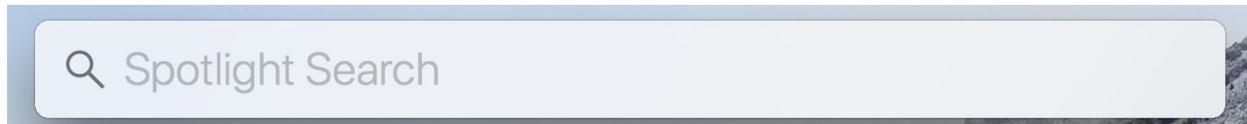


Start with one of the following two sections, depending on whether you are using one of the Macs in the PPPL computer room, or using your own laptop. The remaining sections are identical for the two approaches.

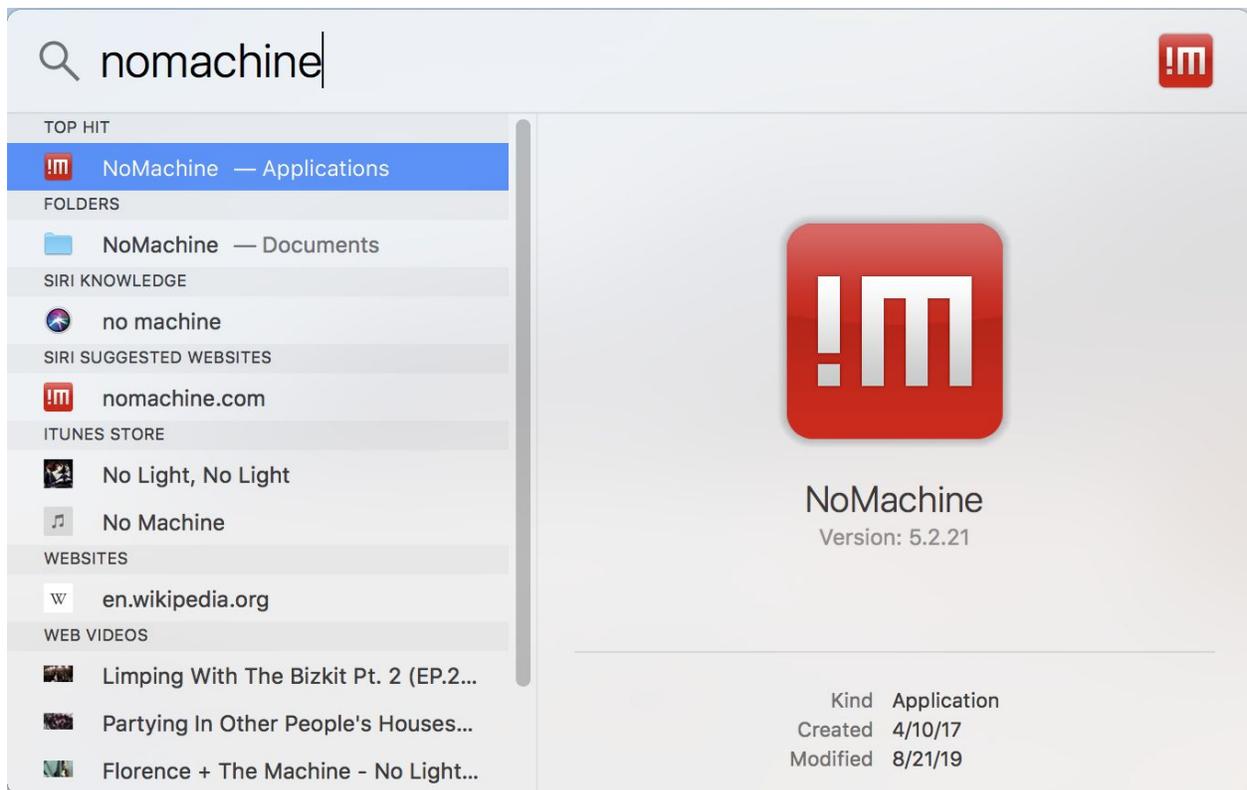
## Using the Macs in the PPPL computer room

Log in to the Mac by entering your username and password.

