

CI PROJECT REPORT

Project Title

Implementing Continuous Integration with GitHub Actions Using Matrix Builds, Code Quality Checks, and Secure Secrets Management

1. Abstract

This project demonstrates the practical implementation of Continuous Integration (CI) using GitHub Actions in a Node.js application. The workflow integrates automated testing, code quality checks, matrix builds across multiple Node.js versions, and secure handling of sensitive information using GitHub Secrets. The objective is to ensure early detection of defects, maintain code quality, and follow industry-standard DevOps practices in a production-ready manner.

2. Introduction

Continuous Integration is a core DevOps practice that enables developers to integrate code changes frequently while automatically validating functionality and quality. Without CI, defects are often detected late, leading to costly fixes and unstable releases. This project applies CI principles by automating linting, testing, and build validation using GitHub Actions.

The implementation aligns strictly with best practices of Implementing Continuous Integration with GitHub Actions, focusing on matrix builds and code quality enforcement.

3. Project Objectives

- Implement Continuous Integration using GitHub Actions
 - Configure matrix builds to test across multiple Node.js versions
 - Enforce code quality using ESLint
 - Execute automated tests using Jest
 - Improve build efficiency using dependency caching
 - Secure sensitive configuration values using GitHub Secrets
 - Validate CI execution through Pull Requests
-

4. Tools and Technologies Used

- **GitHub & GitHub Actions** – CI automation platform
 - **Node.js & npm** – Runtime and dependency management
 - **Jest** – Automated testing framework
 - **ESLint (Flat Config)** – Static code analysis tool
 - **YAML** – Workflow configuration language
 - **GitHub Secrets** – Secure storage of sensitive values
-

5. Project Implementation

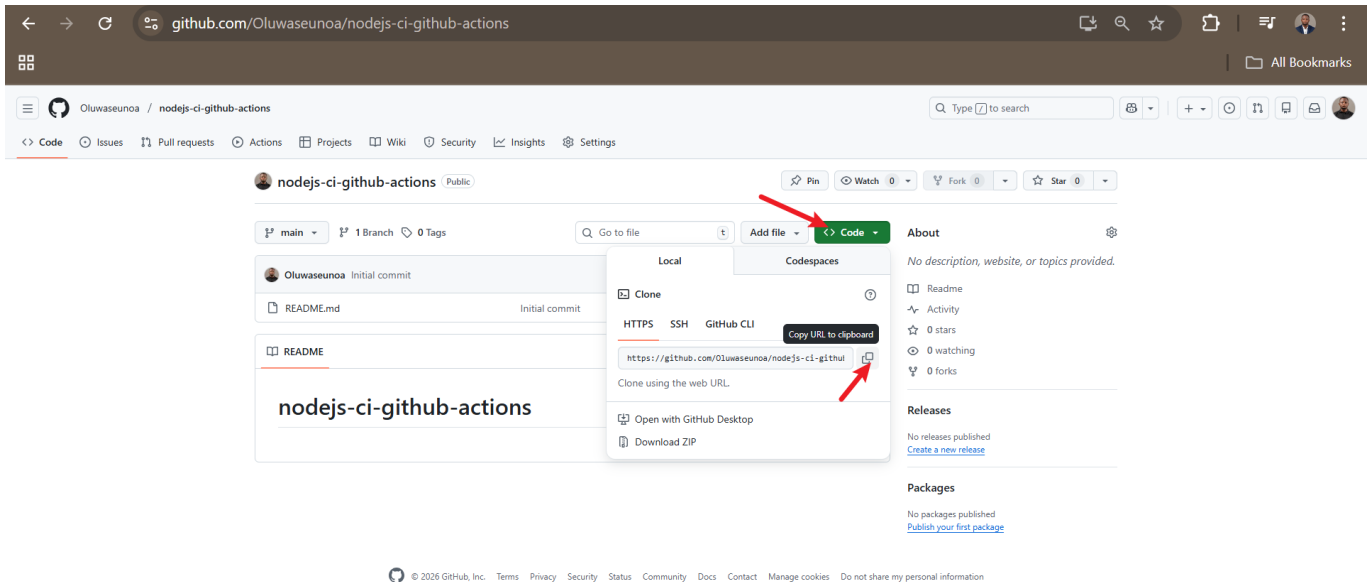
Step 1: Repository Creation

A new GitHub repository was created with a README file to initialize the project.

The screenshot shows the GitHub 'Create a new repository' page. The 'General' section includes fields for 'Owner' (Oluwaseunola) and 'Repository name' (nodejs-ci-github-actions). The 'Configuration' section includes options for 'Choose visibility' (Public), 'Add README' (checked), 'Add .gitignore' (No .gitignore), and 'Add license' (No license). A red arrow points to the 'Create repository' button.

Step 2: Repository Cloning

The repository HTTPS URL was copied and cloned locally.



```
MINGW64/c/Users/HP/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions

HP@DESKTOP-19M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects (main)
$ git clone https://github.com/Oluwaseunola/nodejs-ci-github-actions.git
Cloning into 'nodejs-ci-github-actions'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
Receiving objects: 100% (3/3), done.

HP@DESKTOP-19M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects (main)
$ cd nodejs-ci-github-actions/

HP@DESKTOP-19M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```

Step 3: Node.js Project Initialization

```
npm init -y
```

```
HP@DESKTOP-19M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ npm init -y
wrote to C:\Users\HP\Documents\Workspace\DevOps-Projects\GitHub-Actions-Projects\nodejs-ci-github-actions\package.json:

{
  "name": "nodejs-ci-github-actions",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "repository": {
    "type": "git",
    "url": "git+https://github.com/Oluwaseunola/nodejs-ci-github-actions.git"
  },
  "keywords": [],
  "author": "",
  "license": "ISC",
  "type": "commonjs",
  "bugs": {
    "url": "https://github.com/Oluwaseunola/nodejs-ci-github-actions/issues"
  },
  "homepage": "https://github.com/Oluwaseunola/nodejs-ci-github-actions#readme"
}

HP@DESKTOP-19M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```

Step 4: Dependency Installation

```
npm install --save-dev eslint jest
```

```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ npm install --save-dev eslint jest
npm warn deprecated inflight@1.0.6: This module is not supported, and leaks memory. Do not use it. Check out lru-cache if y
ou want a good and tested way to coalesce async requests by a key value, which is much more comprehensive and powerful.
npm warn deprecated glob@7.2.3: Glob versions prior to v9 are no longer supported

added 362 packages, and audited 363 packages in 1m

61 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```

```
MINGW64:/c/Users/HP/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ npm install

up to date, audited 1 package in 1s

found 0 vulnerabilities

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```

```
MINGW64:/c/Users/HP/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ npm list jest
nodejs-ci-github-actions@1.0.0 C:\Users\HP\Documents\Workspace\DevOps-Projects\GitHub-Actions-Projects\nodejs-ci-github-actions
└─ jest@30.2.0

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```

Step 5: ESLint Configuration

ESLint was initialized and updated to modern Flat Config.

