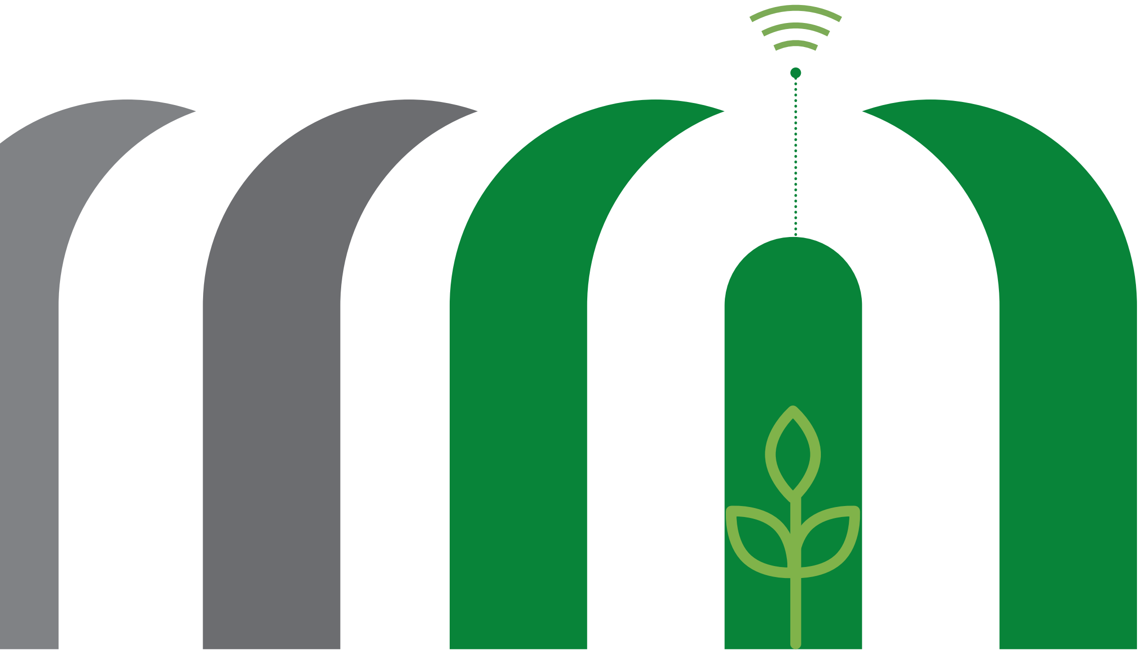
English

MAAS

(Market-as-a-Service)

UI Solution



MAASFARM

Company Profile

CEO Greeting

Existing protected horticulture has been carried out since 30 years ago from the perspective of control management system in independent greenhouses, however, in recent years, protected horticulture is changing into controlling protected horticulture subject to the perspective of crop activity analysis solution and from a simple perspective of adjusting and controlling the environment in protected horticulture facilities (temperature, humidity, CO_2) to cultivation method that analyzes crop activities in environment control standards. From this, pheno-type and geno-type cultivation methods are mentioned.

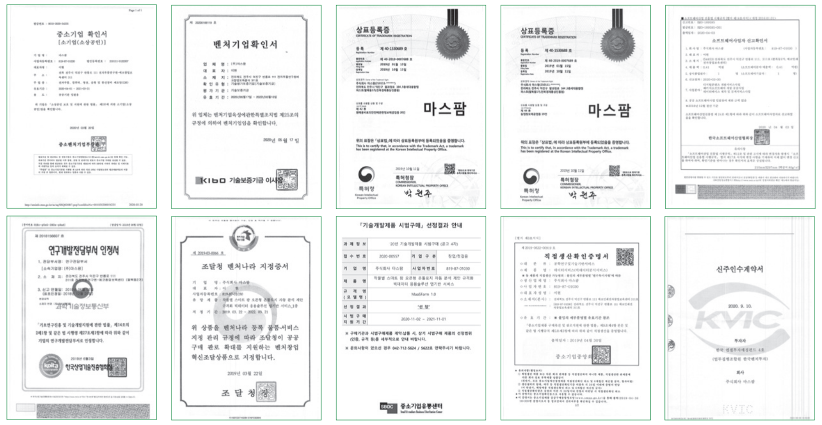
In addition, due to environmental regulations such as CO_2 restrictions, data-based cultivation methods are becoming an issue. The place where this is most actively reflected is Europe.

