

02 computing infrastructure

teaching
data
science

don't start like this

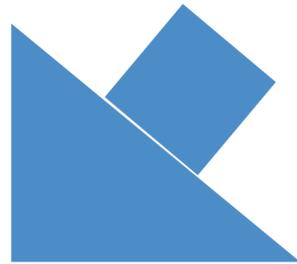
- Install R
- Install RStudio
- Install the following packages
 - rmarkdown
 - tidyverse
 - git
- Load these packages
- install git

start like this

- Go to rstudio.cloud
 - Log in
- ```
> hello R!
```

tidy

# why RStudio in the cloud?



reduce friction at first exposure to R



avoid local installation



install R and RStudio on a server and provide access to students:

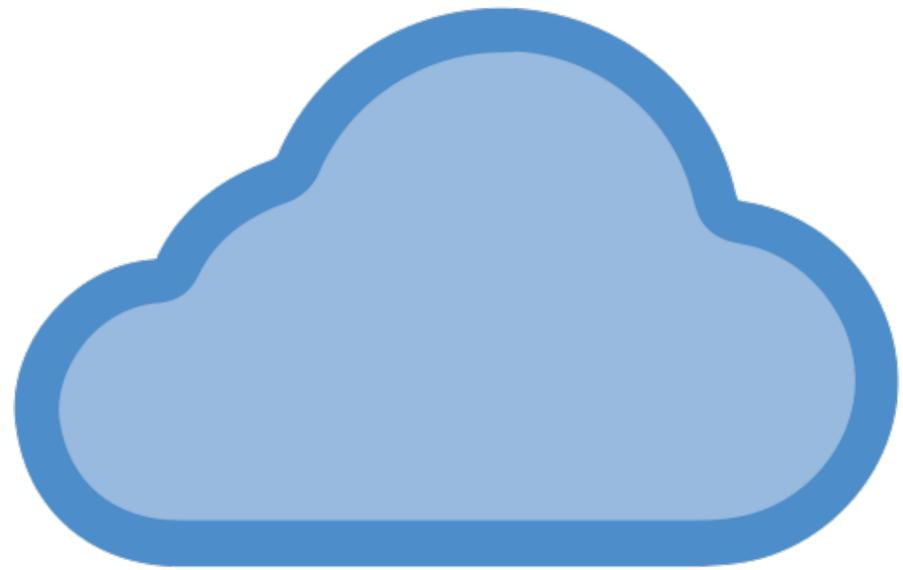
- Centralized RStudio server
- Dockerized RStudio server
- RStudio Cloud

Çetinkaya-Rundel, Mine, and Rundel, Colin. "Infrastructure and tools for teaching computing throughout the statistical curriculum." The American Statistician (2018). Part of the Practical Data Science for Stats collection.

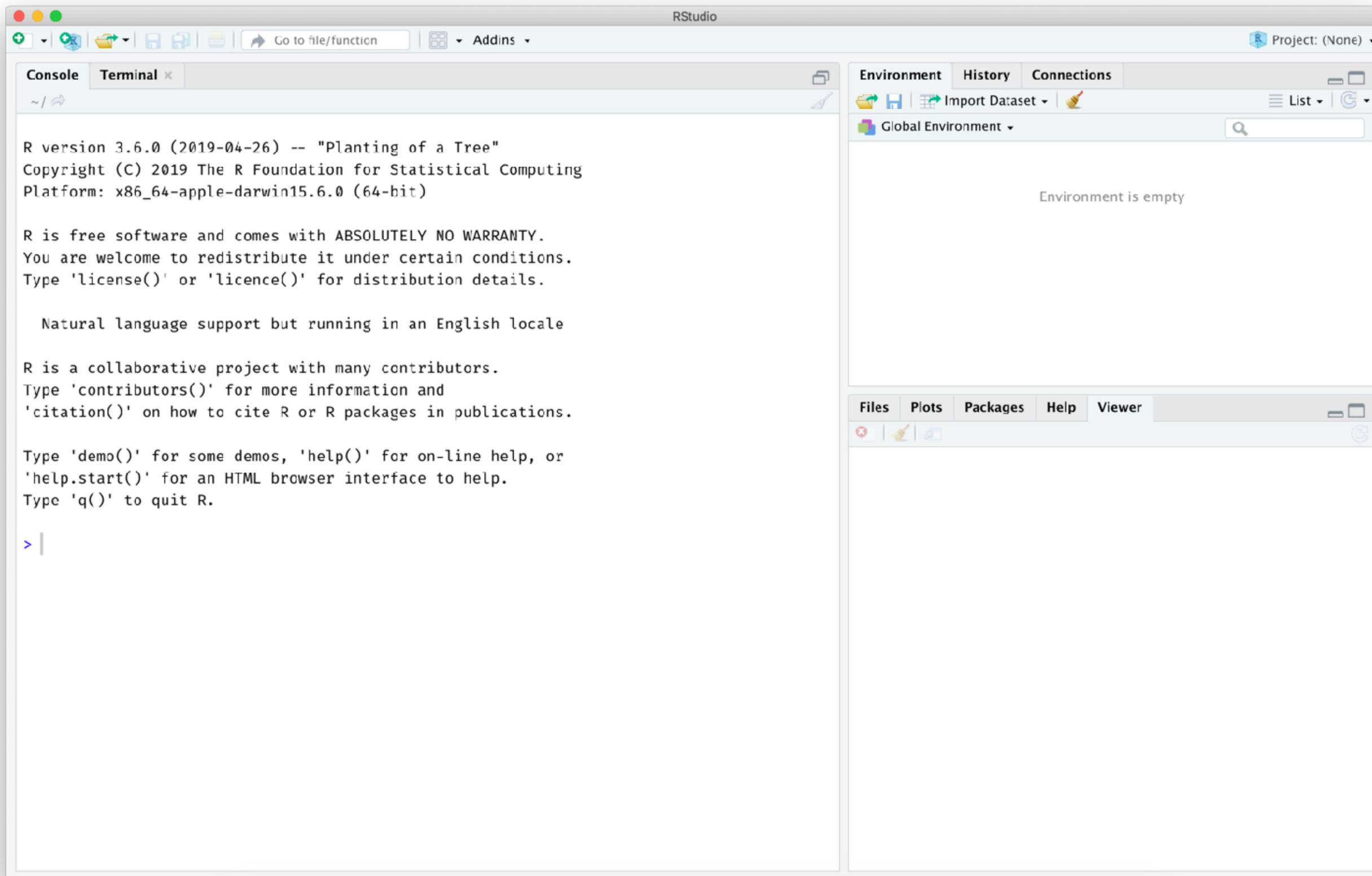
this webinar 😊



# what is RStudio Cloud?



We created **RStudio Cloud** to make it easy for professionals, hobbyists, trainers, teachers, and students to do, share, teach, and learn data science using R.



The screenshot displays the RStudio Cloud web interface. At the top, a browser tab is labeled "RStudio Cloud" and the address bar shows the URL "https://rstudio.cloud/project/374294", which is circled in red. The main workspace area is divided into three panes: a terminal window on the left, an environment pane on the top right, and a file browser on the bottom right.

