

Computational infrastructures for teaching with R

Mine Çetinkaya-Rundel

Sep 18, 2018

tech stack



language

literate programming



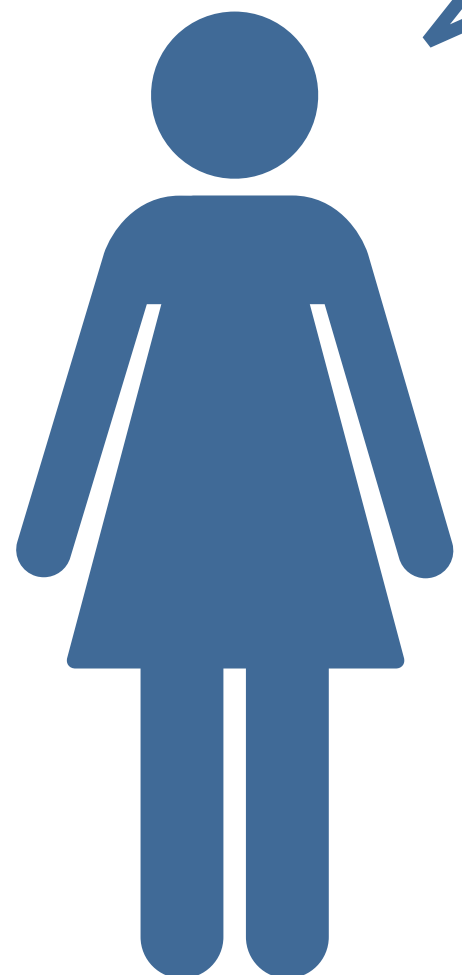
integrated
development
environment

version control &
collaboration



day one

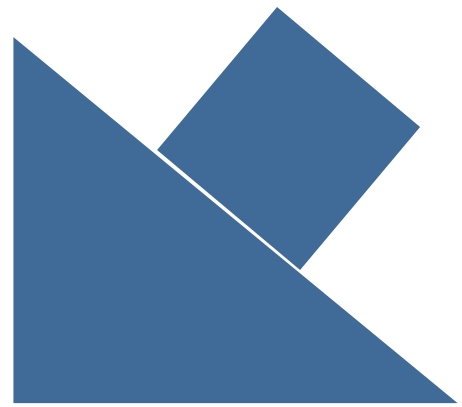
How would
you prefer to
spend first day
of class?



- 01 - Install R
- 02 - Install RStudio
- 03 - Install git
- 04 - Install packages

- 01 - Go to RStudio in the browser
- 02 - Log in
- 03 - Create a compelling data visualization

why RStudio in the cloud?



