



# FIRE: THE FIRST-YEAR INNOVATION & RESEARCH EXPERIENCE

## **SUSTAINABILITY ANALYTICS**

Introduction to Posit Cloud and R Packages

In-class Activity 1:  
Create a Posit Cloud account

# Supporting Programs

1. **R** is programming language designed for data analysis.
2. **RStudio** is a platform interface used for running R.
3. **Posit Cloud** is the website that allows you to run RStudio without installing any programs.
  - a. The free account allocate 25 hours of compute hours per month
  - b. Make sure to close the project when you don't need it!

## Key Features

- ✓ Up to 50 projects total 
- ✓ 1 shared space (5 members and 10 projects max) 
- ✓ 25 compute hours per month 

**Compute hours** represent how much time a project is open or running with a particular configuration, computed as  $(\text{RAM} + \text{CPUs allocated}) / 2 \times \text{hours}$ . For example, working with a project for 1 hour with 1 GB of RAM and 1 CPU allocated consumes 1 compute hour.


The Cloud Free plan has a cap each month of 25 compute hours. Once you reach the cap, you can no longer open or create projects during your current month.

What counts towards your cap?

- Projects you work on in "Your Workspace"
- Projects you, or others, work on in your shared space

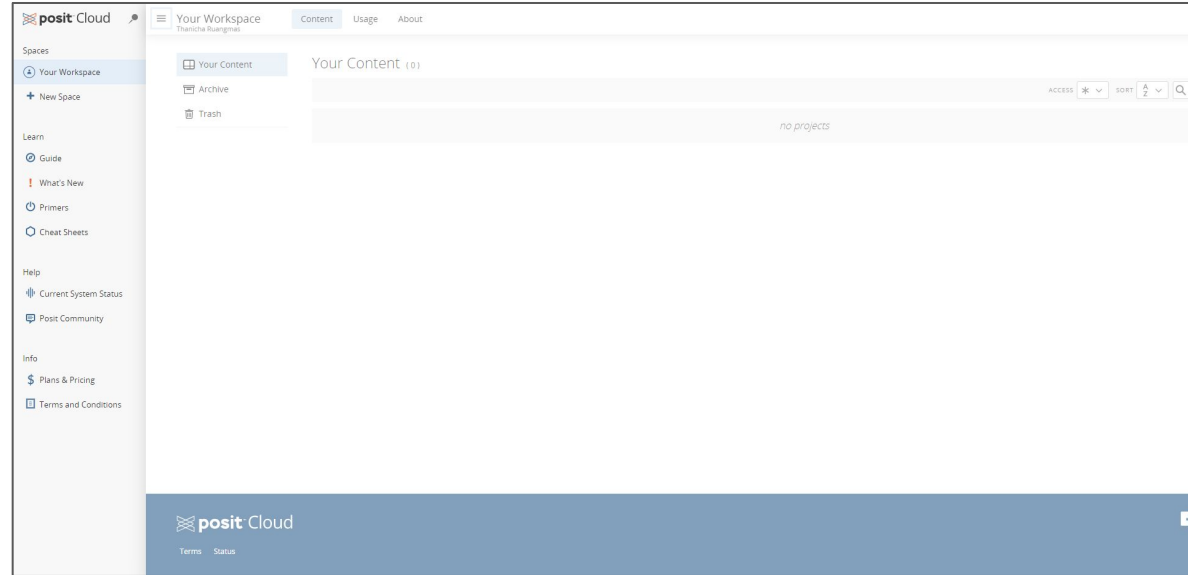
What does not count towards your cap?

