

Strategy of STEAM EDU with AI

TARKUSTECH INNOVATIONS

- Motivate K to K-12 students to learn programming and AI-IoT
- Improving of STEAM education

Computer Science & Design Thinking

Programming Profession

Logics and Algorithm

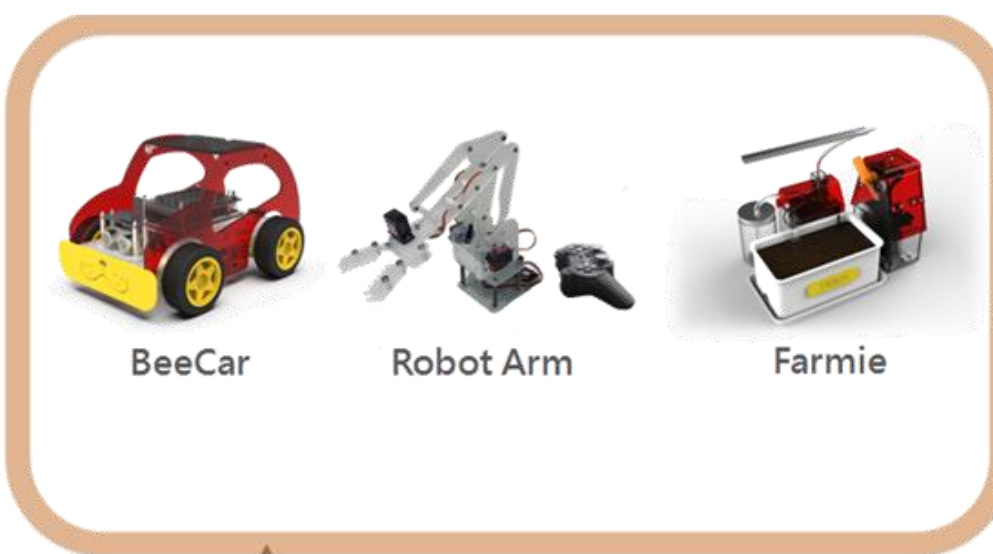
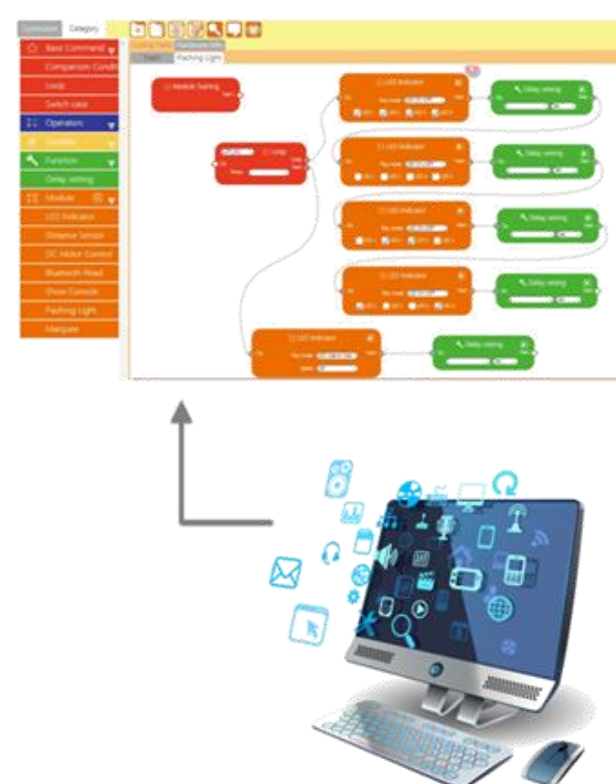
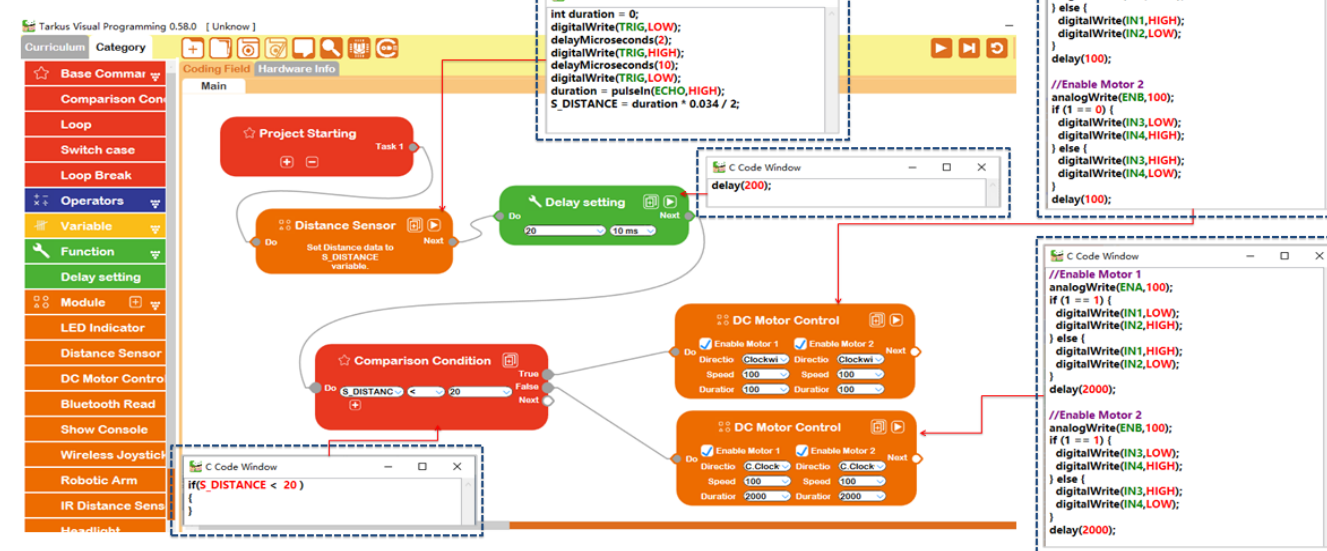
Program syntax

優勢

拓可思的特色

把程式碼放進思考流程

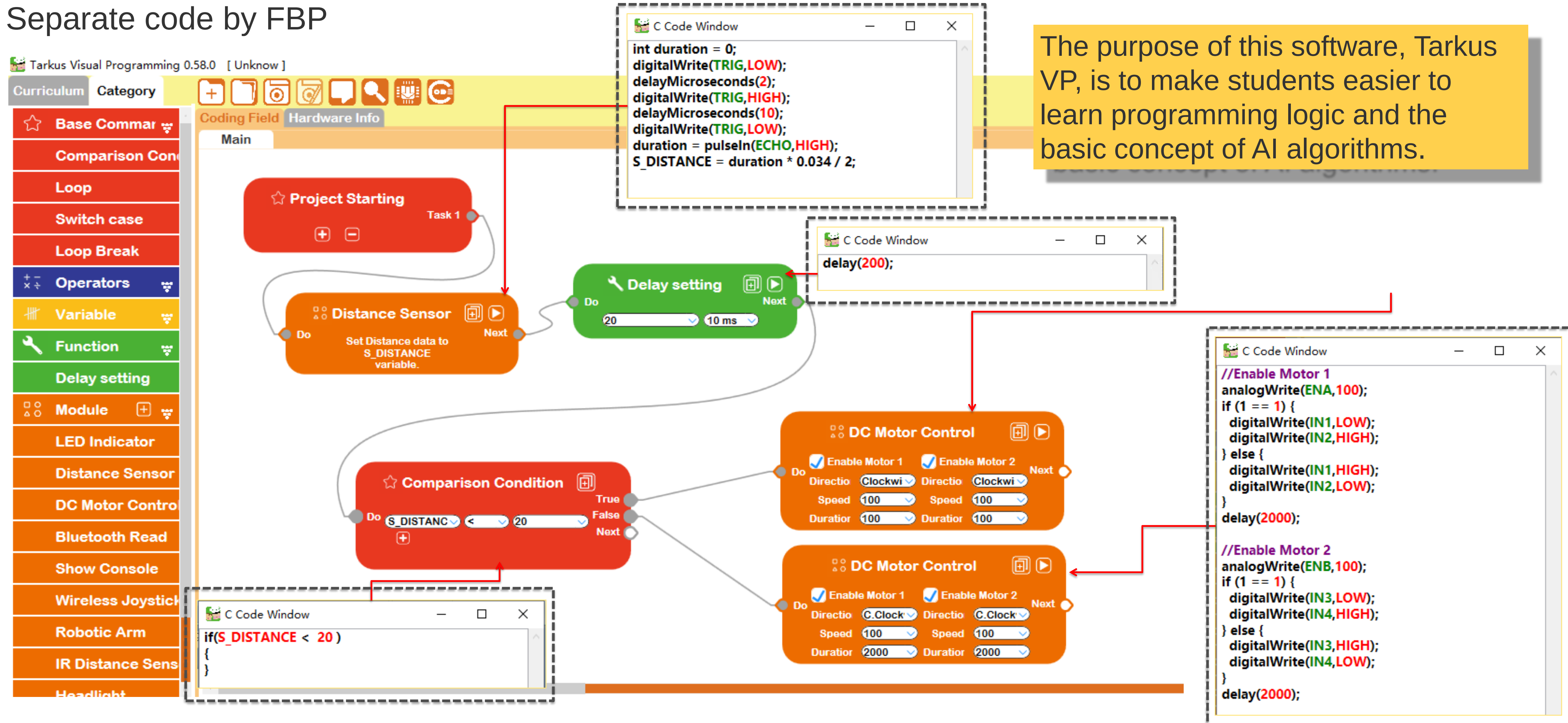
```
LED_control
const int led[] = {3,9,10,11};
int varNums;
int ledNums;
const int brightness[16][4] = {
  {250, 0, 0, 0},
  {100,250, 0, 0},
  { 50,100,250, 0},
  { 5, 50,100,250},
  { 0, 5, 50,100},
  { 0, 0, 5, 50},
  { 0, 0, 0, 5},
  { 0, 0, 0, 0},
  { 0, 0, 0,250},
  { 0, 0,250,100},
  { 0,250,100, 50},
  { 0,250, 50, 10},
  { 0,250, 10, 5},
  { 0,250, 5, 2},
  { 0,250, 2, 1},
  { 0,250, 1, 0}
};
```



● Realize the Flow-base concept

Use Flow Chart to Start Coding
Separate code by FBP

The purpose of this software, Tarkus VP, is to make students easier to learn programming logic and the basic concept of AI algorithms.



