

# UFLDL Tutorial

## From Ufldl

**Description:** This tutorial will teach you the main ideas of Unsupervised Feature Learning and Deep Learning. By working through it, you will also get to implement several feature learning/deep learning algorithms, get to see them work for yourself, and learn how to apply/adapt these ideas to new problems.

This tutorial assumes a basic knowledge of machine learning (specifically, familiarity with the ideas of supervised learning, logistic regression, gradient descent). If you are not familiar with these ideas, we suggest you go to this Machine Learning course (<http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=MachineLearning>) and complete sections II, III, IV (up to Logistic Regression) first.

## Sparse Autoencoder

- Neural Networks
- Backpropagation Algorithm
- Gradient checking and advanced optimization
- Autoencoders and Sparsity
- Visualizing a Trained Autoencoder
- Sparse Autoencoder Notation Summary
- Exercise:Sparse Autoencoder

## Vectorized implementation

- Vectorization
- Logistic Regression Vectorization Example
- Neural Network Vectorization
- Exercise:Vectorization

## Preprocessing: PCA and Whitening

- PCA
- Whitening
- Implementing PCA/Whitening
- Exercise:PCA in 2D
- Exercise:PCA and Whitening

## Softmax Regression

- Softmax Regression
- Exercise:Softmax Regression

## Self-Taught Learning and Unsupervised Feature Learning

- Self-Taught Learning
- Exercise:Self-Taught Learning

## Building Deep Networks for Classification

- From Self-Taught Learning to Deep Networks
- Deep Networks: Overview
- Stacked Autoencoders
- Fine-tuning Stacked AEs
- Exercise: Implement deep networks for digit classification

## Linear Decoders with Autoencoders

- Linear Decoders
- Exercise:Learning color features with Sparse Autoencoders

## Working with Large Images

- Feature extraction using convolution
- Pooling
- Exercise:Convolution and Pooling

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**Note:** The sections above this line are stable. The sections below are still under construction, and may change without notice. Feel free to browse around however, and feedback/suggestions are welcome.

## Miscellaneous

- MATLAB Modules
- Style Guide
- Useful Links

## Miscellaneous Topics

- Data Preprocessing
- Deriving gradients using the backpropagation idea

## Advanced Topics:

### Sparse Coding

- Sparse Coding
- Sparse Coding: Autoencoder Interpretation

- Exercise: Sparse Coding

## ICA Style Models

- Independent Component Analysis
- Exercise: Independent Component Analysis

## Others

- Convolutional training
- Restricted Boltzmann Machines
- Deep Belief Networks
- Denoising Autoencoders
- K-means
- Spatial pyramids / Multiscale
- Slow Feature Analysis
- Tiled Convolution Networks

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Material contributed by: Andrew Ng, Jiquan Ngiam, Chuan Yu Foo, Yifan Mai, Caroline Suen

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