

# CS754: Advanced Image Processing

## Project Proposal

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### Paper to be implemented

**Title:** Estimation of the sample covariance matrix from compressive measurements

**Author:** Farhad Pourkamali-Anaraki

**Year of Publication:** 2017

**Link:** <https://arxiv.org/pdf/1512.08887.pdf>

### Datasets

We will be implementing the algorithm described in the paper with the following datasets:

- MNIST data set of handwritten digits obtained from [www.kaggle.com](http://www.kaggle.com).
- Traffic Data Set containing video surveillance of traffic from a stationary camera. This too will be taken from [kaggle.com](http://kaggle.com).

In the paper, they had also used the Gen4 data matrix from linear programming problems (taken from the University of Florida Sparse Matrix Collection). This however isn't available now. We shall try to find another similar dataset for our project.

### Validation Strategy

- To evaluate the estimate accuracy, we will use the normalized covariance estimation error defined in the paper:

$$\text{error}(\hat{\Sigma}_n) = \frac{\|\hat{\Sigma}_n - \mathbf{C}_n\|_2}{\|\mathbf{C}_n\|_2}$$

This is, supposedly, a measure of closeness of the estimated covariance matrix from compressive measurements to the underlying covariance matrix  $\mathbf{C}_n$  based on the spectral norm.

- The estimation of covariance matrix from compressive measurements is stochastic so each of the experiments will be re-run many times and the mean will be reported.