

Bioinformatics session

A two-day workshop for
bioinformaticians and molecular
biologists with focus on the TSO500
pipeline in InPreD



Overview

1. Setup
2. Development & Collaboration
3. Nextflow
4. tso500_nxf_workflow
5. Python

1. Setup

Create a GitHub account

- go to <https://github.com/> and click on `Sign up`



Create a GitHub account

- enter your email

Welcome to GitHub!

Let's begin the adventure

Enter your email*

→ coder@inpred.no

Continue

Create a GitHub account

- set a password

Welcome to GitHub!

Let's begin the adventure

Enter your email*

✓ coder@inpred.no

Create a password*

→ ••••••••



Continue

Create a GitHub account

- choose a username

Welcome to GitHub!

Let's begin the adventure

Enter your email*

✓ coder@inpred.no

Create a password*

✓ ••••••••••

Enter a username*

→ inpredder

Continue

Create a GitHub account

- choose email preferences

Email preferences

☐ Receive occasional product updates and announcements.

Continue

Create a GitHub account

- solve the puzzle



Create a GitHub account

- create your account



Create a GitHub account

- find the activation code in the email you received



Here's your GitHub launch code, @inpredder!



Continue signing up for GitHub by entering the code below:

40619601

Open GitHub

Create a GitHub account

- select the desired options

This will help us guide you to the tools that are best suited for your projects.

How many team members will be working with you?

☒ Just me

☐ 2-5

☐ 5-10

☐ 10-20

☐ 20-50

☐ 50+

Are you a student or teacher?

☒ N/A

☐ Student

☐ Teacher

Continue

What specific features are you interested in using?

Select all that apply so we can point you to the right GitHub plan.



Collaborative coding

Codespaces, Pull requests, Notifications, Code review, Code review assignments, Code owners, Draft pull requests, Protected branches, and more.



Automation and CI/CD

Actions, Packages, APIs, GitHub Pages, GitHub Marketplace, Webhooks, Hosted runners, Self-hosted runners, Secrets management, and more.



Security

Private repos, 2FA, Required reviews, Required status checks, Code scanning, Secret scanning, Dependency graph, Dependabot alerts, and more.

Create a GitHub account

- choose the free plan

Free

- > Unlimited public/private repositories
- > 2,000 CI/CD minutes/month
Free for public repositories
- > 500MB of Packages storage
Free for public repositories
- > 120 core-hours of Codespaces compute
- > 15GB of Codespaces storage
- > Community support

Continue for free

1. Setup

Be added to InPreD organisation at GitHub

1. Resources

- [Getting started with your GitHub account](#)

2. Development & Collaboration

Short `git` introduction

- distributed version control system
- tracks history of changes committed by different contributors
- every developer has full copy of project and its history

Short `git` introduction

Basic `git` commands

`git init` : initialises new git repository

`git clone <repository url>` : creates local copy of remote repository

`git add <file/s>` : stage new or changed files (anything that should be committed to the repository)

`git commit -m "feat: my new feature"` : commit changes to the repository

Basic `git` commands

commit message conventions

`<type>[optional scope]: <description>`

- `feat` : new feature
- `fix` : patching bug
- `refactor` : code change that neither is neither feat nor fix
- `build` : build system related changes
- `perf` : improving performance

commit message conventions

`<type>[optional scope]: <description>`

- `chore` : code unrelated changes, e.g. dependencies
- `style` : code change that does not change meaning
- `test` : changes to tests
- `docs` : adding/updating documentation
- `ci` : continuous integration, e.g. github actions

