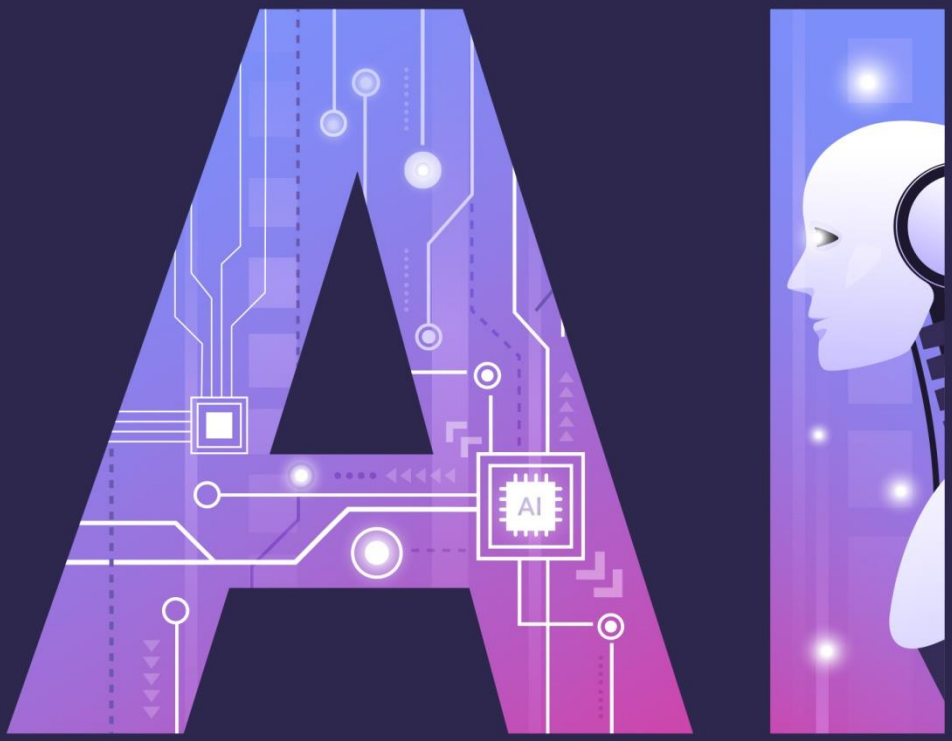
ANALYTICS 7.0
GYAN SE VIGYAN TAK

Training & Placement Partner

Duration: 80 HRS

Mode: Online Live Sessions

Completion Certificate by **TIH IIT Patna**



Course Agenda

- Python for Data Science and Analytics
- Python for Machine learning
- Python for NLP and Web Scraping
- Python for Deep Learning and Neural Network

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About Course

Data Science and Analysis comes into the frame with huge data collections and large numbers of machine learning applications development around the globe. This course will deal with extracting meaning insights from a huge set of labeled or unlabelled data through the process of Data cleaning, analysis and pre-processing. We will learn about the packages, syntax and commands of Python. Various Machine learning advancements based out of data science such as Supervised and Unsupervised Learning will be discussed and figured out to understand real time implementations.

Day 1 & 2 Introduction to Data Science

- What is Data Science and what does a data scientist do.
- Various examples of Data Science in the industries and how Python is deployed for Data Science applications
- Various steps in Data Science process like data wrangling, data exploration and selecting the model.

Python Basic Constructs

- Introduction to a basic construct in Python
- Understanding indentation like tabs and spaces
- Code comments like Pound # character, names and variables
- Python built-in data types like containers (list, set, tuple and dict), numeric (float, complex, int), text sequence (string), constants (true, false, ellipsis) and others (classes, instances, modules, exceptions and more)
- Basic operators in Python like logical, bitwise, assignment, comparison and more, slicing and the slice operator .
- Loop and control statements like break, if, for, continue, else, range() and more.

Day 3

- List List comprehension and Errors and Exception Handling
- Map and Filter
- File Handling

NumPy for Mathematical Computing

- Introduction to mathematical computing in Python
- What are arrays and matrices, array indexing, array math, ND-array object
- Array, different ways of creating array, multidimensional arrays
- Reshaping arrays, mathematical operations with arrays
- Accessing component, transpose,insert, change values of arrays

Day 4 & 5 **Data Analysis and Machine Learning (Pandas)**

- Fundamentals of dataframes and Data types, Reading in data, size, shape, getting index & columns of data,Slicing data, replacing columns, filtering, joining, pivoting and sorting data.
- **Data Wrangling:**
  Missing value handling, data formatting, data normalization, binning,Turning categorical variables to quantitative, Joins.
- **EDA:**
  Descriptive Statistic, Summarizing data, remove duplicates,group by on data, Correlation and methods on dataframe.

Hands On : - Case Study

Day 6 **Maths refresher of data analytics**

- Probability Refresher (Bayes Theorem)
- Descriptive Statistics - Mean,Mode,Median
- Variance and Standard Deviation
- Percentiles, Quartiles and Interquartile Range (IQR)
- Confidence Interval
- Central Limit Theorem
- Correlation and Covariance
- Probability Distribution (Normal, binomial)
- Hypothesis Testing and Statistical Significance
- Null and Alternative Hypothesis
- Z test, T test, Chi Square test

Day 7 **Understanding data visualization (Matplotlib and Seaborn)**

- What is exploratory data analysis and building of hypothesis, plotting and other techniques.
- Getting Started with Matplotlib
- Pyplot
- Figure class
- Axes Class
- Setting Limits and Tick labels
- Multiple Plots
- What is a Legend?
- Creating Different Types of Plots
- Line Graph

- Bar chart
- Histograms
- Scatter Plot
- Pie Chart
- PairPlot
- Working with Images
- Customizing Plots in Matplotlib
- More articles on Matplotlib
- Exercises, Applications and Projects

Day 8, 9 & 10 **Introduction to Machine Learning with Data Science**

- Need of Machine Learning
- Introduction to Machine Learning
- Types of Machine Learning, such as supervised, unsupervised and
- reinforcement learning
- Why Machine Learning with Python and applications of Machine Learning.

