

Homework 1

CSE 802, Spring 2017
Due Date: January 18, 2017

Please read the following instructions carefully:

1. Discussing the following questions with others in the class is permitted. However, you must prepare the solutions to these questions independently. Any indication to the contrary will be considered an act of academic dishonesty.
 2. Submit a zip file containing a write-up of the homework solutions (in pdf format) and the source code by **January 18, 11:59pm** on <https://d2l.msu.edu/>.
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Consider the following 5 classes of fruits and vegetable:

Zucchinis, Persian cucumbers, Pickling cucumbers, Red Delicious apples, and Honeycrisp apples.



1. Assume you have to design a classifier for the above five classes. What features would you consider to distinguish these 5 classes? Make measurements for these features on 6 samples per class.
2. Pick your top-2 most discriminative features. Represent the samples in the 2-dimensional feature space and comment on intra-class variability and inter-class similarity.
3. Design a minimum distance classifier (use Euclidean distance metric) and plot the decision boundary in the 2-dim feature space. Randomly choose 4 patterns per class for classifier training and the remaining 2 for testing. The minimum distance classifier assigns a test pattern to the class with the closest class mean. Plot the decision boundary and report, confusion matrix (5x5 matrix) and the classification error.
4. Repeat the above step but this time for a nearest-neighbor (NN) classifier. The NN classifier assigns a test pattern to the class with the closest training sample. Again, use the Euclidean distance metric.
5. How do the decision boundaries and error rates change when we use a different subset of 4 samples for training? How do you explain this?