The terminal window shows the following text:

```
R version 3.6.0 (2019-04-26) -- "Planting of a Tree"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: x86_64-pc-linux-gnu (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

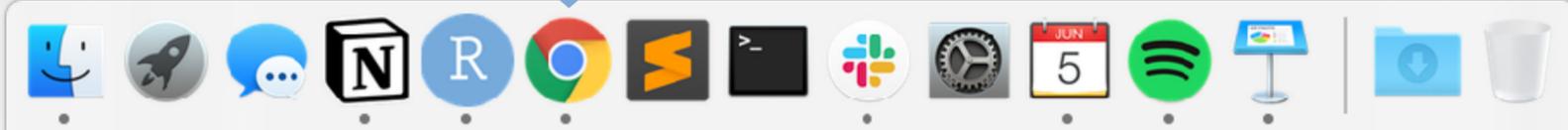
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

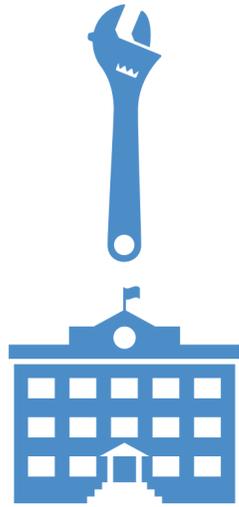
> |
```

The environment pane shows "Global Environment" and "Environment is empty". The file browser shows a directory structure with the following files:

| Name          | Size  | Modified             |
|---------------|-------|----------------------|
| ..            |       |                      |
| .Rhistory     | 0 B   | Jun 5, 2019, 8:32 AM |
| project.Rproj | 205 B | Jun 5, 2019, 8:32 AM |



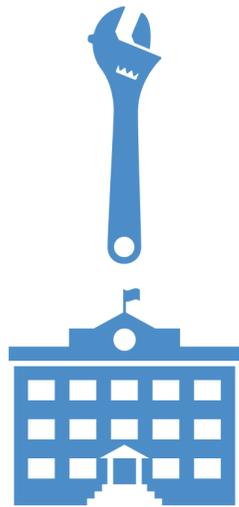
# why RStudio Cloud?



does not require IT support

features designed for instructors:

# why RStudio Cloud?

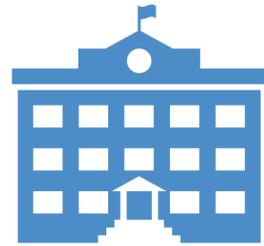


does not require IT support

features designed for instructors:

- classes can be organized in workspaces
- members can be assigned different roles: instructor, TA, student
- projects can be public or private
- projects can be made into assignments
- students can make copies of projects created by instructor
- instructor can peek into student projects
- a base project template can ensure same packages in each new project created in the workspace
- git works out of the box

