COURSE OVERVIEW IT0033
Machine Learning Basics - Understanding Supervised, Unsupervised & Reinforcement Learning

Course Title
Machine Learning Basics - Understanding Supervised, Unsupervised & Reinforcement Learning

Course Date/Venue
Session 1: April 27-May 01, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai UAE
Session 2: August 25-29, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
IT0033

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Objectives

This hands-on, highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.

This course is designed to provide participants with a detailed and up-to-date overview of Machine Learning Basics - Understanding Supervised, Unsupervised and Reinforcement Learning. It covers the importance of machine learning and its applications in various industries; the types of machine learning covering supervised learning, unsupervised learning and reinforcement learning; the data preprocessing for machine learning and regression and classification in supervised learning; the structure of decision trees, entropy and information gain in decision trees, overfitting and pruning techniques as well as the advantages of random forests over decision trees; the support vector machines (SVM) and neural networks in supervised learning, model evaluation and validation techniques; and the hyperparameter tuning in supervised learning.

Further, the course will also discuss the differences between supervised and unsupervised learning including its advantages and disadvantages; the types of clustering covering hierarchical, partitioning and density-based; the similarity measures comprising of euclidean, manhattan and cosine; the dimensionality reduction techniques covering principal component analysis (PCA), t-SNE for non-linear dimensionality reduction; and the practical applications of dimensionality reduction.

During this interactive course, participants will learn the basics of reinforcement learning, markov decision processes (MDP), Q-learning algorithm and deep reinforcement learning (DRL); the challenges and limitations of reinforcement learning, the concept and benefits of transfer learning; pretrained models in supervised learning and transfer learning in reinforcement learning; and the generative models, explainability and interpretability in ML models and deploying machine learning models.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain a fundamental knowledge on machine learning
- Discuss the importance of machine learning and its applications in various industries
- Identify the types of machine learning covering supervised learning, unsupervised learning and reinforcement learning
- Carryout data preprocessing for machine learning and regression and classification in supervised learning
- Describe the structure of decision trees, entropy and information gain in decision trees, overfitting and pruning techniques and advantages of random forests over decision trees
- Recognize support vector machines (SVM) and neural networks in supervised learning as well as apply model evaluation and validation techniques and hyperparameter tuning in supervised learning
- Discuss the differences between supervised and unsupervised learning including its advantages and disadvantages
- Identify the types of clustering covering hierarchical, partitioning and density-based and similarity measures comprising of euclidean, manhattan and cosine
- Apply dimensionality reduction techniques covering principal component analysis (PCA), t-SNE for non-linear dimensionality reduction and practical applications of dimensionality reduction
- Discuss the basics of reinforcement learning, markov decision processes (MDP), Q-learning algorithm and deep reinforcement learning (DRL)
- Explain the challenges and limitations of reinforcement learning, concept and benefits of transfer learning, pretrained models in supervised learning and transfer learning in reinforcement learning
- Discuss generative models, explainability and interpretability in ML models and deploying machine learning models

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of machine learning basics - understanding supervised, unsupervised and reinforcement learning for beginners in machine learning, aspiring data scientists, software engineers and developers, business analysts and data analysts, students and researchers in related fields, product managers and tech leads, entrepreneurs and innovators.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Dr. Abedallah Al-Oqaili, PhD, MSc, is a **Senior IT Engineer** with over **30 years** of teaching and industrial experience in the areas of **MS Excel**, **MS WinWord**, **MS PowerPoint**, **ERP SAP 6.0**, **Artificial Intelligence & Neural Network**, **Cyber Ethical Hacking**, **Windows Operating System**, **Windows Server** Administration, **Python** Programming, **MS Office 365 BI**, **Digital Strategy & Transformation**, **Data Base** Design, **Computer** Maintenance, System Analysis & Design, **SQL Programming**, Decision Support Systems & Business Intelligence, **SQL**, **PL/SQL**, **C**, **C++**, **Java**, **Computer** Applications, **Scripting Languages**, VB, VB.Net, **Simulation & Modelling**, Management Information Systems, **E-commerce**, **Oracle** HRMS, **Oracle** Forms & Reports, **Oracle PL/SQL**, Problem Solving Technique, **Oracle ERP**, **ERP** Customized Oracle Application, Organization & System Process, User Acceptance Testing (**UAT**), Core HR, Payroll, SSHR, OLM, IRec, Medical, RTA & Provident Fund, **Oracle Developer/2000**, **Oracle 7.3 & Oracle 8i System**, **Oracle & FoxPro** for Windows, **DBASE III+**, Clipper, **FoxPro 2.1**, **JDeveloper**: Building Applications with ADF, **Oracle Developer**, Oracle WebDB, **J2EE** (Java 2 Enterprise Edition), **Java** Programming, **Oracle** Payroll Fast Formula, Oracle: Internet Application I, **Oracle** 8i DBA, **Oracle** 8i Forms 1&2, **Oracle** 8i Report, **Oracle** Application Server Rel. 4.0, **Oracle** DBA, Building Web Sites on the Internet, Visual Basic 5, **Oracle7 SQL**, **Oracle** Reports V2.5, **Oracle** Forms V4.5/V5.0/V6.0/V6i, **Oracle** Server Administrations, Software Systems Analysis & Design, General Orientation Course at ATOS, **Application** Engineering (PC Based System Design & Development), Novell 3.11, Novell NetWare, Lotus 123, Excel and Word Processing. Further, he is also well-versed in Project Management, Project Analysis, Design and Development for Mail Revenue & Handling System, Leadership Training, Manager Skills, Supervisory Skills, Microsoft Project, Advanced Excel, Instructional Techniques, Oracle Mobile Development Framework and Technical Writing.

