Introduction to Git and GitHub

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Agenda

- What is Git? What is GitHub?
- Why are we learning this?
- Reflections on learning Git
- Getting set up
- Practical exercises (many!)
- Further resources
- What we didn’t cover

What is Git?

- Version control system that allows you to track files and file changes in a repository (“repo”)
- Primarily used by programmers
- Runs from the command line (usually)
- Can be used alone or in a team

What is GitHub?

- A website, not a version control system
- Allows you to put your Git repos online
- Benefits of GitHub:
  - Backup of files
  - Visual interface for navigating repos
  - Makes repo collaboration easy
  - “GitHub is just Dropbox for Git”
- Note: Git does not require GitHub

Why are we learning this?

- Version control is useful when you write code, and data scientists write code
- Enables teams to easily collaborate on the same codebase
- Enables you to contribute to open source projects
- Attractive skill for employment

Git can be hard for beginners

- Designed (by programmers) for power and flexibility over simplicity
- Hard to know if what you did was right
- Hard to explore since most actions are “permanent” (in a sense) and can have serious consequences
- Most learning resources are command-focused instead of workflow-focused

Don’t sweat it!

- We’ll focus on the most important 10% of Git
- Being slow to learn Git will not hold you back in the rest of the course
- We can help you to troubleshoot
- We’re all in this together!

Installation

- GitHub:
  - Create an account at github.com
  - There's nothing to install
  - Note: "GitHub for Windows" & "GitHub for Mac" are GUI clients (alternatives to command line)
- Git:
  - Download from git-scm.com/downloads
  - Install

Setup

- Open Git Bash (Windows) or Terminal (Mac/Linux):
  - git config --global user.name “YOUR FULL NAME”
  - git config --global user.email “YOUR EMAIL”
- Use the same email address you used with your GitHub account
- Generate SSH keys: tiny.cc/gitssh
  - Not required, but more secure that HTTPS

Navigating a GitHub repo (1 of 2)

- Example repo: git.io/ggplot2
- Account name, repo name, description
- Folder structure
- Viewing files:
  - Rendered view (with syntax highlighting)
  - Raw view
- README.md:
  - Describes a repo
  - Automatically displayed
  - Written in Markdown

Navigating a GitHub repo (2 of 2)

- Commits:
  - One or more changes to one or more files
  - Revision highlighting
  - Commit comments are required
  - Most recent commit comment shown by filename
- Profile page

Creating a repo on GitHub

- Click “Create New” (plus sign):
  - Define name, description, public or private
  - Initialize with README (if you’re going to clone)
- Notes:
  - Nothing has happened to your local computer
  - This was done on GitHub, but GitHub used Git to add the README.md file

Cloning a GitHub repo

- Cloning = copying to your local computer
  - Like copying your Dropbox files to a new machine
- First, change your working directory to where you want the repo to be stored: cd
- Then, clone the repo: git clone <URL>
  - Get SSH or HTTPS URL from GitHub (ends in .git)
  - Clones to a subdirectory of the working directory
  - No visual feedback when you type your password
- Navigate to the repo (cd) then list the files (ls)

Checking your remotes

- A “remote alias” is a reference to a repo not on your local computer
  - Like a connection to your Dropbox account
- “origin” remote was set up by “git clone”
- View remotes: git remote -v

Making changes, checking your status

- Making changes:
  - Modify README.md in any text editor
  - Create a new file: touch <filename>
- Check your status:
  - git status
- File statuses (possibly color-coded):
  - Untracked (red)
  - Tracked and modified (red)
  - Staged for committing (green)
  - Committed

Committing changes

- Stage changes for committing:
  - Add a single file: git add <filename>
  - Add all “red” files: git add .
- Check your status:
  - Red files have turned green
- Commit changes:
  - git commit -m “message about commit”
- Check your status again!
- Check the log: git log

Pushing to GitHub

- Everything you've done to your cloned repo (so far) has been local
- You've been working in the "master" branch
- Push committed changes to GitHub:
  - Like syncing local file changes to Dropbox
  - git push <remote> <branch>
  - Often: git push origin master
- Refresh your GitHub repo to check!

