Example Git/GitHub Workflow

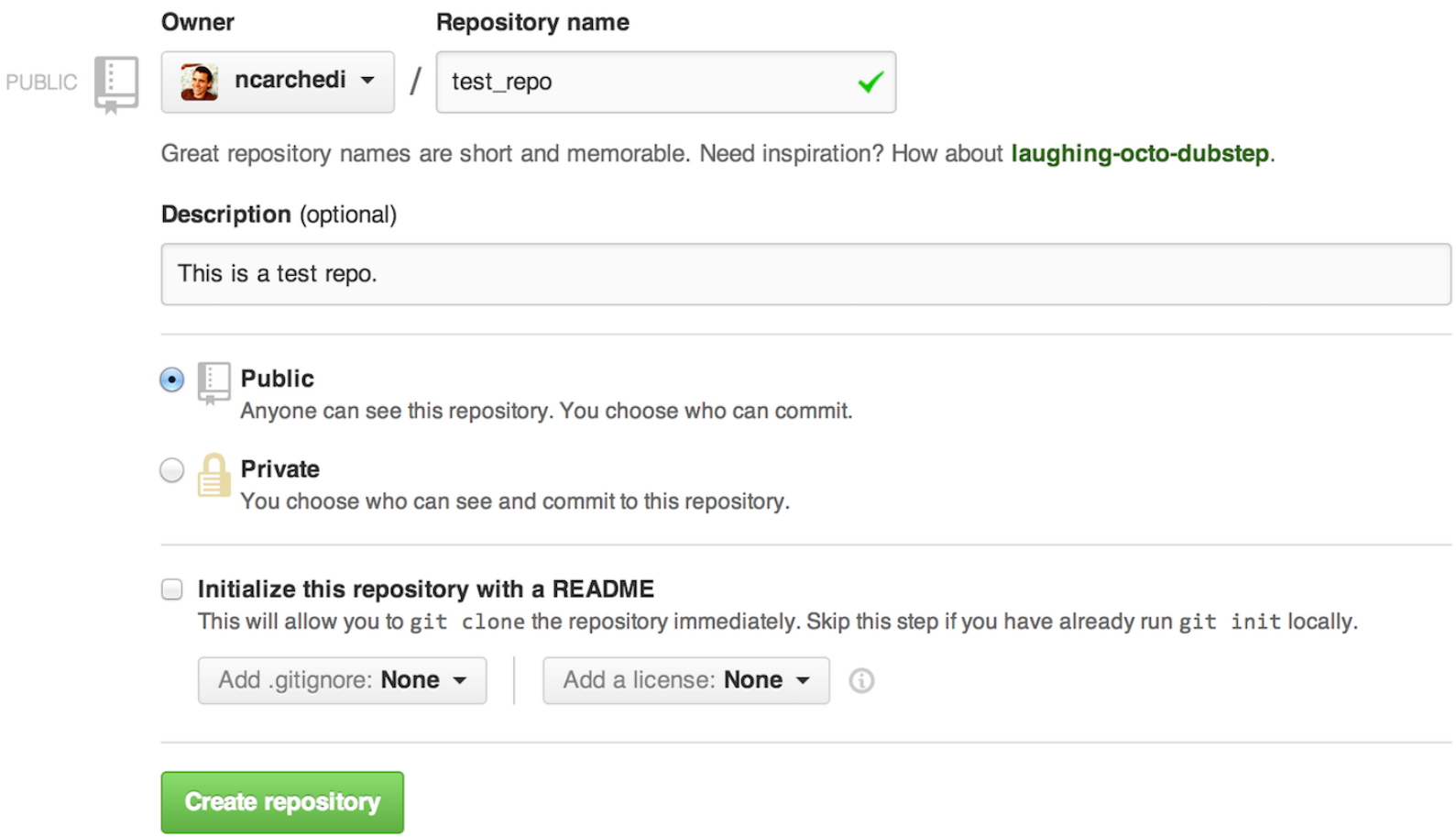
Jeffrey Leek, Assistant Professor of Biostatistics

