

# **Machine Learning Using Tensorflow**

## **Week1: Introduction to Machine Learning**

Shu-Ting Pi, PhD  
UC Davis



# Goals of this course

## Prerequisites of this course:

familiar with Python, but new to machine learning (ML)

## Philosophy of this course:

- Not to make you an “expert” on ML.
- Just to make you an “user” of ML to solve problems
- Will not cover too many theories about ML.
- Only basic concepts will be introduced.

## Course designed:

- Discuss a few topics of ML every week.
- Discuss a code implementation every week.

# How do human learn?



Features !



Features !



Features !

# Types of machine learning

## Supervised learning:

All data are labeled, answers can be compared

Suitable for “regression, classification”

## Unsupervised learning:

Data are not labeled, features are collected by machine

Suitable for “clustering”

## Reinforcement learning:

Between supervised and unsupervised: state, action, reward

Suitable for “decision”

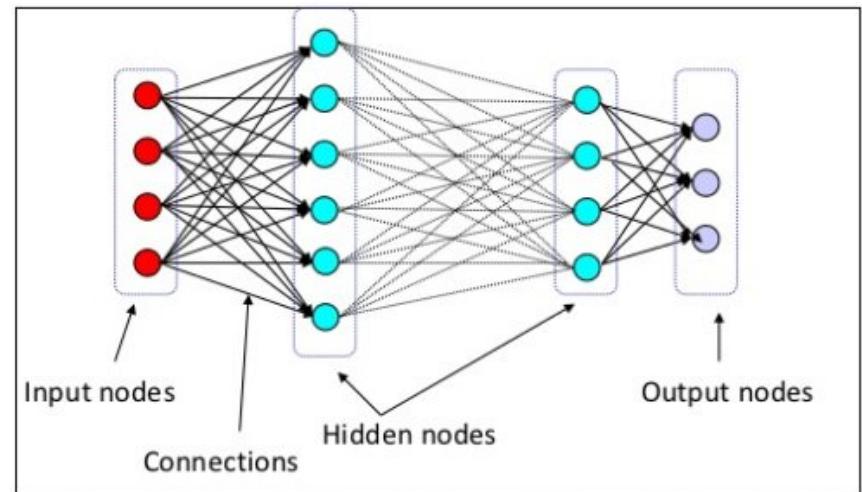
# What is deep learning?

Deep learning <-> artificial neural network

Human neural network



Artificial neural network



Two key features:  
“multilayer” and “non-linear”  
(will explain in the future)

# Resources of machine learning

## Theoretical courses:

Yaser Abu-Mostafa@ Caltech CS156:

<https://goo.gl/uekMp6>

林軒田 @ NTU

<http://www.csie.ntu.edu.tw/~htlin/mooc/>

## Balance:

Andrwe Ng @ Stanford

<https://goo.gl/Cfxco>

## Implementation:

Movan @ Youtuber

<https://morvanzhou.github.io/>

# Frameworks of machine learning

## Caffe, Caffe2 (C++, Python, Matlab):

UC Berkeley develop, Light weight, facebook support

## DeepLearning4J (Java):

Skymind develop, super good documentation

## CNTK (Python, C++, BrainScript):

Microsoft develop

## Theano (Python):

U of Montreal, Most popular in academy, similar to Tensorflow

## Torch, Pytorch (Lua, Python):

Facebook, Twitter,...,etc. Could be the fastest

# Frameworks of machine learning

## Tensorflow (Python, C++):

Google developed, most popular in AI

## Keras (Python):

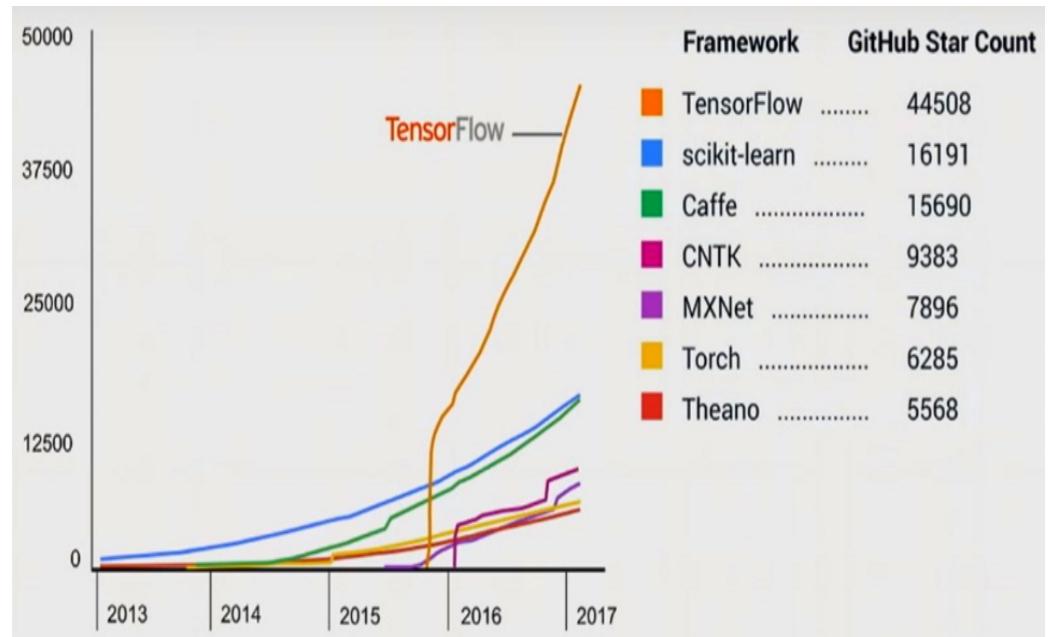
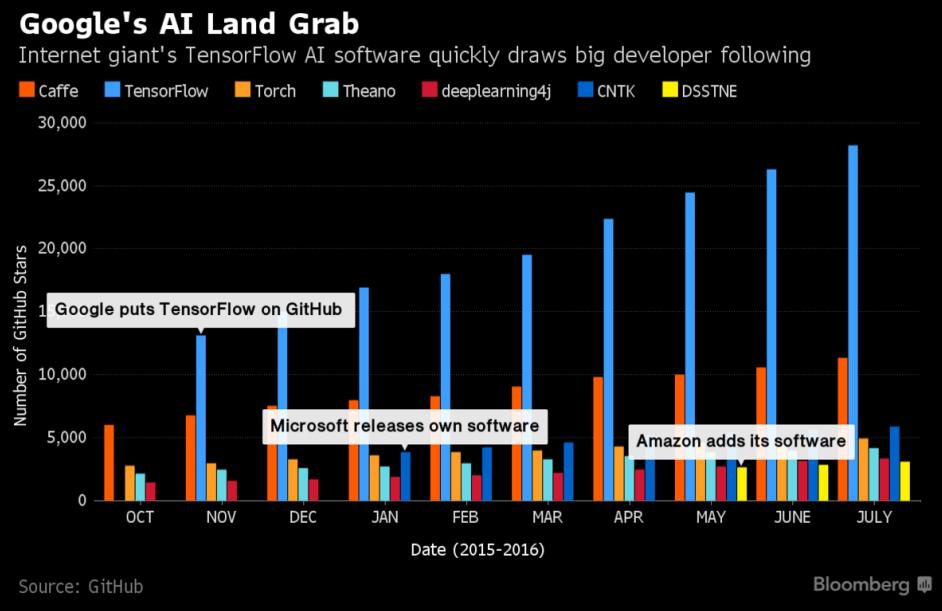
Repacking of Tensorflow, CNTK, Theano, Much easier than Tensorflow

