

Python + Machine Learning

1. PROGRAMMING LANGUAGE?

What is Programming Language?
Overview of Python, Version and why use Python?
Hardware Overview
Installing Python on Windows OR Linux
Using Python and Writing a Program
Installing Python and Writing a Program
Writing the "Hello World" Assignment
Variables types and properties
Quiz, questions and queries

2. CONTROL FLOW AND LOOPS

if-elif-else Statements
Logical, Boolean Expressions
Making Decision, Flow Control
Loops and Iteration
For & while Statements
Break, Continue & Pass statements
Range() Function
Use if Range() function in Loops

3. DEFINING FUNCTIONS

What are functions
User-defined & Pre-defined functions
Functions Argument Values
Default & Keyword Argument Values
Init function & Self Argument
Arbitrary & Unpacking Argument Lists
Lambda Expressions
Function Annotation

4. DATA STRUCTURE

What Are Linear Structures?
The Queue, Stack, and Deque Interfaces
The List Interface: Linear Sequences
The USet Interface: Unordered Sets
The SSet Interface: Sorted Sets
Dictionary, Tuples, Range, xrange
Stacks, Queues, DQueues
Use of Strings

5. CLASSES

- Names and Objects
- Python Scopes and Namespaces
- Classes
- Inheritance
- Private Variables
- Odds and Ends
- Iterators
- Generators
- Generator Expressions

6. FILES & EXCEPTION HANDLING

- Working with Files
- Opening a text file
- Reading & Writing a file
- File Operations
- Dealing with errors
- Modules & Importing Modules
- Regular Expressions
- Introduction to List Comprehensions
- List Comprehension Operations

7. ERRORS AND EXCEPTIONS

- Syntax OR Compile Errors
- Exceptions OR Runtime Exceptions
- Handling Exceptions
- Raising Exceptions
- User-defined Exceptions
- Defining Clean-up Actions
- Predefined Clean-up Actions

mapping
MINDS

DATA SCIENCE

1. INTRODUCTION TO NUMPY

Overview of the pandas Series
Look Ups, Selections, and Indexing
Advanced Indexing Options
Handling NaN Values, Reindexing,
Filling Methods and Series Addition
Series Multiplication, More Reindexing, and Mapping

2. NUMPY: BASIC STATISTICS

Vectors and Matrices
Generating Matrices to Work With
Matrix Products
Average versus median
2D Arithmetic

3. INTRODUCTION TO PANDAS

Overview of the pandas Series
Look Ups, Selections, and Indexing
Advanced Indexing Options
Handling NaN Values, Reindexing,
Filling Methods and Series Addition
Series Multiplication, More Reindexing, and Mapping

4. PANDAS DATA-FRAMES

DataFrame Basics
Reading Files, Plotting, and Basic Methods
More Plotting, Joins, Basic DateTime Indexing, and Writing to Files
Adding & Reseting Columns, Mapping with Functions
More Mapping, Filling NaN values, Plotting, Correlations, and Histograms
More Plotting, Rolling Calculations, Basic DateTime Indexing
Analysis Concepts, Filling NaN Values, Cumulative Sums and Value Counts
Data Maintenance, Adding/ Removing Columns and Rows
Basic Grouping, Concepts of Aggregate Functions

5. INTRODUCTION TO MATPLOTLIB

Different types of basic Matplotlib charts
Labels, titles and window buttons
Legends, Bar Charts, Histograms, Stack Plots, Pie Chart
Loading data from a CSV & NumPy

Basic Customization Options

Plotting basic stock data
Styles with Matplotlib
Creating moving averages with our data*
Adding a High minus Low indicator to graph*
Customizing the dates that show*
Label and Tick customizations
Customizing Legends

6. MATHEMATICS

Introduction to Matrices
Gradient descent and cost function
Hypothesis function
Regularisation in linear and logistic regression
Regression-underfitting and overfitting
Neural network in math

7. INTRODUCTION TO OPENCV

What is OpenCV?
Overview of OpenCV, Version and why use OpenCV?
Install OpenCV-Python in Windows OR Linux
Using Python and Writing a Program
Installing Python and Writing a Program
Writing the "Hello World" Assignment
Quiz, questions and queries

8. PLAYING WITH IMAGES OR VIDEOS USING OPENCV

Display and Write an image
Capture Video from Camera
Accessing and Modifying pixel values
Accessing Image Properties
Splitting and Merging Image Channels
Image ROI

9. FEATURE DETECTION AND DESCRIPTION

Understanding Features
Harris Corner Detection
Face Detection using Haar-Cascades

10. INTRODUCTION TO Pre Processing data

Fact and dimension analysis.
Dimensionality reduction
Principal component analysis
Feature selection
Feature scaling

