



Run Linux R on Windows 10 with WSL2 and RStudio Server

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Who is this speaker?

Background

- ① Asst. Professor in Psychology at *University of Kansas*
- ① Postdoc in Computer Science at *Carnegie Mellon University*
- ① PhD in Clinical Psychology at *University of Pittsburgh*

Interests

- ① Emotions and Facial Behavior
- ① Psychological Assessment
- ① Applied Statistics and ML
- ① Bayesian Multilevel Modeling
- ① *circumplex* R package (CRAN)
- ① *agreement* R package (GitHub)

What is Linux and why should I care?

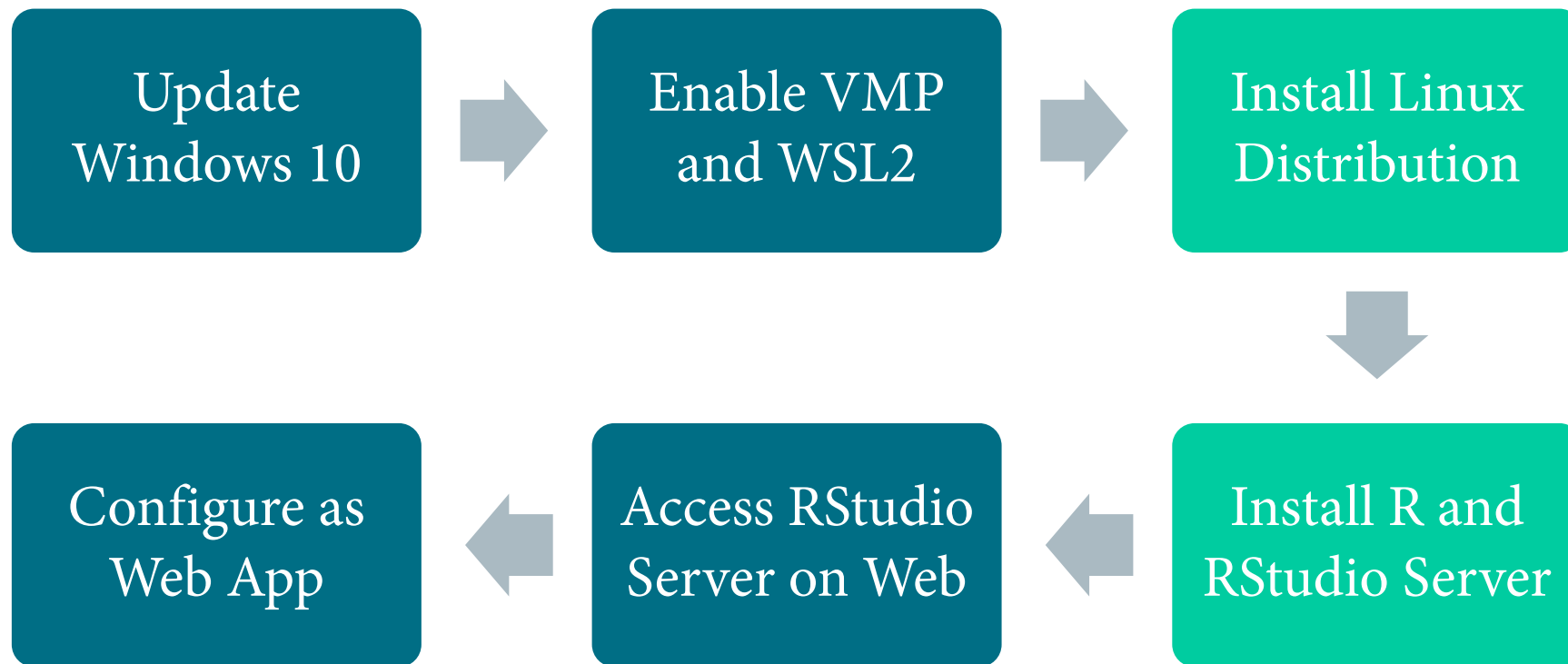
- ① Linux is an *operating system*: it manages hardware \leftrightarrow software
- ① It is *free* and *open-source*
- ① It is *lightweight* and *customizable*
- ① It is great for *programming*
- ① It offers various "distributions"



Why run Linux R on Windows 10?

