SheffieldR Git Workshop

SheffieldR Git Workshop

This workshop will introduce some of the basic concepts for Git and hopefully help you develop a more reproducible and flexible workflow.

Prerequisites

Before you start using git, there are a few components you need to install.

R and RStudio

You should have a version of R installed on your platform of choice. The tutorial will use the built-in Git support with RStudio.

If you don't already have a version of RStudio installed, you can get a copy from https://www.rstudio.com.

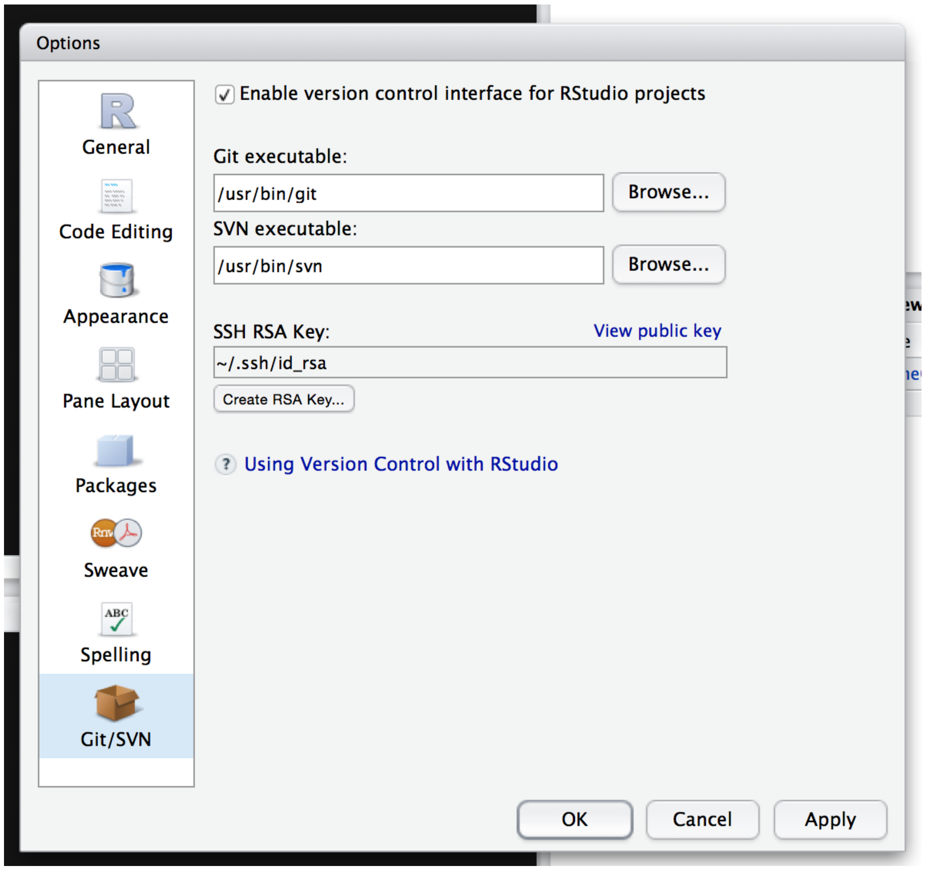
Git

Git comes as a separate package for the main platforms. You might already have Git installed. If you don't, you can get packages for:

- Windows and Mac: http://git-scm.com/downloads
- Ubuntu Linux: `sudo apt-get install git-core`

Setting up RStudio

Before creating a project, RStudio needs to be configured to use Git. Open the Settings page in RStudio and make sure *Enable version control interface for RStudio projects* is checked. Ensure the *Git executable* field is populated. If it isn't, it needs to be set to the directory containing git. For Windows, this will be in `C:\Program Files (x86)\Git\bin\git.exe` if you used the package from git-scm.com. On Linux or Macs it should be in `/usr/local/bin` or `/usr/bin`.



