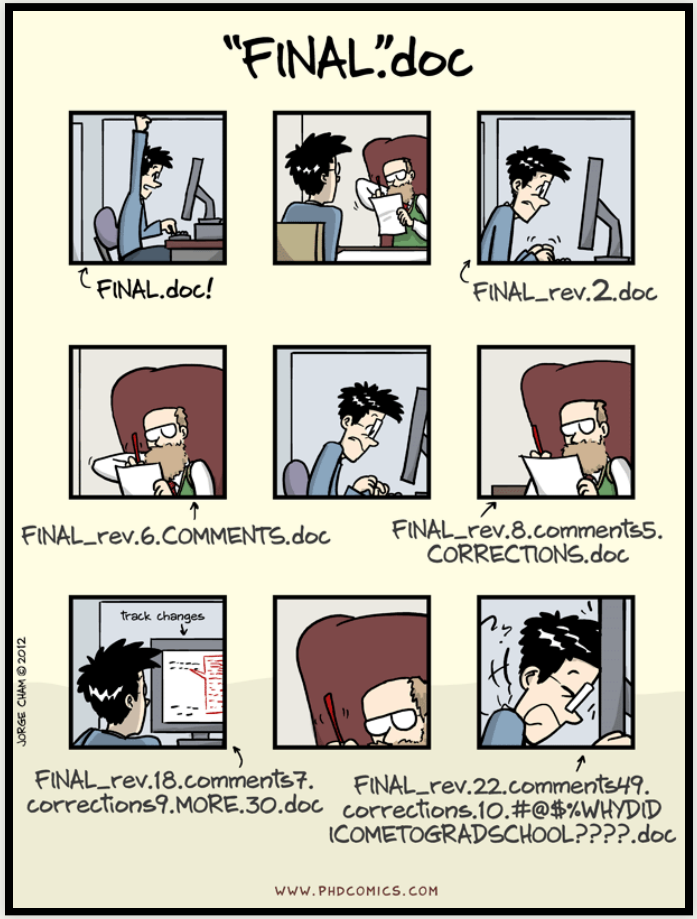
Version control with RStudio

An introduction to git and GitHub



Blake Seers

Topics covered

- Why version control?
- Git as a version control system.
- GitHub as a cloud-based management system.
- Git and GitHub basics.
- Examples to follow.

All that is required is RStudio, a browser, and an internet connection.

Version control

What is a version control system (VCS)?

- A system that tracks the changes to your files through time.
- ‘Track changes’ in Microsoft Word is a rudimentary type of version control.
- You’ve likely tried to implement your own system before (thesis_FINALLLL.docx).
- A good VCS should have a unique identifier showing:
  - What changed?
  - When?
  - Who?
  - Why?

Why should I use a version control system?

1. Safety

   - Fail more safely (can go back in time).
   - Everything is tracked so you can undo an undo.
   - Fail more quickly (continuous integration).
   - Get to a successful place much faster.

2. Community

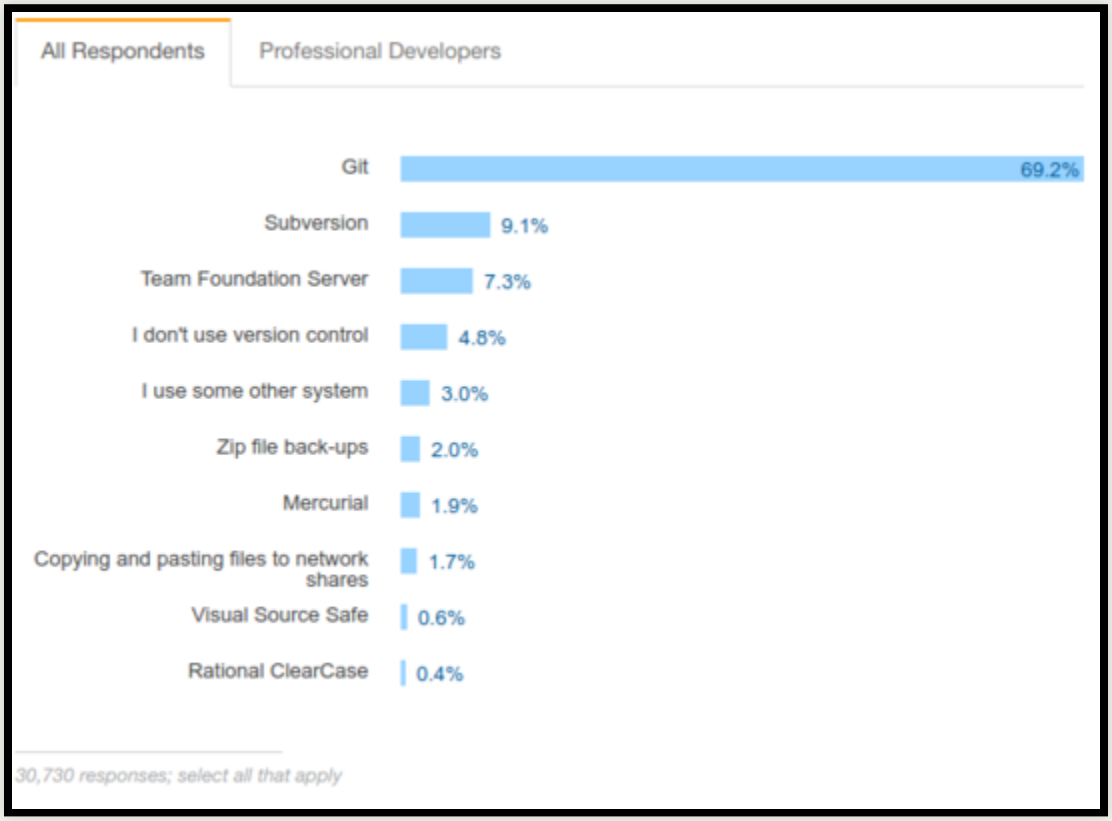
   - There is a large community out there to help you and to benefit from your project.

For more on this, see the talk by Hadley.

Git as a version control system

Why should I git?

- Free, open-source VCS.
- Can work offline.
- Every developer has their own, complete codebase.
- By far the most popular:



Version control with git:

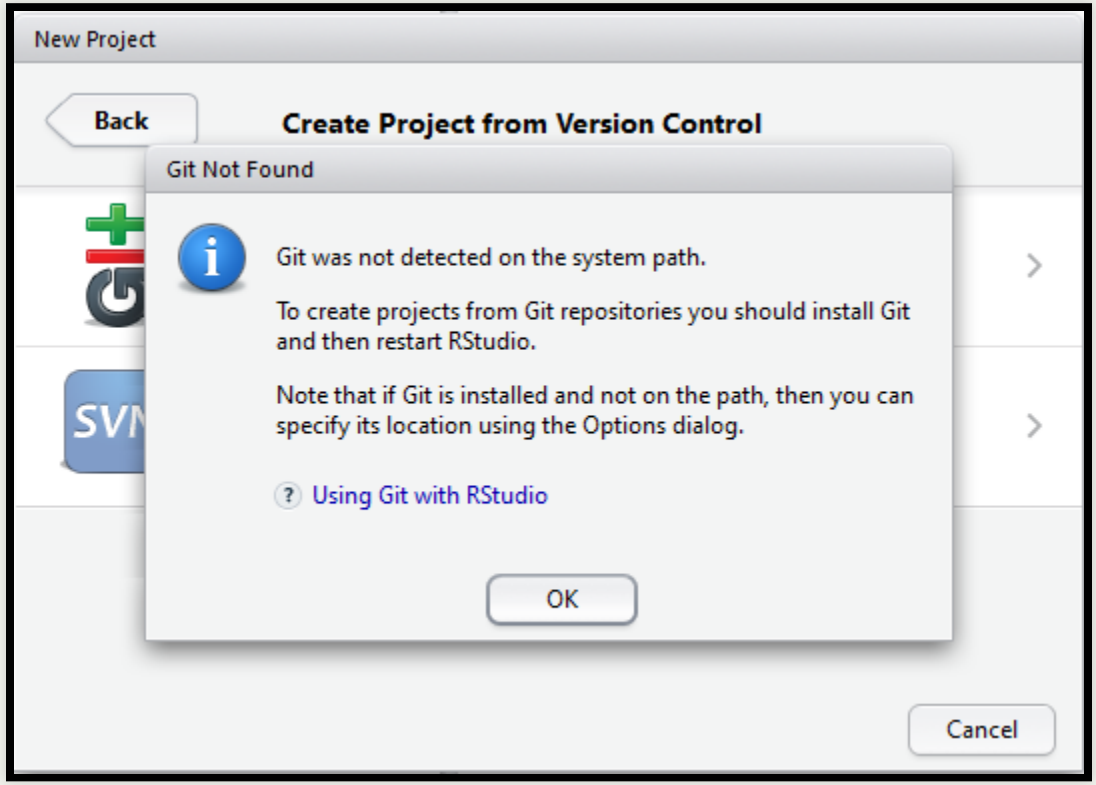
- A unique identifier (SHA for each ‘save’) gives info on:
  - What changed?
  - When?
  - Who?
  - Why?