- ◎ **Take advantage of features and benefits specific to Linux**
 - ◎ Fewer issues with package compilation (no Rtools needed)
 - ◎ More stability due to many package developers using Linux
 - ◎ More parallelization options and better memory management
- ◎ **Facilitate cross-platform development of R code and packages**
 - ◎ CRAN requires your packages to run on Windows, MacOS, and Linux
 - ◎ Troubleshooting errors on a platform you aren't using is really hard
- ◎ **Ease the process of learning about or transitioning to Linux**

Roadmap for the Setup Process




Completed on Windows 10



Completed on Linux VM


Update Windows 10 to version 1903-18362 (or higher) and then open Microsoft PowerShell

PowerShell

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```
dism.exe /online /enable-feature /featurename:Microsoft-Windows-Subsystem-Linux /all /norestart
```


PowerShell

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```
dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart
```

Restart computer and then download and install WSL2 from <https://aka.ms/ws12kernel>

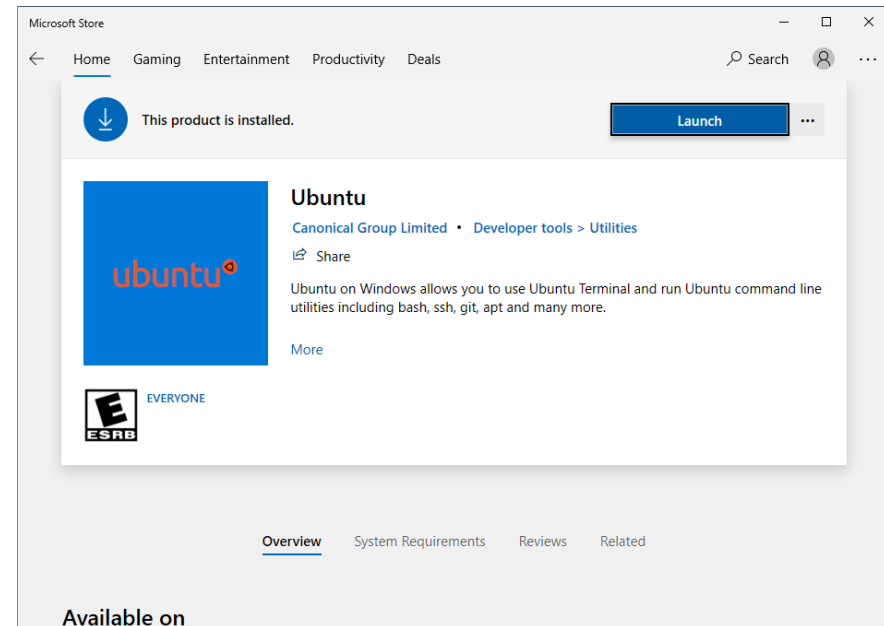
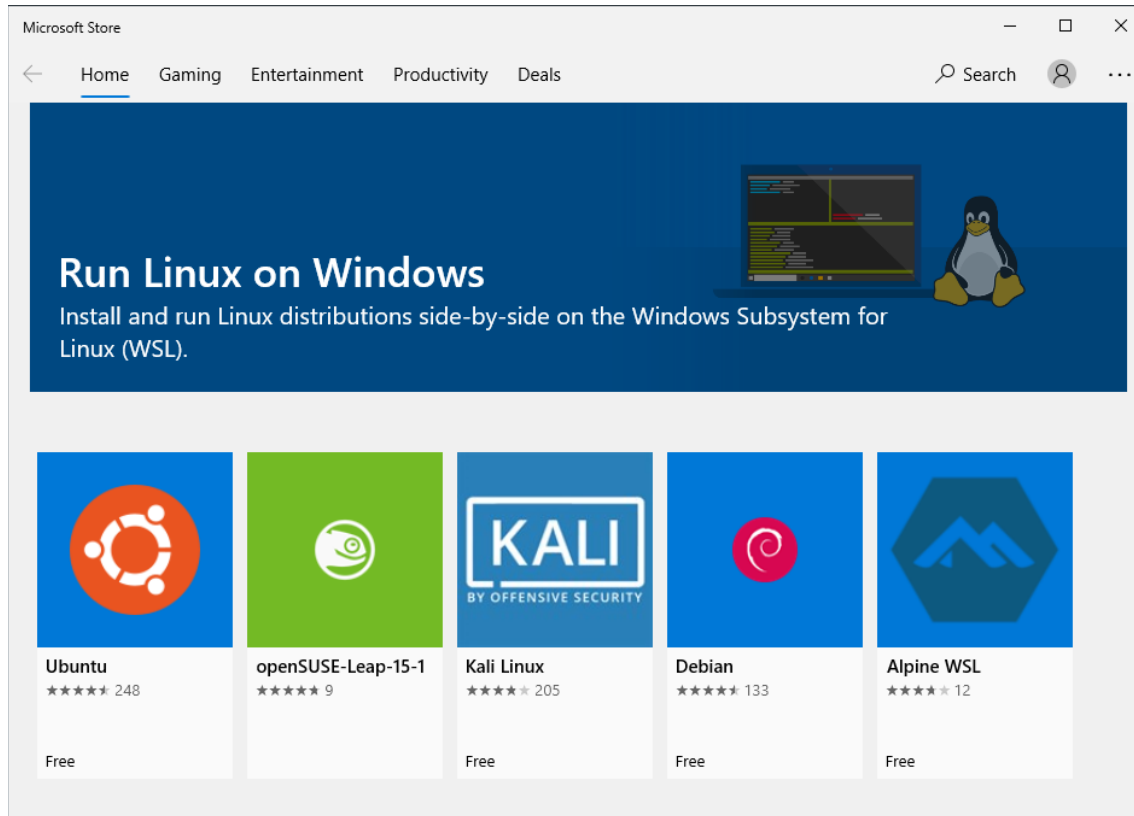
PowerShell

