

# AI/ML Applications and Development

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**Bruce Huang**

Staff Field Application Engineer

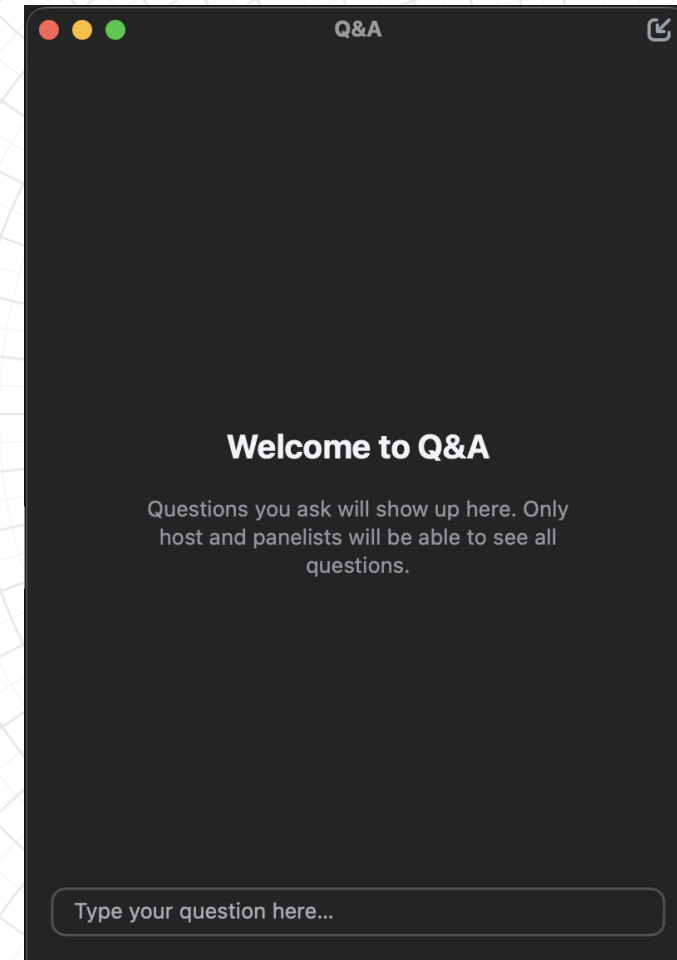
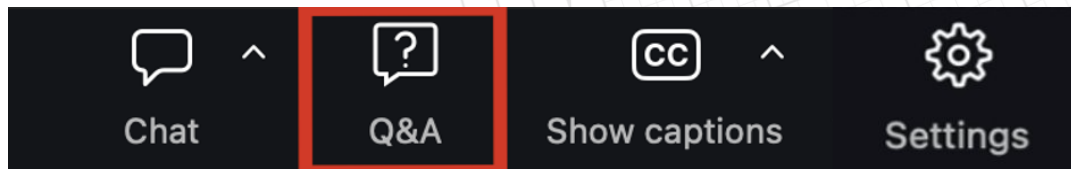
2026  
**tech t|ks**  
WEBINAR SERIES



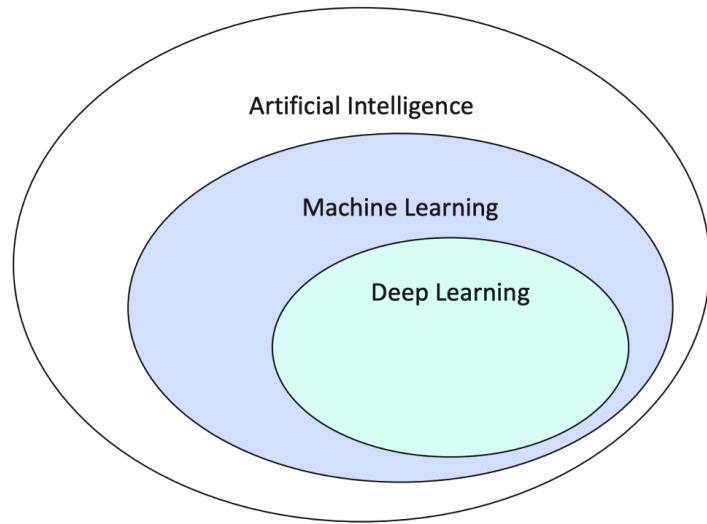
AI/ML

# Q&A

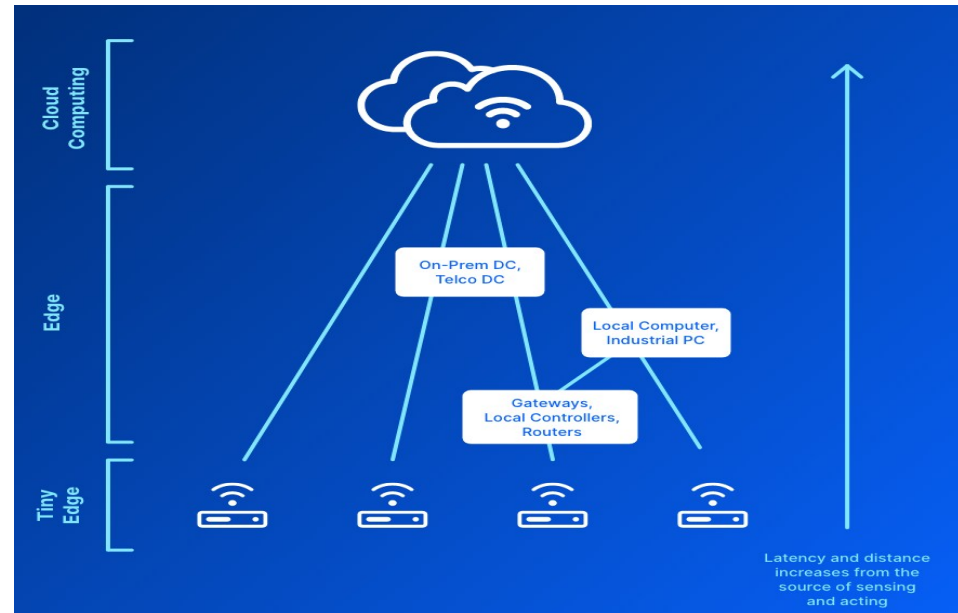
- Select the Q&A button in the bottom control bar to open the Q&A window and submit your questions.



