Course Structure for Summer Training 2020 on "Machine Learning using Python"

Organised by Centre for Data Science (CDS), JISIASR Kolkata

From June 01, 2020 to June 30, 2020

Course Module: Machine Learning

Introduction to Machine Learning, Problem Space Representation, Representations of Patterns and Classes, Feature Extraction, Different approaches to Feature Selection. Component Analysis and Dimensionality Reduction - The Curse of Dimensionality, Principal Component Analysis.

Heuristic Search Techniques, Knowledge Representation, Predicate Logic, Reasoning under uncertainty, Statistical Reasoning, Planning, Learning, Expert System Design, Case Studies.

Regression Analysis: Linear Regression with single and multiple variables, Logistic Regression.

Tree Classifiers: Decision Trees - CART, C4.5, ID3. Random Forests.

Supervised and Unsupervised Learning: Bayesian Decision Theory, Discriminative Classifiers: Decision Boundary, k-Nearest Neighbour, Support Vector Machines, K-Means Clustering.

Introduction to Artificial Neural networks: Network architectures, Rosenblat's perceptron, Multilayer perceptron and Backpropagation, RBF network etc.

Deep Networks: Deep Feed Forward Network, Regularization for Deep Learning, Optimization for Training Deep Models.

Convolutional Networks (CNN), Recurrent (RNN) and Recursive Net; Autoencoders; Representation Learning; Deep generative Models.

Introduction to Parallel and Distributed Deep Learning; Application of Deep Learning Techniques in Computer Vision, Natural Language Processing.

Applications of various machine learning algorithms.

Course Module: Python Programming

Introduction, Operators, Variables and Data Types, Conditional Statements, Looping Construct, Functions, Lists, Dictionaries, Libraries, DB – connectivity.

NumPy: NumPy Standard data types, The Basics of NumPy Arrays, Array Attributes, Array indexing, Array Slicing: accessing sub array, Reshaping Of Arrays, Concatenation & Splitting of Array, Computation on NumPy arrays, Universal Functions (optional), Aggregations (Summing the values, min, max), Array Broadcasting (optional), Comparisons, masks, Boolean logic, NumPy Sorting (ex. np.sort, np.argsort), Structured Arrays, Creation of structured arrays, Record Arrays.

Pandas: Introducing Pandas Objects, Pandas Series Object, Pandas Data Frame Object, Pandas Index Object, Data operations in Panda, Data Selection in Series, Data Selections in DataFrame, Handling Missing Data, Combining Dataset (pd.concat, pd.appened), merge and join, Aggregating and Grouping (GroupBy: Split, Apply, Combine), Pandas String, Pandas Time Series.

Matplotlib: Display Plots, Histograms, Binning and Density, 3D ploting.

Scikit Learn: Introduction to sklearn.

Capstone Project.