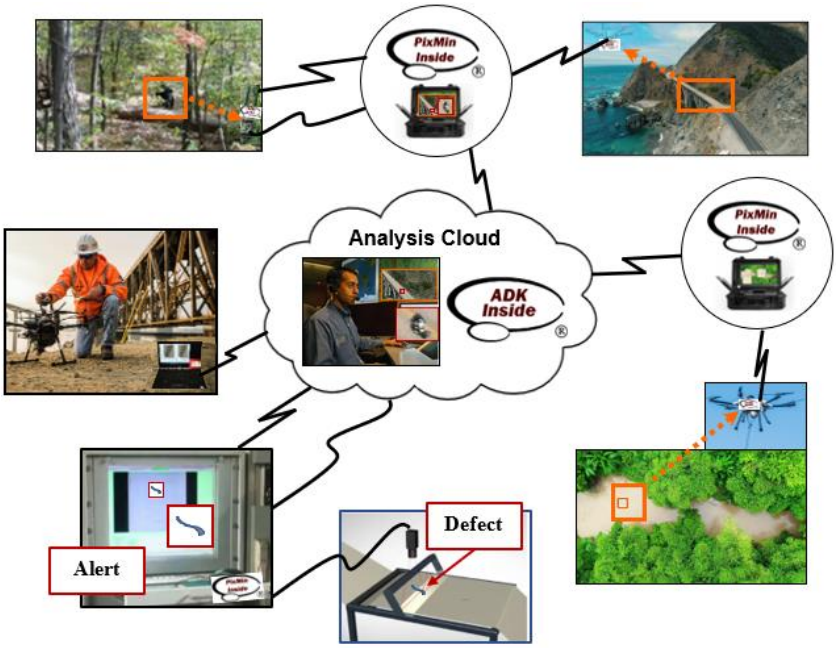
Brainlike, Inc.
1605 Sebring Hills Drive
Henderson, Nevada 89052

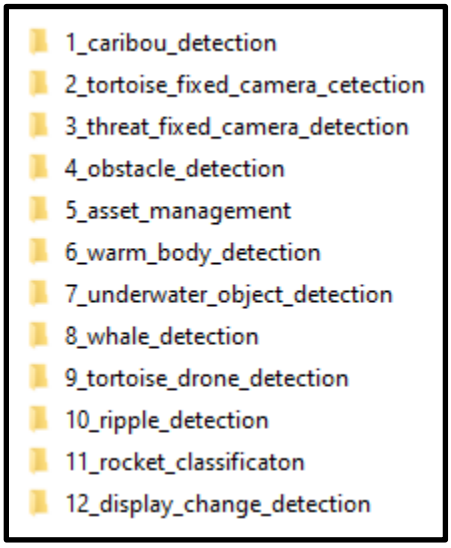
email: information@brainlike.com
website: http://www.brainlike.com/

PixMin Image Processing Overview

PixMin™ processing *triages* imagery by detecting events within streams of sensor data—continuously, automatically, and at the sensor processing edge. By extracting only informative snippets from streamed imagery, PixMin reduces transmission bandwidth and analysis time by orders of magnitude. PixMin can run inside processors that are integral with sensor feeds—above or on land as well as on or under water. PixMin can also run inside sensor hubs connected to sensor feeds, either directly or through wireless telemetry.



PixMin comes with an analyst development kit (ADK), which enables analysts to configure, run, test, and evaluate operational PixMin configurations on their own. Analysts may run a broad variety of use-case datasets that come with the PixMin ADK or run their own datasets, or both. The ADK includes a detailed manual, which steps through all the use-cases, and reports that describe each use-case in detail. The ADK also comes with use-case configuration files, template files, and special-purpose tools.



Each PixMin ADK use-case folder shown on the left includes input image files, configuration files, analysis files, and output files that enable analysts to run the use-case on their own. Analysts may also convert any of the use-case configurations to run with their own datasets if they wish to do so. You will find representative use-case snapshots at the end of this report. We will also send you reports describing each of these use-cases upon request.

