Python and Machine Learning Course Content - Nagaraj

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Day 1

Core Python

Introduction to Script

- What is Script, program?
- Types of Scripts
- Difference between Script and Programming Languages
- Features and Limitation of Scripting
- Types of programming Language Paradigms

Introduction to Python

- What is Python?
- Why Python?
- Who Uses Python?
- Characteristics of Python
- History of Python
- What is PSF?
- Python Versions
- How to Download and Install Python
- Install Python with Diff IDEs
- Features and Limitations of Python
- Python Applications
- Creating Your First Python Program
- Printing to the Screen
- Reading Keyboard Input
- Using Command Prompt and GUI or IDE
- Python Distributions

Different Modes in PYTHON

- Execute the Script
- Interactive and Script Mode
- Python File Extensions
- SETTING PATH IN Windows
- Clear screen inside python
- Learn Python Main Function
- Python Comments
- Quit the Python Shell

- Shell as a Simple Calculator
- Order of operations
- Multiline Statements
- Quotations in Python
- Python Path Testing
- Joining two lines
- Python Implementation Alternatives
- Sub Packages in Python
- Uses of Python in Data Science, IoT
- Working with Python in Unix/Linux/Windows/Mac/Android..!!

PYTHON NEW IDEs

- PyCharm IDE
- How to Work on PyCharm
- PyCharm Components
- Debugging process in PyCharm
- PYTHON Install Anaconda
- What is Anaconda?
- Coding Environments
- Spyder Components
- General Spyder Features
- Spyder Shortcut Keys
- Jupyter Notebook
- What is Conda? and Conda List?
- Jupyter and Kernels
- What is PIP?

Variables in Python

- What is Variable?
- Variables and Constants in Python
- Variable,Variable names and Value
- Mnemonic Variable Names
- Values and Types
- What Does “Type” Mean?
- Multiple Assignment
- Python different numerical types
- Standard Data Types
- Operators and Operands
- Order of Operations
- Swap variables
- Python Mathematics

- Type Conversion
- Mutable Versus Immutable Objects

String Handling

- What is string?
- String operations and indices
- Basic String Operations
- String Functions, Methods
- Delete a string
- String Multiplication and concatenation
- Python Keywords, Identifiers and Literals
- String Formatting Operator
- Structuring with indentation in Python
- Built-in String Methods
- Define Data Structure?
- Data Structures in PYTHON

Python Operators and Operands

- Arithmetic, Relational Operators and Comparison Operators
- Python Assignment Operators
- Short hand Assignment Operators
- Logical Operators or Bitwise Operators
- Membership Operators
- Identity Operators
- Operator precedence
- Evaluating Expressions

Python Conditional Statements

- How to use “if condition” in conditional structures
- if statement (One-Way Decisions)
- if .. else statement (Two-way Decisions)
- How to use “else condition”
- if .. elif .. else statement (Multi-way)
- When “else condition” does not work
- How to use “elif” condition
- How to execute conditional statement with minimal code
- Nested IF Statement

Python LOOPS

- How to use “While Loop” and “For Loop”
- How to use For Loop for set of other things besides numbers
- Break statements, Continue statement, Enumerate function for For Loop
- Practical Example
- How to use for loop to repeat the same statement over and again
- Break, continue statements

Learning Python Strings

- Accessing Values in Strings
- Various String Operators
- Some more examples
- Python String replace() Method
- Changing upper and lower case strings
- Using “join” function for the string
- Reversing String
- Split Strings

Sequence or Collections in PYTHON

- Strings
- Unicode Strings
- Lists
- Tuples
- buffers
- xrange

Day 2

Python Lists

- Lists are mutable
- Getting to Lists
- List indices
- Traversing a list
- List operations, slices and methods
- Map, filter and reduce
- Deleting elements
- Lists and strings

Python TUPLE

- Advantages of Tuple over List
- Packing and Unpacking
- Comparing tuples
- Creating nested tuple
- Using tuples as keys in dictionaries
- Deleting Tuples
- Slicing of Tuple
- Tuple Membership Test
- Built-in functions with Tuple
- Dotted Charts

Python Sets

- How to create a set?
- Iteration Over Sets
- Python Set Methods
- Python Set Operations
- Union of sets
- Built-in Functions with Set
- Python Frozenset

Python Dictionary

- How to create a dictionary?
- PYTHON HASHING?
- Python Dictionary Methods
- Copying dictionary
- Updating Dictionary
- Delete Keys from the dictionary
- Dictionary items() Method
- Sorting the Dictionary
- Python Dictionary in-built Functions
- Dictionary len() Method
- Variable Types
- Python List cmp() Method
- Dictionary Str(dict)

Python Functions

- What is a function?
- How to define and call a function in Python

- Types of Functions
- Significance of Indentation (Space) in Python
- How Function Return Value?
- Types of Arguments in Functions
- Default Arguments and Non-Default Arguments
- Keyword Argument and Non-keyword Arguments
- Arbitrary Arguments
- Rules to define a function in Python
- Various Forms of Function Arguments
- Scope and Lifetime of variables
- Nested Functions
- Call By Value, Call by Reference
- Anonymous Functions/Lambda functions
- Passing functions to function
- map(), filter(), reduce() functions
- What is a Docstring?