Basic `git` commands

`git status` : overview over untracked, modified and staged changes

`git branch` : show local branches

`git merge` : merge branches

`git pull` : load changes from remote counterpart

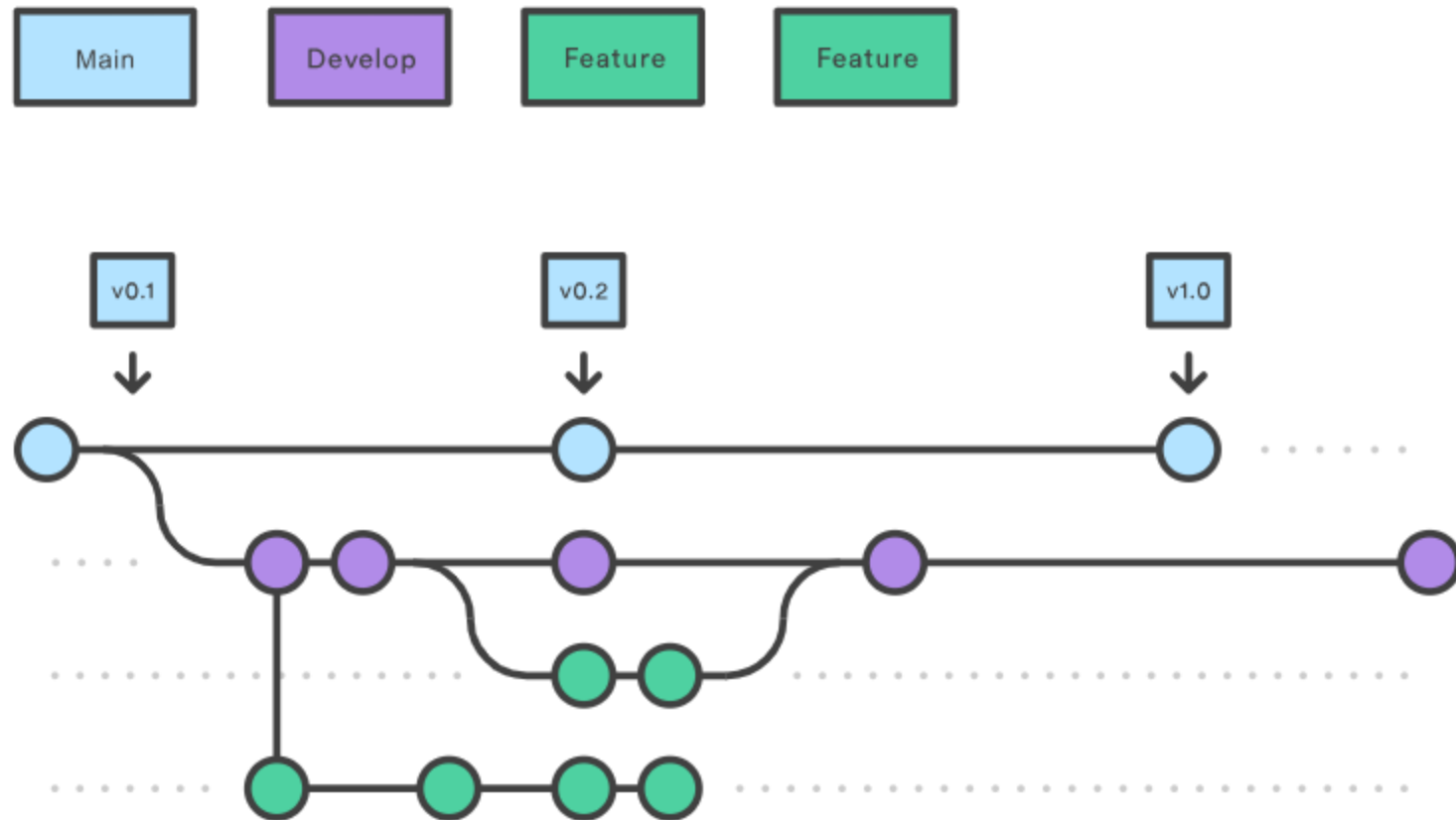
`git push` : upload changes to remote counterpart

2. Development & Collaboration

Branching model: simplified Gitflow workflow

- start with two branches to record project history: `main` and `develop`
- each new feature resides in its own branch (feature branch)
- feature branch is generally created off latest `develop` commit
- upon feature completion, feature branch is merged into `develop`

Branching model: simplified Gitflow workflow



2. Development & Collaboration

GitHub Actions

- continuous integration (CI) and continuous deployment (CD)
- building, testing and deploying directly from GitHub
- set up by adding yaml instructions to `.github/workflows`

```
name: GitHub Actions Demo
on: [push]
jobs:
  Explore-GitHub-Actions:
    runs-on: ubuntu-latest
    steps:
      - run: echo "Hello world!"
```

