

# AI in Manufacturing ものづくりにAIを

Introducing AI data analysis software for data utilization without the need for specialist data science knowledge.  
専門知識なしでデータ活用を実現するAIデータ分析ソフトウェアのご紹介

FA Digital Engineering Dept.

Factory Automation Systems Group

Mar,2024

MITSUBISHI ELECTRIC CORPORATION

# Self Introduction

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デジタルマニュファクチャリングソリューションセンター

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# Mitsubishi Electric's Digital Manufacturing

President & CEO Kei Uruma

Established January 15, 1921

Paid-in Capital ¥175,820 million



Consolidated Revenue:  
¥5,003,694 million

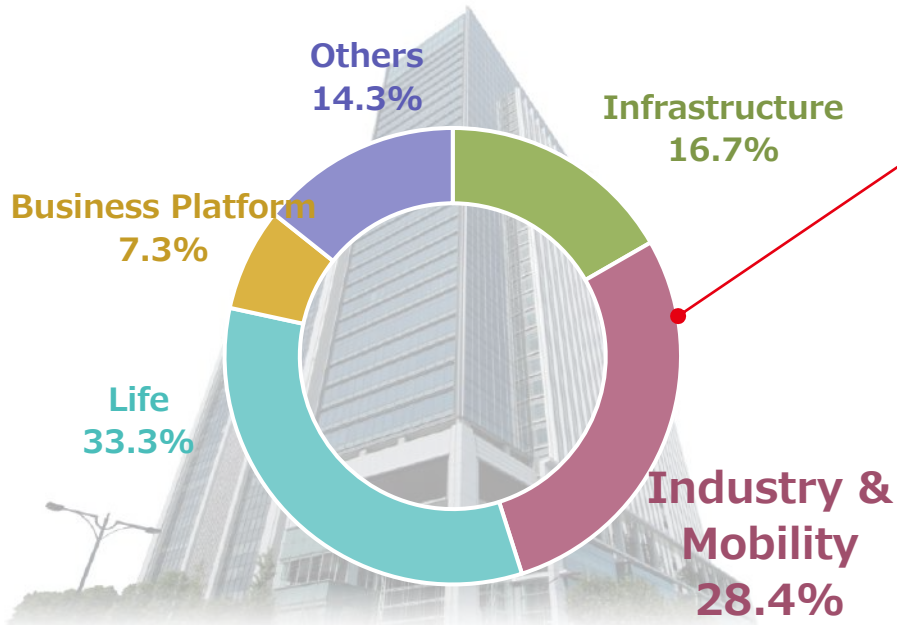


Employees:  
149,655

As of March 2023

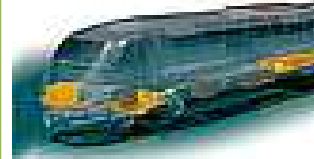
As of March 2023

## Net Sales by segment



## Business field

Infrastructure BA



Public Utility Systems  
Energy & Industrial Systems



Defense & Space Systems

Industry & Mobility BA



Factory Automation Systems



Automotive Equipment

Life BA

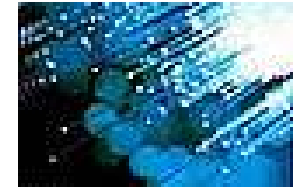


Building Systems



Living Environment & Digital Media Equipment

Business Platform BA



Information Systems & Network Service

Semiconductor & Device



Semiconductor & Device

# Automating the World

As a partner who truly close to customers, we set this global slogan to bring transformative changes in the complex and diverse society and contribute to the realization of a wealthier society by "Automation" that utilizes cutting-edge technology that we have built up so far while carrying on the know-how.

