Step#1: Install Virtual Box

You can get it from this Link: https://www.virtualbox.org/wiki/Downloads

If link does not work, then “Google” Virtual Box. This should be the first search.

Afterward proceed to the Download link which will guide you to how to get the installer based off your Operating System (OS).

Once you start the installation it will ask you to have the installation directory you can have it as default or a specific location of your choosing.

You should have Virtual Box installed after setting up your directory.

Step#2: Create an Ubuntu VM

First step is to name your Ubuntu VM (This is your choice)

As for Type make sure it is set to Linux since we are creating it with Ubuntu

With Version like stated before, we are using Ubuntu you can do 32-bit or 64-bit it will depend on your computer that you are using to create the Virtual Machine.

Next you will get prompted for RAM allocation. It is recommended to have at least 2048 MB for the Virtual Machine to work properly. You can allocate more RAM space if your computer can handle it.

Next window prompts for a hard disk.

Since this is a new instance you can just create a new virtual hard disk. Make sure it is a VDI (Virtual Disk Image.)

The next step is the amount of disk space the VDI will take on your computer. I would recommend Dynamically allocate space, but you can have it set up to take up a fixed space.

In any case you will need to set a fixed size for the VDI to take. The Default is 10 GB, but you can make the VDI more. You do not need a lot of space for this research so do not set the fixed size insanely high.

With that your VM is setup, but before you boot you must set up a CD/DVD drive

Click on your newly created VM and go to settings.

You should get a new window with a bunch of tabs.

Go to the storage tab and take a look at Controller: IDE.

We need to set an iso file for it to boot on in order to install ubuntu.

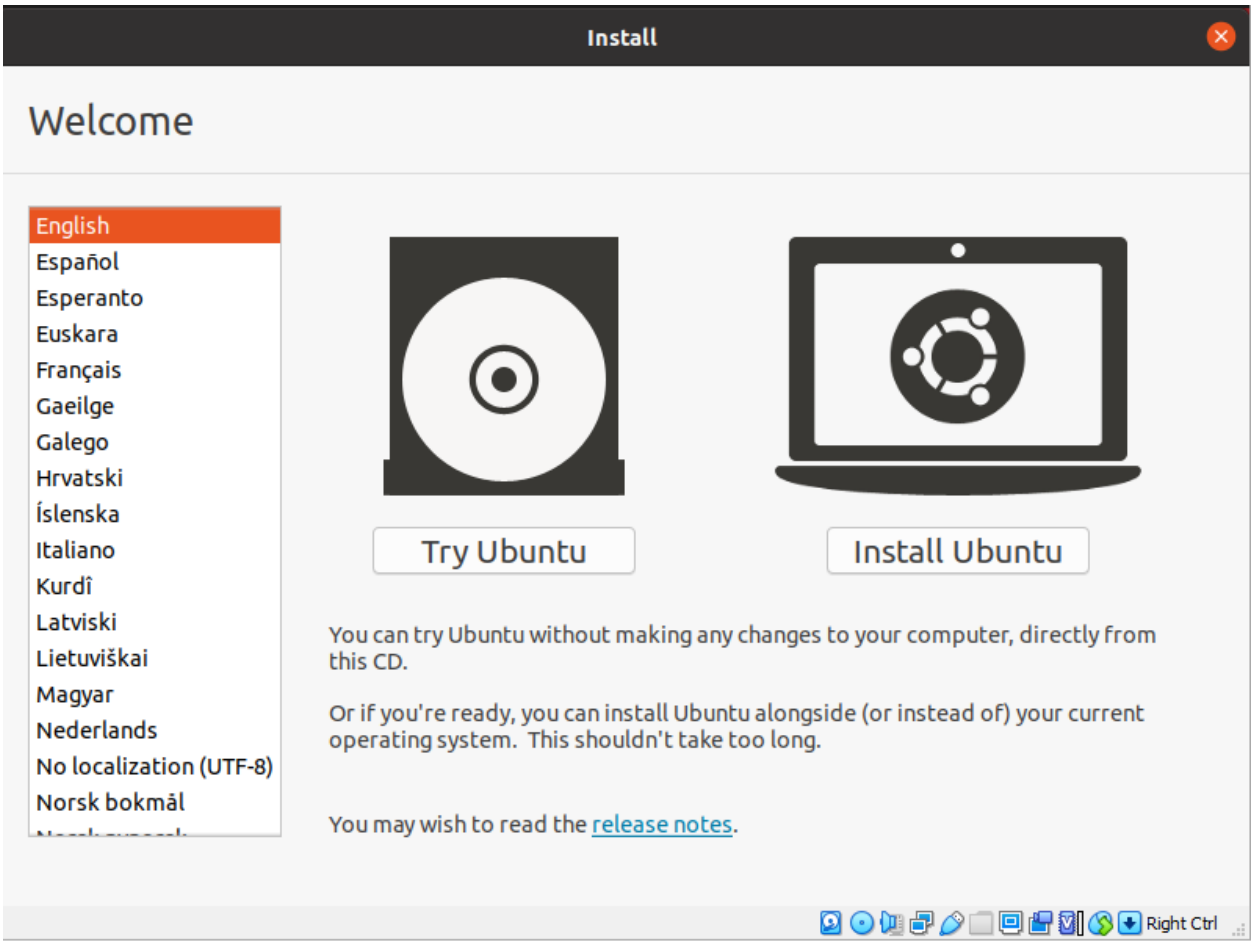
Go ahead and add optical drive and look for ubuntu-“version name”-desktop-amd.iso and add that as the optical drive. Make sure Controller: SATA has “Virtual Machine Name Here”.vdi for it and you should be able to boot and install Ubuntu on your new instance.

