Assignment - 1
Github Actions

CI/CD PIPELINE

A CI/CD pipeline is a set of automated processes that facilitate continuous integration and continuous development/delivery

Continuous integration(CI) involves automatically building, testing and integrating code changes into a shared repository whenever developers make changes. This ensures that code changes are regularly validated and integrated into the main codebase.

Continuous Delivery/Deployment(CD) involves automating the deployment of validated code changes to production environments. Continuous Delivery focuses on automatically deploying code changes to staging or preproduction environments for further testing, while continuous deployment goes a step further by automatically deploying changes directly to production environments after passing all the tests.

Overall, CI/CD pipelines streamline the software development and deployment process, enabling teams to deliver high quality software more quickly and efficiently.

Git and Github

- Git:
    - Git is a distributed version control system (DVCS) used for tracking changes in source code during software development.
    - It allows multiple developers to collaborate on a project simultaneously.
    - Git enables developers to create branches, merge changes, revert to previous versions, and track the history of changes.
    - Git operates locally on the developer's machine and doesn't require a constant connection to a central server.
- GitHub:
    - GitHub is a web-based platform that provides hosting for Git repositories.
    - It adds a layer of collaboration and social networking features on top of Git, allowing developers to share code, collaborate on projects, and contribute to open-source projects.
    - GitHub offers features such as issue tracking, project management tools, wikis, and pull requests for code review and collaboration.
    - It serves as a central hub for developers to store, manage, and share their Git repositories.

Key Differences:

Feature	Git	GitHub
Type	Version control system (software)	Web-based platform (service)
Functionality	Tracks changes in source code	Provides hosting, collaboration, and social features

Operation	Operates locally on developer's machine	Accessed via web browser and Git client
Collaboration	Limited collaboration features	Extensive collaboration tools, pull requests, etc.
Hosting	Repositories stored locally or on servers	Repositories hosted on GitHub's servers
Pricing	Open-source and free to use	Offers free and paid plans with additional features
Examples	Git command line, Git GUI clients	GitHub website, GitHub Desktop, GitHub CLI

In summary, Git is the underlying version control system used for tracking changes in source code, while GitHub is a web-based platform that provides hosting for Git repositories along with collaboration features and social networking aspects for developers.

Git commands

1. `git init`: Initializes a new Git repository in the current directory. This command creates a hidden `.git` directory where Git stores its internal data and configuration files.

2. `git clone <repository URL>`: Clones an existing Git repository from a remote location (such as GitHub, GitLab, or Bitbucket) to your local machine. This command creates a copy of the repository, including all of its files, commit history, and branches.

3. `git add <file>`: Adds a file or changes in a file to the staging area, preparing them to be included in the next commit. You can use `git add .` to add all changes in the current directory.

4. `git commit -m "commit message"`: Records changes to the repository, creating a new commit with a descriptive commit message. The commit message should briefly describe the changes made in the commit.

5. `git status`: Displays the current status of the repository, including any untracked files, changes not staged for commit, and changes ready to be committed (in the staging area).

6. `git diff`: Shows the differences between the changes in the working directory and the changes in the staging area (index). This command helps you review the changes before committing them.

7. `git diff <commit1> <commit2>`: Shows the differences between two commits. You can specify commit hashes, branch names, or other references to compare different versions of the repository.

8. `git pull`: Fetches changes from the remote repository and merges them into the current branch. This command is used to update your local repository with changes made by others.

9. `git push`: Pushes commits from your local repository to the remote repository. This command is used to share your changes with others and keep the remote repository up-to-date.

10. `git branch`: Lists all branches in the repository. By default, it shows only local branches. You can use `git branch -a` to list both local and remote branches.

11. `git checkout <branch>`: Switches to the specified branch. This command allows you to work on different branches within the repository.

12. `git merge <branch>`: Merges the specified branch into the current branch. This command combines changes from another branch into the current branch.

13. **`git remote add <name> <url>`**: Adds a new remote repository with the specified name and URL. This command allows you to manage connections to remote repositories.

14. **`git remote -v`**: Lists all remote repositories associated with the current repository, along with their URLs. This command is useful for verifying remote configurations.

15. **`git log`**: Displays a list of commits in reverse chronological order. By default, it shows the commit hash, author, date, and commit message for each commit.

16. **`git remote show <remote>`**: Shows information about the specified remote repository, such as the URL, tracking branches, and remote branches.

17. **`git fetch <remote>`**: Fetches changes from the specified remote repository but does not merge them into the local branches. This command updates the remote tracking branches in your local repository.

18. **`git checkout -b <branch>`**: Creates a new branch with the specified name and switches to it. This command is a shortcut for creating a new branch and then checking it out.

19. **`git branch -d <branch>`**: Deletes the specified branch from the repository. The branch must be fully merged into other branches before it can be deleted.

20. **`git branch -m <old-name> <new-name>`**: Renames the specified branch from `<old-name>` to **`<new-name>`**. This command can be used to rename the current branch or any other branch in the repository.

21. `git reset <commit>`: Resets the current branch to the specified commit, discarding all changes after that commit. This command can be used to undo commits or reset the repository to a previous state.

22. `git revert <commit>`: Creates a new commit that undoes the changes introduced by the specified commit. This command is used to revert specific commits while preserving the commit history.

23. `git stash`: Temporarily stores changes in the working directory and staging area, allowing you to switch branches or perform other operations without committing the changes.

24. `git stash pop`: Applies the most recently stashed changes to the working directory and staging area, removing them from the stash.

25. `git cherry-pick <commit>`: Applies the changes introduced by the specified commit to the current branch. This command is useful for selectively applying commits from one branch to another.

26. `git rebase <branch>`: Reapplies commits from the current branch onto the specified branch, rewriting the commit history. This command is often used to integrate changes from one branch into another.

27. `git tag <tag-name> <commit>`: Creates a lightweight tag at the specified commit. Tags are used to mark specific points in the commit history, such as release versions or milestones.

28. `git push --tags`: Pushes all tags from the local repository to the remote repository. This command is used to share tags with others when pushing changes.

29. `git submodule`: Manages Git submodules within a repository. Submodules allow you to include other Git repositories as subdirectories within your main repository.

30. `git clean`: Removes untracked files from the working directory. This command is used to clean up the working directory by removing files that are not under version control.

Github Actions

- GitHub Actions is a continuous integration and continuous delivery (CI/CD) platform.
- Allows you to automate your build, test, and deployment pipeline.
- Allows you to create workflows that build and test every pull request to your repository, or deploy merged pull requests to production.
- lets you run workflows when other events happen in your repository.
- GitHub provides Linux, Windows, and macOS virtual machines to run your workflows, or you can host your own self-hosted runners in your own data center or cloud infrastructure.

Components

You can configure a GitHub Actions workflow to be triggered when an event occurs in your repository, such as a pull request being opened or an issue being created. Your workflow contains one or more jobs which can run in sequential order or in parallel. Each job will run inside its own virtual machine runner, or inside a container, and has one or more steps that either run a script that you define or run an action, which is a reusable extension that can simplify your workflow.

