Creating websites in R

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This tutorial provides an introduction to creating websites using R, R Markdown and GitHub pages.

This tutorial was originally presented at the Memorial Sloan Kettering Cancer Center Department of Epidemiology and Biostatistics R User Group meeting on January 23, 2018.

The current version was updated and presented at the R Ladies NYC Meetup on February 15, 2018.

Types of websites

The main types of websites you may want to create include:

1. Personal websites
2. Package websites
3. Project websites
4. Blogs

R Markdown website basics

The minimum requirements for an R Markdown website are:

- `index.Rmd`: contains the content for the website homepage
- `_site.yml`: contains metadata for the website

A basic example of a `_site.yml` file for a website with two pages:

```
name: "my-website"
navbar:
  title: "My Website"
  left:
    - text: "Home"
      href: index.html
    - text: "About"
      href: about.html
```

And a basic `index.Rmd` to create the Home page:

```
---
title: "My Website"
---

Hello, Website! Welcome to the world.
```

You can find an overview of R Markdown website basics here.

GitHub

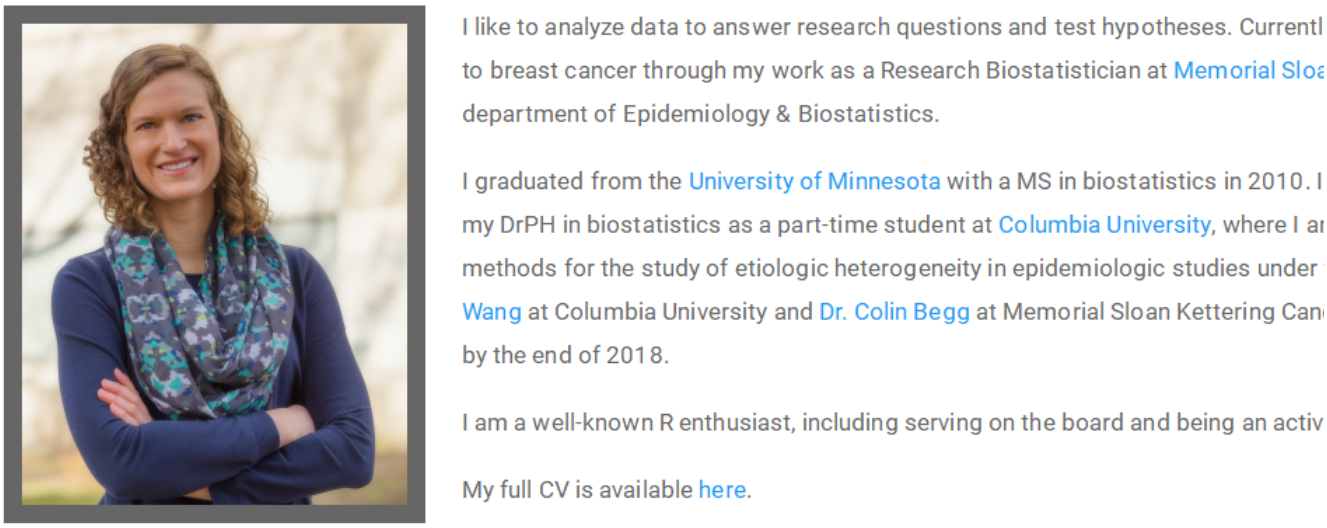
This tutorial will focus on hosting websites through GitHub pages. Hosting websites on GitHub pages is free.

If you don't have a GitHub account already, sign up for one at https://github.com/join?source=header-home with username YOUR_GH_NAME. I'll be referring to this username, YOUR_GH_NAME, as "your GitHub username" throughout this tutorial.

There are other free sites for website hosting, and another popular choice is Netlify.

Personal websites

An example from the homepage of my personal website:



There are two main steps for creating a personal website that will be hosted on GitHub:

1. GitHub setup
2. Local setup

GitHub setup

1. Create a GitHub repository ("repo") named YOUR_GH_NAME.github.io, where YOUR_GH_NAME is your GitHub username.
2. Initialize it with a README
    - For the GitHub inexperienced: this can ease the process of cloning the repo by initializing the remote repo with a master branch

Local setup

1. Clone this remote repository to a local directory with the same name, YOUR_GH_NAME.github.io
2. Add an R Project to this directory
3. Create a `_site.yml` and `index.Rmd` file in your new directory

Why do I need an R Project?

The R Project is useful because RStudio will recognize your project as a website, and provide appropriate build tools.

Note: After creating the R Project and initial files, you may need to close the project and reopen it before R will recognize it as a website and show the appropriate build tools.

Create content

Edit the `_site.yml` file to change the metadata, layout, and theme of your website. Preview Jekyll themes here and play around with different options. Themes are easy to change even after you have added content.

For example, the `_site.yml` for my personal website looks like this:

```
name: "Emily C. Zabor"
output_dir: "."
navbar:
  title: "Emily C. Zabor"
  left:
    - text: "Writing"
      href: research.html
    - text: "Speaking"
      href: talks.html
    - text: "Programming"
      href: software.html
    - text: "Teaching"
      href: teaching.html
  right:
    - icon: fa-envelope fa-lg
      href: contact.html
    - icon: fa-github fa-lg
      href: http://github.com/zabore
```

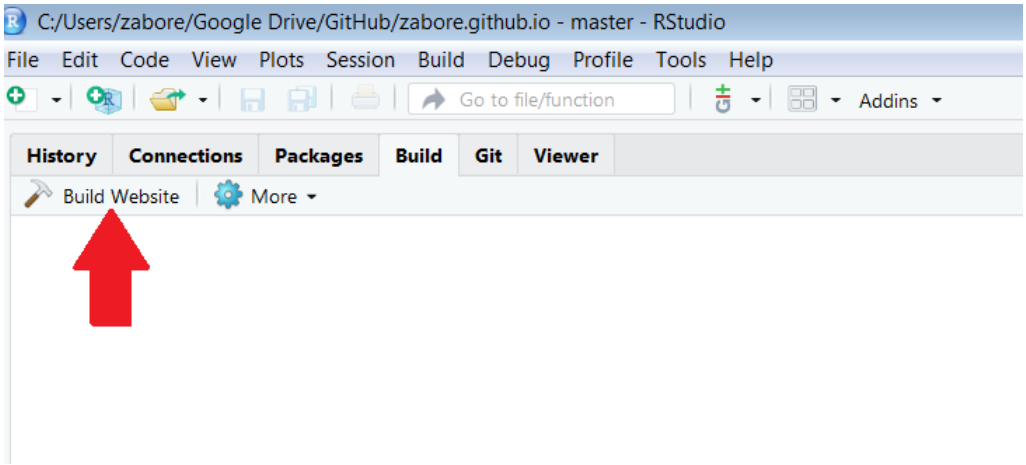
```
    - icon: fa-twitter fa-lg
      href: https://twitter.com/zabormetrics
    - icon: fa-linkedin fa-lg
      href: https://www.linkedin.com/in/emily-zabor-59b902b7/
output:
  html_document:
    theme: paper
    css: 'styles.css'
```

Edit and create `.Rmd` files that contain your website content, which will produce the html pages of your website when you knit them.

