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INDUSTRY 4.0: ADVANCED DATA SCIENCE, DATA VISUALIZATION & MACHINE LEARNING WITH PYTHON

BY ELITE INDIGO

Industry 4.0: Advanced Data Science,Data Visualization & Machine Learning with Python

• Program Overview

This Machine Learning online course will provide you with insights into the vital roles played by machine learning engineers and data scientists.
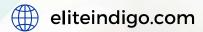
Upon completion of this course, you will be able to uncover the hidden value in data using Python programming for futuristic inference.

• Learning Objectives

By the end of the course, participants will be able to:
- Master the concepts of supervised and unsupervised learning, recommendation engine, and time series modelling
- Gain practical mastery over principles, algorithms, and applications of machine learning
- Implement models such as support vector machines, kernel SVM, naive Bayes, decision tree classifier, random forest classifier, logistic regression, K-means clustering and more in Python
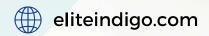
• Duration   Five (5) Full-Day Workshop;

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• Course Schedule

DAY 1

Time	Details
30 Minutes	**Learning + Debrief:** • Short Intro on Trainer Background • Key points
1 Hour	**MODULE 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
2 Hours	**MODULE 2. TECHNIQUES OF MACHINE LEARNING**
1 Hour	**Lunch**
1 Hours	**MODULE 3 . MATHEMATICS & STATISTICS REFRESHER**
2 Hours	**MODULE 4. ACCESSING/IMPORTING AND EXPORTING DATA**
30 Minutes	**Recap & Q&A**

DAY 2

Time	Details
30 Minutes	**Learning + Debrief:** • Short recap of day 1 • Key points
1 Hour	**MODULE 5. DATA CLEANING MANIPULATION MUNGING**
2 Hours	**MODULE 6 . DATA ANALYSTS VISUALIZATION**
1 Hour	**Lunch**
1 Hours	**MODULE 7. LINEAR REGRESSION**
2 Hours	**MODULE 8. LOGISTIC REGRESSION**
30 Minutes	**Recap & Q&A**

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• Course Schedule

DAY 3

Time	Details
30 Minutes	**Learning + Debrief:** • Short recap of day 2 • Key points
1 Hour	MODULE 9. TIME SERIES FORECASTING
2 Hours	MODULE 10 . DECISION TREE
1 Hour	Lunch
1 Hours	MODULE 11. ENSEMBLE LEARNING
2 Hours	MODULE 12 . NAIVE BAYES
30 Minutes	Recap & Q&A

DAY 4

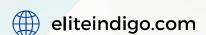| Time	Details
30 Minutes	**Learning + Debrief:** • Short recap of day 3 • Key points
1 Hour	MODULE 13 . MODEL EVALUATION, IMPROVEMENTS & PERFORMANCE METRICS
2 Hours	MODULE 14. KERNEL LEARNING
1 Hour	Lunch
1 Hours	MODULE 15 . SUPPORT VECTOR MACHINES
2 Hours	MODULE 16.UNSUPERVISED LEARNING: SEGMENTATION
30 Minutes	Recap & Q&A

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• Course Schedule

DAY 5

Time	Details
30 Minutes	**Learning + Debrief:** • Short recap of day 4 • Key points
1 Hour	**MODULE 17. NATURAL LANGUAGE PROCESSING**
2 Hours	**MODULE 18. DEEP LEARNING ARTIFICIAL NEURAL NETWORKS (ANN)**
1 Hour	**Lunch**
3 Hours	**MODULE 19. END TO END ML IMPLEMENTATION AND USE CASE SPECIFIC DISCUSSIONS**
30 Minutes	**Recap & Q&A**

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• Course Outline

MODULE 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Contents:

- Applications of Machine Learning
- Machine learning examples
- Setting up Anaconda & Python Notebooks.
- Working on notebooks for Data Science

MODULE 2. TECHNIQUES OF MACHINE LEARNING

Course Contents:

- Supervised learning
- Unsupervised learning
- Semi-supervised

MODULE 3 . MATHEMATICS & STATISTICS REFRESHER

Course Contents:

- Concepts of linear algebra
- Euclidean and Non-Euclidean geometry
- Introduction to Calculus
- Probability and statistics
- Distributions, CDF, PDF
- Mean, Median, Mode
- Standard Deviation, quartiles, percentiles
- Variable Relationships & Estimation
- Hypothesis Testing

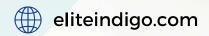### MODULE 4. ACCESSING/IMPORTING AND EXPORTING DATA

Course Contents:

- Importing Data from various sources (Csv, txt, excel...etc) Viewing Data objects
- Exporting Data to various formats
- Important python modules: Pandas, beautIfulsoup

MODULE 5. DATA CLEANING MANIPULATION MUNGING

Course Contents:

- Cleansing Data with Python
- Data Manipulation steps(Sorting& filtering& duplicates, merging, appending, derived variables, sampling, Data type
- conversions, renaming,
- formatting etc)
- Data manipulation tools(Operators, Functions, Packages, control structures, Loops, arrays etc)
- Python Built-in Functions (Text, numeric, date, utility functions)
- Python User Defined Functions
- Stripping out extraneous information
- Normalizing data
- Formatting data
- Important Python modules for data manipulation (Pandas, Numpy, re, math, string, datetime..etc)

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MODULE 6 . DATA ANALYSTS VISUALIZATION

Course Contents:

- Introduction exploratory data analysis
- Descriptive statistics, Frequency Tables and summarization
- Univariate Analysis (Distribution of data & Graphical Analysis)
- Bivariate Analysis(Cross Tabs, Distributions & Relationships, Graphical Analysis
- Creating Graphs
  1. Bar
  2. Pie
  3. line chart
  4. histogram
  5. boxplot
  6. scatter
  7. density

MODULE 7. LINEAR REGRESSION

Course Contents:

- Introduction– Applications
- Assumptions of Linear Regression
- Building Linear Regression Model
- Understanding standard metrics (Variable significance, Rsquare/Adjusted R-square, Global hypothesis ,etc)
- Assess the overall effectiveness of the model
- Validation of Models {Re running Vs. Scoring)
- Standard Business Outputs
- (Decile Analysis, Error distribution (histogram), Model equation, drivers etc.)
- Interpretation of Results

MODULE 8. LOGISTIC REGRESSION

Course Contents:

- Introduction– Applications
- Linear Regression Vs. Logistic
- Regression Vs. Generalized Linear Models
- Building Logistic Regression
- Model (Binary Logistic Model)
- Understanding standard model metrics
- Validation of Logistic Regression Models (Re running Vs. Scoring)
- Multiple Logistic Regression
- Standard Business Outputs
- Interpretation of Results
- Business Validation
- Implementation on new data

MODULE 9. TIME SERIES FORECASTING

Course Contents:

- Introduction –Applications
- Time Series Components(Trend, Seasonality, Cyclicity and Level) and Decomposition
- Classification of Techniques(Pattern based– Pattern less)
- Basic Techniques– Averages, Smoothening, etc
- Advanced Techniques– AR Models, ARIMA, etc Understanding Forecasting Accuracy– MAPE, MAD, MSE, etC

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MODULE 10 . DECISION TREE

Course Contents:

- Decision Trees – IntroductionApplications
- Types of Decision Tree Algorithms
- Construction of Decision Trees through Simplified Examples
- Generalizing Decision Trees; Information Content and Gain Ratio; Dealing with Numerical Variables; other
- Measures of Randomness
- Pruning a Decision Tree; Cost as a consideration ;
- Unwrapping Trees as Rules
- Decision Trees – Validation
- Over fitting– Best Practices to avoid

MODULE 11. ENSEMBLE LEARNING

Course Contents:

- Concept of Ensembling
- Manual Ensembling Vs. Automated Ensembling
- Methods of Ensembling (Stacking, Mixture of Experts)
- Bagging (Logic, Practical Applications)
- Random forest (Logic, Practical Applications)
- Boosting (Logic, Practical Applications)
- Ada Boost
- Gradient Boosting Machines (GBM) XGBoost

MODULE 12 . NAIVE BAYES

Course Contents:

- Concept of Conditional Probability
- Bayes Theorem and Its Applications
- Naive Bayes for classification
- Applications of Naive Bayes in Classifications

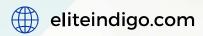### MODULE 13 . MODEL EVALUATION, IMPROVEMENTS & PERFORMANCE METRICS

Course Contents:

- Data Split Practices
- Cross Validation
- K–Fold Validation
- Confusion Matrix
- ROC Curves
- Mean Absolute/Square Errors & R-Square
- Ensemble Learning & Model Stacking

MODULE 14. KERNEL LEARNING

Course Contents:

- Support Vector Machines
- Principal Component Analysis
- Ridge Regression
- Spectral Clustering

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MODULE 15 . SUPPORT VECTOR MACHINES

Course Contents:

- Motivation for Support Vector
- Machine &Applications
- Support Vector Regression
- Support vector classifier (Linear &Non–Linear)
- Mathematical Intuition (Kernel Methods Revisited, Quadratic: Optimization and Soft Constraints)
- Interpretation of Outputs and Fine tune the models with hyper parameters
- Validating SVM models

MODULE 16.UNSUPERVISED LEARNING: SEGMENTATION

Course Contents:

- What is segmentation & Role of ML in Segmentation?
- Clustering algorithms
- Concept of Distance and related math background
- K-Means Clustering
- Hierarchical Clustering

MODULE 17. NATURAL LANGUAGE PROCESSING

Course Contents:

- What is NLP & How to solve NLP problems
- NLP Feature Engineering & Modelling
- How to process any raw data file.

MODULE 18. DEEP LEARNING ARTIFICIAL NEURAL NETWORKS (ANN)

Course Contents:

- Motivation for Neural Networks and Its Applications
- Perceptron and Single Layer Neural Network, and Hand Calculations
- Learning In a Multi Layered Neural Net: BackPropagation and Conjugant Gradient Techniques
- Introducing & Using Tensorflow
- Neural Networks for Regression
- Neural Networks for Classification
- Interpretation of Outputs and Fine tune the models with hyper parameters
- Validating ANN models

MODULE 19. END TO END ML IMPLEMENTATION AND USE CASE SPECIFIC DISCUSSIONS

Course Contents:

- Machine Learning Implementation
- Use Case Discussion

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OUR COURSES

ARTIFICIAL INTELLIGENCE (AI)
Dive into the cutting-edge world of AI, exploring algorithms, data analysis and more.

TECHNICAL SKILL
Sharpen your technical prowess from programming, software and more.

SOFT SKILL
Develop essential interpersonal skills to excel in any professional setting.

LEADERSHIP SKILL
Unleash your leadership potential with our Leadership Skills course

TEAMBUILDING
Understand the dynamics of teamwork, communication, and synergy

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