CS754 - Advanced Image Processing
Project Proposal
1st March, 2018

Project Topic : Tuning the sensing matrix and representation matrix

Abstract : It has been shown that random sampling matrices like ±1 bernoulli, random gaussian matrices etc are universal which give good reconstruction results but not the best. Whereas sensing matrices learned/designed for a particular set of training images perform better in terms of improving the reconstruction accuracy as well as reducing the number of measurements. Also using learned dictionaries give better sparse representation compared to fixed bases like DCT, wavelet etc. For a given dictionary, the learned sensing matrix has larger incoherence. Thus, we will be implementing a joint learning and optimization of sensing matrix and the non-parametric dictionary using a set of training images. For that we will use KSVD algorithm for learning overcomplete dictionary and then coupled-KSVD as a modification for jointly learning dictionary and sampling matrix. We will also compare our results by using other combinations of sensing(like random gaussian, ±1 bernoulli) and fixed basis dictionaries.

Datasets :
1. Berkeley Segmentation Dataset- https://www2.eecs.berkeley.edu/Research/Projects/CS/vision/bsds/
2. Animals with Attributes dataset - https://cvml.ist.ac.at/AwA/

References :
1. Tuning the sensing matrix and representation matrix: Duarte-Carvajalino and Sapiro, "Learning to Sense Sparse Signals: Simultaneous Sensing Matrix and Sparsifying Dictionary Optimization", IEEE Trans. Image Processing

Team Member
Pranay Agrawal - 150050026
Saqib Azim - 150070031