

Course Contents:

Unit 1: Introduction to Machine Learning

[5 Hrs]

Introduction, Components of Learning, Learning Models, Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Frameworks for building Machine Learning System

Unit 2: Supervised Learning:

[12Hrs]

Regression: Linear Regression, Non-Linear Regression, and Model Evaluation Method

Classification: Logistic Regression, Support Vector Machine, K-Nearest Neighbors Methods

Decision Tree Technique: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning

Unit 3: Unsupervised Learning:

[4Hrs]

Introduction to clustering, K-means clustering, K-mode clustering

Unit 4: Model Diagnosis and Tuning:

[7 Hrs]

Bias and Variance, K-Fold Cross-Validation, Random Forests, Boosting, Hyperparameter tuning, GridSearch, RandomSearch.

Unit 5: Text mining:

[6 Hrs]

Text mining process overview, Text assemble, Text Preprocessing, Text Assemble, Text Exploration, Model building, Text exploration, Text Similarity, Text Clustering

Unit 6: Deep Learning

[11Hrs]

Artificial Neural Network, Feed Forward Neural Network with backpropagation, Convolution Neural Network, Recurrent neural network, Bayesian Learning and its applications

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- ① Framework for building a machine learning system.
- ② support vector machine
- ③ KNN algorithm
- ④ Decision Tree learning.
- ⑤ Naive Bayes Algorithm
- ⑥ K-means algorithm
- ⑦ K-medoids clustering algorithm
- ⑧ K-fold cross validation
- ⑨ Bias and variance

- ⑩ Back propagation
- ⑪ Hyper parameter tuning.
- ⑫ CNN
- ⑬ Bayesian learning
- ⑭ Linear Regression.
- ⑮ Logistic Regression.

Unit - I (Introduction) Examples

- ① Introduction of Machine learning? (fig)
- ② components of learning? (fig)
- ③ Applications of Machine learning?
- ④ Explain learning models?
 - Linear Regression
 - Logistic Regression
 - Decision tree
 - Random forest
 - SVM
 - Neural network
 - Naive Bayes.
 - K-Nearest Neighbors (KNN)
 - Gradient Boosting Models
- ⑤ Explain Geometric models
- ⑥ " probabilistic models.
- ⑦ " topic models
- ⑧ " Grouping and Grading

iii) Designing a learning system?
steps and consideration (framework)

(i) What is learning and different types of learning?

(x) Distinguish between supervised and unsupervised learning with practical example.

(x1) Framework for building machine learning system?

Unit - 2 (supervised learning)

(i) What is the classification problem in machine learning? Describe three real life situations in different domains where such problems arise.

(ii) Introduction to Regression?
↳ Explain (Linear Regression) Algorithm.

↳ What is best fit line in Linear Regression.

(iii) Explain about: Root mean squared

Error.

↑

(IV) Explain evaluation metrics for linear regression. How do you evaluate?

↳ RMSE

↳ RSE (Residual standard Error)

(V) Explain Non-linear Regression.

(VI) Describe classification in ML?

(VII) Explain logistic Regression Algorithm?

(VIII) Explain support vector machine Algorithm?

(IX) Explain K-Nearest Neighbors method? (numerical)
(old question)

(X) How do you evaluate regression model and what are the methods for evaluation? Explain two methods?

(XI) Explain decision tree Representation?

(XII) what are the appropriate problems

for Decision tree learning?

(XII) Explain Decision tree algorithm.

(XIII) Can decision tree be used for regression? If yes, explain how if no, explain why?

(XIV) What is Hypothesis space search in decision tree learning?

(XV) Explain Inductive bias in decision tree learning?

Unit-3 (unsupervised learning)

→ What is clustering?

→ Questions related to unsupervised learning?

→ k-means clustering (numerical)

→ k-mode clustering (numerical)

Unit-4 (model diagnosis & tuning)

→ Define Bias and variance?

- what is bias-variance trade off?
- what are ways to reduce high bias and ways to reduce variance.
- what do you mean by underfitting and overfitting?
- Elaborate k-fold cross-validation.
 - ↳ algorithm.
- Advantages / Disadvantages
- Explain Random forest algorithm.
- what do you mean by Boosting?
- Explain Hyper parameter tuning
 - ↳ Grid search and
 - ↳ Random search.

Unit-5 (Text mining)

- what is text mining? Advantages, importance etc.
- Process of text mining?
 - Text assemble.
 - Text preprocessing.
 - Text exploration.
 - model building.

- Text similarity.
- Text clustering.

Unit-6 (Deep learning)

- what is Artificial Neural Network.
- what is Feed forward NN and Feed backward NN.
- what is back propagation algorithm?
- Explain CNN algorithm?
- what is Recurrent neural network.
- Explain Baye's Rule (Theorem)? why is the Baye's rule useful in practice?
- Explain Naive Bayes algorithm?