Workflows -

- A configurable automated process that will run one or more jobs.
- Workflows are defined by a YAML file checked in to your repository
- Workflow runs when triggered by an event in your repository, or they can be triggered manually, or at a defined schedule.
- Workflows are defined in the .github/workflows directory in a repository, and a repository can have multiple workflows

Events -

- An event is a specific activity in a repository that triggers a workflow run.
- activity can originate from GitHub when someone creates a pull request, opens an issue, or pushes a commit to a repository.
- You can also trigger a workflow to run on a schedule, by posting to a REST API, or manually.

Jobs -

- A job is a set of steps in a workflow that is executed on the same runner.

- Each step is either a shell script that will be executed, or an action that will be run.
- Steps are executed in order and are dependent on each other.
- Since each step is executed on the same runner, you can share data from one step to another.
- You can configure a job's dependencies with other jobs; by default, jobs have no dependencies and run in parallel with each other.
- When a job takes a dependency on another job, it will wait for the dependent job to complete before it can run.

Actions -

- An action is a custom application for the GitHub Actions platform that performs a complex but frequently repeated task.
- Use an action to help reduce the amount of repetitive code that you write in your workflow files.
- An action can pull your git repository from GitHub, set up the correct toolchain for your build environment, or set up the authentication to your cloud provider.
- You can write your own actions, or you can find actions to use in your workflows in the GitHub Marketplace.

Runners -

- A runner is a server that runs your workflows when they're triggered.
- Each runner can run a single job at a time.
- GitHub provides Ubuntu Linux, Microsoft Windows, and macOS runners to run your workflows
- each workflow run executes in a fresh, newly-provisioned virtual machine.
- GitHub also offers larger runners, which are available in larger configurations.
- If you need a different operating system or require a specific hardware configuration, you can host your own runners.
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Workflow Implementation

- Creating directories and required files

```
MINGW64:/c/Users/ShreyaSharma/desktop/GithubAct/.github/workflows

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~
$ cd desktop

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop
$ mkdir GithubAct

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop
$ cd GithubAct

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop/GithubAct
$ git init
Initialized empty Git repository in C:/Users/ShreyaSharma/Desktop/GithubAct/.git/

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop/GithubAct (master)
$ git remote add origin https://github.com/xshreya/GithubAct.git

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop/GithubAct (master)
$ mkdir .github

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop/GithubAct (master)
$ cd .github

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop/GithubAct/.github (master)
$ mkdir workflows

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop/GithubAct/.github (master)
$ cd workflows

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop/GithubAct/.github/workflows (master)
$ echo myWorkflow.yml
myWorkflow.yml

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/desktop/GithubAct/.github/workflows (master)
$ notepad myWorkflow.yml
```

```
MINGW64:/c/Users/ShreyaSharma/Desktop/GithubAct

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/Desktop/GithubAct (main)
$ git pull origin main --allow-unrelated-histories
From https://github.com/xshreya/GithubAct
 * branch            main       -> FETCH_HEAD
Already up to date.

AzureAD+ShreyaSharma@CEQ-ICT-DESKTOP-003 MINGW64 ~/Desktop/GithubAct (main)
$ git push origin main
Enumerating objects: 8, done.
Counting objects: 100% (8/8), done.
Delta compression using up to 12 threads
Compressing objects: 100% (4/4), done.
Writing objects: 100% (7/7), 1.15 KiB | 1.15 MiB/s, done.
Total 7 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/xshreya/GithubAct.git
   ab6887f..21d52f2  main -> main
```

- Writing code to the myWorkflow.yml file

```yaml
name: Python CI

on:
  push:
    branches:
      - main
  pull_request:
    branches:
      - main

jobs:
  build:
    runs-on: ubuntu-latest

    steps:
    - name: Checkout Repository
      uses: actions/checkout@v2

    - name: Set up Python
      uses: actions/setup-python@v2
      with:
        python-version: '3.x' # Specify the Python version you want to use

    - name: Run tests
      run: |
        python try.py
```

- Multiline.yml

```yaml
name: Run Multiline Script

on:
  push:
    branches:
      - main

jobs:
  run-script:
    runs-on: ubuntu-latest
    steps:
      - name: Checkout repository
        uses: actions/checkout@v2

      - name: Run Multiline Script
        run: |
          echo "This is a multiline script"
          echo "It can contain multiple commands"
          echo "For example, you can run any bash commands here"
          echo "You can also include variables or conditionals"
          # Add your multiline script here
```

