

# Introduction to Learning and Intelligent Systems - Spring 2015

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## Project 3 : Image Classification

As this is a classification problem with 10 labels and 2048 features, we used the following methods

- Random Forest
- Extra Random Trees
- Decision Tree Classifier
- Ada Boost
- Linear Discriminant Analysis
- Gradient Boosting
- Naive Bayes
- Nearest Centroid
- Nearest Neighbours
- Deep Belief Networks

In general, we deduced the following

- Trees, Gradient Boosting resulted in long training times
- Normalization of data did not improve the prediction metric
- Trees and naive bayes on various heuristics could not break the easy benchmark
- Linear Discriminant Analysis with Single value decomposition met the easy benchmark.
- Deep Belief Networks gave the best prediction metrics

CUDAMat was used on Deep Belief Networks to shorten training times by at least 10x. This also resulted in a large improvement of scores.

We do not yet understand why increasing the number of layers in the network increases performance. Stack overflow sources recommended a range between the number of features and number of classifications.

A modal method was used to boost the results of the deep belief networks.