 Copy

```
wsl --set-default-version 2
```

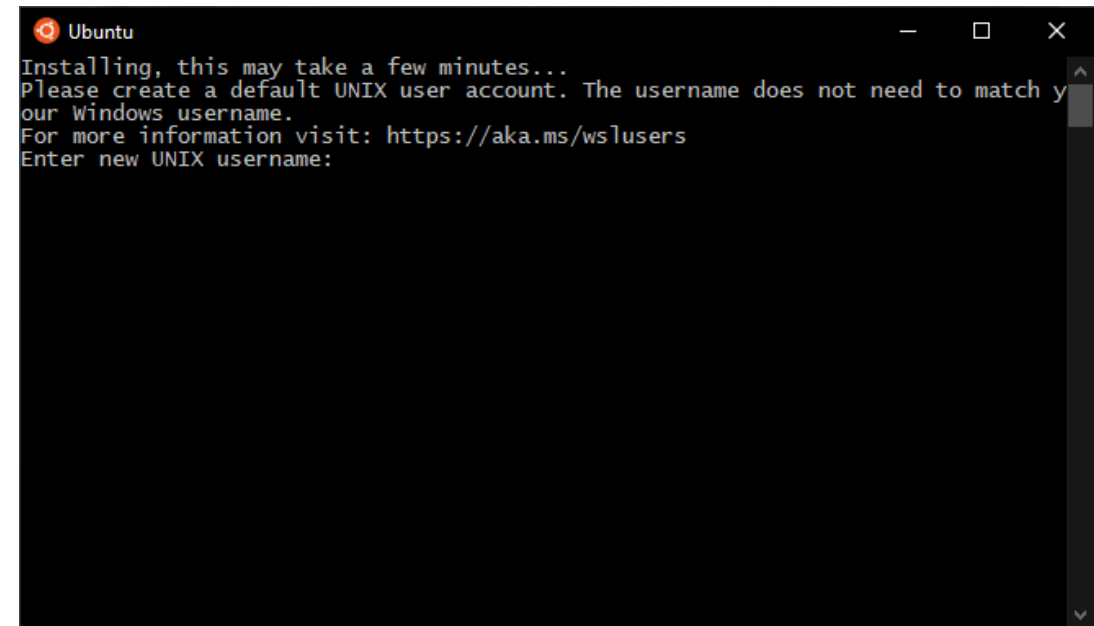
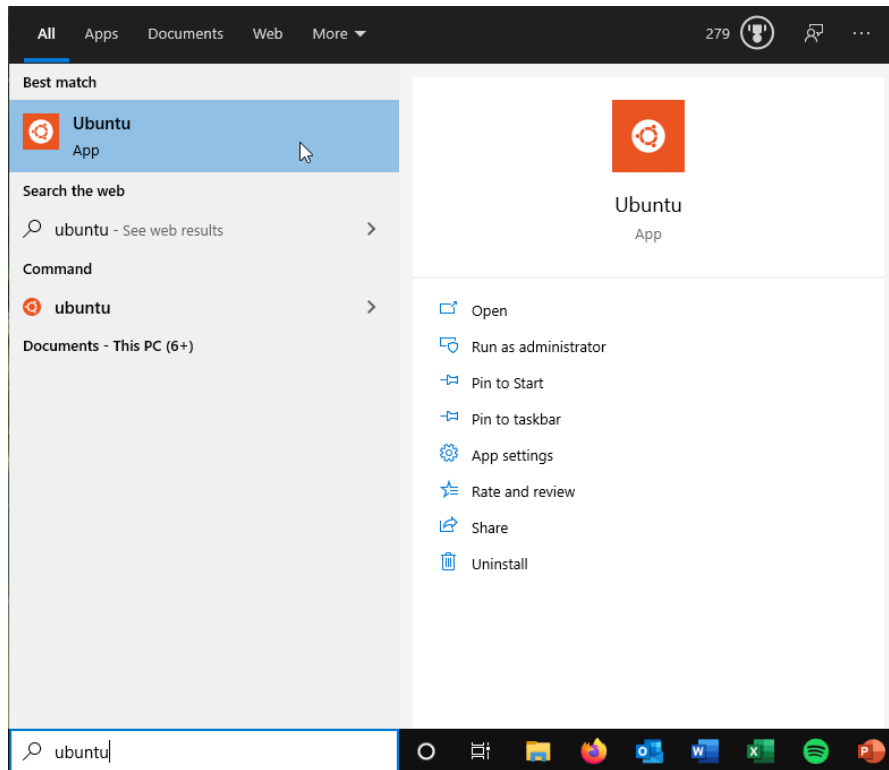
Steps to enable WSL and VMP and update to WSL2