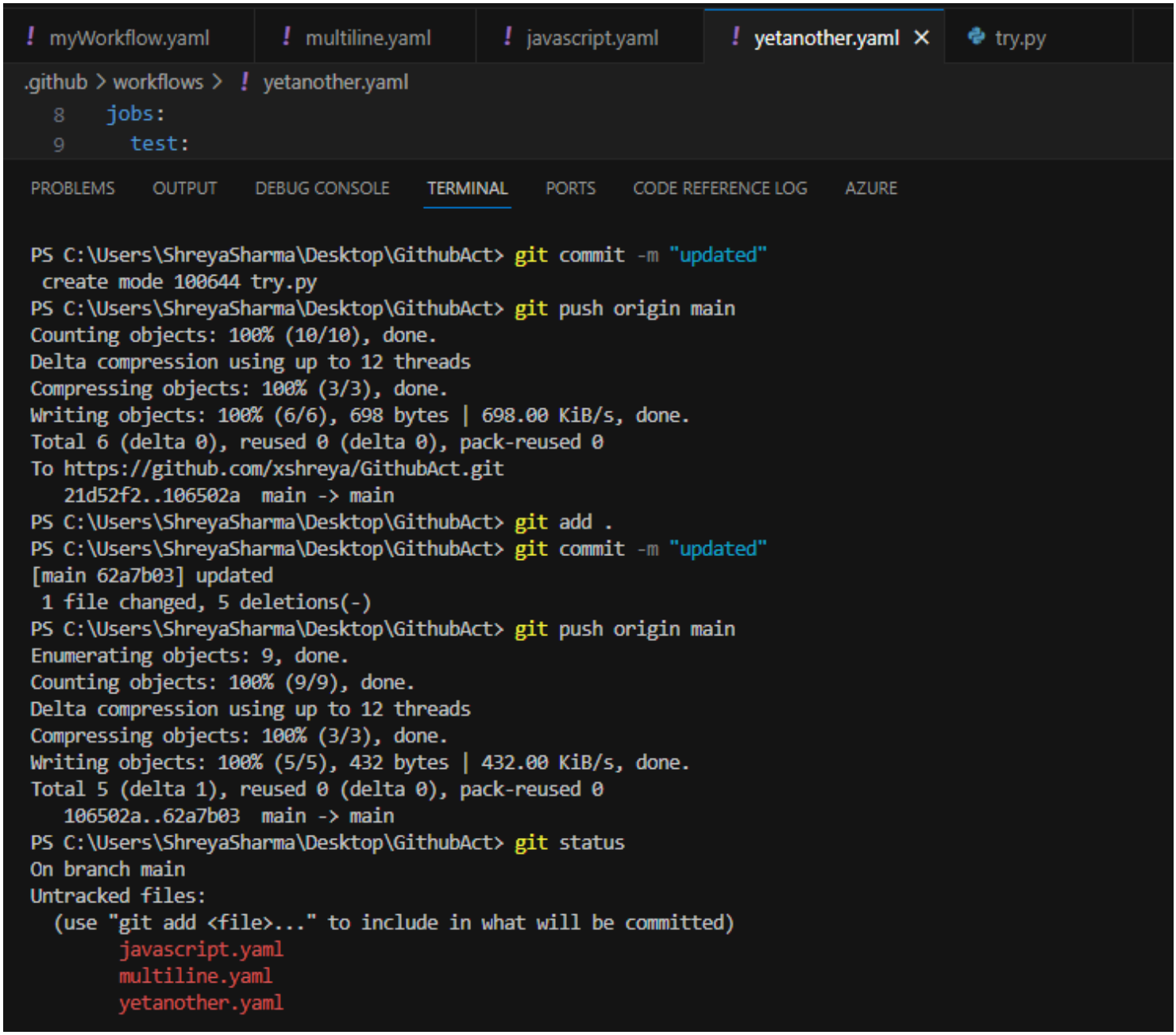
- javascript.yml

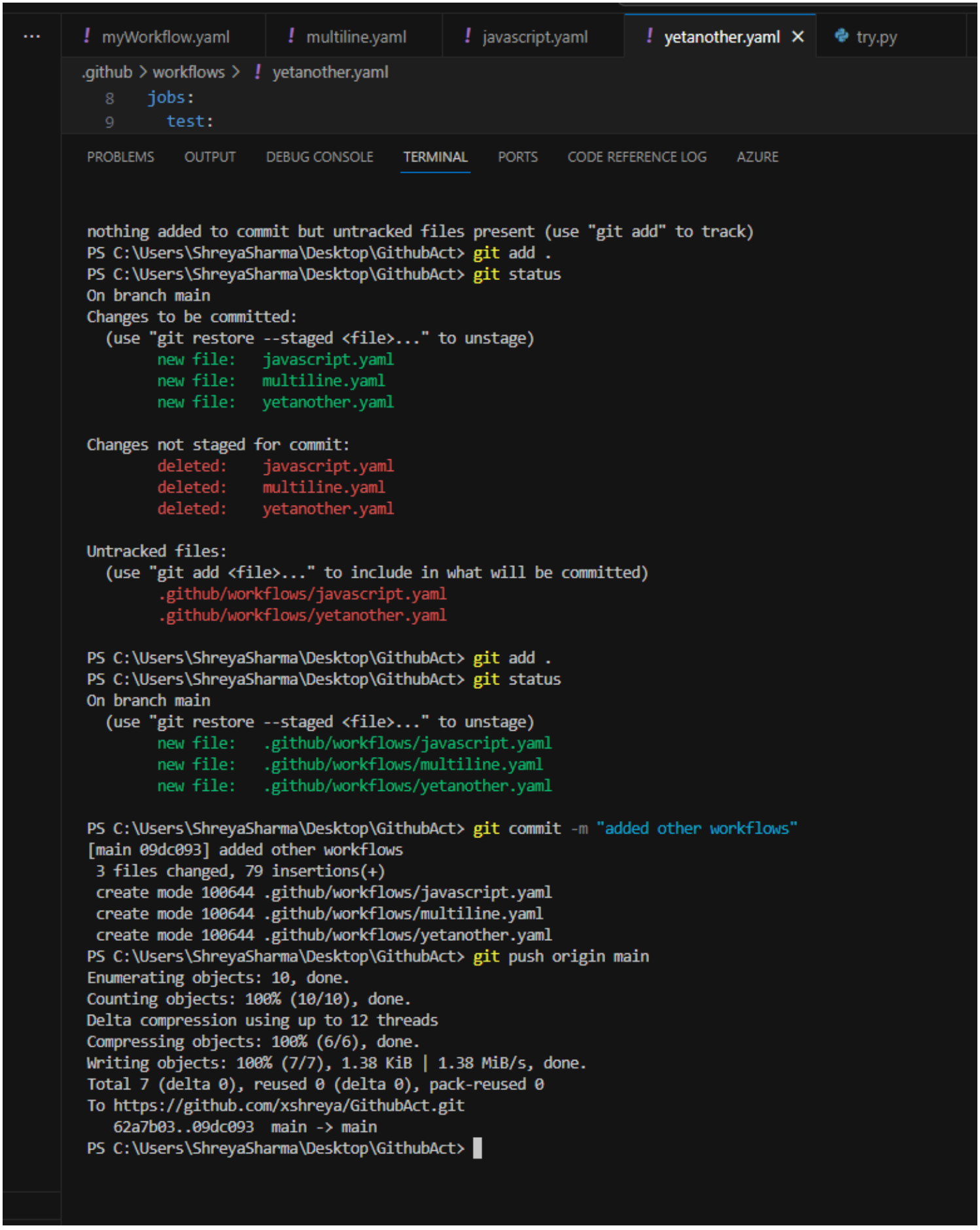
```yaml

name: Run JavaScript Script

on:
  push:
    branches:
      - main

jobs:
  run-script:
    runs-on: ubuntu-latest
    steps:
      - name: Checkout repository
        uses: actions/checkout@v2

      - name: Install Node.js
        uses: actions/setup-node@v2
        with:
          node-version: '14'

      - name: Run JavaScript Script
        run: |
          node -e '
            console.log("This is a multiline JavaScript script");
            console.log("You can write multiple lines of JavaScript code here");
            console.log("For example, you can perform computations, manipulate data, etc.");
            // Add your multiline JavaScript script here
          '

