Machine Learning Applications in Mining Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

The Machine Learning Applications in Mining Training Course is designed to equip professionals with the skills to leverage AI, ML, and predictive analytics in modern mining operations. As the mining industry rapidly evolves toward Mining 4.0, smart mining, and digital transformation, this course bridges the gap between traditional mining engineering and advanced computational intelligence. Participants will learn how to optimize exploration, extraction, safety, and resource management using data-driven decision-making, automation, and real-time analytics.

This training emphasizes practical, real-world implementation of supervised learning, unsupervised learning, deep learning, and predictive maintenance models in mining environments. Through case studies and simulation-based learning, participants will understand how ML improves ore grade prediction, equipment failure forecasting, mineral exploration accuracy, and operational efficiency. The course is structured to prepare learners for the future of autonomous mining systems, IoT-enabled mines, and sustainable resource optimization, ensuring competitiveness in a highly data-centric industry.

Programme Curriculum

Machine Learning Applications in Mining Training Course

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Course Objectives

1. Understand fundamentals of Artificial Intelligence in Mining Industry 4.0
2. Apply Machine Learning algorithms for mineral exploration and ore classification
3. Develop predictive maintenance models for mining equipment
4. Implement deep learning for geological data interpretation
5. Utilize big data analytics in mining operations optimization
6. Improve mine safety using predictive risk modeling
7. Apply computer vision for autonomous mining vehicles
8. Design data-driven decision systems for extraction planning
9. Use IoT sensor data for real-time mining analytics
10. Optimize supply chain and logistics in mining operations
11. Build clustering models for mineral deposit segmentation
12. Apply time-series forecasting for production planning
13. Integrate sustainable mining practices using AI-driven insights

Target Audience

1. Mining Engineers
2. Geologists and Exploration Specialists
3. Data Scientists in Industrial Applications
4. Metallurgical Engineers
5. Operations and Production Managers
6. Safety and Risk Management Officers
7. Industrial Automation Engineers
8. Postgraduate Students in Mining, AI, or Data Science

Course Modules

Module 1: Introduction to AI & Machine Learning in Mining

- Overview of Mining 4.0 transformation
- Role of AI in modern mining ecosystems
- Types of machine learning models
- Data lifecycle in mining operations
- Case Study: AI adoption in autonomous mines in Australia

Module 2: Data Collection & Mining Sensor Systems

- IoT sensors in mining environments
- SCADA and real-time data acquisition

- Data preprocessing techniques
- Handling noisy geological data
- Case Study: Sensor-based monitoring in deep underground mines

Module 3: Python for Mining Analytics

- Python libraries (NumPy, Pandas, Scikit-learn)
- Data cleaning and transformation
- Exploratory data analysis
- Visualization using Matplotlib & Seaborn
- Case Study: Ore dataset analysis using Python

Module 4: Supervised Learning for Ore Classification

- Regression vs classification models
- Decision Trees and Random Forests
- Support Vector Machines in geology
- Model evaluation metrics
- Case Study: Mineral classification in iron ore mining

Module 5: Unsupervised Learning in Exploration

- Clustering techniques (K-Means, DBSCAN)
- Pattern detection in geological data
- Dimensionality reduction (PCA)
- Anomaly detection in mining sites
- Case Study: Gold deposit clustering in Africa

Module 6: Predictive Maintenance in Mining Equipment

- Failure prediction models
- Time-series sensor analysis
- Survival analysis techniques
- Preventive maintenance optimization
- Case Study: Conveyor belt failure prediction system

Module 7: Deep Learning for Geological Imaging

- Neural networks basics
- CNN for rock image classification
- Satellite image interpretation
- Feature extraction techniques
- Case Study: Satellite-based mineral mapping

Module 8: Computer Vision in Autonomous Mining

- Object detection in mining sites
- Driverless haul trucks
- Image segmentation techniques
- Real-time hazard detection
- Case Study: Autonomous drilling system in Canada

Module 9: Time Series Forecasting in Mining Operations

- ARIMA and LSTM models
- Production forecasting
- Demand-supply prediction
- Trend and seasonality analysis
- Case Study: Coal production forecasting

Module 10: Big Data Analytics in Mining

- Hadoop and Spark in mining data
- Distributed data processing
- Real-time analytics pipelines
- Data lakes in mining enterprises
- Case Study: Large-scale mining data platform in Chile

Module 11: AI for Mine Safety and Risk Management

- Hazard prediction systems
- Worker safety analytics
- Accident prevention models
- Environmental monitoring
- Case Study: AI-based safety system in underground mines

Module 12: Optimization Algorithms in Mining

- Linear programming applications
- Genetic algorithms
- Resource allocation optimization
- Scheduling and planning models
- Case Study: Optimized blasting operations

Module 13: IoT and Smart Mining Systems

- Sensor networks in mines
- Edge computing in mining
- Real-time monitoring dashboards
- Automation systems integration
- Case Study: Smart mine implementation in Finland

Module 14: Sustainable Mining Using AI

- Environmental impact analysis
- Energy efficiency models
- Waste reduction optimization
- Carbon footprint tracking
- Case Study: Green mining initiatives in Europe

Module 15: Capstone Project – End-to-End ML Mining Solution

- End-to-end project design
- Dataset selection and cleaning

- Model building and deployment
- Business intelligence reporting
- Case Study: AI-based smart mine simulation project

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

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