## Key societal challenges



**Carbon neutral**  
Decarbonize society



**Circular economy**  
Build a circular society



**Safety/Security**  
Resilient society



**Inclusion**  
Society that values diversity

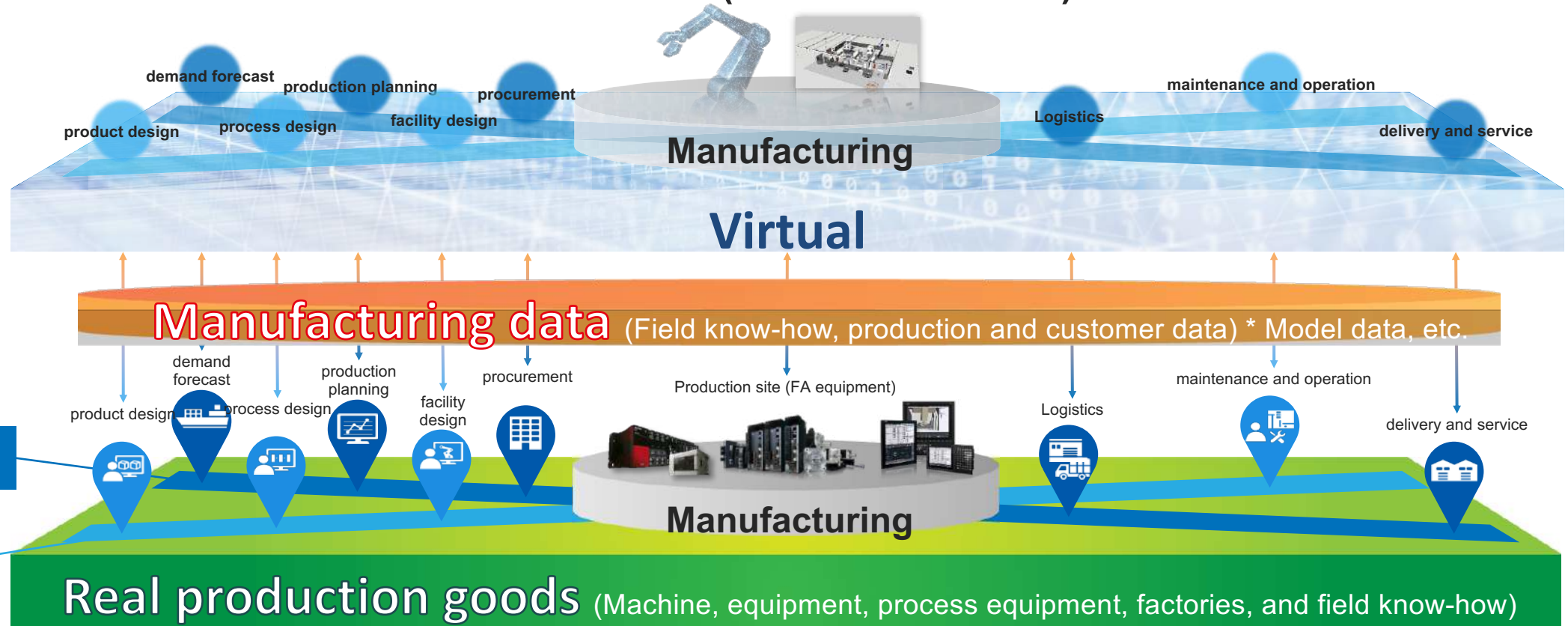


**Well-being**  
Vibrant lives

## Real, Data and Virtual evolve Engineering Chain and Supply Chain!

Using digital technology, virtual and real can be linked through data and build a highly accurate digital twin environment.

### Production site (simulation model)



Based on a wide variety of FA equipment and devices, we provide problem-solving support for customer issues by using manufacturing data with enhanced digital technologies.

### Production system design / development

- Enhanced efficiency and shortened design and development time
- Quick start-up of equipment

### Manufacturing

- 24-hour stable operation
- Manufacturing that does not depend on personal skills and know-how

### Operation / maintenance

- Remote monitoring / diagnosis / maintenance
- Asset management
- Maximized ROI for renewal

## Servitization using data

### Today's topic

#### Digital space

3D Simulator  
**MELSOFT Gemini**

High-precision simulation environment

SCADA Software  
**GENESIS64**

system monitoring environment for increasing productivity

**Manufacturing data**

Data Science Tool  
**MELSOFT MaiLab**

Provide AI-driven, easily achievable, advanced analysis and diagnosis function

Video Analysis Tool  
**GX VideoViewer Pro**

Finding anomalies using video and AI

#### Operational Technology



Sequencer (PLC)



Servo system



CNC



Industrial PC



HMI



Inverter



Robot



FA sensor



Laser beam machine



Electric discharge machine



Rotating machine



Distribution control equipment

**2**

## Mitsubishi Electric's Software Solution

Data Science Tool

**MELSOFT MaiLab**



Although automation of equipment is advancing, the experience and intuition of on-site workers is still greatly relied upon.

## Labor shortage

I've been doing work based on experience and intuition.



How do I hand over to the younger worker?

## Cost waste

I think I'll replace equipment parts.



They just seem to be worn out.

## Quality variation

The device settings should look like this.



Because it's cold today.

## Automating the human experience and intuition

- Making it possible to do something even when a specific person is not there.
- Preventing human error such as oversight.

