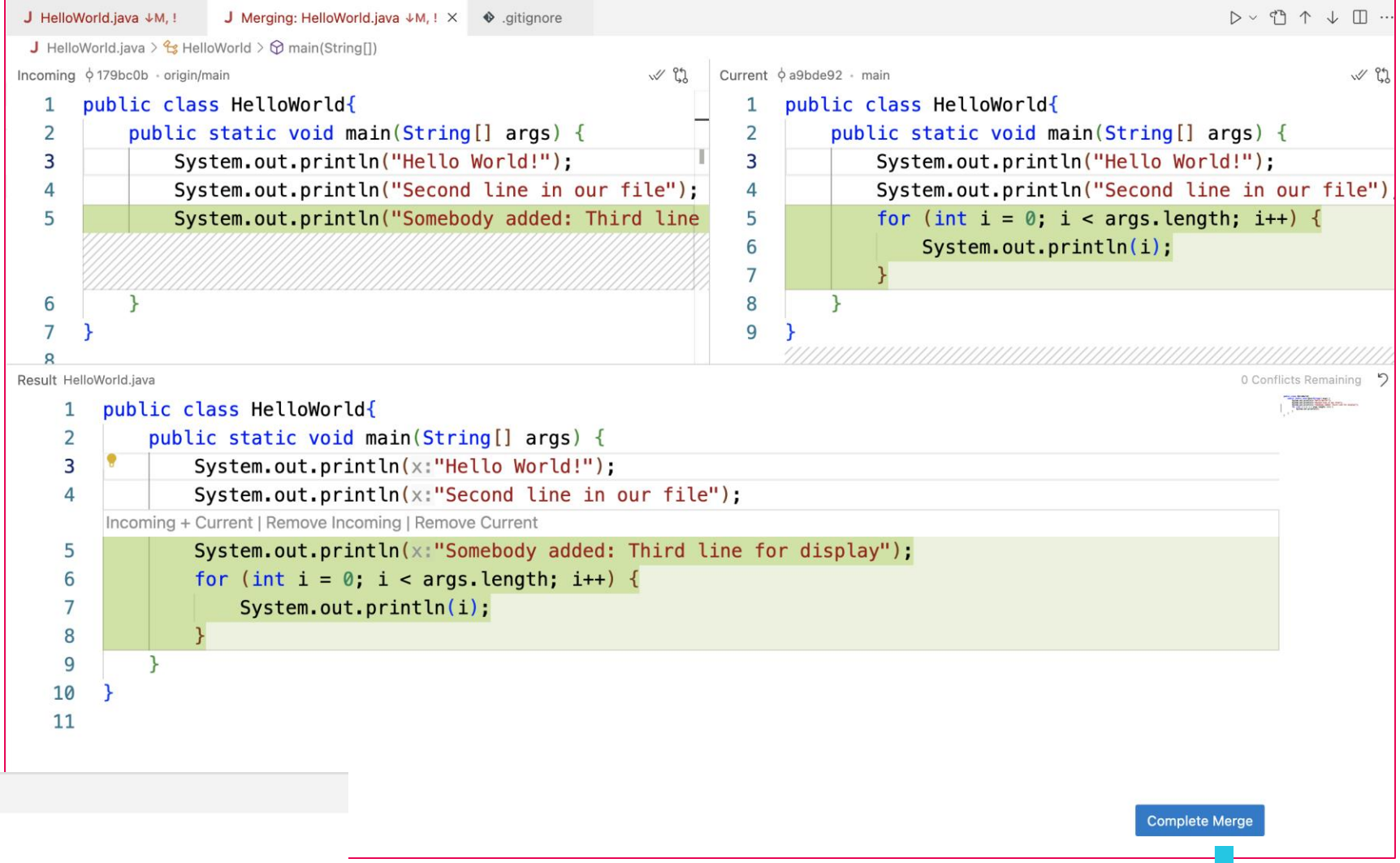
Merge Conflict

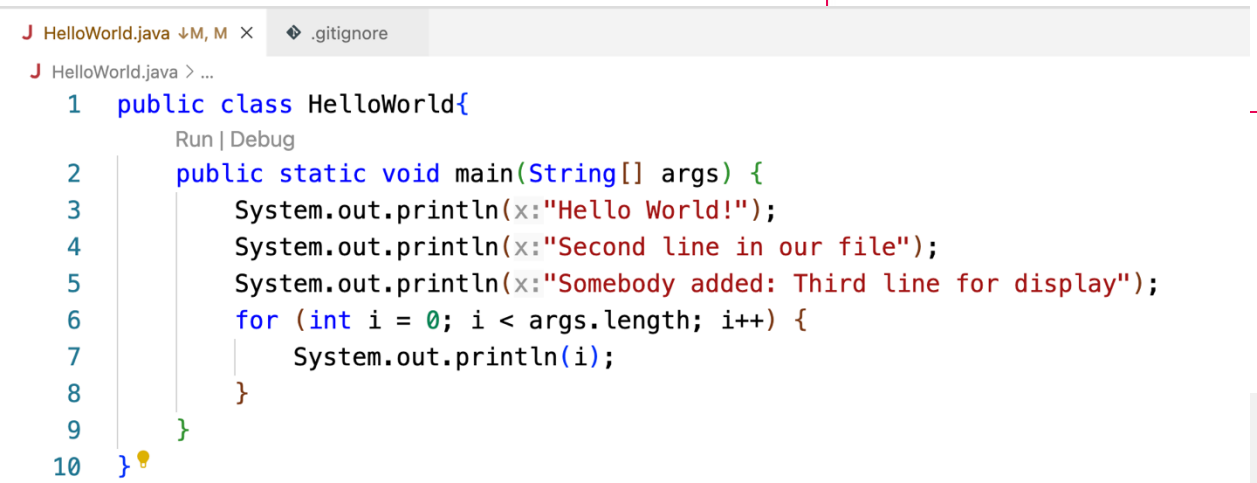
Visual Studio

1. **Accept Incoming | Accept Combination (Incoming First) | Ignore:**
    1. **Accept Incoming:** This option will accept the changes from the incoming branch (usually the changes from the remote repository).
    2. **Accept Combination (Incoming First):** This option will combine the changes from both branches, with the incoming changes being applied first.
    3. **Ignore:** This option will ignore the changes and leave the file as it is.
2. **Accept Current | Accept Combination (Current First) | Ignore:**
    1. **Accept Current:** This option will accept the changes from the current branch (usually the changes you made locally).
    2. **Accept Combination (Current First):** This option will combine the changes from both branches, with the current changes being applied first.
    3. **Ignore:** This option will ignore the changes and leave the file as it is.

Pull latest changes from GitHub Repository

git merge origin/main





Commit the merge & Push the Merged Changes to Remote