Obtaining git

Check if you already have git installed

In RStudio:

File → New Project → Version Control → Git



Download git

On Windows:

1. go to https://git-scm.com/download/win.
2. This will automatically download latest version of git.
3. Choose to ‘Run’ exe to set up:
    - choose “Use Git from the Windows Command Prompt” when asked.

Download git

On Ubuntu:

```
# This PPA provides the latest stable upstream Git version:
add-apt-repository ppa:git-core/ppa
apt update
apt install git
```

(may be adapted depending on your Linux/Unix flavour)

Download git

On Mac OS X:

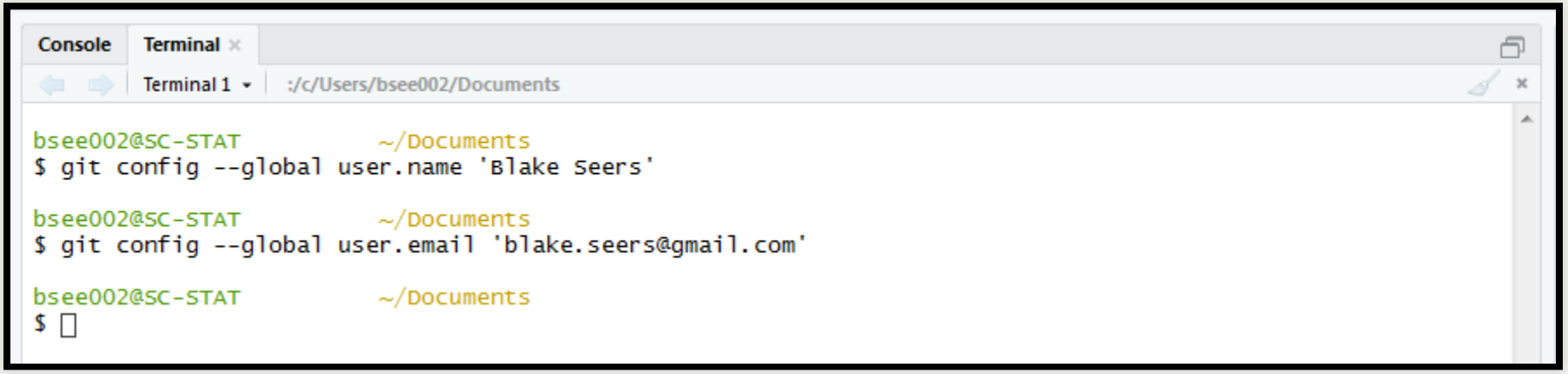
- Maverick 10.9 or higher - should already be installed
- Otherwise go to https://git-scm.com/download/mac

Introduce ourselves to git

Now that we have git installed, we want to introduce ourselves.

In RStudio, open the terminal tab in the console pane:

```
git config --global user.name 'Your Name'
git config --global user.email 'your@email.com'
```



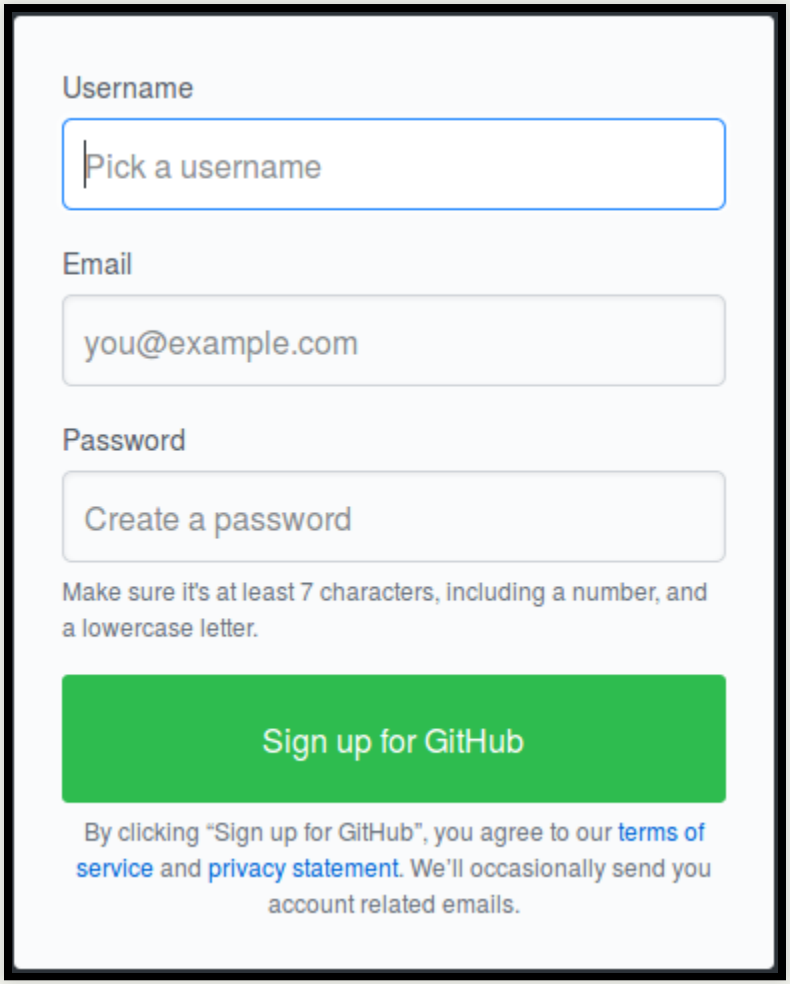
GitHub

What is GitHub?

- An online interface for git.
- Allows for cloud-based repository management.
- Connects you to the online community of developers and end users.
- Allows you to access your files from any computer.

Sign up for GitHub

- Go to https://github.com/join
- Select the ‘Unlimited public repositories’ for the free option.
- You will get emailed a link to complete the verification process.


Username
Pick a username
Email
you@example.com
Password
Create a password
Make sure it's at least 7 characters, including a number, and a lowercase letter.
Sign up for GitHub
By clicking “Sign up for GitHub”, you agree to our terms of service and privacy statement. We'll occasionally send you account related emails.

Join GitHub Education

Discounted and free plans are available for educational use.

You have submitted 3 requests

Jun 26, 2018 for @sccuoa Approved

Jun 26, 2018 for @blasee Approved

May 15, 2015 for @blasee Approved

Tell us what you need | Tell us about you

Which best describes you?

- Student
- Teacher
- Researcher
- Administrator/staff
- Other

What kind of GitHub account are you using for education?

