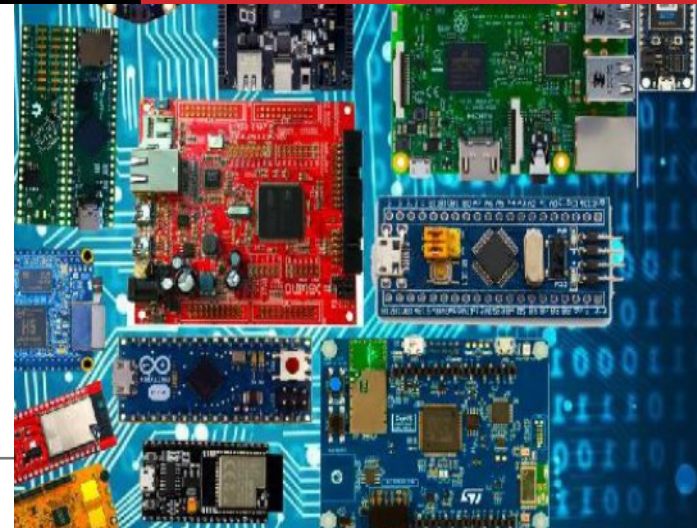




# Embedded Systems

## HARDWARE SETUP

**Dennis A. N. Gookyi**





# CONTENTS

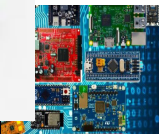
## ❖ Hardware Setup





# KIT

## ❖ The TinyML Kit

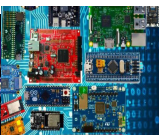




# KIT

## ❖ TinyML kit parts

- ❑ Nano 33 BLE Sense
  - Part number: ABX00035
- ❑ USB microB cable often to type A or C
- ❑ Breadboard
- ❑ Jumper wires 'Male to female'
- ❑ Camera sensor with breakout PCB
  - Part number: OV7675

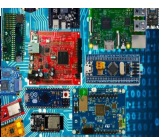
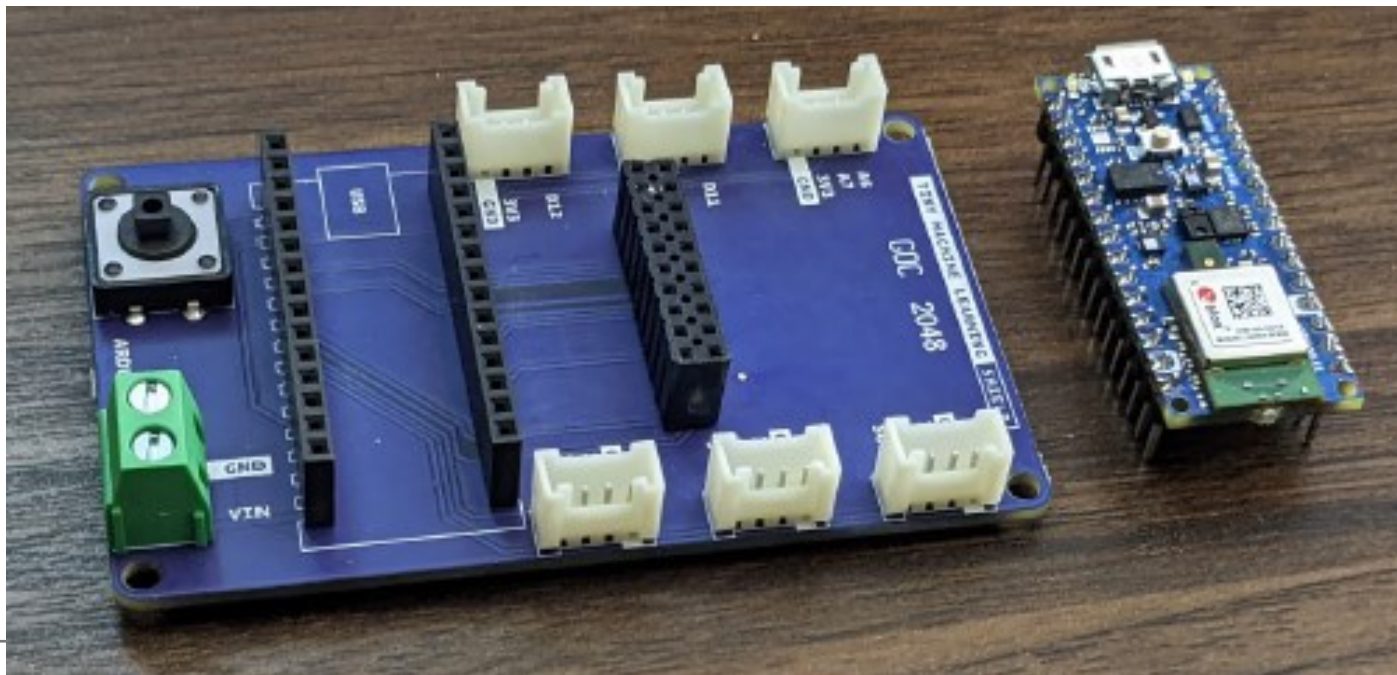






