

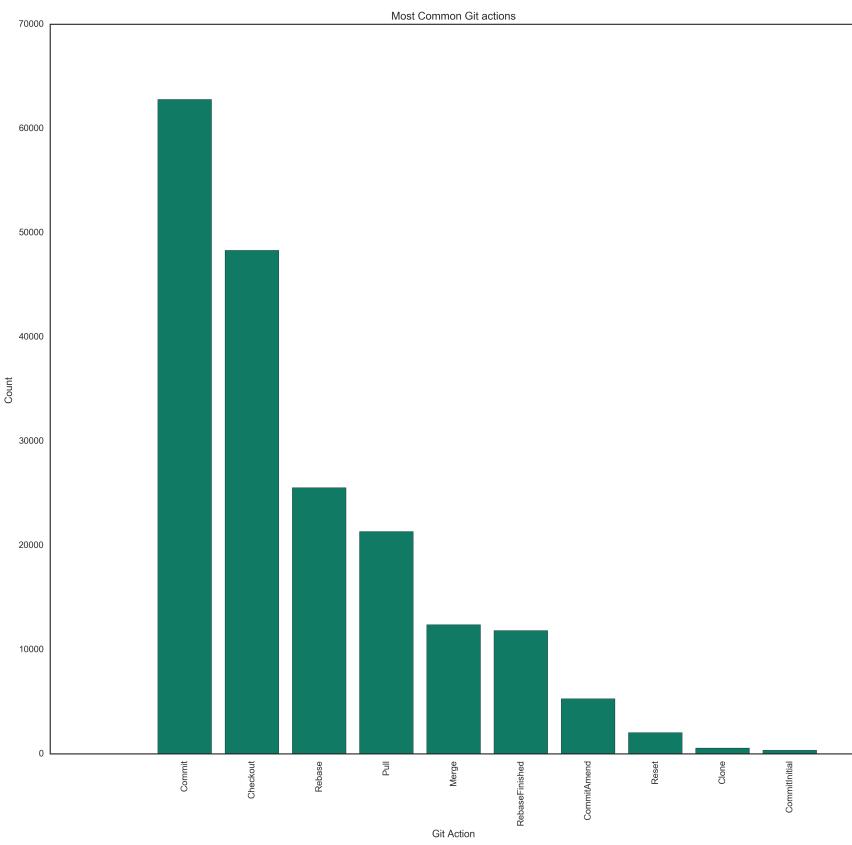
# Understanding the Role of Version Control in Software Build and Testing

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# Research Questions

- ▶ 1) What Git actions does developers do at the beginning and end of an IDE session?
- ▶ 2) Do developers commit their code after a successful build or test?
- ▶ 3) Do developers follow any trends regarding the time of the day to perform version control activities?

