Tensorflow Practice 3

Hanock Kwak

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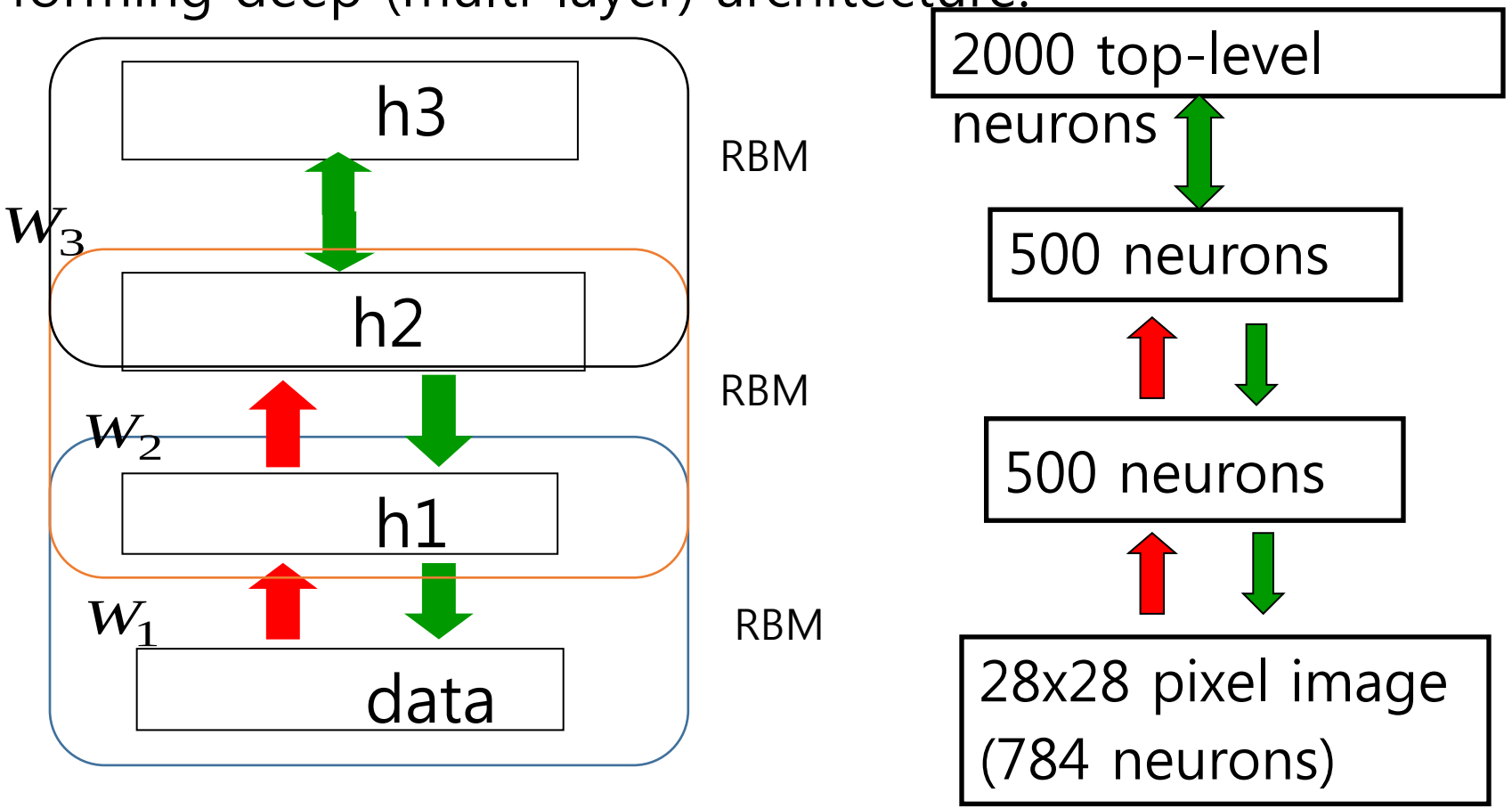
Biointelligence Lab
Computer Science and Engineering, Seoul National University

DBN

DBNs are stacks of restricted Boltzmann machines forming deep (multi-layer) architecture.

