

TECH OFFER

AI Solution for High-Risk Industry Safety Management



KEY INFORMATION

TECHNOLOGY CATEGORY:

Infocomm - Artificial Intelligence

TECHNOLOGY READINESS LEVEL (TRL): **TRL9**

COUNTRY: **CHINA**

ID NUMBER: **TO175209**

OVERVIEW

High-risk industrial sectors, represented by the chemical industries, are prone to experience production safety accidents. When these incidents occur, the consequences can be severe. Traditional risk management methods, often rely on manual processes, have limitations such as insufficient oversight, incomplete management, and ineffective control. These methods also struggle to provide timely pre-incident warnings, active interventions during incidents, and reliable post-incident evidence collection.

To address these challenges, the technology owner has developed an intelligent industry solution leveraging cutting-edge artificial intelligence (AI) technologies, such as computer vision, the Internet of Things (IoT), and big data. By integrating enterprise camera systems with algorithms on server platforms, it establishes an advanced risk detection and management platform based on intelligent video analysis. This platform enhances the safety management through comprehensive risk perception and control, proactive hazard identification, predictive warnings, and visual decision-making assistance. Ultimately, it realizes comprehensive safety and intelligent management capabilities for high-risk industrial enterprises.

The technology owner seeks collaboration with industrial partners interested in artificial intelligence, such as companies in chemical and energy sectors, as well as hardware providers, such as manufacturers of surveillance cameras, to co-develop and implement this technology to meet specific needs.

TECHNOLOGY FEATURES & SPECIFICATIONS

The solution integrates AI technology with safety management of operations in high-risk industries, independently developing over 300 proprietary algorithms to ensure comprehensive monitoring of the four key elements in industrial safety operations: personnel, equipment, environment, and operational procedures. Additionally, it incorporates industrial large language models and knowledge graphs to enhance data-driven decision-making support. The technology exhibits the following key features:

- **Small Sample Detection and Recognition Based on Siamese Network:** Utilizing a proprietary Siamese Network structure, the solution leverages large volumes of normal data and small amounts of abnormal data to train the neural network. By designing a classification network based on compressed sensing optimization, the system achieves over 90% recognition accuracy in high-risk scenarios, even with small sample sizes.
- **Sequence Standard Action Verification Based on Transformer:** In actual chemical production scenarios, standard actions often occur between people and equipment. By designing a Transformer network structure trained on sequential video action dataset, the solution robustly extracts action features and verifies continuous actions in real time. It achieves over 95% detection accuracy in high-risk scenarios like filling platforms and other operations.

Decision Support Based on Industrial Large Language Models and Knowledge Graphs: By combining large language models with knowledge graphs, the solution enables intelligent decision-making support, improving efficiency and accuracy in industrial safety management.

POTENTIAL APPLICATIONS

The solution enables significant advancements in safety management and operational optimisation, helping companies reduce property damage and personal injury while enhancing efficiency and productivity. It also increases industrial automation, reduces costs, and lowers energy consumption.

Applicable across various high-risk industries, such as chemical, oil fields, mining, power, steel, construction sites, energy, and ports, etc., including:

- **Supervision of Production Safety:** Monitors standard operating procedures (SOPs), temporary operation supervision, and personnel PPE compliance, etc.
- **Intelligent Monitoring of Equipment Status:** Inspects vehicles, equipment leaks and drips, instrument data reading, spark inspection, etc.

Additionally, this technology is applicable to industrial quality inspection, to identify and classify product defects, and to perform fine-grained inspections of product surface appearances, ultimately helping companies reduce costs and improve efficiency.

UNIQUE VALUE PROPOSITION

The solution integrates computer vision with high-risk industrial safety, offering a lightweight "Active Safe Workplace" deployment. It is the only real-time safety information system integrating multiple computer vision algorithms, such as video

stream overlay, posture recognition, classification, and traditional security hardware.

- The AI, equipped with learning capabilities, ensures 24/7 uninterrupted supervision across all cameras
- Monitors both fixed operational SOPs and temporary operations
- Features over 300 proprietary, customisable algorithm that can be infinitely combined based on specific conditions and business logic
- Owns extensive chemical industry data resources (PB-level) for algorithm optimization, achieving superior algorithm performance with over 90% accuracy
- Proven experience in chemical industry projects enables rapid deployment in new scenarios, based on mature algorithms and strong generalization capabilities
- Integrates a specialized large language model tailed for industrial safety, leveraging accumulated expertise, data resources, and empirical knowledge, to provide scientifically informed, superior domain-specific decision-making for chemical sector safety