Install your desired Linux distribution from <https://aka.ms/wslstore>



Steps to install Linux distribution (e.g., Ubuntu)

Run your Linux distribution as a Windows app and create a default UNIX user account



Steps to launch and configure Linux distribution (e.g., Ubuntu)

Update your Linux distribution to the newest versions (*Note: code may vary by distribution*)

```
sudo apt update
sudo apt upgrade -y
```

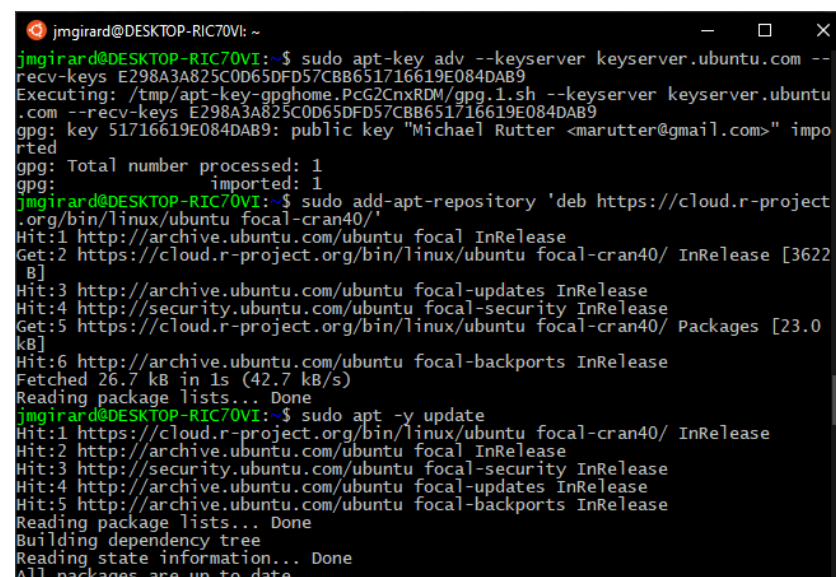
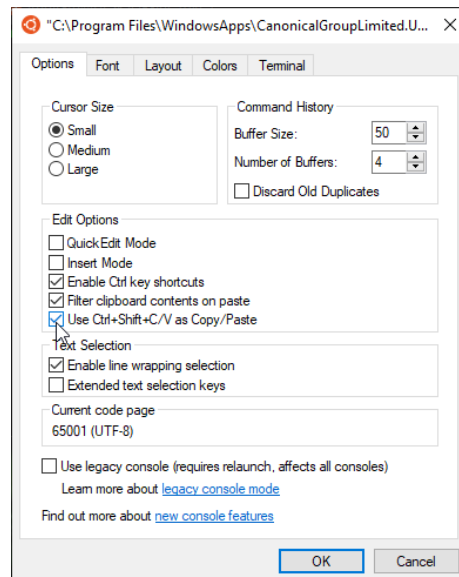
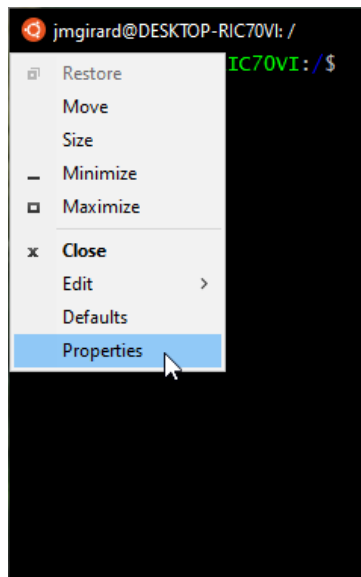
```
jmgirard@DESKTOP-RIC70VI: ~  
jmgirard@DESKTOP-RIC70VI:~$ sudo apt -y update  
[sudo] password for jmgirard:  
Hit:1 http://archive.ubuntu.com/ubuntu focal InRelease  
Get:2 http://archive.ubuntu.com/ubuntu focal-updates InRelease [111 kB]  
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [107 kB]  
Get:4 http://archive.ubuntu.com/ubuntu focal-backports InRelease [98.3 kB]  
Get:5 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [159 kB]  
Get:6 http://archive.ubuntu.com/ubuntu focal/universe amd64 Packages [8628 kB]  
Get:7 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [57.4 kB]  
Get:8 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata [4144 B]  
Get:9 http://security.ubuntu.com/ubuntu focal-security/universe amd64 Packages [53.1 kB]  
Get:10 http://security.ubuntu.com/ubuntu focal-security/universe Translation-en [27.1 kB]  
Get:11 http://security.ubuntu.com/ubuntu focal-security/universe amd64 c-n-f Metadata [2136 B]  
Get:12 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 Packages [1172 B]  
Get:13 http://security.ubuntu.com/ubuntu focal-security/multiverse Translation-en [540 B]  
Get:14 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 c-n-f Metadata [116 B]
```

```
jmgirard@DESKTOP-RIC70VI: ~  
jmgirard@DESKTOP-RIC70VI:~$ sudo apt -y upgrade  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
Calculating upgrade... Done  
The following packages will be upgraded:  
  bcache-tools libgl1 libglvnd0 libglx0 open-vm-tools python3-distupgrade  
  python3-software-properties software-properties-common sudo  
  ubuntu-release-upgrader-core unattended-upgrades  
11 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.  
Need to get 1473 kB of archives.  
After this operation, 137 kB of additional disk space will be used.  
Get:1 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 sudo amd64 1.8.3-1ubuntu1.1 [513 kB]  
Get:2 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 ubuntu-release-upgrader-core all 1:20.04.24 [23.7 kB]  
Get:3 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 python3-distupgrade all 1:20.04.24 [103 kB]  
Get:4 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 bcache-tools amd64 1.0.8-3ubuntu0.1 [19.5 kB]  
Get:5 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 software-properties-common all 0.98.9.2 [10.6 kB]  
Get:6 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 python3-software-properties all 0.98.9.2 [25.2 kB]  
Get:7 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 unattended-upgra
```