[✓] Enable version control interface for RStudio projects

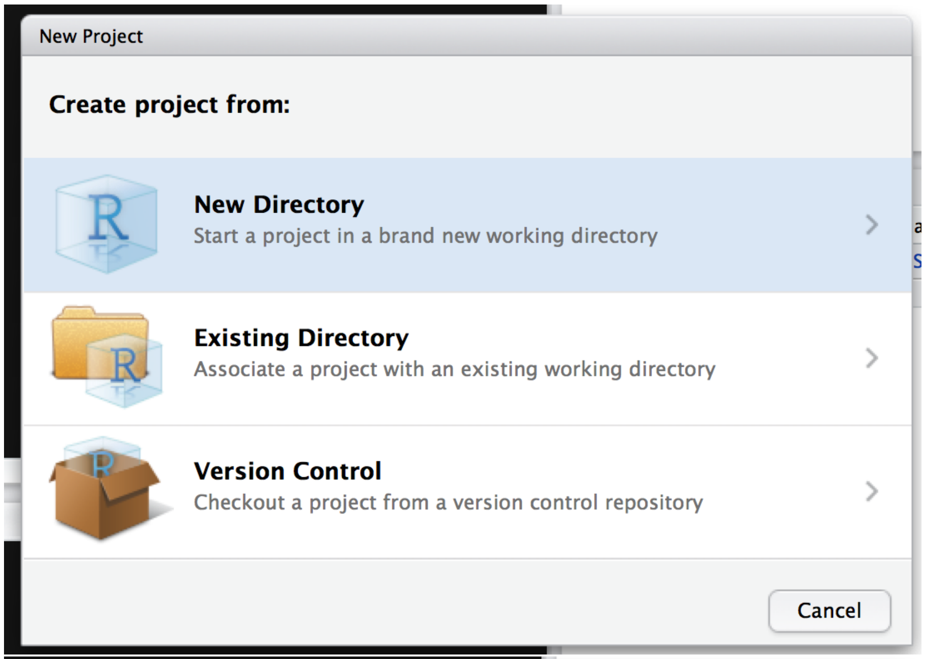
Git executable: /usr/bin/git

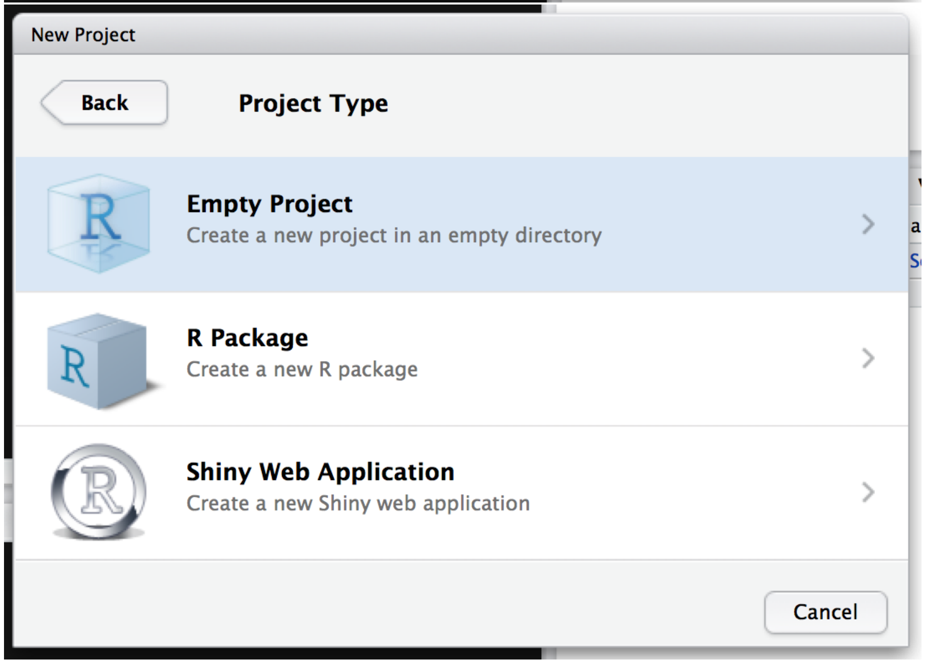
SVN executable: /usr/bin/svn

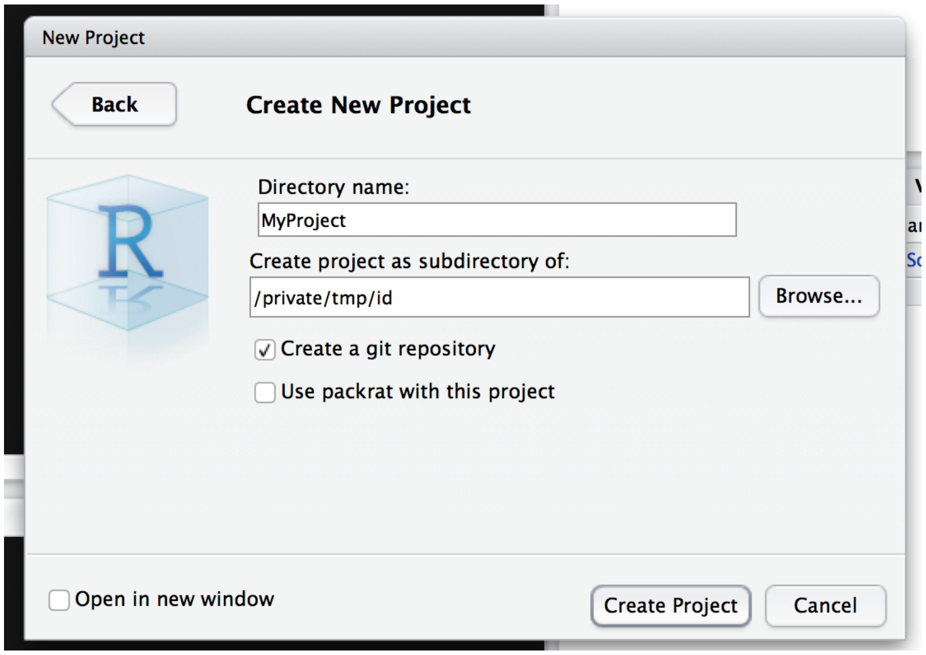
SSH RSA Key: ~/.ssh/id_rsa

Creating a Project with Git Integration

To start the tutorial, we'll go over the basics of checking in changes. To get started, we'll create an RStudio project. Create a project in RStudio in a new directory. Choose an empty project in the Project Type and make sure the *Create a git repository* option is checked.


New Project
Create project from:
New Directory
Start a project in a brand new working directory
Existing Directory
Associate a project with an existing working directory
Version Control
Checkout a project from a version control repository
Cancel


New Project
Back
Project Type
Empty Project
Create a new project in an empty directory
R Package
Create a new R package
Shiny Web Application
Create a new Shiny web application
Cancel



Directory name: MyProject

Create project as subdirectory of: /private/tmp/id

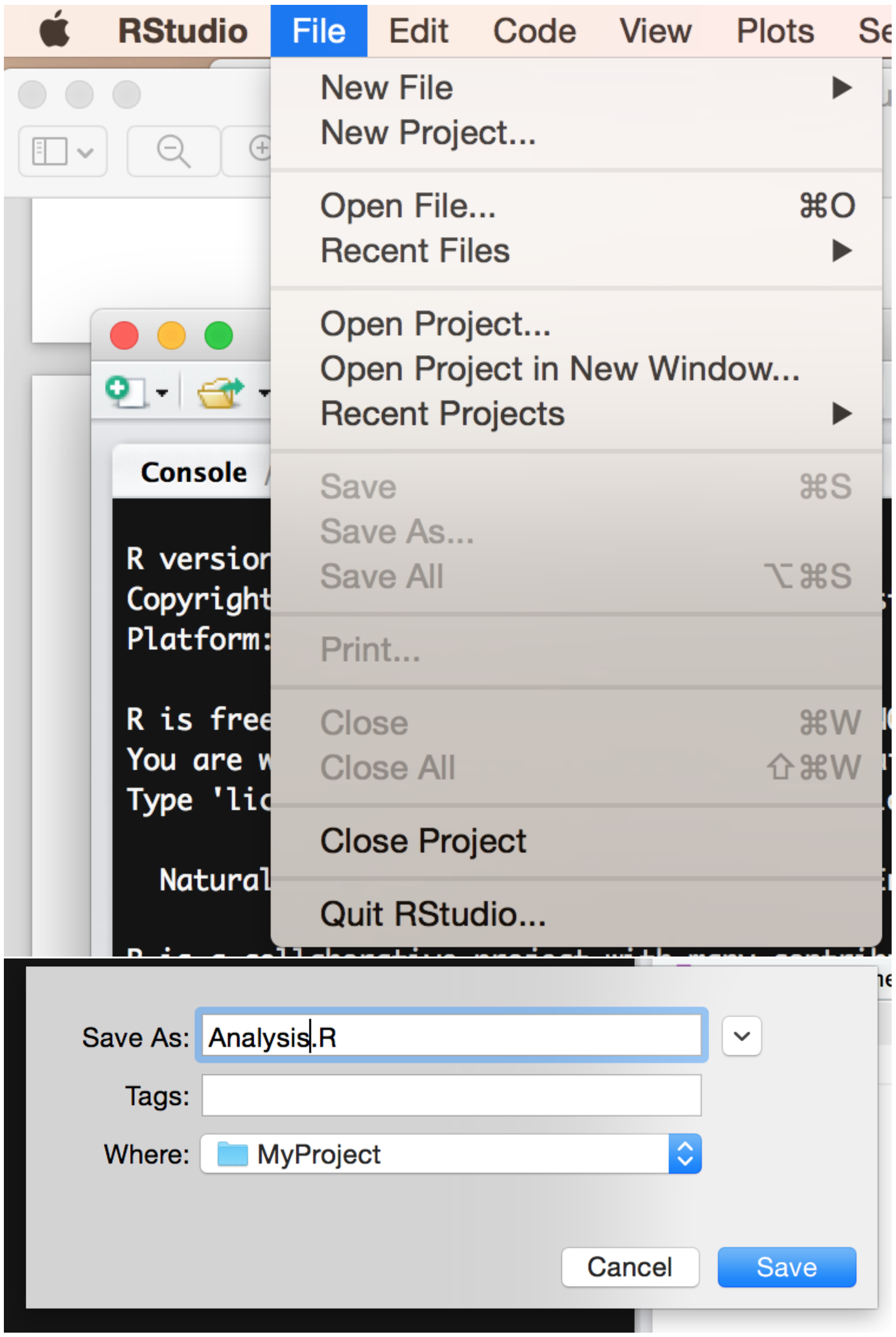
[✓] Create a git repository

[ ] Use packrat with this project

[ ] Open in new window

Adding a New File to the Project

Create a new R Script from the *New File* menu and give it a name. Add some code to the file and save it.