MACHINE LEARNING

1. INTRODUCTION OF MACHINE LEARNING WITH TENSORFLOW

Motivation of Machine Learning?
Use Cases of Machine Learning
Future Scope of Machine Learning
Real World Domain using ML
Types of Machine Learning
Different tools/framework available for ML
Limitation of Machine Learning

2. BASICS OF MACHINE LEARNING

Understanding supervised & unsupervised learning
Understanding bases associated with any machine learning algorithm
Better understanding with SPAM OR HAM detection
Ways of reducing bias and increasing generalisation
Difference between Rule base & ML based approach

3. SUPERVISED LEARNING - CLASSIFICATION PROBLEMS

Uses of classification in spam detection
How shapes (Line, Square, Cube) works in classification problems
An N-Dimensional hypercube

- Naive Bayes - Probabilistic Classifier
- K-Nearest Neighbours - Non-Probabilistic Classifier
- Support Vector Machines (SVM)

4. NAIVE BAYES - PROBABILISTIC CLASSIFIER

What is probability distribution
Random variable? & Types of Random variable?
Standard Deviation?
Bayes Theorem - Probabilistic Theorem?
What is conditional probability?
Use Naive Bayes with python/Tensorflow.
Linear Regression with Multiple Variables

5. K-NEAREST NEIGHBOURS - NON-PROBABILISTIC CLASSIFIER

What is KNN classifier?
Calculate K in KNN?
Kind of problem instance in KNN
Difference between Naive Bayes & KNN
Definition of distance
Data reduction & Dimensionality Reduction?
Feature extraction in KNN

6. SUPPORT VECTOR MACHINES (SVM)

Learn the simple intuition behind Support Vector Machines.
Implement an SVM classifier in SKLearn/scikit-learn
Choose the right kernel for your SVM
Learn about RBF and Linear Kernels

7. REGRESSION

Understand how continuous supervised learning is different from discrete learning.

Code a Linear Regression in Tensorflow.

Understand different error metrics like SSE and R Squared in Linear Regressions.

Outliers

Remove outliers to improve the quality of your linear regression predictions.

Remove the residuals on a real dataset and reimplement your regressor.

Understanding of outliers and residuals on the Enron Email Corpus.

8. UNSUPERVISED LEARNING - CLUSTERING

What is unsupervised Learning?

Uses of clustering in facebook

- K-Means Clustering
- Hierarchical clustering
- Density-Based clustering
- Distribution-Based clustering

Tensorflow

1 Introduction to TensorFlow - Deep Learning

Deep Learning with TensorFlow?

Understand the historical context and motivation for Deep Learning

Set up a basic supervised classification task and train a black box classifier on it.

Train a logistic classifier “by hand” Optimize a logistic classifier using gradient descent, SGD, Momentum and AdaGrad.

2 DEEP NEURAL NETWORKS

Train a simple deep network.

Effectively regularize a simple deep network

Train a competitive deep network via model exploration and hyperparameter tuning

3 CONVOLUTIONAL NEURAL NETWORKS

Train a simple convolutional neural net

Explore the design space for convolutional nets

Pooling Layer Motivation

Convolutional Layer Application

Deep CNN

Deeper CNN

4 RECURRENT NEURAL NETWORKS

Intro to RNN Model

Long Short-Term memory (LSTM)

Recursive Neural Tensor Network Theory

Recurrent Neural Network Model

Artificial Neural Networks

1. INTRODUCTION OF ARTIFICIAL NEURAL NETWORKS

What is Neural Networks?

Historical background

Why use neural networks?

Neural networks vs. conventional computers

Basic Structure of ANNs

How neural networks works?

Types of Artificial Neural Networks

2. HUMAN AND ARTIFICIAL NEURONES - INVESTIGATING THE SIMILARITIES

A simple neuron - description of a simple neuron

From Human Neurones to Artificial Neurones

3. AN ENGINEERING APPROACH

Uses of classification in spam detection
Firing rules - How neurones make decisions
Pattern recognition - an example
A more complicated neuron

- FreeForward
- Feedback

4. ARCHITECTURE OF NEURAL NETWORKS

Feed-forward (associative) networks
Feedback (autoassociative) networks
Network layers?

5. PERCEPTRONS?

The Learning Process
Transfer Function
An Example to illustrate the above teaching procedure
The Back-Propagation Algorithm

6. APPLICATIONS OF NEURAL NETWORKS

Neural networks in practice
Neural networks in medicine

- Modelling and Diagnosing the Cardiovascular System
- Electronic noses - detection and reconstruction of odours by ANNs
- Instant Physician - a commercial neural net diagnostic program