# Introduction and Installation

## **Installation notes**

* FSL is **not** the same thing as FreeSurfer. Their websites look similarly rugged, but the “FS” in FSL has nothing to do with FreeSurfer. Do not make the same mistake as me and spend a day downloading FSL, only to realize that it’s not FreeSurfer.
* There is a tutorial online suggesting that you need “VirtualBox” to run FreeSurfer on Windows – you do not. Disregard that tutorial and the ridiculous 60 GB file that comes with it. It will waste a lot of your time!
* **LINK TO YOUTUBE PLAYLIST WITH VIDEOS THAT ACCOMPANY THIS GUIDE:**
  + <https://youtube.com/playlist?list=PLNDwvfjY9YL2X8MkwrFFORg4qu_2t1OzT>

## **Steps**

### **Video 1 - Enabling “Windows Subsystem for Linux”.** [**https://youtu.be/ux-C0y-3Qzw**](https://youtu.be/ux-C0y-3Qzw)

* + Pathway:
    - 1) Click the “Start” button (windows logo) in the bottom left
    - 2) Press the gear on the left side of the screen to open settings
    - 3) Click on “apps” or “apps and features” – whichever one you see
    - 4) In the next window, click “programs and features” in the top right (the window must be maximized for you to see this)
    - 5) Click on “Turn Windows features on or off” in the top left
    - 6) Scroll down in this window until you see “Windows Subsystem for Linux”, and check the corresponding box.
    - 7) Press “OK”.
    - 8) Select “Restart now”.
  + Relevant YouTube link:

### **Video 2 - Install Ubuntu from the Microsoft Store** [**https://youtu.be/u-u0ky38T9A**](https://youtu.be/u-u0ky38T9A)

* + Pathway:
    - 1) Click the search button (magnifying glass) in the bottom left of your screen.
    - 2) Search “Microsoft Store” and click on it.
    - 3) Within this window, click on the search tool in the top right.
    - 4) Search “Ubuntu” and click on one of the applications. At time of writing there are three: Ubuntu, Ubuntu 20.04 LTS, and Ubuntu 18.04 LTS.
      * I used Ubuntu 18.04 LTS. It worked. I cannot comment on if the others do.
    - 5) On the application page within Microsoft Store, press “Get” to install the application.
    - 6) Upon successful installation, there should be a blue icon within the application’s Microsoft Store page that says “Launch”. Press this button.
    - 7) After a few minutes, the program will ask you to make a username and password.
      * **Write down your username and don’t give it any spaces.**

### **Video 2 - Configuring Ubuntu** [**https://youtu.be/u-u0ky38T9A**](https://youtu.be/u-u0ky38T9A)

* + 1) Copy and paste this into Ubuntu.
    - sudo apt-get update
    - The paste button in Ubuntu is a right click.
    - Do not accidentally include a space after the word “update”.
  + 2) Copy and paste this into Ubuntu.
    - sudo apt-get install tcsh libfreetype6 libglu1-mesa libfontconfig1 libxrender1 libsm6 libxt6

### **Video 3 and 10 - Install a graphics displayer** [**https://youtu.be/3K6Z36cYWqo**](https://youtu.be/3K6Z36cYWqo) **OR** [**https://youtu.be/RcwKpZDobNA**](https://youtu.be/RcwKpZDobNA)

* + Click this link:
    - xmin<https://sourceforge.net/projects/xming/>
    - Press the green “Download” button.
    - Upon successful download, click on the downloaded application at the bottom of your browser or in your “downloads” folder.
      * It should be called something along the lines of XMing setup, with some numbers interspersed. My download was called Xming-6-9-0-31-setup.
    - A prompt will appear: “Do you want to allow this application from an unknown publisher to make changes to your computer?”
      * Select “Yes”.
    - Keep pressing “Next” within the installation window until you see the “Install” button.
    - When you see the “Install” button, press it.
  + If you are using Windows Subsystem for Linux 2, install this XServer instead and see the video titled “Installing a Different XServer” for further instruction.
    - <https://sourceforge.net/projects/vcxsrv/>
    - You should also install this XServer (instead of XMing) if, when launching freeview, Ubuntu reads “failed to get the screen resources” or “XCB error”.

