SOFTCRAYONS
Tech Solutions Pvt. Ltd.

Machine Learning Using Python

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About Course

Machine learning (ML) is a field of inquiry devoted to understanding and building methods that 'learn', that is, methods that leverage data to improve performance on some set of tasks. It is seen as a part of artificial intelligence. Machine learning algorithms build a model based on sample data, known as training data, in order to make predictions or decisions without being explicitly programmed to do so. Machine learning algorithms are used in a wide variety of applications, such as in medicine, email filtering, speech recognition, and computer vision, where it is difficult or unfeasible to develop conventional algorithms to perform the needed tasks.

MACHINE LEARNING USING PYTHON

CURRICULUM

① Introduction To Python

- Why Python
- Application areas of python
- Python implementations
- Cpython
- Jython
- Ironpython
- Pypy
- Python versions
- Installing python
- Python interpreter architecture
- Python byte code compiler
- Python virtual machine(pvm)

② Writing and Executing First Python Program

- Using interactive mode
- Using script mode
- General text editor and command window
- Idle editor and idle shell
- Understanding print() function

- How to compile python program explicitly

3 Python Language Fundamentals

- Character set
- Keywords
- Comments
- Variables
- Literals
- Operators
- Reading input from console
- Parsing string to int, float

4 Python Conditional Statements

- If statement
- If else statement
- If elif statement
- If elif else statement
- Nested if statement

5 Looping Statements

- While loop
- For loop
- Nested loops
- Pass, break and continue keywords

6 Standard Data Types

Int, float, complex, bool, nonetype
Str, list, tuple, range

7 String Handling

What is string
String representations
Unicode string
String functions, methods
String indexing and slicing
String formatting

8 Python List

Creating and accessing lists
Indexing and slicing lists
List methods
Nested lists
List comprehension

9 Python Tuple

Creating tuple
Accessing tuple
Immutability of tuple

10 Python Set

- How to create a set
- Iteration over sets
- Python set methods
- Python frozenset

11 Python Dictionary

- Creating a dictionary
- Dictionary methods
- Accessing values from dictionary
- Updating dictionary
- Iterating dictionary
- Dictionary comprehension

12 Python Functions

- Defining a function
- Calling a function
- Types of functions
- Function arguments
- Positional arguments, keyword arguments
- Default arguments, non-default arguments
- Arbitrary arguments, keyword arbitrary arguments
- Function return statement

- Nested function
- Function as argument
- Function as return statement
- Decorator function
- Closure
- Map(), filter(), reduce(), any() functions
- Anonymous or lambda function

13 Modules & Packages

- Why modules
- Script v/s module
- Importing module
- Standard v/s third party modules
- Why packages
- Understanding pip utility

14 File I/O

- Introduction to file handling
- File modes
- Functions and methods related to file handling
- Understanding with block

15 Object Oriented Programming

- Procedural v/s object oriented programming
- OOP principles
- Defining a class & object creation
- Object attributes
- Inheritance
- Encapsulation
- Polymorphism

16 Exception Handling

- Difference between syntax errors and exceptions
- Keywords used in exception handling
- try, except, finally, raise, assert
- Types of except blocks

17 Regular Expressions(Regex)

- Need of regular expressions
- Re module
- Functions /methods related to regex
- Meta characters & special sequences

18 GUI Programming

- Introduction to tkinter programming
- Tkinter widgets
- Tk, label, Entry, Textbox, Button
- Frame, messagebox, filedialog etc
- Layout managers
- Event handling
- Displaying image

19 Multi-Threading Programming

- Multi-processing v/s Multi-threading
- Need of threads
- Creating child threads
- Functions /methods related to threads
- Thread synchronization and locking

Statistics, Probability & Analytics:

20 Introduction to Statistics

- Sample or population
- Measures of central tendency
- Arithmetic mean

- Harmonic mean
- Geometric mean
- Mode
- Quartile
- First quartile
- Second quartile(median)
- Third quartile
- Standard deviation

21 Probability Distributions

- Introduction to probability
- Conditional probability
- Normal distribution
- Uniform distribution
- Exponential distribution
- Right & left skewed distribution
- Random distribution
- Central limit theorem

22 Hypothesis Testing

- Normality test
- Mean test
- T-test
- Z-test

ANOVA test
Chi square test
Correlation and covariance

23 Numpy Package

Difference between list and numpy array
Vector and matrix operations
Array indexing and slicing

Panda Package

24 Introduction to pandas

Labeled and structured data
Series and dataframe objects
How to load datasets
From excel
From csv
From html table
Accessing data from Data Frame
at & iat
loc & iloc
head() & tail()
Exploratory Data Analysis (EDA)

- describe()
- groupby()
- crosstab()
- boolean slicing / query()
- Data Manipulation & Cleaning
- Map(), apply()
- Combining data frames
- Adding/removing rows & columns
- Sorting data
- Handling missing values
- Handling duplicacy
- Handling data error
- Categorical Data Encoding
- Label Encoding
- One Hot Encoding
- Handling Date and Time

25 **Data Visualization using matplotlib and seaborn packages**

- Scatter plot, lineplot, bar plot
- Histogram, pie chart,
- Jointplot, pairplot, heatmap
- Outlier detection using boxplot

26 Machine Learning

- Introduction To Machine Learning
- Traditional v/s Machine Learning Programming
- Real life examples based on ML
- Steps of ML Programming
- Data Preprocessing revised
- Terminology related to ML

27 Supervised Learning

- Classification
- Regression

28 Unsupervised Learning

- clustering

29 KNN Classification

- Math behind KNN
- KNN implementation
- Understanding hyper parameters

30 Performance metrics

- Math behind KNN

KNN implementation
Understanding hyper parameters

31 Regression

Math behind regression
Simple linear regression
Multiple linear regression
Polynomial regression
Boston price prediction
Cost or loss functions
Mean absolute error
Mean squared error
Root mean squared error
Least square error
Regularization

32 Logistic Regression for classification

Theory of logistic regression
Binary and multiclass classification
Implementing titanic dataset
Implementing iris dataset
Sigmoid and softmax functions

33 Support Vector Machines

Theory of SVM
SVM Implementation
kernel, gamma, alpha

34 Decision Tree Classification

Theory of decision tree
Node splitting
Implementation with iris dataset
Visualizing tree

35 Ensemble Learning

Random forest
Bagging and boosting
Voting classifier

36 Model Selection Techniques

Cross validation
Grid and random search for hyper parameter tuning

37 Recommendation System

Content based technique

- Collaborative filtering technique
- Evaluating similarity based on correlation
- Classification-based recommendations

38 Clustering

- K-means clustering
- Hierarchical clustering
- Elbow technique
- Silhouette coefficient
- Dendogram

39 Text Analysis

- Install nltk
- Tokenize words
- Tokenizing sentences
- Stop words customization
- Stemming and lemmatization
- Feature extraction
- Sentiment analysis
- Count vectorizer
- Tfidfvectorizer
- Naive bayes algorithms

40 Dimensionality Reduction

- Principal component analysis(pca)

41 Open CV

- Reading images
- Understanding gray scale image
- Resizing image
- Understanding haar classifiers
- Face, eyes classification
- How to use webcam in open cv
- Building image data set
- Capturing video
- Face classification in video
- Creating model for gender prediction

42 Projects

- Two project using Python & ML

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