Step#3: Installing Ubuntu on new Virtual Machine.

Once you booted up the VM you have a start up and scan for the installation.

Afterwards you will get prompts to setting up Ubuntu]

Should look like this.



Select Languauage and Click on Install Ubuntu

It should ask for Keyboard Preferences and that you will select yourself if you have a preference.

After select continue and you will be prompted for standard or minimal installation. It is your preference to what you select since you only need the basics for the Ubuntu installation.

It is recommended to check on the third-party it gives more compatibility with other software.

For installation type you should select erase and install since it should be a clean installation anyways.

Select location.

After that it should now ask you to create user account for the VM Ubuntu make your Ubuntu user name and password.

After that it should begin installing. Give it some time. It will restart after installation is done.

Once reset is done and you login you get pop-up for settings.

You can read them all but you can skip them. I would recommend reading them just for you own sake.

With that you have an instance of Ubuntu. Congratulations!

Step#4: Install Python 3.5

Now that you have an instance of Ubuntu it is time to install Python on it.

Before you begin installing make sure to go to terminal and type “python3 --version” it may be possible that python may already be installed. That prompt is also to make sure it was properly installed after installing. This should give you a output of the python version

If not you can install via the terminal start with “sudo apt-get update” and “sudo apt-get ‘python version here’”

Make sure to do “python3 --version” it will output the version like stated above.

Step#4: Install libraries

Now if you were to attempt to run the python files for “tutorial02.py” or “project.py” it would give you an error for numpy. It may not do so for matplotlib because it catches numpy first but we will need to install both libraries.

To install numpy go to terminal and type “sudo apt install python3-numpy”.

This is the command to get the installation of numpy on python 3

After this should prompt you to type user password for authentication

Press ‘y’ for any other prompts and numpy should begin installing may or may not take some time but be patient.

Afterwards you can do two things to confirm installation:

1. Is typing python3 -c “import numpy; print(numpy.__version__)” this should give you version number if properly installed
2. Another way is typing “python3” in terminal. This should now let you type in python3 and from here you can type “import numpy” if no error occurs then you know numpy is properly installed. You can then type quit() to get out of python3 and back to terminal.

Now that we have numpy we also need to install matplotlib. This library allows use to create graphs that are used in the code.

Very Similar to the numpy installation we need to type in the terminal “sudo apt-get install python3-matplotlib”

Remember to type “y” to confirm with prompt.

To confirm we can do two things:

1. Is typing python3 -c “import matplotlib; print(matplotlib.__version__)” this should give you version number if properly installed.
2. Another way is typing “python3” in terminal. This should now let you type in python3 and from here you can type “import matplotlib” if no error occurs then you know matplotlib is properly installed. You can then type quit() to get out of python3 and back to terminal.

Next this step is for tutorial02.py file that was provided. This python file is to create input files that project.py uses for it’s calculations.

First and foremost since tutorial02.py uses modflow that takes in binary files we need to install fortran for it to use binary files. We will also grab pymake for modflow but first we must get fortran.

Type “sudo apt-get install gfortran” in terminal like the other installations we have done before.

Type password when asked for authentication and type ‘y’ to confirm any prompts asked.

Should begin installation. Give it some time.

One other installation before we grab pymake is getting pip3.

We can do so by typing “sud apt-get -y install python3-pip”

Give some time for the install.

Another thing before we install pymake is installing flopy. Flopy is used by tutorial02.py.

Type ‘sudo python3 -m pop install flopy’ to install flopy.

Now with the newly installed pip3 we can grab the installation for pymake.

Type the following: “pip3 install https://github.com/modflowpy/pymake/zipball/master”

This should grab the files from their github and install pymake.

Next is to grab a make file for pymake.

Go online: https://github.com/modflowpy/pymake/blob/master/examples

Scroll down until you find “make_mf2005.py” and click on it

Go ahead and click on “Raw” and right click save page as.

This should download the python make file for you

Once you have the file go ahead and move it from downloads to somewhere else where you can easily access in the terminal.

Go ahead with the terminal move to the directory which the python make file is located. Typing cd changes directory and typing ls tells you the directorys and files the directory you are in has.

Once you reach the python make file go ahead and type “python3 make_mf2005.py” once you type it will begin a run that will take a bit of time.

Now once it is done you will have a makefile “mf2005” and a folder named “temp” keep in mind where the make file is located.

Now in tutorial02.py in line 35 of the code you will have mf = flopy.modflow.Modflow(modelname, exe_name= ‘Directory’)

Where ‘Directory’ is at type the whole directory path to get mf2005

Once you have done that you can run tutorial02.py and begin creating input for “project.py”

Note: It is recommended before you run tutorial02.py to place both project.py and tutorial02.py in a separate file. Once you run tutorial02.py it will output a bunch of files. To reduce clutter it is recommended to place both in file for that reason.

To run tutorial02.py type: “python3 tutorial02.py” in the directory the file is located in.

One last thing which is Optional is a text editor: Ubuntu has it’s own text editor but for me in this research I used Atom which to me personally was much better.

How to install Atom on Ubuntu: OPTIONAL STEP

Type: wget https://atom.io/download/deb

After the download do sudo dpkg -I deb

It should begin installing. Note: after installation it said errors occurred. It still works even with that error. Now to open atom in terminal just type “atom”

You can also download the deb file from the atom website and do the dpkg that way either way works.

Now to have atom open all your python files by default go to any python file.

Go ahead and right click the python file and go to properties.

Go to the “Open With” Tab and click on atom. Afterward click on the “Set as default” button and now when you open any python file you will use atom as the text editor.