# Artificial Intelligence, Machine Learning, and Deep Learning



- **Artificial Intelligence:** Broadly defined as the effort to automate intellectual tasks normally performed by humans
- **Machine Learning:** A system which outputs predictions based on previous observations
- **Deep Learning:** A subset of Machine Learning in which the learning algorithmic architecture is based on approximations of how a human brain might work.



## Cloud vs. Edge

'Edge' is a broad term scaling from MCU sensor devices to local data centers

Industry Trend: Business Intelligence is moving closer to the Source of the Data

# Artificial Intelligence(AI) and Machine Learning(ML) at the Tiny Edge

## Why is ML the future of Smart IoT?



Highly Secure  
due to local Edge  
Processing



Cost reduction  
due to absence  
of cloud infra



Enables  
Offline Mode  
Operation

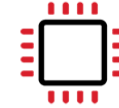


Uses very  
low network  
bandwidth



Higher transfer  
speeds and lower  
latency

## Silicon Labs' ML Capabilities



Leading Edge  
Portfolio



High Performance  
Compute



Robust PSA  
L3 Security



Dedicated Tools and  
Partner Network

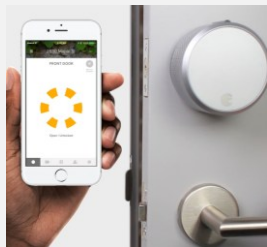
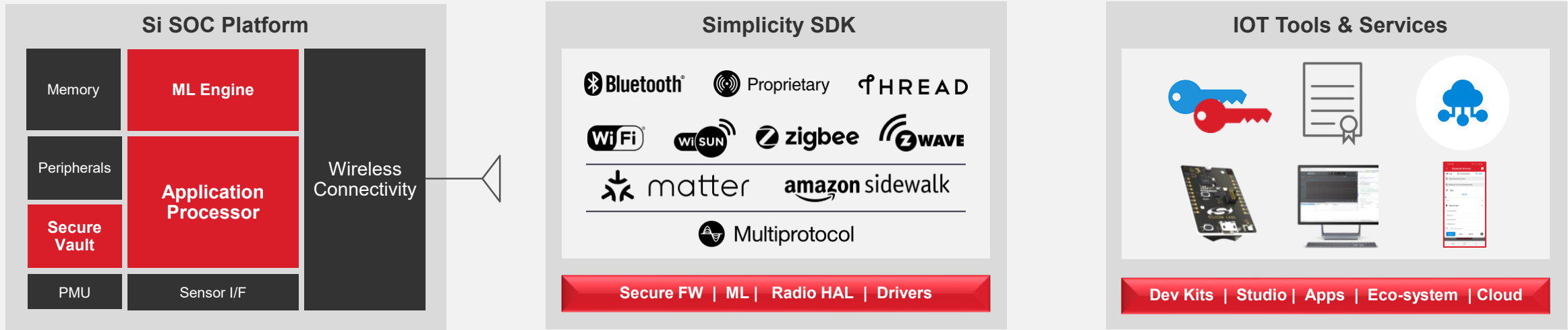


Faster  
Inferencing with  
HW acceleration



More battery  
life with efficient  
compute

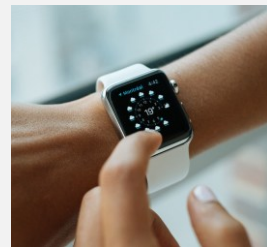
# How Silicon Labs enables the IOT



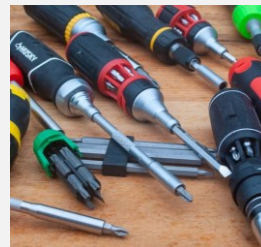
**Secure**



**Battery Life**



**Intelligent**



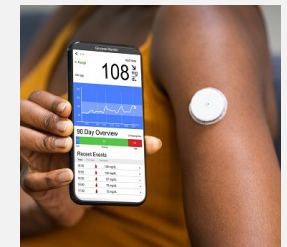
**Interoperable**



**Cost Sensitive**



**Rugged**



**Upgradeable**

# Machine Learning Application Examples

## SENSOR

RAM: 64kB –  
Ops/s: 5M-40M



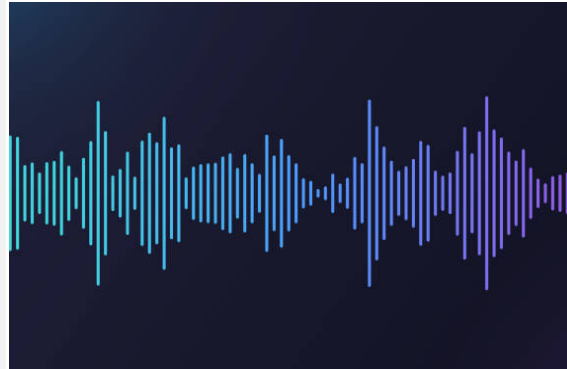
### Signal Processing (time series, low-rate data)

- Predictive/Preventative Maintenance
- Anomaly detection (e.g. air quality, abnormal usage, leak detection)
- Accelerometer use-cases e.g., fall detection, pedometer, step counting

ML SDK	Magic Wand IMU
PoC	Seizure Detection, Smart toothbrush, Motor control, anomaly detection, etc.
Partner	Air Quality Detection, Mine Gas Detection, IMU applications

## AUDIO

RAM: 128kB – 1MB+ (voice)  
Ops/s: 40M-1G w /hardware accelerator



### Audio & Voice

- Security applications e.g., Glass break, scream, shot detection
- Cough detection
- Always-on key-word detection
- Voice assistant
- Echo & noise suppression

ML SDK	Voice Control Light, Audio Classifier
Ref Des	Glass Break Detection
Partner	Occupancy Detection, Wake-word Detection, Voice ID for Doorlock

