



Inspiring Excellence

Lecture Plan

CSE422: Artificial Intelligence

Faculty: Rafiad Sadat Shahir [RSS]

Lecture 1: Artificial Intelligence

- Artificial Intelligence (AI)
 - Turing Test
- History of AI
- Foundations of AI
- Agents and Environments
- Paradigm of AI
 - Modeling, Inference, & Learning

Lecture 2: Uninformed Search

- State-Based Models
- Search Tree
- Uninformed Search
- Breadth First Search (BFS), Depth First Search (DFS)
- Depth Limited Search (DLS)
- Uniform Cost Search (UCS)
- Performance Measure of the Algorithms

Lecture 3: Informed Search

- Informed Search
 - Heuristic Function
- Greedy Best-First Search (GBFS)
- A Star Search (A*)
- Performance Measure of the Algorithms
- Generating heuristics
 - Hamming, Manhattan & Euclidean Distance

Lecture 4: Heuristics

- Optimality of A* Search
 - Admissible Heuristics
 - Proof of Optimality
 - Consistent Heuristics
- Checking Admissibility and Consistency
- Dominance of Heuristic

Lecture 5: Local Search

- Local Search
- Objective Function
- Hill Climbing
 - Initialization Problem
 - Minima, Maxima, Saddle Points & Plateaus
 - Random Restart Hill Climbing
 - Simulated Annealing
- Gradient Descent

Lecture 6: Genetic Algorithm

- Local Beam Search
 - Stochastic Beam Search
 - Evolutionary Algorithms
- Randomized Algorithms
 - Monte Carlo Algorithms
- Genetic Algorithm
 - Population, Fitness, Selection, Crossover, Mutation

Lecture 7: Adversarial Games

- Adversarial Search
 - Two Player, Fully Observable, Turn-Based, Zero-Sum Game
- Minimax Algorithm
 - Utility Function
- Optimizing Minimax Algorithm
 - Evaluation Function
 - Alpha-Beta Pruning
- Expectimax & Expectiminimax Algorithm

Lecture 8: Linear Algebra & Probability

- Basic Terminologies
- Random Variables
 - PMF, CDF, PDF & Expectation
- Two Random Variables
 - Joint, Marginal & Conditional Probability
 - Bayes Rule
 - Independence & Conditional Independence

Lecture 9: Linear Regression

- Machine Learning
- Linear Hypothesis
- Loss Function
 - Squared Error
- Gradient Descent
 - Batch & Stochastic Gradient Descent
- Probabilistic Interpretation
- Higher Dimensional Feature Mapping

Lecture 10: Perceptron & Logistic Regression

- Logistic Regression
 - Logistic Hypothesis
 - Log Loss
- Perceptron
 - Hypothesis of Perceptron
 - Perceptron Learning Rule
- Probabilistic Interpretation

Lecture 11: Gaussian Discriminant Analysis

- Discriminative & Generative Algorithms
- Gaussian Discriminant Analysis (GDA)
 - GDA Assumption
 - $\phi, \mu_0, \mu_1, \Sigma$
 - Inference Using GDA
- GDA and Logistic Regression

Lecture 12: Naive Bayes

- Naive Bayes (NB)
 - NB Assumption
 - Inference Using NB
- Multinomial NB
- Gaussian NB
- Laplace Smoothing

Lecture 13: Artificial Neural Networks

- Logistic Regression as Connectionist System
- Limitations of Perceptron
- Multilayer Perceptron
 - Fully Connected Layers
- Forward Propagation
 - Implementation Using Tensors
 - Activation Functions
 - Importance of Non-Linear Activation Functions

Lecture 14: ANNs (Continued)

- Backpropagation
 - Chain Rule
- Hyperparameters
- Additional Topics:
 - RNNs, CNNs, SNNs
 - Drawbacks of Backpropagation
 - Alternatives to Backpropagation

Lecture 15: Decision Tree

- Decision Tree (DT)
 - If-Else Rule Based Model
- Inference Using DT
- Learning Decision Tree
 - ID3 Algorithm
 - Entropy
 - Gain



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The End