Triplet Network - First Report

Elad Hoffer

December 19, 2014

1   Triplet Network

1.1   Overview

Triplet network (inspired by "Siamese network") is comprised of 3 instances of the same feed-forward network (with shared parameters).
When fed with 3 samples, the network outputs 2 values - the L_2 distance between the embedded representation of 2 input from the representation of the third.
If we will denote the 3 inputs as x y_1 and y_2, and the embedded representation of the network as $Net(x)$, the output will be the vector

$$TripletNet(x, y_1, y_2) = \begin{bmatrix} \|Net(x) - Net(y_1)\|_2 \\ \|Net(x) - Net(y_2)\|_2 \end{bmatrix}$$

1.2   Training

Training is preformed by feeding the network with random samples, where x and y^+ are of the same class, and y^- is of different class. The objective is to classify correctly which sample is of the same class as x. Two same-class samples should have a lower L_2 distance after the network embedding. In order to distinguish between the highest distance, a SoftMax function is applied on both outputs - effectively creating a ratio measure.
By using the same shared-parameters network, we allow the back-propagation algorithm to update the model with regard to all samples *simultaneously*. Training is done by simple stochastic-gradient-descent on a negative-log-likelihood loss with regard to the 2-class problem.
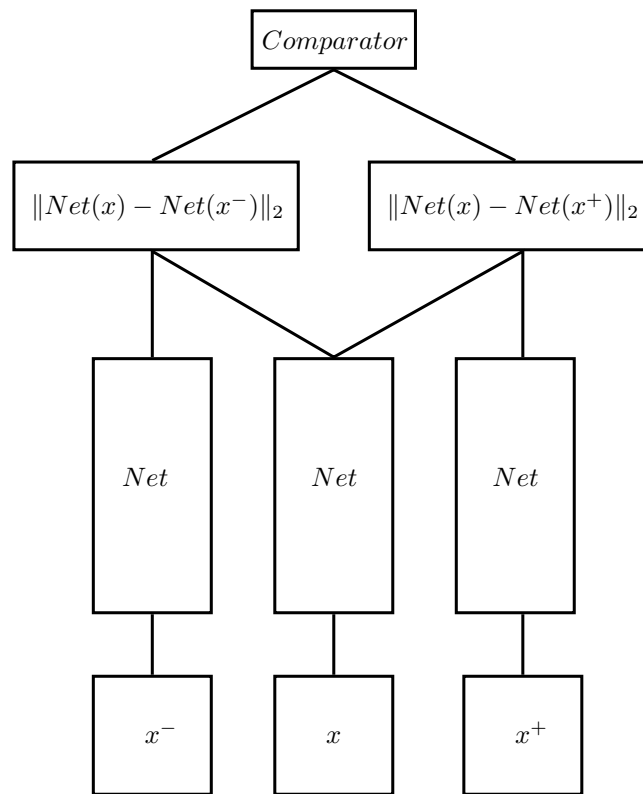
Figure 1: Triplet Network