Modern Software Development Practices

A Hands-on Introduction to Git, Team Programming, and AI Coding Assistants

MISSISSIPPI STATE UNIVERSITY
Electrical and Computer Engineering

Topics

- Source control
- Collaborative programming
- AI-assisted coding

Source Control

- Version history for code and assets
- Enables collaboration without overwriting each other's work
- Essential for debugging, backups, and tracking progress

Types of Version Control

- **Local Version Control:** e.g., manual backups
- **Centralized:** e.g., SVN
- **Distributed:** Git (focused here)

Why Git?

- Lightweight and fast
- Popular (used in ~90% of modern projects)
- GitHub, GitLab, Bitbucket support it

Install git

- Everyone install git

Key Git Terminology

- Repository (repo) – A place for all your code
- Commit – An update to your code
- Branch – A different part of the same project
- Merge – Merge two pieces of code together

Key Git Terminology

- Clone – Clone the repository onto your computer
- Push – Push changes from your machine to GitHub
- Pull – Changes from your GitHub repository to your computer
- Fork – Take someone else's code and make your project out of it

Git Demo

- Make a new folder
- Change directory (cd) into it

Create and Clone a Rep

- git clone https://github.com/user/repo.git

Initializing a Git Repo

- git init (Initialize, not needed for clone)
- git add .
- git commit -m "Initial commit"

Push your changes

- Updates your online repository with the code changes you made

- git push origin <name of branch>

Tracking Changes

- git status
- git diff
- git log

Branches

- Branch – an independent line of development
- Main vs feature branches
- Enables safe experimentation

Working with Branches

- git branch new-feature
- git checkout new-feature
- git merge main

Fork

- Make a copy of someone else's project and add it to your account
- You can use forks to make pull request
- Demo

Pull Requests (PRs)

- A **pull request** is a way to ask a project to review and merge your changes into their code.

- Demo – Everyone fork my repository and make a pull request

Demo

- Clone a repository and run it

  https://github.com/Python-World/python-mini-projects

Break

AI Assisted Coding

- Using machine learning tools to:
  - Generate code
  - Complete functions
  - Explain or debug code
  - Write tests, documentation, and comments

- Popularized by tools like GitHub Copilot, ChatGPT, Amazon CodeWhisperer

Why Use AI Tools?

- Boost productivity
- Reduce boilerplate work
- Explore unfamiliar APIs
- Learn from examples
- Improve documentation and test coverage

What AI Struggles With

- Context beyond current file
- Understanding project-specific logic
- Performance-sensitive code
- Complex architectural decisions
- Guaranteed correctness or security

Demo

- Generate some AI code and implement it