Introduction to Git and GitHub

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Agenda

I. Introduction
II. Exploring GitHub
III. Using Git with GitHub
IV. Contributing on GitHub
V. Bonus Content

I. Introduction

Why learn version control?

- 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

What is Git?

- Version control system that allows you to track files and file changes in a repository (“repo”)
- Primarily used by software developers
- Most widely used version control system
  - Alternatives: Mercurial, Subversion, CVS
- Runs from the command line (usually), gui’s available
- 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
  - Largest code host in the world
  - Alternative: Bitbucket
- Benefits of GitHub:
  - Backup of files
  - Visual interface for navigating repos
  - Makes repo collaboration easy
- “GitHub like a Dropbox for Git”
- *Note: Git does not require GitHub*

Git can be challenging to learn

- 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
- We’ll focus on the most important 10% of Git

II. Exploring GitHub

GitHub setup

- Create an account at github.com
- There's nothing to install
  - "GitHub for Windows" & "GitHub for Mac" are GUI clients (alternatives to command line)

Navigating a GitHub repo (1 of 2)

- Example repo: https://github.com/jayurbain/DataScienceIntro
- 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

Basic Markdown

- Easy-to-read, easy-to-write markup language
- Usually (always?) rendered as HTML
- Many implementations (aka “flavors”)
- Let’s edit README.md using GitHub!
- Common syntax:
  - ## Header size 2
  - *italics* and **bold**
  - [link to GitHub](https://github.com)
  - * bullet
  - `inline code` and ```code blocks```
- Valid HTML can also be used within Markdown

