Data Compression using Neural Network

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1. Introduction

'Neural Network' is method of information processing with model of nerve cells. This model is powerful and useful, so it is used every field in computer sciences. Also in statistics, a neural network model is used.

In this paper we discuss the method of compression of data using a hierarchical neural network model.

2. Neural Network

A neural network has many nodes called 'Neurones' and neurones are links each others. According to given data, every neuron determines strength of links to others. Hence, data determine the neural network.

A hierarchical neural network model is simply model and has some layers of neurones and every neuron links neurones in only next layer (See. Figure 1). Every neuron has value

$$y = \sum_i x_i W_i \ , \tag{1}$$

where $x_i (i = 1,2,\cdots)$ is value from neuron in previous layer and $W_i (i = 1,2,\cdots)$ is weight which mean strength value of links.

This model can be used like a 'Non-linear Regression Model', as the first layer is used as input and the last one is used as output, and neurones learned strength of links (weight) from data. This model is simply but powerful.

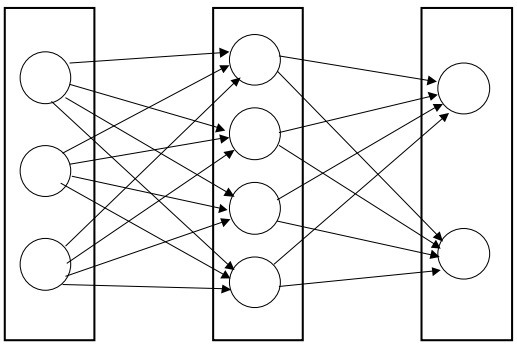

Figure 1. Hierarchical Neural Network Model

3. Compression of data

In hierarchical neural network model, when the number of neurones of the first and the last are same and the middle layer is fewer than others and learning with output data identity with input data, the values of neurones of middle layer has a compression of data (See Figure 2).

Feature of this method is following:

1. Because a neural network model is changed according to data, it is not necessary to make model according to data in advance.

2. The Strength of links of neurones tell us which data influence to compression components.

3. In principal component analysis or factor analysis, we decide the number of components after checking results. But in neural network model, we can decide the number of compression components before analysis, because of we decide the number of neurones in middle layer.

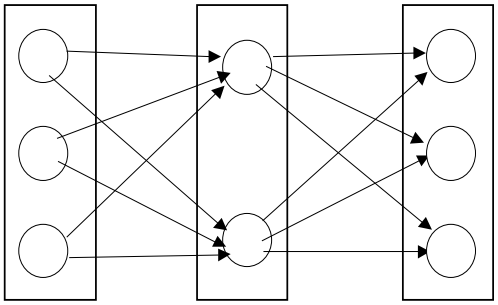

Figure 2. Model for Compress

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RÉSUMÉ

'Le Réseau de Neural' est la méthode de traitement d'information avec le modèle de cellules de nerf. Ce modèle est puissant et utile, donc il est utilisé chaque domaine dans les informatiques. Aussi dans la statistique, un modèle de réseau de neural est utilisé

Dans ce papier nous discutons la méthode de compactage de données en utilisant un réseau de neural.