**Department of Electrical and Computer Engineering**

Homework Assignment No. 07:

**HW No. 07: Information Theory and Statistical Significance**

submitted to:

Professor Joseph Picone

ECE 8527: Introduction to Pattern Recognition and Machine Learning

Temple University

College of Engineering

1947 North 12th Street

Philadelphia, Pennsylvania 19122

March 8th, 2022

prepared by:

Gavin Koma  
Email: [gavintkoma@temple.edu](mailto:gavintkoma@temple.edu)

# Task 1

The goal of Task1 is to assess a two-dimensional dataset with feature vectors: [*x­­*1, *x*2]; and then spend time to quantize each element of each vector to a set of 128 discrete values. We are given the equation do this already and is as such:

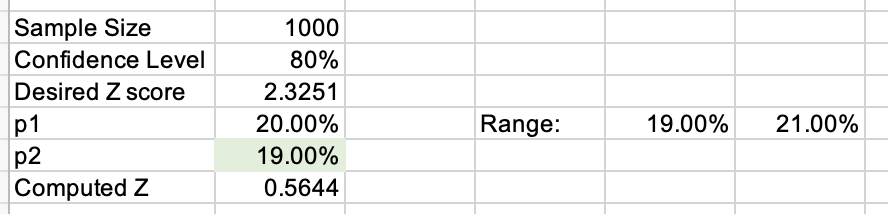
In order to do so, I first began by::: ??????? idk bc I haven’t done this yet lol

# Task 2

Task 2 involves assessing two systems (a baseline system and a new system) which assess performance of a dataset of 1,000 files. We are initially told that the baseline system gives us an error rate of 20.0% and the new system delivers and error rate of 19.0%. Our first goal is to determine if the new system, which delivers an error rate of 19.0%, is statistically significant at a confidence level of 80%.

We can do this by assuming that P1 and P2 are 20.0% and 19.0%, respectively. It is also important to note that the value of N will be the same: 1,000 total datafiles. From here, we can utilize the Z-score formula which is as follows:

We are also provided with an Excel sheet that is capable of calculating our Z-score given a value for P1 and P2. We are able to see that the calculated computed Z score from this Excel sheet is the same as the Z score calculated from the above equation. Attached below is a screenshot of the Z-score.



As discussed in class, we know that any positive scores that are in the z-table will correspond to some value which is less than the mean while the negative scores in the z-table will correspond to any values that are less than the mean. Recall that our calculated z-score is 0.5644 and we can utilize the following formula:

This calculation allows us to find the z-score according to a corresponding area. In this case, the z-score for area (0.1) is less than the computed z-score found above (0.5644). In this case, we know that the z-score which has been calculated by the first formula is larger than the value that is calculated by the second formula. As a byproduct, we are able to say that the new system error rate of P2 is notably smaller than that of P1 but is still not statistically significant as it is larger than 0.05.

# Conclusion