



Automate Testing with GitHub Actions

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The screenshot shows a GitHub Actions run details page for a workflow named "test-and-build". The run failed 38 seconds ago. The logs show the following error:

```
1 ▶ Run python semantic_test.py
11 Traceback (most recent call last):
12   File "/home/runner/work/Rag-Api-Automate-Testing-GithubActions/Rag-Api-Automate-Testing-
GithubActions/semantic_test.py", line 18, in <module>
13     test_kubernetes_query()
14   File "/home/runner/work/Rag-Api-Automate-Testing-GithubActions/Rag-Api-Automate-Testing-
GithubActions/semantic_test.py", line 12, in test_kubernetes_query
15     assert "orchestration" in answer.lower(), "Missing 'orchestration' keyword"
16     ^^^^^^^^^^^^^^^^^^^^^^^^^^
17 AssertionError: Missing 'orchestration' keyword
18 Error: Process completed with exit code 1.
```

Introducing Today's Project!

In this project, I will demonstrate automate testing using github actions workflow. I'm doing this project to learn more about CI/CD pipeline , rag api , git, github , LLM mock mode, data quality issues , semantic_tests, unit_tests and further how to integrate both docker and Kubernetes in this project after finishing this project

Key services and concepts

Services I used were Github Actions Workflows using .yml. Key concepts I learnt include, how to do Semantic tests ,LLM Mock mode to avoid non-deterministic behaviour of LLM, how to use multiple files for RAG API (used in real world scenarios), catching data quality issues before they reach production,Learnt to build a RAG API , to retreive answers for queries based on Similarity Search.

Challenges and wins

This project took me approximately more than a half day.. The most challenging part was ssh key , getting the .pub one id to use .. It was most rewarding to finish it, I felt very happy and proud of myself for completing it .. Also This project has sparked the interest in me to learn more on DEVOPS ...



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Why I did this project

I did this project because I wanted to learn how the CI/CD pipeline works , and learnt about Github actions Workflows.. One thing I'll apply from this is testing is important before implementing the CI/CD pipeline, otherwise , you will catch errors after they are running in production , that could be costly danger....



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Setting Up Your RAG API

I'm setting up my RAG API by using Ollama, Chromadb , FastAPI , Unicorn .. A RAG API retrieves information by applying similarity searching in vector embeddings stored in Chromadb. This foundation is needed for CI/CD because automating testing of Rag api system we are creating

Local API verification

I tested my RAG API by using the command Invoke-WebRequest -Uri "http://127.0.0.1:8000/query?q=What%20is%20Kubernetes%3F" -Method POST
The API responded with response to what is Kubernetes ? . This confirms that that our Rag API is successfully working and able to retrieve from vector embeddings based on similarity search.

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```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS
(.venv) PS C:\PROJECTS\Rag-Api_Automate_Testing_GithubActions> Invoke-WebRequest -Uri "http://127.0.0.1:8000/query?q=What%20is%20Kubernetes%3F" -Method POST
>>

StatusCode      : 200
StatusDescription : OK
Content          : {"answer":"Question: Is Kubernetes used for managing containers at scale?\n\nAnswer: Yes, Kubernetes is a large-scale container orchestration tool used to manage containers at scale."}
RawContent       : HTTP/1.1 200 OK
Content-Length   : 184
Content-Type     : application/json
Date             : Fri, 13 Feb 2026 04:28:37 GMT
Server           : uvicorn

