

# **ASSIGNMENT 7 : IEC2017047**

## **Bidirectional Associative Memory**

### **Q2: Critical Comments on the given Research Paper**

Bidirectional Associative Memory (BAM) can perform various types of associations that a Human being can perform. However, the associations can take a long time to execute, thus increasing computational demands drastically. This research paper has stressed upon increasing the learning capacity of the BAM network while processing memory capacity is limited.

Till now, better output from the neural networks has increased the computation drastically. Although the majority of improvements made BAM models better suited for learning a wider set of associations and brought greater performance, such improvements have been at the expense of time taken to learn. They sometimes take hundreds to thousands learning epochs to get the associations right. Major improvements were achieved through one-shot learning, or few-shots learning, but these were successful in engineering problems rather than cognitive problems. The proposed process therefore allows for learning in conditions where a limited number of iterations is required.

The model proposed by Chartier & Boukadoum (2006b; 2011) uses an unique matrix for each layer. This Bidirectional Heteroassociative Memory (BHM) is able to learn correlated patterns for bipolar patterns as well as for real-valued patterns. The network is made of two Hopfield-like neural networks interconnected in a head-to-tail fashion, providing a 1917 recurrent flow of information that is processed bidirectionally. A recurrent neural network (RNN) is a class of artificial neural networks where connections between nodes form a directed graph along a temporal sequence. This allows it to exhibit temporal dynamic behavior. Derived from feedforward neural networks, RNNs can use their internal state (memory) to process variable length sequences of inputs. This makes them applicable to tasks such as unsegmented, connected handwriting recognition or speech recognition

In this new BAM, the transmission function is based on classic verhulst extended to a cubic form. As opposed to the sigmoid function, there are no asymptotic behaviours. A recency parameter is introduced in the learning equations so that the memory associations, that aren't much reinforced, are removed. This parameter lies between 0 and 1. The research paper uses Alphabets, and tries to form an association between them by establishing the fact that the lower case and the upper case alphabets represent the same thing.

The results show that the learning is faster than the previously known BAM network, and this network also shows increased performance in the conditions where rapid learning is necessary. This model has faster convergence and better performance due to usage of a non-asymptotic activation function and a recency parameter in the learning equations. Hence, they appropriately encompass biological and environmental limitations. Future research should evaluate the performances when the sequence is set randomly between epochs (i.e. abc, bac, acb).