## VISION

RAM: 512kB – 1MB+  
Ops/s: 200M-1.5G+ w /hardware accelerator



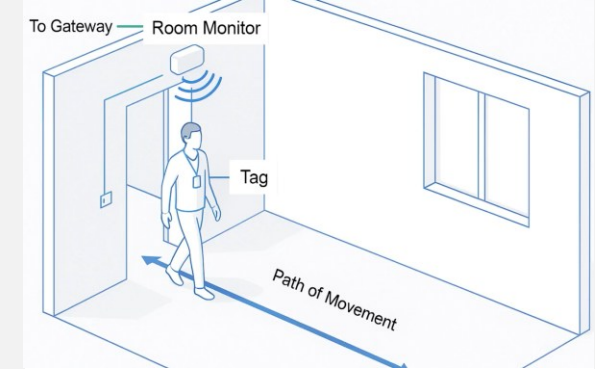
### Low-resolution vision

- Wake-up on object detection (always-on), classification
- Presence detection
- People counting, people-flow counting
- Movement detection

ML SDK	Rock-paper-scissor image classification
Example	People flow counting
Partner	People flow counting, Gesture Recognition, Face detection

## RADIO SIGNALS

RAM: 256kB –  
Ops/s: 200M-1.5G w /hardware accelerator

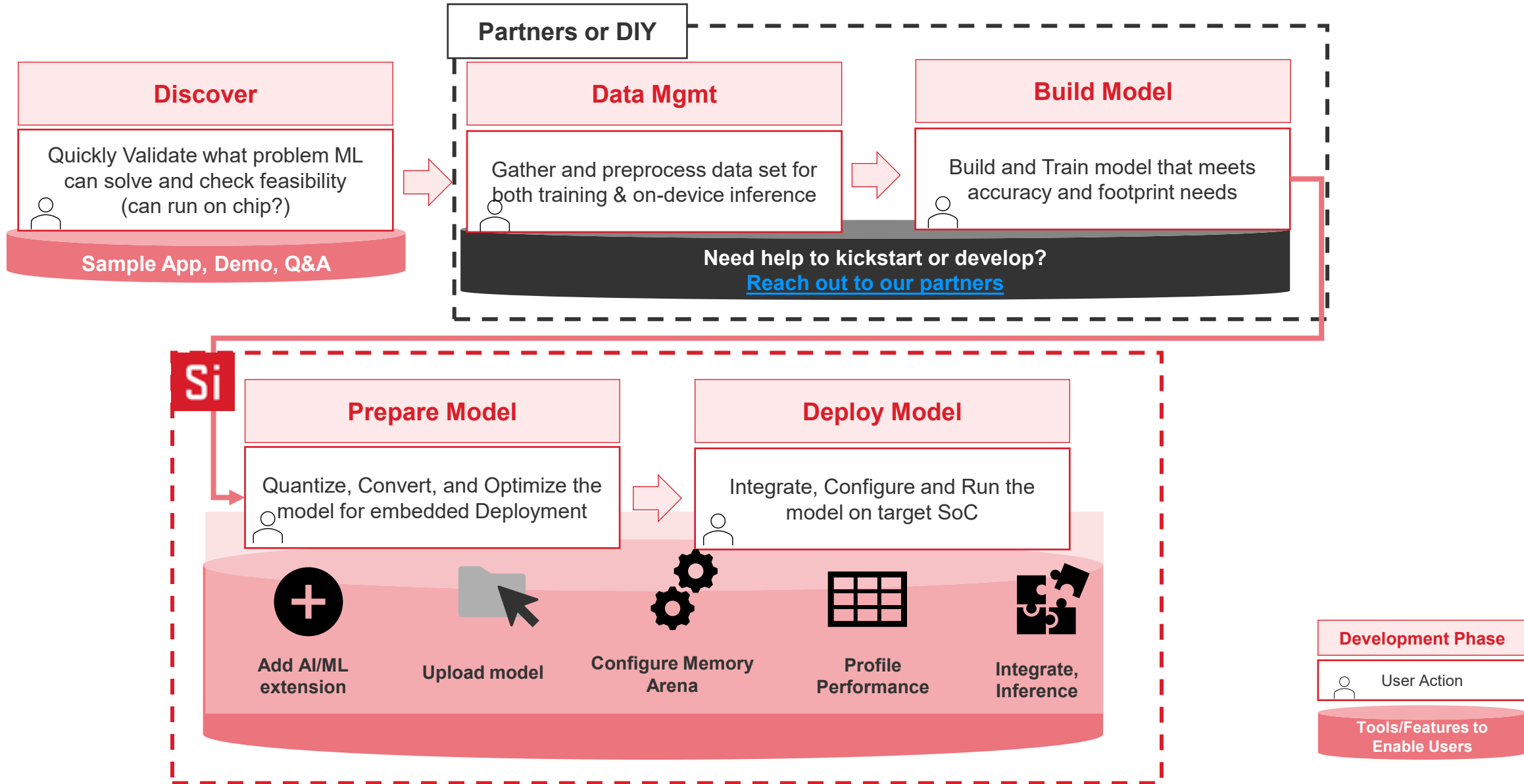


### Locating & Wireless Sensing

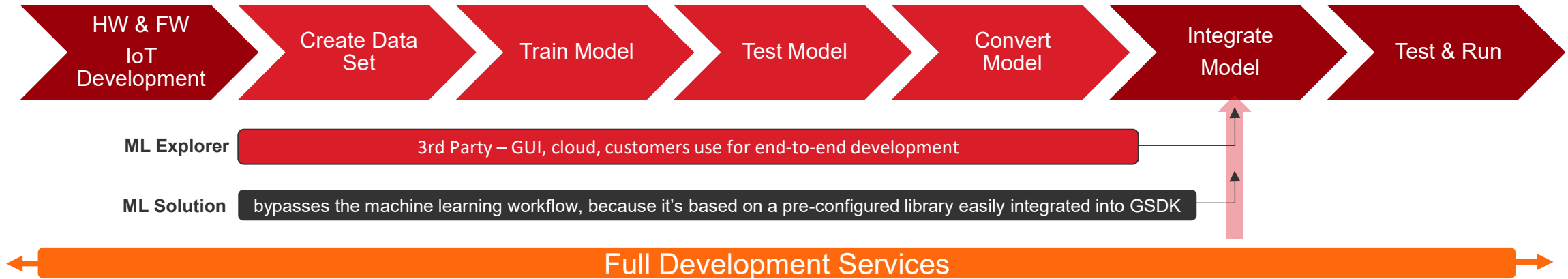
- Tire Positioning via Direction Finding (MVP)
- RTLS
- Presence Detection
- Motion Detection