```

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ npx eslint --init
You can also run this command directly using 'npm init @eslint/config@latest'.
Need to install the following packages:
@eslint/create-config@1.11.0
ok to proceed? (y) y

> nodejs-ci-github-actions@1.0.0 npx
> create-config

@eslint/create-config: v1.11.0

✔ What do you want to lint? · javascript
✔ How would you like to use ESLint? · problems
✔ What type of modules does your project use? · esm
✔ Which framework does your project use? · none
✔ Does your project use TypeScript? · No / Yes
✔ Where does your code run? · browser
i The config that you've selected requires the following dependencies:

eslint, @eslint/js, globals
✔ Would you like to install them now? · No / Yes
✔ Which package manager do you want to use? · npm
🔄 Installing...

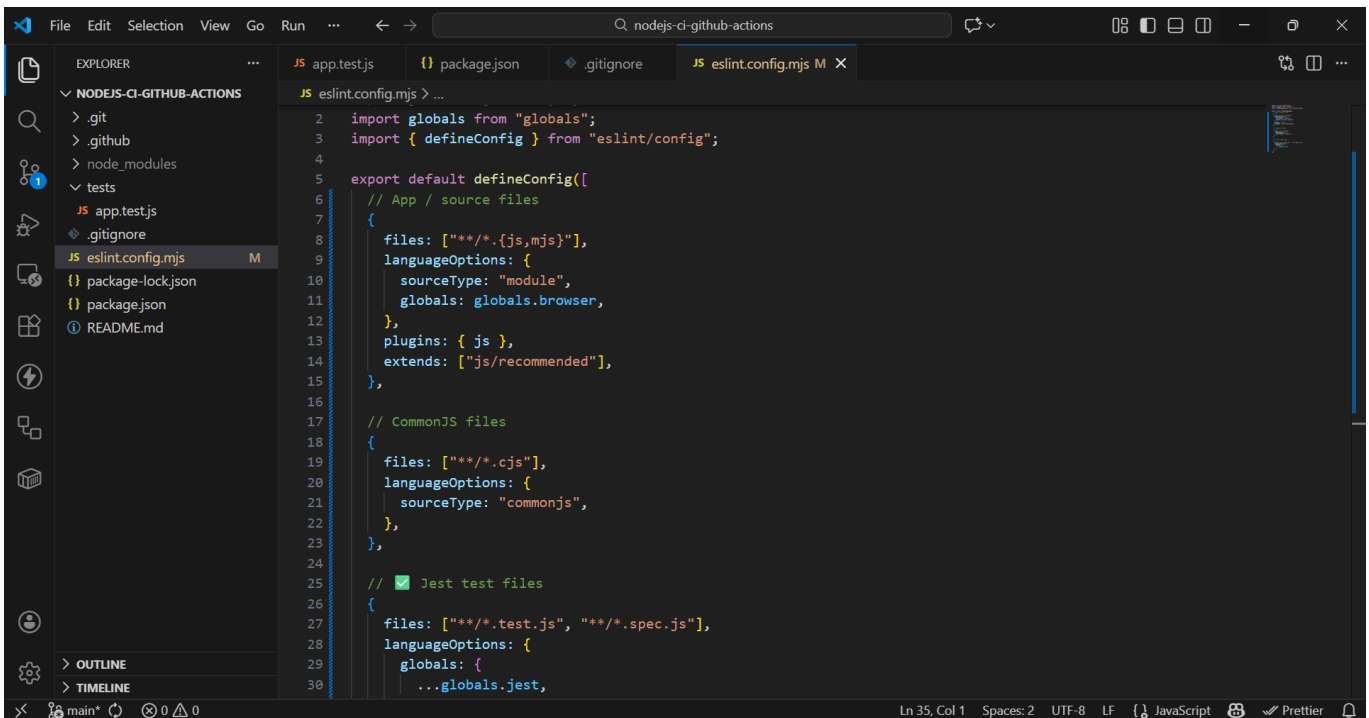
added 1 package, changed 1 package, and audited 364 packages in 5s

62 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
✔ Successfully created C:\Users\HP\Documents\Workspace\DevOps-Projects\GitHub-Actions-Projects\nodejs-ci-github-actions\eslint.config.mjs file.

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$

```



```

// eslint.config.mjs
import globals from "globals";
import { defineConfig } from "eslint/config";

export default defineConfig([
  // App / source files
  {
    files: ["**/*.js", "**/*.mjs"],
    languageOptions: {
      sourceType: "module",
      globals: globals.browser,
    },
    plugins: { js },
    extends: ["js/recommended"],
  },

  // CommonJS files
  {
    files: ["**/*.cjs"],
    languageOptions: {
      sourceType: "commonjs",
    },
  },

  // Jest test files
  {
    files: ["**/*.test.js", "**/*.spec.js"],
    languageOptions: {
      globals: {
        ...globals.jest,
      },
    },
  },
]);

```

Step 6: Test Implementation

A real Jest test was added.

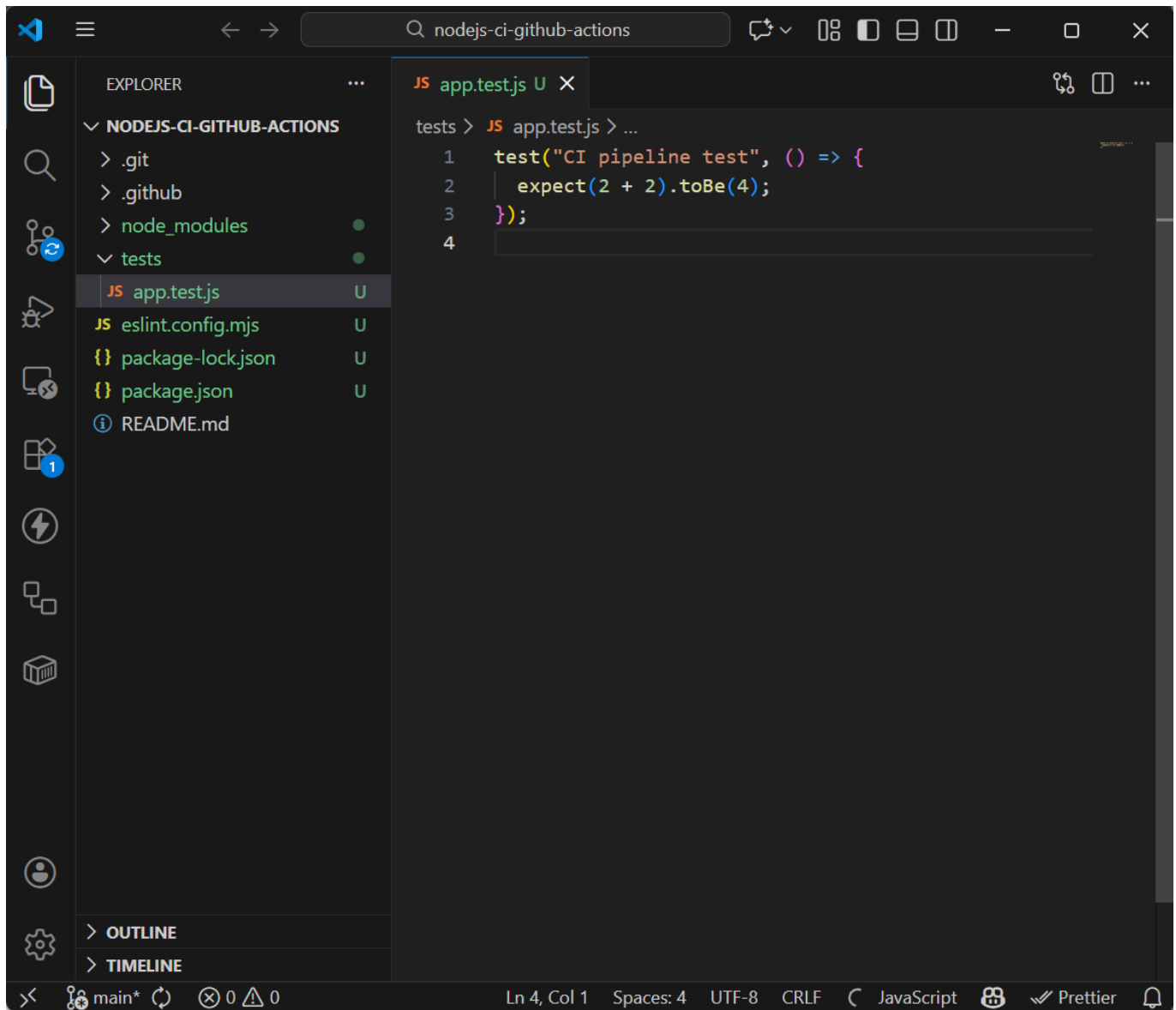
```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-g
ithub-actions (main)
$ mkdir -p .github/workflows