GitHub Actions

```
name: Docker Build
on:
  push:
    branches:
      - main
      - develop
    tags:
      - '!*.*.*'

jobs:
  test:
    name: Run unit tests
    runs-on: ubuntu-latest
    steps:
      -
        name: Check out the repo
        uses: actions/checkout@v4
      -
        name: Unit testing
        uses: fylein/python-pytest-github-action@v2
        with:
          args: pip3 install -r requirements.txt && pytest
    ...
```


GitHub Actions

```
...
  build:
    name: Build Image
    runs-on: ubuntu-latest
    needs: test
    steps:
      -
        name: Check out the repo
        uses: actions/checkout@v4

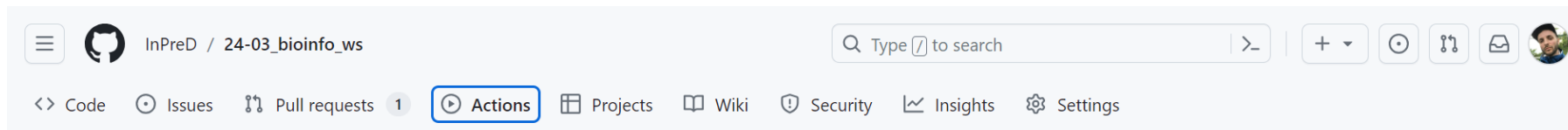
      -
        name: Lint Dockerfile
        uses: hadolint/hadolint-action@v3.1.0

      -
        name: Docker Meta
        id: meta
        uses: docker/metadata-action@v5
        with:
          images: |
            inpred/local_app_prepper
          tags: |
            latest
            type=semver,pattern={{version}}
            type=semver,pattern={{major}}.{{minor}}
            type=semver,pattern={{major}}

      -
        name: Login to Dockerhub
        uses: docker/login-action@v3
        with:
          username: ${{ secrets.DOCKERHUB_USERNAME }}
          password: ${{ secrets.DOCKERHUB_TOKEN }}

      -
        name: Build and push image to Docker Hub
        uses: docker/build-push-action@v5
        with:
          push: true
          tags: ${{ steps.meta.outputs.tags }}
          labels: ${{ steps.meta.outputs.labels }}
```

GitHub Actions



Actions

New workflow

All workflows

Workflows

marp-to-pages

pages-build-deployment

Management

Caches

Deployments

Runners

All workflows

Showing runs from all workflows

Filter workflow runs

36 workflow runs

Event ▾ Status ▾ Branch ▾ Actor ▾

✓	pages build and deployment pages-build-deployment #19: by github-pages (bot)	11 minutes ago 41s	...
✓	docs: add github actions marp-to-pages #17: Commit 34d473e pushed by marrip	12 minutes ago 47s	...
✓	pages build and deployment pages-build-deployment #18: by github-pages (bot)	46 minutes ago 47s	...

GitHub Actions

InPreD / 24-03_bioinfo_ws

Q Type / to search

>_

+ ▾

⌚

🔗

✉

<> Code ⌚ Issues 🔗 Pull requests 1 ⌚ Actions 📁 Projects 📖 Wiki 🛡 Security 📈 Insights ⚙ Settings

