AKTU B.E./B.Tech CSE Sem 8 syllabus

Machine Learning

Machine Learning

UNIT-I

INTRODUCTION – Well defined learning problems, Designing a Learning
System, Issues in Machine Learning; THE CONCEPT LEARNING TASK -
General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias

UNIT-II

DECISION TREE LEARNING - Decision tree learning algorithm- Inductive
bias- Issues in Decision tree learning; ARTIFICIAL NEURAL NETWORKS –
Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks,
Derivation of backpropagation rule Backpropagation AlgorithmConvergence,
Generalization;

UNIT-III

Evaluating Hypotheses: Estimating Hypotheses Accuracy, Basics of sampling
Theory, Comparing Learning Algorithms; Bayesian Learning: Bayes theorem,
Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian
belief networks, EM algorithm;

UNIT-IV

Computational Learning Theory: Sample Complexity for Finite Hypothesis
spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound
Model of Learning; INSTANCE-BASED LEARNING – k-Nearest Neighbour

Learning, Locally Weighted Regression, Radial basis function networks, Case-
based learning

UNIT-V

Genetic Algorithms: an illustrative example, Hypothesis space search, Genetic

Programming, Models of Evolution and Learning; Learning first order rules-
sequential covering algorithms-General to specific beam search-FOIL;

REINFORCEMENT LEARNING - The Learning Task, Q Learning.

Image Processing

IMAGE PROCESSING

DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image Processing – Components –
Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and
Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models,
Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.

IMAGE ENHANCEMENT :
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–
Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier
Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian

filters, Homomorphic filtering, Color image enhancement.

IMAGE RESTORATION :
Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics
– Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch
Filtering – Inverse Filtering – Wiener filtering

IMAGE SEGMENTATION:
Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation –
Region growing – Region splitting and merging – Morphological processing- erosion and dilation,
Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed
segmentation algorithm.

IMAGE COMPRESSION AND RECOGNITION:
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG
standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional
Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on
matching.

Speech Natural language processing

UNIT-1

INTRODUCTION :
Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM –
Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and
rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance
WORD LEVEL ANALYSIS
Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes,
Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS
tagging – Hidden Markov and Maximum Entropy models.

UNIT-2 SYNTACTIC ANALYSIS

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT-3 SEMANTICS AND PRAGMATICS

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT-4 BASIC CONCEPTS of Speech Processing :

Speech Fundamentals: Articulatory Phonetics – Production And Classification Of Speech Sounds; Acoustic Phonetics – Acoustics Of Speech Production; Review Of Digital Signal Processing Concepts; Short-Time Fourier Transform, Filter-Bank And LPC Methods.

UNIT-5 SPEECH ANALYSIS:

Features, Feature Extraction And Pattern Comparison Techniques: Speech Distortion Measures– Mathematical And Perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances And Filtering, Likelihood Distortions, Spectral Distortion Using A Warped Frequency Scale, LPC, PLP And MFCC Coefficients, Time Alignment And Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-Estimation, Implementation Issues.