High value-added crops such as paprika-tomato and vegetables will be the target market, and application to protected horticulture for high value-added crops will become our target market.

Apart from the existing cultivation perspectives, 3rd generation smart farms seek to form big data from integration of distribution, processing, and promotion data to provide one-stop solution for business model services from cultivation, sales, and processing.

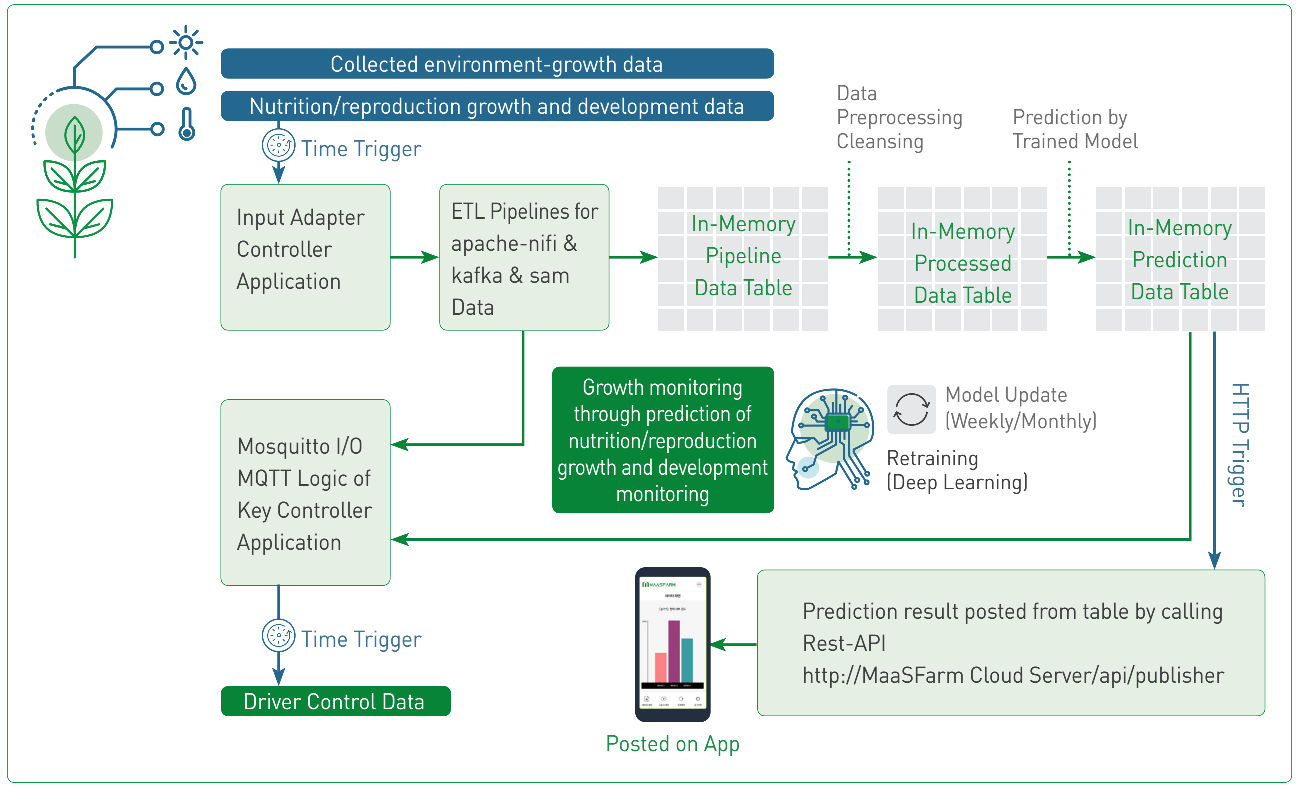
Motivated by perspectives above, we started providing 3rd generation smart farms and cloud platform-based growth analysis and environment control solution and app service for fruit and vegetables, crops and protected horticulture, and from 2020, we started providing first UI service business model that offers intelligent data services for protected horticulture driver control services and distribution price proposal services using cultivation logic of database application solution which applies machine learning via modelling based on optimal tomato production prediction and environmental control model after collection-storage-processing. These UI services will be permanently developed and at the same time new crops will be added.