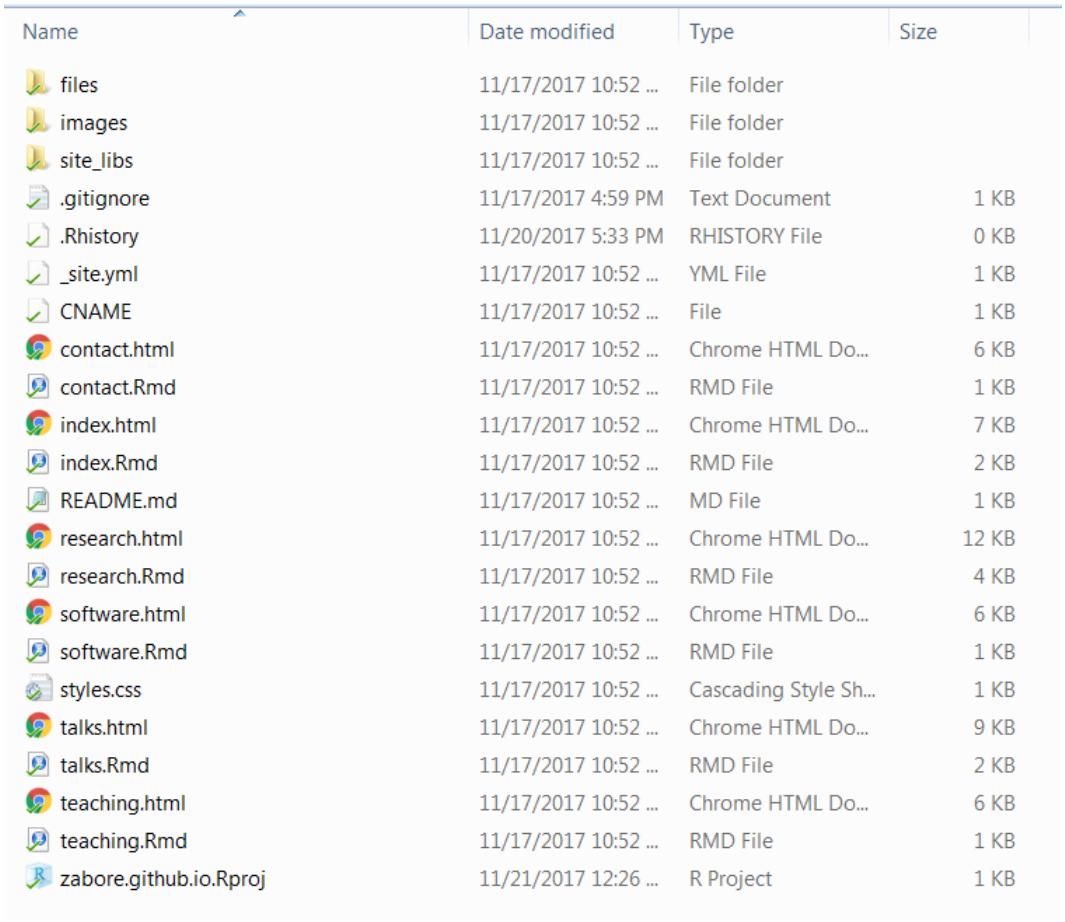
For example, the `index.Rmd` file for my personal website homepage looks like this:

```
---
---

<link rel="stylesheet" href="styles.css" type="text/css">

<img src="images/emily_2.jpg" style="width:25%; border:10px solid; margin-right: 20px" align="left">

I like to analyze data to answer research questions and test hypotheses. Currently I investigate questions related to breast

I graduated from the [University of Minnesota](http://www.sph.umn.edu/academics/divisions/biostatistics/) with a MS in biost

I am a well-known R enthusiast, including serving on the board and being an active member of [R Ladies NYC](http://www.rladi

My full CV is available [here](files/Zabor_CV_2017_Q4.pdf).
```

Once you have your content written and the layout setup, on the Build tab in RStudio, select “Build Website”:



Now your local directory contains all of the files needed for your website:

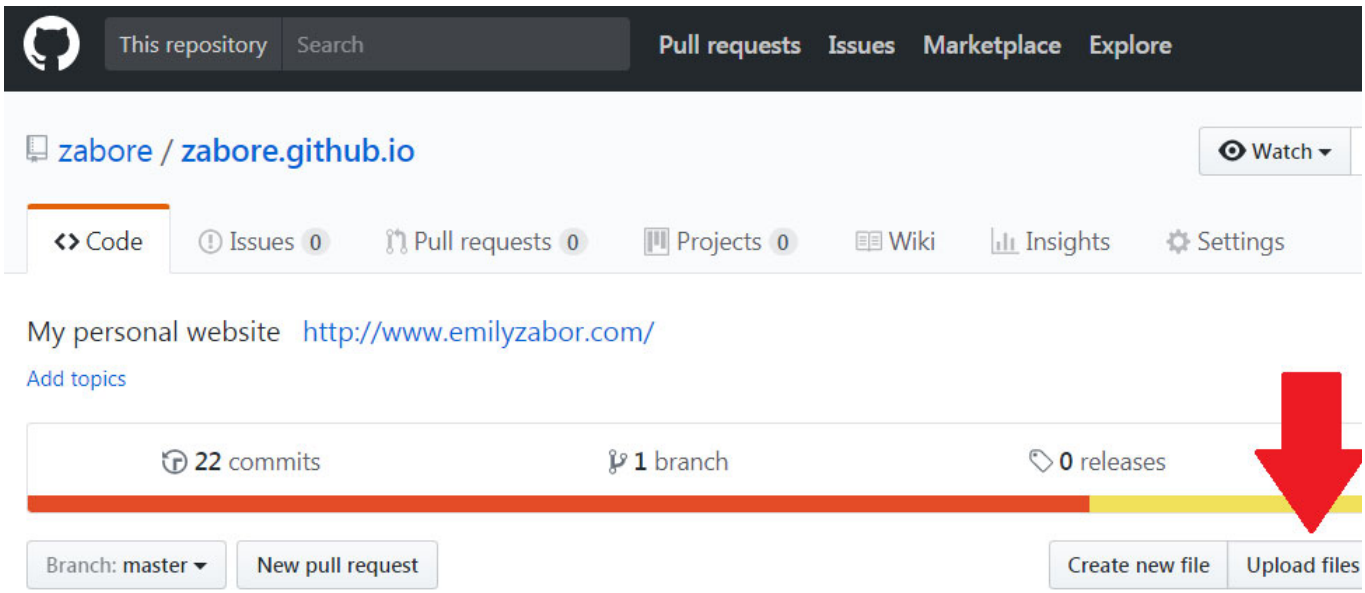


Name	Date modified	Type	Size
files	11/17/2017 10:52 ...	File folder	
images	11/17/2017 10:52 ...	File folder	
site_libs	11/17/2017 10:52 ...	File folder	
.gitignore	11/17/2017 4:59 PM	Text Document	1 KB
.Rhistory	11/20/2017 5:33 PM	RHISTORY File	0 KB
_site.yml	11/17/2017 10:52 ...	YML File	1 KB
CNAME	11/17/2017 10:52 ...	File	1 KB
contact.html	11/17/2017 10:52 ...	Chrome HTML Do...	6 KB
contact.Rmd	11/17/2017 10:52 ...	RMD File	1 KB
index.html	11/17/2017 10:52 ...	Chrome HTML Do...	7 KB
index.Rmd	11/17/2017 10:52 ...	RMD File	2 KB
README.md	11/17/2017 10:52 ...	MD File	1 KB
research.html	11/17/2017 10:52 ...	Chrome HTML Do...	12 KB
research.Rmd	11/17/2017 10:52 ...	RMD File	4 KB
software.html	11/17/2017 10:52 ...	Chrome HTML Do...	6 KB
software.Rmd	11/17/2017 10:52 ...	RMD File	1 KB
styles.css	11/17/2017 10:52 ...	Cascading Style Sh...	1 KB
talks.html	11/17/2017 10:52 ...	Chrome HTML Do...	9 KB
talks.Rmd	11/17/2017 10:52 ...	RMD File	2 KB
teaching.html	11/17/2017 10:52 ...	Chrome HTML Do...	6 KB
teaching.Rmd	11/17/2017 10:52 ...	RMD File	1 KB
zabore.github.io.Rproj	11/21/2017 12:26 ...	R Project	1 KB

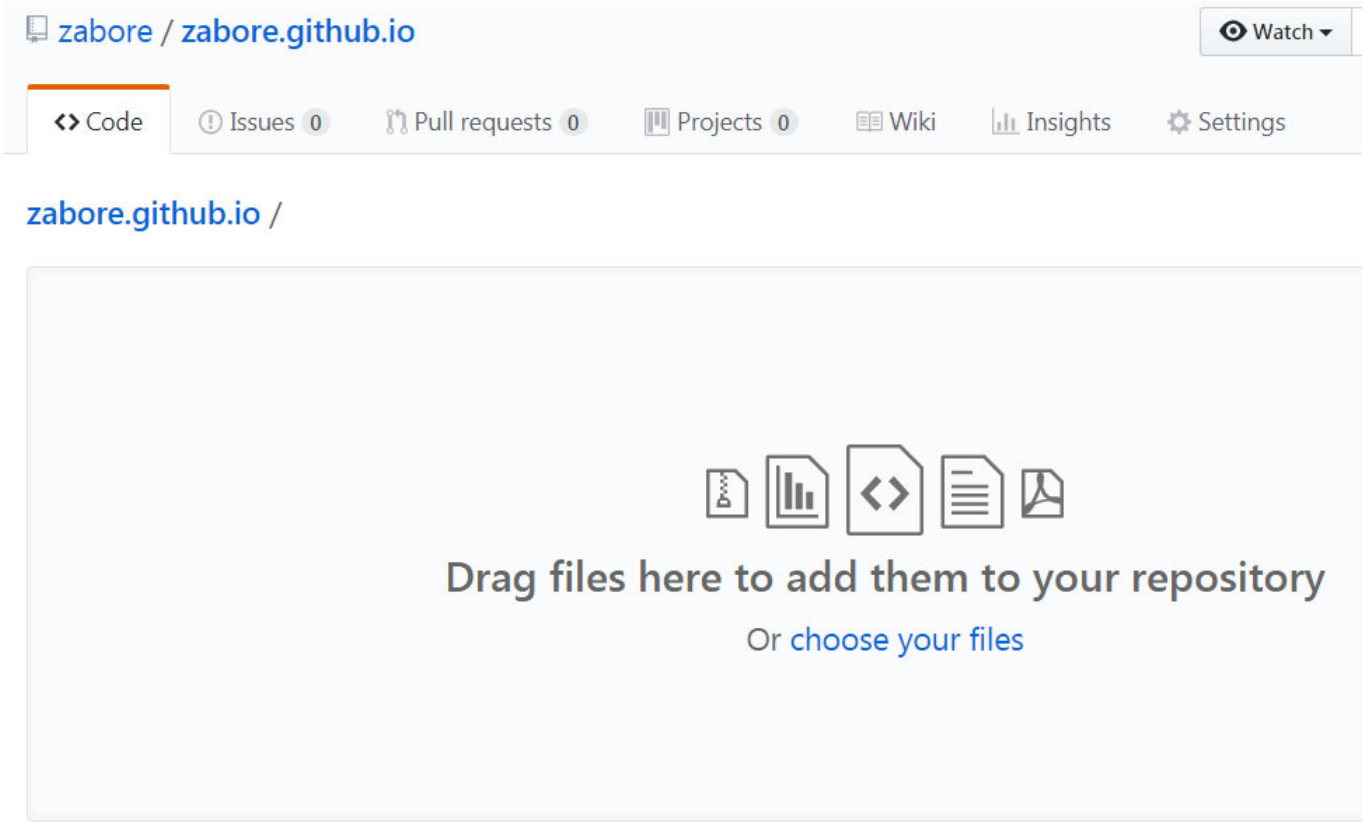
Deploy website

Basic approach:

- Select “Upload files” from the main page of your GitHub repo:

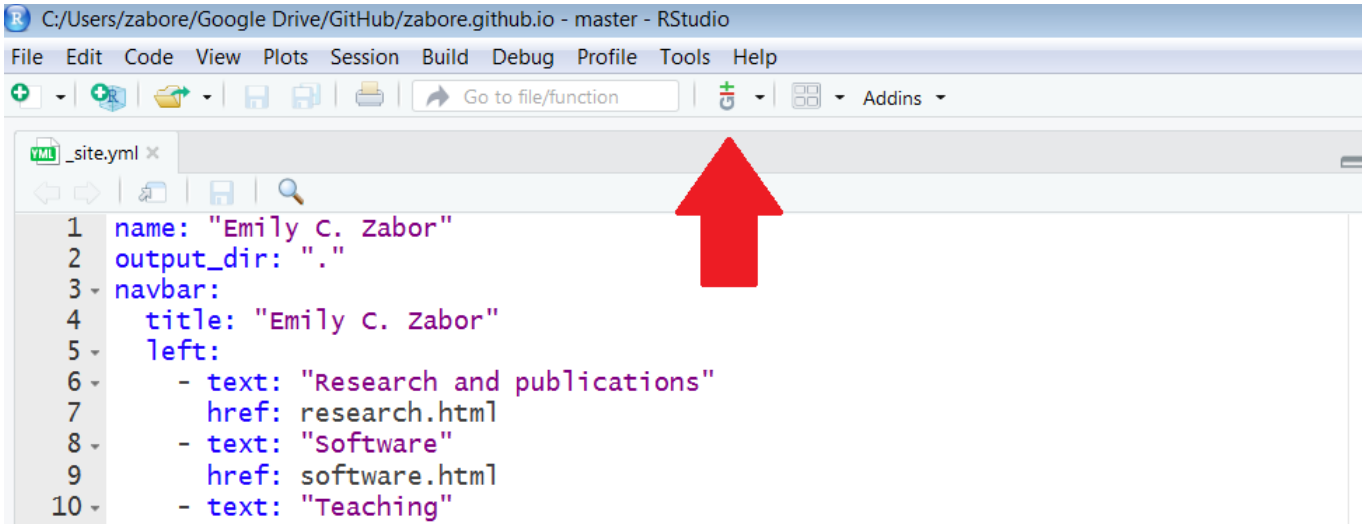


- And simply drag or select the files from the local repository:



Advanced approach (recommended):

- use Git from the shell, from a Git client, or from within RStudio (another great reason to use an R Project!)

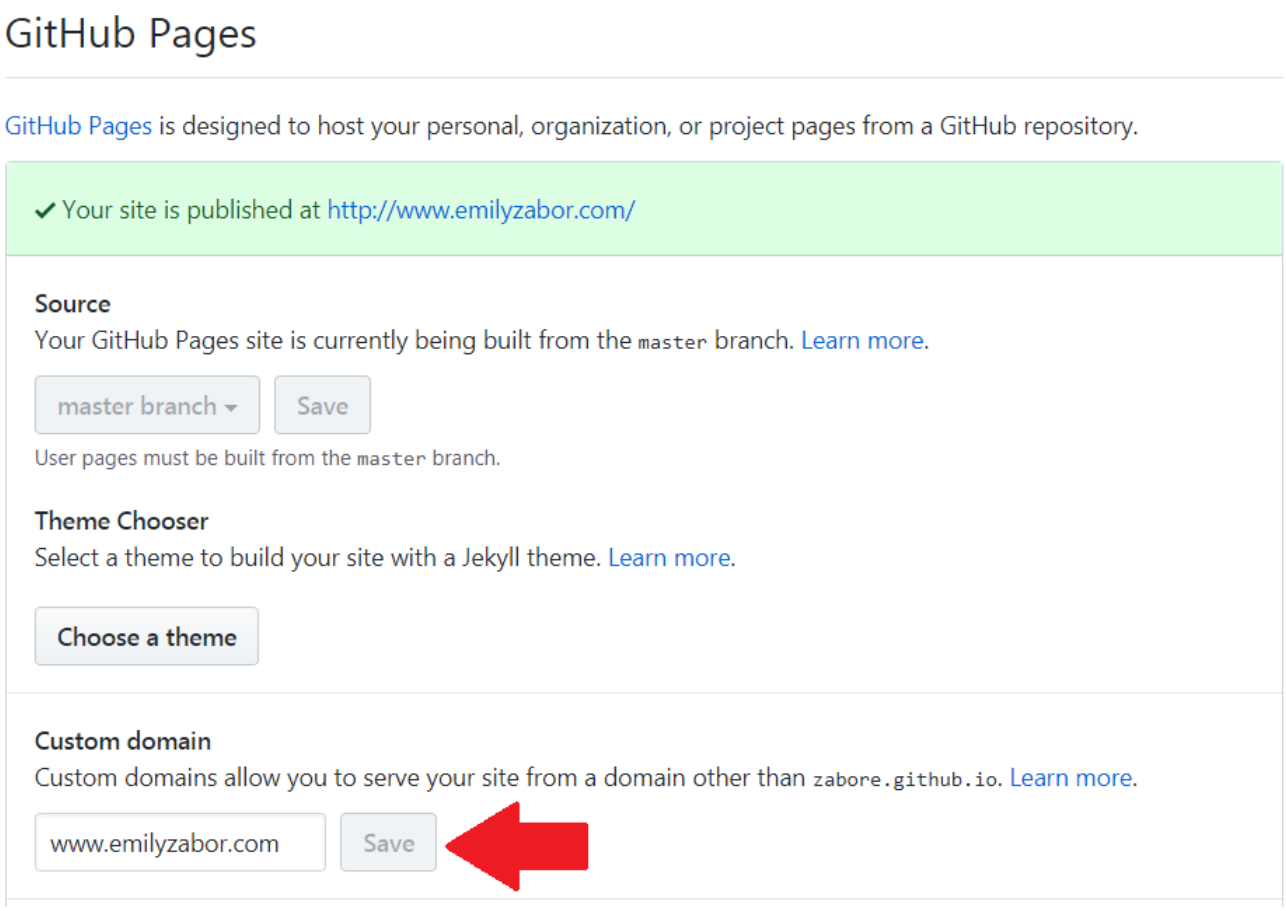


- But this is not a Git/GitHub tutorial. If you want to learn more about Git/GitHub, which I encourage you to do, here's a great resource to get you started: http://happygitwithr.com/