ML SDK	
Alpha Demo	Under NDA only
Partner	Unikie Tire Positioning, Emanate

# ML Software Pipeline



# ML Partnership Overview



	Edge Impulse	SensiML	MicroAI*	Sensory	AIZIP	Klika-Tech	AITAD
Low-Rate Sensors	✓	✓	✓		✓	✓	✓
Audio Pattern Matching	✓	✓			✓	✓	✓
Voice Commands	✓	✓		✓	✓	✓	✓
Low-Resolution Vision	✓				✓		✓
Regions	AMER, EMEA, APAC	AMER, EMEA, APAC	AMER, APAC	AMER, EMEA, APAC	AMER, EMEA, APAC	AMER, EMEA, APAC	EMEA

\*MicroAI has a platform for users to develop their own application, but it's solely for anomaly detection or system health score

**ML Explorer**

**ML Solution**

**Full Dev Service**

# Partner Software and Tool Support

## ML Expert

SDK with Sample Apps



Start with [Developer Journey page](#)



TFLite Flatbuffer

TFLite-micro Interpreter

CMSIS-NN Kernels

Silicon Labs HW-based Kernels

Cortex M

ML HW Accelerator

## Low-code / AutoML

GUI Developer Tools



TFLite-micro Interpreter

CMSIS-NN Kernels

Silicon Labs HW-based Kernels

Cortex M

ML HW Accelerator

## ML Solutions

Solution Libraries

Wake Word / Voice Command



Wide variety of applications



Anomaly Detection



System Integrators

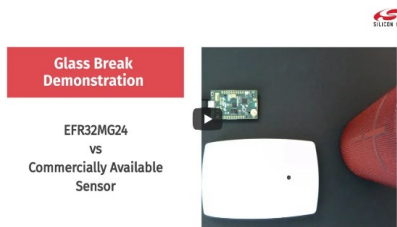


Cortex M (& MVP)

# Glass Break Sensing for Security Applications with AIZIP

- Battery operated single SoC runs the complete application including radio, ML sensing
- Turnkey solution, algorithm from partner AIZIP, SW licensing by partner
- ML sensing method outperforms traditional sensing algos, especially in avoiding false positives, see video
- Reference design + SW example with FG28 but applicable with many OPNs
- 3yr+ battery life (CR123)

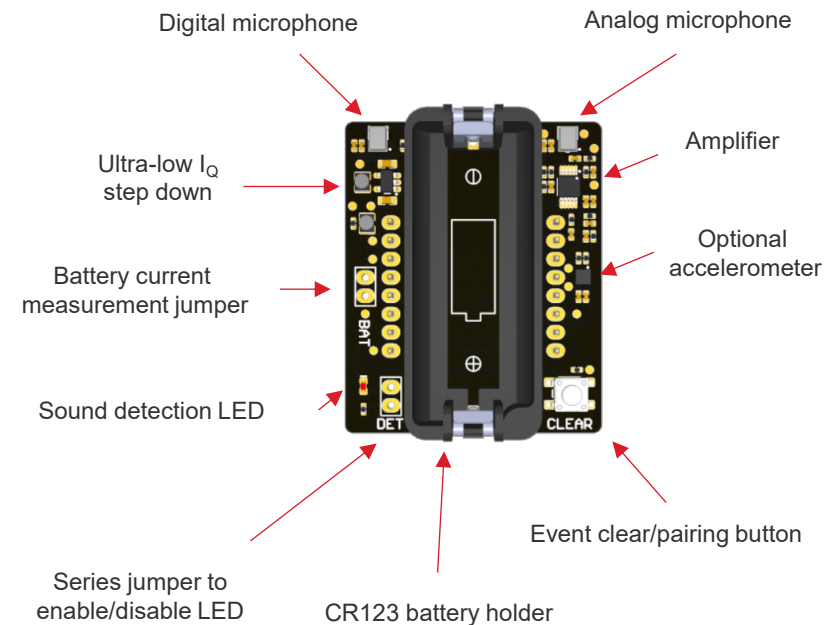
[DEMO video](#)