- Projects you work on in others' shared spaces

- ✓ Up to 1 GB RAM per project 
- ✓ Up to 1 CPU per project 
- ✓ Up to 1 hour background execution time 

# In-class Activity 1: Create a Posit Cloud Account

1. Go to [posit.cloud](https://posit.cloud)
2. Click “Get Started”
3. Click “Sign up” with the free version
4. Follow the verification process to get started



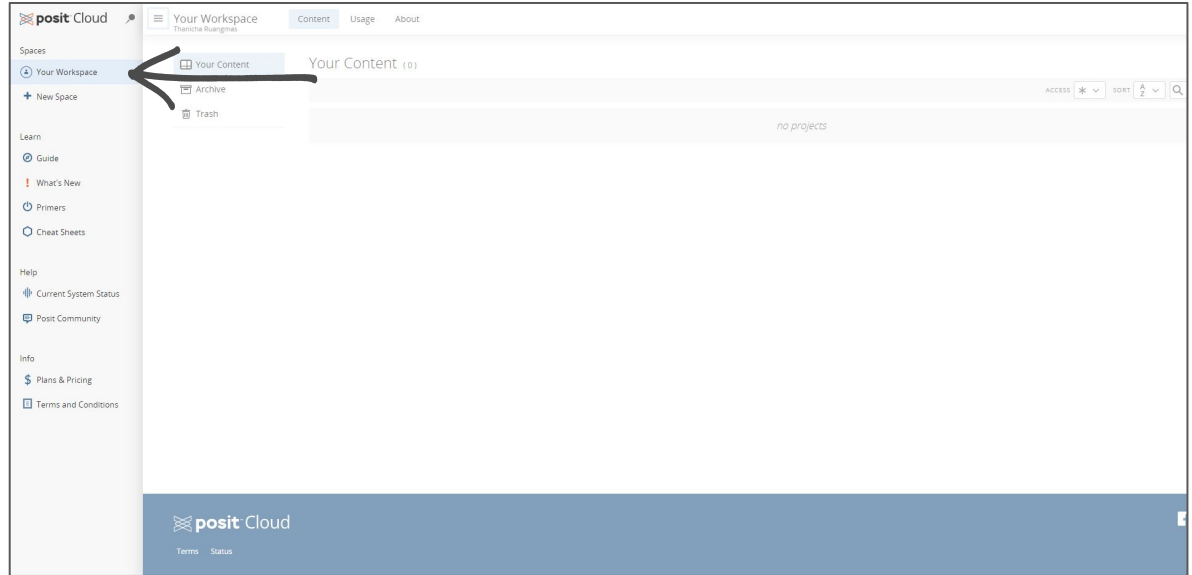
## In-class Activity 2:

Create a Workspace, a Project, and a New Script

# In-class Activity 2: Create a Workspace, a Project, and a New Script

A Workspace is equivalent to a folder.

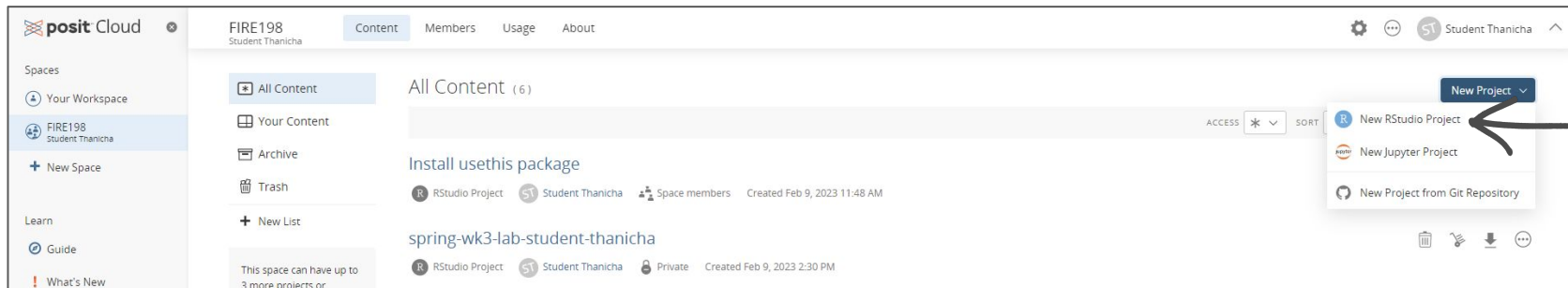
1. Create a new space and name it **FIRE198**



## In-class Activity 2: Create a Workspace, a Project, and a New Script

A Project is a set of scripts and files in one analysis. In this class, each assignment is its own Project.