reduce friction at first exposure to R



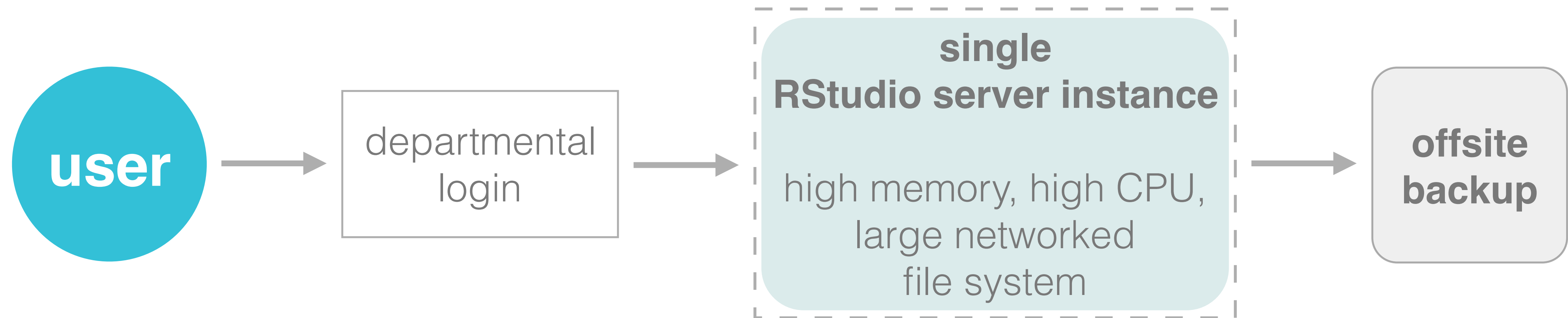
avoid local installation



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

- Centralized RStudio server
- Dockerized RStudio server
- RStudio Cloud

Centralized RStudio server



saxon.stat.duke.edu:8787/

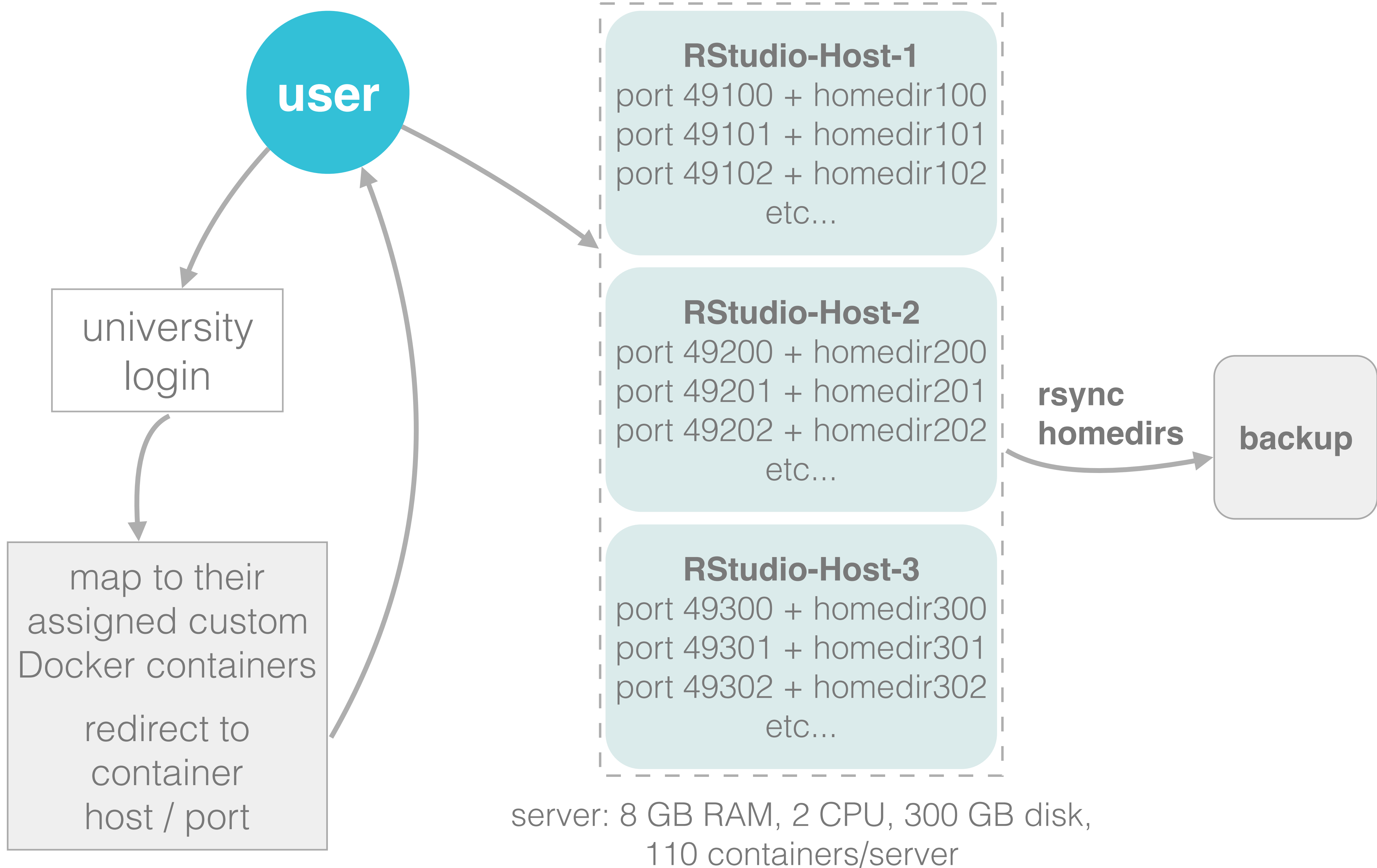


Instructor(s) can install and update software, change configurations, restart or kill sessions, and monitor all aspects of the system



Increased demand on instructor and departmental IT staff, but benefits might outweigh the costs

Dockerized RStudio server





Building partnerships with university IT professionals can lead to collaborations that benefit the entire university.



Implementation can be overwhelming and time consuming and require partnership with university IT professionals.

Docker Containers

Welcome back Mine Cetinkaya-Rundel!

