**Aim: To study various machine learning libraries like - Scipy, Sklearn,**

**Keras, Tensorflow with their usage.**

## To study the various machine learning libraries like - Scipy, Sklearn, Keras, TensorFlow with their usage

**# Numpy:**

- NumPy is a Python package. It stands for 'Numerical Python'.

- It is a library consisting of multidimensional array objects and a collection of routines for processing of array.

- **## Operations using NumPy:**

- Mathematical and logical operations on arrays.

- Fourier transforms and routines for shape manipulation.

- Operations related to linear algebra. NumPy has in-built functions for linear algebra and random number generation

**# Scipy:**

- Scipy is a scientific computing package for Python. scipy imports all the functions from numpy namespace.

- The SciPy library is built to work with NumPy arrays and provides many user-friendly and efficient numerical practices such as routines for numerical integration and optimization.

- SciPy provides algorithms for optimization, integration, interpolation, eigenvalue problems, algebraic equations, differential equations, statistics and many other classes of problems.

- Scipy Extends NumPy providing additional tools for array computing and provides specialized data structures, such as sparse matrices and k-dimensional trees.

**# Pandas:**

- Pandas is an open-source Python Library providing high-performance data manipulation and analysis tool using its powerful data structures. The name Pandas is derived from the word Panel Data – an Econometrics from Multidimensional data.

- Python with Pandas is used in a wide range of fields including academic and commercial domains including finance, economics, Statistics, analytics, etc.

- **## Key Features of Pandas:**

- Fast and efficient DataFrame object with default and customized indexing.

- Tools for loading data into in-memory data objects from different file formats.

- Data alignment and integrated handling of missing data.

- Reshaping and pivoting of date sets.

- Label-based slicing, indexing and subsetting of large data sets.

- Columns from a data structure can be deleted or inserted.

- Group by data for aggregation and transformations.

- High performance merging and joining of data.

- Time Series functionality.

**# Sci-Kit learn (sklearn):**

- Sklearn or Scikit-learn is an open source machine learning library that supports supervised and unsupervised learning.

- It also provides various tools for model fitting, data preprocessing, model selection and evaluation, and many other utilities.

- **## Features:**

- Rather than focusing on loading, manipulating and summarising data, Scikit-learn library is focused on modeling the data. Some of the most popular groups of models provided by Sklearn are as follows −

- Supervised Learning algorithms − Almost all the popular supervised learning algorithms, like Linear Regression, Support Vector Machine (SVM), Decision Tree etc., are the part of scikit-learn.

- Unsupervised Learning algorithms − On the other hand, it also has all the popular unsupervised learning algorithms from clustering, factor analysis, PCA (Principal Component Analysis) to unsupervised neural networks.

- Clustering − This model is used for grouping unlabeled data.

- Cross Validation − It is used to check the accuracy of supervised models on unseen data.

- Dimensionality Reduction − It is used for reducing the number of attributes in data which can be further used for summarisation, visualisation and feature selection.

- Ensemble methods − As name suggest, it is used for combining the predictions of multiple supervised models.

- Feature extraction − It is used to extract the features from data to define the attributes in image and text data.

- Feature selection − It is used to identify useful attributes to create supervised models.

- Open Source − It is open source library and also commercially usable under BSD license

**# TensorFlow:**

- TensorFlow makes it easy for beginners and experts to create machine learning models for desktop, mobile, web, and cloud.

- It is used for implementing machine learning and deep learning applications.

- To develop and research on fascinating ideas on artificial intelligence, Google team created TensorFlow.

- TensorFlow is designed in Python programming language, hence it is considered an easy to understand framework.

- **## Features:**

- It includes a feature of that defines, optimizes and calculates mathematical expressions easily with the help of multi-dimensional arrays called tensors.

- It includes a programming support of deep neural networks and machine learning techniques.

- It includes a high scalable feature of computation with various data sets.

- TensorFlow uses GPU computing, automating management. It also includes a unique feature of optimization of same memory and the data used.

**# Keras:**

- Keras is an open source deep learning framework for python.

- It has been developed by an artificial intelligence researcher at Google named Francois Chollet.

- Leading organizations like Google, Square, Netflix, Huawei and Uber are currently using Keras.

- **## Features**

- Keras leverages various optimization techniques to make high level neural network API easier and more performant. It supports the following features −

- Consistent, simple and extensible API.

- Minimal structure - easy to achieve the result without any frills.

- It supports multiple platforms and backends.

- It is user friendly framework which runs on both CPU and GPU.

- Highly scalability of computation.