● Partners & Consultants



Dr. Fu-Yuan Chiu
National Tsing Hua University
Department of Education and Learning Technology



Joint Innovation Center
Startup Terrace

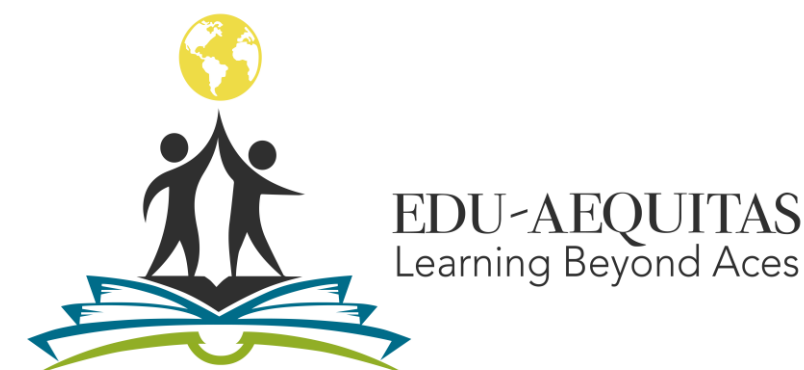


台灣科技大學迷你教育研究團隊



國立清華大學教育服務團隊

MAKERPRO
自造達人社群/媒體/平台



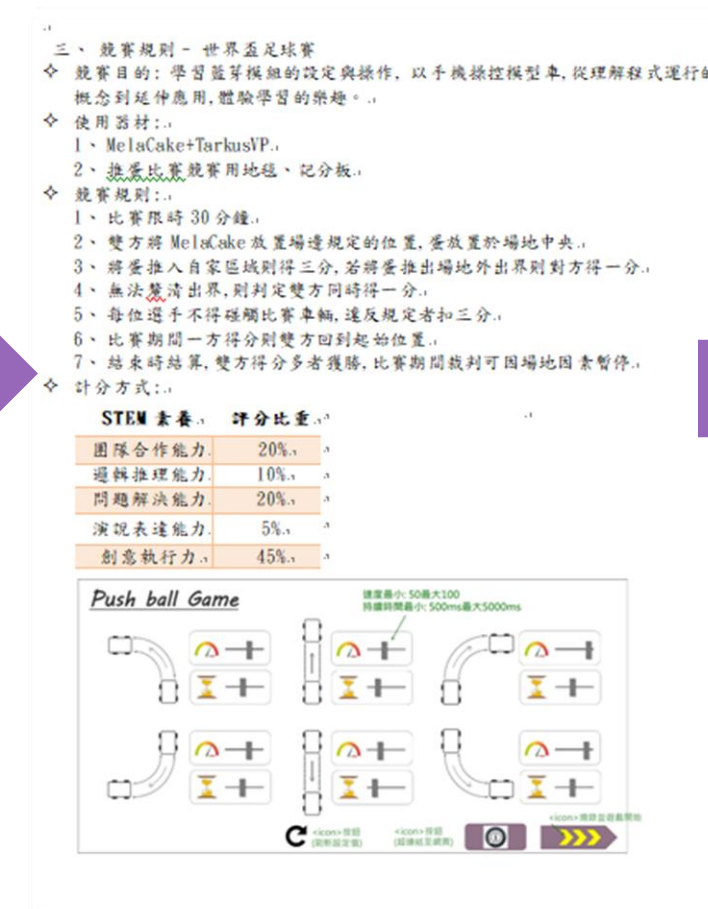
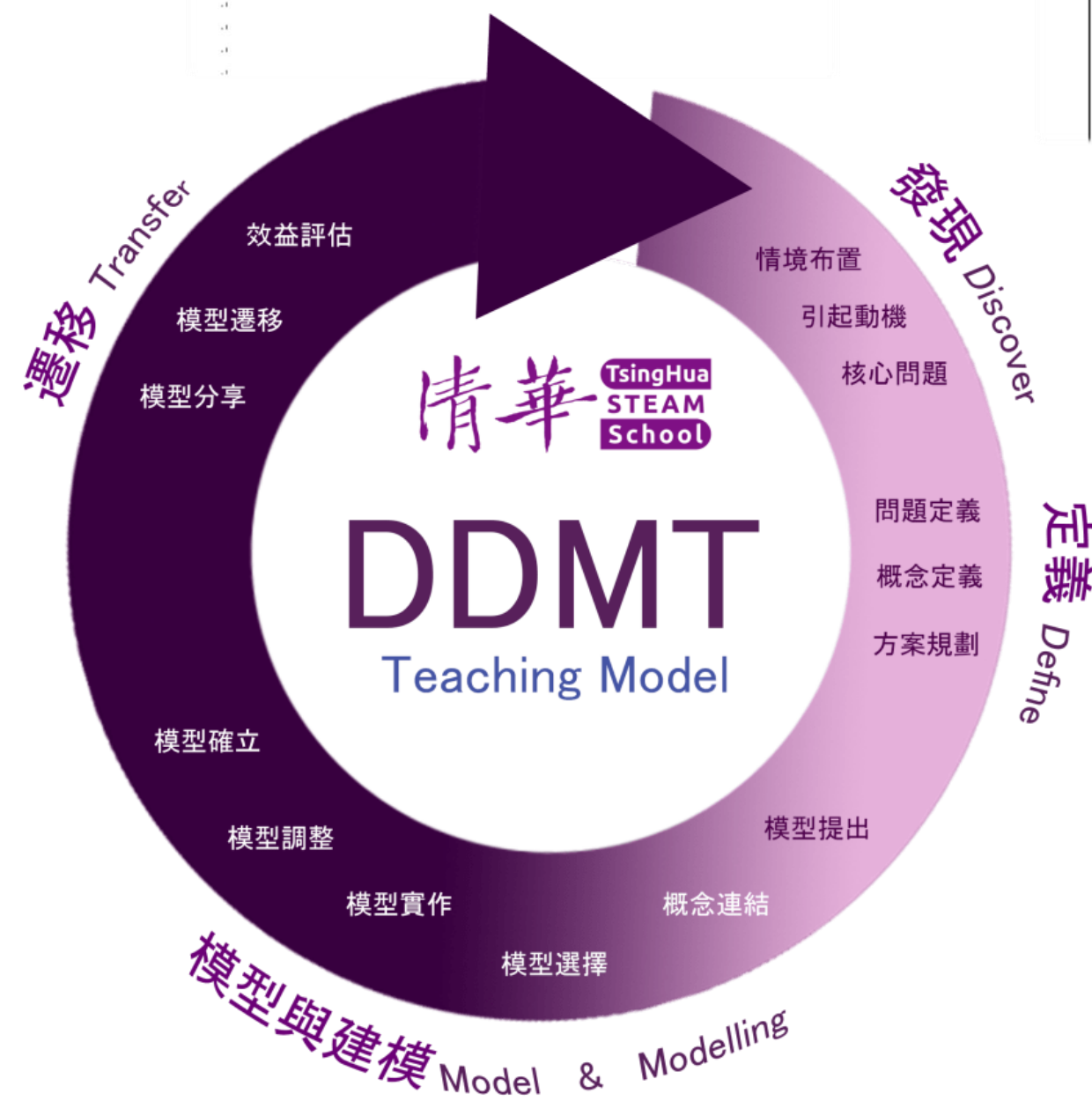
Prof. Huei-Tse Hou
National Taiwan University of Science and Technology
Graduate Institute of Applied Science and Technology

● DDMT & EA-Tsing Hua STEAM certificate

Story of task



Flow of Thinking

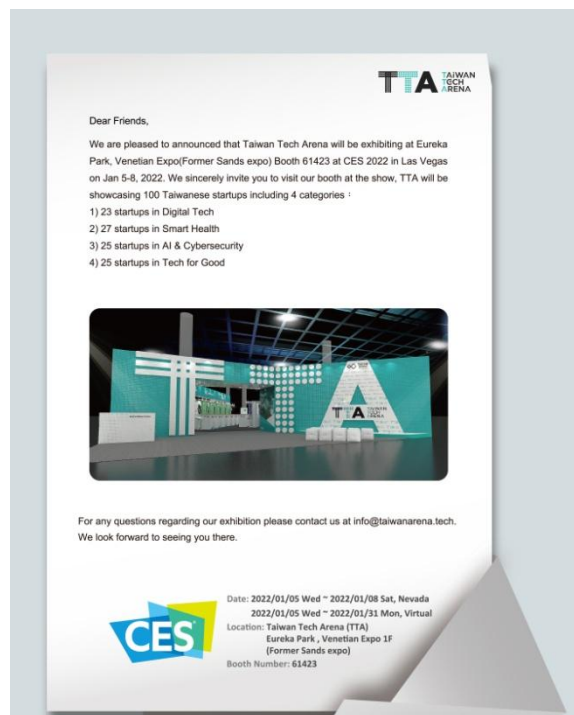


Tasks and Gaming

Feedback & Critical thinking



● Global Awards and Workshops



2022 US CES
new product: Farmie



Amazon
AWSJIC



2021 Holon IQ
TAIWAN EDTECH 50



Finalist of
2021 Intel DevCup

經濟部 2020/2021 APICTA Awards 亞太資訊科技聯盟大賽

2020/2021 APICTA Awards 臺灣代表隊名單(企業組)

● 主類別(Head Categories)入選名單

共 28 家企業

類別	件數	企業	產品
HC-C (Consumer) 消費者端應用	2	Hyggepower Technology Ltd. 宇能科技股份有限公司	Energy Optimizer AI 智慧電管家
		25sprout 新芽網路股份有限公司	SurveyCake 企業級雲端問卷服務
		Unilgym Co., Ltd. 優力勁聯股份有限公司	AI Interactive fitness service 互動體感健身
		Green Hope Spring CO., Ltd. 綠色冀泉股份有限公司	Plant trees to protect the earth and kids football 以樹養球(地球&幼兒足球)
		Airbender Co., Inc. 優質健康股份有限公司	ChiWavez BioEnergy Pain Alleviation Device 氣宗生物能量疼痛舒緩儀
		Tarkustech Innovations Co., Ltd. 拓可思科技研發股份有限公司	TarkusVP 顯示螢幕之圖形化使用者介面
HC-ICS (Inclusions & Community Services) 社群服務	7		Botan Life (natural straws six-grade industry)

2021 APICTA Awards
Taiwan Finalist



Partnership with iii
to join Worlddidac 2021



Partnership with Hong Kong HKEDA institution:
workshops with Education Bureau
contest for 4+ schools

