New

Sensor Suite

Axis direction

Predictive maintenance
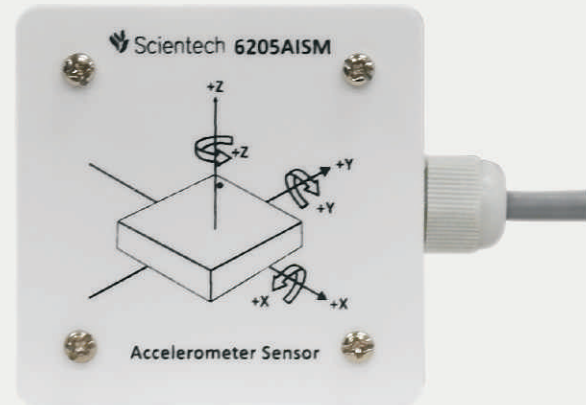
Sound

Real time maintenance

Edge Computing

Pattern Recognition

Scientech 6205AISM

+Z
+Z
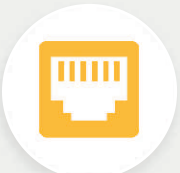+Y
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Accelerometer Sensor

Interfaces

Bluetooth

WiFi

Ethernet

USB

Patent Pending

The field of Artificial Intelligence (AI) has witnessed tremendous growth in recent years with the advent of Deep Neural Networks (DNNs) that surpass humans in a variety of cognitive tasks. The algorithmic superiority of DNNs comes at extremely high computation and memory costs that pose significant challenges to the hardware platforms executing them. This limitation has led to the development of specialized hardware and software solutions designed to overcome these constraints, enabling AI applications in resource-constrained environments.

Scientech 6205AISM is a cutting-edge system which combines deep learning technology with sensor fusion to provide unparalleled insights into machine health and motion patterns. It utilizes a microphone to capture subtle audio cues indicative of potential faults or anomalies. The product employs a 6-axis accelerometer and gyroscope to track complex motion patterns and vibrations. With using deep learning models to analyze sensor data and predictive maintenance needs. It can provide real time alerts for proactive maintenance.

Features

- Platform to learn, explore, and develop AI – IoT skills.
- Color LCD display.
- Linux operating system.
- Command line interface.
- Working of TinyML on microchip.
- Data Collection for model training.
- Process of model training.
- Creating a library of model.
- 6-Axis Accelerometer and Gyroscope.
- Microphone.
- Arduino software compatible hardware.
- Wi-Fi connectivity for cloud interface.
- 2 din sockets for sensor interface.
- Ethernet Connectivity for internet access.
- Server and Client Pipeline.
- Working of Local ports.
- Compact tabletop ergonomic design.
- Ready experimental details.
- User friendly, self-explanatory system.

Scope of Learning

- Introduction to Edge Computing, Tiny ML, Deep Learning, Wio Terminal, Artificial Intelligence, Command line interface, Embedded C, Accelerometer, Mic and Machine Learning Deep Learning.
- Neural Network overview and representation.
- Convolutional Neural Networks.
- Recurrent Neural Networks.
- Activation Function.
- Loss Function.

Testing and understanding of -

- Microphone.
- Accelerometer and Gyroscope.
- Tiny ML.
- Wio Terminal.
- Command line interface.
- Embedded C.
- EDA.
- Predictive Maintenance.
- Deep Learning.

Technical Specifications

Processor	:	64bit ARMv7 Quad Core Processor 1.2GHz
Connectivity	:	802.11 b/g/n Wireless LAN,Bluetooth4.1,USB& Ethernet
RAM	:	4GB
Memory	:	64GB (upgradable)
OS	:	Linux
Ethernet	:	10/100 Base T Ethernet socket
Video Output	:	HDMI and Composite RCA
Microchip	:	ATSAMD51P19 (ARM cortex-M4F core running at 120MHz – Boost upto 200MHz)
BLE Microchip	:	nRF52840
Sensors and Actuator connector	:	1 no.
Digital I/O Pins	:	4
Analog Input Pins	:	2
UART	:	1 no.
I2C	:	1 no.
Power Supplies	:	5V and 3.3V
Switches	:	5 nos.
5 Way Switches	:	1 no.
Color LCD	:	2.4 inch
Resolution	:	320 x 240
USB	:	2.0
USB	:	3.0
Wi-Fi Module	:	802.11 a/b/g/n 1x1, 2.4GHz & 5GHz
Bluetooth	:	Support BLE5.0
Artificial Nose	:	1 no.
Program Memory Size	:	512 KB, with external Flash 4MB
Power Supply	:	110V - 260V AC, 50/60Hz
Weight	:	3.5Kg (approximately)
Operating Conditions	:	0-40°C, 85% RH

