# Continuous Integration

2022.04.18

SWPP Practice Session

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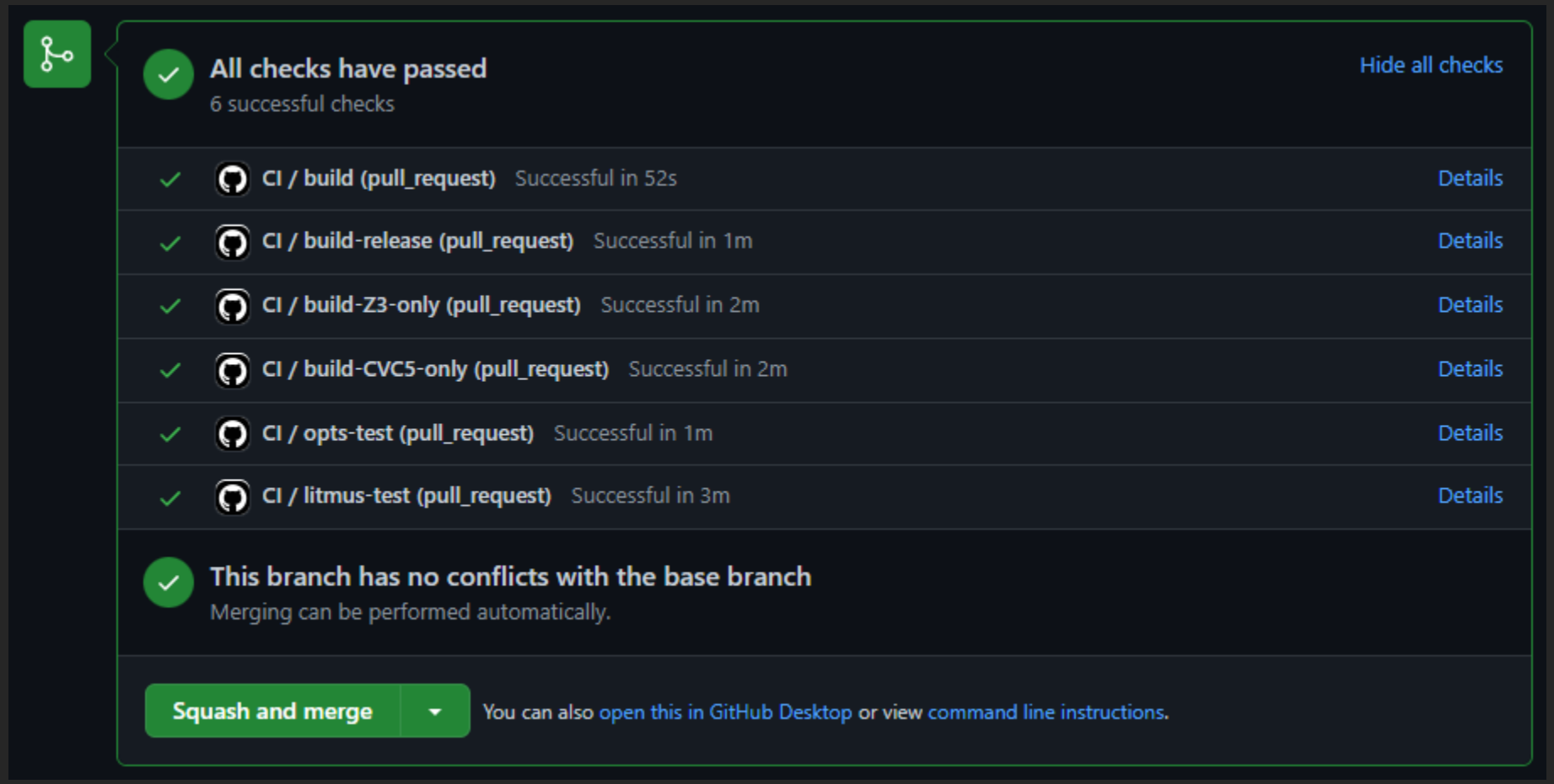
# Continuous Integration?