Supervised Learning

- What is supervised learning, classification
- Decision Tree, algorithm for Decision Tree induction
- Confusion Matrix
- Random Forest
- Naïve Bayes, working of Naïve Bayes, how to implement Naïve Bayes Classifier
- Support Vector Machine, working process of Support Vector Mechanism
- What is Hyper Parameter Optimization
- Comparing Random Search with Grid Search

Supervised Learning and Linear Regression

- Introduction to supervised learning
- Types of supervised learning - regression and classification
- Introduction to regression
- Simple linear regression
- Multiple linear regression,
- Assumptions in linear regression, and math behind linear regression.

Hands-on Exercise – Linear Regression and Train-Test Implementation

Hands On : - Case Study

Day 11 & 12 **Classification and Logistic Regression**

- Introduction to classification
- Linear regression vs logistic regression
- Math behind logistic regression with detailed formulas
- log it function and odds
- Confusion matrix and accuracy
- True positive rate v/s false positive rate
- Threshold evaluation with ROCR.

Hands-on Exercise – Logistic regression, Confusion matrix Implementation

Day 13 & 14 **Decision Tree and Random Forest**

- Introduction to tree-based classification
- Understanding a decision tree
- Impurity function and entropy to understand the concept of information gain for the right split of node
- Gini index
- Overfitting
- Pruning, pre-pruning, post-pruning, cost-complexity pruning
- Introduction to ensemble techniques
- Understanding bagging
- Introduction to random forests
- Finding the right number of trees in a random forest.

Hands-on Exercise – Decision tree Implementation and hyper parameters in the random forest.

Hands On: - Case Study

Day 15 & 16 **Saving a model**

- How a save a model using Pickle

Unsupervised Learning

- Introduction to unsupervised learning, use cases of unsupervised learning
- What is K-means clustering, understanding the K-means clustering algorithm
- Hierarchical clustering and K-means clustering and how does hierarchical clustering work
- Types of unsupervised learning
- Clustering and dimensionality reduction

- Types of clustering
- Introduction to k-means clustering
- Math behind k-means.
- **Hands-on Exercise** – K-Means

Assignment : - Customer behavioral Analysis to form clusters with similarity.

Day 17 & 18 Dimensionality Reduction

- Importance of Dimensions
- Why Dimensionality Reduction
- PCA and its implementation
- Hands On: - PCA

Day 19 & 20 Introduction to Deep Learning and Neural Networks

- Role of Machine Learning in field of Artificial Intelligence
- Deep Learning v/s Machine Learning
- Brief History of AI Recap: SL, UL and RL
- Classification and regression in supervised learning,
- Clustering and association in unsupervised learning
- Algorithms that are used in these categories
- Introduction to AI and neural networks
- Deep Learning: Successes Last Decade
- What is AI and Deep Learning
- Discussion: Self-Driving Car Object Detection
- Applications of Deep Learning
- Challenges of Deep Learning
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Multi-layered Neural Networks

- Multi-layer network introduction
- Regularization
- Deep neural networks
- Multi-layer perceptron
- Overfitting and capacity
- Neural network hyperparameters
- Different activation functions used in neural networks: - ReLu, Softmax, Sigmoid, and hyperbolic functions,
- Back propagation, forward propagation, convergence, hyper parameters

Day 21 & 22 **Artificial Neural Networks**

- Various methods that are used to train artificial neural networks
- Gradient descent rule
- Tuning the learning rate
- Regularization techniques
- Optimization techniques
- Stochastic process
- Vanishing gradients
- Dropout layer
- Regression techniques: - including Lasso L1 and Ridge L2

Day 23 **Deep Learning Frameworks and Packages**

- Understanding how Deep Learning works
- Activation functions
- Illustrating perceptron
- Perceptron training
- Multi-layer perceptron
- Key parameters of perceptron
- Pytorch
- Pytorch and Its Ecosystem
- Use-case implementation
- Batch normalization
- Neural network training process customization.
- Hands On: Build a Deep Learning Model Using Pytorch

Day 24 & 25 **DNNs (Deep Neural Networks)**

- Introduction to deep neural networks (DNNs)
- Several building blocks of artificial neural networks (ANNs),
- The architecture of DNN and its building blocks
- various parameters, layers, and optimization algorithms in DNN
- activation functions.

Day 26 & 27 **CNNs (Convolutional Neural Networks)**

- What is a convolutional neural network?
- Understanding the architecture and use-cases of CNN
- Pooling layers
- Visualize CNN
- How to fine-tune a convolutional neural network
- Transfer learning

- Kernel filter
- Feature maps, and pooling

Hands On :- **Model to recognize facial expression**

- Develop a project to identify facial expressions of a human.Facial expressions can play an important tool for collecting feedback for any service provided and understanding sentiments of a client or creating security solutions while driving. We will develop a neural network and computer vision project which can identify a user's facial expression after taking some service or a driver who is driving to identify if he feels sleepy while driving to generate alarm.

Day 28 Natural Language Processing and Text Mining

- Introduction to Natural Language Processing (NLP)
- Introduction to text mining
- Introduction to Sentiment
- Natural Language Toolkit (NLTK) environment and text mining: its cleaning, pre-processing and text classification.

Hands-on Exercise – NLTK implementation