AI & Data Science 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 mining industry is undergoing a radical transformation driven by Artificial Intelligence (AI), Machine Learning (ML), Big Data Analytics, and Industrial Internet of Things (IIoT). AI & Data Science in Mining Training Course is designed to equip professionals with cutting-edge skills in AI-powered mineral exploration, predictive maintenance, geological modeling, and data-driven decision-making. Participants will learn how modern mining operations leverage deep learning, computer vision, sensor fusion, and cloud-based analytics to optimize extraction processes and reduce operational risks.

With increasing demand for critical minerals, ESG compliance, automation, and digital twins in mining, organizations are investing heavily in AI-driven exploration, ore grade prediction, equipment failure forecasting, and autonomous haulage systems. This course provides a structured pathway to mastering data science pipelines, geospatial analytics, AI model deployment, and mining optimization strategies. Learners will gain hands-on exposure to real-world mining datasets, industrial case studies, and advanced tools such as Python, TensorFlow, Power BI, GIS systems, and cloud AI platforms. The goal is to develop industry-ready professionals capable of transforming traditional mining into a smart, safe, sustainable, and highly efficient digital mining environment.

Programme Curriculum

AI & Data Science in Mining Training Course

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Course Duration

10 Days

Course Objectives

1. Master AI-driven smart mining systems
2. Understand machine learning for mineral exploration
3. Apply predictive maintenance in heavy mining equipment
4. Develop geospatial analytics for ore detection
5. Build deep learning models for geological pattern recognition
6. Implement IoT and sensor data analytics in mining operations
7. Optimize production using data-driven decision systems
8. Design digital twins for mining operations
9. Improve safety using AI-based hazard detection systems
10. Analyze mining datasets using Python, R, and SQL
11. Deploy cloud-based AI solutions in mining environments
12. Enhance sustainability through ESG data analytics
13. Create autonomous mining workflow models

Target Audience

1. Mining Engineers
2. Geologists and Exploration Scientists
3. Data Scientists & AI Engineers
4. Industrial Automation Specialists
5. Petroleum & Mineral Resource Analysts
6. Environmental & Safety Engineers
7. IT Professionals in Mining Industry
8. Government Mining & Energy Regulators

Course Modules

Module 1: Introduction to Smart Mining & Industry 4.0

- Evolution from traditional to digital mining
- Role of AI, IoT, and Big Data in mining
- Smart mine architecture overview
- Real-time monitoring systems
- Case Study: Autonomous mining transformation in Australia iron ore mines

Module 2: Python for Mining Data Science

- Python fundamentals for mining analytics
- NumPy, Pandas for geological datasets
- Data cleaning for sensor data
- Time-series mining data handling
- Case Study: Equipment performance dataset analysis

Module 3: Data Acquisition in Mining Systems

- IoT sensors in mining operations
- SCADA and telemetry systems
- Data pipelines from underground mines
- Real-time data streaming tools
- Case Study: Sensor network in underground coal mine

Module 4: Geospatial Data Analytics (GIS)

- Spatial data processing techniques
- Satellite imagery analysis
- GIS tools in exploration
- Mineral mapping techniques
- Case Study: Satellite-based gold detection project

Module 5: Machine Learning Fundamentals

- Supervised vs unsupervised learning
- Regression models for ore prediction
- Clustering for mineral classification
- Model evaluation metrics
- Case Study: Ore grade prediction model

Module 6: Deep Learning in Mining

- Neural networks basics
- CNN for rock image classification
- RNN for sensor time-series data
- TensorFlow applications
- Case Study: Rock fracture detection using CNN

Module 7: Predictive Maintenance Systems

- Equipment failure prediction models
- Vibration and temperature data analysis
- Anomaly detection algorithms
- Maintenance scheduling optimization
- Case Study: Haul truck predictive failure system

Module 8: Big Data in Mining

- Hadoop and Spark basics
- Mining data lakes architecture

- Distributed processing systems
- Data warehousing techniques
- Case Study: Large-scale mine operational analytics

Module 9: AI for Mineral Exploration

- AI-driven exploration models
- Geochemical data analysis
- Pattern recognition in ore deposits
- Predictive geology models
- Case Study: AI-based copper deposit discovery

Module 10: Computer Vision in Mining

- Image processing techniques
- Ore sorting automation
- Drone imagery analysis
- Defect detection in equipment
- Case Study: Autonomous ore sorting system

Module 11: Digital Twins in Mining

- Concept of mining digital twins
- Simulation of mine operations
- Real-time replication systems
- Performance optimization models
- Case Study: Full-scale digital mine simulation

Module 12: Cloud Computing for Mining AI

- AWS/Azure/GCP for mining data
- Cloud-based ML pipelines
- Scalable storage systems
- API integration for mining tools
- Case Study: Cloud-based mining dashboard

Module 13: Safety & Risk Analytics

- AI-based hazard detection
- Worker safety monitoring systems
- Risk prediction models
- Emergency response optimization
- Case Study: AI-driven mine collapse prediction

Module 14: ESG & Sustainable Mining Analytics

- Environmental impact modeling
- Carbon footprint tracking
- Waste management analytics
- Sustainability KPIs
- Case Study: Green mining optimization project

Module 15: Autonomous Mining Systems

- Autonomous trucks and drilling systems
- Robotics in mining
- Reinforcement learning applications
- Fleet optimization algorithms
- Case Study: Autonomous haulage system in open-pit mine

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
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:

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Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com