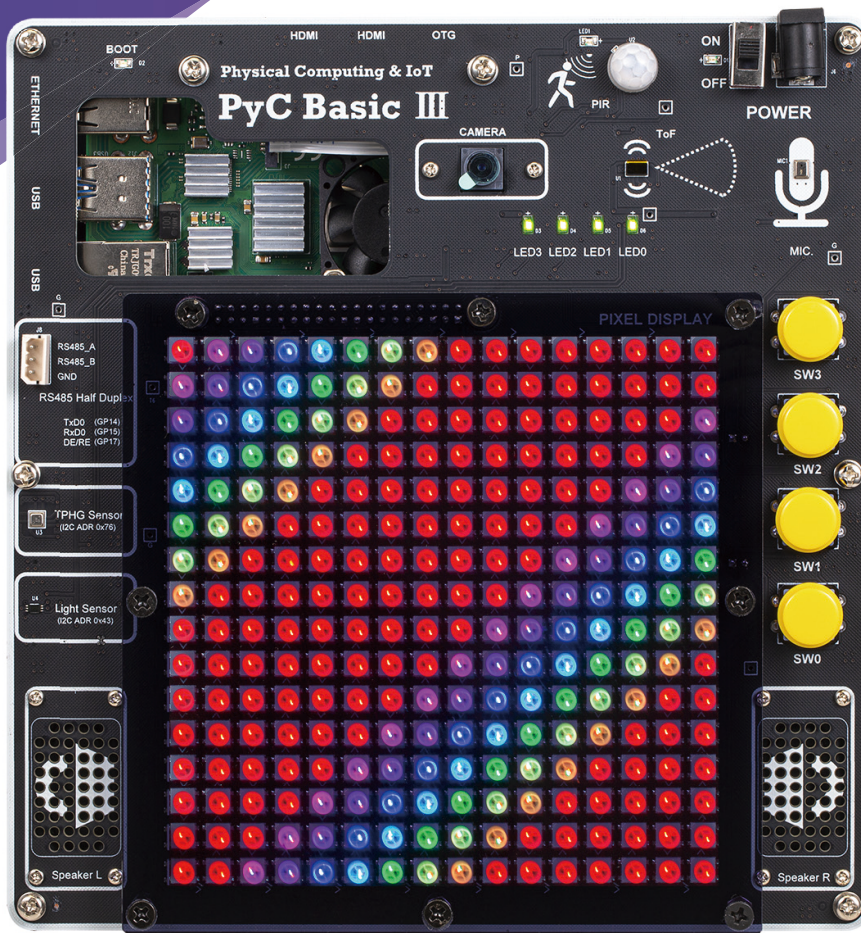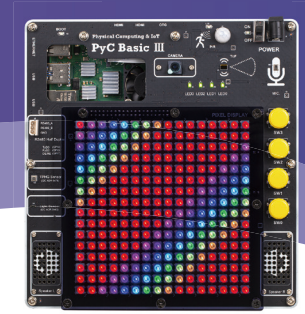# AIoT Programming Introductory Equipment
for Learning IoT, Data Science, and Machine Learning

PYC Basic III

PyC Basic Ⅲ

- Introductory AIoT programming equipment for learning IoT, Data Science, and Machine Learning

- It consists of a high-performance, low-power ARM quad core processor module and various input/output devices optimized for learning as a single board so that sensor data can be collected and analyzed in real time or predicted through model definition in an AIoT environment

- Provides various input devices such as ADC-based distance measurement, illumination level, noise level, and motion detection and I2C-based proximity, ambient light, color, gesture, temperature and humidity, etc. in order to improve understanding of embedded interface

- Provided various output devices such as from basic LED to OLED that can output text or simple graphic and RGB Type 16x16 Pixel Display with colorful lighting effects in order to support visualization of analyzed or predicted sensor data

- Provides Gigabit Ethernet, dual-band Wi-Fi (2.4GHz, 5GHz), and Bluetooth 5.0 in order to remotely control the training equipment with a smartphone or tablet in an IoT connectivity environment