### 2. Create a New RStudio Project.



The screenshot displays the Posit Cloud interface for a workspace named 'FIRE198' owned by 'Student Thanicha'. The main content area shows 'All Content (6)' with a list of RStudio Projects. A 'New Project' button is visible in the top right corner, and a dropdown menu is open, showing options: 'New RStudio Project', 'New Jupyter Project', and 'New Project from Git Repository'. A black arrow points to the 'New RStudio Project' option. The interface includes a left sidebar with 'Spaces' and 'Learn' sections, and a top navigation bar with 'Content', 'Members', 'Usage', and 'About' tabs.

# In-class Activity 2: Create a Workspace, a Project, and a New Script

## 3. Rename the Project to **My First Project**

## 4. Click on the icon to create a new script.

The screenshot shows the Posit Cloud interface. The top toolbar contains several icons, with a callout '4' pointing to the 'New Script' icon. The main window displays a terminal window with the R version 4.2.2 startup message. The right sidebar shows the 'Environment' tab, which is currently empty. Below the environment tab is a 'System Library' table listing various R packages.

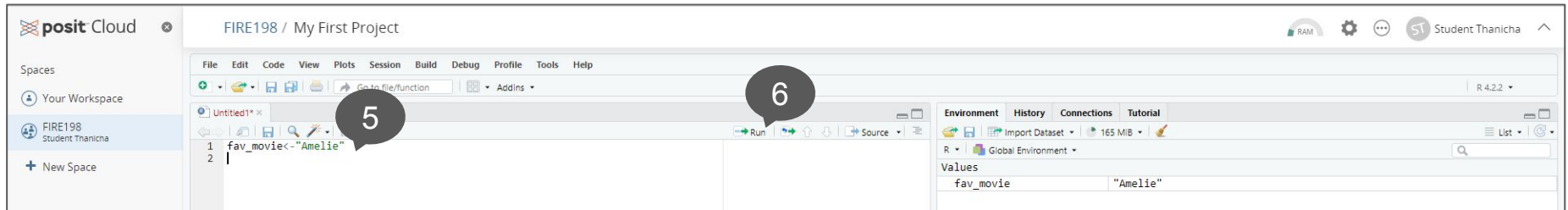
Name	Description	Version
<input type="checkbox"/> askpass	Safe Password Entry for R, Git, and SSH	1.1
<input type="checkbox"/> assertthat	Easy Pre and Post Assertions	0.2.1
<input type="checkbox"/> backports	Reimplementations of Functions Introduced Since R-3.0.0	14.1
<input checked="" type="checkbox"/> base	The R Base Package	4.2.2
<input type="checkbox"/> base64enc	Tools for base64 encoding	0.1-3
<input type="checkbox"/> bit	Classes and Methods for Fast Memory-Efficient Boolean Selections	4.0.5
<input type="checkbox"/> bit64	A S3 Class for Vectors of 64bit Integers	4.0.5



## In-class Activity 2: Create a Workspace, a Project, and a New Script

5. In the console, assign the title of your favorite move to the value **fav\_movie**

6. Click Run or Ctrl+Enter to process the script



The screenshot displays the Posit Cloud IDE interface for a project named "FIRE198 / My First Project". The interface includes a menu bar (File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, Help), a toolbar, and a main workspace area. The workspace area shows a script editor with the following code:

```
1 fav_movie<- "Amelie"  
2 |
```

A callout bubble with the number "5" points to the code editor. The "Run" button (a green play icon) is highlighted with a callout bubble containing the number "6". The right-hand side of the interface shows the "Environment" pane, which displays the current environment as "R" and "Global Environment". The "Values" section shows the variable "fav\_movie" with the value "Amelie".