# contexts

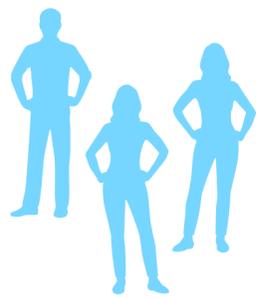


intro stat /  
data science



upper level stats / data  
science / programming

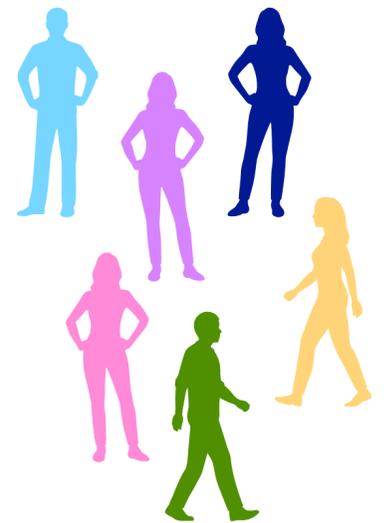
workshops

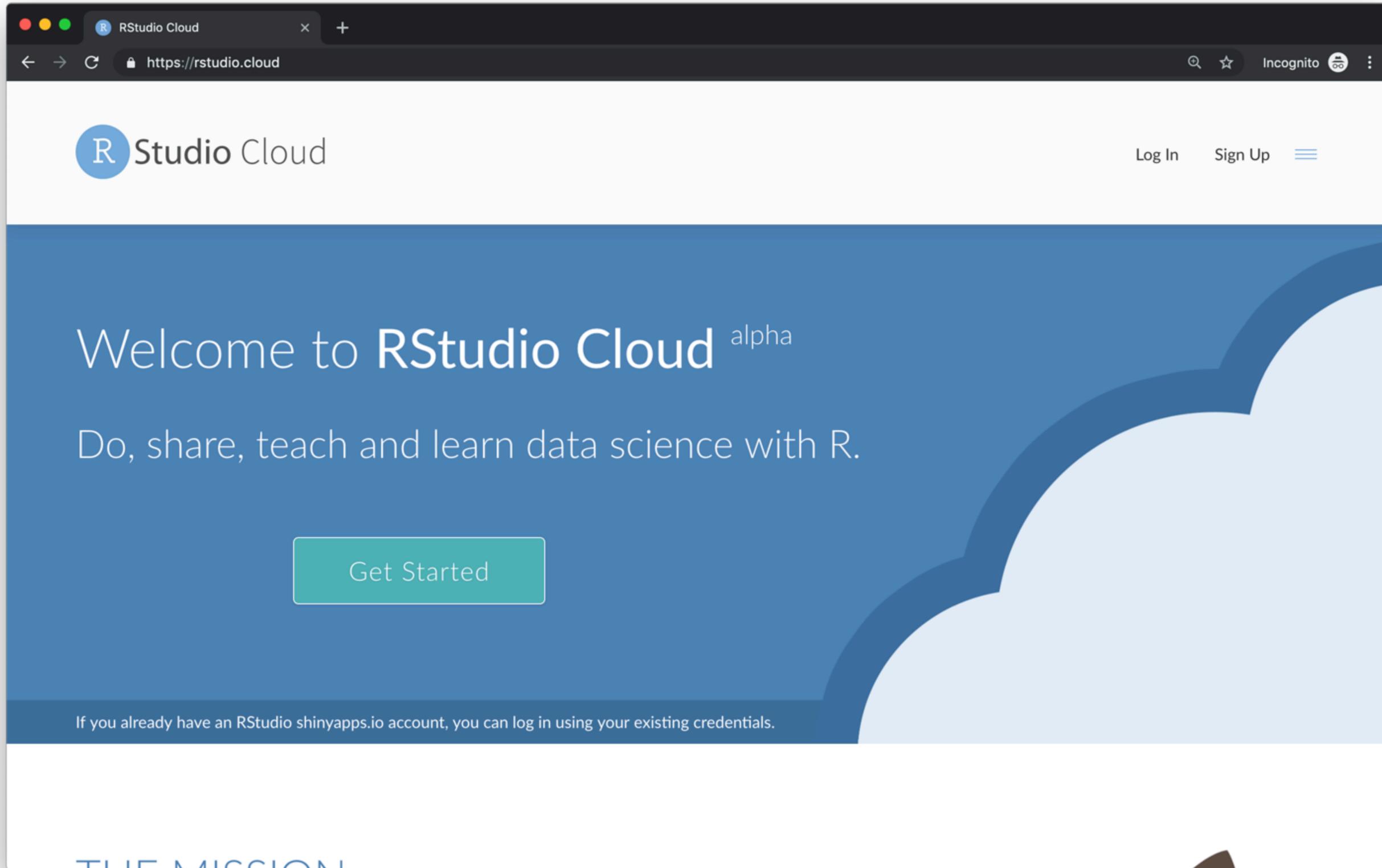


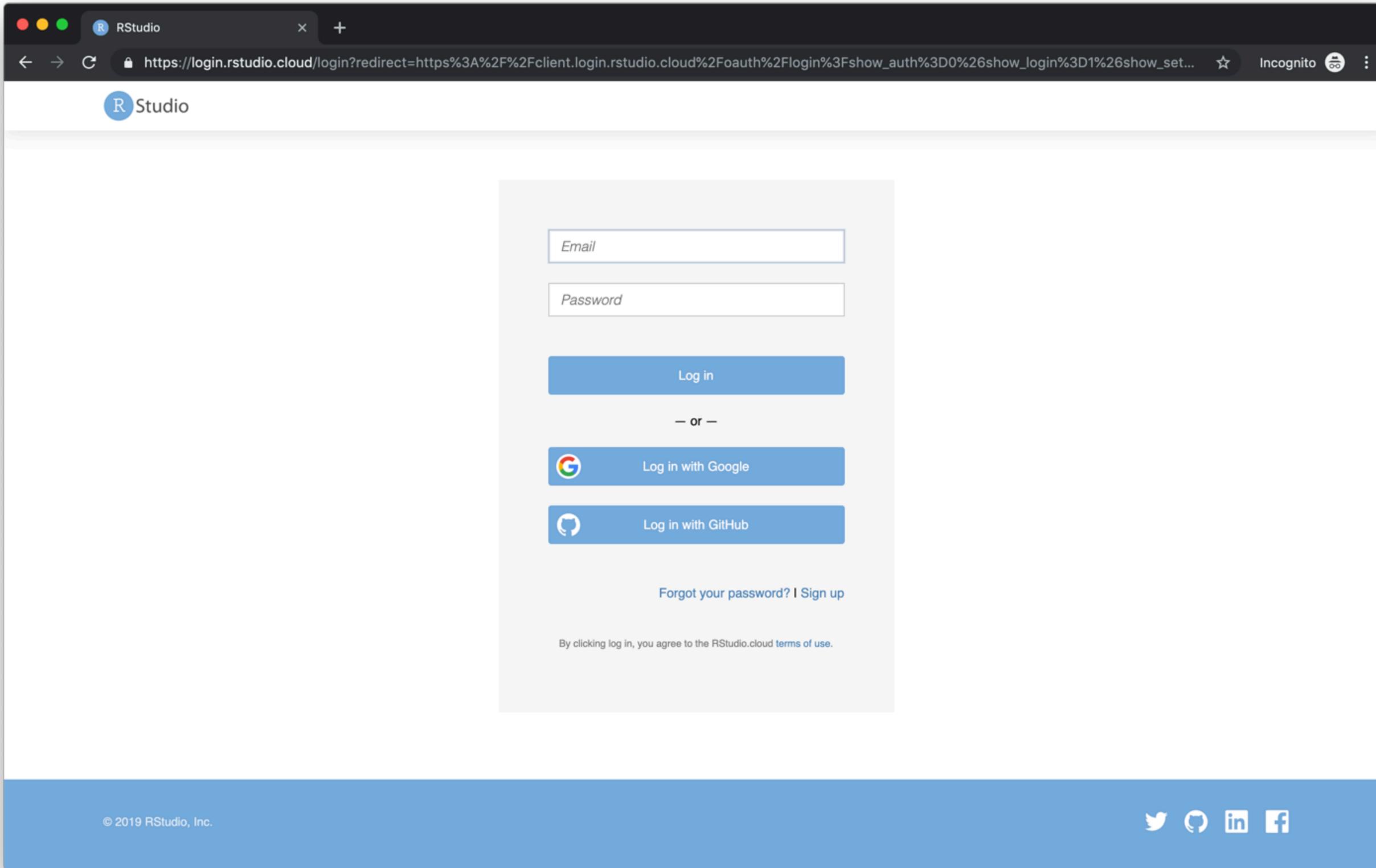
little to no background in  
stats, data science,  
programming



varied computing  
background and different  
computer setups





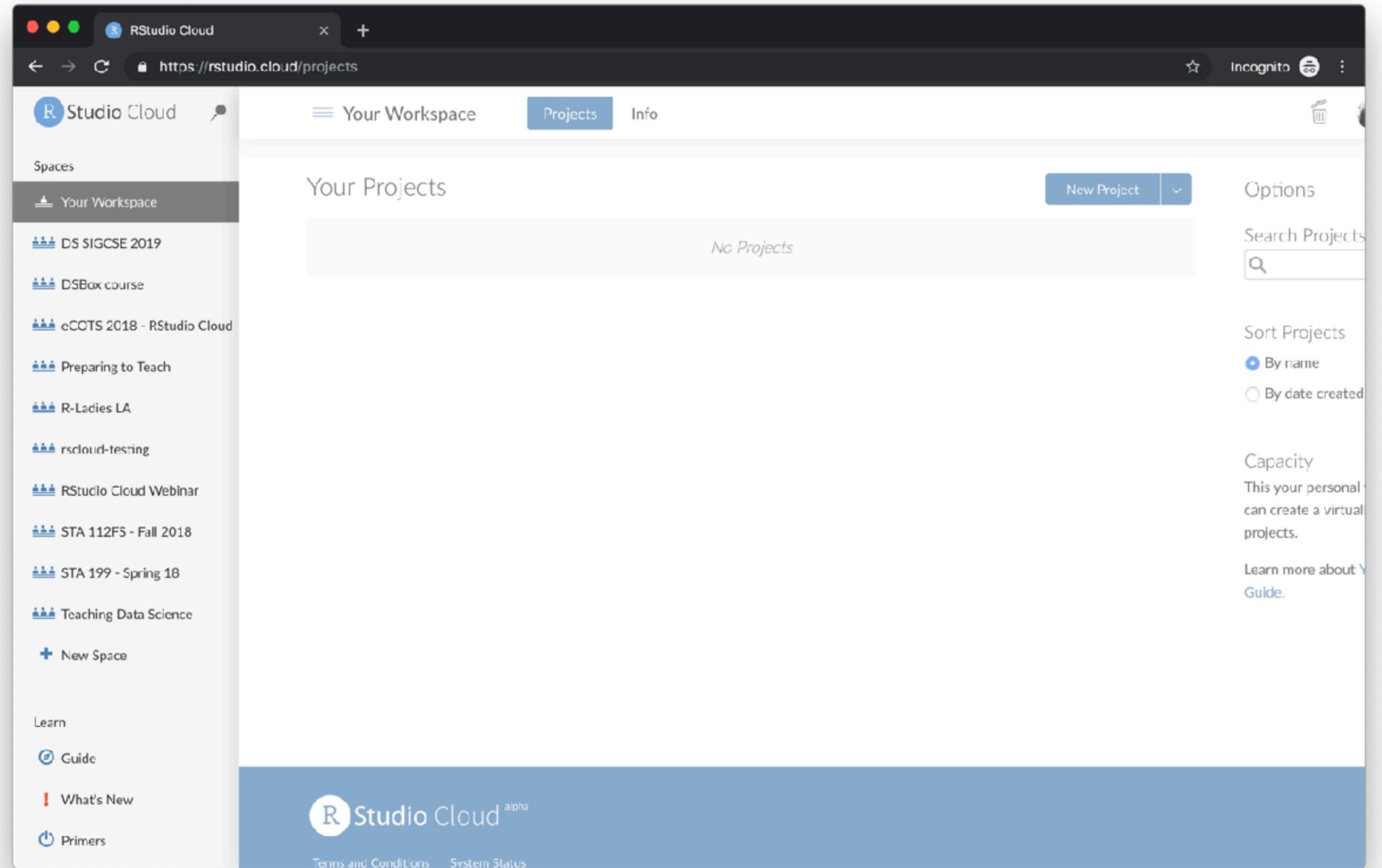


log in with Google,  
GitHub, or  
[shinyapps.io](https://shinyapps.io)