- Provides a dedicated learning environment based on a web browser that supports both Python and Google block coding platform, Blockly in order to increase the convenience of AIoT programming and use on PC and tablet

- Provides OS that optimizes Debian Linux for ARM-based IoT, data science, and machine learning and Pop library supporting reliable hardware abstraction

- Supports for open integrated development environment based on Visual Studio Code for professional application development

- Provides dedicated learning content to implement IoT, data science, and machine learning

◎ Operating Program

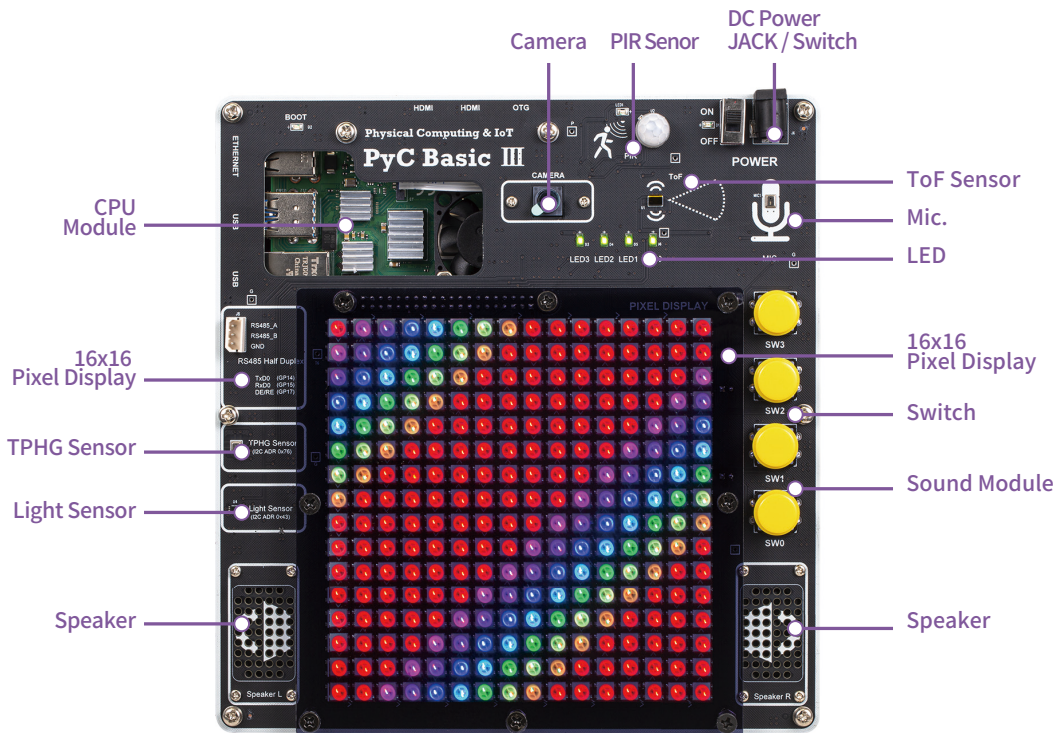| List		Specifications
Linux OS	Linux Kernel	aarch64 5.x
	CLI	Zsh with Oh-My-Zsh, Tmux, powerlevel10k thema, Powerline fonts
	Tool Chain	GCC (c, c++), JDK, Node JS, Python3, Cling, Clang
	Connectivity	SSH Server, Bluez, MQTT Server(Mosquitto), Blynk Server,
	Multimedia	OpenCV 4
	Data Science & AI	Numpy, Matplotlib, Pandas, Scipy, Seaborn, Scikit-learn
Pop Library with PyC Basic III	Output Object	Leds, PiezoBuzzer, OLed, PixelDisplay
	Input Object	Switchs, UltraSonic, Potentiometer, Cds, Sound, Psd. Pir, Gesture, TempHumi,
	AI	Linear Regression, Logistic Regression, Perceptron, ANN