# About the dataset - VC table, Build Table and Test cases Table=> Bad Dataset, Less variability.



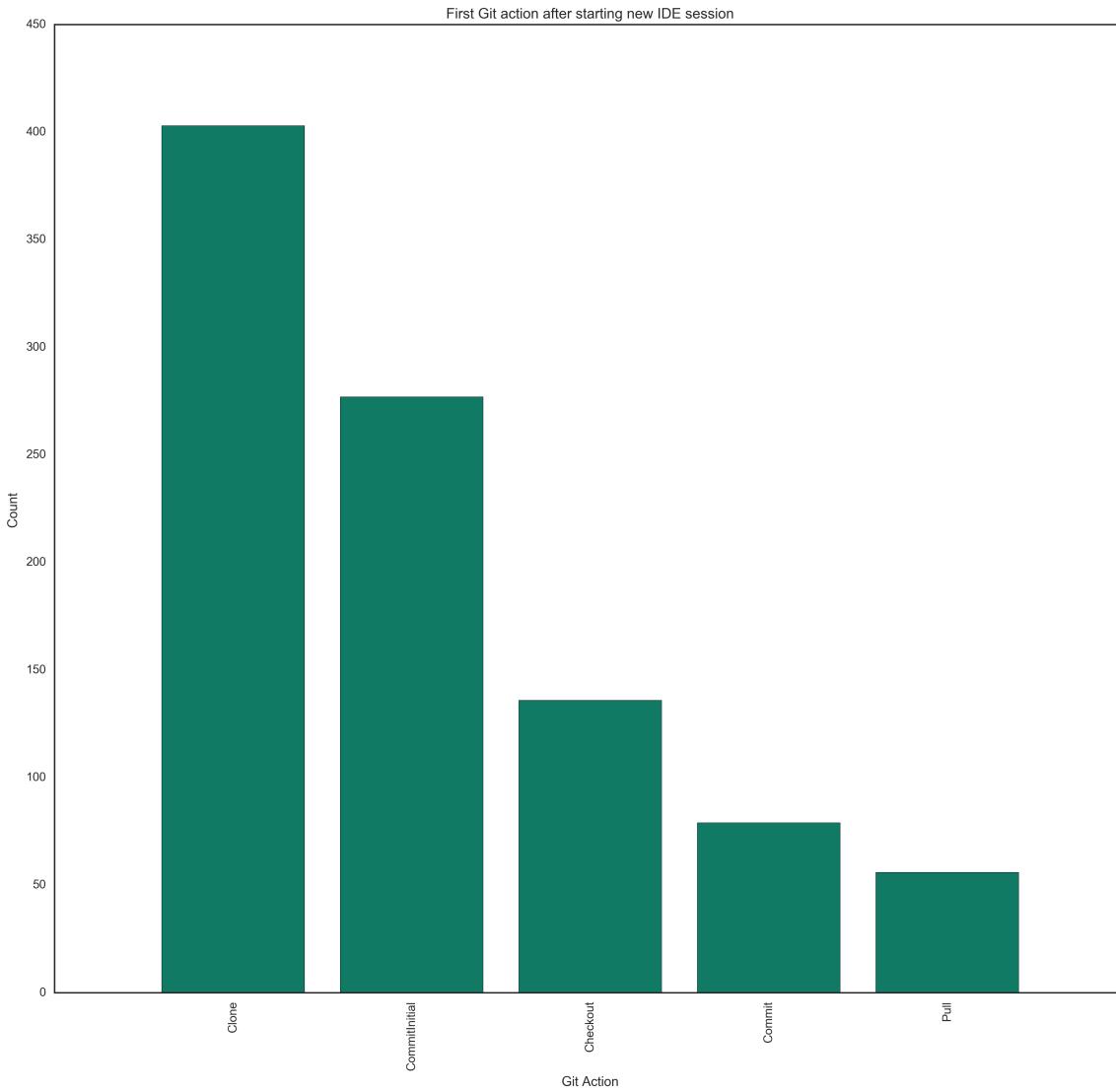
## Build Table

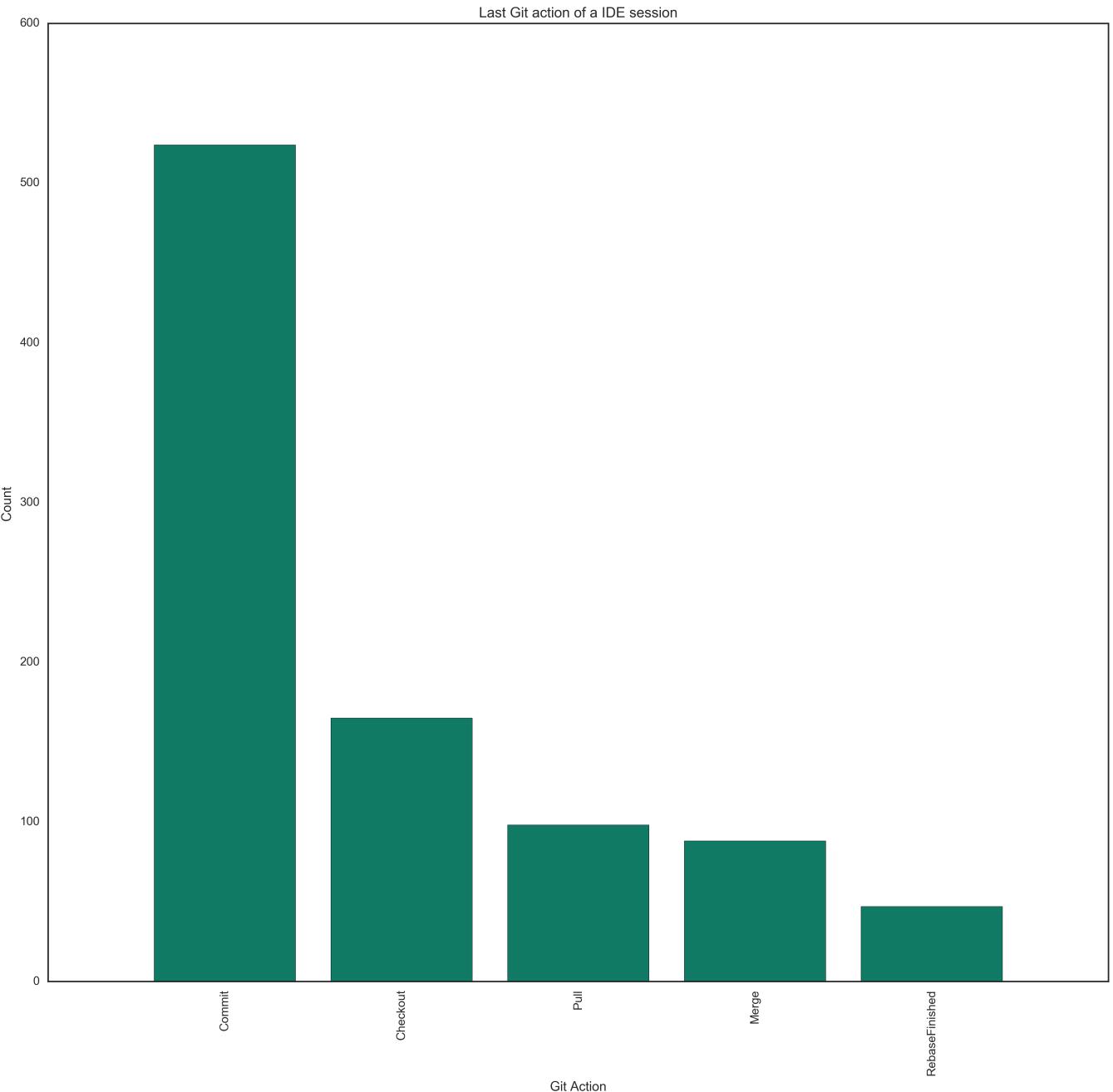
"vsBuildActionBuild" -12662 are built events  
"vsBuildActionRebuildAll" -639  
"vsBuildActionClean" -263  
"vsBuildActionDeploy" -9  
Success:75358, failed 3278  
Debug': 75450, Release: 2025, CodeAnalysis: 785,  
Local.Debug: 163

Test table: 336113 test cases  
Success: 289747 (1)  
Rest all error, ignored, failed

## RQ 1. What Git actions does developers do at the beginning and end of an IDE session?

- ▶ We looked for Unique IDE Sessions with has a Git activity in the Version Control Table. We found 825 Sessions
- ▶ We looked to find the first action after an IDE Session started and Last action before ending IDE session. (executedAt field)
- ▶ We also studied first four and last 3 sequence of git activities in a session.