Eclipse - IDE with Java and Python

[Click here](#) to create your personal Eclipse environment

RStudio - statistics application with Rmarkdown and knitr support

[Click here](#) to create your personal RStudio environment

vm-manage.oit.duke.edu/containers

Spyder - Scientific PYthon Development EnviRonment IDE with Anaconda Python

[Click here](#) to create your personal Spyder environment

Jupyter - interactive data science and scientific computing notebooks

[Click here](#) to create your personal Jupyter environment

KerasTensorflow - Jupyter with Keras and Tensorflow-GPU

[Click here](#) to create your personal KerasTensorflow environment

STA663 - notebooks for Statistical Computing and Computation

[Click here](#) to create your personal STA663 environment

MATLAB - mathematics and matrix manipulations

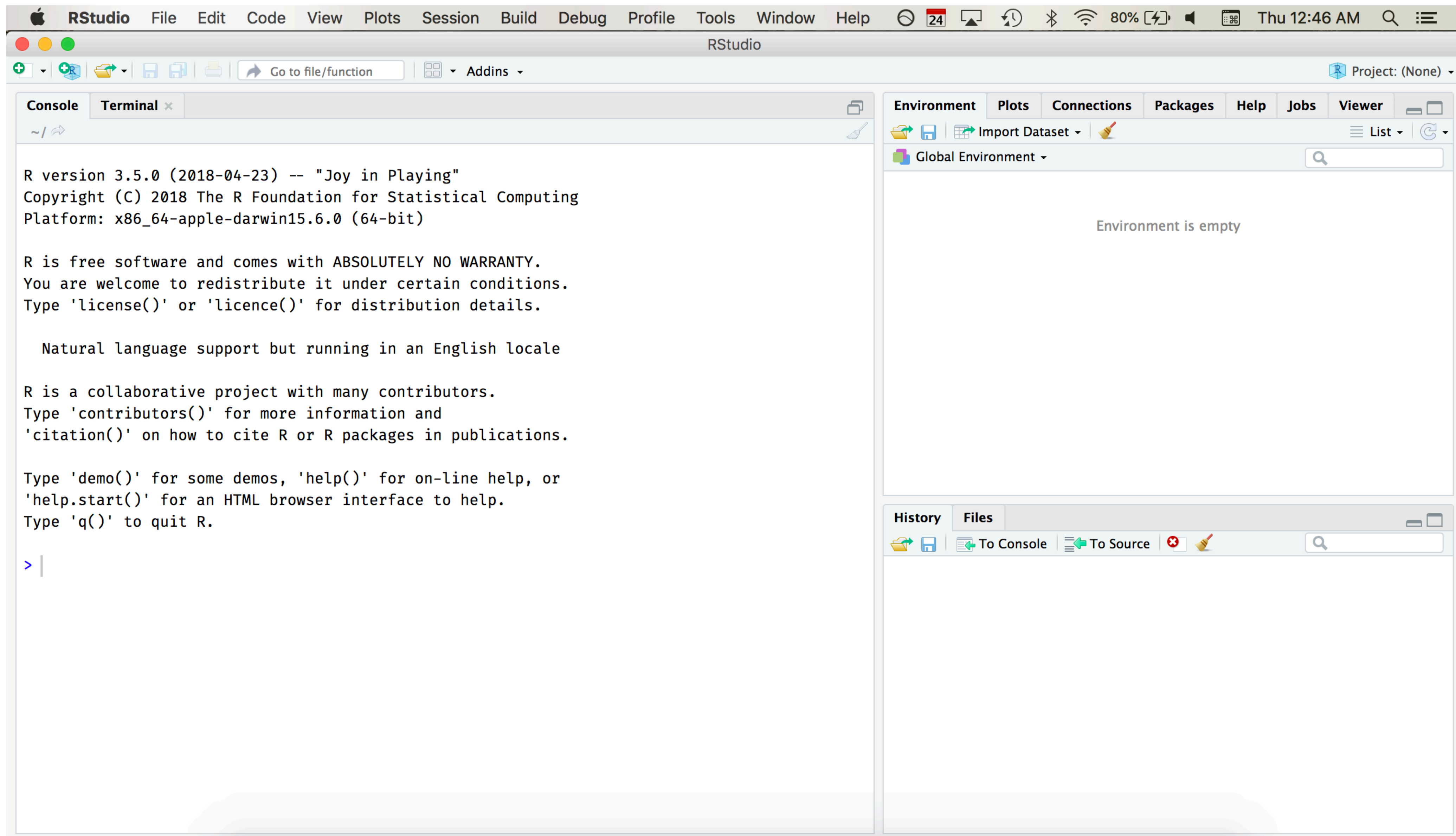
[Click here](#) to create your personal MATLAB environment

RStudio Cloud

what is RStudio Cloud?



makes it easy for professionals, hobbyists, trainers, teachers, and students to do, share, teach, and learn data science using R



Chrome File Edit View History Bookmarks People Window Help

Secure <https://rstudio.cloud/project/38096>

Your Workspace / Untitled Project Click to name your project

Mine Çetinkaya-Rundel

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins R 3.4.4

Console Terminal x

/cloud/project/

R version 3.4.4 (2018-03-15) -- "Someone to Lean On"
Copyright (C) 2018 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.

>

Environment History Connections

Import Dataset

Global Environment

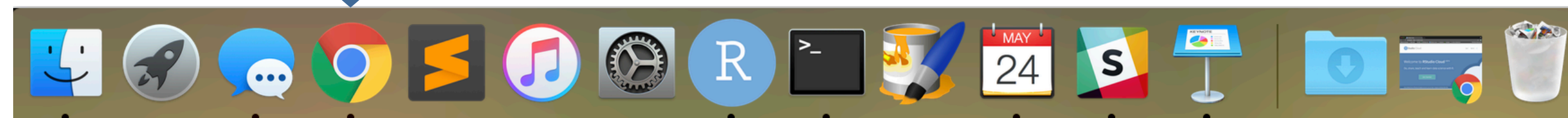
Environment is empty

Files Plots Packages Help Viewer

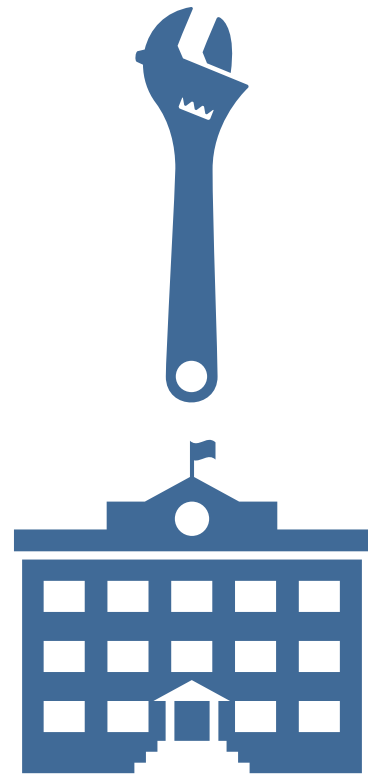
New Folder Upload Delete Rename More

/ > cloud > project

	Name	Size	Modified
↑	..		
📄	.Rhistory	0 B	May 24, 2018, 12:40 AM
📁	project.Rproj	205 B	May 24, 2018, 12:40 AM



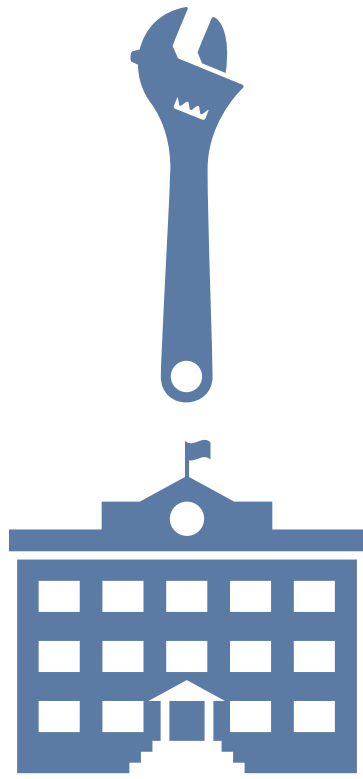
why RStudio Cloud?



does not require IT support

features designed for instructors:

why RStudio Cloud?