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-g
ithub-actions (main)
$ mkdir tests

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-g
ithub-actions (main)
$ █
```

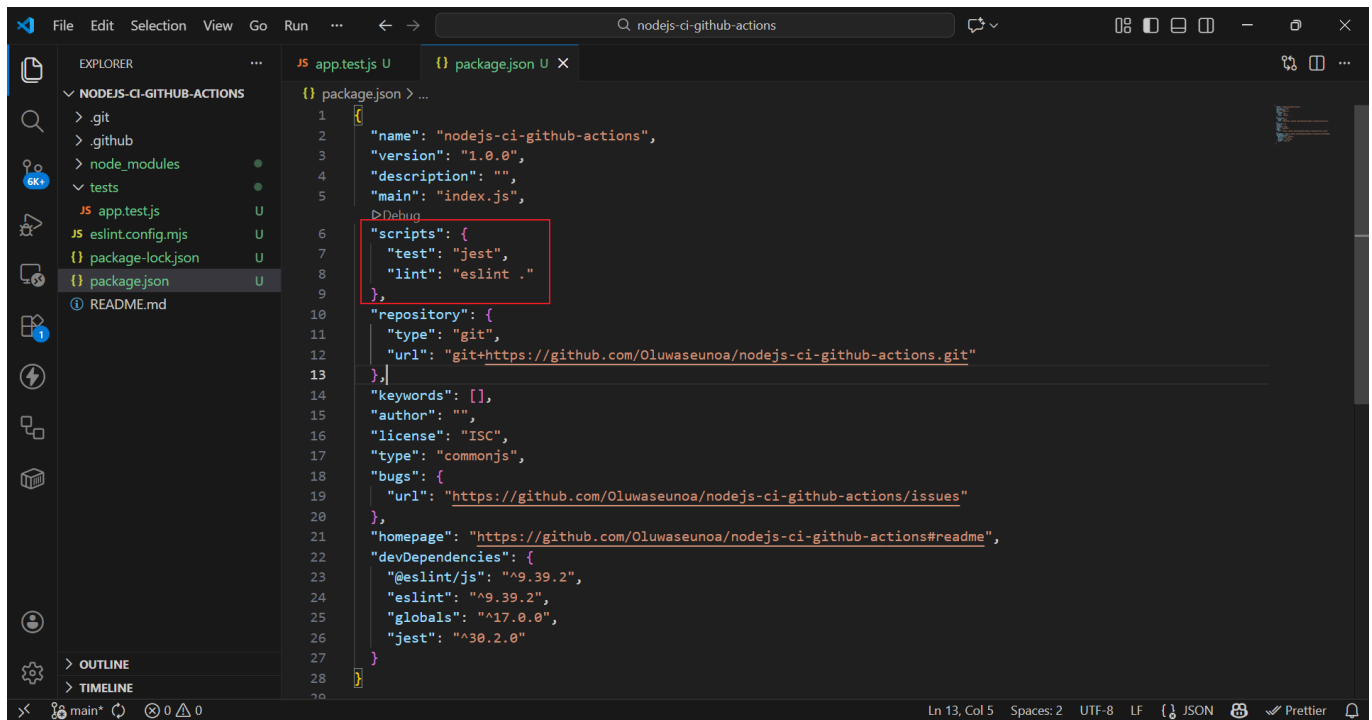
```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-g
ithub-actions (main)
$ touch tests/app.test.js

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-g
ithub-actions (main)
$ █
```



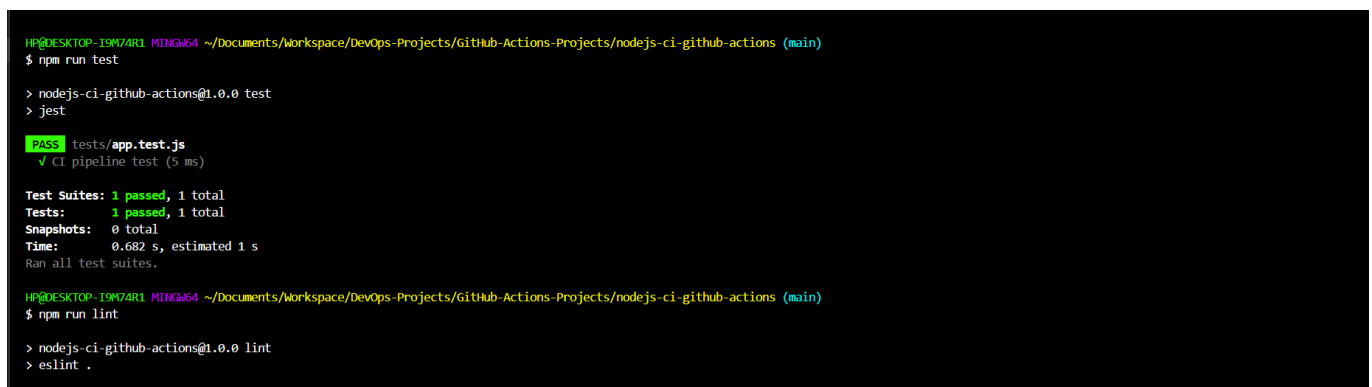
Step 7: Package Script Configuration