Press command+space to make a search bar appear.



Type "nomachine"



and press enter, which should start NoMachine. You can now skip the next section about "Using your own laptop" and jump to the section "Logging in to the PPPL cluster using NoMachine"

## Using your own laptop

This approach is only possible if you have set up a password with the PPPL help desk. You will need Pulse Secure to set up a VPN connection. Instructions for installing Pulse Secure can be found here:

<https://access.pppl.gov/vpn2/indexv2.htm>

You will need Duo Mobile on your phone for 2-factor authentication.

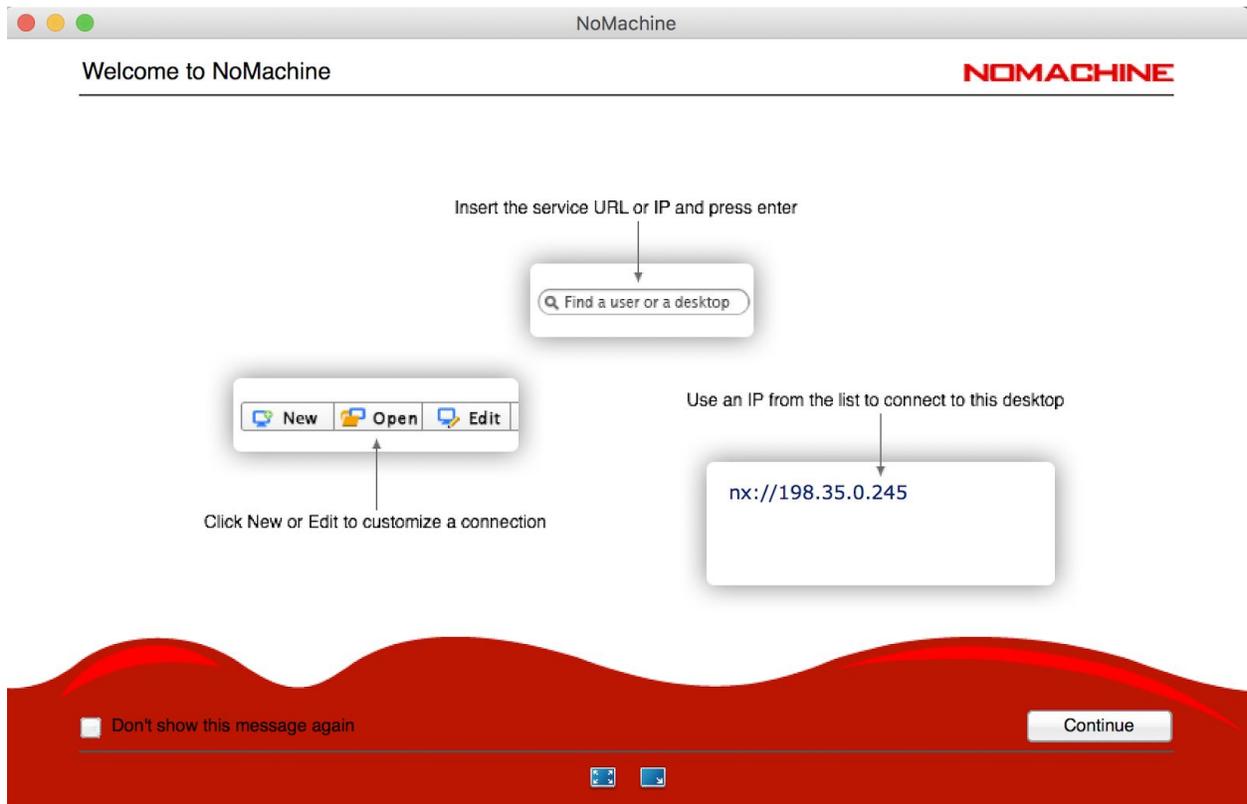
You will then need to have NoMachine installed on your laptop. Instructions for installing it can be found here:

<https://researchcomputing.pppl.gov/nx/nx.html>

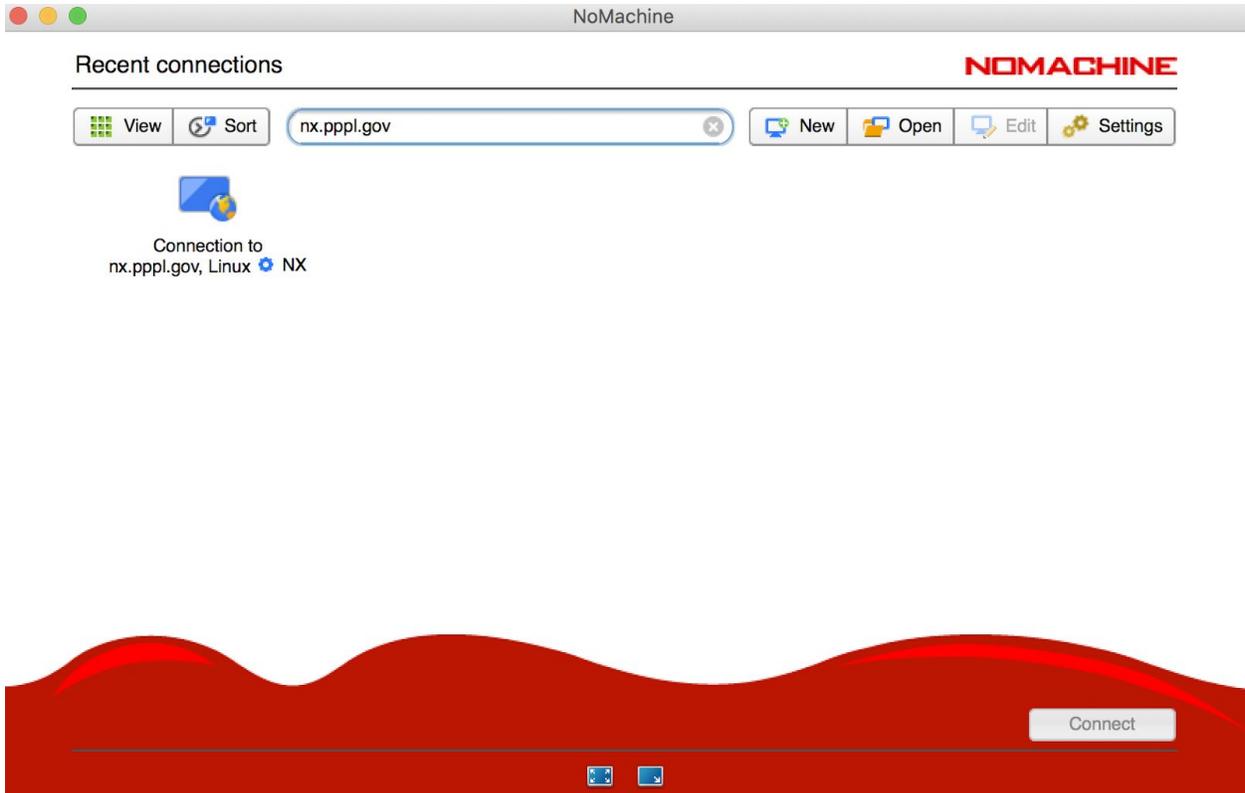
Start NoMachine.

## Logging in to the PPPL cluster using NoMachine

At this point, you should have started NoMachine, and you may see a window like this:



Click "continue". In the search bar near the top of the NoMachine window, type 'nx.pppl.gov'



You may get a message saying 'The authenticity of host...' If so, just click 'yes'.

Enter your username and password.

NoMachine - Connection to nx.pppl.gov

Connection to nx.pppl.gov **NOMACHINE**

Please type your username and password to login.

