



Big Data Mining

巨量資料探勘

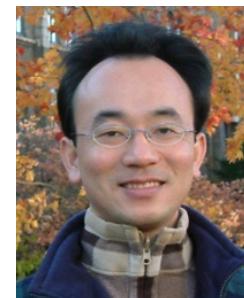
Deep Learning with
Google TensorFlow

(Google TensorFlow 深度學習)

1042DM10

MI4 (M2244) (3094)

Tue, 3, 4 (10:10-12:00) (B216)



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<http://mail.tku.edu.tw/myday/>

2016-05-10



課程大綱 (Syllabus)

週次 (Week) 日期 (Date) 內容 (Subject/Topics)

- | | | |
|---|------------|---|
| 1 | 2016/02/16 | 巨量資料探勘課程介紹
(Course Orientation for Big Data Mining) |
| 2 | 2016/02/23 | 巨量資料基礎：MapReduce典範、Hadoop與Spark生態系統
(Fundamental Big Data: MapReduce Paradigm, Hadoop and Spark Ecosystem) |
| 3 | 2016/03/01 | 關連分析 (Association Analysis) |
| 4 | 2016/03/08 | 分類與預測 (Classification and Prediction) |
| 5 | 2016/03/15 | 分群分析 (Cluster Analysis) |
| 6 | 2016/03/22 | 個案分析與實作一 (SAS EM 分群分析)：
Case Study 1 (Cluster Analysis – K-Means using SAS EM) |
| 7 | 2016/03/29 | 個案分析與實作二 (SAS EM 關連分析)：
Case Study 2 (Association Analysis using SAS EM) |

課程大綱 (Syllabus)

週次 (Week) 日期 (Date) 內容 (Subject/Topics)

- | | | |
|----|------------|---|
| 8 | 2016/04/05 | 教學行政觀摩日 (Off-campus study) |
| 9 | 2016/04/12 | 期中報告 (Midterm Project Presentation) |
| 10 | 2016/04/19 | 期中考試週 (Midterm Exam) |
| 11 | 2016/04/26 | 個案分析與實作三 (SAS EM 決策樹、模型評估) :
Case Study 3 (Decision Tree, Model Evaluation using SAS EM) |
| 12 | 2016/05/03 | 個案分析與實作四 (SAS EM 迴歸分析、類神經網路) :
Case Study 4 (Regression Analysis,
Artificial Neural Network using SAS EM) |
| 13 | 2016/05/10 | Google TensorFlow 深度學習
(Deep Learning with Google TensorFlow) |
| 14 | 2016/05/17 | 期末報告 (Final Project Presentation) |
| 15 | 2016/05/24 | 畢業班考試 (Final Exam) |

LeCun, Yann,
Yoshua Bengio,
and Geoffrey Hinton.

"Deep learning."

Nature 521, no. 7553 (2015):
436-444.

Deep learning

Yann LeCun^{1,2}, Yoshua Bengio³ & Geoffrey Hinton^{4,5}

Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics. Deep learning discovers intricate structure in large data sets by using the backpropagation algorithm to indicate how a machine should change its internal parameters that are used to compute the representation in each layer from the representation in the previous layer. Deep convolutional nets have brought about breakthroughs in processing images, video, speech and audio, whereas recurrent nets have shone light on sequential data such as text and speech.

Machine-learning technology powers many aspects of modern society: from web searches to content filtering on social networks to recommendations on e-commerce websites, and it is increasingly present in consumer products such as cameras and smartphones. Machine-learning systems are used to identify objects in images, transcribe speech into text, match news items, posts or products with users' interests, and select relevant results of search. Increasingly, these applications make use of a class of techniques called deep learning.

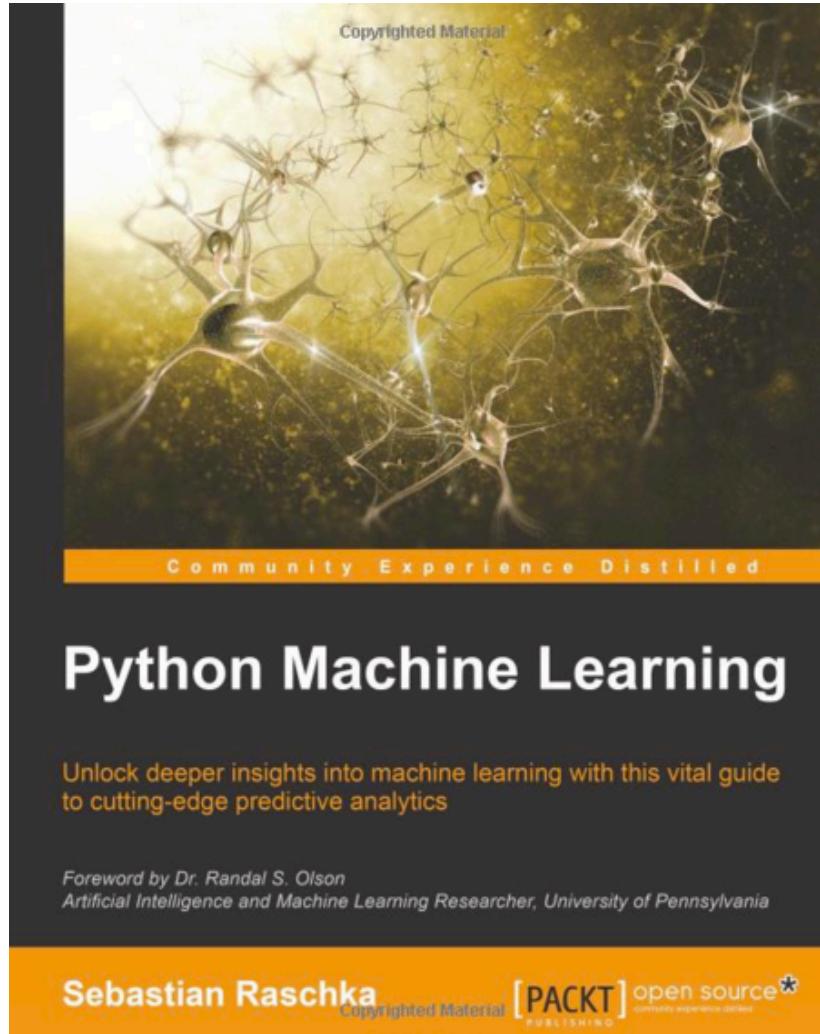
Conventional machine-learning techniques were limited in their ability to process natural data in their raw form. For decades, con-

intricate structures in high-dimensional data and is therefore applicable to many domains of science, business and government. In addition to beating records in image recognition^{1–4} and speech recognition^{5–7}, it has beaten other machine-learning techniques at predicting the activity of potential drug molecules⁸, analysing particle accelerator data^{9,10}, reconstructing brain circuits¹¹, and predicting the effects of mutations in non-coding DNA on gene expression and disease^{12,13}. Perhaps more surprisingly, deep learning has produced extremely promising results for various tasks in natural language understanding¹⁴, particularly topic classification, sentiment analysis, question answering¹⁵ and language translation^{16,17}.

Sebastian Raschka (2015),

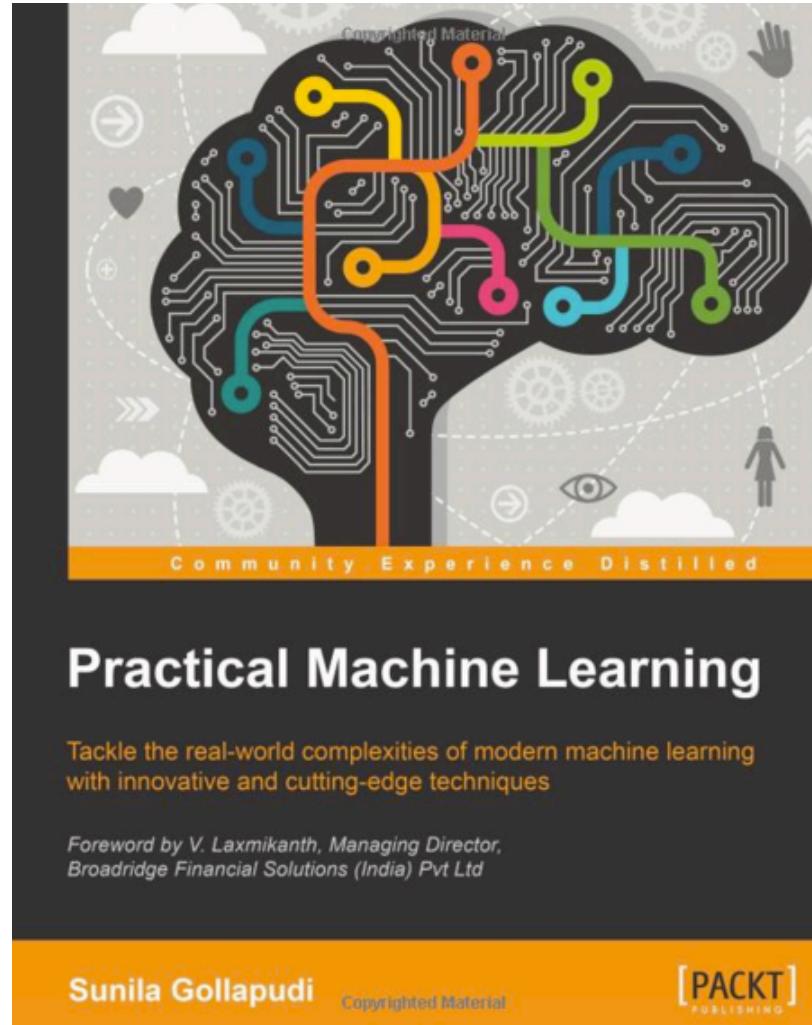
Python Machine Learning,

Packt Publishing



Source: <http://www.amazon.com/Python-Machine-Learning-Sebastian-Raschka/dp/1783555130>

Sunila Gollapudi (2016),
Practical Machine Learning,
Packt Publishing



Machine Learning Models

Deep Learning

Kernel

Association rules

Ensemble

Decision tree

Dimensionality reduction

Clustering

Regression Analysis

Bayesian

Instance based

**Neural networks
(NN)
1960**

Multilayer Perceptrons (MLP)

1985

Restricted Boltzmann Machine (RBM)

1986

Support Vector Machine (SVM)

1995



Hinton presents the **Deep Belief Network (DBN)**

**New interests in deep learning
and RBM**

State of the art MNIST

2005

Deep Recurrent Neural Network (RNN) 2009

Convolutional DBN

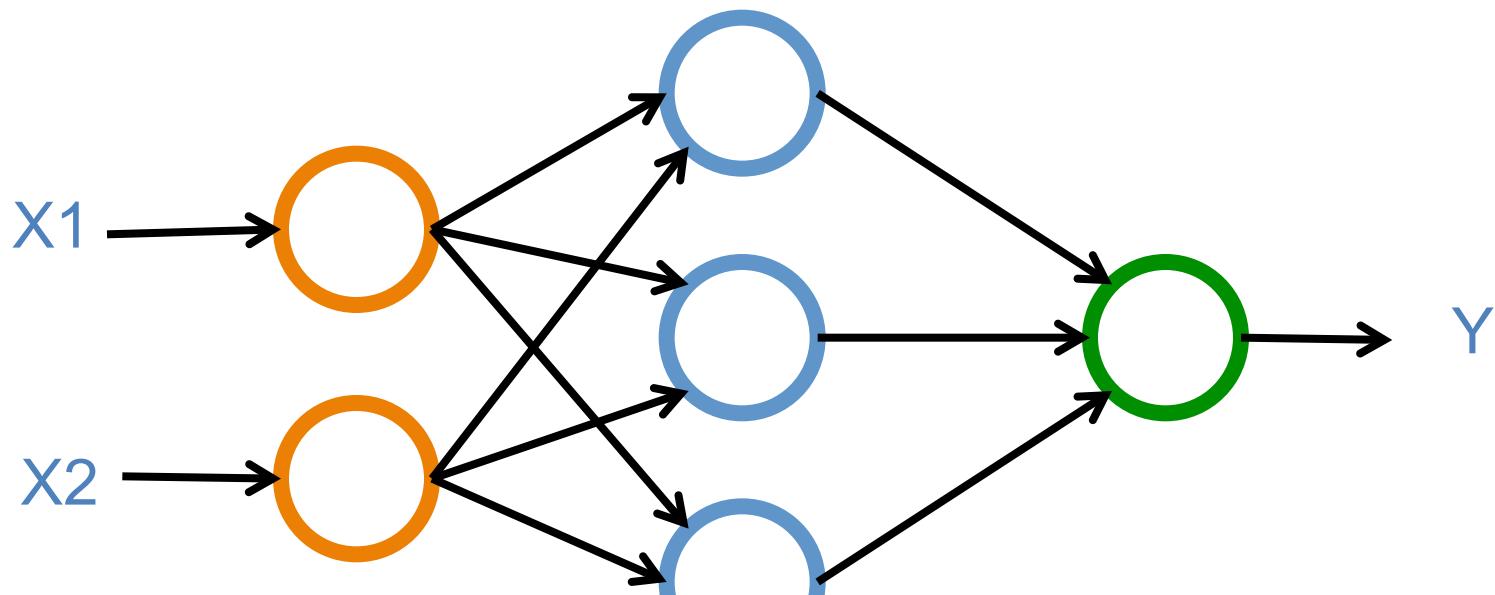
2010

Max-Pooling CDBN

2011

Neural Networks

Input Layer **Hidden Layer** **Output Layer**
(X) **(H)** **(Y)**



Deep Learning

Geoffrey Hinton

Yann LeCun

Yoshua Bengio

Andrew Y. Ng



Geoffrey Hinton

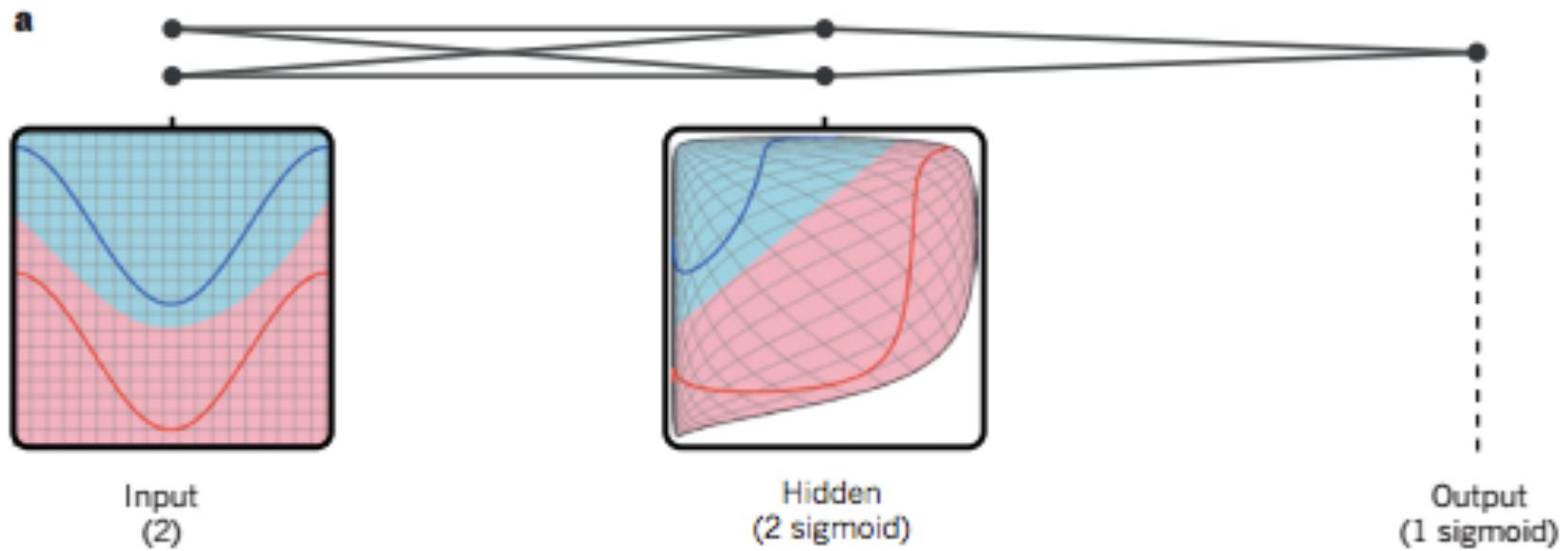
Google

University of Toronto

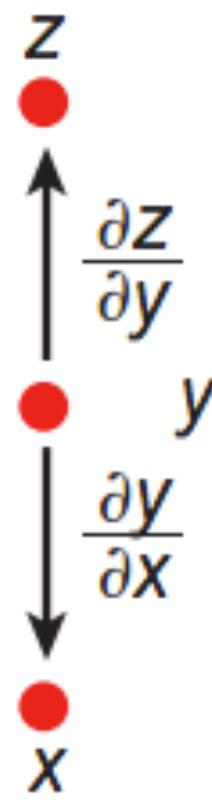
LeCun, Yann,
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Deep Learning



Deep Learning



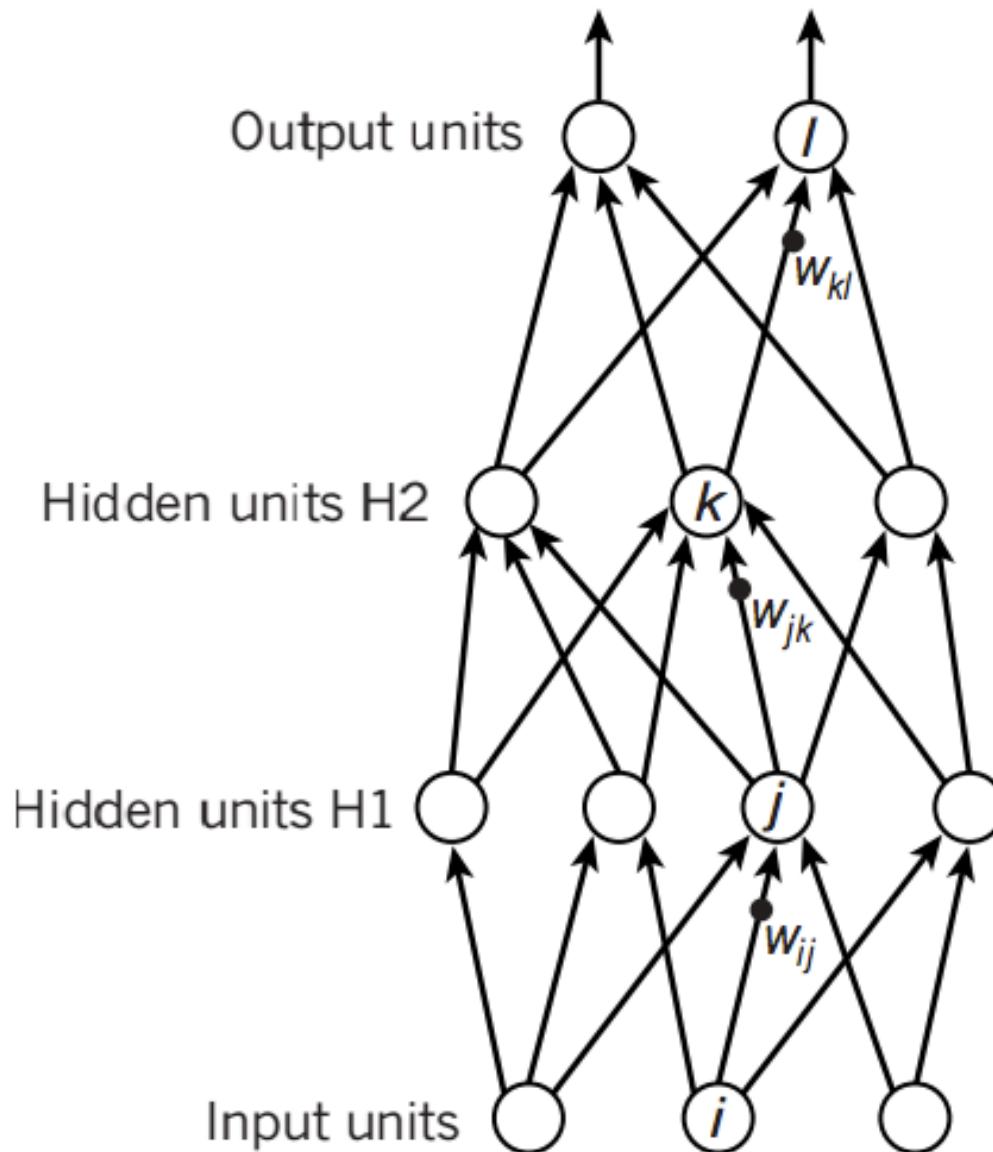
$$\Delta z = \frac{\partial z}{\partial y} \Delta y$$

$$\Delta y = \frac{\partial y}{\partial x} \Delta x$$

$$\Delta z = \frac{\partial z}{\partial y} \frac{\partial y}{\partial x} \Delta x$$

$$\frac{\partial z}{\partial x} = \frac{\partial z}{\partial y} \frac{\partial y}{\partial x}$$

Deep Learning



$$y_l = f(z_l)$$

$$z_l = \sum_{k \in H2} w_{kl} y_k$$

$$y_k = f(z_k)$$

$$z_k = \sum_{j \in H1} w_{jk} y_j$$

$$y_j = f(z_j)$$

$$z_j = \sum_{i \in \text{Input}} w_{ij} x_i$$

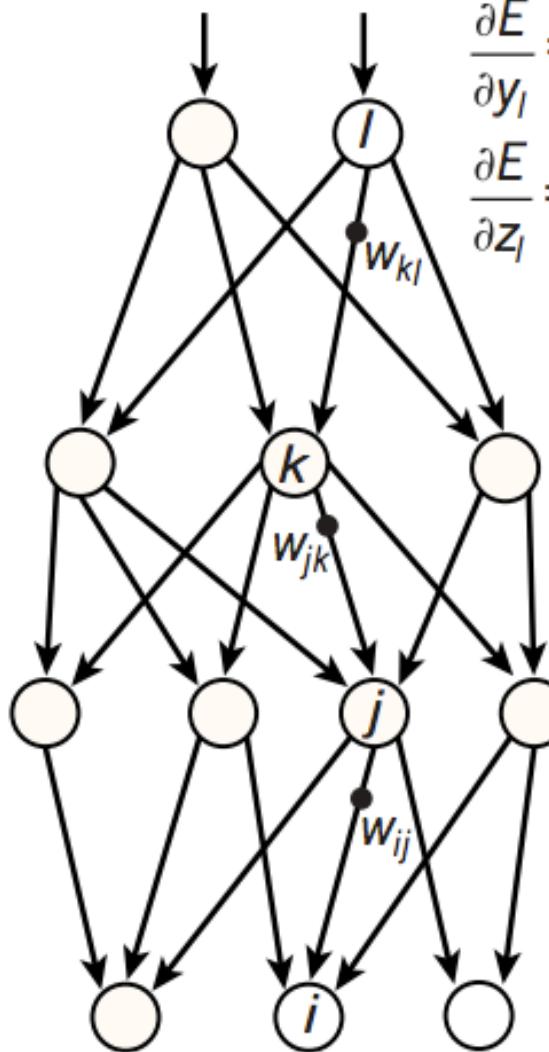
Deep Learning

d

Compare outputs with correct answer to get error derivatives

$$\frac{\partial E}{\partial y_k} = \sum_{l \in \text{out}} w_{kl} \frac{\partial E}{\partial z_l}$$

$$\frac{\partial E}{\partial z_k} = \frac{\partial E}{\partial y_k} \frac{\partial y_k}{\partial z_k}$$



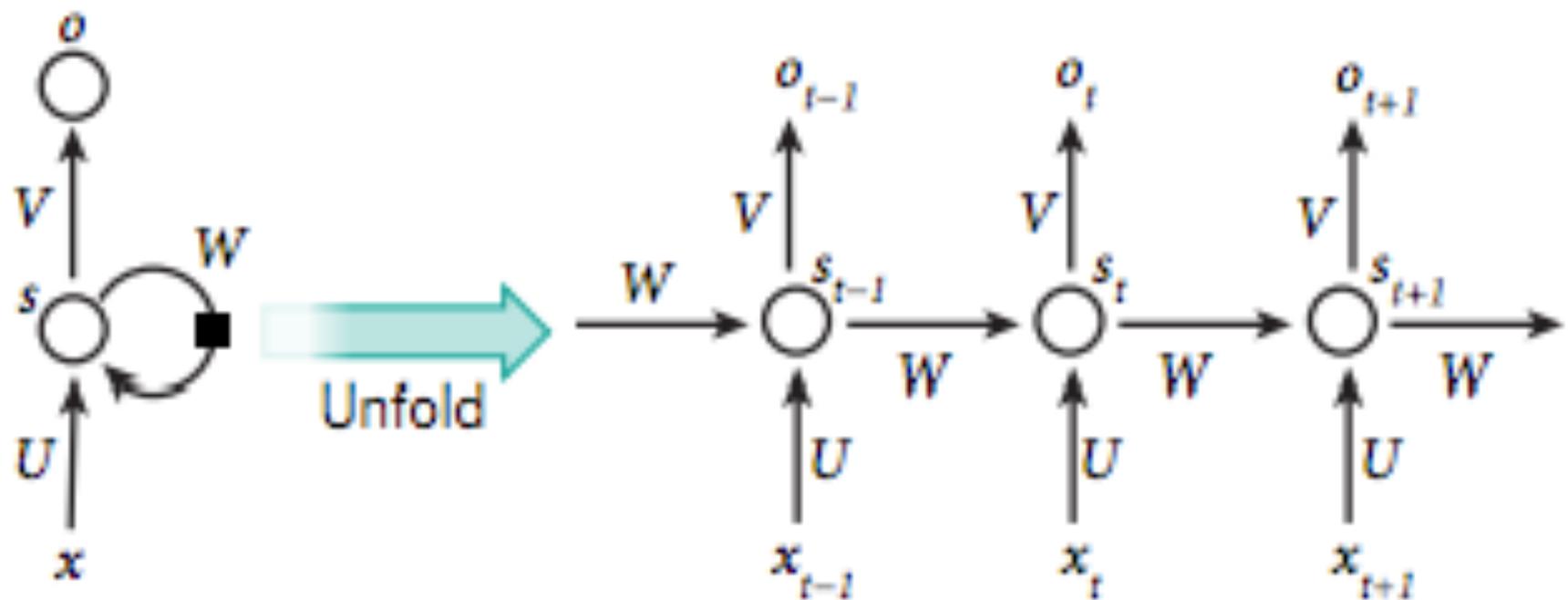
$$\frac{\partial E}{\partial y_i} = y_i - t_i$$

$$\frac{\partial E}{\partial z_l} = \frac{\partial E}{\partial y_l} \frac{\partial y_l}{\partial z_l}$$

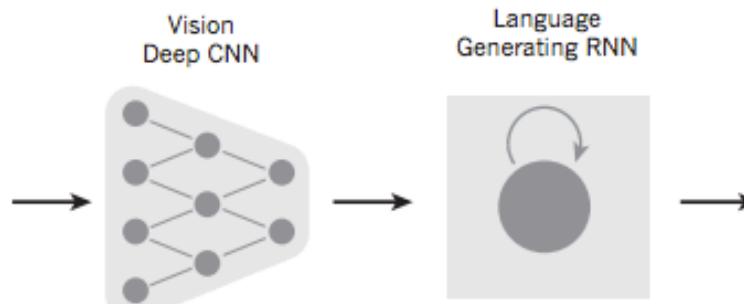
$$\frac{\partial E}{\partial y_j} = \sum_{k \in H2} w_{jk} \frac{\partial E}{\partial z_k}$$

$$\frac{\partial E}{\partial z_j} = \frac{\partial E}{\partial y_j} \frac{\partial y_j}{\partial z_j}$$

Recurrent Neural Network (RNN)



From image to text



A group of people shopping at an outdoor market.

There are many vegetables at the fruit stand.



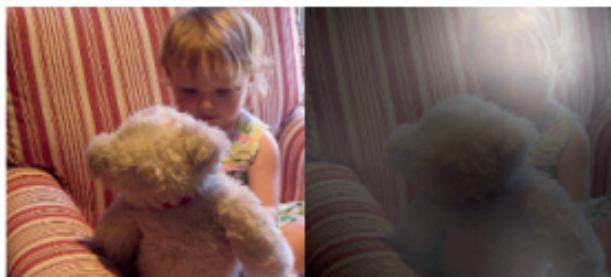
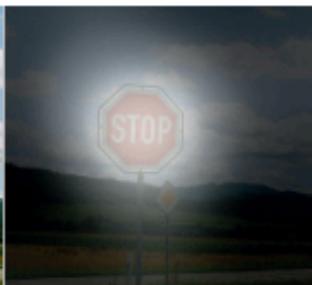
A woman is throwing a **frisbee** in a park.



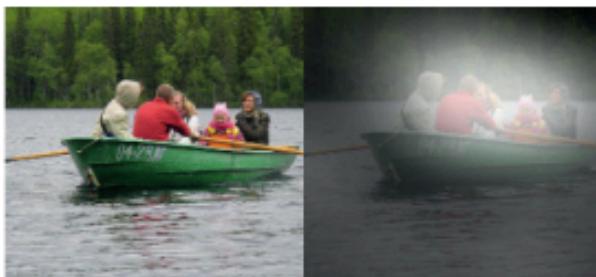
A **dog** is standing on a hardwood floor.



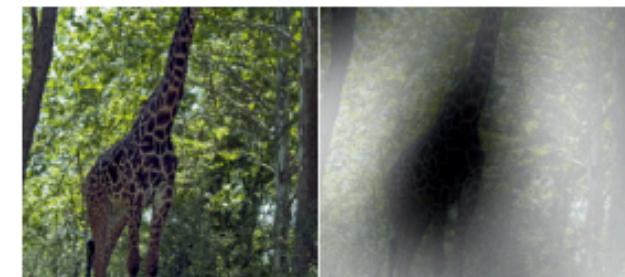
A **stop** sign is on a road with a mountain in the background



A **little girl** sitting on a bed with a **teddy bear**.



A group of **people** sitting on a boat in the water.



A **giraffe** standing in a forest with **trees** in the background.

From image to text

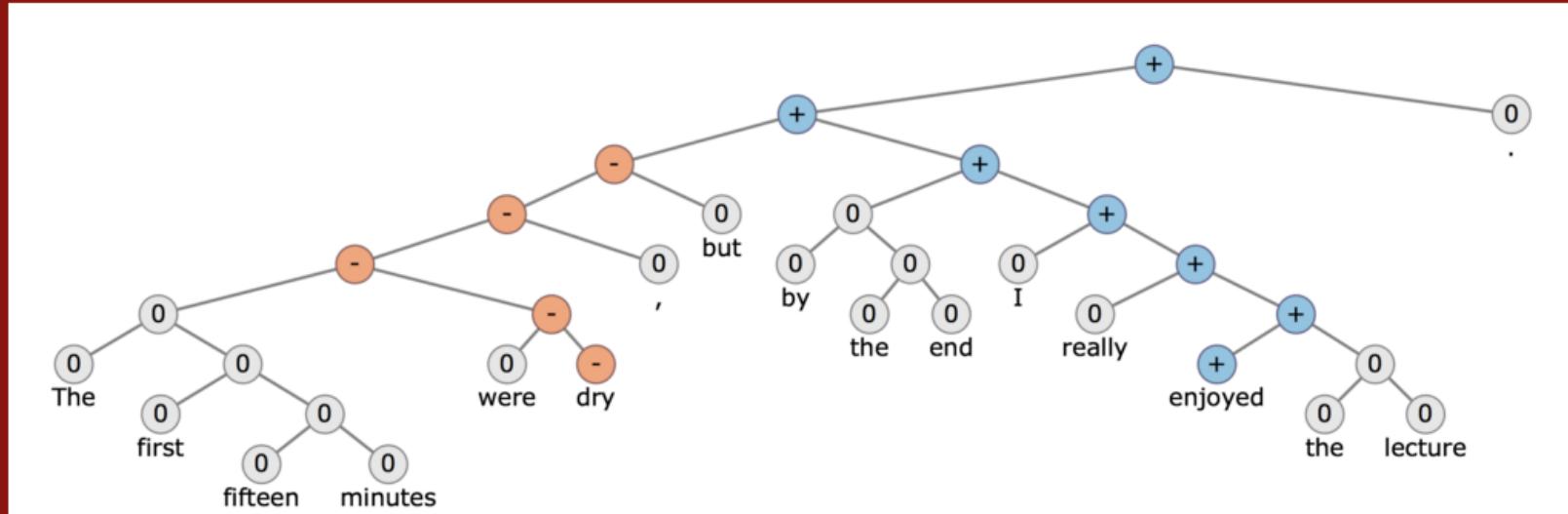
Image: deep convolution neural network (CNN)
Text: recurrent neural network (RNN)



A group of **people** sitting on a boat in the water.

CS224d: Deep Learning for Natural Language Processing

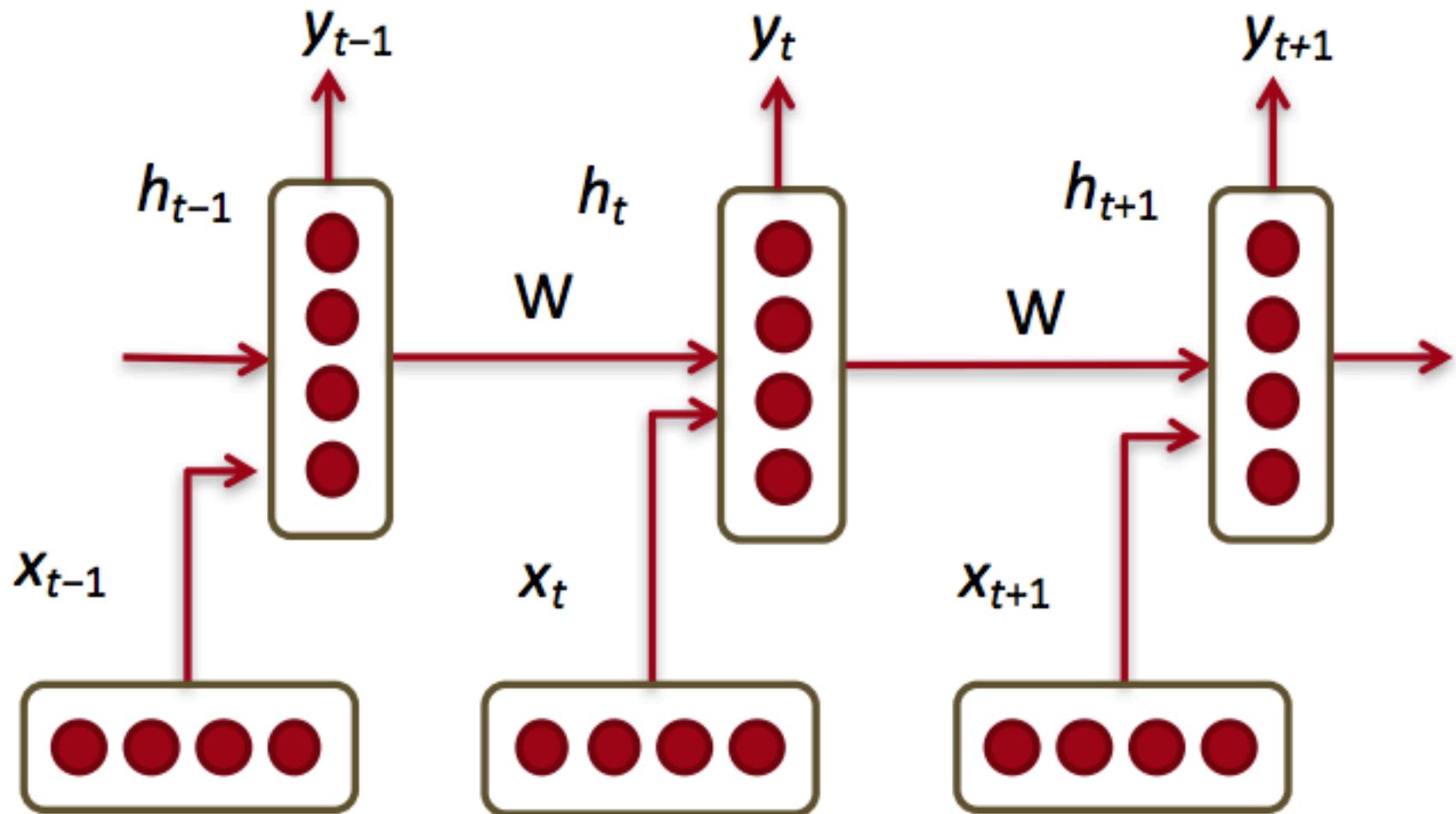
CS224d: Deep Learning for Natural Language Processing



Course Description

Natural language processing (NLP) is one of the most important technologies of the information age. Understanding complex language utterances is also a crucial part of artificial intelligence. Applications of NLP are everywhere because people communicate most everything in language: web search, advertisement, emails, customer service, language translation, radiology reports, etc. There are a large variety of underlying tasks and machine learning models powering NLP applications. Recently, deep learning approaches have obtained very high performance across many different NLP tasks. These models can often be trained with a single end-to-end model and do not require traditional, task-specific feature engineering. In this spring quarter course students will learn to implement, train, debug, visualize and invent their own neural network models. The course provides a deep excursion into cutting-edge research in deep learning applied to NLP. The final project will involve training a complex recurrent neural network and applying it to a large scale NLP problem. On the model side we will cover word vector representations,

Recurrent Neural Networks (RNNs)



Hours Sleep	Hours Study	Score
3	5	75
5	1	82
10	2	93
8	3	?

A scatter plot diagram illustrating the relationship between Sleep (X-axis), Study (Y-axis), and Score (Z-axis). The X-axis is labeled 'Hours Sleep' and the Y-axis is labeled 'Hours Study'. The Z-axis is labeled 'Score'. The plot shows three data points: one for 'Training' and two for 'Testing'. A dashed horizontal line is drawn at the level of the 'Testing' data points.

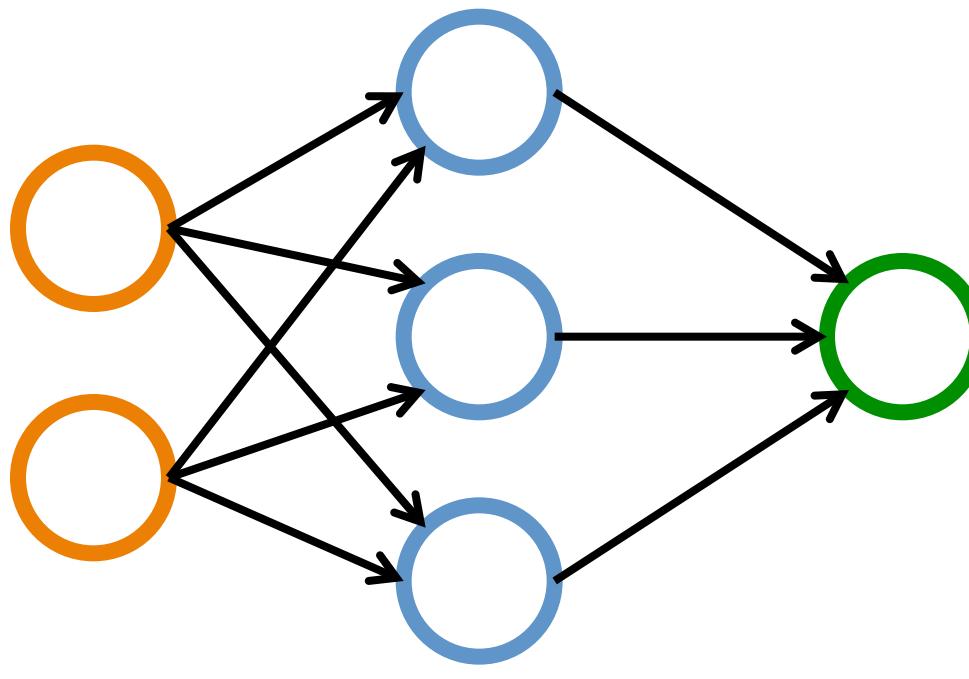
	X	Y	Z
Hours Sleep	Hours Study	Score	
Training	3	5	75
Training	5	1	82
Training	10	2	93
Testing	8	3	?

