**LITERATURE SURVEY:**

**1. TITLE: Establishing Structure for Artificial Neural Networks Based-On Fractal Journal of Theoretical and Applied Information Technology** **(2005 – 2013).**

**AUTHOR: Yang Zong-chang**

In this study, to the main problem of establishing structure for the Artificial Neural Networks (ANN), from a microscopical perspective, two ideas called the fractal measurement of association multifaceted nature (FDCC) and the fractal measurement of the desire many-sided quality (FDEC) are presented. At that point a paradigm reference for setting up ANN structure taking into account the two proposed ideas is displayed that, the FDCC won’t not be lower than its (FDEC), and when FDCC is equivalent or surmised to FDEC, the ANN structure may be an ideal one. The proposed measure is inspected with great results.

**2. TITLE: Recognition of Arabic numerals with grouping and ungrouping using back propagation neural network, Pattern Recognition, Informatics and Mobile Engineering (PRIME)** **(21-22 Feb. 2013).**

**AUTHOR: Selvi.P.P, Meyyappan, T**

In this Study a method to recognize Arabic numerals using back propagation neural system. Arabic digit are the ten digits that were descended from the Indian numeral system. The recognition phase recognizes the numerals precisely. The method used here is Matlab coding. Model and written descriptions are tested with the proposed method and the results are plotted.

**3. TITLE: The Application of Convolution Neural Networks in Handwritten Numeral Recognition (2015).**

**AUTHOR: Xiaofeng Han and Yan Li**

In this study the author summarizes the latest development of CNN and expounds the relative research of image recognition technology and elaborates on the application of CNN in handwritten numeral recognition. However, every neural network has some error rate due to parallel in digit shape. The method is proposed to overcome those errors.

**4. TITLE: Flexible, high performance convolutional neural networks for image classification (2011).**

**AUTHOR: D. C. Ciresan, U. Meier, J. Masci, L. M. Gambardella, and J. Schmidhuber**

In this study they have shown that deep nets perform better when they are trained by simple back-propagation. Their architecture results in the lowest error rate on MNIST compare to NORB and CIFAR.

**5. TITLE: Performance analysis of hybrid feature extraction technique for recognizing English handwritten characters, Information and Communication Technologies (WICT) (2012).**

**AUTHOR: Pradeep, J.; Srinivasan, E.; Himavathi, S**

In the Study of, an off-line handwritten English character recognition system using hybrid feature extraction technique and neural network classifiers are proposed. Neural Network (NN) topologies, namely, rear spread neural network and radial basis function network are built to classify the font. The k-nearest neighbour network is also built for evaluation. The nosh onward NN topology exhibits the highest recognition accuracy and is identified to be the most suitable classifier.

**6. TITLE: Japanese character (Kana) pattern recognition application using neural network, Electrical Engineering and Informatics (ICEEI) (2011).**

**AUTHOR: Budiwati, S.D.; Haryatno, J.; Dharma, E.M** In this study,Japanese language has complex  writing systems, Kanji and  Kana (Katakana and Hiragana). Each one has different style of writing. One simple way to differentiate is Kanji have more strokes than Kana. Meanwhile, it needs a lot of effort to remember characters of Katakana and Hiragana, thus it will be very difficult to distinguish handwritten Katakana and Hiragana, since there are a lot of similar characters. This is the reason why we need pattern recognition.