# RStudio's Interface

The screenshot shows the RStudio interface with the following components and annotations:

- Source Editor:** Contains R code: `1 fav_movie<-\"Amelie\"` and `2 |`. A red text annotation "Where scripts are written" is overlaid on this area.
- Environment Pane:** Shows the variable `fav_movie` with the value `"Amelie"`. A red text annotation "Where processed values are shown" is overlaid on this pane.
- Terminal/Console:** Displays the R version (4.2.2), copyright information, and a list of help topics. A red text annotation "Where RStudio tells its status" is overlaid on this pane.
- Package Manager:** Shows a list of installed and available packages. A red text annotation "Where packages and files are shown" is overlaid on this pane.

Name	Description	Version
<b>System Library</b>		
<input type="checkbox"/> askpass	Safe Password Entry for R, Git, and SSH	1.1
<input type="checkbox"/> assertthat	Easy Pre and Post Assertions	0.2.1
<input type="checkbox"/> backports	Reimplementations of Functions Introduced Since R-3.0.0	1.4.1
<input type="checkbox"/> base	The R Base Package	4.2.2
<input checked="" type="checkbox"/> base64enc	Encoding and Decoding of Base64 Encoded Data	0.2.3
<input type="checkbox"/> bit	Classes and Methods for Arbitrary Precision Arithmetic	4.0.4
<input type="checkbox"/> bit64	A S3 Class for Vectors of 64bit Integers	4.0.5
<input type="checkbox"/> blob	A Simple S3 Class for Representing Vectors of Binary Data (BLOBs)	1.2.3
<input type="checkbox"/> boot	Bootstrap Functions (Original by John Fox)	1.3-28
<input type="checkbox"/> broom	Convert Statistical Objects into Tidy Tibbles	1.0.3
<input type="checkbox"/> bslib	Custom 'bootstrap' 'sass' Themes for 'shiny' and 'rmarkdown'	0.4.2
<input type="checkbox"/> cachem	Cache R Objects with Automatic Pruning	1.0.6
<input type="checkbox"/> callr	Call R from R	3.7.3
<input type="checkbox"/> cellranger	Translate Spreadsheet Cell Ranges to Rows and Columns	1.1.0
<input type="checkbox"/> class	Functions for Classification	7.3-20
<input type="checkbox"/> cli	Helpers for Developing Command Line Interfaces	3.6.0
<input type="checkbox"/> clipr	Read and Write from the System Clipboard	0.8.0
<input type="checkbox"/> cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.	2.1.4
<input type="checkbox"/> codetools	Code Analysis Tools for R	0.2-18
<input type="checkbox"/> colorspace	A Toolbox for Manipulating and Assessing Colors and Palettes	2.1-0
<input type="checkbox"/> compiler	The R Compiler Package	4.2.2

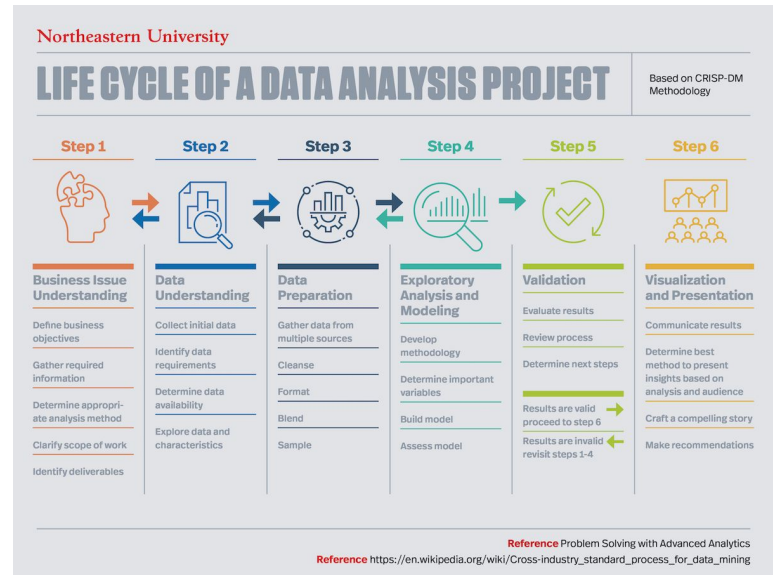
# In-class Activity 3:

## Install a package and set a base project

What is a package?