Training a Network

=

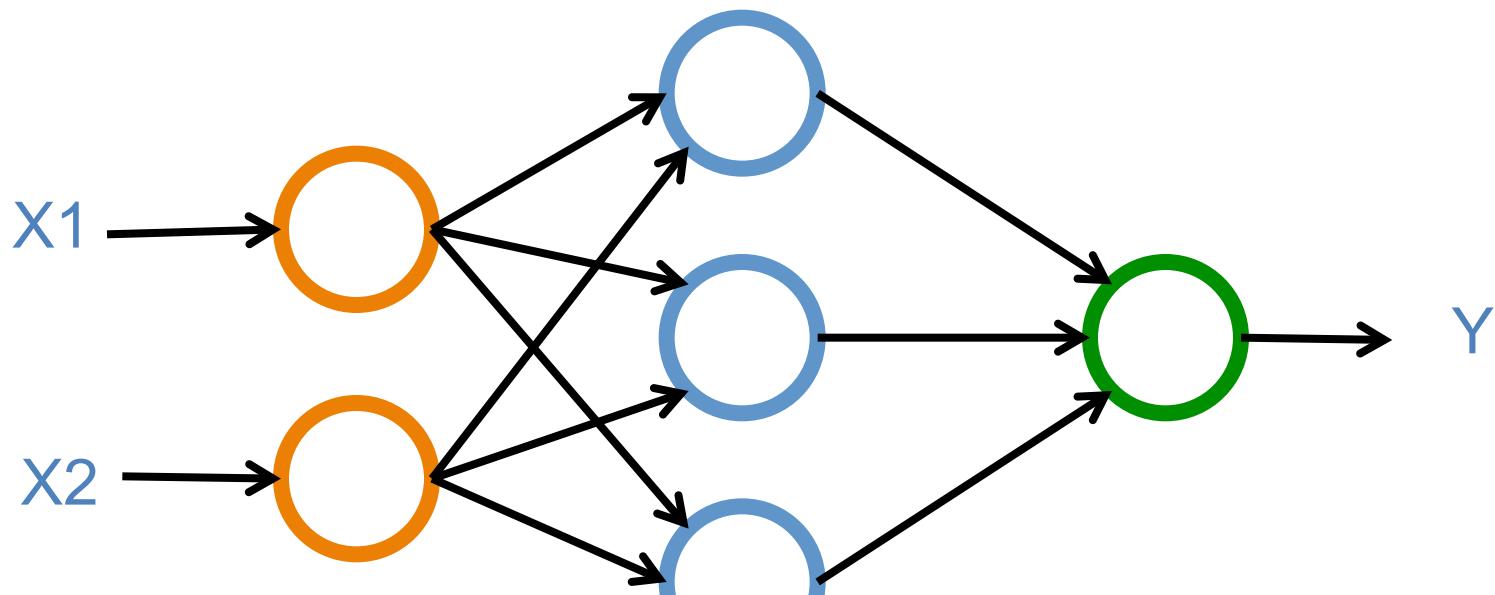
Minimize the Cost Function

Neural Networks



Neural Networks

Input Layer **Hidden Layer** **Output Layer**
(X) **(H)** **(Y)**



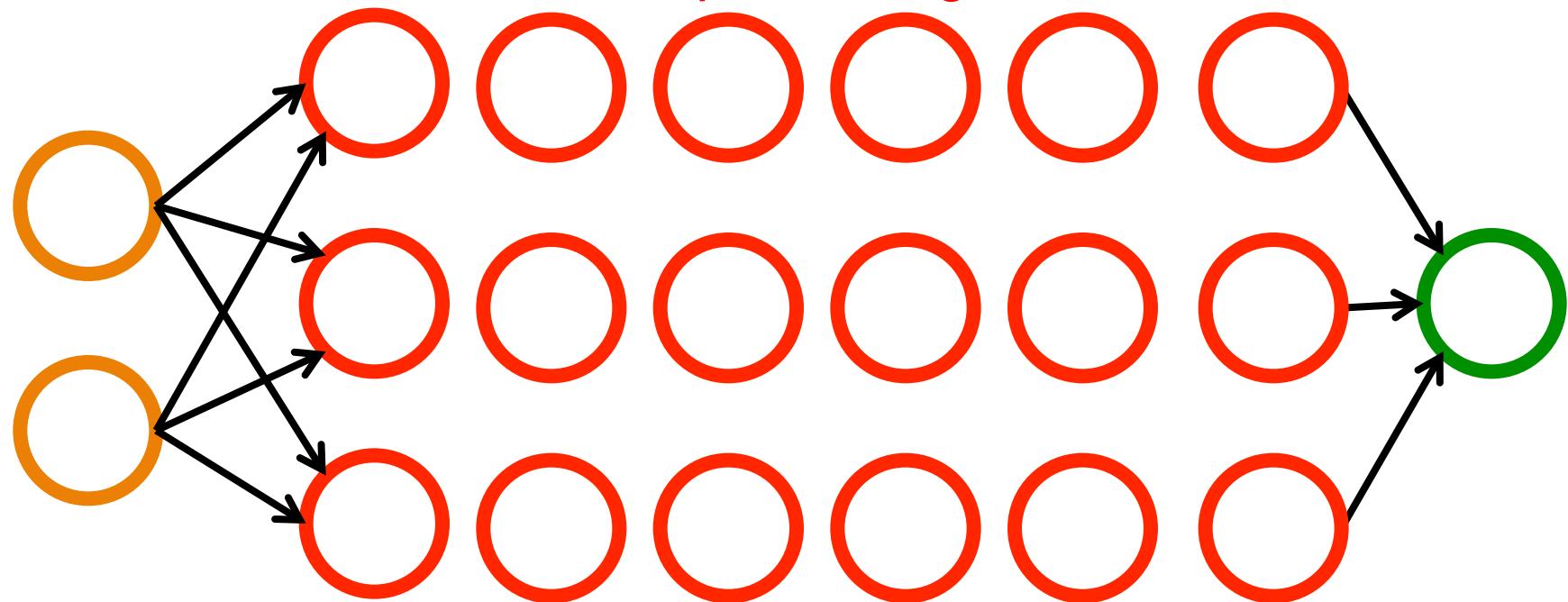
Neural Networks

Input Layer
(X)

Hidden Layers
(H)

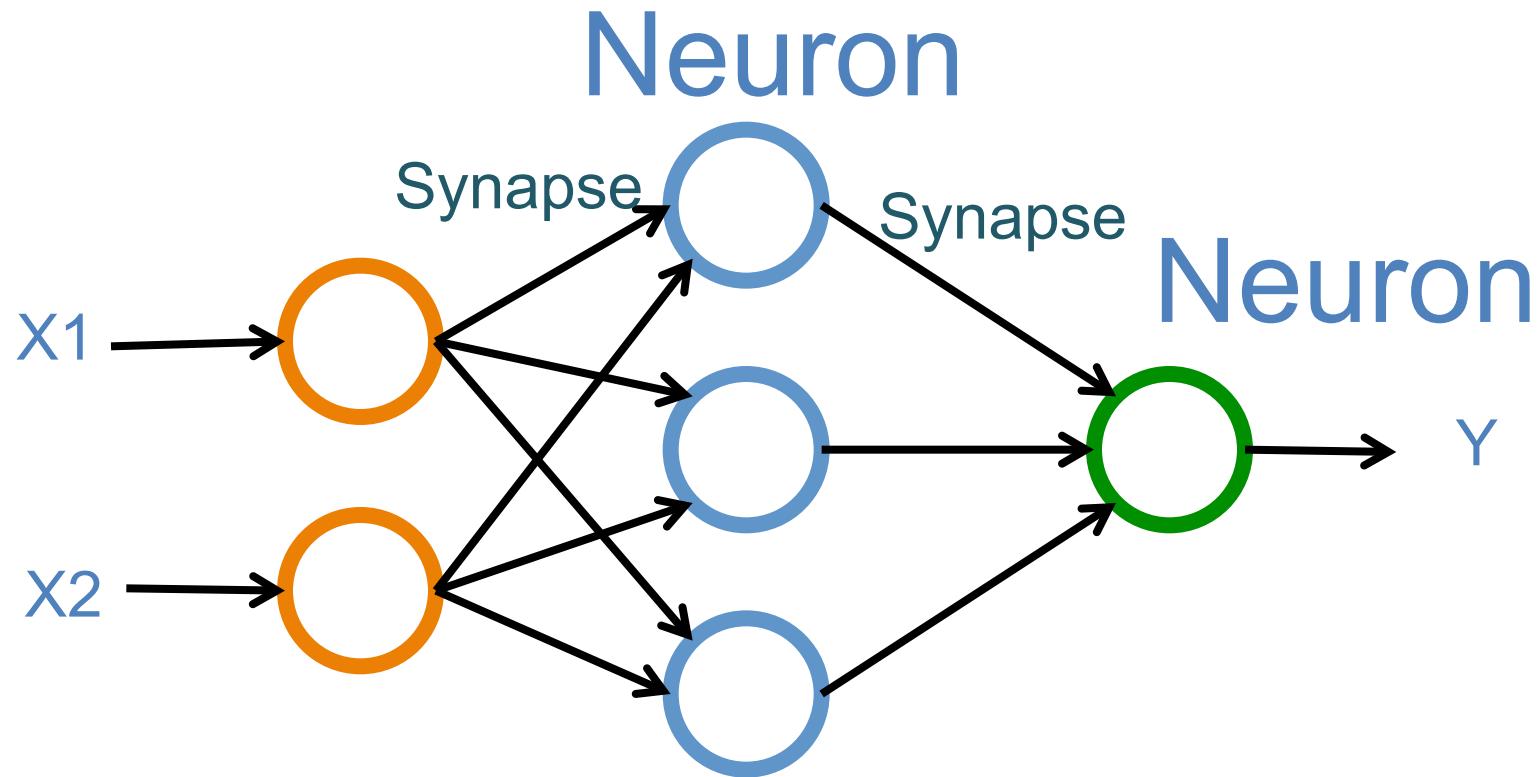
Output Layer
(Y)

Deep Neural Networks
Deep Learning

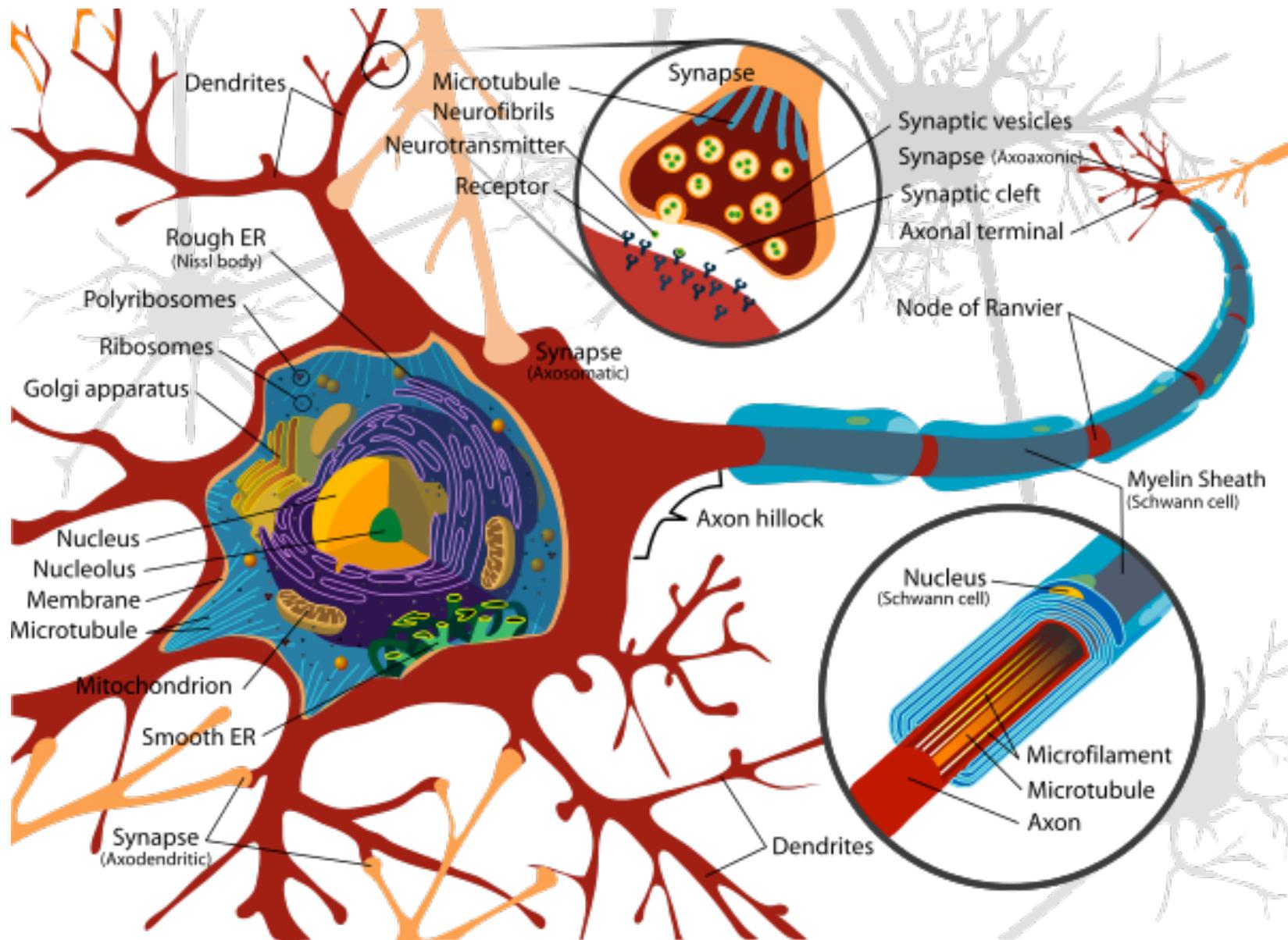


Neural Networks

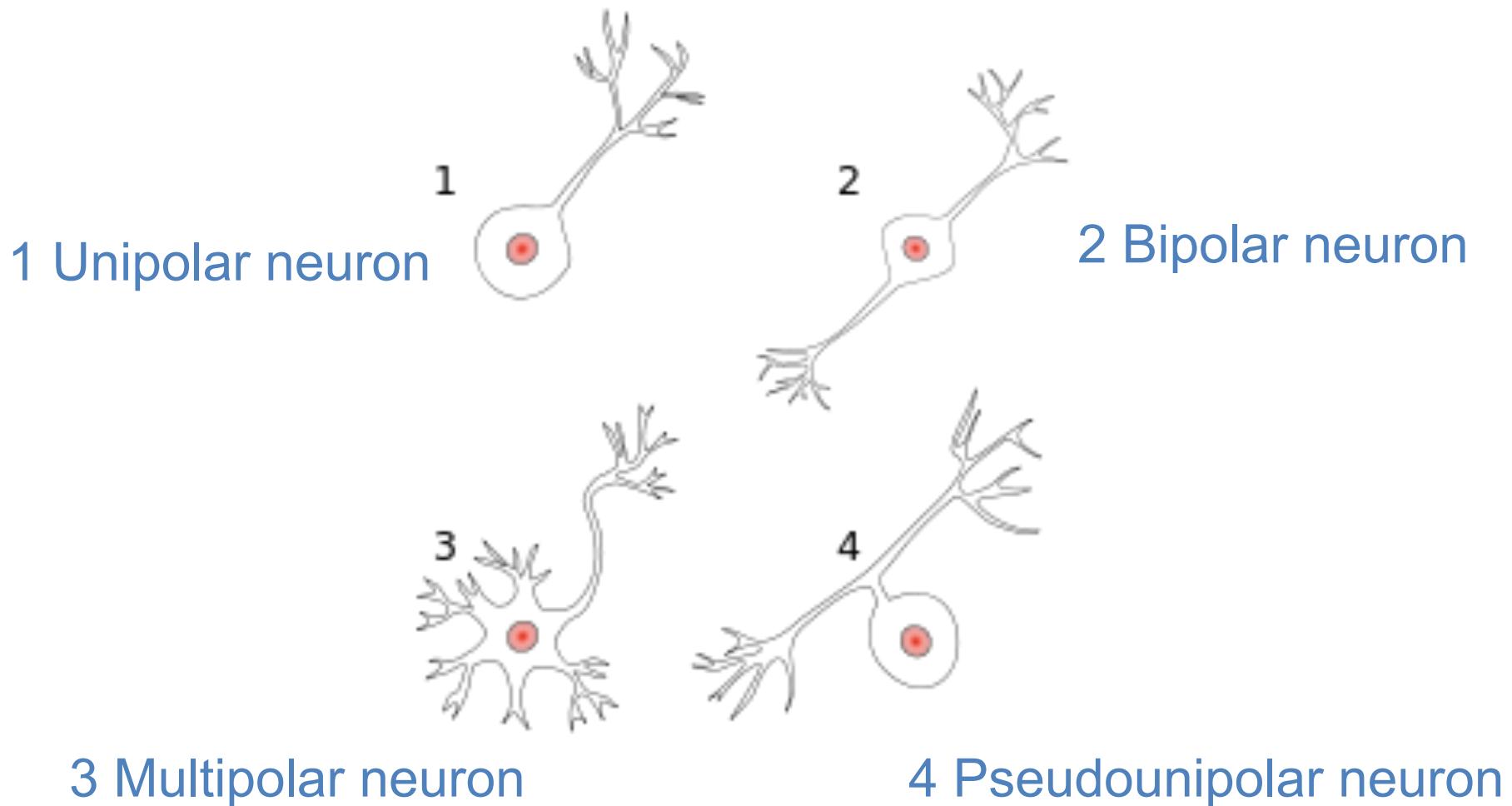
Input Layer (X) **Hidden Layer** (H) **Output Layer** (Y)



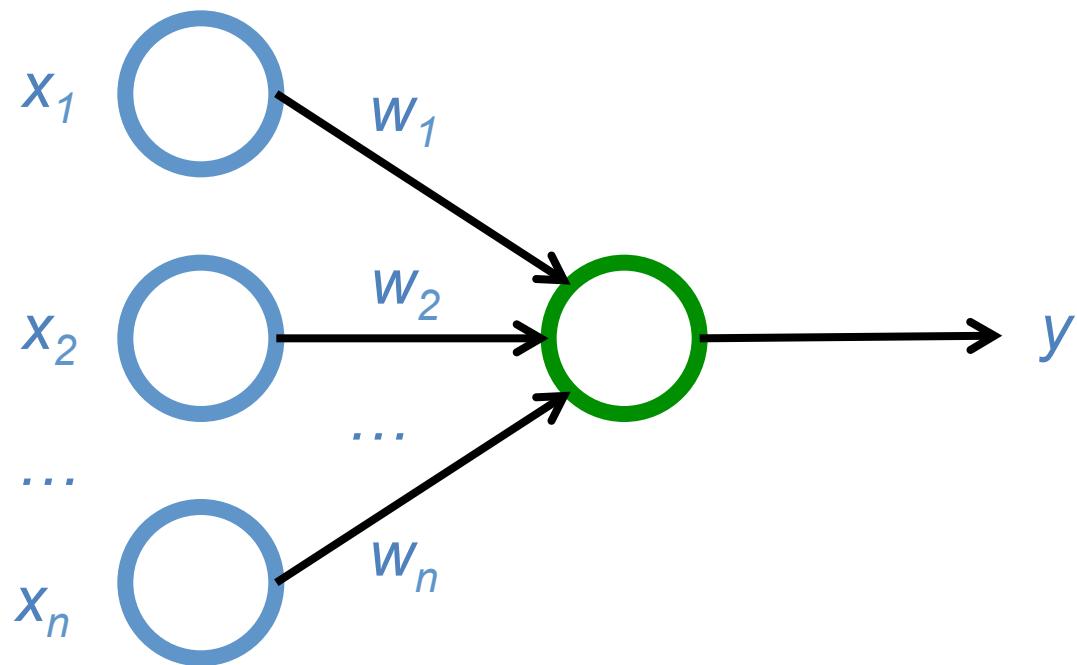
Neuron and Synapse



Neurons

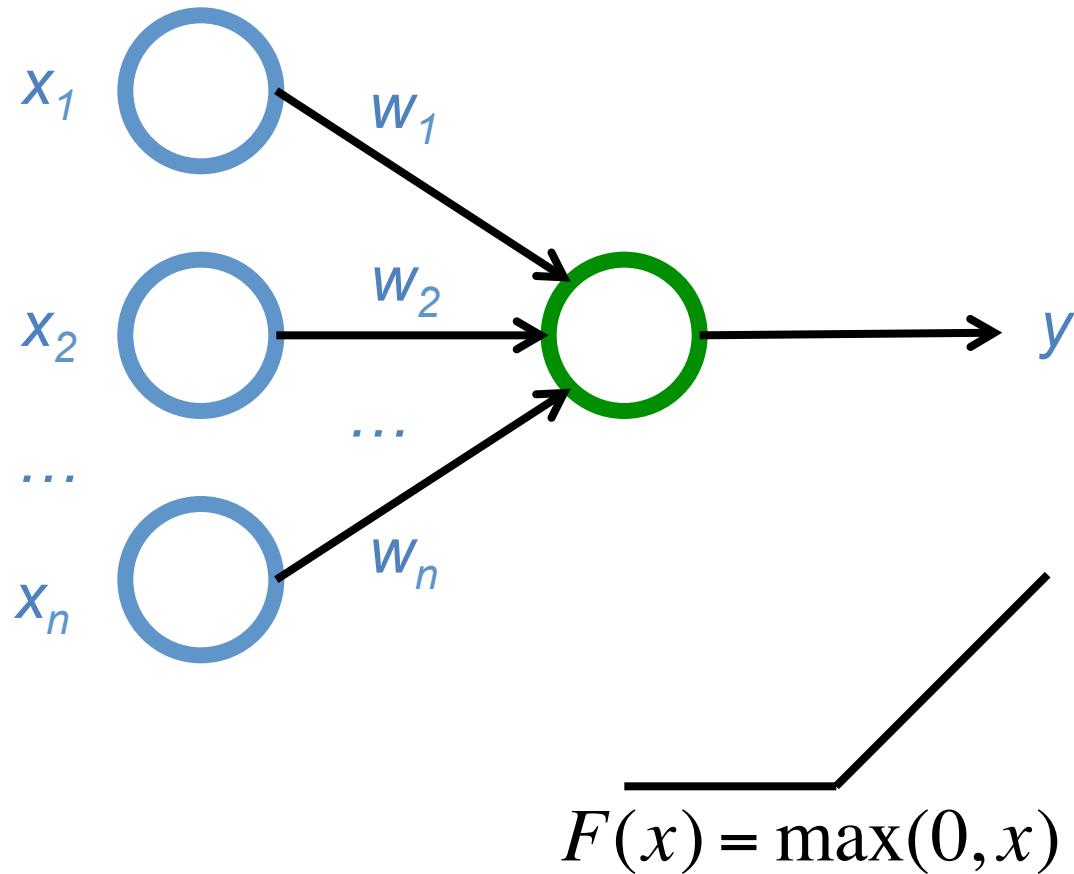


The Neuron

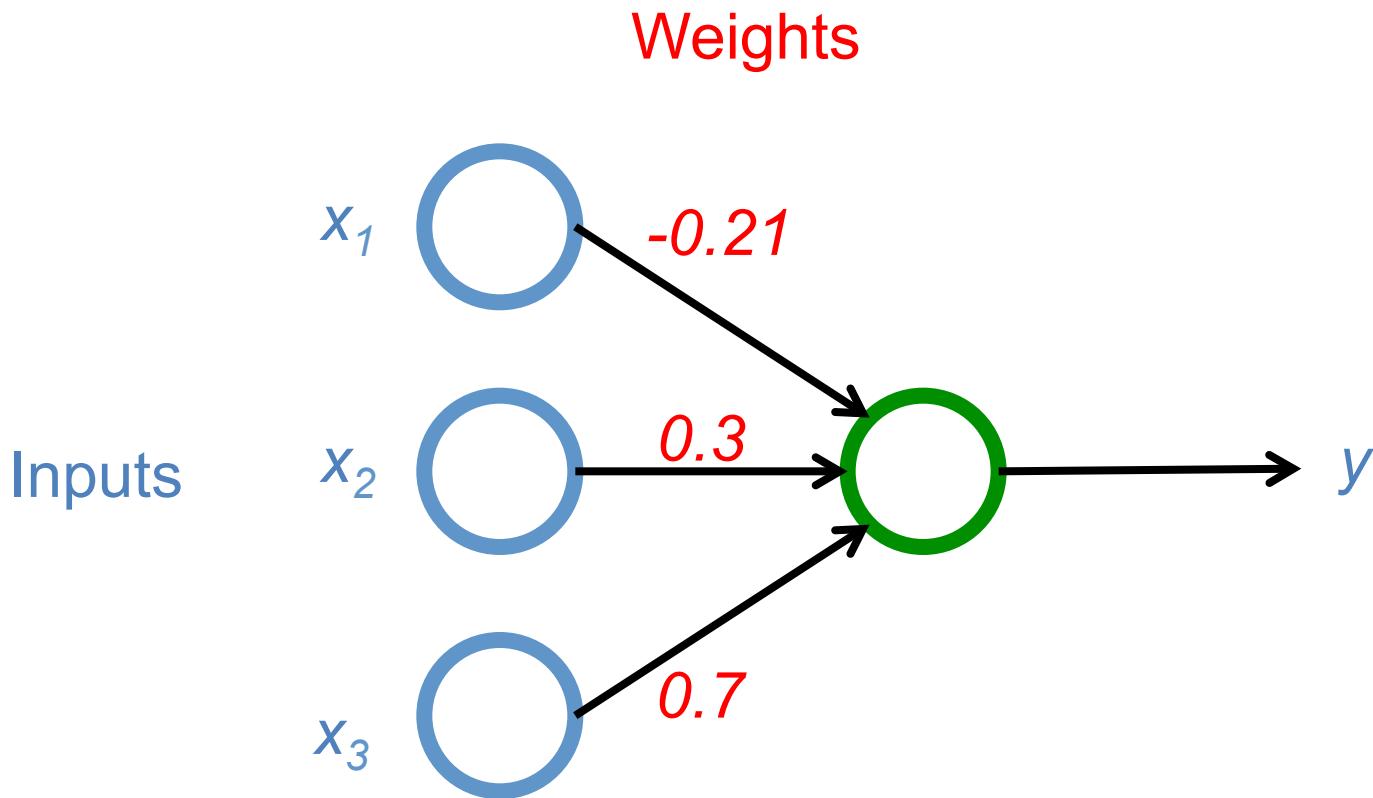


The Neuron

$$y = F\left(\sum_i w_i x_i\right)$$

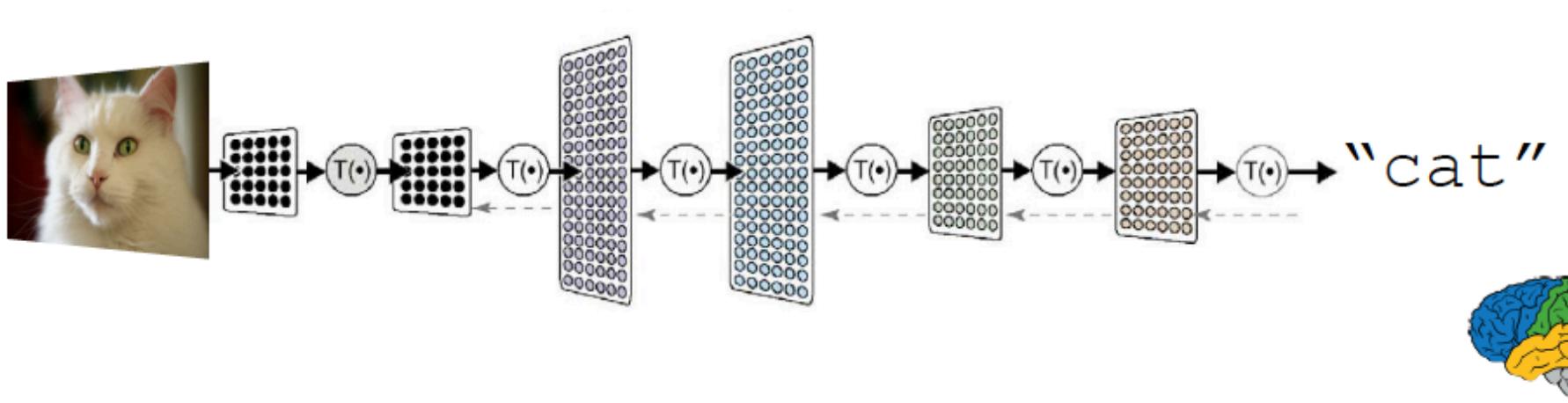


$$y = \max(0, -0.21 * x_1 + 0.3 * x_2 + 0.7 * x_3)$$



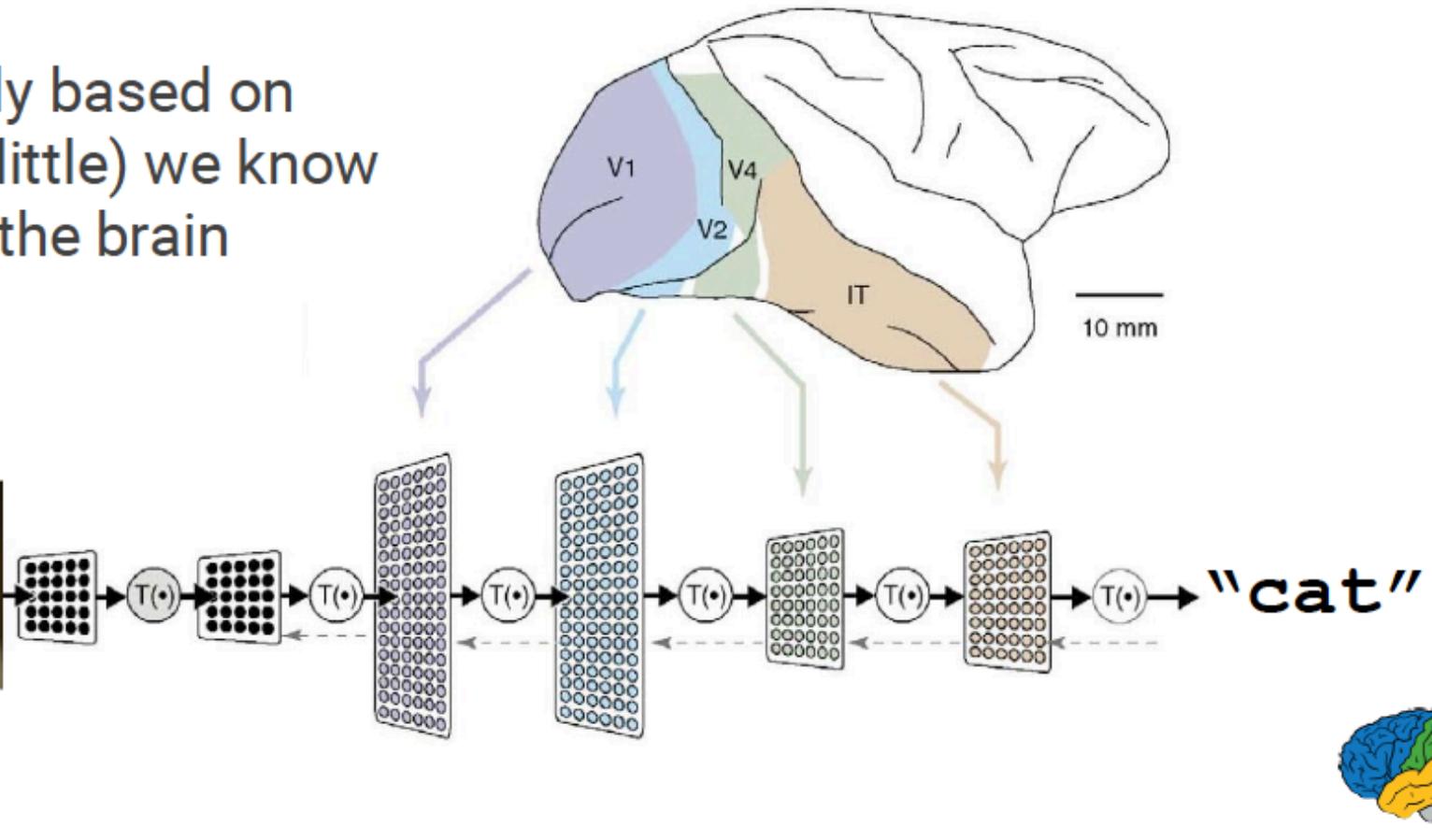
Deep Learning

- A powerful class of machine learning model
- Modern reincarnation of artificial neural networks
- Collection of simple, trainable mathematical functions
- Compatible with many variants of machine learning



What is Deep Learning?

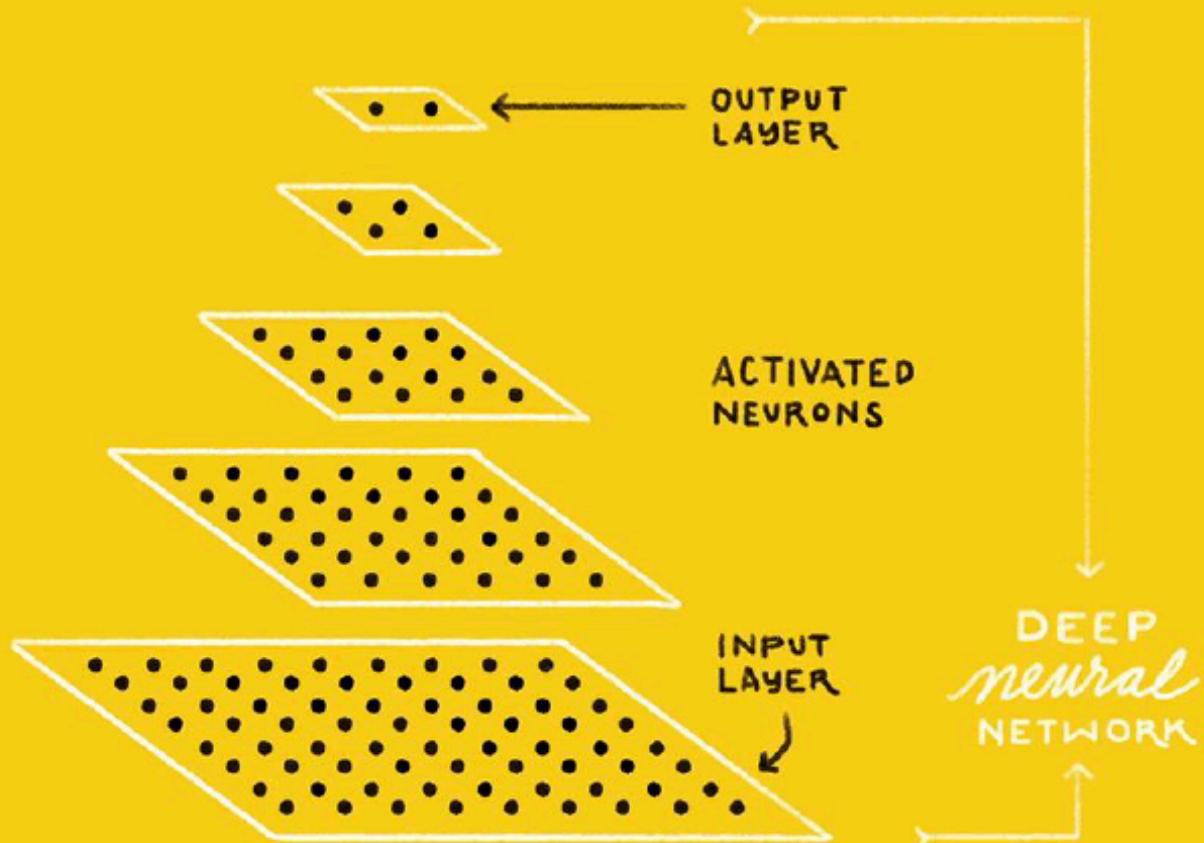
- Loosely based on (what little) we know about the brain



IS THIS A
CAT or DOG?



