Deep Learning

1. Introduction
    - Definition
    - History
    - Limitations and Considerations
    - Key Elements of Machine Learning
        - Representation
        - Evaluation
        - Optimization
    - Neural Networks
    - Artificial Neurons
        - Perceptron
        - Sigmoid
    - Architecture of Neural Networks
        - Input Layer
        - Hidden Layer
        - Output Layer
    - Understanding the importance and impact of
        - Algorithm (Low)
        - Feature Selection (Medium)
        - Real World Data (High)
    - Overfitting and regularization
    - LAB: Introduction to Tensorflow (Part 1)
2. Datasets, Networks, and Trainers
    - Gathering Data
        - Quantifying real world data
        - Representing Data
        - What is,
            - Training Data
            - Testing Data

        - Validation Data
    - Splitting a Dataset
    - Normalizing Data
- Networks
    - Role and Importance
    - Layers
    - Bias
    - Look at Feed Forward Networks
    - Look at Recurrent Networks
- Deeper Look at Layers
    - Sigmoid Layer
    - TanH Layer
    - Softmax Layer
    - Relu Layer
- Trainers
    - Role and Importance
    - Cost/Loss Functions and - Gaussian Distributions
    - Gradient Descent Algorithm
    - Back Propagation Trainer
        - http://neuralnetworksanddeeplearning.com/chap2.html
        - Back Propagation with a single modified neuron
        - Back Propagation with linear neurons
- Types of Learning
    - Supervised
    - Unsupervised
    - Semi-Supervised
    - Reinforcement
- Machine Learning Techniques
    - Classification
    - Regression
        - Linear Regression

        - Logistic Regression
    - Clustering
        - K-Means Clustering
        - Hierarchial Clustering
    - Classification Vs. Regression
- LAB: Introduction to Tensorflow (Part 2)

3. Machine Learning with Tensorflow
    - Sessions, Variables and Constants
    - Reading from Files
        - Filenames, shuffling and epoch limits
        - File formats
        - Preprocessing
        - Batching
    - Threads and Queues
        - Queue Usage
        - Coordinator
        - Queue Runner
    - LAB: Linear Regression
    - LAB: Cost Functions and Hand Made Descents
    - LAB: Logistic Regression
    - LAB: Softmax Classification
    - ASSIGNMENT: Predicting Onset of Diabetes using TF NN
    - CASE STUDY: Image Classification with Convolution networks using TF NN
4. Machine Learning with PyBrain
    - Introduction and Installation
    - Model Overview
    - Building A Network
        - Building
        - Activating
        - Examining

        - Creating a Feed Forward Network
        - Creating a Recurrent Network
    - Building A Dataset
        - Adding
        - Examining
        - Differences between
            - Regression or Supervised Dataset
            - Classification
            - Sequential Dataset
    - Training using Back Propagation Trainer
    - Layers and Connectors
    - Saving and Loading Classifiers using Pickle
    - LAB: Classification of Multivariate Gaussion Distribution using FeedForward Network
    - ASSESSMENT: Predicting House Prices using TF NN
    - PROJECT: Automatic Image Classification with Neural Networks and PyBrain