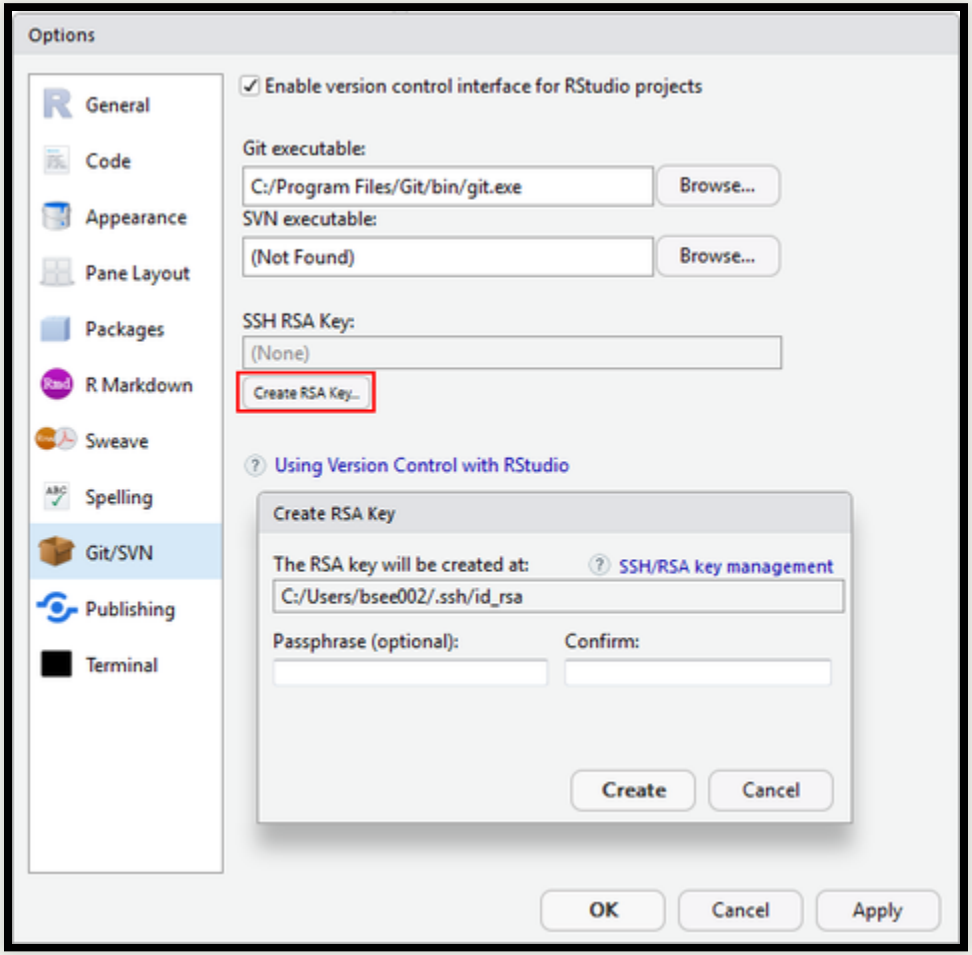
- Individual account
- Organization account

Next

Secure Shell (SSH) key (optional)

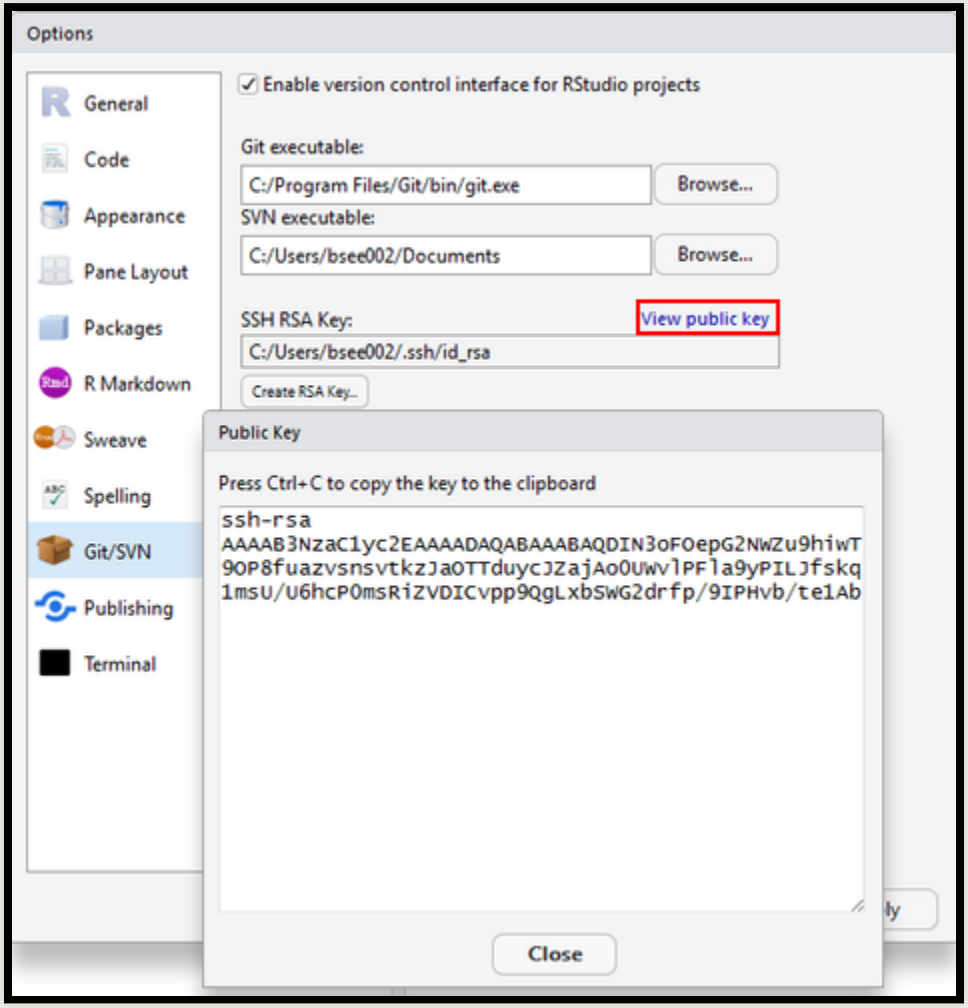
Create an SSH key in RStudio

- SSH allows you to connect and authenticate to remote servers.
- Tools → Global options → Git/SVN → Create RSA Key…



Connect SSH key to GitHub account

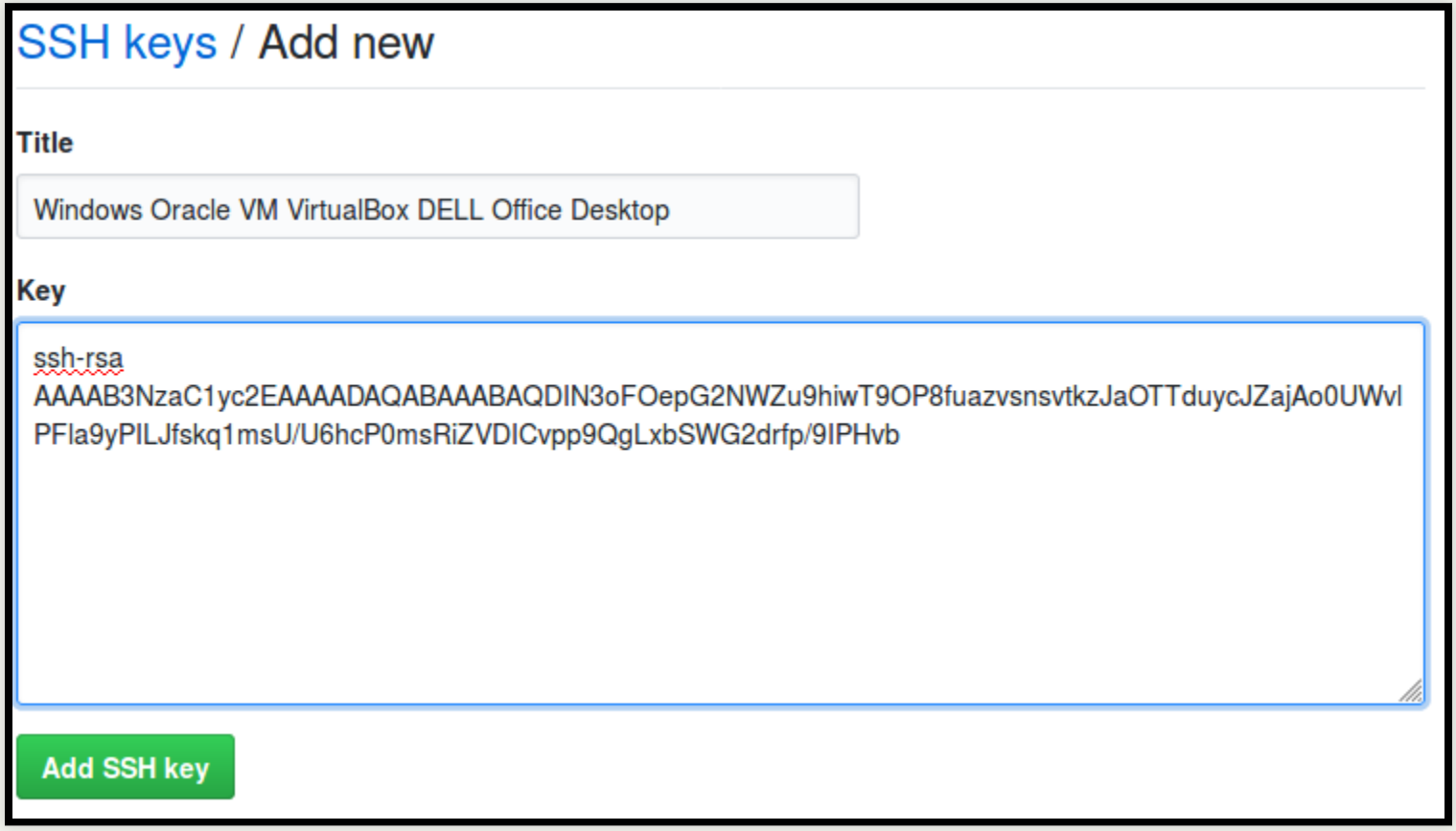
Click on “View Public Key” to copy the contents to clipboard.