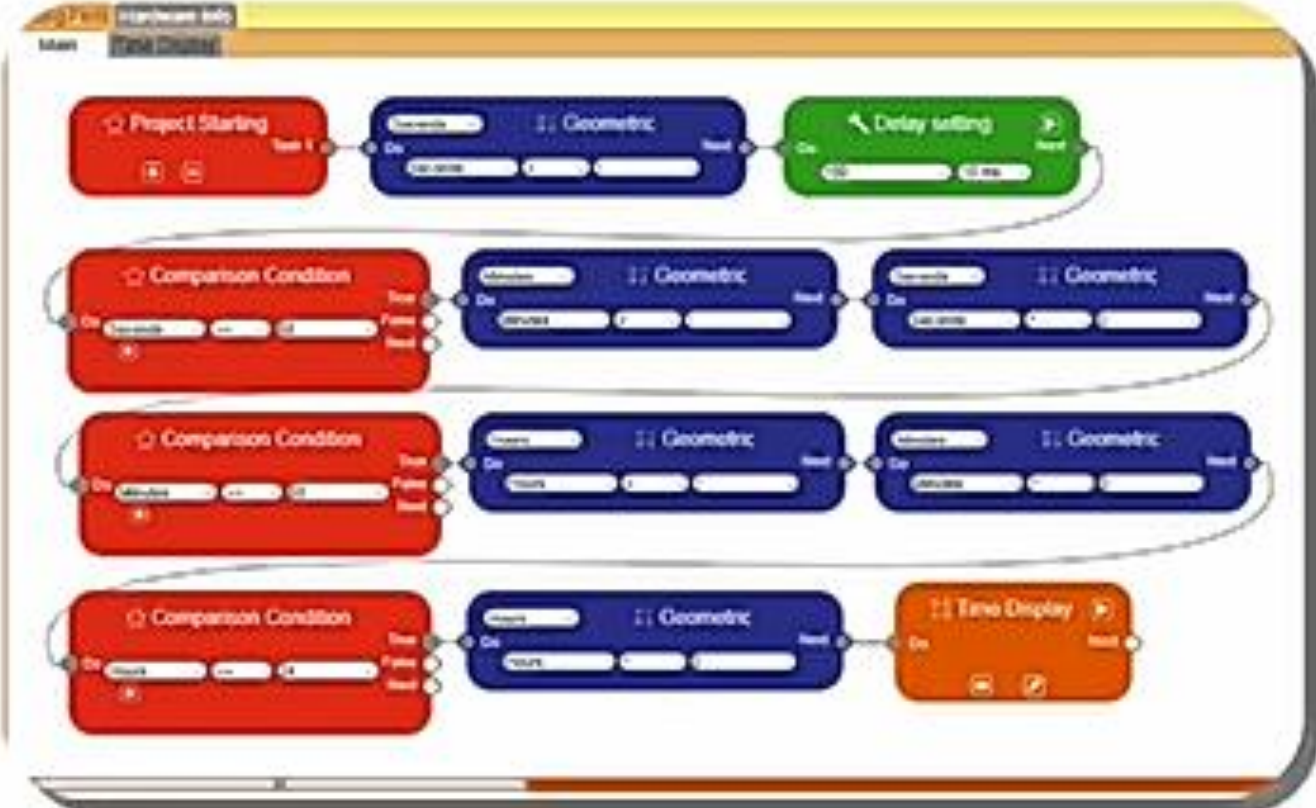


Video

Tarkustech Introduction

TTA TAIWAN TECH ARENA

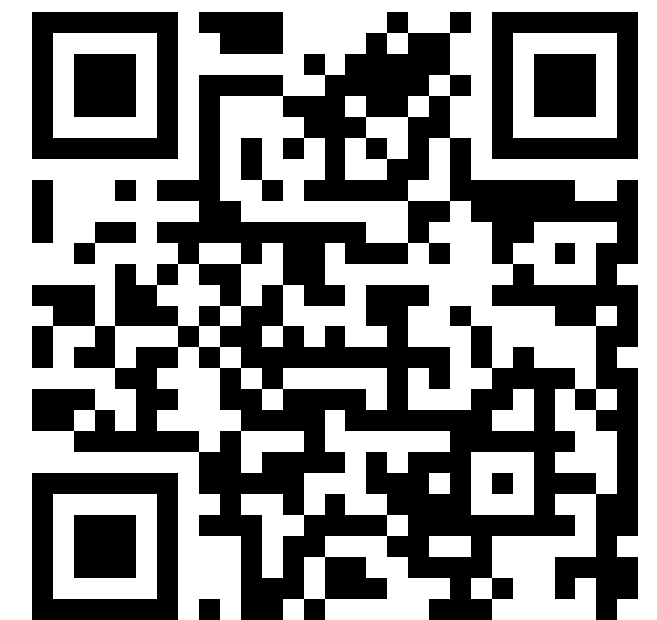
- Tarkus Visual Programming – TarkusVP



2

TARKUS

Tarkustech Innovations Co/ CEO
Claire Kao



<https://youtu.be/NQzMS9YfH9E>

VALUE PROPOSITION

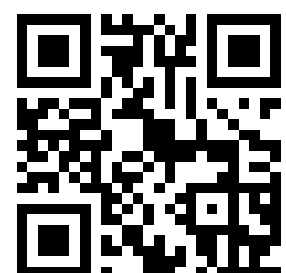
- Curriculum Goal : Coding for A.I. from beginner to be a programmer

WHY US

1. Use the intuitive interface to learn the fundamental of programming
2. Learning map link to A.I. and IoT, it benefits on future career conducting
3. Curriculum topics connect to AIoT life applications and link to future life

● STEAM Learning Map – Future level & Link to AIoT

Level	Age	Learning Target	Main Field	STEAM Theme Stage A	STEAM /Theme Stage B	STEAM /Theme Stage C
Level 9	16~18	AI: Deep Learning Practice	Deep Learning	Numpy	Pandas	TensorFlow
Level 8		ICT & AIoT Advanced applications	Edge AI	Pixetto	Pixy2 CMUcam5	Intel OpenVino
Level 7			Object Detection	Teachable Machine + ESP32 Cloud AI recognition		Intel DevCloud
Level 6			Algorithms	Algorithms	Data Structures	Data Analysis
Level 5	15~17	Computer Science	ICT Basic	C++	VBA/C#	Python
Level 4	13~15	Academic Subjects	Electro-Mechanism	BeeCar MakerVer	Robotic Arm MakerVer	ESP32 Basics
Level 3	11~13	TarkusVP to Arduino	TarkusVP to Arduino	BeeCar/Arduino	Robotic Arm/Arduino	Smart farm/Python
Level 2	9~11	STEAM & Coding Robotic foundations	TarkusVP	BeeCar/TarkusVP	Robotic Arm/TarkusVP	Smart Farm/TarkusVP
Level 1	7~9		Scratch to TarkusVP	Scratch & BeeCar	Scratch & Robotic Arm	Scratch & Smart Farm
Level 0	5~7		Coding Logics	Papago board games	CuPia Blocks	3D Pens



Tarkustech Innovations



Video

Farmie introduction



Since 2020.4.20 @ 資策會

<https://youtu.be/kfcy8VQTzsA>

Interface

Hardware Control Modules



Power Board

Fans
Water pump
USB planting light
Battery

Sensor Board

T/H Sensor dht11
Soil Humidity
Light Sensor
Rain Drop Sensor
RGB Indicator LED
Buzzer