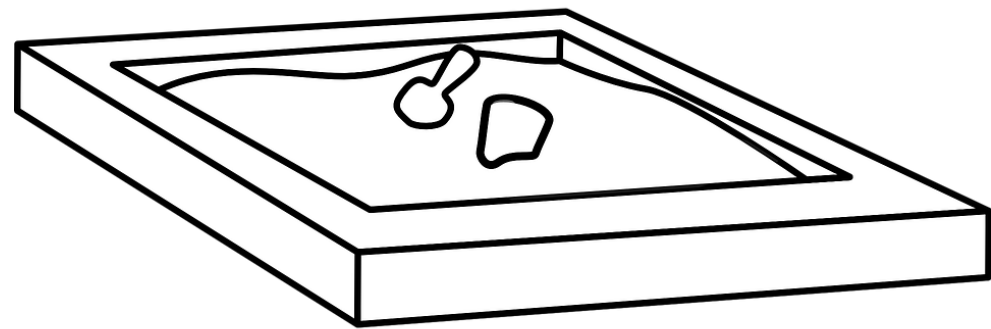


does not require IT support

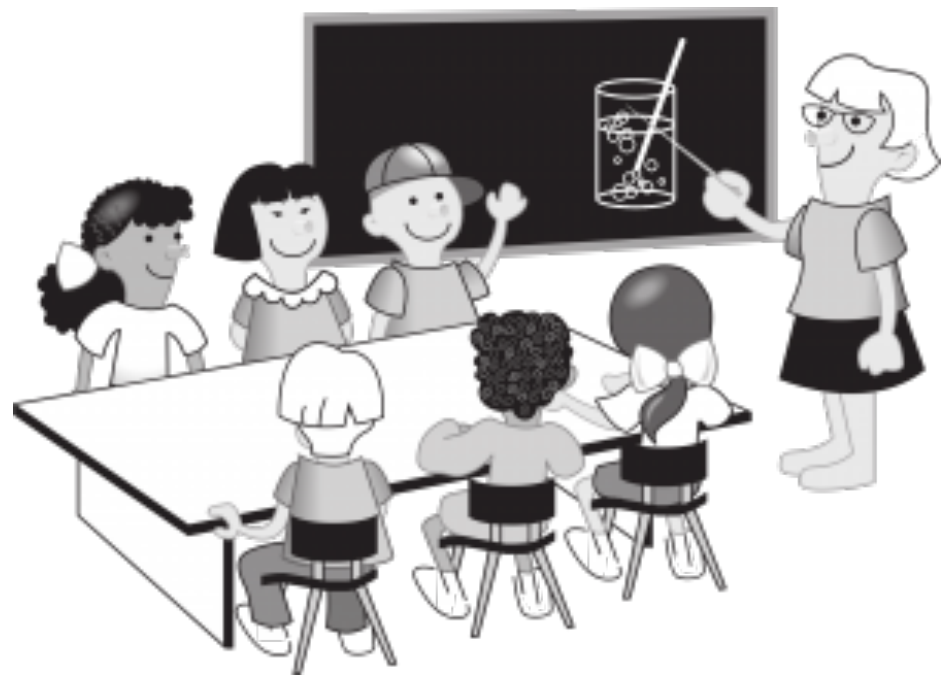
features designed for instructors:

- classes can be organized in workspaces
- members can be assigned different roles: instructor, TA, student
- projects can be public or private
- 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 integration
- interactive learning with built-in **learnr** primers

workspaces



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



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

permissions

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**

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

Permissions

☒ Contributors can see the members list

☐ Viewers can see the members list

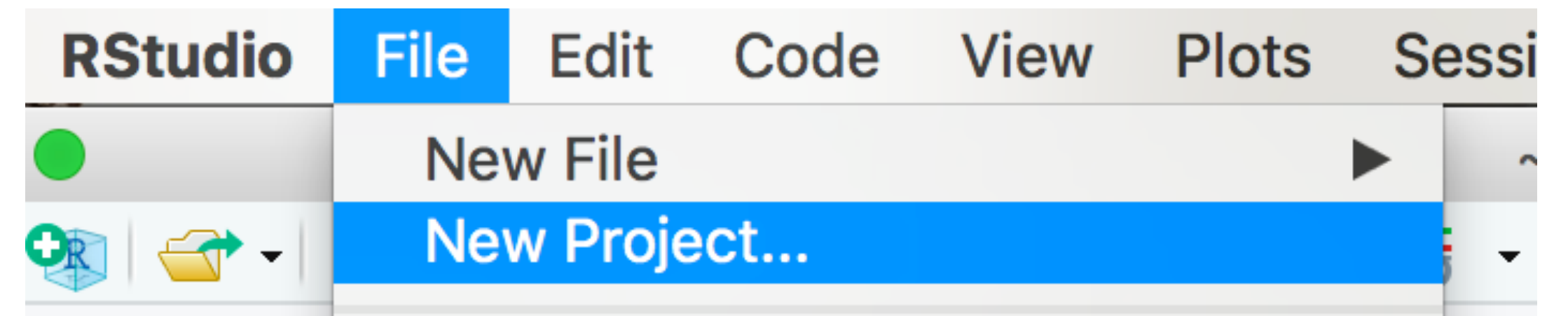
if you're ok with students seeing other students' names on the list but don't want your visitors seeing your roster