III. Using Git with GitHub

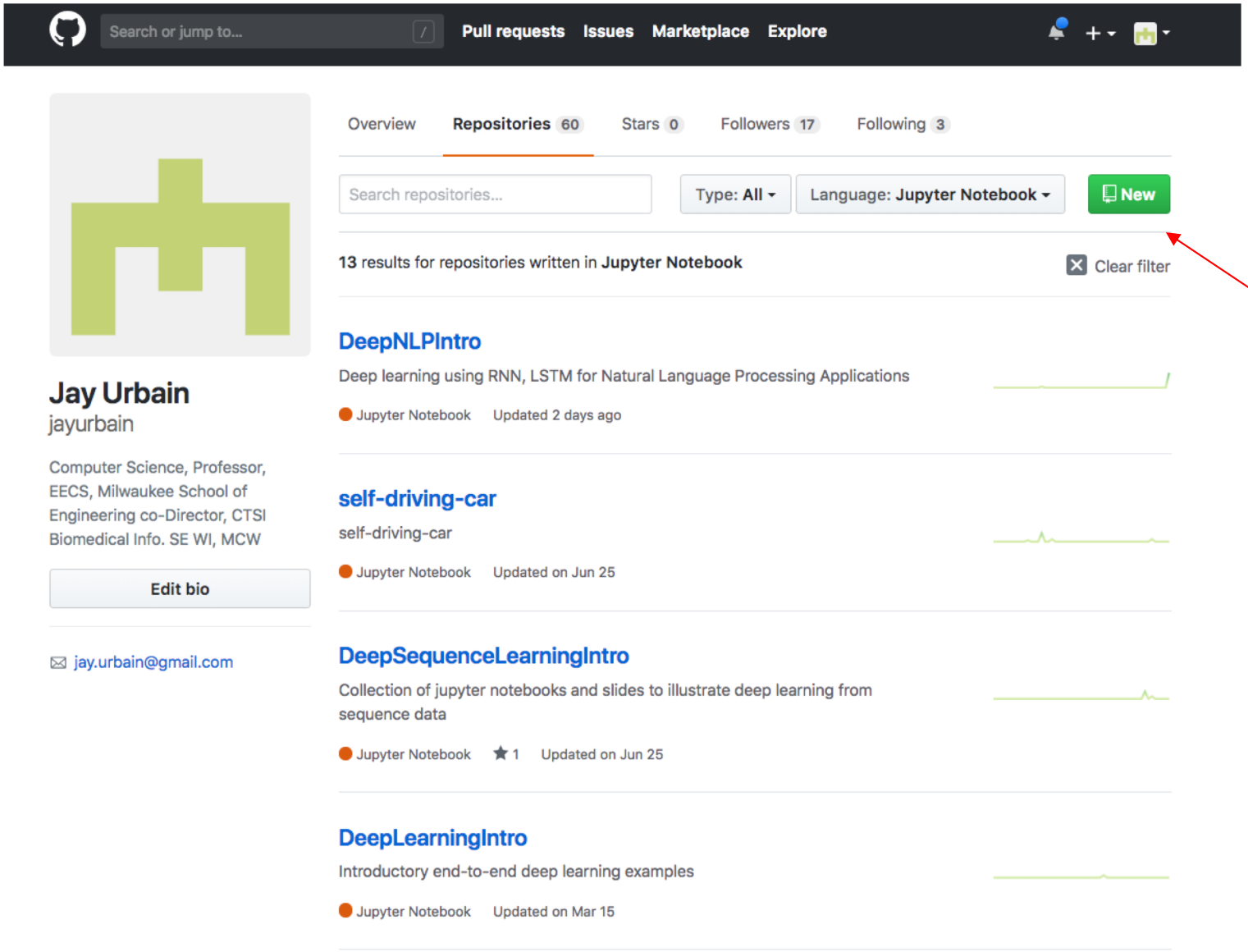
Git installation and setup

- Installation: tiny.cc/installgit
- Open Git Bash or Power Shell (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

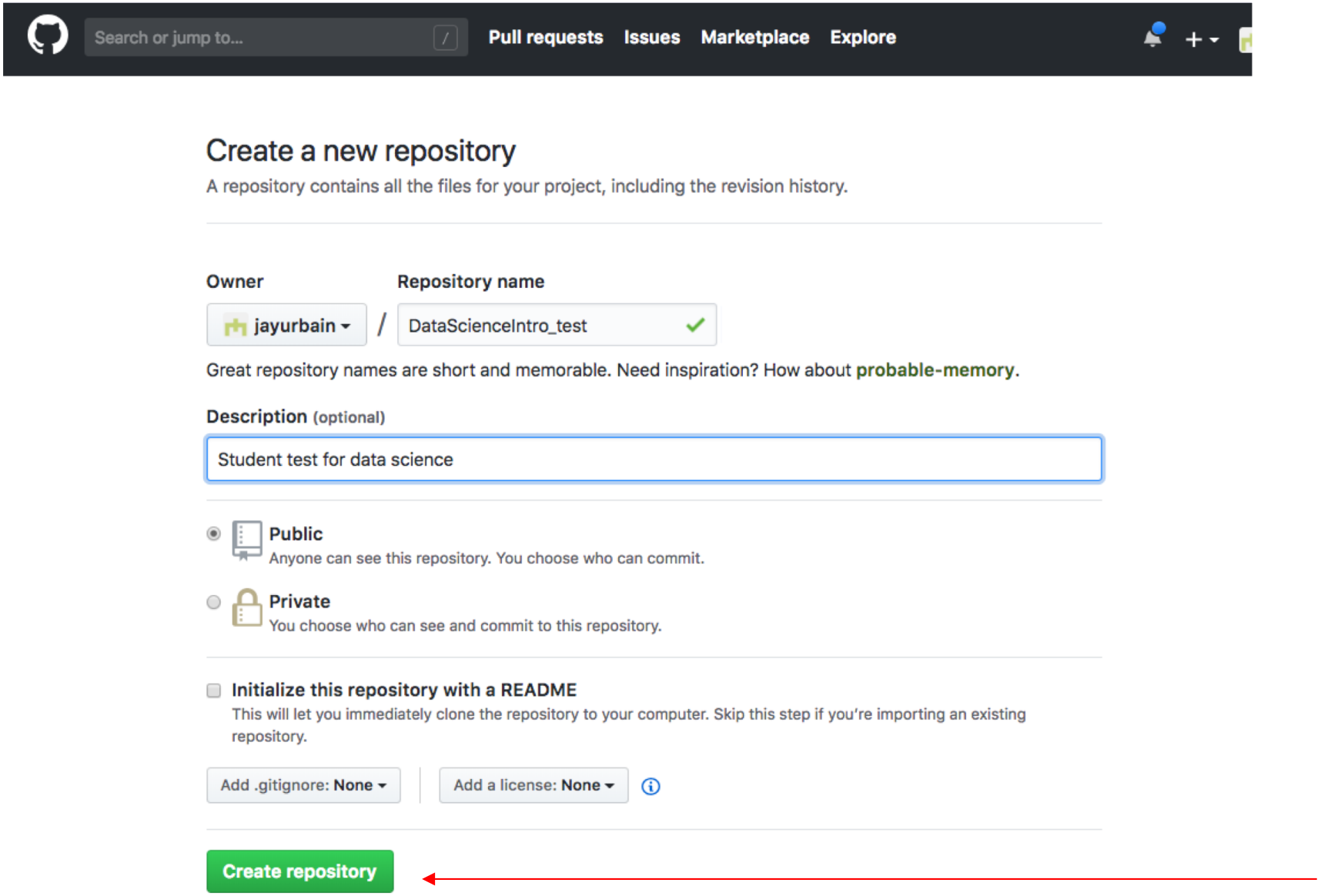
Preview of what you're about to do

- Copy your new GitHub repo to your computer
- Make some file changes locally
- Save those changes locally ("commit" them)
- Update your GitHub repo with those changes

