

Setting Up Your R Workshop In The Cloud

DataTeka

Tatjana Kecojevic

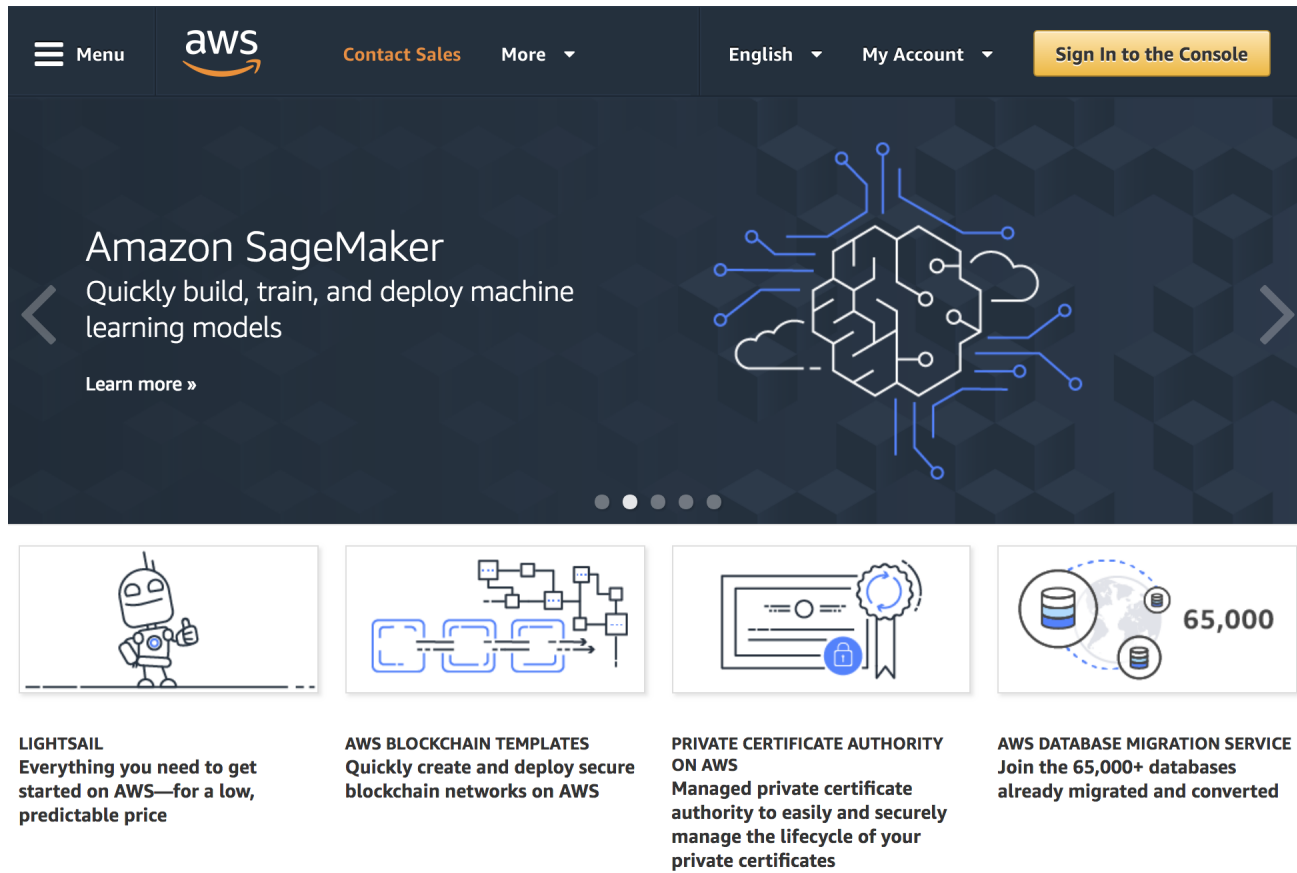
May 2018

RStudio Server on AWS! 🤠

Get Started 🤔💤



Set up an account with **AWS**



The screenshot shows the AWS homepage with a dark blue header. The header includes a 'Menu' icon, the 'aws' logo, 'Contact Sales', 'More', 'English', 'My Account', and a 'Sign In to the Console' button. The main banner features 'Amazon SageMaker' with the text 'Quickly build, train, and deploy machine learning models' and a 'Learn more »' link. To the right is a graphic of a brain with circuit lines. Below the banner are four service tiles: 'LIGHTSAIL' with a robot icon, 'AWS BLOCKCHAIN TEMPLATES' with a blockchain diagram, 'PRIVATE CERTIFICATE AUTHORITY ON AWS' with a certificate icon, and 'AWS DATABASE MIGRATION SERVICE' with a database icon and the number '65,000'.