Basic Modules on Software

RGB Indicator

Buzzer

Fan

Water pump

Planting light

Temp/Humid Read

Soil Humid Read

Light Sensing

Rain Drop Sensing

New modules for Machine Learning

Website cloud dashboard

Read data via Wifi

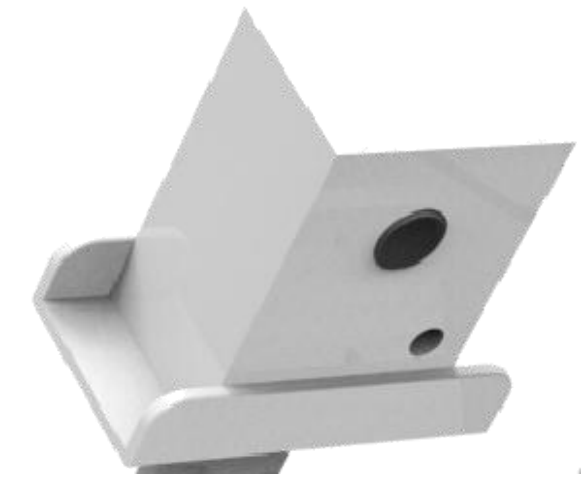
Capturing pictures

Data storage

Clock Timer

Export data WiFi

Battery & Power



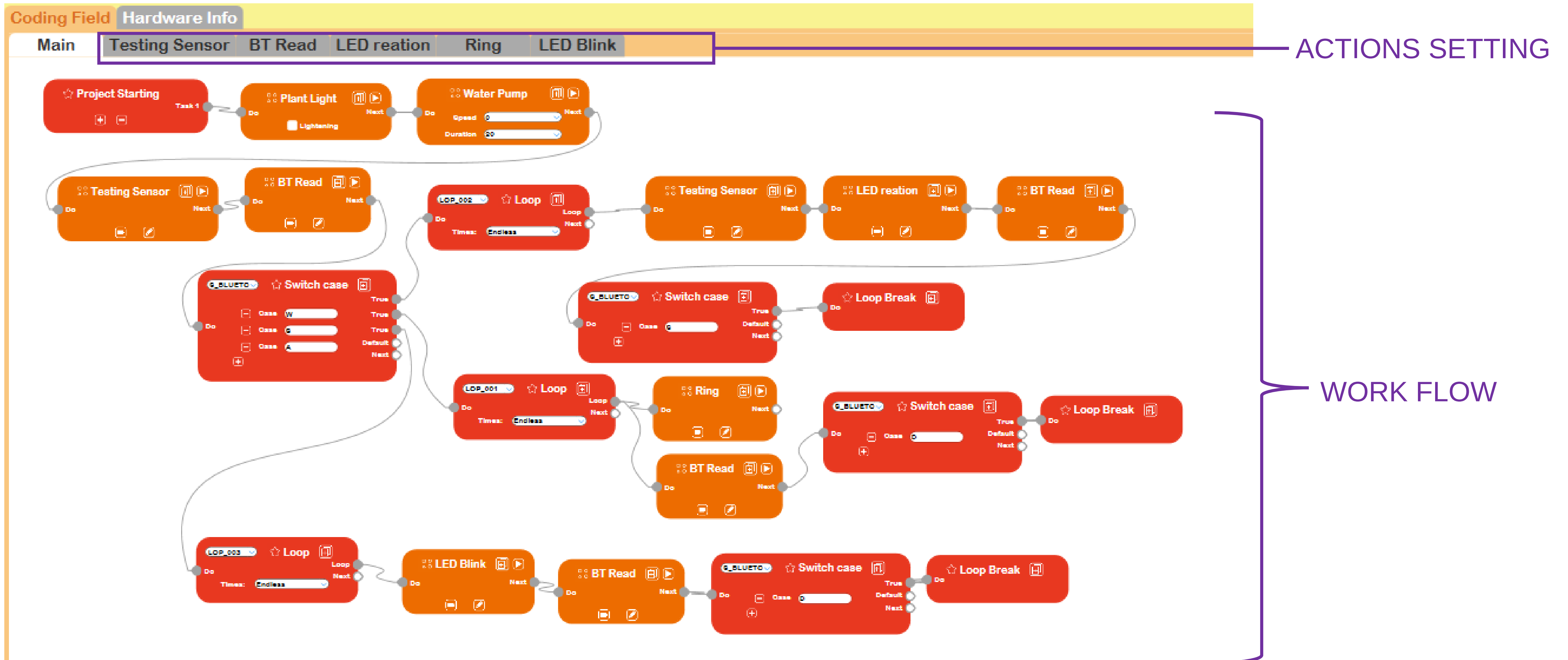
IOT Board

ESP32+CAM
Monitoring on website
SD card storage
Battery & power module

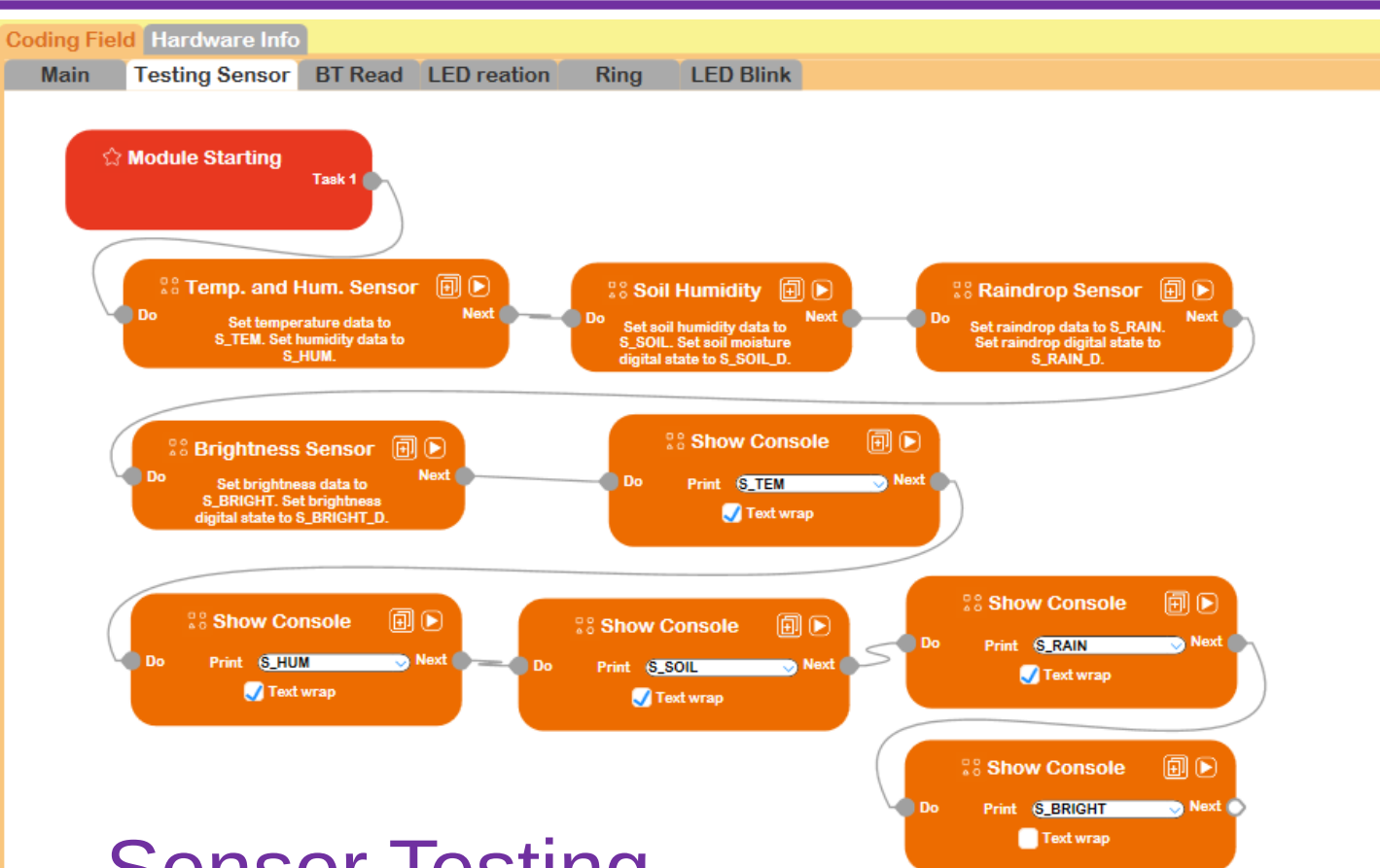
- ✓ Image Recognitions with ESP32
 - Video streaming
 - Picture recognition
 - Color recognition
 - Support C / C ++ & Python
 - UART interface