projects

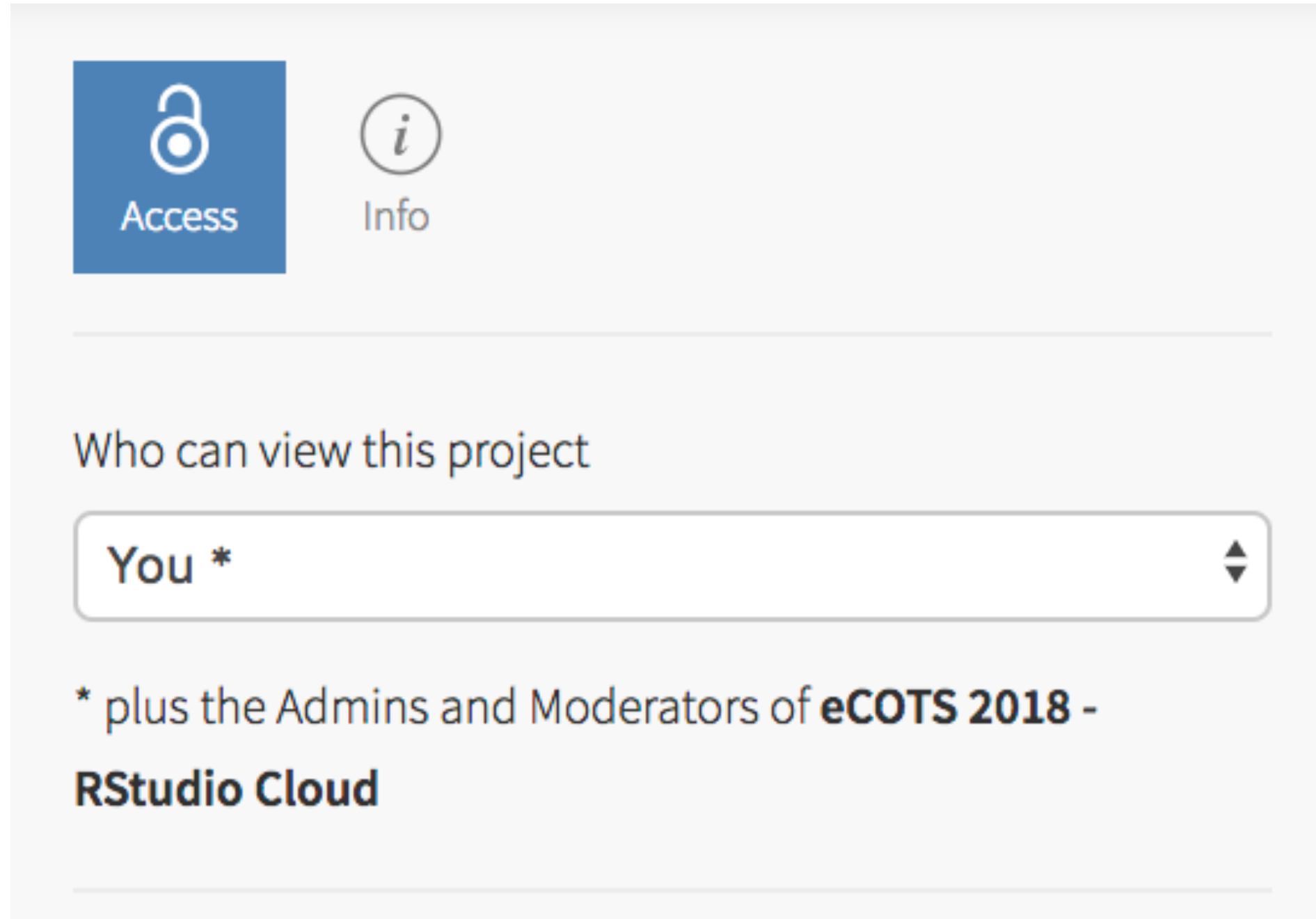
a new project in RStudio Cloud



is a new project in RStudio



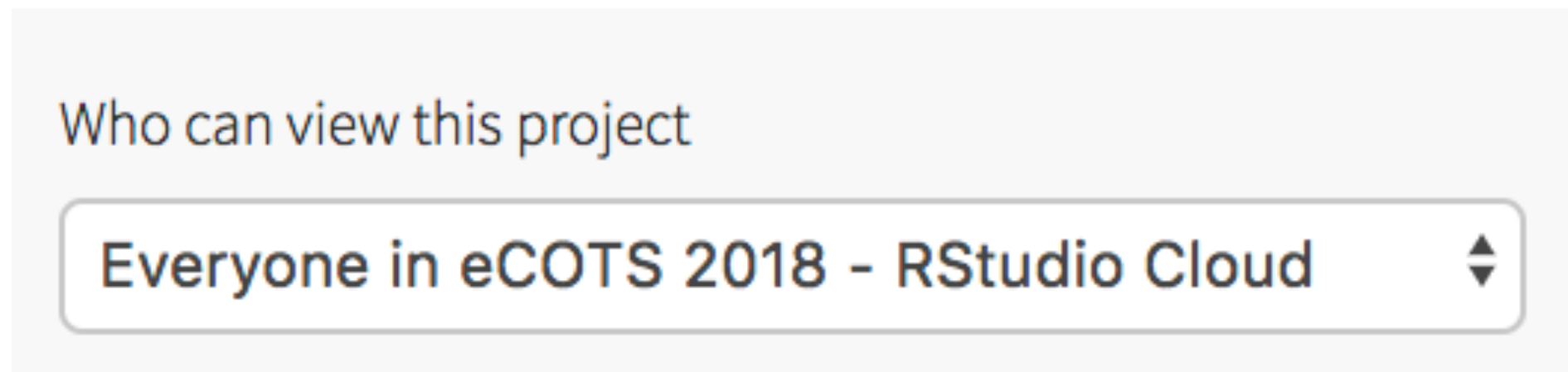
sharing projects



The screenshot shows the 'Access' tab of a project in RStudio Cloud. At the top, there are two icons: a blue square with a white padlock icon labeled 'Access' and a circle with an 'i' icon labeled 'Info'. Below these, the text 'Who can view this project' is followed by a dropdown menu currently set to 'You *'. A footnote below the dropdown states: '* plus the Admins and Moderators of **eCOTS 2018 - RStudio Cloud**'.