Amazon SageMaker
Quickly build, train, and deploy machine learning models
[Learn more »](#)

LIGHTSAIL
Everything you need to get started on AWS—for a low, predictable price

AWS BLOCKCHAIN TEMPLATES
Quickly create and deploy secure blockchain networks on AWS

PRIVATE CERTIFICATE AUTHORITY ON AWS
Managed private certificate authority to easily and securely manage the lifecycle of your private certificates

AWS DATABASE MIGRATION SERVICE
Join the 65,000+ databases already migrated and converted

Set up VPC (virtual private cloud)

The screenshot shows the AWS VPC Dashboard. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and a notification icon. The left sidebar contains a 'VPC Dashboard' section with a 'Filter by VPC' dropdown and a 'Select a VPC' button. Below this is a list of VPC-related resources: Virtual Private Cloud, Your VPCs, Subnets, Route Tables, Internet Gateways, Egress Only Internet Gateways, DHCP Options Sets, Elastic IPs, Endpoints, Endpoint Services, NAT Gateways, Peering Connections, and Security. The main content area is titled 'Resources' and features two buttons: 'Start VPC Wizard' and 'Launch EC2 Instances'. A note states: 'Note: Your Instances will launch in the US West (Oregon) region.' Below this, a message says: 'You are using the following Amazon VPC resources in the US West (Oregon) region:'. A table lists the resources: 1 VPC, 0 Egress-only Internet Gateways, 1 Route Table, 0 Elastic IPs, 0 Endpoints, 1 Security Group, 0 VPN Connections, 0 Customer Gateways, 1 Internet Gateway, 3 Subnets, 1 Network ACL, 0 VPC Peering Connections, 0 Nat Gateways, 0 Running Instances, 0 Virtual Private Gateways, and 1 DHCP Options Set. Below the table is a section titled 'VPN Connections' with a description: 'Amazon VPC enables you to use your own isolated resources within the AWS cloud, and then connect those resources directly to your own datacenter using industry-standard encrypted IPsec VPN connections.' and a 'Create VPN Connection' button.

aws Services ▾ Resource Groups ▾ 🔔

VPC Dashboard

Filter by VPC:

🔍 Select a VPC

Virtual Private Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

Egress Only Internet Gateways

DHCP Options Sets

Elastic IPs

Endpoints

Endpoint Services

NAT Gateways

Peering Connections

Security

Resources ↻

Start VPC Wizard **Launch EC2 Instances**

Note: Your Instances will launch in the US West (Oregon) region.

You are using the following Amazon VPC resources in the US West (Oregon) region:

1 VPC	1 Internet Gateway
0 Egress-only Internet Gateways	3 Subnets
1 Route Table	1 Network ACL
0 Elastic IPs	0 VPC Peering Connections
0 Endpoints	0 Nat Gateways
1 Security Group	0 Running Instances
0 VPN Connections	0 Virtual Private Gateways
0 Customer Gateways	1 DHCP Options Set

VPN Connections

Amazon VPC enables you to use your own isolated resources within the AWS cloud, and then connect those resources directly to your own datacenter using industry-standard encrypted IPsec VPN connections.

Create VPN Connection

Let us learn all of Elain's moves!!! 😊 🎵 🎵 🎵



Launch EC2 Instance

aws Services Resource Groups

EC2 Dashboard

- Events
- Tags
- Reports
- Limits
- INSTANCES
 - Instances
 - Launch Templates
 - Spot Requests
 - Reserved Instances
 - Dedicated Hosts
 - Scheduled Instances
- IMAGES
 - AMIs
 - Bundle Tasks
- ELASTIC BLOCK STORE
 - Volumes
 - Snapshots
- NETWORK & SECURITY
 - Security Groups
 - Elastic IPs
 - Placement Groups
 - Key Pairs
 - Network Interfaces

Resources

You are using the following Amazon EC2 resources in the US West (Oregon) region:

- 0 Running Instances
- 0 Elastic IPs
- 0 Dedicated Hosts
- 0 Snapshots
- 0 Volumes
- 0 Load Balancers
- 5 Key Pairs
- 2 Security Groups
- 0 Placement Groups

Learn more about the latest in AWS Compute from AWS re:Invent 2017 by viewing the [EC2 Videos](#).

Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

Launch Instance

Note: Your instances will launch in the US West (Oregon) region

Service Health

Service Status:

- US West (Oregon): This service is operating normally

Availability Zone Status:

- us-west-2a: Availability zone is operating normally

Scheduled Events

US West (Oregon):

No events

Choose an Amazon Machine Image (AMI)

Step 1: Choose an Amazon Machine Image (AMI)

[Cancel and Exit](#)

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

Quick Start

My AMIs

AWS Marketplace

Community AMIs

**Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type** - ami-6b8cef13

Amazon Linux

Free tier eligible

The Amazon Linux AMI is an EBS-backed, AWS-supported image. The default image includes AWS command line tools, Python, Ruby, Perl, and Java. The repositories include Docker, PHP, MySQL, PostgreSQL, and other packages.