Interface

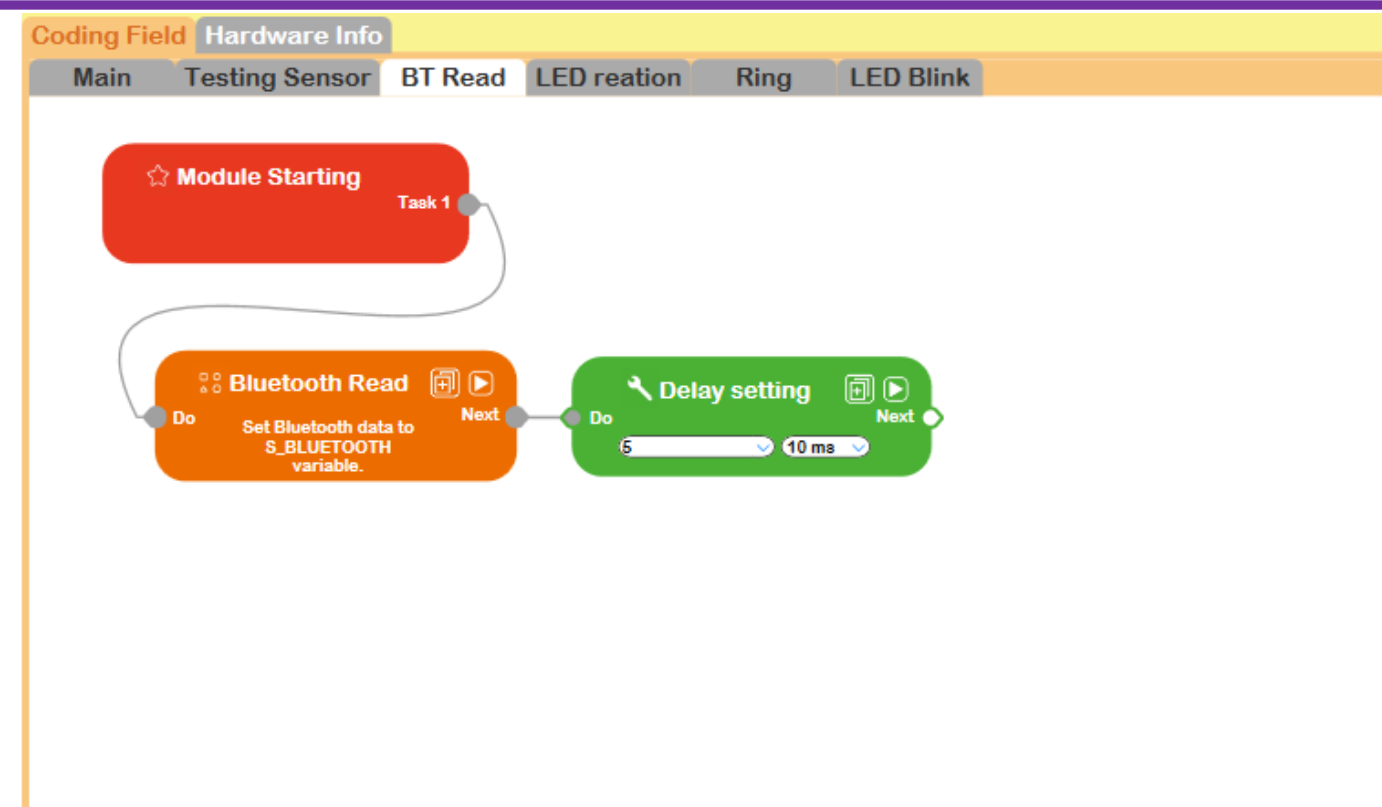
Software Design Interface



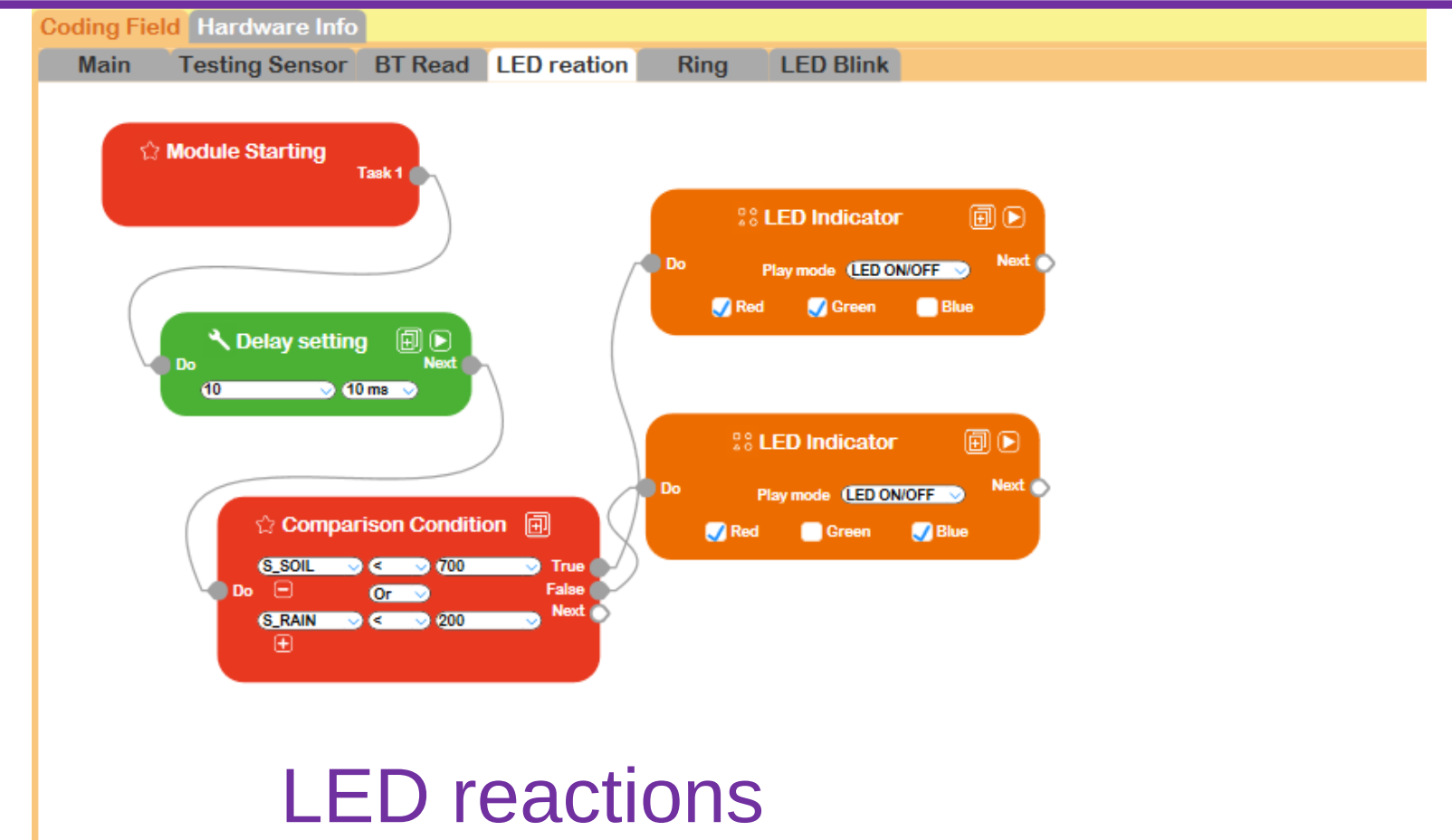
Software Design Interface



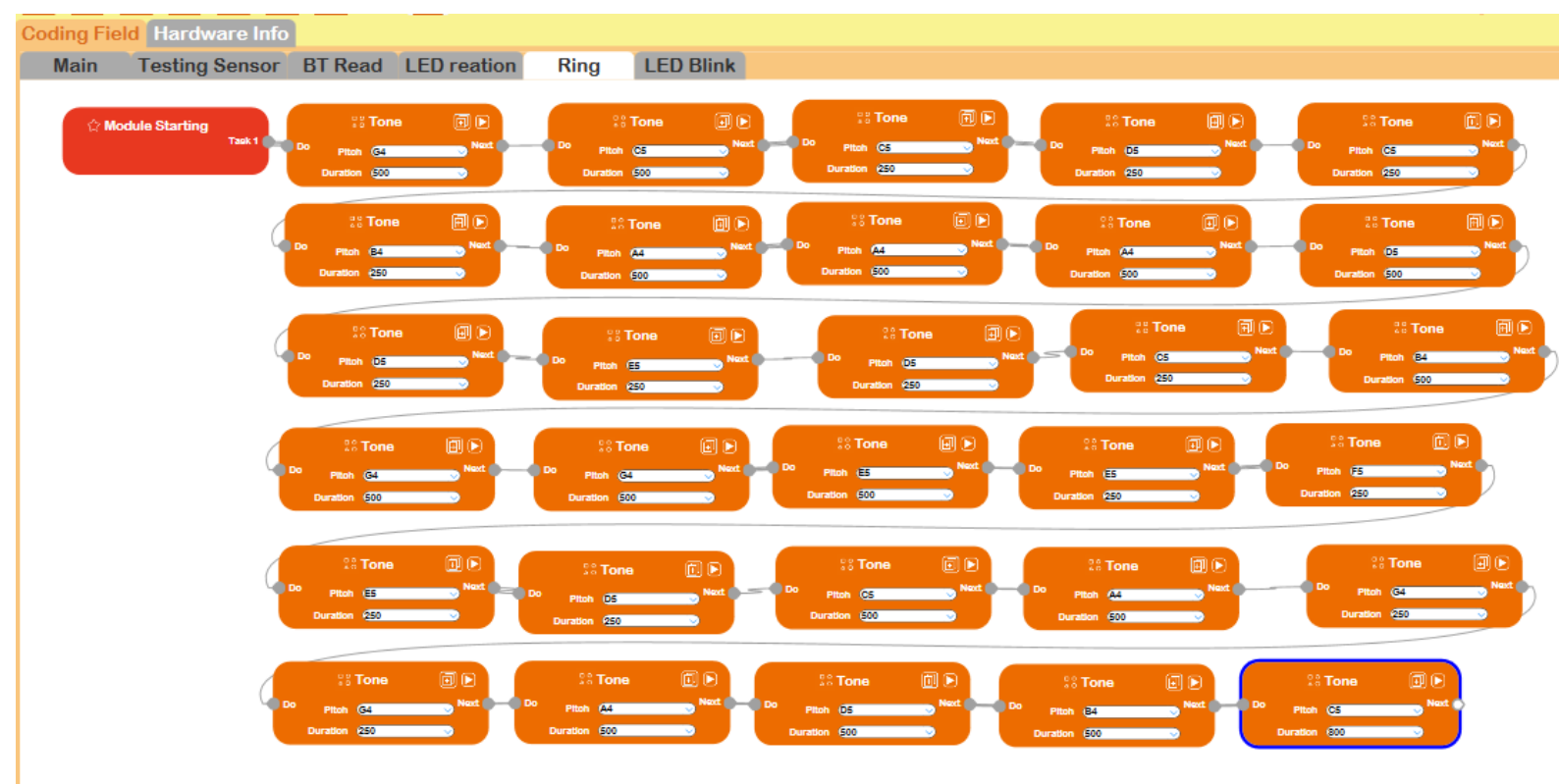
Sensor Testing



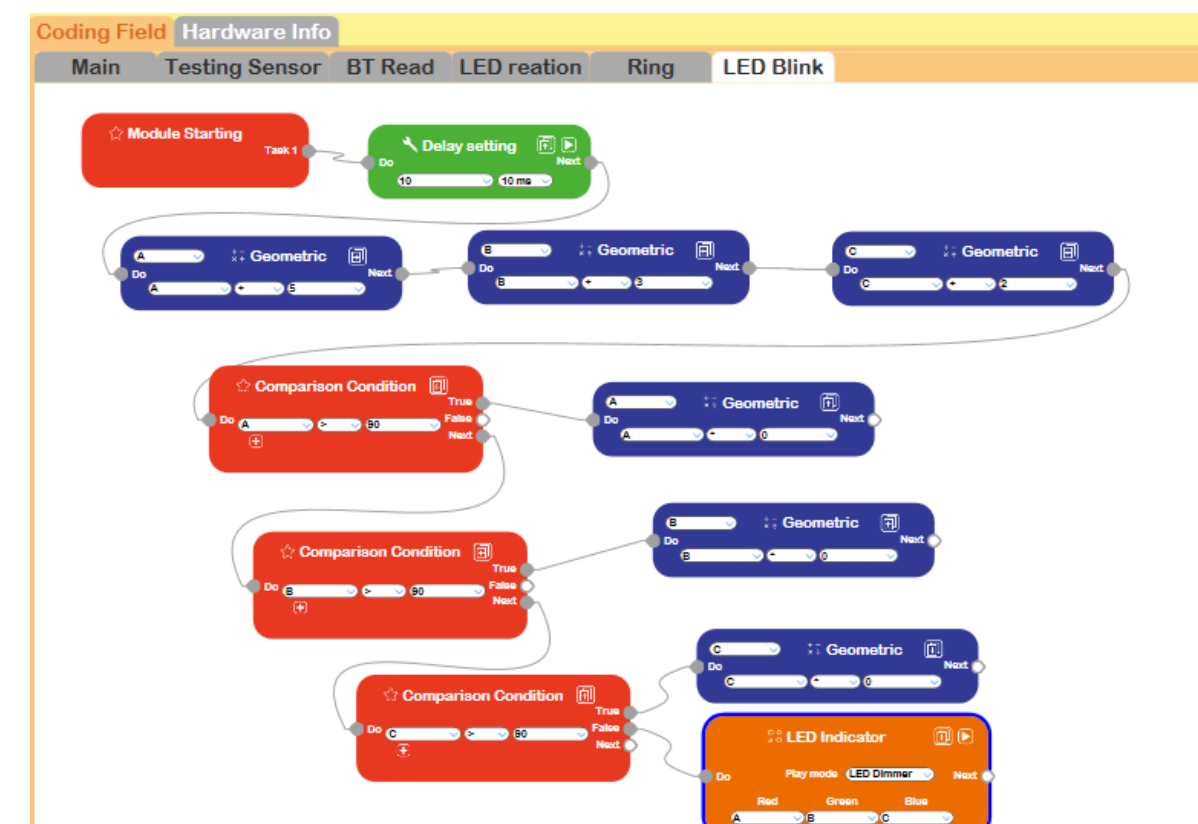
Bluetooth Read



LED reactions



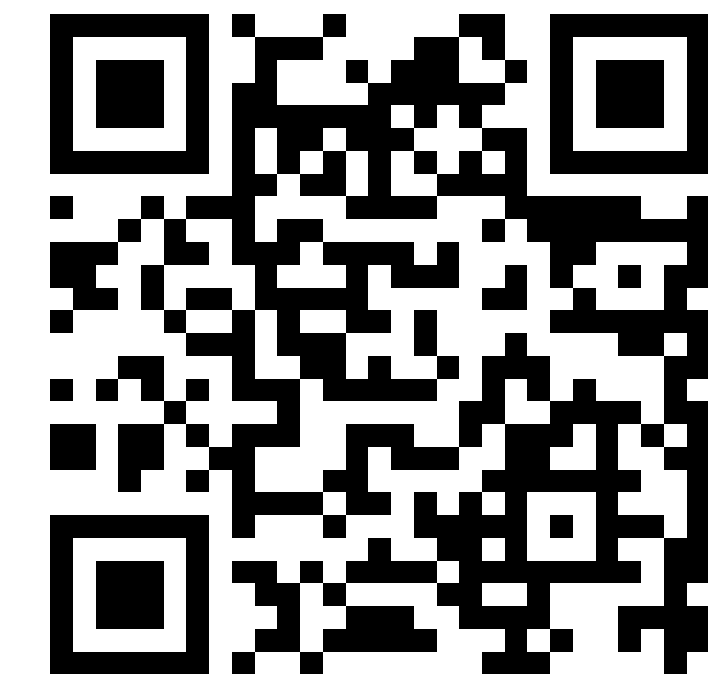
Ring Tones



LED Blink

Video

Demo in CES 2022



<https://youtu.be/5WdNmFEPRFE>

A dimly lit office scene where three individuals are focused on a large computer monitor. The monitor displays a complex data visualization with blue and white lines. One person, wearing a light blue shirt, is pointing at the screen with their right hand. Another person, wearing glasses and a dark shirt, is looking at the screen. A third person, also wearing glasses, is looking at the screen. The background is blurred, showing office shelves and equipment. The overall atmosphere is professional and collaborative.