by default, projects in a workspace are visible to you (+ admins and moderators only)

+ students can't see each others' projects



This screenshot shows the same 'Access' tab interface, but the dropdown menu is now set to 'Everyone in eCOTS 2018 - RStudio Cloud'.

change permissions to make your projects visible to students

copying a project

≡ ECOTS 2018 - RStudio Cloud / hello cloud

TEMPORARY



Save a Permanent Copy



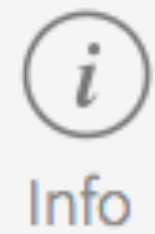
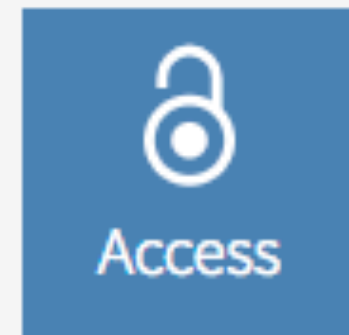
Student Mine

when a student clicks on your shared project, they are notified that this is a temporary copy, and are given the option to make their own copy, including all starter documents and code + installed packages



make a second account for yourself and add as contributor (student) to see what your students see

viewing student projects



Who can view this project

You *

* plus the Admins and Moderators of **eCOTS 2018 - RStudio Cloud**

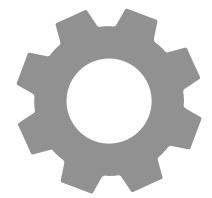
Permissions

- ☐ Contributors can make their projects visible to all members

instructor and TAs can view student projects

- ▶ Go to rstudio.cloud
- ▶ Create a new workspace
- ▶ Create a new project in this workspace and make it visible to others in the workspace
 - ▶ Add a template R Markdown document and knit it
- ▶ Get the sharing link for your workspace and email it to your partner so that they can join as a contributor
- ▶ Students: Make a copy of the project in the workspace and make some change to the R Markdown document and knit it, then close the project
- ▶ Instructors: Peek into your student's project