← marp-to-pages

docs: add images for github actions #18

Cancel workflow

⋮

🏠 Summary

Jobs

build

Run details

🕒 Usage

📄 Workflow file

Triggered via push now

marrip pushed 698fa73 develop

Status

In progress

Total duration

—

Artifacts

—

main.yml

on: push

build

16s

🗨

—

+

GitHub Actions

InPreD / 24-03_bioinfo_ws


Q

Type / to search

>_

+

▼



<>

CodeIssuesPull requests

1

▶

ActionsProjectsWikiSecurityInsightsSettings

← marp-to-pages

✓ docs: add images for github actions #18

Re-run all jobs



🏠 Summary

Jobs

✓ build

Run details

🕒 Usage

📄 Workflow file

build

succeeded now in 37s

Beta

Give feedback

Q Search logs

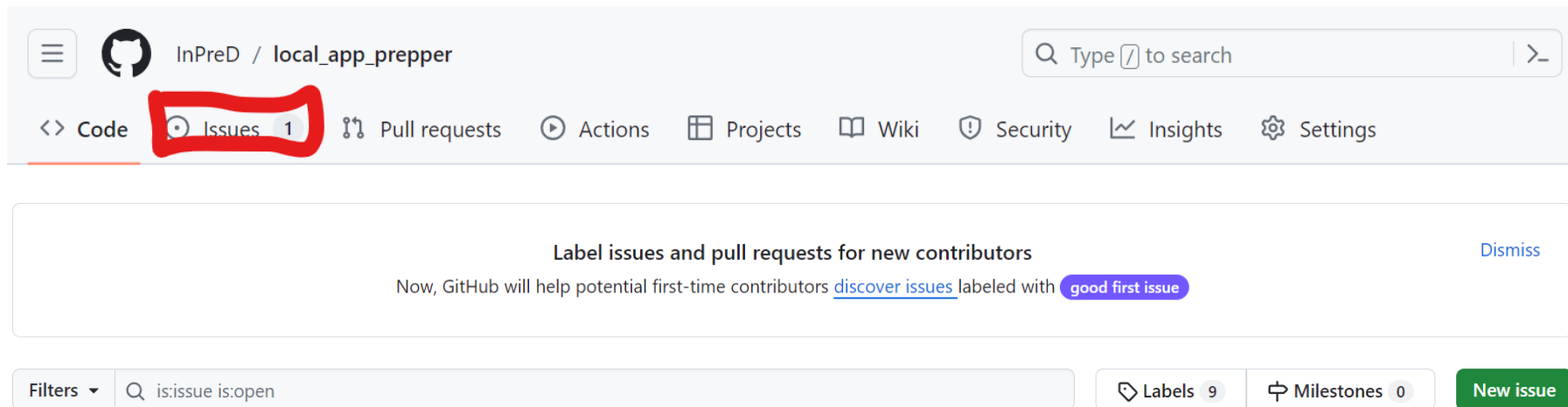


- > ✓ Set up job1s
- > ✓ Pull marpteam/marp-cli:v3.0.213s
- > ✓ Checkout code0s
- > ✓ Ensure build dir exists0s
- > ✓ Copy images directory (if exists)0s
- > ✓ Marp Build (README)2s
- > ✓ Marp Build (README.pdf)3s

2. Development & Collaboration

GitHub workflow

- go to issues and create a **New issue**



GitHub workflow

- give the issue a descriptive title and a description and **Submit new issue**



Add a title

new fancy feature

Add a description

Write

Preview

H B I ≡ <> 🔗 | ☰ ☷ ☶ | 📎 @ ↻ ↩

Add your description here...

📄 Markdown is supported

🖼️ Paste, drop, or click to add files

Assignees



No one—[assign yourself](#)

Labels



None yet

Projects



None yet

Milestone



No milestone

Development

Shows branches and pull requests linked to this issue.

Helpful resources

[GitHub Community Guidelines](#)

Submit new issue

GitHub workflow

- if you decide to work on the issue (own repository), **Create a branch** via the issue

The screenshot displays a GitHub issue interface. At the top, a comment by user 'marrip' is shown with the text 'No description provided.' Below this, a notification indicates that 'marrip' self-assigned the issue. The 'Add a comment' section is active, featuring a rich text editor with a toolbar containing various formatting and editing icons. The editor's placeholder text is 'Add your comment here...'. At the bottom of the editor, there are links for 'Markdown is supported' and 'Paste, drop, or click to add files'. To the right of the comment section, a sidebar contains several metadata fields: 'Assignees' (listing 'marrip'), 'Labels' (showing 'None yet'), 'Projects' (showing 'None yet'), 'Milestone' (showing 'No milestone'), and 'Development' (highlighted with a red box, showing a link to 'Create a branch' for this issue or link a pull request). Below these fields, there is a 'Notifications' section with a 'Customize' link and an 'Unsubscribe' button. At the bottom of the page, there are two buttons: 'Close issue' and 'Comment'.

