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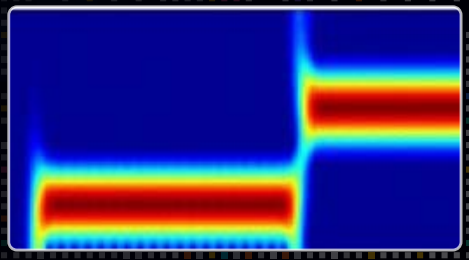

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GlobalSense Drives New Standards in Automotive Diagnostics with Edge AI

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By Mike Senese (Edge Impulse)

GlobalSense is rethinking automotive diagnostics with audio-powered fault and collision detection. By turning everyday sounds into meaningful insights, the company aims to close gaps left by traditional diagnostic tools.

GlobalSense is a San Diego, California-based technology startup pioneering a new approach to automotive diagnostics and event detection. Co-founded by CEO Dr. Saeid Safavi in August 2021, GlobalSense is transforming how sound can be utilized as a powerful tool for extracting deep significance from generally common events. Its initial endeavor is to fill the significant gaps left by traditional automotive diagnostic tools, developing an innovative solution for fault diagnostics and collision detection using a new onboard device powered by audio-detection algorithms.

"Our focus is on sound sensing, or acoustic sensing, which we believe is a new sensory mechanism that can be introduced to many industries," says Safavi.

The Challenge: Sound Classification

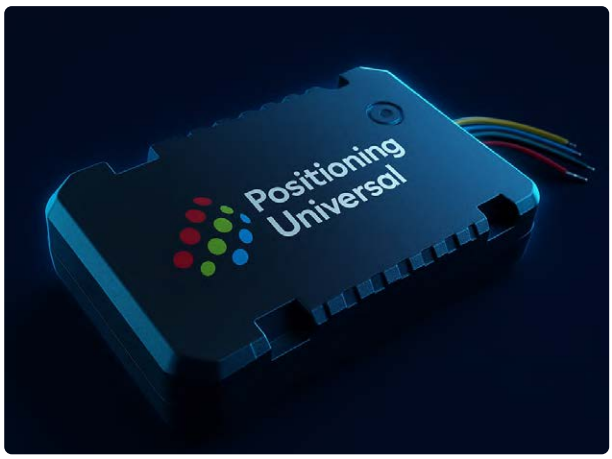
GlobalSense initially focused on built-in automotive event detection (accidents, break-ins, etc.) that relies heavily on accelerometer-based sensors. However, these systems often suffer from a high failure rate in certain types of incidents. Safavi explains, "These devices are all based on acceleration and deceleration as the only sensory mechanism, and they miss about 30% of collisions simply because some collisions do not fit the threshold algorithm they rely on — such as rollovers or sideswipes."

On the other hand, technicians often rely on a blend of OBD2 fault codes and personal experience to spot issues. A seasoned mechanic may detect a rod knock, belt slip, or misfire simply by ear — something current digital tools cannot replicate with consistency. This reliance on human perception has left a large diagnostic gap, especially in environments where speed, accuracy, and scale matter — like auctions, dealerships, and fleet operations. At the same time, automotive valuation and arbitration processes often stall due to incomplete or disputed condition reports. Current inspection systems miss subtle but costly issues, leading to unnecessary returns, arbitration disputes, and loss of trust.

GlobalSense has been focused on automotive fault detection from its inception, a challenging undertaking due to the lack of data, the complexity of the problem, and the wide variance in acoustic signatures of vehicle components such as engines, transmissions, and accessories, meaning the same fault can sound very different across makes and models.

Solution: Edge AI + Automated Data Pipeline

After some initial attempts to build their own AI sequences, GlobalSense chose to employ Edge Impulse's comprehensive workflow for creating edge AI algorithms to accelerate their development of the



Source: Positioning Universal

necessary sound-based diagnostic models. The integration allowed GlobalSense to refine its models more quickly and accurately than their initial attempts.

"Before Edge Impulse came to play, you had to do everything in-house," says Safavi. "The cycle from training the data and putting it in the hardware and testing it on the hardware was much longer."

This collaboration with Edge Impulse enabled GlobalSense to productize its sound-based security and safety models for the automotive industry. As a result, one of GlobalSense's customers, Positioning Universal, has integrated this technology into their aftermarket tracking devices, now in mass production for the global market.

Autosonix: Platform for Diagnosing Faults

AutoSonix is a new product built to address the longstanding challenges of automotive fault diagnosis and maintenance. "To solve these challenges, we needed more data, much more of it," explains Safavi. That barrier was overcome through a partnership with Condition Now, an automotive data services company. This collaboration enabled GlobalSense to establish infrastructure for large-scale sound and OBD data collection in partnership with multiple auto auctions.

> *The Edge Impulse toolchain has helped us shorten our time to market for some products by an order of magnitude.*

These auctions, already using Condition Now's services, provided GlobalSense with daily recordings from fleets of thousands of cars. The partnership also led to the optimization of data collection infrastructure, development of customer portals, and, most importantly, creation of processes for capturing and preparing data in formats best suited for edge and cloud AI engines. Mobile apps and specialized tools were also built to ensure consistent, high-quality data inputs.