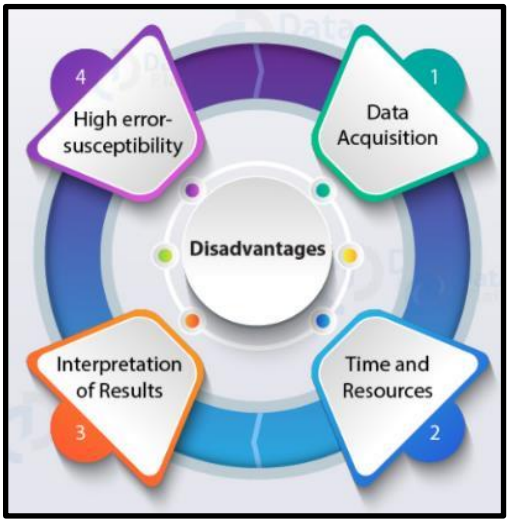
The following Microsoft® Excel analogy may help you see the distinction between analytical ADK use and operational PixMin use.

Microsoft® provides Excel for analysis of spreadsheet data. Likewise, we provide the PixMin ADK for analysis of historical images. Excel may also run operationally for real-time data monitoring. Likewise, PixMin runs operationally for real-time imagery monitoring. For example, futures traders deploy Excel monitoring to receive stock price feeds, one line at a time. During each time slice, Excel examines each line item and triggers automatic alerts to highlight trading opportunities. Likewise, PixMin processes can continuously receive camera imagery, one image at a time. During each time slice PixMin examines each sector within an image and triggers automatic alerts to highlight events of interest.

Before deploying Excel monitoring in this way, futures traders configure and evaluate Excel monitoring models for eventual operational deployment. For example, trading analysts use Excel spreadsheets along with historical trading data for "paper trading" to determine how real-time Excel monitoring should be configured to trigger trading alerts effectively. Likewise, image processing analysts use the PixMin ADK along with historical imagery to determine how PixMin will trigger detection alerts operationally.

Analysts without programming language backgrounds can readily use Excel spreadsheets for futures trading analysis and to meet many other needs. In the process, they refer as needed to Excel documentation. Likewise, analysts without programming language backgrounds can readily use the PixMin ADK, referring as needed to our ADK documentation.

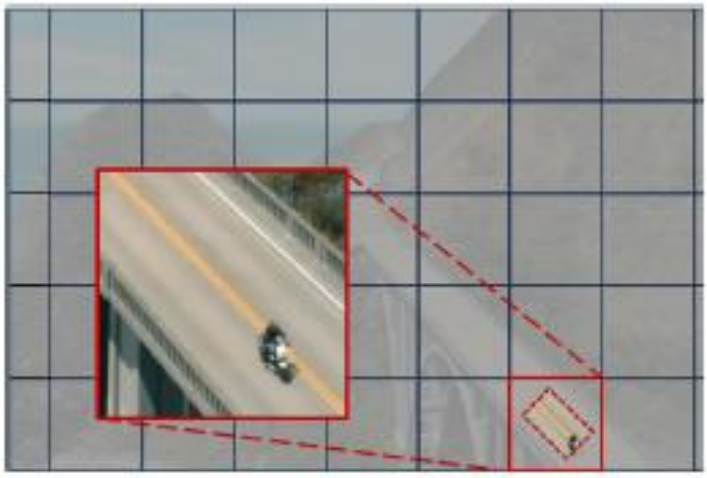
The term *triage* reflects what PixMin does. While medical triage identifies trauma victims with especially urgent needs, PixMin triage highlights regions within images that may contain especially important content. In evaluating a broad variety of image-based decision settings, we have found that trained observers must usually make final detection decisions instead of relying on fully automated methods to do so. For that reason, we have designed PixMin triage, like its medical counterpart, to help experts use their time effectively rather than replacing them completely. We have designed PixMin to *triage* image data effectively so that higher level decisions (by analysts as well as computers) can be more precise and efficient.