CAT DOG



Learning Algorithm

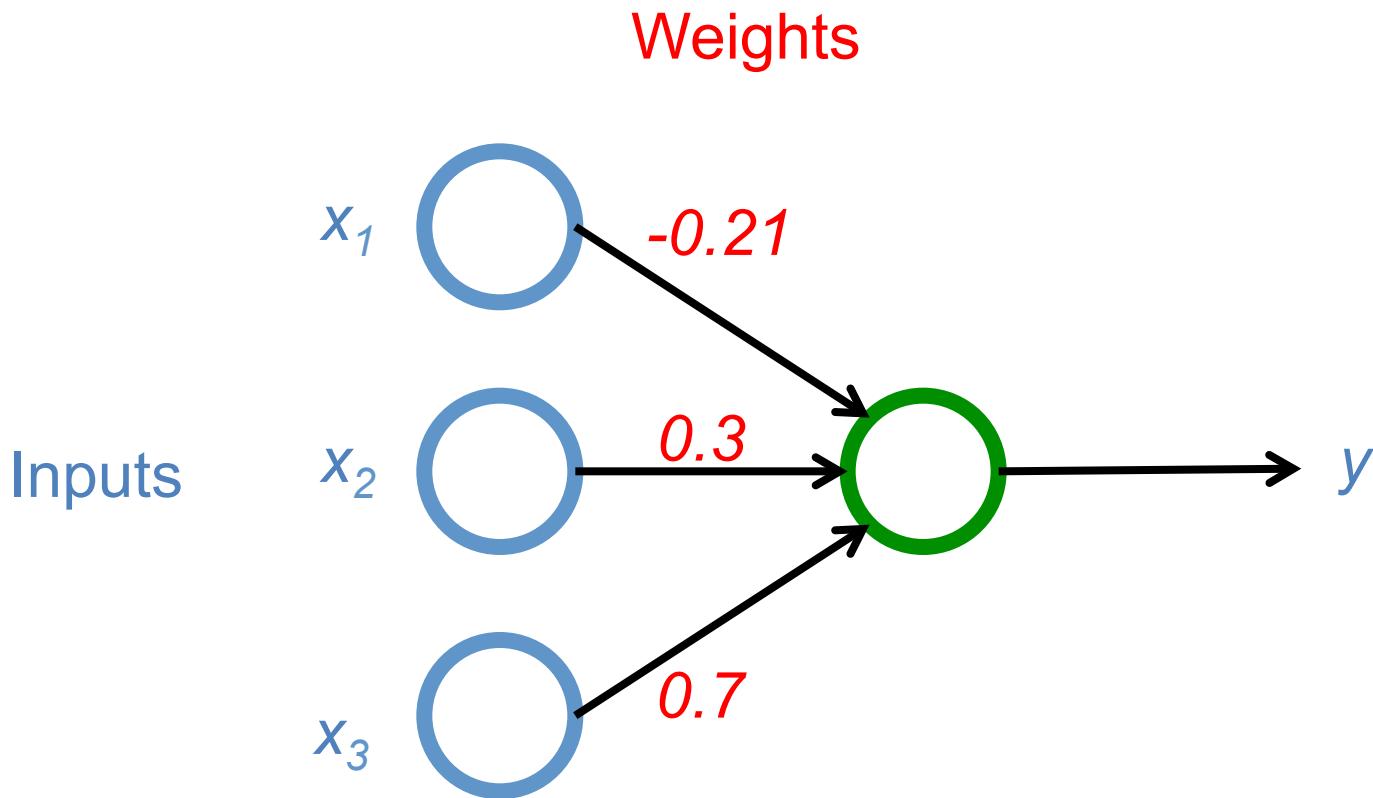
While not done:

Pick a random training example “(input, label)”

Run neural network on “input”

Adjust weights on edges to make output closer to “label”

$$y = \max(0, -0.21 * x_1 + 0.3 * x_2 + 0.7 * x_3)$$

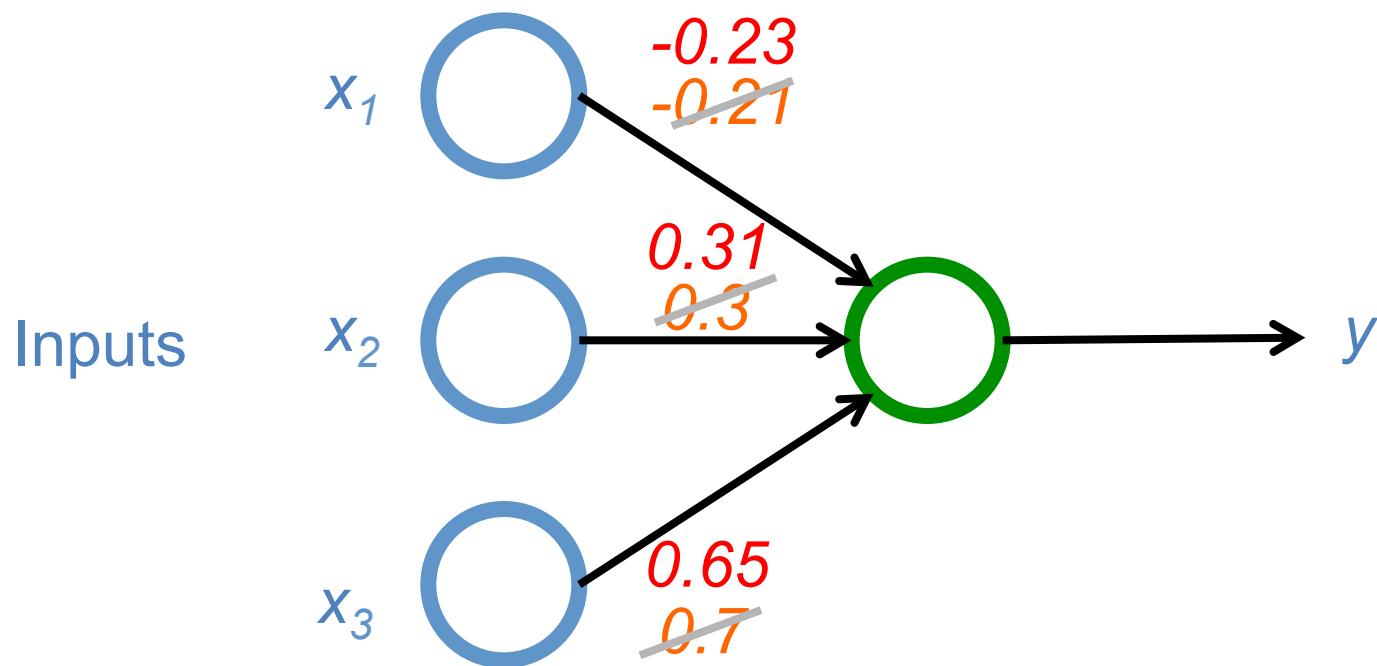


Next time:

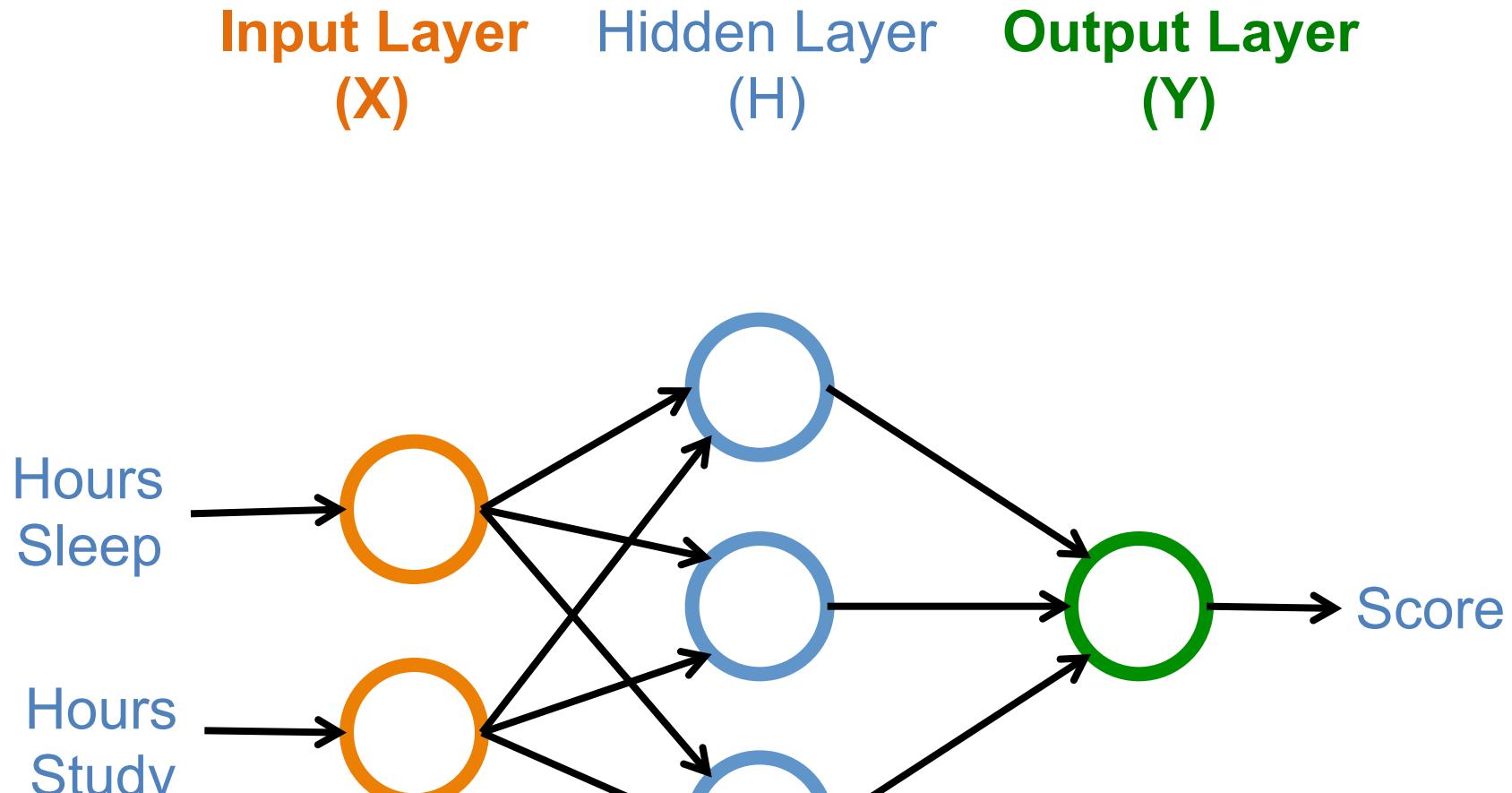
$$y = \max(0, -0.23 * x_1 + 0.31 * x_2 + 0.65 * x_3)$$

$$y = \max(0, -0.21 * x_1 + 0.3 * x_2 + 0.7 * x_3)$$

Weights

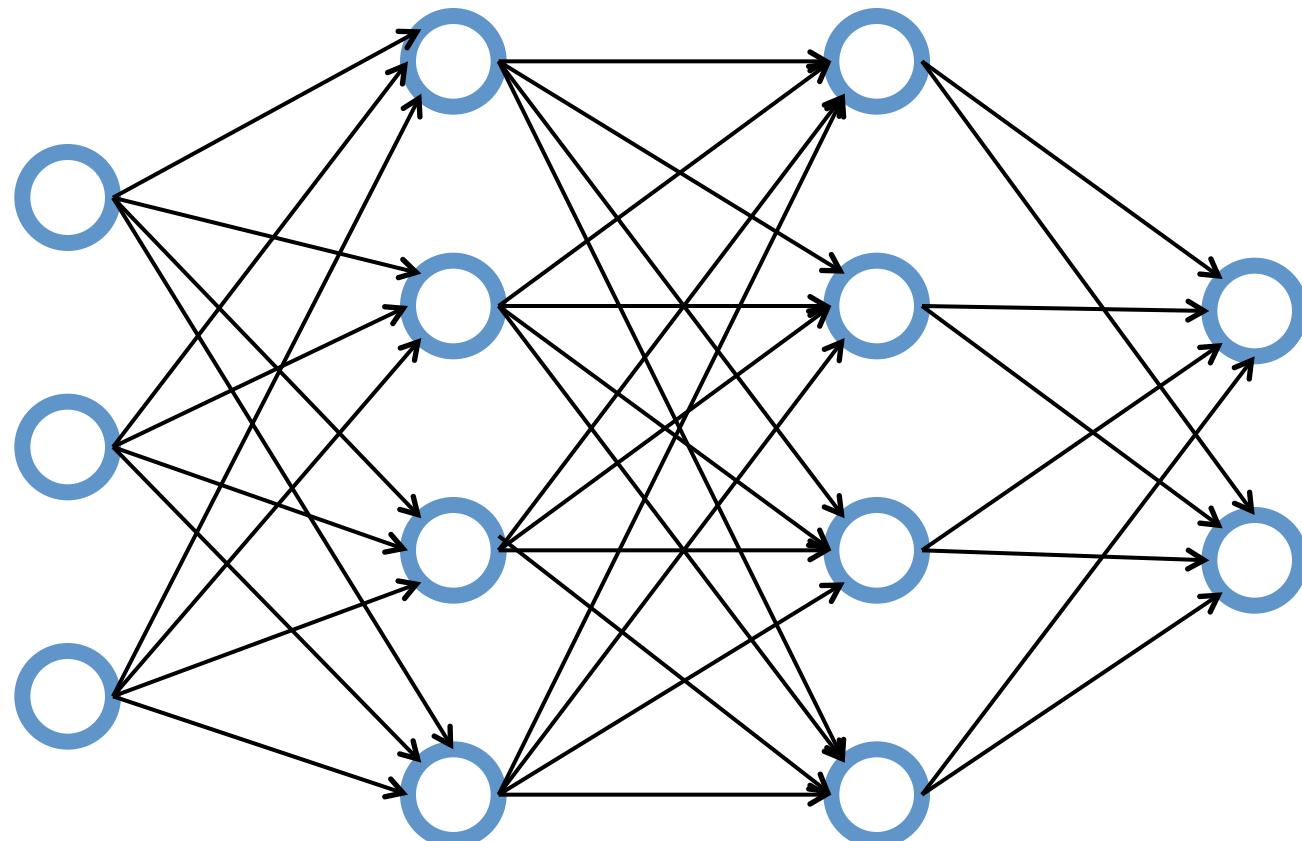


Neural Networks



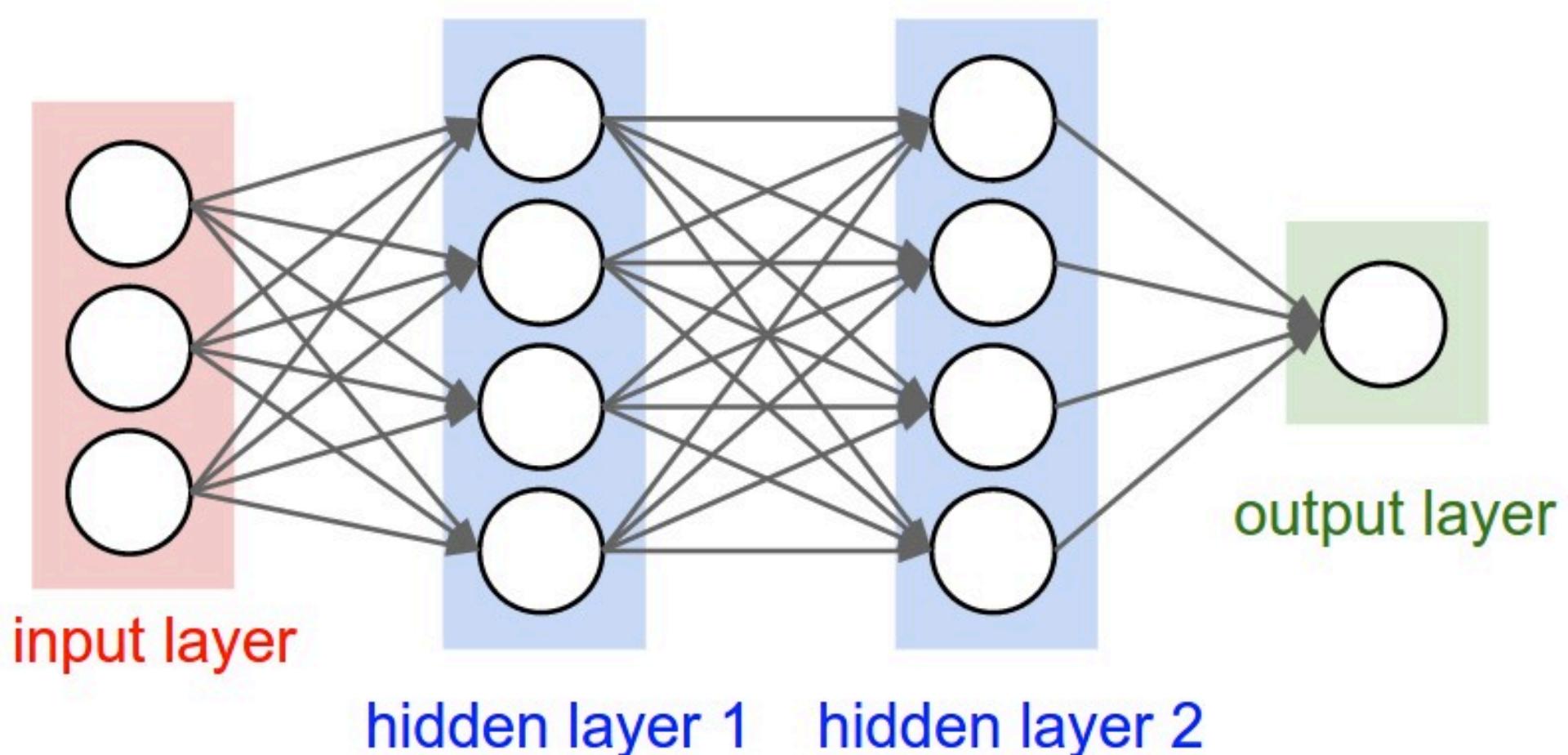
Neural Networks

Input Layer (X) Hidden Layer (H) Output Layer (Y)

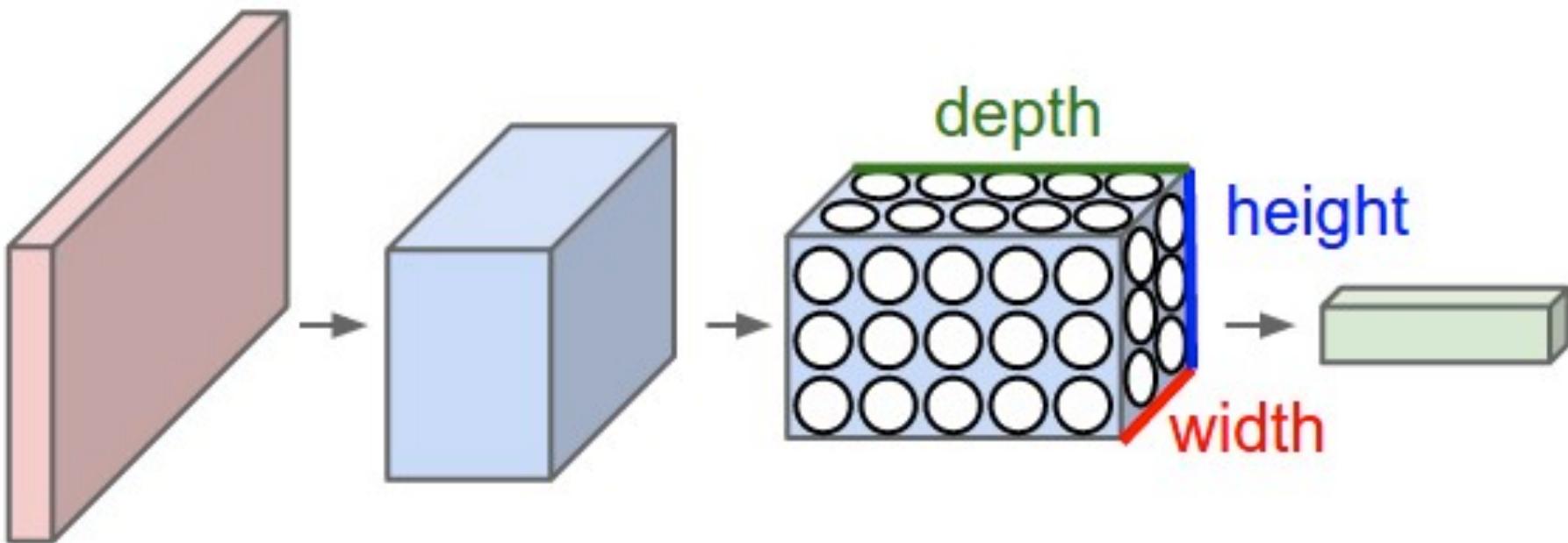


Convolutional Neural Networks (CNNs / ConvNets)

A regular 3-layer Neural Network



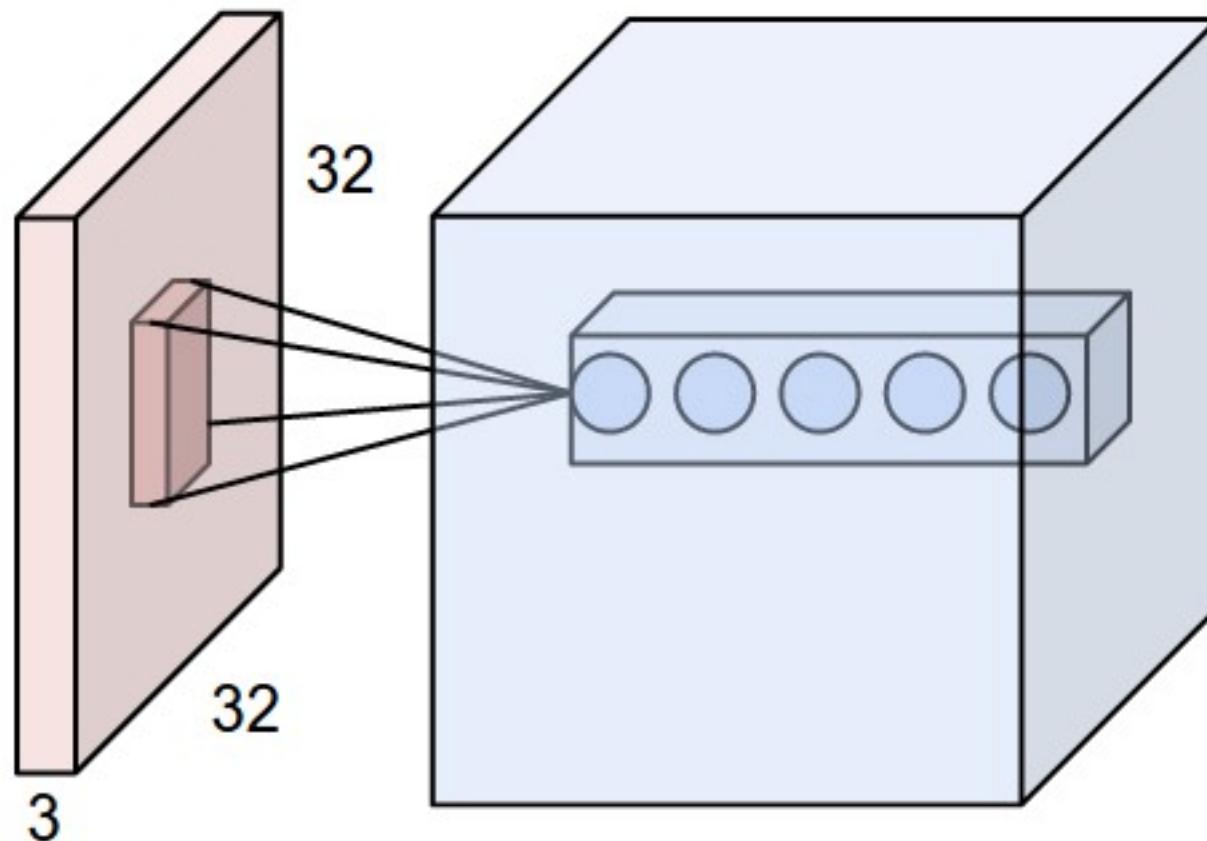
A ConvNet arranges its neurons in three dimensions (width, height, depth)



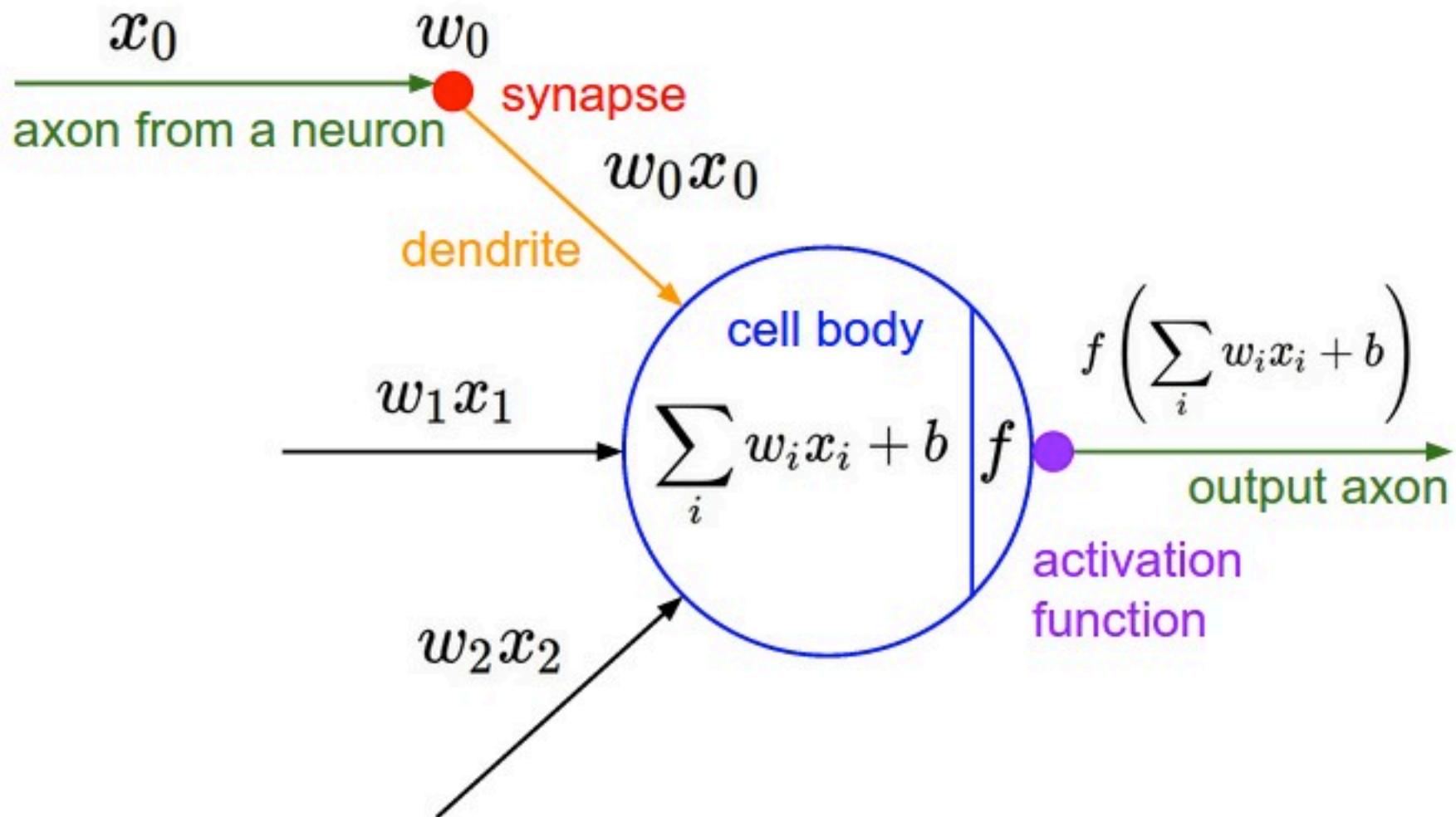
The activations of an example ConvNet architecture.



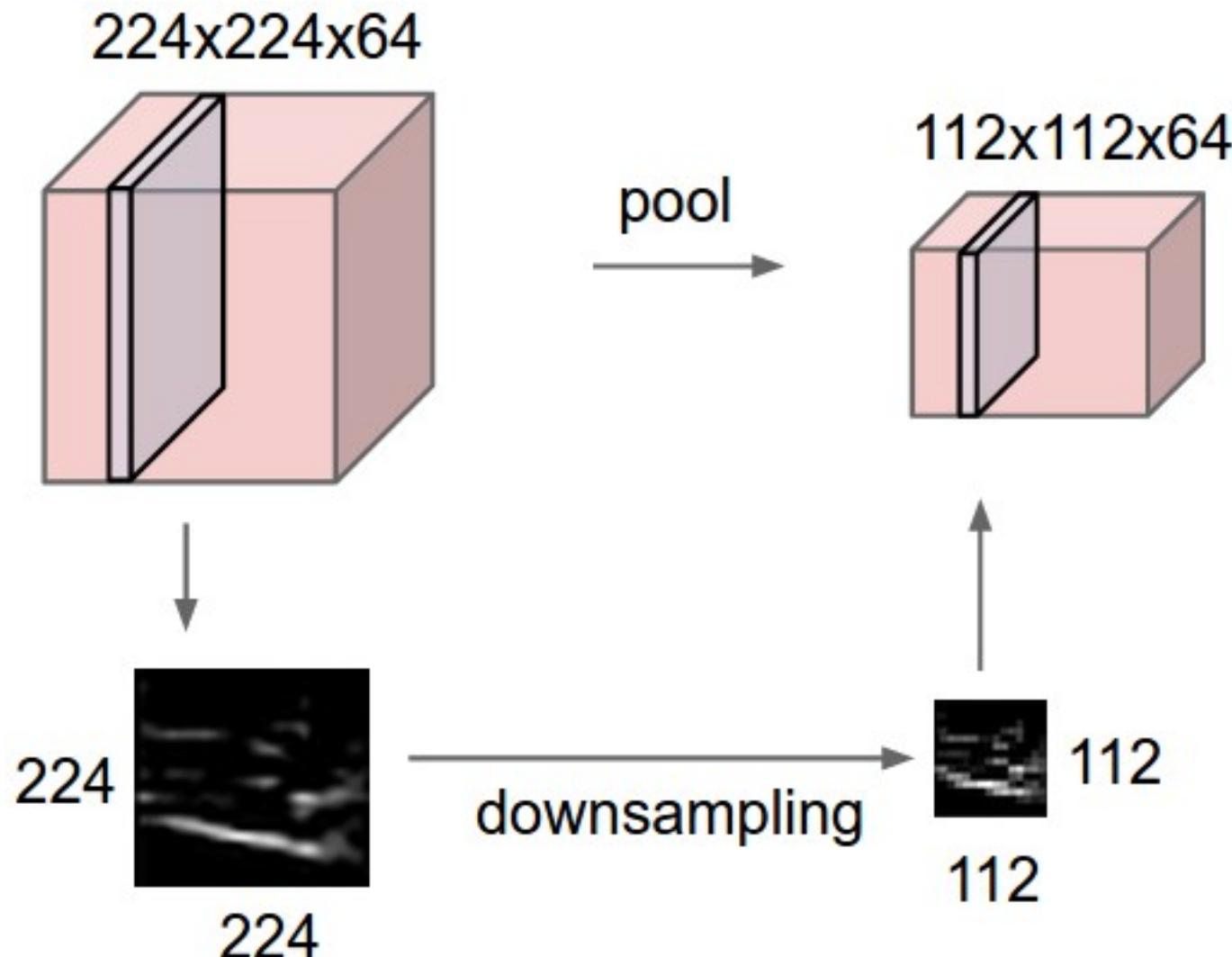
ConvNets



ConvNets



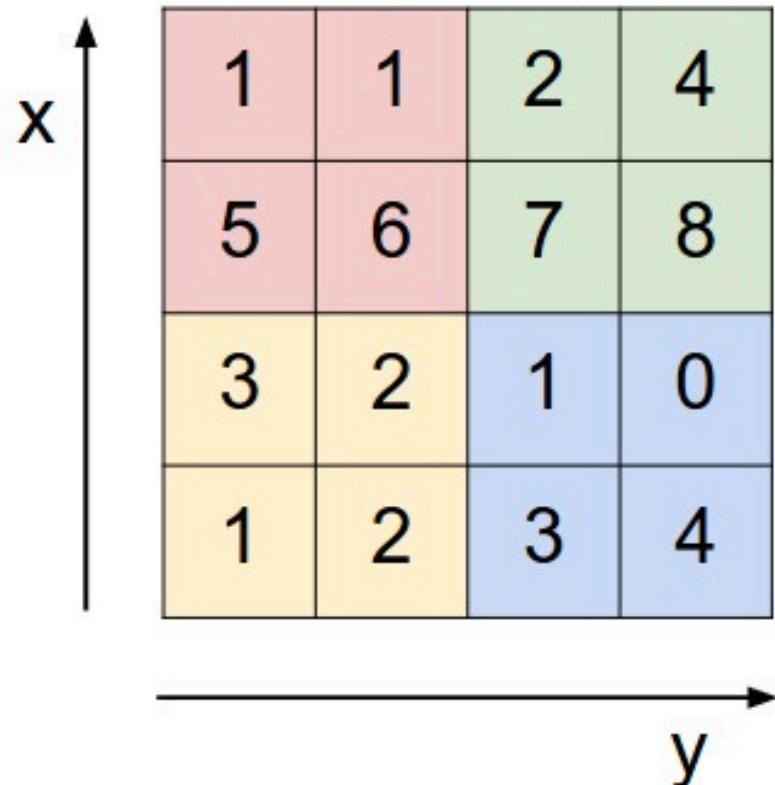
ConvNets



ConvNets

max pooling

Single depth slice



max pool with 2x2 filters
and stride 2



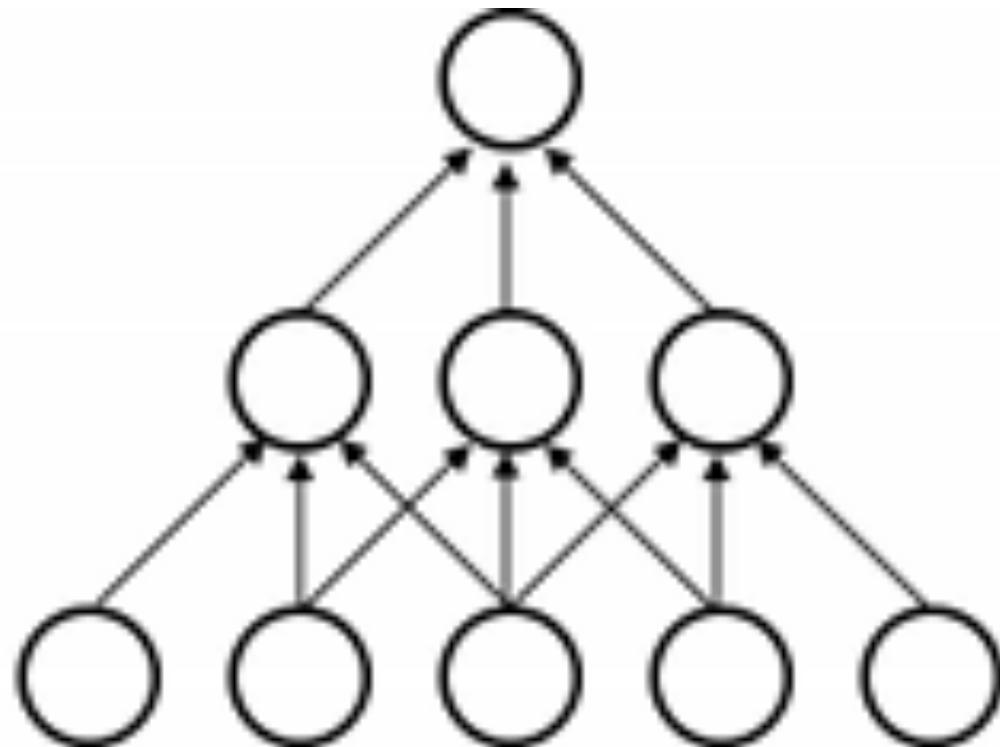
6	8
3	4

Convolutional Neural Networks (CNN) (LeNet) Sparse Connectivity

layer $m+1$

layer m

layer $m-1$

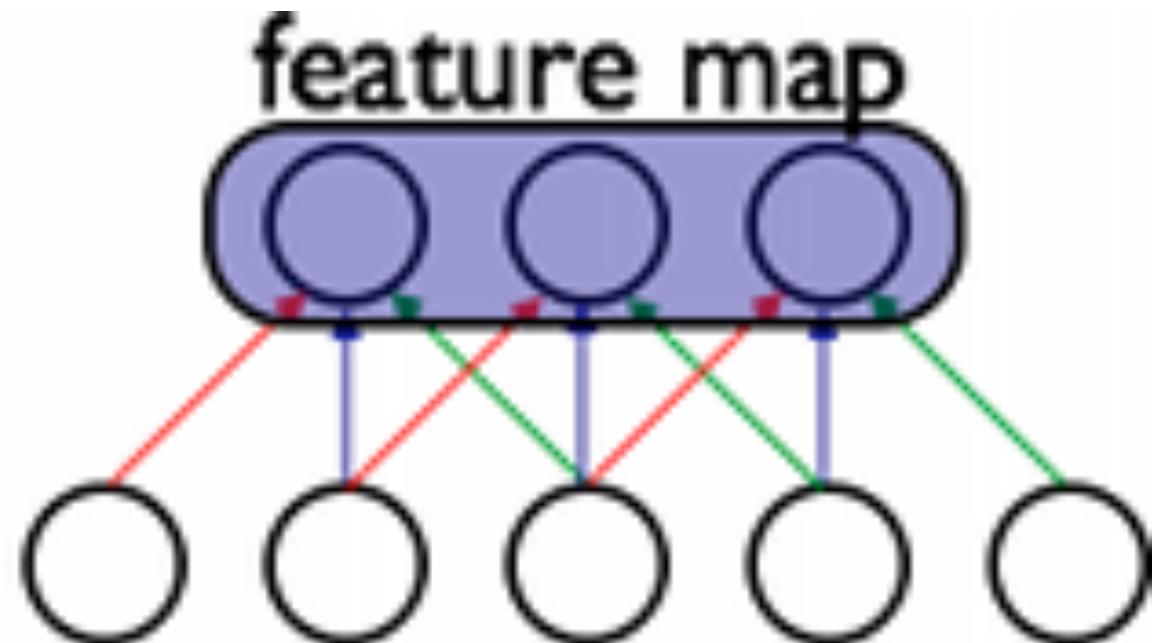


Convolutional Neural Networks (CNN) (LeNet)

Shared Weights

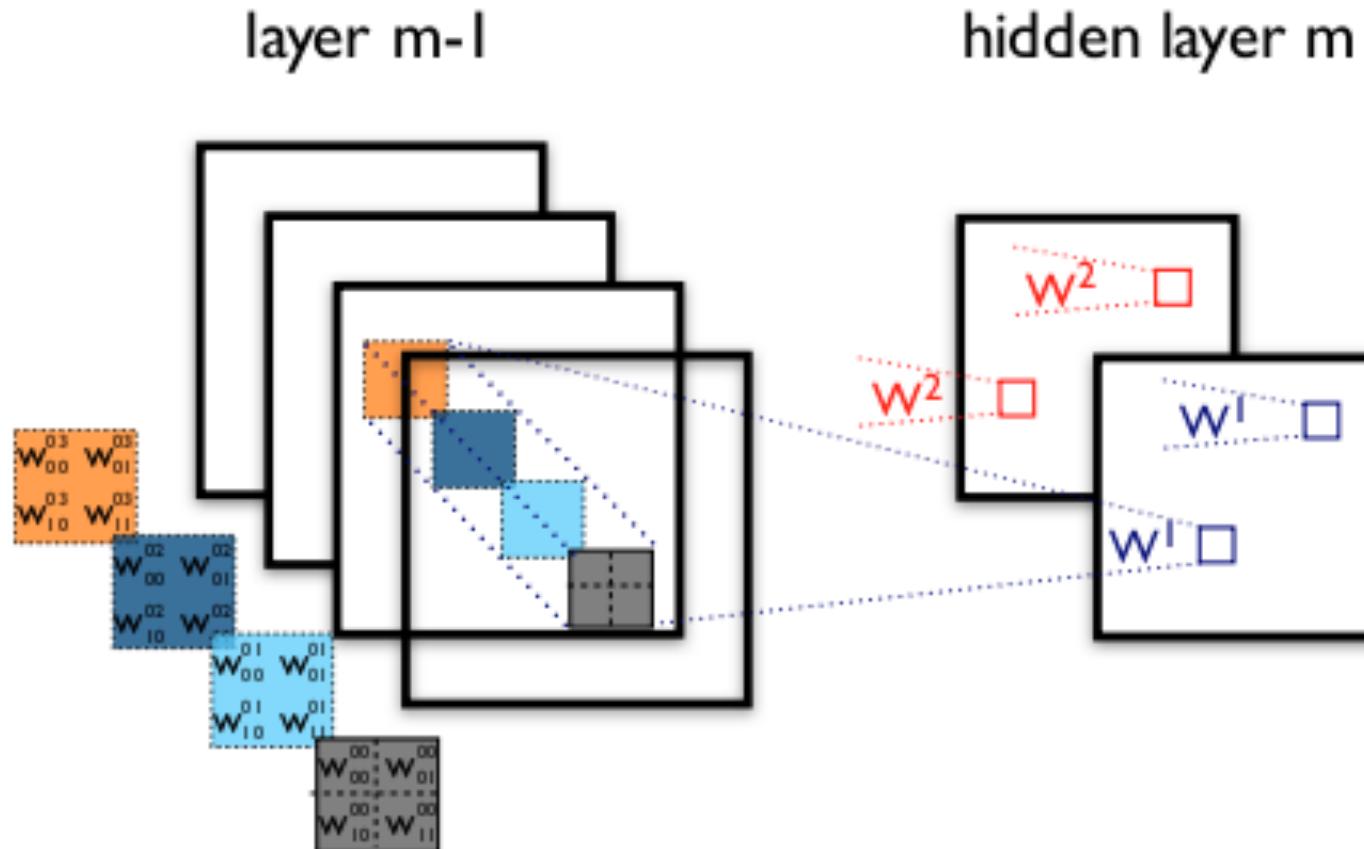
layer m

layer m-1

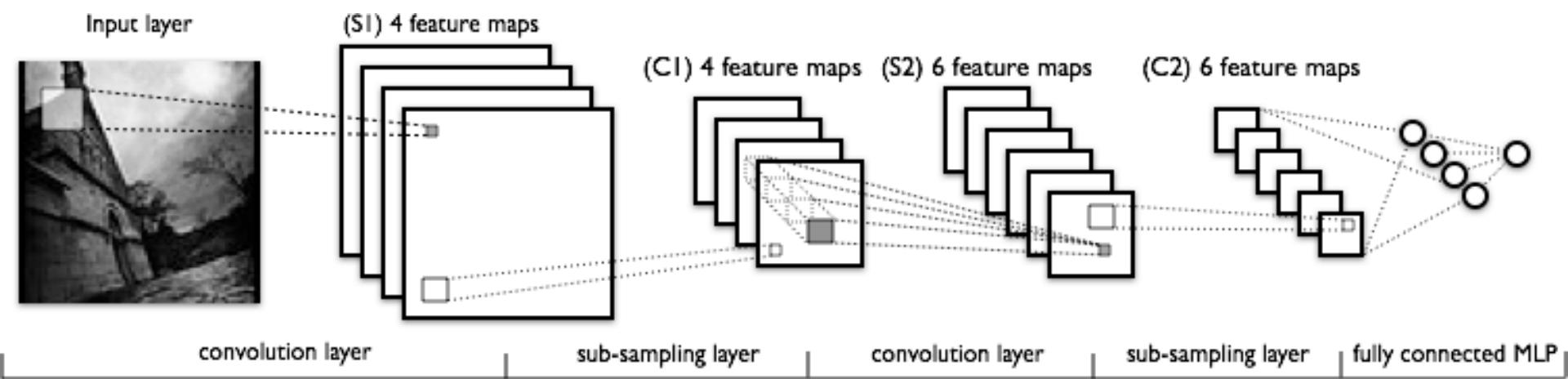


Convolutional Neural Networks (CNN) (LeNet)

example of a convolutional layer



Convolutional Neural Networks (CNN) (LeNet)



show flights from Boston to New York today

Recurrent Neural Networks with Word Embeddings

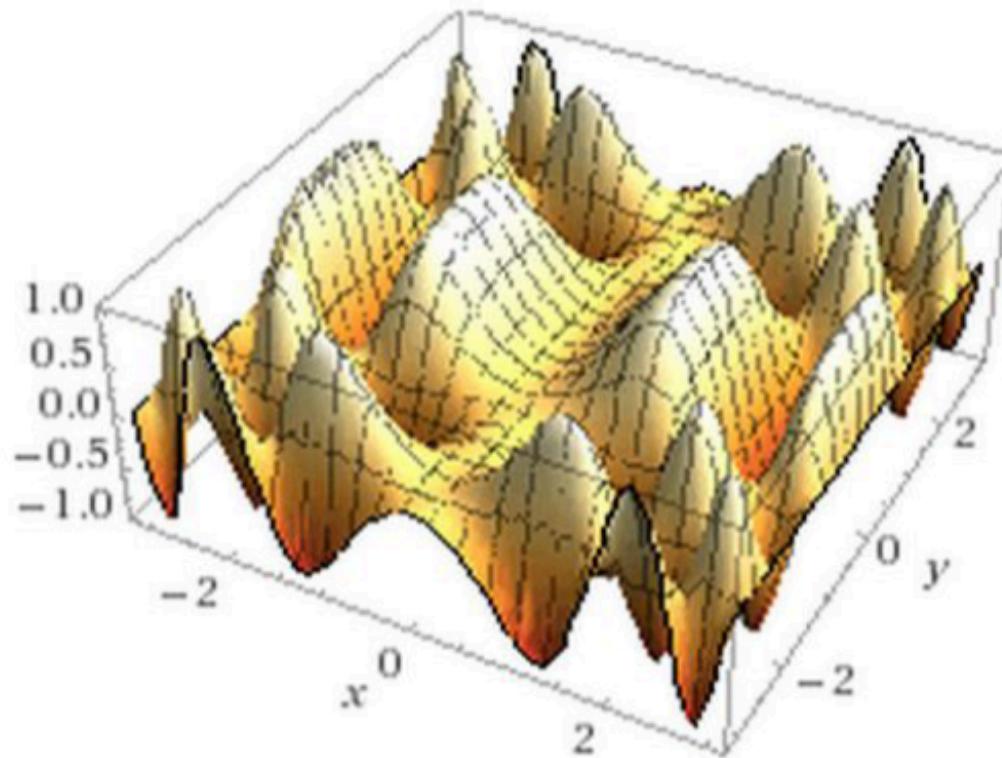
Semantic Parsing / Slot-Filling (Spoken Language Understanding)

Input (words)	show	flights	from	Boston	to	New	York	today
Output (labels)	O	O	O	B-dept	O	B-arr	I-arr	B-date

show flights from Boston to New York today

show flights from **Boston** to **New York** **today**

Input (words)	show	flights	from	Boston	to	New	York	today
Output (labels)	O	O	O	B-dept	O	B-arr	I-arr	B-date



This shows a function of 2 variables: real neural nets are functions of hundreds of millions of variables!