- Making it possible to do something that was overlooked or not noticed.

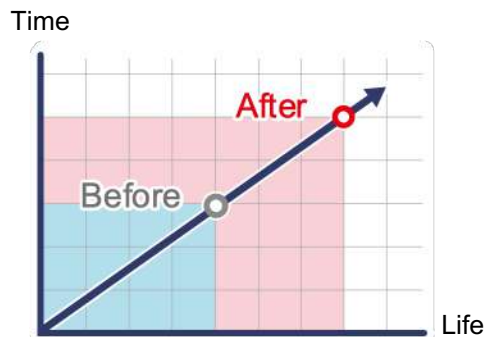
# Replacing “human experience and intuition” with **AI**

## Mitsubishi Electric’s data analysis solution **MELSOFT MaiLab**

Mitsubishi Electric’s Data Science Tool MELSOFT MaiLab is a data science tool that further improves manufacturing by replacing “human experience and intuition” with digital technology and enabling it to be easily incorporated into control systems.

### Cost reduction

Example: Judging replacement timing for consumables



### Skill succession and labor saving

Example: Taking over the knowhow of skilled workers



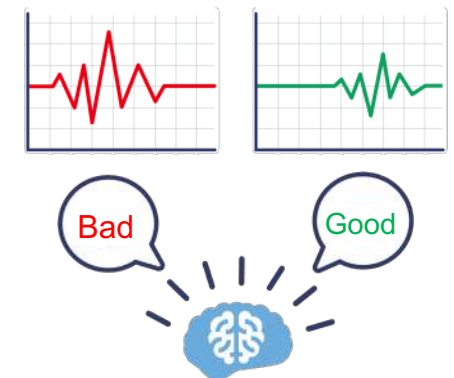
### Improved productivity

Example: Detecting problems before breakdown



### Improved quality

Example: Improving accuracy of data confirmation





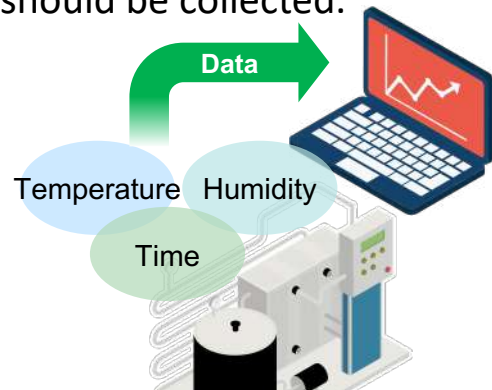
# Data analysis flow using MaiLab

Step

1

## Data preparation

Examine what data should be collected and how they should be collected.



Factor analysis of on-site issues

Selection/collection of necessary data

Step

2

## Data analysis/ diagnosis model creation

Analyze data and find potential data connections. Create the diagnosis model(AI) and verify its validity.



Analyze data trends.

Create/verify diagnosis model

Step

3

## Operation

Operate the diagnosis model (AI) in a real-time diagnosis system and verify the results.



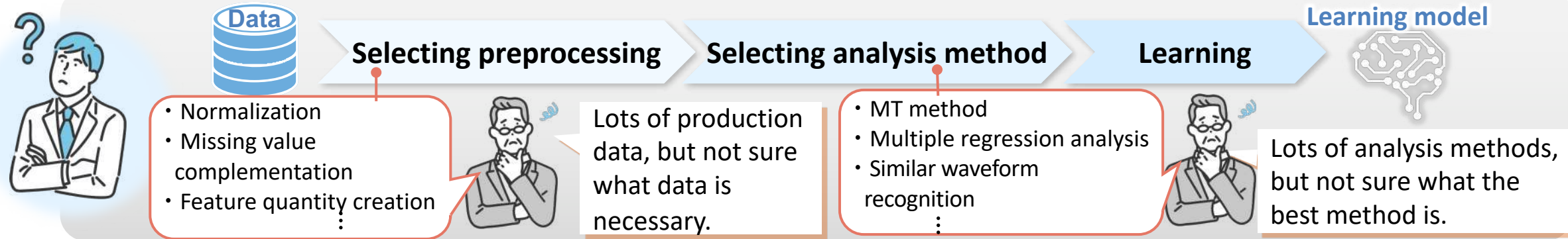
Diagnosis system operation

Verification of results

# Replace human experience and intuition with AI.

## In the Manufacturing, there is little data analysis/AI knowledge

Purchased an AI software, but lack of knowledge of data analysis makes it difficult to produce



With  **MELSOFT MaiLab**

**MaiLab solution**

**Can be used with little data analysis and AI knowledge.**



The AutoML function automatically executes from preprocessing to model creation.