Certification



About MAASFARM

MAASFARM is a company specializing in provision of environment, growth, farm, control, and management data to smart protected horticulture farms optimized through database application solution based on integrated Apache Hadoop DB platform by organizing consortium-shared platform with internet of-things (IoT) for optimization of smart farms.


Collected environment-growth data
Nutrition/reproduction growth and development data
Time Trigger
Input Adapter Controller Application
ETL Pipelines for apache-nifi & kafka & sam Data
In-Memory Pipeline Data Table
Data Preprocessing Cleansing
In-Memory Processed Data Table
Prediction by Trained Model
In-Memory Prediction Data Table
HTTP Trigger
Growth monitoring through prediction of nutrition/reproduction growth and development monitoring
Model Update (Weekly/Monthly)
Retraining (Deep Learning)
Mosquitto I/O MQTT Logic of Key Controller Application
Time Trigger
Driver Control Data
Posted on App
Prediction result posted from table by calling Rest-API
http://MaaSFarm Cloud Server/api/publisher

MAAS(Market-as-a-Service) **MAASFARM**(Private Cloud Platform)

Company History

2017

12 - Signed agreement with Generation-Convergence Startup Campus, a startup support business by Ministry of SMEs and Startups

01 - Established a private company, MAAS Consulting

03 - Constructed automatic environment growth data processing platform and growth analysis solution for smart farms with vegetable and crop specification services

05 - Released app service for growth analysis kit for smart protected horticulture farms with fruit, vegetable, and crop specification services in Google Play Store

- Acquired venture business confirmation from Korea SMEs and Startups Agency

2018

- Filed patent
- Incorporated as MAASFARM Co., Ltd.

06 - Successfully performed Generation-Convergence Startup Campus, a startup support business by Ministry of SMEs and Startups

10 - Signed Innopolis agreement with Ministry of Science and ICT

12 - Established research department

- Participated in 1st Future Intellectual Smart Farm and City Exhibition

01 - Filed trademark for MAASFARM

- Added business types: Software development (ICT for farming), construction of data processing system for farming (ICT)

03 - Registered as a supplier for K-Data voucher support business by Ministry of Science and Technology

- Attracted KRW 200 million policy fund loan from Korea Technology Finance Corporation

04 - Relocated business and factory: moved into Korea Electronics Technology Institute Eco Business Incubation Center at Jeonbuk Innopolis

- Designated as an innovative procurement goods by Public Procurement Service – Venture Nara
- Registered direct production certificate (factory)

05 - Smart farm registered as beneficiary company of Gimje Innovation Valley

06 - Successfully performed Innopolis business with Ministry of Science and ICT

2019

07 - Short listed for trial purchase of technology development product by Small and Medium Business Distribution Center

- Signed agreements on data voucher support with Ministry of Science and ICT and on product supply with National Information Society Agency

08 - Established Open Lab in Jeonbuk Agriculture and Life SW Integrated Cluster Korea Electronics Technology Institute (Paprika Farm in Jeonbuk Agriculture Technology Institute)

- Signed agreement to install test beds and commenced data collection
- Launched and installed environment data collector and gateway for protected fruit, vegetable, and crop horticulture farm

09 - Successfully performed Jeonbuk University LINIC+ assignment

10 - Participated in the 5th Jeonbuk Agriculture and Life SW Integration Fair and International Exchange Event

12 - Submitted successful performance report with K—Data for Ministry of Science and ICT data voucher support business

- Capital increase by KRW 140 Million

04 - Exhibited in Venture Procurement Section, Procurement Market Expo

- Signed foreign branch agreement with Korea Trade-Investment Promotion Agency – Copenhagen, Denmark

05 - Signed agreement for 2020 Agricultural and Food Venture Incubation Support Business with Foundation of Agricultural Technology Commercialization and Transfer