Save As: Analysis.R
Tags:
Where: MyProject

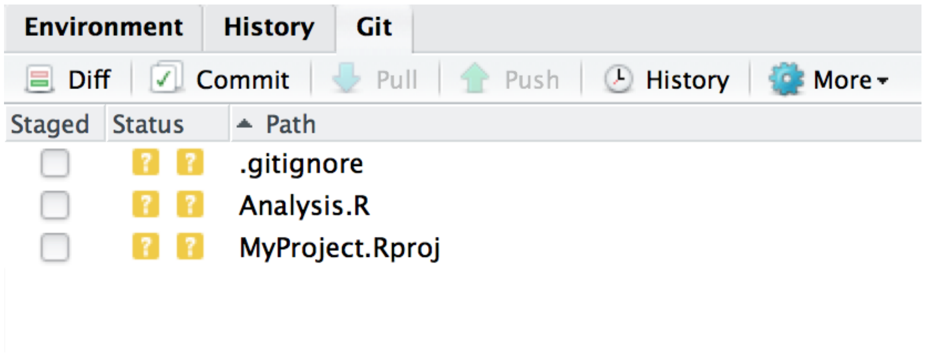
Overview of the Git Panel

RStudio's Git integration consists of two components. The Git panel gives the overview of the files in your project. Clicking the *History* button (or the Diff or Commit buttons) brings up the detailed source control view.

Empty Repositories

Git tracks the state of files by recording the changes. When you've made modifications to files, you can store those changes alongside a message. Git only tracks files that have been "added" to its own list of files it should track. When first started, Git won't track anything, so you'll have to add the files to git to track their changes.

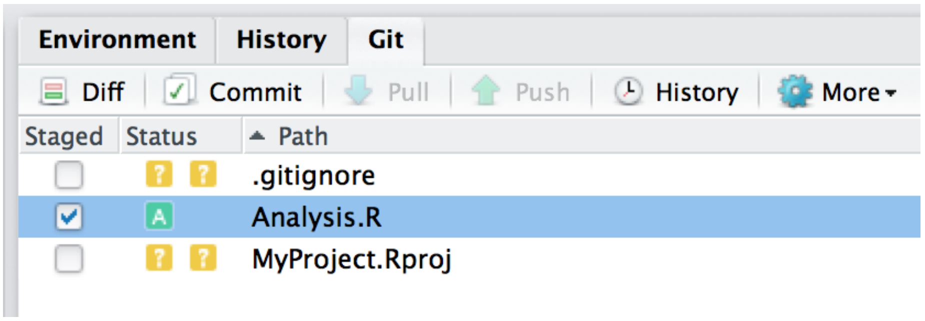
This makes it easy to keep your repository cleaner: you only need to track the relevant files so temporary files or outputs won't "pollute" your commits.



Staged	Status	Path
☐	? ?	.gitignore
☐	? ?	Analysis.R
☐	? ?	MyProject.Rproj

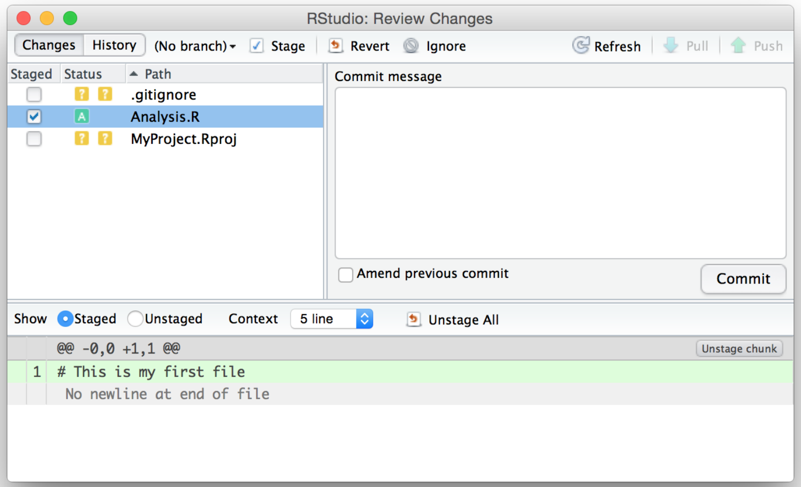
Adding Files to Git

To set Git to record changes to files, add the file you created to it by checking the box next to its name in the Git panel. This "stages" the change (adding the file). A staged change isn't saved, but will be included when you commit. The file's status will change to an "A" to indicate that the file's addition will be included in your next commit.



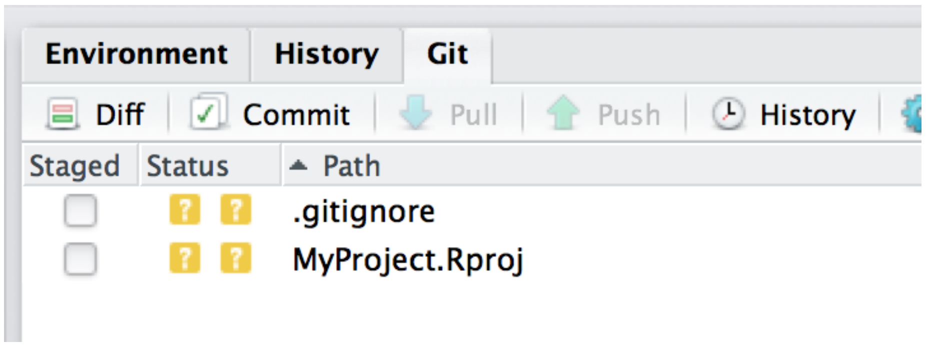
Committing the Change

Click the commit button to show the commit editor. You can check the changes you're about to commit before giving your commit a message and clicking a commit button.



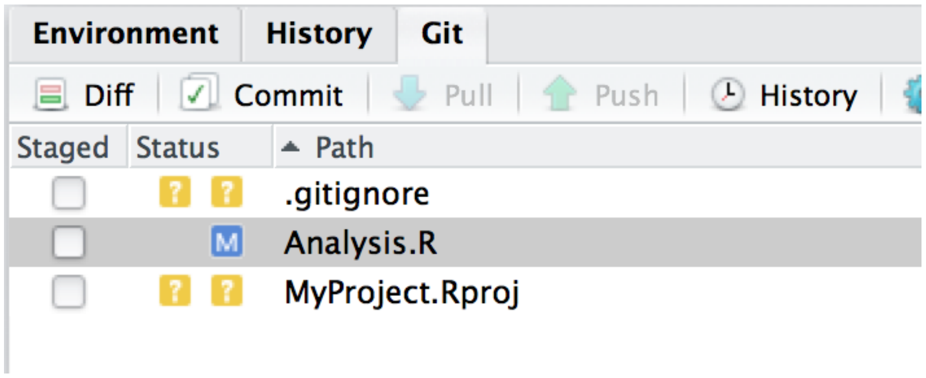
```
@@ -0,0 +1,1 @@
# This is my first file
 No newline at end of file
```

After committing your file, close the Git output window and the "Review changes" window to get back to the main RStudio interface.