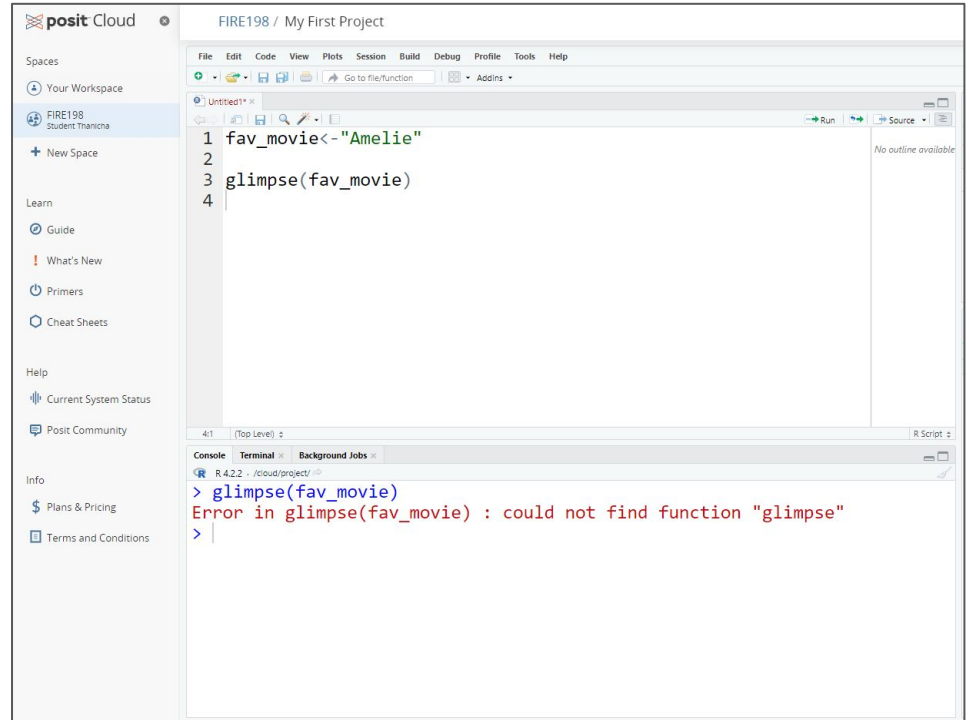
# What is a package?

- A package is a bundle of code that allows users to use additional functionalities in R.
- The **tidyverse** package allows you to use the functions that you will learn in the next couple of weeks. It is a powerful tool for Data Understanding and Data Preparation.
- In order to use a package, you need to install and declare it.



# Error: Could not find function

- The function `glimpse()` did not work because we haven't installed the **tidyverse** package yet.
- Good news: Within a Workspace, you need to install a package and set it as a base project only once.



The screenshot shows the Posit Cloud IDE interface. The main editor window displays an R script with the following code:

```
1 fav_movie <- "Amelie"
2
3 glimpse(fav_movie)
4
```

The console at the bottom shows the execution of the script, resulting in an error:

```
R 4.2.2 /cloud/project/
> glimpse(fav_movie)
Error in glimpse(fav_movie) : could not find function "glimpse"
>
```