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

Select

64-bit

Choose an Instance Type

Filter by: All instance types Current generation [Show/Hide Columns](#)

Currently selected: t2.micro (Variable ECUs, 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory, EBS only)								
	Family	Type	vCPUs ⓘ	Memory (GiB)	Instance Storage (GB) ⓘ	EBS-Optimized Available ⓘ	Network Performance ⓘ	IPv6 Support ⓘ
<input type="checkbox"/>	General purpose	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
<input checked="" type="checkbox"/>	General purpose	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.small	1	2	EBS only	-	Low to Moderate	Yes

Configure Instance Details

Purchasing option ⓘ ☐ Request Spot instances

Network ⓘ vpc-ab83aad2 | eRum ⌵ ↻ Create new VPC

Subnet ⓘ subnet-ec4924b6 | Public subnet | us-west-2c ⌵ Create new subnet
251 IP Addresses available

Auto-assign Public IP ⓘ Enable ⌵

IAM role ⓘ None ⌵ ↻ Create new IAM role

Shutdown behavior ⓘ Stop ⌵

Enable termination protection ⓘ ☐ Protect against accidental termination

Monitoring ⓘ ☐ Enable CloudWatch detailed monitoring
Additional charges apply.

Tenancy ⓘ Shared - Run a shared hardware instance ⌵
Additional charges will apply for dedicated tenancy.

T2 Unlimited ⓘ ☐ Enable
Additional charges may apply

Set Advance Details

▼ Advanced Details


User data ⓘ ☒ As text ☐ As file ☐ Input is already base64 encoded

{Optional}

Pase the code below into Advance Details Box

```
#!/bin/bash
# install R
yum install -y R
# install RStudio-Server
wget https://download2.rstudio.org/rstudio-server-rhel-1.1.447-x86_64.rpm
yum install -y --nogpgcheck rstudio-server-rhel-1.1.447-x86_64.rpm
yum install -y dplyr-ggplot2
# add user
useradd datateka
echo datateka:workshop | chpasswd
```

Note that you will need the latest **RStudio binaries**

 **R** Studio

Support a commercial license? Compare
and open source products

ProductsResourcesPricingAbout UsBlogs

Learn Why Enterprise Customers Use RStudio Server Pro

Choose your Linux Platform

Debian/Ubuntu	RedHat/CentOS	openSUSE/SLES	Other Platforms
<h4>Prerequisites</h4> <p>RStudio Server v1.1 requires RedHat or CentOS version 6 (or higher) as well as an installation of R. You can install R for RedHat and CentOS using the instructions on CRAN: https://cran.rstudio.com/bin/linux/redhat/README.</p> <h4>RedHat/CentOS 6 and 7</h4> <p>To download and install RStudio Server open a terminal window and execute the commands corresponding to the 32 or 64-bit version as appropriate.</p> <p>64bit</p> <p>Size: 43.6 MB MD5: 742a56ed04cb7deb3f80bde6a07cdcda Version: 1.1.447 Released: 2018-04-18</p> <pre>\$ wget https://download2.rstudio.org/rstudio-server-rhel-1.1.447-x86_64.rpm \$ sudo yum install rstudio-server-rhel-1.1.447-x86_64.rpm</pre>			

Review and Launch Instance

Edit Security Groups

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☒ Create a new security group
☐ Select an existing security group

Security group name:

Description:

Type <small>i</small>	Protocol <small>i</small>	Port Range <small>i</small>	Source <small>i</small>	Description <small>i</small>	
SSH <small>⬆ ⬇ ⬆</small>	TCP	22	<div>Custom <small>⬆</small> Custom ✓ Anywhere My IP</div> 0.0.0.0/0	e.g. SSH for Admin Desktop	✕
Custom TCP <small>⬆ ⬇ ⬆</small>	TCP	8787	0.0.0.0/0, ::/0	e.g. SSH for Admin Desktop	✕

Select/Create Key Pair

Select an existing key pair or create a new key pair ✕

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. [Learn more](#) about [removing existing key pairs from a public AMI](#).

Create a new key pair ⬆ ⬇ ⬆

Key pair name

View Your Instance

Launch Instance ▼ Connect Actions ▼

search : i-0dd115f4a81245b6c Add filter

	Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 P
		i-0dd115f4a81245b6c	t2.micro	us-west-2c	pending	Initializing	None	ec2-54-213-99-227.us-...	54.213.

Launch Instance ▼ Connect Actions ▼

search : i-0dd115f4a81245b6c Add filter

	Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 P
		i-0dd115f4a81245b6c	t2.micro	us-west-2c	running	Initializing	None	ec2-54-213-99-227.us-...	54.213.