Custom domains

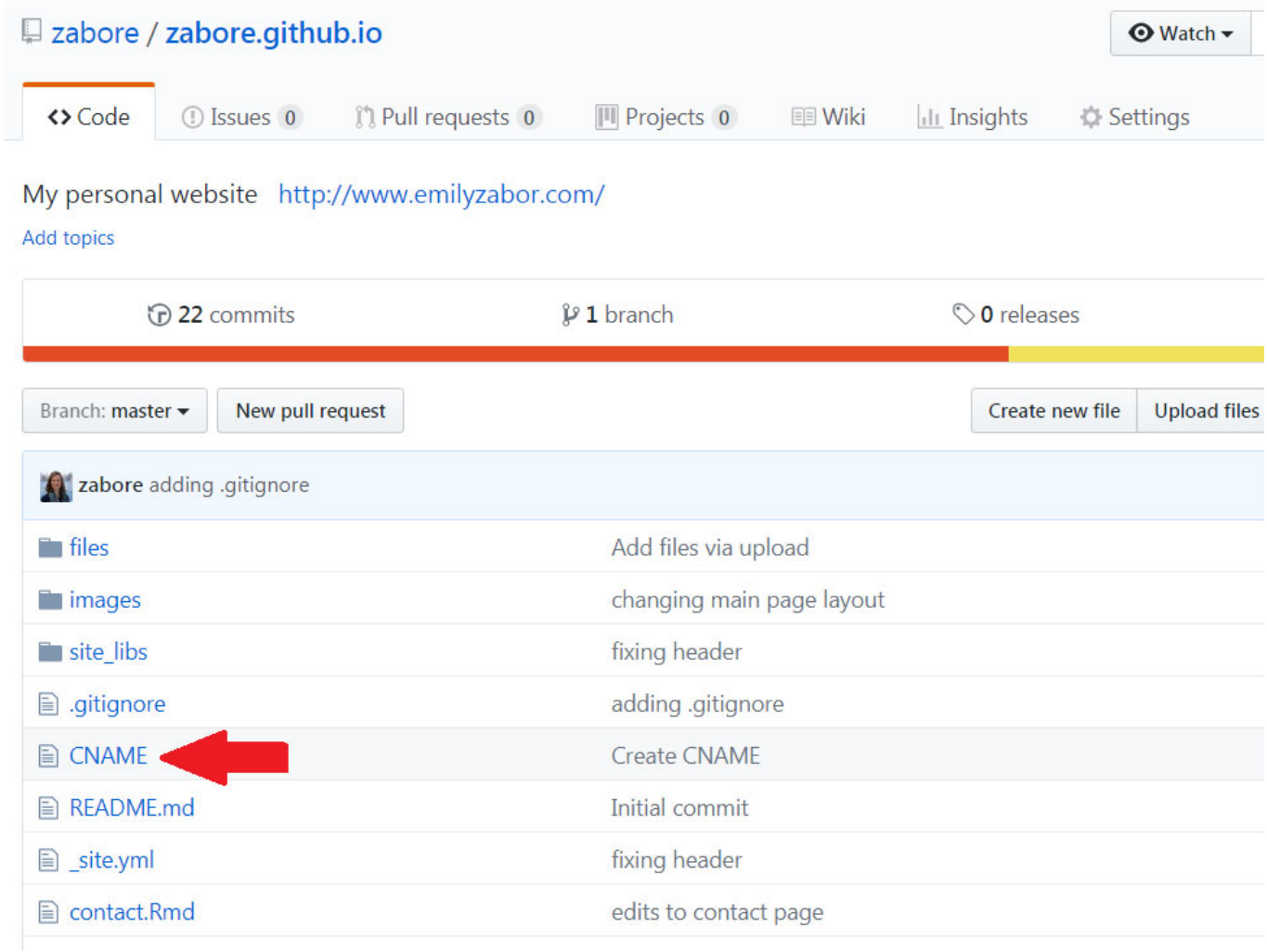
The default is for your site to be hosted at http://YOUR_GH_NAME.github.io, but you can add a custom domain name as well. There are two steps:

1. In your GitHub repository YOUR_GH_NAME.github.io, go to Settings > GitHub pages. Type your domain name in the box under Custom domain and hit Save.

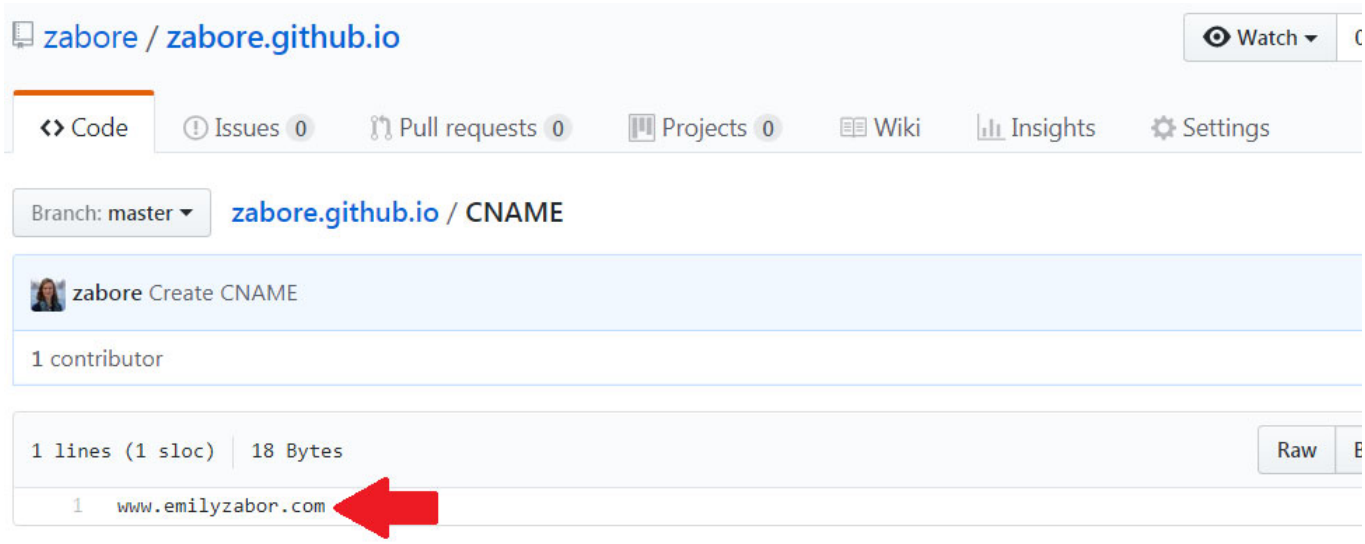


2. Add a CNAME file to your GitHub repsitory YOUR_GH_NAME.github.io.

It will appear like this in your repository:



And inside the file you will simply have your domain name:



Package websites

An example from the website for my package `ezfun`:

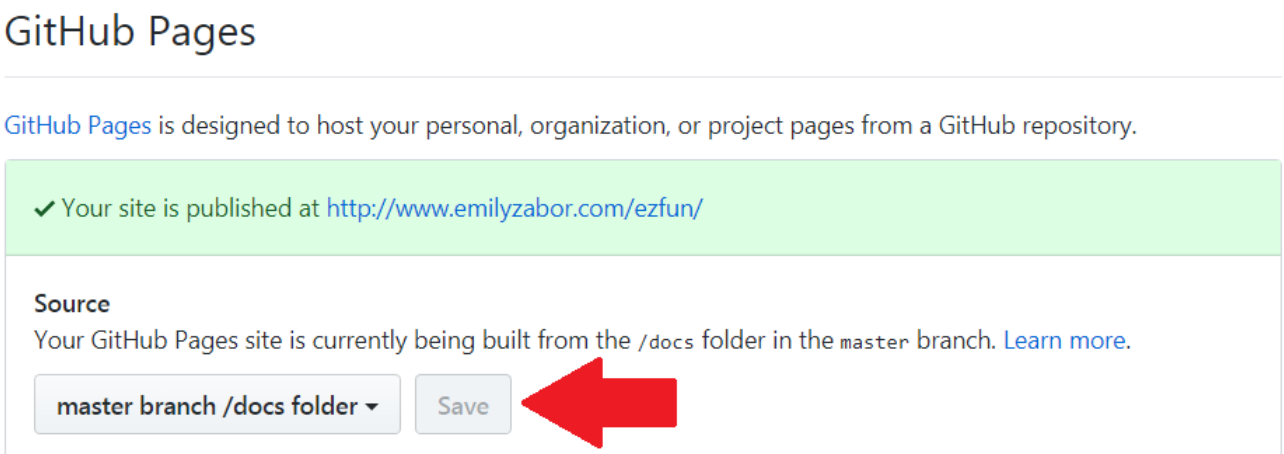
Use Hadley Wickham's great package `pkgdown` to easily build a website from your package that is hosted on GitHub. Details of `pkgdown` can be found on the pkgdown website, which was also created using `pkgdown`.

This assumes you already have an R package with a local directory and a GitHub repository.

From within your package directory run:

```
devtools::install_github("hadley/pkgdown")
pkgdown::build_site()
```

- This will add a folder called `docs` to the local directory for your package
- Upload/push these changes to the GitHub repository for your package
- In the GitHub repository for your package go to Settings > GitHub pages. Select "master branch/docs folder" as the source and hit Save

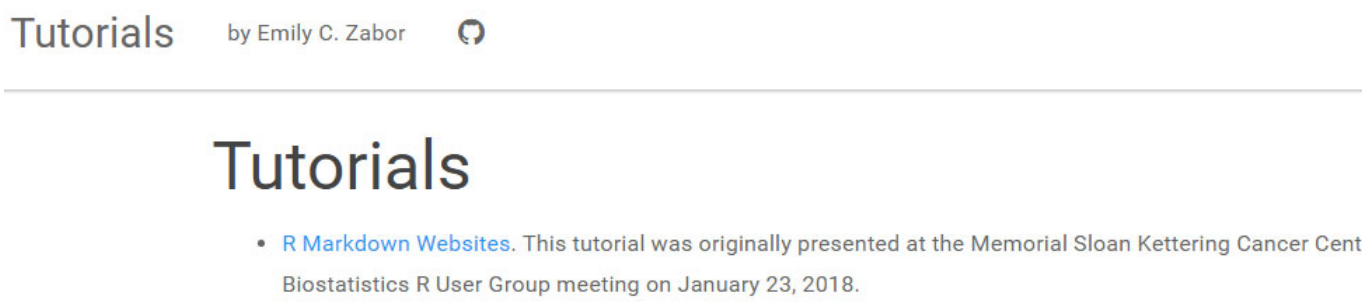


- The page will be added as to your personal website as YOUR_GH_NAME.github.io/repo_name
    - The Home page of the site will be pulled from the README file on your package repository
    - The Reference page of the site lists the included functions with their description
    - Each function can be clicked through to see the help page, if any
    - Would also build pages for any available vignettes

And you're done, it's that easy.