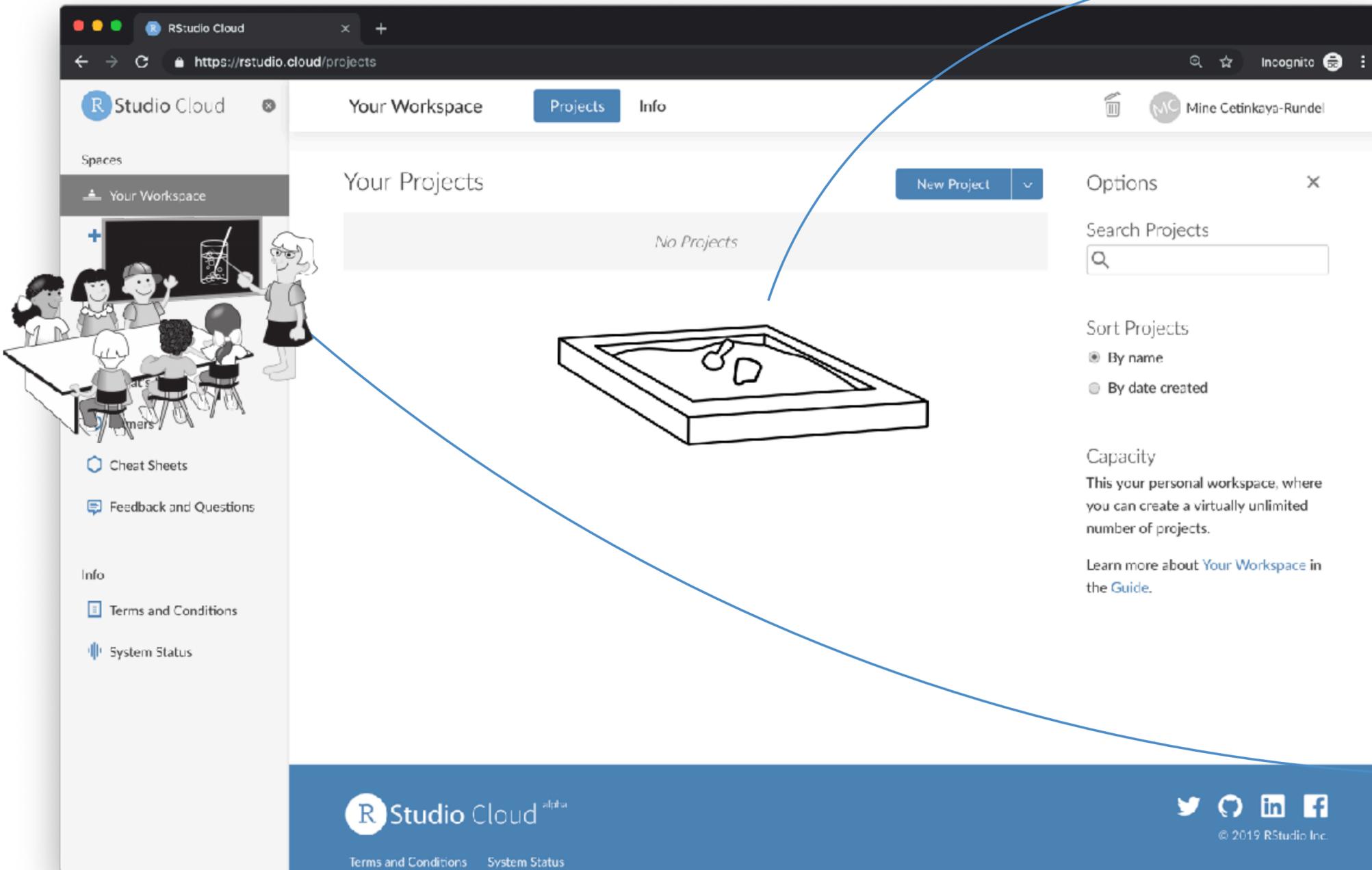
or create a new  
account

# > Your turn!

Log out of RStudio Cloud and log back in.



# workspaces



when you create an account on RStudio Cloud you get a workspace of your own - projects you create here are can be public or private

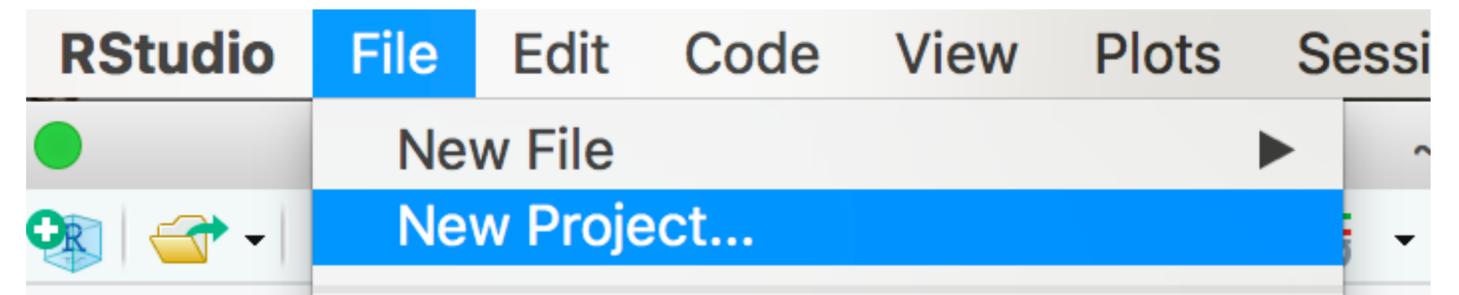
you can add a new workspace and control its permissions - projects you create here can also be public or private