Connect SSH key to GitHub account

In your browser:

- go to https://github.com/settings/ssh/new

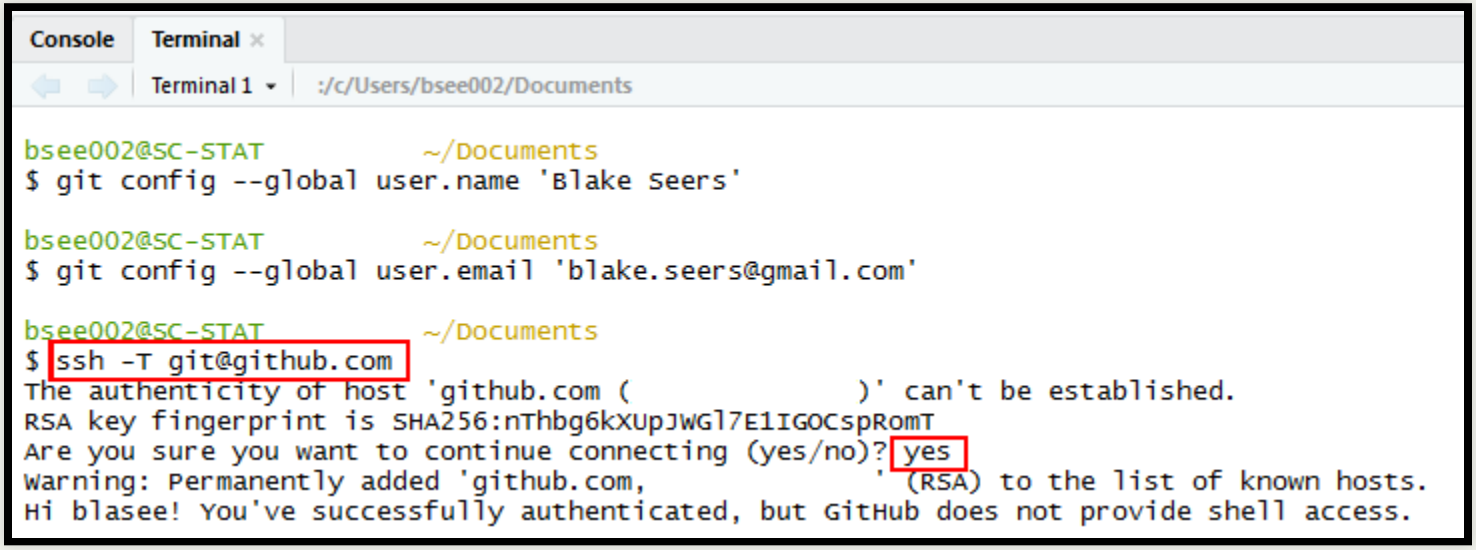


Check connection

In the Terminal pane, in RStudio:

```
ssh -T git@github.com
```

… and then type `yes` when prompted.



Core concepts

Core concepts in git and GitHub

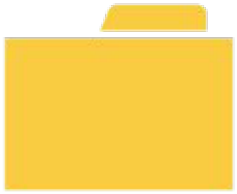
- **Repository**
  - Contains all your files (and history) for the project.
  - One-to-one mapping between **R** project and 'repo'.
- **Commit**
  - Each commit is a snapshot of your files.
  - Equivalent to a saving `FINAL_after_3rd_review.docx`.
  - Can time travel between commits.
- **Staging**
  - Files that have been selected (staged) for a commit.

Core concepts in git and GitHub

- **Push**
  - Making the changes you have made locally (using git) available to the online repository (GitHub).
- **Pull**
  - Updating your local repository to the current version in the online repository.

