Project step 1: Proposal

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**Project assignment:**

Hebb neural network for letters and numbers recognition

**Background information:**

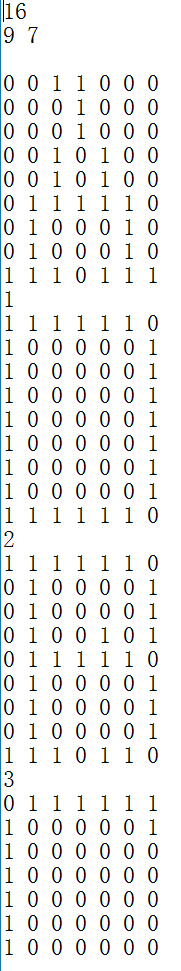
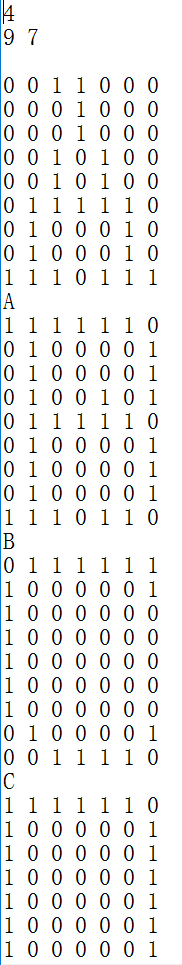
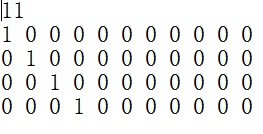
Visual pattern recognition, such as reading characters or distinguishing shapes, can easily be done by human beings, but it is very difficult to design a machine which can do it as well as human beings do. We believe that the best strategy is to learn from the brain itself (KUNIHIKO, 1987). We are studying the mechanism of visual information-processing in the brain, and trying to use it as a design principle for new information processors (Fukushima & Miyake, 1982). More specifically, we are studying how to synthesize a neural network model which has the same ability as the human brain. As a result of this approach, a pattern-recognition system called the "neocognitron" has been developed (Fukushima, 1980).

Artificial neural networks represent a type of computing that is based on the way that the brain performs computations. Neural networks are good at fitting non-linear functions and recognizing patterns. Consequently, they are used in the aerospace, automotive, banking, defense, electronics, entertainment, financial, insurance, manufacturing, oil and gas, robotics, telecommunications, and transportation industries.

**Project desired objectives and goals:**

Users could provide three .txt files, one test\_data file is the test file which has several matrixes made by 0 and 1 (formatted such as 9\*7, 8\*10). The other two (training\_data and target\_data) is used to compare to these matrixes and the machine could recognize is the matrix represent a letter or a number or nothing.

The test\_data.txt, training\_data.txt and target\_data.txt need to look like this:

 test\_data  training\_data  target\_data

**Preliminary description of the software:**

In the beginning, users can choose the files (test\_data, training\_data and target\_data) they provided and the software will respond them is there any letter or number in the file of test\_data.

In the software, it will receive three .txt files. Next the software will transfer the data from training\_data as a two-dimensional arrays S[k][i], target\_data as T[k][j] and calculate the two arrays to generate a new array w[i][j]. After that the software will calculate the two arrays w[i][j] and the patterns[p\_test] from test\_data. Finally, the result will compare to the y[k][j] and T[k][j] to get the result.

**Preliminary** **pseudocode:**

Choose the training\_data.txt

Create s[k][i]

Choose the target\_data.txt

Create T[k][j]

Calculate s[k][i] and T[k][j]

Create w[i][j]

Choose the test\_data.txt

Create patterns[p\_test]

Calculate patterns[p\_test] and w[i][j]

Create y[k][j]

Compare y[k][j] and T[k][j]

Print result as y\_out.txt

**References:**

Fukushima, K. (1980). Neocognitron: A self- self-organizing neural network model for a mechanism of pattern recognition unaffected by shift in position. Biological Cybernetics. 36(4), 193-202.

KUNIHIKO FUKUSHIMA. (1987). Neocognitron: A Hierarchical Neural Network Capable of Visual Pattern Recognition. NeuralNetworks, Vol. 1, pp. 119-130.

Fukushima, K., & Miyake, S. (1982). Neocognitron: Anew algorithm for pattern recognition tolerant of deformations and shifts in position. Pattern Recognition, 15(6), 455-469.