While many articles cite artificial intelligence (AI) promise for sensor processing at the tactical edge, conventional AI comes up short. Effective edge-based AI must triage massive streams of sensor data (*e.g.*, camera imagery) into nuggets of useful information efficiently adaptively, and deftly, in settings having low available size, weight, and power (SWaP), along with limited bandwidth. Instead, conventional machine learning (CML) requires cloud-based computing and CML relies on expensive, time-consuming analytics based on large datasets. As a result, frequent CML re-training under

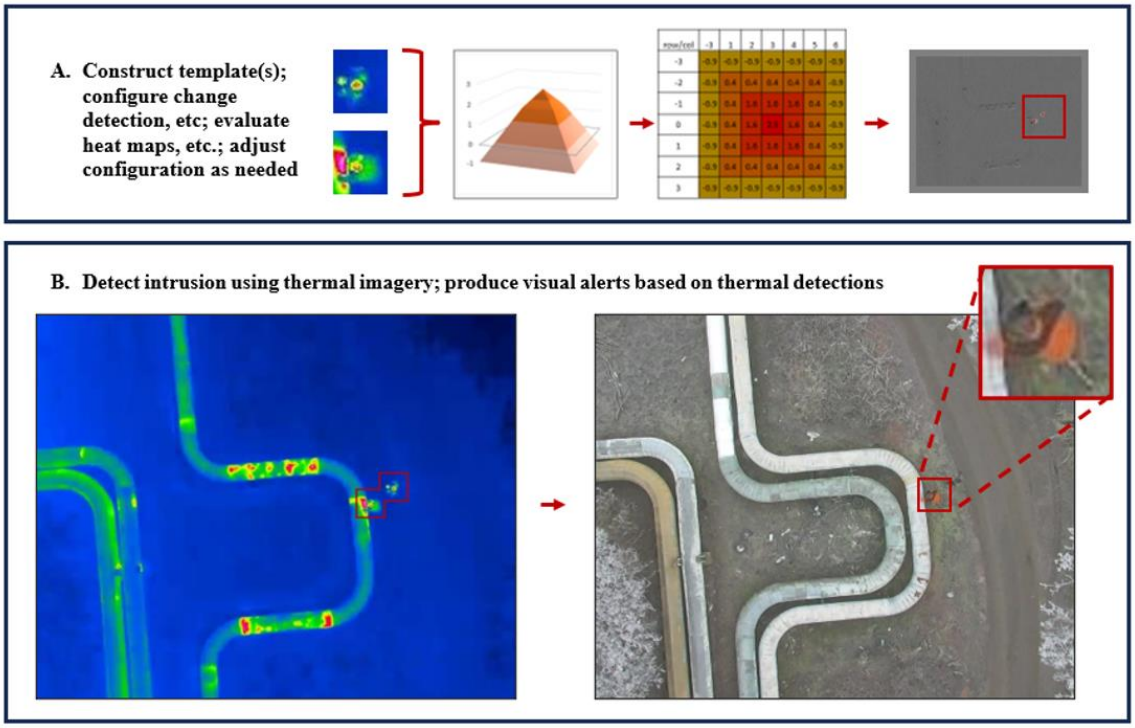
varying field conditions does not work. In addition to precluding these four disadvantages, PixMin technology produces high processing speed while meeting low SWaP requirements.
Written in low level C and utilizing patented methods, PixMin edge machine learning (EML) runs much faster than comparable CML methods such as OpenCV template matching. Furthermore, CML-trained solutions do not automatically adapt to changing conditions. We have repeatedly shown that PixMin EML strongly complements CML by overcoming these limitations at the sensory edge, for defense, environmental, and other edge processing applications.

In the remainder of this report, you will find representative use-case snapshots. If you would like to see reports describing any of these use-cases or if you would like to see any related on-line demonstrations, feel free to contact us. When you do, we will ask about your real-time event detection needs and discuss how PixMin can meet them.

