ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

# COURSE OBJECTIVES:

* To provide the fundamental knowledge of Artificial Intelligence and Machine Learning.
* To understand the basic areas of AI & ML including problem solving, knowledge representation, reasoning, models, Loss functions.
* To apply machine learning and optimization techniques to make predictions

# Unit – I

**Introducing Artificial Intelligence:** Introduction to AI - Intelligent Agents, Problem-Solving Agents, Searching for Solutions - Breadth-first search, Depth-first search, Hill-climbing search, simulated annealing search, Local Search in Continuous Spaces. Games - Optimal Decisions in Games, Water-Jug problem, Travelling salesman problem, Alpha–Beta Pruning.

# Unit – II

**Knowledge Representation in AI:** Need for Knowledge representation. Types of Knowledge. Knowledge and Intelligence, AI Knowledge cycle. Various approaches to Knowledge Representation. Requirements of Knowledge Representation System. Intelligent agent.

**Constraint Satisfaction:** Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses

# Unit – III

**Introduction to Machine Learning:** Learning, Traditional vs Machine Learning, Types of ML, Classification and Regression model, Challenges faced by ML, Steps of developing an ML model, Bias and Variance, Regularization, Testing and validating, K cross validation, Hyper parameter tuning, Model Selection.

**Model optimization and Evaluation:** Confusion matrix, Recall, accuracy, precision, Model optimization, Cost/Loss Function, Derivative of cost function and non-derivative cost function, Gradient descent, Mini-batch Gradient, Descent (sckit-learn), Stochastic Gradient descent (sckit-learn), Momentum (sckit-learn).

# Unit – IV

**Supervised Machine Learning Algorithm with python:** Supervised Machine Learning Algorithms, k-Nearest Neighbors, Linear Regression, Logistic Regression, Log Loss, Support Vector Machine, Hinge Loss, Kernel Trick, polynomial Kernel, Decision Trees, Gini impurity, Ensemble learner, Random Forests.

# Unit –V

**Unsupervised Machine Learning with python:** The Curse of Dimensionality, Projection, Manifold Learning Principal component analysis, Clustering , K-Means, Limits of K-Means, Clustering for Image Segmentation, Clustering for Preprocessing, Clustering for Semi-Supervised Learning, DBSCAN.

RECOMMENDED BOOKS:

1. Artificial Intelligence: A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
2. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
3. Pattern Recognition and Machine Learning, Christopher M. Bishop
4. Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow by Aurélien Géron
5. Introduction to Machine Learning with Python by Andreas C. Müller &amp; O’reilly

**COURSE OUTCOMES:** After completing the course, the student will be able to:

**CO1:** Define basic concepts of Artificial Intelligence & Machine Learning.

**CO2:** Illustrate various techniques for knowledge representation and processing.

**CO3:** Apply various model optimization and tuning approaches.

**CO4:** Develop a model using supervised/unsupervised machine learning algorithms for classification/prediction/clustering

**CO5:** Evaluate performance of machine learning algorithms on various data sets of a domain.

**LIST OF EXPERIMENT**

1. Implement Depth first search for water jug problem
2. Write a Program to find the solution for travelling salesman Problem
3. Write a program to implement 8 puzzle problem
4. Write a program to implement Hill Climbing Algorithm
5. Write a program to implement A\* Algorithm and AO\* Algorithm
6. Perform exploratory data analysis and visualization after importing a .CSV file.

* Handle missing data by detecting and dropping/ filling missing values.
* Transform data using different methods.
* Detect and filter outliers.
* Perform Vectorized String operations on Pandas Series.
* Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.

1. Implement Various Regression algorithm for House Price Prediction (USA housing Dataset) and compare there accuracy using scikitlearn

* Linear Regression
* Polynomial Regression
* Support Vector machine

1. Implement Regularized Regression for house price prediction and evaluate there accuracy using sckitlearn.

* Ridge Regression
* Lasso Regression

1. Implement Various Classification algorithm for iris data set and evaluate there performance.

* Navie Bayes Classifier
* Logistic Regression
* Support vector Machine
* Decision tree

1. Implement Various ensemble on housing and iris dataset and evaluate there performance

* Voting classifier
* Random Forest (Bagging and pasting)

1. Implement principle component analysis on any choosen dataset
2. Implement various clustering algorithm on choosen dataset

* K-Mean
* DBSCAN

# Skill Based Mini Project

Artificial Learning Project

1. Build a bot which provides all the information related to students in college.
2. Build a virtual assistant for Wikipedia using Wolfram Alpha and Python.
3. Build a Banking Bot
4. Online Assignment Plagiarism Checker

Supervised learning projects

1. Implement a regressor for any Medical disease diagnosis.
2. Implement a Cervical Cancer Risk Classifier
3. Regression model for Video Game Sales Prediction
4. Calories Burnt Prediction using Machine Learning
5. Vehicle Count Prediction From Sensor Data
6. Regression model for predicting if song will be popular
7. Regression model for Customer Behavior Analysis
8. Regression model to predict health insurance cost
9. Titanic Survival Prediction

Unsupervised Learning Projects

1. Spam and not Spam Classifier
2. Spotify Music Recommendation System
3. Online Payment Fraud Detection using Machine Learning in Python
4. Customer Segmentation using Unsupervised Machine Learning in Python
5. Target Customer segmentation.
6. Topic Modeling for Twitter Customer Reviews
7. Bank-Note Authentication