base project template



Space Settings

Name

eCOTS 2018 - RStudio Cloud

Base project template



none



Save

Set Base Project Template



Select the project to use

none

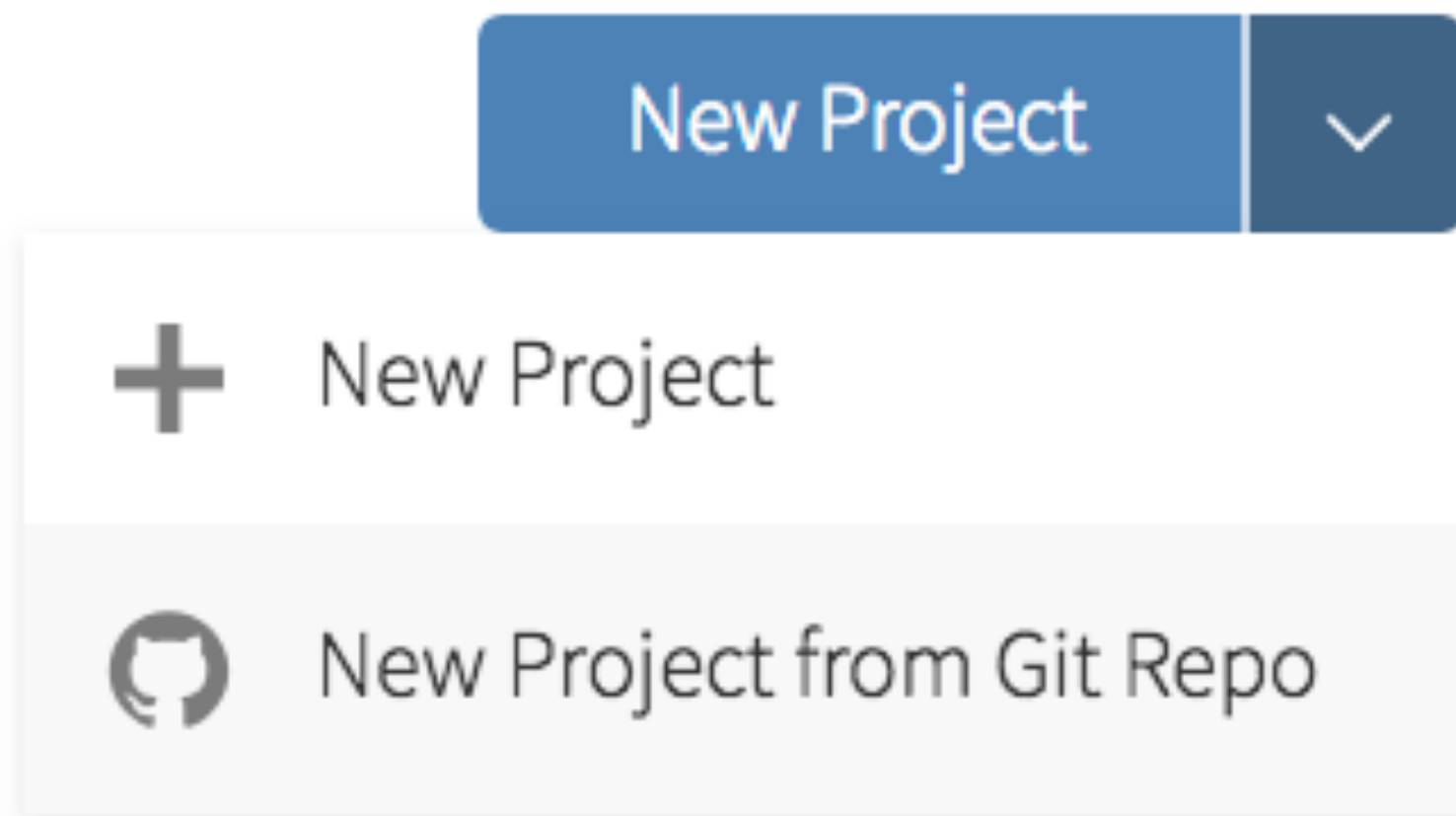
hello cloud

If you don't see the project you're looking for listed above, make sure that you have set its access to 'Everyone in eCOTS 2018 - RStudio Cloud'.

