AI-Based Ore Sorting 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

Artificial Intelligence (AI) is revolutionizing the mining and mineral processing industry by enabling high-precision, real-time decision-making in ore sorting operations. The integration of machine learning, computer vision, hyperspectral imaging, sensor fusion, and predictive analytics is transforming traditional mining into a data-driven, automated, and highly efficient ecosystem. AI-based ore sorting significantly improves ore grade optimization, waste reduction, recovery rates, operational efficiency, and sustainability compliance, making it a core competency for modern mining professionals.

AI-Based Ore Sorting Training Course is designed to equip learners with advanced knowledge of AI-powered ore characterization, automated mineral recognition, sensor-based sorting systems, and intelligent decision algorithms. Participants will gain hands-on exposure to industrial case studies involving XRT (X-ray Transmission), NIR (Near-Infrared), LIBS (Laser-Induced Breakdown Spectroscopy), and deep learning-based image classification systems. The course bridges mining engineering with AI technologies to develop future-ready professionals capable of optimizing beneficiation processes and reducing operational costs in large-scale mining environments.

Programme Curriculum

AI-Based Ore Sorting Training Course

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Course Duration

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Course Objectives

1. Master AI-driven ore sorting technologies for mineral processing optimization
2. Understand machine learning algorithms for ore classification and grading
3. Apply computer vision in real-time mineral identification systems
4. Analyze sensor fusion techniques (XRT, NIR, LIBS) in ore separation
5. Optimize ore recovery rates using predictive analytics models
6. Implement deep learning frameworks for mineral texture recognition
7. Evaluate ore beneficiation efficiency using AI dashboards
8. Develop automated sorting pipelines for mining operations
9. Reduce operational cost using AI-based waste rejection systems
10. Enhance sustainability through low-energy ore processing techniques
11. Integrate IoT-enabled smart mining systems with AI models
12. Improve decision-making using data-driven mineral analytics
13. Deploy industrial-scale AI sorting solutions in mining plants

Target Audience (8 Segments)

1. Mining Engineers
2. Mineral Processing Engineers
3. Geologists & Exploration Scientists
4. Data Scientists in Industrial AI
5. Metallurgical Engineers
6. Mining Operations Managers
7. Automation & Control Engineers
8. Environmental & Sustainability Analysts

Course Modules

Module 1: Fundamentals of Ore Sorting

- Basics of mineral classification
- Principles of ore separation
- Industrial sorting technologies overview
- Physical vs AI-based sorting systems
- Case Study: Iron ore upgrading in Australia using sensor sorting

Module 2: Introduction to AI in Mining

- AI evolution in mining industry

- Machine learning fundamentals
- Data pipelines in mineral processing
- AI use cases in beneficiation
- Case Study: AI optimization in copper mining operations in Chile

Module 3: Computer Vision for Ore Recognition

- Image acquisition systems
- Feature extraction techniques
- CNN models for mineral detection
- Real-time classification systems
- Case Study: Gold ore visual classification system in South Africa

Module 4: Sensor-Based Sorting Technologies

- XRT imaging systems
- NIR spectroscopy applications
- LIBS technology in mineral detection
- Sensor calibration techniques
- Case Study: Diamond sorting using XRT systems in Canada

Module 5: Machine Learning Models in Ore Sorting

- Supervised learning models
- Unsupervised clustering methods
- Regression models for ore grade prediction
- Model training and validation
- Case Study: Copper grade prediction using ML in Peru

Module 6: Deep Learning in Mineral Analysis

- CNN architectures
- Transfer learning in mining datasets
- Image segmentation techniques
- Model optimization strategies
- Case Study: Nickel ore segmentation using deep learning in Indonesia

Module 7: Data Collection & Preprocessing

- Mining data acquisition systems
- Data cleaning techniques
- Feature engineering methods
- Dataset labeling for ores
- Case Study: Large-scale dataset creation for iron ore classification in Brazil

Module 8: Hyperspectral Imaging in Ore Sorting

- Spectral signature analysis
- Mineral identification via wavelengths
- Image processing pipelines
- Calibration of hyperspectral sensors
- Case Study: Rare earth element detection in China

Module 9: Real-Time Sorting Systems

- Edge computing in mining
- Low-latency decision systems
- Embedded AI models
- Automation integration
- Case Study: Real-time tungsten sorting in Europe

Module 10: IoT Integration in Smart Mining

- Sensor networks in mines
- Data transmission protocols
- Cloud-based mining systems
- Predictive maintenance systems
- Case Study: Smart iron mine IoT integration in India

Module 11: Predictive Analytics in Ore Recovery

- Time-series forecasting
- Yield prediction models
- Statistical analysis techniques
- Optimization algorithms
- Case Study: Gold recovery improvement in Ghana

Module 12: Robotics in Ore Sorting

- Robotic sorting arms
- Vision-guided robotics
- Automation workflows
- Safety systems integration
- Case Study: Automated lithium sorting plant in Australia

Module 13: AI Model Deployment in Mining Plants

- Model serving techniques
- Edge vs cloud deployment
- System scalability
- Maintenance and updates
- Case Study: AI deployment in large-scale phosphate mining

Module 14: Sustainability & Environmental Optimization

- Waste reduction strategies
- Energy-efficient processing
- ESG compliance in mining
- Carbon footprint analytics
- Case Study: Sustainable ore processing in Scandinavian mines

Module 15: Digital Twin for Mining Operations

- Digital twin architecture
- Simulation of ore processing plants

- Real-time system synchronization
- Performance optimization
- Case Study: Digital twin implementation in Australian mining industry

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:

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