Git Branching, Merging, Reset & Rebase – Practical Assignment

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Repository Link: https://github.com/Saichowdary9/flask-todo-app

Objective

The objective of this practical assignment is to demonstrate hands-on understanding of Git and GitHub by performing repository setup, SSH authentication, branch creation, merging, conflict resolution, reset, and rebase operations using a Flask-based To-Do application.

Tools & Technologies Used

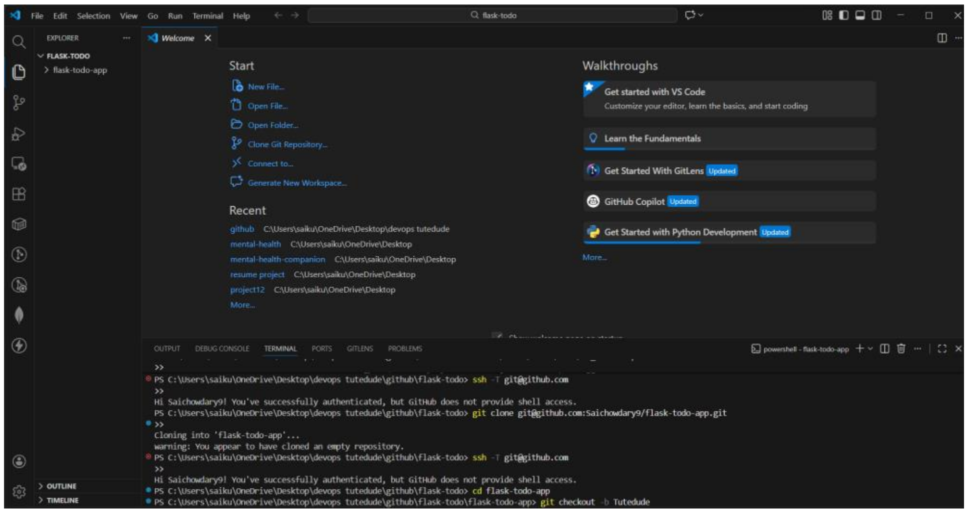
- Git & GitHub
- Flask (Python)
- MongoDB
- HTML (Frontend)
- Visual Studio Code
- Windows PowerShell

Part 1: SSH Authentication and Repository Setup

In this phase, a new GitHub repository was created and connected securely using SSH authentication. An ED25519 SSH key was generated and added to the GitHub account. The repository was cloned using SSH, and initial Flask project files were added in a separate branch named after the username. The branch was later merged into the main branch.

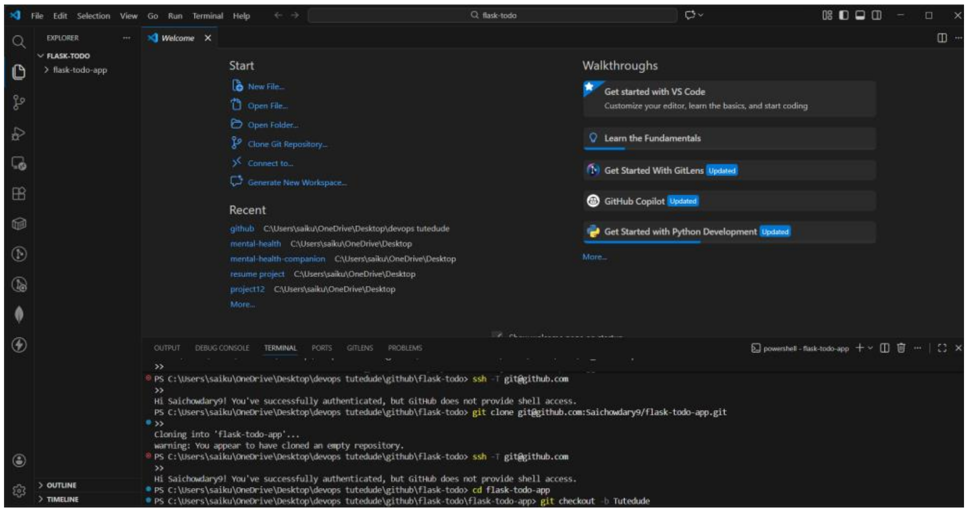
Screenshots below show SSH authentication success, repository cloning, branch creation, and commits.