# HARDWARE SETUP

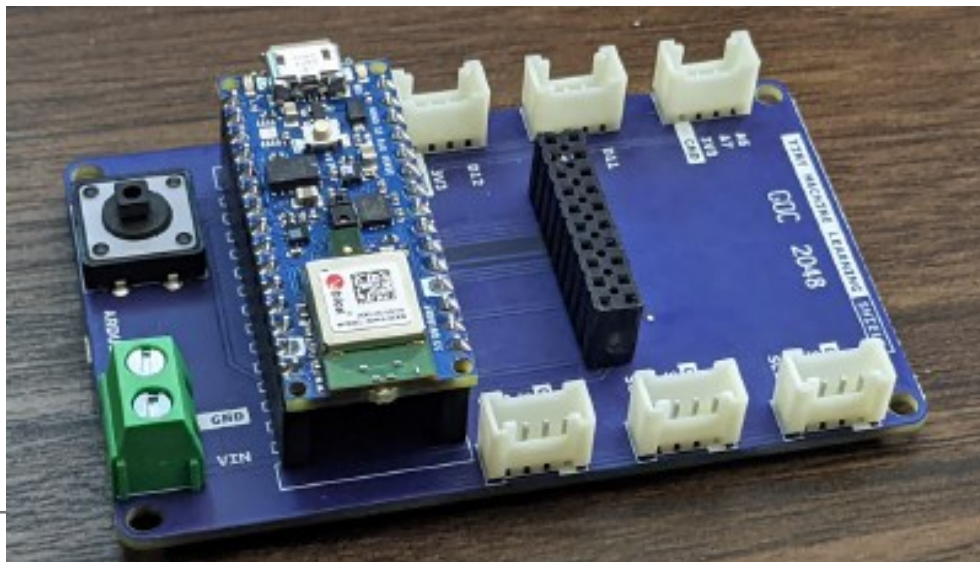
- ❖ Slot the Nano 33 BLE Sense board into the Tiny Machine Learning Shield
  - Target the pair of spatially separated 1x15 female headers
  - Carefully align the pins of the microcontroller board with the headers and then gently push down until the board is seated flush against the top of each header