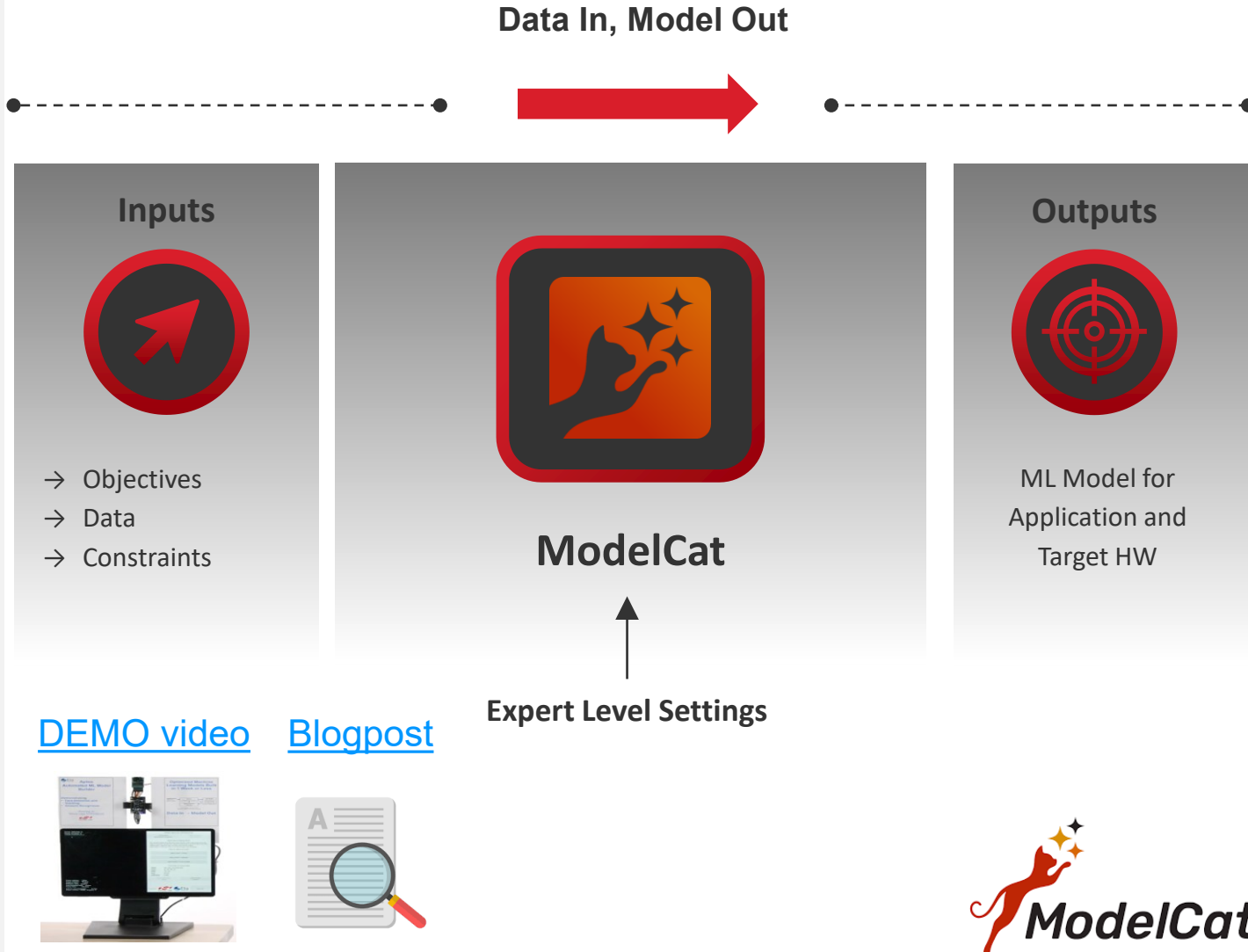
[Blogpost](#)



## Glass Break sensor reference design with FG28 - Available for customer testing



# AI Models for Vision Applications on MCUs with ModelCat AI



- ML based Vision solutions on resource constrained SoCs such as xG24/xG26
- Easy solution creation for low-resolution vision use cases like people counting, face detection and image classification, pattern recognition
- Device 'capability-aware' ML model creation overcomes the gap between complex ML and Embedded Systems with AI-in-the-Loop technology
- Ported to MG26 MVP accelerator, demo available

Competitive to faster MCUs

Model	Inference Time (ms)	Energy/Inference (mJ)	Average Power During Inference (mW)
Hand Gesture Recognition	123.7	2.49	20.1
Face Detection (Most accurate)	299	6.03	20.2
Face Detection (Medium)	102.4	2.23	21.8
Face Detection (Fastest)	58.9	1.25	21.2

# BLE Positioning with ML, demo from Unikie



A Tire Pressure Monitoring System (TPMS) using BG24 tracks tire position so that pressure is correctly maintained even if position is changed

## [DEMO Video](#)

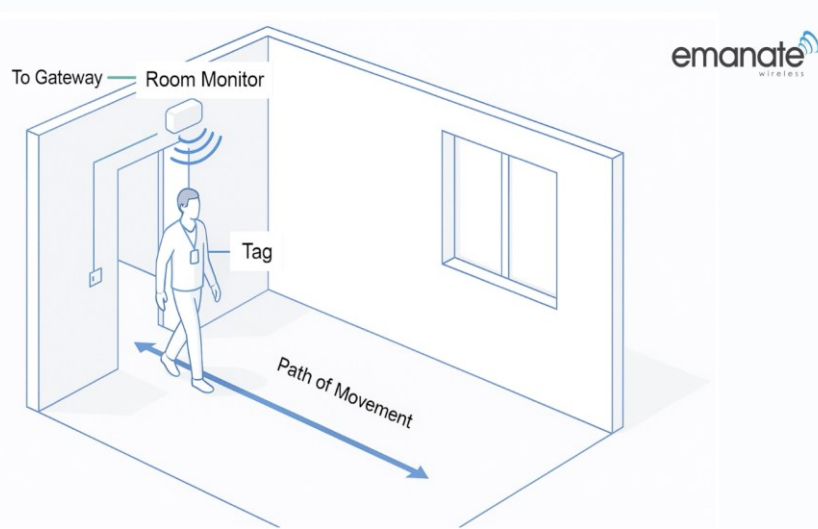


## [Blogpost](#)



- **Unikie and Silicon Labs Partnership**
- **Production-ready on-device AI solutions from the partner**
- **Car Demo:**
  - BG24+BG22 Tire Pressure Monitoring System (TPMS) with ML based positioning, using 2x2 antenna
  - Very fast and low resource consuming, low memory solution
- **Applications beyond TPMS**
  - Real-time locating for tags in a space
  - Smart doorlocks: resolution for inside our outside problem
  - Local positioning-based applications such as indoor navigation and tracking
  - Smart access control and proximity-based control systems for personalized device behavior

# Emanate Wireless Machine Learning Clinical-Grade RTLS for Hospitals



**RadioVision™**  
**BLE Doorway Chokepoint**  
**99.9% Room Accuracy**

**BENEFITS**

Easily turns any BLE location solution into a 99.9% Room Accurate solution  
 Standard-based Solution, no proprietary technologies  
 Mounts Easily and Quickly, with little configuration.  
 Battery Powered, with no PoE required