# Sequence First Four

- CommitInitial->Commit->Commit->Commit 76
- Clone->Checkout->Commit->Commit 71
- Checkout->Checkout->Commit->Checkout 57
- Clone->Commit->Commit->Commit 55
- CommitInitial->Commit->Checkout->Commit 42
- Clone 40
- CommitInitial->Commit 38
- Pull->Pull->Pull->Pull 37
- Clone->Checkout->Checkout->Checkout 34
- Checkout->Pull->Checkout->Checkout 32

# Last three Sequence

- Commit->Commit->Commit, 204
- Commit->Checkout->Commit 48
- Clone 40
- CommitInitial->Commit 38
- Checkout->Pull->Checkout 32

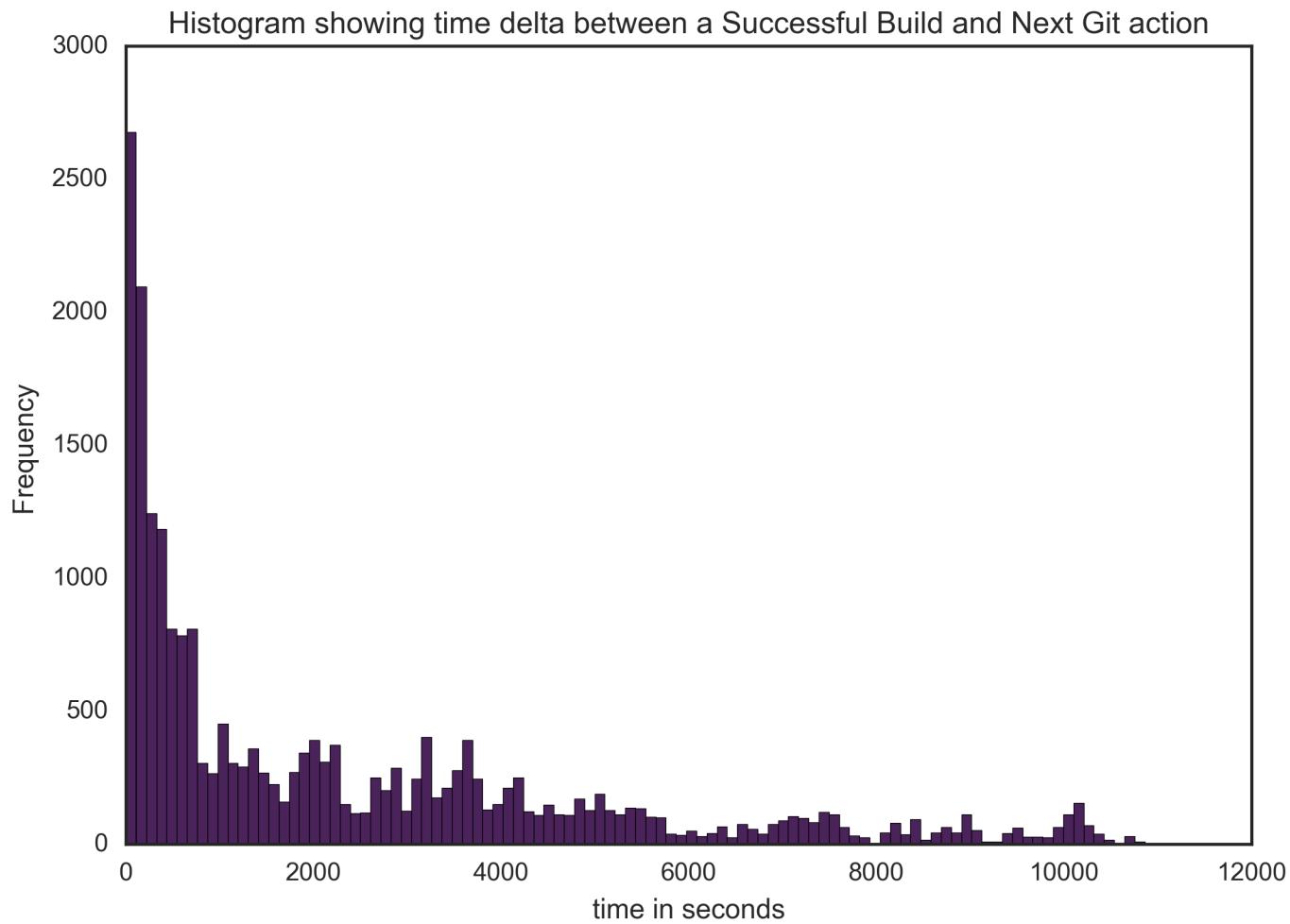
# Do developers commit their code after a successful build or test?

## SuccessFul Build:

- ▶ We found 459 IDE sessions which had both a Git activity and a build activity and these sessions were selected for analysis.
- ▶ This resulted in 87755 Git actions and 41898 build actions. In 27037 cases there was a Git action followed by a build.

