Using MicroAI AtomML™
to Enable Endpoint AI Solutions

Innovating with MicroAI AtomML™

The Business Need

Many companies are considering Artificial Intelligence (AI) solutions to monitor and manage their smart assets. These deployments provide greater understanding and deeper insights that are not obvious to the human eye.

However, AI solutions often require complex and expensive hardware to perform the training processes needed to create the necessary AI models. This hardware is typically not available in a local environment, and thus the expensive task of sending and processing large amounts of data in the cloud is almost always required. These additional costs and challenges have turned many developers away from AI-enabled solutions.

The Business Need

The logical advancement in this technology would be to deploy AI at the edge; however, MicroAI has developed MicroAI AtomML™, an AI solution that lives on endpoint microcontroller-based devices. Microcontroller units (MCUs) are everywhere.

Although typically invisible, these units serve as the backbone for many of the smart devices we use every day: keyboards, monitors, auto components, washers, dryers, coffee makers, etc. As we become more dependent on these smart devices any unexpected downtime can create significant disruption in our daily lives. These service disruptions often lead to costly repair and a loss of confidence in the reliability of those devices.

MicroAI AtomML™ provides a game-changing approach to smart device management. Unlike other device-management solutions, MicroAI AtomML™ is designed to live and run directly on the device MCU.

This cutting-edge approach provides a more reliable and cost-effective method for monitoring the performance of critical assets within an IoT device ecosystem.

Endpoint-based AI provides many potential advantages that are not present in traditional edge or cloud-based solutions.

Typical benefits would include:

- Training models that are designed with more individuality and therefore are more specific and relevant to the specific application.

- Data is processed at its source. This results in reduced latency between collection and training or execution of AI models.

- A reduction in the amount of data being sent from endpoint to edge device since the data processing has already occurred.

- Real-time asset management and optimization driven by local AI results.

- More intimate security enablement to protect valuable assets from cyber-attack.

- Compact enough to run on any microcontroller unit, bringing AI training to the individual device or machine.

MicroAI AtomML™ - A Simple Use Case

Let us put this into action. Our use case will be to monitor CPU temperature and to provide an alert to avoid overheating the component. MCU ESP32 will be used in this case. The basic steps of this use case will be as follows:

01 Wiring of the MCU with the sensor and configure the MCU for modeling and running.

02 Configure an interface to provide connection to a sensor.

03 Design the MCU so that if the wire is plugged into GND it will model the artificial intelligence (AI) and if not plugged in it will run the AI engine in real time.

04 Connect the MCU to a dashboard that will display real-time data and alerts.

05 Train the AI model with normal use of a CPU (modeling time to be 10 minutes).

06 Once modeling is complete the wire will be removed from GND and the AI engine will be started---in real time.

07 The model will be allowed to run for 5 minutes and then tested to see if the MCU will generate an alert. To introduce abnormal CPU temperature the CPU will be overclocked to max out its processes. The CPU fan will also be turned off.

08 Once the abnormal temperature increase is detected by the MCU a real-time alert will be generated on the dashboard.

MicroAI AtomML™ - Innovative Smart Device Management

The above use case is a simplified example of the advantages of using MicroAI™ Atom to monitor the performance of critical assets right at the point of the MCU.

- **Quicker and more reliable feedback.**

  Instead of collecting information and sending that data to the cloud, MicroAI AtomML™ collects and processes data locally---right at the MCU. This provides users with data straight from the device---in real time. Avoid the costs associated with additional hardware and cloud-based data storage

- **Faster adjustments to local conditions.**

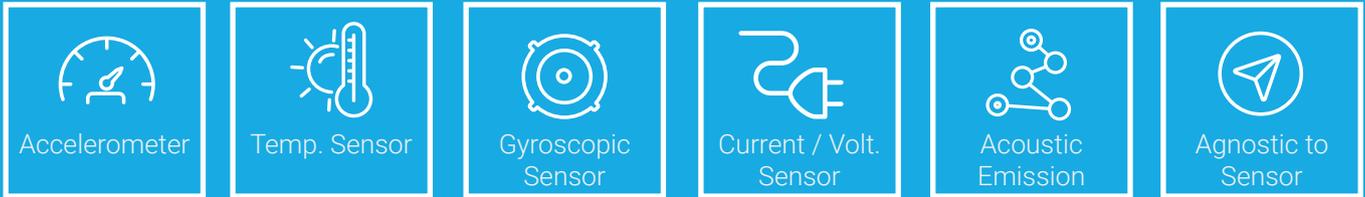 Since Atom lives directly on the MCU it can adjust---in real time---to changing conditions within its environment. This can significantly improve the reliability of the devices within an IoT ecosystem with faster problem detection, notification, and resolution. The local approach to device security provides enhanced protection against threats to the IoT ecosystem.

- **Flexibility and Scalability**

  MicroAI AtomML™ can be applied as a single entity on a single device or scaled to include application to an entire IoT device ecosystem. Smart assets continue to evolve through a process of self-learning and selfcorrection.

MicroAI™ Ecosystem

OUTPUTS TO

| Accelerometer | Temp. Sensor | Gyroscopic Sensor | Current / Volt. Sensor | Acoustic Emission | Agnostic to Sensor |

MicroAI™ Endpoint AI

Data Fusion

↓

ML Model Training

↓

Data processiong through AI Engine

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Outputs

OUTPUTS TO

Data Visualization
Data and Mobile App Reporting
Enterprise Asset Management
Asset Performance Management
Comparative Analysis

Workflow Management
Plant Organization
Product Cycle Management
Maintenance / Service Scheduling
Support / Warranty Management

Existing IT Systems
Manufacturing Execution System
Workorder Management
Dispatch Management
Other Existing Infrastructure

SYSTEMS DATA

| IT System Data | PLC Data | Maint. Informaion |

About MicroAI

Based in Dallas, Texas and founded in 2018, MicroAI™ is an award-winning, AI-driven technology company that designs, develops and deploys nextgeneration IoT solutions for OEMs, network operators and enterprises.

A joint venture of Systena America and Plasma, MicroAI™'s proprietary algorithms power our MicroAI™ solution, which is small enough to live on a connected device. MicroAI™ is redefining artificial intelligence at the network edge, delivering powerful edge AI and machine learning solutions that help enterprises and industrial companies achieve deeper insights into the behavior of machines and processes within their organization.

MicroAI™'s MicroAI AtomML™ technology curates raw IoT data on the network edge rather than in the cloud,helping companies discern valuable data and quickly spot anomalies by triggering actionable insights and alerts. Devices are trained in the local environment, allowing for personalization while providing thehighest levels of security and privacy.

With deployments in industries such as oil and gas, manufacturing, agriculture and telecom, our solutions help companies optimize the performance and security of their assets in a highly-connected world.

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