Python Modules

- What is a Module?
- Types of Modules
- The import Statement
- The from...import Statement
- ..import * Statement
- Underscores in Python
- The dir( ) Function
- Creating User defined Modules
- Command line Arguments
- Python Module Search Path

Packages in Python

- What is a Package?
- Introduction to Packages?
- py file
- Importing module from a package
- Creating a Package
- Creating Sub Package
- Importing from Sub-Packages
- Popular Python Packages

Python Date and Time

- How to Use Date & DateTime Class
- How to Format Time Output
- How to use Timedelta Objects
- Calendar in Python
- datetime classes in Python
- How to Format Time Output?
- The Time Module
- Python Calendar Module
- Python Text Calendar, HTML Calendar Class
- Unix Date and Time Commands

Day 3

File Handling

- What is a data, Information File?
- File Objects
- File Different Modes and Object Attributes
- How to create a Text Fil and Append Data to a File and Read a File
- Closing a file
- Read, read line ,read lines, write, write lines...!!
- Renaming and Deleting Files
- Directories in Python
- Working with CSV files and CSV Module
- Handling IO Exceptions

Python OS Module

- Shell Script Commands
- Various OS operations in Python
- Python File System Shell Methods

Python Exception Handling

- Python Errors
- Common RunTime Errors in PYTHON
- Abnormal termination
- Chain of importance Of Exception
- Exception Handling
- Try ... Except
- Try .. Except .. else
- Try ... finally
- Argument of an Exception

- Python Custom Exceptions
- Ignore Errors
- Assertions
- UsingAssertionsEffectively

Python Class and Objects

- Introduction to OOPs Programming
- Object Oriented Programming System
- OOPS Principles
- Define Classes
- Creating Objects
- Class variables and Instance Variables Constructors
- Basic concept of Object and Classes
- Access Modifiers
- How to define Python classes
- Python Namespace
- Self-variable in python
- Garbage Collection
- What is Inheritance? Types of Inheritance?
- How Inheritance works?
- Python Multiple Inheritance
- Overloading and Over Riding
- Polymorphism
- Abstraction
- Encapsulation
- Built-In Class Attributes

Python Regular Expressions

- What is Regular Expression?
- Regular Expression Syntax
- Understanding Regular Expressions
- Regular Expression Patterns
- Literal characters
- Repetition Cases
- Example of w+ and ^ Expression
- Example of \s expression in re.split function
- Using regular expression methods
- Using re.match()
- Finding Pattern in Text (re.search())
- Using re.findall for text
- Python Flags
- Methods of Regular Expressions

Python XML Parser

- What is XML?
- Difference between XML and HTML and XML, JSON, Gson
- How to Parse XML and Create XML Node
- Python vs JAVA
- XML and HTML

Day 4

Introduction

- ML Fundamentals
- ML Common Use Cases
- Understanding Supervised and Unsupervised Learning Techniques
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Statistics

- What is Statistics
- Descriptive Statistics
- Central Tendency Measures
- The Story of Average
- Dispersion Measures
- Data Distributions
- Central Limit Theorem
- What is Sampling
- Why Sampling
- Sampling Methods
- Inferential Statistics
- What is Hypothesis testing
- Confidence Level
- Degrees of freedom
- what is pValue
- Chi-Square test
- What is ANOVA
- Correlation vs Regression
- Uses of Correlation & Regression
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Machine Learning tools and Techniques

2. Data Handling, Data Validation and Graphs

a. Important packages used in Machine Learning

b. Data importing

Numpy & Pandas

- Learning NumPy
- Introduction to Pandas
- Creating Data Frames
- GroupingSorting
- Plotting Data
- Creating Functions
- Slicing/Dicing Operations.

Working with datasets

d. Descriptive statistics
e. Central Tendency
f. Variance
g. Percentiles
h. Outlier detection
i. Variable distribution charts
3. Regression Analysis
a. Correlation
b. Simple Regression models
c. R-Square
d. Multiple regression
e. Multicollinearity
f. Individual Variable Impact
g. Air passenger's data case study
h. SAT score data case study

Day 5

Classification using Logistic Regression and Trees

- Logistic Regression

Introduction to Predictive Modeling
Linear Regression Overview
Simple Linear Regression
Multiple Linear Regression

- o Need of logistic Regression
- o Logistic regression models

- Validation of logistic regression models
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Multicollinearity in logistic regression

- Individual Impact of variables
- Confusion Matrix
- Service Provider Attrition data case study
- Decision Trees
- Segmentation
- Entropy
- Information gain
- Building Decision Trees
- Validation of Trees
- Pruning the trees
- Fine tuning the trees
- Prediction using Trees
- Customer retention case study
- Cluster Analysis
- Supervised vs unsupervised learning
- Need of Cluster Analysis
- K- Means clustering algorithm
- The theory behind cluster Analysis
- Building and interpreting clusters