# In-class Activity 3: Install a package and set a base project

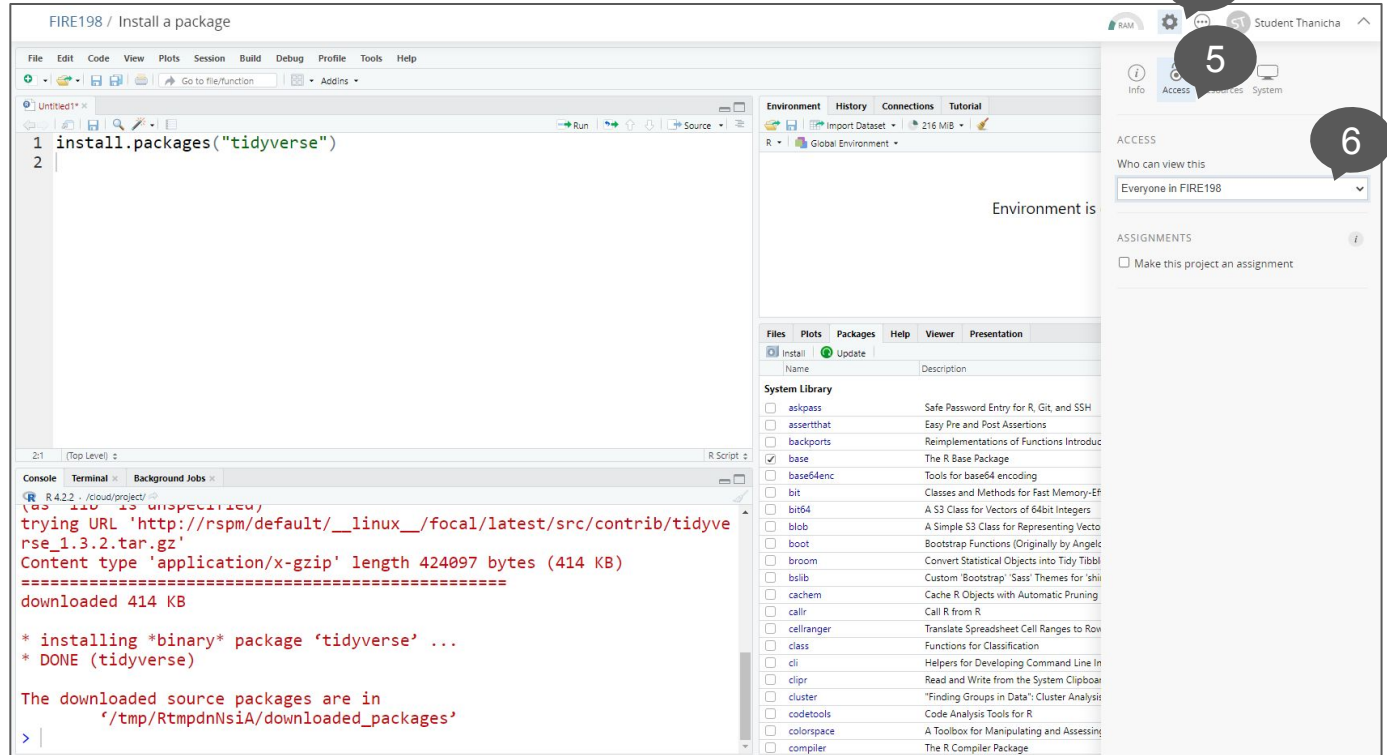
## Set a base project

4. Go to Settings

5. Go to Access

6. Change Who can view this to

**Everyone in FIRE198**



The screenshot shows the RStudio interface with the following components:

- Code Editor:** Contains the command `install.packages("tidyverse")`.
- Console:** Shows the execution output:

```
R 4.2.2 > install.packages("tidyverse")
trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/tidyverse_1.3.2.tar.gz'
Content type 'application/x-gzip' length 424097 bytes (414 KB)
=====
downloaded 414 KB

* installing *binary* package 'tidyverse' ...
* DONE (tidyverse)

The downloaded source packages are in
  '/tmp/RtmpdnNsiA/downloaded_packages'
```
- Environment Panel:** Shows the current environment is 'Global Environment'.
- Access Panel:** Shows the 'Who can view this' dropdown set to 'Everyone in FIRE198'.
- System Library Panel:** Lists installed and available packages, with 'base' checked.

Numbered callouts (4, 5, 6) point to the Settings gear icon, the Access panel, and the 'Who can view this' dropdown menu, respectively.