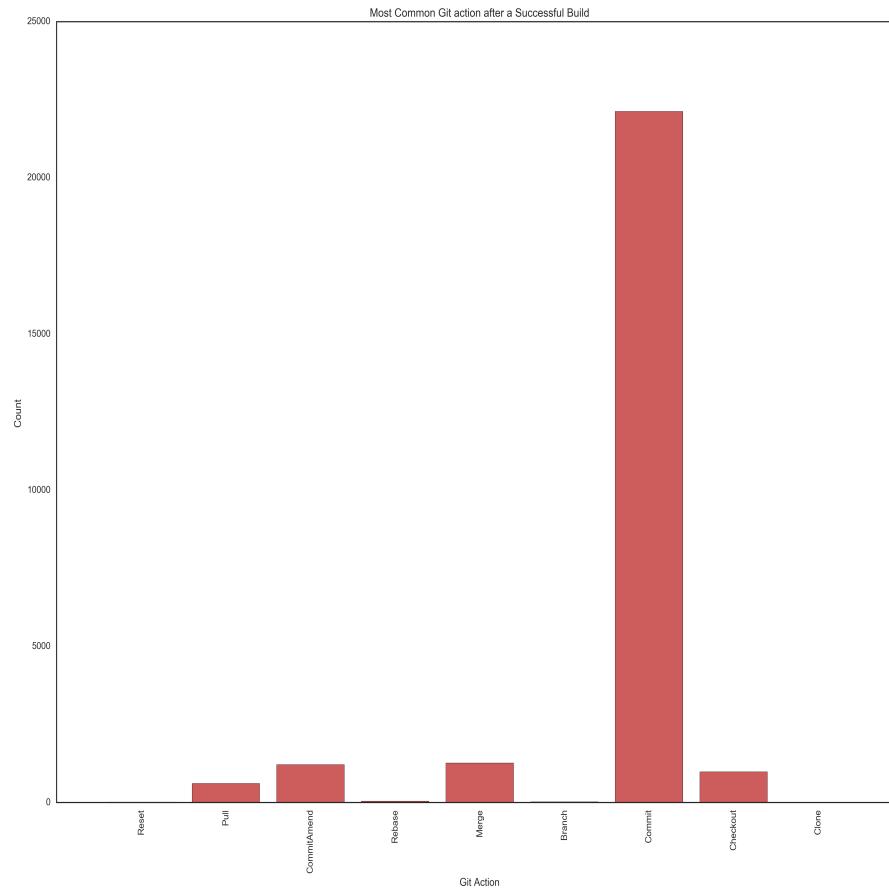
# Results

- ▶ In 27037 cases there was a Git action followed by a build. We found that 1581 out of 26280 successful builds, there was a Git action performed within a minute (6%).
- ▶ 16546 times a Git action was performed within an hour after a successful test (61%).
- ▶ The average time for a Git action after a successful build is 4.44 hours.