# HARDWARE SETUP

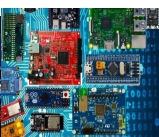
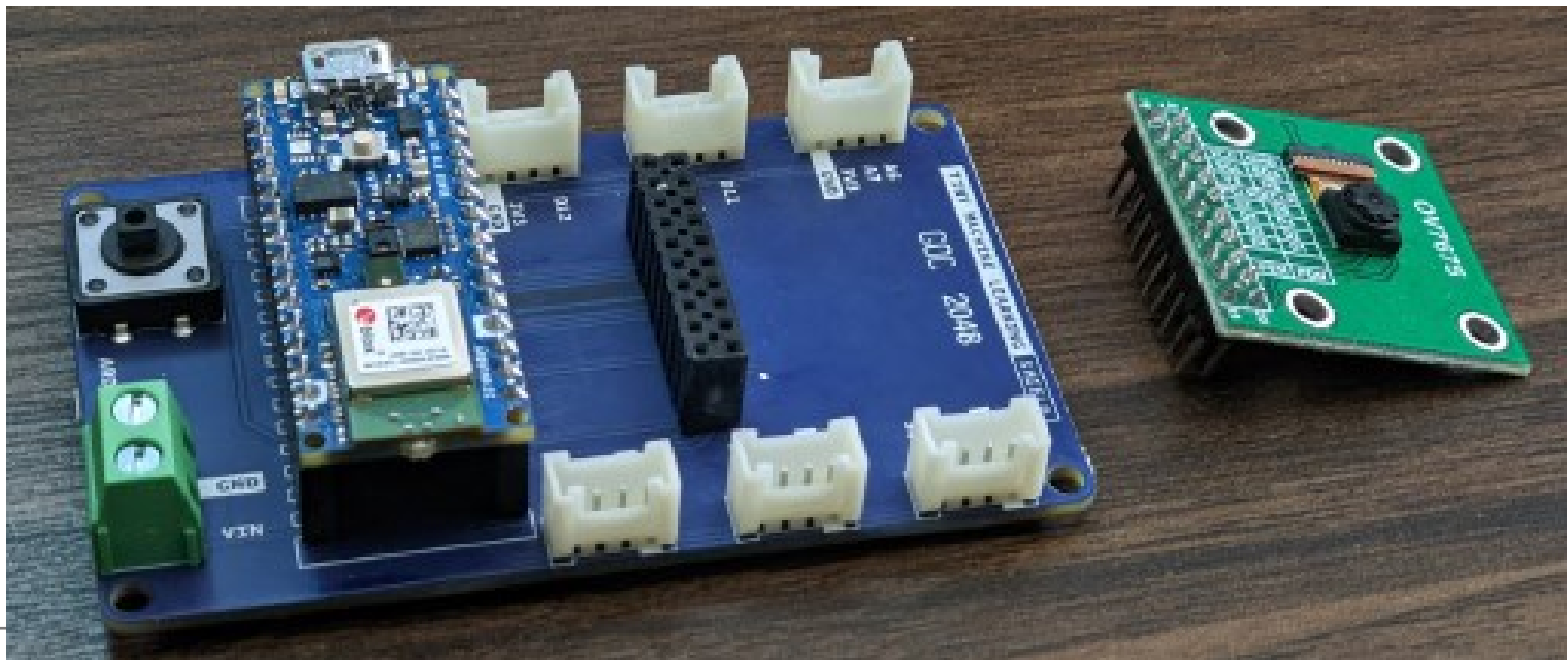
- ❖ Slot the Nano 33 BLE Sense board into the Tiny Machine Learning Shield
  - The downward-facing pins should no longer be visible
  - Avoid touching the components atop the board to prevent inadvertently damaging the surface mount devices
  - Pay attention to the orientation of the board so that the indication of the USB port on the PCB silkscreen matches the physical port on the board itself



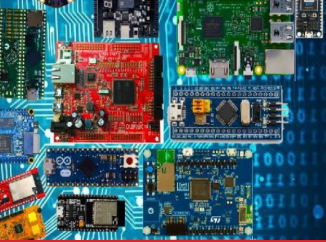


# HARDWARE SETUP

- ❖ Slot the OV7675 camera module into the shield using the same technique
  - Target the 2x10 female header
  - Carefully align the pins of the camera module with the headers and then gently push down until the board is seated flush against the top of each header