```
"scripts": {  
  "test": "jest",  
  "lint": "eslint ."  
}
```

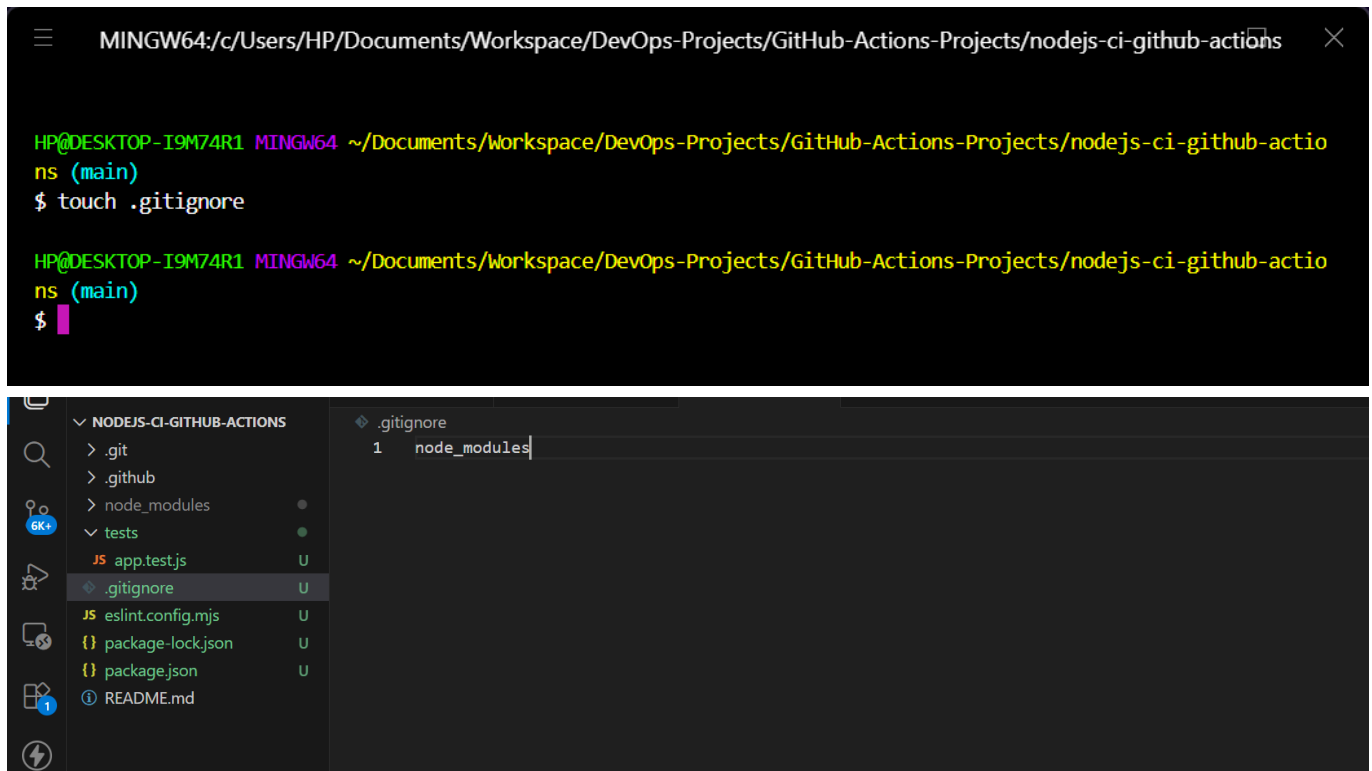


Step 8: Local Validation

```
npm run lint
npm test
```



Step 9: Git Ignore Configuration



The image consists of two screenshots. The top screenshot is a terminal window titled 'MINGW64:/c/Users/HP/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions'. It shows a user running the command 'touch .gitignore' in a directory. The bottom screenshot is a Visual Studio Code editor window showing the file explorer on the left with the project 'NODEJS-CI-GITHUB-ACTIONS' expanded. The file '.gitignore' is selected, and its content is shown in the editor: 'node_modules'.

```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ touch .gitignore

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```

VS Code Explorer: NODEJS-CI-GITHUB-ACTIONS

- > .git
- > .github
- > node_modules
- ▼ tests
- JS app.test.js U
- ▼ .gitignore U
- JS eslint.config.mjs U
- { } package-lock.json U
- { } package.json U
- ① README.md

.gitignore

```
1 node_modules
```

Step 10: Initial Commit & Push

```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ git add .
warning: in the working copy of 'eslint.config.mjs', LF will be replaced by CRLF the next time Git touches it
warning: in the working copy of 'package-lock.json', LF will be replaced by CRLF the next time Git touches it
warning: in the working copy of 'package.json', LF will be replaced by CRLF the next time Git touches it

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ git commit -m "Complete CI setup with Jest tests and ESLint configuration"
[main dd5b206] Complete CI setup with Jest tests and ESLint configuration
 5 files changed, 5295 insertions(+)
 create mode 100644 .gitignore
 create mode 100644 eslint.config.mjs
 create mode 100644 package-lock.json
 create mode 100644 package.json
 create mode 100644 tests/app.test.js

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ git push
Enumerating objects: 9, done.
Counting objects: 100% (9/9), done.
Delta compression using up to 8 threads
Compressing objects: 100% (6/6), done.
Writing objects: 100% (8/8), 43.54 KiB | 3.35 MiB/s, done.
Total 8 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
To https://github.com/Oluwaseunola/nodejs-ci-github-actions.git
 a1853ba..dd5b206  main -> main

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```

```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ git add .github/workflows/ci.yml

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ git commit -m "Add CI pipeline with matrix build, linting, and tests"
[main 401435f] Add CI pipeline with matrix build, linting, and tests
 1 file changed, 34 insertions(+)
 create mode 100644 .github/workflows/ci.yml

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ git push origin main
Enumerating objects: 6, done.
Counting objects: 100% (6/6), done.
Delta compression using up to 8 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (5/5), 705 bytes | 235.00 KiB/s, done.
Total 5 (delta 1), reused 0 (delta 0), pack-reused 0 (from 0)
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
To https://github.com/Oluwaseunola/nodejs-ci-github-actions.git
 258c878..401435f  main -> main

HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```

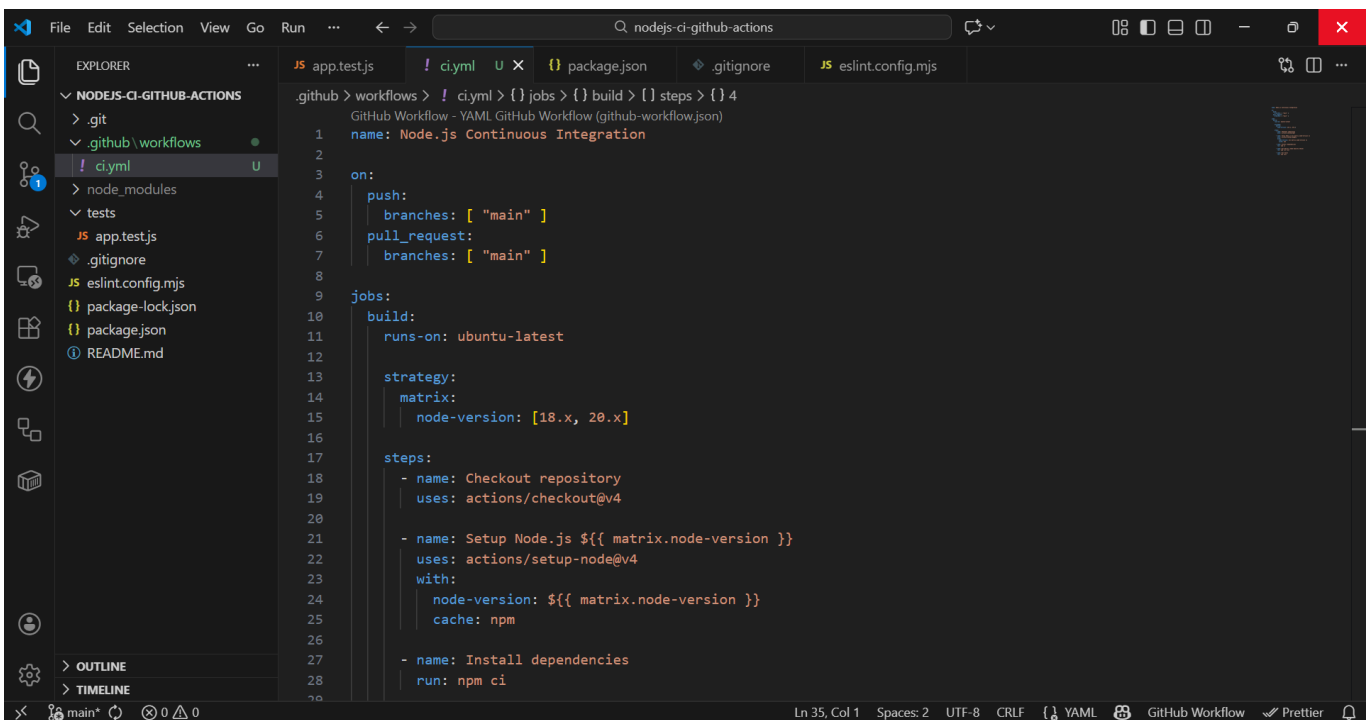
Step 11: GitHub Actions Workflow Creation

```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ mkdir -p .github/workflows
```

```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```

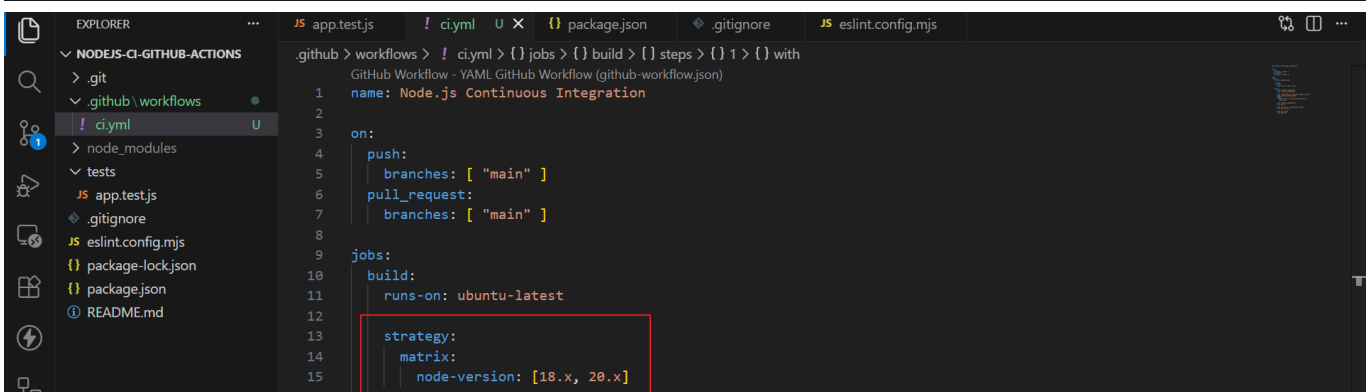
```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ touch .github/workflows/ci.yml
```

```
HP@DESKTOP-I9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$
```



The screenshot shows the VS Code editor with the file explorer on the left displaying the project structure. The main editor window shows the content of `ci.yml`. The file is a GitHub Workflow for Node.js Continuous Integration. It triggers on push to the main branch or pull requests to the main branch. The workflow includes a job named 'build' that runs on 'ubuntu-latest' using a matrix strategy for Node.js versions [18.x, 20.x]. The steps include checking out the repository, setting up Node.js, and installing dependencies.

```
.github > workflows > ! ci.yml > {} jobs > {} build > {} steps > {} 4
GitHub Workflow - YAML GitHub Workflow (github-workflow.json)
1  name: Node.js Continuous Integration
2
3  on:
4    push:
5      branches: [ "main" ]
6    pull_request:
7      branches: [ "main" ]
8
9  jobs:
10   build:
11     runs-on: ubuntu-latest
12
13     strategy:
14       matrix:
15         node-version: [18.x, 20.x]
16
17     steps:
18       - name: Checkout repository
19         uses: actions/checkout@v4
20
21       - name: Setup Node.js ${{ matrix.node-version }}
22         uses: actions/setup-node@v4
23         with:
24           node-version: ${{ matrix.node-version }}
25           cache: npm
26
27       - name: Install dependencies
28         run: npm ci
29
```



The screenshot shows the VS Code editor with the file explorer on the left. The main editor window shows the content of `ci.yml`. A red box highlights the `strategy` section, which defines a matrix for Node.js versions [18.x, 20.x].

```
.github > workflows > ! ci.yml > {} jobs > {} build > {} steps > {} 1 > {} with
GitHub Workflow - YAML GitHub Workflow (github-workflow.json)
1  name: Node.js Continuous Integration
2
3  on:
4    push:
5      branches: [ "main" ]
6    pull_request:
7      branches: [ "main" ]
8
9  jobs:
10   build:
11     runs-on: ubuntu-latest
12
13     strategy:
14       matrix:
15         node-version: [18.x, 20.x]
16
```

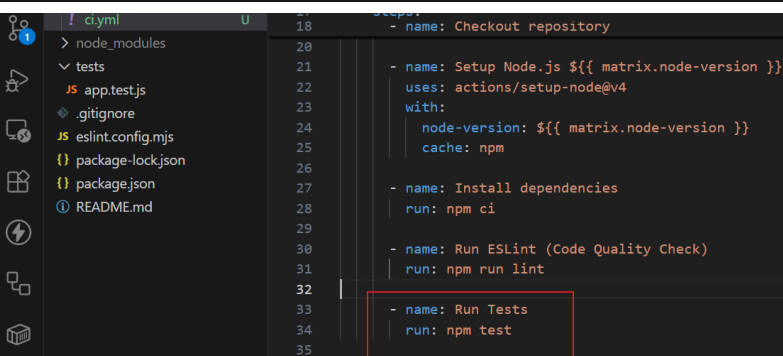
Step 12: Dependency Caching

```
17 steps:
18   - name: Checkout repository
19     uses: actions/checkout@v4
20
21   - name: Setup Node.js ${ matrix.node-version }
22     uses: actions/setup-node@v4
23     with:
24       node-version: ${ matrix.node-version }
25       cache: npm
26
27   - name: Install dependencies
28     run: npm ci
29
30   - name: Run ESLint (Code Quality Check)
31     run: npm run lint
32
33   - name: Run Tests
34     run: npm test
35
```

Step 13: Code Quality & Test Execution in CI

```
18   - name: Checkout repository
19     uses: actions/checkout@v4
20
21   - name: Setup Node.js ${ matrix.node-version }
22     uses: actions/setup-node@v4
23     with:
24       node-version: ${ matrix.node-version }
25       cache: npm
26
27   - name: Install dependencies
28     run: npm ci
29
30   - name: Run ESLint (Code Quality Check)
31     run: npm run lint
32
33   - name: Run Tests
34     run: npm test
35
```

Ln 32, Col 1 Spaces: 2 UTF-8 CRLF YML GitHub Workflow Prettier



