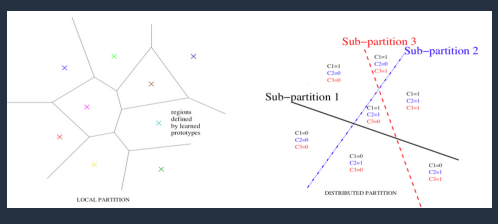
Author: Harry Wang

HOW TO STUDY DEEP LEARNING
THE PROCESS

STEP ONE

Fundamentals of Machine Learning



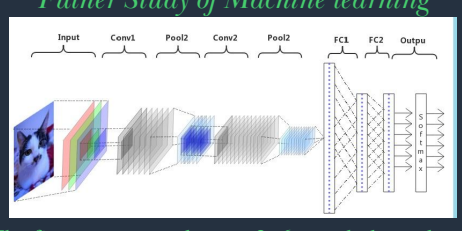
I recommends reading the NIPS 2015 in-depth learning tutorial provided by Geoff Hinton, Yoshua Bengio and Yann Lecun, with less introduction.

Note: Basic Programming knowledge and Calculus is required

Learn Each Part Seperately!
Deep Learning(DL) belongs to machine learning, while convolutional neural network, DBN, and stacked auto-encoder network are some models in DL

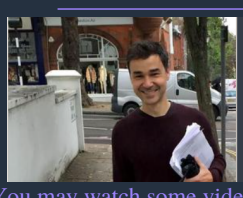
STEP TWO

Futher Study of Machine learning



The first step may take you 3~6 month depends on how well your math and computer science are, after you've understood the basic concepts of machine learning, you can start to study some formulas and ideas of deep learning now.

STEP THREE



Nando de Freitas
Professor of Computer Science
Fellow, Linacre College
Leaving date: 5th April 2017

You may watch some videos at this step, and here are som suggestions:

- Deep learning at Oxford 2015 Professor Nando de Freitas explains the basic knowledge. If you are already familiar with neural networks and want to go deeper, you may start with Lecture 9.
- Neural Networks Class by Hugo Larochelle
- Neural networks for machine learning Geoffrey Hinton's course in Coursera. Hinton is an excellent researcher. They showed the use of generalized back propagation algorithm, which is very important to the development of deep learning.

$$PE_{(pos,2i)} = sin(pos/10000^{2i/d_{\text{model}}})$$
$$PE_{(pos,2i+1)} = cos(pos/10000^{2i/d_{\text{model}}})$$

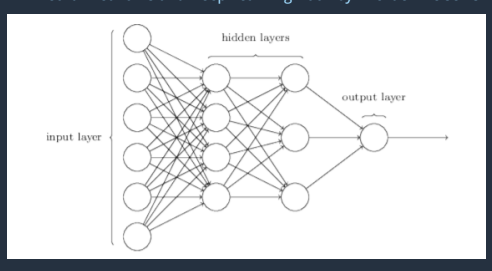
Location coding

$$\frac{1}{10000^{\frac{2i}{d_{model}}}} = e^{\log\left\{\frac{1}{10000^{\frac{2i}{d_{model}}}}\right\}} =$$
$$e^{-\log\{10000^{\frac{2i}{d_{model}}}\}} = e^{-\frac{2i}{d_{model}}\log\{10000\}} = e^{2i*(-\frac{\log\{10000\}}{d_{model}})}$$

STEP FOUR

If you prefer reading to video, or if you want to have a deeper understanding of it...

- Neural Networks and Deep Learning Book by Michael Nielsen's



1. TensorFlow
Github: https://github.com/tensorflow/tensorflow
2. scikit-learn
Github: https://github.com/scikit-learn/scikit-learn
3. Neural Style
Github: https://github.com/jcjohnson/neural-style

STEP FIVE

Select an area and drill down further

- **Computer vision:** deep learning has changed this field
- **Natural language processing (NLP):** for machine translation, question answering, emotion analysis. To master this field, we need to deeply understand the basic computational properties of these two algorithms and natural language
- **Memory network (rnn-lstm):** the circular neural network combining attention mechanism with external writable memory in LSTM means some interesting work. It can build a system that can understand, store and retrieve information in the form of questions and answers.
- **Deep reinforcement learning:** known by alphago, the go playing system defeated the strongest go player in history.
- **etc**(You may search that by yourself)

RESOURCES FOR STEP FIVE

- **Computer Vision:** The CS231n course at Stanford University, taught by Andrej Karpath.
- **NLP:** CS224d, Deep Learning for Natural Language Processing
- **RNN-LSTM:** This research area began with the Facebook AI Laboratory of Dr. Yann Lecun of New York University.
- **Deep reinforcement learning:** David Silver's (Google deep mind) rl video lecture and Professor rich Dutton's book are a good start.

PostWomen: http://liyasthomas.github.io/postwoman/
Voice Clone: https://github.com/CorentinJ/Real-Time-Voice-Cloning
NeuralTalk: https://github.com/karpathy/neuraltalk2
Colornet: https://github.com/pavelgonchar/colornet

STEP SIX

Set up a project

Doing is the key to becoming an expert.
Try to build something that interests you and matches your skill level.

- Traditionally, MNIST data sets are classified first
- Try face detection and classification on Imagenet. If you do, do Imagenet challenge 2017.
- Twitter emotion analysis using RNN or CNN
- Teach neural network to reproduce the artistic style of famous painters (neural algorithm of artistic style)
- Constructing music with cyclic neural network
- Use deep reinforcement to learn to play table tennis
- Neural network evaluation selfie
- Color black and white pictures using deep learning

MORE

Here are some guidelines to help you keep learning

- Read some good blogs. Both Christopher Olah's blog and Andrew karpath's blog explain the basic concepts and recent breakthroughs.
- Follow new trends on twitter. Here are a few starts @ drfeifei, @ ylecun, @ karpath, @ andrewyng, @ KDnuggets, @ openai, @ googleresearch.
- The Google + deep learning community, Yann lecunn, is a good way to keep in touch with deep learning innovation and communicate with other deep learning professionals and enthusiasts.

For more details, you may visit
https://github.com/ChristosChristofidis/awesome-deep-learning.