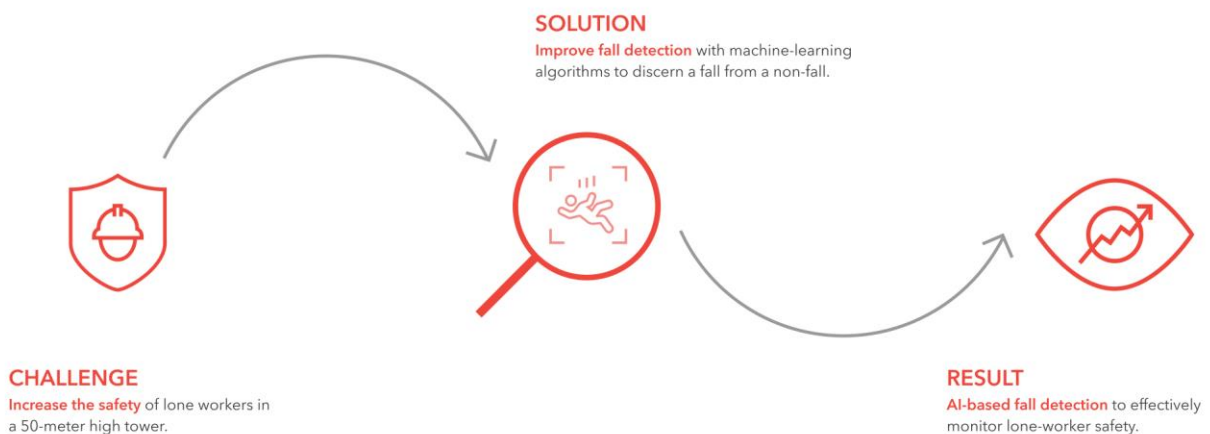




Machine-learning detection protects 'lone workers' at Alpro

All over the world, Alpro – a subsidiary of the Danone Group – is synonymous for soy drinks and plant-based food products. One of the company's main plants is located in the Belgian town of Wevelgem. All soy beans are processed in a 50-meter-high tower, where employees need to take numerous flights of stairs 24/7. To increase the safety of 'lone workers' during weekends and at night, Alpro and delaware are exploring the use of machine learning-based fall detection.



"We're producing around the clock, 7 days a week," says Stijn Raemdonck, CIO at Alpro. "So employees need to check on products and machines around the clock as well. During weekends, however, they are often alone in the tower for long periods of time. This poses a major safety risk: what if they fall or get injured when no one's around?"

1 Hacking workforce safety

Today, these 'lone workers' are equipped with mobile DECT telephones, which automatically call them every hour or so. The problem, though, is that the system also triggers a number of false positives, because workers don't always hear the calls near noisy machines. "These false alarms seriously harm people's trust in the system," says Stijn. "We want to do better to ensure that everyone gets home from work safe and sound every single day."

To find a solution that could enhance the existing safety measures, Stijn decided to partner up with Alpro's long-time IT partner, delaware. "During the [DEL20 innovation campaign](#), we took the opportunity to deploy all the innovative firepower available to develop a smart safety system. A group of young IT students, supported by delaware experts, were challenged to come up with viable solutions during a 24-hour brainstorm session, called the [delaware hackathon](#)."