GitHub workflow

- Change branch source to develop and Create branch

Create a branch for this issue ×

Branch name
4-new-fancy-feature 📋

Repository destination
🖥 InPreD/local_app_prepper ▾

What's next?
☐ Open in codespace
☒ Checkout locally
☐ Open branch with GitHub Desktop

Beta [Share feedback](#) Create branch

Change branch source

Create a branch for this issue ×

Branch name
4-new-fancy-feature 📋

Repository destination
🖥 InPreD/local_app_prepper ▾

Branch source
🔗 develop ▾

What's next?
☐ Open in codespace
☒ Checkout locally
☐ Open branch with GitHub Desktop

Beta [Share feedback](#) Create branch

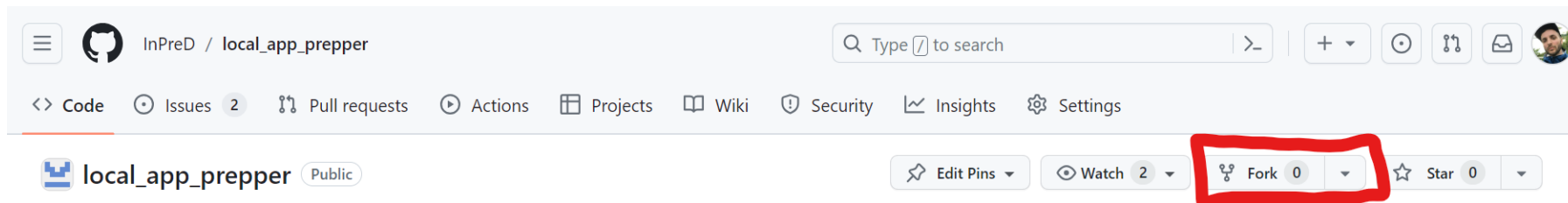
GitHub workflow

- load the new branch to your local repository, check it out and start working
- push your changes back to the remote

```
$ git pull  
$ git checkout 4-new-fancy-feature  
$ git add README.md  
$ git commit -m "docs: updating docs"  
$ git push
```

GitHub workflow

- for repositories you don't have access to, create a fork



GitHub workflow

Create a new fork

A *fork* is a copy of a repository. Forking a repository allows you to freely experiment with changes without affecting the original project.

Required fields are marked with an asterisk (*).

Owner * Repository name *


 marrip / local_app_prepper

✔ local_app_prepper is available.


By default, forks are named the same as their upstream repository. You can customize the name to distinguish it further.

Description (optional)

creates inputs.json files to be used with the LocalApp

 Copy the **main** branch only

Contribute back to InPreD/local_app_prepper by adding your own branch. [Learn more.](#)

 You are creating a fork in your personal account.

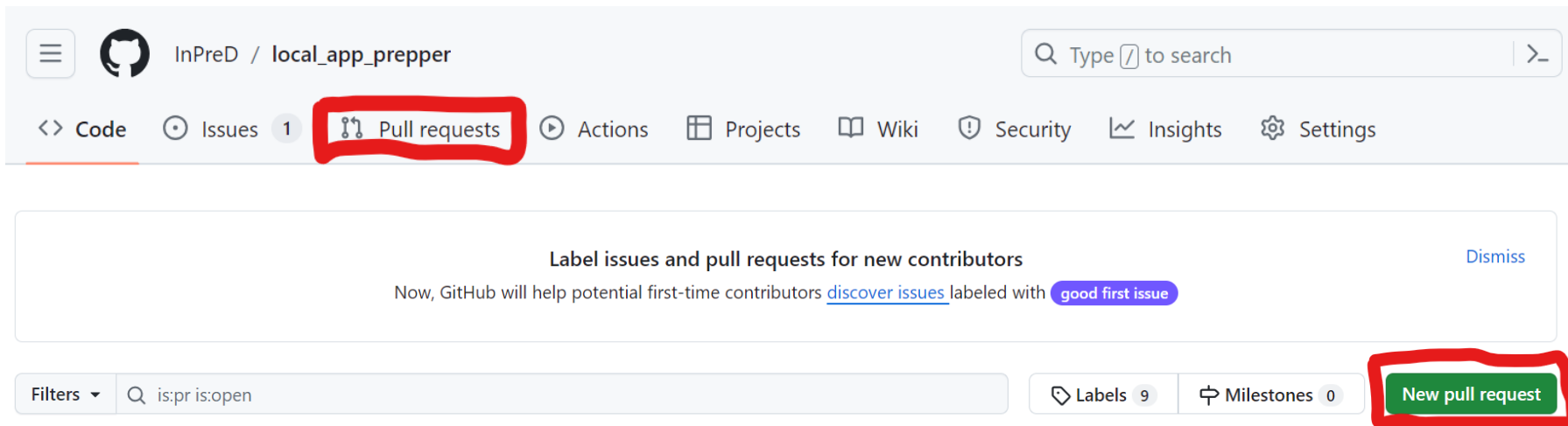
Create fork

GitHub workflow

- once you have a fork, `git clone` your forked repository
- create a new branch and work on that
- `git push` your changes back to the forked remote