May 17, 2016

An example workflow

- Feel free to create a test repo of your own (on your GitHub account) and follow along
- This is not meant to be an exhaustive introduction to all Git and GitHub features
- Best way to learn Git and GitHub are by using them
- If you get stuck, use the resources at the end of the last lecture

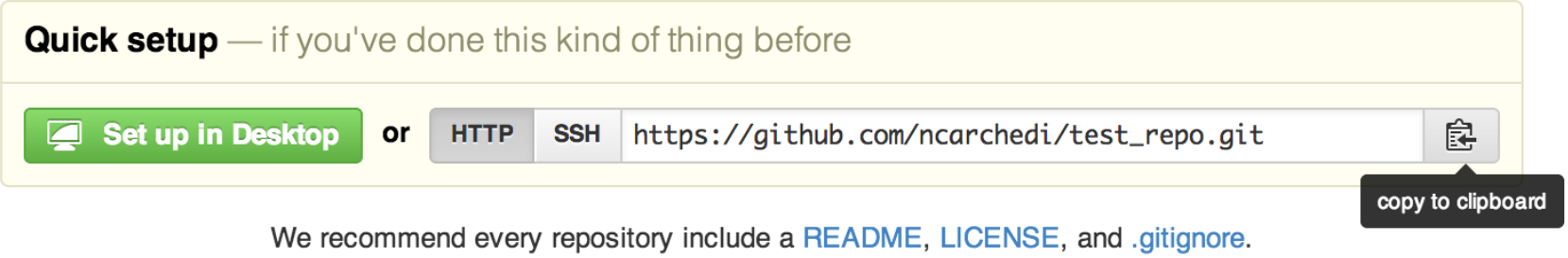
Create a new repo on GitHub



- Leave the box next to "Initialize this repository with a README" **unchecked**, since we will add one later

Copy repo URL to clipboard

- After clicking "create repository", you will get a screen with some basic instructions for getting started
- They are a good starting point, but we won't follow them exactly here
- Copy the URL displayed below to your clipboard (yours will be slightly different since it depends on your username and repo name)



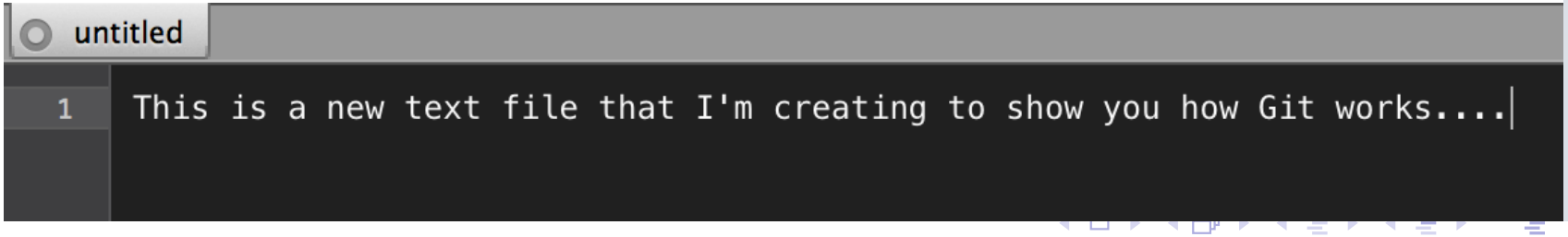
Create a new local directory

- Open Git Bash or Terminal (Windows or Mac, respectively) and create a new directory on your computer
- "Step inside" of this new directory with the `cd` command
- `mkdir` stands for "make directory", `cd` stands for "change directory", and `ls` stands for "list"
- Since we get no output after typing `ls`, we can see that the directory we created is still empty

```
~ $ mkdir ~/test_repo
~ $ cd ~/test_repo/
~/test_repo $ ls
~/test_repo $
```

Create a new file in directory

- Open your favorite text editor and create a new text file
- Make sure to save it in the directory you just created



