

COMPANY



SECTORS



AUTOMOTIVE
ELECTRONICS



CONSUMER
ELECTRONICS

LOCATION



SOUTH KOREA

WHY SensiML?



SMART SENSING
ML ALGORITHMS



RAPID
DEVELOPMENT



POWER EFFICIENT
DEVICE CODE



SELF RELIANT
DEVELOPMENT

Case Study

Mando-Hella Electronics Rapidly Develops Smart Sensor Applications for New Markets with SensiML Analytics Toolkit

Mando-Hella Electronics (MHE) is an industry leader in advanced automotive electronics and components. A joint venture of Mando and Hella, its Korean parent company Halla Group has holdings diversely covering automotive, construction, education, and sports sectors. With such broad market access, Halla Group sought to use its core competence in sensor electronics to extend new technology innovation and products into its other business units.

The challenge however, was how to efficiently explore and test new smart sensing product concepts quickly and cost effectively before investing to the level necessary to commercialize any given concept. MHE sought to test a variety of product prototypes and diverse market use cases spanning educational wearables, consumer oriented smart home sensor devices, smart toys, pet wearables, and intelligent sensors to support active elder care. Each application leveraged MHE's expertise in sensing hardware technology, but they still needed a way to rapidly build out the application specific sensor algorithms with sufficient sophistication to differentiate novel features that would set MHE's products apart from existing products in the market.



MHE's products apart from existing products in the market.

Smart Sensing ML Algorithms Few product development teams possess sufficient time and resources to expend in a hand-coding process for building optimized algorithms for sensor processors. For cloud analytics, a number of AI and machine learning platforms exist to build intelligent learning algorithms. Mando-Hella's



IN THEIR WORDS



“We used to develop algorithms with manually collected data acquisition, analysis run in complex mathematical software packages, and then develop device code by hand coding in C. No more. With SensiML Analytics Toolkit, we’ve greatly automated the entire algorithm development process.”

Kwangho Yoo
Project Manager, MHE

technical team was familiar and adept at both hand-coding and AI platform and classical ML techniques. Despite this capability, Mando-Hella evaluated and then selected the SensiML Analytics Toolkit because it provided them the ability to greatly increase their productivity in building efficient sensor classification algorithms. This freed the Mando-Hella team to work on other areas of innovation in application level features and device power management to meet ambitious battery life requirements.

SensiML is a machine learning algorithm development tool that was built from the ground up with low-power sensor endpoints in mind. With extensive event detection, feature extraction, and ML algorithm libraries built and tuned to run on popular low power microcontrollers, SensiML automates algorithm development much as cloud AI tools can do for high performance computing environments. What separates SensiML is the ability to generate code that compares favorably to the best hand-coded algorithms capable by teams composed of firmware experts, data scientists, and domain experts spending months to achieve the same for code intended for such ultra-low power devices.

Rapid Prototyping has been slow to take hold in tools for designing smart sensor algorithms. Today’s statistical modeling tools are not capable of generating automated ML algorithms

with cycle accurate simulation of on-device behavior on low-power microcontrollers. For Mando-Hella, it was not practical to perform trial-and-error algorithm development with models initially built in conceptual mathematical analytics

tools and then translated to working embedded code before testing on actual hardware. A key appeal of SensiML for Mando-Hella was the ability to know upfront during the algorithm creation process what kind of performance, memory, and computing power was to be expected from a given algorithm before code was ever generated and tested on actual hardware.



ABOUT Mando-Hella

Mando-Hella is a joint venture of Mando and Hella. Mando-Hella is a leading supplier of automotive sensors, DAS and chassis ECU and other electronic components. Founded in 2008 in Incheon, Mando-Hella was the first Korean supplier developing sophisticated systems, such as digital type Torque & Angle sensor, power pack for R-EPS, 24GHz BSD/LCA radar application. Mando-Hella's turnover reached \$500 million in 2017. Nearly 928 people work in 4 facilities all over the world.

ABOUT SensiML

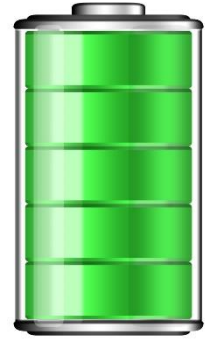
SensiML, a spin-out from Intel Corporation, offers cutting-edge software enabling IoT developers to quickly and easily generate application-specific pattern recognition algorithms transforming connected sensors into smart actionable event detectors.

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Power Efficient Device Code was a critical requirement for Mando-Hella in the development of their battery powered consumer product designs. In virtually all cases, the devices were expected to provide upwards of one-week battery charge cycle times with both small form factor and therefore limited battery capacity. Towards this aim, two key aspects of SensiML's toolkit were significant enablers of meeting these goals. First, the ability to perform local inferencing on the device itself meant wireless transmission of copious sensor data for processing elsewhere could be avoided. Relative to the power consumption of the radio transmit power, the algorithm computational power was negligible saving significant power draw from the overall system. Second, the inclusion of power optimized library codes that were tailored to Mando-Hella's chosen SoC hardware allowed for idealized algorithm power conservation. Each step in the SensiML algorithm is broken into profiled library elements that can be factored into the optimization constraints when building a SensiML algorithm (Knowledge Pack). For Mando-Hella, this meant they had a good handle on knowing the smart sensor algorithms they desired would conform to their power budgets as well.



Self-Reliant Development was an overarching expectation of Mando-Hella from the outset. As MHE pursued new markets for its sensor know-how, it was imperative to the company that the expertise, application IP development, and support understanding remain closely held within their core team. SensiML worked closely with MHE to train their engineers and fulfill new capabilities, but the development and ownership of all resulting algorithms was achieved entirely by MHE personnel. With tools built to be quick and easy to learn, SensiML allows teams to get productive in as few as two days of tool training. And with expert mode scripting that is built on the Python language, SensiML offers the ability to go deep as well with sample codes and templates built around a broadly familiar client interface to the SensiML Analytics Server.

With the combination of hardware know-how and SensiML Analytics Toolkit for automating the development of smart sensor algorithms, MHE has developed no fewer than five completely unique intelligent products in less than 9 months' time. The significantly improvement productivity allows MHE to quickly iterate on product features and applications and ensures they have a competitive advantage in expanding their existing business into new markets.