Project websites

You can create a website for a non-package repository as well. For example, I have a page on my website linking to the repository in which this tutorial is stored.



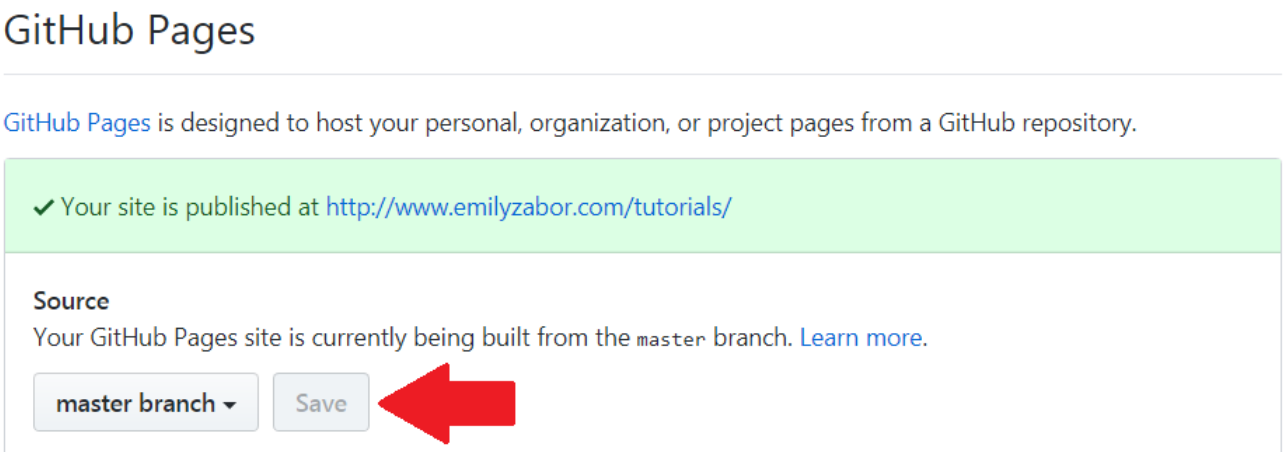
Local setup

From within the local directory of the project of interest:

1. Create a `_site.yml` and `index.Rmd` file in your new directory
2. Edit these files to create content and manage layout, as before for personal websites

GitHub setup

- Upload/push these new files to the GitHub repository for your project
- Enable GitHub pages for the repository by going to Settings > GitHub Pages, where you'll select the "master branch" folder and hit Save

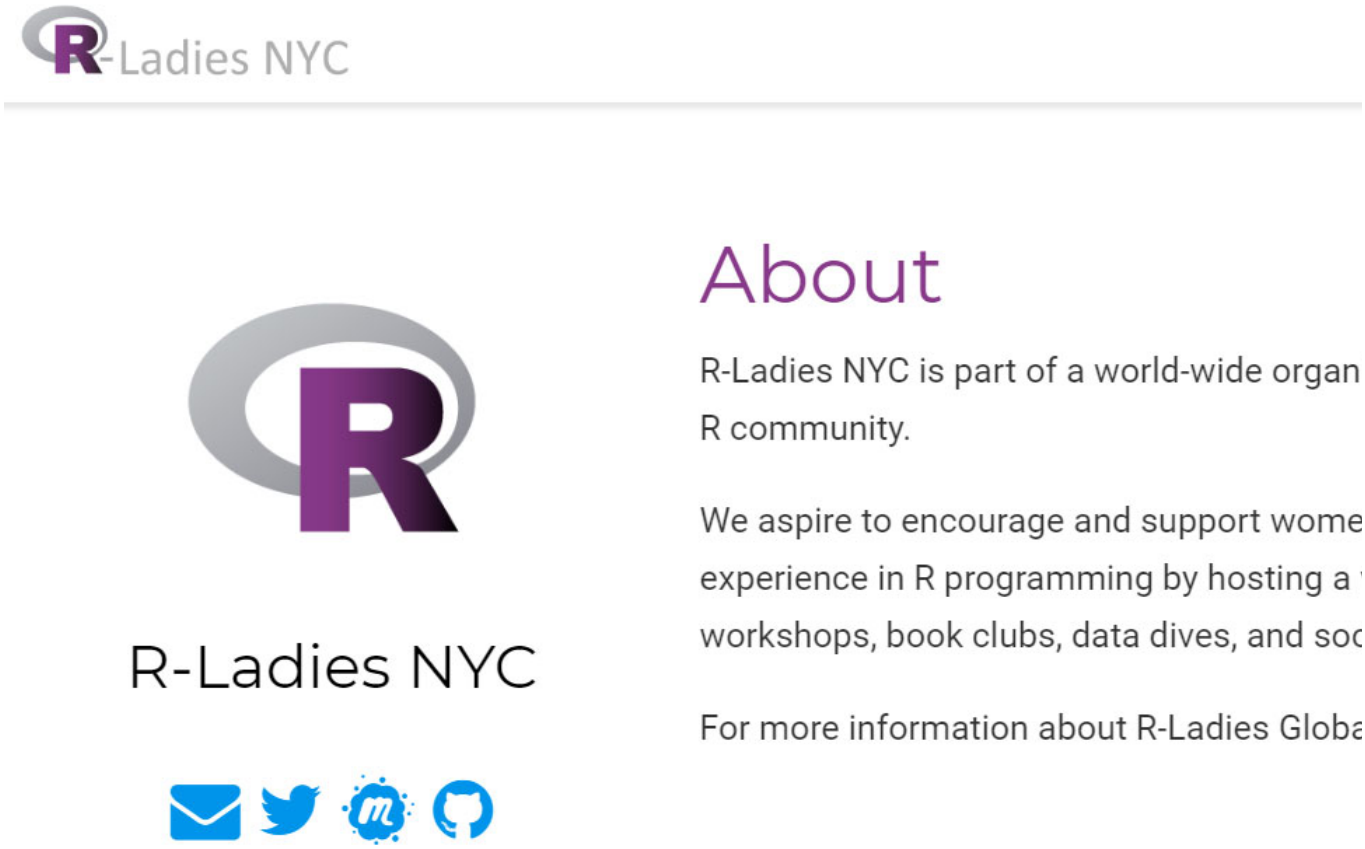


Blogs

R Markdown websites are simple to create and deploy, but can become cumbersome if you make frequent updates or additions to the website, as in the case of a blog. Luckily, the R package `blogdown` exists just for this purpose. `blogdown` is an R package that allows you to create static websites, which means that the deployed version of the website only consists of JavaScript, HTML, CSS, and images. Luckily the `blogdown` package makes it so that you don't have to know any of those things to create a beautiful website for your blog, powered by Hugo.

For a complete resource on using the `blogdown` website, checkout this short blogdown book.

I don't have a personal blog, so let's look at the website I built to feature the events and blog of the R-Ladies NYC organization as an example.



Setup

The first three steps are similar to those from creating a basic R Markdown website:

1. Create a GitHub repository named YOUR_GH_NAME.github.io, where YOUR_GH_NAME is your GitHub username, initialized with a README file
2. Clone the GitHub repo to a local directory with the same name
3. Add an R Project to the local directoroy

Next we get started with `blogdown`.

4. Install `blogdown` and Hugo

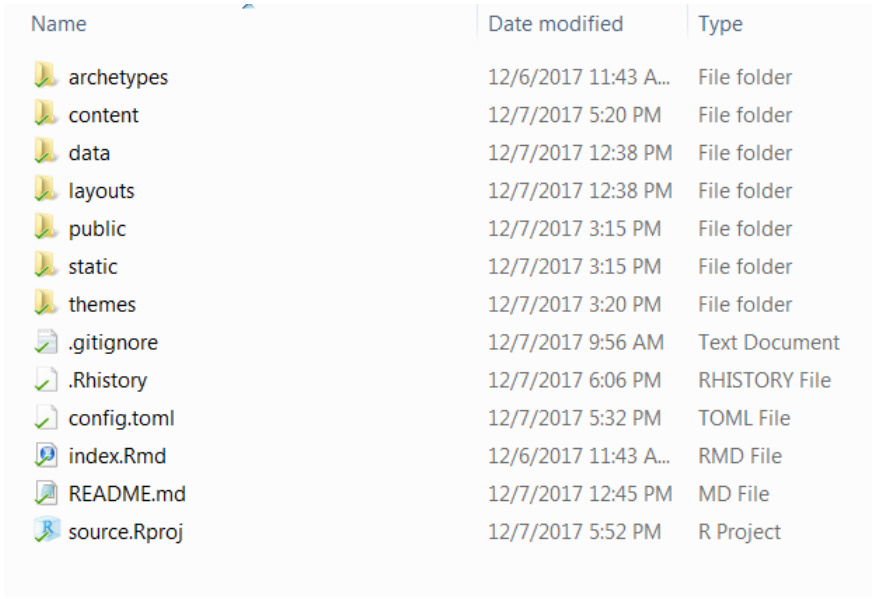
```
install.packages("blogdown")
blogdown::install_hugo()
```

5. Choose a theme and find the link to the theme's GitHub repository. In this case themes aren't quite as easy to change as with basic R Markdown websites, so choose carefully.