◎ Hardware Specification

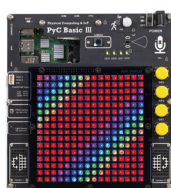| List		Specifications
Base Board	Size	174 x 184mm
	Power	5V 5A
Main Module	CPU	ARM Quad core Cortex-A72 (ARM v8) 64-bit SoC @ 1.8GHz
	Memory	LPDDR4-3200 4GB
	Connectivity	Gigabit Ethernet, Wi-Fi 2.4G & 5G 802.11ac, Bluetooth 5.0, BLE
	USB	USB 3.0 2port, 2.0 2port
	HDMI	micro-HDMI 2port (up to 4kp60 supported)
	Codec	H.265 (4kp60 decode), H264 (1080p60 decode, 1080p30 encode)
	Graphics	OpenGL ES 3.0
	Data Storage	32 GB Micro SD
	GPIO	40 pin GPIO header (fully backwards compatible with previous boards)
		2-lane MIPI DSI display port
		2-lane MIPI CSI camera port
	Power supply	5V DC via USB-C connector, 5V DC via GPIO header
Peripheral	LED x 4EA	Color: Red Interface: GPIO Operating Voltage: 3.3V
	SWITCH x 4EA	Interface: GPIO Operating Voltage: 3.3V
	PIXEL DISPLAY	Color: pixel RGB IC: WS2811 Pixel: 256 EA (16 x 16) Operating Voltage: 5V Power: 0.3W/pixel Waterproof level: Non-waterproof Interface: GPIO (Serial protocal) Size: 110 x 110mm
	PIR Sensor	I/O Interface : Digital Out Sensing Range : 110° Spectral Response : 5 ~ 14 um
	TOF SENSOR	I/O Interface : I2C 940 nm laser VCSEL Measures absolute range up to 2 m Eye Safe : Class 1 laser device compliant with latest standard IEC 60825-1:2014 - 3rd edition
	TPHG Sensor	I/O Interface : I2C Temperature Measure : -40 ~ 85℃ Humidity Measure : 0 ~ 100%r.H. Pressure range : 300 ~ 1100hPa VOC Measure : Ethane, Ethanol, Acetone, Carbon Monoxide, Butadiene, methyl
	Light Sensor	I/O Interface : I2C Illuminance to digital converter Wide range : 1 ~ 65535(lx)
	RS485 Connector	I/O Interface : RxD, TxD, DE RS485 Control Device
	SOUND BLOCK	USB Audio Module 1ch Microphone Omni-directional Sensitivity: -42dBV Stereo Speaker 2W
	CAMERA	Image Sensor: Sony IMX219 Resolution: 8M pixel native resolution sensor (3280 x 2464 pixel static images) Video: 1080p30, 720p60 and 640x480p90 Linux Integration: V4L2 driver available Focal length: 3.04 mm Horizontal field of view: 62.2 degrees Vertical field of view: 48.8 degrees Focal ratio (F-Stop): 2.0

◎ Training Contents

Introduction to Data Science and Artificial Intelligence in IoT Environment (Python version)

- PyC Basic III Practice Environment

- IoT Sensor Control

- IoT Communication
  MQTT Practice
  MQTT Based Sensor Control Practice
  Cloud and Smartphone Connected Practice

- Data Analysis and Visualization Library
  NumPy and Fast Multidimensional Matrix Calculation Practice
  Pandas, Time Series and Table Data Analysis Practice
  Matplotlib and Data Visualization Practice

- Introduction to Artificial Intelligence
  Linear Regression Practice
  Logistic Regression Practice
  Perceptron Practice
  ANN Practice

◎ Layout

Camera | PIR Senor | DC Power JACK / Switch

Physical Computing & IoT
PyC Basic III

CPU Module

ToF Sensor
Mic.
LED

16x16 Pixel Display

TPHG Sensor

Light Sensor

Speaker

16x16 Pixel Display
Switch
Sound Module
Speaker

◎ Component

PYC Basic III

Platform USB
(include OS image and Tools)
1EA

5V 5A Power Adapter
1EA

Micro SD Adapter
1EA

USB to Ethernet Adapter
1EA

Ethernet Cable
1EA

User Guide book
1EA