- Acquired venture business confirmation through Technology Evaluation Guarantee Company project by Korea Technology Finance Corporation

2020

06 - Signed agreements on 2020 Production Innovation Voucher Support Business with Korea SMEs and Startups Agency

07 - Signed agreements on Agricultural and Food RnD Plan Support (IP Plan) Business with Foundation of Agricultural Technology Commercialization and Transfer

08 - Signed agreement on construction of innovative smart agriculture and life system industry hub by linking with transferred public institutions

09 - Successfully attracted startup matching fund investment from Korea Venture Investment Corp

Solution

MAAS(Market-as-a-Service) UI Solution 1.0

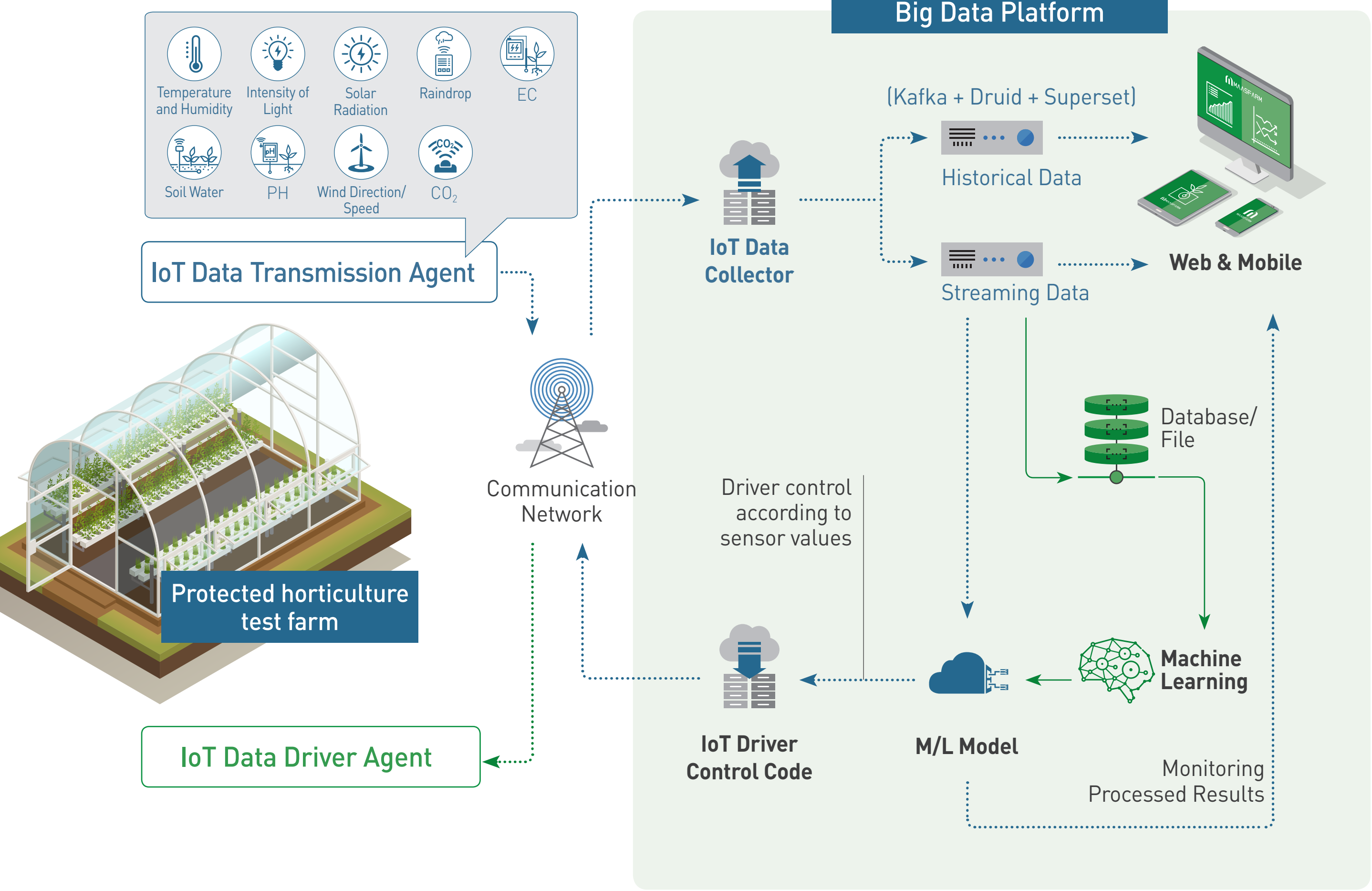
MAAS
(Market-as-a-Service)
UI Solution 1.0
MAASFARM