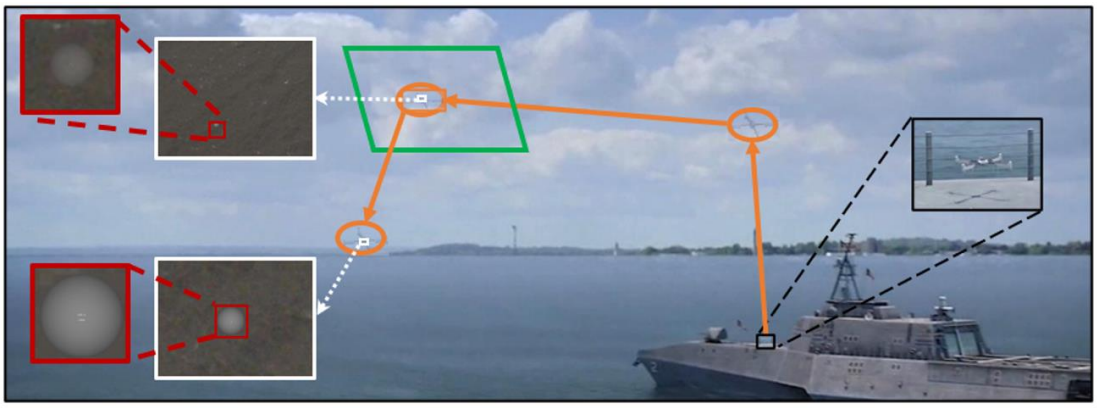


Use-Case 1 (above). Caribou Detection. Use Case 3 (below). Threat Detection.

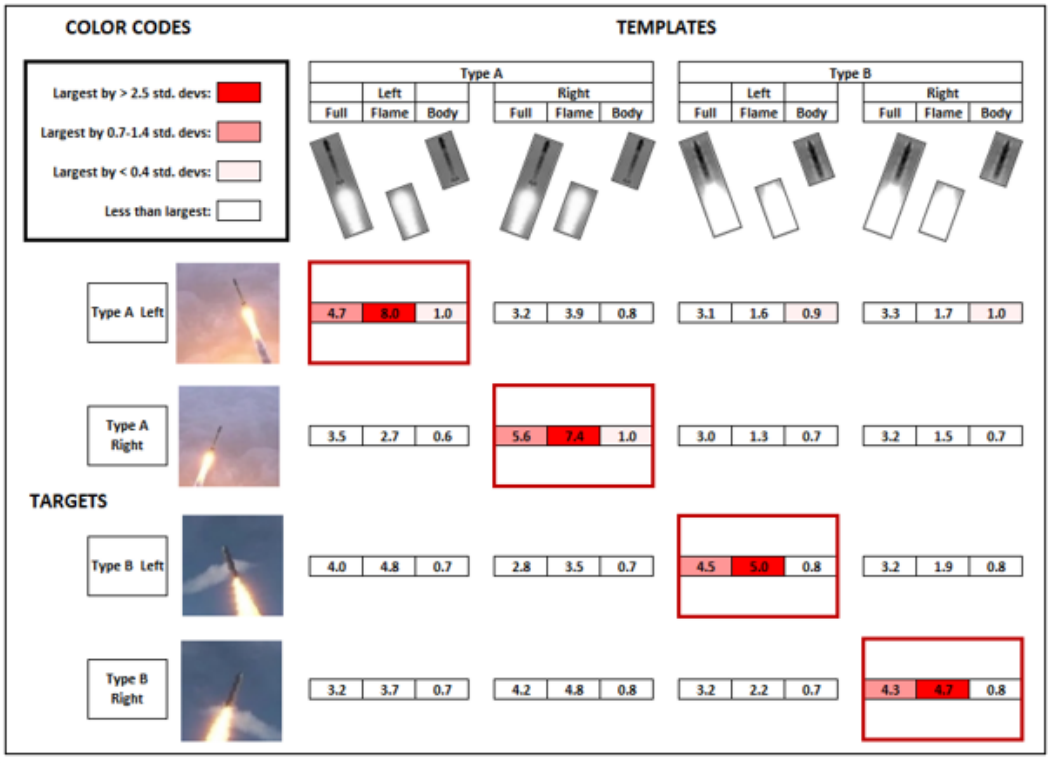
Use-Case 4 (above). Driverless Vehicle Camera Object Detection.
Use Case 6 (below). Warm Body Detection.