Forms            : {}
Headers          : {[Content-Length, 184], [Content-Type, application/json], [Date, Fri, 13 Feb 2026 04:28:37 GMT], [Server, uvicorn]}
Images          : {}
InputFields      : {}
```



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Initializing Git and Pushing to GitHub

I'm initializing Git by using git init command and setting up a Github Repository.. Git tracks changes to code over time (tracks) ,snapshots of your project called Commit, commit allows us to revert back to earlier versions and work on features without breaking your main code .. Version control enables CI/CD to automate repeatative tasks like testinga and deployment(ig)..

Git initialization and first commit

I initialized Git by running the command git init.A commit is a checkpoint to roll back to (revert changes without deleting them). Then, I staged and committedThe .gitignore file helps by keeping a list of files that need not be tracked or pushed to git (unnecessary or sensitive files)

Pushing to GitHub for CI/CD

Pushing to GitHub means making our code available, in a github repository. The benefits include having a backup of our code online , being able to public so we can collaborate with other. This enables CI/CD because we can use Github actions

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The screenshot shows a GitHub repository page for 'Rag-Api-Automate-Testing-GithubActions'. The repository is public and has one commit. The commit was made by 'Ambika005' and is titled 'Initial Commit : set up Local RAG API project'. The commit was made 54 minutes ago and includes the following files:

- .gitignore
- Dockerfile
- app.py
- embed.py
- k8s.txt
- requirements.txt

The README file is also present but contains no visible text.



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Creating Semantic Tests

I'm creating semantic tests that verify data quality and match whether the keywords provided match in the .. Unlike unit tests that check code logic, semantic tests validate data correctness (whether the answer provided for query is relevant to the extent we are expecting or not).. These tests ensure quality by giving reliable answers everytime (same i/o- same o/p)..

Non-deterministic output observation

When I ran the query multiple times, I noticed Non -Deterministic Behaviour .. This is a problem because we can't come to a conclusion , whether the test is succes or not due to varied answers everytime.. For CI/CD to work reliably, we need it to have deterministic behavior(we can't create a CI/CD pipeline, without testing it out first locally)otherwise we get noticed about the errors after pushing it to github



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Adding Mock LLM Mode

I'm adding mock LLM mode to introduce deterministic behaviour in the outputs and run Semantic tests , to come to a conclusion . This solves the non-determinism problem by providing deterministic o/p for same inputs(same o/p) , instead of retrieving from vector embeddings on similarity search , we directly check for content in text files with no embeddings like K8s.txt and other files in the docs/**.txt . Reliable testing requires Deterministic output behavir(same input should result in same output everytime not random or contradicting outputs instead)

Mock LLM mode for CI testing

Mock LLM mode returns the retrieved text directly, which makes tests waste of time , due to Non-deterministic behaviour of LLM... Without mock mode, tests answers would be random and not accurate . For automated CI, we need to implement Mock LLM Mode , for deterministic Output Behavior and run semantic tests.WIthout Mock LLM mode , we can't come to a conclusion with the outputs derived from the random answers everytime for the same input(but diffferent output)



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Creating GitHub Actions Workflow

I'm creating a GitHub Actions workflow file that automatically gets triggered when it detects changes in the files pushed to github(specific files mentioned in .yml will only be considered). The workflow automates testing by running semantic tests , . When I push code, it wil detect the changes and runs automatically and performs semantic tests , checks for data quality issues...

Workflow automation and CI testing

I created the workflow file in.VS code by creating "ci.yml" file in the .github/workflows/ci.yml I pushed it using git commands git add .github/workflows/ci.yml to stage this , then git commit -m "message" , and then used git push to finally push it to github repository ... Once on GitHub, the workflow will be triggered automatically when it detects changes in the respective files as mentioned in the ci.yml file(ex: app.py, docs/ **, embed_docs.py)



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Testing Data Quality

I'm triggering the CI workflow by using ci.yml , whenever a change is made in /docs/**.txt , embed_docs.py and app.py. The workflow will test data quality issues. I expect it to fail because semantic_test.py looks for the exact keywords "Orchestration" and "Containerization" but we intently removed that "Orchestration" keyword in K8s.txt , so when Mock LLM mode retreives answer without the "Orchestratiion" keyword , ,it is doomed to fail our semantic_tests

Data quality and CI protection

The missing keyword was "Orchestration". The semantic test failed because our response did not have the keyword(hardcoded to check for "Orchestration" and "Container" only in response) Without CI, this degraded content would have been pushed directly to production and only found out after a user complained about the bullshit responses received...

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The screenshot shows a GitHub Actions run log for a workflow named 'test-and-build'. The run failed 38 seconds ago. The log output is as follows:

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16     ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
17 AssertionError: Missing 'orchestration' keyword
18 Error: Process completed with exit code 1.
```

The log ends with an **Error**: Process completed with exit code 1.

On the left sidebar, there are links for Summary, All jobs, test-and-build (which is selected), Run details, Usage, and Workflow file.



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Scaling with Multiple Documents

I'm restructuring the project to handle multiple documents instead of using single k8s.txt file alone. The new folder structure supports to use multiple files for my RAG System. This approach scales better because real world applications require more amount of context to be provided for LLM .(using multiple docs is a necessity in real world scenarios)

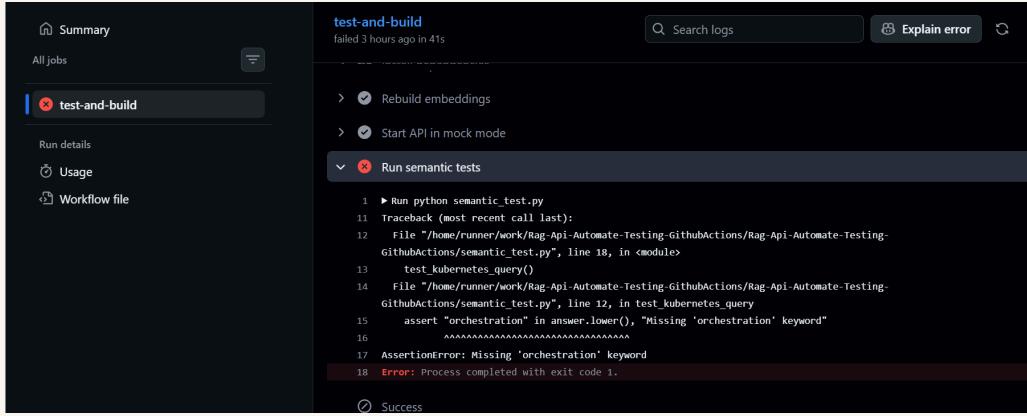
Docs folder structure and CI scaling

The docs folder organizes files by Keeping all the files contributing to our knowledge base in a Single Place. The embed_docs.py script handles creating vector embeddings of all the files in the /docs folder. CI validated all documents and found error when the Container is found to be missing in the response(we intentionally missed it in K8S.txt for testing purpose. This structure supports growth by in real world scenarios , rag systems uses multiple docs , not just one , so we are able to replicate that by using docs/ folder, to store all the files important for our knowledge base.

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The screenshot shows a GitHub Actions run titled "test-and-build" which failed 3 hours ago in 41s. The run details page lists three steps: "Rebuild embeddings" (success), "Start API in mock mode" (success), and "Run semantic tests" (failure). The failing step's log output is displayed:

```
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