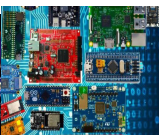
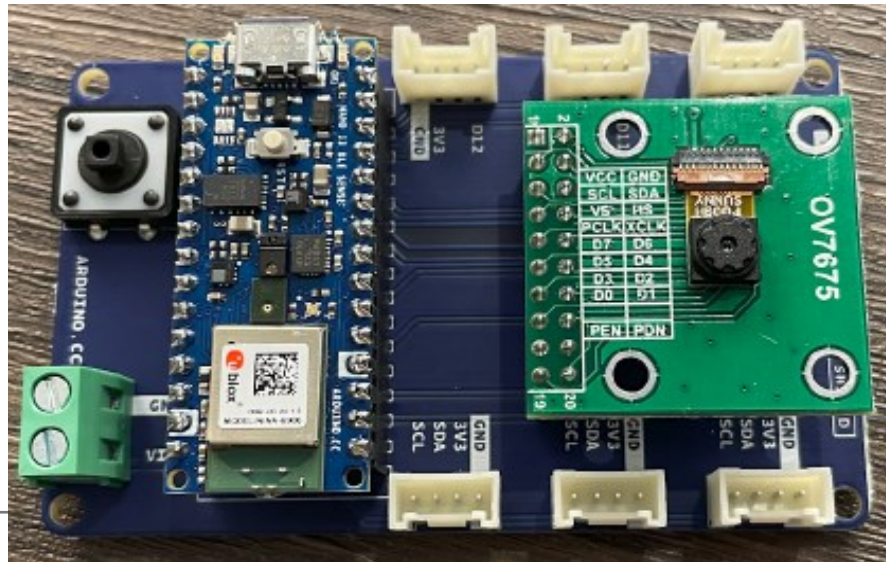






# HARDWARE SETUP

- ❖ Slot the OV7675 camera module into the shield using the same technique
  - The downward-facing pins should no longer be visible
  - Avoid touching the camera module atop the board to prevent inadvertent damage
  - Pay attention to the orientation of the camera module so that the camera sensor is to the right of the header array further from the microcontroller board than the header array

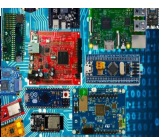
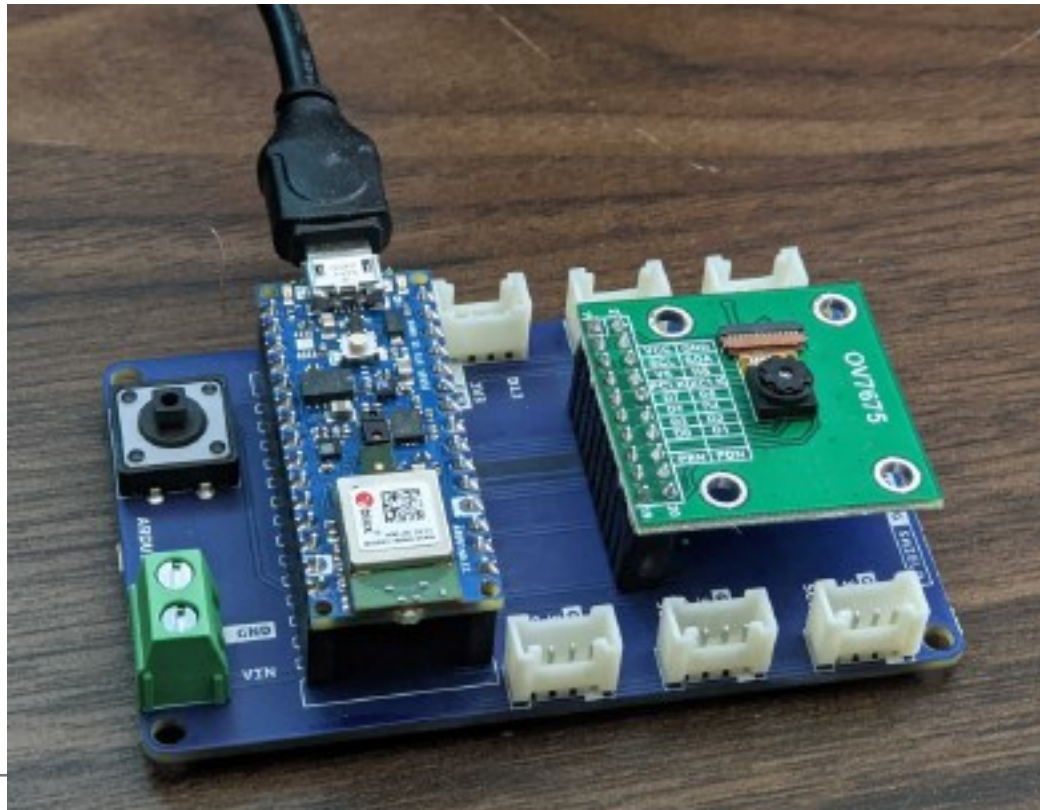






