

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

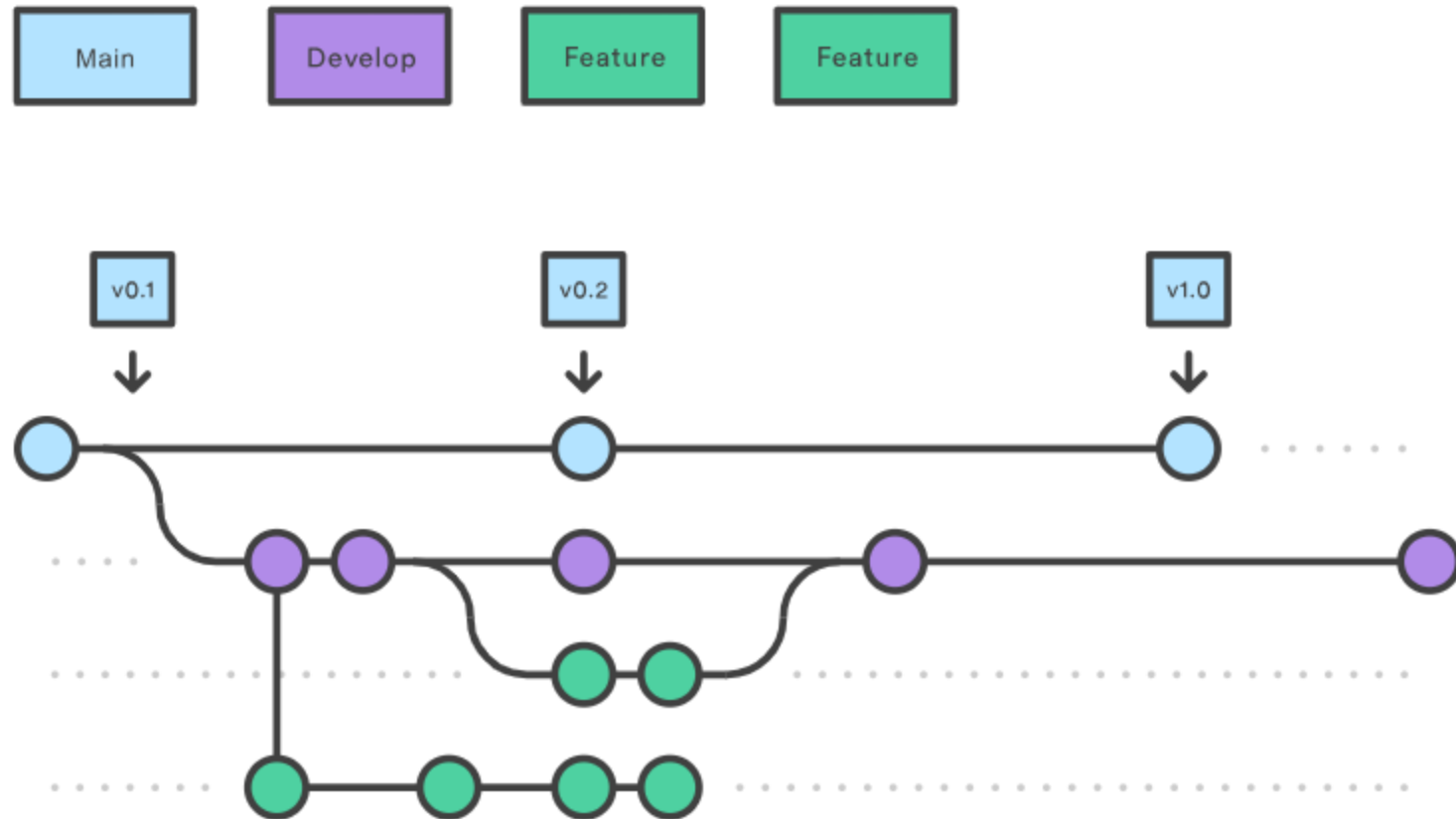
`git push` : upload changes to remote counterpart

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

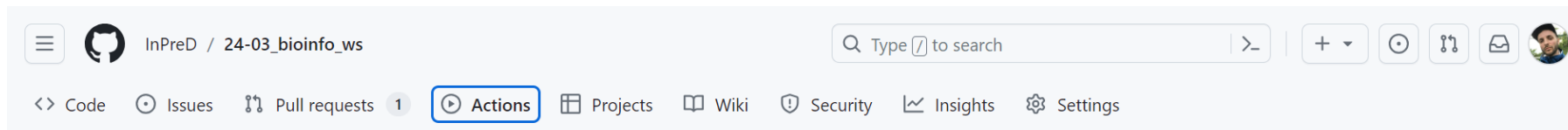
```
name: Docker Build
on:
  push:
    branches:
      - main
      - develop
    tags:
      - '!*.*.*'

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

Type / to search

>

+

<> Code

Issues

Pull requests 1

Actions

Projects

Wiki

Security

Insights

Settings

← 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

Search logs

>

✓

Set up job

1s

>

✓

Pull marpteam/marp-cli:v3.0.2

13s

>

✓

Checkout code

0s

>

✓

Ensure build dir exists

0s

>

✓

Copy images directory (if exists)

0s

>

✓

Marp Build (README)

2s

>

✓

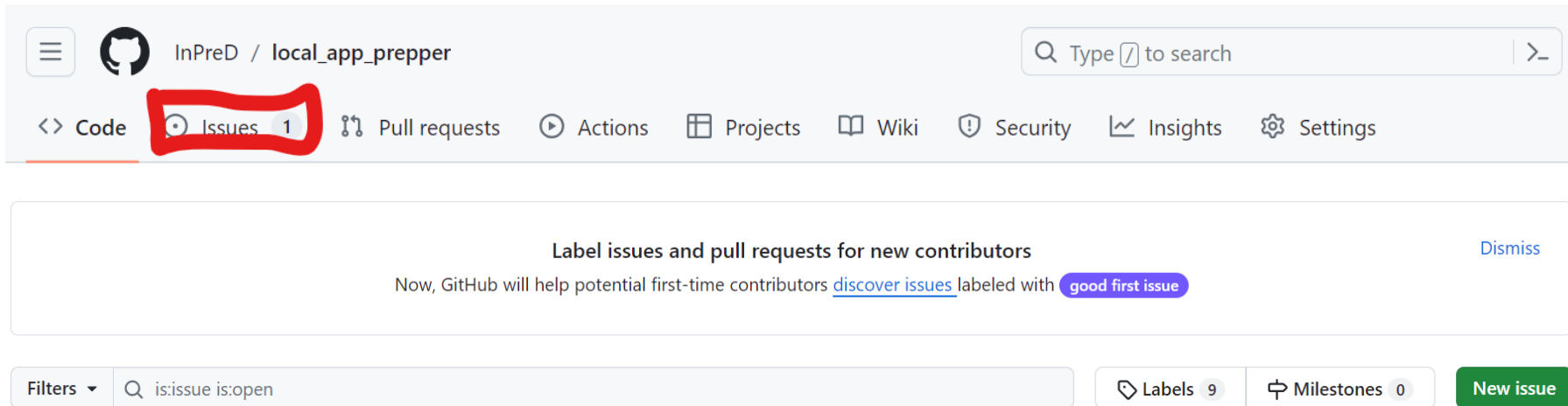