Launch Instance ▼ Connect Actions ▼

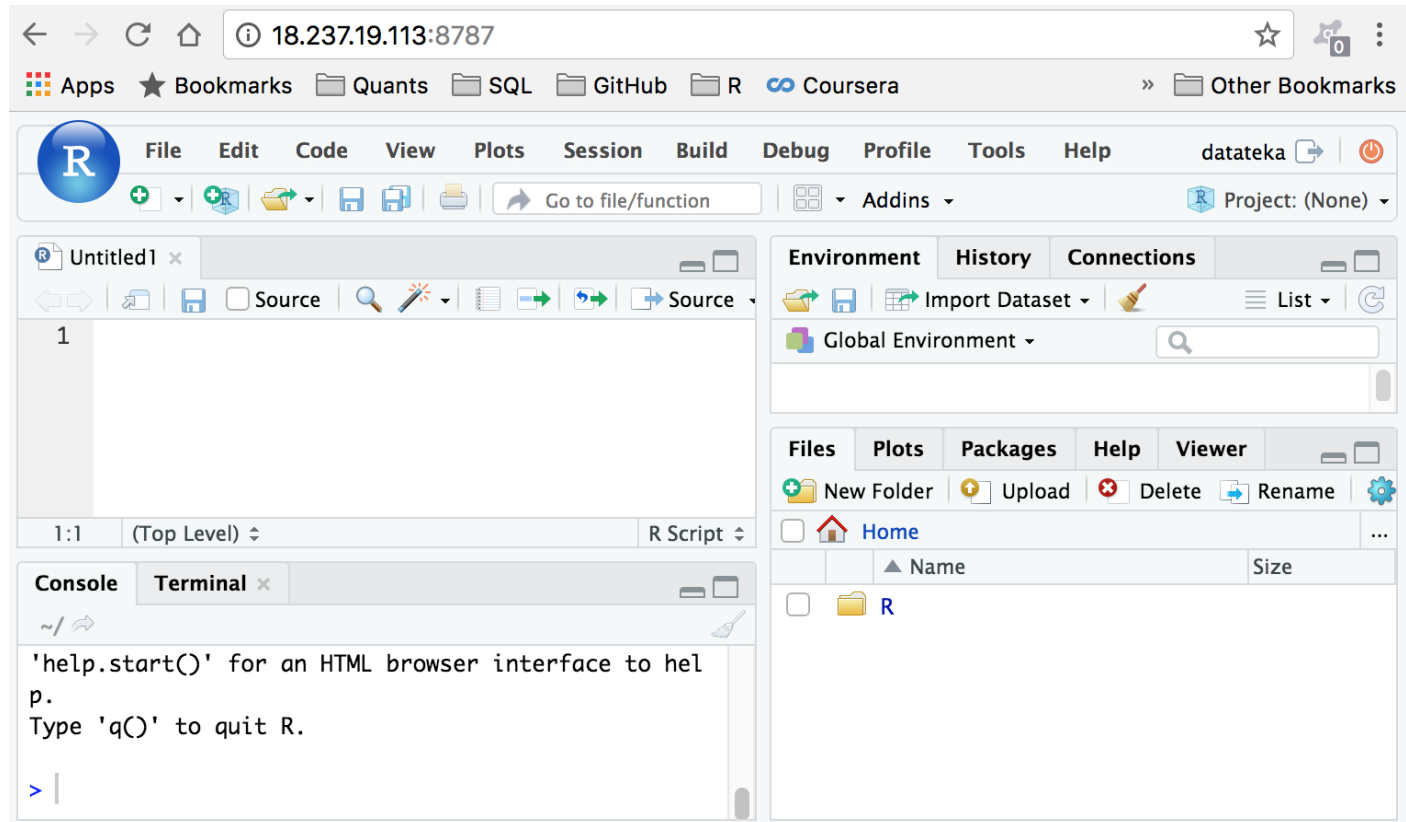
search : i-039131a9969ef1790 Add filter

	Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 P
		i-039131a9969ef1790	t2.micro	us-west-2c	running	2/2 checks ...	None	ec2-18-237-19-113.us-...	18.237.

Instance: i-039131a9969ef1790 Public DNS: ec2-18-237-19-113.us-west-2.compute.amazonaws.com

Description	Status Checks	Monitoring	Tags
Instance ID	i-039131a9969ef1790	Public DNS (IPv4)	ec2-18-237-19-113.us-west-2.compute.amazonaws.com
Instance state	running	IPv4 Public IP	18.237.19.113
Instance type	t2.micro	IPv6 IPs	-
Elastic IPs		Private DNS	ip-10-0-0-248.us-west-2.compute.internal
Availability zone	us-west-2c	Private IPs	10.0.0.248
Security groups	launch-wizard-3 , view inbound rules	Secondary private IPs	
Scheduled events	No scheduled events	VPC ID	vpc-ab83aad2
AMI ID	amzn-ami-hvm-2018.03.0.20180412-x86_64-gp2 (ami-6b8cef13)	Subnet ID	subnet-ec4924b6
Platform	-	Network interfaces	eth0
IAM role	-	Source/dest. check	True
Key pair name	eRum	T2 Unlimited	Disabled