# HARDWARE SETUP

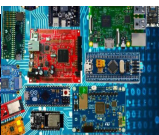
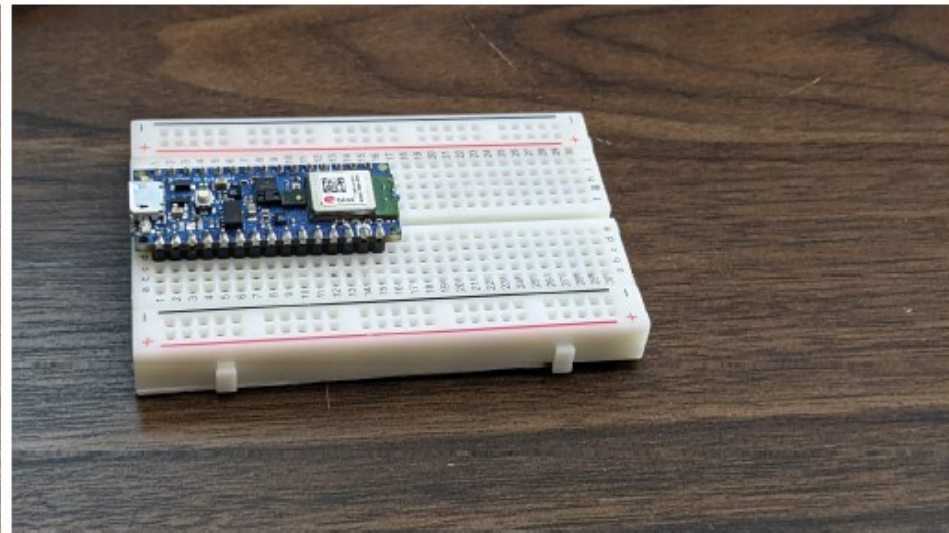
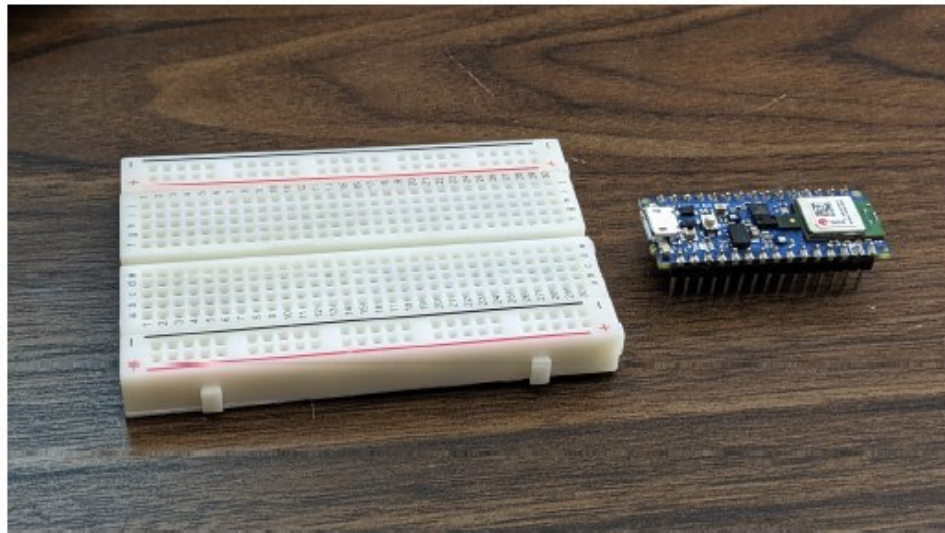
- ❖ Finally, use the provided USB cable (type-A to microB) to connect the Nano 33 BLE Sense development board to your machine
  - If your PC only features type-C USB ports, you will need to obtain an adaptor