- Continuous: whenever a code is uploaded to the repo…
  - Whenever a commit or a pull request is made
- Integration: check the validity of the code after merging
  - Through automated building & testing

# Example of CI in Action



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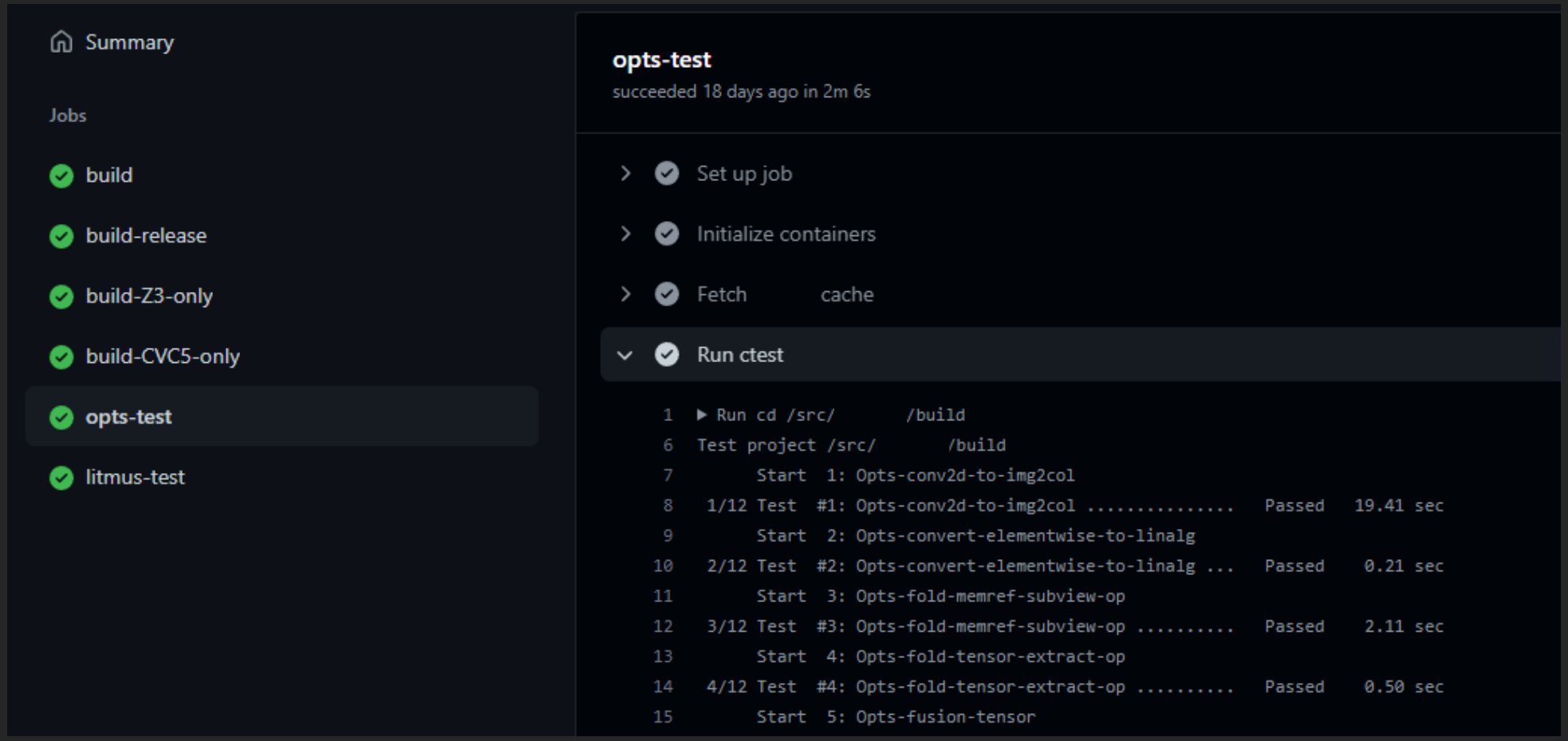