Your RStudio in Amazon Cloud



We know how to do Elain's Dance!!! 😊 🎵 🎵 🎵



RStudio Cloud! 🙌 🎵 🎵 🎵

Do the Cosmo Dance?! 😜 🎵 🎵 🎵



Instructor:

Set up your classroom: +New Space

The screenshot displays the RStudio Cloud interface for an instructor. The left sidebar contains navigation options: 'Spaces' (with 'Your Workspace'), 'My Classroom' (selected), and 'New Space'. Below this is an 'Info' section with 'Feedback and Questions' and 'Terms and Conditions'. The top navigation bar includes 'My Classroom', 'Projects' (active), 'Members', 'Settings', and a trash icon. The main content area is titled 'Shared Projects' and shows a project named 'How2Markdown' by 'DataTeka Instructor', created on May 9, 2018. A 'New Project' button and a 'Delete' icon are visible. On the right, there is a 'Search Projects' search bar, a 'List Projects' section with radio buttons for 'All', 'Shared with everyone' (selected), and 'Yours', and a 'Sort Projects' section with radio buttons for 'By name' (selected) and 'By date created'. At the bottom right, there is a 'My Classroom' section with 'learning RMarkdown' and a 'Your Other Spaces' section with 'Your Workspace' and 'New Space'.

Instructor:

Set up a project: Project Tab

The screenshot displays the RStudio Cloud interface. On the left, the 'Spaces' sidebar shows 'My Classroom' selected. The main editor area is titled 'My Classroom / How2Markdown' and shows an R Markdown file with code for including a GIF and a link to a website. The 'Environment' tab is active, showing an empty global environment. The 'Files' tab is also visible, showing a file explorer with a 'project' folder. The 'Console' tab at the bottom shows the output of the R code, including help indices and package installation status.

Studio Cloud

My Classroom / How2Markdown

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins R 3.4.4

Markdown_Intro.Rmd RMarkdown_Intro_Tasks.Rmd

```
145
146 ```{r, out.width = "300px", echo=FALSE}
147 knitr::include_graphics("giphy.gif")
148 ```
149
150 ---
151 ## [img alt="giphy.gif"]
152 **Useful Links**:
153
154 Using R Markdown for Class Reports:
155 <http://www.stat.cmu.edu/~cshalizi/rmarkdown/>
156
```

Environment History Connections

Global Environment

Environment is empty

Files Plots Packages Help Viewer

New Folder Upload Delete Rename Mo

> / > cloud > project

Name	Size	Mo
..		
.Rhistory	0 B	Me
giphy.gif	6.8 MB	Me
kramer_congrats.gif	752.6 KB	Me
libs		
project.Rproj	205 B	Me
RMarkdown.png	1.1 MB	Me
RMarkdown_Intro.html	734.6 KB	Me
RMarkdown_Intro.Rmd	1.7 KB	Me
RMarkdown_Intro_Tasks.html	6.4 KB	Me
RMarkdown_Intro_Tasks.Rmd	5.1 KB	Me

Console Terminal

/cloud/project/

```
** help
*** installing help indices
** building package indices
** installing vignettes
** testing if installed package can be loaded
* DONE (xaringan)

The downloaded source packages are in
  '/tmp/RtmpK1dYrs/downloaded_packages'
>
```

Access Info

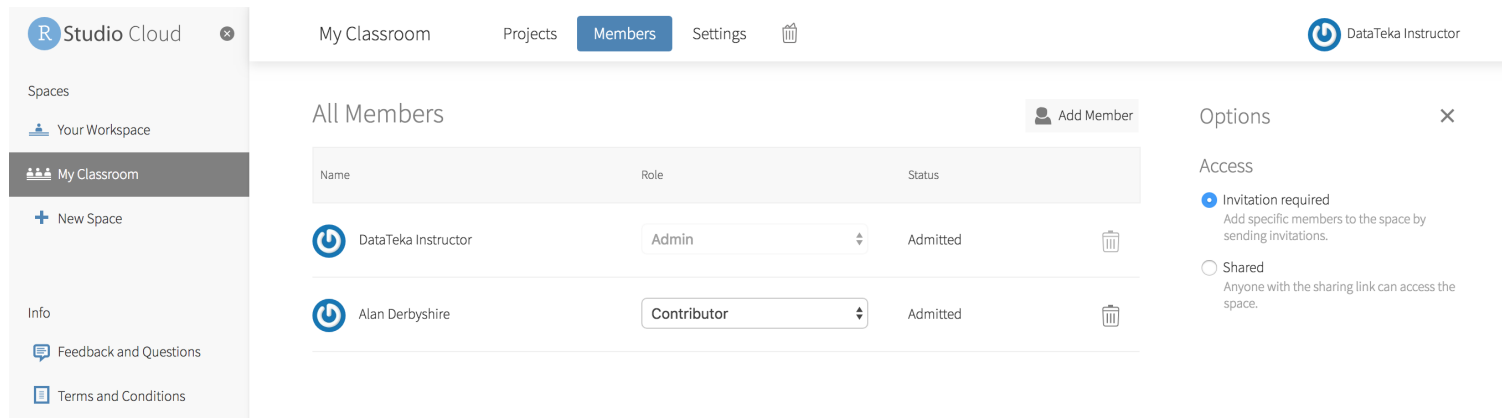
Who can view this project

Everyone in My Classroom

DataTeka Instructor

Instructor:

Add your students: Members



The screenshot displays the Studio Cloud interface. On the left is a sidebar with navigation options: 'Studio Cloud', 'Spaces' (containing 'Your Workspace' and 'My Classroom'), 'New Space', and 'Info' (containing 'Feedback and Questions' and 'Terms and Conditions'). The main area has a top navigation bar with 'My Classroom', 'Projects', 'Members' (selected), 'Settings', and a trash icon. The 'Members' section is titled 'All Members' and includes an 'Add Member' button. Below this is a table with columns 'Name', 'Role', and 'Status'. The table lists two members: 'DataTeka Instructor' with role 'Admin' and status 'Admitted', and 'Alan Derbyshire' with role 'Contributor' and status 'Admitted'. On the right, an 'Options' panel is open, showing 'Access' settings with 'Invitation required' selected and 'Shared' as an alternative.

Name	Role	Status
DataTeka Instructor	Admin	Admitted
Alan Derbyshire	Contributor	Admitted

Options

Access

- ☒ Invitation required
Add specific members to the space by sending invitations.
- ☐ Shared
Anyone with the sharing link can access the space.

Student:

**Check your emails and Join the
classroom 🤔**

Click the link below to sign up now:

[https://login.rstudio.cloud/invite?
redirect=https%3A%2F%2Frstudio.cloud%2Fspaces%2F
89&space_name=My+Classroom&code=zEBHxdecg8di2
5XfW0LW5SxdCYHVljBbLvQZDo&setup=1](https://login.rstudio.cloud/invite?redirect=https%3A%2F%2Frstudio.cloud%2Fspaces%2F89&space_name=My+Classroom&code=zEBHxdecg8di25XfW0LW5SxdCYHVljBbLvQZDo&setup=1)

This message was sent by RStudio Cloud on behalf of

Student:

Check the Project

Save a Permanent Copy of the **TEMPORARY** Project

The screenshot displays the RStudio Cloud interface. The top bar shows the 'Studio Cloud' logo and the project name 'My Classroom / How2Markdown'. A red 'TEMPORARY' label is visible next to the 'Save a Permanent Copy' button. The main editor area shows an R Markdown file with the following content:

```
1 ---
2 title: "Introduction To R Markdown"
3 subtitle: "DataTeka"
4 author: "Tatjana Kecojec"
5 date: "May 2018"
6 output:
7   xaringan::moon_reader:
8     css: ["default", "css/ohsu.css", "css/ohsu-fonts.css"]
9     lib_dir: libs
10    nature:
11      highlightStyle: atelier-lakeside-light
12      highlightLines: true
13      countIncrementalSlides: false
```

