# COURSE OVERVIEW IT0008
# AI Multilayer Perceptron

**Course Title**
AI Multilayer Perceptron


**Course Date/Venue**
Session 1: May 04-08, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai UAE
Session 2: December 15-19, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

3.0 CEUs (30 PDHs) AWARD

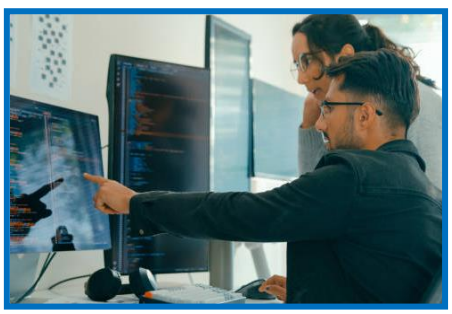
**Course Reference**
IT0008

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

**Course Objectives**

***This practical and 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 Artificial Intelligence Multilayer Perceptron. It covers the artificial intelligence, multilayer perceptron and the fundamentals of artificial (ANN); the multilayer perceptron (MLP), activation functions and forward propagation in MLP; the development environment, backpropagation, cost function and optimization; the hyperparameter tuning in MLP and the causes of overfitting in neural networks; and the regularization techniques, data augmentation to reduce overfitting and cross-validation strategies.



Further, the course will also discuss the performance of training and evaluating an MLP model; implementing MLP in TensorFlow and Keras and the deep MLP architectures; selecting important selecting features for MLP, handling categorical variables in MLP and data preprocessing best practices; the MLP for classification tasks, regression tasks and real-world applications; and using MLP for time-series forecasting.

During this interactive course, participants will learn the batch normalization and dropout for efficient training; optimizing MLP with transfer learning and implementing early stopping and model checkpoints; using TensorBoard for MLP training visualization; the parallel and distributed training for MLP and fine-tuning MLP models for optimal performance; deploying MLP models in production; the model explainability and interpretability and MLP in edge devices; the security and ethical considerations in AI; and the future of multilayer perceptrons in AI.

## Course Objectives

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

- Apply and gain an in-depth knowledge on artificial intelligence multilayer perceptron
- Discuss artificial intelligence and multilayer perceptron and the fundamentals of artificial (ANN)
- Identify multilayer perceptron (MLP), activation functions and forward propagation in MLP
- Set-up the development environment and discuss backpropagation, cost function and optimization
- Apply hyperparameter tuning in MLP, identify the causes of overfitting in neural networks and carryout regularization techniques, data augmentation to reduce overfitting and cross-validation strategies
- Perform training and evaluating an MLP model, implement MLP in TensorFlow and Keras and discuss the deep MLP architectures
- Select important features for MLP, handle categorical variables in MLP and apply data preprocessing best practices
- Implement MLP for classification tasks, regression tasks and real-world applications and use MLP for time-series forecasting
- Apply batch normalization and dropout for efficient training, optimize MLP with transfer learning and implement early stopping and model checkpoints
- Use TensorBoard for MLP training visualization and discuss parallel and distributed training for MLP as well as fine-tuning MLP models for optimal performance
- Deploy MLP models in production and describe model explainability and interpretability
- Implement MLP in edge devices and discuss security and ethical considerations in AI and the future of multilayer perceptrons in AI

## 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 artificial intelligence multilayer perceptron for aspiring data scientists, machine learning engineers, software developers, computer science, professionals in data analytics and other technical staff.

## 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)

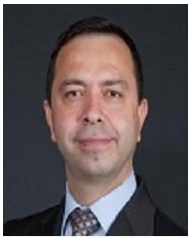
  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** 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. Tuncay Ercan**, PhD, MSc, BSc, is a **Senior IT**, **Telecommunications**, **Control & Electronics Engineer** with over **30 years** of extensive experience in the areas of **IT Business Case Fundamentals**, **Effective E-communication and Collaboration Skills**, **Business Value Estimation**, **Business Value Measurement**, **Risk Management & Mitigation Plan**, **Change Management Plan**, **Social Media Platforms**, Instant Messaging, **IT Risk Management** Concepts, **IT Risk Management** Standard Approaches, **IT Risk** Identification, **IT Risk Monitoring** & **Control**, **Information Technology** Architectures, **Application** Architecture, **Logical Applications**, **Interfaces**, **Portfolio** Management, **Application Security**, **Application Integration** Technologies & Strategies, **Solution Architecture** Patterns, **Web Applications** & Services, **Mobile** & **Cloud Applications**, Advanced **Database Management** Systems, **Network Security**, **IP Security** in an Information Society, Advanced **Engineering Methodologies**, **Research & Development** for SMEs, Multicore Architectures and Parallel Programming, **HP New** Technologies, **Microsoft Academic Program**, **D-link Network** Products Support and Engineering, Chestra **Project Management**, **SCO Unix Administration**, **Cabling Systems**, **Frequency** Management, **Joint Operations Intelligence and Information Systems**, **Network Administration**, **SQL Server 7.0**, **Windows 2000 Administration**, Map Info Administration, Internet Information Server Administration, Exchange Server Administration, **İntelligence Software**, **Microsoft Office** Advanced Courses (Excel, Access, Outlook), Raptor Firewall, Windows NT 4.0 System Administration, 3COM, Cisco Router Administration, SUN Unix System Administration, ASELSAN Digital and Analog Switchboard. He is currently the **Chief of Internship Commission** of **Yasar University** wherein he evaluates students, responsible for computer engineering programs and prepare faculty directives for long-term internship.