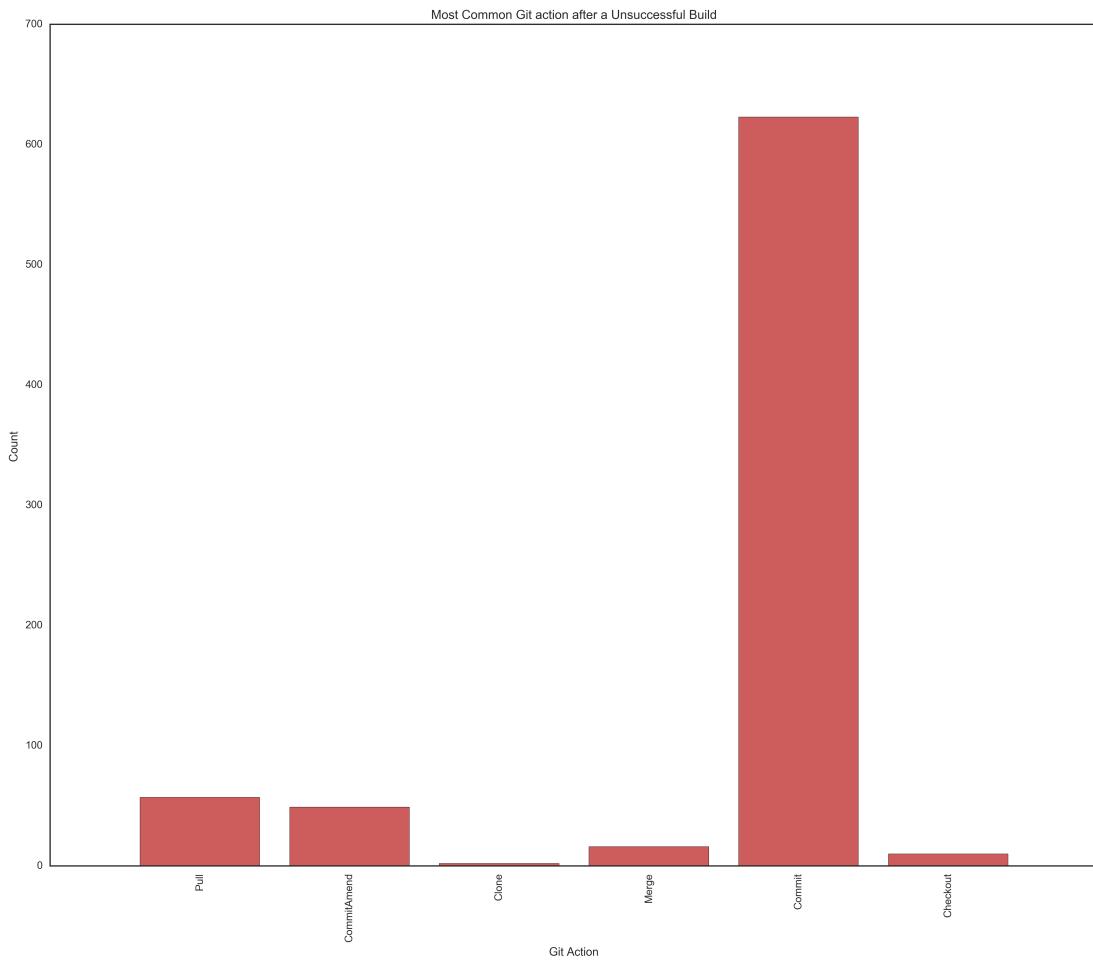
# When Build Success- Git action

- ▶ The most common Git action followed by a successful build is commit (88%), followed by Commit-Amend (5%), Merge (4%), checkout (2%) and Pull (1%).



# When Build fails:

- ▶ we found only 757 unsuccessful build which was followed by a Git action. We found that among the 757 unsuccessful build, 222 were followed by a successful build.
- ▶ The average time for commit after an unsuccessful build is 6.7 hours. This is because the developers spend additional time fixing their build errors and then running a successful build before committing their code.
- ▶ Even though the most common developer actions after an unsuccessful build is commit (82%), actions such as Pull (8%) and Commit-Amend (5%) closely



# Successful Build after an UnSuccessful one

- ▶ number of times git followed by Successful build:222
- ▶ under\_one\_minute
- ▶ 9
- ▶ under\_one\_hour
- ▶ 124
- ▶ average time for git action in hours
- ▶ 4.52583458458