[LINK TO MACHINE-LEARNING & AI](#)

● Concept of Machine Learning Class Design: 2021 Intel Devcup OpenVINO competition

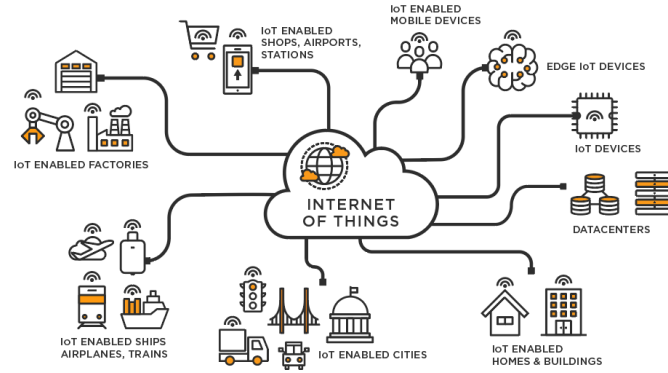
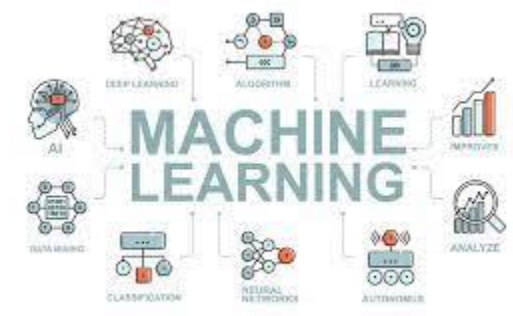
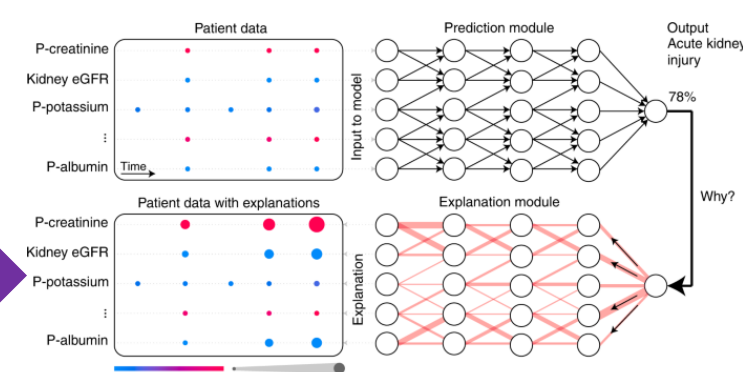
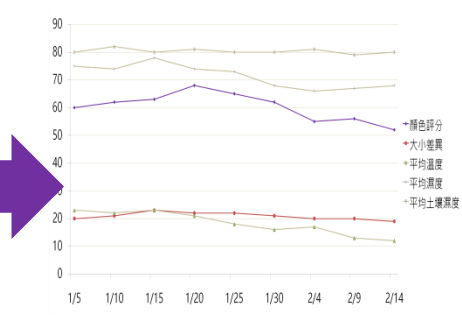
競賽辦法 競賽流程 參賽要點 文件下載 合作夥伴 大會資訊 人氣票選區 2021精彩回顧 English

【拓可思】微型農場AI應用教學整合方案



<https://makerpro.cc/intel-devcup/微型農場ai應用教學整合方案/>

● EA-Tsing Hua DDMT design thinking Model

DDMT Model	Design Thinking Stages	Steps and Contents																																																
Discover	- Context awareness 情境覺察 - Motivation 動機 - Core Problem 核心問題	Sun Light Soil Humidity Air Temp & Humid																																																
Define	- Problem Definition 定義問題 - Concept Definition 概念定義 - Solution Planning 計畫解決辦法	 IoT fundamentals & Introduction Level1  Image Recognition & Machine learning Level2  Data Analysis & AI prediction Level3																																																
Model & Modeling	- Modelling 模型 - Concept Alignment 概念對照 - Model Selection 模型選擇																																																	
	- Prototyping 原型 - Debugging 排除錯誤 - Final Model 最終模型	 Classification Object Detection People Counter System Performance Comparison																																																
Transfer	- Model Sharing 模型分享 - Model Transfer 模型遷移 - Evaluation 評估	<table><tr><th></th><th>對照組</th><th>實驗組A</th><th>實驗組B</th><th>實驗組C</th><th>實驗組D</th></tr><tr><td>每日溫溼度統計</td><td>25.6°C 78.5%</td><td>25.6°C 78.5%</td><td>25.6°C 78.5%</td><td>25.6°C 78.5%</td><td>25.6°C 78.5%</td></tr><tr><td>每日照時間統計</td><td>10.35 hrs</td><td>10.35 hrs</td><td>10.35 hrs</td><td>10.35 hrs</td><td>10.35 hrs</td></tr><tr><td>生長燈調節</td><td>模式 A1</td><td>模式 A1</td><td>模式 A1</td><td>模式 A1</td><td>模式 A1</td></tr><tr><td>澆灌行為</td><td>模式 B1</td><td>模式 B2</td><td>模式 B3</td><td>模式 B4</td><td>模式 B5</td></tr><tr><td>空氣調節</td><td>模式 C1</td><td>模式 C1</td><td>模式 C1</td><td>模式 C1</td><td>模式 C1</td></tr><tr><td>與前日健康差異</td><td>+2</td><td>+15</td><td>+12</td><td>+10</td><td>+6</td></tr><tr><td>期間評分均值</td><td>60</td><td>80</td><td>73</td><td>70</td><td>65</td></tr></table>		對照組	實驗組A	實驗組B	實驗組C	實驗組D	每日溫溼度統計	25.6°C 78.5%	25.6°C 78.5%	25.6°C 78.5%	25.6°C 78.5%	25.6°C 78.5%	每日照時間統計	10.35 hrs	10.35 hrs	10.35 hrs	10.35 hrs	10.35 hrs	生長燈調節	模式 A1	模式 A1	模式 A1	模式 A1	模式 A1	澆灌行為	模式 B1	模式 B2	模式 B3	模式 B4	模式 B5	空氣調節	模式 C1	模式 C1	模式 C1	模式 C1	模式 C1	與前日健康差異	+2	+15	+12	+10	+6	期間評分均值	60	80	73	70	65
	對照組	實驗組A	實驗組B	實驗組C	實驗組D																																													
每日溫溼度統計	25.6°C 78.5%	25.6°C 78.5%	25.6°C 78.5%	25.6°C 78.5%	25.6°C 78.5%																																													
每日照時間統計	10.35 hrs	10.35 hrs	10.35 hrs	10.35 hrs	10.35 hrs																																													
生長燈調節	模式 A1	模式 A1	模式 A1	模式 A1	模式 A1																																													
澆灌行為	模式 B1	模式 B2	模式 B3	模式 B4	模式 B5																																													
空氣調節	模式 C1	模式 C1	模式 C1	模式 C1	模式 C1																																													
與前日健康差異	+2	+15	+12	+10	+6																																													
期間評分均值	60	80	73	70	65																																													

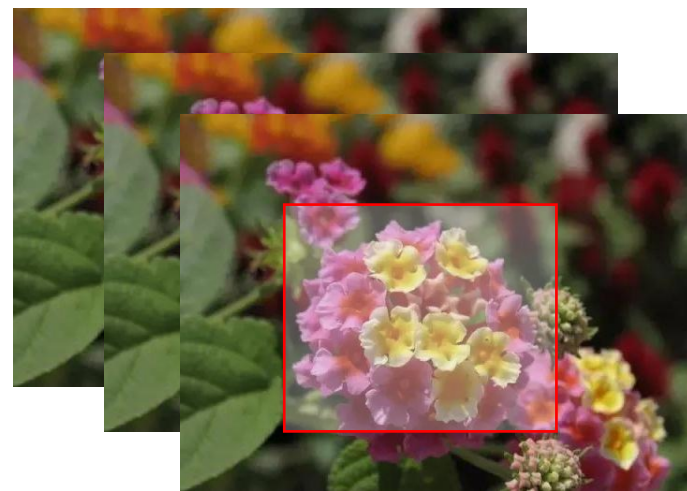
● Concept of Machine Learning Class Design