Steps to update your Linux distribution (e.g., Ubuntu)

Install (or update) R on your Linux virtual machine (*Tip: enable copy-paste into terminal*)

```
sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys E298A3A825C0D65DFD57CBB651716619E084DAB9
sudo add-apt-repository 'deb https://cloud.r-project.org/bin/linux/ubuntu focal-cran40/'
sudo apt update
sudo apt install -y r-base r-base-core r-recommended r-base-dev gdebi-core build-essential libcurl4-gnutls-dev libxml2-dev libssl-dev
```



Steps to install and update R on Linux (e.g., Ubuntu)

Install RStudio Server on your Linux virtual machine and then start the service

```
wget https://rstudio.org/download/latest/stable/server/bionic/rstudio-server-latest-amd64.deb
sudo gdebi rstudio-server-latest-amd64.deb
```

```
sudo rstudio-server start
```

```
jmgirard@DESKTOP-RIC70VI: ~
jmgirard@DESKTOP-RIC70VI:~$ wget https://rstudio.org/download/latest/stable/server/bionic/rstudio-server-latest-amd64.deb
udo gdebi rstudio-server-latest-amd64.deb--2020-08-16 21:48:13-- https://rstudio.org/download/latest/stable/server/bionic/rstudio-server-latest-amd64.deb