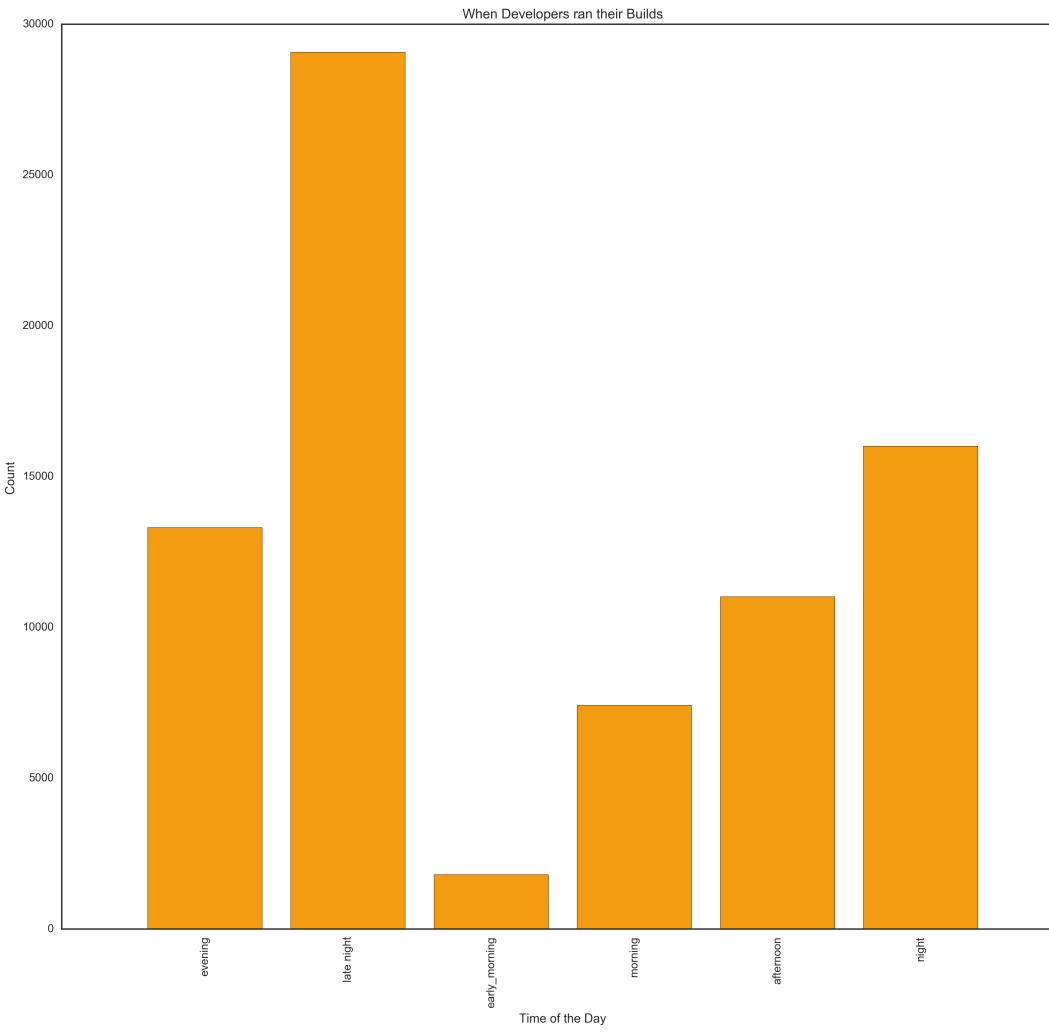
# For Successful tests

- ▶ We selected those IDE sessions which has both test execution and Git actions.
- ▶ We found 157 such sessions which consisted of 72029 Git actions and 327463 test cases.
- ▶ We found that there were 250304 successful Test cases (76% of total test cases) and all of them were followed by a Git activity
- ▶ There were 7260 out of 250304 instances where a Git action as performed within one minute of a successful test case.
- ▶ This number changed to 201028 out of 250304 (80.31%) for actions within an hour.
- ▶ For an Unsuccessful test case, this number changed to 0.8% for under a minute and 73% for under an hour.
- ▶ It must be noted that only 63% of the failed Test case had a Git action performed.

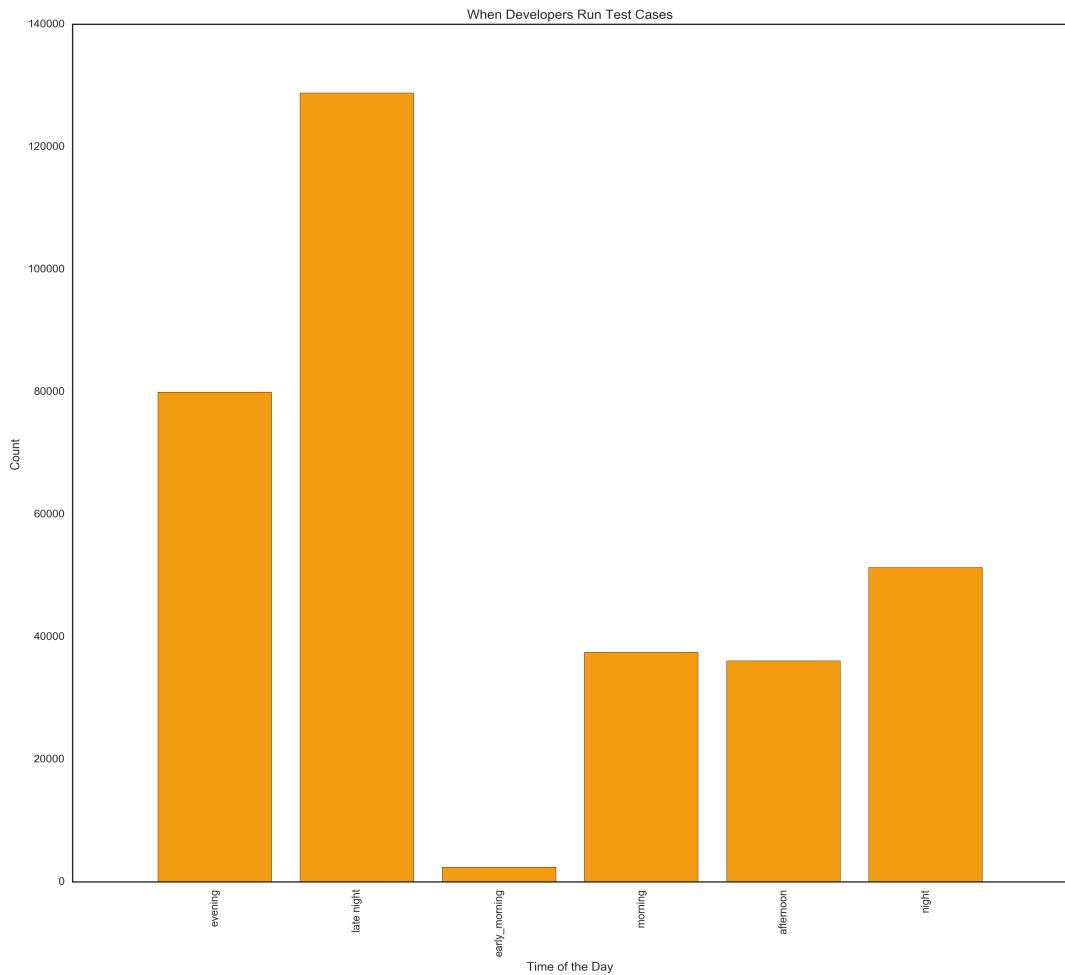
# Do developers follow any trends regarding the time of the day to perform development activities.

- ▶ Early morning-> 06:00-08:59Hrs,
- ▶ Morning->09:00-11:59Hrs,
- ▶ Afternoon->12:00-15:59Hrs,
- ▶ Evening-> 16:00-18:59Hrs,
- ▶ Night->19:00-21:59Hrs,
- ▶ Late Night: 22:00-05:59Hrs.