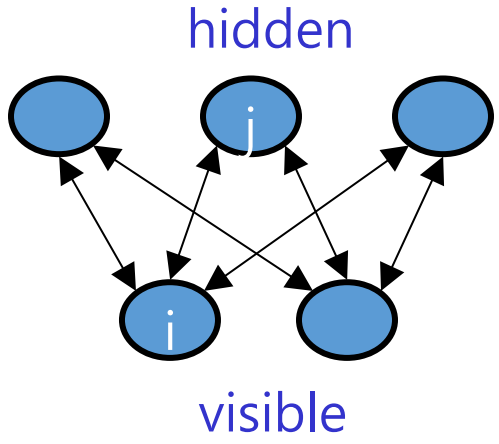


Restricted Boltzmann machines (RBM)

- We restrict the connectivity to make learning easier.
  - **Only one layer of hidden units**.
    - We will deal with more layers later
  - **No connections between hidden units**.

$$Energy(v,h) = -b'v - c'h - h'Wv$$

- In an RBM, the hidden units are conditionally independent given the visible states.
  - So we can quickly get an unbiased sample from the posterior distribution when given a data-vector.
  - This is a big advantage over directed belief nets
- Approximation of the log-likelihood gradient:
  - **Contrastive Divergence**



binary state of visible unit i

binary state of hidden unit j

$$E(v,h) = -\sum_{i,j} v_i h_j w_{ij}$$

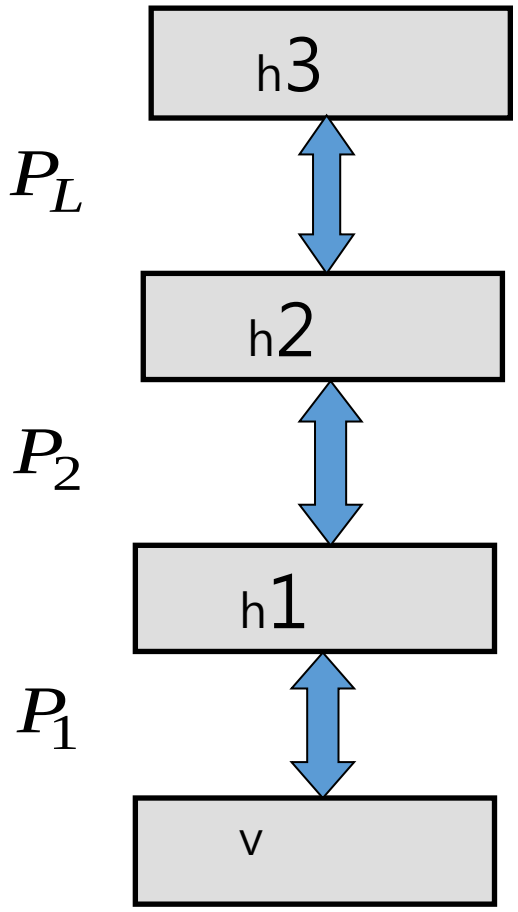
Energy with configuration v on the visible units and h on the hidden units