Resolving rstudio.org (rstudio.org)... 45.33.2.142
Connecting to rstudio.org (rstudio.org)|45.33.2.142|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://s3.amazonaws.com/rstudio-server/server/bionic/amd64/rstudio-server-1.3.1073-amd64.deb [following]
--2020-08-16 21:48:13-- https://s3.amazonaws.com/rstudio-server/server/bionic/amd64/rstudio-server-1.3.1073-amd64.deb
Resolving s3.amazonaws.com (s3.amazonaws.com)... 52.216.249.14
Connecting to s3.amazonaws.com (s3.amazonaws.com)|52.216.249.14|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 66735410 (64M) [application/x-deb]
Saving to: 'rstudio-server-latest-amd64.deb'

rstudio-server-late 100%[=====>] 63.64M 25.3MB/s in 2.5s
2020-08-16 21:48:16 (25.3 MB/s) - 'rstudio-server-latest-amd64.deb' saved [66735410/66735410]

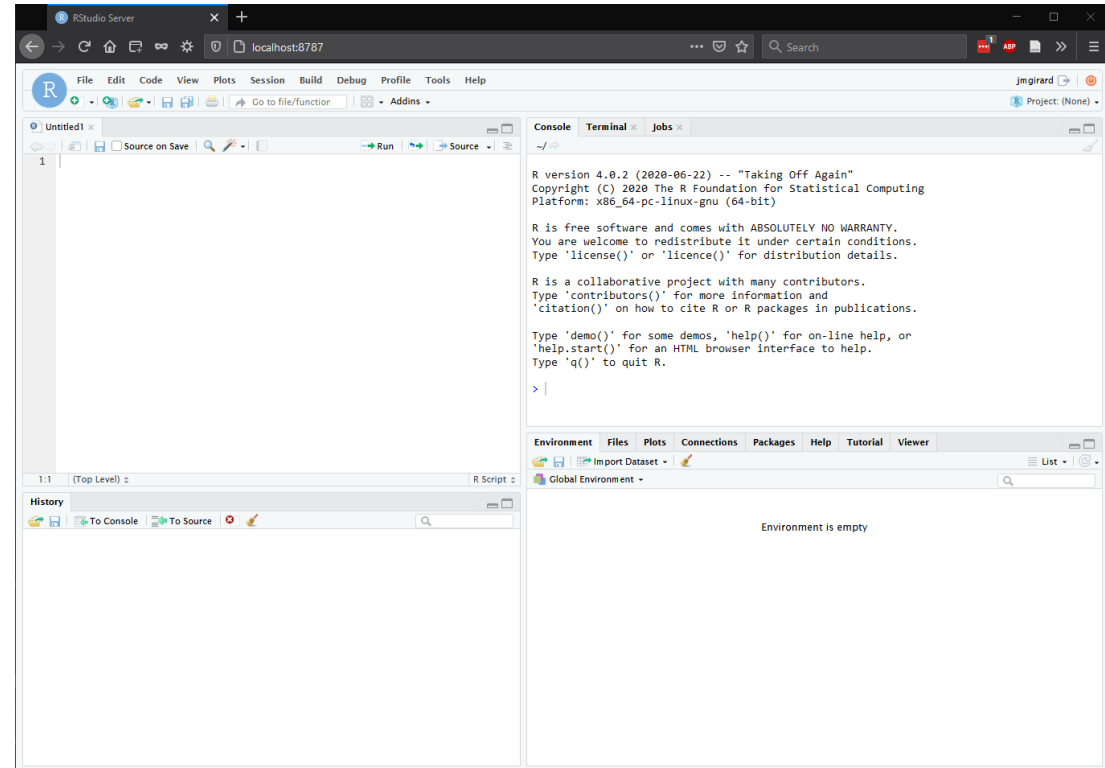
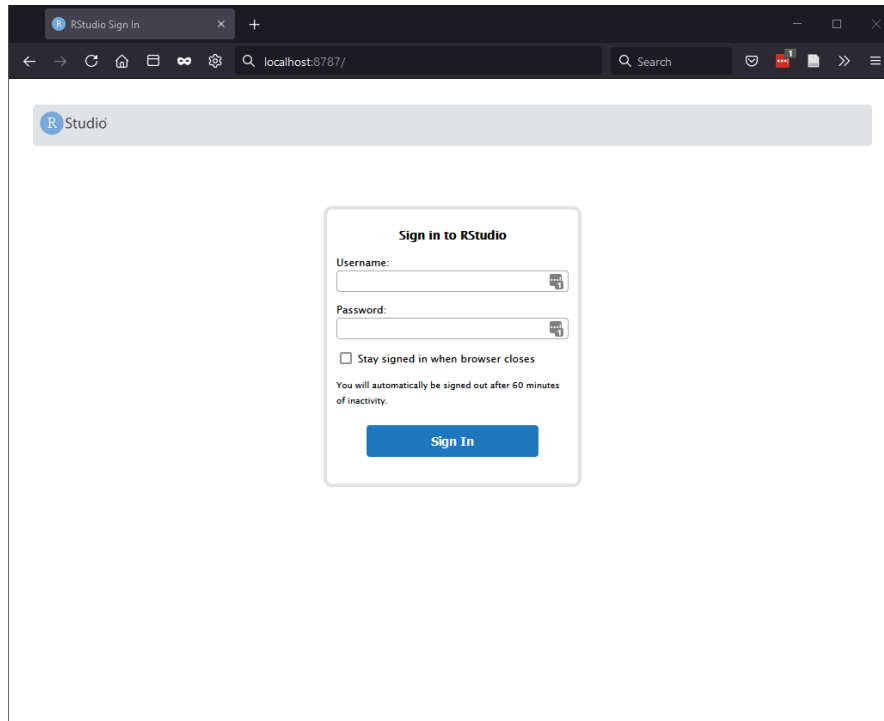
jmgirard@DESKTOP-RIC70VI:~$ sudo gdebi rstudio-server-latest-amd64.deb
```

```
jmgirard@DESKTOP-RIC70VI: /
jmgirard@DESKTOP-RIC70VI:/$ sudo rstudio-server start
[sudo] password for jmgirard:
jmgirard@DESKTOP-RIC70VI:/$
```

Steps to install and start RStudio Server on Linux (e.g., Ubuntu)

