

## **Foundations of AI**

### **Learning Objectives:**

Learn how to build real-world Artificial Intelligence applications with Python to intelligently interact with the world around you. Develop expertise in popular AI & ML technologies and problem-solving methodologies. Also develop the ability to independently solve business problems using Artificial Intelligence & Machine Learning.

### **Topics Covered:**

- What is AI?
- Python for AI
- Probability & Statistics
- Visualization Techniques
- Case Study

### **Hands-on:**

- Write Python code to analyze, manipulate and visualize data
- Learn to implement statistical techniques with Microsoft Excel
- Write Python code using Python library - matplotlib, seaborn to visualize data and represent it graphically
- Conduct exploratory data analysis in python to identify potential revenue maximisation opportunities and also visualize data

## **Machine Learning : Supervised Learning**

### **Learning Objectives:**

Learn about supervised learning techniques - regression and classification. Also understand various techniques to build Decision Trees.

### **Topics Covered:**

- Regression (Linear, Multiple and Logistic)
- Classification (K-NN, Naive Bayes) Techniques
- Decision Trees
- Case Study

### **Hands-on:**

This dataset classifies people described by a set of attributes as good or bad credit risks. Using classification techniques, build a model to predict good or bad customers to help the bank decide on granting loans to its customers

## **Machine Learning : Unsupervised Learning**

### **Learning Objectives:**

Learn about unsupervised learning technique - K-Means Clustering and Hierarchical Clustering. Also understand the Elbow method and Silhouette method.

### **Topics Covered:**

- K-means Clustering
- Hierarchical Clustering
- High-dimensional Clustering
- Case Study

### **Hands-on:**

In marketing, if you're trying to talk to everybody, you're not reaching anybody.. This dataset has social posts of teen students. Based on this data, use K-Means clustering to group teen students into segments for targeted marketing campaigns.

## **Machine Learning : Ensemble Techniques**

### **Learning Objectives:**

Learn about bootstrap sampling and its advantages followed by bagging. Boost model performance with Boosting. Through a real-life case study, learn Random Forest and how it helps avoid overfitting compared to decision trees.

### **Topics Covered:**

- Boosting
- Bagging
- Random Forest
- Case Study

### **Hands-on:**

In statistics and machine learning, ensemble methods use multiple learning algorithms to obtain better predictive performance than could be obtained from any of the constituent learning algorithms alone. In this case study, use AdaBoost, GBM & Random Forest on Lending Data to predict loan status. Ensemble the output and see your result perform better than a single model.

## **Machine Learning : Reinforcement Learning**

### **Learning Objectives:**

Understand the basics of RL and its applications in AI. Get an understanding of Markov Decision Processes: Model processes as Markov chains, and learn algorithms for solving optimisation problems. Write Q-learning algorithms to solve complex RL problems.

**Topics Covered:**

- Value based methods
- Q-learning
- Policy-based methods

**Hands-on:** No hands-on

**Deep Learning****Learning Objectives:**

Learn advanced machine learning techniques using the Neural Networks algorithms. Neural Networks can enable pattern recognition based on a large amount of inputs. Learn how NN algorithms work, and end up with an introduction to deep learning.

This module covers various activation functions like sigmoid, hyperbolic-tangent, Rectified Linear Units, Leaky Rectified Linear Units.

**Topics Covered:**

- Neural Network Basics
- Deep Neural Networks
- TensorFlow using Neural Networks & Deep Learning
- Case Study

**Hands-on:**

A research study was aimed at the case of customers' default payments in Taiwan. From the perspective of risk management, the result of predictive accuracy of the estimated probability of default will be more valuable than the binary result of classification - credible or not credible clients.

**Natural Language Processing****Learning Objectives:**

Get started with the Natural language toolkit, and learn the basics of text processing in Python. Learn how to extract features from unstructured text and build machine learning models on text data. Conduct sentiment analysis, learn to parse English sentences and extract meaning from them. Explore the applications of text analytics in new areas and various business domains.

**Topics Covered:**

- Statistical NLP and text similarity
- Text Summarization
- Syntax and Parsing techniques
- Semantics and Generation

- Case Study

**Hands-on:**

Stock market prediction has been an interesting research topic for many years. Finding an efficient and effective means of studying the market perceptions found its way in different social networking platforms such as Twitter. With proper tools and the help of technology, meaningful and precious information can be gathered, analyzed, and utilized in different areas like in the movement and performance of the stock market.

**Computer Vision****Learning Objectives:**

Learn to use the power of computer vision and play with what you see, detect faces, eyes and other attributes using Haar cascades.

**Topics Covered:**

- Convolutional Neural Networks
- Keras Library for Deep Learning in Python
- Pre-processing Image Data
- Object and face recognition using OpenCV
- Case Study

**Hands-on:**

While we drive on a highway, we tend to feel sleepy. In this project, using OpenCV and implementing object detection and feature extraction we detect fatigue in real-time and report an alarm which will not only keep a driver attentive while driving but also reduce the number of accidents.

**Intelligent Agents****Learning Objectives:**

Learn the AI search technique that employs heuristic for its moves. Understand the fundamental concepts of genetic algorithms and visualize the evolution.

**Topics Covered:**

- Uniform and heuristic-based search techniques
- Planning and constraint satisfaction techniques
- Adversarial search and its uses
- Case Study

**Hands-on:**

Use cutting edge AI techniques to teach a computer to play a computer game.