Selecting preprocessing



Perform normalization.

Selecting analysis method



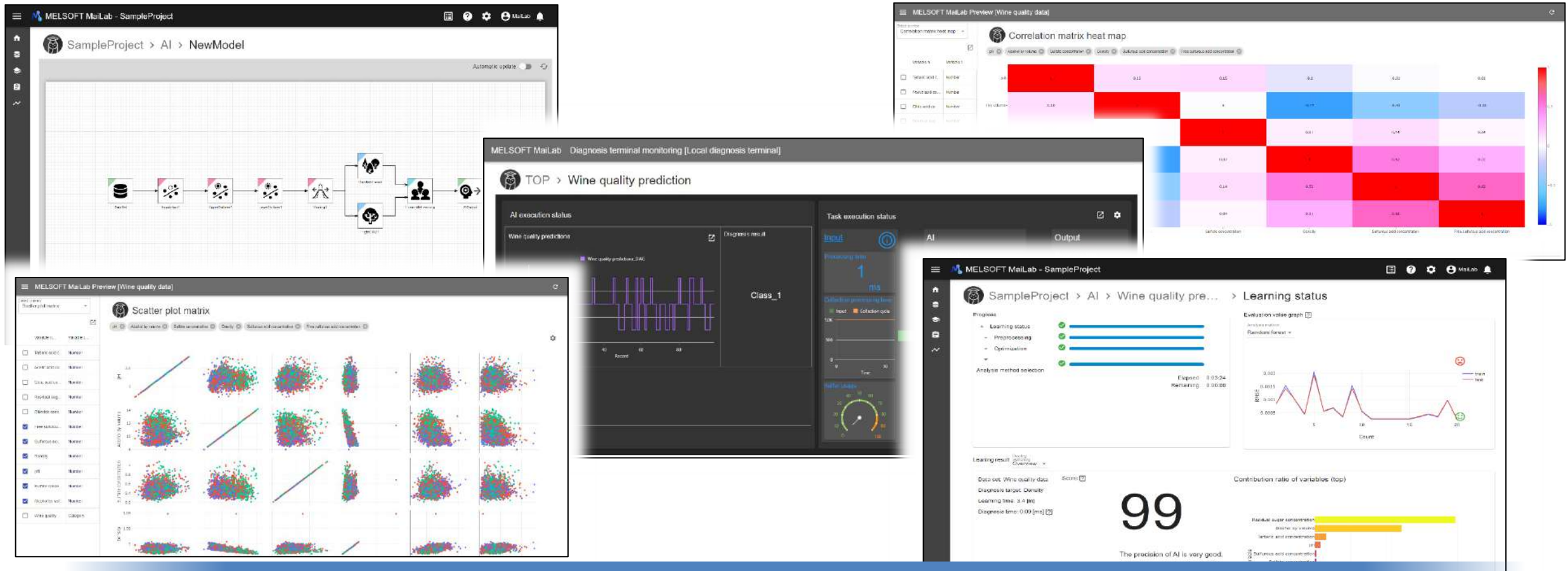
Deep Learning is the optimum method.

Learning



# In the Manufacturing, there is little data analysis/AI knowledge

Sophisticated design and extensive graph displays enable analysis



Intuitive and easy-to-understand screen display

## Easy to apply the results to equipment

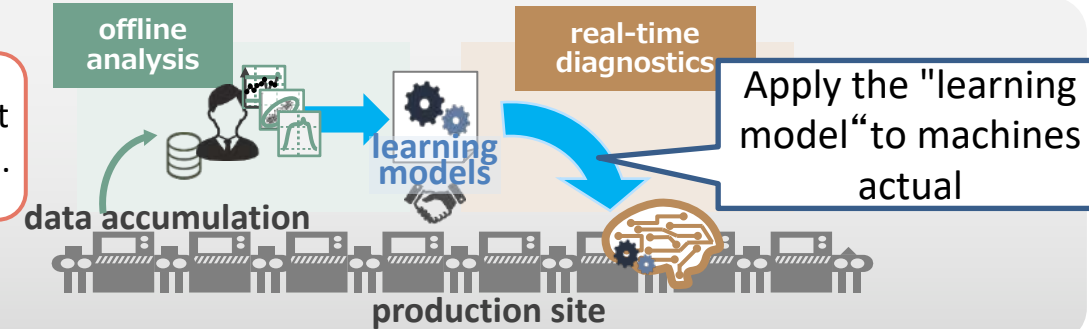
I built a learning model using AI, but I don't know how to apply this model to equipment.



