

Contribution ID: 395

Type: Oral Presentation

## AI-Powered IT Infrastructure for Enhanced Safety in EAF Operations

Wednesday 8 October 2025 17:30 (20 minutes)

The Electric Arc Furnace (EAF) plant in the steel industry presents significant health and safety risks for workers due to extreme temperatures, toxic fumes, and potential operational hazards. To enhance workplace safety, this study proposes an advanced automated system that leverages cutting-edge IT and AI technologies to improve process monitoring and risk prevention.

A key objective of this system is to minimize human presence near the EAF and detect potential hazards in real-time. To achieve this, an IT infrastructure has been developed, integrating a network of sensors including cameras, microphones, and other data-gathering devices—to continuously monitor the operational environment. This infrastructure provides a comprehensive dataset for AI-driven analysis aimed at improving safety conditions.

The system employs computer vision and various neural network architectures to analyze the area surrounding the EAF. Specifically, it is designed to: (a) detect early signs of incidents by identifying smoke, flames, and abnormal furnace conditions, and (b) monitor workers presence in real-time to automatically halt hazardous operations when personnel is detected within critical zones. These capabilities significantly reduce the risk of workplace accidents by ensuring rapid response to potential dangers.

Currently, a prototype leveraging camera-based monitoring has been developed and tested. This system successfully identifies risk conditions in real-time and tracks personnel proximity to the EAF, demonstrating its potential to enhance safety and automate intervention measures. Future work will focus on refining detection accuracy, integrating additional sensor data, and expanding automation functionalities to further reduce occupational hazards in steel production environments.

**Primary authors:** Mr ZAMPRONI, Alessandro (Tenova S.p.A.); SIDDIQUE, Arslan (Scuola Superiore Sant'Anna); Mr BAVESTRELLI, Giovanni (Tenova S.p.A.); Dr VANNUCCI, Marco (Scuola Superiore Sant'Anna); Mr AKRAM, Muhammad Waseem (Scuola Superiore Sant'Anna); Prof. COLLA, Valentina (Scuola Superiore Sant'Anna)

Presenter: Prof. COLLA, Valentina (Scuola Superiore Sant'Anna)

Session Classification: AI & Machine Learning Applications

Track Classification: Digital tranformation