# Installing Theano

Theano is a Python package. Packages in Python are also called modules. Theano is the main module that defines the functions used by the tutorial on deep learning.

To install Theano, you have a large choice of distributions, depending on your system. The main web page with installation instructions is <http://deeplearning.net/software/theano/install.html> .

If you have questions about installation, please come to my office hour, don’t send me email. (See email policy in Syllabus.) Or post on the course discussion forum on courses.cs.sfu.ca .

Theano sits at the top of a fairly large stack of dependencies on other modules. The easiest scenario is that you find a Python distribution for your system that installs Theano as part of its distribution. To check if you already have Theano installed, type “import theano” at the Python prompt. If that returns without an error, you should be set. You may not be so lucky, in which case you need to add Theano after installing a Python distribution. Here’s an example of what worked for me using MacOSX. This is meant to be an example to give you an idea of what needs to be done, not a complete set of instructions that you can just cut and paste.

# Installing Theano with Anaconda and MacOSX

1. Install Xcode. Make sure you have installed g++, it should come with Xcode.
2. Install Anaconda from <http://continuum.io/downloads> . I used Version 1.8. Anaconda gives you Python and a whole lot of Python packages, including scikit-learn for machine learning and almost everything that Theano needs. Some Linux installations of Anaconda seem to include Theano too.
3. Open a terminal window and type “conda install pydot “. Conda is the package manager that comes with Anaconda. The last package Theano needs is pydot. When conda installs pydot, it also manages links between other packages that Theano needs.
4. You need to set the variable DYLD\_FALLBACK\_LIBRARY\_PATH to the anaconda library. You should also set the python path to point to Anaconda. This can be done by editing/creating your .bash\_profile file . Don’t forget to open a new terminal to execute the .bash\_profile. For example, my .bash\_profile file looks like this.

oliverpower:~ oschulte$ more .bash\_profile

export PATH=/Users/oschulte/anaconda/bin:$PATH

export DYLD\_FALLBACK\_LIBRARY\_PATH=/Users/oschulte/anaconda/lib
oliverpower:~ oschulte$

1. At the terminal type “pip install Theano”. This should download and install Theano.
2. Run the Anaconda Python. Import the theano module. If this works, you should be able to execute “theano.test()” at the Ptyhon interpreter prompt. This will test your Theano installation. The test may take hours and will probably produce numerous error messages. **Submit about one page showing your error messages.**

The final error message should look something like this:

=================================================================

ERROR: test\_elemwise0 (theano.tests.test\_rop.test\_RopLop)

----------------------------------------------------------------------

Traceback (most recent call last):

 File "/Users/oschulte/anaconda/lib/python2.7/site-packages/theano/tests/test\_rop.py", line 280, in test\_elemwise0

 self.check\_rop\_lop((self.x + 1) \*\* 2, self.in\_shape)

 File "/Users/oschulte/anaconda/lib/python2.7/site-packages/theano/tests/test\_rop.py", line 191, in check\_rop\_lop

 raise KnownFailureTest("Rop doesn't handle non-differentiable "

KnownFailureTest: Rop doesn't handle non-differentiable inputs correctly. Bug exposed by fixing Add.grad method.

----------------------------------------------------------------------

Ran 2443 tests in 7924.021s

FAILED (errors=18)

<nose.result.TextTestResult run=2443 errors=18 failures=0>

>>>

# Learning Python

There are many tutorials, refreshers and other resources available for learning Python. The deep learning tutorial lists some. The official tutorial at <http://docs.python.org/2/tutorial/index.html> . Sections 1-6 (up to and including modules) should suffice as background. You can also start using the Deep Learning Tutorial code and see where you feel you need more background about Python in general.

# Review Exercise: Bayes Nets and d-separation

Go through the UBC AIspace tutorial on conditional independence and d-separation.

1. Start the decision and belief net tool. This can be found at <http://www.aispace.org/bayes/index.shtml>.
2. If you are already familiar with d-separation, go immediately into Solve Mode and enter the Conditional Independence Quiz.
3. If you are not familiar with d-separation, review the tutorial at <http://www.aispace.org/bayes/help/tutorial5.shtml>. There are many other sources on-line that explain d-separation as well.
4. Answer 10 or so questions in the conditional independence quiz until your are confident that you have understood the d-separation concept.