GitHub workflow

- when you are done, go to pull requests and create a **New pull request**



GitHub workflow

- choose `develop` as `base` and your new feature branch for `compare`

Compare changes

Compare changes across branches, commits, tags, and more below. If you need to, you can also [compare across forks](#).

base: main ← compare: main

Choose a head ref

Find a branch

Branches Tags

✓ main default

4-new-fancy-feature

develop

Choose different branch

Learn about pull requests

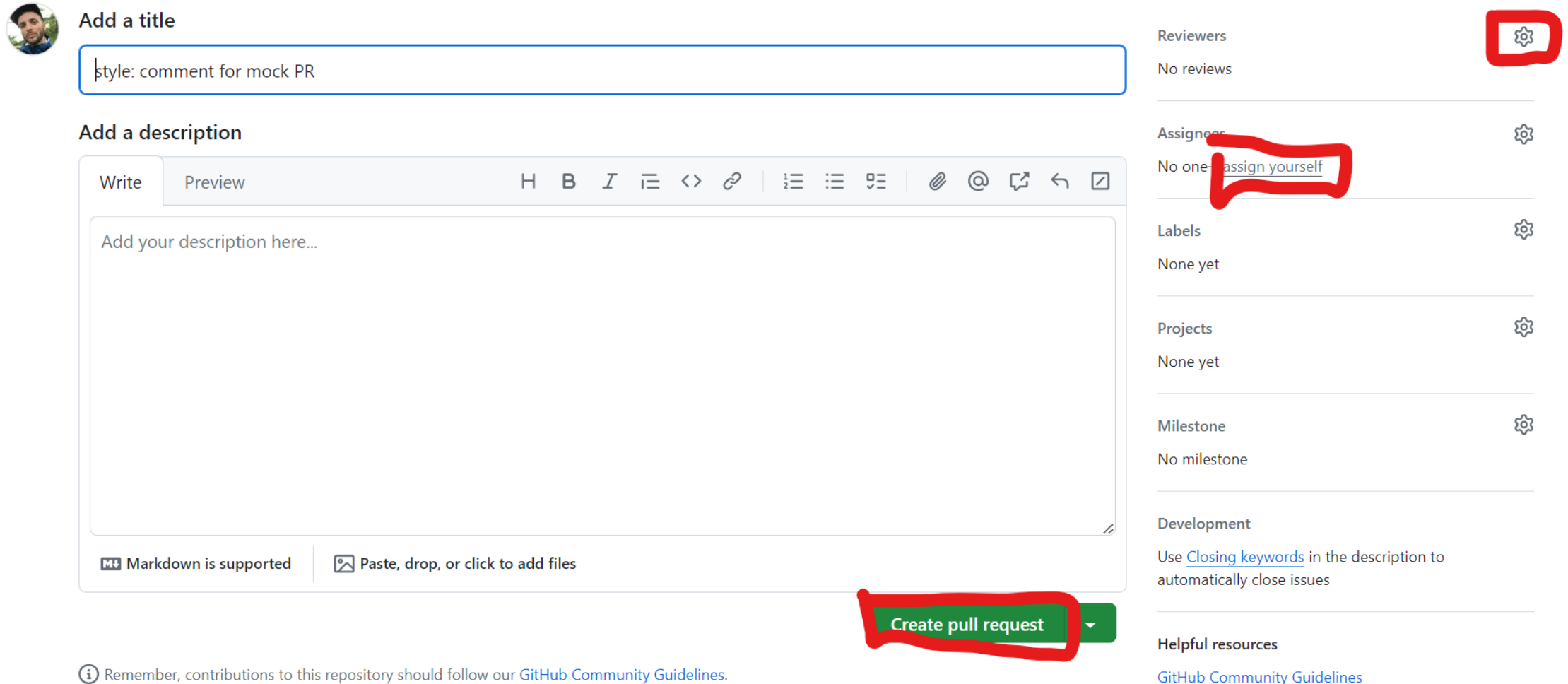
Create pull request

e and review just about anything

Branches, tags, commit ranges, and time ranges. In the same repository and across forks.

