EE 399 SPRING QUATER 2023
Instructor: **J. Nathan Kutz**

MIDTERM #1:
DUE: 1:30pm May 1 on Canvas
Download **yalefaces.mat**. (You should already have this file from homework 2)

`https://drive.google.com/file/d/1pqs5WAO7FKVL9GBZkvws6cB3ztLxwdQS/view?usp=sharing`

This file has a total of different faces with approximately 65 lighting scenes for each face (2414 faces in all). The individual images are columns of the matrix $\mathbf{X}$, where each image has been downsampled to 32×32 pixels and converted into gray scale with values between 0 and 1. So the matrix is size 1024×2414. To important the file, use the following

```
import numpy as np
from scipy.io import loadmat
results=loadmat('yalefaces.mat')
X=results['X']
```

Label the faces from 0 to 9.

(a) Grab the first 10 individual faces from the data set (each face has 64 lighting scenes). So you will have matrix of size 1024×640

(b) From the 64 faces of each person, randomly pull out 14 faces for a test set and use the remaining 50 faces for training.

(c) Do a 20-mode PCA analysis of the face images and evaluate the classification accuracy using a *linear discrimant analysis*.

(d) Repeat (c) with an SVM (support vector machines) and decision tree classifier. How well do these separate between all ten faces?