# ISyE 6416, Spring 2018

## Professor X. Huo

## Homework 8: Splines

This assignment is due at **9:30 AM on Thursday, April 19, 2018.**

**Problem Description.**

1. The attached file DJI_2009.csv is downloaded from `finance.yahoo.com`. It contains the historical prices of the Dow Jones Industrial Average (^DJI) from October 1, 1928 to February 20, 2009. plot the time series of the *adjusted closing prices*.

   The data set is saved as a .csv file. You can read it into Matlab using function `load`. Try `'help load'` in Matlab for more details. Below is a command line that I've used:

   ```
   load('DJI_2009.csv', '-regexp', '^Date|^Open|^High|^Low|^Close|^Volume|^Adj Close');
   ```

2. Take the value for the last 300 days. Fit a smoothing spline to these data points. First choose different values of the algorithmic parameter to fit the splines. Secondly, use the *generalized cross validation criterion* to determine the value of the algorithmic parameter. Compare the results for the different values of the algorithmic parameter. Explain what you observe.

3. Note that for the values of 300 days, you may still use the codes that are provided in the lecture notes. If you would like to fit a penalized smoothing spline for the last 3000 days, if the same codes are used, it would take a long time to run. In theory, the computational complexity is $O(n)$: an efficient implementation can significantly reduce the running time. Write a more efficient implementation.