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

# HW No. 1: Gausssian Distributions

For all the homework assignments in this class, use this template to turn in your work:

*https://isip.piconepress.com/courses/temple/ece\_8527/resources/templates/homework\_v00.docx*

Submit a pdf file using the “Save As Reduced File Size” feature of Adobe Acrobat.

To do this assignment, you will need to download “JMP Statistical Software” from the Temple site *download.temple.edu*.

**Background:** Please view this video:

<https://www.youtube.com/watch?v=crnDur5mIIk>

to learn how to do some basic things in JMP.

**Task 1**: In the programming language of your choice, generate 2D Gaussian data in a spreadsheet format in which column 0 is the class assignment, and columns 1 and 2 are the feature vector values. Create four classes. The means are as follows: class 1: (1,1), class 2: (1,-1), class 3: (-1, -1) and class 4: (-1,1). Use a diagonal covariance matrix for each class with the values:

 $cov=\left[\begin{matrix}0.1&0\\0&0.1\end{matrix}\right]$.

Using JMP’s built in tools, import the data into JMP and classify the data using a Naïve Bayes algorithm. Plot the data and comment on what you observe about the classification performance.

**Task 2:** Increase the variance by changing the value 0.1 in the covariance matrix to 1.0. Plot the data. Again, classify the data using Naïve Bayes. Comment on what you observe.

**Summary:** We use Gaussian distributions and similar simple test data to debug and evaluate algorithms. This assignment attempts to build your comfort level with how Gaussian distributions work and how to visualize these distributions.

JMP and Python are two very popular environments for doing machine learning experiments and statistical analyses. We will make extensive use of both this semester.