During his career life, Dr. Abedallah has gained his technical and practical expertise through a variety of challenging and key positions such as the IT **Senior Manager**, **IT Manager**, **IT Project Manager**, **IT Trainer**, **Management Information System Faculty Head**, **Computer Science College Professor**, **Computer** and **Business Networking Department Trainer**, **IT Superintendent**, **IT Software Supervisor**, **IT System Analyst** and **IT Programmer** for various international companies such as the PAAET Basic Education College, Philadelphia University, Royal Jordan Airlines and Abu Al-Haj Training Center.

Dr. Abedallah has a **PhD** in **Computer Information Systems** and a **Master's** degree in **Information System** from the **University** of **Banking** and **Financial Sciences**, **Computer Information Systems**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), a **Certified Systems Engineer & Systems Administrator** (**Security**, **Microsoft Office Specialist** and **Microsoft Certified IT Professional**) and has delivered numerous trainings, conferences and workshops worldwide.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Machine Learning*** *Definition and Importance of Machine Learning • Traditional Programming versus Machine Learning • Applications of Machine Learning in Various Industries • Challenges and Limitations of Machine Learning*
0930 – 0945	*Break*
0945 – 1040	***Types of Machine Learning*** *Supervised Learning: Definition and Use Cases • Unsupervised Learning: Definition and Use Cases • Reinforcement Learning: Definition and Use Cases • Key Differences and Applications of Each Type*
1040 – 1135	***Data Preprocessing for Machine Learning*** *Importance of Data Quality • Handling Missing and Outlier Data • Feature Scaling and Normalization • Splitting Data into Training, Validation and Test Sets*
1135 - 1230	***Overview of Supervised Learning*** *Definition and Concept of Supervised Learning • Labeling Data and the Role of Output Variables • Common Applications (Spam Detection, Fraud Detection) • Advantages and Limitations of Supervised Learning*
1230 – 1245	*Break*
1245 – 1335	***Regression in Supervised Learning*** *Understanding Regression Problems • Linear Regression: Concepts and Applications • Multiple Regression versus Simple Regression • Evaluating Regression Models (MSE, RMSE, R^2 Score)*
1335 - 1420	***Classification in Supervised Learning*** *Understanding Classification Problems • Logistic Regression and Decision Boundaries • Performance Metrics: Accuracy, Precision, Recall, F1-Score • Applications (Email Spam Classification, Sentiment Analysis)*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Decision Trees & Random Forests*** *Structure of Decision Trees • Entropy and Information Gain in Decision Trees • Overfitting and Pruning Techniques • Advantages of Random Forests over Decision Trees*
0830 – 0900	***Support Vector Machines (SVM)*** *Understanding the Hyperplane Concept • Linear versus Non-Linear SVM • Kernel Trick for Complex Classification Problems • Pros and Cons of Using SVM*