Growth analysis solution software and app service for smart protected horticulture farms with fruit, vegetable, and crop specification service

Cloud platform-based crop activity, growth and prediction analysis for cultivation logic and controller environment control solution for specialized UI intelligent data service including optimum production.
(Crop activity, distribution pricing, controller monitoring, composite controller controlling and price proposal management system)

1. 1st step : Automatic analysis and proposal by data specification monitoring applied solution which collates, stores and processes data collected by ICT collection package (all-in-one gateway comprising of wireless LTE router and sensors) installed in protected fruit horticulture in smart greenhouses
2. 2nd step: Provides harvest quality through crop specification service solution that analyzes prediction and controls drivers by utilizing AI deep learning and cultivation logic controller technology
3. Management system for distribution price provision and proposal solution

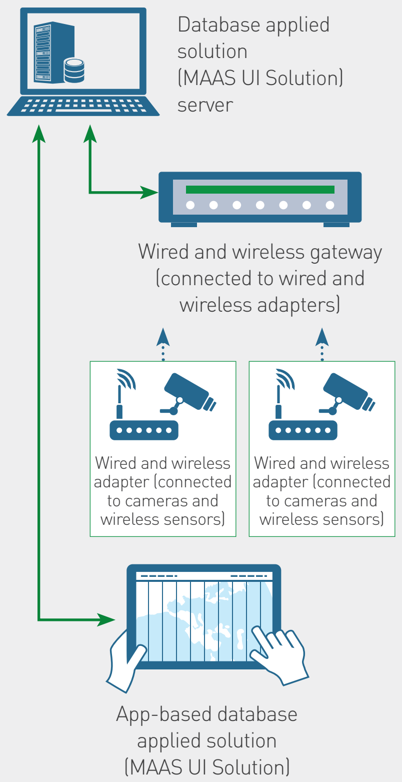
Protected horticulture /outdoor crop cultivation environment measurement


Temperature and Humidity
Intensity of Light
Solar Radiation
Raindrop
EC
Soil Water
PH
Wind Direction/ Speed
CO₂
IoT Data Transmission Agent
Protected horticulture test farm
IoT Data Driver Agent
Communication Network
Big Data Platform
(Kafka + Druid + Superset)
IoT Data Collector
Historical Data
Streaming Data
Web & Mobile
Database/ File
Driver control according to sensor values
IoT Driver Control Code
M/L Model
Machine Learning
Monitoring Processed Results

Strengths

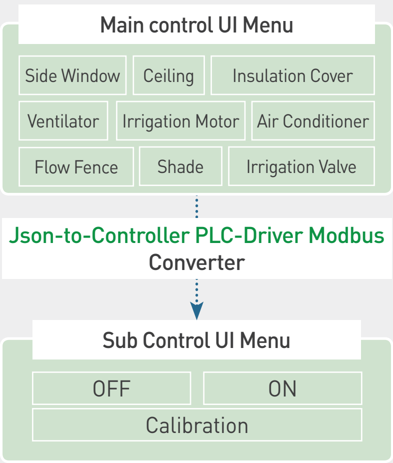
1 Linked to AIoT System

AI Cloud Platform Crop Activity Analysis Solution
+ IoT Gateway / LTE Internet Router
+ Sensor IoT / Driver IoT and Composite Driver IoT


Database applied solution (MAAS UI Solution) server
Wired and wireless gateway (connected to wired and wireless adapters)
Wired and wireless adapter (connected to cameras and wireless sensors)
Wired and wireless adapter (connected to cameras and wireless sensors)
App-based database applied solution (MAAS UI Solution)