Important Property of Neural Networks

Results get better with

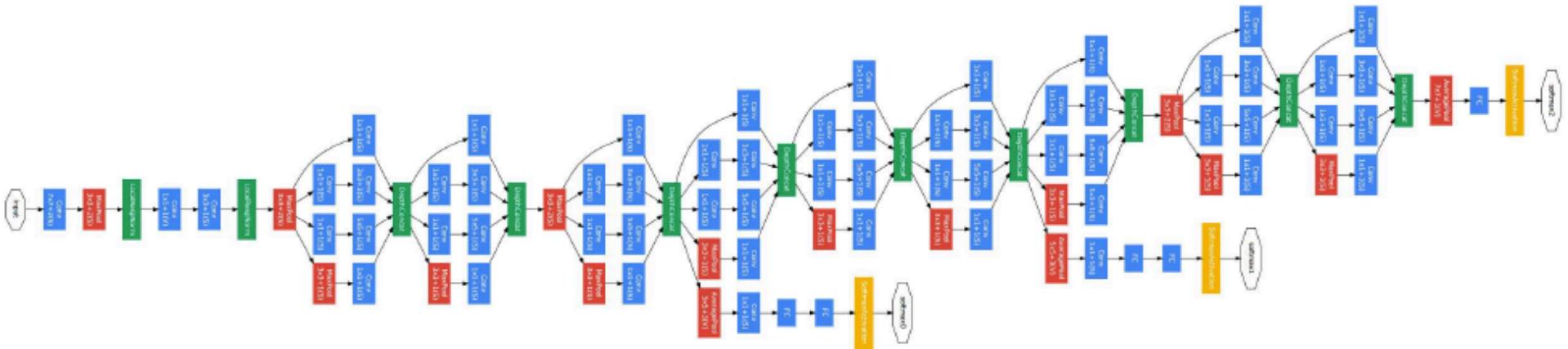
More data +

Bigger models +

More computation

(Better algorithms, new insights
and improved techniques always help, too!)

The Inception Architecture (GoogLeNet, 2014)



Going Deeper with Convolutions

Christian Szegedy, Wei Liu, Yangqing Jia, Pierre Sermanet, Scott Reed, Dragomir Anguelov, Dumitru Erhan, Vincent Vanhoucke, Andrew Rabinovich

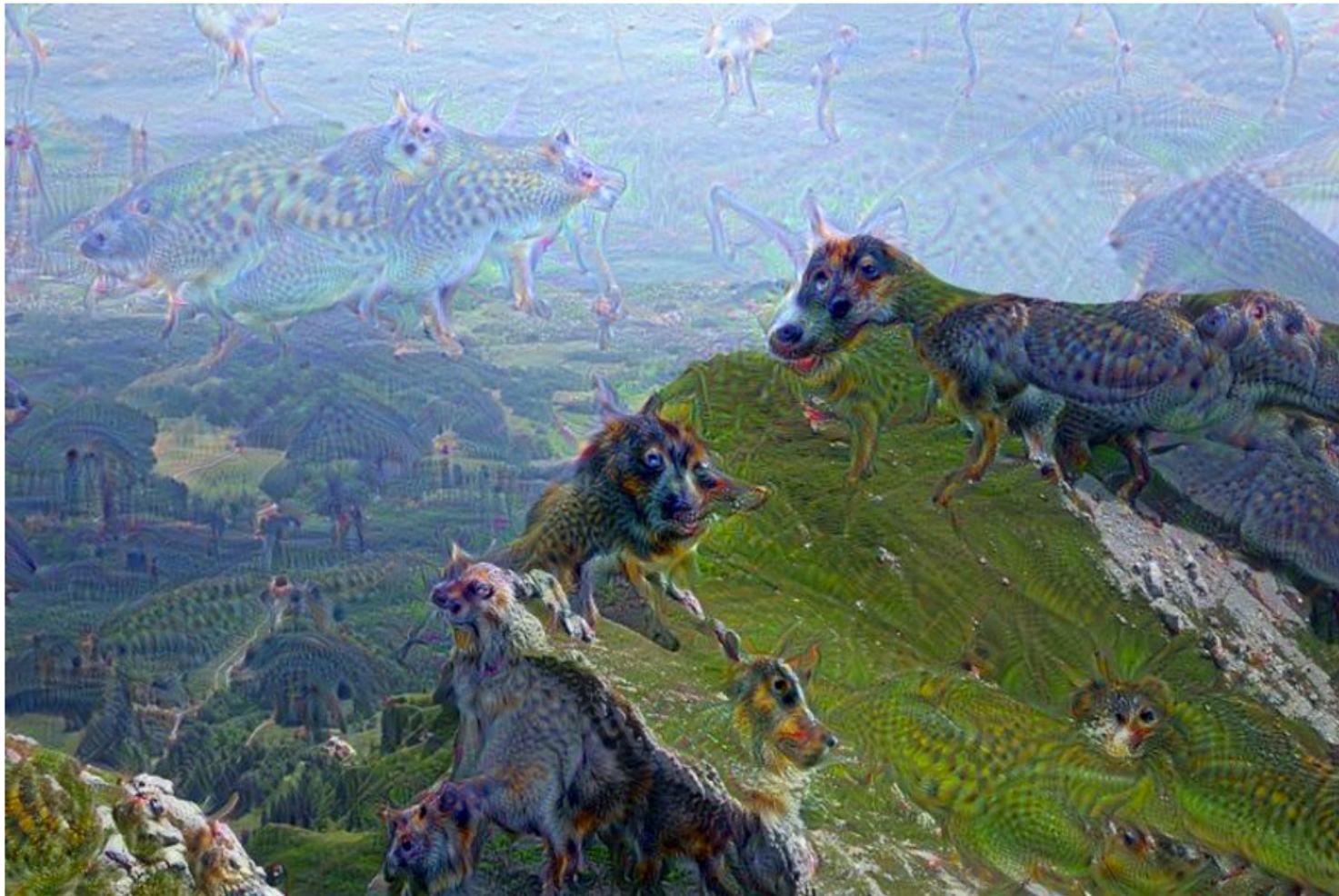
ArXiv 2014, CVPR 2015



DeepDream

 GitHub, Inc. [US] <https://github.com/tensorflow/tensorflow/blob/master/tensorflow/examples/tutorials/deepdream/deepdream.ipynb>

In [15]: `render_deepdream(tf.square(T('mixed4c')), img0)`



Note that results can differ from the [Caffe](#)'s implementation, as we are using an independently trained network. Still, the network seems to like dogs and animal-like features due to the nature of the ImageNet dataset.

Deep Learning Software

- Theano
 - CPU/GPU symbolic expression compiler in python (from MILA lab at University of Montreal)
- Keras
 - A theano based deep learning library.
- Tensorflow
 - TensorFlow™ is an open source software library for numerical computation using data flow graphs.



TensorFlow

Google TensorFlow

TensorFlow™

GET STARTED TUTORIALS HOW TO API RESOURCES ABOUT

Fork me on GitHub

TensorFlow is an Open Source Software
Library for Machine Intelligence

GET STARTED

About TensorFlow

TensorFlow™ is an open source software library for numerical computation using data flow graphs. Nodes in the graph represent mathematical operations, while the graph edges represent the multidimensional data arrays (tensors) communicated between them. The flexible architecture allows you to deploy computation to one or more CPUs or GPUs in a desktop, server, or mobile device with a single API.



<https://www.tensorflow.org/>

TensorFlow
is an
Open Source
Software Library
for
Machine Intelligence

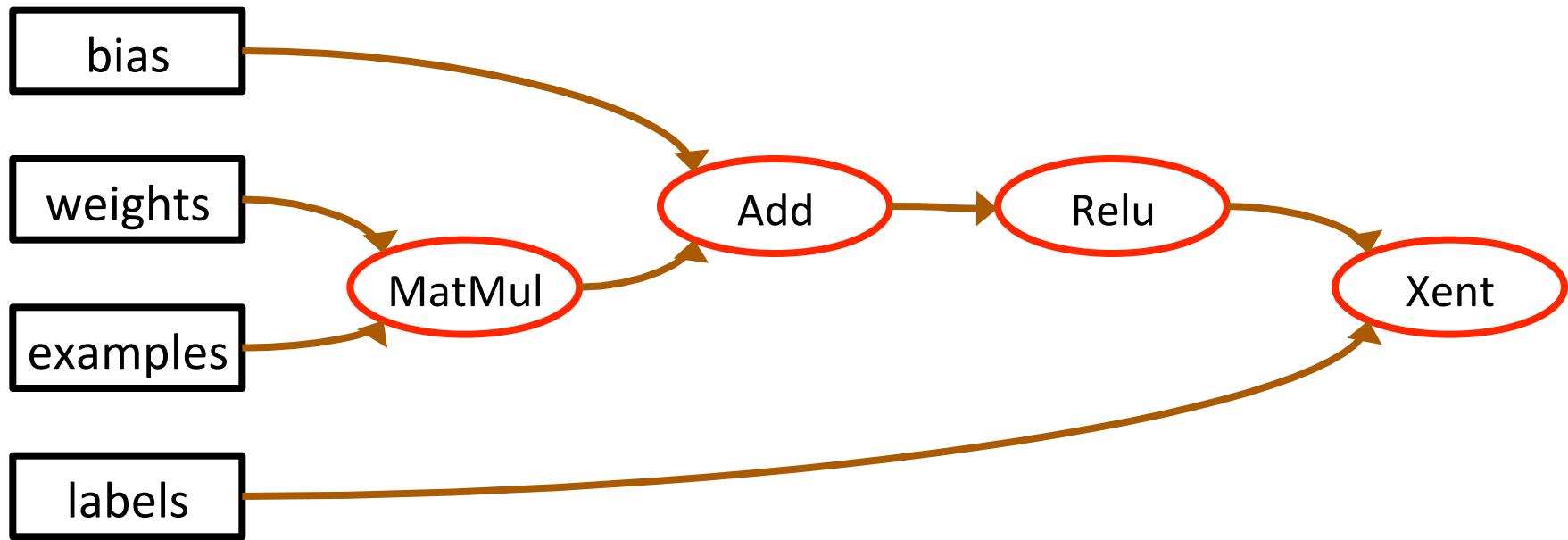
numerical computation using data flow graphs

**Nodes:
mathematical operations**

**edges:
multidimensional data arrays
(tensors)
communicated between nodes**

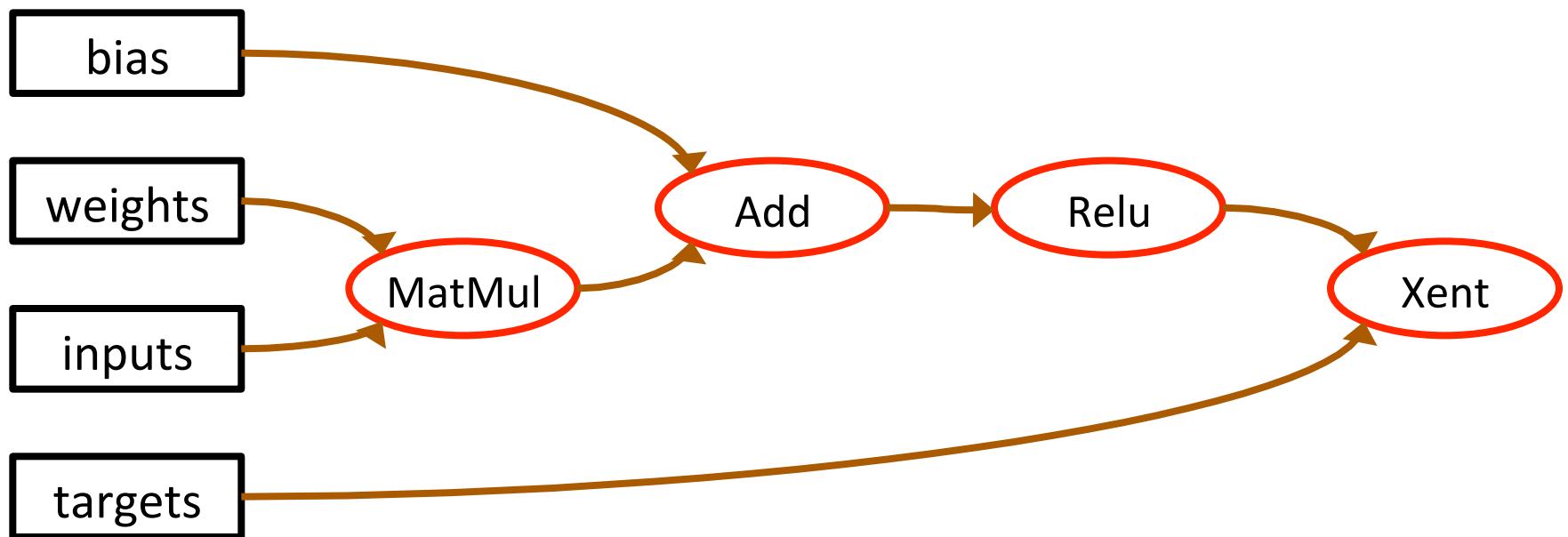
Computation is a Dataflow Graph

Graph of Nodes,
also called Operations or ops.

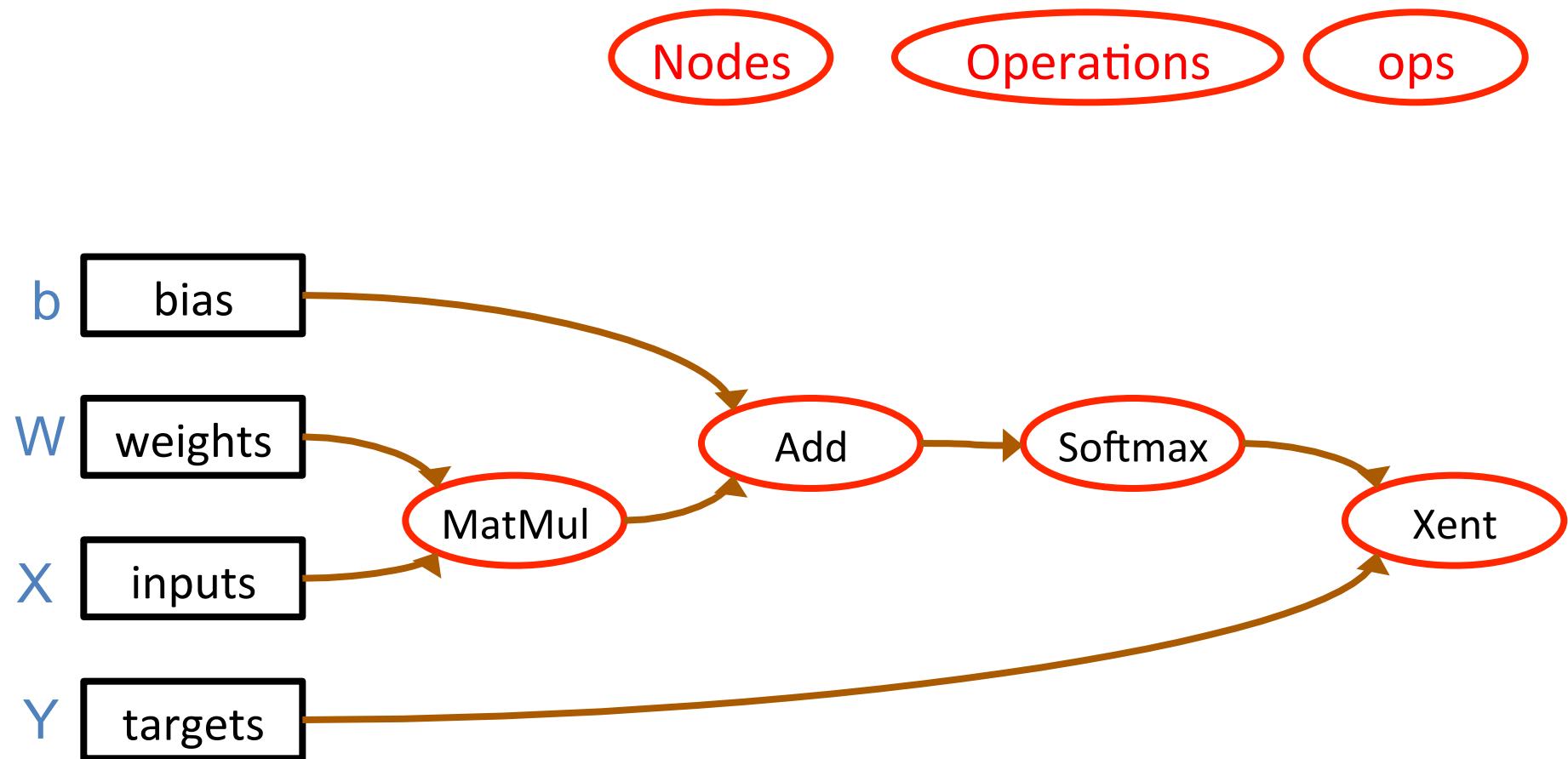


Computation is a Dataflow Graph

Edges are N-dimensional arrays: **Tensors**



Logistic Regression as Dataflow Graph

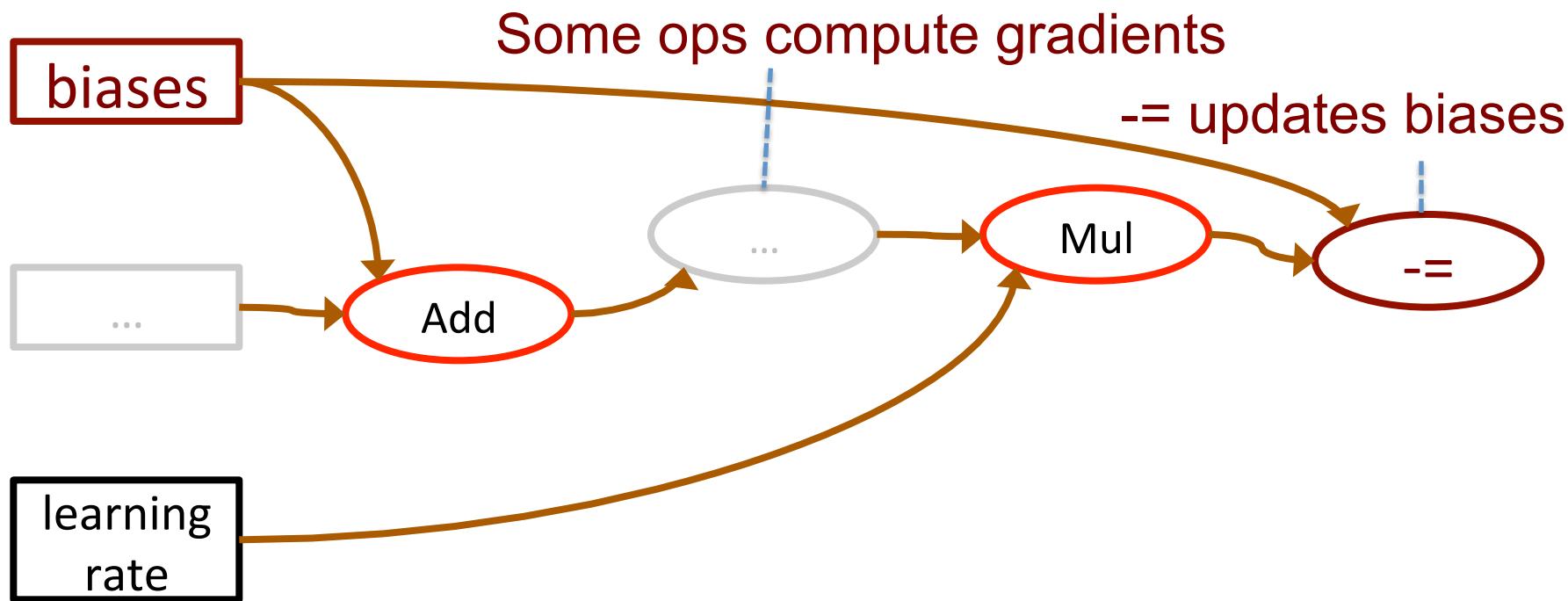


Edges are N-dimensional arrays: **Tensors**

Computation is a Dataflow Graph

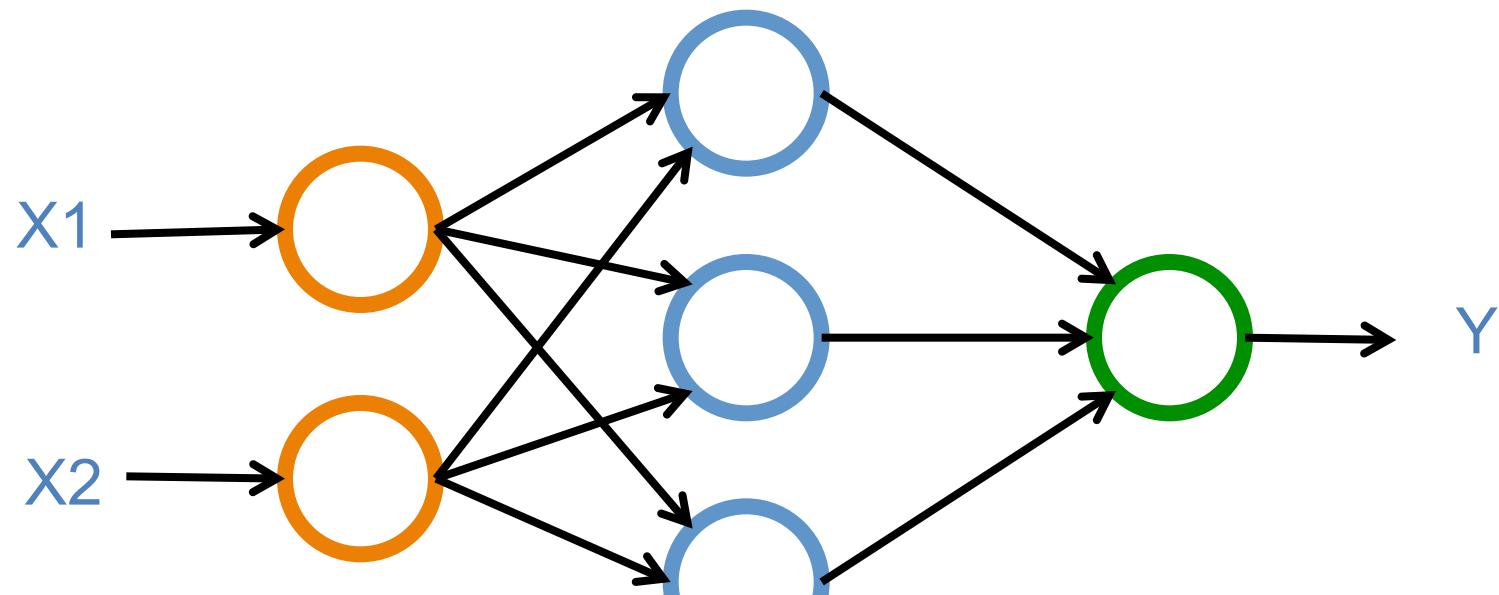
with state

'Biases' is a variable

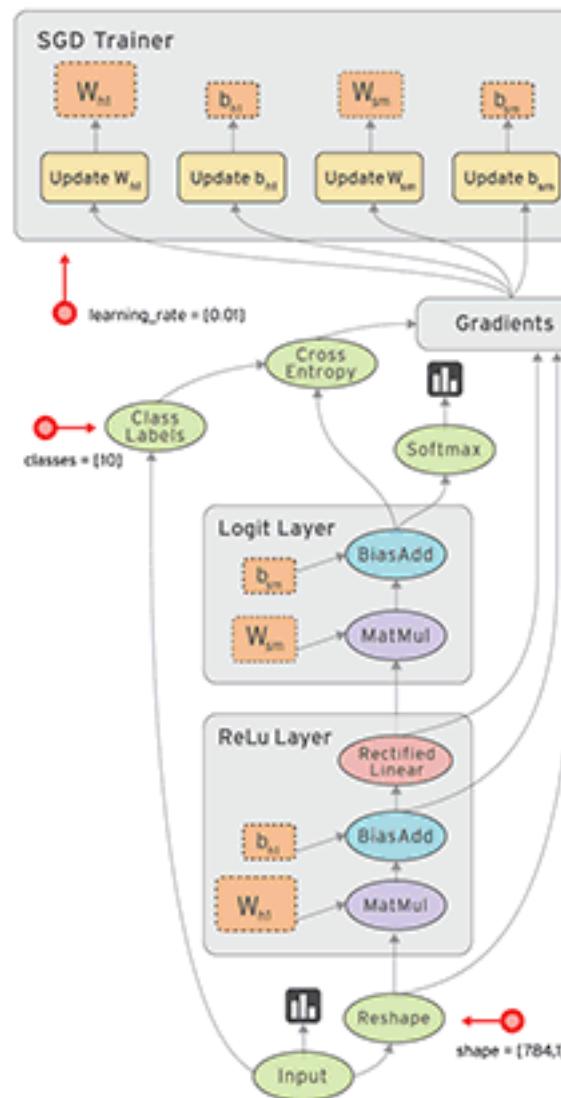


Neural Networks

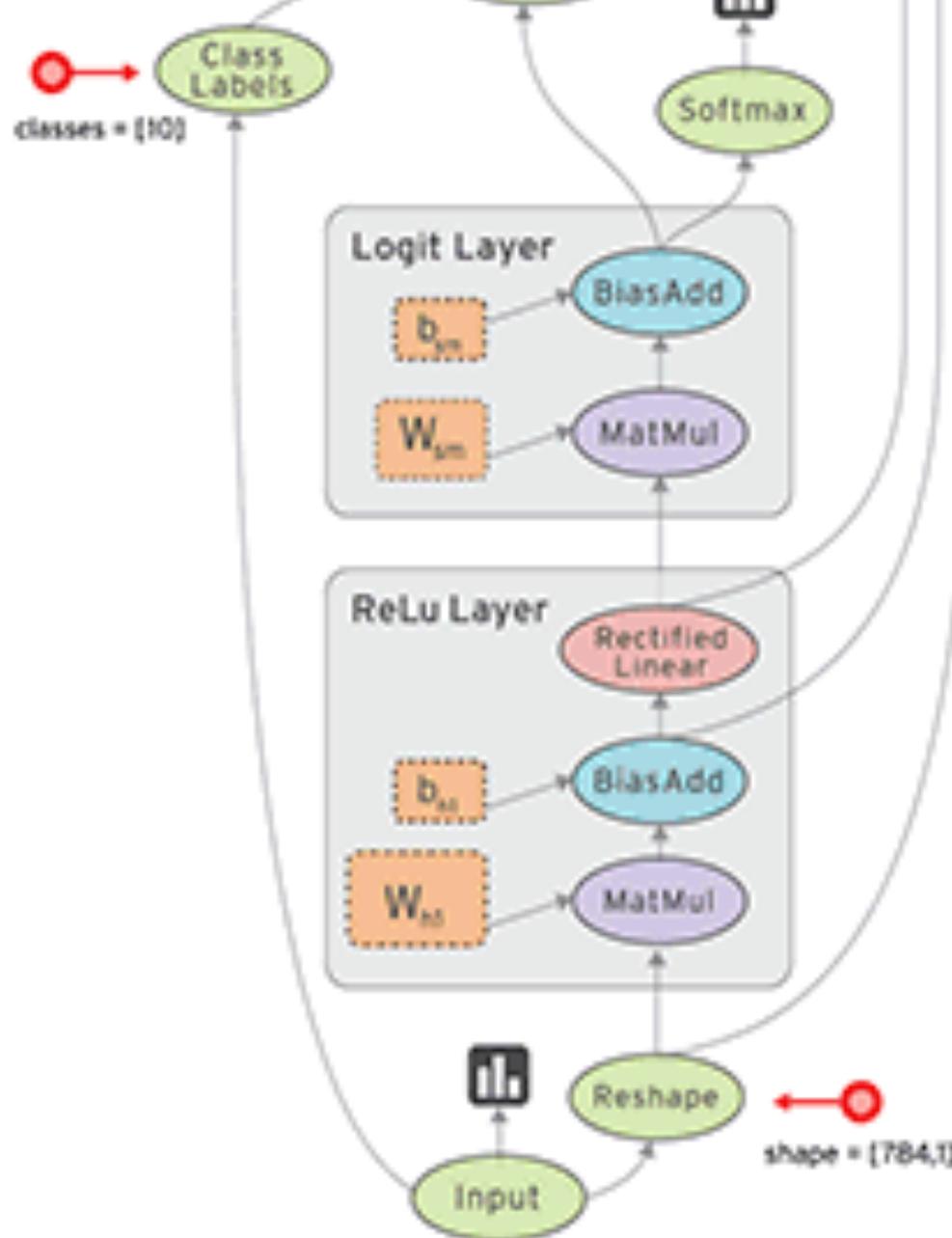
Input Layer **Hidden Layer** **Output Layer**
(X) **(H)** **(Y)**



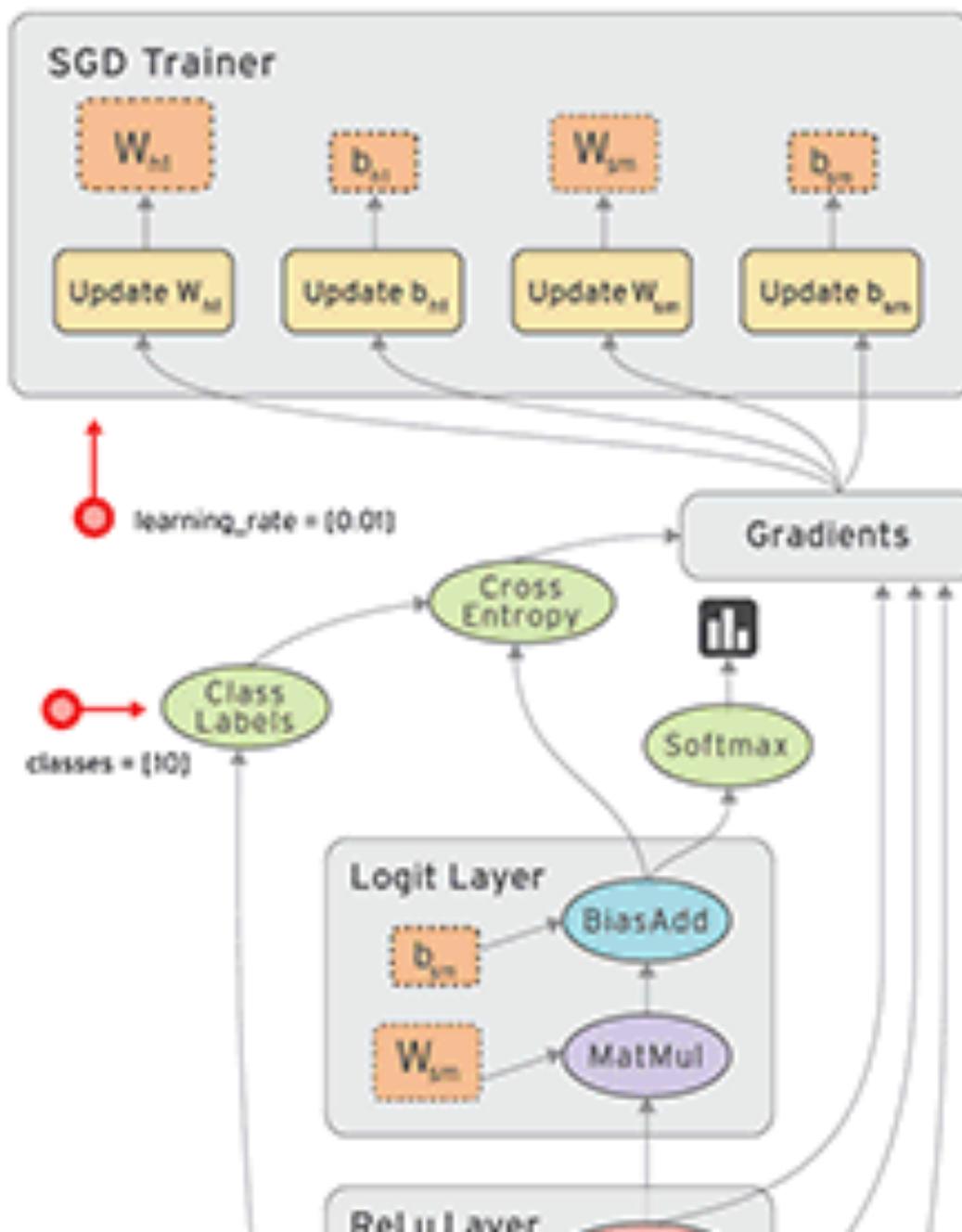
Data Flow Graph



Data Flow Graph



Data Flow Graph



TensorFlow Playground

Tinker With a **Neural Network** Right Here in Your Browser.
Don't Worry, You Can't Break It. We Promise.

Iterations
000,582Learning rate
0.03Activation
TanhRegularization
NoneRegularization rate
0Problem type
Classification

DATA

Which dataset do you want to use?



Ratio of training to test data: 50%

Noise: 0

Batch size: 10

INPUT

Which properties do you want to feed in?

 X_1 X_2 X_1^2 X_2^2 $X_1 X_2$ X_1^3

3 HIDDEN LAYERS



3 HIDDEN LAYERS



4 neurons

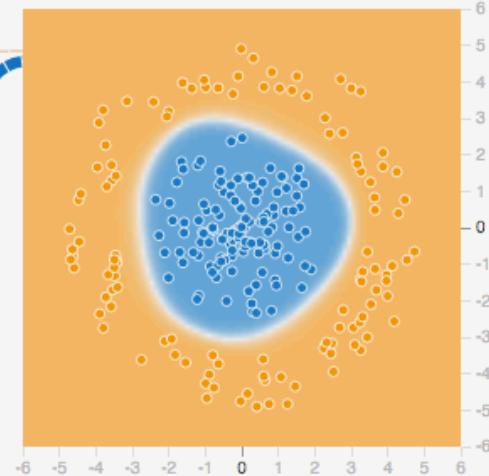
2 neurons

2 neurons

The outputs are mixed with varying **weights**, shown by the thickness of the lines.

This is the output from one **neuron**. Hover to see it larger.

OUTPUT

Test loss 0.000
Training loss 0.000

TensorBoard

TensorBoard EVENTS IMAGES GRAPHS **HISTOGRAMS**

Fit to screen
 Download PNG

Run **train** (1)

Session runs (0)

Upload

Color Structure Device
color: same substructure gray; unique substructure

Graph (* = expandable)
 Namespace*
 OpNode
 Unconnected series*
 Connected series*
 Constant
 Summary
 Dataflow edge
 Control dependency edge
 Reference edge

Main Graph

The Main Graph visualization shows a neural network architecture. It consists of several nodes: **input**, **layer1**, **layer2**, **cross_entropy**, and **accuracy**. The **input** node has two outgoing edges labeled "train" to **layer1** and **cross_entropy**. The **layer1** node has two outgoing edges labeled "train" to **layer2** and **cross_entropy**. The **layer2** node has one outgoing edge labeled "train" to **cross_entropy**. The **cross_entropy** node has one outgoing edge labeled "train" to **accuracy**. The **accuracy** node has one outgoing edge labeled "train" to a separate **train** node. The **train** node is part of an auxiliary graph. The edges between nodes are labeled with tensor shapes: **input** to **layer1** is 2×10 , **layer1** to **layer2** is 2×10 , **layer2** to **cross_entropy** is 2×10 , and **cross_entropy** to **accuracy** is 1×10 .

Auxiliary nodes

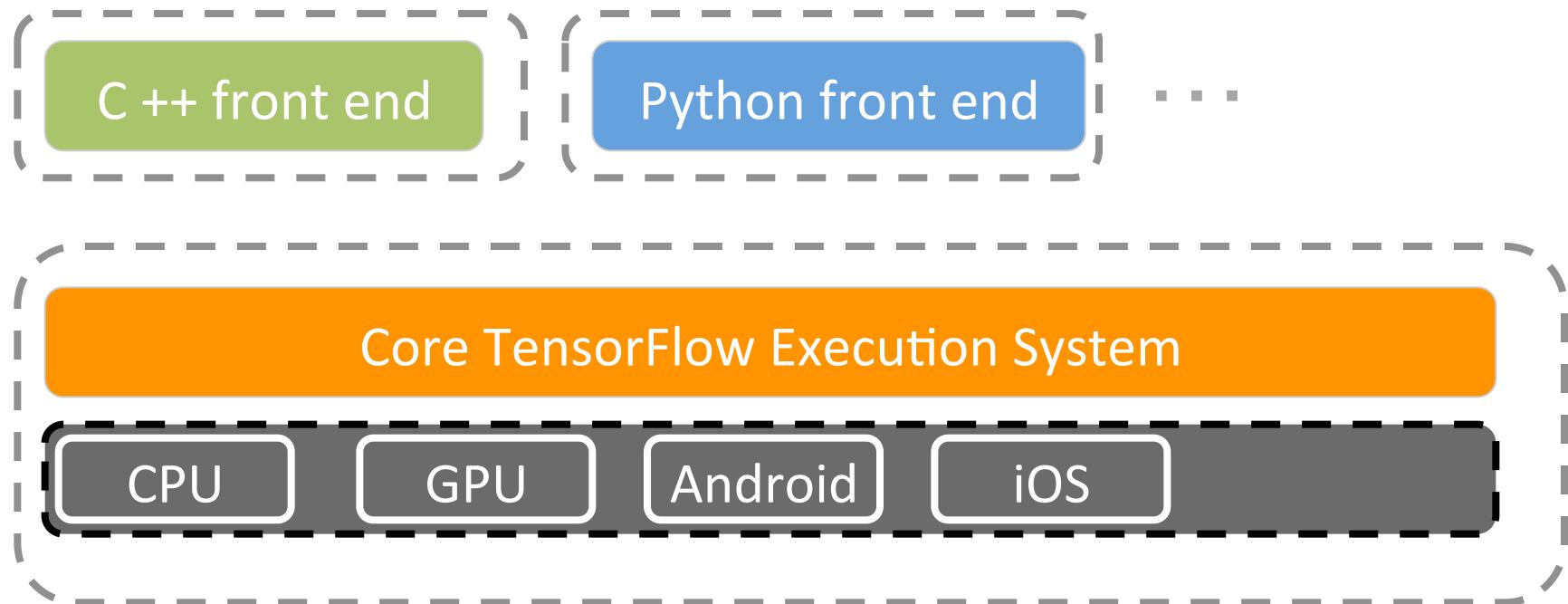
The Auxiliary nodes visualization provides a detailed view of the **train** node. It shows the internal structure of the **train** node, which contains several sub-nodes: **cross_entropy**, **input**, **predicti...**, **layer2**, and **layer1**. The **cross_entropy** node has an outgoing edge labeled "train" to the main **train** node. The **input** node has an outgoing edge labeled "train" to the main **train** node. The **predicti...** node has an outgoing edge labeled "train" to the main **train** node. The **layer2** node has an outgoing edge labeled "train" to the main **train** node. The **layer1** node has an outgoing edge labeled "train" to the main **train** node.