 Username

Password

Save this password in the connection file

Back OK

NoMachine - Connection to nx.pppl.gov

Connection to nx.pppl.gov **NOMACHINE**

View Sort Find a type My desktops New desktop

 Create a new GNOME virtual desktop

 Create a new KDE virtual desktop

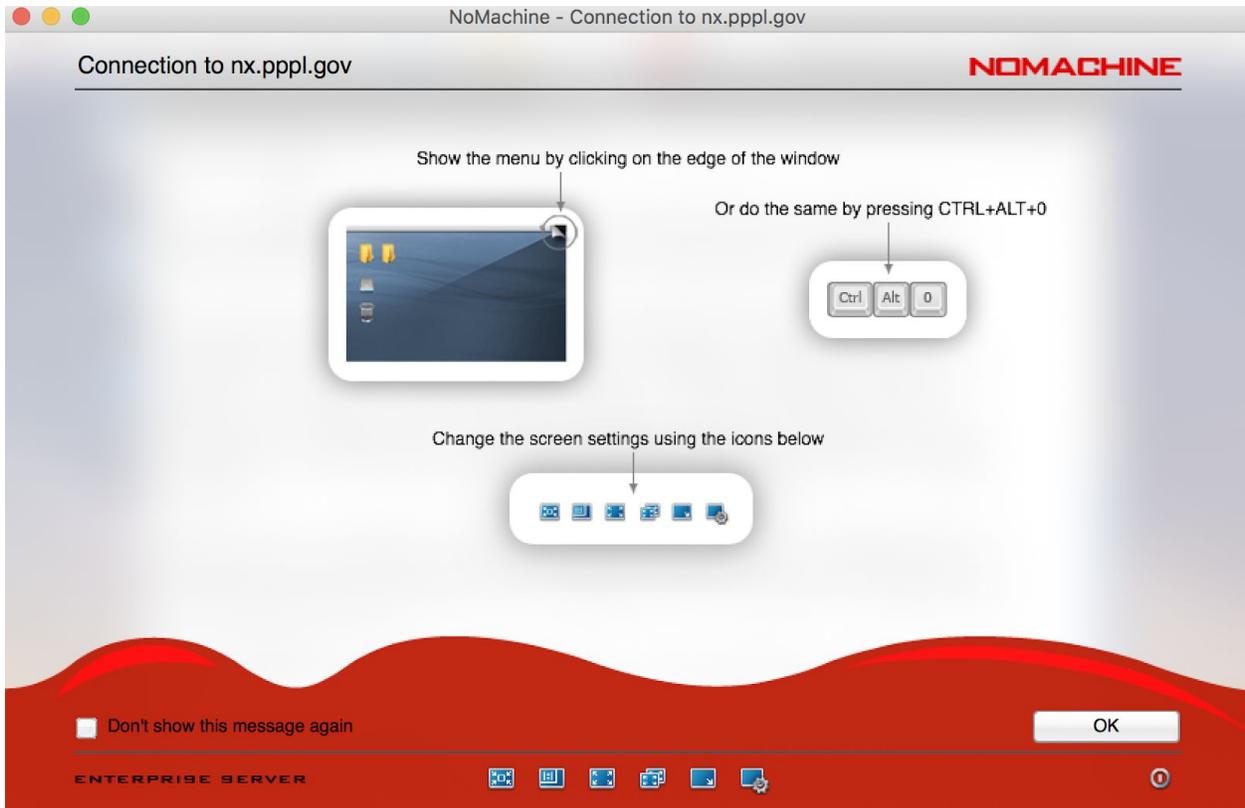
 Create a new custom session

Save this setting in the connection file

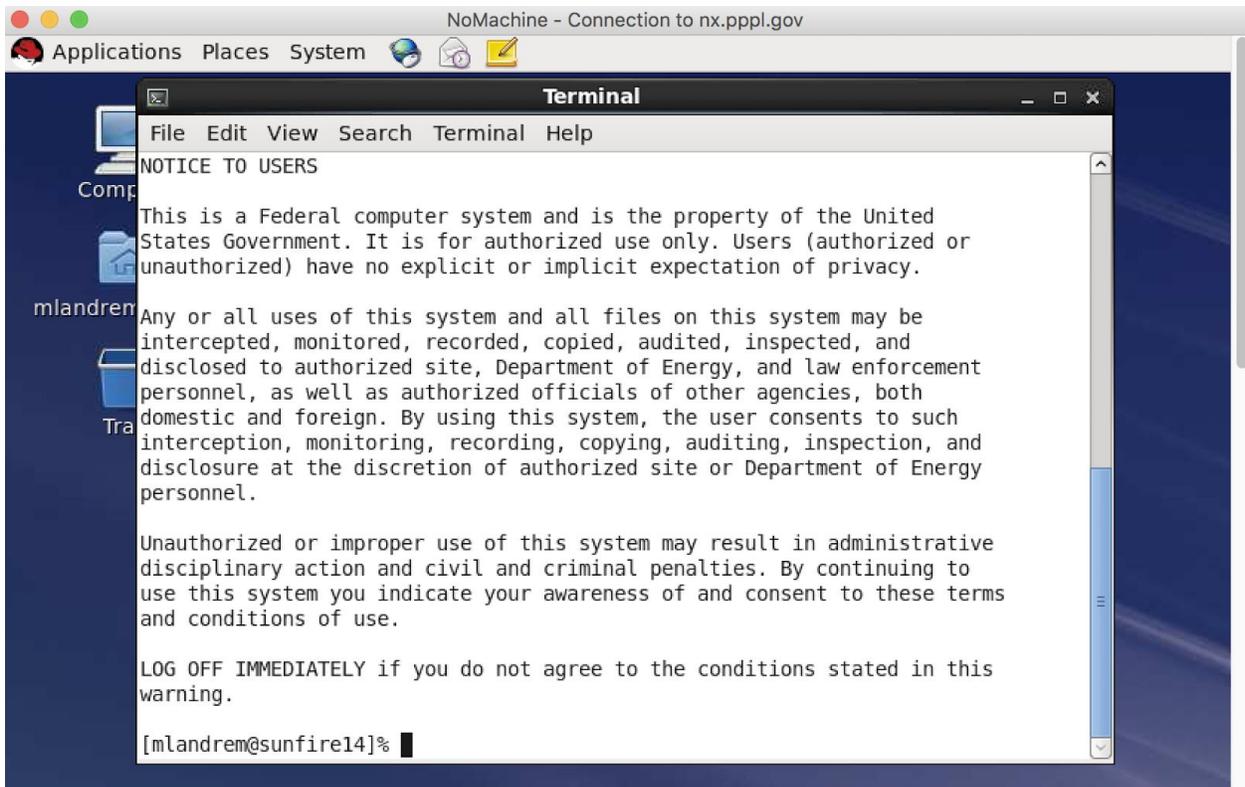
Back Continue

ENTERPRISE SERVER

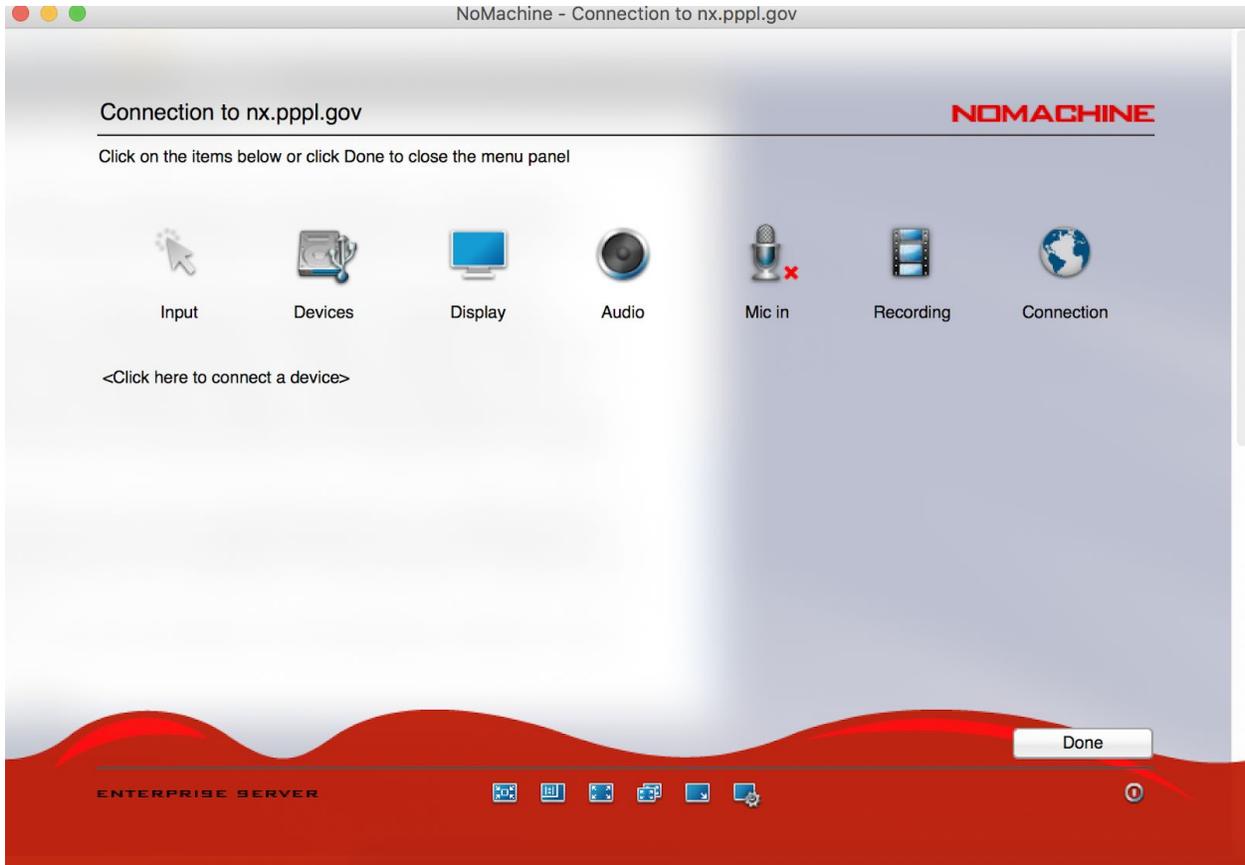
Select "Create a new GNOME desktop."



Click "OK". You should now have a desktop with a terminal window on the PPPL cluster.



You may wish to enlarge the window. Press control+option+0. You will see the following screen:



Select 'display', 'resize remote screen', then 'done', 'done'. This will resize the remote desktop to match your window.

If you wish to open new terminal windows, you can go to the 'Applications' menu at the top left, select 'System tools', 'terminal'. Based on the command prompt, you can see that the server name is 'nxsrv\*' for some number \*. Type 'ssh portal' to go to one of the cluster login nodes. This step is not necessary for the terminal window that appears when you first opened NoMachine.

## Once you have a terminal window on the cluster:

First we need to set up the environment using the following commands:

```
module use /p/focus/modules
module load tmp python matlab
```

Note that these commands will be needed for every terminal window you open before you can run vmec or regcoil or plot output from that terminal window.

### Vmec example

Make a directory for your work:

```
mkdir 20190822_SimonsSummerSchool
cd 20190822_SimonsSummerSchool
```

**Make local copies of the input files:**

```
cp /u/epaul/vmec_inputs/rotating_ellipse/input.rotating_ellipse .
cp /u/epaul/vmec_inputs/rotating_ellipse/batch_script .
```

**Submit the job to the queue:**

```
sbatch batch_script
```

You shouldn't need to know any details of the queue system on the PPPL cluster, but if you are interested, you can find information here:

<https://pppl-intranet.princeton.edu/departments/computing-and-information-technology/research-computing>