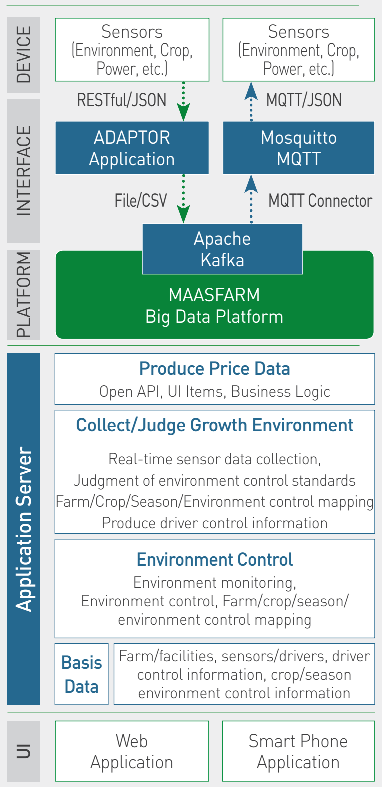
2 KS Standard Based Driver Control

Modbus format data conversion controller using daemon server to convert controller key value from server to controller after Json app service information


Main control UI Menu
Side Window
Ceiling
Insulation Cover
Ventilator
Irrigation Motor
Air Conditioner
Flow Fence
Shade
Irrigation Valve
Json-to-Controller PLC-Driver Modbus Converter
Sub Control UI Menu
OFF
ON
Calibration

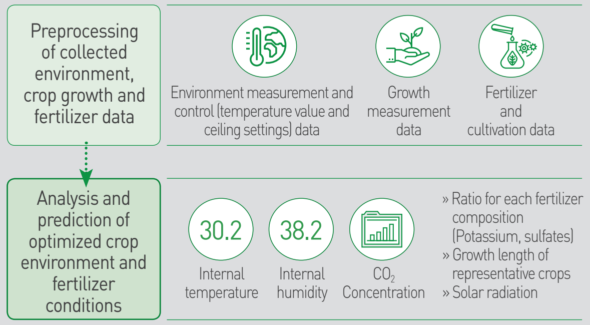
3 UI Platform and DB Applications

System diagram that adds application server for real-time data collection and processing by reflecting IoT driver control on smart protected horticulture farm platform


DEVICE
INTERFACE
PLATFORM
Application Server
UI
Sensors (Environment, Crop, Power, etc.)
Sensors (Environment, Crop, Power, etc.)
RESTful/JSON
MQTT/JSON
ADAPTOR Application
Mosquitto MQTT
File/CSV
MQTT Connector
Apache Kafka
MAASFARM Big Data Platform
Produce Price Data
Open API, UI Items, Business Logic
Collect/Judge Growth Environment
Real-time sensor data collection, Judgment of environment control standards Farm/Crop/Season/Environment control mapping Produce driver control information
Environment Control
Environment monitoring, Environment control, Farm/crop/season/ environment control mapping
Basis Data
Farm/facilities, sensors/drivers, driver control information, crop/season environment control information
Web Application
Smart Phone Application

4 Many Years of Experience

Analyze optimized cultivation environment / fertilizer conditions through preprocessing of collected data


Preprocessing of collected environment, crop growth and fertilizer data
Environment measurement and control (temperature value and ceiling settings) data
Growth measurement data
Fertilizer and cultivation data
Analysis and prediction of optimized crop environment and fertilizer conditions
30.2
Internal temperature
38.2
Internal humidity
CO₂ Concentration
» Ratio for each fertilizer composition (Potassium, sulfates)
» Growth length of representative crops
» Solar radiation

5 Rich Test Bed

Established Open Nature Lab test bed within Fruit and Vegetable Research Lab

Target Market

Mature Tomato

Android/App store app-based AI big data (deep machine learning analysis) application service

Cherry Tomato	Supports app store version + combined channels in Denmark, Japan, Canada and local governments
Paprika	Supports app store version + B2B channels in China, Russia and Australia and combined channels in local governments
Strawberry	Supports app store version + B2B channels in the US, Malaysia and the Netherlands and combined channels in local governments