### **Video 4 - Downloading FreeSurfer** [**https://youtu.be/0\_lqIT2H\_9g**](https://youtu.be/0_lqIT2H_9g)

* Click this link <https://surfer.nmr.mgh.harvard.edu/fswiki/rel7downloads>
* Scroll down to the table with headings “**OS Build | Build Platform | Version etc.**”
* Find the row that has “CentOS 7 x86\_64 (64b) tar archive” listed in the “Build Platform” column.
* Press the download link for that row, under the column “Download”.
  + The download will be in your downloads folder by default.
* Launch Ubuntu by searching it and then clicking it (using the magnifying glass icon in the bottom left).
* Copy and paste the following into Ubuntu.
  + cd /mnt/c/Users/***Mauricio***/Downloads
    - Your Windows username is not the same as the Ubuntu username you previously created. You can find your Windows user name by using Windows file explorer and navigating to This PC 🡪 Users. Look at the User list, and decide which user you are.

#### If you get the error “No such file or directory found”. (If you do not get this error, close this portion of the document and proceed to “Now, copy and paste …” below)

* + - I had a really weird issue where Ubuntu could not locate my user or any of the files I had stored. No matter what I tried, Ubuntu insisted that there was “no such file or directory” under Users/Nate Hostetler.
      * If Ubuntu returns you the error “No such file or directory found”, there is an interesting way to troubleshoot this and determine where the problem lies. It is easiest to see this with an example.
        + As mentioned earlier, my issue was with my User – for some reason, Ubuntu did not think that the user “Nate Hostetler” existed.
        + Step by step, add more to this phrase until you get an error message. For me, this looked something like this:

/mnt

“Is a directory”

/mnt/c

“Is a directory”

/mnt/c/Users

“Is a directory”

/mnt/c/Users/Nate Hostetler

/mnt/c/Users/Nate: No such file or directory.

* + - * + Now, I knew where the error was. Ubuntu recognized everything until I entered my user’s name. I tried using an underscore/hyphen to separate my first and last name – but nothing worked.
        + The workaround I ended up using was making an entirely new User on my PC and storing the file there. Then, I routed Ubuntu to this new user instead of to my User. For some reason, Ubuntu recognized this new pathway as valid. This was a long and annoying fix that involved changing permissions and stuff, so just call me if this happens to you and you need help.

If you want to figure it out on your own, I basically just made a new user and then right clicked on that user in the “Users” tab in file explorer. I then clicked “Give access to”, and gave access to my actual user, the one that was initially giving me all the grief (Nate Hostetler).

Now, with the downloaded file stored in a location that Ubuntu recognized and that my user had access to, I repeated the step above – guiding Ubuntu to my new user named NateHostetler6.

cd /mnt/c/Users/NateHostetler6/Downloads

#### Now, copy and paste the following into Ubuntu and press enter.

* + sudo tar -zxvf freesurfer-linux-centos7\_x86\_64-7.1.1.tar.gz
  + If it copies into Ubuntu as “otar”, remove the o. It should only say tar.
* Each subsequent step represents a separate “copy + paste into Ubuntu”.
  + 1) cd freesurfer
  + 2) pwd
  + 3) export FREESURFER\_HOME=$HOME/freesurfer
  + 4) export SUBJECTS\_DIR=$FREESURFER\_HOME/subjects
  + 5) source $FREESURFER\_HOME/SetUpFreeSurfer.sh

### **Video 5 - Obtaining a FreeSurfer License** [**https://youtu.be/1qA3uPUOBRU**](https://youtu.be/1qA3uPUOBRU)

* Click this link:
  + <https://surfer.nmr.mgh.harvard.edu/registration.html>
  + Fill in the information required, pressing agree where necessary.
  + You will receive an email that contains your license file. The license file is called “license.txt”.
  + Open an instance of windows file explorer and press the “View” button at the top. Within this “view” pane at the top of the file explorer, click “options”. Within the next window, select the “view” tab at the top. In the window here, click on “Show hidden files, folders, and drives”. Click apply, then OK, and then exit the window.
  + Save the license.txt file from the email to the following location:
    - **This PC 🡪 Users 🡪 Your Windows User’s Name 🡪 AppData 🡪 Local 🡪 Packages 🡪 CanonicalGroupLimited.Ubuntu18.04onWindows\_79rhkp1fndgsc 🡪 LocalState 🡪 rootfs 🡪 home 🡪 YOUR USERNAME FOR UBUNTU THAT YOU WROTE DOWN EARLIER 🡪 freesurfer.**