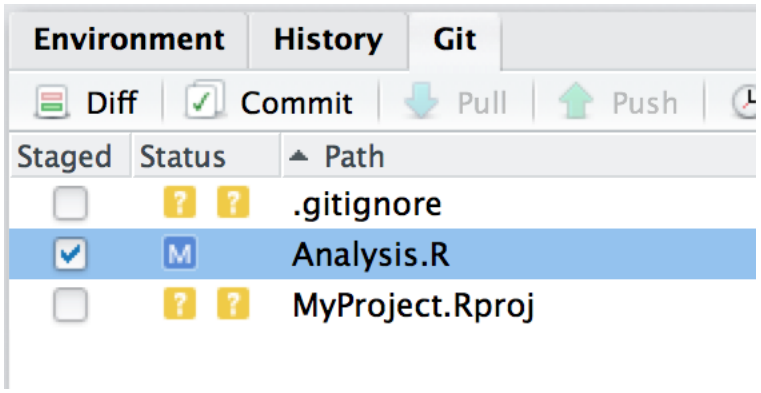


You'll see that your file isn't listed in the Git panel. This is because the file is now "clean"; it hasn't been changed since it was committed so there are no changes to stage.

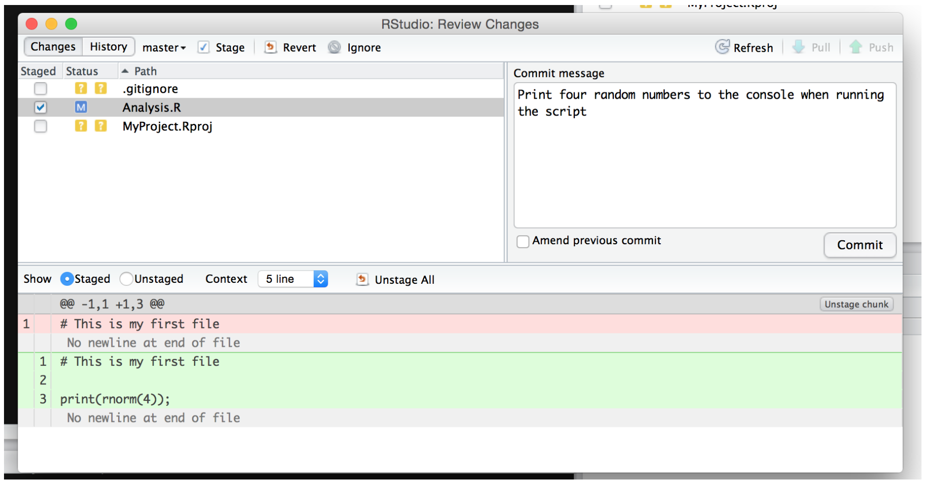
Change the file and save it, and the Git panel will show that the file has been changed again.



The file now shows up in the Git panel because it's been modified (M). You can stage these modifications by clicking the Staged checkbox.



You can then commit the changes via the commit button again.



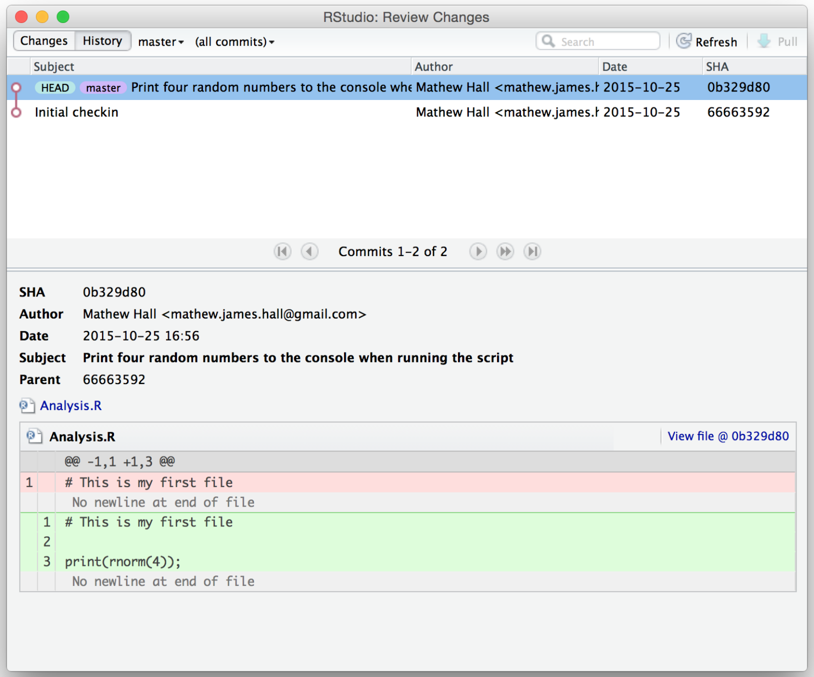
Staged	Status	Path
☐	? ?	.gitignore
☑	M	Analysis.R
☐	? ?	MyProject.Rproj

Commit message
```
Print four random numbers to the console when running
the script
```
☐ Amend previous commit

```
@@ -1,1 +1,3 @@
1     # This is my first file
       No newline at end of file
   1  # This is my first file
   2
   3  print(rnorm(4));
       No newline at end of file
```

Looking at Previous Revisions

The History button opens the Review Changes window that shows the history of commits made to the repository.



Subject	Author	Date	SHA
HEAD master Print four random numbers to the console whe	Mathew Hall <mathew.james.h	2015-10-25	0b329d80
Initial checkin	Mathew Hall <mathew.james.h	2015-10-25	66663592

Commits 1–2 of 2

SHA	0b329d80
Author	Mathew Hall <mathew.james.hall@gmail.com>
Date	2015-10-25 16:56
Subject	**Print four random numbers to the console when running the script**
Parent	66663592

Analysis.R

Analysis.R View file @ 0b329d80

```
@@ -1,1 +1,3 @@
1     # This is my first file
       No newline at end of file
   1  # This is my first file
   2
   3  print(rnorm(4));
       No newline at end of file
```

Selecting a commit will show the "diff" recorded by Git. You can also use the "View file @ (revision)" button to see how the file looked when it was committed. In RStudio, you can save this file elsewhere to retrieve old copies. *(Git provides more advanced features for dealing with (and changing) history but these aren't (currently) available from within RStudio.)*

Diffs

When you make a commit, Git stores them as a bundle of diffs against the previous file. That way, Git always has a full set of all the changes made to the file since its addition to the repository. Diffs consist of several chunks; each chunk is a part of the file that changed.