Visual Studio

bright~$**git commit -m "Added a for loop"**

[main 929291c] Added a for loop

bright~$**git push**

Enumerating objects: 10, done.

Counting objects: 100% (10/10), done.

Delta compression using up to 12 threads

Compressing objects: 100% (6/6), done.

Writing objects: 100% (6/6), 658 bytes | 658.00 KiB/s, done.

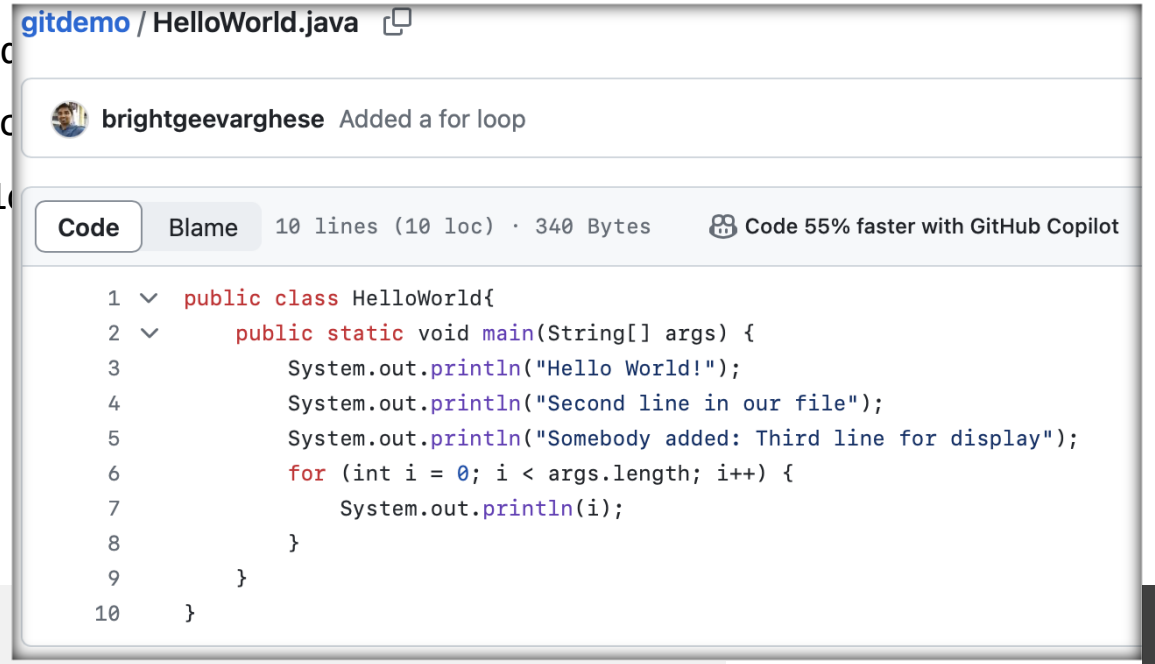
Total 6 (delta 2), reused 0 (delta 0), pack-reused 0 (from 0)

remote: Resolving d

To https://github.cc

179bc0b..929291

bright~$



Exercise

Experimenting is fun ☺

Contribute to 3rd party github repository:

– You have been tasked to work on this repository: https://github.com/brightgeevarghese/novgitdemo.git

– Fork the repository from my account to your GitHub account.

– Clone your forked copy from your GitHub account to your local machine

– Add your new folder(s)/file(s)

– Commit your change(s)/addition(s)

– Push your commit(s) to the remote repository named origin, which published it to your GitHub account

– Create/send a Pull Request from your GitHub account tothe upstream remote repository.