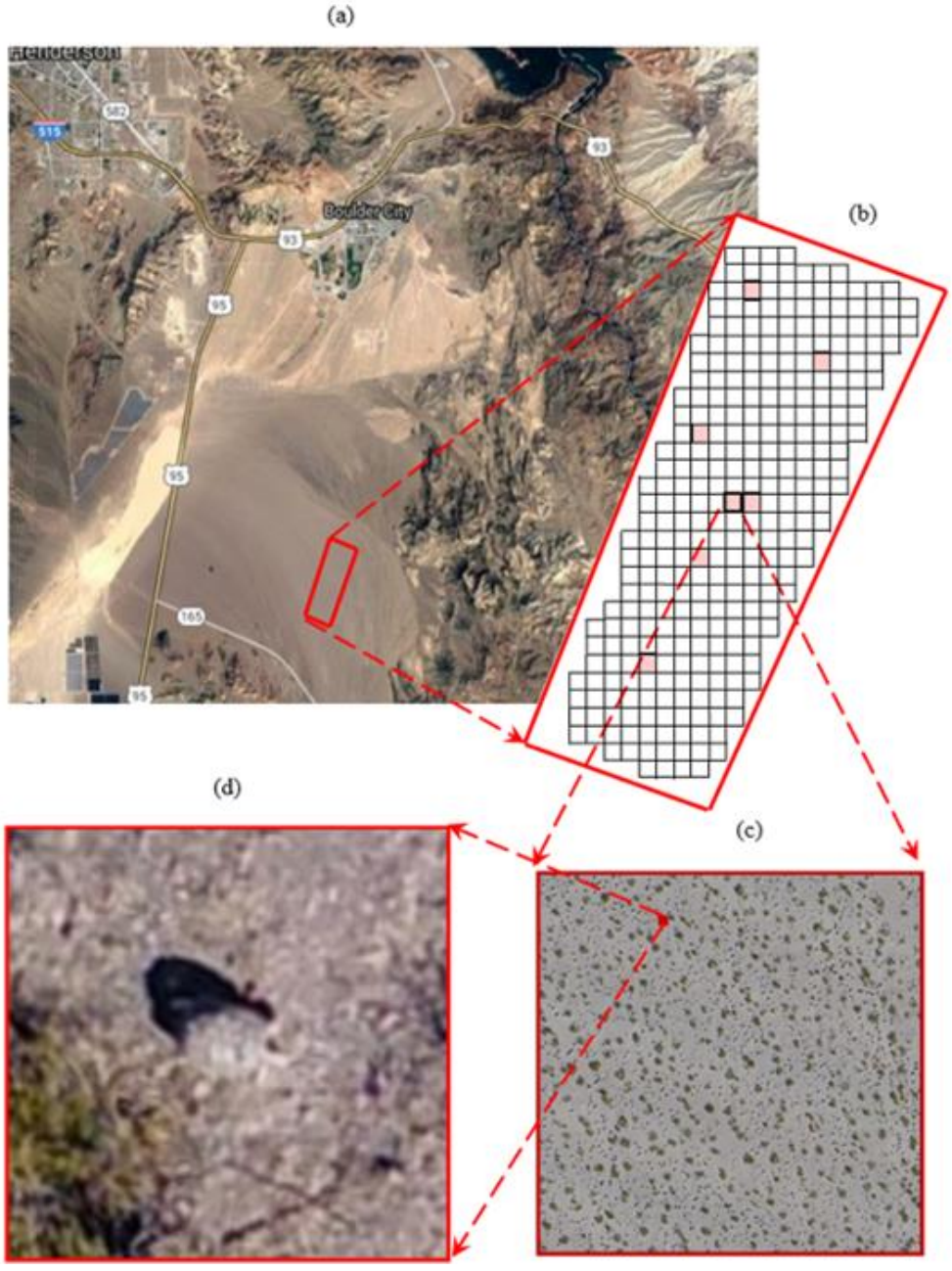


Use-Case 7 (below). Underwater Object Detection.

