# IEOR 265 – Homework 2
# Due Thursday, April 14, 2016 on bCourses

---

## Tensor Regression

In: A. Aswani. 2015. Low-Rank Approximation and Completion of Positive Tensors. Submitted, convex optimization was used to develop polynomial-time algorithms for low-rank approximation and completion of positive tensors, and the paper formulated statistical regression problems with categorical predictors as tensor completion problems. In this assignment, we are interested in applying this methodology to predict redshift from photometric parameters.

1. Download the dataset:
   http://astrostatistics.psu.edu/datasets/SDSS_quasar.html
2. Download the MATLAB code for tensor completion:
   http://ieor.berkeley.edu/~aaswani/plrt/
3. Install MOSEK
   https://mosek.com/resources/downloads
4. Request an Academic License for MOSEK
   https://mosek.com/resources/academic-license
5. Apply tensor regression as follows:
   - Response Variable: Redshift ($z$)
   - Predictor Variables
     - the difference between brightness in the u (ultraviolet) band and that in the g (green) band ($u\_mag - g\_mag$)
     - the difference between brightness in the g (green) band and that in the r (red) band ($g\_mag - r\_mag$)
     - the difference between brightness in the i (more red) band and that in the z (even more red) band ($i\_mag - z\_mag$)
   - Transform (bin) the continuous predictors to create categorical predictors
   - Summarize the results of the algorithms
   - Apply and present cross-validation results
     Split your data into training and testing with a 80% and 20% ratio.

## k-Nearest Neighbors (KNN)

It turns out that tensor completion is not the best estimator for the problem at hand, and k-nearest neighbors (KNN) works well. Repeat your analysis applying KNN and summarize your results.