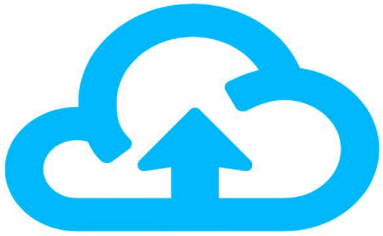
Core concepts in git and GitHub

Repository, AKA Repo



Commit

Push



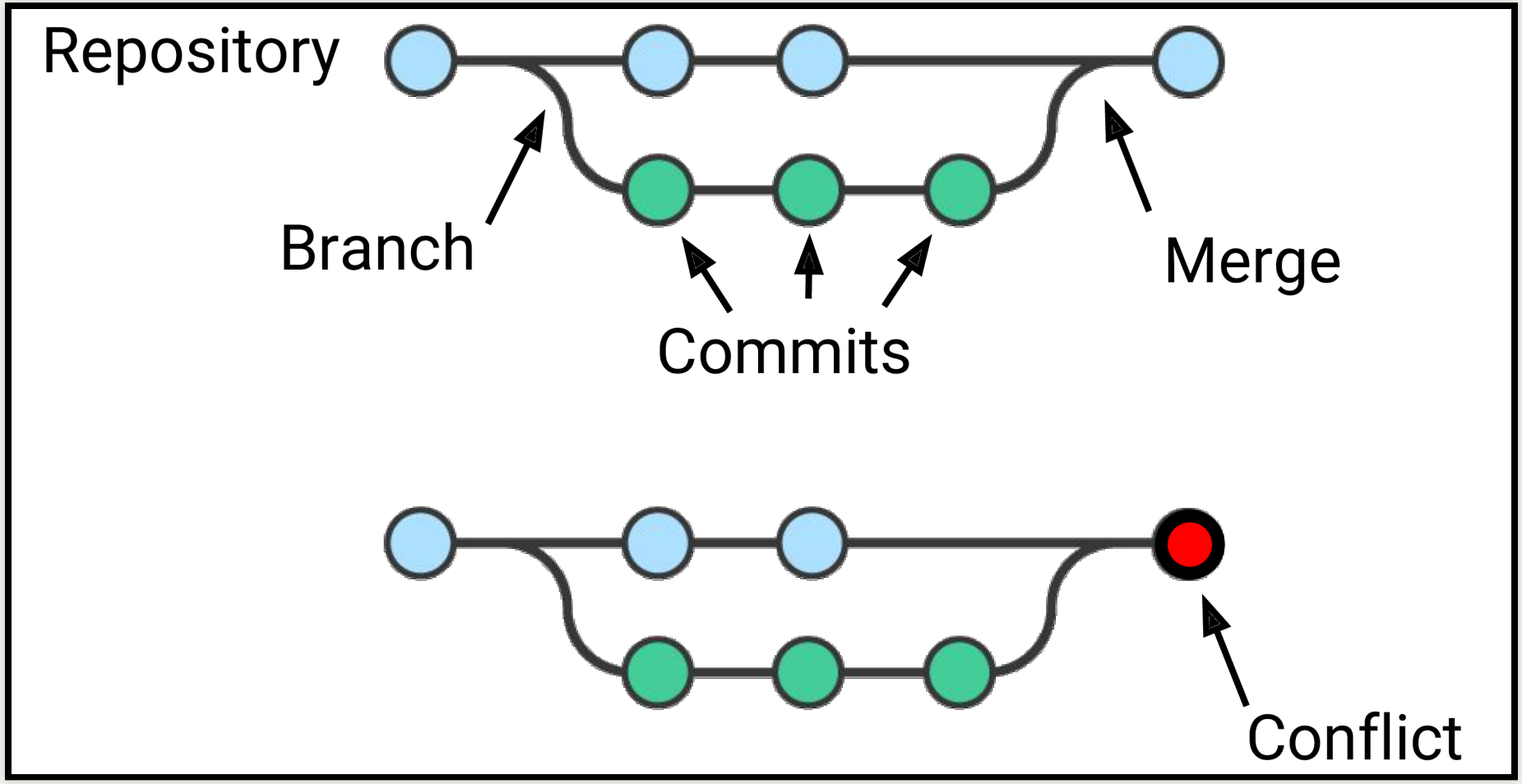
Pull

Core concepts in git and GitHub

- **Clone**
  - Copy (clone) an existing repository locally.
  - For example, working on a project from a different computer.
- **Fork**
  - A personal copy of a repository ‘taken’ from another user.

Core concepts in git and GitHub

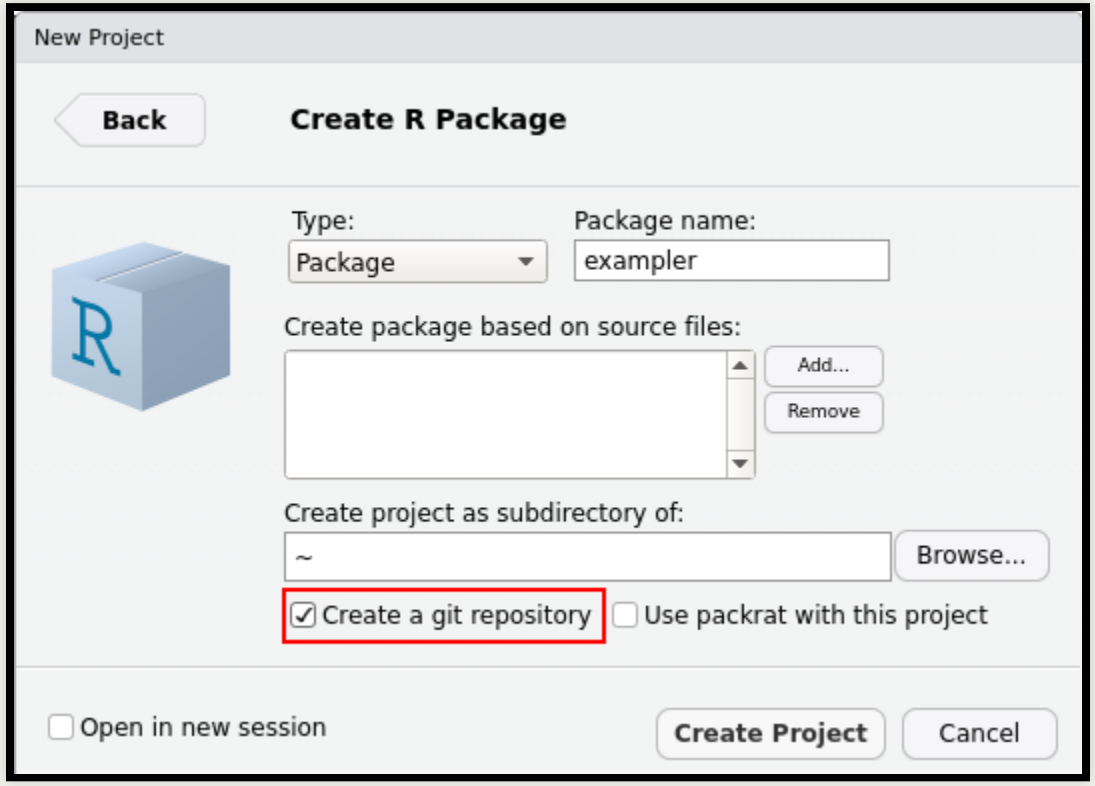
- **Branch**, **Merge**, and **Conflict**



Examples for getting started with git

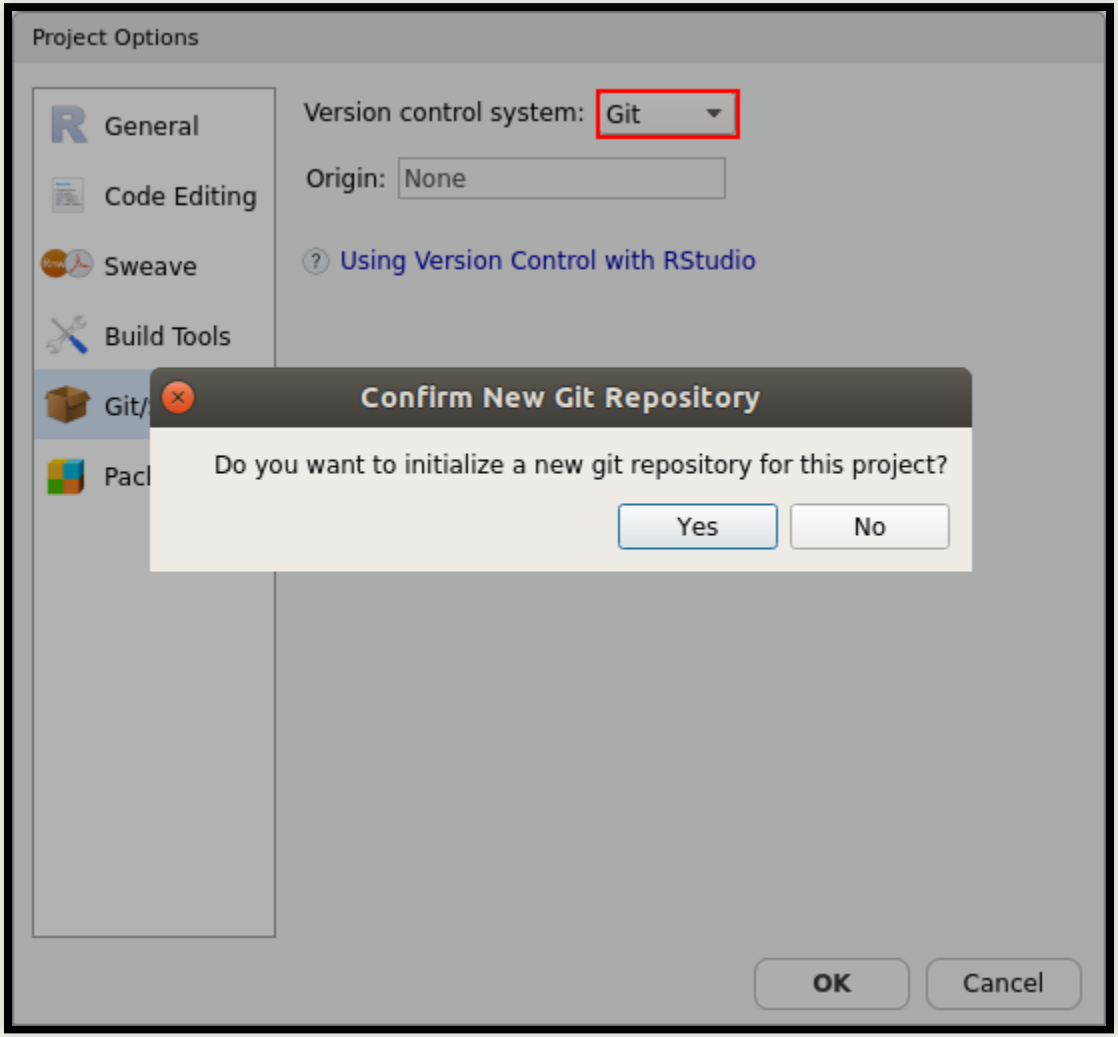
Start a new **R** package

- New Project → R Package:



