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

# HW No. 1: Gausssian Distributions and MAXIMUM LIKELIHOOD DECODING

The tasks to be accomplished in this homework assignment are:

1. We will denote a one-dimensional Gaussian random variable (GRV) with a mean of 1 and a variance of 2 as GRV[1,2]. Generate 10,000 data points for each of two GRVs: GRV[1,1] and GRV[-1,1]. Compute the error rate using an optimal maximum likelihood decoder with a threshold set at 0. Repeat for a threshold set at -0.5 and 0.5. Do these error rates match the predicted values?
2. Generate 1,000 data points for each of two GRVs: GRV[1,  ] and GRV[-1, ]. Set  and vary  over the range [0.1, 2]. Plot the error rate as a function of .
3. Generate a 2D GRV with a mean of [-1,1] and an identity covariance matrix. Generate a second GRV with a mean of [1,1] and an identity covariance matrix. Compute the error rate for the optimal maximum likelihood decoder. Does this match the theoretical prediction?
4. Generate a plot of the support region for the first GRV in (3) as you vary the covariance. Demonstrate how the shape of the support region changes depending on the nature of the covariance matrix (replicating the slides in lecture no. 2).

Collect your results into an MS Word document that includes screenshots, generate a corresponding pdf file, and email it to me using:

“ECE 8110:” in the subject line

An attachment with the filename “hw01\_lastname\_firstname.pdf” (e.g., hw01\_picone\_joseph.pdf).