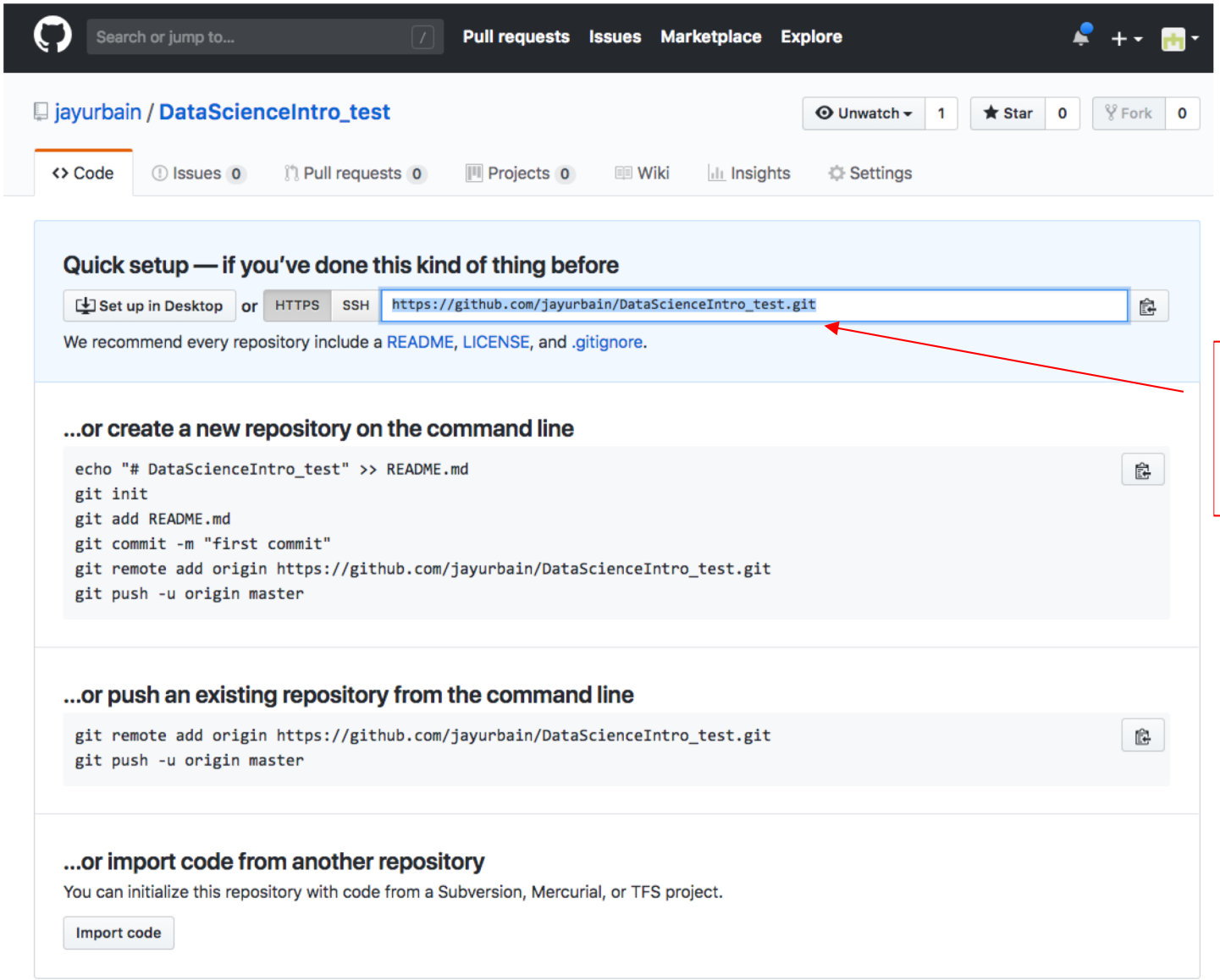
Create repo on github



Create repo on github



Create repo on github



Copy Repository url

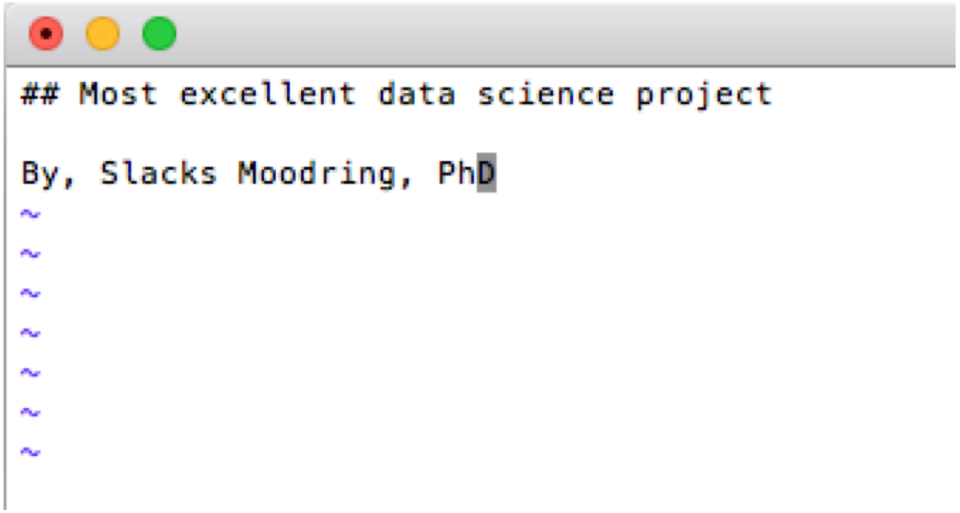
Cloning a GitHub repo

- 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 you created to be stored: cd
- Then, clone the repo: git clone <URL>
  - Get HTTPS or SSH 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)

```
jays-mbp-2:DataScienceIntro jayurbain$ git clone https://github.com/jayurbain/DataScienceIntro_test.git
Cloning into 'DataScienceIntro_test'...
warning: You appear to have cloned an empty repository.
jays-mbp-2:DataScienceIntro jayurbain$
```

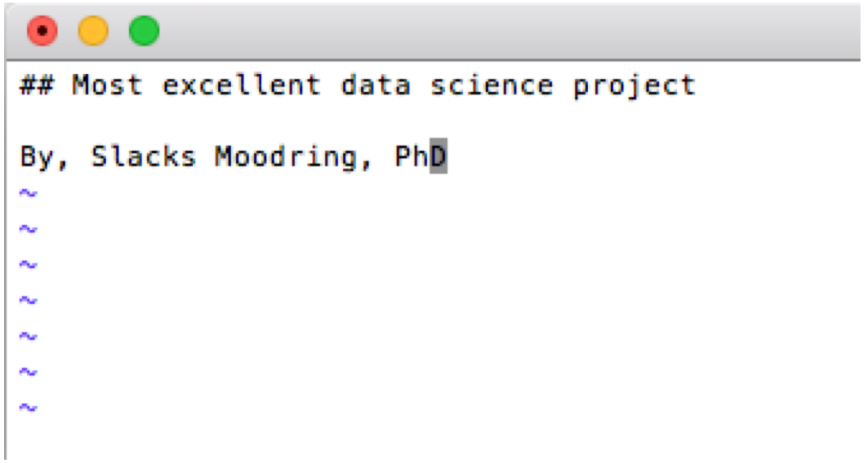
Making changes

- Change directories into your cloned repository.
- Create and add something to README.md



Making changes, checking your status

- Making changes:
  - Modify README.md in any text editor
  - Create a new file: touch <filename>



Making changes, checking your status

- Check your status:
  - git status
- File statuses (possibly color-coded):
  - Untracked (red)
  - Tracked and modified (red)
  - Staged for committing (green)
  - Committed

```
jays-mbp-2:DataScienceIntro_test jayurbain$ git status
On branch master

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will be committed)

        README.md

nothing added to commit but untracked files present (use "git add" to track)
```

Committing changes

- Stage changes for committing:
  - Add a single file: git add <filename>
  - Add all “red” files: git add . # stages all but not deleted
  - Add all “red” files: git add –A # stages all

- 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

Committing changes

- Stage changes for committing:
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  - Add all “red” files: git add –A # stages all

- Check your status:
  - Red files have turned green

```
jays-mbp-2:DataScienceIntro_test jayurbain$ git add README.md
jays-mbp-2:DataScienceIntro_test jayurbain$ git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)

        new file:   README.md
```