GitHub workflow

- assign yourself, add at least one reviewer (cog icon), provide some context and Create pull request



The screenshot shows the GitHub 'Create pull request' form. A red box highlights the 'Add a title' section, which contains the text 'style: comment for mock PR'. Another red box highlights the 'Add a description' section, which is empty. A third red box highlights the 'Assignees' section, where 'No one' is selected and 'assign yourself' is highlighted. A fourth red box highlights the 'Create pull request' button at the bottom right. On the right sidebar, a red box highlights the 'Reviewers' section, which shows 'No reviews' and a cog icon. Below the 'Assignees' section, the 'Labels' section shows 'None yet' and a cog icon. The 'Projects' section shows 'None yet' and a cog icon. The 'Milestone' section shows 'No milestone' and a cog icon. The 'Development' section shows 'Use [Closing keywords](#) in the description to automatically close issues'. At the bottom, a note says 'Remember, contributions to this repository should follow our [GitHub Community Guidelines](#)'.

Add a title

style: comment for mock PR

Add a description

Write Preview

Add your description here...

Markdown is supported Paste, drop, or click to add files

Reviewers

No reviews

Assignees

No one assign yourself

Labels

None yet

Projects

None yet

Milestone

No milestone

Development

Use [Closing keywords](#) in the description to automatically close issues

Helpful resources

[GitHub Community Guidelines](#)

Create pull request

Remember, contributions to this repository should follow our [GitHub Community Guidelines](#).

GitHub workflow

- if you still want to work on the pull request, you can **Convert to draft** to let the reviewers know that it is not done yet
- otherwise you can just wait for them to review your changes

style: comment for mock PR #5

Edit <> Code



marrip wants to merge 1 commit into `main` from `4-new-fancy-feature`

Conversation 0

Commits 1

Checks 0

Files changed 1

+3 -1



marrip commented now

Member

No description provided.



style: comment for mock PR

Verified

35908ea



marrip requested a review from gertrudeln now



marrip self-assigned this now



marrip linked an issue `now` that may be closed by this pull request

new fancy feature #4

Open

Reviewers

gertrudeln

Still in progress

Convert to draft

Assignees

marrip

Labels

None yet

Projects

None yet

Milestone

No milestone

GitHub Workflow

- as a reviewer, make your you check your email notifications to see if there is pull requests waiting for you
- open the pull request and start the review in the **Files changed** tab


style: comment for mock PR #5

Edit

<> Code ▾

 Open marrip wants to merge 1 commit into `main` from `4-new-fancy-feature` 

 Conversation 0

 Commits 1

 Checks 0

 Files changed 1

+3 -1 



marrip commented now

Member ...

No description provided.




  style: comment for mock PR

Verified


35908ea

  marrip requested a review from **gertrudeln** now

  marrip self-assigned this now

  marrip linked an issue now that may be closed by this pull request

new fancy feature #4

 Open

Reviewers

 **gertrudeln**

Still in progress? [Convert to draft](#)

Assignees

 **marrip**

Labels

None yet


Projects

None yet

Milestone

No milestone

GitHub workflow

- you can leave comments and suggestions in the code by hovering over the line with the changes and clicking on 


style: comment for mock PR #5

Edit


<> Code ▾

 Open marrip wants to merge 1 commit into `main` from `4-new-fancy-feature` 

 Conversation 0

 Commits 1

 Checks 0

 Files changed 1



+3 -1 

Changes from all commits ▾ File filter ▾ Conversations ▾ Jump to ▾ 

0 / 1 files viewed

Review in codespace

Review changes ▾

4  local_app_prepper.py 

☐ Viewed

 ...