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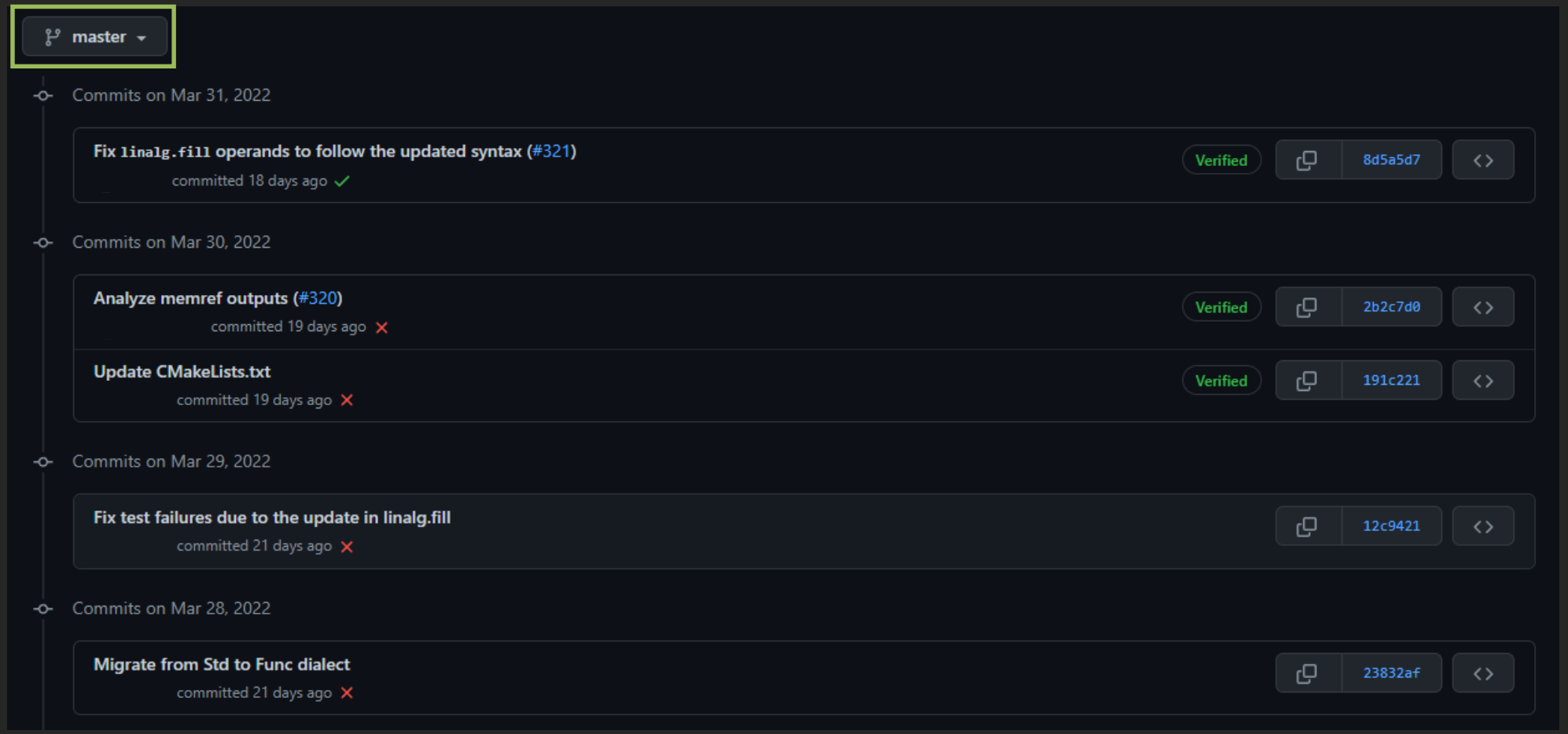
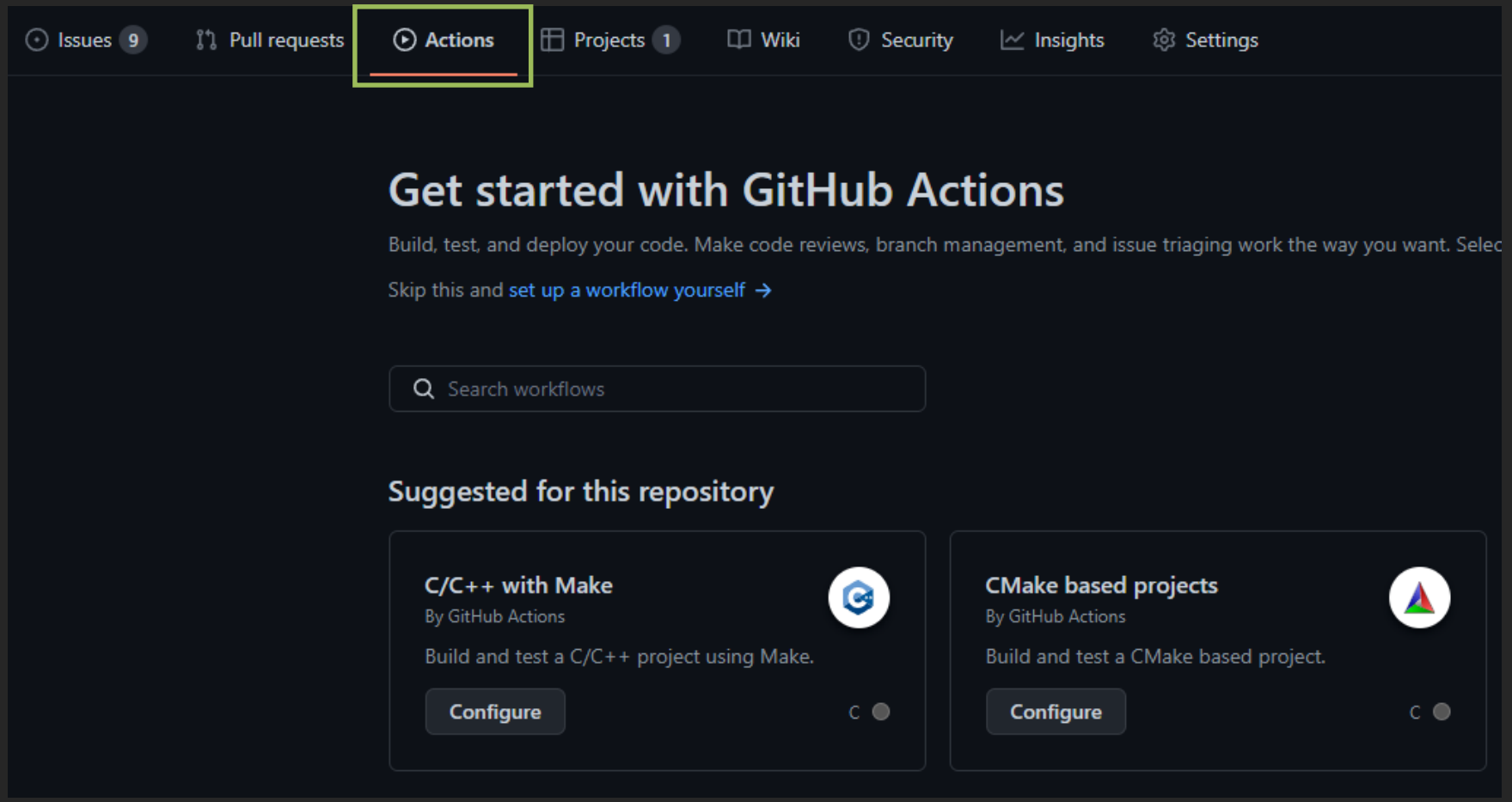