A chunk itself is made up of added and deleted lines. Sometimes, these are easy to read. Other times, they get confusing to read. For example, if you swap two large blocks of code they may be recorded as two separate chunks. You can keep your diffs readable by making your commits as self-contained as possible.

Git for Single Users

We've covered the basics of working with Git for single users: you now have enough experience to use it in your own projects without having to email/duplicate old copies to keep working revisions. Instead, just note the revision (the "SHA" from the Review Changes history tab) used to generate results and you'll always be able to go back and regenerate them.

Git repositories can exist on shared services like Dropbox. However, if you do keep a repository in such a service, make sure you only modify it from one machine at a time, and that the repository is fully synchronised before you make any changes.

Collaborating with Git

If you work with multiple collaborators (or use multiple computers), you can use Git to make sure everyone has a current copy of changes and to resolve problems when multiple people change the same files.

It's possible to copy a repository from one location to another, and all the changes will be kept. Because the history of the repository is included when the copy is taken, Git is able to work out how files should look if people make different changes to their own copies then try to merge them back into a central copy.

Cloning a Repository

To start working with an existing repository, you can clone it. This takes a complete copy of the remote repository, allowing you to go back in its history as you can with other repositories. The clone operation also remembers where the repository came from. If the remote repository changes, you can then pull changes back into your own copy.

Pushing to a Repository

If you have permission, you can push any changes made to your local repository back to the remote. The tutorial will cover the basic process of making changes and publishing them.

GitHub and BitBucket

GitHub provides a free service that allows you to host a repository and share it with the public (private access is available for a fee). BitBucket provides a similar service. These services serve your central copy, which other collaborators can clone, make changes to, then push commits to.

Cloning a GitHub Project

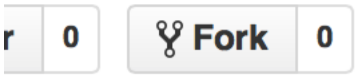
For this exercise, we've set up a GitHub repository at https://github.com/SheffieldR/git-workshop. In this exercise, you'll use GitHub to "fork" the repository, add your name to the README.md file and submit a pull request. This is the normal flow for collaboration with

Getting a GitHub Account

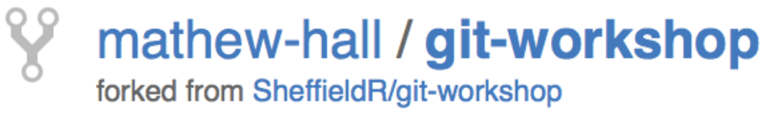
To use GitHub, you'll need an account. You can sign up for one at https://github.com/join. Once you have an account you can create repositories.

Forking the Repository

When you want to contribute to a repository, you won't normally be allowed to send changes straight to it. Instead, you have to take a copy of the repository and make changes on the copy. Then, you ask the maintainer of the original repository to adopt your changes. This process is called "forking" because you're creating a fork in the project's timeline. The maintainer will then "merge" the two timelines back into one.

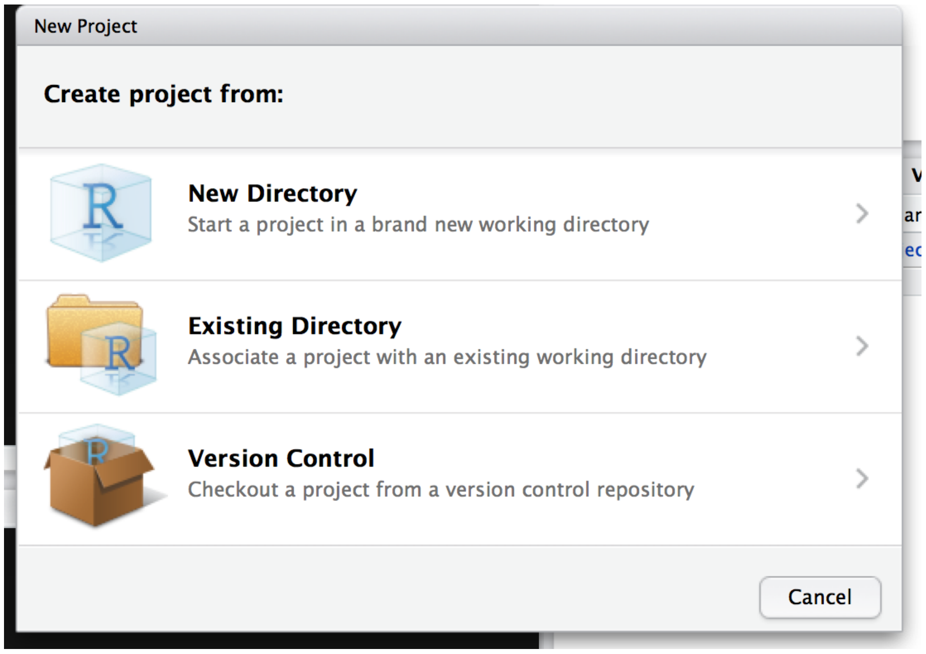


To fork our repository, visit https://github.com/SheffieldR/git-workshop and click the “Fork” button. This will create a copy of the repository in your account. The repository will be recorded as a fork, linking to the original repository.


mathew-hall / git-workshop
forked from SheffieldR/git-workshop

Cloning the Repository with RStudio

To get started, create a new project in RStudio. This time, choose the “Version Control” option, then select the Git option.



New Project

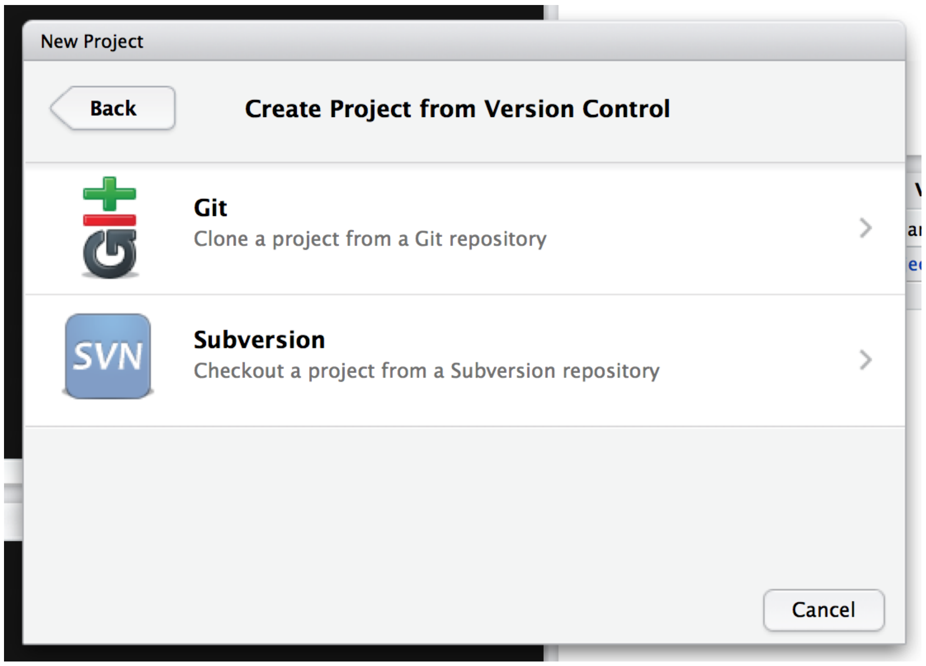
Create project from:

New Directory
Start a project in a brand new working directory

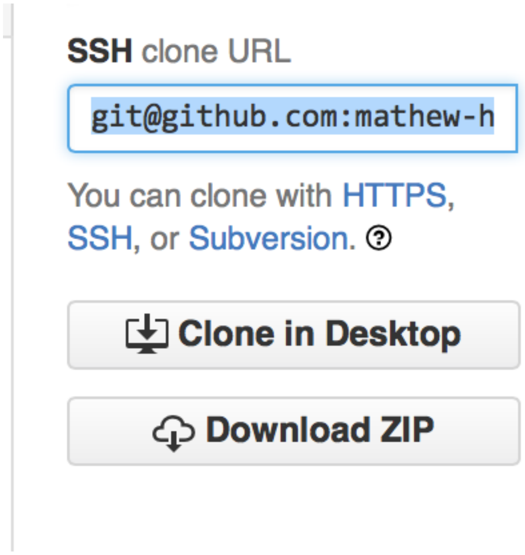
Existing Directory
Associate a project with an existing working directory

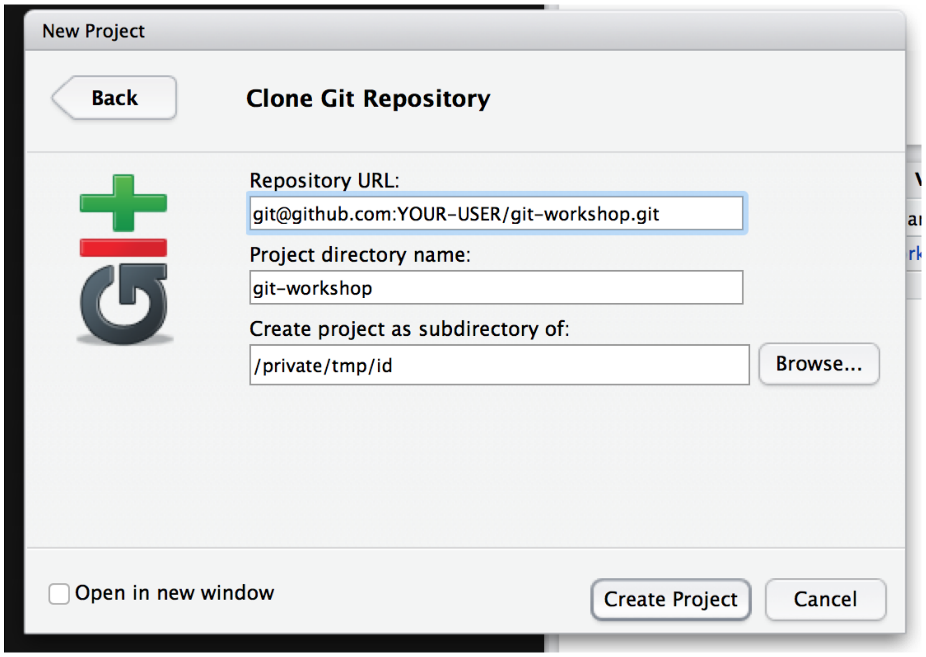
Version Control
Checkout a project from a version control repository

Cancel


New Project
Back
Create Project from Version Control
Git
Clone a project from a Git repository
Subversion
Checkout a project from a Subversion repository
Cancel

On your GitHub project fork, copy the “Clone URL” and paste it into the Git repository URL in the RStudio Git window.




New Project

Back

Clone Git Repository

Repository URL:
git@github.com:YOUR-USER/git-workshop.git

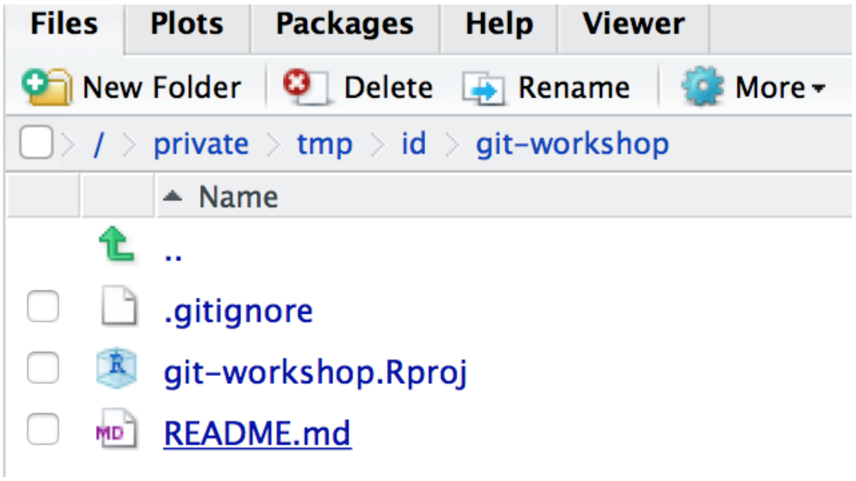
Project directory name:
git-workshop

Create project as subdirectory of:
/private/tmp/id

Click the Create Project button to check out the remote copy.

Making changes

Once RStudio has checked the project out, it will automatically generate a project file and `.gitignore` file. These files can be ignored for the exercise. Open the `README.md` file from the Files panel.



/ > private > tmp > id > git-workshop

Name
..
.gitignore
git-workshop.Rproj
README.md

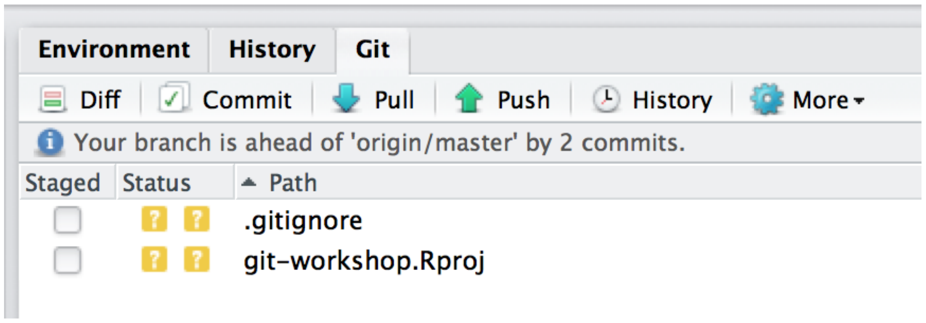
Make some changes to the README.md file and commit them using the Git panel, going through the same steps as before.

Add a New R File (Optional)

If you wish, you can also add a new file and write some R code. Don't forget to add it to Git and save the changes.

Pushing Your Changes

You're now ready to push your changes to your forked copy of the repository. First, open the History window from the Git panel.

