Australian Teachers
CORPORATION

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SYLLABUS

Machine Learning with TensorFlow

Duration: 5 Days (Total: 20 Hours)

Contents

1.0 Course Overview

This training module provides a hands-on and comprehensive introduction to **Machine Learning using TensorFlow**. Through practical coding sessions, real-life datasets, and engaging projects, learners will understand the fundamental concepts of machine learning and neural networks while gaining experience using one of the most powerful ML frameworks in the industry.

2.0 Learning Outcomes

By the end of this training, participants will be able to:

- Understand key concepts of machine learning and deep learning
- Use TensorFlow to build and train models
- Perform effective data preprocessing and feature engineering
- Evaluate, optimize, and deploy ML models
- Apply machine learning in real-world projects across different industries

3.0 Training Methodology

- Interactive Lectures

- Code-Along Demonstrations
- Group Projects
- Real-World Datasets
- Visual Explanations & Simulations
- Hands-On Labs (Google Colab / Jupyter Notebooks)

4.0 Introduction to Machine Learning and TensorFlow (3 Hours)

Objectives:

- Define machine learning and its categories
- Understand the purpose and architecture of TensorFlow
- Set up an environment for development

Topics Covered:

- What is Machine Learning? (Supervised, Unsupervised, Reinforcement)
- Why TensorFlow? – Features and Ecosystem
- Installation and Environment Setup (Google Colab/Jupyter)
- Machine Learning Pipeline (Load Data → Train → Evaluate → Predict)

Activities:

- Code Demo: First TensorFlow Program
- Discussion: Examples of ML in daily life
- Quiz: ML concepts and classification types

5.0 Data Preprocessing & Feature Engineering (3 Hours)

Objectives:

- Clean and prepare raw data
- Engineer features for better performance

Topics Covered:

- Data Cleaning: Handling Missing Data and Outliers
- Encoding: Label Encoding, One-Hot Encoding
- Feature Scaling: Normalization and Standardization
- TensorFlow Data Pipelines (tf.data.Dataset)

Activities:

- Hands-On: Preprocessing a dataset with Pandas and TensorFlow
- Visualization: Feature correlation heatmap

- Mini-Task: Convert raw CSV into model-ready data

6.0 Building ML Models with TensorFlow (4 Hours)

Objectives:

- Construct and train ML models using TensorFlow/Keras
- Understand loss functions and optimizers

Topics Covered:

- Sequential and Functional API in TensorFlow
- Compiling Models: Loss, Optimizers, and Metrics
- Training: Epochs, Batches, Validation
- Model Evaluation and Predictions

Activities:

- Lab: Regression and Classification Model in TensorFlow
- Plotting: Training vs Validation Accuracy
- Group Task: Build a model to predict housing prices

7.0 Deep Learning with Neural Networks (3 Hours)

Objectives:

- Learn the fundamentals of neural networks
- Implement deep learning with TensorFlow

Topics Covered:

- Neural Network Concepts: Neurons, Layers, Activation Functions
- Building Deep Models with Hidden Layers
- Overfitting and Regularization: Dropout, L2
- Introduction to CNNs (Convolutional Neural Networks)

Activities:

- Lab: Handwritten Digit Recognition with MNIST
- Visualization: Model architecture and activation flow
- Experiment: Test models with different architectures

8.0 Model Evaluation and Optimization (3 Hours)

Objectives:

- Evaluate model performance and tune hyperparameters

Topics Covered:

- Evaluation Metrics: Accuracy, Precision, Recall, F1, ROC-AUC
- Hyperparameter Tuning: Grid Search & Random Search
- TensorBoard & Keras Tuner
- Saving & Loading Models

Activities:

- Practice: Model Optimization with Validation
- Visual Lab: TensorBoard usage
- Challenge: Improve accuracy with tuning

9.0 Deployment and Real-World Applications (2 Hours)

Objectives:

- Deploy ML models and explore industry applications

Topics Covered:

- Exporting Models for Deployment (SavedModel, TensorFlow Lite)
- Intro to TensorFlow Serving & TensorFlow.js

- Ethics and Fairness in ML
- ML Applications in Healthcare, Finance, Retail, etc.

Activities:

- Demo: Convert model to TensorFlow Lite
- Brainstorm: ML project ideas for social impact
- Case Study: AI bias in facial recognition

10.0 Conclusion and Wrap-Up (1 Hour)

Key Takeaways:

- Recap of key concepts and techniques
- Importance of responsible AI and continuous learning

Final Activities:

- Presentation: Team-based ML mini-project
- Feedback Forms
- Certificate Distribution