```

- Matrix and env variables demo

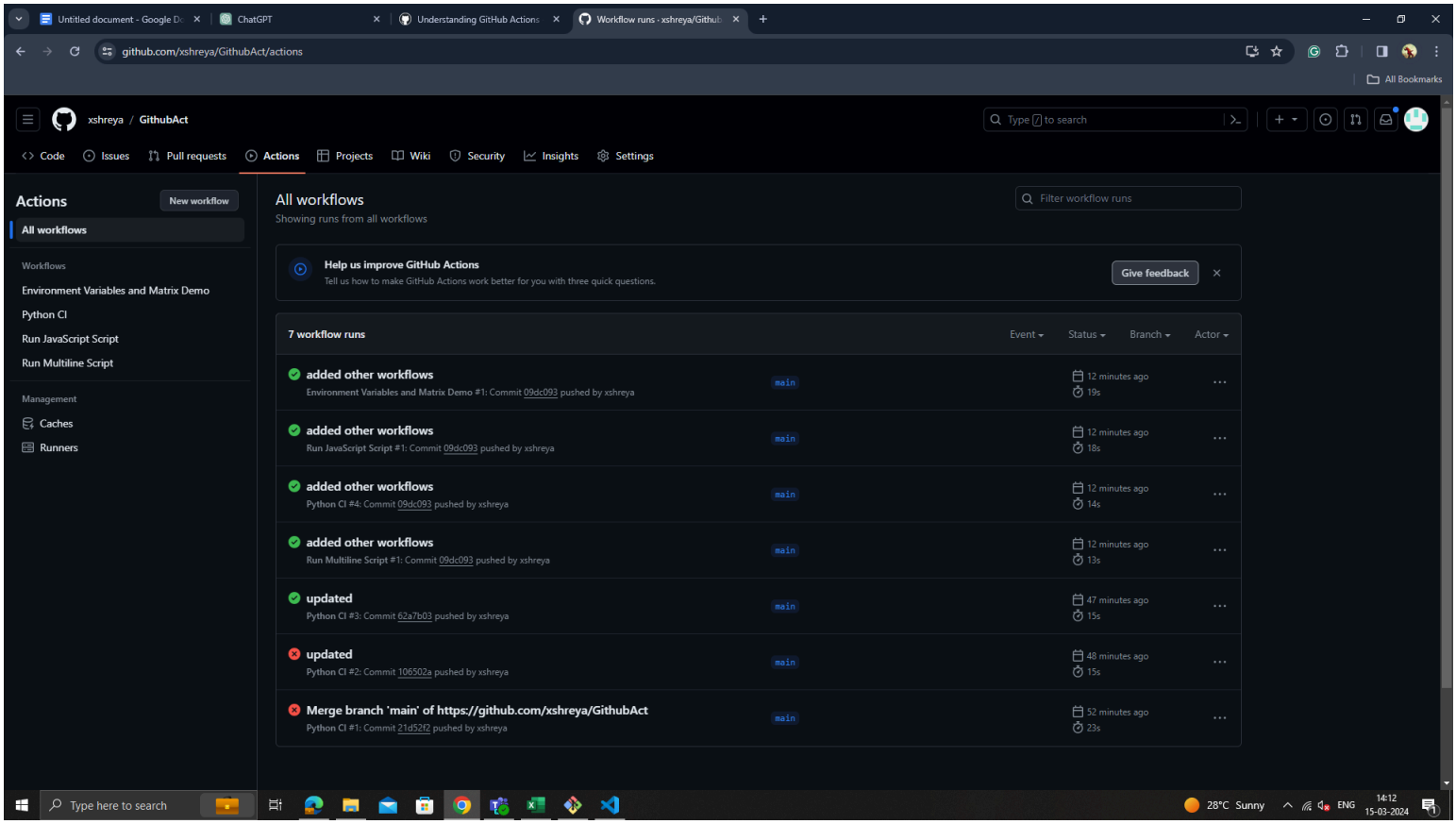
```yaml
name: Environment Variables and Matrix Demo

on:
  push:
    branches:
      - main

jobs:
  test:
    runs-on: ubuntu-latest
    strategy:
      matrix:
        node-version: [12.x, 14.x, 16.x]
    env:
      ENV_VAR_1: "Value 1"
      ENV_VAR_2: "Value 2"
    steps:
      - name: Checkout repository
        uses: actions/checkout@v2

      - name: Set up Node.js ${{ matrix.node-version }}
        uses: actions/setup-node@v2
        with:
          node-version: ${{ matrix.node-version }}

      - name: Display Environment Variables
        run: |
          echo "Environment variable 1: $ENV_VAR_1"
          echo "Environment variable 2: $ENV_VAR_2"
          echo "Matrix node version: ${{ matrix.node-version }}"
```