Committing changes

- Commit changes:
  - git commit -m “message about commit”
- Check your status again!
- Check the log: git log

```
jays-mbp-2:DataScienceIntro_test jayurbain$ git commit README.md -m "initial commit"
[master (root-commit) 96e0cf4] initial commit
 1 file changed, 3 insertions(+)
 create mode 100644 README.md
jays-mbp-2:DataScienceIntro_test jayurbain$ git status
On branch master
Your branch is based on 'origin/master', but the upstream is gone.
  (use "git branch --unset-upstream" to fixup)

nothing to commit, working tree clean
jays-mbp-2:DataScienceIntro_test jayurbain$ git log
commit 96e0cf4d2db42ae2fbf3eea259e785b46cbb6cc8 (HEAD -> master)
Author: jayurbain <jay.urbain@gmail.com>
Date:   Thu Aug 2 09:23:32 2018 -0500

    initial commit
```

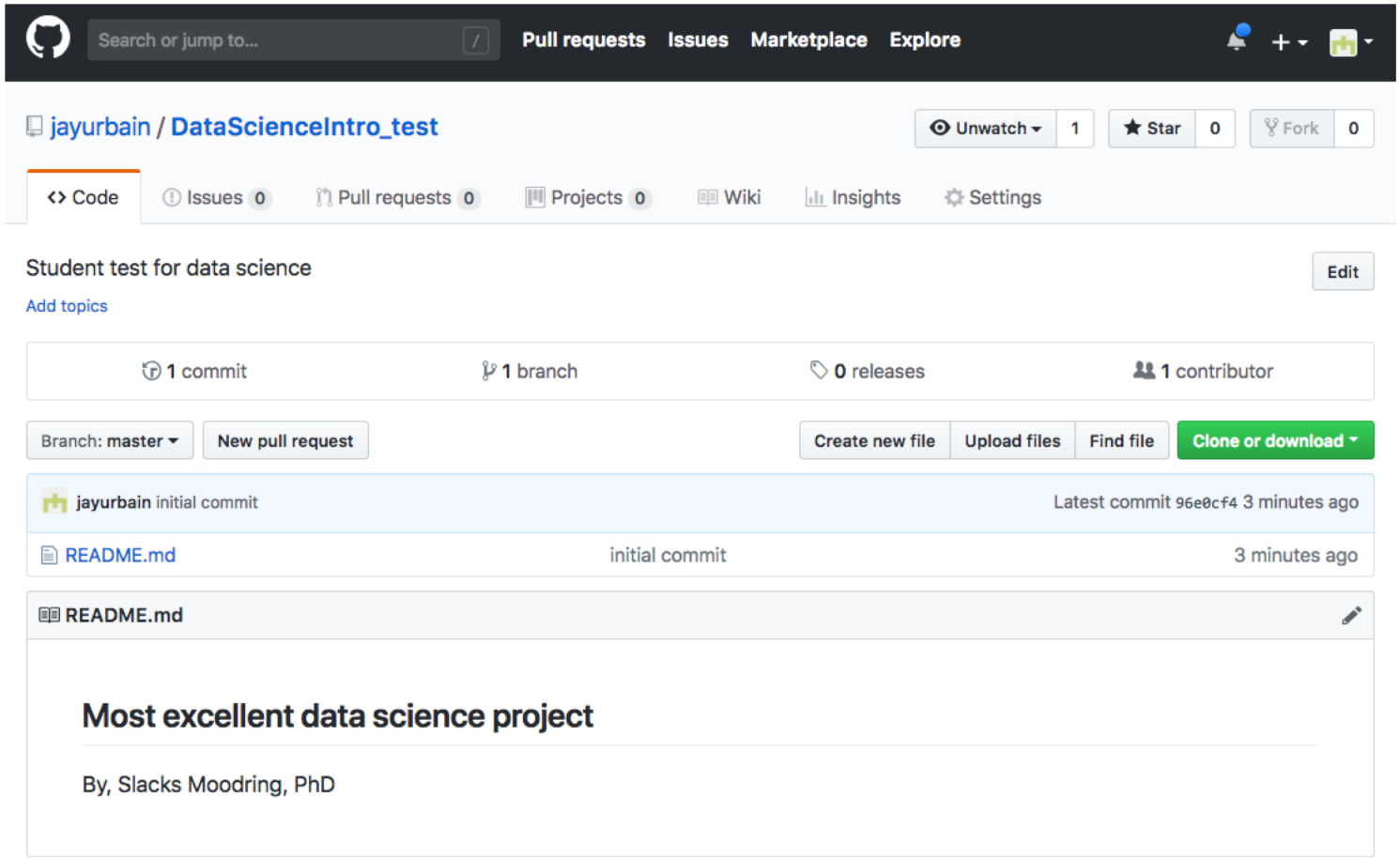
Pushing to GitHub

- 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!

```
jays-mbp-2:DataScienceIntro_test jayurbain$ git push origin master
Counting objects: 3, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 275 bytes | 275.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/jayurbain/DataScienceIntro_test.git
 * [new branch]      master -> master
jays-mbp-2:DataScienceIntro_test jayurbain$
```