Try your first TensorFlow

```
$ python
```

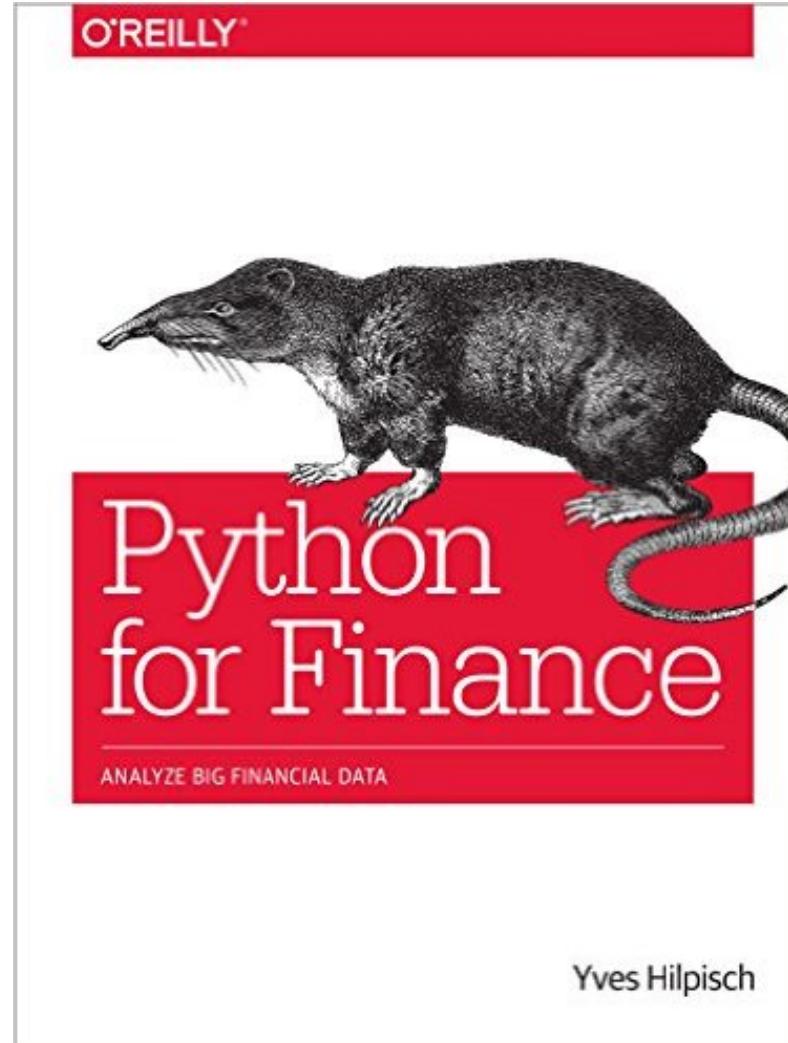
```
>>> import tensorflow as tf
>>> hello = tf.constant('Hello, TensorFlow!')
>>> sess = tf.Session()
>>> sess.run(hello)
Hello, TensorFlow!
>>> a = tf.constant(10)
>>> b = tf.constant(32)
>>> sess.run(a+b)
42
>>>
```

Architecture of TensorFlow

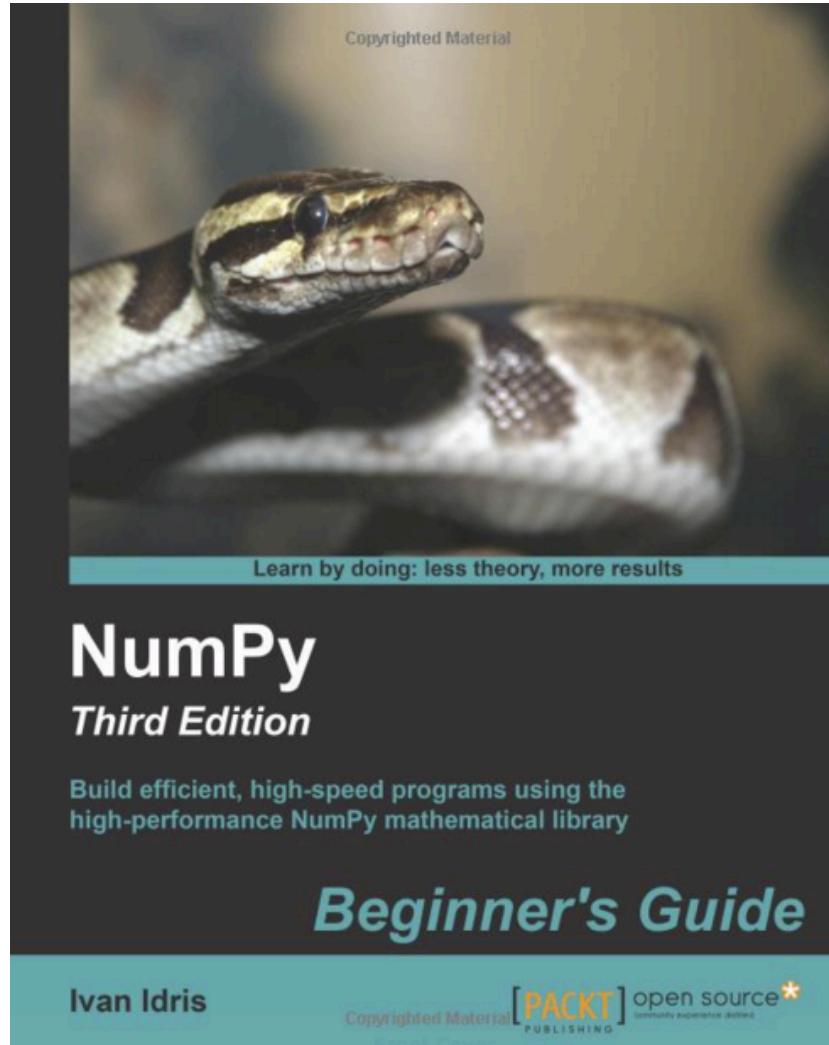




**Yves Hilpisch,
Python for Finance: Analyze Big Financial Data,
O'Reilly, 2014**

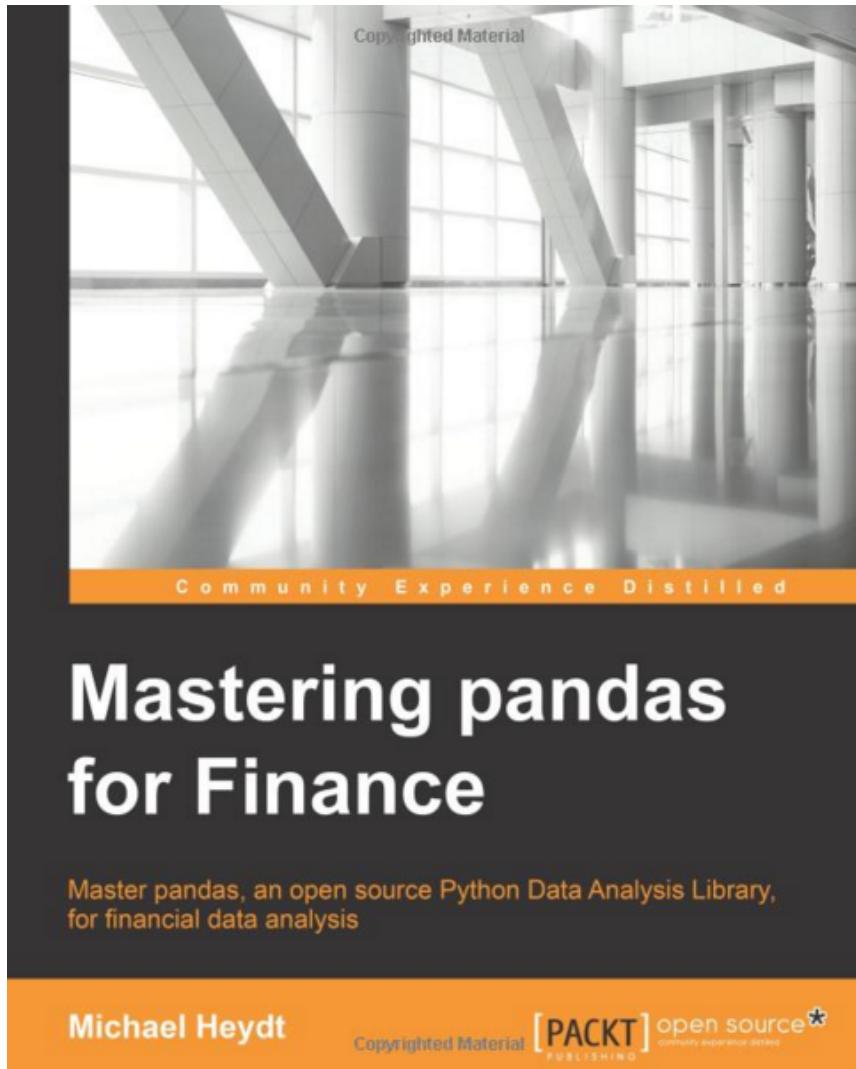


Ivan Idris,
Numpy Beginner's Guide, Third Edition
Packt Publishing, 2015



Source: <http://www.amazon.com/Numpy-Beginners-Guide-Ivan-Idris/dp/1785281968>

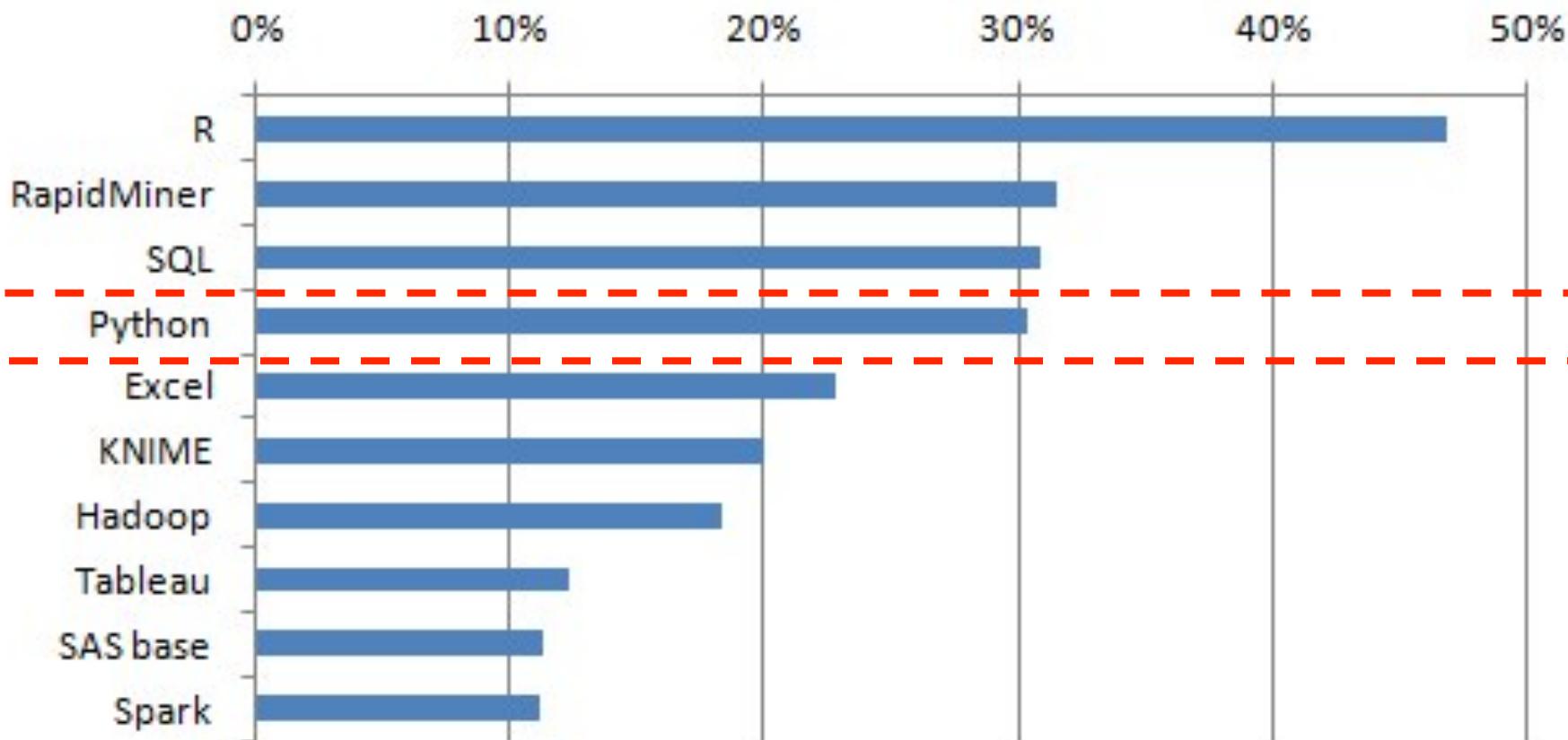
Michael Heydt , Mastering Pandas for Finance, Packt Publishing, 2015



Source: <http://www.amazon.com/Mastering-Pandas-Finance-Michael-Heydt/dp/1783985100>

Python: Analytics and Data Science Software

Top Analytics, Data Mining, Data Science software used, 2015



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```
# Python 3: List comprehensions
>>> fruits = ['Banana', 'Apple', 'Lime']
>>> loud_fruits = [fruit.upper() for fruit in
fruits]
>>> print(loud_fruits)
['BANANA', 'APPLE', 'LIME']
```

```
# List and the enumerate function
>>> list(enumerate(fruits))
[(0, 'Banana'), (1, 'Apple'), (2, 'Lime')]
```



Compound Data Types

Lists (known as arrays in other languages) are one of the compound data types that Python understands. Lists can be indexed, sliced and manipulated with other built-in functions. [More about lists in Python 3](#)

1 2 3 4 5

Python is a programming language that lets you work quickly and integrate systems more effectively. [» Learn More](#)

[Get Started](#)[Download](#)[Docs](#)[Jobs](#)

**Python is an
interpreted,
object-oriented,
high-level
programming language
with
dynamic semantics.**

NumPy



NumPy

Scipy.org

NumPy

NumPy is the fundamental package for scientific computing with Python. It contains among other things:

- a powerful N-dimensional array object
- sophisticated (broadcasting) functions
- tools for integrating C/C++ and Fortran code
- useful linear algebra, Fourier transform, and random number capabilities

Besides its obvious scientific uses, NumPy can also be used as an efficient multi-dimensional container of generic data. Arbitrary data-types can be defined. This allows NumPy to seamlessly and speedily integrate with a wide variety of databases.

Numpy is licensed under the [BSD license](#), enabling reuse with few restrictions.

Getting Started

-
- [Getting Numpy](#)
 - [Installing the SciPy Stack](#)
 - [NumPy and SciPy documentation page](#)
 - [NumPy Tutorial](#)
 - [NumPy for MATLAB® Users](#)
 - [NumPy functions by category](#)
 - [NumPy Mailing List](#)

[About Numpy](#)

[License](#)

[Old array packages](#)

NumPy
is the
fundamental package
for
scientific computing
with Python.

Python versions (py2 and py3)

- Python 0.9.0 released in 1991 (first release)
- Python 1.0 released in 1994
- Python 2.0 released in 2000
- Python 2.6 released in 2008
- **Python 2.7 released in 2010**
- Python 3.0 released in 2008
- Python 3.3 released in 2010
- Python 3.4 released in 2014
- Python 3.5 released in 2015

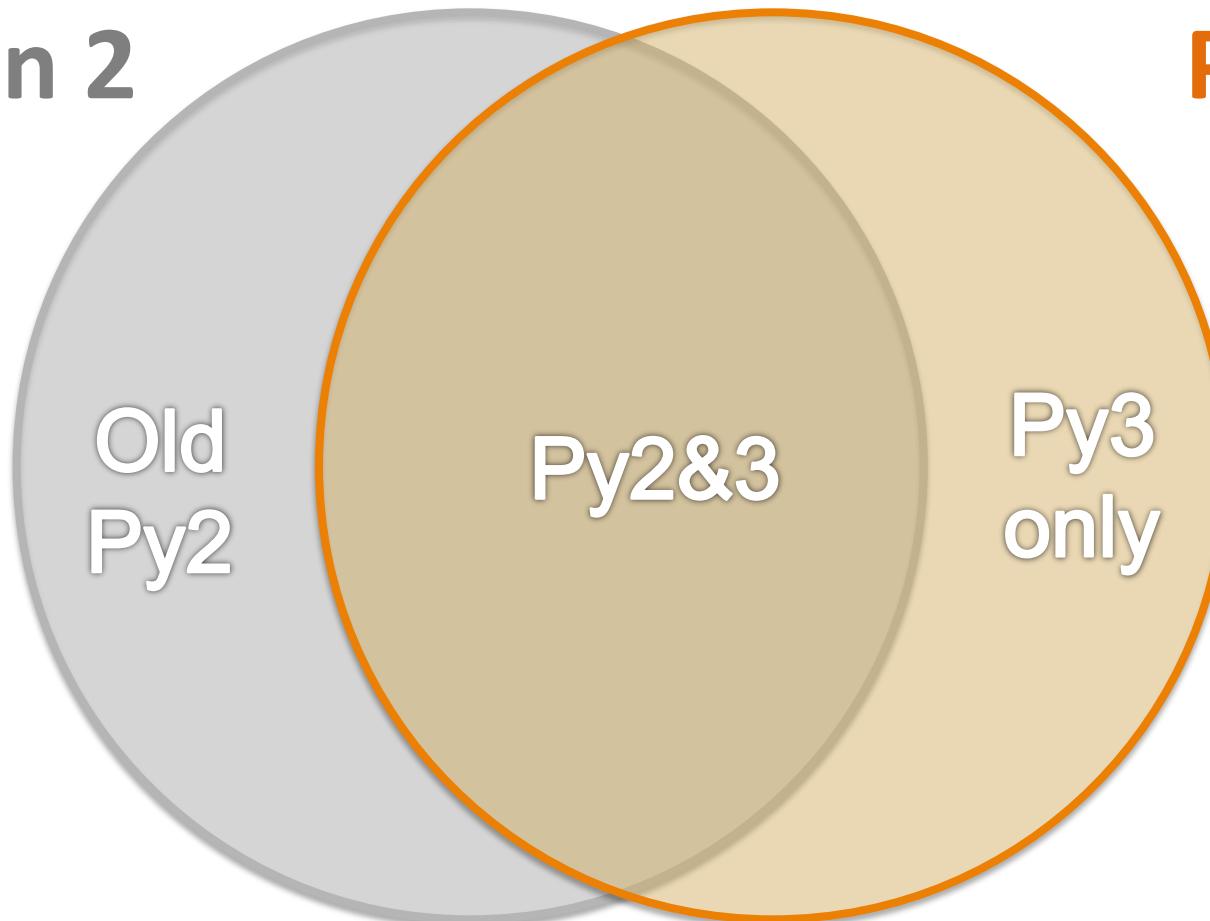
Python (Python 2.7 & Python 3.5)



Standard Syntax

Python 2

Python 3



Source: PyCon Australia (2014), Writing Python 2/3 compatible code by Edward Schofield

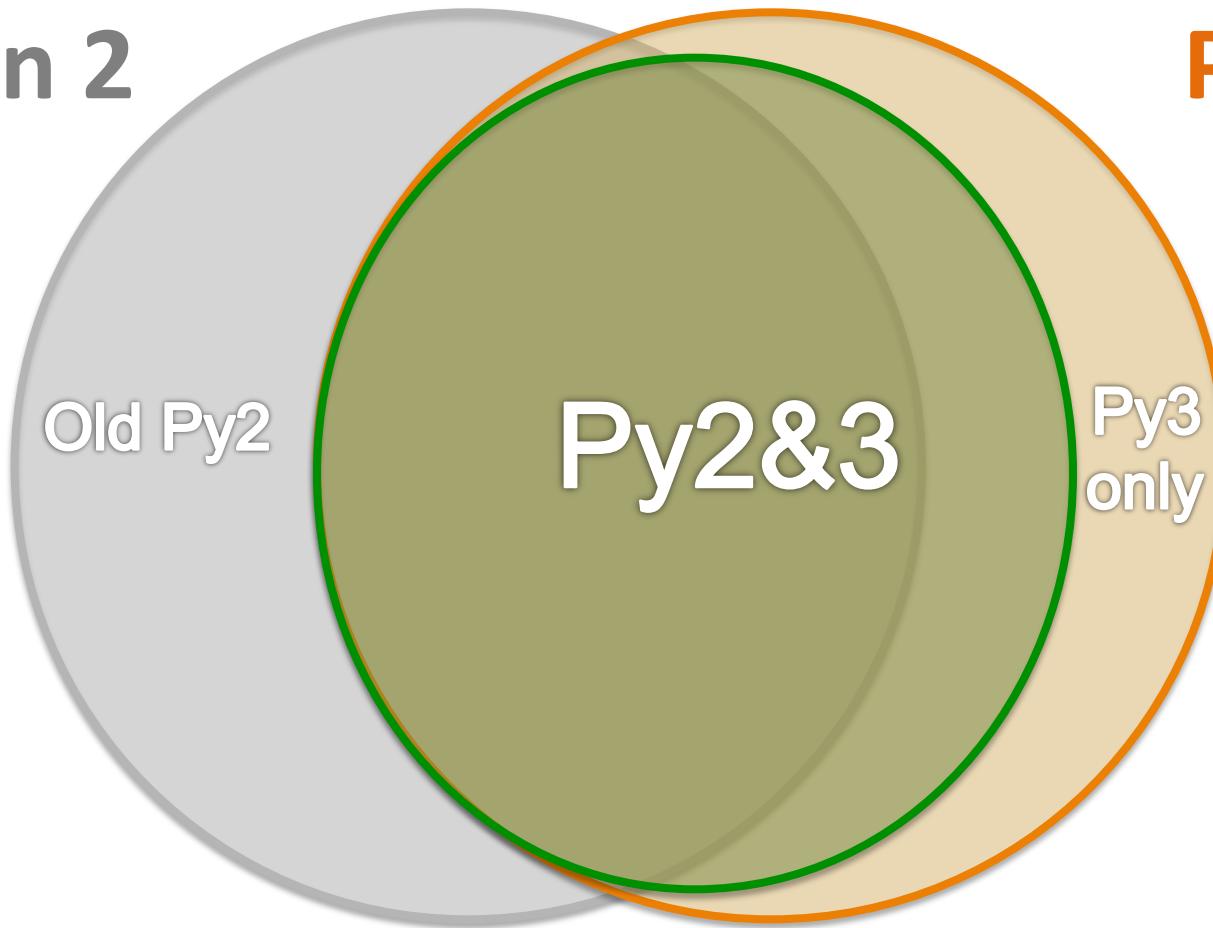
<https://www.youtube.com/watch?v=KOqk8j11aAI>

```
from __future__ import ...
```



Python 2

Python 3



Source: PyCon Australia (2014), Writing Python 2/3 compatible code by Edward Schofield

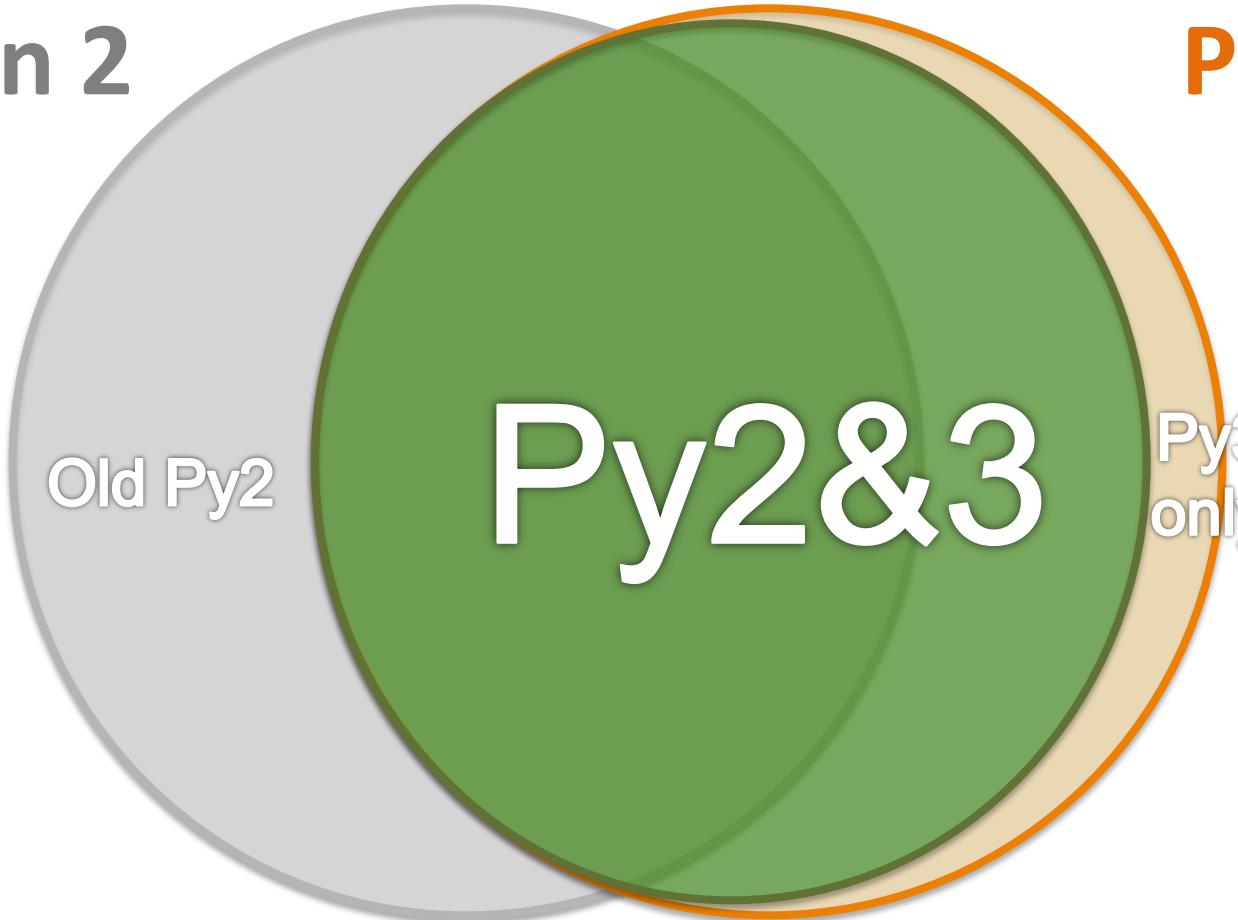
<https://www.youtube.com/watch?v=KOqk8j11aAI>

```
from future.builtins import *
```



Python 2

Python 3



Source: PyCon Australia (2014), Writing Python 2/3 compatible code by Edward Schofield

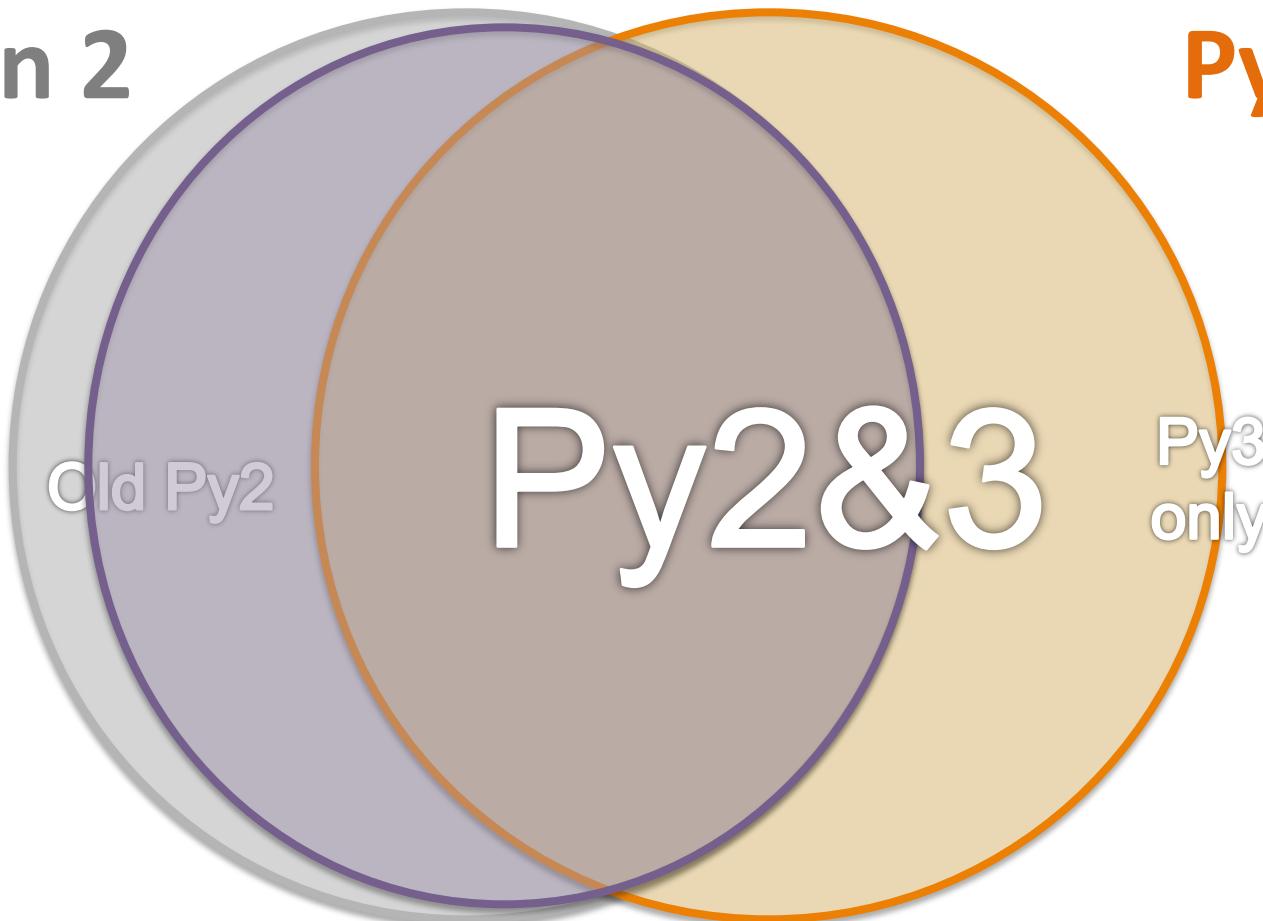
<https://www.youtube.com/watch?v=KOqk8j11aAI>

```
from past.builtins import *
```



Python 2

Python 3



Source: PyCon Australia (2014), Writing Python 2/3 compatible code by Edward Schofield

<https://www.youtube.com/watch?v=KOqk8j11aAI>

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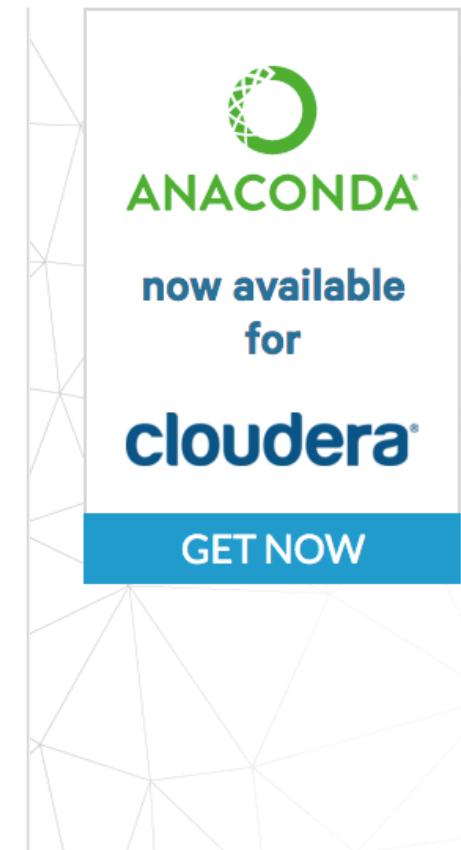
Get Superpowers with Anaconda

Anaconda is a completely free Python distribution (including for commercial use and redistribution). It includes more than 400 of the most popular Python packages for science, math, engineering, and data analysis. See the packages included with Anaconda and the [Anaconda changelog](#).

Which version should I download and install?

Because Anaconda includes installers for Python 2.7 and 3.5, either is fine. Using either version, you can use Python 3.4 with the conda command. You can create a 3.5 environment with the conda command if you've downloaded 2.7 – and vice versa.

If you don't have time or disk space for the entire distribution, try [Miniconda](#), which contains only conda and Python. Then install just the individual packages you want through the conda command.



Download Anaconda Python 2.7

Anaconda for OS X

PYTHON 2.7	PYTHON 3.5
<p>Mac OS X 64-bit Graphical Installer</p> <p>274M (OS X 10.7 or higher)</p>	<p>Mac OS X 64-bit Graphical Installer</p> <p>267M (OS X 10.7 or higher)</p>
<p>Mac OS X 64-bit Command-Line installer</p> <p>239M (OS X 10.7 or higher)</p>	<p>Mac OS X 64-bit Command-Line installer</p> <p>233M (OS X 10.7 or higher)</p>

OS X Anaconda Installation

Choose either the graphical installer or the command line installer for OS X.

Graphical Installer:

1. Download the graphical installer.
2. Double-click the downloaded .pkg file and follow the instructions.

<https://www.continuum.io/downloads>

OS X Anaconda Installation

OS X Anaconda Installation

Choose either the graphical installer or the command line installer for OSX.

Graphical Installer:

1. Download the graphical installer.
2. Double-click the downloaded .pkg file and follow the instructions.

Command Line Installer:

1. Download the command line installer.
2. In your terminal window, type one of the below and follow the instructions:

Python 2.7:

```
bash Anaconda2-2.5.0-MacOSX-x86_64.sh
```

Python 3.5:

```
bash Anaconda3-2.5.0-MacOSX-x86_64.sh
```

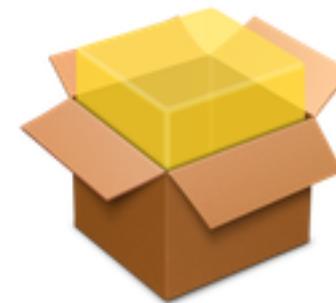
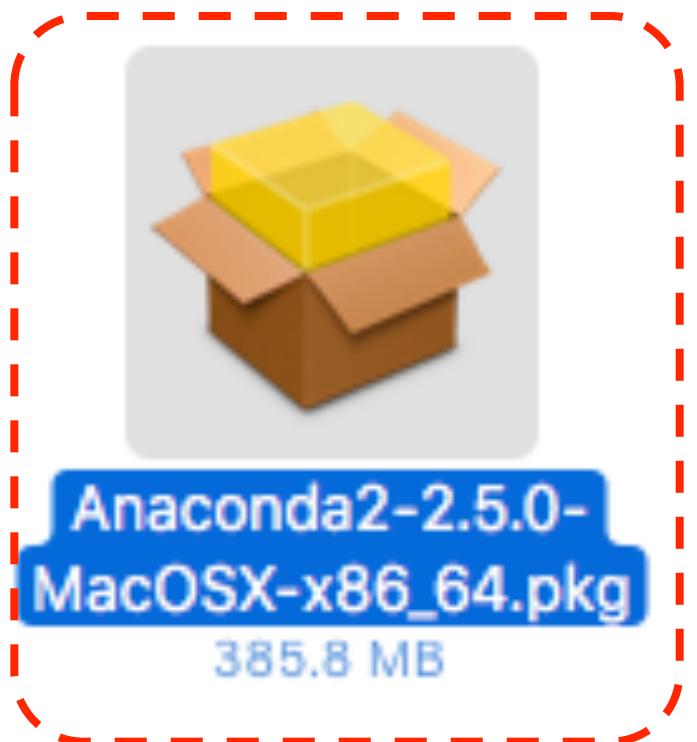
NOTE: Include the "bash" command even if you are not using the bash shell.

3. Optional: Verify data integrity with MD5.

<https://www.continuum.io/downloads>

OS X Anaconda Installation

Anaconda2-2.5.0-MacOSX-x86_64.pkg



Anaconda2-2.5.0-MacOSX-x86_64.pkg

Installer package - 385.8 MB

OS X Anaconda Installation

Install Anaconda2

Welcome to the Anaconda2 Installer

- Introduction
- Read Me
- License
- Destination Select
- Installation Type
- Installation
- Summary

 ANACONDA

You will be guided through the steps necessary to install this software.

Go Back Continue

OS X Anaconda Installation

 Install Anaconda2


ANACONDA

Important Information

- Introduction
- Read Me**
- License
- Destination Select
- Installation Type
- Installation
- Summary

Anaconda is a modern open source analytics platform powered by Python. See <https://www.continuum.io/downloads/>.

By default, this installer modifies your bash profile to put Anaconda in your PATH. To disable this, choose "Customize" at the "Installation Type" phase, and disable the "Modify PATH" option. If you do not do this, you will need to add `~/anaconda/bin` to your PATH manually to run the commands, or run all anaconda commands explicitly from that path.

To install to a different location, select "Change Install Location..." at the "Installation Type" phase, the choose "Install on a specific disk...", choose the disk you wish to install on, and click "Choose Folder...". The "Install for me only" option will install anaconda to the default location, `~/anaconda`.

The packages included in this installation are:

- python 2.7.11

Print... **Save...** **Go Back** **Continue**

OS X Anaconda Installation

Install Anaconda2

Important Information

The packages included in this installation are:

- python 2.7.11
- abstract-rendering 0.5.1
- alabaster 0.7.7
- anaconda-client 1.2.2
- appnope 0.1.0
- appscript 1.0.1
- argcomplete 1.0.0
- astropy 1.1.1
- babel 2.2.0
- backports_abc 0.4
- beautifulsoup4 4.4.1
- bitarray 0.8.1
- blaze-core 0.9.0
- bokeh 0.11.0
- boto 2.39.0
- bottleneck 1.0.0
- cdecimal 2.3

Print... Save... Go Back Continue



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Install Anaconda 2: 165 packages included

1	- python 2.7.11	59	- jupyter 1.0.0	128	- scikit-learn 0.17
2	- abstract-rendering 0.5.1	60	- jupyter_client 4.1.1	129	- scipy 0.17.0
3	- alabaster 0.7.7	61	- jupyter_console 4.1.0	130	- setuptools 19.6.2
4	- anaconda-client 1.2.2	62	- jupyter_core 4.0.6	131	- simplegeneric 0.8.1
5	- appnope 0.1.0	63	- launcher 1.0.0	132	- singledispatch 3.4.0.3
6	- appscript 1.0.1	64	- libdynd 0.7.1	133	- sip 4.16.9
7	- argcomplete 1.0.0	65	- libpng 1.6.17	134	- six 1.10.0
8	- astropy 1.1.1	66	- libtiff 4.0.6	135	- snowballstemmer 1.2.1
9	- babel 2.2.0	67	- libxml2 2.9.2	136	- sockjs-tornado 1.0.1
10	- backports_abc 0.4	68	- libxslt 1.1.28	137	- sphinx 1.3.5
11	- beautifulsoup4 4.4.1	69	- llvmlite 0.8.0	138	- sphinx_rtd_theme 0.1.9
12	- bitarray 0.8.1	70	- lxml 3.5.0	139	- spyder 2.3.8
13	- blaze-core 0.9.0	71	- markupsafe 0.23	140	- spyder-app 2.3.8
14	- bokeh 0.11.0	72	- matplotlib 1.5.1	141	- sqlalchemy 1.0.11
15	- boto 2.39.0	73	- mistune 0.7.1	142	- sqlite 3.9.2
16	- bottleneck 1.0.0	74	- mkl 11.3.1	143	- ssl_match_hostname 3.4.0.2
17	- cdecimal 2.3	75	- mkl-service 1.1.2	144	- statsmodels 0.6.1
18	- cffi 1.2.1	76	- multipledispatch 0.4.8	145	- sympy 0.7.6.1
19	- clyent 1.2.0	77	- nbconvert 4.1.0	146	- terminado 0.5
20	- colorama 0.3.6	78	- nbformat 4.0.1	147	- tk 8.5.18
21	- configobj 5.0.6	79	- networkx 1.11	148	- toolz 0.7.4
22	- cryptography 1.0.2	80	- nltk 3.1	149	- tornado 4.3
23	- curl 7.45.0	81	- node-webkit 0.10.1	150	- traitlets 4.1.0
24	- cycler 0.9.0	82	- nose 1.3.7	151	- unicodecsv 0.14.1
25	- cython 0.23.4	83	- notebook 4.1.0	152	- werkzeug 0.11.3
26	- cytoolz 0.7.5	84	- numba 0.23.1	153	- wheel 0.26.0
27	- datashape 0.5.0	85	- numexpr 2.4.6	154	- xlrd 0.9.4
28	- decorator 4.0.6	86	- numpy 1.10.4	155	- xlsxwriter 0.8.4
29	- docutils 0.12	87	- odo 0.4.0	156	- xlwings 0.6.4
30	- dynd-python 0.7.1	88	- openpyxl 2.3.2	157	- xlwt 1.0.0
		89	- openssl 1.0.2f	158	- xz 5.0.5
		90	- pandas 0.17.1	159	- yaml 0.1.6
		91	- path.py 8.1.2	160	- zeromq 4.1.3
		92	- patsy 0.4.0	161	- zlib 1.2.8
		93	- pep8 1.7.0	162	- anaconda 2.5.0
		94	- pexpect 3.3	163	- conda 3.19.1
		95	- pickleshare 0.5	164	- conda-build 1.19.0
				165	- conda-env 2.4.5

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● Ins
● Installation
● Summary

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Install Anaconda2

Select a Destination

- Introduction
- Read Me
- License
- Destination Select**
- Installation Type
- Installation
- Summary

How do you want to install this software?

		Macintosh HD 235.65 GB available 748.93 GB total

Installing this software requires 1.27 GB of space.
You have chosen to install this software on the disk "Macintosh HD".

[Choose Folder...](#)

[Go Back](#) Continue


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OS X Anaconda Installation

Install Anaconda2

Standard Install on "Macintosh HD"

- Introduction
- Read Me
- License
- Destination Select
- Installation Type
- Installation
- Summary

This will take 1.27 GB of space on your computer.

Click **Install** to perform a standard installation of this software on the disk "Macintosh HD".

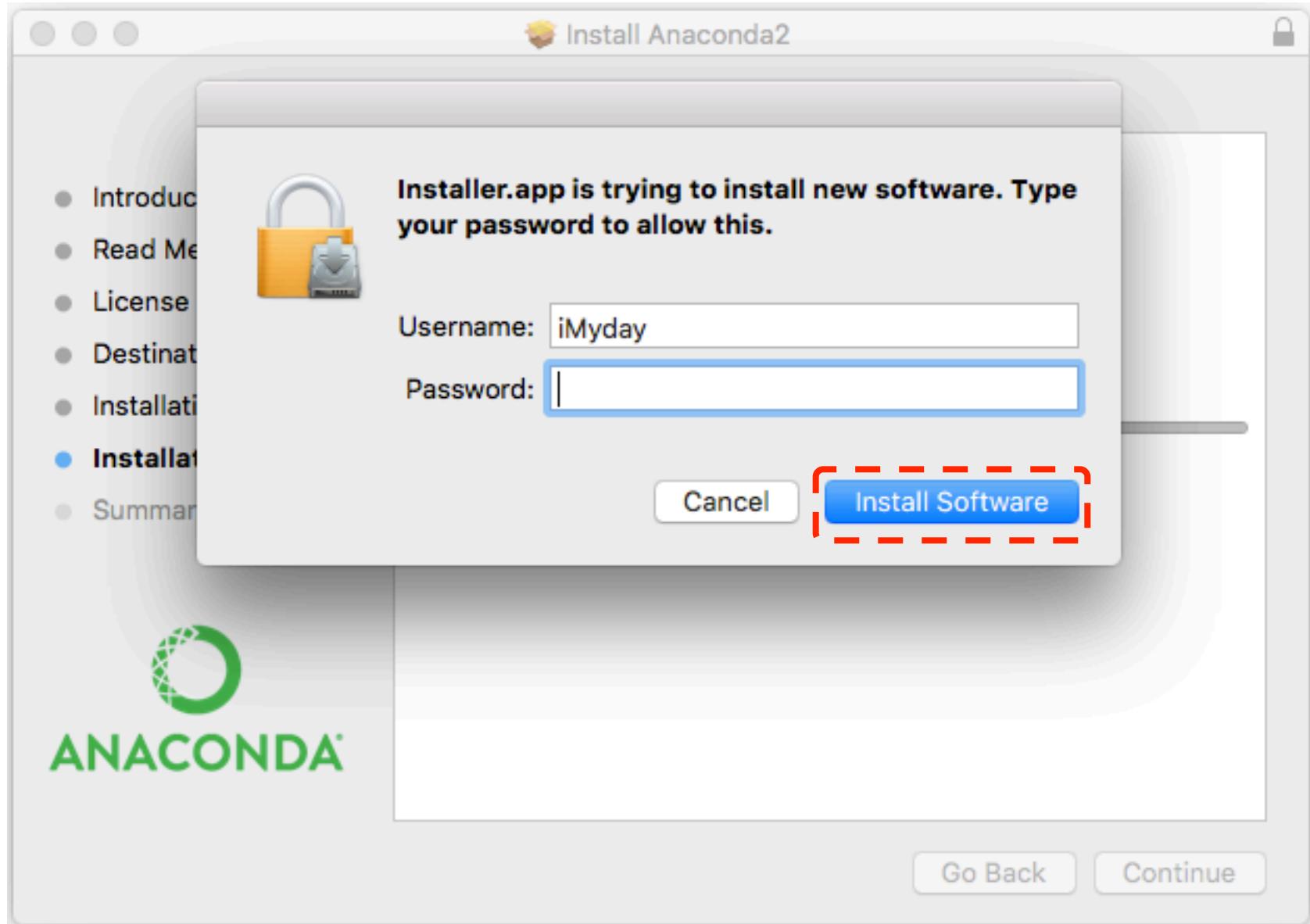
Change Install Location...

Customize **Go Back** **Install**



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OS X Anaconda Installation



OS X Anaconda Installation

Install Anaconda2

Installing Anaconda2

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- Read Me
- License
- Destination Select
- Installation Type
- Installation**
- Summary

Writing files...

Install time remaining: About 4 minutes

Go Back Continue



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OS X Anaconda Installation

Install Anaconda2

Installing Anaconda2

- Introduction
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- Destination Select
- Installation Type
- Installation**
- Summary

Registering updated applications...

Install time remaining: About a minute

Go Back Continue



ANACONDA

OS X Anaconda Installation

The installation was completed successfully.

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● Introduction
● Read Me
● License
● Destination Select
● Installation Type
● Installation
● **Summary**

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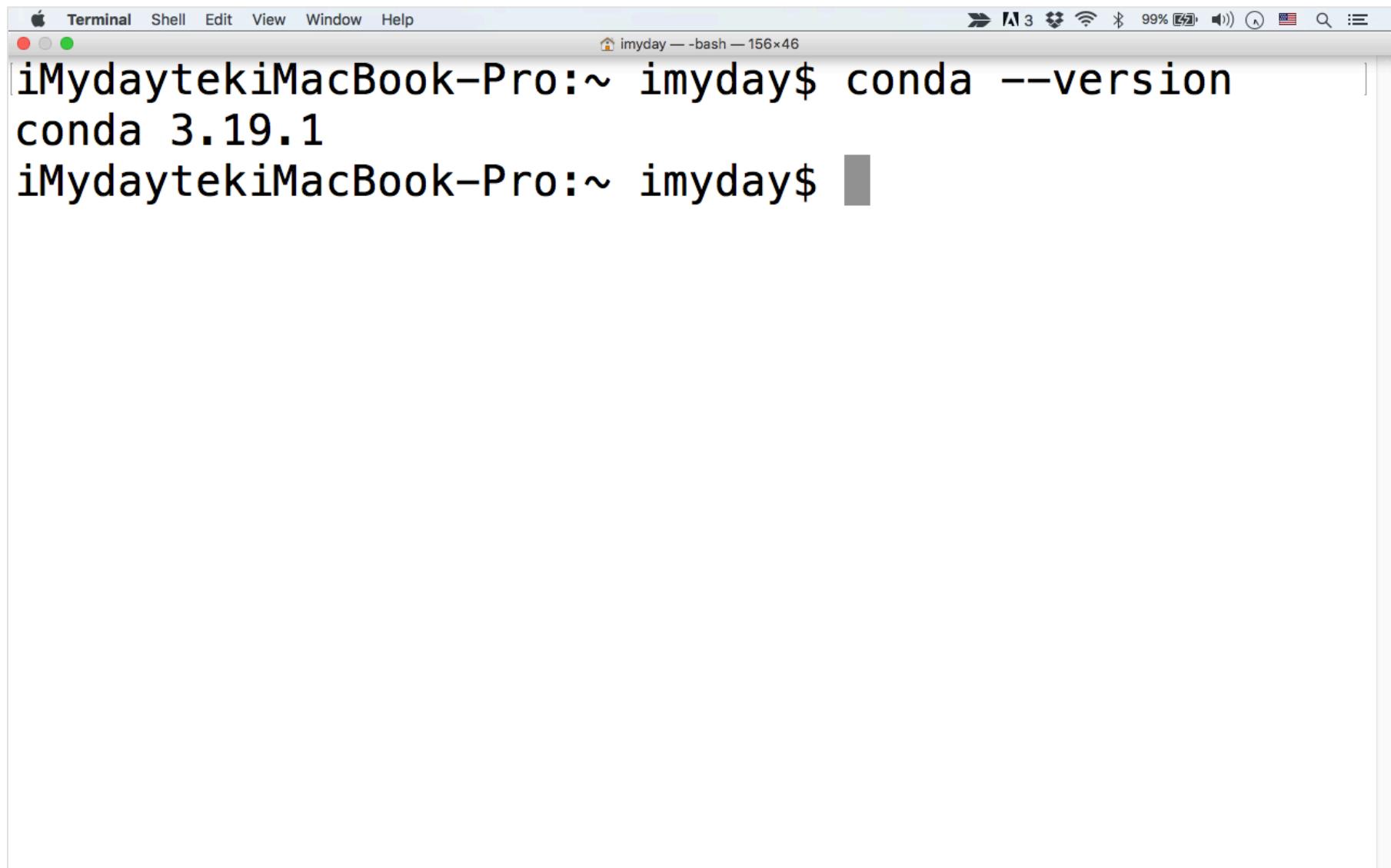
conda list

```
iMydaytekiMacBook-Pro:~ imyday$ conda list
# packages in environment at //anaconda:
#
abstract-rendering      0.5.1          np110py27_0
alabaster                0.7.7          py27_0
anaconda                 2.5.0          np110py27_0
anaconda-client           1.2.2          py27_0
appnope                  0.1.0          py27_0
appscript                 1.0.1          py27_0
argcomplete               1.0.0          py27_1
astropy                  1.1.1          np110py27_0
babel                    2.2.0          py27_0
backports-abc             0.4            <pip>
backports.ssl-match-hostname 3.4.0.2        <pip>
backports_abc              0.4          py27_0
beautifulsoup4             4.4.1          py27_0
bitarray                  0.8.1          py27_0
blaze                     0.9.0          <pip>
blaze-core                0.9.0          py27_0
bokeh                     0.11.0         py27_0
boto                      2.39.0         py27_0
bottleneck                1.0.0          np110py27_0
cdecimal                  2.3            py27_0
cffi                      1.2.1          py27_0
```

conda --version

```
iMyday — -bash — 80x24
sqlite          3.9.2           0
ssl_match_hostname 3.4.0.2      py27_0
statsmodels     0.6.1      np110py27_0
sympy           0.7.6.1      py27_0
tables           3.2.2       <pip>
terminado        0.5       py27_1
tk                8.5.18         0
toolz            0.7.4       py27_0
tornado          4.3       py27_0
traitlets        4.1.0       py27_0
unicodecsv       0.14.1      py27_0
werkzeug         0.11.3      py27_0
wheel             0.26.0      py27_1
xlrd              0.9.4       py27_0
xlsxwriter       0.8.4       py27_0
xlwings           0.6.4       py27_0
xlwt              1.0.0       py27_0
xz                5.0.5           0
yaml              0.1.6           0
zeromq            4.1.3           0
zlib              1.2.8           0
[iMydaytekiMacBook-Pro:~ imyday$ conda --version
conda 3.19.1
iMydaytekiMacBook-Pro:~ imyday$ ]
```

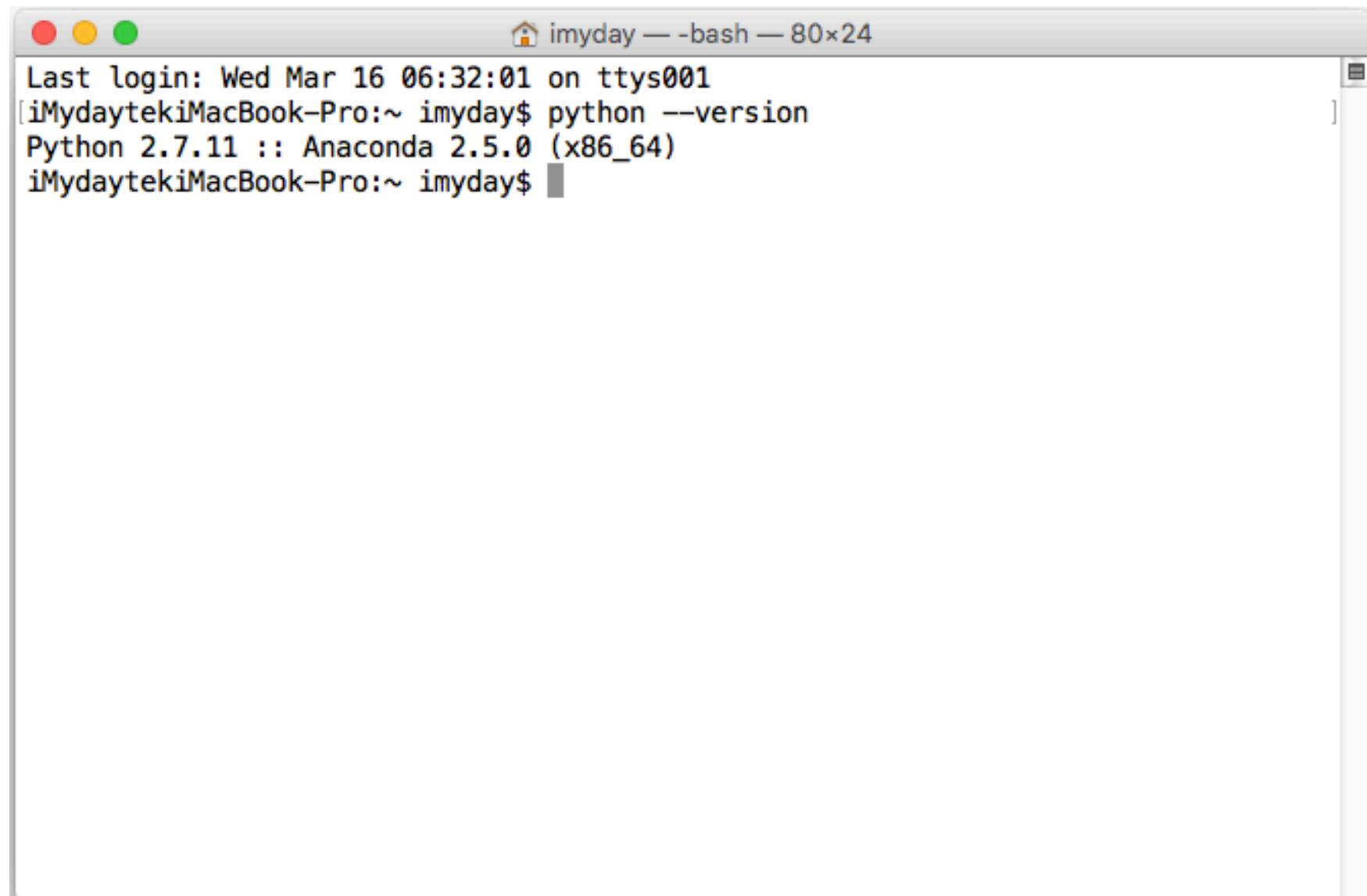
conda --version



A screenshot of a macOS Terminal window. The window title bar includes the Apple icon, 'Terminal', and other standard menu items like 'Edit', 'View', and 'Help'. The status bar at the top right shows signal strength, battery level (99%), and a search icon. The main terminal area displays the command 'conda --version' followed by its output: 'conda 3.19.1'. The prompt 'imyday\$' indicates the user's name and the shell type.

```
iMydaytekiMacBook-Pro:~ imyday$ conda --version
conda 3.19.1
iMydaytekiMacBook-Pro:~ imyday$
```

python --version



A screenshot of a Mac OS X terminal window titled "imyday — -bash — 80x24". The window shows the command "python --version" being run and its output. The output indicates that Python 2.7.11 is running on an Anaconda 2.5.0 (x86_64) environment. The terminal has a standard OS X look with red, yellow, and green window control buttons.

```
Last login: Wed Mar 16 06:32:01 on ttys001
[iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 2.7.11 :: Anaconda 2.5.0 (x86_64)
iMydaytekiMacBook-Pro:~ imyday$ ]
```

ipython notebook

```
iMydaytekiMacBook-Pro:~ imyday$ ipython notebook
[I 14:26:49.944 NotebookApp] Serving notebooks from local directory: /Users/imyday
[I 14:26:49.944 NotebookApp] 0 active kernels
[I 14:26:49.944 NotebookApp] The Jupyter Notebook is running at: http://localhost:8888/
[I 14:26:49.944 NotebookApp] Use Control-C to stop this server and shut down all
kernels (twice to skip confirmation).
[W 14:26:56.639 NotebookApp] 404 GET /api/kernels/a87ab95b-6d6e-44d3-aaa7-c1901c
960677/channels?session_id=265FB16817FB4AB79202F6D3C3BDB0E6 (::1): Kernel does n
ot exist: a87ab95b-6d6e-44d3-aaa7-c1901c960677
[W 14:26:56.663 NotebookApp] 404 GET /api/kernels/a87ab95b-6d6e-44d3-aaa7-c1901c
960677/channels?session_id=265FB16817FB4AB79202F6D3C3BDB0E6 (::1) 95.43ms refere
r=None
[W 14:26:56.681 NotebookApp] 404 GET /api/kernels/b7fae9a6-d77b-4ead-832c-c070b1
8d642b/channels?session_id=EF4C761633E541C88568CDBCDE1091B7 (::1): Kernel does n
ot exist: b7fae9a6-d77b-4ead-832c-c070b18d642b
[W 14:26:56.683 NotebookApp] 404 GET /api/kernels/b7fae9a6-d77b-4ead-832c-c070b1
8d642b/channels?session_id=EF4C761633E541C88568CDBCDE1091B7 (::1) 6.62ms referer
=None
[W 14:27:29.595 NotebookApp] 404 GET /api/kernels/a87ab95b-6d6e-44d3-aaa7-c1901c
960677/channels?session_id=265FB16817FB4AB79202F6D3C3BDB0E6 (::1): Kernel does n
ot exist: a87ab95b-6d6e-44d3-aaa7-c1901c960677
[W 14:27:29.631 NotebookApp] 404 GET /api/kernels/a87ab95b-6d6e-44d3-aaa7-c1901c
```

conda search python

```
iMydaytekiMacBook-Pro:~ imyday$ conda search python
Using Anaconda Cloud api site https://api.anaconda.org
Fetching package metadata: ....
biopython          1.60          np17py27_0  defaults
                   1.60          np17py27_0  defaults
                                         ...
                                         1.1          py27_0  defaults
                                         1.1          py26_0  defaults
                                         1.1          py27_1  defaults
                                         1.1          py26_1  defaults
                                         1.2          py27_0  defaults
                                         1.2          py26_0  defaults
                                         1.2          py33_1  defaults
                                         1.2          py27_1  defaults
                                         1.2          py26_1  defaults
                                         1.2          py34_2  defaults
                                         1.2          py33_2  defaults
                                         1.2          py27_2  defaults
                                         1.2          py26_2  defaults
                                         1.2          py34_3  defaults
                                         1.2          py33_3  defaults
                                         1.2          py27_3  defaults
                                         1.2          py26_3  defaults
                                         1.2          py35_4  defaults
                                         1.2          py34_4  defaults
                                         1.2          py33_4  defaults
                                         * 1.2          py27_4  defaults
                                         1.2          py26_4  defaults
                                         3.0          py27_0  defaults
wxpython          3.0           np17py27_0  defaults
iMydaytekiMacBook-Pro:~ imyday$
```

`conda create -n py35 python=3.5 anaconda`

```
iMydaytekiMacBook-Pro:~ imyday$ conda create -n py35 python=3.5 anaconda
Using Anaconda Cloud api site https://api.anaconda.org
Fetching package metadata: .....
Solving package specifications: ..... .
Package plan for installation in environment //anaconda/envs/py35:

The following packages will be downloaded:

  package          |      build
  --:: --
openssl-1.0.2g           |          0      3.0 MB
xz-5.0.5                  |          1     173 KB
python-3.5.1              |          0     12.7 MB
anaconda-custom            |      py35_0      3 KB
setuptools-20.2.2          |      py35_0    458 KB
wheel-0.29.0               |      py35_0     82 KB
pip-8.1.0                  |      py35_0    1.6 MB
  --:: --
                                         Total:   18.0 MB

The following NEW packages will be INSTALLED:

  anaconda:  custom-py35_0      Create a Python 3.5 environment
  openssl:   1.0.2g-0
```

Create a Python 3.5 environment

```
imyday — conda create -n py35 python=3.5 anaconda — 80x24
xz-5.0.5 | 1 173 KB
python-3.5.1 | 0 12.7 MB
anaconda-custom | py35_0 3 KB
setuptools-20.2.2 | py35_0 458 KB
wheel-0.29.0 | py35_0 82 KB
pip-8.1.0 | py35_0 1.6 MB
-----
Total: 18.0 MB

The following NEW packages will be INSTALLED:

anaconda: custom-py35_0
openssl: 1.0.2g-0
pip: 8.1.0-py35_0
python: 3.5.1-0
readline: 6.2-2
setuptools: 20.2.2-py35_0
sqlite: 3.9.2-0
tk: 8.5.18-0
wheel: 0.29.0-py35_0
xz: 5.0.5-1
zlib: 1.2.8-0

Proceed ([y]/n)? y
```

Create a Python 3.5 environment

```
zlib:      1.2.8-0

Proceed ([y]/n)? y

Fetching packages ...
openssl-1.0.2g 100% [########################################] Time: 0:00:04 743.84 kB/s
xz-5.0.5-1.tar 100% [########################################] Time: 0:00:00 228.62 kB/s
python-3.5.1-0 100% [########################################] Time: 0:00:16 815.46 kB/s
anaconda-custo 100% [########################################] Time: 0:00:00 2.70 MB/s
setuptools-20. 100% [########################################] Time: 0:00:01 257.08 kB/s
wheel-0.29.0-p 100% [########################################] Time: 0:00:00 95.97 kB/s
pip-8.1.0-py35 100% [########################################] Time: 0:00:05 305.56 kB/s
Extracting packages ...
[     COMPLETE     ] [########################################] 100%
Linking packages ...
[     COMPLETE     ] [########################################] 100%
#
# To activate this environment, use:
# $ source activate py35
#
# To deactivate this environment, use:
# $ source deactivate
#
iMydaytekiMacBook-Pro:~ imyday$
```

source activate py35

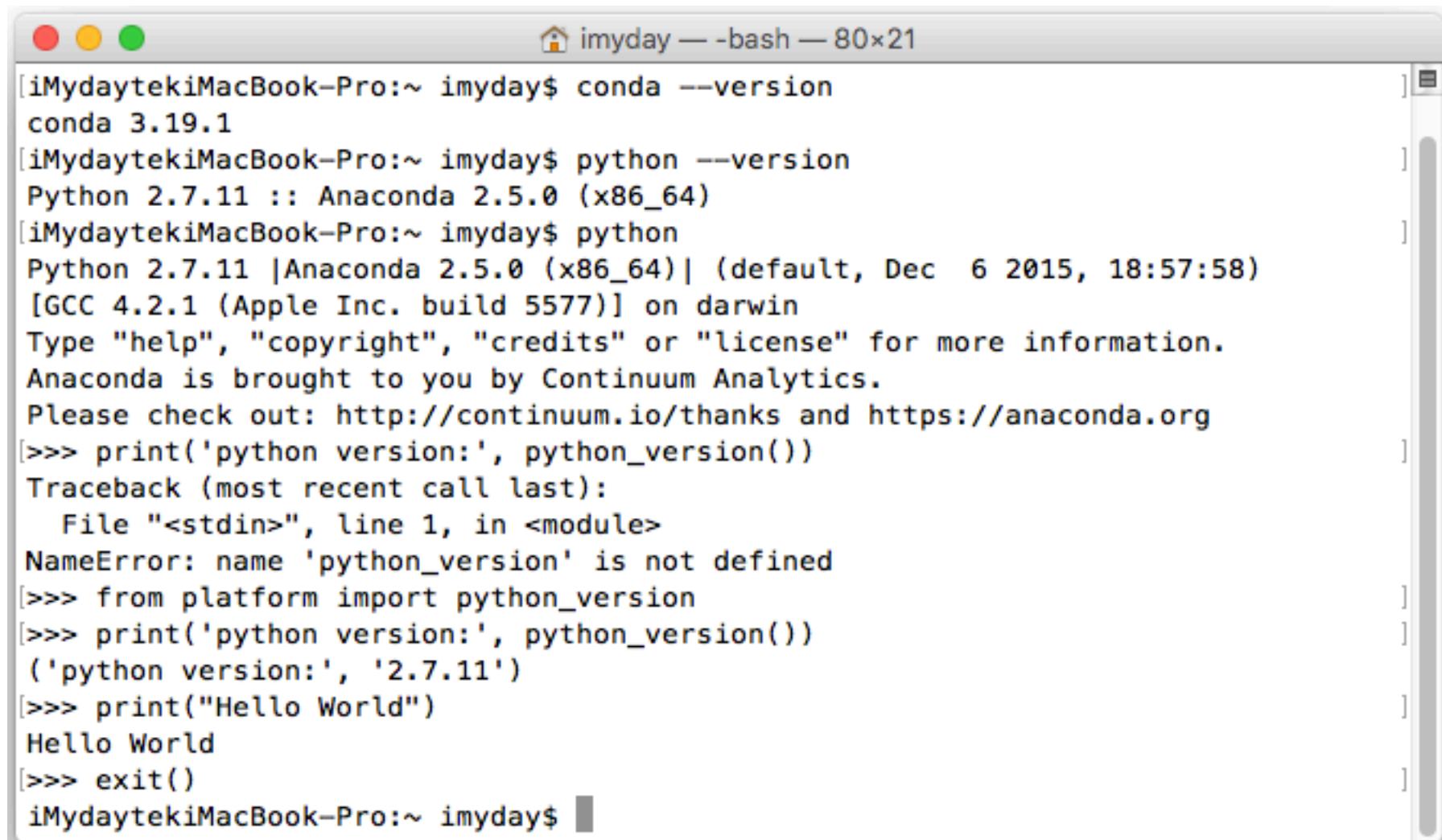
```
iMyday — bash — 80x24

Fetching packages ...
openssl-1.0.2g 100% |#####
xz-5.0.5-1.tar 100% |#####
python-3.5.1-0 100% |#####
anaconda-custo 100% |#####
setuptools-20. 100% |#####
wheel-0.29.0-p 100% |#####
pip-8.1.0-py35 100% |#####
Extracting packages ...
[      COMPLETE      ]|#####
Linking packages ...
[      COMPLETE      ]|#####
#
# To activate this environment, use:
# $ source activate py35
#
# To deactivate this environment, use:
# $ source deactivate
#
[iMydaytekiMacBook-Pro:~ imyday$ source activate py35
discarding //anaconda/bin from PATH
prependng //anaconda/envs/py35/bin to PATH
(py35)iMydaytekiMacBook-Pro:~ imyday$ ]
```

python --version

```
iMyday — bash — 80x24
setup tools-20. 100% |#####
wheel-0.29.0-p 100% |#####
pip-8.1.0-py35 100% |#####
Extracting packages ...
[      COMPLETE      ] |##### 100%
Linking packages ...
[      COMPLETE      ] |##### 100%
#
# To activate this environment, use:
# $ source activate py35
#
# To deactivate this environment, use:
# $ source deactivate
#
[iMydaytekiMacBook-Pro:~ imyday$ source activate py35
discarding //anaconda/bin from PATH
prependng //anaconda/envs/py35/bin to PATH
[(py35)iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 3.5.1 :: Anaconda custom (x86_64)
[(py35)iMydaytekiMacBook-Pro:~ imyday$ source deactivate
discarding //anaconda/envs/py35/bin from PATH
[iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 2.7.11 :: Anaconda 2.5.0 (x86_64)
iMydaytekiMacBook-Pro:~ imyday$
```

```
from platform import python_version
print('Python Version:', python_version())
```



A screenshot of a macOS terminal window titled "imyday — -bash — 80x21". The window contains the following text:

```
[iMydaytekiMacBook-Pro:~ imyday$ conda --version
conda 3.19.1
[iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 2.7.11 :: Anaconda 2.5.0 (x86_64)
[iMydaytekiMacBook-Pro:~ imyday$ python
Python 2.7.11 |Anaconda 2.5.0 (x86_64)| (default, Dec  6 2015, 18:57:58)
[GCC 4.2.1 (Apple Inc. build 5577)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
Anaconda is brought to you by Continuum Analytics.
Please check out: http://continuum.io/thanks and https://anaconda.org
[>>> print('python version:', python_version())
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name 'python_version' is not defined
[>>> from platform import python_version
[>>> print('python version:', python_version())
('python version:', '2.7.11')
[>>> print("Hello World")
Hello World
[>>> exit()
iMydaytekiMacBook-Pro:~ imyday$ ]
```

conda info --envs

```
iMydaytekiMacBook-Pro:~ imyday$ conda --version
conda 3.19.1
[iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 2.7.11 :: Anaconda 2.5.0 (x86_64)
[iMydaytekiMacBook-Pro:~ imyday$ conda info --envs
Using Anaconda Cloud api site https://api.anaconda.org
# conda environments:
#
py35                  //anaconda/envs/py35
root                  * //anaconda
[iMydaytekiMacBook-Pro:~ imyday$
```

conda --version

python --version

```
iMydaytekiMacBook-Pro:~ imyday$ conda --version
conda 3.19.1
[iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 2.7.11 :: Anaconda 2.5.0 (x86_64)
[iMydaytekiMacBook-Pro:~ imyday$ conda info --envs
Using Anaconda Cloud api site https://api.anaconda.org
# conda environments:
#
py35                  //anaconda/envs/py35
root                  * //anaconda

[iMydaytekiMacBook-Pro:~ imyday$ conda create -n py27 python=2.7 anaconda
Using Anaconda Cloud api site https://api.anaconda.org
Fetching package metadata: .....
Solving package specifications: .....
Package plan for installation in environment //anaconda/envs/py27:

The following packages will be downloaded:

  package          |      build
  -----          | -----
  anaconda-custom |      py27_0      3 KB
  setuptools-20.2.2|      py27_0     453 KB
  wheel-0.29.0    |      py27_0     81 KB
```

conda info --envs

```
iMyday — bash — 80x24
anaconda-custo 100% |#####
setupools-20. 100% |#####
wheel-0.29.0-p 100% |#####
pip-8.1.0-py27 100% |#####
Extracting packages ...
[     COMPLETE      ] |#####
Linking packages ...
[     COMPLETE      ] |#####
#
# To activate this environment, use:
# $ source activate py27
#
# To deactivate this environment, use:
# $ source deactivate
#
[iMydaytekiMacBook-Pro:~ imyday$ conda info --envs
Using Anaconda Cloud api site https://api.anaconda.org
# conda environments:
#
py27                  //anaconda/envs/py27
py35                  //anaconda/envs/py35
root                 * //anaconda
]
py27
py35
iMydaytekiMacBook-Pro:~ imyday$
```

py27
py35

Source activate py35 conda install notebook ipykernel

```
iMydaytekiMacBook-Pro:~ imyday$ conda info --envs
Using Anaconda Cloud api site https://api.anaconda.org
# conda environments:
#
py27          //anaconda/envs/py27
py35          //anaconda/envs/py35
root          * //anaconda

iMydaytekiMacBook-Pro:~ imyday$ source activate py35
discarding //anaconda/bin from PATH
prepend //anaconda/envs/py35/bin to PATH
(py35)iMydaytekiMacBook-Pro:~ imyday$ conda install notebook ipykernel
Using Anaconda Cloud api site https://api.anaconda.org
Fetching package metadata: .....
Solving package specifications: .....
Package plan for installation in environment //anaconda/envs/py35:

The following packages will be downloaded:

  package          |      build
  -----|-----
  appnope-0.1.0    |      py35_0           4 KB
  decorator-4.0.9   |      py35_0           7 KB
  ipython_genutils-0.1.0 |      py35_0          33 KB
```

conda install notebook ipykernel

```
imyday — -bash — 80x24
ipython:          4.1.2-py35_0
ipython_genutils: 0.1.0-py35_0
jinja2:           2.8-py35_0
jsonschema:       2.4.0-py35_0
jupyter_client:   4.2.1-py35_0
jupyter_core:    4.1.0-py35_0
markupsafe:      0.23-py35_0
mistune:          0.7.2-py35_0
nbconvert:        4.1.0-py35_0
nbformat:         4.0.1-py35_0
notebook:         4.1.0-py35_1
path.py:          8.1.2-py35_1
pexpect:          3.3-py35_0
pickleshare:     0.5-py35_0
ptyprocess:       0.5-py35_0
pygments:         2.1.1-py35_0
python.app:       1.2-py35_4
pyzmq:            15.2.0-py35_0
simplegeneric:   0.8.1-py35_0
terminado:        0.5-py35_1
tornado:          4.3-py35_0
traitlets:        4.1.0-py35_0

Proceed ([y]/n)? y
```

conda install notebook ipykernel

```
imyday — bash — 80x24
mistune-0.7.2- 100% |#####
path.py-8.1.2- 100% |#####
pexpect-3.3-py 100% |#####
ptyprocess-0.5 100% |#####
pygments-2.1.1 100% |#####
python.app-1.2 100% |#####
pyzmq-15.2.0-p 100% |#####
simplegeneric- 100% |#####
tornado-4.3-py 100% |#####
jinja2-2.8-py3 100% |#####
pickleshare-0. 100% |#####
terminado-0.5- 100% |#####
traitlets-4.1. 100% |#####
ipython-4.1.2- 100% |#####
jupyter_core-4 100% |#####
jupyter_client 100% |#####
nbformat-4.0.1 100% |#####
ipykernel-4.3. 100% |#####
nbconvert-4.1. 100% |#####
notebook-4.1.0 100% |#####
Extracting packages ...
[      COMPLETE      ]|#####
Linking packages ...
[      COMPLETE      ]|#####
```

Source activate py27 conda install notebook ipykernel

```
iMydaytekiMacBook-Pro:~ imyday$ conda info --envs
Using Anaconda Cloud api site https://api.anaconda.org
# conda environments:
#
py27          //anaconda/envs/py27
py35          //anaconda/envs/py35
root          * //anaconda

[iMydaytekiMacBook-Pro:~ imyday$ source activate py27
discarding //anaconda/bin from PATH
prepend //anaconda/envs/py27/bin to PATH
(py27)iMydaytekiMacBook-Pro:~ imyday$ conda install notebook ipykernel
Using Anaconda Cloud api site https://api.anaconda.org
Fetching package metadata: .....
Solving package specifications: .....
Package plan for installation in environment //anaconda/envs/py27:

The following packages will be downloaded:

  package          |      build
  -----          |
decorator-4.0.9    |      py27_0      12 KB
mistune-0.7.2     |      py27_0      178 KB
pygments-2.1.1    |      py27_0      1.2 MB
```

conda install notebook ipykernel

```
imyday — bash — 80x24
jsonschema:      2.4.0-py27_0
jupyter_client:  4.2.1-py27_0
jupyter_core:   4.1.0-py27_0
markupsafe:     0.23-py27_0
mistune:        0.7.2-py27_0
nbconvert:       4.1.0-py27_0
nbformat:        4.0.1-py27_0
notebook:        4.1.0-py27_1
path.py:         8.1.2-py27_1
pexpect:        3.3-py27_0
pickleshare:    0.5-py27_0
ptyprocess:     0.5-py27_0
pygments:       2.1.1-py27_0
python.app:     1.2-py27_4
pyzmq:          15.2.0-py27_0
simplegeneric:  0.8.1-py27_0
singledispatch: 3.4.0.3-py27_0
six:            1.10.0-py27_0
ssl_match_hostname: 3.4.0.2-py27_0
terminado:      0.5-py27_1
tornado:        4.3-py27_0
traitlets:      4.1.0-py27_0

Proceed ([y]/n)? y
```

conda install notebook ipykernel

```
simplegeneric:      0.8.1-py27_0
singledispatch:    3.4.0.3-py27_0
six:               1.10.0-py27_0
ssl_match_hostname: 3.4.0.2-py27_0
terminado:         0.5-py27_1
tornado:           4.3-py27_0
traitlets:          4.1.0-py27_0
```

```
Proceed ([y]/n)? y
```

```
Fetching packages ...
```

```
decorator-4.0. 100% [########################################] Time: 0:00:00 48.24 kB/s
mistune-0.7.2- 100% [########################################] Time: 0:00:01 177.69 kB/s
pygments-2.1.1 100% [########################################] Time: 0:00:03 354.58 kB/s
ipython-4.1.2- 100% [########################################] Time: 0:00:04 210.93 kB/s
jupyter_core-4 100% [########################################] Time: 0:00:00 71.68 kB/s
jupyter_client 100% [########################################] Time: 0:00:00 111.21 kB/s
ipykernel-4.3. 100% [########################################] Time: 0:00:00 145.24 kB/s
notebook-4.1.0 100% [########################################] Time: 0:00:05 816.06 kB/s
```

```
Extracting packages ...
```

```
[      COMPLETE      ] [########################################] 100%
```

```
Linking packages ...
```

```
[      COMPLETE      ] [########################################] 100%
```

```
(py27)iMydaytekiMacBook-Pro:~ imyday$
```

python --version

```
iMyday — bash — 80x24

Fetching packages ...
decorator-4.0. 100% |#####
mistune-0.7.2- 100% |#####
pygments-2.1.1 100% |#####
ipython-4.1.2- 100% |#####
jupyter_core-4 100% |#####
jupyter_client 100% |#####
ipykernel-4.3. 100% |#####
notebook-4.1.0 100% |#####
Extracting packages ...
[      COMPLETE      ]|#####
Linking packages ...
[      COMPLETE      ]|#####
(py27)iMydaytekiMacBook-Pro:~ imyday$ conda info --envs
Using Anaconda Cloud api site https://api.anaconda.org
# conda environments:
#
py27          * //anaconda/envs/py27
py35          //anaconda/envs/py35
root          //anaconda

