Safety

Mind Over Matter: Using AI to Make Manufacturing Safer

Kip Hanson | Aug 17, 2023

Manufacturing facilities have become significantly less hazardous over the past couple of decades, with the rate of injuries and illnesses shrinking more than 70 percent.

Artificial intelligence may make them even safer, pushing the injury rate lower than the 3.3 per 100 workers reported to the ***U.S. Bureau of Labor Statistics*** in 2021. That was just a fraction of the 12.2 in 1994, the first year for which data was available on the agency's website.

Granted, even the most capable AI engine can do little on its own to improve workplace safety—yet, anyway. But with the appropriate data from its eyes and ears, the ***Industrial Internet of Things***, it can identify dangerous trends and alert humans to take corrective action.

And when equipped with sensors and video cameras, AI can spot risky behavior by employees and potential machinery problems alike. The National Safety Council (NSC) is urging employers to take advantage of that through its ***Work to Zero*** initiative, introduced in response to a 2021 uptick in workplace deaths.

It's publishing a series of reports to educate industry stakeholders after determining that many were unaware of AI's potential to improve workplace safety.

One of them, "***Using Data and AI to Gain Insights into Your Safety Program***," suggests that three types of AI and machine learning may prove particularly helpful: computer vision, natural language processing and predictive and prescriptive analytics engines.

The Watchful Eye: Computer Vision

Cameras are everywhere these days and the workplace is no exception. But rather than hiring a person to monitor banks of TV screens and write down what they see, companies like ***Honeywell*** and others have equipped cameras with algorithms that allow them to record and interpret visual data.

Artificial Intelligence: A Smart Car

While many people use the terms artificial intelligence (AI) and machine learning (ML) interchangeably, they're not synonymous.

To put it in simple terms, you can think of AI as an automobile, with machine learning acting as its engine. In this scenario, machine learning consumes "fuel" in the form of data, learning from it and using the results to power the AI decision-making vehicle.

And just as there are many types of cars (ranging from race cars to pickup trucks to commuter vehicles), each with different designs and features, there are many types of AI (such as neural networks, fuzzy logic, application-specific algorithms and so on).

Each of these AI instances takes a different approach to problem-solving based on the mission parameters and goals, and some even have broad, almost humanlike decision-making capabilities, but most could not operate without a machine-learning engine.

In summary, AI represents the broader concept of machines and computers with the ability to carry out tasks in a way humans would consider "smart," while machine learning is (usually) how they gain that intelligence.

These smart cameras are powerful tools for identifying potential hazards on the manufacturing floor. By leveraging complex algorithms to analyze live video feeds, computer vision can detect risks that might elude the human eye.

For instance, an AI-enabled camera can watch for safety gear compliance, detecting whether workers are wearing the required helmets, gloves or safety glasses. It can also identify incorrect lifting techniques or failure to observe safety zones around heavy machinery, alerting supervisors in real time to prevent accidents.

Camera-equipped drones, meanwhile, are increasingly used to identify a facility's structural problems, such as leaks or cracks, especially in hard-to-reach and hazardous areas.

Bridging the Gap: Natural Language Processing

Natural language processing (NLP) is another form of AI, one that deals with the interaction between computers and human language.

Using natural language processing, safety instructions and machine manuals can easily be converted into multiple languages, ensuring that non-English-speaking employees understand safety protocols. That helps to reduce miscommunication and allows for a more inclusive safety culture.

Furthermore, natural language processing can analyze written reports, like incident logs or safety audits, to identify patterns and trends that might suggest underlying safety issues.

AI-powered virtual assistants with natural language processing capabilities can also offer real-time guidance to workers on safety procedures and answer their questions in an intuitive, personalized manner, leading to an informed and safer workforce.

Even now, global technology giant Nvidia is developing other use cases for natural language processing in manufacturing, many of which go well beyond safety considerations, according to a ***post in Medium***.

Predictive Power: Putting Internet of Things Data to Work

Finally, one of the most promising applications of AI in manufacturing safety and performance lies in predictive analytics.

From temperature and vibration to pressure, duty cycles and more, Internet of Things-based machine sensors can collect a vast array of data. By analyzing this data continuously, AI can reveal patterns indicating unexpected wear and tear or the need for maintenance of critical components.

This approach allows for proactive measures, preventing equipment malfunctions that could otherwise lead to dangerous situations. Not only does this prevent accidents and improve workplace safety, but it also serves to improve overall equipment effectiveness, or OEE, an industry gauge of operational performance.

The same data can also be used to analyze overall safety trends and highlight areas for improvement. For instance, if a specific production line reports more incidents than others, predictive analytics can help figure out the cause and suggest corrective actions.

Companies specializing in manufacturing analytics include ***MachineMetrics***, ***Sight Machine***, ***Tulip*** and many others.

The Future of Workplace Safety Is Here

There's much more to the Work to Zero initiative than the three areas just described. A separate report, for instance, explores how robots make workplaces safer.

That's because industrial and collaborative robots alike are capable of taking on tasks that can be dangerous (or simply dull and dirty) for people. The result is fewer complaints of repetitive strain injury (RSI) such as carpal tunnel syndrome and back injuries.

Other reports suggest that proximity monitoring technology helps to prevent collisions between humans and forklifts (or workplace robots). There's also the possibility of using wearable devices to monitor fatigue and augmented or virtual reality (AR/VR) to train workers and guide them through hazardous tasks.

The upshot? By investing in and implementing technologies like these, companies can create more proactive, responsive and efficient safety protocols—which can not only bolster their own bottom lines but also build a more productive future for the entire manufacturing sector.

