CIS 731

ARTIFICIAL NEURAL NETWORKS

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Implemented the non-trivial function approximation problem for the UCI data set. Designed the neural network with input layer of 9 neurons, hidden layer of 18 neurons and output layer with 1 neuron.

This neural network classifies whether lump is benign or malignant type of breast cancer from a digitized image of a fine needle aspirate (FNA) of a breast mass.

- **Data set used:**
  Breast Cancer Wisconsin.

- **Data set feature's details:**
  1. Clump Thickness: 1 - 10
  2. Uniformity of Cell Size: 1 - 10
  3. Uniformity of Cell Shape: 1 - 10
  4. Marginal Adhesion: 1 - 10
  5. Single Epithelial Cell Size: 1 - 10
  6. Bare Nuclei: 1 - 10
  7. Bland Chromatin: 1 - 10
  8. Normal Nucleoli: 1 - 10
  9. Mitoses: 1 - 10
  10. Class: (0 for benign, 1 for malignant)

- **Link to data set:**
  https://archive.ics.uci.edu/ml/machine-learning-databases/breast-cancer-wisconsin/breast-cancer-wisconsin.data

- **Performance Comparison:**

Function Used (Hidden Layer)	Loss	Accuracy
Sigmoid (batch size =8, epochs = 50)	0.0466	0.9674
Piecewise Linear with 4 segments	0.0242	0.9723
Piecewise Linear with 6 segments	0.0232	0.9723
Piecewise Linear with 8 segments	0.0197	0.9772
Piecewise Linear with 10 segments	0.0206	0.9772
Piecewise Linear with 12 segments	0.0189	0.9801
Piecewise Linear with 14 segments	0.0174	0.9804

- **Summarization:**

  From the above comparison, I summarize for my experiment that the piecewise linear function provides better accuracy than the sigmoid function.

  Also, for piecewise linear function, the accuracy increases, as we increase the n value that is number of segments.