(py27)iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 2.7.11 :: Anaconda custom (x86_64)
(py27)iMydaytekiMacBook-Pro:~ imyday$
```

source deactivate

```
Extracting packages ...
[ COMPLETE      ]|#####
Linking packages ...
[ COMPLETE      ]|#####
(py27)iMydaytekiMacBook-Pro:~ imyday$ conda info --envs
Using Anaconda Cloud api site https://api.anaconda.org
# conda environments:
#
py27          * //anaconda/envs/py27
py35          //anaconda/envs/py35
root          //anaconda

(py27)iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 2.7.11 :: Anaconda custom (x86_64)
(py27)iMydaytekiMacBook-Pro:~ imyday$ source activate py35
discarding //anaconda/envs/py27/bin from PATH
prependng //anaconda/envs/py35/bin to PATH
(py35)iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 3.5.1 :: Anaconda custom (x86_64)
(py35)iMydaytekiMacBook-Pro:~ imyday$ source deactivate
discarding //anaconda/envs/py35/bin from PATH
[iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 2.7.11 :: Anaconda 2.5.0 (x86_64)
iMydaytekiMacBook-Pro:~ imyday$
```

ipython notebook

ipython notebook

```
iMydaytekiMacBook-Pro:~ imyday$ ipython notebook
[I 14:26:49.944 NotebookApp] Serving notebooks from local directory: /Users/imyday
[I 14:26:49.944 NotebookApp] 0 active kernels
[I 14:26:49.944 NotebookApp] The Jupyter Notebook is running at: http://localhost:8888/
[I 14:26:49.944 NotebookApp] Use Control-C to stop this server and shut down all
kernels (twice to skip confirmation).
[W 14:26:56.639 NotebookApp] 404 GET /api/kernels/a87ab95b-6d6e-44d3-aaa7-c1901c
960677/channels?session_id=265FB16817FB4AB79202F6D3C3BDB0E6 (::1): Kernel does n
ot exist: a87ab95b-6d6e-44d3-aaa7-c1901c960677
[W 14:26:56.663 NotebookApp] 404 GET /api/kernels/a87ab95b-6d6e-44d3-aaa7-c1901c
960677/channels?session_id=265FB16817FB4AB79202F6D3C3BDB0E6 (::1) 95.43ms refere
r=None
[W 14:26:56.681 NotebookApp] 404 GET /api/kernels/b7fae9a6-d77b-4ead-832c-c070b1
8d642b/channels?session_id=EF4C761633E541C88568CDBCDE1091B7 (::1): Kernel does n
ot exist: b7fae9a6-d77b-4ead-832c-c070b18d642b
[W 14:26:56.683 NotebookApp] 404 GET /api/kernels/b7fae9a6-d77b-4ead-832c-c070b1
8d642b/channels?session_id=EF4C761633E541C88568CDBCDE1091B7 (::1) 6.62ms referer
=None
[W 14:27:29.595 NotebookApp] 404 GET /api/kernels/a87ab95b-6d6e-44d3-aaa7-c1901c
960677/channels?session_id=265FB16817FB4AB79202F6D3C3BDB0E6 (::1): Kernel does n
ot exist: a87ab95b-6d6e-44d3-aaa7-c1901c960677
[W 14:27:29.631 NotebookApp] 404 GET /api/kernels/a87ab95b-6d6e-44d3-aaa7-c1901c
```

jupyter notebook

Python 3

The screenshot shows the Jupyter Notebook interface running at `localhost:8888/tree/Documents/SCDBA`. The top navigation bar includes 'Files', 'Running', and 'Clusters'. A sidebar on the left shows a file tree with a root folder 'SCDBA' containing an ellipsis ('..'). The main area displays the message 'Notebook list empty.' A context menu is open in the top right corner, with the 'New' option expanded. The 'Python 3' option is highlighted with a red dashed box.

localhost:8888/tree/Documents/SCDBA

jupyter

Files Running Clusters

Select items to perform actions on them.

/ Documents / SCDBA ..

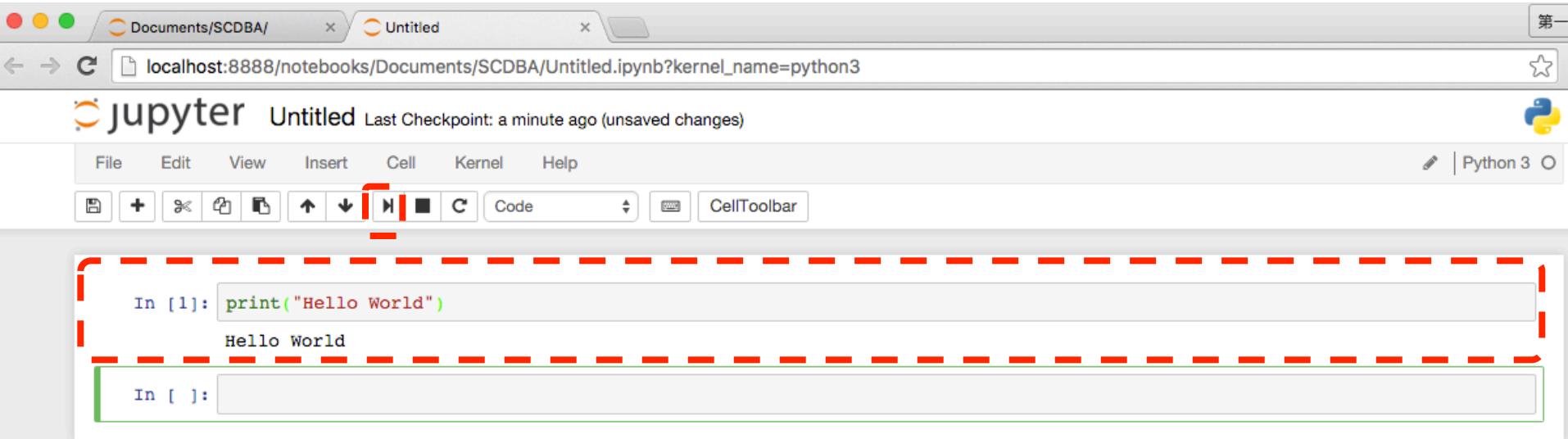
Notebook list empty.

Upload New ▾

- Text File
- Folder
- Terminal
- Notebooks
- Python 3

jupyter notebook

Python 3



jupyter notebook

Python 2

The screenshot shows the Jupyter Notebook interface. At the top, there's a browser-style header with the URL "localhost:8888/tree/Documents/SCDBA". Below it is the Jupyter logo and a navigation bar with tabs for "Files", "Running", and "Clusters". The main area is a file browser showing a directory structure under "/Documents/SCDBA". A context menu is open at the bottom right, with a red box highlighting the "New" button. This menu lists options: "Text File", "Folder", "Terminal", "Notebooks", and "Python 2", with "Python 2" also highlighted by a red box.

localhost:8888/tree/Documents/SCDBA

jupyter

Files Running Clusters

Select items to perform actions on them.

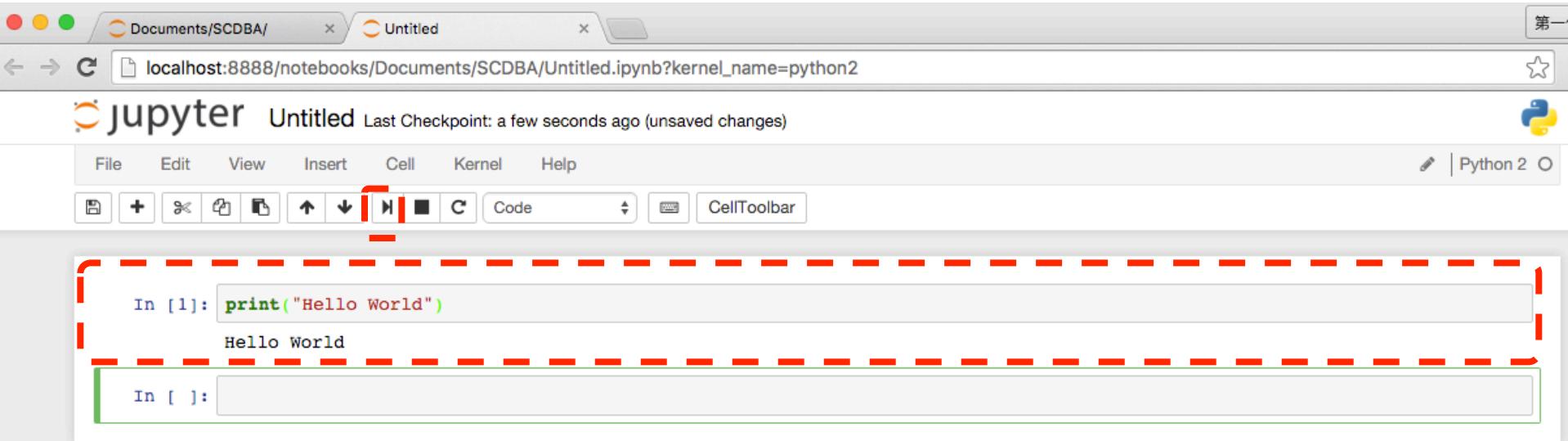
/ Documents / SCDBA ..

Upload New

- Text File
- Folder
- Terminal
- Notebooks
- Python 2

jupyter notebook

Python 2



ipython notebook

jupyter notebook

A screenshot of a web-based Jupyter Notebook interface. At the top, a browser header shows the URL `localhost:8888/tree`. Below the header, the word "jupyter" is displayed in a large, orange font. A navigation bar contains three tabs: "Files" (selected), "Running", and "Clusters". To the right of the tabs are buttons for "Upload", "New", and a refresh icon. The main area displays a file tree with the following structure:

- AndroidStudioProjects
- app
- Applications
- AppsPro
- bin
- Desktop
- Development
- Documents
- Downloads
- Dropbox
- imtkuapp5
- jEdit
- man
- Movies
- Music
- OneDrive
- Pictures

jupyter notebook

The screenshot shows the Jupyter Notebook interface running locally at `localhost:8888/tree`. The top navigation bar includes tabs for `Home`, `localhost:8888/tree`, and other browser controls. The main area displays a file tree with various local directories and a context menu open on the right side.

File Tree:

-
- [AndroidStudioProjects](#)
- [app](#)
- [Applications](#)
- [AppsPro](#)
- [bin](#)
- [Desktop](#)
- [Development](#)
- [Documents](#)
- [Downloads](#)
- [Dropbox](#)
- [imtkuapp5](#)
- [jEdit](#)
- [man](#)
- [Movies](#)
- [Music](#)
- [OneDrive](#)
- [Pictures](#)

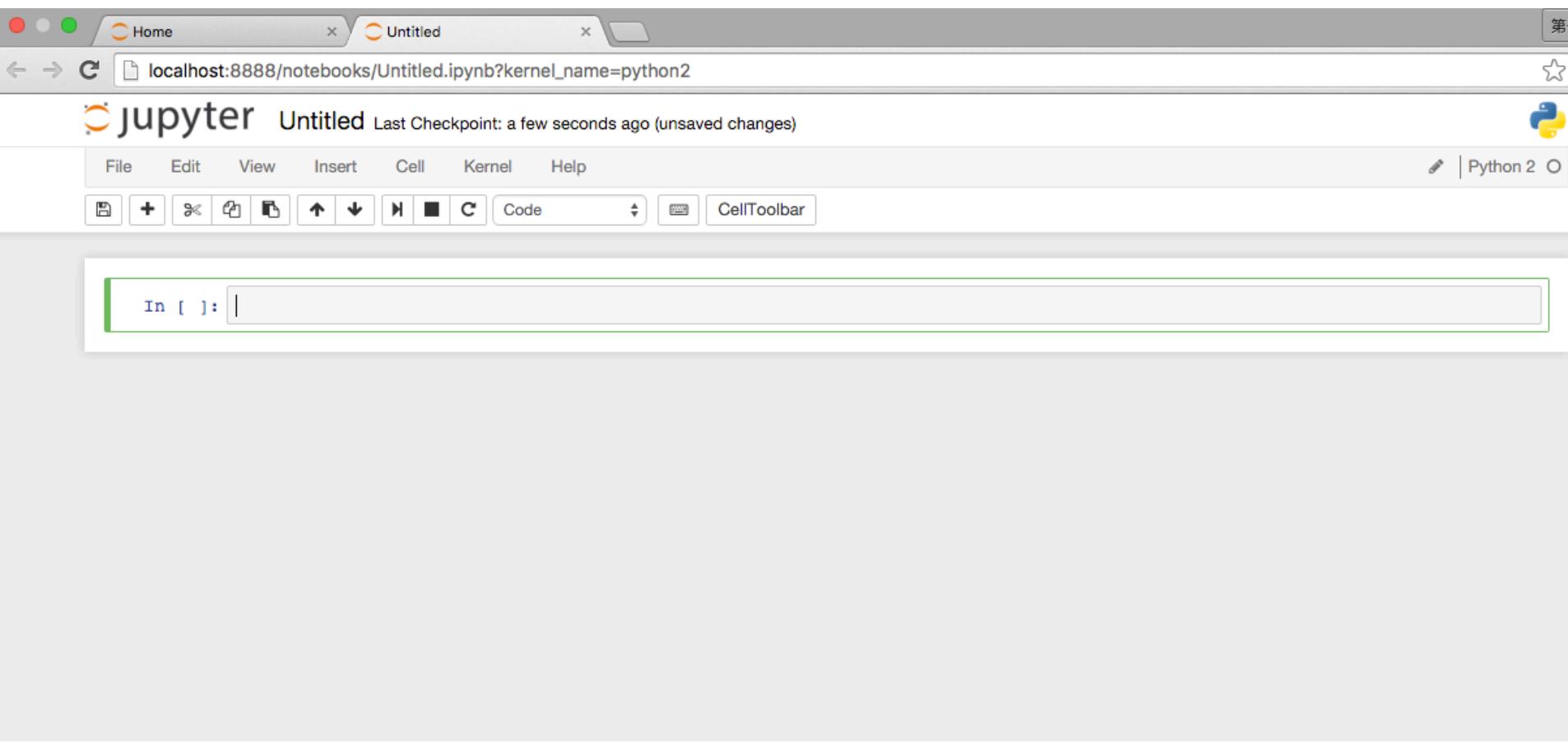
Context Menu (Open at Python 2):

- Upload
- New
-
- Text File
- Folder
- Terminal
- Notebooks
- Python 2

Bottom Status Bar:

localhost:8888/tree#

jupyter notebook



```
print('Hello World, Python')
```

The screenshot shows a Jupyter Notebook interface. At the top, there is a yellow banner with the text `print('Hello World, Python')`. Below this is a browser-like header bar with the URL `localhost:8888/notebooks/Untitled.ipynb?kernel_name=python2`. The main title bar says "jupyter Untitled Last Checkpoint: a minute ago (unsaved changes)". The toolbar includes standard file operations like File, Edit, View, Insert, Cell, Kernel, Help, and a CellToolbar. A Python 2 kernel icon is also present. The main workspace shows a code cell with the input `In []: print('Hello World, Python')`.

```
print('Hello World, Python')
```

The screenshot shows a Jupyter Notebook interface. At the top, there is a browser-like header with the URL "localhost:8888/notebooks/Untitled.ipynb?kernel_name=python2". Below it is the Jupyter logo and the title "Untitled". A status bar indicates "Last Checkpoint: 3 minutes ago (unsaved changes)". On the right, there is a Python 2 logo. The main area contains a toolbar with various icons for file operations and cell management. Below the toolbar, a code cell is shown with the following content:

```
In [1]: print('Hello World, Python')
Hello World, Python
```

The cell output "Hello World, Python" is displayed below the input. A new cell, "In []:", is currently selected and highlighted with a green border.

Conda Get-Started

The screenshot shows a web browser displaying the Conda documentation at <http://conda.pydata.org/docs/get-started.html>. The page title is "Conda Get-Started". The main content area is titled "Get started" and contains a bulleted list of topics related to getting started with Conda. On the left, there is a sidebar with a navigation menu.

Page Title: conda.pydata.org/docs/get-started.html

Page Header: Docs » Get started [Edit on GitHub](#)

Left Sidebar (Get started section):

- Intro to conda
- Download conda
- Installation
- Test drive
- Conda cheat sheet

Left Sidebar (Using conda section):

- Using conda
- Building packages
- Help & reference
- Get involved

Main Content (Get started section):

- Intro to conda
- Download conda
 - Should I download Anaconda or Miniconda?
 - Which version of Anaconda or Miniconda should I choose?
 - Should I choose GUI installer or command line installer?
 - What version of Python should I choose?
 - What about cryptographic hash verification?
- Installation
 - Quick install
 - Miniconda quick install requirements
 - Windows Miniconda install
 - OS X Miniconda install
 - Linux Miniconda install
 - Full installation
 - Anaconda requirements
 - Install instructions
 - Windows Anaconda install
 - OS X Anaconda install
 - Linux Anaconda install
 - Configuration
 - The conda configuration file (.condarc)
 - General configuration
 - Channel locations (channels)
 - Always yes (always yes)

Update or Upgrade Python

If you are in an environment with Python version 3.4.2, this command will update Python to 3.4.3, which is the latest version in the 3.4 branch:

```
$ conda update python
```

Upgrade Python to another branch such as 3.5 by installing that version of Python:

```
$ conda install python=3.5
```

Python–Future

python-future.org/index.html

Python-Future Overview Cheat Sheet FAQ Contents ▾ Page ▾ Search

Easy, clean, reliable Python 2/3 compatibility

Table of Contents

What's New

Overview: Easy, clean, reliable Python 2/3 compatibility

Quick-start guide

Cheat Sheet: Writing Python 2/3 compatible code

Imports

What else you need to know

Automatic conversion to Py2/3

Frequently Asked Questions (FAQ)

Standard library incompatibilities

Older interfaces

Changes in previous versions

Licensing and credits

API Reference (in progress)

Easy, clean, reliable Python 2/3 compatibility

`python-future` is the missing compatibility layer between Python 2 and Python 3. It allows you to use a single, clean Python 3.x-compatible codebase to support both Python 2 and Python 3 with minimal overhead.

Contents:

- [What's New](#)
 - [What's new in version 0.15.2 \(2015-09-11\)](#)
 - [What's new in version 0.15.1 \(2015-09-09\)](#)
 - [What's new in version 0.15.0 \(2015-07-25\)](#)
 - [Previous versions](#)
- [Overview: Easy, clean, reliable Python 2/3 compatibility](#)
 - [Features](#)
 - [Code examples](#)
 - [Automatic conversion to Py2/3-compatible code](#)
 - [Automatic translation](#)
 - [Licensing](#)
 - [Next steps](#)
- [Quick-start guide](#)
 - [Installation](#)
 - [If you are writing code from scratch](#)
 - [To convert existing Python 3 code](#)
 - [To convert existing Python 2 code](#)
 - [Standard library reorganization](#)
 - [Python 2-only dependencies](#)
 - [Next steps](#)
- [Cheat Sheet: Writing Python 2/3 compatible code](#)
 - [Setup](#)
 - [Essential syntax differences](#)
 - [Strings and bytes](#)

<http://python-future.org/index.html>

Fork me on GitHub

pip install future

pip install six

The imports below refer to these pip-installable packages on PyPI:

```
import future          # pip install future
import builtins        # pip install future
import past            # pip install future
import six             # pip install six
```

```
futurize              # pip install future
pasteurize            # pip install future
```

print

```
# Python 2 only:  
print 'Hello'
```

```
# Python 2 and 3:  
print('Hello')
```

```
# Python 2 only:  
print 'Hello', 'Guido'
```

```
# Python 2 and 3:  
from __future__ import print_function #(at top of module)  
  
print('Hello', 'Guido')
```

Writing Python 2-3 compatible code

Essential syntax differences

print

```
# Python 2 only:  
print 'Hello'
```

```
# Python 2 and 3:  
print('Hello')
```

To print multiple strings, import `print_function` to prevent Py2 from interpreting it as a tuple:

```
# Python 2 only:  
print 'Hello', 'Guido'
```

```
# Python 2 and 3:  
from __future__ import print_function    # (at top of module)  
  
print('Hello', 'Guido')
```

Unicode (text) string literals

```
# Python 2 only
s1 = 'The Zen of Python'
s2 = u'きたないのよりきれいな方がいい\n'

# Python 2 and 3
s1 = u'The Zen of Python'
s2 = u'きたないのよりきれいな方がいい\n'
```

Unicode (text) string literals

```
# Python 2 and 3
from __future__ import unicode_literals # at top of module

s1 = 'The Zen of Python'
s2 = 'きたないのよりきれいな方がいい\n'
```



Text input and output

```
print("Hello World")
```

```
print("Hello World\nThis is a message")
```

```
x = 3  
print(x)
```

```
x = 2  
y = 3  
print(x, ' ', y)
```

```
name = input("Enter a name: ")
```

```
x = int(input("What is x? "))
```

```
x = float(input("Write a number"))
```

Variables

```
x = 2
```

```
price = 2.5
```

```
word = 'Hello'
```

```
word = 'Hello'
```

```
word = "Hello"
```

```
word = '''Hello'''
```

```
x = 2
```

```
x = x + 1
```

```
x = 5
```

Python Basic Operators

```
print('7 + 2 =', 7 + 2)
print('7 - 2 =', 7 - 2)
print('7 * 2 =', 7 * 2)
print('7 / 2 =', 7 / 2)
print('7 // 2 =', 7 // 2)
print('7 % 2 =', 7 % 2)
print('7 ** 2 =', 7 ** 2)
```

```
print('7 + 2 =', 7 + 2)
print('7 - 2 =', 7 - 2)
print('7 * 2 =', 7 * 2)
print('7 / 2 =', 7 / 2)
print('7 // 2 =', 7 // 2)
print('7 % 2 =', 7 % 2)
print('7 ** 2 =', 7 ** 2)
```

7 + 2 = 9
7 - 2 = 5
7 * 2 = 14
7 / 2 = 3.5
7 // 2 = 3
7 % 2 = 1
7 ** 2 = 49

BMI Calculator in Python

```
height_cm = float(input("Enter your height in cm: "))
weight_kg = float(input("Enter your weight in kg: "))

height_m = height_cm/100
BMI = (weight_kg/(height_m**2))

print("Your BMI is: " + str(round(BMI,1)))
```

If statements

```
> greater than  
< smaller than  
== equals  
!= is not
```

```
score = 80
if score >=60 :
    print("Pass")
else:
    print("Fail")
```

For loops

```
for i in range(1,11):  
    print(i)
```

```
1  
2  
3  
4  
5  
6  
7  
8  
9  
10
```

For loops

```
for i in range(1,10):  
    for j in range(1,10):  
        print(i, ' * ', j , ' = ', i*j)
```

```
9 * 1 = 9  
9 * 2 = 18  
9 * 3 = 27  
9 * 4 = 36  
9 * 5 = 45  
9 * 6 = 54  
9 * 7 = 63  
9 * 8 = 72  
9 * 9 = 81
```

Functions

```
def convertCMToM(xcm):  
    m = xcm/100  
    return m
```

```
cm = 180  
m = convertCMToM(cm)  
print(str(m))
```

Lists

```
x = [60, 70, 80, 90]  
print(len(x))  
print(x[0])  
print(x[1])  
print(x[-1])
```

60
70
80
90

Tuples

A **tuple** in Python is a collection that cannot be modified.

A tuple is defined using **parenthesis**.

```
x = (10, 20, 30, 40, 50)  
print(x[0])  
print(x[1])  
print(x[2])  
print(x[-1])
```

10
20
30
50

Python Ecosystem

Python Ecosystem

import math

```
x = log(1)  
print(x)
```

```
-----  
NameError                                 Traceback (most recent call last)  
<ipython-input-64-55d85b4998db> in <module>()  
----> 1 x = log(1)  
      2 print(x)  
  
NameError: name 'log' is not defined
```

math.log?

```
import math  
x = math.log(1)  
print(x)
```

0.0

```
math.log(8,2)|
```

3.0

Docstring:
log(x[, base])

Return the logarithm of x to the given base.

If the base not specified, returns the natural logarithm (base e) of x.

Type: builtin_function_or_method

NumPy

- NumPy provides a multidimensional array object to store homogenous or heterogeneous data; it also provides optimized functions/methods to operate on this array object.

NumPy

```
v = range(1, 6)
print(v)
2 * v

import numpy as np
v = np.arange(1, 6)

v
2 * v
```

```
v = range(1, 6)
print(v)
```

```
[1, 2, 3, 4, 5]
```

```
2 * v
```

```
[1, 2, 3, 4, 5, 1, 2, 3, 4, 5]
```

```
import numpy as np
v = np.arange(1, 6)
v
```

```
array([1, 2, 3, 4, 5])
```

```
2 * v
```

```
array([ 2,  4,  6,  8, 10])
```

Compatible Python 2 and Python 3 Code

- `print()`
- Exceptions
- Division
- Unicode strings
- Bad imports

Compatible Python 2 and Python 3 Code

```
print()  
print("This works in py2 and py3")  
  
from __future__ import print_function  
print("Hello", "World")
```

What version of Python should I choose?

- The latest version of Python 2 is 2.7, and that is included with Anaconda and Miniconda.
- The newest stable version of Python is 3.5, and that is included with Anaconda3 and Miniconda3.
- You can easily set up additional versions of Python such as 3.4 by downloading any version and creating a new environment with just a few clicks.

Create Python 2 or 3 environments

The screenshot shows a web browser displaying the Conda documentation at conda.pydata.org/docs/py2or3.html#create-python-2-or-3-environments. The page title is "Create Python 2 or 3 environments". The left sidebar has a dark background and lists various sections: "Conda", "Search docs", "Get started", "Using conda" (which is expanded), "Managing environments", "Managing Python" (which is selected and highlighted in grey), "Managing packages", "Using R with conda", "Using Microsoft R Open", "Building packages", "Help & reference", and "Get involved". The main content area has a light background and contains two sections: "Create a Python 3.5 environment" and "Create a Python 2.7 environment". Each section includes a code example in a terminal window and explanatory text.

Create Python 2 or 3 environments

Anaconda supports Python 2.7, 3.4, and 3.5. The default is Python 2.7 or 3.5, depending on which installer you used. If the installer you used is Anaconda or Miniconda, the default is 2.7. If the installer you used is Anaconda3 or Miniconda3, the default is 3.5.

Create a Python 3.5 environment

To create a new environment with a different version of Python, use the `conda create` command. In this example, we'll make the new environment for Python 3.5:

```
$ conda create -n py35 python=3.5 anaconda
```

Here, the 'py35' is the name of the environment you want to create, and 'anaconda' is the meta-package that includes all of the actual Python packages comprising the Anaconda distribution. When creating a new environment and installing Anaconda, you can specify the exact package and Python versions, for example, `numpy=1.7` or `python=3.5`.

Create a Python 2.7 environment

In this example, we'll make a new environment for Python 2.7:

```
$ conda create -n py27 python=2.7 anaconda
```

File IO with open()

```
# Python 2 only
f = open('myfile.txt')
data = f.read()                      # as a byte string
text = data.decode('utf-8')

# Python 2 and 3: alternative 1
from io import open
f = open('myfile.txt', 'rb')
data = f.read()                      # as bytes
text = data.decode('utf-8')          # unicode, not bytes

# Python 2 and 3: alternative 2
from io import open
f = open('myfile.txt', encoding='utf-8')
text = f.read()          # unicode, not bytes
```

Six: Python 2 and 3 Compatibility Library

← → C https://pythonhosted.org/six/ ⌂ ⌃ ⌁ ⌂ ⌃ ⌁

six 1.10.0 documentation » modules | index

Table Of Contents

- Six: Python 2 and 3 Compatibility Library
 - Indices and tables
 - Package contents
 - Constants
 - Object model compatibility
 - Syntax compatibility
 - Binary and text data
 - unittest assertions
 - Renamed modules and attributes compatibility
 - urllib parse
 - urllib error
 - urllib request
 - urllib response
 - Advanced - Customizing renames

Six: Python 2 and 3 Compatibility Library

Six provides simple utilities for wrapping over differences between Python 2 and Python 3. It is intended to support codebases that work on both Python 2 and 3 without modification. six consists of only one Python file, so it is painless to copy into a project.

Six can be downloaded on [PyPi](#). Its bug tracker and code hosting is on [BitBucket](#).

The name, "six", comes from the fact that 2×3 equals 6. Why not addition? Multiplication is more powerful, and, anyway, "five" has already been snatched away by the (admittedly now moribund) Zope Five project.

Indices and tables

- Index
- Search Page

Package contents

six.PY2
A boolean indicating if the code is running on Python 2.

six.PY3
A boolean indicating if the code is running on Python 3.

Constants

Six provides constants that may differ between Python versions. Ones ending `_types` are mostly useful as the second argument to `isinstance` OR `issubclass`.

six.class_types
Possible class types. In Python 2, this encompasses old-style and new-style classes. In Python 3, this is just new-styles.

This Page

Show Source

Quick search

Enter search terms or a module, class or function name. Go

<https://pythonhosted.org/six/>

Conda Test Drive

The screenshot shows a web browser displaying the Conda Test Drive documentation at <http://conda.pydata.org/docs/test-drive.html>. The page has a green header bar with the Conda logo and a search bar. The main content area has a breadcrumb navigation path: Docs > Get started > Test drive. It features a large section titled "Test drive" with a sub-section titled "Conda test drive milestones:" containing a numbered list of tasks. On the left, a sidebar lists various "Get started" topics.

Docs » Get started » Test drive

Edit on GitHub

Test drive

To start the conda 30-minute test drive, you should have already followed our 2-minute *Quick install* guide to download, install and update Miniconda, OR have downloaded, installed and updated Anaconda or Miniconda on your own.

NOTE: After installing, be sure you have closed and then re-opened the terminal window so the changes can take effect.

Conda test drive milestones:

1. **USING CONDA.** First we will verify that you have installed Anaconda or Miniconda, and check that it is updated to the current version. 3 min.
2. **MANAGING ENVIRONMENTS.** Next we will play with environments by creating a few environments, so you can learn to move easily between the environments. We will also verify which environment you are in, and make an exact copy of an environment as a backup. 10 min.
3. **MANAGING PYTHON.** Then we will check to see which versions of Python are available to install, install another version of Python, and switch between versions. 4 min.
4. **MANAGING PACKAGES.** We play with packages. We will a) list packages installed on your computer, b) see a list of available packages, and c) install and remove some packages using conda install. For packages not available using conda install, we will d) search on Anaconda.org. For packages that are in neither location, we'll e) install a package with the pip package manager. We will also install a free 30 day trial of Continuum's commercial package IOPro. 10 min.
5. **REMOVING PACKAGES, ENVIRONMENTS, OR CONDA.** We'll end the test drive by removing

<http://conda.pydata.org/docs/test-drive.html>

Get started

Intro to conda

Download conda

Installation

Test drive

Conda cheat sheet

Using conda

Building packages

Help & reference

Get involved

Managing Conda and Anaconda

Managing conda and anaconda

conda info

Verify conda is installed, check version #

conda update conda

Update conda package and environment manager to current version

conda update anaconda

Update the anaconda meta package (the library of packages ready to install with **conda** command)

Managing environments

Managing environments

conda info --envs or **conda info -e** Get a list of all my environments, active environment shown with *

conda create --name snowflakes biopython Create an environment and install program(s)

or

conda create -n snowflakes biopython

TIP: To avoid dependency conflicts, install all programs in the environment (snowflakes) at the same time.

TIP: Environments install by default into the `envs` directory in your `conda` directory. You can specify a different path; see **conda create --help** for details.

source activate snowflakes (Linux, Mac)

Activate the new environment to use it

activate snowflakes (Windows)

TIP: `Activate` prepends the path to the `snowflakes` environment.

conda create -n bunnies python=3.4 astroid Create a new environment, specify Python version

conda create -n flowers --clone snowflakes Make exact copy of an environment

conda remove -n flowers --all

Delete an environment

conda env export > puppies.yml

Save current environment to a file

conda env create -f puppies.yml

Load environment fromm a file

Managing Python

Managing Python

conda search --full-name python
or
conda search -f python

Check versions of Python available to install

conda create -n snakes python=3.4

Install different version of Python in new environment

source activate snakes (*Linux, Mac*)
activate snakes (*Windows*)

Switch to the new environment that has a different version of Python

TIP: Activate prepends the path to the snakes environment.

Managing Packages in Python

Managing packages, including Python

`conda list`

View list of packages and versions installed in active environment

`conda search beautiful-soup`

Search for a package to see if it is available to conda install

`conda install -n bunnies beautiful-soup` Install a new package

NOTE: If you do not include the name of the new environment (`-n bunnies`) it will install in the current active environment.

TIP: To view list of all packages available through `conda install`, visit <http://docs.continuum.io/anaconda/pkg-docs.html>.

`conda update beautiful-soup`

Update a package in the current environment

`conda search --override-channels -c pandas bottleneck` Search for a package in a specific location (i.e. the pandas channel on Anaconda.org)

NOTE: Or go to Anaconda.org in the browser and search by package name. This will show the specific channel (owner) through which it is available.

`conda install -c pandas bottleneck` Install a package from a specific channel

`conda search --override-channels -c defaults beautiful-soup` Search for a package to see if it is available from the Anaconda repository

`source activate bunnies` (Linux, Mac)

`activate bunnies` (Windows)

`pip install see`

Activate the environment where you want to install a package and install it with pip (included with Anaconda and Miniconda)

`conda install iopro accelerate`

Install commercial Continuum packages

`conda skeleton pypi pyinstrument`

`conda build pyinstrument`

Build a Conda package from a Python Package Index (PyPI) Package



TensorFlow

Install TensorFlow

TensorFlow™

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Fork me on GitHub

Version: r0.8

[Introduction](#)[Recommended Next Steps](#)[Download and Setup](#)[Requirements](#)[Overview](#)[Pip Installation](#)[Virtualenv installation](#)[Anaconda environment installation](#)[Docker installation](#)[Test the TensorFlow installation](#)[\(Optional, Linux\) Enable GPU Support](#)[Run TensorFlow from the Command Line](#)[Run a TensorFlow demo model](#)[Installing from sources](#)[Clone the TensorFlow repository](#)[Installation for Linux](#)

Download and Setup

You can install TensorFlow either from our provided binary packages or from the github source.

Requirements

The TensorFlow Python API supports Python 2.7 and Python 3.3+.

The GPU version (Linux only) works best with Cuda Toolkit 7.5 and cuDNN v4. other versions are supported (Cuda toolkit >= 7.0 and cuDNN 6.5(v2), 7.0(v3), v5) only when installing from sources. Please see [Cuda installation](#) for details.

Overview

We support different ways to install TensorFlow:

- [Pip install](#): Install TensorFlow on your machine, possibly upgrading previously installed Python packages. May impact existing Python programs on your machine.
- [Virtualenv install](#): Install TensorFlow in its own directory, not impacting any existing Python programs on your machine.
- [Anaconda install](#): Install TensorFlow in its own environment for those running the Anaconda Python distribution. Does not impact existing Python programs on your machine.

Install TensorFlow

TensorFlow™

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Version: r0.8

Introduction

Recommended Next Steps

Download and Setup

Requirements

Overview

Pip Installation

Virtualenv installation

Anaconda environment installation

Docker installation

Test the TensorFlow installation

(Optional, Linux) Enable GPU Support

Run TensorFlow from the Command Line

Run a TensorFlow demo model

Installing from sources

Clone the TensorFlow repository

Installation for Linux

Follow the instructions on the [Anaconda download site](#)

Create a conda environment called `tensorflow`:

```
# Python 2.7  
$ conda create -n tensorflow python=2.7  
  
# Python 3.5  
$ conda create -n tensorflow python=3.5
```

Activate the environment and use pip to install TensorFlow inside it. Use the `--ignore-installed` flag to prevent errors about `easy_install`.

```
$ source activate tensorflow  
(tensorflow)$ # Your prompt should change  
  
# Ubuntu/Linux 64-bit, CPU only:  
(tensorflow)$ pip install --ignore-installed --upgrade https://storage.googleapis.com/tensorflow/mac/cpu/tensorflow-0.8.0-py2-none-any.whl  
  
# Ubuntu/Linux 64-bit, GPU enabled. Requires CUDA toolkit 7.5 and CuDNN v4. For  
# other versions, see "Install from sources" below.  
(tensorflow)$ pip install --ignore-installed --upgrade https://storage.googleapis.com/tensorflow/mac/gpu/tensorflow-0.8.0-py2-none-any.whl  
  
# Mac OS X, CPU only:  
(tensorflow)$ pip install --ignore-installed --upgrade https://storage.googleapis.com/tensorflow/mac/cpu/tensorflow-0.8.0-py2-none-any.whl
```

conda create -n tensorflow python=2.7

```
iMydaytekiMacBook-Pro:~ imyday$ conda create -n tensorflow python=2.7
Using Anaconda Cloud api site https://api.anaconda.org
Fetching package metadata: .....
Solving package specifications: .....