... @@ -1,6 +1,8 @@

1 1 #!/usr/local/bin/python

2



3 just a comment

4 +

3 5 from prepper.cli import main

4 6

5 7 if __name__ == "__main__":

6 - main()



8 + main()
















GitHub workflow

- you can type your comment


3 + # just a comment


Write

Preview

 |       |    |     

Leave a comment

 Markdown is supported

 Paste, drop, or click to add files

Cancel












Add single comment

Start a review



GitHub workflow

- or you leave a suggestion, ideally you click **Start a review** to initialise the reviewing process












3 + # just a comment

Write Preview  H B I        @   



Leave a comment

 Markdown is supported  Paste, drop, or click to add files

Cancel Add single comment **Start a review**

Write Preview  H B I        @   

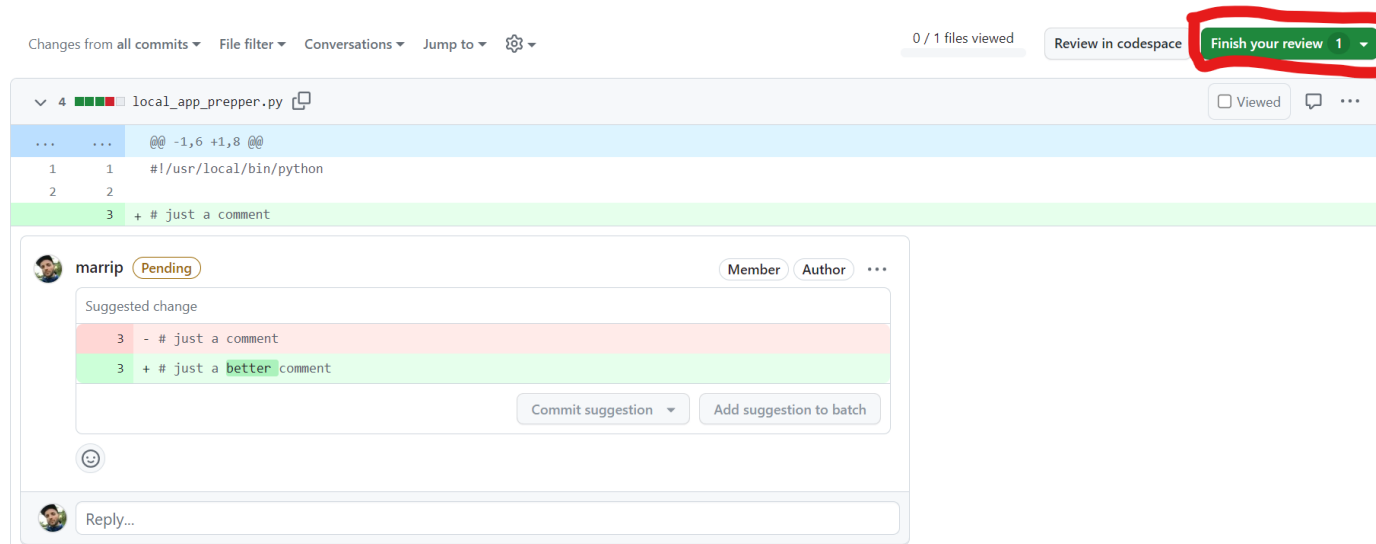
```  
suggestion  
# just a better comment  
```

 Markdown is supported  Paste, drop, or click to add files

Cancel Add single comment **Start a review**

GitHub workflow

- when you are done with reviewing, Finish your review



GitHub workflow

- again, leave a comment if you like, and choose if you just want to **Comment**, **Approve** or **Request changes**

Finish your review



Write Preview **H** **B** *I* | | @

Leave a comment

Markdown is supported Paste, drop, or click to add files

- ☒ **Comment**
Submit general feedback without explicit approval.
- ☐ **Approve**
Submit feedback and approve merging these changes.
- ☐ **Request changes**
Submit feedback that must be addressed before merging.

Submit review

GitHub workflow

- you can add a general comment to the pull request under Conversation



Add a comment

Write

Preview

H B I ≡ < > 🔗 ≡ ≡ ≡ 📎 @ 🗨️ ⬅️ 📄

LGTM 🍏

Markdown is supported 📎 Paste, drop, or click to add files

🔗 Close with comment

Comment

- release and semantic versioning
- licensing

2. Resources

- [About Git](#)
- [Gitflow workflow](#)
- [GitHub Actions](#)

3. Nextflow

- general (install, best practice)
- nf-core template
- stubbing

4. `tso500_nxf_workflow`

- status
- demonstration

5. Python

- general (best practice, cli)
- unit testing (pytest)

Resources

- [github actions](#)
- [nf-core](#)
- [pytest unittesting](#)
- [semantic versioning](#)