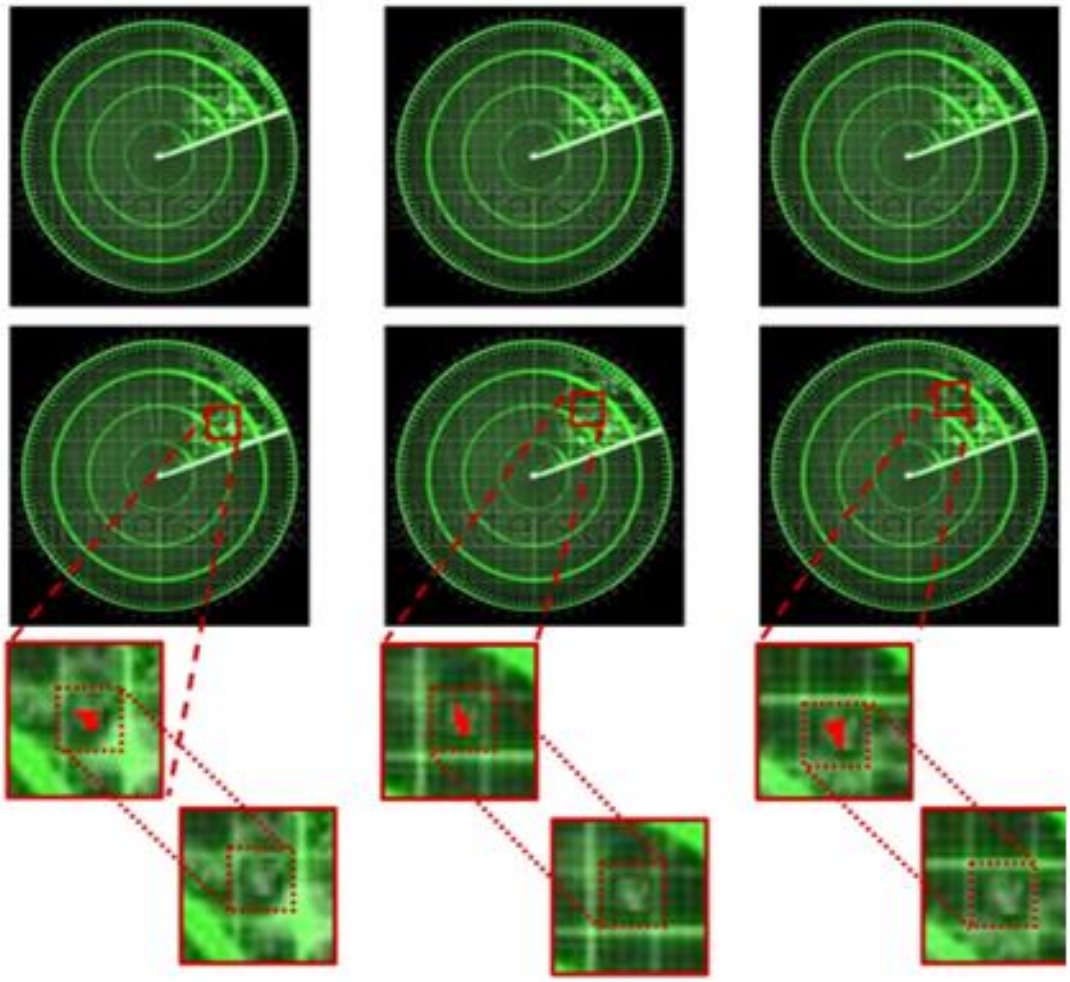


Use-Case 8 (above). Marine Mammal Detection. Use-Case 11 (below). Rocket Classification.





Use-Case 10. Drone-based Desert Tortoise Detection.



Use-Case 12. Display-Based Change Detection.