Initialize an existing repo with git

Tools → Project Options → Git/SVN:



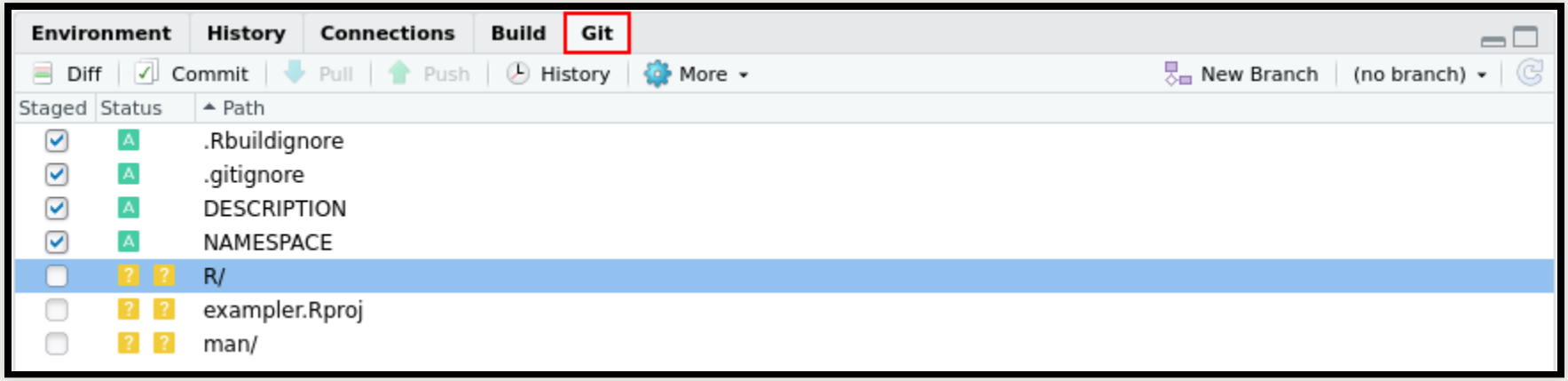
The git tab

- Once initialized, there is a git tab in RStudio:

- This git tab in RStudio tab contains all the common git functionality we need.

Add files to the staging area

- In RStudio just check the boxes to add files to be staged.
- Here we will add all files in an 'initial commit'.

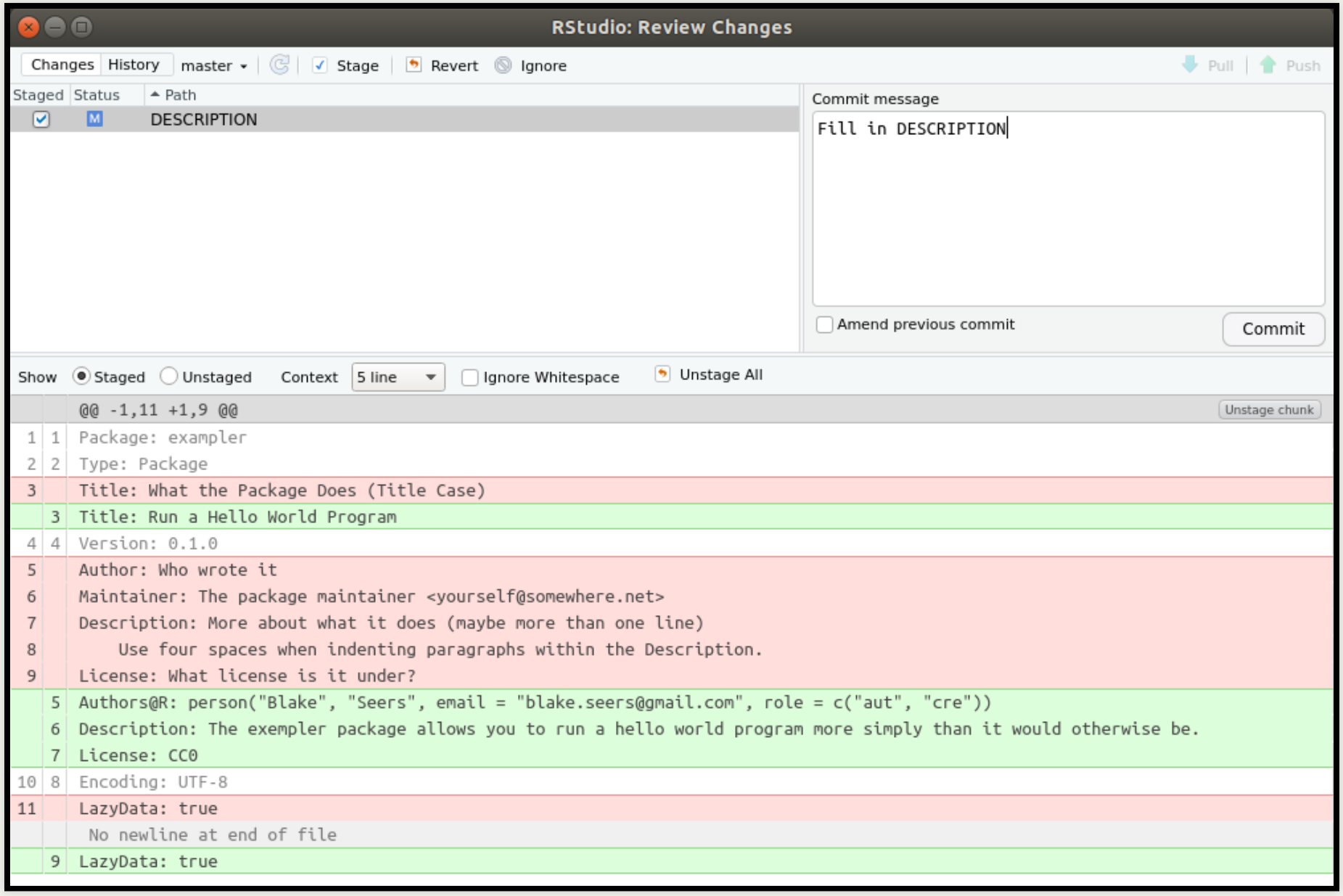


- Press the 'Commit' button when you're ready to commit.
- Shortcut in RStudio: Ctrl + Alt + M.

