IIIT Vadodara
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TE4 Machine Learning
Lab Submission

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Note - Coding done in jupyter-notebook using python. Commenting done in codes for help.

Problem 1. Given the data set of 150 number of Iris flowers. a) Cluster these flowers using K-means clustering technique. Interpret the results of simulation use two stopping criteria. b) Cluster these flowers using Hierarchical clustering technique.

Solution The Clustering is done in respective files :-

- Hierarchical Clustering - Hierarchical.ipynb

- K-Means - K means.ipynb and K meansStoppingCriteria2.ipynb

Problem 2. Minimize:
i) RasenBerok function.
ii) Sphere function.
Using the constraint given
i) using GA(Binary and real)
ii) using DE-1

iii) using DE-2.

Compare and interpret the results.

Solution Codes in respective files. There are multiple files for each type of algorithms. I have implemented GA binary and GA real-valued for the minimization of Rosenbrock and Sphere functions. As we can see that all three algorithms performed well on the functions, but the best was genetic algorithm - 2. It converged quite fast and it required very less iterations for the same. While binary and real-coded GA had quite similar methods but the way to do so were different. I used the difference between two consecutive epochs to see the convergence of the algorithm.

Problem 3. Identity the given system using LMS learning rule

Solution Codes are in respective files. **Convergence Characteristics :-** We have used multiple convergence characteristics like difference in final output, number of iterations, etc. Effects of -

- small alpha - Algorithm takes more time to converge

- medium alpha - perfect.

- large alpha - Miss the optimum solution

Estimated Coeffs are coming out to be quite different since our algorithm tends on the initialization which we took as random.

Problem 4. Identity the given system using RMS learning rule

Solution Codes are in respective files.

Problem 5. Use data from finance.org. Develop an adaptive model for exchange prediction of 1 day ahead and 5 days ahead for: i) 1 US Dollar to Rupees ii) 1 US Dollar to British pound. using

Figure 1: Learning Rate
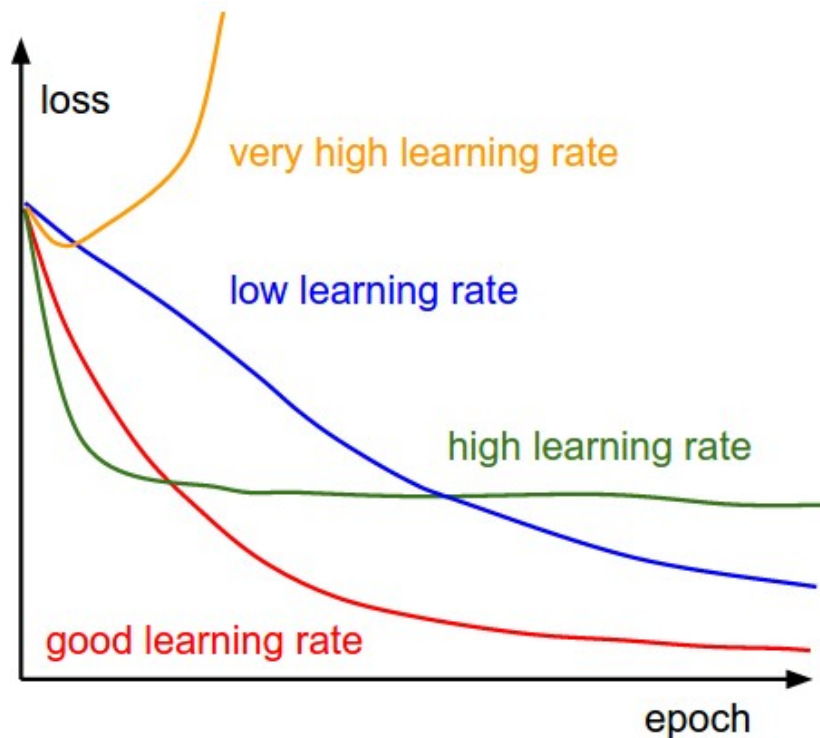
a) Sequential training. b) Batch processing. c) Sequential feature Choose the window size appropriately. Choose normalized actual value, mean and variance as the features. 80 percent of features are used for training and remaining 20 percent of features are used for testing/validation. Compare and interpret all the results. Use LMS / RLS based learning.

Solution Codes are in respective files.

Problem 6. Develop a simple adaptive classifier over (i) X-OR dataset (ii) IRIS dataset using:
i) LMS Algorithm
ii) RLS Algorithm

Solution Codes are in respective files.