Interactive AI Development Platform

Interactive AI Development Platform is an innovative platform developed using the Seeed Studio Wio Terminal, Arduino Nano 33 BLE Sense Rev2 and Raspberry Pi 5, designed to streamline the process of data collection and model creation for edge AI applications. The platform allows users to connect various sensors to the Wio Terminal and utilize Arduino Nano 33 BLE Sense Rev2's inbuilt sensors, which acts as the data acquisition module. Data is collected through a command-line interface (CLI) installed on the Raspberry Pi 5, ensuring efficient and reliable data transfer.

Once the data is collected, Interactive AI Development Platform automatically sends it to Edge Impulse Studio, where users can easily create and train machine learning models tailored to their specific needs. The seamless integration of hardware and software within development platform makes it a powerful tool for IoT developers, educators, and researchers looking to harness the potential of edge computing and AI. With development platform, building intelligent, responsive systems becomes more accessible, enabling rapid prototyping and deployment of AI-driven solutions.
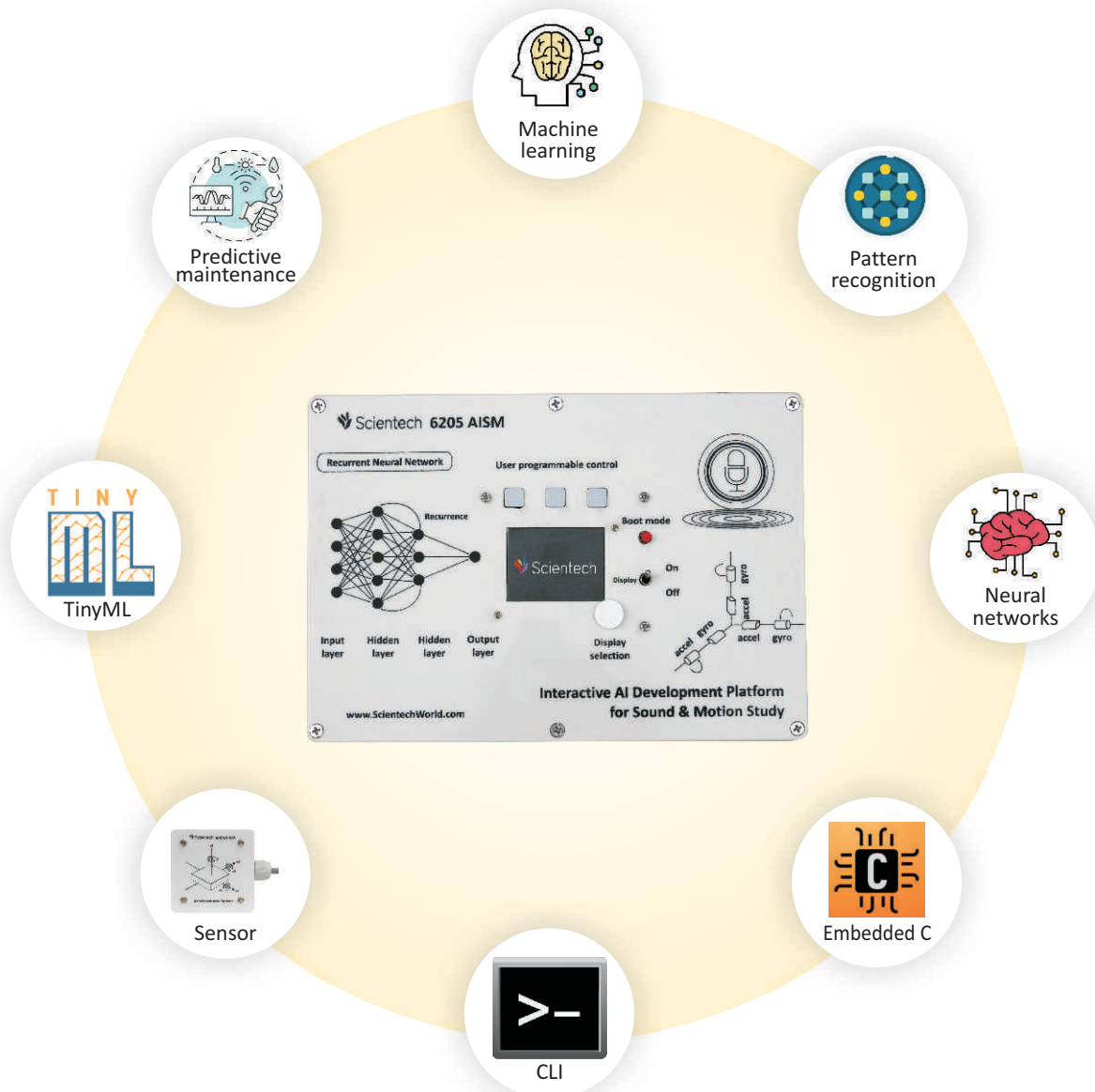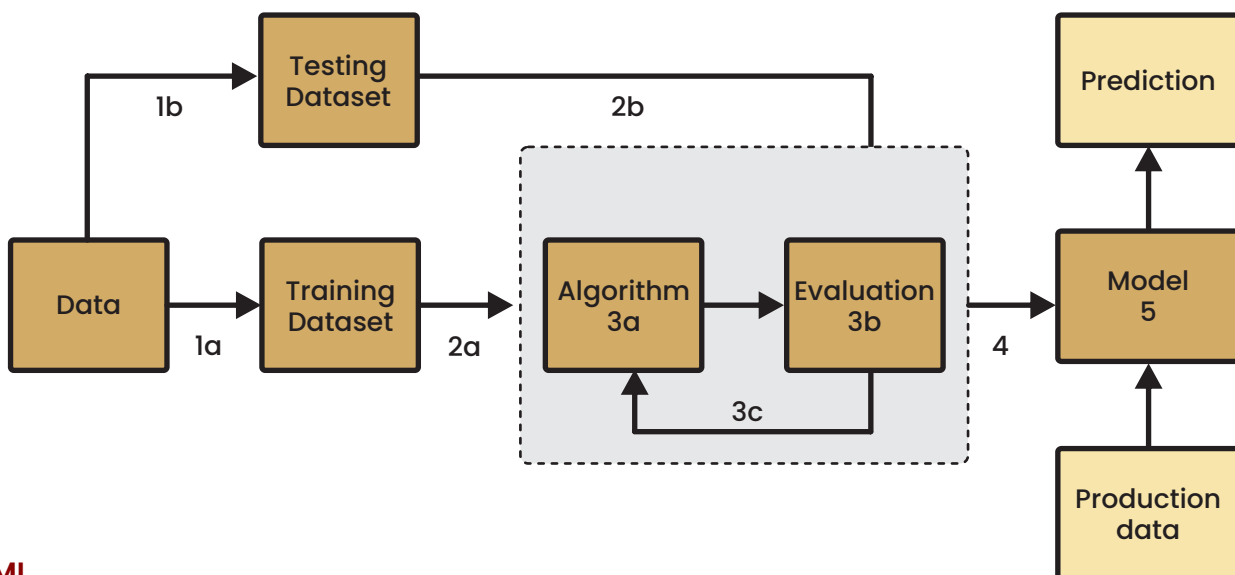
Machine Learning