An initial commit

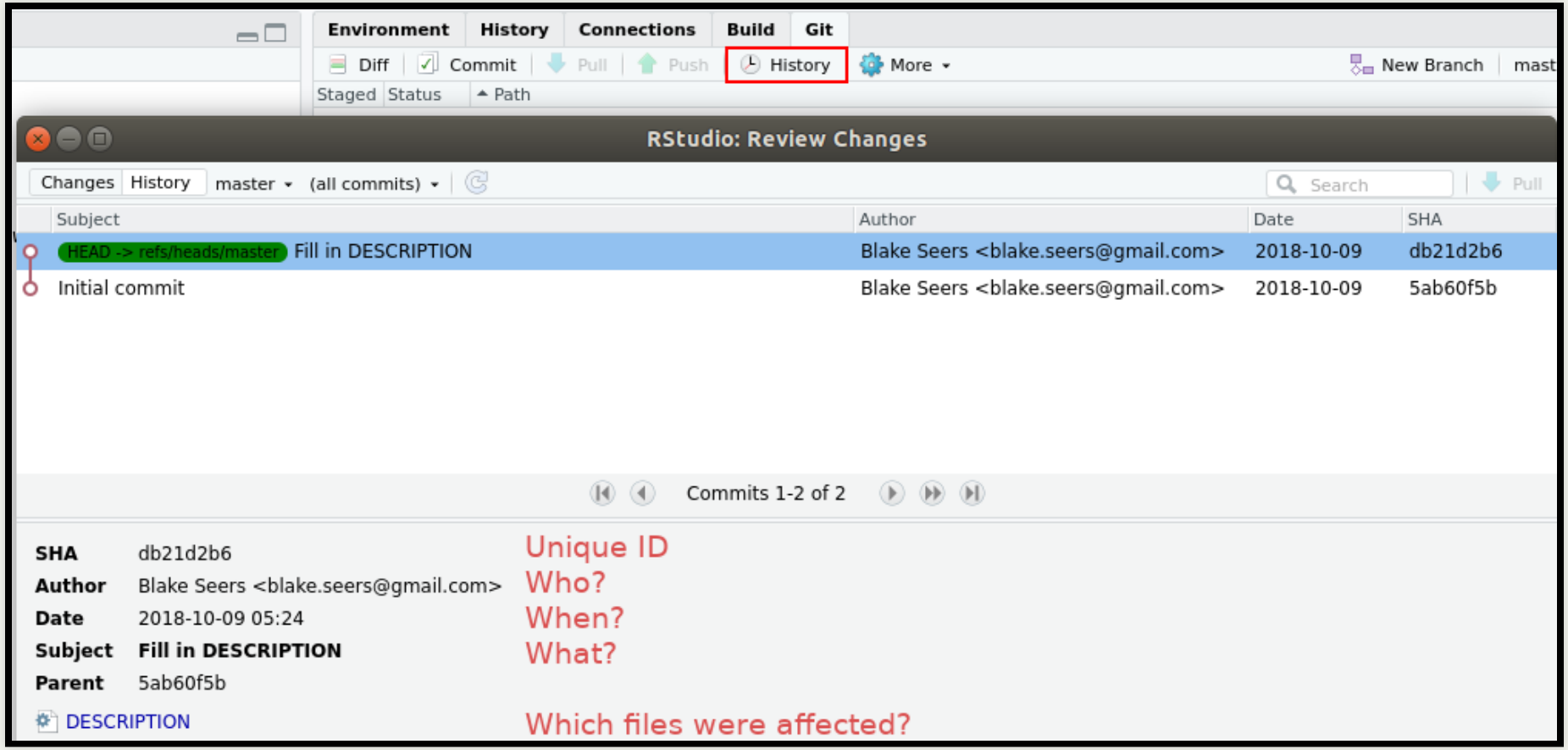
- It is common to use ‘initial commit’ for the first commit message.

Modify a file and commit



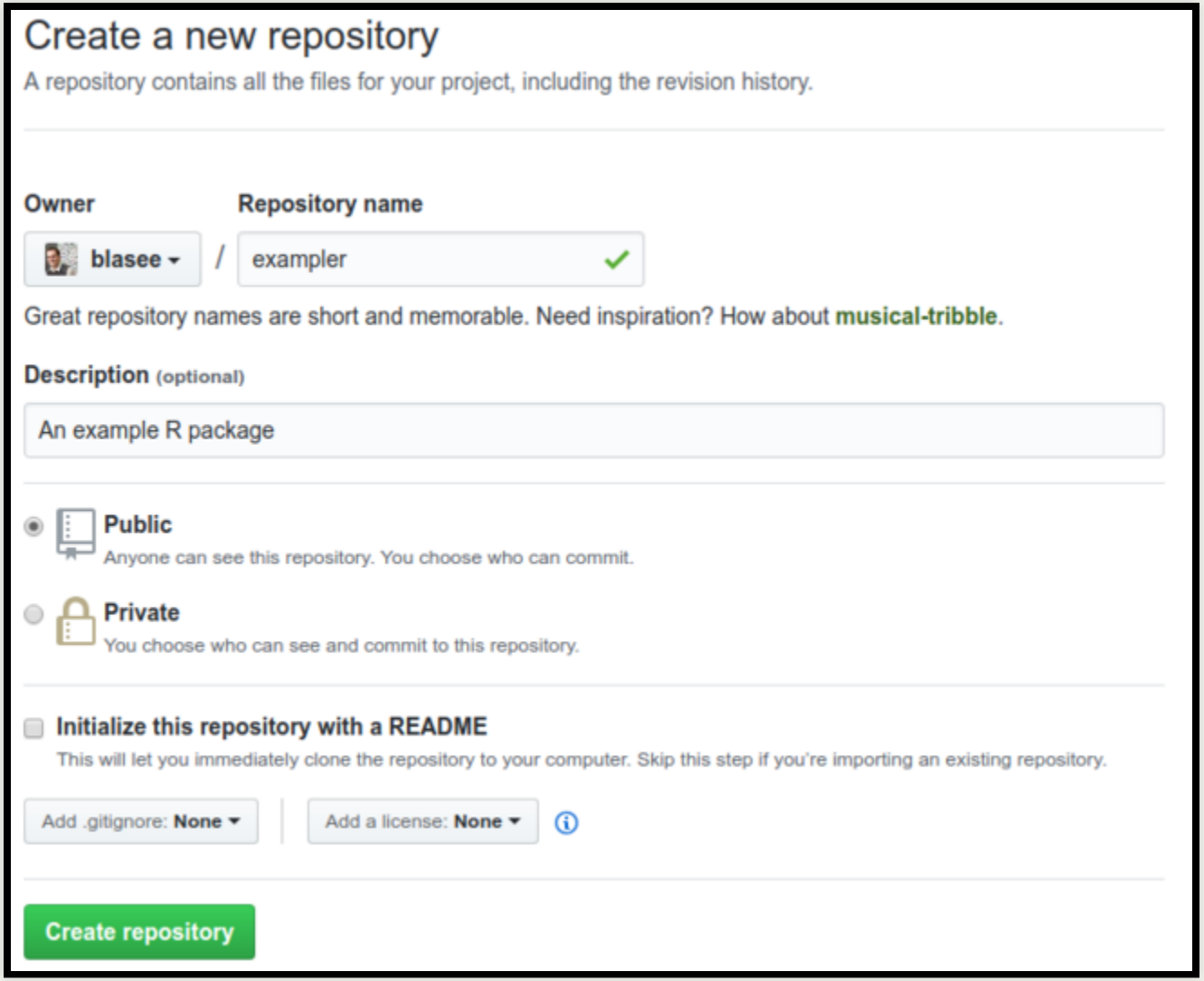
View a history of commits in RStudio

Now we are ready to add our commits to GitHub.



Create a repo on GitHub

- Go to https://github.com/new to create a new repo:

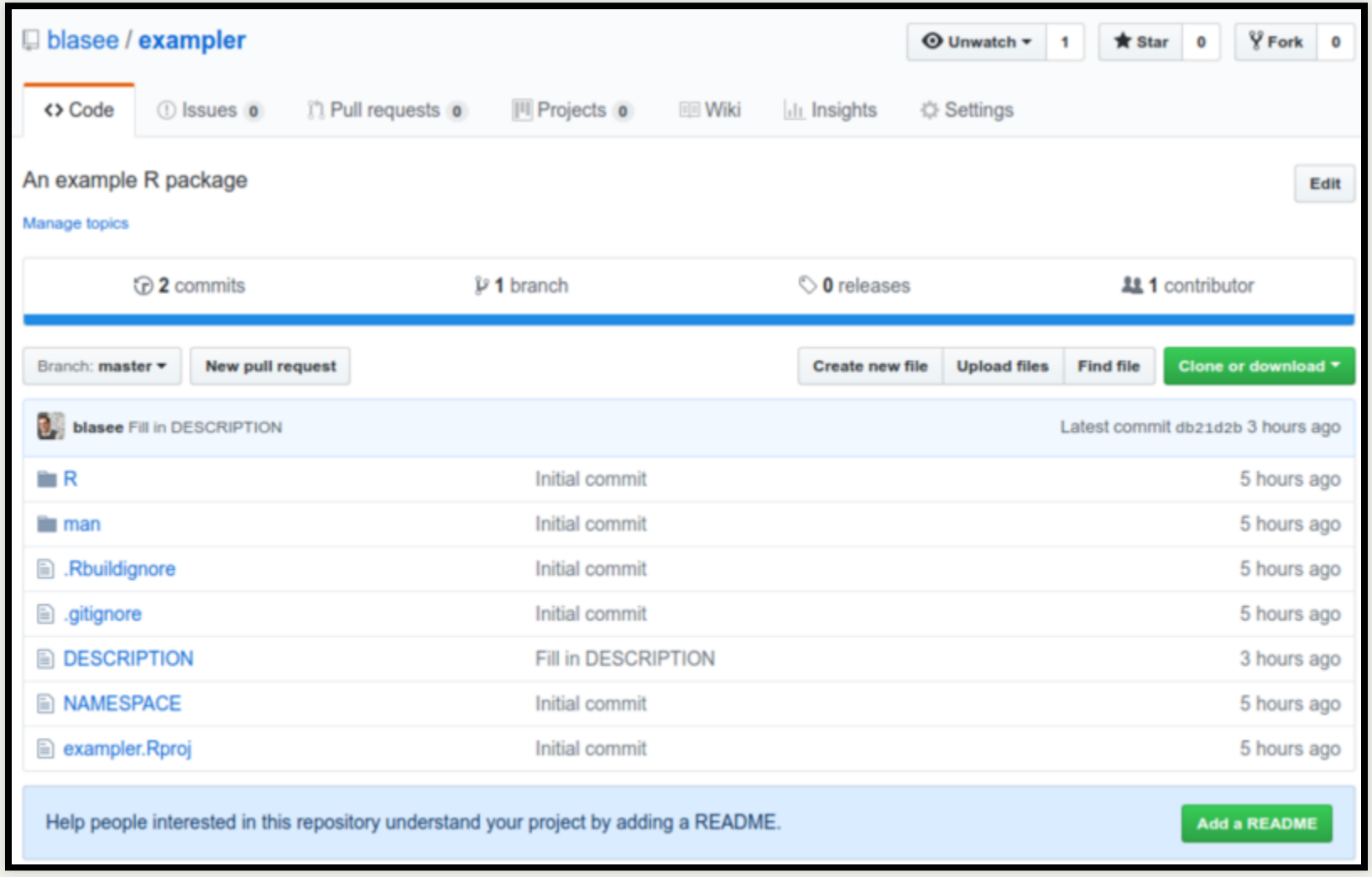


Create a repo on GitHub

- Simply copy-paste the code to the console in RStudio.

Package on GitHub

- Your files are now on GitHub!
- `devtools::install_github("blasee/exampler")`



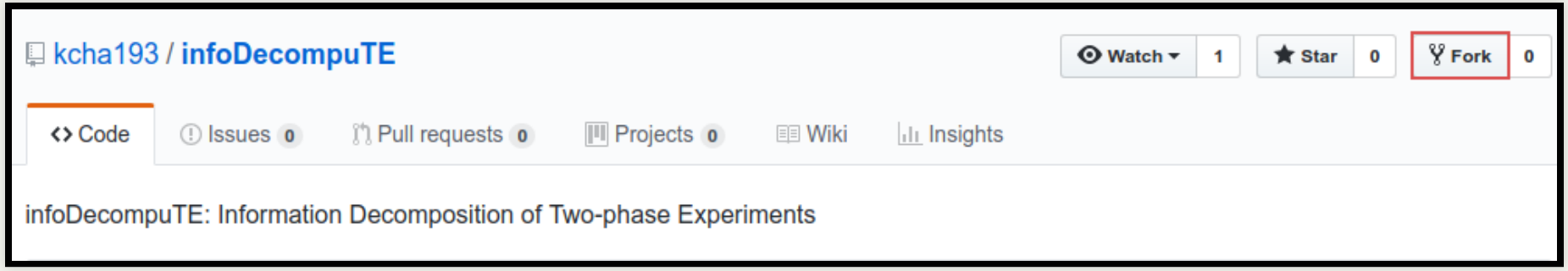
Push in RStudio

- Just because it is on GitHub, does not mean it is a finished product.
- Can go back to RStudio and continue working, committing, and pushing:
  - to push (or pull) in the future, you can press the “Push” button:

Forking and cloning repositories

Fork a repository

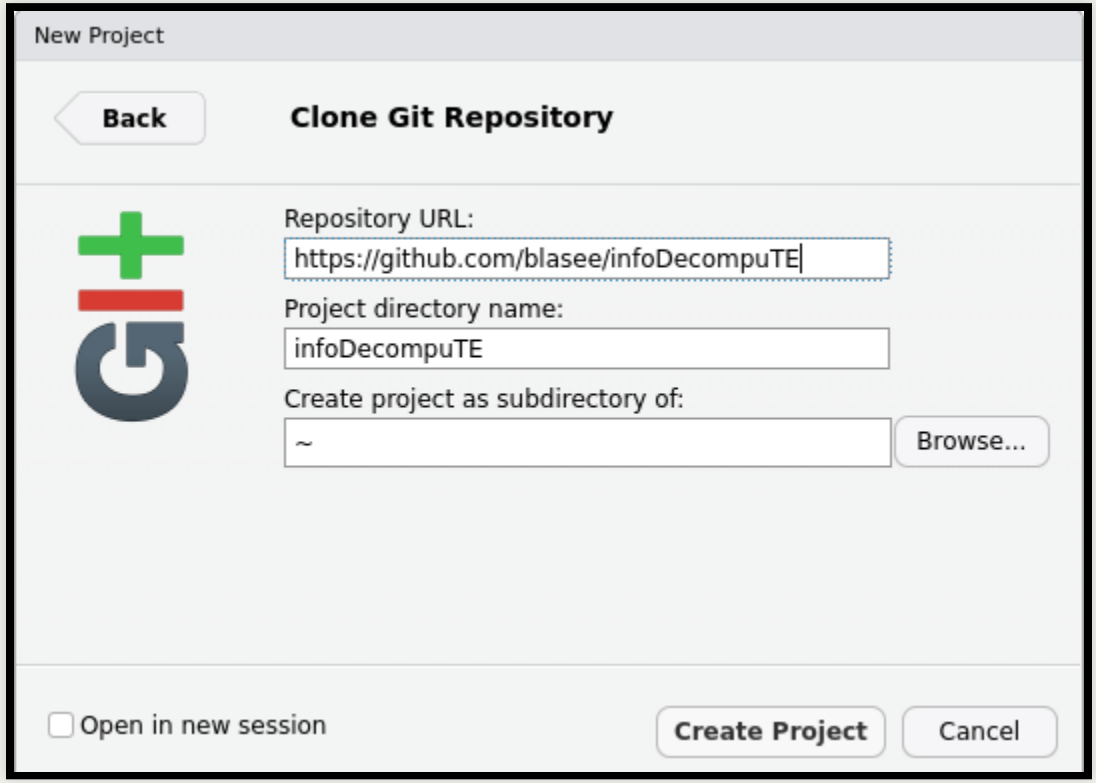
- Go to any repository and press ‘Fork’:



- This repository now lives at https://github.com/blasee/infoDecompuTE

Clone the repository from RStudio

File → New Project → Version Control → Git



Concluding remarks

gitignore files

- Files that match the patterns in gitignore will be ignored by git.
- Similar to Rbuildignore.
- Patterns include:
  - '#' for comments.
  - \ is the escape character.
  - dir/ ignores the directory 'dir'.
  - * matches anything (except "/")
  - ? matches anything (except "/" and "[]")

Best practices

Each commit should:

- address a single issue.
- have a helpful commit message.
- use imperitive verbs in the present tense.
  - '*Add* print S4 method to person class'
  - '*Remove* ORIGINAL.csv file from top directory'
  - '*Update* dependency from `XML` to `xml2`'
  - '*Fix* installation problem on Windows'

Important things not covered

- Creating tags and releases (**R** packages).
- Adding README files to your repository.
- Branching and reverting
- Tracking issues on GitHub
- Pull request on GitHub
- Continouous integration services
- GitHub pages for a website for your repo

Summary

- Use version control for your projects:
  - **R** packages
  - Thesis / dissertation
  - Course notes
  - Book
  - Website
- Version control is easy with RStudio.
- Code and collaborate with RStudio, git and GitHub!