Business Promotion Plan

Process Improvement

- Data Specification Monitoring Solution
- Collect-Convert Controller
- Prediction-Analysis Controller
- Device-Control Cultivation-Logic Controller

UI cultivation logic for optimal production yield prediction	UI cultivation logic for supply and demand stabilization prediction	UI cultivation logic for meteorological prediction for each season	UI cultivation logic for uniform size specification prediction	UI cultivation logic for optimal sweetness prediction	UI cultivation logic for growth abnormality evaluation prediction

Structured Data Analysis

Management & Analysis

Apache Ambari　Apache Zeppelin　Apache Superset

Work Flow　|　Apache Spark　TensorFlow

Apache Kafka A distributed streaming platform　Apache STORM　nifi　STREAMING ANALYTICS MANAGER　|　druid

YARN : Data Operation System

Hadoop Distributed File System

Profit Model

Big data type market
B2B

Entry level market
B2C / B2G

- » AI Big Data Analysis
- » Automatic Processing
- » Pipeline

+

- » Wireless Gateway
- » Environment-Growth Sensor
- » Camera
- » IoT Service

Smart farm AI big data application Services by each crop

Improve quality of life in farms (Improvement in existing small greenhouses at low cost)

Simple Smart Farm

Provide standardized yield services (Standardized markets requesting uniform sized crops, such as school meals)

Big Data Type Smart Farm

Business Case

[Optimized mature tomato production]

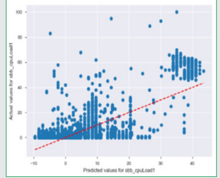
Data Modelling Process

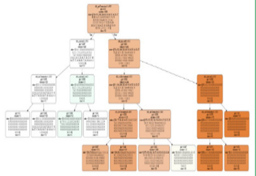
Process of producing environment control standards and yield prediction models through analysis of Rural Development Administration data

- Apprehend RDA data status
- Correct and analyze handwritten data
- Select outstanding farm
- Standard environment control model Yield prediction model

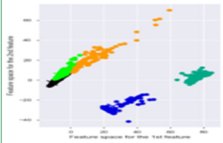
Prediction algorithm

Statistics-based supervised learning regression algorithm

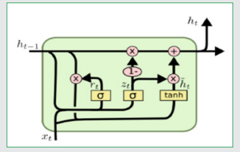




Statistics-based non-supervised learning algorithm

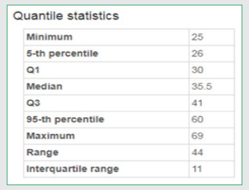


Neural network-based supervised learning RNN(LSTM) algorithm



Feature Engineering

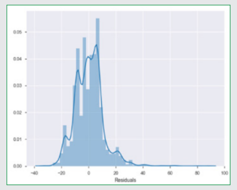
Feature statistics info



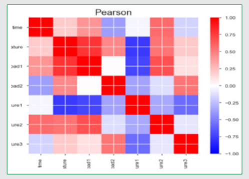
Quantile statistics

Minimum	25
5-th percentile	26
Q1	30
Median	35.5
Q3	41
95-th percentile	60
Maximum	69
Range	44
Interquartile range	11

