**Machine Learning with R – Training Course Contents**

**Duration:3 Days**

**Objective**: This course walks through the process of creating a machine learning prediction solution. The course introduces and uses R, the primary language for Machine Learning.

**Detailed Course Contents**

Introduction to R

What is R?

Why R?

Installing R

R environment

How to get help in R

R console and Editor

R Studio

Variables in R

Scalars

Vectors

Matrices

List

Data frames

Using c, Cbind, Rbind, attach and detach functions in R

Factors

Data Processing using R

Reading Data

Writing Data

Slicing of Data

Merging Data

Apply functions

Programming in R - Overview

Graphics Using R

Box plot

Histogram

Pareto charts

Pie graph

Line chart

Scatterplot

Developing graphs

Understanding Machine Learning With R

Introduction

What Is Machine Learning?

Types of Machine Learning

Machine Learning

Simulation (Sampling from Probability Distributions)

Supervised and Unsupervised Learning

Regression

Prediction

Forecasting

Dimension reduction (Principal Component Analysis)

Decision Tree

Anomaly Detection in data

Data clustering (k-means)

Classification (k- nearest neighbor)

Classification (Support Vector Machine)

Understanding the Machine Learning Workflow

Machine Learning Workflow Overview

Asking the Right Question

From Question to Solution Statement

Preparing Your Data

Introduction to Data Preparation

Getting Data

Loading, Cleaning, and Inspecting Data

Molding Data

Selecting Your Algorithm

Introduction to Algorithm Selection

Selecting an Initial Algorithm

Training the Model

Introduction to Training

The Training Process

Training with R

Testing Your Model's Accuracy

Introduction to Evaluating the Model

Evaluating the Model with R

Improving Model Performance

Advanced Machine Learning Algorithms

Nearest neighbor classification

Instance based classifiers

Nearest-Neighbor classifiers

Lazy vs. Eager learning

k-NN variations

How to determine the good value for k

When to consider nearest neighbors

Condensing

Nearest neighbor issues

Naive Bayes classification

Naive Bayes learning

Conditional probability

Bayesian theorem: basics

The Bayes classifier

Model parameters

Naive Bayes training

Types of errors

Sensitivity and specificity

ROC curve

Holdout estimation

Cross-validation

Decision Trees - Part I

Key requirements

Decision tree as a rule set

How to create a decision tree

Choosing attributes

ID3 heuristic

Entropy

Pruning trees - Pre and post

Subtree Replacement

Raising

Decision Trees - Part II

Tree induction

Splitting based on ordinal attributes

How to determine the best split

Measure of impurity: GINI

Splitting based on GINI

Attributes binay

Categorical -GINI

Strengths and weakness of decision trees

Artificial Neural Network

Background of brain and neuron

Neural networks

Neurons diagram

Neuron models- step function

Ramp func etc

Perceptrons

Network architectures

Single-layer feed-forward

Artificial Neural Network continued

Multi layer feed-forward NN (FFNN)

Back propagation

NN design issues

Recurrent network architecture

Supervised learning NN

Self organizing map

Network structure

SOM algorithm