Access the RStudio Server via a Windows web browser at <http://localhost:8787>

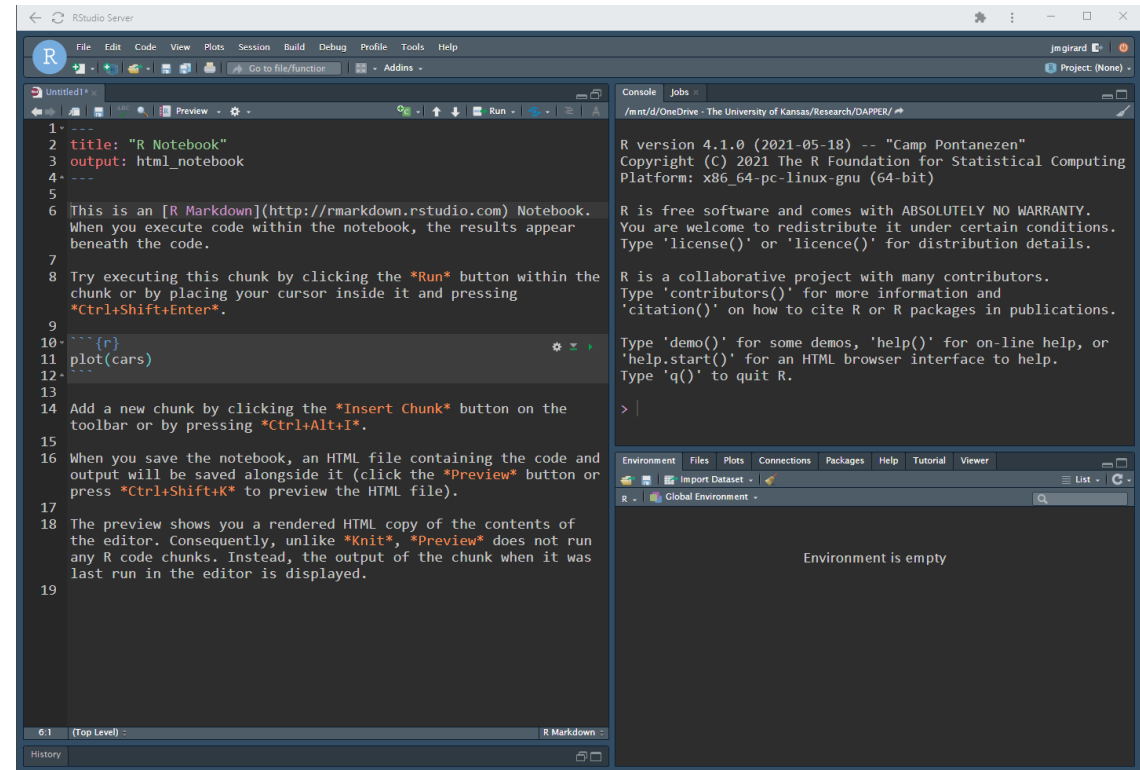
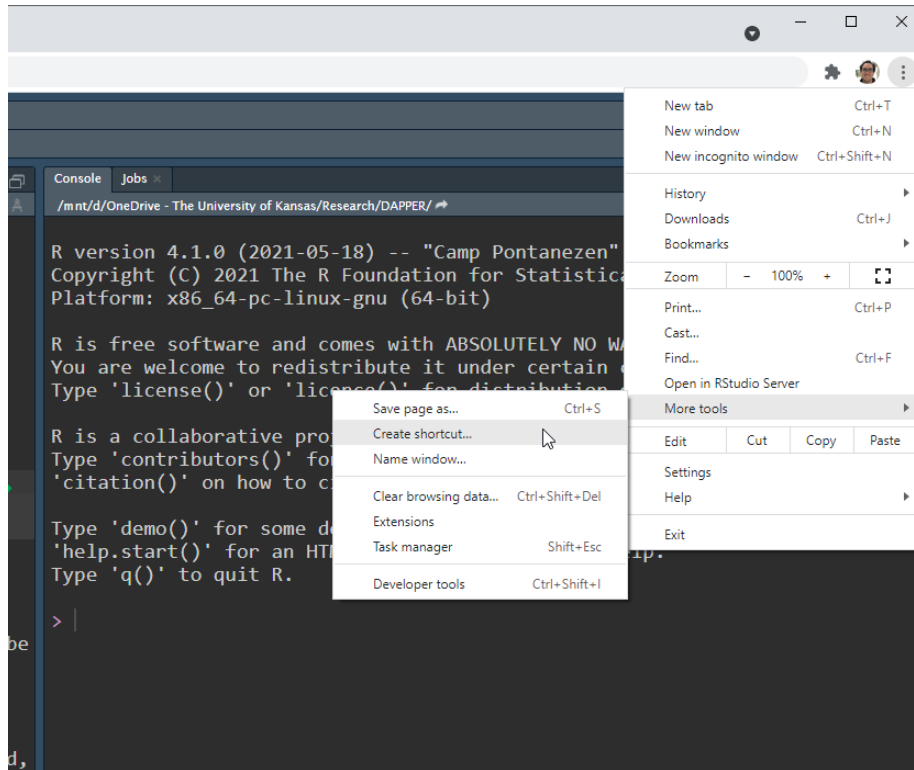
Log in to your RStudio Server using your recently created UNIX user account