How how to apply the learning model to equipment?



Want to easily connect to existing a data base.

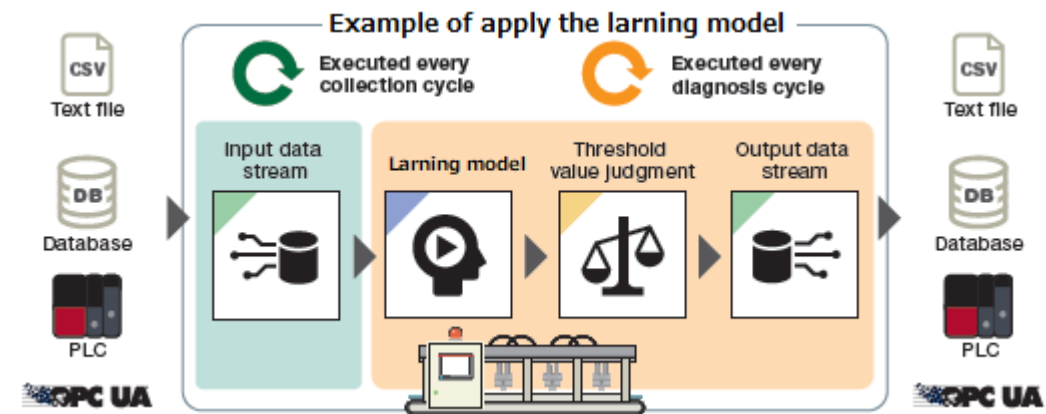
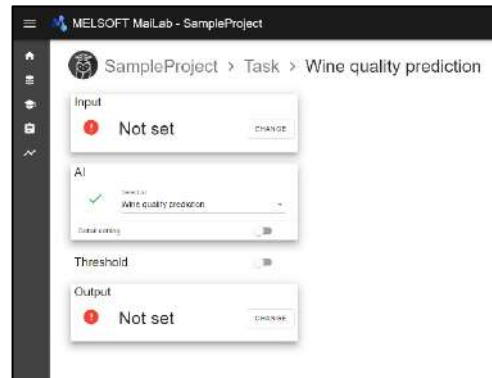


With  MELSOFT MaiLab

MaiLab solution

## Easy to apply the results to equipment

Settings of apply to equipment



## Be required to be explanatory

I know the result of AI diagnosis, but I don't know how this diagnosis came about and I can't connect it to the next action.



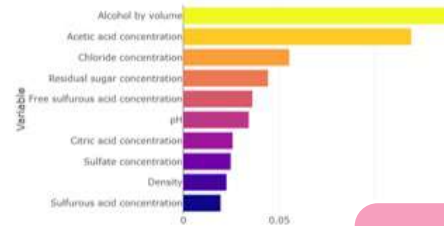
I'm going to stop this system because it's going to be abnormal, but why did the abnormality level rise?

With  MELSOFT MaiLab

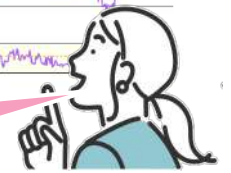
MaiLab solution

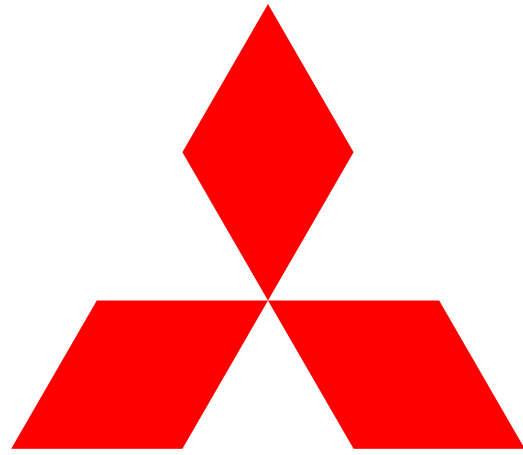
Be able to see the basis of the diagnosis (contribution of each variable) together with the results

Be able to see the basis of the diagnosis (contribution of each variable) together with the results. Get tips can be obtained for changing settings with high impact or investigating the cause of NG.



AI becomes more explanatory and leads to actions to improve production!





**MITSUBISHI  
ELECTRIC**

*Changes for the Better*