Figure 1: SSH setup, cloning, and initial branch operations



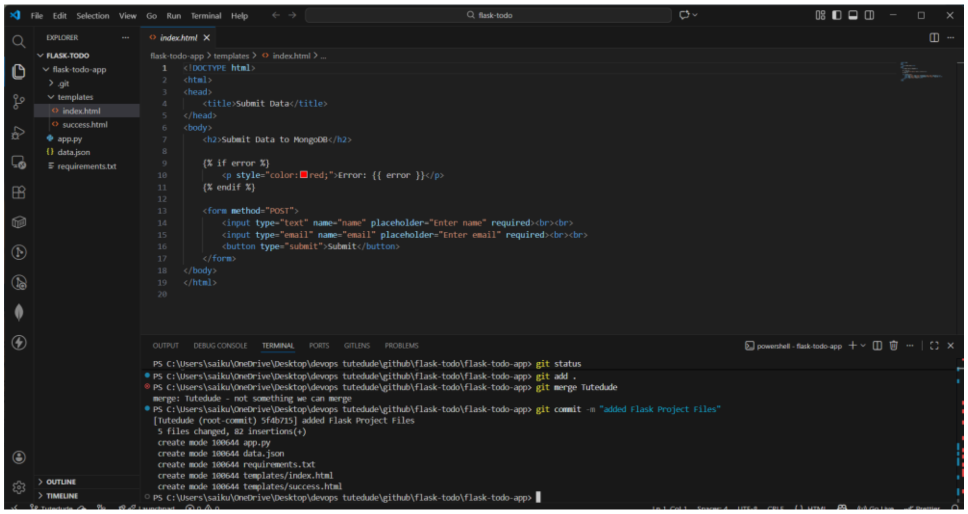
```
>>
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo> ssh -T git@github.com
>>
Hi Saichowdary9! You've successfully authenticated, but GitHub does not provide shell access.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo> git clone git@github.com:Saichowdary9/flask-todo-app.git
>>
Cloning into 'flask-todo-app'...
warning: You appear to have cloned an empty repository.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo> ssh -T git@github.com
>>
Hi Saichowdary9! You've successfully authenticated, but GitHub does not provide shell access.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo> cd flask-todo-app
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git checkout -b Tutedude
```

Figure 2: SSH setup, cloning, and initial branch operations



```
>>
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo> ssh -T git@github.com
>>
Hi Saichowdary9! You've successfully authenticated, but GitHub does not provide shell access.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo> git clone git@github.com:Saichowdary9/flask-todo-app.git
>>
Cloning into 'flask-todo-app'...
warning: You appear to have cloned an empty repository.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo> ssh -T git@github.com
>>
Hi Saichowdary9! You've successfully authenticated, but GitHub does not provide shell access.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo> cd flask-todo-app
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git checkout -b Tutedude
```

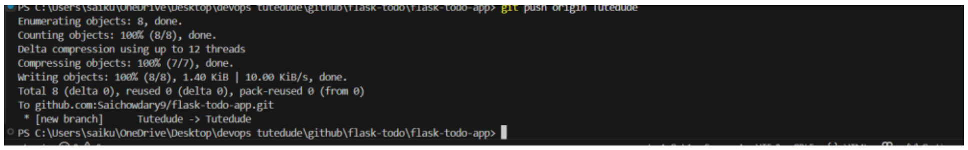
Figure 3: SSH setup, cloning, and initial branch operations



```html
<!DOCTYPE html>
<html>
<head>
    <title>Submit Data</title>
</head>
<body>
    <h2>Submit Data to MongoDB</h2>

    {% if error %}
        <p style="color:red;">Error: {{ error }}</p>
    {% endif %}

    <form method="POST">
        <input type="text" name="name" placeholder="Enter name" required><br><br>
        <input type="email" name="email" placeholder="Enter email" required><br><br>
        <button type="submit">Submit</button>
    </form>
</body>
</html>
```