Create a new repo locally

- We already created a **GitHub** repository, but we still need to create a **Git** repository locally on your computer
- We can see that our new file is now in our chosen directory with `ls`
- `git init` initializes a Git repo in our current directory
- `git status` is a helpful command that we'll make frequent use of
- Does exactly what is sounds like – gives us a "status report" for our local repo

```
~/test_repo $ ls
test_file.txt
~/test_repo $ git init
Initialized empty Git repository in /Users/nicholasacarchedi/test_repo/.git/
~/test_repo $ git status
On branch master

Initial commit

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

Stage file for commit

- Notice that our newly created file falls under "untracked files" when we look at `git status`
- Use `git add` to tell Git that we want it to start "paying attention" to this file
- Could have used `git add test_file.txt` for the same result, but `git add .` is often easier if you are okay tracking all currently untracked files

```
~/test_repo $ git add .
~/test_repo $ git status
On branch master

Initial commit

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

Commit changes

- Using `git commit` with a `-m` after it tells Git that whatever follows in double quotes is the message that we want to attach to this round of changes
- Another call to `git status` confirms that there is nothing new to commit (since our first commit)

```
~/test_repo $ git commit -m "first commit, which includes a test text file"
[master (root-commit) d7126e2] first commit, which includes a test text file
 1 file changed, 1 insertion(+)
 create mode 100644 test_file.txt
~/test_repo $ git status
On branch master
nothing to commit, working directory clean
~/test_repo $
```

Check log

- `git log` shows us a history of all commits
- So far, there's only one

```
~/test_repo $ git log
commit d7126e2ab3ec1d6df4cac1c40d0f9cc239888017
Author: Nick Carchedi <nick.carchedi@gmail.com>
Date:   Mon Jan 20 16:58:21 2014 -0500

    first commit, which includes a test text file
~/test_repo $
```

Add link to remote repo

- We now have a remote repo on GitHub's servers and a local repo on our computer, but they still don't know about each other
- To establish a link between the two, we paste the URL copied earlier from GitHub as follows

```
~/test_repo $ git remote add origin https://github.com/ncarchedi/test_repo.git
~/test_repo $ git remote -v
origin  https://github.com/ncarchedi/test_repo.git (fetch)
origin  https://github.com/ncarchedi/test_repo.git (push)
~/test_repo $
```

- `git remote -v` shows us that our GitHub repo is now set up as a "remote" repository for our local repo, which allows the two repos to communicate

Push changes to GitHub

- We want our GitHub repo to reflect the changes we've made locally (i.e. to contain our new text file)
- `git push -u origin master` tells Git to push our changes to the "master" (or main) branch of the "origin" (or primary) remote
- You only need to include the `-u origin master` once, as Git will remember this configuration for future `pushes`
- `git push` then becomes sufficient, assuming you don't want to do anything fancy

```
~/test_repo $ git push -u origin master
Counting objects: 3, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 306 bytes | 0 bytes/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/ncarchedi/test_repo.git
 * [new branch]      master -> master
Branch master set up to track remote branch master from origin.
~/test_repo $
```