weight between units i and j

$$\frac{\partial E(v,h)}{\partial w_{ij}} = -v_i h_j$$

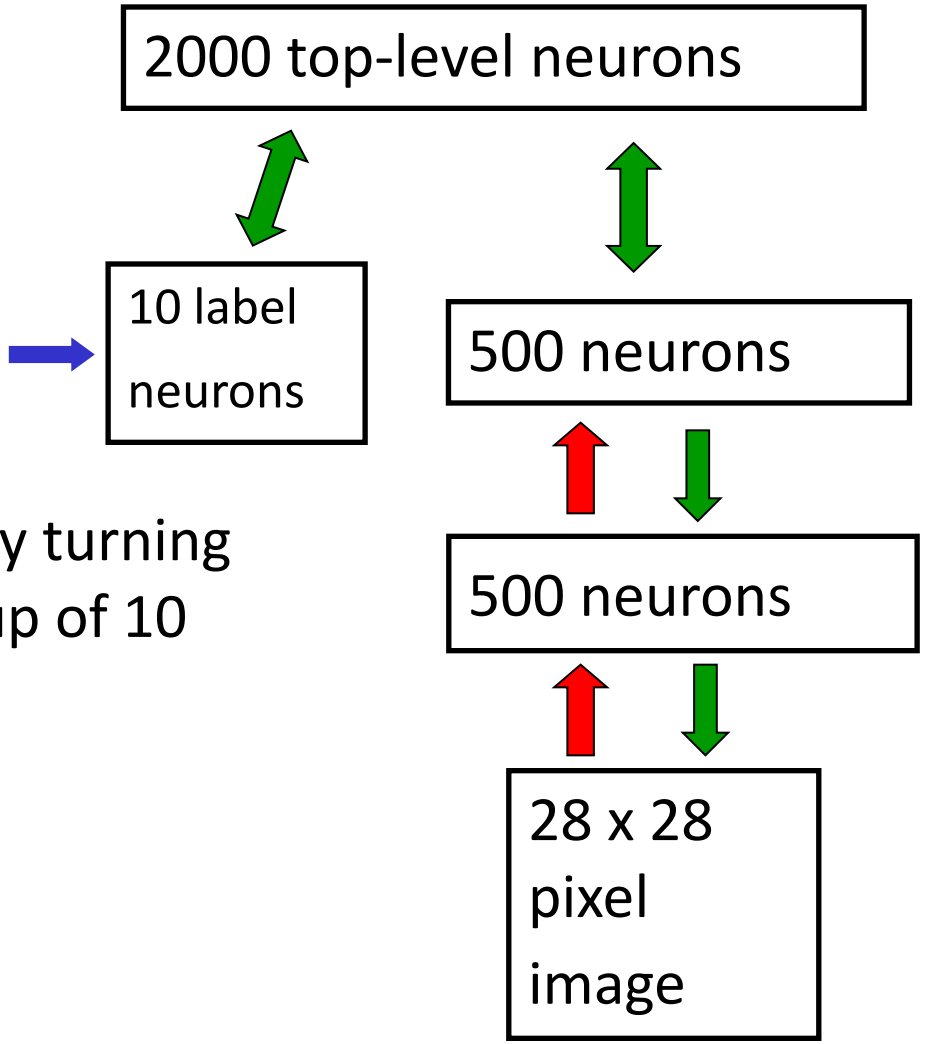
Deep Belief Networks

- **Stacking RBMs** to from Deep architecture
- DBN with / layers of models the joint distribution between observed vector x and I hidden layers h.
- Learning DBN: **fast greedy learning algorithm** for constructing multi-layer directed networks on layer at a time



A neural model of digit recognition

When training the top layer of weights, the labels were provided as part of the input



The labels were represented by turning on one unit in a 'softmax' group of 10 units:

$$p_i = \frac{\exp(x_i)}{\sum_j \exp(x_j)}$$

Looking into the ‘mind’ of the machine

Code

- http://solarisailab.com/archives/374

Guide

- First, copy and paste codes to the IPython Notebook

In [2]:

```
# -*- coding: utf-8 -*-

# 절대 임포트 설정
from __future__ import absolute_import
from __future__ import print_function

# 필요한 라이브러리들을 임포트
import collections
import math
import os
import random
import zipfile

import numpy as np
from six.moves import urllib
from six.moves import xrange  # pylint: disable=redefined-builtin
import tensorflow as tf
%matplotlib inline
```

Put this code!