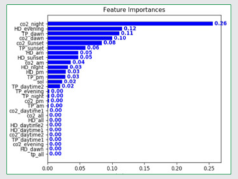
Feature history



Feature correlations

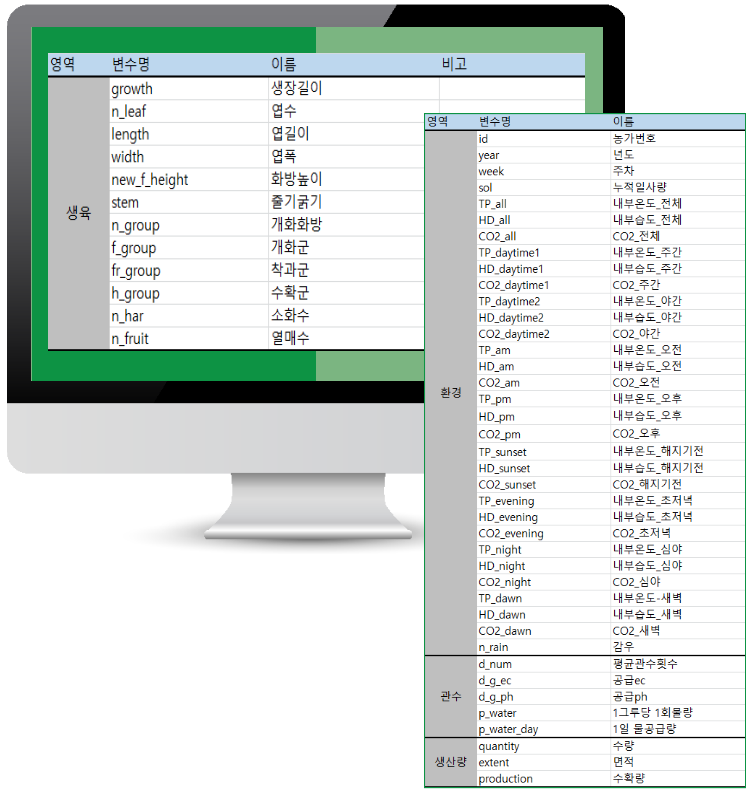


Feature improtance



Contracted to transfer RDA handwritten data

Handwritten collected data in 69 farms from Jeonnam, Jeonbuk and Gyeongbuk in 2016-2018.



영역	변수명	이름	비고
생육	growth	생장길이	
	n_leaf	엽수	
	length	엽길이	
	width	엽폭	
	new_f_height	화방높이	
	stem	줄기굵기	
	n_group	개화화방	
	f_group	개화군	
	fr_group	착과군	
	h_group	수확군	
	n_har	소화수	
	n_fruit	열매수	

영역	변수명	이름
환경	id	농가번호
	year	년도
	week	주차
	sol	누적일사량
	TP_all	내부온도_전체
	HD_all	내부습도_전체
	CO2_all	CO2_전체
	TP_daytime1	내부온도_주간
	HD_daytime1	내부습도_주간
	CO2_daytime1	CO2_주간
	TP_daytime2	내부온도_야간
	HD_daytime2	내부습도_야간
	CO2_daytime2	CO2_야간
	TP_am	내부온도_오전
	HD_am	내부습도_오전
	CO2_am	CO2_오전
	TP_pm	내부온도_오후
	HD_pm	내부습도_오후
	CO2_pm	CO2_오후
	TP_sunset	내부온도_해지기전
	HD_sunset	내부습도_해지기전
	CO2_sunset	CO2_해지기전
	TP_evening	내부온도_초저녁
	HD_evening	내부습도_초저녁
	CO2_evening	CO2_초저녁
	TP_night	내부온도_심야
	HD_night	내부습도_심야
	CO2_night	CO2_심야
	TP_dawn	내부온도-새벽
	HD_dawn	내부습도_새벽
	CO2_dawn	CO2_새벽
	n_rain	감우
관수	d_num	평균관수횟수
	d_g_ec	공급ec
	d_g_ph	공급ph
	p_water	1그루당 1회물량
	p_water_day	1일 물공급량
생산량	quantity	수량
	extent	면적
	production	수확량

Intelligent data service model for optimized mature tomato production

Period		Average value
Middle of growth in 1-year growth stage (Nov~Dec)	Max. Production (kg/3.3mxm/week)	7.7
	Average Production (kg/3.3mxm/week)	2.7
	Average No. of weeks	7
Average number of harvesting weeks per year		40
Reasonable growth proposal	Length(cm)	Provide seasonal model after signing contract (membership registration)
	Stem thickness(mm)	
	Flower cluster height(cm)	
Setting environment control standards for maximum production	Accumulated solar radiation (J/cm^2)	
	Average daily temperature	
	Average weekly temperature	
	Average night temperature	
	Average day humidity (%)	
	No. of irrigations per day	
	Water quantity per supply (cc/day/plant)	
	Saline concentration(ds/m)	
	pH concentration	

MAASFARM

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