Check status

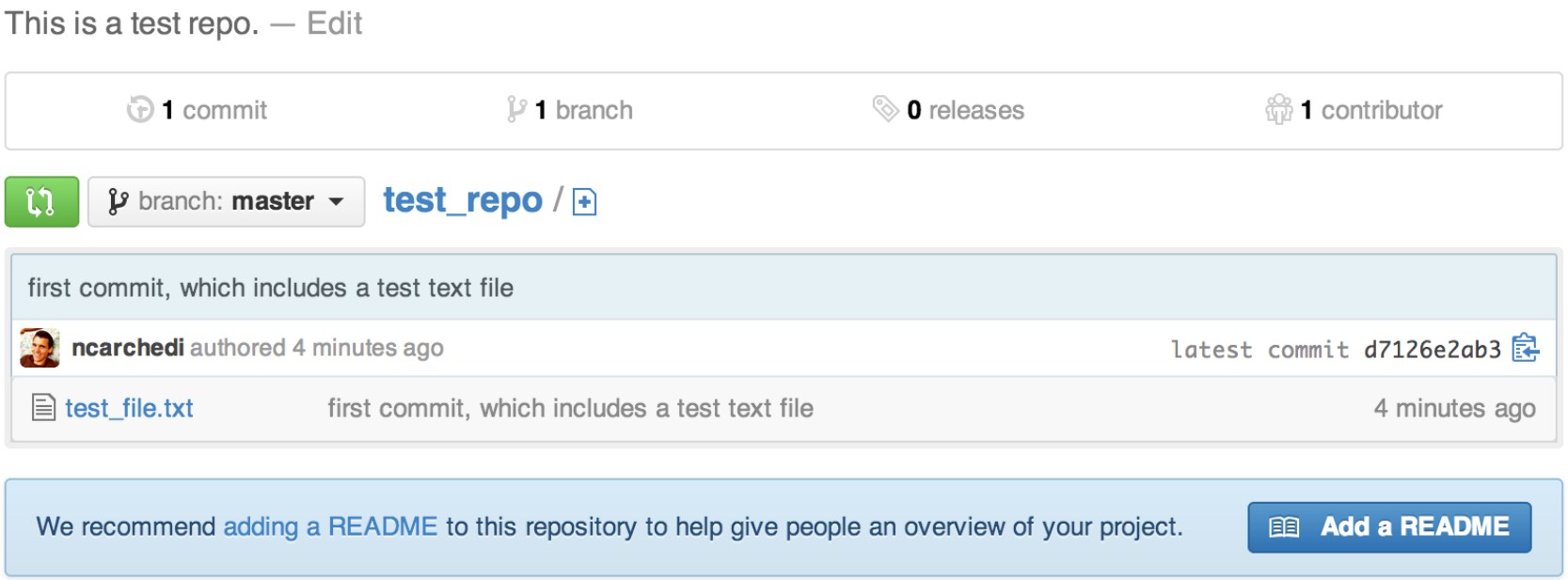
- Check status again for piece of mind
- Notice that it confirms *Your branch is up-to-date with 'origin/master'*

```
~/test_repo $ git status
On branch master
Your branch is up-to-date with 'origin/master'.

nothing to commit, working directory clean
~/test_repo $
```

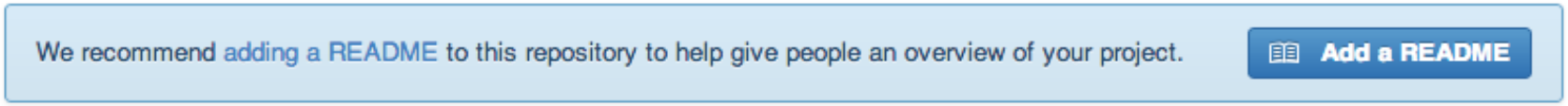
Check GitHub

- We want to make sure that our changes made it to GitHub safely and indeed they did
- Our text file shows up in the file list