# HARDWARE SETUP - WIRING UP OFF-THE-SHELF PARTS

- ❖ Slot the Nano 33 BLE Sense board into a solderless breadboard
  - The downward-facing pins should not be visible
  - Avoid touching the components atop the board to prevent inadvertently damaging the surface mount devices

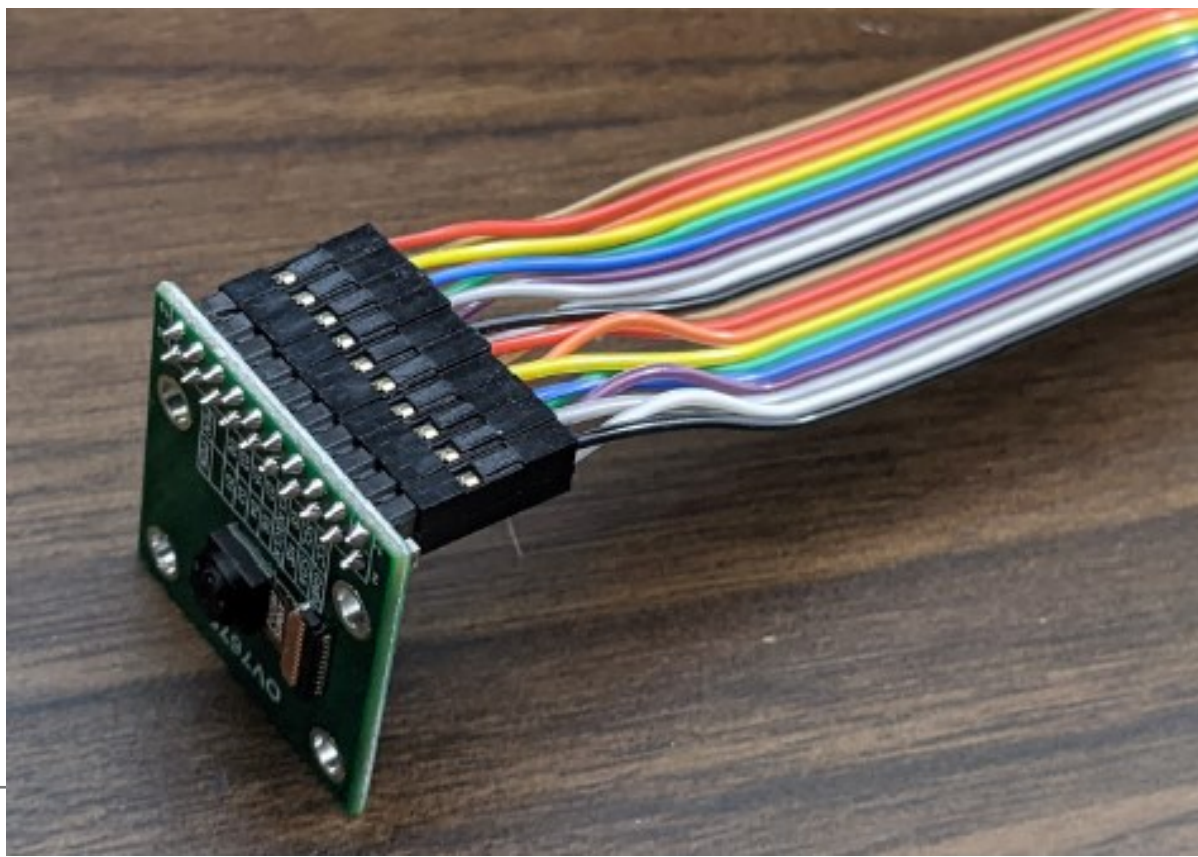


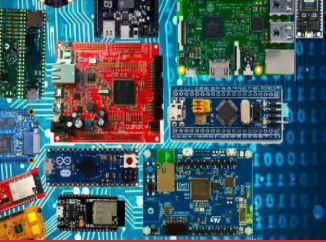




# HARDWARE SETUP - WIRING UP OFF-THE-SHELF PARTS

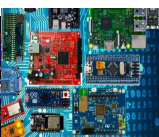
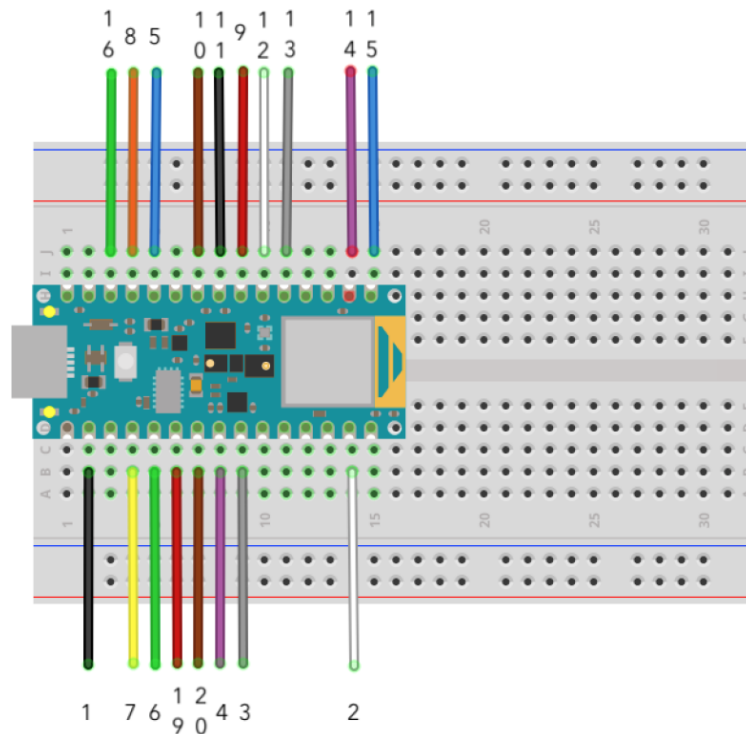
- ❖ With a female-to-male jumper wire, use the following Fritzing (wiring) diagram, pinout diagrams, and connection table to link the OV7675 camera module to the microcontroller board via the solderless breadboard





# HARDWARE SETUP - WIRING UP OFF-THE-SHELF PARTS

- ❖ The next step will be to connect the camera module pinout (1-20) to specific pins on the microcontroller board via the solderless breadboard
- ❖ Below we've mapped these OV7675 module pin numbers onto a fritzing (wiring) diagram for the Arduino Nano 33 BLE sense