Steps to access the Linux RStudio Server from Windows

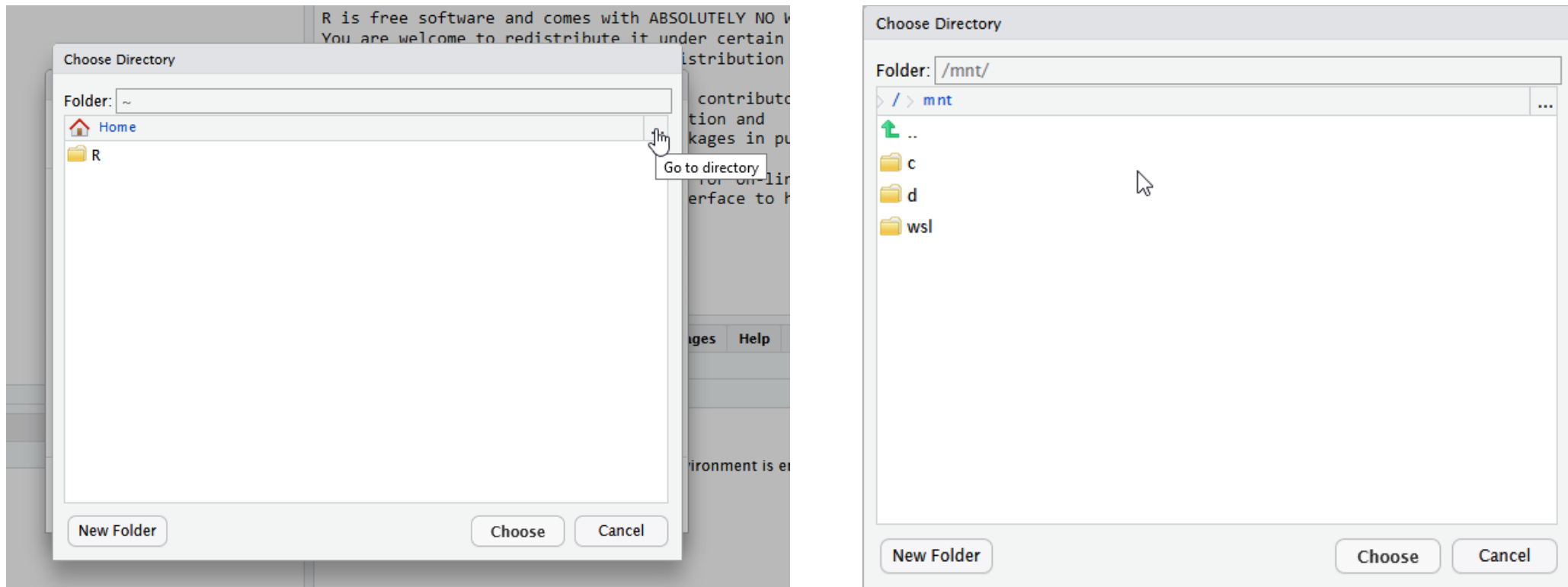
Navigate to RStudio Server in Chrome on Windows via <http://localhost:8787>

Click : then *More tools* then *Create shortcut...* and check *Open in New Window*



Steps to run RStudio Server as a "web app" in Google Chrome

Create or open a new RStudio project on the Windows file system via [/mnt/](#)



Steps to access Windows files on the Linux virtual machine

Troubleshooting and Questions

- ◎ Some R packages have dependencies to install via Linux
- ◎ Stop/Start RStudio Server before/after restarting Windows
e.g., `sudo rstudio-server stop` and `sudo rstudio-server start`
- ◎ Use *genie* if you run into error messages about *systemd*
<https://github.com/arkane-systems/genie>
- ◎ Can we share access to RStudio Server via the Windows network?
- ◎ When will WSL support graphical user interfaces in Linux?

More detailed instructions for every step are on my website: www.jmgirard.com/rstudio-wsl2



Applied Machine Learning in R

Jeffrey Girard, PhD, *University of Kansas*
Shirley Wang, AM, *Harvard University*

July 19-23, 2021, at 1:00-5:00pm ET
5x Half-Day Online / Virtual Workshop

Student / Trainee	\$700
Faculty / Professional	\$1000

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