# Configuring GitHub Actions



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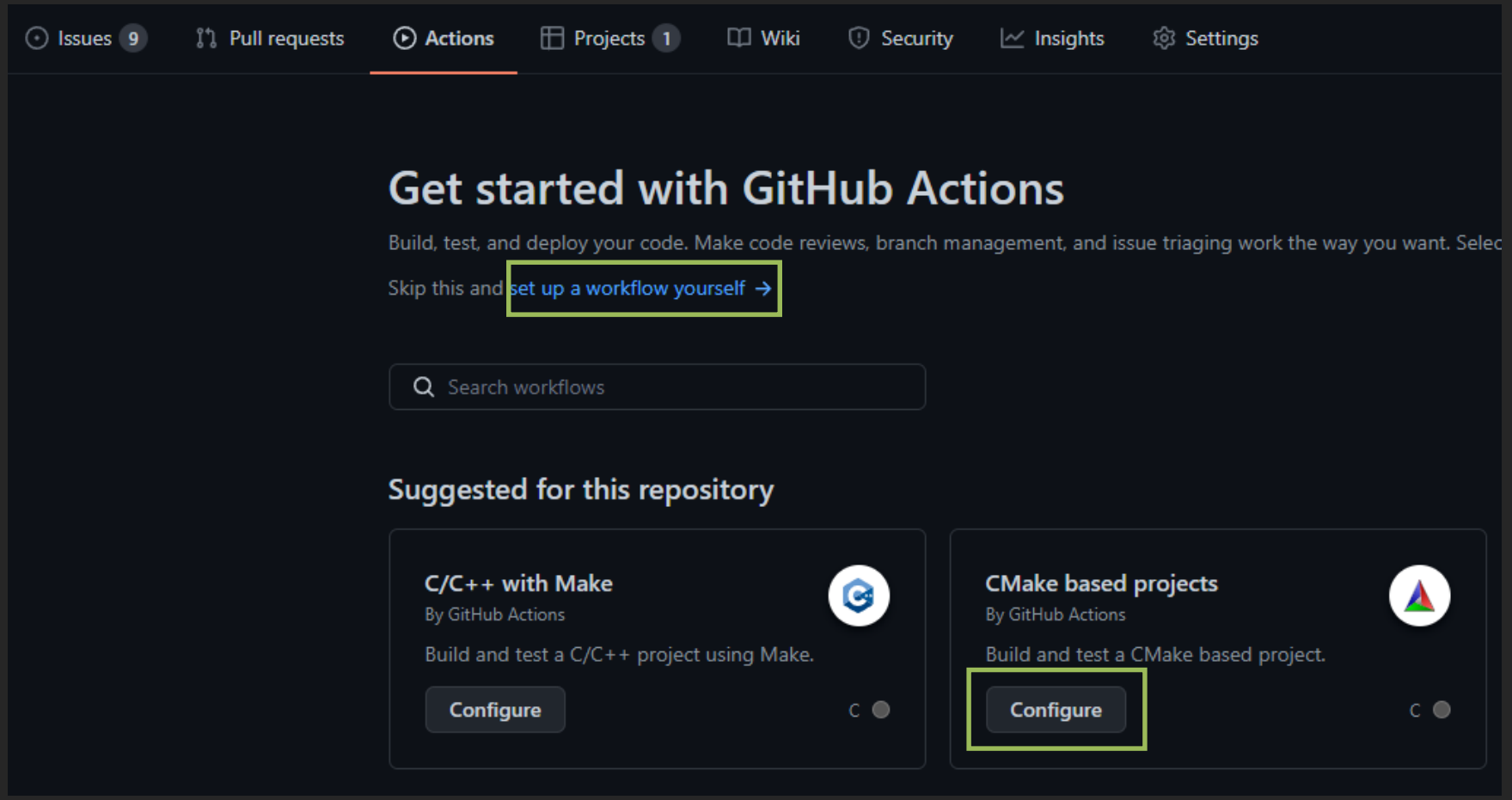

