

Machine Learning Using Tensorflow

Week1: Introduction to Machine Learning

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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 design

- 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”

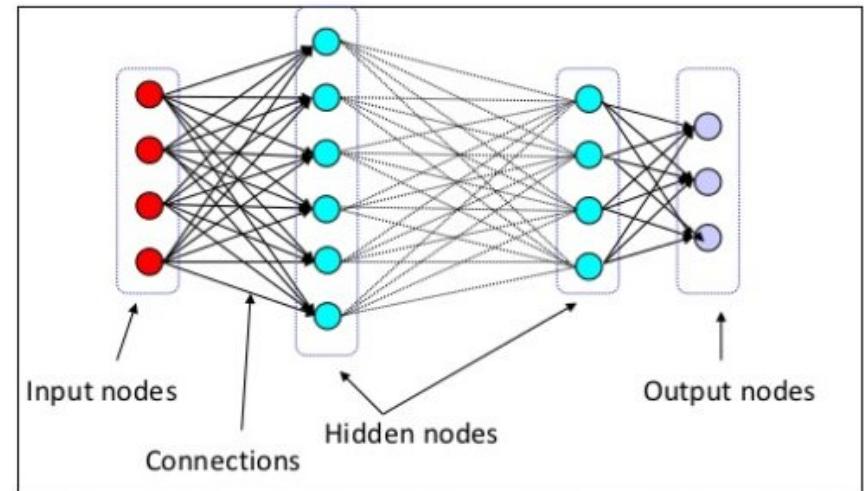
What is deep learning?

Deep learning <-> artificial neural network

Human neural network



Artificial neural network

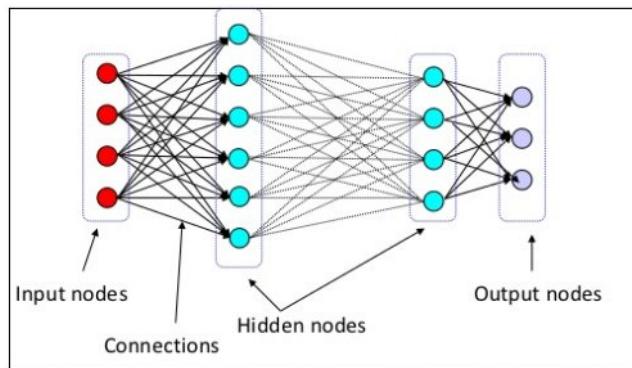


Two key features:
“multilayer” and “non-linear”
(will explain in the future)

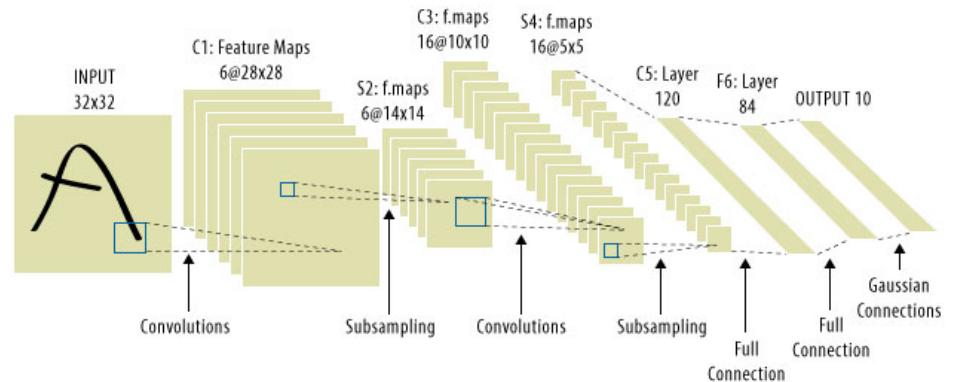
One concept:
Representing data using different ways
and eventually extract the features

Examples of Deep Learning

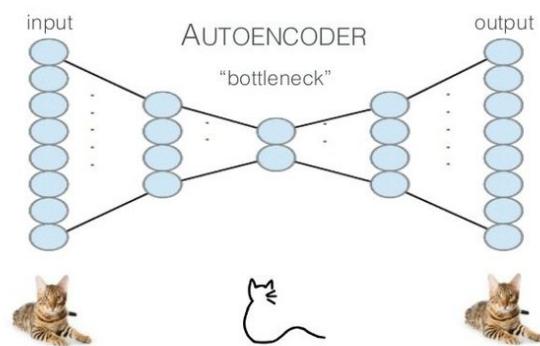
Fully connected NN



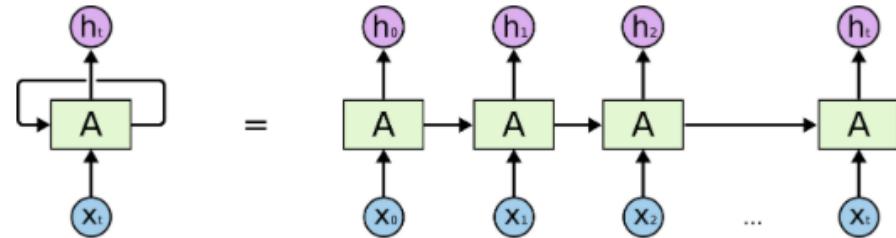
Convolution NN



Autoencoder NN



Recurrent NN



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):