# projects

a new project in RStudio Cloud



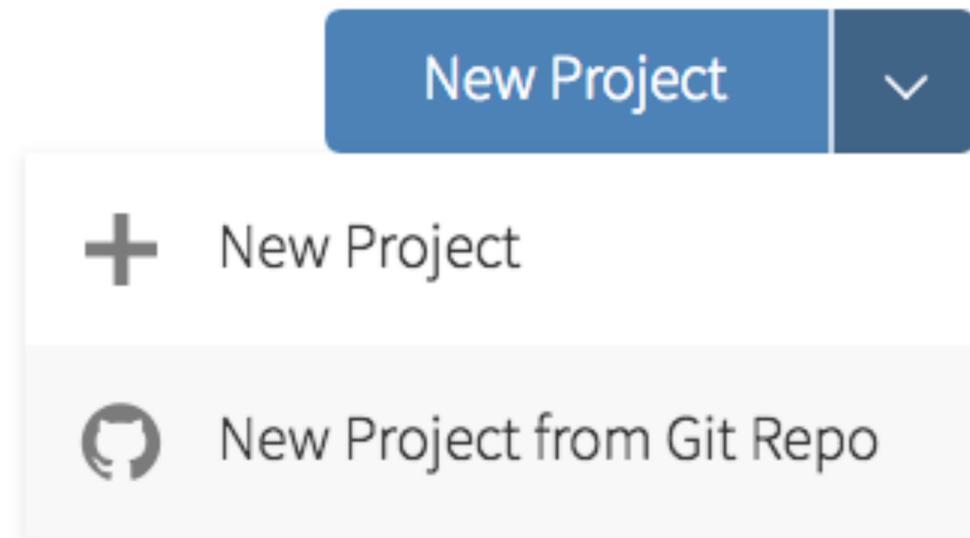
is a new project in RStudio



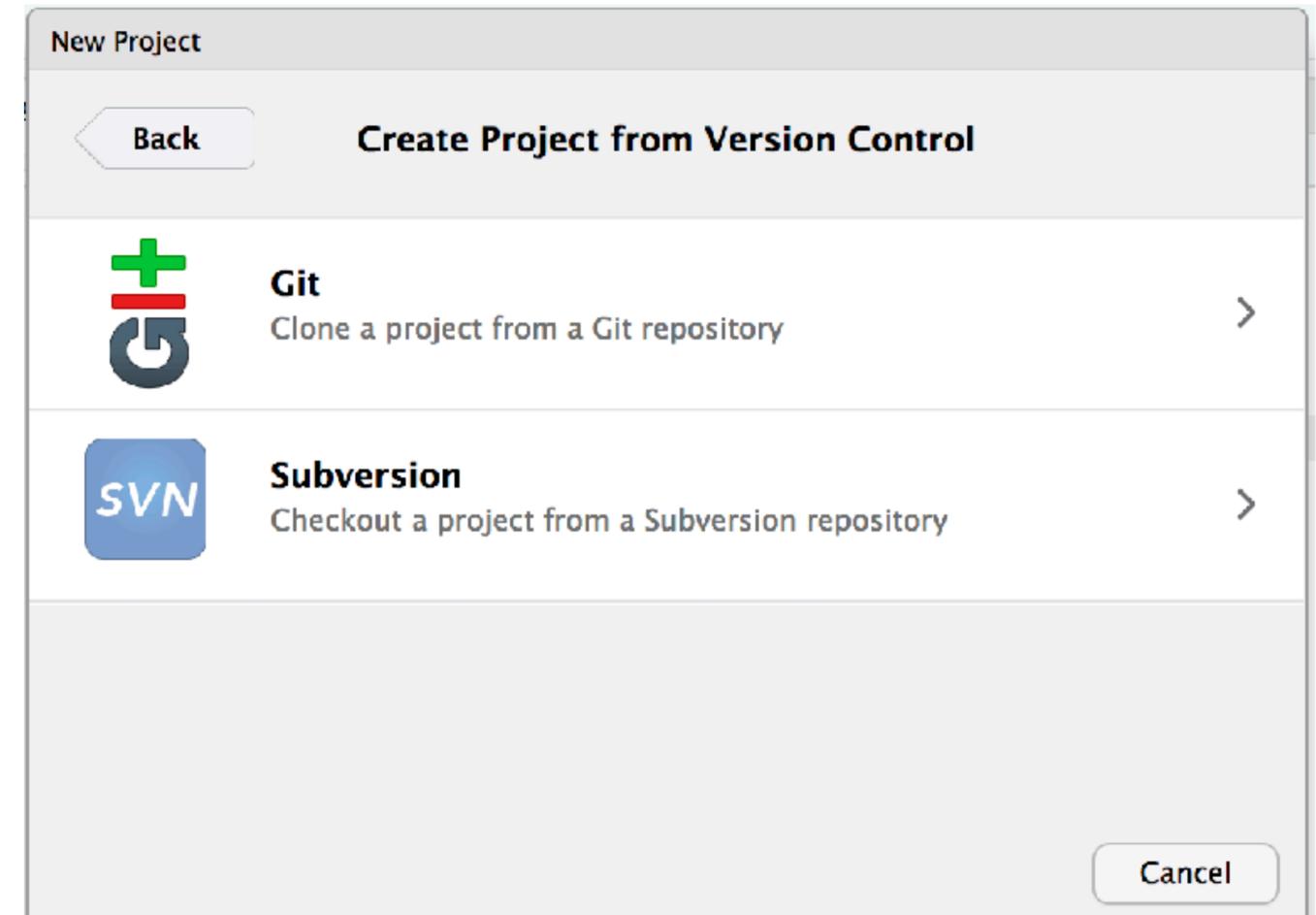
If you use RStudio, use projects! Trust me, you won't regret it. Find out more at [r4ds.had.co.nz/workflow-projects.html](https://r4ds.had.co.nz/workflow-projects.html).

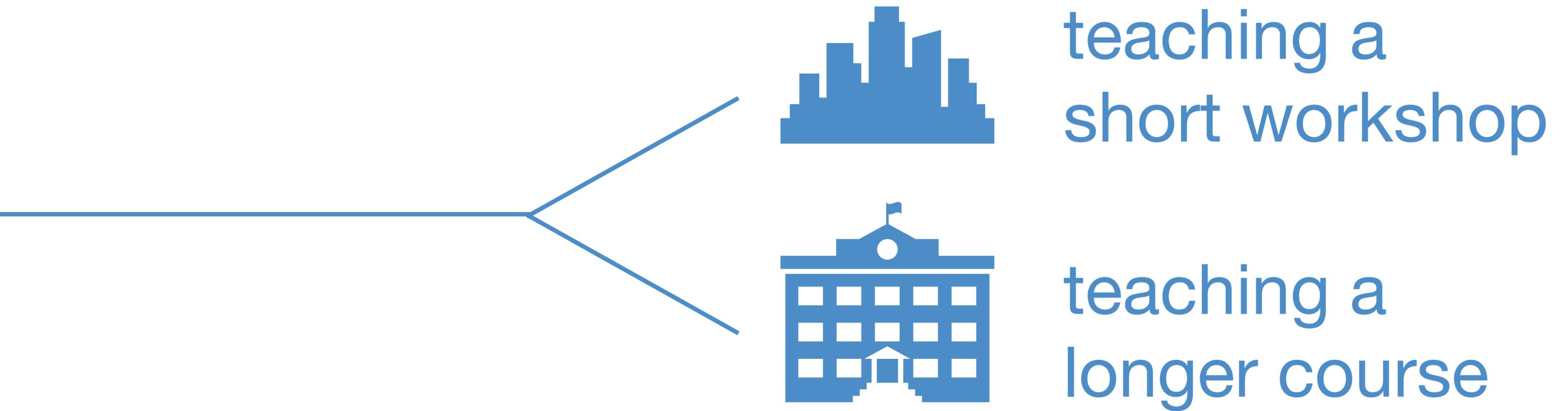
# projects from git

a new project from Git Repo  
in RStudio Cloud



is creating (cloning) a project  
from a Git repository RStudio







teaching a  
short workshop



teaching a  
longer course



**Mine CetinkayaRundel**

@minebocek

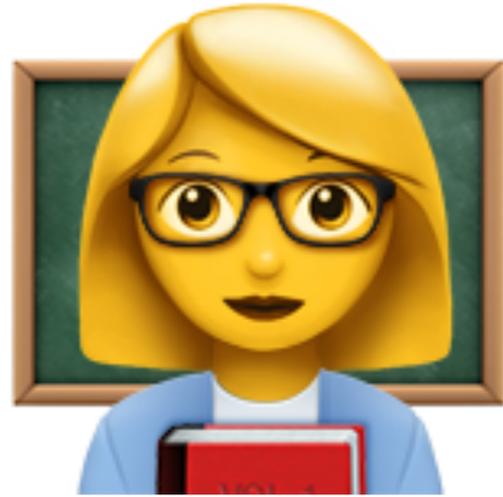


Replying to @noamross @rstudio

Easy peasy, it'll even fit in a tweet:

- Go to [rstudio.cloud](https://rstudio.cloud) -> Login -> New Project
- Install packages, add scripts, Rmds etc.
- Gear icon -> Access -> Everyone
- Copy URL and share

3:06 PM - 29 May 2019



instructor



student

Studio Cloud x

Spaces

Your Workspace

+ New Space

Learn

- Guide
- What's New
- Primers
- Cheat Sheets
- Feedback and Questions

Info

- Terms and Conditions
- System Status

## Your Projects

New Project ▾

No Projects

Options ✕

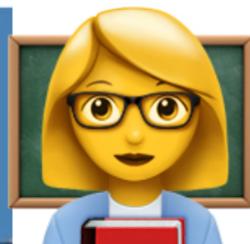
Search Projects

- Sort Projects
- By name
  - By date created

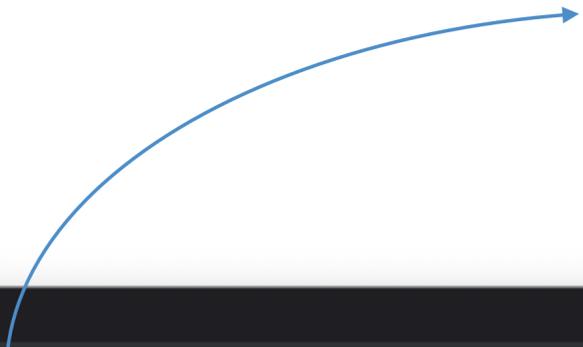
Capacity

This your personal workspace, where you can create a virtually unlimited number of projects.

Learn more about [Your Workspace](#) in the [Guide](#).