## Scikit-learn (Python):

Collection of several ML algorithm, much easier to use, update frequently

**Above three libraries will be our main tools to explore ML!**

# Why do we choose Tensorflow?



Except Tensorflow, we will also focus on sklearn & Keras

# What is Tensorflow?

**Developed by Google:**

Voice, Gmail, Photos, Alpha Go,...,etc.

**Hardware:**

CPU and GPU, automatically balanced

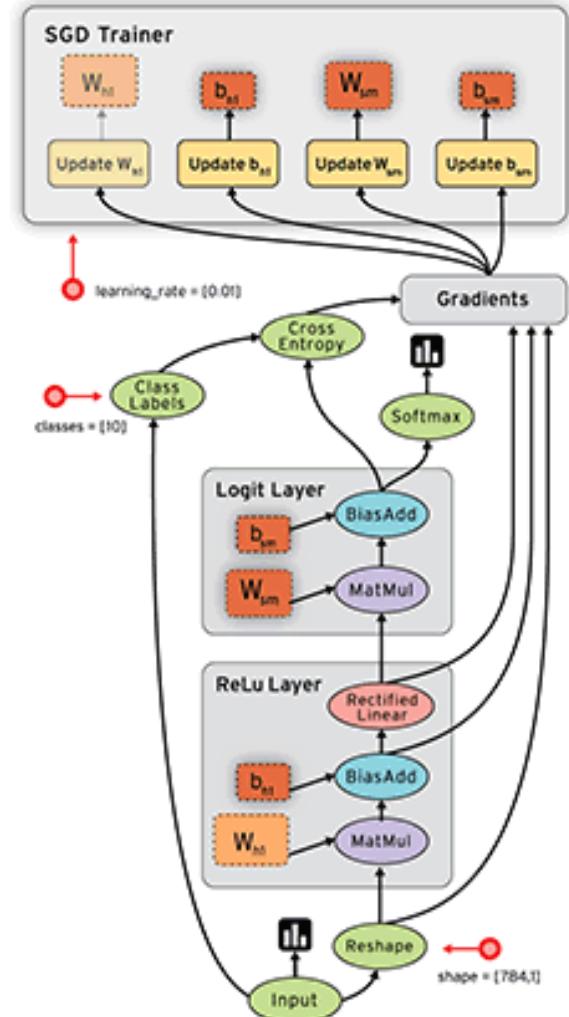
**Computation Graph:**

Users design computation graph

Tensorflow handles all the others

**Rich algorithms:**

Most popular ML algorithms are included.



# Package to install

## Anaconda:

Best and well-maintained python distribution

## Protocol Buffer:

Google's data record tool. Needed for Tfrecord.

## Bazel:

Google's Makefile, needed if compile TF from source code.

## Tensorflow, scikit-learn, Keras:

ML tools used in this courses.

# In-Class Exercise

```
1  """
2  this is not a real python code. this document
3  just a quick summary about some packages that you
4  should install in our class.
5  """
6  1. anaconda: (please install python 3.x)
7  https://docs.anaconda.com/anaconda/install/
8
9  2. tensorflow (required):
10 https://www.tensorflow.org/install/
11 GPU version is more complicated, so recommend CPU first.
12
13 pip install --upgrade tensorflow
14
15 * you can also intall through anaconda, Docker, or source codes.
16
17 3. Keras (required):
18 https://keras.io/
19
20 pip install keras
21
22 4. scikit learn (required):
23 http://scikit-learn.org/stable/
24
25 pip install -U scikit-learn
26
27 5. Protocol Buffer (optional)
28 https://developers.google.com/protocol-buffers/
29 A google version of XML or JSON (data structure)
30
31 6. Bazel (optional)
32 https://bazel.build/
33 A google version of Makefile
```