During his career life, Dr. Tuncay has gained his practical and field experience through his various significant positions and dedication as the **Planning** & **Projects Chief**, **Network Chief**, **Frequency Chief**, **LAN Operations Chief**, **Communications Center Chief**, **Head** of **Technical Programs**, **Information Systems Project Officer**, **User Commander**, **ADP Chief**, **Radio Relay Squadron Commander**, **Trainer/Lecturer**, **Project Coordinator** and **Professor** for various Universities, Colleges, Institutes and Research Centers.

Dr. Tuncay has **PhD**, **Master** and **Bachelor** degrees in **Computer Engineering** and **Bachelor** degrees in **Electronics Engineering** and **Systems Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), published numerous articles and journals and delivered numerous courses, trainings, workshops and conferences internationally.

## 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 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***

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| *0730 – 0800* | *Registration & Coffee* |
| *0800 – 0815* | *Welcome & Introduction* |
| *0815 – 0830* | ***PRE-TEST*** |
| *0830 – 0930* | ***Introduction to Artificial Intelligence & Machine Learning***<br>*Definition of AI, ML & Deep Learning • Types of Machine Learning (Supervised, Unsupervised, Reinforcement Learning) • Overview of Neural Networks & Deep Learning • Applications of AI in Real-World Scenarios* |
| *0930 – 0945* | *Break* |
| *0945 – 1030* | ***Fundamentals of Artificial Neural Networks (ANN)***<br>*Biological Inspiration of Neural Networks • Basic Structure of an Artificial Neuron • Activation Functions (Sigmoid, ReLU, Tanh, Softmax) • Forward Propagation Mechanism* |
| *1030 – 1130* | ***Basics of Multilayer Perceptron (MLP)***<br>*Definition of Multilayer Perceptron • Layers in an MLP (Input Layer, Hidden Layers, Output Layer) • How MLP Differs from a Single-Layer Perceptron • Role of Weights & Biases in MLP* |
| *1130 – 1215* | ***Understanding Activation Functions***<br>*Importance of Activation Functions • Sigmoid versus ReLU versus Softmax • Choosing the Right Activation Function • Vanishing Gradient Problem & Solutions* |
| *1215 – 1230* | *Break* |

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| *1230 – 1330* | ***Forward Propagation in MLP***<br>*Matrix Multiplication in Forward Propagation • Computing Neuron Outputs • Understanding Dot Product & Summation in MLP • Implementing Forward Propagation in Python* |
| *1330 – 1420* | ***Setting Up the Development Environment***<br>*Installing Python & TensorFlow/Keras • Using Jupyter Notebook & Google Colab • Overview of Necessary Libraries (Numpy, Pandas, Matplotlib) • Running a Simple Neural Network in TensorFlow* |
| *1420 – 1430* | ***Recap***<br>*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***

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| *0730 – 0830* | ***Understanding Backpropagation***<br>*What Is Backpropagation? • Role of the Chain Rule in Differentiation • Weight Updates Using Gradients • Example Calculation of Backpropagation* |
| *0830 – 0930* | ***Cost Function & Optimization***<br>*Definition of Cost Function (MSE, Cross-Entropy) • Gradient Descent Optimization • Types of Optimizers (SGD, Adam, RMSprop) • Impact of Learning Rate on Training* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Hyperparameter Tuning in MLP***<br>*Choosing the Number of Hidden Layers • Impact of Number of Neurons Per Layer • Optimizing Learning Rate & Batch Size • Using Gridsearchcv for Hyperparameter Tuning* |
| *1100 – 1215* | ***Overfitting & Regularization in MLP***<br>*Causes of Overfitting in Neural Networks • Regularization Techniques (L1, L2, Dropout) • Data Augmentation to Reduce Overfitting • Cross-Validation Strategies* |
| *1215 – 1230* | *Break* |
| *1230 – 1330* | ***Training & Evaluating an MLP Model***<br>*Preparing Training & Test Datasets • Splitting Data for Validation • Evaluating Model Performance (Accuracy, Precision, Recall) • Interpreting Confusion Matrices & ROC Curves* |
| *1330 – 1420* | ***Implementing MLP in TensorFlow & Keras***<br>*Building an MLP Model Using Keras Sequential API • Compiling & Fitting the Model • Visualizing Training Loss & Accuracy • Saving & Loading Trained Models* |
| *1420 – 1430* | ***Recap***<br>*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**