# [rstd.io/cloud-workshop-project](https://rstd.io/cloud-workshop-project)



template.Rmd

```
1 ---
2 title: "Template"
3 author: "Mine"
4 date: "6/5/2019"
5 output: html_document
6 ---
7
8 {r setup, include=FALSE}
9 knitr::opts_chunk$set(echo = TRUE)
10 ---
11
12 ## R Markdown
13
14 This is an R Markdown document. Markdown is a simple formatting syntax for authoring
15 HTML, PDF, and MS Word documents. For more details on using R Markdown see
16 <http://rmarkdown.rstudio.com>.
```

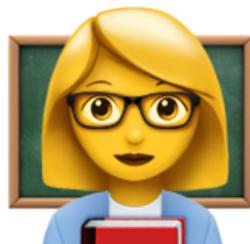
Environment: Global Environment - Environment is empty

| Name          | Size  | Modified             |
|---------------|-------|----------------------|
| ..            |       |                      |
| .Rhistory     | 0 B   | Jun 5, 2019, 9:41 AM |
| project.Rproj | 205 B | Jun 5, 2019, 9:41 AM |
| template.Rmd  | 828 B | Jun 5, 2019, 9:43 AM |

Console:

```
/cloud/project/
* DONE (readxl)
* installing *binary* package 'tidyr' ...
* DONE (tidyr)
* installing *binary* package 'broom' ...
* DONE (broom)
* installing *binary* package 'modelr' ...
* DONE (modelr)
* installing *binary* package 'tidyverse' ...
* DONE (tidyverse)

The downloaded source packages are in
'/tmp/RtmpUxzq2A/downloaded_packages'
```





Search input field with a microphone icon on the right.

Google Search I'm Feeling Lucky



# sharing an individual project

try it out at [rstd.io/cloud-workshop-project](https://rstd.io/cloud-workshop-project)

- ✓ students land directly in a project upon login
- ✓ works well for workshops where all work will be completed in a single project
- ✓ also great for sharing code in general, e.g. collaboration, replexes, etc.

- ! students need to remember to make a copy of the project (which means you need to remember to remind them!)
- ! changes you make after student launches the project won't propagate to their project

# > Your turn!

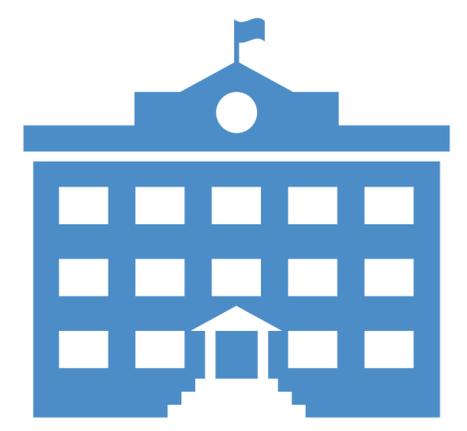
## **You're the instructor:**

- Create a new **project** and give it a name.
- Create a template R Markdown document in the project.
- Change the access level of the project so others can see it as well.
- Grab the project URL and share it with your neighbor:
  - *Tip:* You can create a short link for the URL at [bitly.com](https://bitly.com).

**Now you're the student:** Access your neighbor's project as if you're the student and they're the instructor.



teaching a  
short workshop



teaching a  
longer course

RStudio Cloud × +

← → ↻ <https://rstudio.cloud/projects> 🔍 ☆ Incognito 🍪 ⋮

**R** Studio Cloud ×

Your Workspace **Projects** Info

MC Mine Cetinkaya-Rundel

Spaces

Your Workspace

**New Space**

Learn

- Guide
- What's New
- Primers
- Cheat Sheets
- Feedback and Questions

Info

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- System Status

## Your Projects

**New Project** ▼

Delete

### Workshop Materials

Created Jun 5, 2019 9:40 AM

### Options ×

Search Projects

Sort Projects

- By name
- By date created

### Capacity

This your personal workspace, where you can create a virtually unlimited number of projects.

Learn more about [Your Workspace](#) in the [Guide](#).



# > Your turn!

## **You're the instructor:**

- Create a new **workspace** and give it a name.
  - *Tip:* Check in with your neighbor and use a different name.
- Add a short description.

# getting students into class workspace

## Access

Invitation required  
Add specific members to the space by sending invitations.

Shared  
Anyone with the sharing link can access the space.

Initial Role (i)

Contributor

 Copy Sharing Link

after drop/add switch over to this access level, use invitations for visitors added mid-semester

make workspace shared for a short period of time, share link with students, enroll them as contributors



# permission levels

**admin** manage users, view, edit and manage all projects **instructor**

**moderator** view, edit and manage all projects **TA**

**contributor** create, edit and manage their own projects **student**

**viewer** view projects shared with everyone **auditor**



# permissions

## Permissions

- Contributors can see the members list
- Contributors can make their projects visible to all members
- Viewers can see the members list

students can see each others' names, but cannot change the visibility of their projects

auditors / visitors can't see students' names



# capacity

## Capacity

This space can have up to 9 more members.

Request More Members



### Request More Members



Total number of members you'd like in this space (approximate)



What you're using this space for

You should hear from us via our support system within 24 hours.

Thanks,

The RStudio Cloud Team

Request More Members



# > Your turn!

## **You're the instructor:**

- Change the settings of your workspace to Shared.
- Change the permissions so that contributors or viewers can't see the list of members and can't change the visibility of their projects.

## All Projects

New Project ▾

*No Projects*

### Options ✕

#### Search Projects

#### List Projects

- All
- Shared with everyone
- Yours

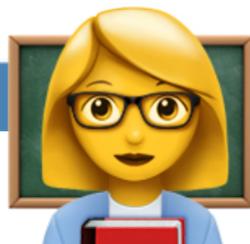
#### Sort Projects

- By name
- By date created

#### Capacity

This space can have up to 25 more projects.

