**ECE 8527: Introduction to  
Machine Learning and Pattern Recognition**

# HW No. 2: Bayesian DEcision Theory

For this assignment, you will use the data set located here:

*https://www.isip.piconepress.com/courses/temple/ece\_8527/resources/data/set\_04/*

We will focus on the files *train.txt* and *dev.txt*, which containing training and development test set data. You can assume the loss function weighs all errors equally.

The tasks to be accomplished in this homework assignment are:

1. Classify the data in dev.txt using a maximum likelihood classifier (assume the priors are equal). Compute the “experimental” error rate by classifying each point in the training and dev sets and scoring them against the true class assignment.
2. Assume the priors are not equal. Compute and plot the error rate as you vary the prior of class “0” over the range [0,1].
3. Fit the training data with a multivariate Gaussian distribution (compute the mean and covariance) and plot the posterior for each class (ignore the evidence factor).
4. Describe how you would compute the theoretical error rate that can be achieved on this data assuming you model each distribution as a multivariate Gaussian distribution. Write the integrals. For 100 points of extra credit, evaluate the integrals using a numerical or symbolic integration package.