

Summary of Intelligent Robotics class of 2018.11.7

성기호, 안정도, Peter Muschick, 김유진

Intro

AI engineers made algorithm to mimic brain. This algorithm is Neural Networks(NN)

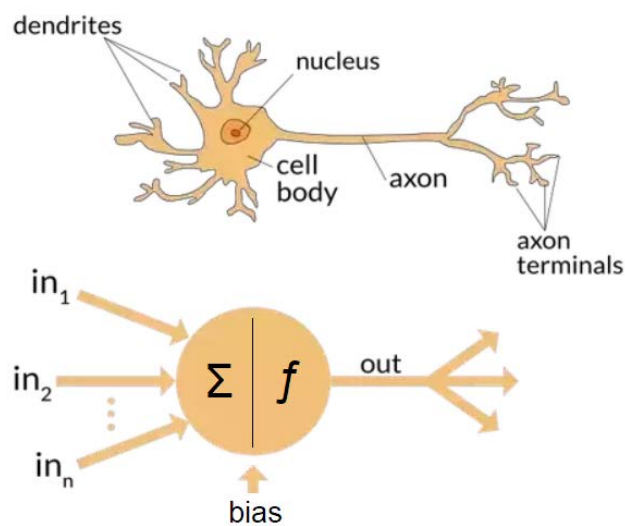


Figure 1. Neurons of human and Neural Networks

Human have got most of information by vision. So, it is natural that Neural Networks have shown better performance in vision than others have done.

Type of learning

Supervised : All data is labeled and the algorithms learn to predict the output from the input data.

Unsupervised: All data is unlabeled and the algorithms learn to inherent structure from the input data.

Semi-supervised: Some data is labeled but most of it is unlabeled and a mixture of supervised and unsupervised techniques can be used.

Trend of AI

Unsupervised learning & data compression

- Autoencoder which requires modification in loss function

Translational invariance

- Convolutional Neural Networks

Variable-sized sequence prediction

- Recurrent Neural Networks(RNN)

Autoencoder

Linear vs nonlinear dimensionality reduction

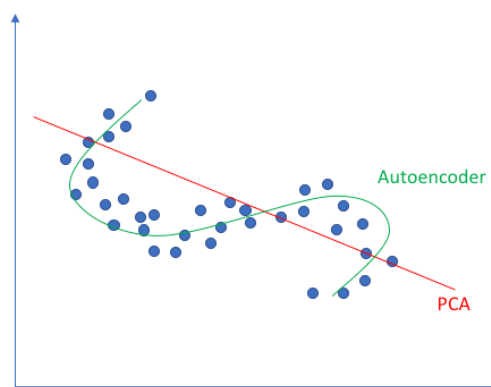


Figure 2. Comparison of data compression algorithm

Initial aim of autoencoder: pretraining weights in each layers with unsupervised learning algorithm

Algorithm

1. encoding : in machine A, map data $X^{(i)}$ to compressed $Z^{(i)}$
2. sending : send $Z^{(i)}$ to the other machine B
3. decoding : In machine B, map from compressed $Z^{(i)}$ back to $\tilde{X}^{(i)}$

Example

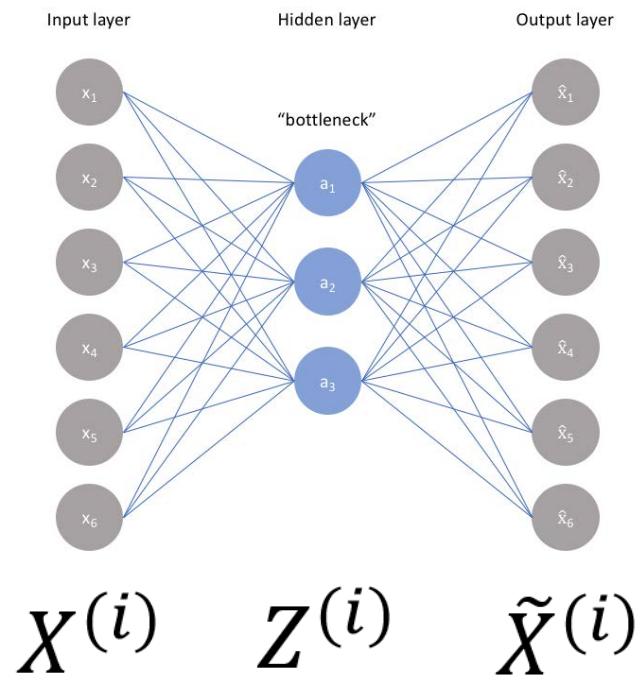


Figure 3. Simple structure of Autoencoder

Hidden layer : $Z^{(i)} = W_1 X^{(i)} + b_1$

Output layer : $\tilde{X}^{(i)} = W_2 Z^{(i)} + b_2$

Cost function : $E(W_1, W_2, b_1, b_2) = \sum (\tilde{X}^{(i)} - X^{(i)})^2$
 $= \sum (W_2(W_1 X^{(i)} + b_1) + b_2 - X^{(i)})^2$

Reference

- [1]<https://towardsdatascience.com/the-differences-between-artificial-and-biological-neural-networks-a8b46db828b7>
- [2]<https://machinelearningmastery.com/supervised-and-unsupervised-machine-learning-algorithms/>
- [3]<https://www.jeremyjordan.me/autoencoders/>