Request More Projects

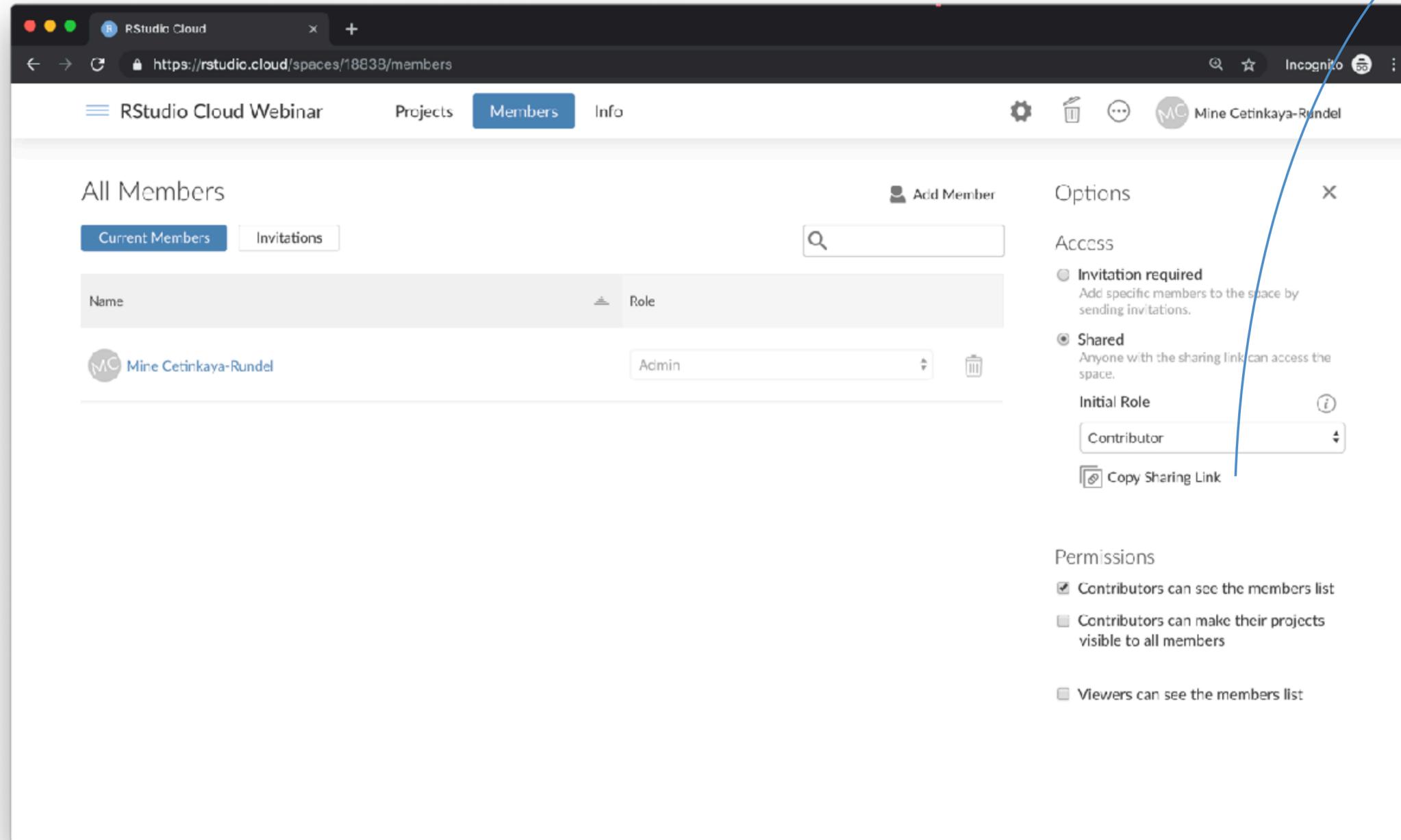


# > Your turn!

## **You're the instructor:**

- Add a base project to your workspace:
  - Install one or two of your favorite packages.
  - Start an R Markdown document so necessary packages get installed.
  - Add a `code-of-conduct.md`.
  - Make this project visible to everyone.
- In the settings menu, set this project as the base project.
- Create a new assignment: **hw-01**.

[rstd.io/cloud-course-workspace](https://rstd.io/cloud-course-workspace)



The screenshot shows the RStudio Cloud interface for a workspace named "RStudio Cloud Webinar". The "Members" tab is active, displaying a list of "All Members". One member, "Mine Cetinkaya-Rundel", is listed with the role "Admin". An "Options" sidebar is open on the right, showing settings for "Access" and "Permissions".

**Members List:**

| Name                  | Role  |
|-----------------------|-------|
| Mine Cetinkaya-Rundel | Admin |

**Options Panel:**

- Access:**
  - Invitation required: Add specific members to the space by sending invitations.
  - Shared: Anyone with the sharing link can access the space.
- Initial Role:** Contributor
- Copy Sharing Link

**Permissions:**

- Contributors can see the members list
- Contributors can make their projects visible to all members
- Viewers can see the members list





Google Search I'm Feeling Lucky

 A privacy reminder from Google

REMIND ME LATER REVIEW NOW

United Kingdom

Advertising Business

Privacy Terms Settings



# > Your turn!

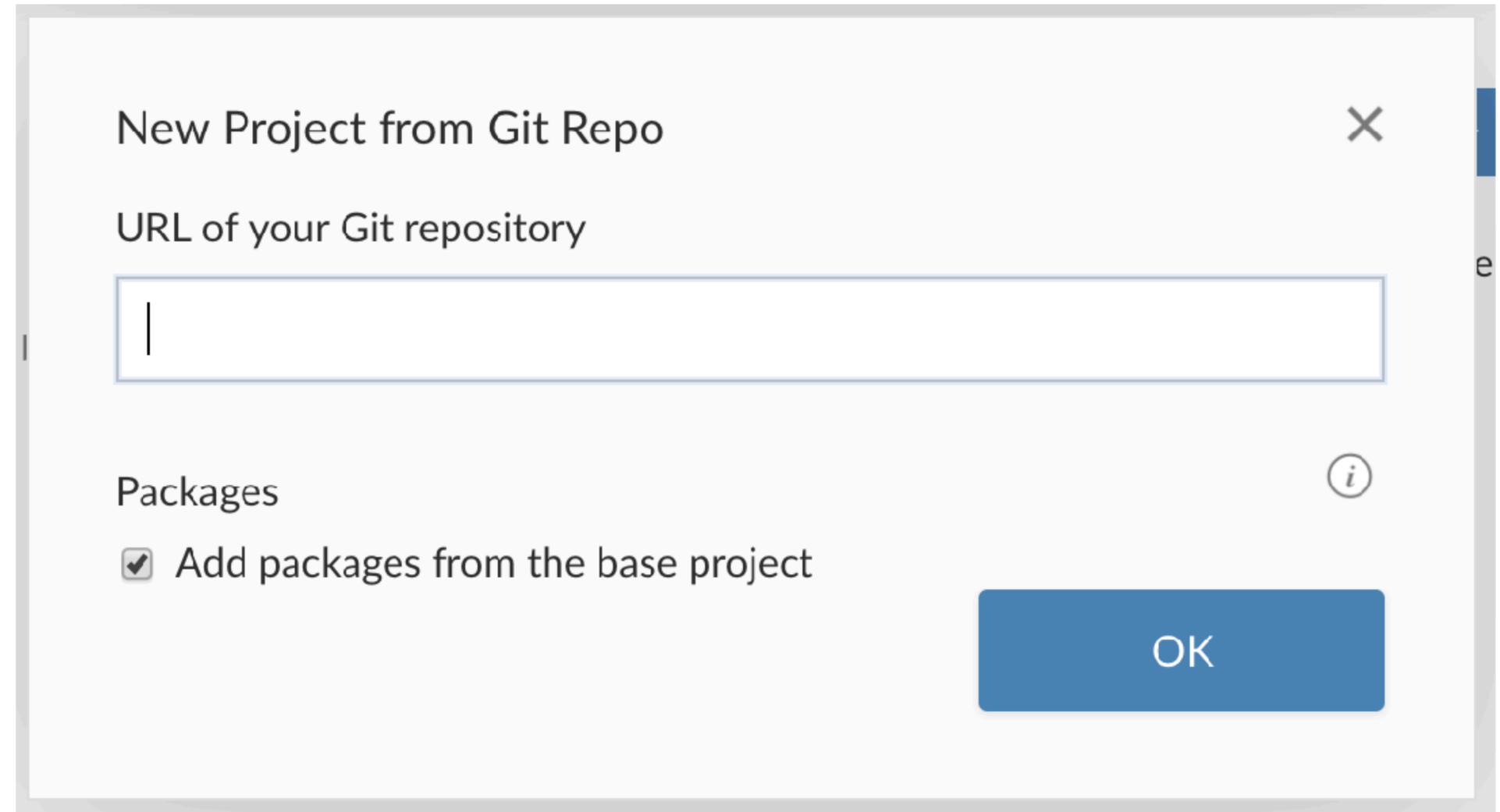
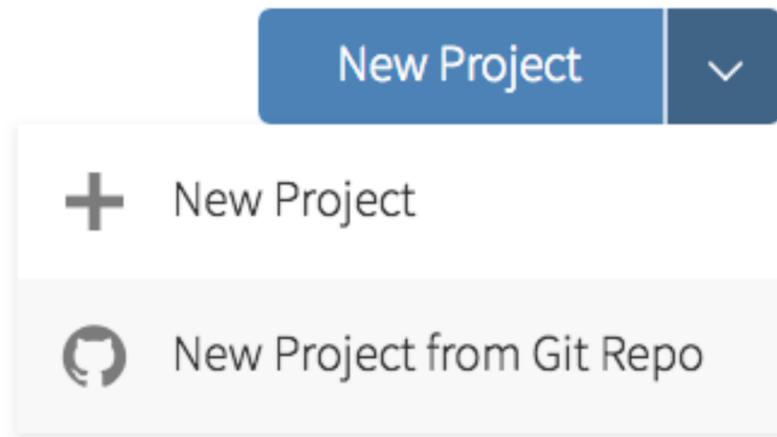
## **You're the instructor:**

- Grab the sharing link for your workspace.
- Make a short link for it.
- Share it with your neighbor.

## **Now you're the student:**

- Access your neighbor's workspace and start the assignment.