Your job will hopefully start immediately (since it requests only 5 minutes of 1 node.) VMEC will take about half a minute to run. Use your favorite text editor (emacs, vim, etc) to read the `slurm-*.out` file. Hopefully it ends with something like this:

```
EXECUTION TERMINATED NORMALLY
```

```
FILE : rotating_ellipse
```

```
NUMBER OF JACOBIAN RESETS =      0
```

TOTAL COMPUTATIONAL TIME (SEC)	23.30
TIME TO INPUT/OUTPUT	0.12
READ IN DATA	0.00
WRITE OUT DATA TO WOUT	0.12
TIME IN FUNCT3D	22.83
BCOVAR FIELDS	2.73
FOURIER TRANSFORM	5.08
INVERSE FOURIER TRANSFORM	3.29
FORCES AND SYMMETRIZE	1.91
RESIDUE	6.08
EQFORCE	0.00

```
NO. OF PROCS:  16
```

```
PARVMEC      :    T
```

```
LPRECOND     :    F
```

```
LV3FITCALL   :    F
```

There should be a file created named `wout_rotating_ellipse.nc`

We have provided tools to plot the output using either python or matlab. If you prefer to plot via python:

```
/u/epaul/vmec_inputs/plotVmec.py wout_rotating_ellipse.nc &
```

Or if you prefer to plot via matlab:

First make a local copy of the plotting script:

```
cp /u/epaul/vmec_inputs/plot_vmec.m .
```

Use your favorite text editor to set line 3 of this script to the appropriate filename. Start matlab:

```
matlab -nodesktop -nosplash
```

Once matlab starts, enter the command “plot\_vmec”:

```
< M A T L A B (R) >
Copyright 1984-2018 The MathWorks, Inc.
R2018b (9.5.0.944444) 64-bit (glnxa64)
August 28, 2018
```

To get started, type doc.

For product information, visit [www.mathworks.com](http://www.mathworks.com).

```
>> plot_vmec
```

Alternatively, the matlab gui can be launched by typing the command “matlab”. The script can be edited within the gui, and the script can be executed with the “run” button.

Other vmec input files are available in the following locations:

```
cp /u/epaul/vmec_inputs/NCSX/input.NCSX_li383 .
```

```
cp /u/epaul/vmec_inputs/W7X/input.W7-X_standard_configuration_vacuum
```

```
.
```

## Regcoil example

Make a local copy of the template regcoil input file:

```
cp /u/epaul/regcoil_inputs/rotating_ellipse/regcoil_in.rotating_ellipse .
```

You can use your favorite text editor to look at this input file. Note that one of the input parameters is the path to the vmec “wout” file from the previous part of the lab.

Now run the regcoil code. It is fast enough that we do not need to use the queue system.

```
regcoil regcoil_in.rotating_ellipse
```

We have provided tools to plot the output using either python or matlab. If you prefer python:

```
/u/epaul/regcoil_inputs/plotCoilsFromRegcoil.py regcoil_out.rotating_ellipse.nc 5 0
```

Here, the input parameter “5” indicates the number of coils per half field period you want.

The second parameter ‘0’ is optional and can usually be left as 0. If you run into the error message “WARNING!!! The expected number of coils was not the number found”, this parameter should be adjusted.

If you prefer matlab:

First make a local copy of the plotting script:

```
cp /u/epaul/regcoil_inputs/plotCoilsFromRegcoil.m .
```

If needed, use your favorite text editor to set line 2 of this script to the appropriate filename.

Start matlab:

```
matlab -nodesktop -nosplash
```

Once matlab starts, run the command “plotCoilsFromRegcoil”:

< M A T L A B (R) >  
Copyright 1984-2018 The MathWorks, Inc.  
R2018b (9.5.0.944444) 64-bit (glnxa64)  
August 28, 2018

To get started, type doc.  
For product information, visit [www.mathworks.com](http://www.mathworks.com).

>> plotCoilsFromRegcoil