Modeling & Building

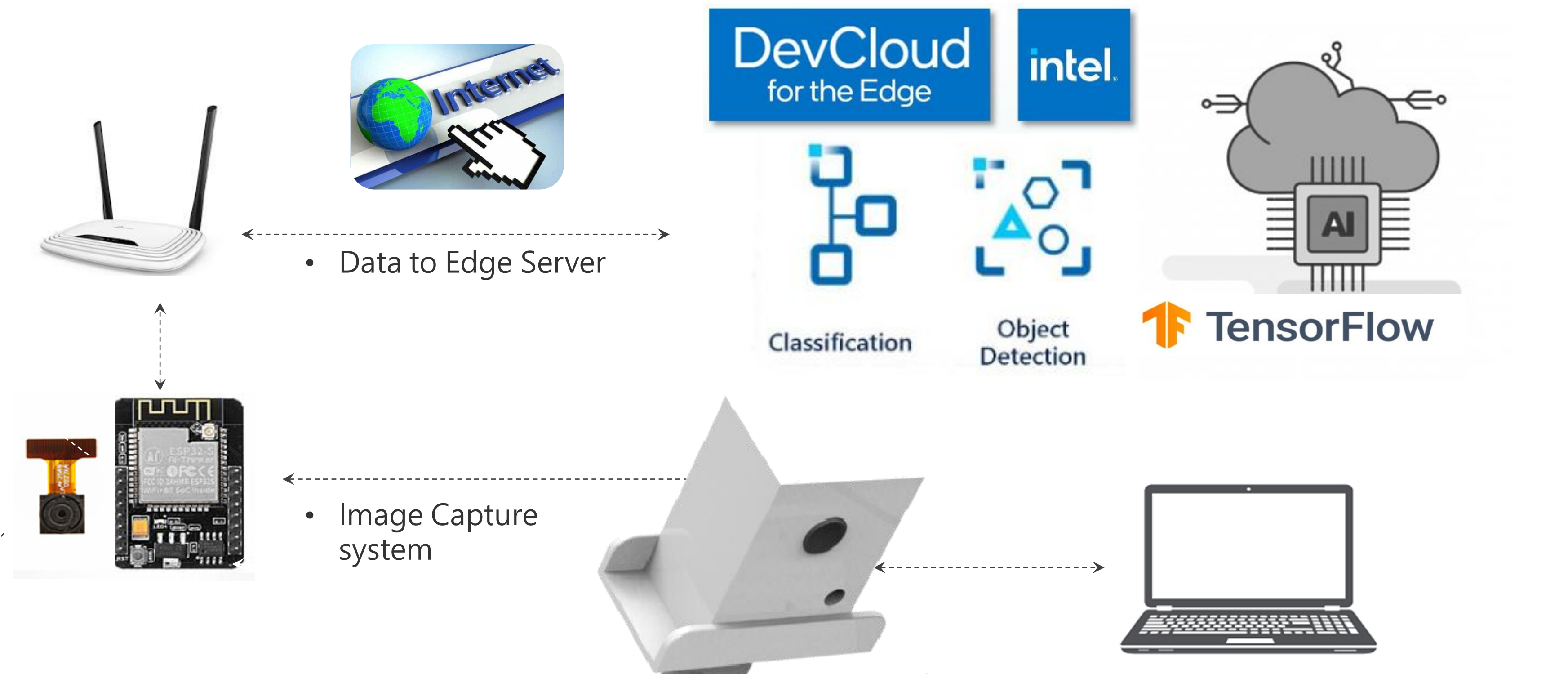
Model Optimization

Deployment

- Regularly take photos and upload to cloud
- Identifying flowers from photos



- Each photo has a data field
 - Date & time
 - Expected identification of flower species
 - Soil moisture (watering behavior)
 - air temperature and humidity
 - Sunshine and light hours
 - Score (default is 0)



● Concept of Machine Learning Class Design

Modeling & Building

Model Optimization

Deployment

DevCloud
for the Edge

intel



Classification



Object
Detection



People Counter
System



Performance
Comparison

Intel DevCloud Sample Applications

Score of Target Analysis

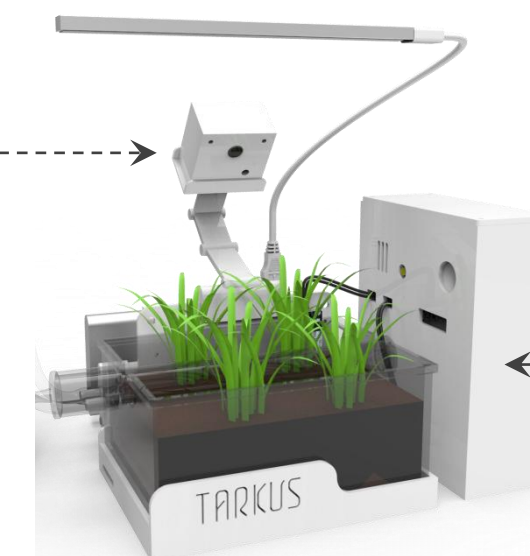
- Regularly take photos and upload to cloud
- Identifying flowers from photos
- Flower condition (health status)
- Number of flowers

Factors

- soil humidity, air temp. and humidity
 - ML adjusts watering behavior, air conditioning
- Sunshine time and grow light time calculation
 - ML adjusts the time of plant lights

Experiment

- Comparison of data corresponding to image recognition results
- Enter data into database



● Concept of Machine Learning Class Design

Modeling & Building

Model Optimization

Deployment

Factors

- soil humidity, air temp. and humidity
 - ML adjusts watering behavior, air conditioning
- Sunshine time and grow light time calculation
 - ML adjusts the time of plant lights

Experiment

- Comparison of data corresponding to image recognition results
- Enter data into database
- Scoring Healthy
 - Disparity States
 - Image recognition to upload photos difference from past
- Scoring Elements:
 - Flower condition (health status)
 - Number of flowers



Original

GroupA

GroupB

GroupC

GroupD

Temp & Humid per day	25.6°C 78.5%	25.6°C 78.5%	25.6°C 78.5%	25.6°C 78.5%	25.6°C 78.5%
Sun light	10.35 hrs	10.35 hrs	10.35 hrs	10.35 hrs	10.35 hrs
Plant Light Mode	Mode A1	Mode A1	Mode A1	Mode A1	Mode A1
Watering	Mode B1	Mode B2	Mode B3	Mode B4	Mode B5
Air condition	Mode C1	Mode C1	Mode C1	Mode C1	Mode C1
Healthy	+2	+15	+12	+10	+6
Average Score	60	80	73	70	65

● Concept of Machine Learning Class Design

Modeling & Building

Model Optimization

Deployment



Spring



Summer



Autumn



Winter

Different plants for each season

Growing analysis

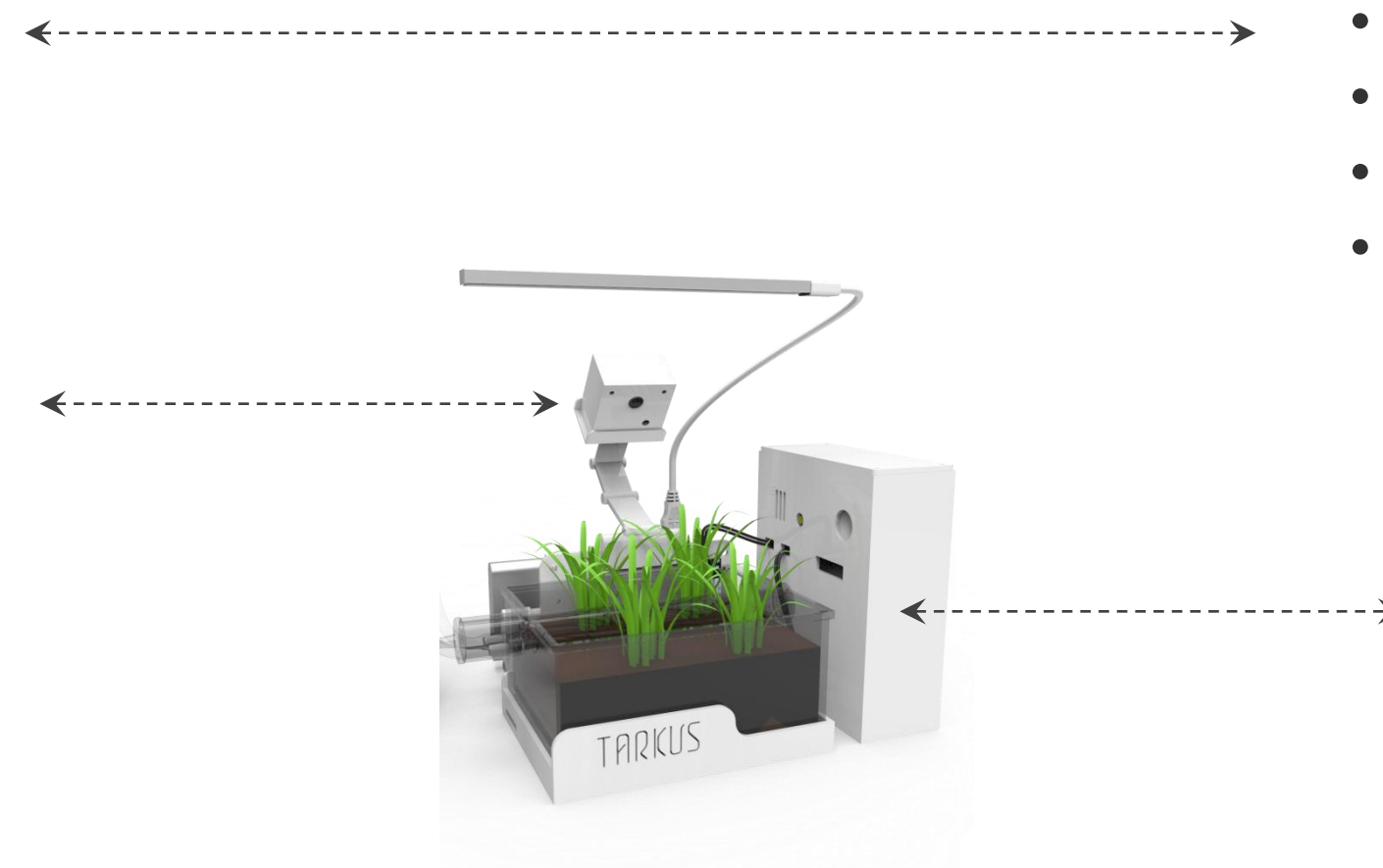
- Upload pictures to cloud
- Analysis of pictures
- Scoring for status of plants
- Matching the User settings

Edge or Cloud guide

- Scoring for each results

Machine Learning

- Best parameters
- Growing Behaviors
- Growing status
- Environmental database
- Suggestions and plans