Machine Learning is a subset of Artificial Intelligence focused on developing algorithms and statistical models that enable computers to perform specific tasks without explicit programming. It allows systems to improve their performance on a task through experience and data analysis.

Key aspects include:

• Pattern recognition and prediction

• Automated learning from data

• Improved accuracy over time

• Applications in natural language processing, computer vision, predictive analytics, and more

Machine Learning empowers computers to learn from experience, enabling solutions that adapt and improve autonomously. It's revolutionizing industries by unlocking insights from vast amounts of data and automating complex decision-making processes.


TinyML

TinyML is a branch of machine learning focused on creating and implementing AI models on low-power, small-footprint microcontrollers. It enables the execution of machine learning tasks on devices with limited resources, such as Arduino boards, ESP32 modules, or other resource-constrained edge devices.

Key features of TinyML include:

• Optimized for memory efficiency and low power consumption

• Enables real-time processing on microcontrollers

• Supports various applications like gesture recognition, audio classification, and sensor data analysis

• Employs specialized frameworks and compilers designed for embedded systems

TinyML bridges the gap between traditional microcontroller programming and advanced AI capabilities, allowing developers
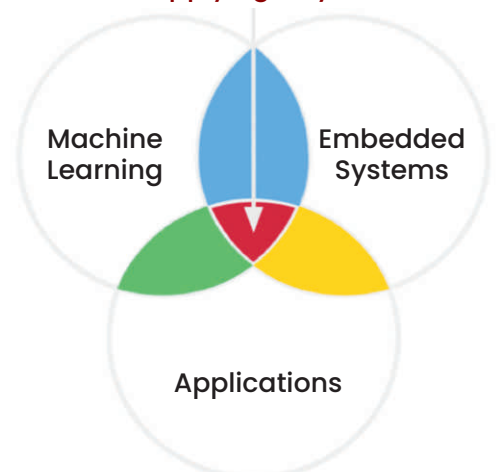
RNN

Recurrent Neural Networks (RNNs) are a type of artificial neural network well-suited to modeling complex sequences of data. They are particularly effective at handling temporal data such as text, speech, video, and time series.

Key characteristics of RNNs include:

- Ability to maintain internal state and use this information when making predictions
- Sequential processing of input data
- Memory of previous inputs in hidden state
- Time series prediction

RNNs have shown remarkable performance in tasks requiring understanding and generating sequential data, making them crucial components in many modern AI systems.
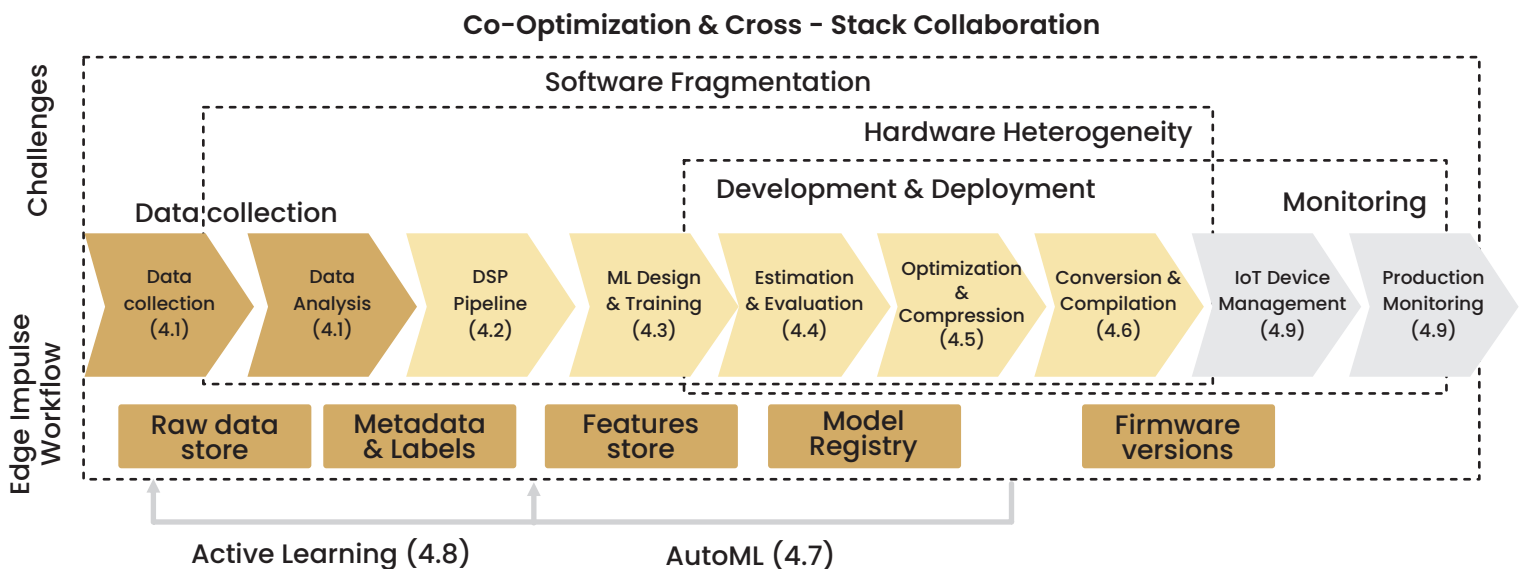