Marp Build (README.pdf)

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.

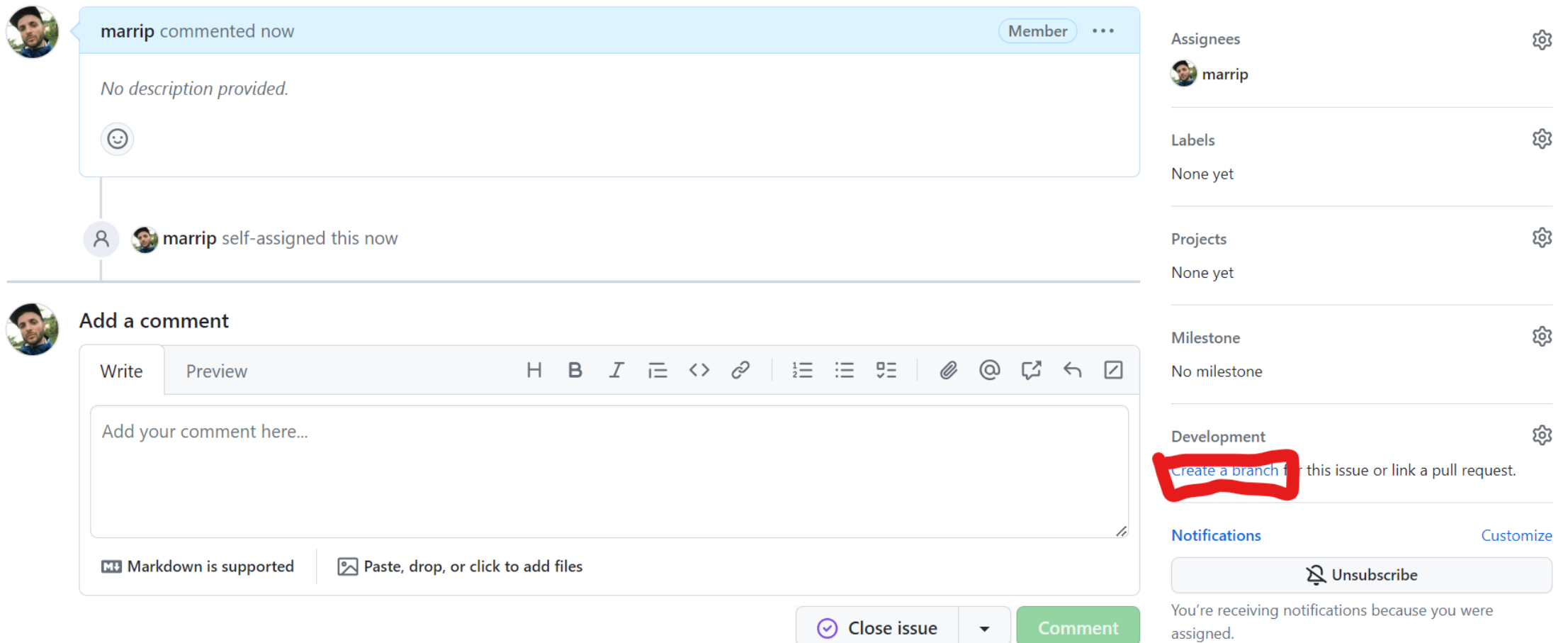
Helpful resources

[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 comment section, there are buttons for 'Close issue' and 'Comment'. On the right side of the issue, a sidebar contains several sections: 'Assignees' (listing 'marrip'), 'Labels' (showing 'None yet'), 'Projects' (showing 'None yet'), 'Milestone' (showing 'No milestone'), and 'Development'. The 'Development' section is highlighted with a red box and contains the text 'Create a branch for this issue or link a pull request.' Below this, there is a 'Notifications' section with a 'Customize' link and an 'Unsubscribe' button. At the very bottom, a message states: 'You're receiving notifications because you were assigned.'