0900 – 0915	*Break*
0915 – 1100	***Neural Networks in Supervised Learning*** *Basics of Artificial Neural Networks (ANN) • Activation Functions (Sigmoid, ReLU, Tanh) • Backpropagation and Gradient Descent • Use Cases in Supervised Learning*
1100 – 1230	***Model Evaluation & Validation Techniques*** *Train-Test Split versus Cross-Validation • Bias-Variance Tradeoff • Underfitting versus Overfitting • Model Performance Metrics*
1230 – 1245	*Break*
1245 – 1335	***Hyperparameter Tuning in Supervised Learning*** *Importance of Hyperparameters • Grid Search versus Random Search • Using Cross-Validation for Hyperparameter Optimization • Automating Hyperparameter Tuning with AI Tools*
1335 - 1420	***Supervised Learning Case Study & Hands-on Practice*** *Implementing Classification Using Sklearn • Hands-on: Logistic Regression for Predicting Loan Approval • Hands-on: Decision Tree for Customer Churn Prediction • Discussion on Model Selection & Practical Challenges*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Unsupervised Learning*** *Definition and Key Characteristics • Differences Between Supervised and Unsupervised Learning • Advantages and Disadvantages of Unsupervised Learning • Applications (Market Segmentation, Anomaly Detection)*
0830 – 0900	***Clustering in Unsupervised Learning*** *Introduction to Clustering • Types of Clustering (Hierarchical, Partitioning, Density-Based) • Similarity Measures (Euclidean, Manhattan, Cosine) • Real-World Applications of Clustering*
0900 – 0915	*Break*
0915 – 1100	***K-Means Clustering*** *Understanding the K-Means Algorithm • Selecting the Optimal Number of Clusters (Elbow Method, Silhouette Score) • Strengths and Weaknesses of K-Means • Hands-on Exercise: Customer Segmentation*
1100 – 1230	***Hierarchical Clustering*** *Concept of Dendrograms • Agglomerative versus Divisive Clustering • Choosing the Right Linkage Method (Single, Complete, Average) • Real-World Use Cases (Genomics, Social Network Analysis)*
1230 – 1245	*Break*
1245 – 1335	***Dimensionality Reduction Techniques*** *Introduction to Curse of Dimensionality • Principal Component Analysis (PCA) • t-SNE for Non-Linear Dimensionality Reduction • Practical Applications of Dimensionality Reduction*

1335 - 1420	***Unsupervised Learning Case Study & Hands-on Practice*** *Implementing K-Means Clustering with Python • Hands-on: Customer Segmentation Using K-Means • Hands-on: PCA for Feature Reduction in Image Processing • Discussion on Challenges and Best Practices*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Reinforcement Learning*** *Understanding the RL Paradigm • Key Components (Agent, Environment, Reward, Action) • Comparison Between RL and Supervised/Unsupervised Learning • Applications (Game Playing, Robotics, Autonomous Vehicles)*
0830 – 0930	***Markov Decision Processes (MDP*** *Introduction to MDPs • Policy, Reward and State-Action Transitions • Bellman Equation in RL • Practical Example of MDP in Decision Making*
0930 – 0945	*Break*
0945 – 1100	***Q-Learning Algorithm*** *Understanding the Q-Table • Epsilon-Greedy Algorithm for Exploration & Exploitation • Q-Learning versus SARSA Algorithm • Practical Implementation of Q-Learning in Python*
1100 – 1215	***Deep Reinforcement Learning (DRL)*** *Introduction to Deep Q-Networks (DQN) • Policy Gradients and Actor-Critic Methods • Combining Neural Networks with RL • Real-World Applications of Deep RL*
1215 – 1230	*Break*
1245 – 1335	***Challenges & Limitations of Reinforcement Learning*** *Sample Efficiency and Computational Costs • Exploration-Exploitation Tradeoff • Generalization in Reinforcement Learning • Ethical Concerns in RL Applications*
1335 - 1420	***Reinforcement Learning Case Study & Hands-on Practice*** *Implementing Q-Learning for Maze Solving • Hands-on: Training an RL Agent in OpenAI Gym • Hands-on: Reinforcement Learning for Stock Trading • Discussion on RL in Robotics & Automation*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Transfer Learning in Machine Learning*** *Concept and Benefits of Transfer Learning • Pretrained Models in Supervised Learning • Transfer Learning in Reinforcement Learning • Use Cases (Image Recognition, NLP)*
0830 – 0930	***Generative Model*** *Generative Adversarial Networks (GANs) • Variational Autoencoders (VAEs) • Applications in Image & Text Generation • Limitations and Ethical Considerations*

0930 – 0945	*Break*
0945 – 1100	***Explainability & Interpretability in ML Models*** *Why Interpretability Matters in ML • SHAP (SHapley Additive ExPlanations) • LIME (Local Interpretable Model-Agnostic Explanations) • Addressing Bias in Machine Learning Models*
1100 – 1215	***Real-World Machine Learning Applications*** *Machine Learning in Healthcare • Machine Learning in Finance (Fraud Detection) • Machine Learning in Autonomous Systems • Future Trends in Machine Learning*
1215 – 1230	*Break*
1230 – 1300	***Deploying Machine Learning Models*** *Introduction to Model Deployment • Model Serving with Flask/Django • Cloud-Based Deployment (AWS, GCP, Azure) • Automating ML Pipelines with MLOp*
1300 - 1345	***Final Hands-On Project & Review*** *Implementing a Real-World ML Project • Model Selection and Optimization Techniques • Best Practices for Machine Learning Development*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This hands-on, highly-interactive course includes real-life case studies and exercises:-

Course Coordinator

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