6. Within your project session, generate a new site. The option `theme_example = TRUE` will obtain the files for an example site that you can then customize for your needs. Below "user/repo" refers to the GitHub username and GitHub repository for your selected theme.

```
blogdown::new_site(theme = "user/repo", theme_example = TRUE)
```

This will generate all of the file structure for your new blog.



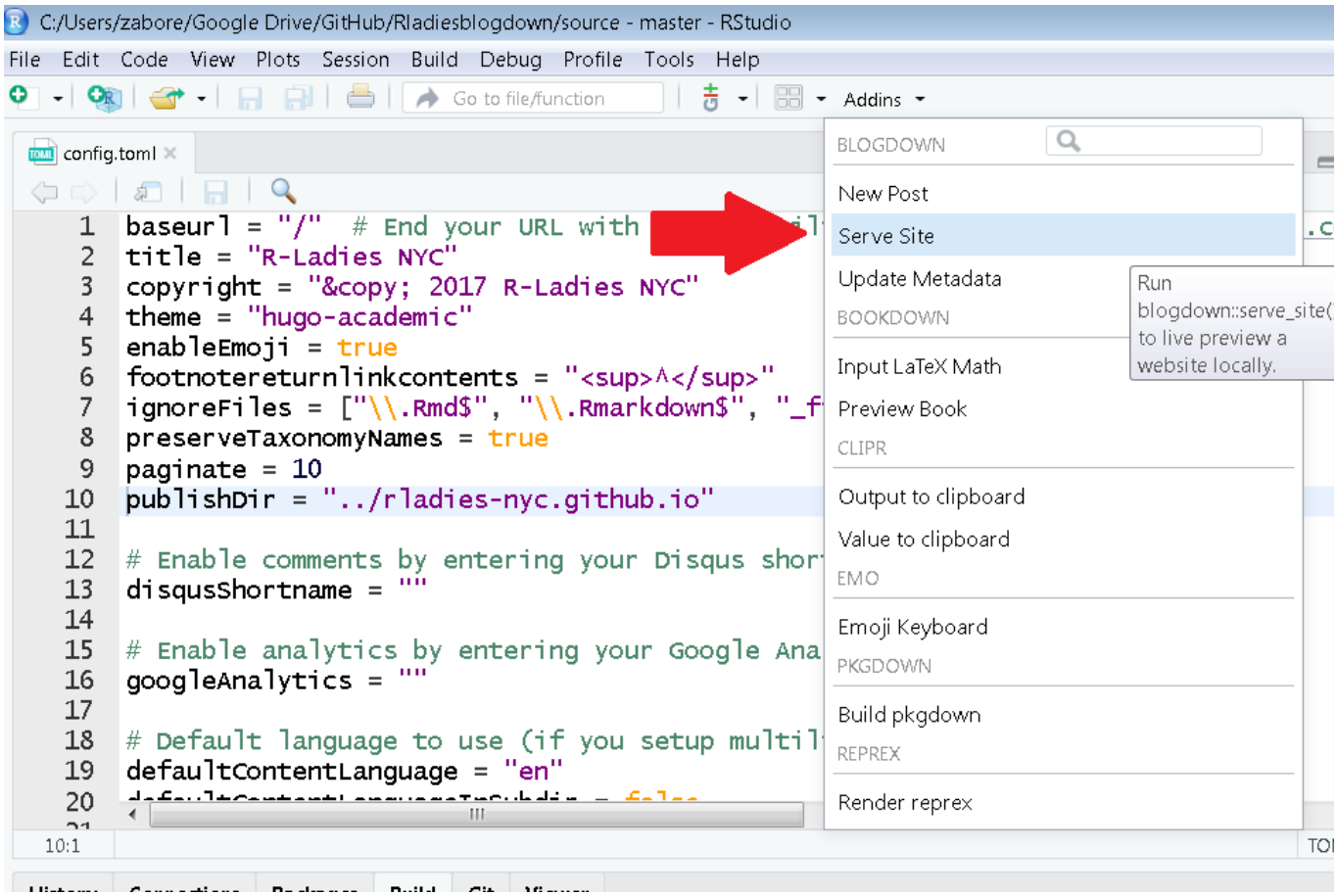
Name	Date modified	Type
archetypes	12/6/2017 11:43 A...	File folder
content	12/7/2017 5:20 PM	File folder
data	12/7/2017 12:38 PM	File folder
layouts	12/7/2017 12:38 PM	File folder
public	12/7/2017 3:15 PM	File folder
static	12/7/2017 3:15 PM	File folder
themes	12/7/2017 3:20 PM	File folder
.gitignore	12/7/2017 9:56 AM	Text Document
.Rhistory	12/7/2017 6:06 PM	RHISTORY File
config.toml	12/7/2017 5:32 PM	TOML File
index.Rmd	12/6/2017 11:43 A...	RMD File
README.md	12/7/2017 12:45 PM	MD File
source.Rproj	12/7/2017 5:52 PM	R Project

After this is complete, you should quit and then reopen the project. Upon reopening, RStudio will recognize the project as a website.

Customizing the appearance

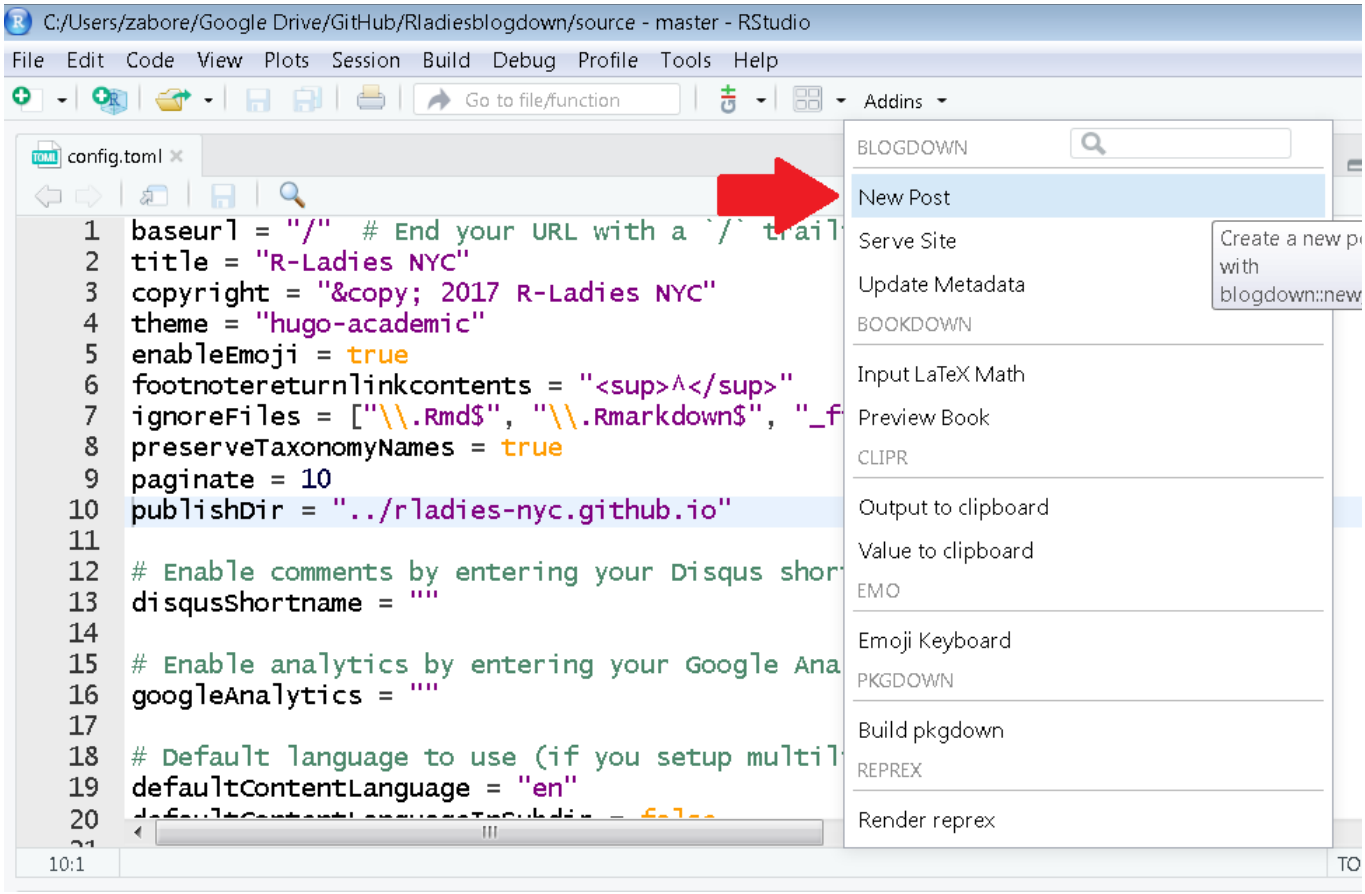
Make changes to the `config.toml` file (equivalent to the `_site.yml` from basic R Markdown websites) to change the layout and appearance of your website. The available features of the `config.toml` file will differ depending on your theme, and most theme examples come with a well annotated `config.toml` that you can use as a template.