Running the code

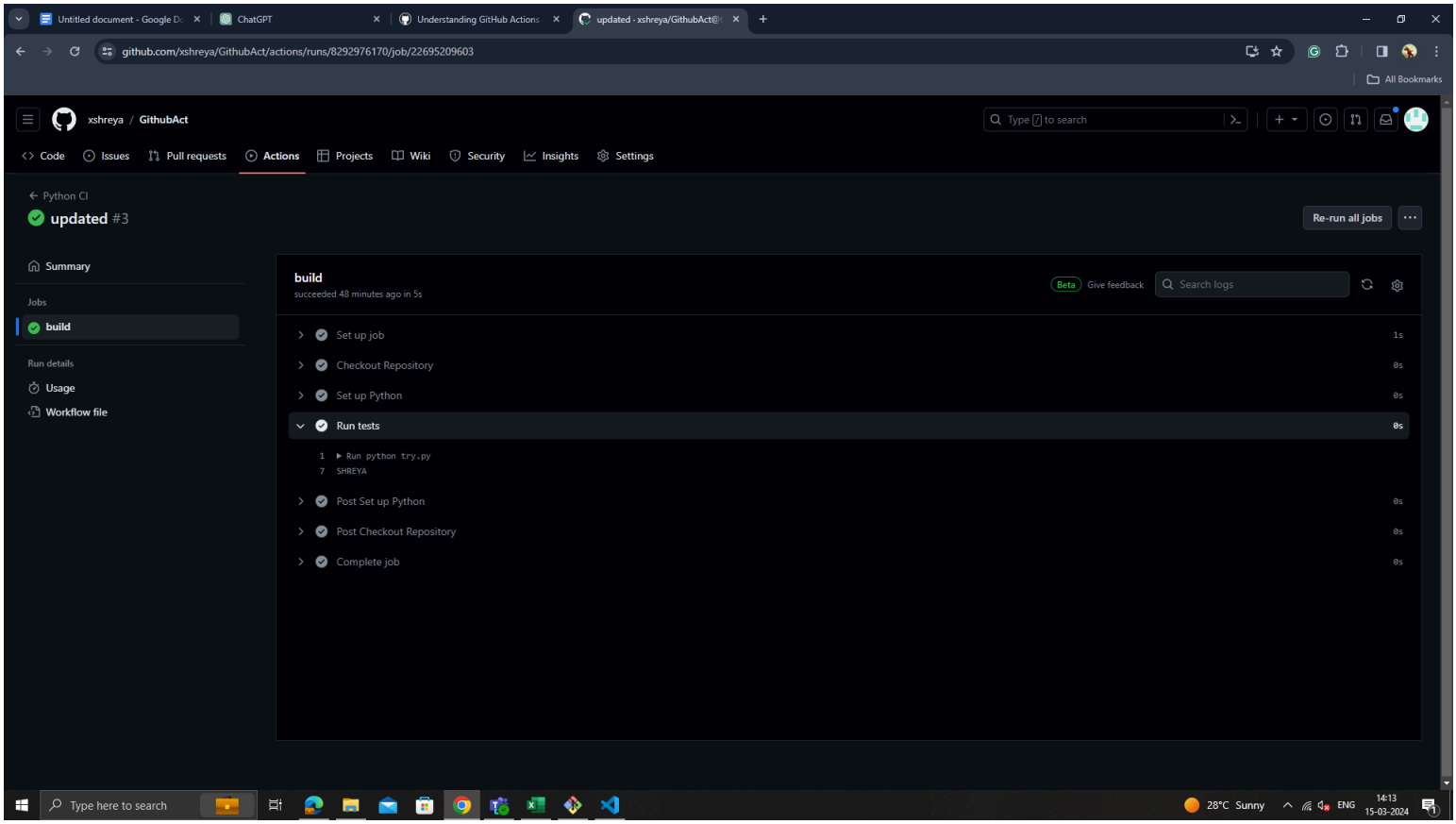



myWorkflow.yaml
multiline.yaml
javascript.yaml
yetanother.yaml
try.py
.github > workflows > yetanother.yaml
8 jobs:
9 test:
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS CODE REFERENCE LOG AZURE
nothing added to commit but untracked files present (use "git add" to track)
PS C:\Users\ShreyaSharma\Desktop\GithubAct> git add .
PS C:\Users\ShreyaSharma\Desktop\GithubAct> git status
On branch main
Changes to be committed:
(use "git restore --staged <file>..." to unstage)
new file: javascript.yaml
new file: multiline.yaml
new file: yetanother.yaml
Changes not staged for commit:
deleted: javascript.yaml
deleted: multiline.yaml
deleted: yetanother.yaml
Untracked files:
(use "git add <file>..." to include in what will be committed)
.github/workflows/javascript.yaml
.github/workflows/yetanother.yaml
PS C:\Users\ShreyaSharma\Desktop\GithubAct> git add .
PS C:\Users\ShreyaSharma\Desktop\GithubAct> git status
On branch main
(use "git restore --staged <file>..." to unstage)
new file: .github/workflows/javascript.yaml
new file: .github/workflows/multiline.yaml
new file: .github/workflows/yetanother.yaml
PS C:\Users\ShreyaSharma\Desktop\GithubAct> git commit -m "added other workflows"
[main 09dc093] added other workflows
3 files changed, 79 insertions(+)
create mode 100644 .github/workflows/javascript.yaml
create mode 100644 .github/workflows/multiline.yaml
create mode 100644 .github/workflows/yetanother.yaml
PS C:\Users\ShreyaSharma\Desktop\GithubAct> git push origin main
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% (7/7), 1.38 KiB | 1.38 MiB/s, done.
Total 7 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/xshreya/GithubAct.git
62a7b03..09dc093 main -> main
PS C:\Users\ShreyaSharma\Desktop\GithubAct>