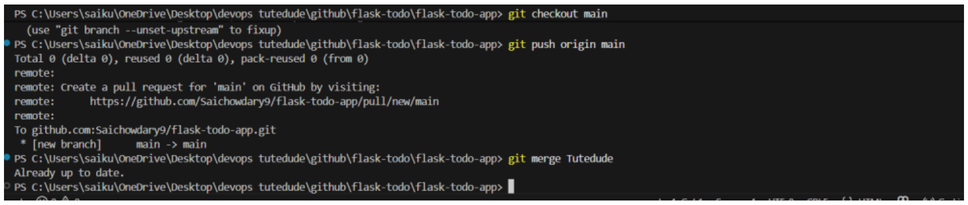
```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git status
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git add .
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git merge Tutedude
merge: Tutedude - not something we can merge
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git commit -m "added Flask Project Files"
[Tutedude (root-commit) 5f4b715] added Flask Project Files
 5 files changed, 82 insertions(+)
 create mode 100644 app.py
 create mode 100644 data.json
 create mode 100644 requirements.txt
 create mode 100644 templates/index.html
 create mode 100644 templates/success.html
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Figure 4: SSH setup, cloning, and initial branch operations



```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git push origin Tutedude
Enumerating objects: 8, done.
Counting objects: 100% (8/8), done.
Delta compression using up to 12 threads
Compressing objects: 100% (7/7), done.
Writing objects: 100% (8/8), 1.40 KiB | 10.00 KiB/s, done.
Total 8 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
To github.com:Saichowdary9/flask-todo-app.git
 * [new branch]      Tutedude -> Tutedude
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Figure 5: SSH setup, cloning, and initial branch operations

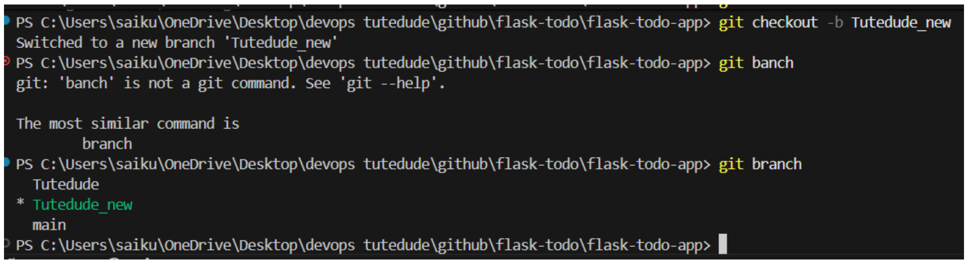


```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git checkout main
  (use "git branch --unset-upstream" to fixup)
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git push origin main
Total 0 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
remote:
remote: Create a pull request for 'main' on GitHub by visiting:
remote:      https://github.com/Saichowdary9/flask-todo-app/pull/new/main
remote:
To github.com:Saichowdary9/flask-todo-app.git
 * [new branch]      main -> main
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git merge Tutedude
Already up to date.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Part 2: JSON Update Using Feature Branch

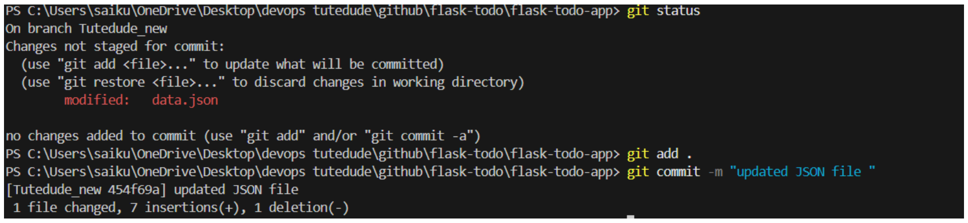
A new feature branch named Tutedude_new was created from the main branch. In this branch, the JSON file used for the /api route was modified to update API response data. The changes were committed and pushed to GitHub. Finally, the branch was merged back into the main branch.

Figure 6: JSON update, commit, push, and merge to main



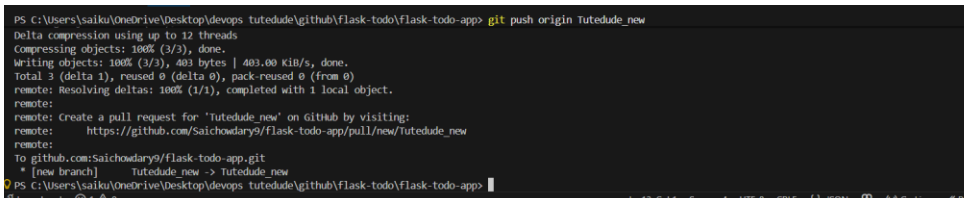
```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git checkout -b Tutedude_new
Switched to a new branch 'Tutedude_new'
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git banch
git: 'banch' is not a git command. See 'git --help'.

