# Machine Learning Engineering on AWS Training

Duration: **3 Day**

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**Machine Learning Engineering on AWS** is an intermediate-level training program designed for professionals who want to build, deploy, scale, and operationalize machine learning solutions on Amazon Web Services. As organizations increasingly adopt cloud-based artificial intelligence solutions, AWS provides a comprehensive ecosystem for managing the entire machine learning lifecycle—from data preparation and model training to deployment and monitoring.

Throughout this hands-on course, participants gain practical experience using**Amazon SageMaker AI**, **Amazon EMR**, **SageMaker Data Wrangler**, **SageMaker Pipelines**, **Model Registry**, **MLOps**, **CI/CD**, and advanced monitoring services to build production-ready machine learning applications.

Combining theoretical knowledge, guided labs, and real-world projects, this training prepares learners to develop secure, scalable, and enterprise-grade machine learning solutions on AWS.

## Prerequisites

Participants are recommended to have:

- Familiarity with basic **Machine Learning** concepts
- Experience with Python programming
- Knowledge of **NumPy**, **Pandas**, and **Scikit-Learn**
- Basic understanding of cloud computing concepts
- Familiarity with AWS services
- Experience with Git or other version control systems (beneficial)

## Who Should Attend

This course is ideal for:

- **Machine Learning Engineers**
- **Data Scientists**
- **AI Engineers**
- **DevOps Engineers**
- **Cloud Engineers**
- **SysOps Engineers**
- Software Developers
- Data Engineers
- Professionals building ML solutions on AWS

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## What You Will Learn

By the end of this course, learners will be able to:

- Build machine learning solutions on AWS.
- Train and deploy models using **Amazon SageMaker AI**.
- Process large-scale datasets with **Amazon EMR**.
- Perform data preparation and feature engineering.
- Select appropriate modeling approaches.
- Evaluate and optimize model performance.
- Apply **Hyperparameter Tuning** techniques.
- Implement production-grade deployment strategies.
- Establish **MLOps** workflows.
- Monitor model performance and data quality.
- Design secure AWS machine learning architectures.

## Training Outline

### Introduction to Machine Learning on AWS

#### Machine Learning Fundamentals

- **Machine Learning Fundamentals**
- Supervised and unsupervised learning
- Machine learning lifecycle
- Translating business problems into ML solutions

#### Machine Learning on AWS

- AWS machine learning ecosystem
- **Amazon SageMaker AI**
- AWS ML services overview
- Cloud-native AI solutions

#### Responsible AI

- Ethical AI principles
- Fairness and bias mitigation
- Explainable AI
- Responsible machine learning practices

### Analyzing Machine Learning Challenges

#### Business Problem Evaluation

- ML use cases
- Defining business objectives
- Success criteria and KPIs

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### Training Approaches

- Model development strategies
- Training methodologies
- Algorithm selection techniques

## Data Processing and Preparation

### Data Types and Management

- Structured and unstructured data
- Data collection processes
- Data storage strategies

### AWS Storage Solutions

- Amazon S3
- AWS storage services
- Choosing the right storage architecture

### Exploratory Data Analysis

- Data exploration techniques
- Data visualization
- Data quality assessment

## Data Transformation and Feature Engineering

### Data Cleaning

- Handling missing data
- Correcting inaccurate records
- Removing duplicate entries

### Feature Engineering

- Feature creation techniques
- Feature selection strategies
- Data transformation methods

### AWS Data Processing Services

- **Amazon SageMaker Data Wrangler**
- **Amazon EMR**
- SageMaker Processing

## Choosing a Modeling Approach

### SageMaker Built-In Algorithms

- **SageMaker Built-In Algorithms**
- Algorithm selection

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- Business use cases

#### Amazon SageMaker Autopilot

- **AutoML**
- Automated model development
- Intelligent model recommendations

#### Model Selection Considerations

- Performance evaluation
- Business alignment
- Cost optimization

### Training Machine Learning Models

#### Model Training Concepts

- Training methodologies
- Training infrastructure
- Distributed training approaches

#### Training with Amazon SageMaker

- SageMaker Training Jobs
- Resource allocation
- Training optimization techniques

### Model Evaluation and Optimization

#### Performance Evaluation

- Evaluation metrics
- Accuracy and error analysis
- Model comparison methodologies

#### Hyperparameter Optimization

- **Hyperparameter Tuning**
- Reducing training time
- Automated optimization strategies

### Model Deployment Strategies

#### Deployment Approaches

- Real-time inference
- Batch inference
- Edge deployment

#### Inference Infrastructure

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- Endpoint management
- Containerized inference
- Resource optimization

#### A/B Testing

- Traffic shifting strategies
- Model comparison
- Canary deployment approaches

### Securing AWS Machine Learning Resources

#### Identity and Access Management

- IAM policies
- Role-based access controls
- Secure ML environments

#### Network Security

- Network access controls
- VPC integration
- Data protection strategies

#### CI/CD Security

- Secure deployment pipelines
- Pipeline protection
- Security validation controls

### MLOps and Automation

#### MLOps Fundamentals

- **Machine Learning Operations (MLOps)**
- Model lifecycle management
- Continuous integration and delivery

#### Amazon SageMaker Pipelines

- **Amazon SageMaker Pipelines**
- Workflow automation
- Process standardization

#### Model Registry

- **Amazon SageMaker Model Registry**
- Model versioning
- Model governance

### Monitoring Model Performance and Data Quality

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### Model Monitoring

- **SageMaker Model Monitor**
- Performance tracking
- Production observability

### Data Drift and Model Drift

- Detecting data drift
- Monitoring model degradation
- Automated remediation strategies

## Automated Troubleshooting and Continuous Improvement

- Anomaly detection
- Automated corrective actions
- Performance optimization
- Operational excellence