Pushing to GitHub

- Refresh repository on github



Quick recap of what you've done

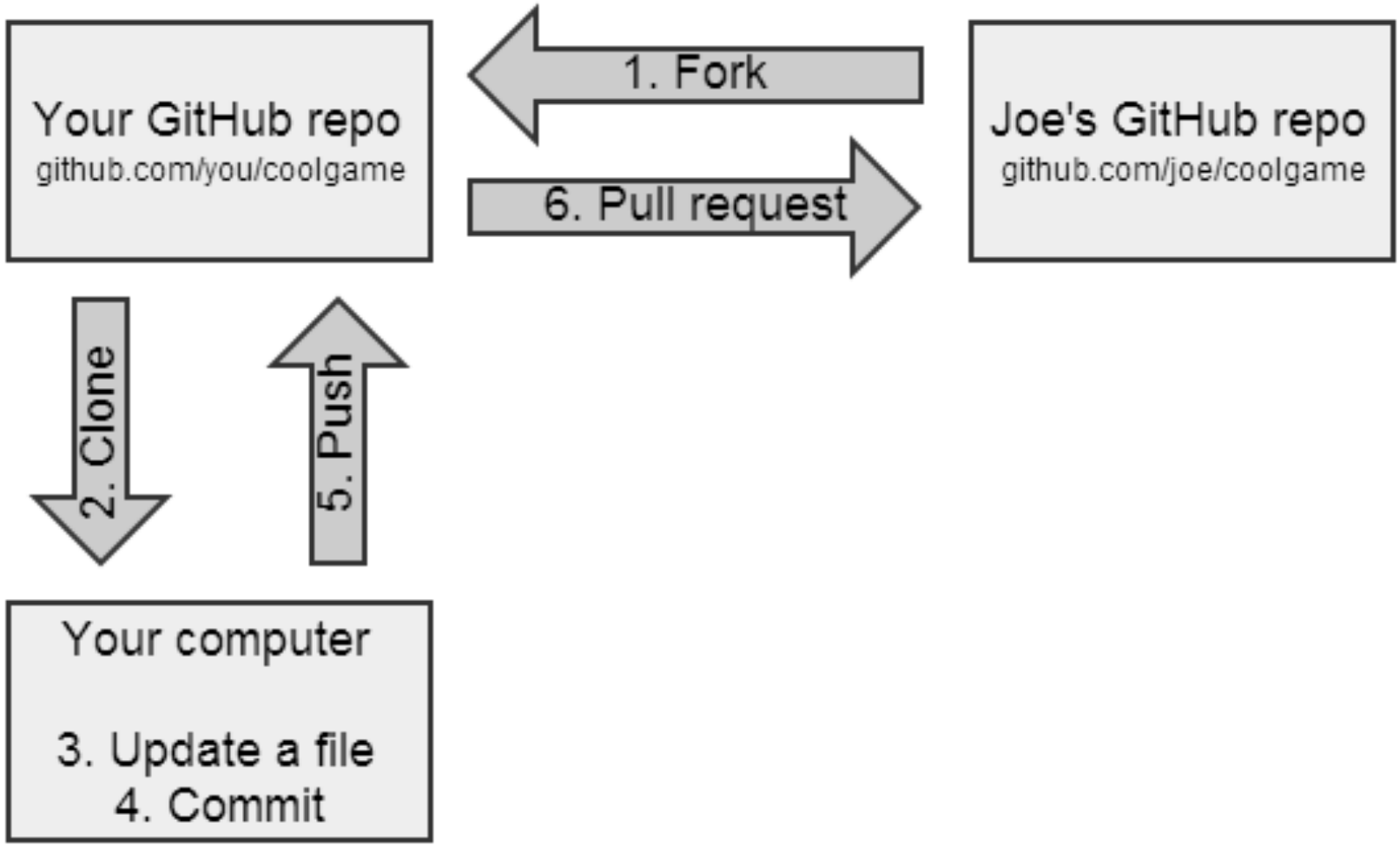
- Created a repo on GitHub
- Cloned repo to your local computer (git clone)
  - Automatically sets up your "origin" remote
- Made file changes
- Staged changes for committing (git add)
- Committed changes (git commit)
- Pushed changes to GitHub (git push)
- Inspected along the way (git remote, git status,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