The most similar command is
        branch
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git branch
  Tutedude
* Tutedude_new
  main
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Figure 7: JSON update, commit, push, and merge to main



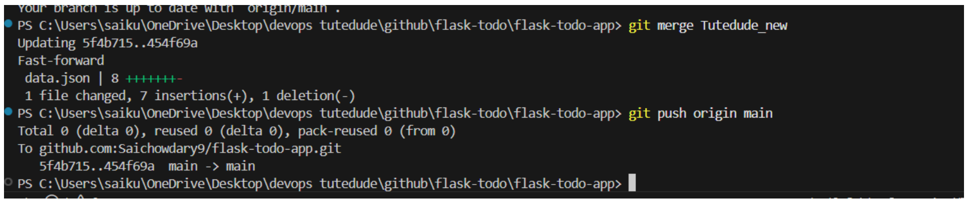
```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git status
On branch Tutedude_new
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   data.json

no changes added to commit (use "git add" and/or "git commit -a")
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git add .
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git commit -m "updated JSON file "
[Tutedude_new 454f69a] updated JSON file
 1 file changed, 7 insertions(+), 1 deletion(-)
```

Figure 8: JSON update, commit, push, and merge to main



```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git push origin Tutedude_new
Delta compression using up to 12 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 403 bytes | 403.00 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 'Tutedude_new' on GitHub by visiting:
remote:      https://github.com/Saichowdary9/flask-todo-app/pull/new/Tutedude_new
remote:
To github.com:Saichowdary9/flask-todo-app.git
 * [new branch]      Tutedude_new -> Tutedude_new
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Figure 9: JSON update, commit, push, and merge to main

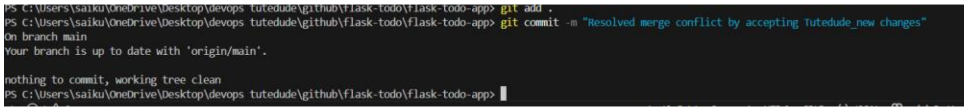


```
Your branch is up to date with 'origin/main'.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git merge Tutedude_new
Updating 5f4b715..454f69a
Fast-forward
 data.json | 8 +++++++-
 1 file changed, 7 insertions(+), 1 deletion(-)
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git push origin main
Total 0 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
To github.com:Saichowdary9/flask-todo-app.git
   5f4b715..454f69a  main -> main
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Part 3: Frontend and Backend Development Using Separate Branches

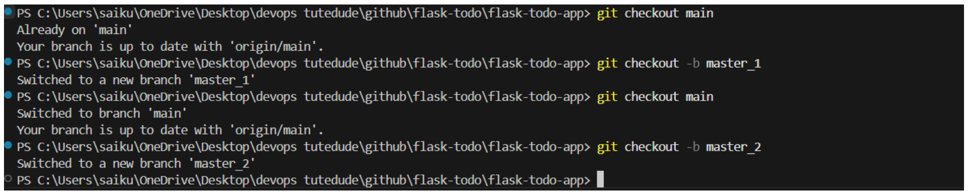
Two branches, master_1 and master_2, were created from the main branch. The master_1 branch was used for frontend development, where a To-Do form was created. The master_2 branch was used for backend development, where a Flask API endpoint (/submittodoitem) was implemented to store data in MongoDB. Both branches were later merged into the main branch.