**FEATURES**

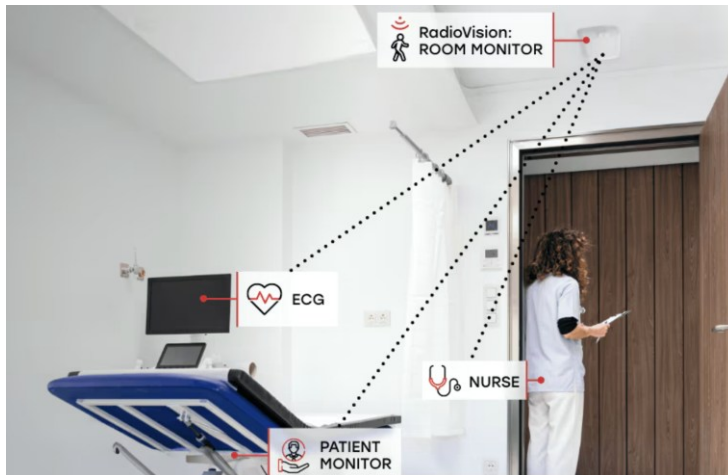
4x4 BLE AoA Antenna  
 PIR Motion Detector  
 5 Year Lithium Battery  
 All DSP/ML processing runs locally on Device.  
 OTA Firmware Update.

[Arrange a Demo](#)

[Case Study](#)



[DEMO Video](#)



# WAITES Eliminates Downtime with AI-Powered Preventive Maintenance



**Waites Provides Superior Condition Monitoring in Industrial Environments to eliminate Downtime with AI-Powered Preventive Maintenance.**

1. Its AI machine learning algorithms trained on 8 trillion sensor readings from half a million sensors installed around the world.
2. Utilizing the MG24 built-in [AI/ML matrix vector processor \(MVP\)](#) hardware accelerator, Waites can complete sizeable complex mathematical operations of time-series data up to 8x faster while consuming 6x less energy.
3. Data from sensors, including vibration waveforms, temperature, and meta metrics is analyzed by on-chip AI and then streamed to Waites' cloud system via cellular or gateway relays with no required integration to the facility's IT network.

The World's Most Advanced Triaxial Vibration Sensor

## **SM7 Wireless Condition Monitoring**

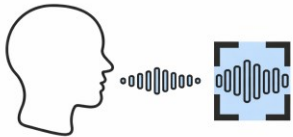
The SM7 is Waites' most advanced AI-powered vibration sensor, delivering full-spectrum visibility, earlier fault detection, and insights you can act on with confidence.

# Motor Control and AI/ML on Series2 MCUs

- **Wireless connectivity + RT Motor Control + Machine learning in one SoC**

- Motor operated between up to 5,500 RPM without timing issues along with a BLE connection
- Anomaly detection or Keyword spotting ML applications being offloaded to MVP ML accelerator
- Open-source BLDC motor control library
- FreeRTOS

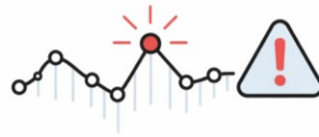
## KEYWORD SPOTTING



### Control the fan with your voice

Uses on-board mic;  
'go' and 'stop'  
'up' and 'down' for speed  
'left' and 'right' for direction

## ANOMALY DETECTION



### Analyzing on-board IMU data

An anomaly score from 0-100 is calculated for each window of IMU samples. The event is considered anomalous once it exceeds a defined threshold

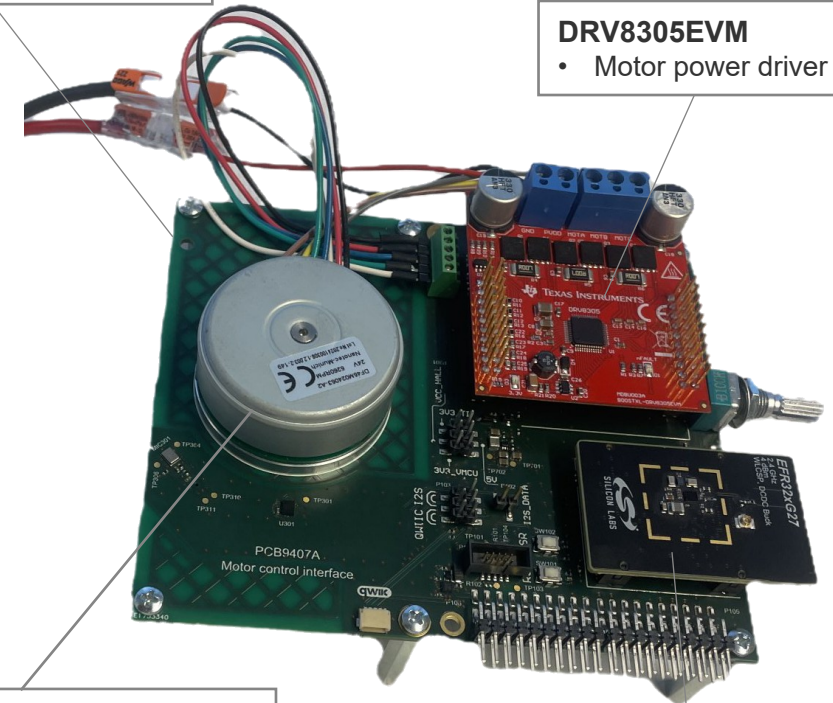
## Motor Control Developer Kit by Silicon Labs