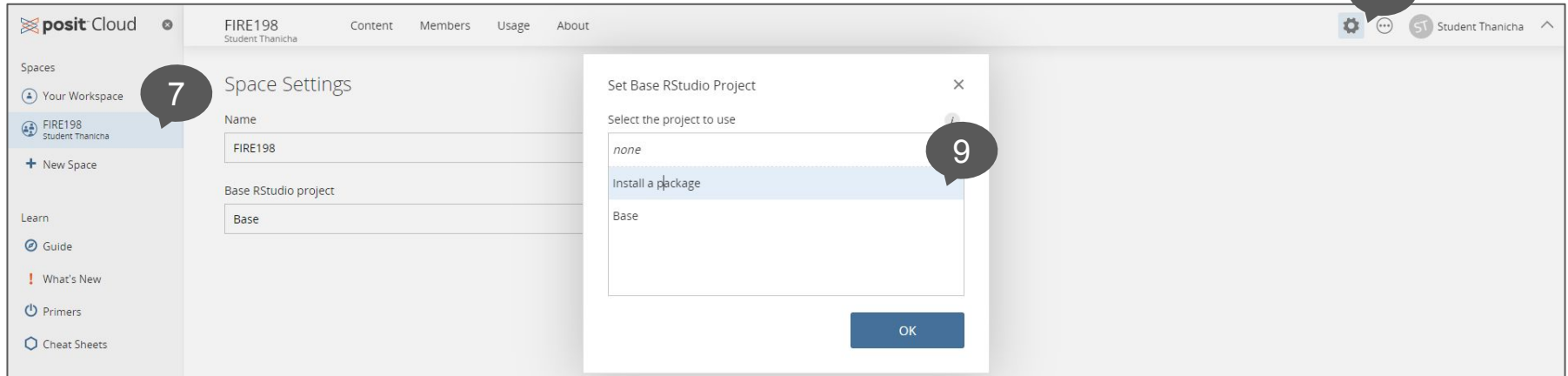


# In-class Activity 3: Install a package and set a base project

7. Go back to the FIRE198 Workspace

8. Click Settings

9. Change the Base RStudio Project to Install a package



The screenshot displays the Posit Cloud interface for the FIRE198 workspace. The left sidebar shows the workspace name and navigation options. The main content area is titled "Space Settings" and includes fields for "Name" (FIRE198) and "Base RStudio project" (Base). A modal dialog titled "Set Base RStudio Project" is open, showing a list of options: "none", "Install a package" (highlighted), and "Base". A blue "OK" button is at the bottom of the dialog. Three callout bubbles with numbers 7, 8, and 9 are overlaid on the interface to indicate the steps: 7 points to the workspace name in the sidebar, 8 points to the settings gear icon in the top right, and 9 points to the "Install a package" option in the modal dialog.

# In-class Activity 3: Install a package and set a base project

## Test if it works

10. Go back to the FIRE198 Workspace

11. Create a new project and name it **test package installation**

12. Type `library("tidyverse")` in the console

13. Run it

The screenshot shows the Posit Cloud interface for a workspace named "FIRE198 / test package installation". The interface is divided into several sections:

- Sidebar (Left):** Contains "Spaces" (FIRE198 Student Manicha), "Learn" (Guide, What's New, Primers, Cheat Sheets), "Help" (Current System Status, Posit Community), and "Info" (Plans & Pricing, Terms and Conditions).
- Main Editor Area:** Shows a code editor with the following code:

```
1 library("tidyverse")
2
```
- Console (Bottom):** Shows the output of the command `library("tidyverse")`. The output includes a list of attached packages and their versions, followed by a conflicts section.

```
> library("tidyverse")
— Attaching packages —
ggplot2 3.4.0    tidyverse 1.3.2
✓ tibble 3.1.8    ✓ purrr  1.0.1
✓ tidyr  1.3.0    ✓ dplyr  1.1.0
✓ readr  2.1.3    ✓ stringr 1.5.0
✓ forcats 1.0.0
— Conflicts —
tidyverse_conflicts() —
✗ dplyr::filter() masks stats::filter()
✗ dplyr::lag()    masks stats::lag()
>
```

Callout boxes indicate the following actions:

- 10: Points to the "FIRE198" workspace in the sidebar.
- 11: Points to the "New Space" button in the sidebar.
- 12: Points to the code editor containing `library("tidyverse")`.
- 13: Points to the "Run" button in the code editor.