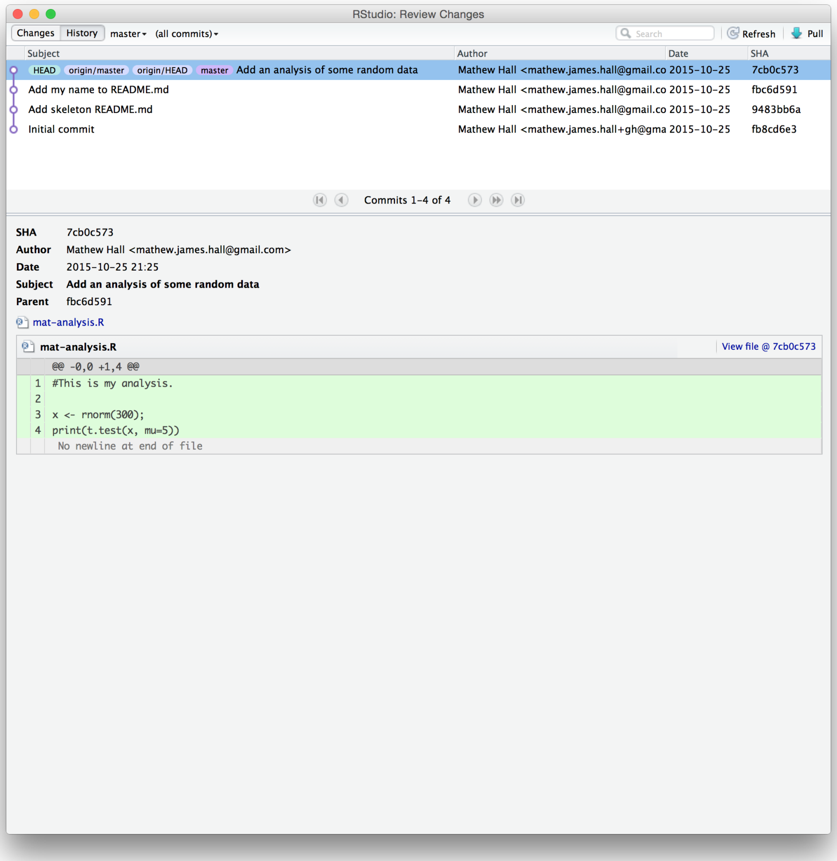


Your branch is ahead of 'origin/master' by 2 commits.

Staged	Status	Path
☐	? ?	.gitignore
☐	? ?	git-workshop.Rproj

The overview shows that your copy of the repository is ahead of the "origin" - you've made changes that aren't saved remotely yet. Close the Review Changes window and then click the Push button in the Git panel.

After some time, your changes are now available remotely on your fork. You can verify your push worked by checking the History in RStudio.



Subject	Author	Date	SHA
HEAD origin/master origin/HEAD master Add an analysis of some random data	Mathew Hall <mathew.james.hall@gmail.co	2015-10-25	7cb0c573
Add my name to README.md	Mathew Hall <mathew.james.hall@gmail.co	2015-10-25	fbc6d591
Add skeleton README.md	Mathew Hall <mathew.james.hall@gmail.co	2015-10-25	9483bb6a
Initial commit	Mathew Hall <mathew.james.hall+gh@gma	2015-10-25	fb8cd6e3

Commits 1–4 of 4

SHA 7cb0c573
Author Mathew Hall <mathew.james.hall@gmail.com>
Date 2015-10-25 21:25
Subject **Add an analysis of some random data**
Parent fbc6d591

mat-analysis.R

mat-analysis.R View file @ 7cb0c573

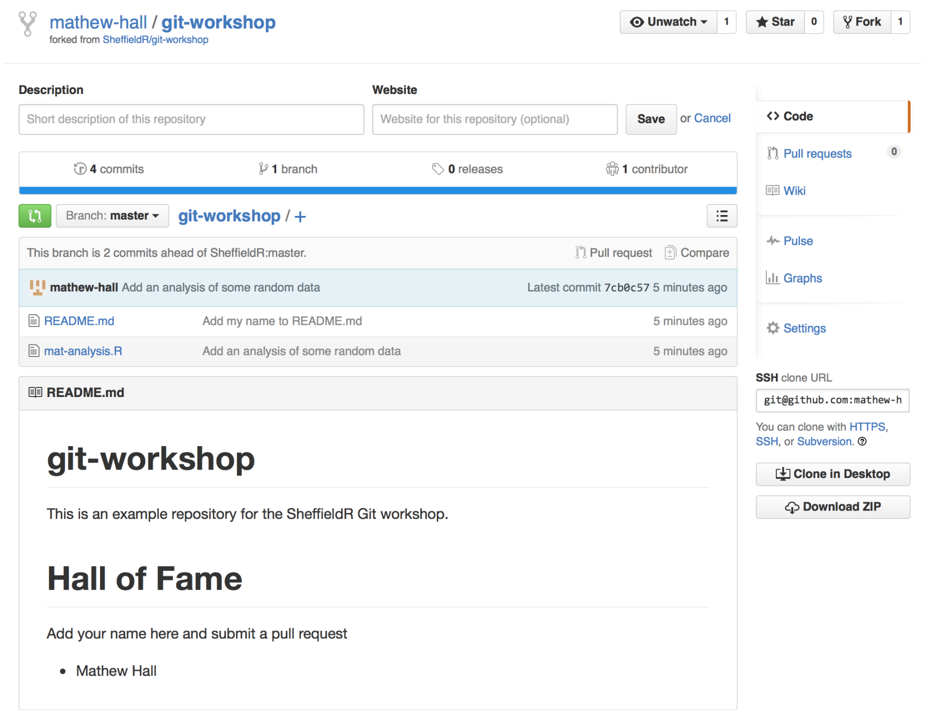
```
@@ -0,0 +1,4 @@
#This is my analysis.

x <- rnorm(300);
print(t.test(x, mu=5))
 No newline at end of file
```

The "origin" and local histories are the same; the remote branch has "caught up" to your changes.

Making a Pull Request

Go to your repository on GitHub. You should see your changes to the `README.md` file in the project overview.



mathew-hall / git-workshop
forked from SheffieldR/git-workshop

Unwatch 1 | Star 0 | Fork 1

Description: Short description of this repository
Website: Website for this repository (optional)
Save or Cancel

4 commits | 1 branch | 0 releases | 1 contributor

Branch: master | git-workshop / +

This branch is 2 commits ahead of SheffieldR:master. | Pull request | Compare

mathew-hall Add an analysis of some random data | Latest commit `7cb0c57` 5 minutes ago

README.md	Add my name to README.md	5 minutes ago
mat-analysis.R	Add an analysis of some random data	5 minutes ago

README.md

git-workshop

This is an example repository for the SheffieldR Git workshop.