Note: Checking your remotes

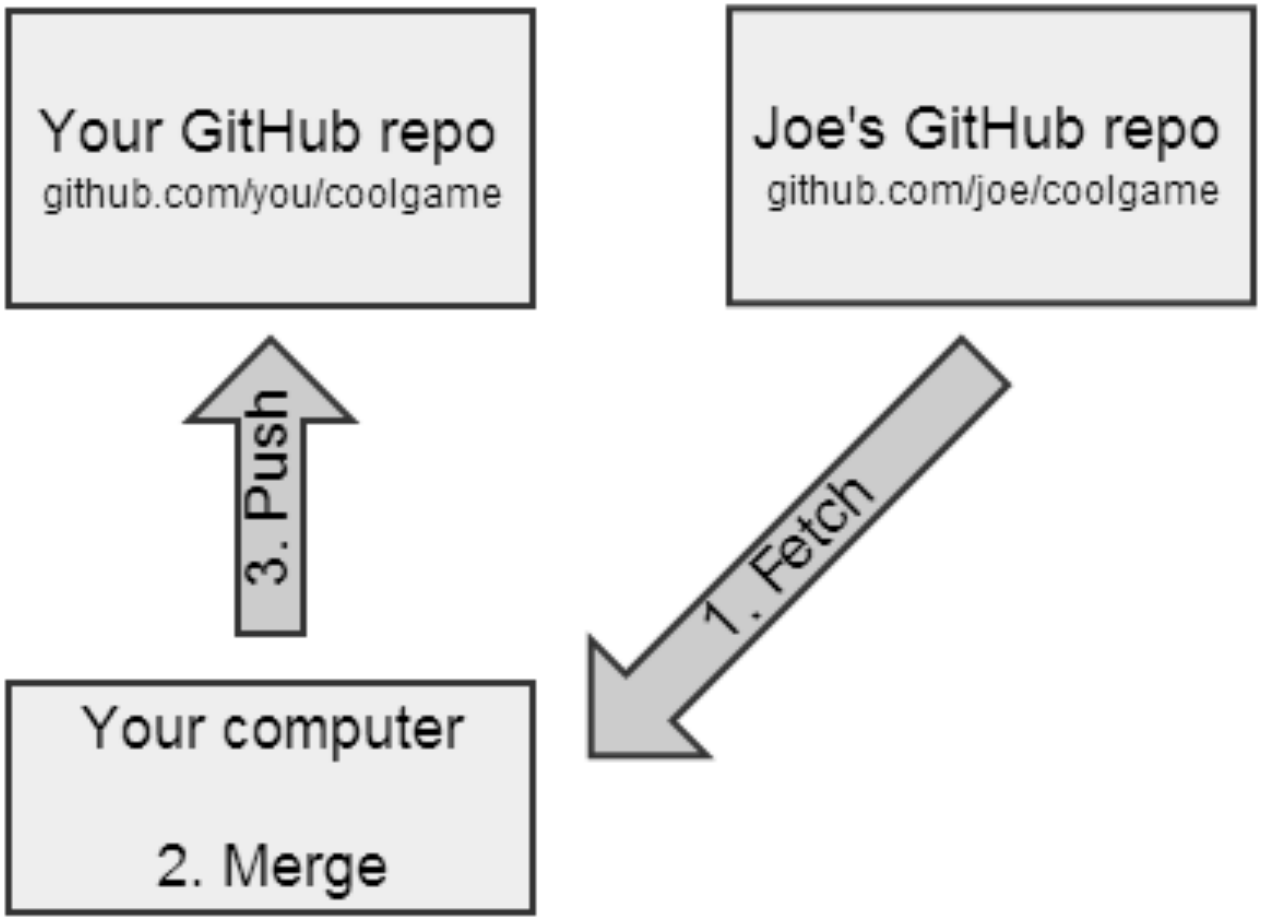
- A “remote alias” is a reference to a repo not on your local computer
  - Like a connection to your Dropbox account
- View remotes: git remote -v
- “origin” remote was set up by “git clone”
- Note: Remotes are repo-specific

```
jays-mbp-2:DataScienceIntro_test jayurbain$ git remote -v
origin  https://github.com/jayurbain/DataScienceIntro_test.git (fetch)
origin  https://github.com/jayurbain/DataScienceIntro_test.git (push)
jays-mbp-2:DataScienceIntro_test jayurbain$
```