● Concept of Machine Learning Class Design

Modeling & Building

Model Optimization

Deployment

Edged Score System

- The planting results of each student are graded together

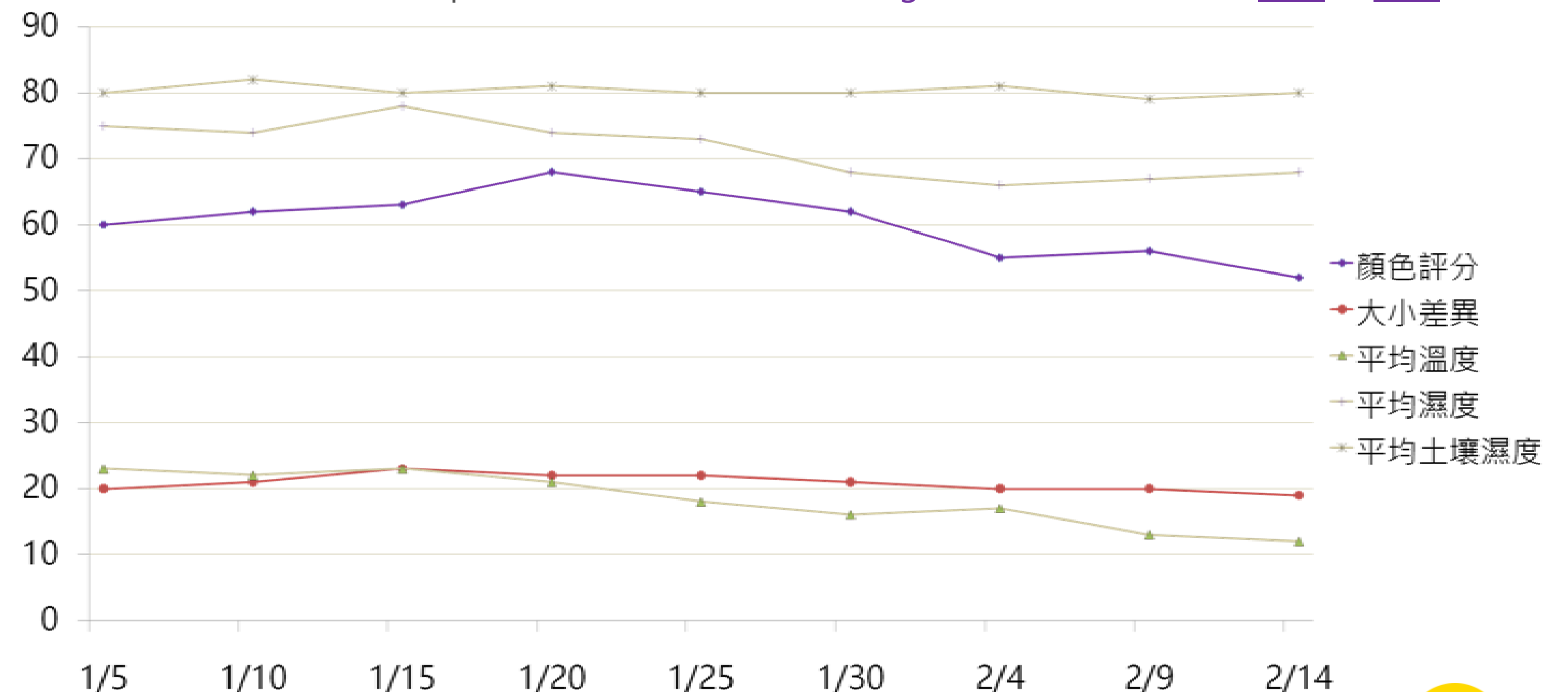
The best ML parameters

- environmental control variable
- The act of watering, the act of lighting the sun
- Corresponding growth cycle and health status score
- Data-corresponding image recognition scoring results comparison
- Suggesting optimal parameters under environmental control variables

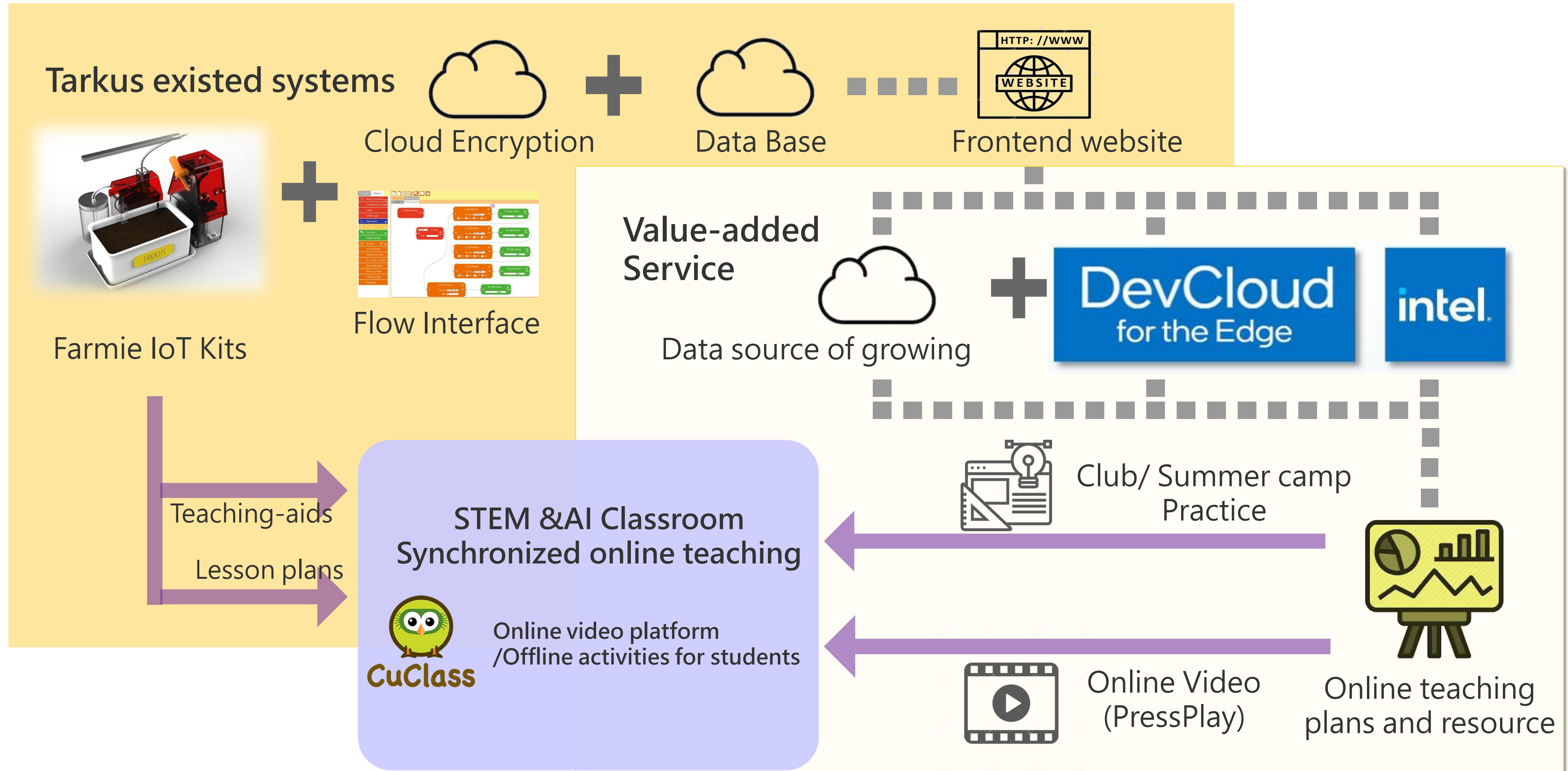


Group A

	Settings	ML optimized suggestions
Plant Light	Mode A1	According to sunlight, set plant light with <u>2.3</u> hrs
Watering	Mode B2	According to status, set soil Humid. to <u>75.6%</u>
Air Temp.	Mode C1	According to status, set air with <u>25.1°C</u> ; <u>78.2%</u>

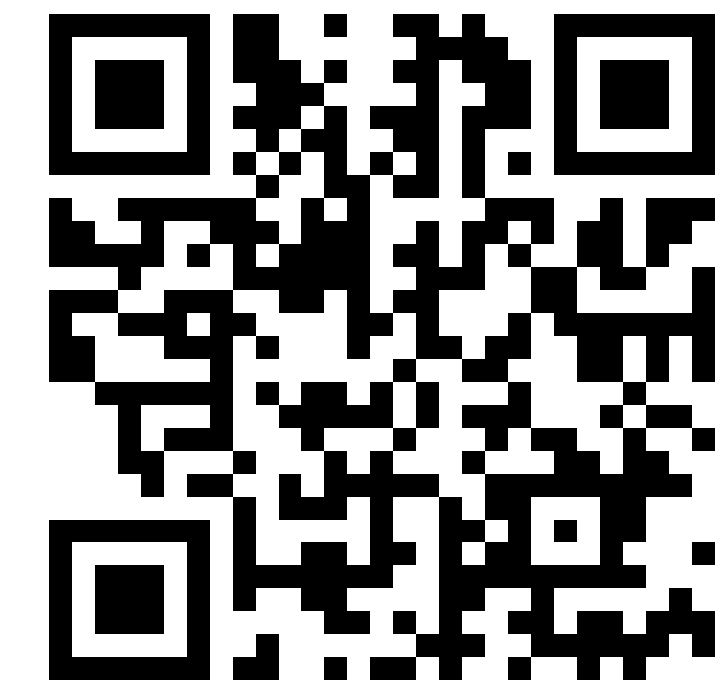


● Concept of System Architecture



Video

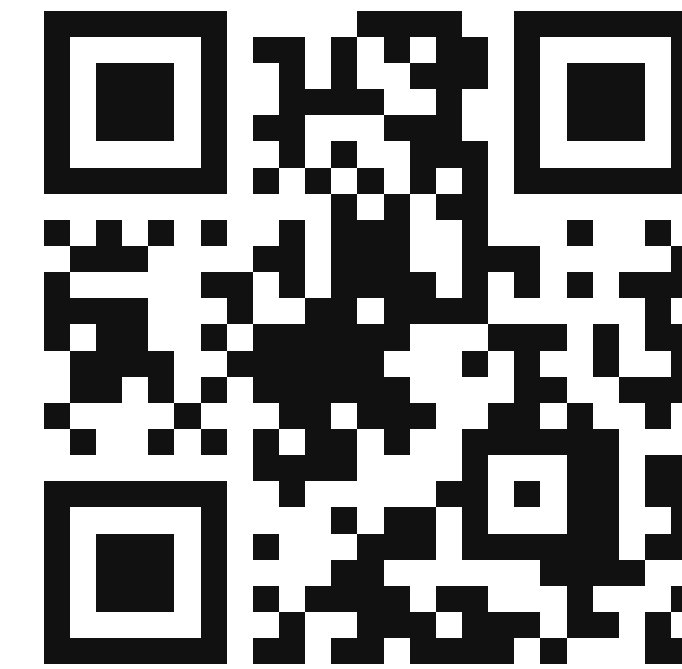
Tarkustech in CES 2022



<https://youtu.be/Wg8v-jJBvnY>

ADVANTAGES

1. Integrations of software and hardware will provide a total solution to STEAM teachers.
2. Encryption mechanism on server and hardware benefits to members control.
3. Generate from the place crowded of IT talents – Taiwan, with the full R&D energy and curriculum co-work with top academic institutes: NCTU, NTHU, NTUST.



<https://tarkustech.com/>

THANK YOU!