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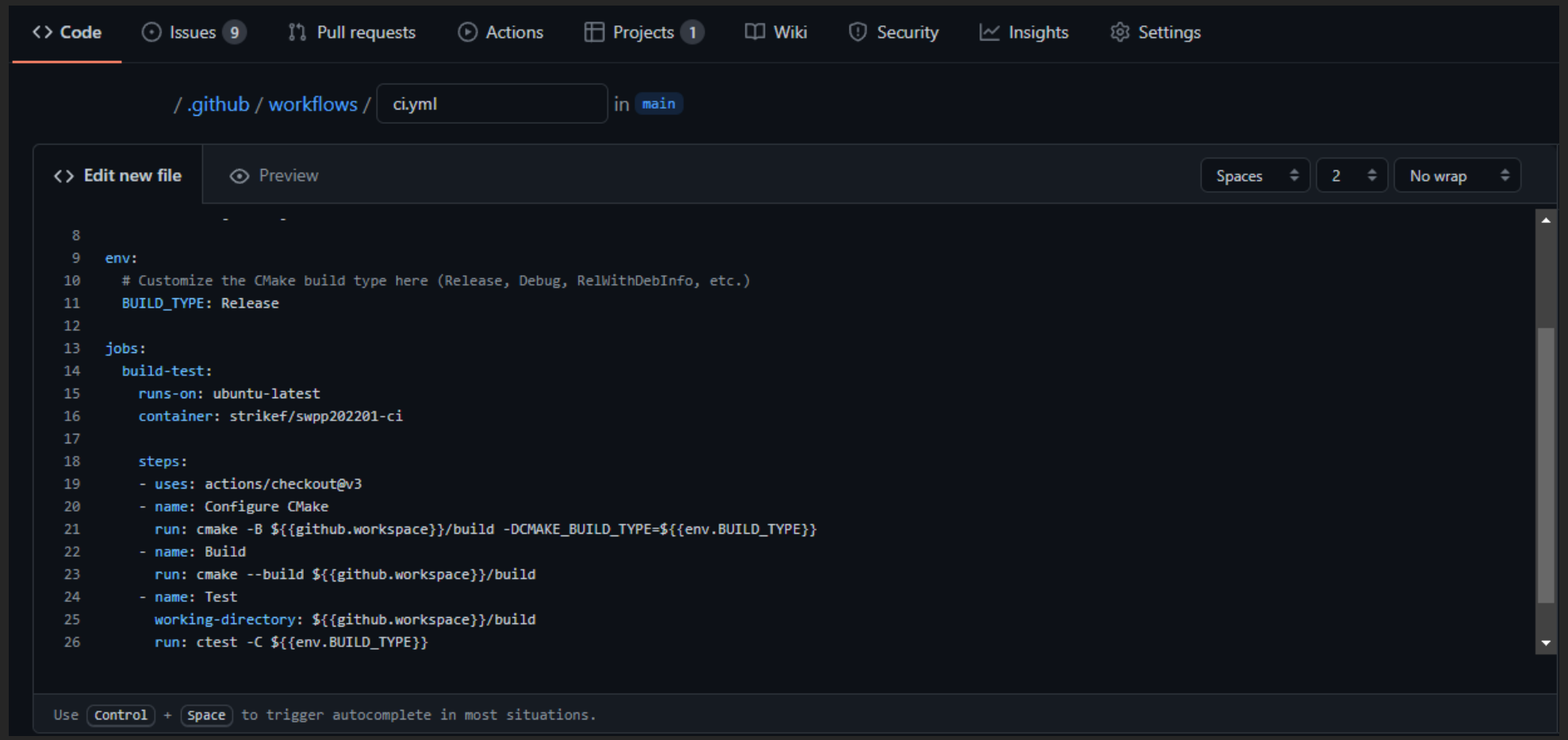


# Terminology: Workflow

- Determines when the tasks will be run
  - Every day or every hour (cron)
  - Whenever a pull request or commit is uploaded (event)
  - When someone wants (dispatch)
- Contains one or more jobs
  - Jobs can be given dependencies between them