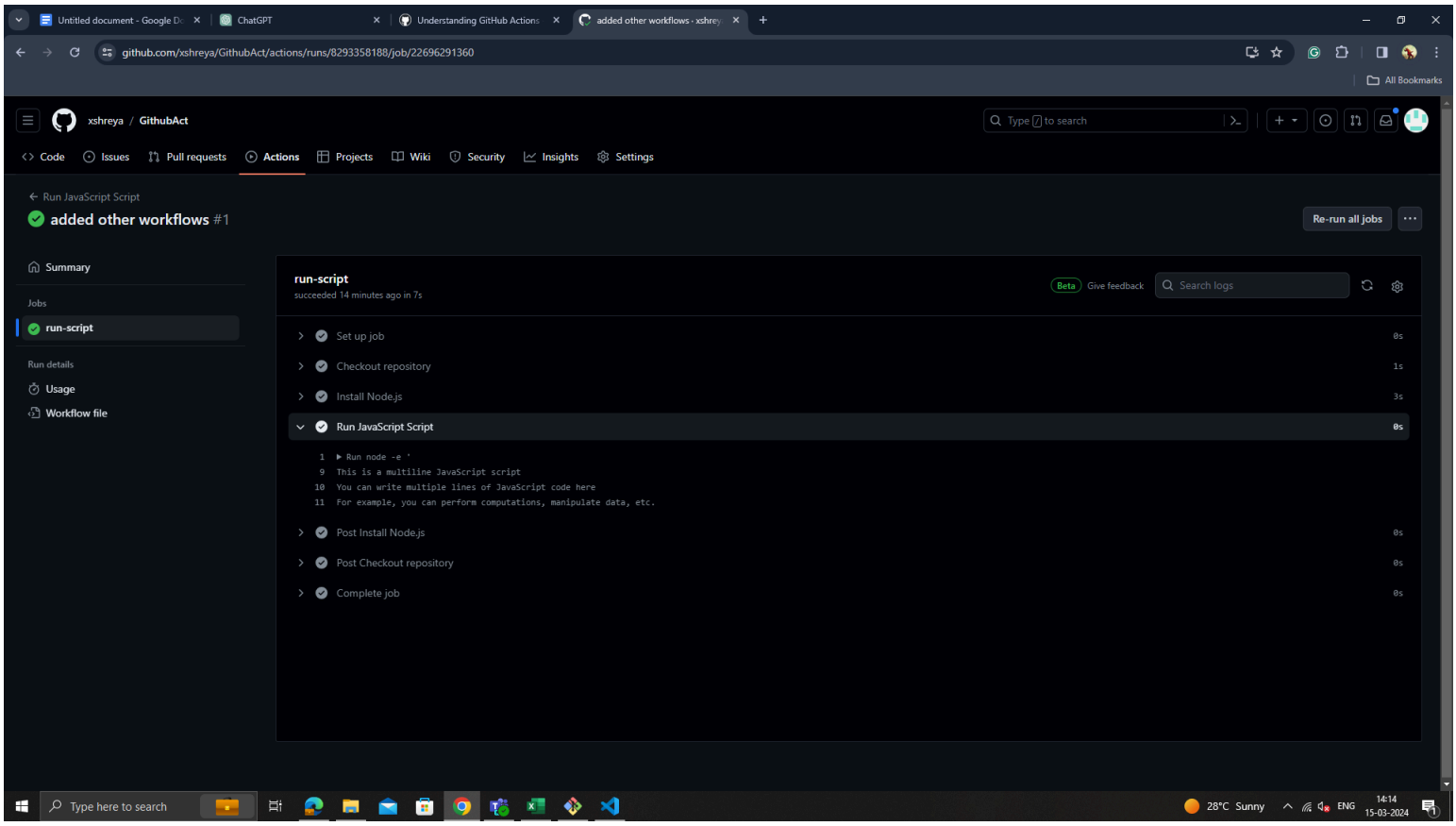
Outputs



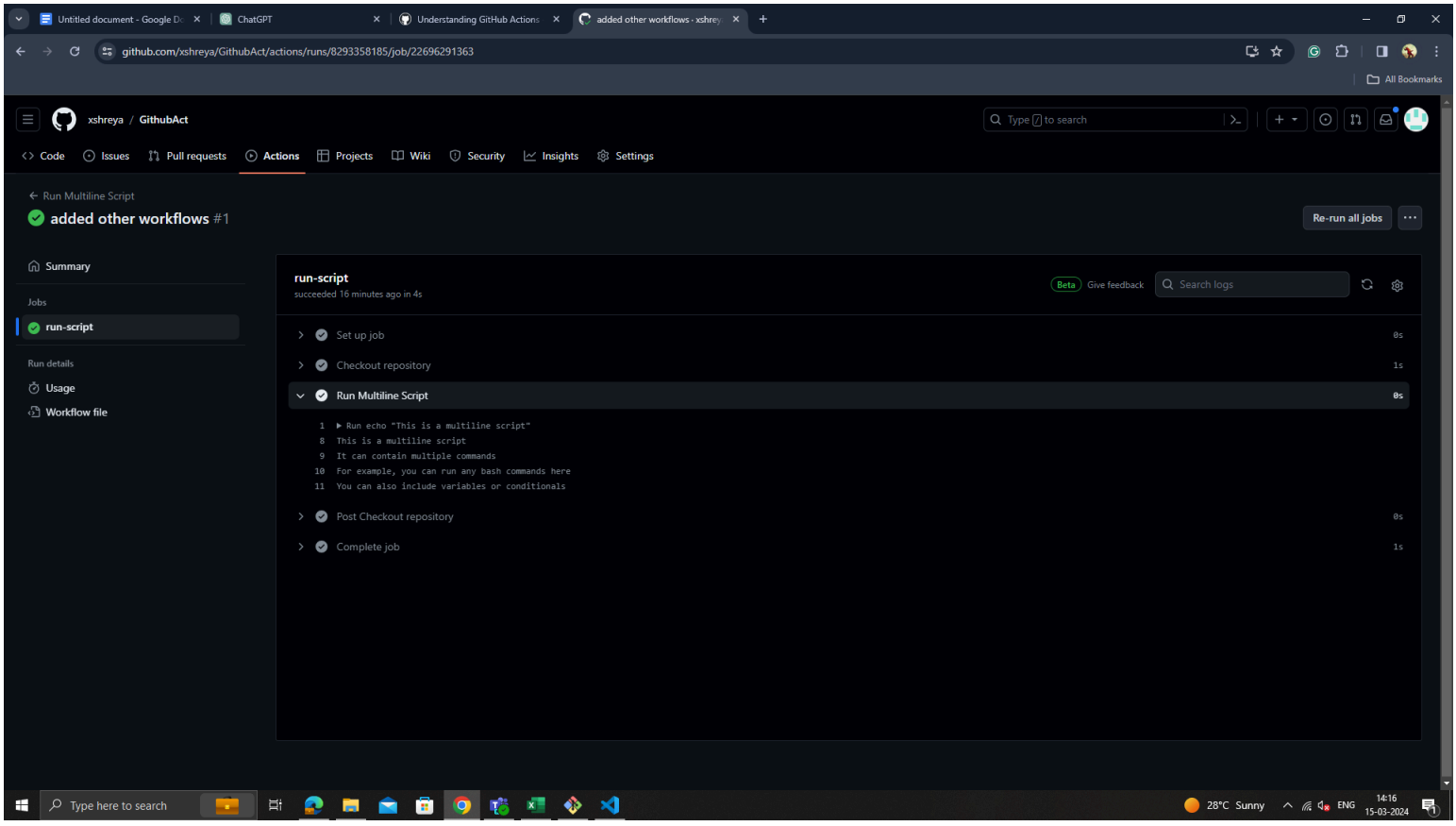
Output of python.yml



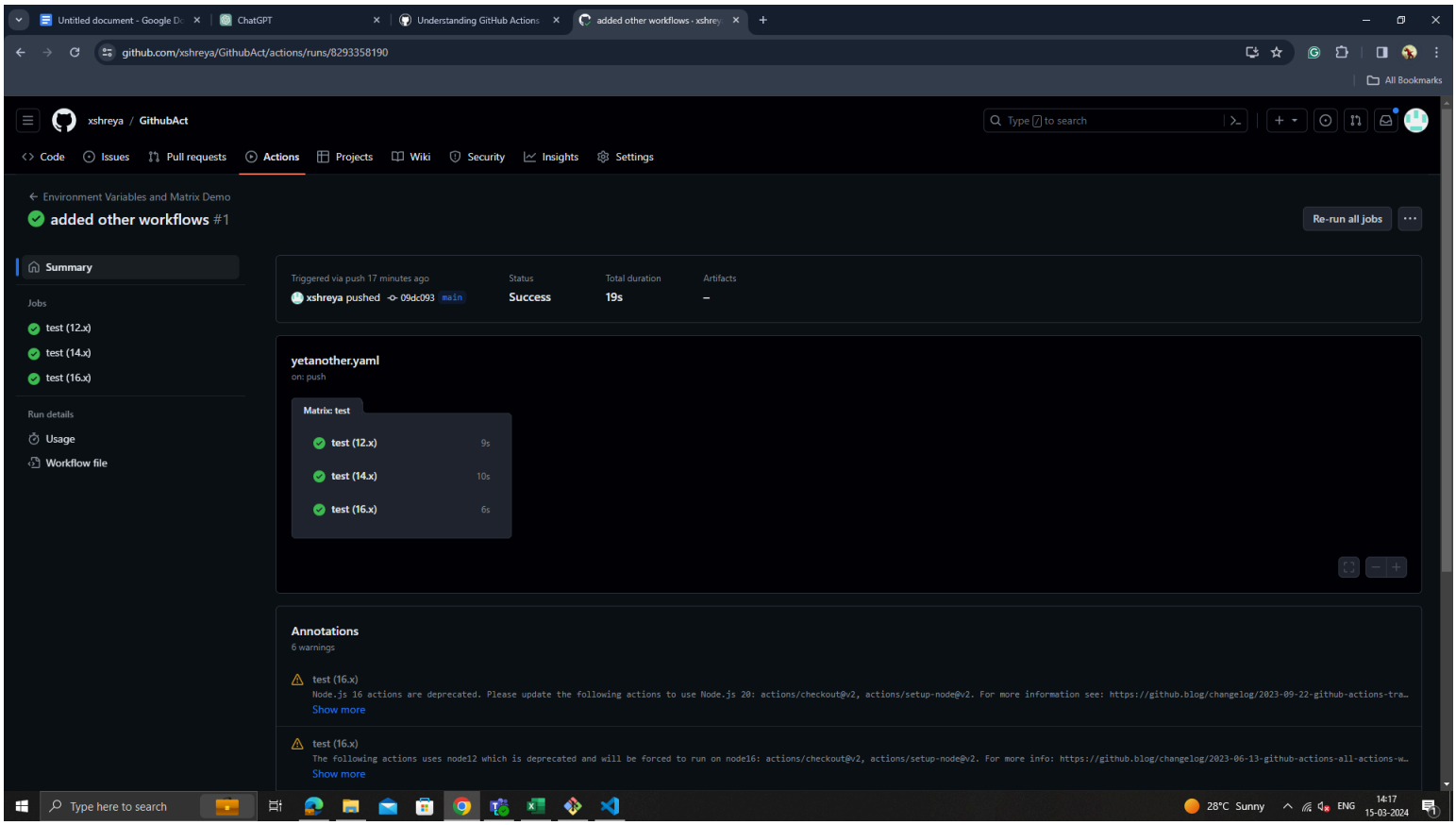
Output of javascript.yml

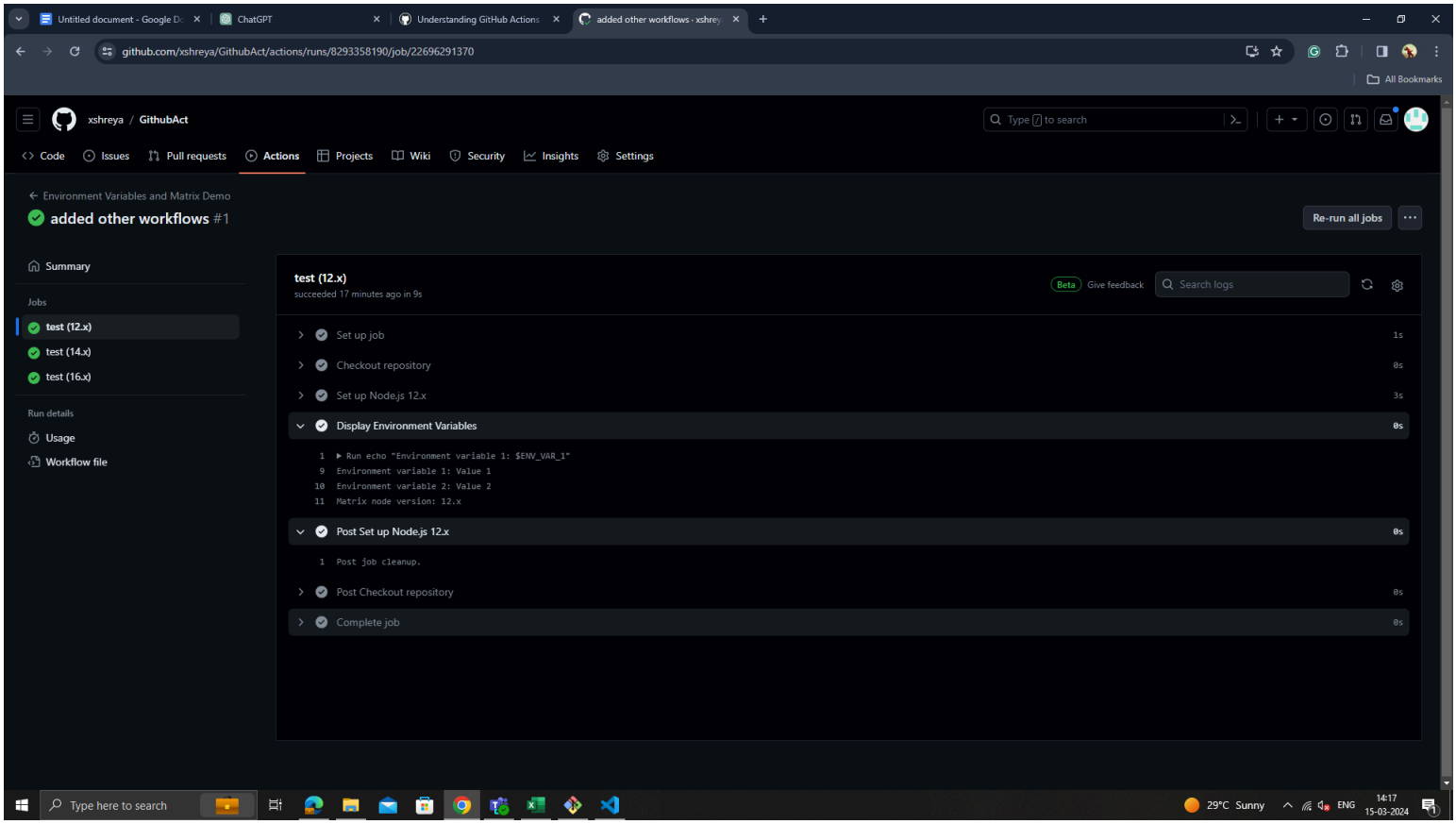


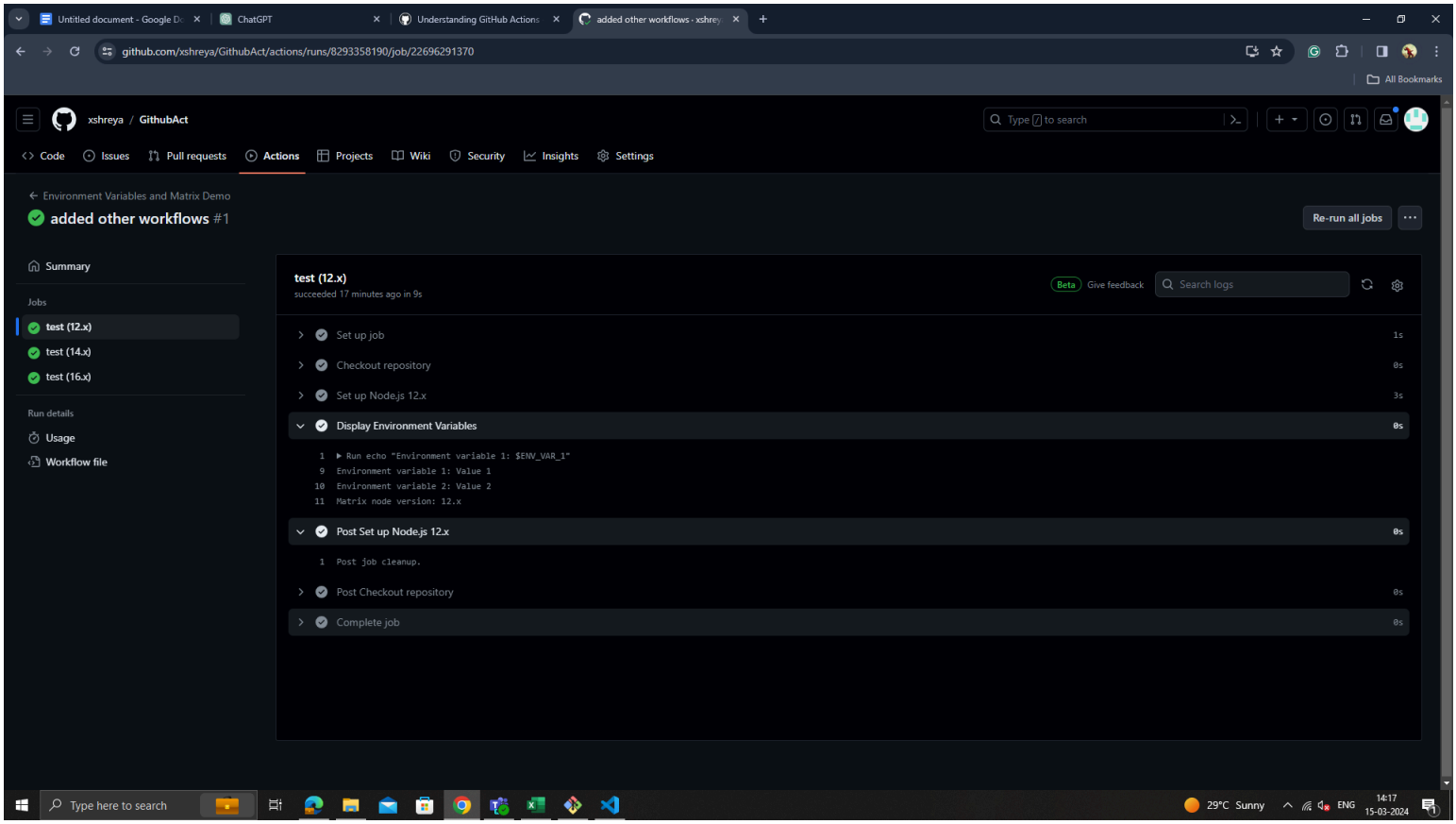
Output of mulitline.yaml

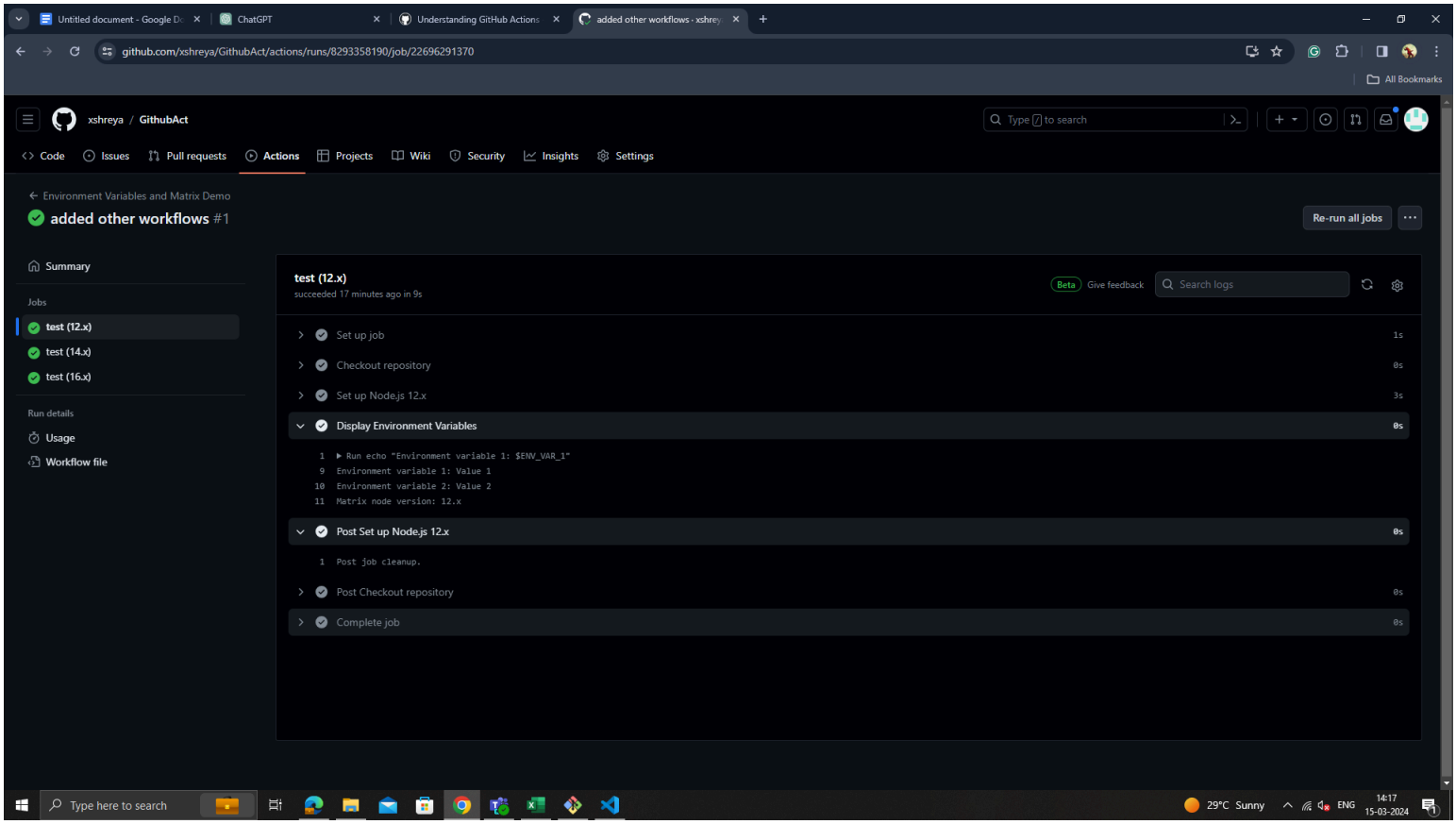


Output of yetanother.yml






Untitled document - Google Do
ChatGPT
Understanding GitHub Actions
added other workflows · xshreya
github.com/xshreya/GithubAct/actions/runs/8293358190/job/22696291370
All Bookmarks
xshreya / GithubAct
Type / to search
Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings
Environment Variables and Matrix Demo
added other workflows #1
Re-run all jobs