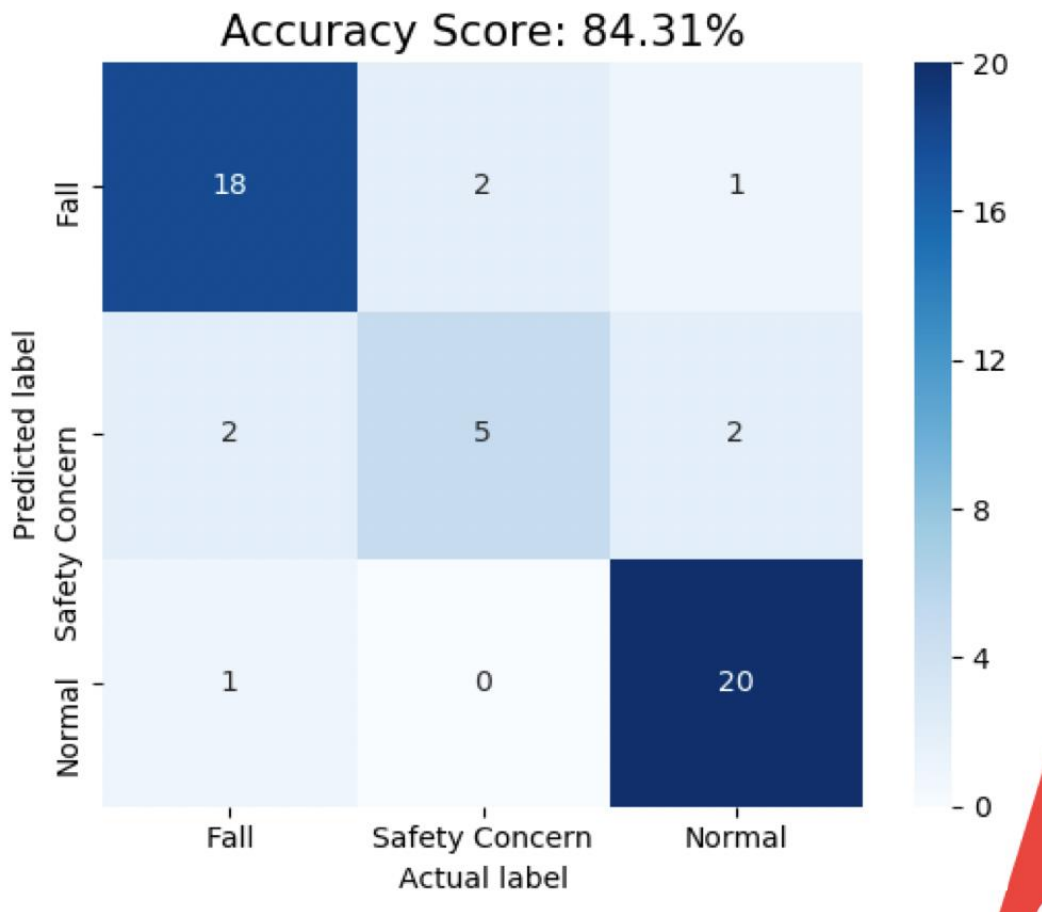


2 High accuracy

The hackathon was an eye-opener for Stijn's team. "Initially, we were convinced that this would be an IoT project based on vibration sensors. But we soon realized that all the sensor technology we needed for fall detection is readily available in today's consumer smartphones, in the form of accelerometers and 3-axis gyroscopes."

To ensure high accuracy and avoid false positives as much as possible, Alpro and Delaware turned to machine learning. "There needs to be a clear difference between a 'real' fall and 'unsafe behavior', like jumping a few stairs," Stijn explains. "To ensure that the algorithm can tell the difference between both, we needed to collect a lot of data."

Alpro employees threw test dummies down the plant's stairways, smartphones and all. After collecting about 100 data points, the model had already achieved an accuracy of 88% in discerning a fall from a non-fall. In a multiclass context – with a 'safety concern' category in addition to the 'fall' and 'non-fall' categories – accuracy remained at an impressive 84%. This number is expected to increase as more data is collected.



Matrix depicting the machine-learning model's predicted label vs. the actual label in a multiclass context with three possible outcomes.





3 Prevention and privacy

Stijn's – and Alpro's – long-term dream is to create a factory where safety is handled preventively – or even proactively – instead of reactively. “There's still a lot of potential that goes beyond compliance with existing safety regulations,” he adds. “With the right amount of high-quality data and machine learning, we can effectively spot potential hazards before they occur.”

Of course, there is still the issue of employee privacy. “If people feel monitored all the time, they will resist the adoption of new safety technology. The last thing we want to do, is create a ‘big brother’ atmosphere on the work floor by tracking employees’ individual behavior. That's why, with delaware’s help, we’re setting up a two-part system that effectively de-individualizes the data. In system A, data is stored for a very short time: just long enough to analyze whether an alarm should be triggered or not. System B anonymizes the data but keeps it for longer to be able to recognize certain patterns and improve the system’s predictive capabilities.”

“With delaware’s help, we’re setting up a two-part system that anonymizes the data but still allows us to improve the system’s predictive capabilities.” - Stijn Raemdonck, CIO of Alpro