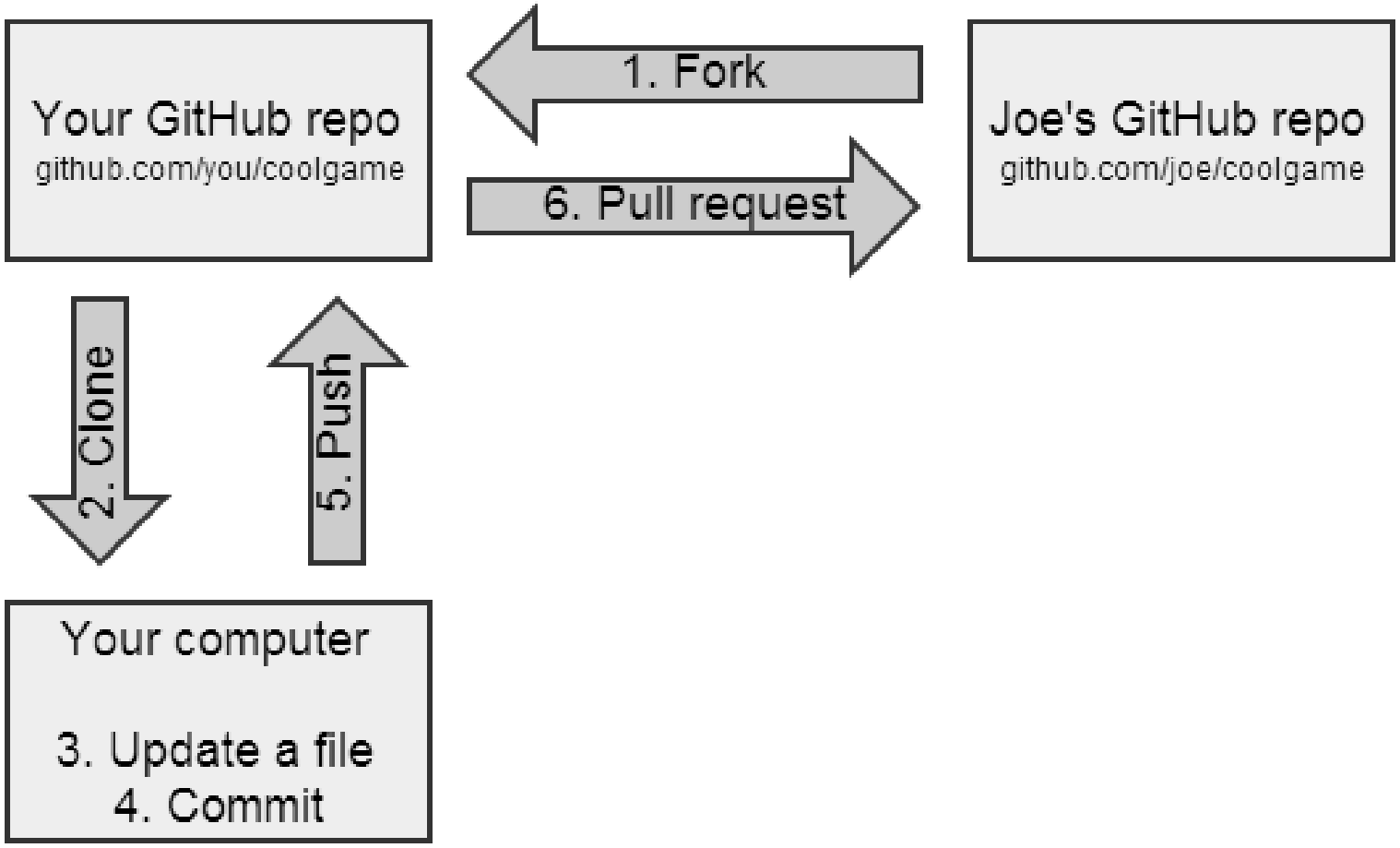
Quick recap of what you've done

- Created a repo on GitHub
- Cloned repo to your local computer (git clone)
  - Automatically set up your "origin" remote
- Made two file changes
- Staged changes for committing (git add)
- Committed changes (git commit)
- Pushed changes to GitHub (git push)
- Inspected along the way (git remote, git status, git log)