Summary
Jobs
test (12.x)
test (14.x)
test (16.x)
Run details
Usage
Workflow file
test (12.x)
succeeded 17 minutes ago in 9s
Beta
Give feedback
Search logs
Set up job
1s
Checkout repository
0s
Set up Node.js 12.x
3s
Display Environment Variables
0s
1 ▶ Run echo "Environment variable 1: $ENV_VAR_1"
9 Environment variable 1: Value 1
10 Environment variable 2: Value 2
11 Matrix node version: 12.x
Post Set up Node.js 12.x
0s
1 Post job cleanup.
Post Checkout repository
0s
Complete job
0s
Type here to search
29°C Sunny
ENG
14:17
15-03-2024


Untitled document - Google Do
ChatGPT
Understanding GitHub Actions
added other workflows · xshreya
github.com/xshreya/GithubAct/actions/runs/8293358190/job/22696291370
All Bookmarks
xshreya / GithubAct
Type / to search
Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings
Environment Variables and Matrix Demo
added other workflows #1
Re-run all jobs
Summary
Jobs
test (12.x)
test (14.x)
test (16.x)
Run details
Usage
Workflow file
test (12.x)
succeeded 17 minutes ago in 9s
Beta
Give feedback
Search logs
Set up job
1s
Checkout repository
0s
Set up Node.js 12.x
3s
Display Environment Variables
0s
1 ▶ Run echo "Environment variable 1: $ENV_VAR_1"
9 Environment variable 1: Value 1
10 Environment variable 2: Value 2
11 Matrix node version: 12.x
Post Set up Node.js 12.x
0s
1 Post job cleanup.
Post Checkout repository
0s
Complete job
0s
Type here to search
29°C Sunny
ENG
14:17
15-03-2024