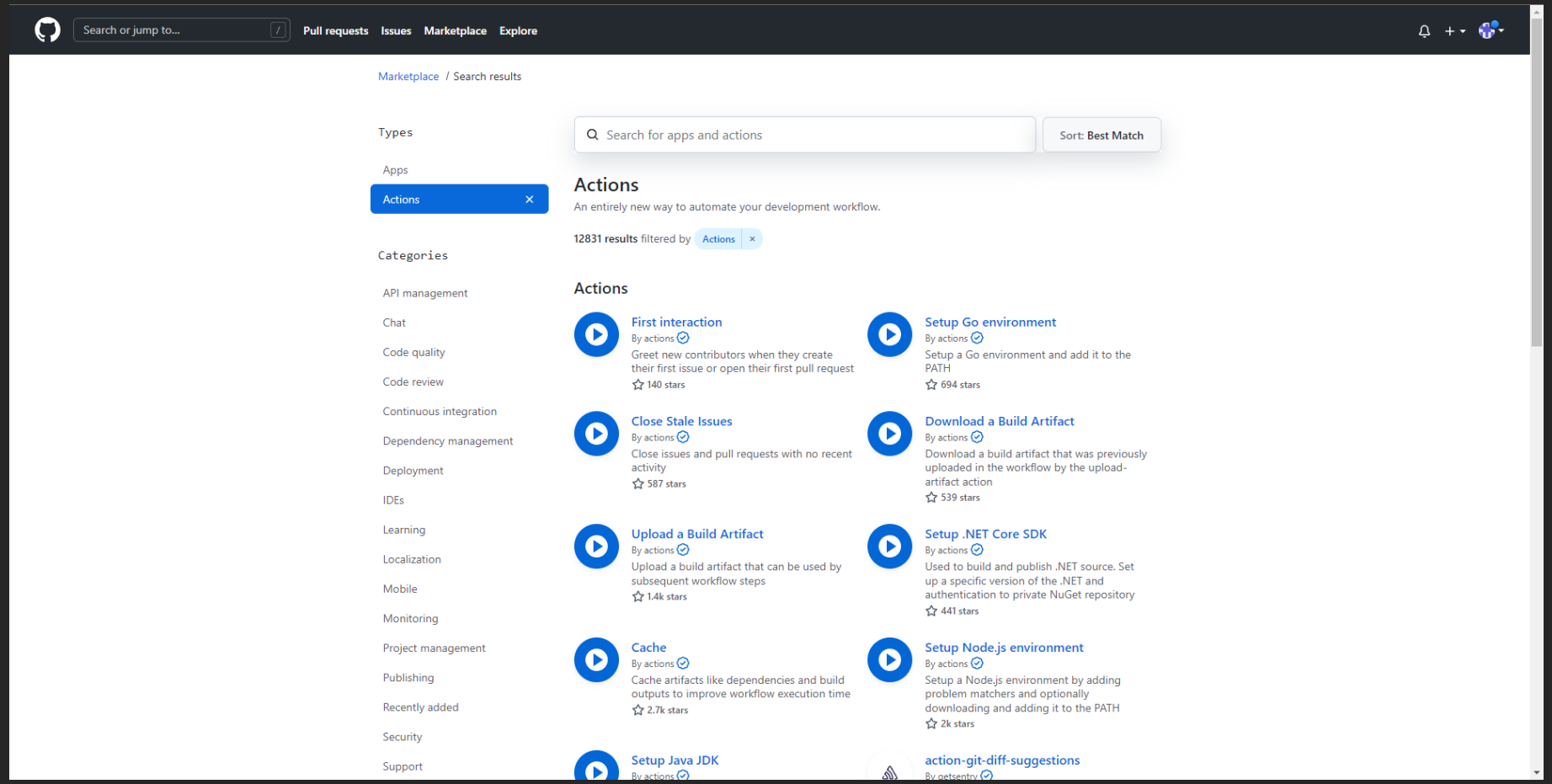
# Terminology: Job

- Unit of tasks
  - Build the project
  - Run this test, run that test, …
  - Different jobs can be run in parallel!
- Contains run one or more steps
  - Steps can be skipped under certain conditions

# Terminology: Step

- Order of commands
  - Execute Action
  - Execute shell command(s)
- Executed linearly
  - By default, previous step(s) should succeed
  - Result of previous step(s) can be used in another step(s)

# Actions in GitHub Actions



# actions/checkout

- Clone the repository
  - Can clone from specific repo, branch, or commit
  - Much quicker than cloning through shell command
- See the official repo for more details

# actions/cache

- Cache the file or directory for future use
  - Manage the entries via keys
  - Entries of different keys are stored separately
  - Each entry can be written only once
  - Keys can be fully or partially matched
- See the official repo and guide for more details

# actions/cache

- Available within the entire repository
  - Jobs can use the cache written by another job
  - Workflows can use the cache written by another workflow
  - Can be used to separate the time-consuming task
- 10GB capacity limit per repository
  - Older entries will be evicted upon reaching the limit

# Actions Instance

- Each repository can use 2,000 minutes per month for free
  - Should be more than sufficient for the team project
- But you have to set up the instance for yourself
  - You need LLVM, Alive2, and whole lot of dependencies
  - You may unknowingly deviate from others & TAs' environment!
- Solution: use Docker in Actions!

# Docker

- Container (OS-level virtualization) solution
  - Essentially an isolated Linux environment
- Creates a container based on image
  - Image: read-only disk (similar to ISO files)
  - Container: VM instance created from the image

# Docker Image

- Images can be created using the script named Dockerfile
- Or you can simply download the image from the Docker Hub
  - Like GitHub, you can get the image from the repository
  - Each repository contains several tags
  - Each tag corresponds to an image (or version)

# SWPP Docker Image

- We'll distribute the Docker image for the project
  - It will be based on ubuntu 22.04
  - It will contain pre-built LLVM and almost all necessary deps
  - You can use it for both development and CI
- Set the `container` option to use it in GitHub Actions
  - Specify the image repo name, and you're done!