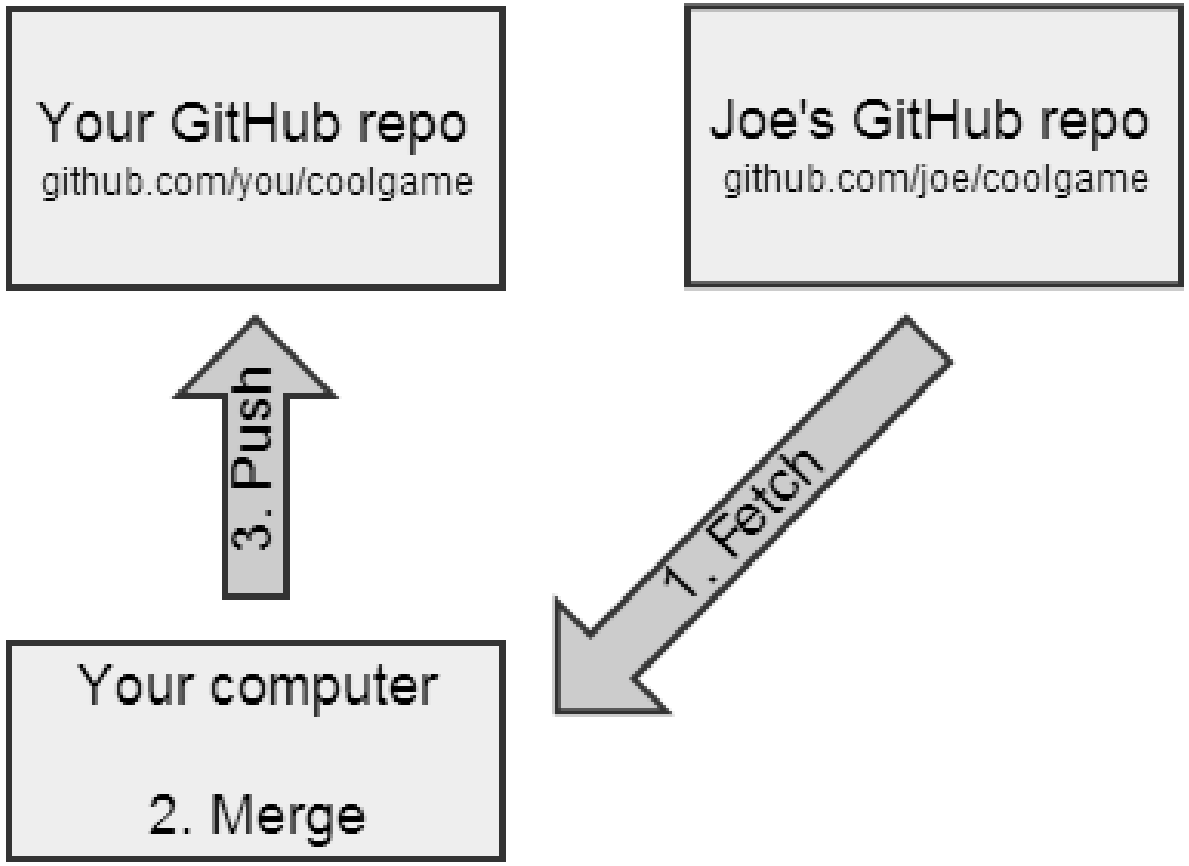
Forking a repo on GitHub

- What is forking?
  - Copy a repo to your account (including history)
  - Does not stay in sync with the “upstream”
  - Do it! git.io/gadsdc2
- Why fork?
  - You want to make modifications
  - You want to contribute to the upstream
- Clone your fork: git clone <your URL>
  - Don’t clone inside your other local repo

GitHub flow for contributing



GitHub flow for syncing a fork



Sync your gadsdc2 fork

- We've added a new file to gadsdc2
- Add an "upstream" remote (one-time operation):
  - git remote add upstream <Aaron's URL>
  - Check that it worked: git remote -v
- Pull the changes from the upstream:
  - Like updating your local files from Dropbox
  - git pull upstream master
  - Pull = fetch + merge (basically)
- Push the changes up to GitHub (optional):
  - git push origin master

Working with branches

- A branch is a “context” for your work:
  - Controls your files
  - Managed by the “.git” folder
  - View your branches: git branch
- Try branching in the test repo you created:
  - Create branch and switch to it: git checkout -b new_branch
  - Create a file, stage the change, commit it
  - Switch to the master branch: git checkout master
    - ls: the file is gone!
    - git log: the commit is gone!
  - Switch to the new branch: git checkout new_branch
    - The file and commit are back

Recipe for submitting homework

1. git checkout master
2. git pull upstream master
3. git checkout -b name_of_branch
4. do your assignment
5. git add .
6. git commit -m “message”
7. git push origin name_of_branch
8. GitHub: switch to branch, submit pull request

Further resources

- Pro Git (book): git-scm.com/book
- Git Reference: gitref.org
- Recipe for submitting homework: git.io/recipe
- My quick reference guide: tiny.cc/gitref
  - Common sets of commands explained
- My video series: tiny.cc/gitvideos
  - Watch most of this presentation again!

Not covered (but useful to learn!)

- Initializing a repo locally (git init), then later pushing it to GitHub
- Deleting or moving a repo locally
- Deleting a branch
- Using .gitignore to ignore certain files
- Rolling back or unstaging changes
- Resolving merge conflicts
- Fixing LF/CRLF issues