



## CASE STUDY

### Client Overview

Pure Technologies Ltd. is a world leader in the development and application of innovative technologies for inspection, monitoring, and management of critical infrastructure. Their expertise and technologies are used around the world to help utility operators mitigate the impact of deterioration and maximize capital budgets for rehabilitation and replacement programs.

### Machine Learning

Machine learning is the creation of models to identify items or complete a task without explicit programming. By changing parameters, engineers can train the models to be faster, more accurate, or identify different data. This rapid development process is the core of machine learning.

Microsoft Partner Network

**IMPACT  
AWARDS**

2017 WINNER



Gold

**Microsoft Partner**



## PURE TECHNOLOGIES

### Turning Machine Learning into a Competitive Advantage

The Pure Technologies' project is an excellent example of how open source machine learning can drastically reduce processing costs by automating the analysis of large, dense amounts of technical data.

Pure Technologies supports energy and utility companies by searching pipelines for leaks and damage. When their patented *SmartBall*®, a free-swimming sensor ball, is placed into any pipeline, it uses a high-fidelity microphone to record audio data as it travels.

These recordings were then copied to the lab and listened to by technicians, who interpreted the sounds to identify potential leaks, and assess their severity. This was a tedious manual classification process with an average analysis time of approximately 5 hours-per-kilometer, or 50 hours of manual effort for an average 10km pipeline section.

Sierra Systems was challenged to help reduce this workload and to improve efficiencies.

## OUR SOLUTION

Sierra Systems developed a deep learning artificial intelligence system that was trained to recognize and classify leak audio patterns. The system accurately identifies leaks 150 times faster than a person can, and can be scaled to process multiple pipelines in parallel resulting in massive gains in efficiency.

The data collected from *SmartBall*® is now fed into a model developed using *Python* and the *Microsoft Cognitive Toolkit* - a premier, commercial-grade deep learning toolkit. The machine learning model uses the latest in visual classification techniques and Convolutional Neural Networks to review the data, and distinguishes leaks from non-leaks. As well, the model is compact enough to run on devices out in the field where the pipelines reside.

With this data, managers can execute repair orders in hours instead of weeks.

## BENEFITS

By the fourth sprint, the machine learning model showed a 99.3% reduction in the time required to process the inspection of a 10km pipeline section. This improvement allows for faster response times and increased inspection frequency due to lower costs. In addition, this model forms the genesis of a larger model that can further classify audio anomalies to determine the type and severity of various pipeline issues.