Once you have customized your website features, click on the RStudio addin "Serve Site" to preview the site locally.

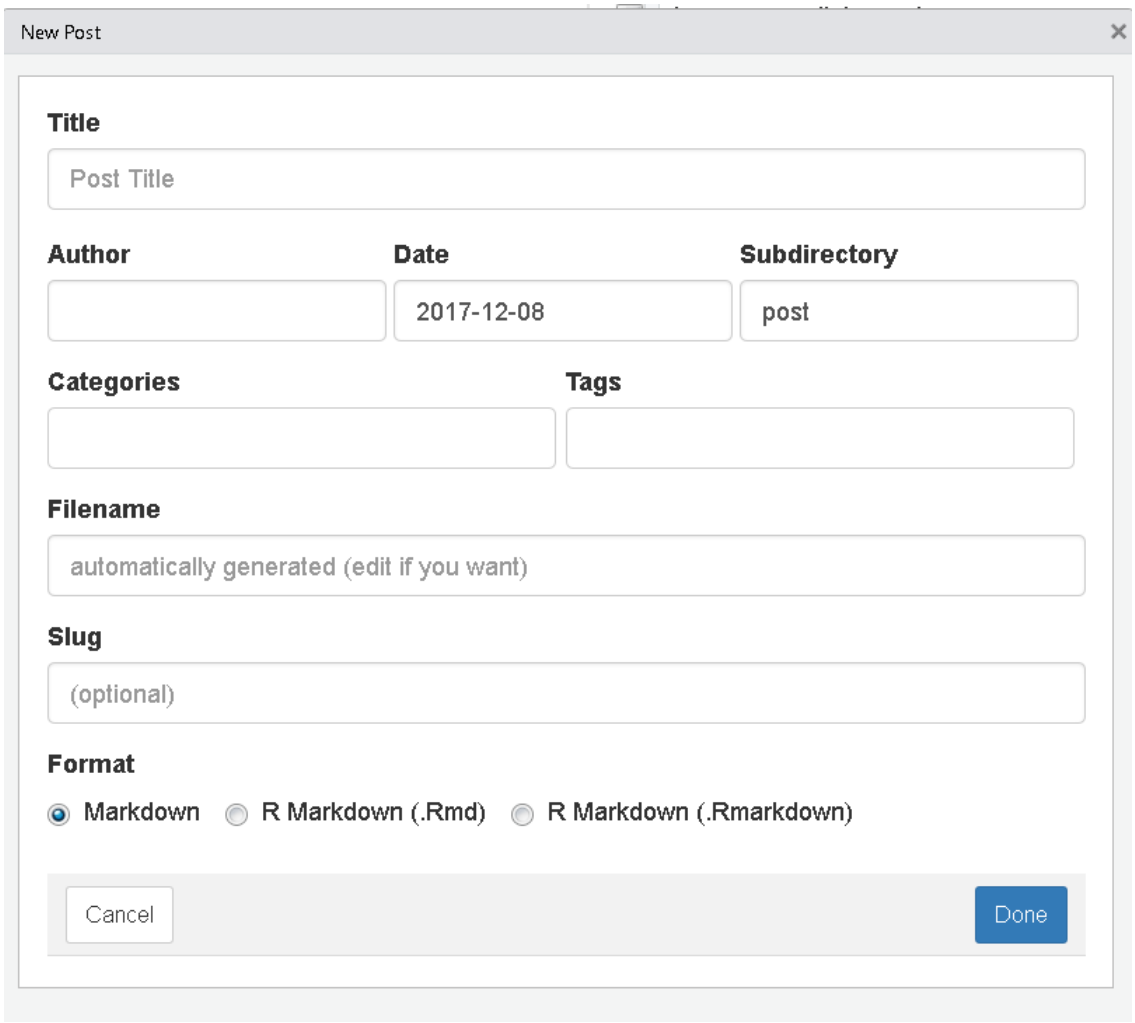


Writing a new blog post

There are several ways to create a new post for your site, but the easiest is using the RStudio addin "New Post":



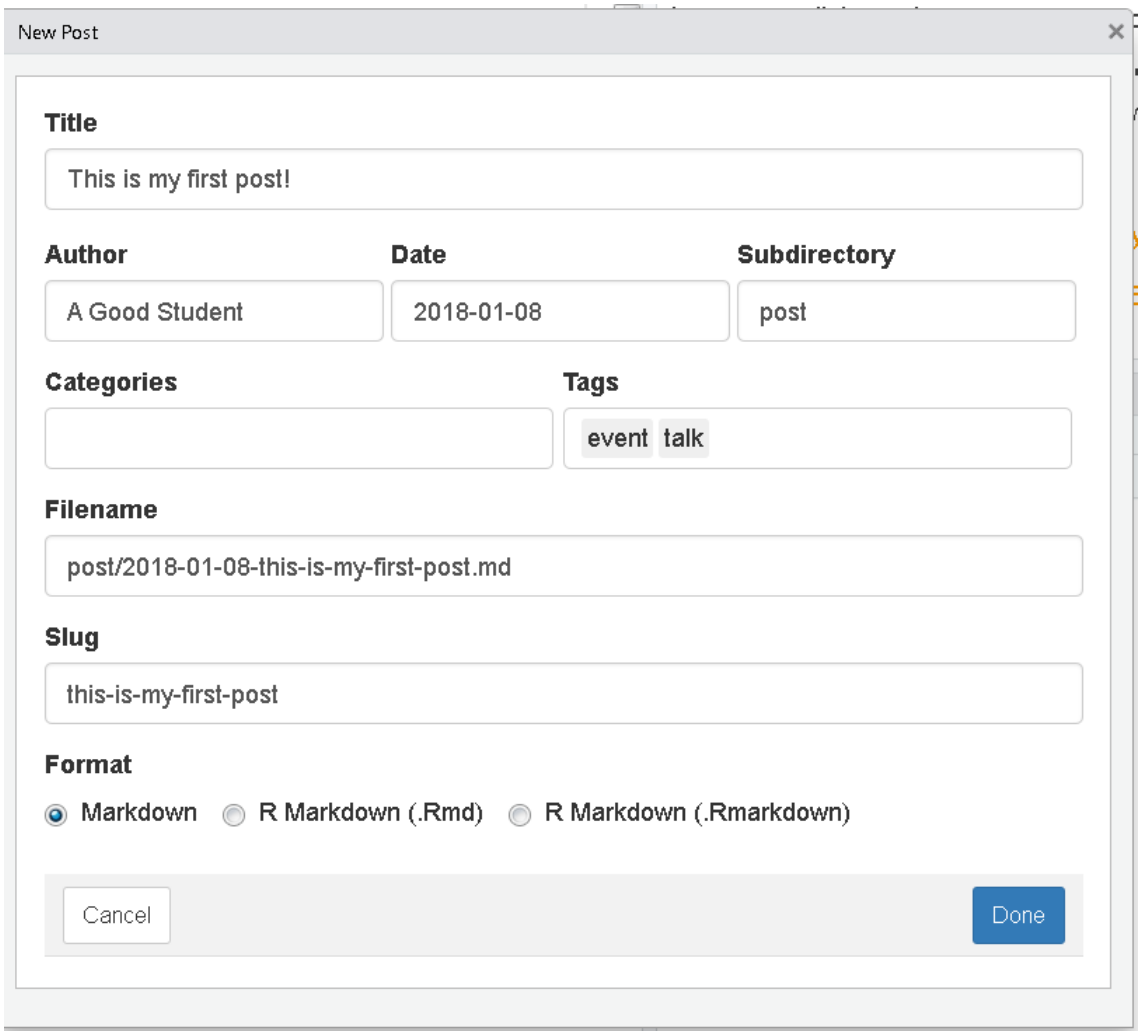
This opens a pop-up where you can enter the meta-data for a new post:



In addition to setting the Title, Author and Date of the post, you can additionally create categories, which will organize your posts in folders, and can add tags to posts, which can make them searchable within your site's content. Be aware that the functioning of these features will vary by theme. Dates can be in the future to allow future release of a post.