"With this unprecedented volume of high-quality data provided by Condition Now, we've been able to develop a platform capable of training and updating specialized detection models and supporting real-time processing, ultimately improving accuracy and reliability," says Safavi.

This collaboration resulted in the launch of AutoSonix LLC, a joint entity between GlobalSense and Condition Now. AutoSonix is transforming how sound, motion, and onboard vehicle data are harnessed to deliver actionable insights at scale. Its mission is to close the gaps left by traditional diagnostic and inspection tools by combining acoustic AI, OBD2 data, and edge intelligence into one streamlined solution.

"Automotive diagnostics have relied for decades on subjective mechanic intuition or incomplete scan tool data. AutoSonix turns that into an objective, repeatable, and scalable process," Safavi adds.

AutoSonix built its platform around edge AI, processing directly on the device or mobile phone, to ensure real-time feedback, privacy, and scalability. By capturing a vehicle's acoustic signature, fusing it

Source: AutoSonix

Before Edge Impulse came to play, you had to do everything in-house. The cycle from training the data and putting it in the hardware and testing it on the hardware was much longer.

with motion data from smartphones, and layering in OBD2 telemetry, AutoSonix delivers objective diagnostic results in seconds, without needing a cloud datacenter for first-pass inference.

This edge-first approach not only reduces latency but also protects privacy by ensuring only relevant events and signatures are transmitted — not raw audio recordings. The system integrates seamlessly into dealer and auction workflows through a mobile app, enabling even untrained users to generate high-quality diagnostics with minimal effort.

Edge Impulse Integration

GlobalSense leveraged Edge Impulse's platform to create a streamlined, iterative approach to model development and deployment. As data from auctioned vehicles arrived daily, GlobalSense uploaded it to the platform to test models, refining and adjusting them based on real-world performance. Edge Impulse's intuitive interface and robust features enabled the team to quickly identify and resolve issues, significantly improving the efficiency of the model training process. This included the seamless integration of GlobalSense's proprietary data preparation and post-processing algorithms, as well as its custom AI models, directly into the Edge Impulse workflow. These integrations are now becoming an important part of the AutoSonix AI platform and its seamless user experience.

Local Cloud Support

To enhance the edge-capabilities of the AutoSonix platform, GlobalSense has also worked closely with mimik Technology, the developer of the Hybrid Edge Cloud (HEC) platform, which enables smart devices to act as local cloud-equivalents for decentralized, agentic, AI-driven applications. This collaboration promises a low-power, seamless deployment of AutoSonix Edge AI models on devices like mobile phones, OBD systems, and more, while maximizing privacy and eliminating the need for constant cloud connectivity.

GlobalSense/AutoSonix leverages a range of AWS services and resources, including EC2, RDS, S3, container services, Kubernetes, and Elastic Load Balancing. These services support diverse functions, from data collection and storage to enabling services for current customers, such as auto auctions.

Silicon Partnership

Alongside Edge Impulse, GlobalSense is working with key partners in the technology and automotive sector to enhance data collection and labeling. A partnership with Syntiant, an AI-focused chip manufacturer, provided GlobalSense with specialized hardware for processing sound data, helping to improve the energy footprint of their models.

"We've been working with Syntiant for over three and a half years, integrating their chip into our customer product with a commitment to 2.5 million chips over time," says Safavi. "It's a mutually beneficial partnership — Syntiant gains from our customer base, and we leverage their technology and resources to enhance our offerings."

Outcomes

With the partnership, GlobalSense has been able to start assembling their customer portfolio. This includes automotive aftermarket device manufacturers, auto auctions, dealerships, and insurance companies. GlobalSense is positioned to expand beyond automotive into other fields where sound data can be used for predictive maintenance and anomaly detection.

"Edge Impulse has enabled us to potentially save several million dollars per year for one customer by helping us deploy the smallest possible models, reducing our overall BOM costs," says Safavi. "Additionally, the Edge Impulse toolchain has helped us shorten our time to market for some products by an order of magnitude."

By leveraging Edge Impulse's powerful platform, GlobalSense has created a scalable, high-performance solution that fills a critical gap in the automotive industry and beyond.

Next Steps

While GlobalSense's initial focus is the automotive sector — where its solutions already streamline inspections, arbitration, and valuations — the underlying technology has applications far beyond cars. Fleet operators, commercial trucking, and industrial equipment providers stand to benefit from the same sound-and-motion-based diagnostic intelligence.

Beyond automotive, GlobalSense has its eyes — or, ears — on multiple industries, including industrial IoT, HVAC, gas and oil, and more. Their groundbreaking work with sound-based sensors will bring an entirely new perspective to many fields, leveraging edge AI to make diagnostic processes more accurate, cost-effective, and scalable.

"Automotive is the point of entry for us, because we know the industry," says Safavi. "But as we build perfection and experience in this specific form of sensory mechanism, we plan to extend it to industrial IoT, HVAC, fault detection, or other applications that have moving parts and make noises."

GlobalSense and AutoSonix partnership with Edge Impulse has enabled them to build a pioneering sound-based diagnostic solution that delivers real value to the automotive industry. This collaboration highlights the potential of edge AI to transform complex, data-intensive fields and offers a glimpse into the future of sound-based predictive maintenance across sectors.

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