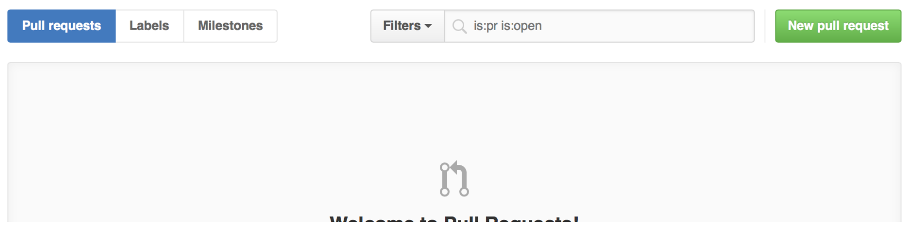
Hall of Fame

Add your name here and submit a pull request

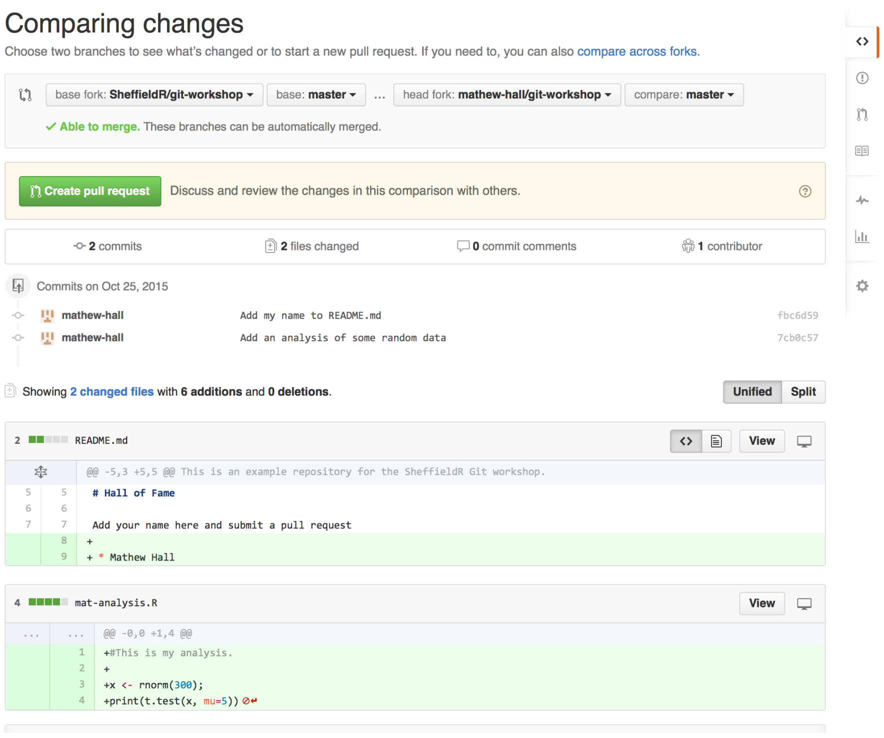
- Mathew Hall

SSH clone URL
`git@github.com:mathew-h`
You can clone with HTTPS, SSH, or Subversion.

Click the “Pull Requests” link on the right hand side of the project.



Click the “New Pull Request” button to create a pull request for your changes.



Comparing changes

Choose two branches to see what's changed or to start a new pull request. If you need to, you can also compare across forks.

base fork: **SheffieldR/git-workshop** base: **master** … head fork: **mathew-hall/git-workshop** compare: **master**

✓ **Able to merge.** These branches can be automatically merged.

Create pull request Discuss and review the changes in this comparison with others.

2 commits **2** files changed **0** commit comments **1** contributor

Commits on Oct 25, 2015

mathew-hall	Add my name to README.md	fbc6d59
mathew-hall	Add an analysis of some random data	7cb0c57

Showing **2 changed files** with **6 additions** and **0 deletions**.

Unified Split

2 README.md View

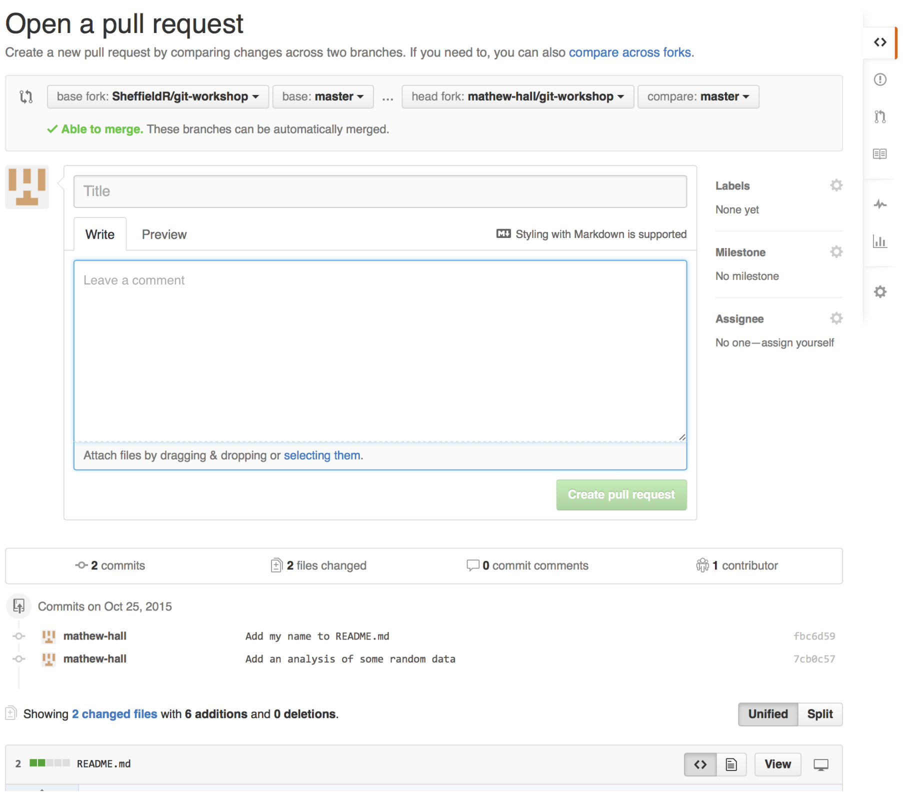
```
@@ -5,3 +5,5 @@ This is an example repository for the SheffieldR Git workshop.
 # Hall of Fame

 Add your name here and submit a pull request
+
+ * Mathew Hall
```

4 mat-analysis.R View

```
@@ -0,0 +1,4 @@
+#This is my analysis.
+
+x <- rnorm(300);
+print(t.test(x, mu=5))
```

You'll see all the differences that you're proposing the maintainer integrates with the repository. Make sure you haven't accidentally included any superfluous files. If you're happy with the changes, click the "Make Pull Request" button.



Open a pull request

Create a new pull request by comparing changes across two branches. If you need to, you can also compare across forks.

base fork: SheffieldR/git-workshop ▾ base: master ▾ … head fork: mathew-hall/git-workshop ▾ compare: master ▾

✓ Able to merge. These branches can be automatically merged.

2 commits | 2 files changed | 0 commit comments | 1 contributor

Commits on Oct 25, 2015

mathew-hall	Add my name to README.md	fbc6d59
mathew-hall	Add an analysis of some random data	7cb0c57

Showing 2 changed files with 6 additions and 0 deletions.

You can now add a title and description that motivates your suggested changes.