Notice at the bottom that you can select whether to use a regular markdown (`.md`) or R markdown (`.Rmd`) file. `.Rmd` files will have to be rendered before generating html pages so it is best practice to limit their use to cases where R code is included.

A file name and slug will automatically be generated based on the other metadata. The slug is a URL friendly title of your post.



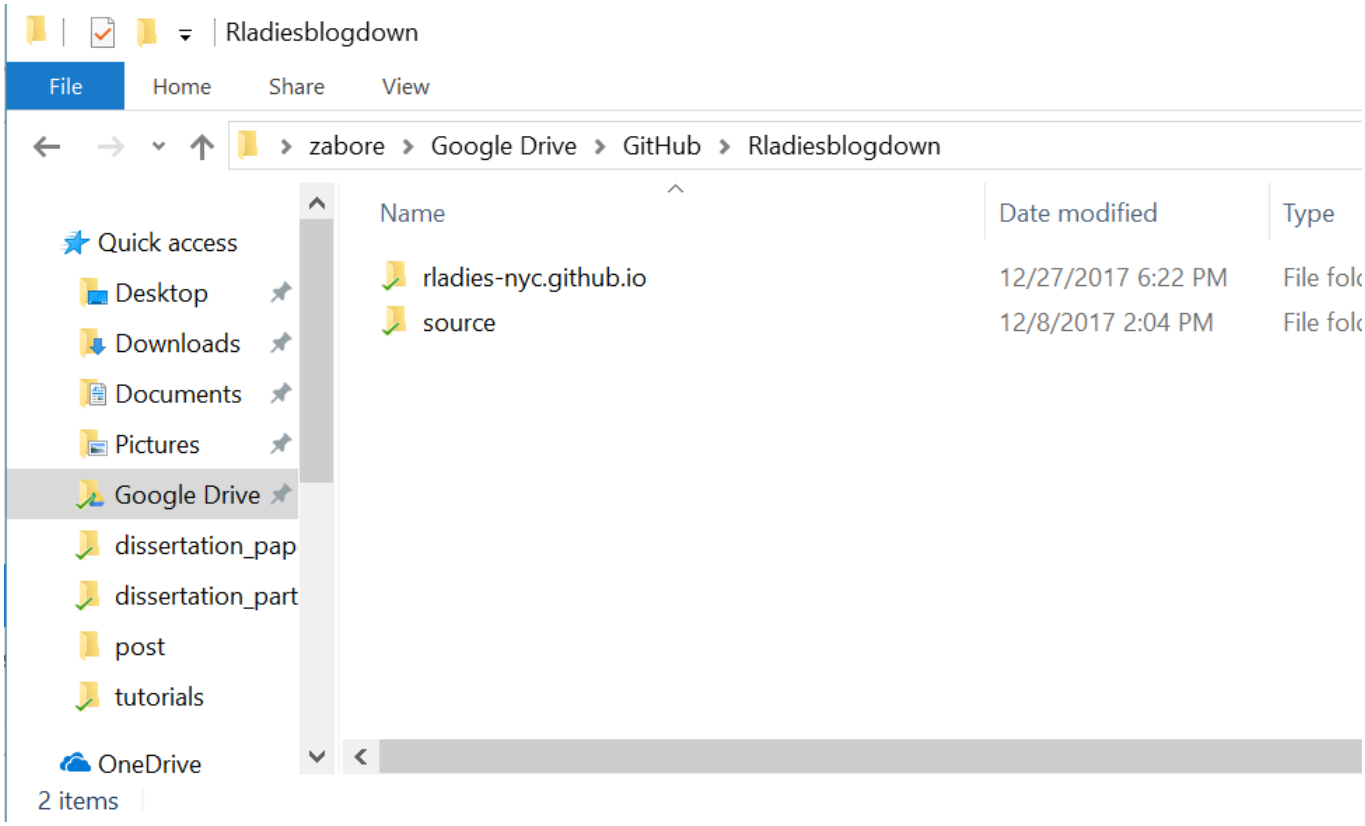
Hosting

A `blogdown` site is a bit more cumbersome both to build and to host on GitHub as compared to a regular R Markdown website, and as compared to what I described above.

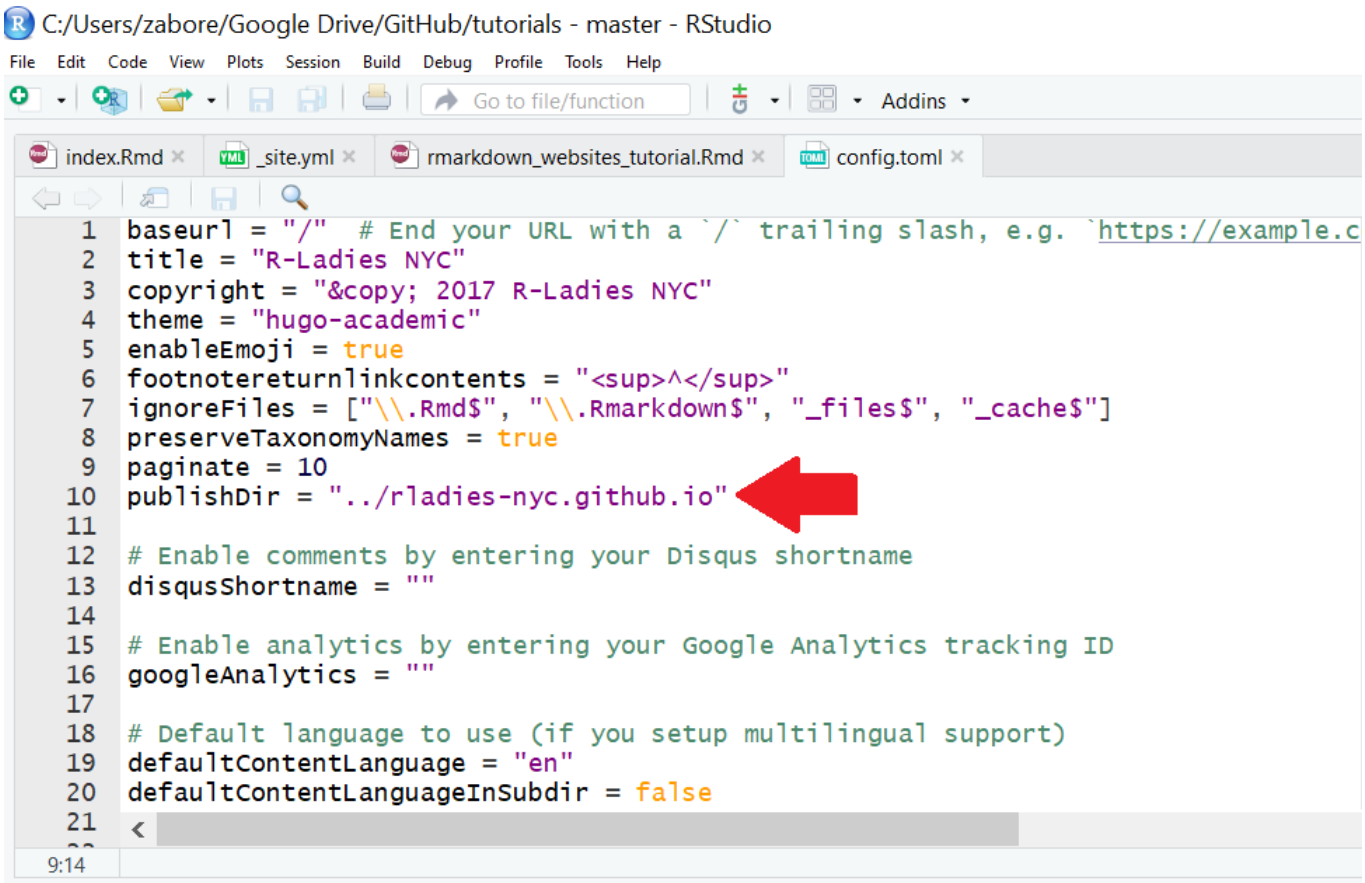
Problem 1: Because it is a static site, upon building, the files needed to generate the site online are automatically created in a separate subdirectory called `public` within your local directory. However this will cause problems with GitHub hosting since the files to host need to be in the local YOUR_GH_NAME.github.io directory

My solution:

1. Maintain separate directories for the source files (I named this directory “source”) and for the static files (the directory YOUR_GH_NAME.github.io) that will be generated on build. The “source” folder is where your R project and `config.toml` files will live.



2. In your `config.toml` use the option `publishDir =` to customize `blogdown` to publish to the YOUR_GH_NAME.github.io folder, rather than to the default local location



Problem 2: GitHub defaults to using Jekyll with website content, and this needs to be disabled since `blogdown` sites are built with Hugo

To get around this, you need to include an empty file named `.nojekyll` in your GitHub repo YOUR_GH_NAME.github.io, prior to publishing.