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

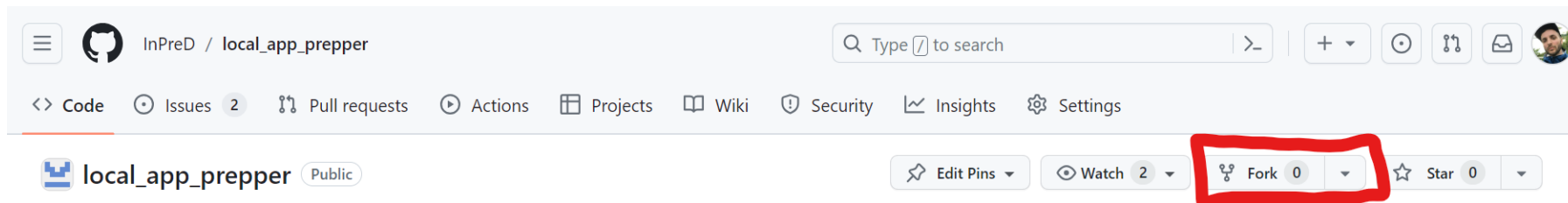
GitHub workflow

- load the new branch into 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



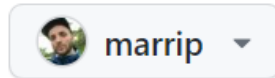
- once you have a fork, `git clone` your forked repository, create a new branch and work on that
- `git push` your changes back to the forked remote

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 *

/ 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



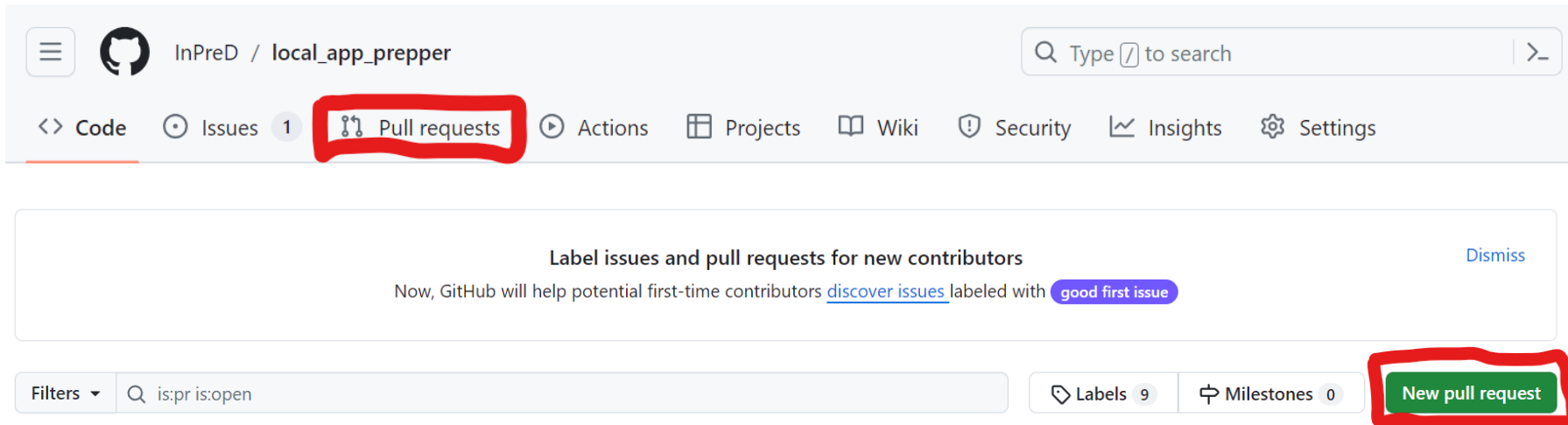
Copy the `main` branch only

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

ⓘ You are creating a fork in your personal account.

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 different branch

Find a branch

Learn about pull requests

Create pull request

Choose a head ref

Find a branch

Branches Tags

✓ main default

4-new-fancy-feature

develop

e and review just about anything

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

- 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](#)