### Motor Control Base Board

- Integrated sensors: Mic, IMU

### DRV8305EVM

- Motor power driver



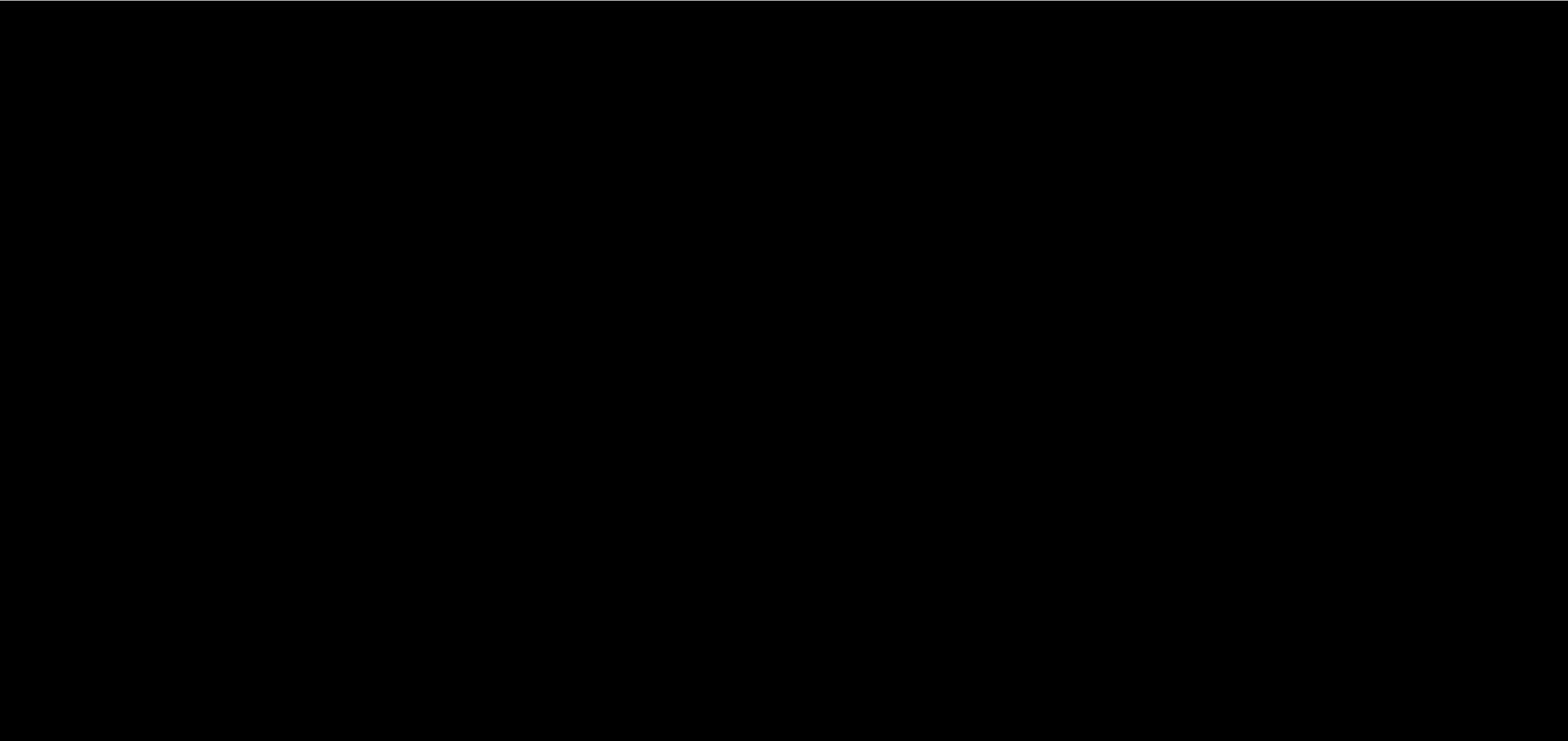
### DF45M024053 – A2 Motor

- RPM: 5,260 (Speed Rated)
- 24v, 16 poles
- 3 x Hall sensors

### Silicon Labs Radio Board









- Exchangeable S2 SoCs

# ML Profiler and Voice-Controlled Light Demo



# AI/ML on Wireless Gecko Series in Production

## EFR32 SERIES 2 SOCS

EFR32xG24	EFR32xG26	EFR32xG28	SiWx917
			
			
78MHz CortexM33 <b>AI/ML accelerator</b> 1.5MB / 256kB 2.4 GHz radio 20 dBm TX Power Secure Vault - Mid Secure Vault - High	78MHz CortexM33 <b>AI/ML accelerator</b> 3MB / 512kB 20 dBm TX Power Secure Vault - Mid Secure Vault - High	78MHz CortexM33 <b>AI/ML accelerator</b> 1MB / 256kB Sub-GHz radio 20 dBm TX Power Secure Vault - Mid Secure Vault - High	180 MHz CortexM4 <b>AI/ML accelerator</b> 8MB / 672kB 19 dBm TX Power Secure Vault - Mid Secure Vault - High

### Starter Kits

- xG24-DK2601B Developer kit
- xG26-DK2608A Developer Kit
- xG28-EK2705 Explorer Kit
- SiWx917-DK2605 Developer Kit

### Broad Range of Sensors

- Inertial Sensor
- 2 Digital Microphones
- PIR sensor
- Pressure Sensor
- Relative Humidity and Temperature Sensor
- UV and Ambient Light Sensor
- Hall-effect Sensor

### Ready to demonstrate ML

- Examples on GitHub
- Many sample applications and demos from partners
- Plug&Play Sensor extensions with Sparkfun Qwiic
- CR2032 coin cell battery



Common Machine Learning software and tools on our Wireless SoC portfolio

Use cases are dependent on RAM and wireless stack

# Machine Learning Development Kits

## xG26/24 DEV KIT

- Wireless SoC with multi-protocol radio based on EFR32xG26/xG24
- ARM® Cortex-M33 with TrustZone, 512/256 kB RAM and 3200/1536 kB Flash, 80 MHz
- AI/ML Hardware Accelerator
- Broad Range of Sensors
  - 6-axis Inertial Sensor
  - 2 Digital Microphones
  - Pressure Sensor
  - Indoor Air Quality and Gas Sensor
  - Relative Humidity and Temperature Sensor
  - UV and Ambient Light Sensor
  - Hall-effect Sensor
- [Link](#)



## xG26/24 EXPLORER KIT

- Based on EFR32xG26/xG24 2.4 GHz Wireless SoC
- +10 dBm, 1536 kB flash, 256 kB RAM, QFN48
- Two LEDs and two push buttons
- Reset button
- USB connector for power and debug connection
- On-board SEGGER J-Link debugger
- Virtual COM port
- Packet Trace Interface (PTI)
- Breakout pads for GPIO access and connection to external hardware
- Third-party add-on connectors
  - mikroBUS socket
  - Qwiic® connector
- [Link](#)