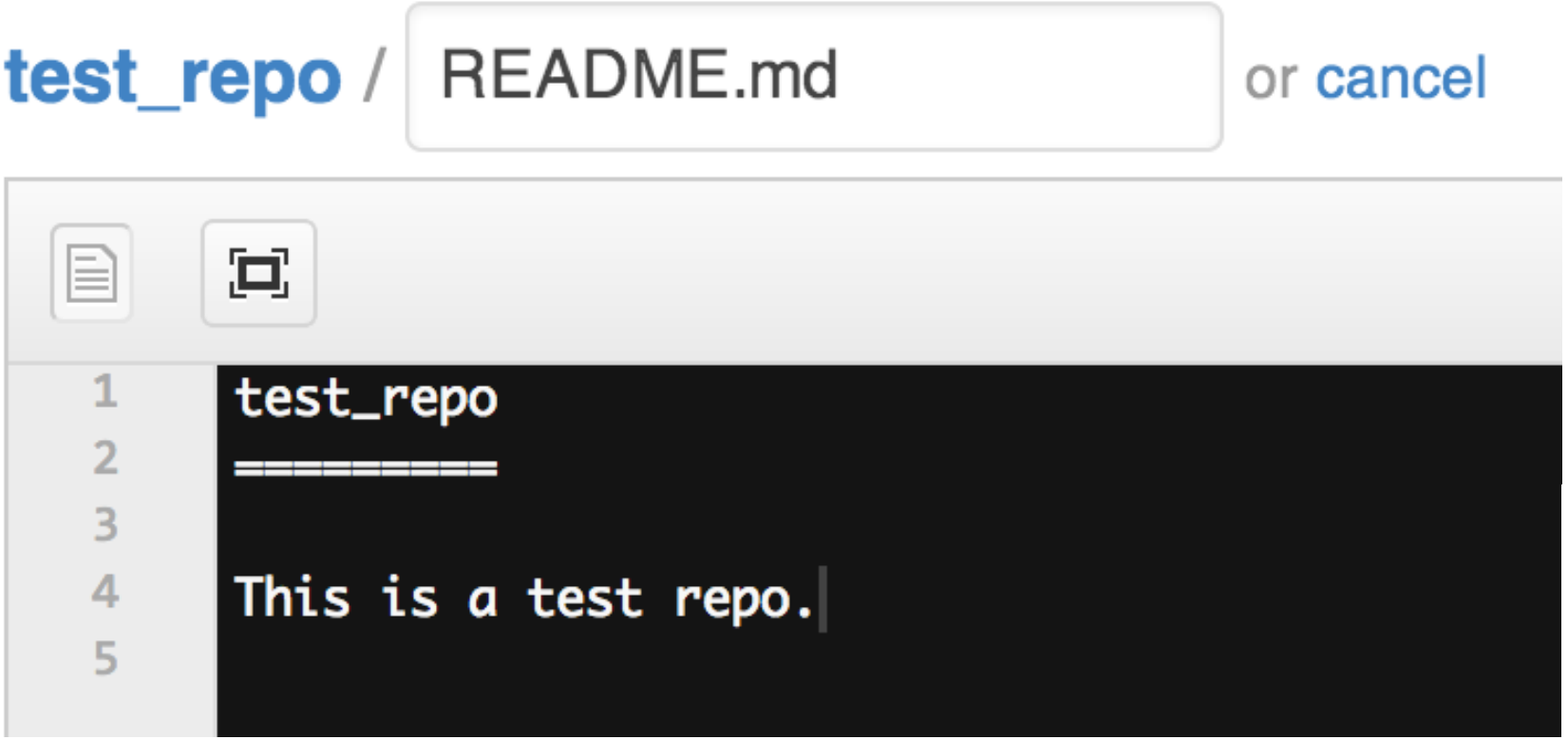
Add README file from GitHub

- How can we can "pull" changes from a remote repository to our local repository?
- To illustrate, we'll add and edit a README file directly from the GitHub website
- A more common scenario would be that a collaborator makes changes to a shared repository and you want to incorporate those changes into your local repo
- Click on the "Add a README" button on your GitHub repo page, under the list of files



Edit README file from GitHub

- Put anything you want in the README, then press "Commit New File" to commit the file to your GitHub repo
- **Note:** README files written in Markdown will render in HTML on your repository's homepage.



Fetch changes from GitHub

- Now that README.md exists on GitHub, we want to "pull" it down to our local repo
- There is a `git pull` command that allows you to do this, but it's recommended that you instead use a combination of `git fetch` and `git merge`
- `git fetch origin` tells Git to fetch all changes from the "origin" (primary) remote repo, which we set up earlier with `git remote add origin ...`

```
~/test_repo $ git fetch origin
remote: Counting objects: 4, done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 0 (delta 0)
Unpacking objects: 100% (3/3), done.
From https://github.com/ncarchedi/test_repo
   d7126e2..d0e46d4  master     -> origin/master
~/test_repo $
```

Merge changes into local repo

- Git is now aware of all changes that have been made to the remote (i.e. GitHub) repo
- Still need to incorporate these changes into our local repo
- `git branch -a` shows us that we now have two "branches" stored on our computer: `master` and `remotes/origin/master`
- `master` represents the files on our local repo and `remotes/origin/master` represents the files we pulled from our remote repo
- Use `git merge origin/master` to incorporate the changes from our remote repo

```
~/test_repo $ git branch -a
* master
  remotes/origin/master
~/test_repo $ git merge origin/master
Updating d7126e2..d0e46d4
```

Check status

- A quick call to `ls` confirms that the README.md file is now in our local directory
- `git status` tells us that we have no new changes and are up-to-date with our remote repo

```
~/test_repo $ ls
README.md        test_file.txt
~/test_repo $ git status
On branch master
Your branch is up-to-date with 'origin/master'.

nothing to commit, working directory clean
~/test_repo $
```