Input layer   Hidden layer   Hidden layer   Output layer
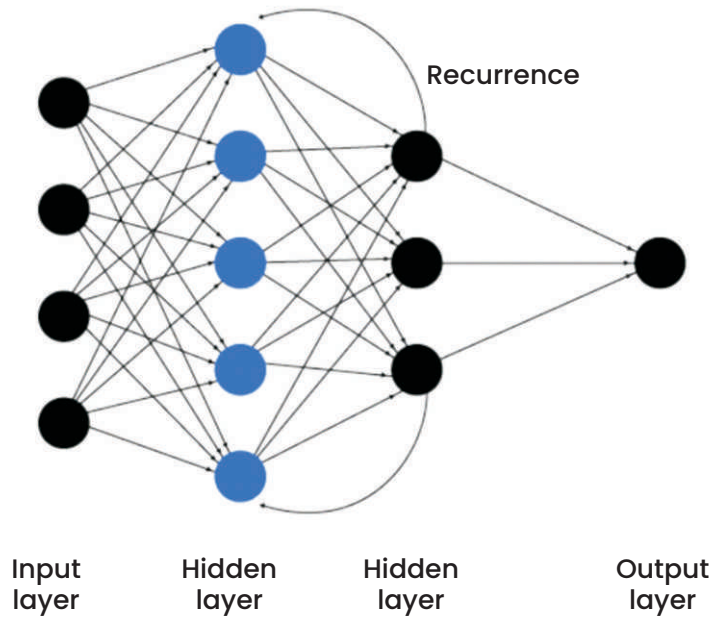
Edge Impulse

Edge Impulse is a cloud-based machine learning platform specifically designed for developing and deploying audio, speech, and sensor signal processing models. It empowers developers to create custom AI solutions without extensive expertise in deep learning.
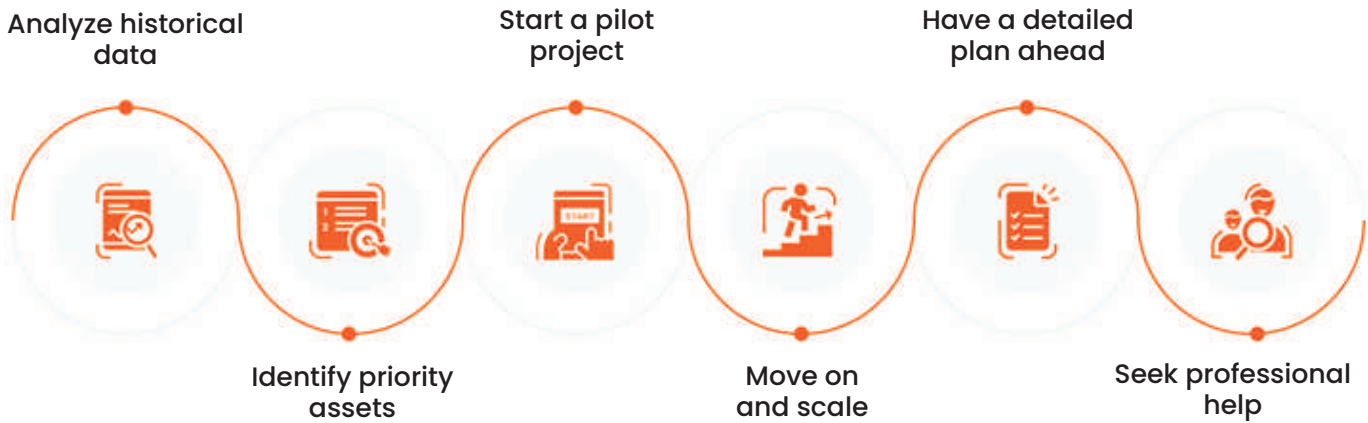
Key features include:

- End-to-end workflow from data collection to deployment
- Optimized for resource-constrained edge devices
- Support for various hardware platforms and frameworks
- Real-time collaboration tools for teams
- Extensive library of pre-trained models and tutorials

Co-Optimization & Cross - Stack Collaboration

Applications

How to implement predictive maintenance

Analyze historical data · **Identify priority assets** · **Start a pilot project** · **Move on and scale** · **Have a detailed plan ahead** · **Seek professional help**

Predictive Maintenance based on sound

Sound sensors installation on machinery · Sound data collection · Automated sound analysis · Real-time monitoring and instant notifications

Subject to Change