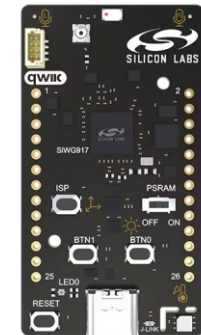
## xG28 EXPLORER KIT

- Based on EFR32xG28, 1024 kB flash and 256 kB RAM
- Two LEDs and two push buttons
- Reset button
- USB connector for power and debug connection
- On-board SEGGER J-Link debugger
- Virtual COM port
- Packet Trace Interface (PTI)
- Breakout pads for GPIO access and connection to external hardware
- Third-party add-on connectors
  - mikroBUS™ socket
  - Qwiic® connector
- [Link](#)

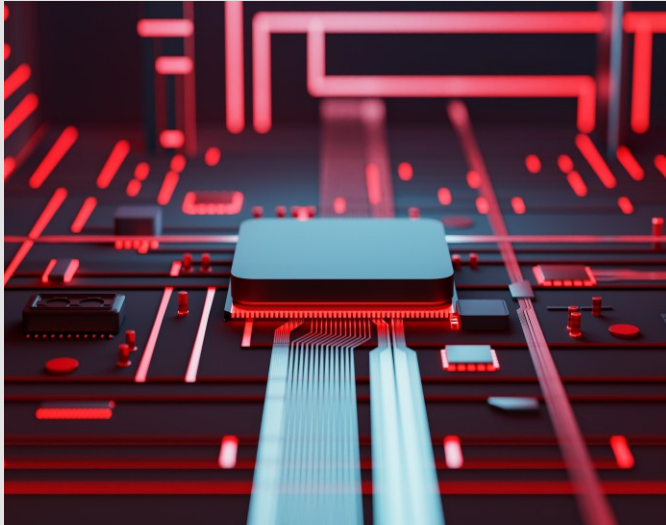


## SiWx917 DEV KIT

- Based on SiWG917
- 8 MB Flash, 8 MB external PSRAM, 7x7 QFN, -40°C to +85°C
- Integrated on-chip antenna
- RF: Front-end design based on external RF Switch and BPF, RF connector for conducted RF measurements
- On-board sensors: Temperature Sensor, Humidity Sensor, 6-axis inertial sensor, 2 x Digital Microphones, Ambient Light Sensor
- Qwiic Connector: For compatibility with Sparkfun's expansion hardware (Sensors, Camera, LCD, etc)
- USB Port: Board Power, Serial Communication (ISP Bootloader)
- On-board Debugger: SWD, VCOM
- [Link](#)



# Learn More About Silicon Labs Machine Learning



## GETTING STARTED

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AI/ML Webpage

[Visit site](#)

Developer Journey

[Visit site](#)



## FOR MORE INFORMATION

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ML Model Profiler

[Visit site](#)

Works With AI/ML content - 2025

[Visit site](#)



## CALL TO ACTION

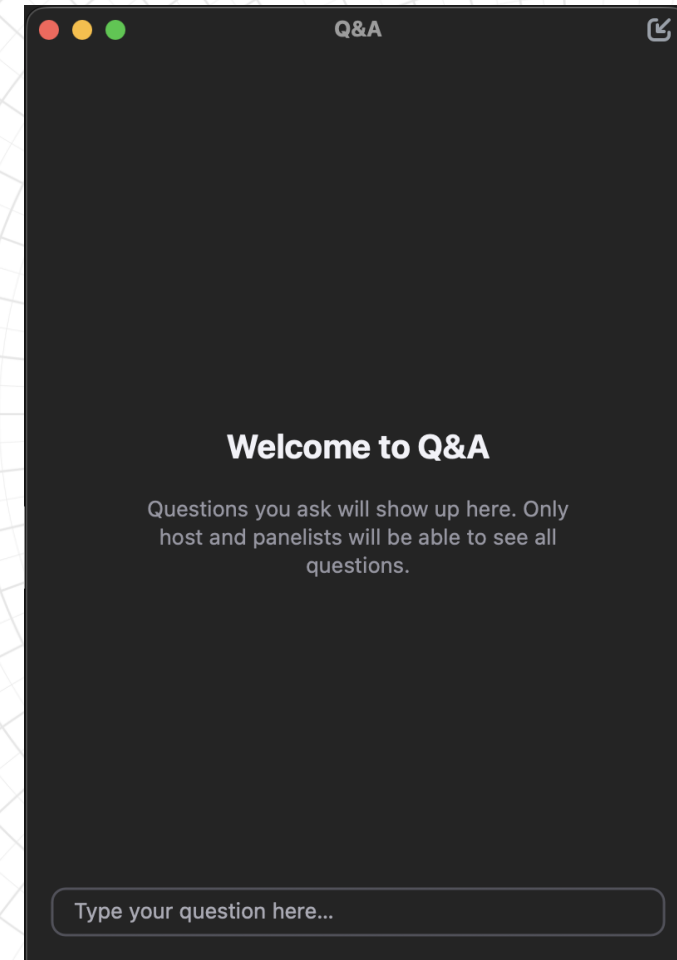
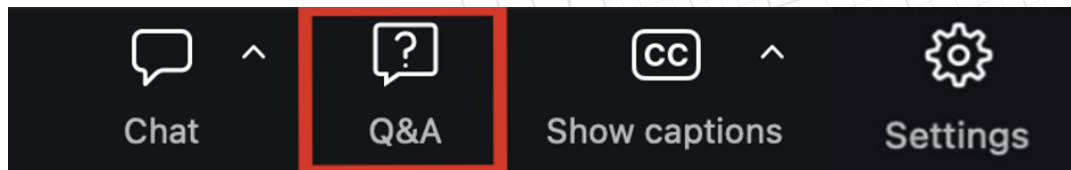
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For any questions about SiLabs offerings, please contact our Sales team or visit our Community page

<https://community.silabs.com/>

# Q&A

- Select the Q&A button in the bottom control bar to open the Q&A window and submit your questions.



# Thank you

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