Package plan for installation in environment //anaconda/envs/tensorflow:

The following packages will be downloaded:

  package          |      build
  --:: --
  openssl-1.0.2h   |          0      3.0 MB
  setuptools-20.7.0 |      py27_0    453 KB
  pip-8.1.1        |      py27_1    1.5 MB
  --:: --
                           Total:    5.0 MB

The following NEW packages will be INSTALLED:

  openssl: 1.0.2h-0
  pip:     8.1.1-py27_1
  python:  2.7.11-0
  readline: 6.2-2
  setuptools: 20.7.0-py27_0
  sqlite:   3.9.2-0
  tk:       8.5.18-0
  wheel:    0.29.0-py27_0
  zlib:     1.2.8-0

Proceed ([y]/n)? y
```

source activate tensorflow

```
iMyday@iMyday-MacBook-Pro:~ imyday$ source activate tensorflow
Proceed ([y]/n)? y

Fetching packages ...
openssl-1.0.2h 100% [########################################] Time: 0:00:04 778.75 kB/s
setuptools-20. 100% [########################################] Time: 0:00:05 79.42 kB/s
pip-8.1.1-py27 100% [########################################] Time: 0:00:07 216.54 kB/s
Extracting packages ...
[      COMPLETE      ]|########################################| 100%
Linking packages ...
[      COMPLETE      ]|########################################| 100%
#
# To activate this environment, use:
# $ source activate tensorflow
#
# To deactivate this environment, use:
# $ source deactivate
#
[iMyday@iMyday-MacBook-Pro:~ imyday$ source activate tensorflow
discarding //anaconda/bin from PATH
prependng //anaconda/envs/tensorflow/bin to PATH]
```

```
pip install --ignore-installed --upgrade  
https://storage.googleapis.com/tensorflow/  
mac/tensorflow-0.8.0-py2-none-any.whl
```

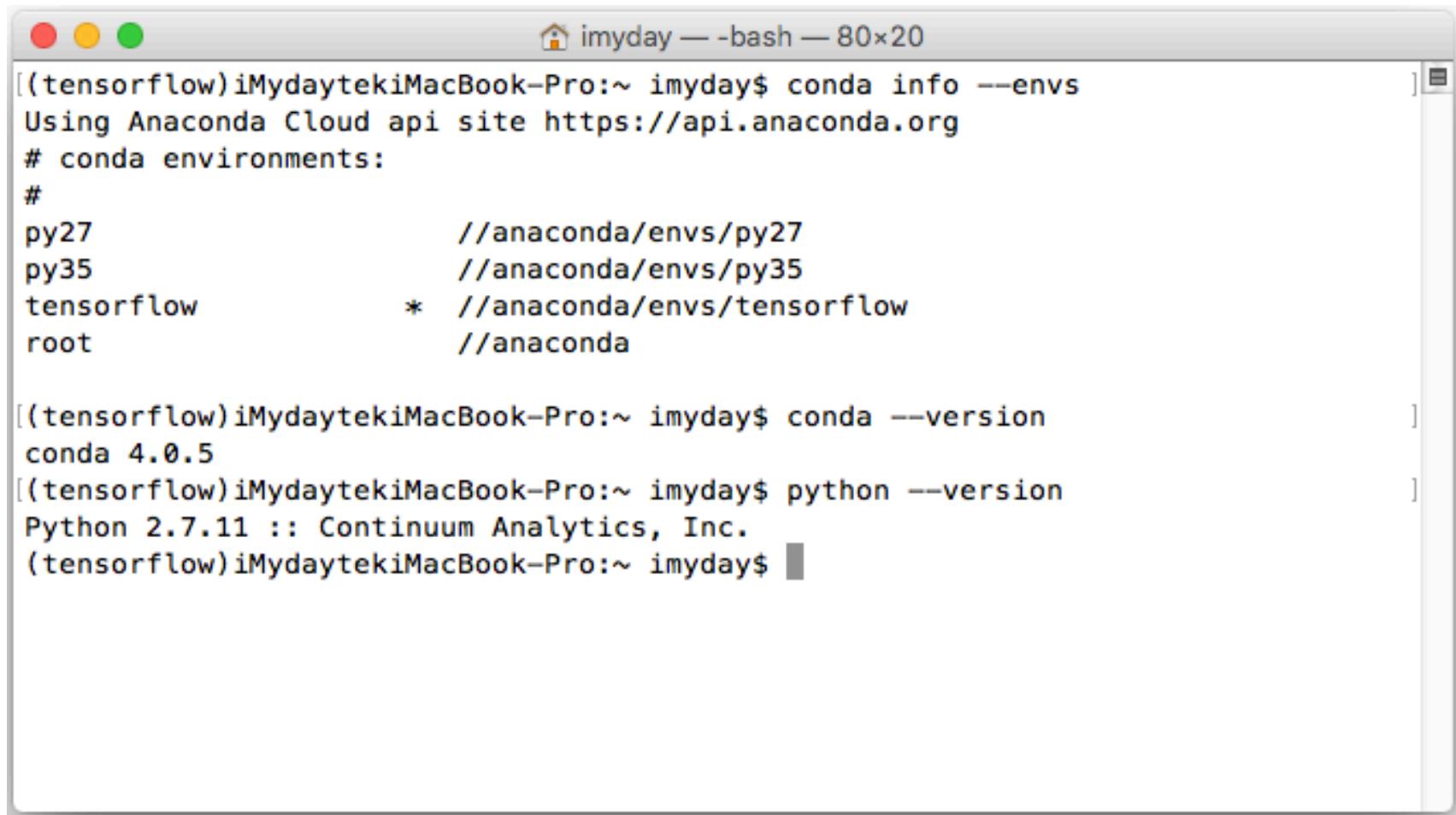
The screenshot shows a terminal window titled "imyday — bash — 80x28". The command entered is "pip install --ignore-installed --upgrade https://storage.googleapis.com/tensorflow/mac/tensorflow-0.8.0-py2-none-any.whl". The terminal output details the package dependencies and their download progress:

```
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ pip install --ignore-installed --upgrade https://storage.googleapis.com/tensorflow/mac/tensorflow-0.8.0-py2-none-any.whl  
Collecting tensorflow==0.8.0 from https://storage.googleapis.com/tensorflow/mac/tensorflow-0.8.0-py2-none-any.whl  
  Downloading https://storage.googleapis.com/tensorflow/mac/tensorflow-0.8.0-py2-none-any.whl (19.3MB)  
    100% |██████████| 19.3MB 32kB/s  
Collecting six>=1.10.0 (from tensorflow==0.8.0)  
  Downloading six-1.10.0-py2.py3-none-any.whl  
Collecting protobuf==3.0.0b2 (from tensorflow==0.8.0)  
  Downloading protobuf-3.0.0b2-py2.py3-none-any.whl (326kB)  
    100% |██████████| 327kB 482kB/s  
Collecting wheel (from tensorflow==0.8.0)  
  Downloading wheel-0.29.0-py2.py3-none-any.whl (66kB)  
    100% |██████████| 71kB 1.3MB/s  
Collecting numpy>=1.10.1 (from tensorflow==0.8.0)  
  Downloading numpy-1.11.0-cp27-cp27m-macosx_10_6_intel.macosx_10_9_intel.macosx_10_9_x86_64.macosx_10_10_intel.macosx_10_10_x86_64.whl (3.9MB)  
    100% |██████████| 3.9MB 159kB/s  
Collecting setuptools (from protobuf==3.0.0b2->tensorflow==0.8.0)  
  Downloading setuptools-21.0.0-py2.py3-none-any.whl (509kB)  
    100% |██████████| 512kB 682kB/s  
Installing collected packages: six, setuptools, protobuf, wheel, numpy, tensorflow  
Successfully installed numpy-1.11.0 protobuf-3.0.0b2 setuptools-20.7.0 six-1.10.0 tensorflow-0.8.0 wheel-0.29.0  
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$
```

conda info --envs

conda --version

python --version

A screenshot of a macOS terminal window titled "imyday — -bash — 80x20". The window contains the following text:

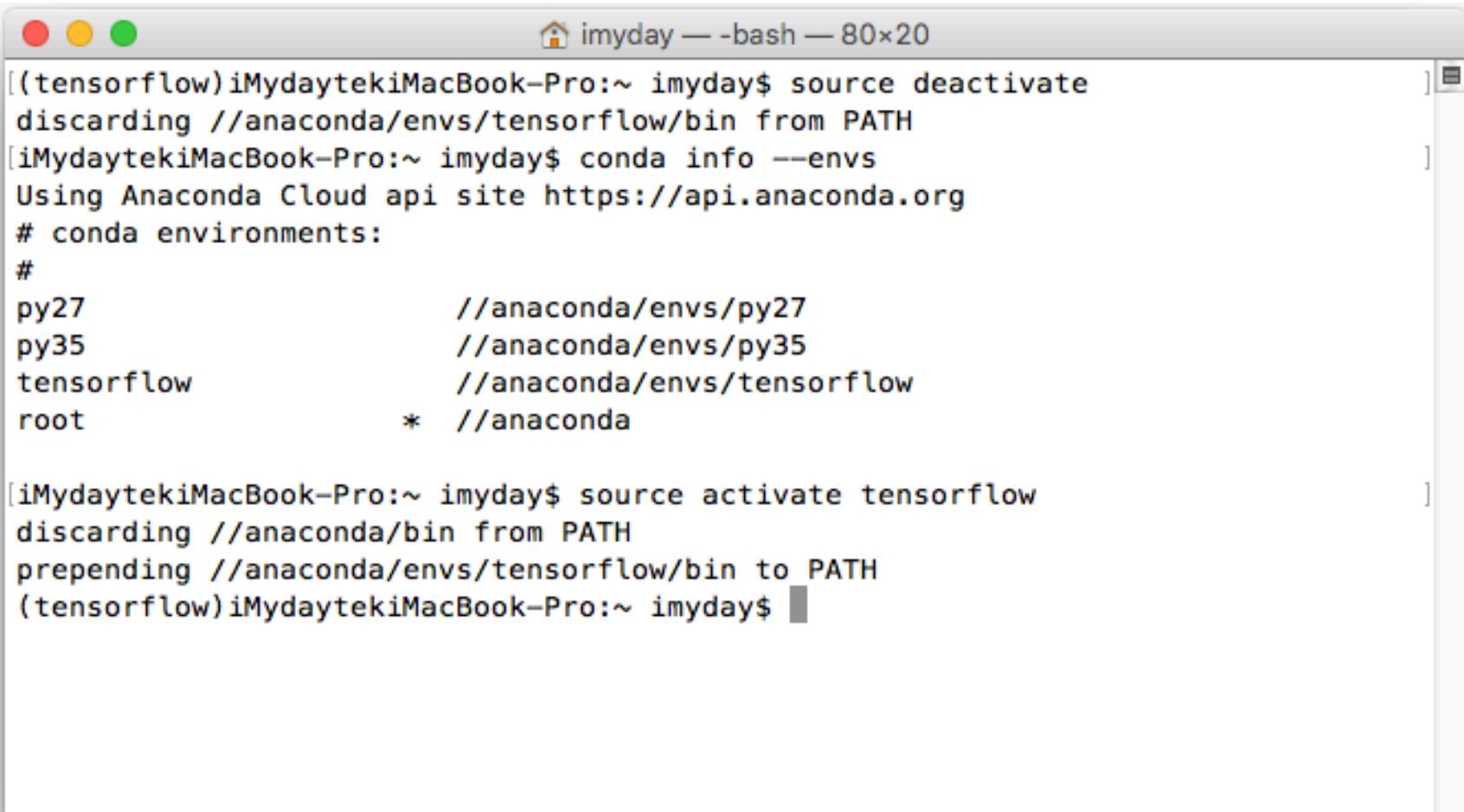
```
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ conda info --envs
Using Anaconda Cloud api site https://api.anaconda.org
# conda environments:
#
py27          //anaconda/envs/py27
py35          //anaconda/envs/py35
tensorflow    * //anaconda/envs/tensorflow
root          //anaconda

(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ conda --version
conda 4.0.5
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ python --version
Python 2.7.11 :: Continuum Analytics, Inc.
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$
```

source deactivate

conda info --envs

source activate tensorflow



```
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ source deactivate
discarding //anaconda/envs/tensorflow/bin from PATH
[iMydaytekiMacBook-Pro:~ imyday$ conda info --envs
Using Anaconda Cloud api site https://api.anaconda.org
# conda environments:
#
py27                  //anaconda/envs/py27
py35                  //anaconda/envs/py35
tensorflow            //anaconda/envs/tensorflow
root                  * //anaconda

[iMydaytekiMacBook-Pro:~ imyday$ source activate tensorflow
discarding //anaconda/bin from PATH
prependng //anaconda/envs/tensorflow/bin to PATH
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$
```

```
$ python  
...  
=>> import tensorflow as tf  
=>> hello = tf.constant('Hello, TensorFlow!')  
=>> sess = tf.Session()  
=>> print(sess.run(hello))  
Hello, TensorFlow!
```

The screenshot shows a Mac OS X terminal window with a light gray background and dark gray borders. The title bar reads "imyday — python — 80x16". The window contains the following text:

```
[tensorflow] iMydaytekiMacBook-Pro:~ imyday$ python  
Python 2.7.11 |Continuum Analytics, Inc.| (default, Dec 6 2015, 18:57:58)  
[GCC 4.2.1 (Apple Inc. build 5577)] on darwin  
Type "help", "copyright", "credits" or "license" for more information.  
Anaconda is brought to you by Continuum Analytics.  
Please check out: http://continuum.io/thanks and https://anaconda.org  
=>>> import tensorflow as tf  
=>>> hello = tf.constant('Hello, TensorFlow!')  
=>>> sess = tf.Session()  
=>>> print(sess.run(hello))  
Hello, TensorFlow!  
=>>> a = tf.constant(10)  
=>>> b = tf.constant(32)  
=>>> print(sess.run(a + b))  
42  
=>>>
```

```
$ python
>>> import tensorflow as tf
>>> hello = tf.constant('Hello TensorFlow')
>>> sess = tf.Session()
>>> sess.run(hello)
'Hello TensorFlow'
>>> exit()
$
```

```
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ python
Python 2.7.11 |Continuum Analytics, Inc.| (default, Dec  6 2015, 18:57:58)
[GCC 4.2.1 (Apple Inc. build 5577)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
Anaconda is brought to you by Continuum Analytics.
Please check out: http://continuum.io/thanks and https://anaconda.org
[>>> import tensorflow as tf
[>>> hello = tf.constant('Hello TensorFlow')
[>>> sess = tf.Session()
[>>> sess.run(hello)
['Hello TensorFlow'
[>>> exit()
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$
```

conda list

```
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ conda list
# packages in environment at //anaconda/envs/tensorflow:
#
numpy                  1.11.0          <pip>
openssl                1.0.2h           0
pip                    8.1.1          py27_1
protobuf               3.0.0b2          <pip>
python                 2.7.11           0
readline                6.2              2
setuptools              20.7.0          py27_0
six                     1.10.0          <pip>
sqlite                  3.9.2             0
tensorflow              0.8.0          <pip>
tk                      8.5.18           0
wheel                   0.29.0          py27_0
zlib                    1.2.8             0
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$
```

pip install ipython

```
iMyday — bash — 80x20
(tensorflow)iMyday@iMyday-MacBook-Pro:~ imyday$ pip install ipython
Collecting ipython
  Downloading ipython-4.2.0-py2-none-any.whl (736kB)
    100% |████████████████████████████████| 737kB 191kB/s
Collecting traitlets (from ipython)
  Downloading traitlets-4.2.1-py2.py3-none-any.whl (67kB)
    100% |███████████████████████████████| 71kB 315kB/s
Collecting pickleshare (from ipython)
  Downloading pickleshare-0.7.2-py2.py3-none-any.whl
Collecting simplegeneric>0.8 (from ipython)
  Downloading simplegeneric-0.8.1.zip
Collecting backports.shutil_get_terminal_size (from ipython)
  Downloading backports.shutil_get_terminal_size-1.0.0-py2.py3-none-any.whl
Collecting decorator (from ipython)
  Downloading decorator-4.0.9-py2.py3-none-any.whl
Requirement already satisfied (use --upgrade to upgrade): setuptools>=18.5 in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython)
Collecting gnureadline (from ipython)
  Downloading gnureadline-6.3.3-cp27-none-macosx_10_9_x86_64.whl (132kB)
    100% |███████████████████████████████| 133kB 155kB/s
```

conda list

```
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ conda list
# packages in environment at //anaconda/envs/tensorflow:
#
appnope          0.1.0           <pip>
backports.shutil-get-terminal-size 1.0.0      <pip>
decorator        4.0.9           <pip>
gnureadline     6.3.3           <pip>
ipython          4.2.0           <pip>
ipython-genutils 0.1.0           <pip>
numpy            1.11.0          <pip>
openssl          1.0.2h          0
pathlib2         2.1.0           <pip>
pexpect          4.0.1           <pip>
pickleshare      0.7.2           <pip>
pip              8.1.1           py27_1
protobuf         3.0.0b2          <pip>
ptyprocess       0.5.1           <pip>
python           2.7.11          0
readline         6.2              2
setuptools       20.7.0          py27_0
simplegeneric    0.8.1           <pip>
six              1.10.0          <pip>
sqlite           3.9.2           0
tensorflow        0.8.0           <pip>
tk                8.5.18          0
traitlets        4.2.1           <pip>
wheel            0.29.0          py27_0
zlib             1.2.8           0
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$
```

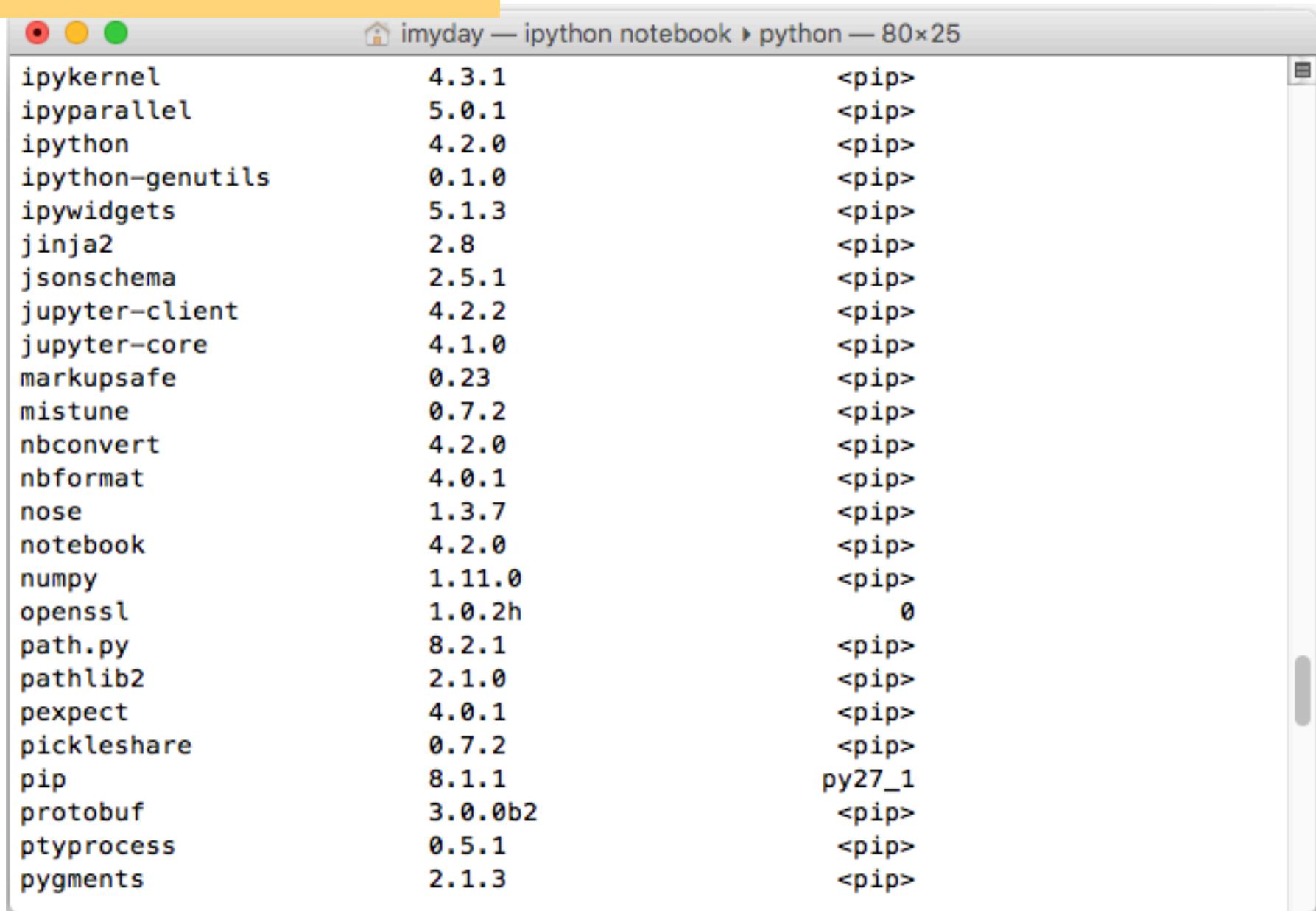
pip install ipython[all]

```
iMyday — ipython notebook ▶ python — 80×25
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ pip install ipython[all]
Requirement already satisfied (use --upgrade to upgrade): ipython[all] in /anaconda/envs/tensorflow/lib/python2.7/site-packages
Requirement already satisfied (use --upgrade to upgrade): traitlets in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython[all])
Requirement already satisfied (use --upgrade to upgrade): pickleshare in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython[all])
Requirement already satisfied (use --upgrade to upgrade): simplegeneric>0.8 in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython[all])
Requirement already satisfied (use --upgrade to upgrade): backports.shutil-get-terminal-size in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython[all])
Requirement already satisfied (use --upgrade to upgrade): decorator in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython[all])
Requirement already satisfied (use --upgrade to upgrade): setuptools>=18.5 in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython[all])
Requirement already satisfied (use --upgrade to upgrade): gnureadline in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython[all])
Requirement already satisfied (use --upgrade to upgrade): appnope in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython[all])
Requirement already satisfied (use --upgrade to upgrade): pexpect in /anaconda/envs/tensorflow/lib/python2.7/site-packages (from ipython[all])
Collecting nose>=0.10.1 (from ipython[all])
  Downloading nose-1.3.7-py2-none-any.whl (154kB)
    100% |████████████████████████████████| 163kB 62kB/s
```

conda list

```
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ conda list
# packages in environment at //anaconda/envs/tensorflow:
#
alabaster          0.7.7            <pip>
appnope             0.1.0            <pip>
babel               2.3.4            <pip>
backports-abc       0.4              <pip>
backports.shutil-get-terminal-size 1.0.0           <pip>
backports.ssl-match-hostname 3.5.0.1           <pip>
certifi              2016.2.28        <pip>
configparser         3.3.0.post2      <pip>
decorator             4.0.9            <pip>
docutils              0.12             <pip>
entrypoints          0.2.1             <pip>
functools32          3.2.3.post2      <pip>
futures              3.0.5             <pip>
gnureadline          6.3.3             <pip>
imagesize             0.7.1             <pip>
ipykernel             4.3.1             <pip>
ipyparallel          5.0.1             <pip>
ipython              4.2.0             <pip>
ipython-genutils     0.1.0             <pip>
ipywidgets            5.1.3             <pip>
jinja2                 2.8              <pip>
jsonschema            2.5.1             <pip>
```

conda list



A screenshot of a Mac OS X terminal window titled "imyday — ipython notebook ▶ python — 80×25". The window contains the output of the "conda list" command, displaying a list of Python packages and their versions. The packages listed include: ipykernel (4.3.1), ipyparallel (5.0.1), ipython (4.2.0), ipython-genutils (0.1.0), ipywidgets (5.1.3), jinja2 (2.8), jsonschema (2.5.1), jupyter-client (4.2.2), jupyter-core (4.1.0), markupsafe (0.23), mistune (0.7.2), nbconvert (4.2.0), nbformat (4.0.1), nose (1.3.7), notebook (4.2.0), numpy (1.11.0), openssl (1.0.2h), path.py (8.2.1), pathlib2 (2.1.0), pexpect (4.0.1), pickleshare (0.7.2), pip (8.1.1), protobuf (3.0.0b2), ptyprocess (0.5.1), and pygments (2.1.3). The package "openssl" has a version of "0". The "pip" package is listed with the channel "py27_1". All other packages are listed with the source "[<pip>](#)".

ipykernel	4.3.1	<pip>
ipyparallel	5.0.1	<pip>
ipython	4.2.0	<pip>
ipython-genutils	0.1.0	<pip>
ipywidgets	5.1.3	<pip>
jinja2	2.8	<pip>
jsonschema	2.5.1	<pip>
jupyter-client	4.2.2	<pip>
jupyter-core	4.1.0	<pip>
markupsafe	0.23	<pip>
mistune	0.7.2	<pip>
nbconvert	4.2.0	<pip>
nbformat	4.0.1	<pip>
nose	1.3.7	<pip>
notebook	4.2.0	<pip>
numpy	1.11.0	<pip>
openssl	1.0.2h	0
path.py	8.2.1	<pip>
pathlib2	2.1.0	<pip>
pexpect	4.0.1	<pip>
pickleshare	0.7.2	<pip>
pip	8.1.1	py27_1
protobuf	3.0.0b2	<pip>
ptyprocess	0.5.1	<pip>
pygments	2.1.3	<pip>

ipython notebook

```
imyday — ipython notebook ▶ python — 80x25
simplegeneric      0.8.1          <pip>
singledispatch     3.4.0.3        <pip>
six                1.10.0         <pip>
snowballstemmer    1.2.1          <pip>
sphinx             1.4.1          <pip>
sqlite              3.9.2          0
tensorflow          0.8.0          <pip>
terminado          0.6            <pip>
testpath            0.3            <pip>
tk                  8.5.18          0
tornado             4.3            <pip>
traitlets           4.2.1          <pip>
wheel               0.29.0         py27_0
widgetsnbextension  1.2.2          <pip>
zlib                1.2.8          0
(tensorflow)iMydaytekiMacBook-Pro:~ imyday$ ipython notebook
[TerminalIPythonApp] WARNING | Subcommand `ipython notebook` is deprecated and w
ill be removed in future versions.
[TerminalIPythonApp] WARNING | You likely want to use `jupyter notebook` in the
future
//anaconda/envs/tensorflow/lib/python2.7/site-packages/widgetsnbextension/__init
__.py:30: UserWarning: To use the jupyter-js-widgets nbextension, you'll need to
update
    the Jupyter notebook to version 4.2 or later.
    the Jupyter notebook to version 4.2 or later."""")
```

```
import tensorflow as tf
hello = tf.constant('Hello TensorFlow')
sess = tf.Session()
print(sess.run(hello))
```

C localhost:8889/notebooks/SCDBA/DeepLearningTensorFlow1.ipynb

jupyter DeepLearningTensorFlow1 (autosaved)



File Edit View Insert Cell Kernel Help

Python 2



```
In [1]: import tensorflow as tf
hello = tf.constant('Hello TensorFlow')
sess = tf.Session()
print(sess.run(hello))
```

Hello TensorFlow

```
In [2]: a = tf.constant(10)
b = tf.constant(32)
c = sess.run(a+b)
print(c)
```

42

```
a = tf.constant(10)
b = tf.constant(32)
c = sess.run(a+b)
print(c)
```

TensorFlow Example

```
import tensorflow as tf
import numpy as np

# Create 100 phony x, y data points in NumPy, y = x * 0.1 + 0.3
x_data = np.random.rand(100).astype(np.float32)
y_data = x_data * 0.1 + 0.3

# Try to find values for W and b that compute y_data = W * x_data + b
# (We know that W should be 0.1 and b 0.3, but Tensorflow will
# figure that out for us.)
W = tf.Variable(tf.random_uniform([1], -1.0, 1.0))
b = tf.Variable(tf.zeros([1]))
y = W * x_data + b

# Minimize the mean squared errors.
loss = tf.reduce_mean(tf.square(y - y_data))
optimizer = tf.train.GradientDescentOptimizer(0.5)
train = optimizer.minimize(loss)

# Before starting, initialize the variables. We will 'run' this first.
init = tf.initialize_all_variables()

# Launch the graph.
sess = tf.Session()
sess.run(init)

# Fit the line.
for step in xrange(201):
    sess.run(train)
    if step % 20 == 0:
        print(step, sess.run(W), sess.run(b))

# Learns best fit is W: [0.1], b: [0.3]
```

TensorFlow Example

```
import tensorflow as tf
import numpy as np

# Create 100 phony x, y data points in NumPy, y = x * 0.1 + 0.3
x_data = np.random.rand(100).astype(np.float32)
y_data = x_data * 0.1 + 0.3

# Try to find values for W and b that compute y_data = W * x_data + b
# (We know that W should be 0.1 and b 0.3, but Tensorflow will
# figure that out for us.)
W = tf.Variable(tf.random_uniform([1], -1.0, 1.0))
b = tf.Variable(tf.zeros([1]))
y = W * x_data + b

# Minimize the mean squared errors.
loss = tf.reduce_mean(tf.square(y - y_data))
optimizer = tf.train.GradientDescentOptimizer(0.5)
train = optimizer.minimize(loss)

# Before starting, initialize the variables. We will 'run' this first.
init = tf.initialize_all_variables()

# Launch the graph.
sess = tf.Session()
sess.run(init)

# Fit the line.
for step in xrange(201):
    sess.run(train)
    if step % 20 == 0:
        print(step, sess.run(W), sess.run(b))

# Learns best fit is W: [0.1], b: [0.3]
```

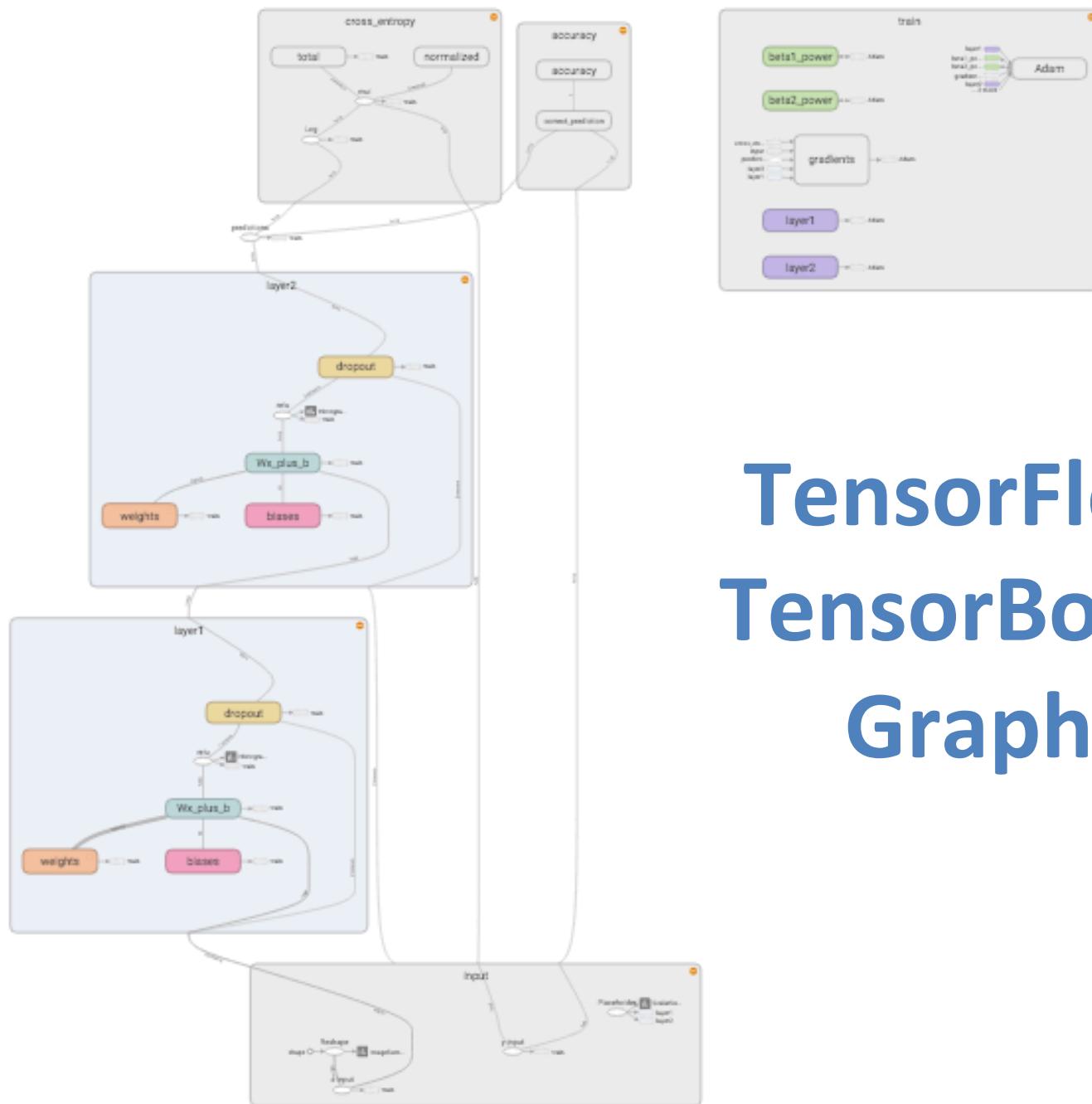
TensorFlow Example

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```

```
(0, array([-0.07500112], dtype=float32), array([ 0.54339123], dtype=float32))
(20, array([ 0.05152683], dtype=float32), array([ 0.32598534], dtype=float32))
(40, array([ 0.09009784], dtype=float32), array([ 0.30530834], dtype=float32))
(60, array([ 0.09797716], dtype=float32), array([ 0.3010844], dtype=float32))
(80, array([ 0.09958676], dtype=float32), array([ 0.30022153], dtype=float32))
(100, array([ 0.09991558], dtype=float32), array([ 0.30004525], dtype=float32))
(120, array([ 0.09998275], dtype=float32), array([ 0.30000925], dtype=float32))
(140, array([ 0.09999647], dtype=float32), array([ 0.30000189], dtype=float32))
(160, array([ 0.09999929], dtype=float32), array([ 0.3000004], dtype=float32))
(180, array([ 0.09999986], dtype=float32), array([ 0.3000001], dtype=float32))
(200, array([ 0.0999999], dtype=float32), array([ 0.30000007], dtype=float32))
```



TensorFlow TensorBoard Graphs

TensorFlow Example

MNIST Softmax

```
from __future__ import absolute_import
from __future__ import division
from __future__ import print_function

# Import data
from tensorflow.examples.tutorials.mnist import input_data

import tensorflow as tf

flags = tf.app.flags
FLAGS = flags.FLAGS
flags.DEFINE_string('data_dir', '/tmp/data/', 'Directory for storing data')

mnist = input_data.read_data_sets(FLAGS.data_dir, one_hot=True)

sess = tf.InteractiveSession()

# Create the model
x = tf.placeholder(tf.float32, [None, 784])
W = tf.Variable(tf.zeros([784, 10]))
b = tf.Variable(tf.zeros([10]))
y = tf.nn.softmax(tf.matmul(x, W) + b)

# Define loss and optimizer
y_ = tf.placeholder(tf.float32, [None, 10])
cross_entropy = tf.reduce_mean(-tf.reduce_sum(y_ * tf.log(y), reduction_indices=[1]))
train_step = tf.train.GradientDescentOptimizer(0.5).minimize(cross_entropy)

# Train
tf.initialize_all_variables().run()
for i in range(1000):
    batch_xs, batch_ys = mnist.train.next_batch(100)
    train_step.run({x: batch_xs, y_: batch_ys})

# Test trained model
correct_prediction = tf.equal(tf.argmax(y, 1), tf.argmax(y_, 1))
accuracy = tf.reduce_mean(tf.cast(correct_prediction, tf.float32))
print(accuracy.eval({x: mnist.test.images, y_: mnist.test.labels}))
```

TensorFlow Example MNIST Softmax

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TensorFlow Example MNIST Softmax

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```

Extracting /tmp/data/train-images-idx3-ubyte.gz

Extracting /tmp/data/train-labels-idx1-ubyte.gz

Extracting /tmp/data/t10k-images-idx3-ubyte.gz

Extracting /tmp/data/t10k-labels-idx1-ubyte.gz

0.9179

TensorFlow

Deep MNIST for Experts

```

from __future__ import absolute_import
from __future__ import division
from __future__ import print_function

import gzip
import os
import tempfile

import numpy
from six.moves import urllib
from six.moves import xrange # pylint: disable=redefined-builtin
import tensorflow as tf
from tensorflow.contrib.learn.python.learn.datasets.mnist import read_data_sets

def weight_variable(shape):
    initial = tf.truncated_normal(shape, stddev=0.1)
    return tf.Variable(initial)

def bias_variable(shape):
    initial = tf.constant(0.1, shape=shape)
    return tf.Variable(initial)

def conv2d(x, W):
    return tf.nn.conv2d(x, W, strides=[1, 1, 1, 1], padding='SAME')

def max_pool_2x2(x):
    return tf.nn.max_pool(x, ksize=[1, 2, 2, 1],
                          strides=[1, 2, 2, 1], padding='SAME')

W_conv1 = weight_variable([5, 5, 1, 32])
b_conv1 = bias_variable([32])

x_image = tf.reshape(x, [-1, 28, 28, 1])

h_conv1 = tf.nn.relu(conv2d(x_image, W_conv1) + b_conv1)
h_pool1 = max_pool_2x2(h_conv1)

W_conv2 = weight_variable([5, 5, 32, 64])
b_conv2 = bias_variable([64])

h_conv2 = tf.nn.relu(conv2d(h_pool1, W_conv2) + b_conv2)
h_pool2 = max_pool_2x2(h_conv2)

W_fc1 = weight_variable([7 * 7 * 64, 1024])
b_fc1 = bias_variable([1024])

h_pool2_flat = tf.reshape(h_pool2, [-1, 7*7*64])
h_fc1 = tf.nn.relu(tf.matmul(h_pool2_flat, W_fc1) + b_fc1)

keep_prob = tf.placeholder(tf.float32)
h_fc1_drop = tf.nn.dropout(h_fc1, keep_prob)

W_fc2 = weight_variable([1024, 10])
b_fc2 = bias_variable([10])

y_conv = tf.nn.softmax(tf.matmul(h_fc1_drop, W_fc2) + b_fc2)

cross_entropy = tf.reduce_mean(-tf.reduce_sum(y_ * tf.log(y_conv), reduction_indices=[1]))
train_step = tf.train.AdamOptimizer(1e-4).minimize(cross_entropy)
correct_prediction = tf.equal(tf.argmax(y_conv, 1), tf.argmax(y_, 1))
accuracy = tf.reduce_mean(tf.cast(correct_prediction, tf.float32))
sess.run(tf.initialize_all_variables())
for i in range(20000):
    batch = mnist.train.next_batch(50)
    if i%100 == 0:
        train_accuracy = accuracy.eval(feed_dict={
            x:batch[0], y_: batch[1], keep_prob: 1.0})
        print("step %d, training accuracy %g" % (i, train_accuracy))
    train_step.run(feed_dict={x: batch[0], y_: batch[1], keep_prob: 0.5})

print("test accuracy %g" % accuracy.eval(feed_dict={
    x: mnist.test.images, y_: mnist.test.labels, keep_prob: 1.0}))

```

TensorFlow Deep MNIST for Experts

```
from __future__ import absolute_import
from __future__ import division
from __future__ import print_function

import gzip
import os
import tempfile

import numpy
from six.moves import urllib
from six.moves import xrange # pylint: disable=redefined-builtin
import tensorflow as tf
from tensorflow.contrib.learn.python.learn.datasets.mnist import read_data_sets

def weight_variable(shape):
    initial = tf.truncated_normal(shape, stddev=0.1)
    return tf.Variable(initial)

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```

TensorFlow Deep MNIST for Experts

```
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h_pool1 = max_pool_2x2(h_conv1)

W_conv2 = weight_variable([5, 5, 32, 64])
b_conv2 = bias_variable([64])

h_conv2 = tf.nn.relu(conv2d(h_pool1, W_conv2) + b_conv2)
h_pool2 = max_pool_2x2(h_conv2)

W_fc1 = weight_variable([7 * 7 * 64, 1024])
b_fc1 = bias_variable([1024])

h_pool2_flat = tf.reshape(h_pool2, [-1, 7*7*64])
h_fc1 = tf.nn.relu(tf.matmul(h_pool2_flat, W_fc1) + b_fc1)

keep_prob = tf.placeholder(tf.float32)
h_fc1_drop = tf.nn.dropout(h_fc1, keep_prob)

W_fc2 = weight_variable([1024, 10])
b_fc2 = bias_variable([10])

y_conv = tf.nn.softmax(tf.matmul(h_fc1_drop, W_fc2) + b_fc2)
```

TensorFlow Deep MNIST for Experts

```
cross_entropy = tf.reduce_mean(-tf.reduce_sum(y_ * tf.log(y_conv), reduction_indices=[1]))
train_step = tf.train.AdamOptimizer(1e-4).minimize(cross_entropy)
correct_prediction = tf.equal(tf.argmax(y_conv,1), tf.argmax(y_,1))
accuracy = tf.reduce_mean(tf.cast(correct_prediction, tf.float32))
sess.run(tf.initialize_all_variables())
for i in range(20000):
    batch = mnist.train.next_batch(50)
    if i%100 == 0:
        train_accuracy = accuracy.eval(feed_dict={
            x:batch[0], y_: batch[1], keep_prob: 1.0})
        print("step %d, training accuracy %g"%(i, train_accuracy))
    train_step.run(feed_dict={x: batch[0], y_: batch[1], keep_prob: 0.5})

print("test accuracy %g"%accuracy.eval(feed_dict={
    x: mnist.test.images, y_: mnist.test.labels, keep_prob: 1.0}))
```

TensorFlow Deep MNIST for Experts

```
step 0, training accuracy 0.06
step 100, training accuracy 0.7
step 200, training accuracy 0.94
step 300, training accuracy 0.94
step 400, training accuracy 0.94
step 500, training accuracy 0.92
step 600, training accuracy 0.88
step 700, training accuracy 0.94
step 800, training accuracy 0.96
step 900, training accuracy 0.94
step 1000, training accuracy 0.92
step 1100, training accuracy 0.98
step 1200, training accuracy 0.92
step 1300, training accuracy 0.96
step 1400, training accuracy 0.98
step 1500, training accuracy 0.98
step 1600, training accuracy 0.9
step 1700, training accuracy 0.94
step 1800, training accuracy 0.98
step 1900, training accuracy 0.92
step 2000, training accuracy 1
step 2100, training accuracy 0.96
step 2200, training accuracy 1
step 2300, training accuracy 1
step 2400, training accuracy 0.98
step 2500, training accuracy 0.94
step 2600, training accuracy 0.98
step 2700, training accuracy 1
step 2800, training accuracy 0.94
step 2900, training accuracy 0.98
step 3000, training accuracy 0.98
```

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<http://www.wsdm-conference.org/2016/slides/WSDM2016-Jeff-Dean.pdf>
- Deep Learning Basics: Neural Networks Demystified,
[https://www.youtube.com/playlist?
list=PLiaHhY2iBX9hdHaRr6b7XevZtgZRa1PoU](https://www.youtube.com/playlist?list=PLiaHhY2iBX9hdHaRr6b7XevZtgZRa1PoU)
- Deep Learning SIMPLIFIED,
[https://www.youtube.com/playlist?
list=PLjJh1vlSEYgvGod9wWiydumYl8hOXixNu](https://www.youtube.com/playlist?list=PLjJh1vlSEYgvGod9wWiydumYl8hOXixNu)
- Theano: <http://deeplearning.net/software/theano/>
- Keras: <http://keras.io/>