CONCEPT

AI in Safety Monitoring: Predictive Analytics and Computer Vision for Incident Prevention

5 – 9 April 2027
London - Central London four-star



AI in Safety Monitoring: Predictive Analytics and Computer Vision for Incident Prevention

Ref: 1214_6930 **Date:** 5 – 9 April 2027 **Location:** London - Central London four-star **Fees:** 25300 SAR

Technical depth: Practitioner · **Practical mode:** Case study

Introduction

Most organisations still learn about safety failures from lagging measures: injuries, lost time and loss-of-containment events recorded after the harm is done. Near-miss reports, inspection findings, permit records, sensor readings and camera feeds already hold early warning signs, but few HSE teams have the capacity to read them. This Core Concept course shows HSE practitioners how to apply computer vision, natural language processing and predictive analytics to that data, and how to govern the models responsibly. Participants work through case material from several sectors and leave with a Predictive Safety Monitoring Pilot Plan.

Course Objectives

- Map an organisation's safety data sources and leading and lagging indicators against ISO 45001 and API RP 754 tiers to locate where AI adds predictive value
- Select AI techniques, including computer vision, natural language processing and risk-scoring models, that fit a specific hazard and data set
- Evaluate vendor and in-house model performance with precision, recall and false-alarm criteria before deployment
- Design alert triage and response workflows that turn model outputs into preventive actions and permit-to-work controls
- Apply ISO/IEC 42001 and ISO/IEC 23894 controls to manage bias, drift, worker privacy and human oversight
- Produce a Predictive Safety Monitoring Pilot Plan ready for management approval

Target Audience

- HSE advisers and specialists who analyse incident, near-miss and inspection data
- Process safety engineers responsible for performance indicators and major accident prevention
- Site and contractor safety coordinators who act on monitoring alerts in the field
- HSE data analysts and reporting staff who build safety dashboards and trend reports
- Operations and maintenance engineers who own sensor, CCTV and condition-monitoring systems used for safety
- Digital and innovation staff supporting the introduction of AI tools into HSE functions

Course Outline

Day 1: From Lagging Measures to Predictive Safety

- Leading and Lagging Indicators Under ISO 45001 Clause 9.1 Performance Evaluation
- Process Safety Indicator Tiers in API RP 754 and IOGP Report 456
- Safety Data Source Inventory: Incidents, Near Misses, Inspections, Permits and Sensors
- AI Concepts and Terminology Under ISO/IEC 22989
- Predictive Safety Maturity Self-Assessment Matrix

Day 2: AI Techniques and Governance Frameworks

- Computer Vision for PPE, Exclusion Zone and Unsafe Act Detection
- Natural Language Processing for Near-Miss and Incident Report Classification
- Supervised Risk-Scoring Models Using Logistic Regression and Gradient Boosting
- CRISP-DM Project Life Cycle for Safety Analytics
- ISO/IEC 42001 AI Management System and NIST AI RMF Functions

Day 3: Applying AI to Monitoring and Prevention

- Use-Case Prioritisation Matrix: Hazard Severity, Data Availability and Feasibility
- Safety Data Preparation: Labelling, Class Imbalance and Data Quality Checks
- Model Performance Evaluation with Confusion Matrix, Precision and Recall
- Alert Triage and Escalation Workflow Linked to Permit-to-Work
- Predictive Risk Dashboard Design for Supervisors and Control Rooms

Day 4: Risks, Failure Modes and Controls

- AI Risk Assessment Using ISO/IEC 23894 and ISO 31000
- False Alarms, Alert Fatigue and Automation Bias in Safety Decisions
- Model Drift Monitoring and Revalidation Triggers
- Worker Privacy in Video Analytics Using ISO/IEC 29100 Principles
- Bowtie Analysis of AI Monitoring as a Barrier and Its Degradation Factors

Day 5: Case Work and the Pilot Plan

- Construction Site Case Study: Computer Vision Exclusion-Zone Alerts
- Refinery Case Study: Predicting Loss of Containment from Maintenance and Permit Data
- Logistics Warehouse Case Study: Forklift and Pedestrian Interaction Analytics
- Predictive Safety Monitoring Pilot Plan Drafting
- Peer Review Panel and Pilot Plan Defence

Skills You Will Gain

- Safety Performance Indicator Design
- Safety Data Analysis
- Computer Vision Use-Case Scoping
- AI Model Evaluation
- Alert Response Design
- AI Risk Management
- Human Factors in Automation
- HSE Technology Governance

Why Attend This Course

- Leave with a Predictive Safety Monitoring Pilot Plan for a real hazard in your own operation, already reviewed by peers
- Question vendor claims about detection accuracy with evidence rather than demonstrations
- Recognise when an alerting system is creating noise and complacency instead of prevention
- See how HSE teams in construction, energy, manufacturing and logistics are applying the same tools

Conclusion

AI in safety monitoring earns its place only when it predicts harm early enough to act and when people trust and respond to its alerts. The course builds from indicator design and safety data, through the main AI techniques and governance standards, to use-case selection, model evaluation, alert workflows and the failure modes that erode protection. The final day brings this together in a Predictive Safety Monitoring Pilot Plan that participants can take to management for approval and use to run a controlled, measurable first deployment.