The console at the bottom shows the R startup message:

```
/cloud/project/
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.

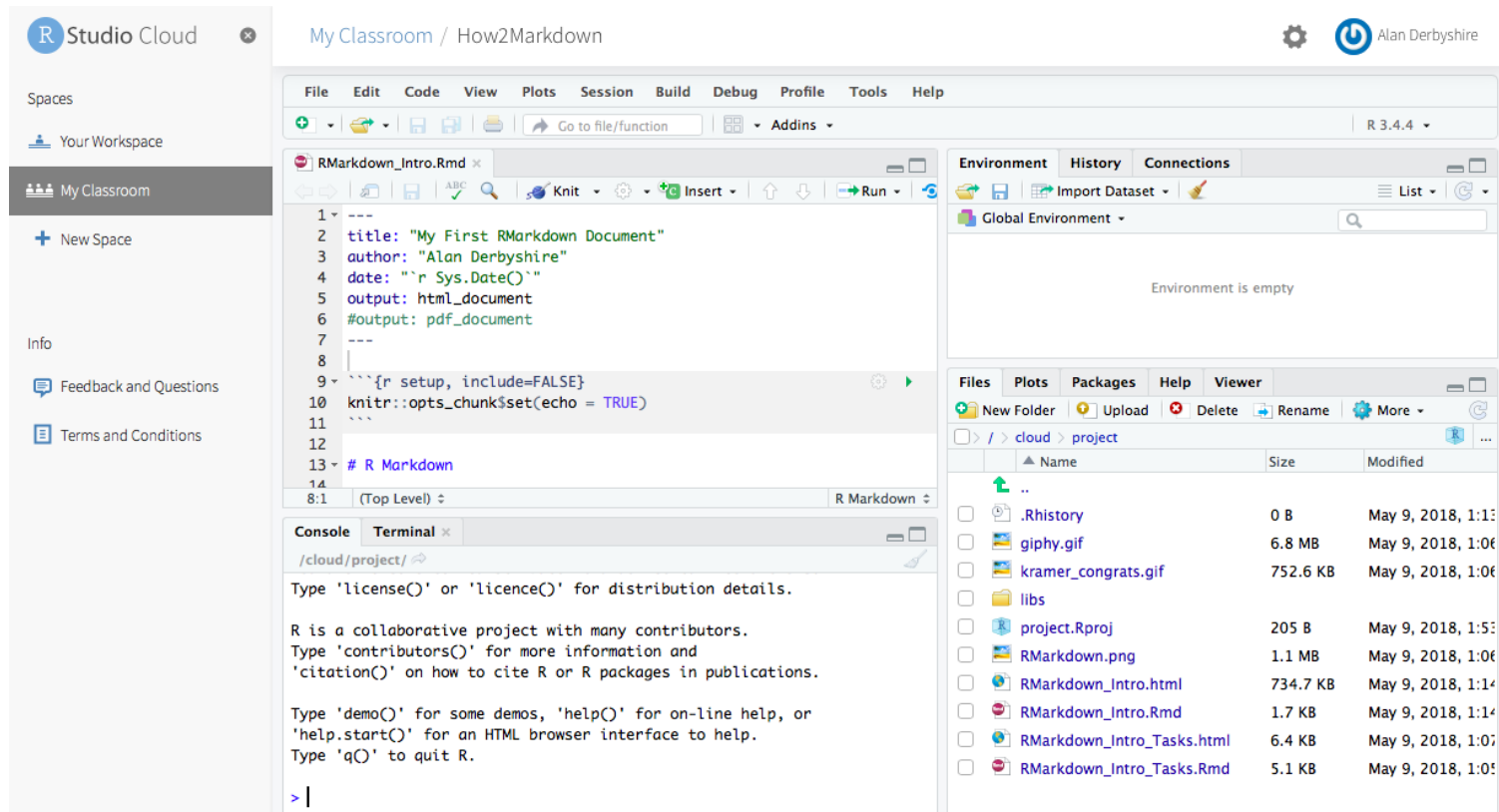
> |
```

The file explorer on the right shows the project structure:

Name	Size	Modified
..		
.Rhistory	0 B	May 9, 2018, 1:41
giphy.gif	6.8 MB	May 9, 2018, 1:06
kramer_congrats.gif	752.6 KB	May 9, 2018, 1:06
libs		
project.Rproj	205 B	May 9, 2018, 1:41
RMarkdown.png	1.1 MB	May 9, 2018, 1:06
RMarkdown_Intro.html	734.6 KB	May 9, 2018, 1:02
RMarkdown_Intro.Rmd	1.7 KB	May 9, 2018, 1:02
RMarkdown_Intro_Tasks.html	6.4 KB	May 9, 2018, 1:07
RMarkdown_Intro_Tasks.Rmd	5.1 KB	May 9, 2018, 1:05

Student:

Working on project 🤔💧🤔😄🧐😎🧐



RStudio Cloud My Classroom / How2Markdown Alan Derbyshire

Spaces
Your Workspace
My Classroom
New Space

Info
Feedback and Questions
Terms and Conditions

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins R 3.4.4

RMarkdown_Intro.Rmd

```
1 ---
2 title: "My First RMarkdown Document"
3 author: "Alan Derbyshire"
4 date: "`r Sys.Date()`"
5 output: html_document
6 #output: pdf_document
7 ---
8
9 {r setup, include=FALSE}
10 knitr::opts_chunk$set(echo = TRUE)
11
12
13 # R Markdown
14
```

Environment History Connections

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 9, 2018, 1:11
giphy.gif	6.8 MB	May 9, 2018, 1:06
kramer_congrats.gif	752.6 KB	May 9, 2018, 1:06
libs		
project.Rproj	205 B	May 9, 2018, 1:55
RMarkdown.png	1.1 MB	May 9, 2018, 1:06
RMarkdown_Intro.html	734.7 KB	May 9, 2018, 1:14
RMarkdown_Intro.Rmd	1.7 KB	May 9, 2018, 1:14
RMarkdown_Intro_Tasks.html	6.4 KB	May 9, 2018, 1:07
RMarkdown_Intro_Tasks.Rmd	5.1 KB	May 9, 2018, 1:05

Console Terminal

/cloud/project

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.