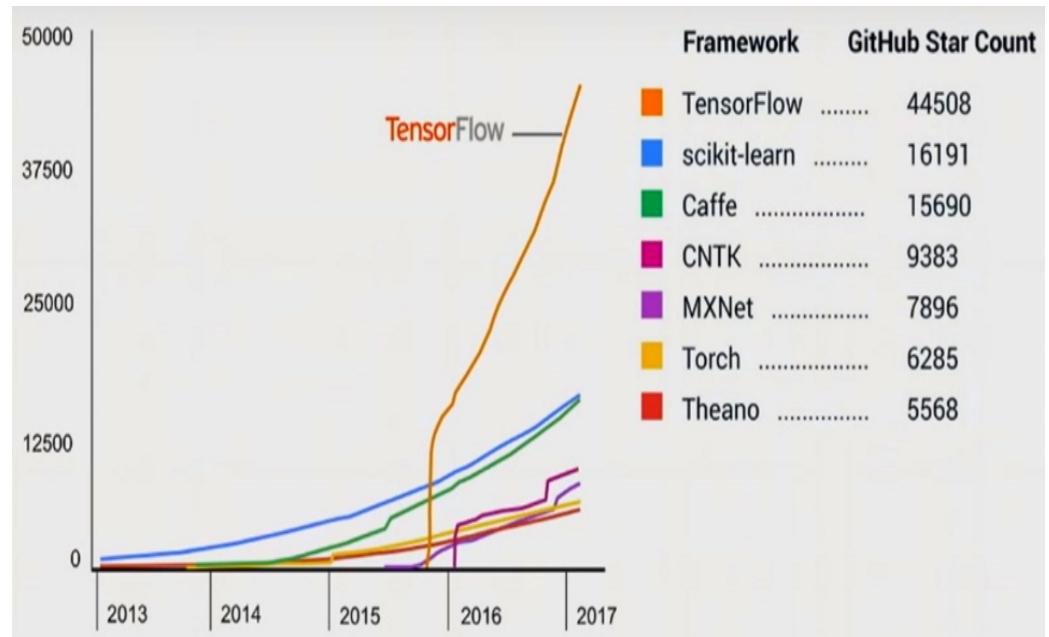
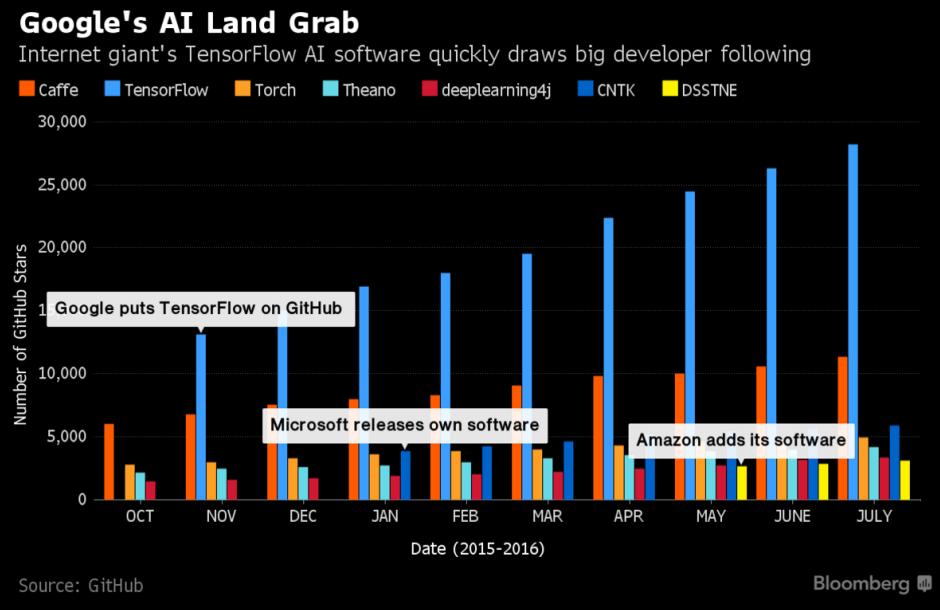
Encapsulation of Tensorflow, CNTK, Theano, Much easier than Tensorflow

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

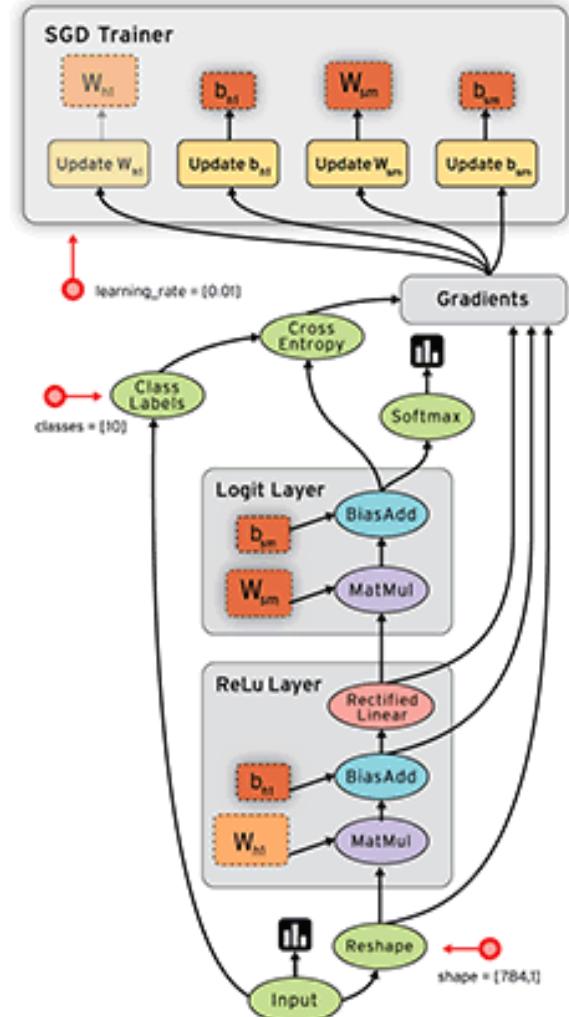
Computation Graph:

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
```