comparison of sparse

coding algorithms for image compression

October 22, 2016

# Goals of project

The main purpose of the project is to *experimentally* compare results of different sparse coding algorithms and shallow-sparse autoencoders for image compression. More specifically, we will compare T-sparse autoencoder, winner-take-all autoencoder, LARS-Lasso, Coordinate Descend(COD), principal component analysis(PCA) and orthogonal matching pursuit. In the project, we aim to compare the efficiency of these algorithms with different data sets of images and to determine the overall best performing algorithm. In existing literature, the comparison of performance analysis of different techniques is often restricted to a particular dataset. This gives a skewed result in favor of a particular algorithm. With experimental comparison, we aim to give an analysis in terms of whether a claimed algorithm can pass the test of realistic data from different datasets.

# LEARNING OUTCOMES

For implementing the algorithms which are to be compared, we will be reading the algorithms from the paper and understanding the mathematical underpinnings of those algorithms. Each member of the group will learn two new algorithms, implement them and test them against varied datasets to generate the performance analysis. The performances will be compared based on a common metric.

# tIMELINE OF PROJECT ACTIVITIES

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Activities** | **Week Of ...** | | | | | | | | |
|  | 10/10 | 10/17 | 10/24 | 10/31 | 11/7 | 11/14 | 11/21 | 11/28 | 12/5 |
| Decide Topics of interest |  |  |  |  |  |  |  |  |  |
| Literature Review |  |  |  |  |  |  |  |  |  |
| Project Proposal |  |  |  |  |  |  |  |  |  |
| Presentation Preparation |  |  |  |  |  |  |  |  |  |
| T-Sparse Autoencoder Impl. |  |  |  |  |  |  |  |  |  |
| Winner Take All sparse Autoencoder Impl |  |  |  |  |  |  |  |  |  |
| LARS-Lasso Impl |  |  |  |  |  |  |  |  |  |
| Co-ordinate Descent Impl |  |  |  |  |  |  |  |  |  |
| OMP using KSVD Impl |  |  |  |  |  |  |  |  |  |
| Principal Component Analysis(PCA) Impl |  |  |  |  |  |  |  |  |  |
| Performance Measure Extraction Algorithm Impl |  |  |  |  |  |  |  |  |  |
| Testing Dataset survey |  |  |  |  |  |  |  |  |  |
| Performance Analysis 8-bit Uniform Quantization |  |  |  |  |  |  |  |  |  |
| Performance Analysis Variable Uniform Quantization |  |  |  |  |  |  |  |  |  |
| Complexity Analysis |  |  |  |  |  |  |  |  |  |
| Report generation |  |  |  |  |  |  |  |  |  |

# EXISTING LITERATURE

Image compression is a field that has been thoroughly examined over the past years and continues to attract attention. Many approaches have been used for the task of image compression, and sparse representation is one of them. In using the sparse coding algorithms most of the work done follows two approaches, i.e. one where the resulting compression is using a predefined dictionary and other where the a dictionary is learned explicitly for the training data. In [1] the authors have used the latter approach for compression of medical images and generated a dictionary using K-SVD and have used the OMP algorithm [] to give the sparse representations of the input using the learned dictionary.

Recently there has been a lot of work done in the field of image processing using neural networks and they have been used in a wide range of applications including image compression. In [] the authors have compared the results of k-sparse autoencoders and winner take all autoencoders with other sparse coding algorithms

# REFERENCES