Figure 10: Branch creation for frontend and backend



```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git add .
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git commit -m "Resolved merge conflict by accepting Tutedude_new changes"
On branch main
Your branch is up to date with 'origin/main'.

nothing to commit, working tree clean
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Figure 11: Branch creation for frontend and backend

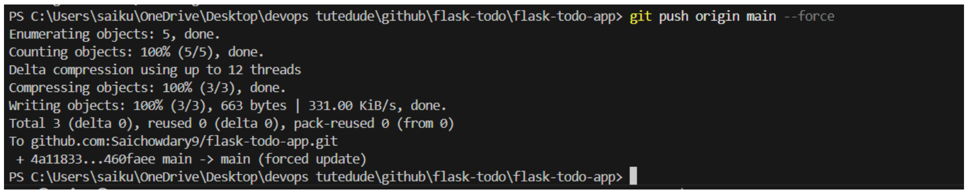


```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git checkout main
Already on 'main'
Your branch is up to date with 'origin/main'.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git checkout -b master_1
Switched to a new branch 'master_1'
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git checkout main
Switched to branch 'main'
Your branch is up to date with 'origin/main'.
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git checkout -b master_2
Switched to a new branch 'master_2'
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Part 4: Sequential Commits, Git Reset, and Rebase

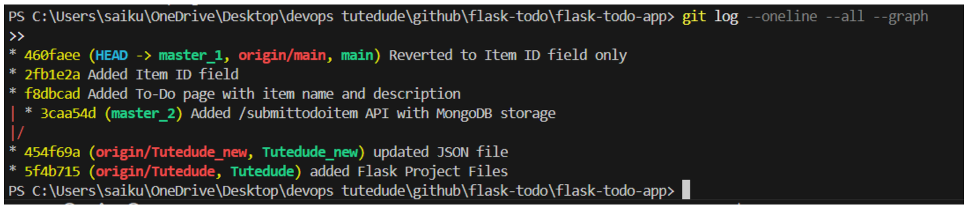
In this phase, the To-Do form was enhanced by adding Item ID, Item UUID, and Item Hash fields. Each field was committed separately to maintain a clean commit history. The branch was merged into main. A soft reset was performed to roll back to the commit where only the Item ID field existed, while preserving staged changes. Finally, a rebase operation was executed to apply updated main branch history back to the feature branch without squashing commits.

Figure 12: Git reset, force push, and final commit graph



```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git push origin main --force
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 12 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 663 bytes | 331.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
To github.com:Saichowdary9/flask-todo-app.git
 + 4a11833...460faee main -> main (forced update)
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Figure 13: Git reset, force push, and final commit graph



```
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app> git log --oneline --all --graph
>>
* 460faee (HEAD -> master_1, origin/main, main) Reverted to Item ID field only
* 2fb1e2a Added Item ID field
* f8dbcad Added To-Do page with item name and description
| * 3caa54d (master_2) Added /submittodoitem API with MongoDB storage
|/
* 454f69a (origin/Tutedude_new, Tutedude_new) updated JSON file
* 5f4b715 (origin/Tutedude, Tutedude) added Flask Project Files
PS C:\Users\saiku\OneDrive\Desktop\devops tutedude\github\flask-todo\flask-todo-app>
```

Conclusion

This assignment successfully demonstrated practical Git workflows including branching strategies, feature development, merging, conflict handling, reset, and rebasing. These version control practices are essential for collaborative development and DevOps workflows.