ECEN 649: Patten Recognitions

Assignment 1 – Fall 2018

Due date: Thursday September 27, 2018

Reading assignment: Lecture notes 1 & 2 (required), Chapter 1, 2, and 9 of the textbook (recommended), Wikipedia page on Perceptron (recommended)

Computer assignment: For this assignment, please do NOT use any existing software packages for naive Bayes or Perceptron.

(Naive Bayes) Download the MNIST data sets in the CSV format at `https://pjreddie.com/projects/mnist-in-csv/`. Each sample in the data sets is a 28×28 binary image of a hand-written digit (0–9). One sample from the data set is depicted in Figure 1.

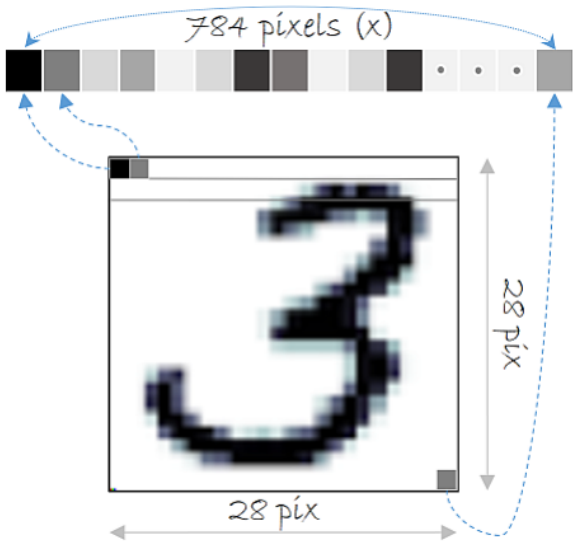

Figure 1: A hand-written digit.

1) Use the train set to estimate the probabilities for getting each digit and the conditional probabilities of individual pixels given the values of the digit. Record your results into a table.

2) For each sample in the test set, use the probabilities estimated from the first part and Naive Bayes to predict the value of the digit based on the values of all $28 \times 28 = 784$ pixels. Calculate the success rate of your predictor.

(Perceptron) Download the IRIS data sets in the CSV format from your email. Each sample from the data sets includes two real-valued features and one binary outcome.

1) Plot each sample from the train set in a 2-D plot. Use the Perceptron algorithm to learn a half space predictor that completely separates the positive samples from the negative ones. Plot the decision boundary of your predictor on the same 2-D plot.

2) Plot each sample from the test set and the decision boundary of your predictor in a separate 2-D plot. Calculate the success rate of your predictor.