

# UCTRONICS MACHINE LEARNING KIT

Based on Raspberry Pi Pico

SKU: U6180

## Instruction Manual

### INTRODUCTION

UCTRONICS Machine Learning kit is designed to offer a compact hardware base for more possibilities of the Raspberry Pi Pico. The on-board mini breadboard and expanded available GPIO pins get you started in learning the electronics and circuits easily. More importantly, the kit packs a camera, display, microphone and IMU to help you run the examples of Tensorflow Lite Micro tiny machine learning, which has been ported to the RP2040.

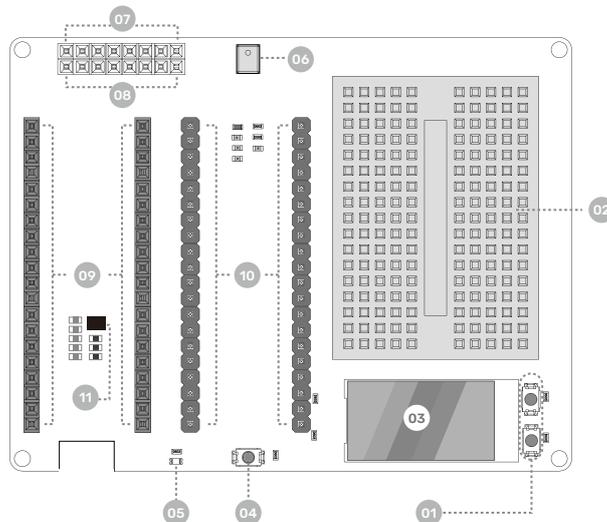
This manual includes how to set up the camera and run the 3 pre-trained TensorFlow Lite Micro examples, Person Detection Magic wand and Wake-Word Detection. You can also build, train and deploy your models on it.

### SPECS

|                   |  |
|-------------------|--|
| Camera Module     | HiMax HM01B0, Up to QVGA (320 x 240)@60fps   |
| Screen            | 0.96 inch LCD SPI Display (160 x 80, ST7735) |
| IMU               | ICM-42622                                    |
| Operating Voltage | 5V   |
| Breadboard        | 35x47mm, 170 points                          |
| Dimension         | 90x70mm                                      |

### SCHEMATIC VIEW

|    |                                     |    |                       |
|----|-------------------------------------|----|-----------------------|
| 01 | 2 x programmable buttons            | 02 | Mini Breadboard       |
| 03 | Display                             | 04 | Reset button          |
| 05 | Power indicator                     | 06 | Microphone            |
| 07 | Socket for HM01B0 and HM0360 camera | 08 | Socket for SPI camera |
| 09 | Socket for Pico                     | 10 | Pico GPIO expander    |
| 11 | IMU                                 |    |                       |



### HARDWARE SETUP

1. Align and insert the Pico header into the socket.
2. Align and insert the HM01B0 camera header into the socket, keep the camera outwards.
3. Plug the USB end of the Micro USB cable to the computer, then press and hold the

BOOTSEL button on your Pico and connect the Micro USB end to the port on your Pico, the power indicator and the backlight of the display will come up.

4. Release the button after connection. A disk volume should pop up on your computer. That is your Raspberry Pi Pico.

**NOTE: Raspberry Pi Pico and micro USB cable are not included in the kit.**

## FIRST USE

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Go to the page [https://github.com/ArduCAM/Pico4ML\\_AdapterBoard](https://github.com/ArduCAM/Pico4ML_AdapterBoard) and press the code button to download the driver to the Raspberry Pi or laptop, you can also gitclone [https://github.com/ArduCAM/Pico4ML\\_AdapterBoard.git](https://github.com/ArduCAM/Pico4ML_AdapterBoard.git)

### HM01B0 Camera

1. Open the corresponding file HM01B0
2. Compile the driver:  
cd Pico4ML\_AdapterBoard/HM01B0  
mkdir build  
cd build  
cmake ..  
make
3. A file named main.uf2 will be generated in the build file under HM01B0, then drag and drop the uf2 file to your Pico. The volume will automatically unmount and the screen should display the imaging of the camera.

**NOTE: Please unplug and reconnect the micro USB cable if the screen displays nothing.**

### Wake-word Detection

1. Open the corresponding file pico-wake-word
2. Compile the driver:  
cd Pico4ML\_AdapterBoard/pico-wake-word  
mkdir build  
cd build  
cmake ..  
make
3. A file named pico\_micro\_speech\_pdm.uf2 will be generated in the build file under pico-wake-word, then drag and drop the uf2 file to your Pico.

4. Hold your Pico closer and say "yes" or "no". The screen will display the corresponding word.

### Magic Wand (Gesture Detection)

1. Open the corresponding file MagicWand
2. Compile the driver:  
cd Pico4ML\_AdapterBoard/MagicWand  
mkdir build  
cd build  
cmake ..  
make
3. A file named pico4ml\_ble\_magic\_wand.uf2 will be generated in the build file under MagicWand, then drag and drop the uf2 file to your Pico.
4. Wave your Pico base board quickly in a W (wing), O (ring), or L (slope) shape. The screen will display the corresponding mark.

### Person Detection

1. Open the corresponding file tfmicro
2. Compile the driver:  
cd Pico4ML\_AdapterBoard/tfmicro  
mkdir build  
cd build  
cmake ..  
make
3. A file named person\_detection\_screen\_int8.uf2 will be generated under the path tfmicro/build/examples/person\_detection\_screen, then drag and drop the uf2 file to your Pico.
4. Hold your Pio to capture images. The screen will display the image and the probabilities of the presence of a person.

The driver also includes the examples for other cameras, please contact us for more information if you are interested.

## CONTACT US

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