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| 0730 – 0830 | ***Understanding Deep MLP Architectures***<br>*Difference Between Shallow & Deep Networks • Benefits of Deeper Networks • Challenges in Training Deep MLPs • Role of Non-Linearity in Deep Networks* |
| 0830 – 0930 | ***Feature Engineering for MLP***<br>*Selecting Important Features • Normalization & Standardization of Inputs • Handling Categorical Variables in MLP • Data Preprocessing Best Practices* |
| 0930 – 0945 | *Break* |
| 0945 – 1100 | ***Implementing an MLP for Classification Tasks***<br>*Classification versus Regression • Building a Multi-Class Classification MLP • Using Softmax Activation for Classification • Evaluating Classification Performance* |
| 1100 – 1215 | ***Implementing an MLP for Regression Tasks***<br>*Regression versus Classification Differences • Using MLP for Predicting Continuous Values • Choosing Activation & Loss Functions for Regression • Evaluating Regression Performance (MSE, RMSE, $R^2$ Score)* |
| 1215 – 1230 | *Break* |
| 1230 – 1330 | ***Using MLP for Time-Series Forecasting***<br>*Overview of Time-Series Forecasting • Preparing Sequential Data for MLP • Using Windowing & Lagging Techniques • Evaluating Time-Series Models* |
| 1330 – 1420 | ***Implementing MLP for Real-World Applications***<br>*Predicting Stock Prices with MLP • Image Recognition Using MLP • Sentiment Analysis on Text Data • Fraud Detection Using MLP Models* |
| 1420 – 1430 | ***Recap***<br>*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**

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| 0730 – 0830 | ***Batch Normalization & Dropout for Efficient Training***<br>*Role of Batch Normalization in Stabilizing Training • Implementing Batch Normalization in Keras • How Dropout Prevents Overfitting • Best Practices for Using Dropout* |
| 0830 – 0930 | ***Optimizing MLP with Transfer Learning***<br>*Concept of Transfer Learning • When to Use Transfer Learning for MLP • Implementing Transfer Learning with Pretrained Models • Fine-Tuning an Existing Model for New Tasks* |
| 0930 – 0945 | *Break* |
| 0945 – 1100 | ***Implementing Early Stopping & Model Checkpoints***<br>*Role of Early Stopping in Training Deep Networks • Setting Up Model Checkpoints for Best Performance • Using Callbacks in Keras • Restoring the Best Model from Checkpoints* |
| 1100 – 1215 | ***Using Tensorboard for MLP Training Visualization***<br>*What Is Tensorboard & Why Use It? • Visualizing Loss & Accuracy Graphs • Tracking Model Performance Over Time • Comparing Different Training Runs* |

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| *1215 – 1230* | *Break* |
| *1230 – 1330* | ***Parallel & Distributed Training for MLP***<br>*Training Models on GPUs & TPUs • Using TensorFlow Distributed Strategy • Scaling Models for Large Datasets • Cloud-Based Training (Google Cloud, AWS)* |
| *1330 – 1420* | ***Fine-Tuning MLP Models for Optimal Performance***<br>*Adjusting Learning Rate Dynamically • Using Adaptive Optimizers • Hyperparameter Tuning Using Keras Tuner • Evaluating Model Generalization Performance* |
| *1420 – 1430* | ***Recap***<br>*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***

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| *0730 – 0830* | ***Deploying MLP Models in Production***<br>*Converting Models to TensorFlow Lite • Deploying MLP Models as Apis Using Flask • Using TensorFlow.Js for Web-Based Deployment • Deploying Models on Cloud Services* |
| *0830 – 0930* | ***Model Explainability & Interpretability***<br>*Why Interpretability Matters in AI • Using SHAP (SHapley Additive ExPlanations) • Feature Importance Analysis • Visualizing Neuron Activations* |
| *0930 – 0945* | *Break* |
| *0945 – 1030* | ***Implementing MLP in Edge Devices***<br>*Challenges of Deploying ML on Edge Devices • Converting Models for Low-Power Environments • TensorFlow Lite for Mobile & Embedded Devices • Running AI Models on Raspberry Pi* |
| *1030 – 1130* | ***Security & Ethical Considerations in AI***<br>*Bias in AI & Ways to Mitigate It • Ensuring Fairness in AI Models • Privacy Concerns in AI Applications • Compliance with AI Regulations* |
| *1130 – 1215* | ***Hands-on Project: End-to-End MLP Model***<br>*Selecting a Real-World Use Case • Preprocessing & Feature Selection • Training & Evaluating an MLP Model • Deploying the Model as a Web Application* |
| *1215 – 1230* | *Break* |
| *1230 – 1345* | ***The Future of Multilayer Perceptrons in AI***<br>*MLP versus Modern Architectures (CNNs, Transformers) • Where MLP Still Excels in AI Applications • Trends in Deep Learning & Neural Networks • Next Steps for Mastering AI & MLP* |
| *1345 – 1400* | ***Course Conclusion***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about the Course 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 practical and highly-interactive course includes real-life case studies and exercises:-

**Course Coordinator**

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