# git integration

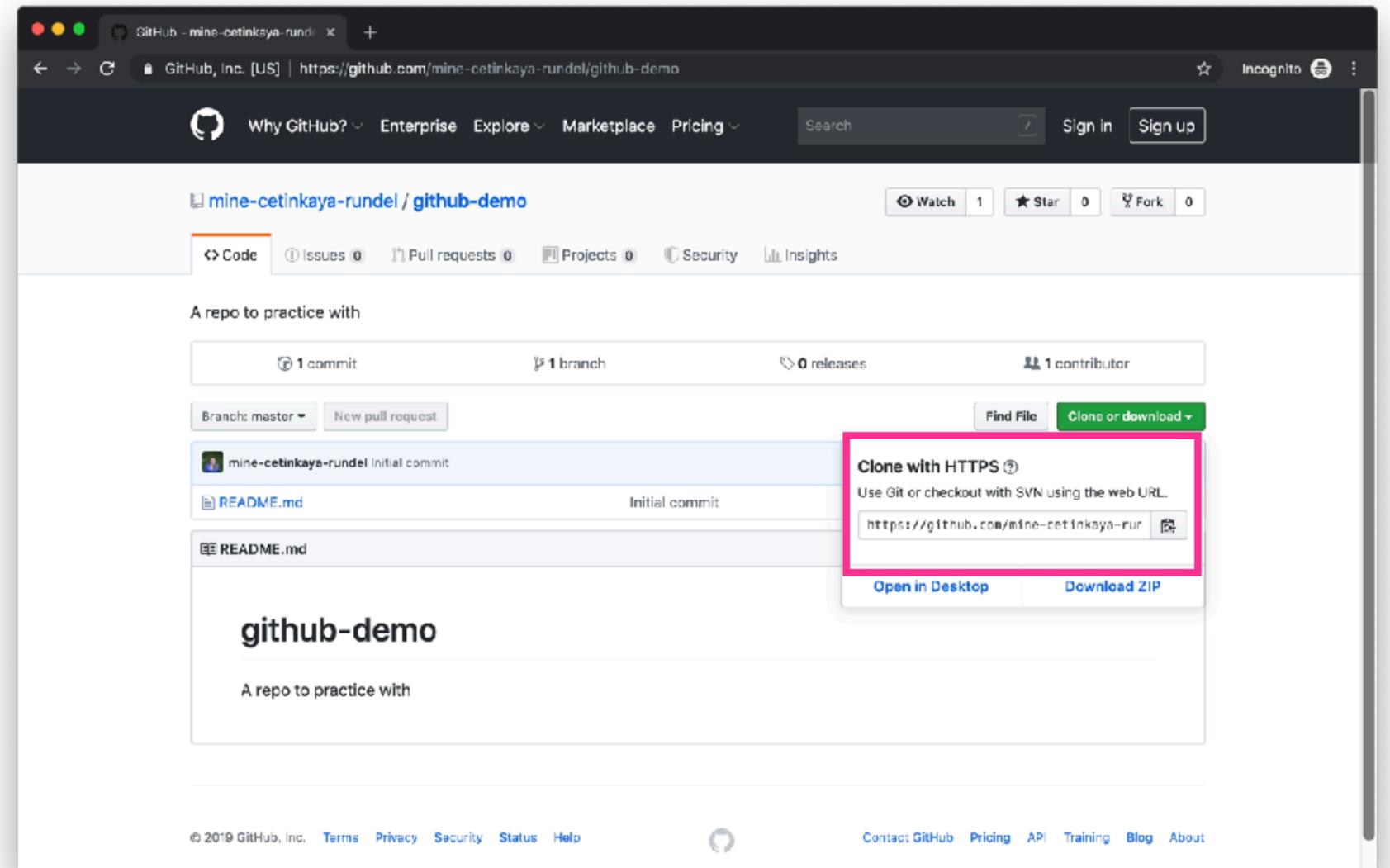


+ base project template can be used, so new project from git also has the right packages installed!

# > Your turn!

## You're still the student:

- Stay in your neighbor's workspace.
- Grab the HTTPS URL of a GitHub repo of your own. If you don't have one, you can use [rstd.io/gh-demo](https://github.com/mine-cetinkaya-rundel/github-demo).
- Start a new project from the GitHub repo.



# sharing a workspace

try it out at [rstd.io/cloud-course-workspace](https://rstd.io/cloud-course-workspace)

- ✓ various permission levels
- ✓ base projects with desired packages installed
- ✓ assignments, which remove the need to remind students to make a copy of the project before starting work
- ✓ ability to peek into students' projects

! students land in the workspace, may need to provide instructions for the next steps

! you can update the base project throughout the course, but it will only be applied to projects created going forward

# parting remarks

# tips



each project is allocated 1GB of RAM

💡 test things out before assignments involving large datasets



what your students see is not always what you see

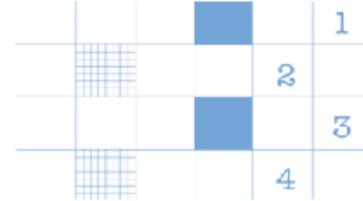
💡 create a secondary account and add as a student

The Basics



Start here to learn the skills that you will rely on in every analysis (and every primer that follows): how to inspect, visualize, subset, and transform your data, as well as how to run code.

Work with Data



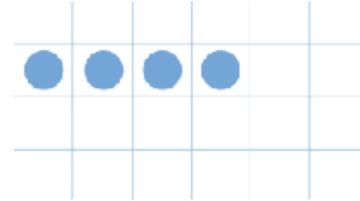
Learn the most important data handling skills in R: how to extract values from a table, subset tables, calculate summary statistics, and derive new variables.

Visualize Data



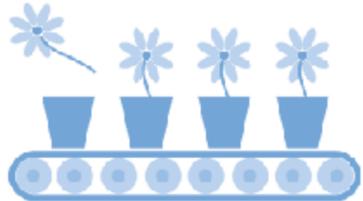
Learn how to use ggplot2 to make any type of plot with your data. Then learn the best ways to visualize patterns within values and relationships between variables.

Tidy Your Data



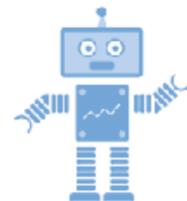
Unlock the tidyverse by learning how to make and use tidy data, the data format designed for R.

Iterate



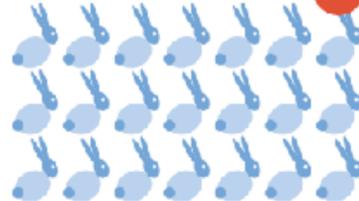
Master a core programming paradigm with the purrr package: for each \_\_\_\_ do \_\_\_\_.

Write Functions



Functions are the key to programming in R. This primer will teach you how to write and use your own reusable functions.

Report Reproducibly



Learn to report, reproduce, and parameterize your work with the best authoring format for Data Science: R Markdown.

Build Interactive Web Apps



Say hello to Shiny, R's package for building interactive web apps. Learn to turn your analyses into elegant tools to share with others.

Organize Your Work



Become an R guru by mastering all of the tools built into the RStudio IDE. Discover best practices for programming, debugging, version control, package building and more.



A large, bold, orange lowercase alpha symbol (α) is positioned on the left side of the slide.

## WORK IN PROGRESS

We're in alpha and still adding important features and improving performance, reliability and availability.

Please reach out with any questions or feedback at <https://community.rstudio.com/c/rstudio-cloud>.



## FREE LUNCH?

RStudio Cloud is currently free to use. As we learn what it costs to operate the service and how it is used by the community, we will offer free and paid plans, as we do with [shinyapps.io](https://shinyapps.io). We will be asking you for feedback on our ideas along the way.

\$ \$ \$

# > Your turn!

## **You're the instructor:**

- Go back to your workspace.
- Create a new project with one of your existing assignments to it.
  - If you don't have one of your own assignments you want to use, you can also use <https://github.com/rstudio-education/datascience-box/tree/master/assignments/hw-02>.
- Make the project an assignment.

## **Now you're the student:**

- Go back to your neighbor's workspace and peek at their new assignment.