GitHub flow for contributing



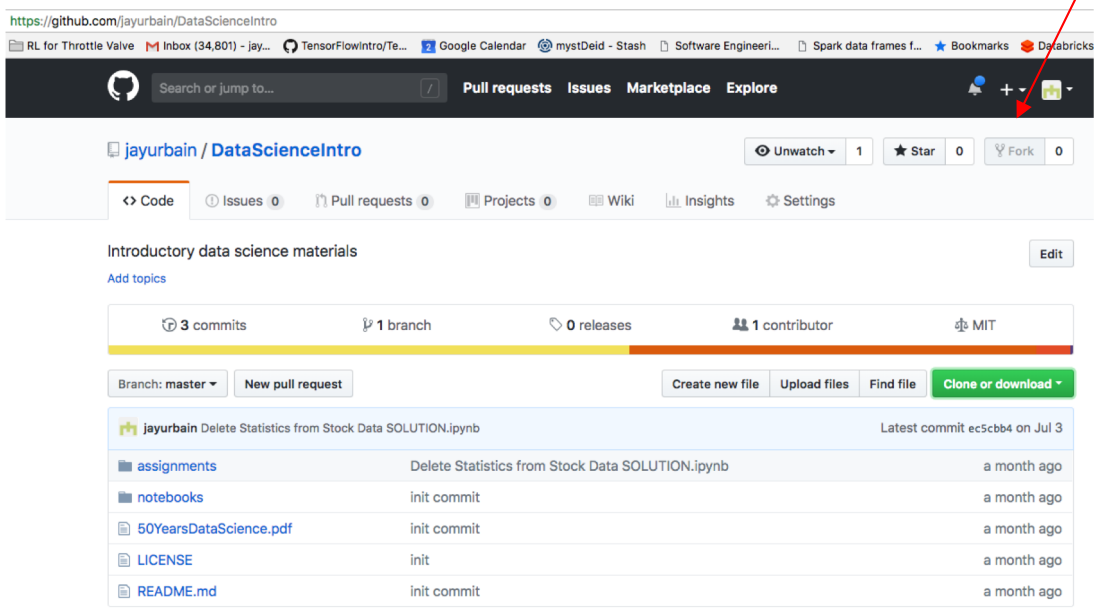
GitHub flow for syncing a fork



Forking a repo on GitHub

- What is forking?
  - Copy a repo to your account (including history)
  - Does not stay in sync with the “upstream”
- Why fork?
  - You want to make modifications
  - You want to contribute to the upstream

Fork repository



Forking a repo on GitHub

- Clone **your** fork: git clone <your URL>

$ git clone https://github.com/slacksmoodring/datascienceintro_test

  - Note: Don't clone inside your other local repo

Recipe for submitting homework

First:
git clone https://github.com/jayurbain/datascienceintro

For each homework:

1. cd datascienceintro
2. git pull # for each home work, make sure your local repository is up to date
3. Work on your homework files
4. git add . or git add <filename> # only if you need to add new files
5. git status
6. git commit -m “message”
7. Submit files, typically *.ipynb + *.html, feedback, and other items to Blackboard!

Note: If you would like to suggests about the course repository:

- Make comments in the issues section of: https://github.com/jayurbain/datascienceintro

Two ways to initialize Git

- Initialize on GitHub:
  - Create a repo on GitHub (with README)
  - Clone to your local machine
- Initialize locally:
  - Initialize Git in existing local directory: git init
  - Create a repo on GitHub (without README)
  - Add remote: git remote add origin <URL>

Deleting or moving a repo

- Deleting a GitHub repo:
  - Settings, then Delete
- Deleting a local repo:
  - Just delete the folder!
- Moving a local repo:
  - Just move the folder!

Excluding files from a repo

- Create a ".gitignore" file in your repo: touch .gitignore
- Specify exclusions, one per line:
  - Single files: pip-log.txt
  - All files with a matching extension: *.pyc
  - Directories: env/
- Templates: github.com/github/gitignore

Gists: lightweight repos

- You have access to Gist: gist.github.com
- Add one or more files
- Supports cloning, forking, commenting, committing
- Can be public or secret (not private)
- Useful for snippets, embedding, iPython nbviewer, etc.

Useful to learn next

- Working with branches
- Rolling back changes
- Resolving merge conflicts
- Fixing LF/CRLF issues