**Digital Image Processing**
**(ECE513)**


**Computer Project 2: Image Transforms For Data Compression (Report Due April 7th , 2020)**

The goal of this computer assignment is to study and compare two different image transforms, namely 2-D DCT and DWT, for the purpose of image data compression. The "Pepper" image (see course web page under Images) is used for this assignment.

1. **DCT Approach:** Partition the image into non-overlapping blocks and apply DCT to each block. Use at least two different blocks sizes, e.g., 8x8 and 16x16. Devise a scheme to reduce the blocked data in the DCT domain using an *energy-based* or other 'meaningful' criterion (e.g., histogram of the DCT coefficients). For each block-size and data reduction criterion, reconstruct the image from the retrained coefficients and display the results. Compare the results of your reconstructions using performance measures such as distortion or signal-to-noise ratio (use $SNR_{dB} = 10\log_{10}(\sigma_o^2 / \sigma_e^2)$) where $\sigma_o^2$ is the variance of the original image and $\sigma_e^2$ is the variance of the error image) as well as visual evaluation of the results.

2. **DWT Approach:** Apply 2-D DWT to the same image and display the results for two and three-level decompositions and two different choices of wavelets e.g., Daubechies (db), Symlet (sym), Biorthogonal (bior), etc. Present the histograms of the sub-images and compare the data reduction ability of the two transforms in Parts 1 and 2. Compare the best results of the DWT with that of the DCT for the cases studied.

3. Provide a detailed discussion on the effectiveness of this transform for image data reduction and representation in a report. **Please read the guidelines for preparing your report.**