# In-class Activity 3: Install a package and set a base project

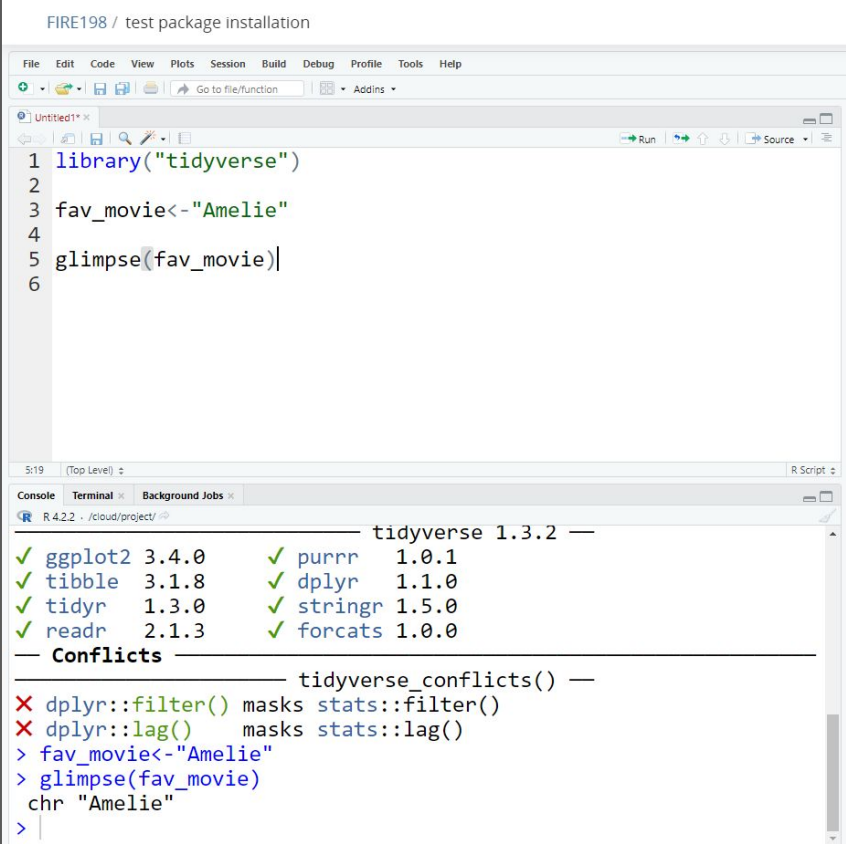
## Test if it works

Type in the console and run

```
fav_movie<-"Amelie"
```

```
glimpse(fav_movie)
```

You will see that it summarizes the value as a character.



```
FIRE198 / test package installation
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Untitled1* x
Run Source
1 library("tidyverse")
2
3 fav_movie<-"Amelie"
4
5 glimpse(fav_movie)
6

5:19 (Top Level) R Script
Console Terminal Background Jobs
R 4.2.2 /cloud/project/
tidyverse 1.3.2
✓ ggplot2 3.4.0 ✓ purrr 1.0.1
✓ tibble 3.1.8 ✓ dplyr 1.1.0
✓ tidyr 1.3.0 ✓ stringr 1.5.0
✓ readr 2.1.3 ✓ forcats 1.0.0
Conflicts
tidyverse_conflicts()
✗ dplyr::filter() masks stats::filter()
✗ dplyr::lag() masks stats::lag()
> fav_movie<-"Amelie"
> glimpse(fav_movie)
chr "Amelie"
>
```