OK

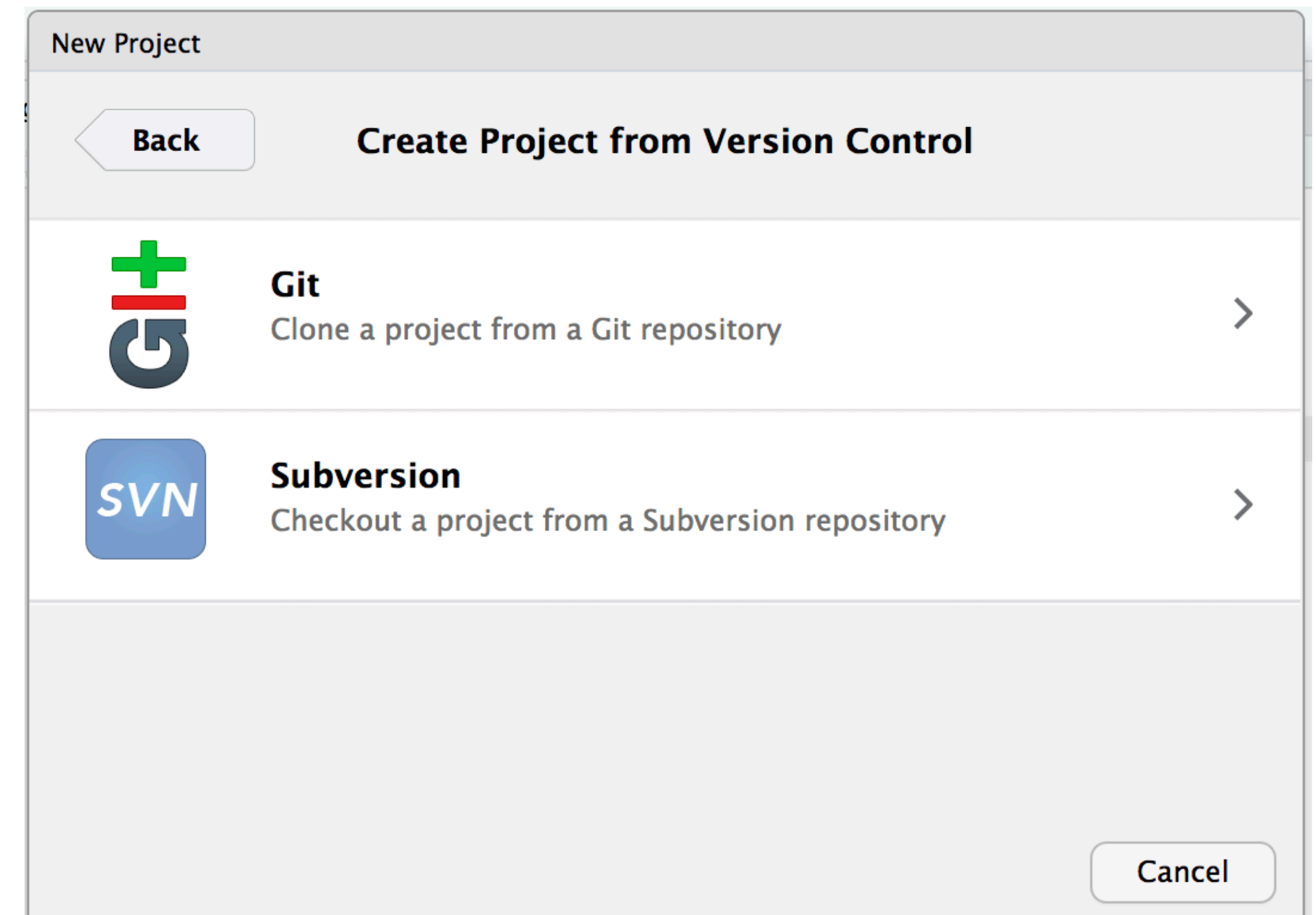
git integration

a new project from Git Repo
in RStudio Cloud



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

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



built-in `learnr` primers

 Your Workspace

 Projects

Info

Learn



Mine Çetinkaya-Rundel

Studio Primers

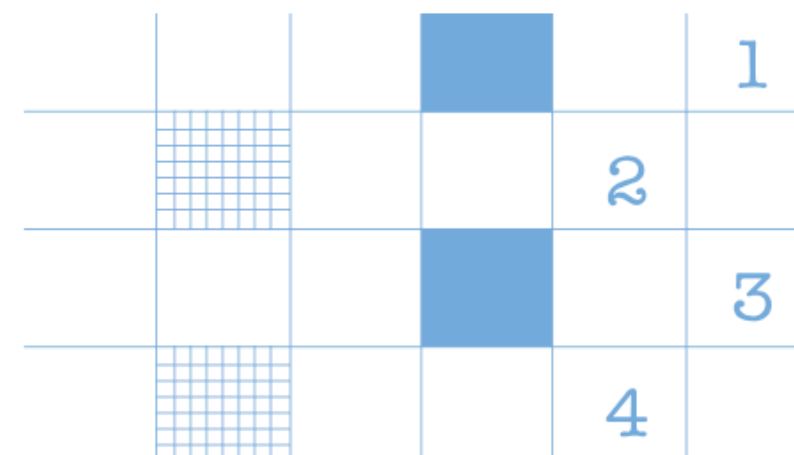
Learn data science basics with the interactive tutorials below.

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



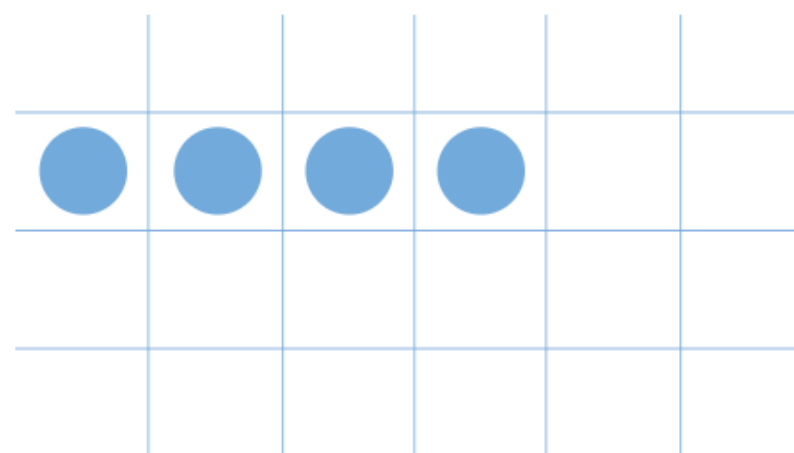
Learn the most important data handling skills in R: how to extract values from a table, subset tables, calculate summary statistics, and derive new variables.

Visualize Data



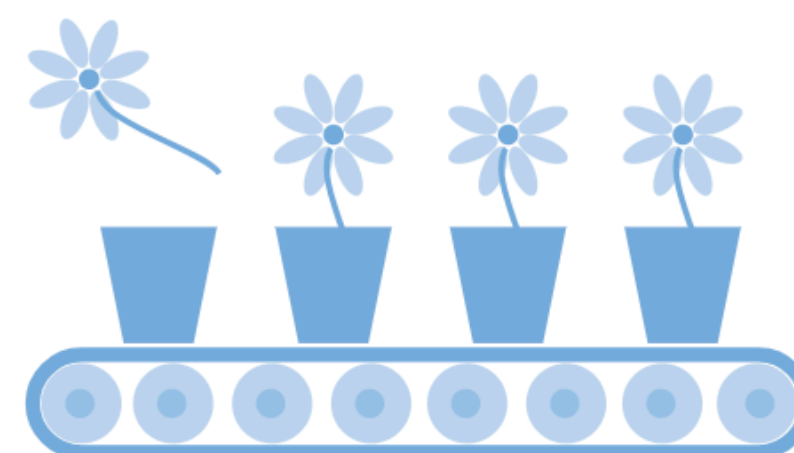
Learn how to use `ggplot2` to make any type of plot with your data. Then learn the best ways to visualize patterns within values and relationships between variables.

Tidy Your Data



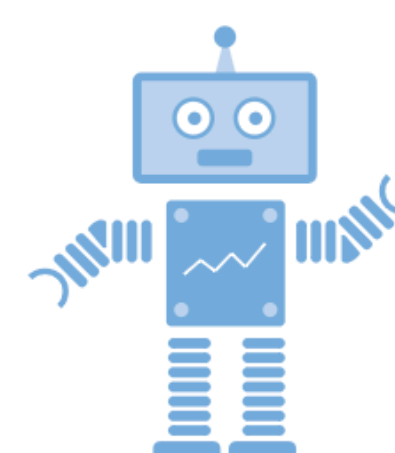
Unlock the tidyverse by learning how to make and use tidy data, the data format designed for R.

Iterate



Master a core programming paradigm with the `purrr` package: for each ____ do ____.

Automate Tasks



COMING
SOON

Functions are the key to programming in R. This primer will teach you how to write and use them.

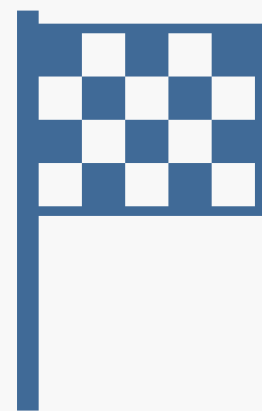
limits



each project is allocated 1GB of RAM



test things out before assignments
involving large datasets



each account is allocated one private space,
with up to 3 members and 5 projects



you can submit a request to the RStudio
Cloud team for more capacity

parting remark

A large, bold, orange alpha symbol (α) is positioned on the left side of the slide, serving as a visual indicator for the 'WORK IN PROGRESS' section.

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>.

vision

You only get
one first day
of class

Start with
something
that excites
students,
teach the
necessary
evils later.