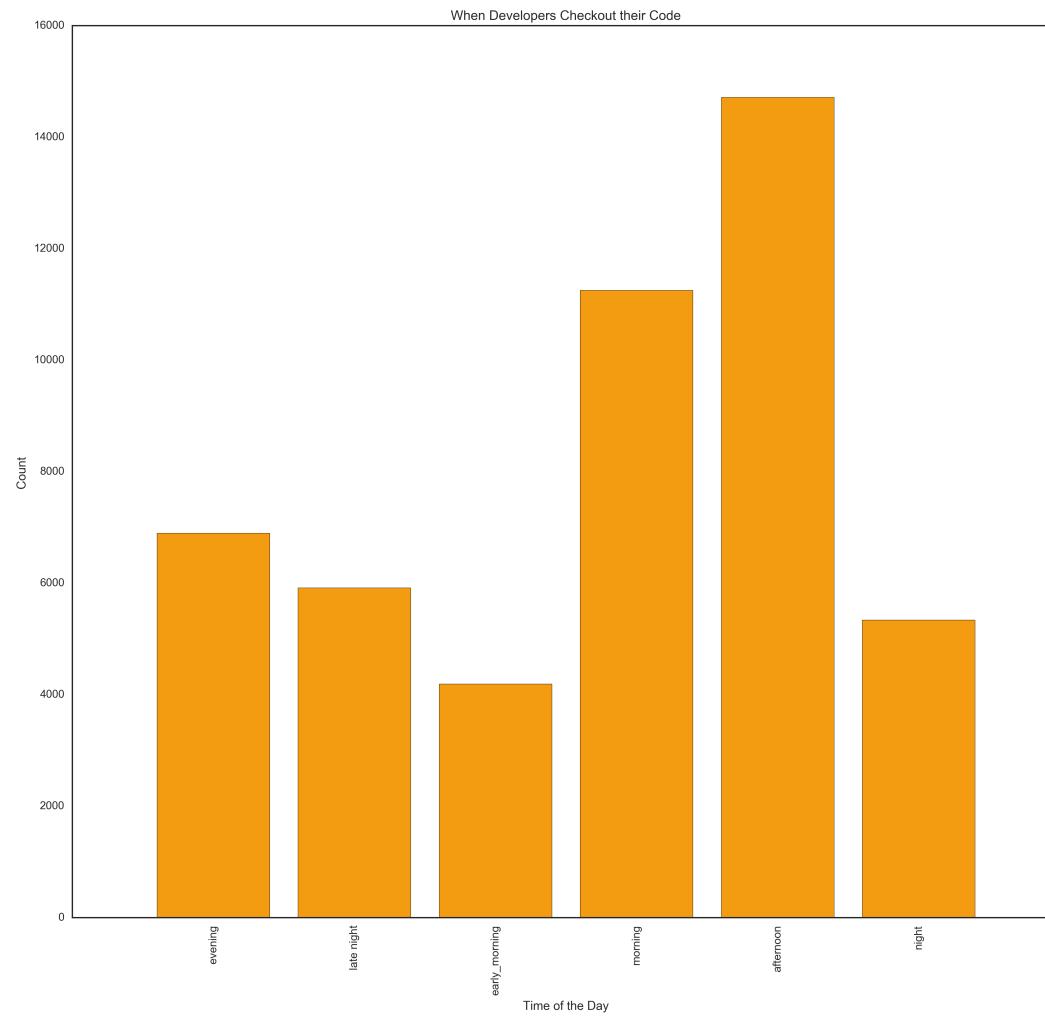
# Build

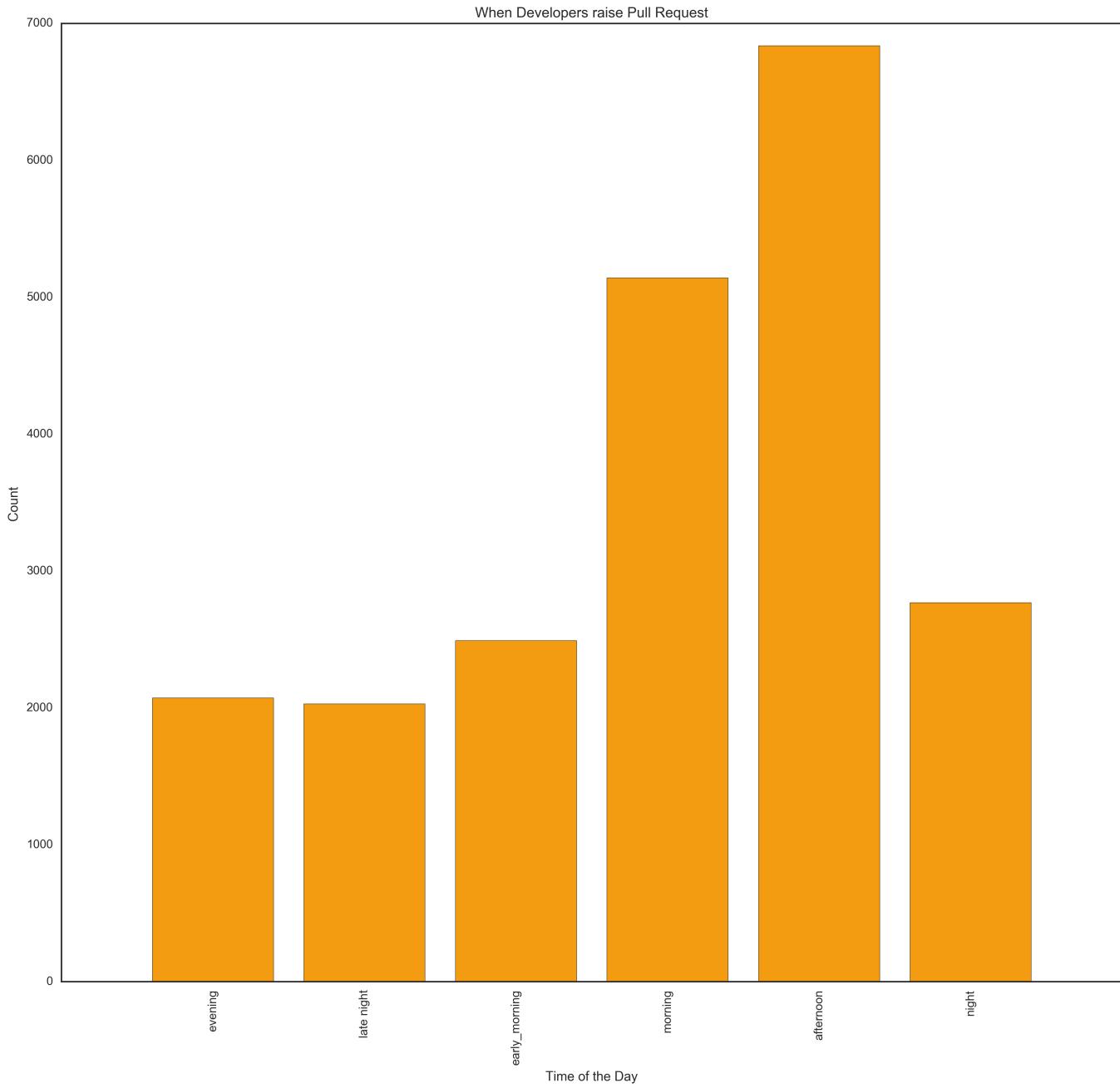


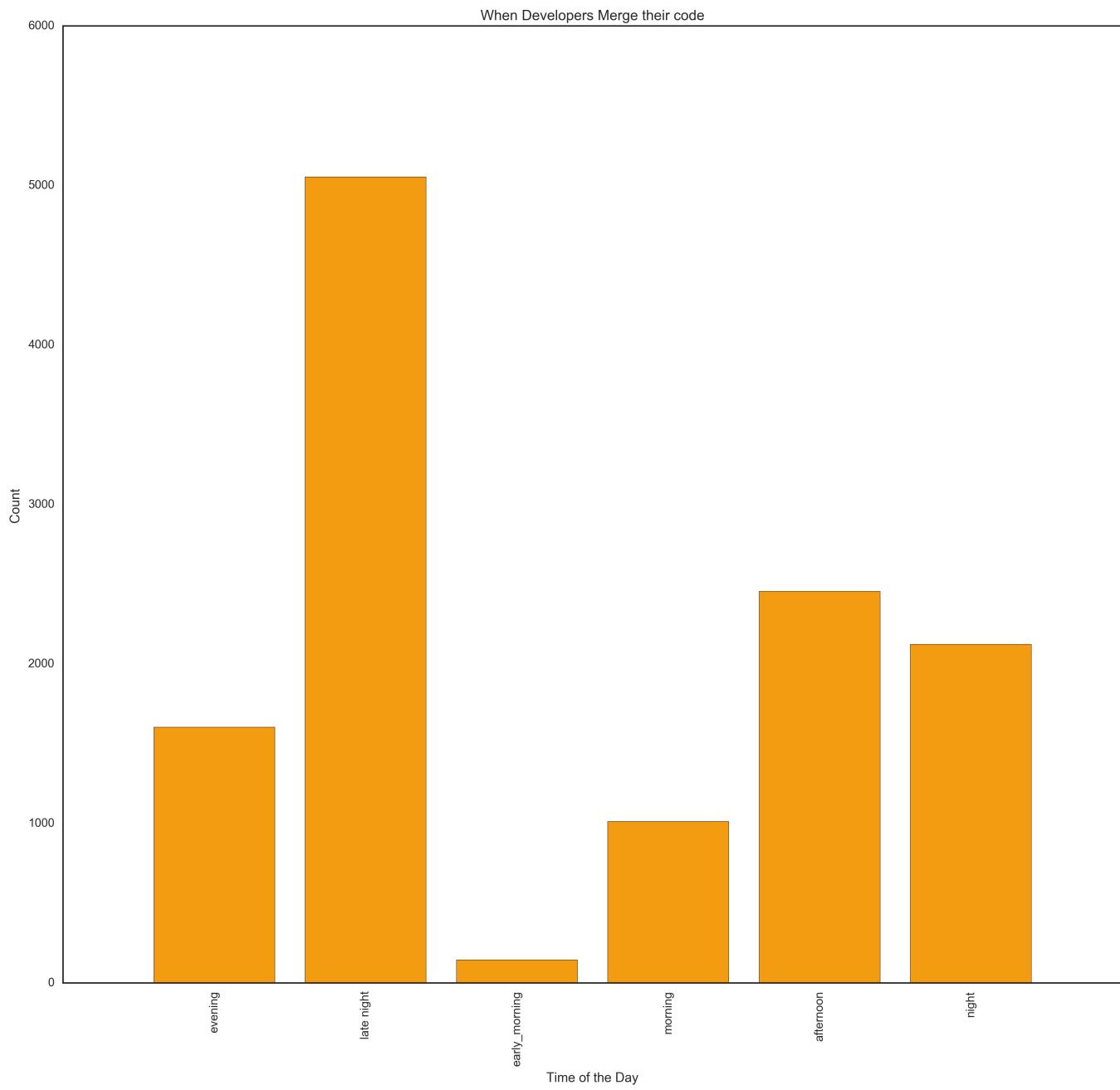
# Tests



# Checkout







# Conclusion

- ▶ We explored what Git actions does developers do at the beginning and end of an IDE session - Beginning -> Clone, Ending -> Commit