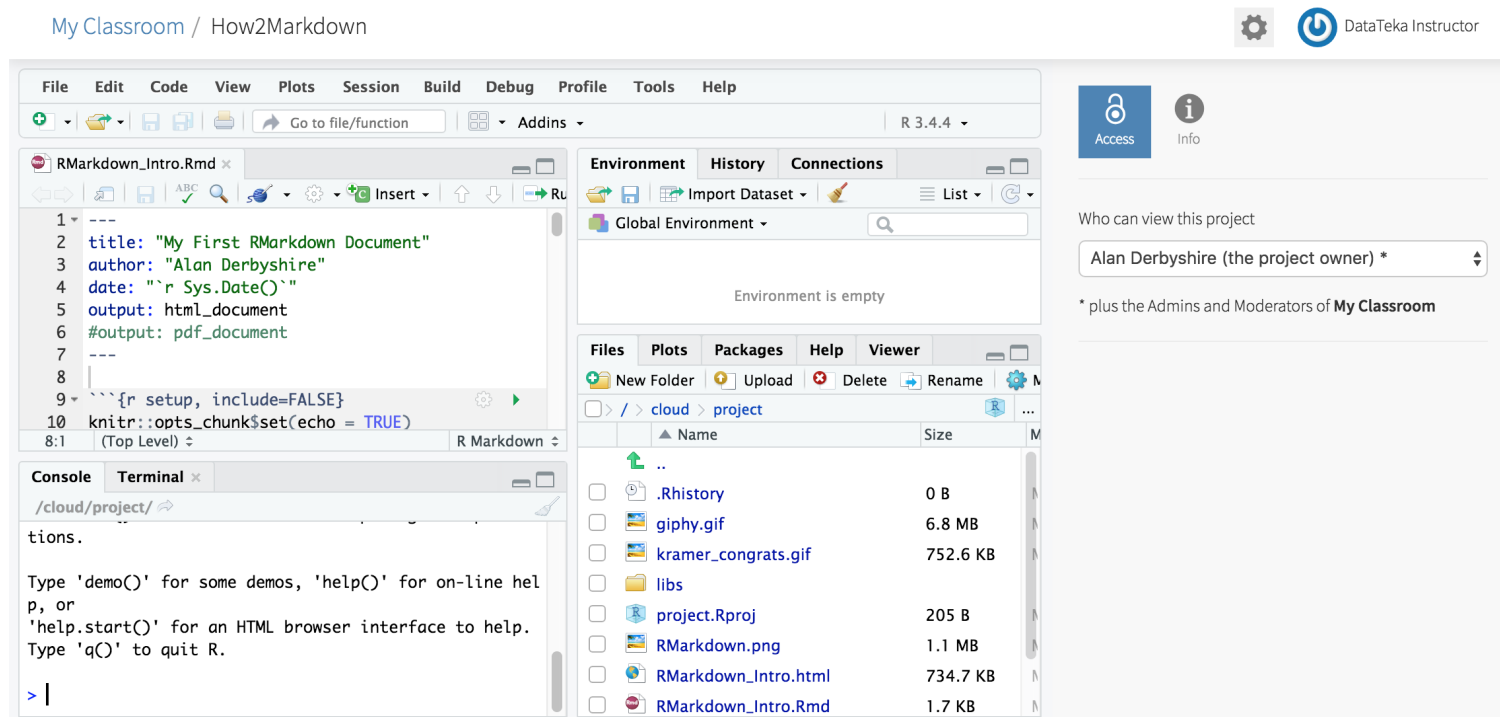
> |

Instructor:

Check student's work 🤔😊😇🎵🎵🎵

My Classroom / How2Markdown

Settings DataTeka Instructor



The screenshot displays the RStudio IDE interface. The main editor window shows a markdown file named 'RMarkdown_Intro.Rmd' with the following content:

```
1 ---
2 title: "My First RMarkdown Document"
3 author: "Alan Derbyshire"
4 date: "`r Sys.Date()`"
5 output: html_document
6 #output: pdf_document
7 ---
8
9 ```{r setup, include=FALSE}
10 knitr::opts_chunk$set(echo = TRUE)
11 ```
```

The console window at the bottom left shows the output of the R code, including the prompt '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 on the right shows the 'Global Environment' with the message 'Environment is empty'.

The file explorer on the right shows the following files and folders:

Name	Size
..	0 B
.Rhhistory	0 B
giphy.gif	6.8 MB
kramer_congrats.gif	752.6 KB
libs	
project.Rproj	205 B
RMarkdown.png	1.1 MB
RMarkdown_Intro.html	734.7 KB
RMarkdown_Intro.Rmd	1.7 KB

Who can view this project

Alan Derbyshire (the project owner) *

* plus the Admins and Moderators of My Classroom

Everybody Loves RStudio Cloud Dance 🙇🎵🎵



Thanks!

www.datateka.com

tanjakec.github.io

@DataTeka

@Tatjana_Kec

Slides created via the R package **xaringan**.

The chakra comes from **remark.js**, **knitr**, and **R Markdown**.