```
18   - name: Checkout repository
19     uses: actions/checkout@v4
20
21   - name: Setup Node.js ${ matrix.node-version }
22     uses: actions/setup-node@v4
23     with:
24       node-version: ${ matrix.node-version }
25       cache: npm
26
27   - name: Install dependencies
28     run: npm ci
29
30   - name: Run ESLint (Code Quality Check)
31     run: npm run lint
32
33   - name: Run Tests
34     run: npm test
35
```

Ln 32, Col 1 Spaces: 2 UTF-8 CRLF YML GitHub Workflow Prettier

6. Security Enhancement: GitHub Secrets Integration

...

Note: Screenshot for secret creation is missing from your list.

Consider taking a new one showing the "New repository secret" form.

7. CI Validation Using Pull Requests

```
MINGW64/c/Users/HP/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions

HP@DESKTOP-T9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (main)
$ git checkout -b create-file.txt
Switched to a new branch 'create-file.txt'

HP@DESKTOP-T9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (create-file.txt)
$

MINGW64/c/Users/HP/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions

HP@DESKTOP-T9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (create-file.txt)
$ echo "This is file.txt" > file.txt

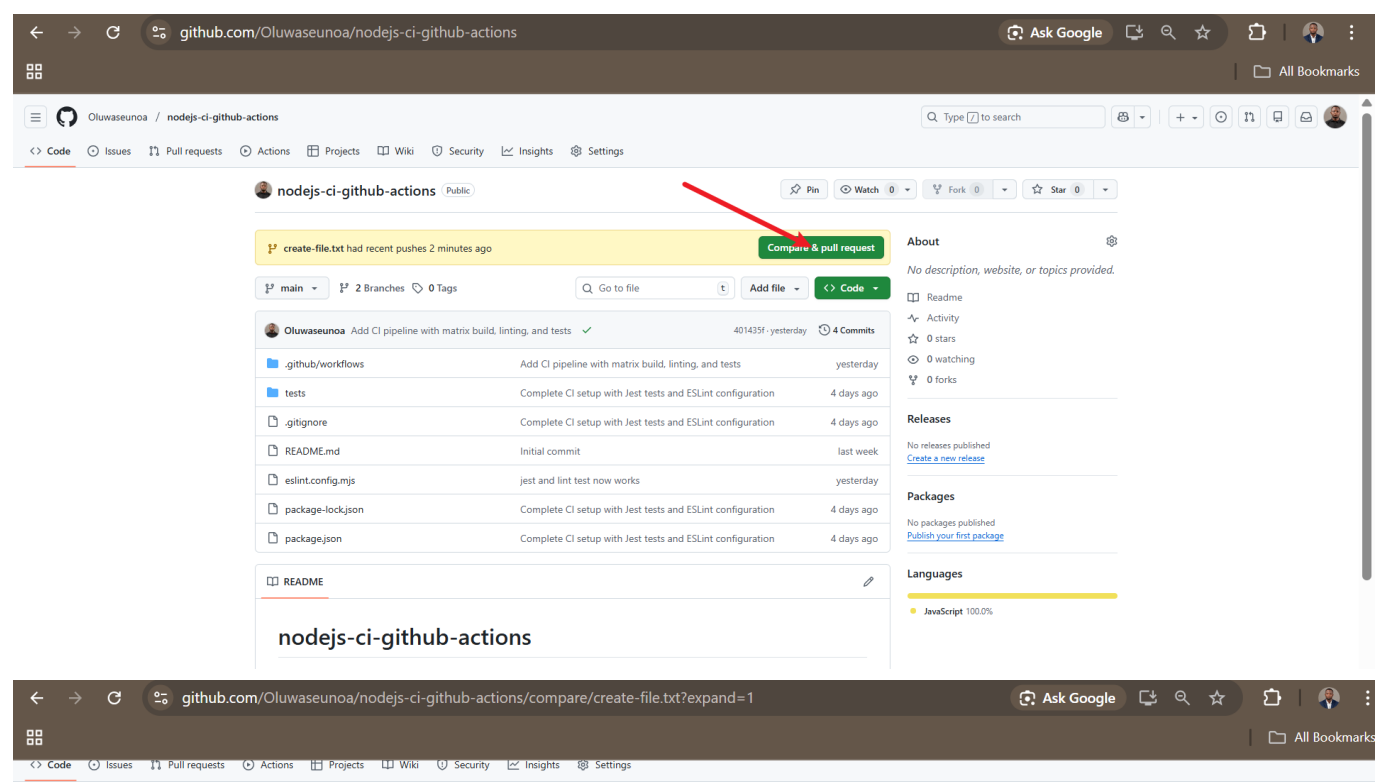
HP@DESKTOP-T9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (create-file.txt)
$

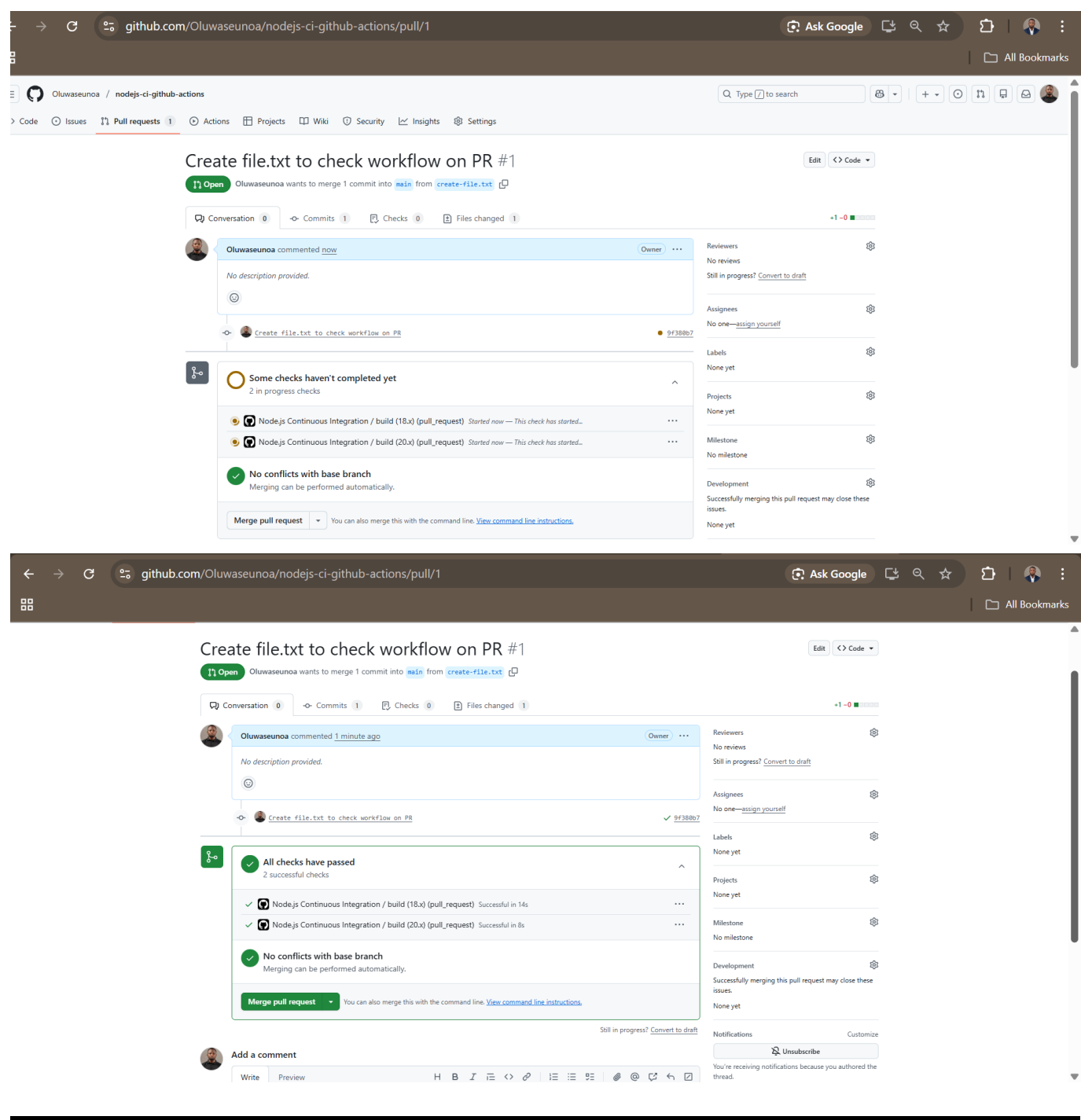
MINGW64/c/Users/HP/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions

HP@DESKTOP-T9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (create-file.txt)
$ git add .
warning: in the working copy of 'file.txt', LF will be replaced by CRLF the next time Git touches it

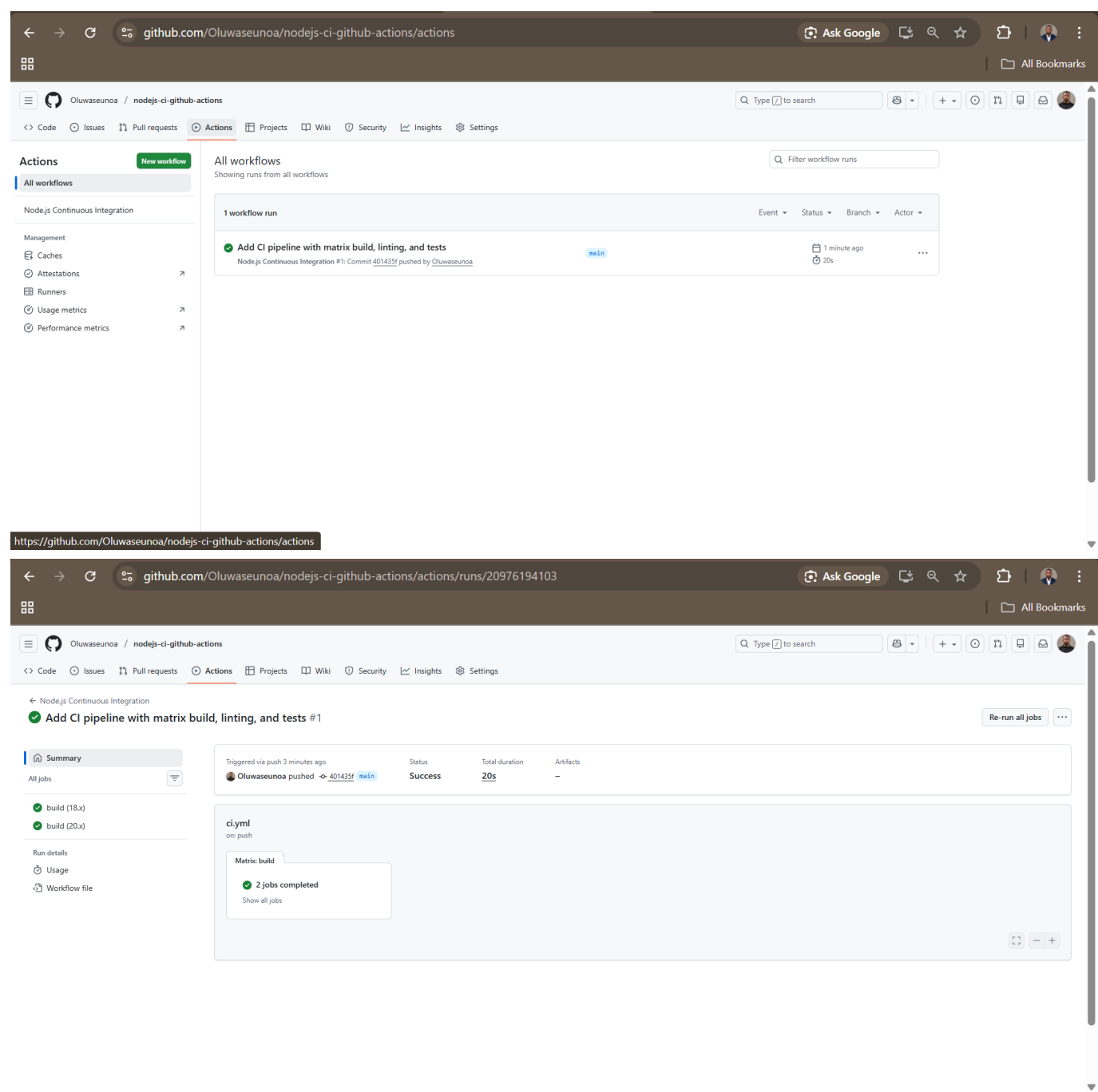
HP@DESKTOP-T9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (create-file.txt)
$ git commit -m "Create file.txt to check workflow on PR"
[create-file.txt 9f380b7] Create file.txt to check workflow on PR
1 file changed, 1 insertion(+)
create mode 100644 file.txt