### Videos 6-8: Launching FreeSurfer

#### **Video 6 “Making FreeSurfer Easier to Launch”**: <https://youtu.be/Yz1QFweMOHM>

* Open Ubuntu and XMing (your graphics displayer from earlier). To open XMing, use the search tool (magnifying glass in the bottom left) to search for and click on XLaunch (all the stock settings are fine here, just click through).
* Copy and paste the following into Ubuntu.
  + sudo gedit .bashrc
* Scroll to the bottom of the resulting code-filled window. Beneath the final line of code, copy and paste the following:
  + alias sfs=’export FREESURFER\_HOME=/home/**YOUR UBUNTU USERNAME FROM EARLIER**/freesurfer ; source $FREESURFER\_HOME/SetUpFreeSurfer.sh’
  + It might not let you paste. Just type it in exactly (letter for letter) instead, and replace “YOUR UBUNTU …” with your username. For me, this was nhostetl. This is **not the same as your windows username. It is the username you wrote down up here .**
* Close Ubuntu.
* Reopen Ubuntu.
* Type sfs into Ubuntu.
* Type freeview into Ubuntu.

#### Video 7: Only works if you completed the above steps: <https://youtu.be/bYnEwXVHvyA>

Any time you wish to run freesurfer, type sfs first. Then type freeview, or whatever other command you need. Your steps to run freesurfer

1. open Ubuntu
2. Type sfs and press enter
3. Type freeview, recon-all, whatever else you wanna do.

To open freesurfer, your XMing must be running. If FreeSurfer fails to open, trying launching XMing through XLaunch (search it and click it), and then try again.

#### Video 8: without completing the steps listed prior to “Option A” <https://youtu.be/_pmzJTiSLrU>

* Open a new instance of Ubuntu.
* Copy and paste the following into Ubuntu, in order:
  + 1) export SUBJECTS\_DIR=$FREESURFER\_HOME/subjects
  + 2) source $FREESURFER\_HOME/SetUpFreeSurfer.sh
* Now type “freeview”, “recon-all”, or whatever other command you wish to run.

### **Video 9 - If you get an error that freeview cannot open, follow the steps provided here:** [**https://youtu.be/Ruuv5OTE9qo**](https://youtu.be/Ruuv5OTE9qo)

<https://surfer.nmr.mgh.harvard.edu/fswiki/UpdateFreeview>

**Note**: for step 2, you may have to input “sudo” into Ubuntu before inputting the commands. This would look something like this: (the website does not normally have sudo in this command)

**sudo** rm -rf ${FREESURFER\_HOME}/lib/qt ${FREESURFER\_HOME}/lib/vtk

cp -r freesurfer/lib/qt ${FREESURFER\_HOME}/lib/qt

cp -r freesurfer/lib/vtk ${FREESURFER\_HOME}/lib/vtk

cp freesurfer/bin/freeview freesurfer/bin/qt.conf ${FREESURFER\_HOME}/bin/

**As a general rule, when Ubuntu tells you that “permission is denied”, input sudo before the command and see if it works.**

# Resources for Further Learning

* I am finding FreeSurfer’s website and YouTube channel to be very helpful. Specifically, I’m finding the website’s tutorial page to be very handy. Here is the link to their tutorial page, and YouTube channel (where the videos accompanying the tutorial can be found).
  + [Freesurfer - YouTube](https://www.youtube.com/channel/UCruQerP8aa-gYttXkAcyveA)
  + [FsTutorial - Free Surfer Wiki](https://surfer.nmr.mgh.harvard.edu/fswiki/FsTutorial)
  + <https://surfer.nmr.mgh.harvard.edu/fswiki/UnixTutorial>
    - This link is **incredibly** helpful for learning your way around the Linux terminal (the codey aspect of FreeSurfer).
* In addition, I have found Andy’s Brain Blog’s YouTube channel to be great. Here is the link:
  + <https://www.youtube.com/watch?v=6wxJ1up-E7E&list=PLIQIswOrUH6_DWy5mJlSfj6AWY0y9iUce>
    - This is a playlist he has about FreeSurfer. There are other videos on his channel that are helpful as well.