Suggested Teaching Guidelines for

Practical Machine Learning PG-DBDA Aug 19

Duration: Duration: 40 hours theory and 60 hours Lab

Objective: Practicing Machine Learning Algorithms

Prerequisites: Good knowledge of Python Programming and Statistics

Evaluation method:
Theory exam– 40%
Lab Exam - 40%
Internal exam- 20%

List of Books / Other training material

Text Book:

1. Introduction to Machine Learning with Python - A Guide for Data Scientists, Muller Andreas / Shroff Publishers

Reference Book:

1. Machine Learning with R by Brett Lantz
2. Machine Learning for Big Data: Hands- On for Developwer by Jasaon Bell , Wiley
3. Machine Learning: Hands-on for Developers and Technical Professionals
4. Machine Learning: A Bayesian and Optimization Perspective
5. Introduction to Machine Learning, Third Edition
6. R in Action, Robert Kabakoff

Note: Each session having 2 Hours

Session 1

Lecture

- What is machine learning?
- Algorithm types of Machine learning
- Supervised and Unsupervised Learning
- Uses of Machine learning
- Evaluating ML techniques

Session 2 and 3

Lecture

- Clustering
- Hierarchical Clustering & K means
- Distance Measure and Data Preparation – Scaling & Weighting
- Evaluation and Profiling of Clusters
- Hierarchical Clustering
- Clustering Case Study
- Principal Component analysis

Session 4

Lecture

- Decision Trees

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- Classification and Regression Trees

Session 5 & 6
Lecture

- Bayesian analysis and Naïve bayes classifier
- Assigning probabilities and calculating results
- Discriminant Analysis (Linear and Quadratic)
- K-Nearest Neighbors Algorithm

Session 7 & 8
Lecture

- Concept of Model Ensembling
- Random forest, Gradient boosting Machines, Model Stacking

Session 9
Lecture

- Association rules mining
- Apriori and FP-growth algorithms

Session 10
Lecture

- Support vector Machines
- Basic classification principle of SVM
- Linear and Non linear classification (Polynomial and Radial)

Session 11 & 12
Lecture

- Moving average, Exponential Smoothing, Holt's Trend Methods, Holt-Winters' Methods for seasonality
- Auto-correlation(ACF & PACF), Auto-regression, Auto-regressive Models, Moving Average Models
- ARMA & ARIMA

Session 13
Lecture

- Neural Network and its applications
- Single layer neural Network
- Activation Functions: Sigmoid, Hyperbolic Tangent, ReLu
- Overview of Back propagation of errors

Session 14
Lecture

- Introduction to Deep Learning
- Introduction to Convolutional Neural Network & Recurrent Neural Network
- Introduction to Auto-encoders

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Session 15
Lecture

- Introduction to NLP
- Working with NLTK

Session 16
Lecture

- Introduction to Tensorflow
- Introduction to Keras

Session 17 and 18
Lecture

- Introduction to Scikit Learn
- Performing ML using Scikit Learn

Session 19
Lecture

- Introduction to ML cloud platform
- Introduction to ML tools like H2O

Session 20
Lecture

- Introduction to AI
- Applications of AI
- Role of DNN and conventional ML in AI

Session 21
Lecture
Deep Learning Essentials

- Early Stopping for Preventing Overfitting
- Dropout
- Training Methods for Neural Network (High-Level Overviews only)
  - Update of weights with single training set element, Batch Training, Mini-batch Training, Stochastic Gradient Descent
- Training Methods for Neural Network (High-Level Overviews only)
  - Classic Backpropagation
  - Momentum Backpropagation
  - ADAM
- L1 and L2 Regularization

Session 22
Lecture
Convolutional Neural Network I

- Convolutional Concept
- Inception Network
- Transfer Learning
- Data Augmentation

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Session 23
Lecture
Convolutional Neural Network II

- Object Detection
- YOLO Algorithm (High-Level Overview)

Session 24
Lecture
Recurrent Neural Network (RNN)

- RNN Concept
- Types of RNNs
- Vanishing gradients with RNNs
- Gated Recurrent Unit (GRU) - (High-Level Overview only)
- Long Short Term Memory (LSTM) - (High-Level Overview only)

Session 25
Natural Language Processing

- Word2Vec
- GloVe word vectors
- Sentiment Classification