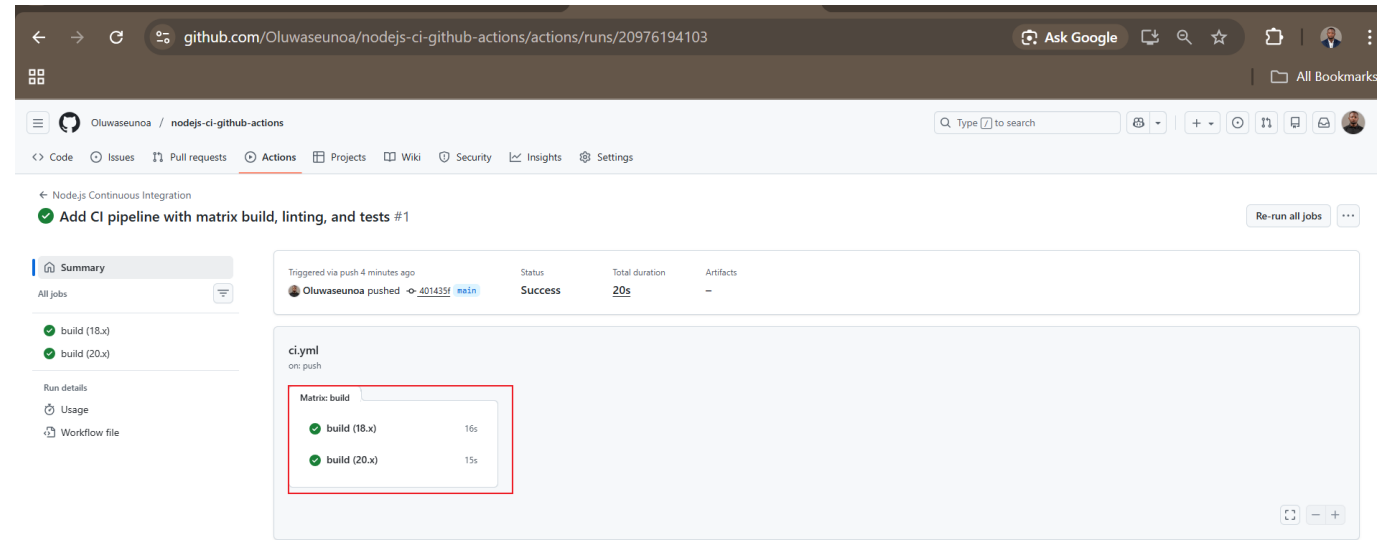
HP@DESKTOP-T9M74R1 MINGW64 ~/Documents/Workspace/DevOps-Projects/GitHub-Actions-Projects/nodejs-ci-github-actions (create-file.txt)
$ git push origin create-file.txt
Enumerating objects: 4, done.
Counting objects: 100% (4/4), done.
Delta compression using up to 8 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 313 bytes | 78.00 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 'create-file.txt' on Github by visiting:
remote:   https://github.com/Oluwaseunola/nodejs-ci-github-actions/pull/new/create-file.txt
remote:
To https://github.com/Oluwaseunola/nodejs-ci-github-actions.git
 * [new branch]   create-file.txt -> create-file.txt
```





8. Results and Observations





- CI workflow ran successfully across multiple Node.js versions
- All checks passed
- Parallel execution reduced total time

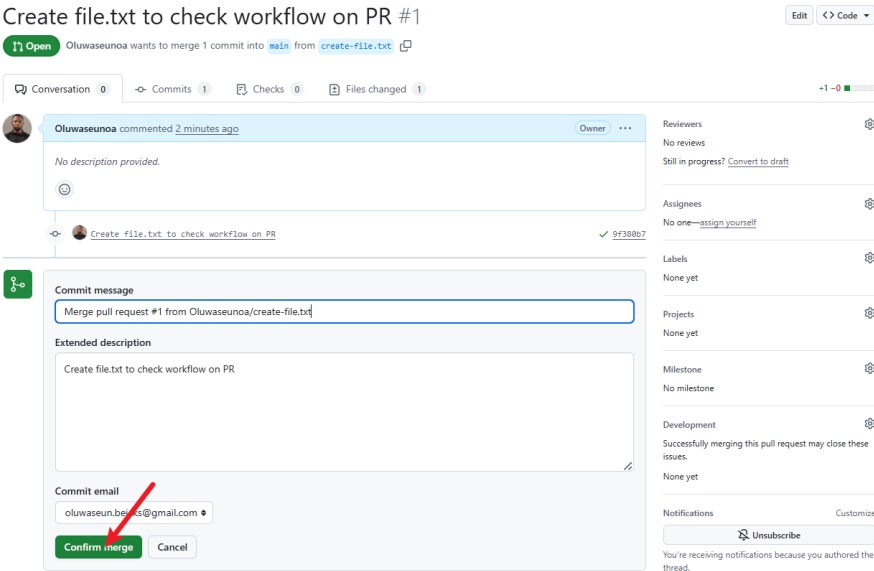
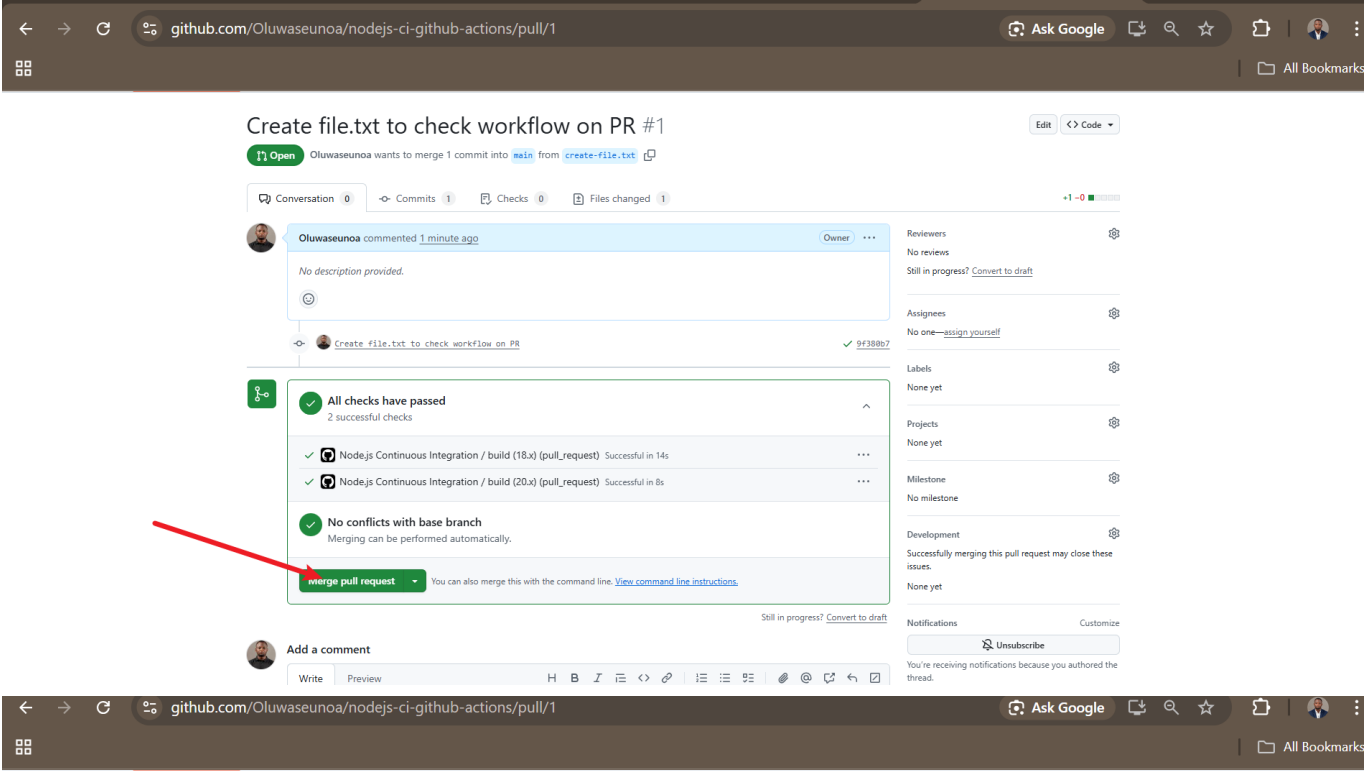
9. Conclusion

This project successfully implemented a secure, production-ready Continuous Integration pipeline using GitHub Actions. By integrating matrix builds, automated testing, code quality checks, dependency caching, and GitHub Secrets, the project meets all Module 3 requirements and reflects real-world DevOps best practices. The implementation ensures reliability, scalability, and security in modern software development workflows.

10. Future Improvements

- Add code coverage reporting
- Integrate deployment (CD)
- Enforce branch protection rules
- Add security scanning tools

Bonus: Merge Process (Final Step)



github.com/Oluwaseunola/nodejs-ci-github-actions/pull/1

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