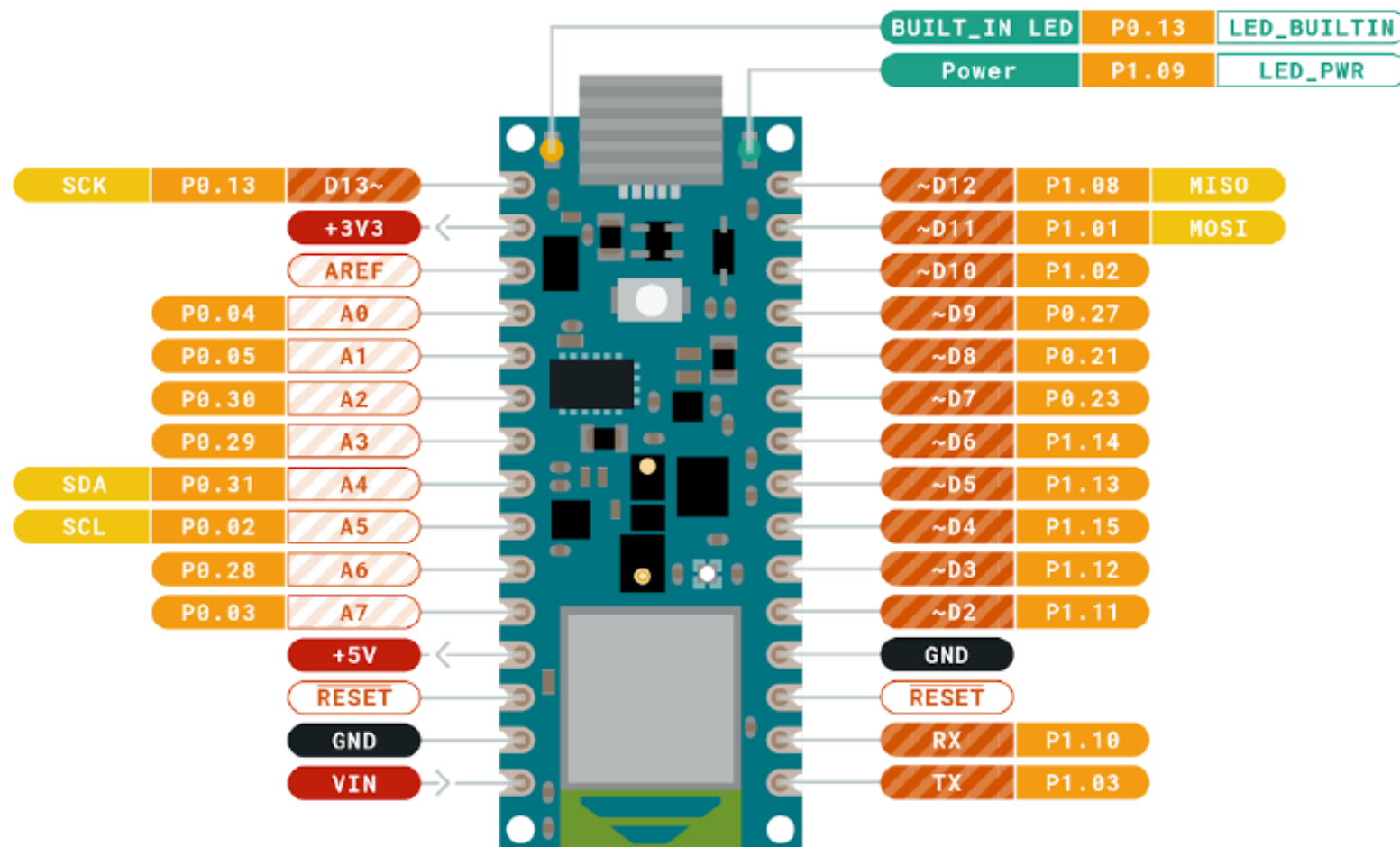


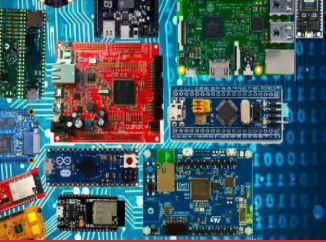




# HARDWARE SETUP - WIRING UP OFF-THE-SHELF PARTS

- ❖ Full pinout (designation) for the Nano 33 BLE Sense development board

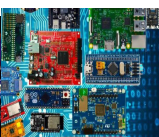




# HARDWARE SETUP - WIRING UP OFF-THE-SHELF PARTS

- ❖ Table explaining the full pin connections needed from the OV7675 to the Arduino Nano 33 BLE Sense

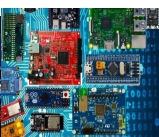
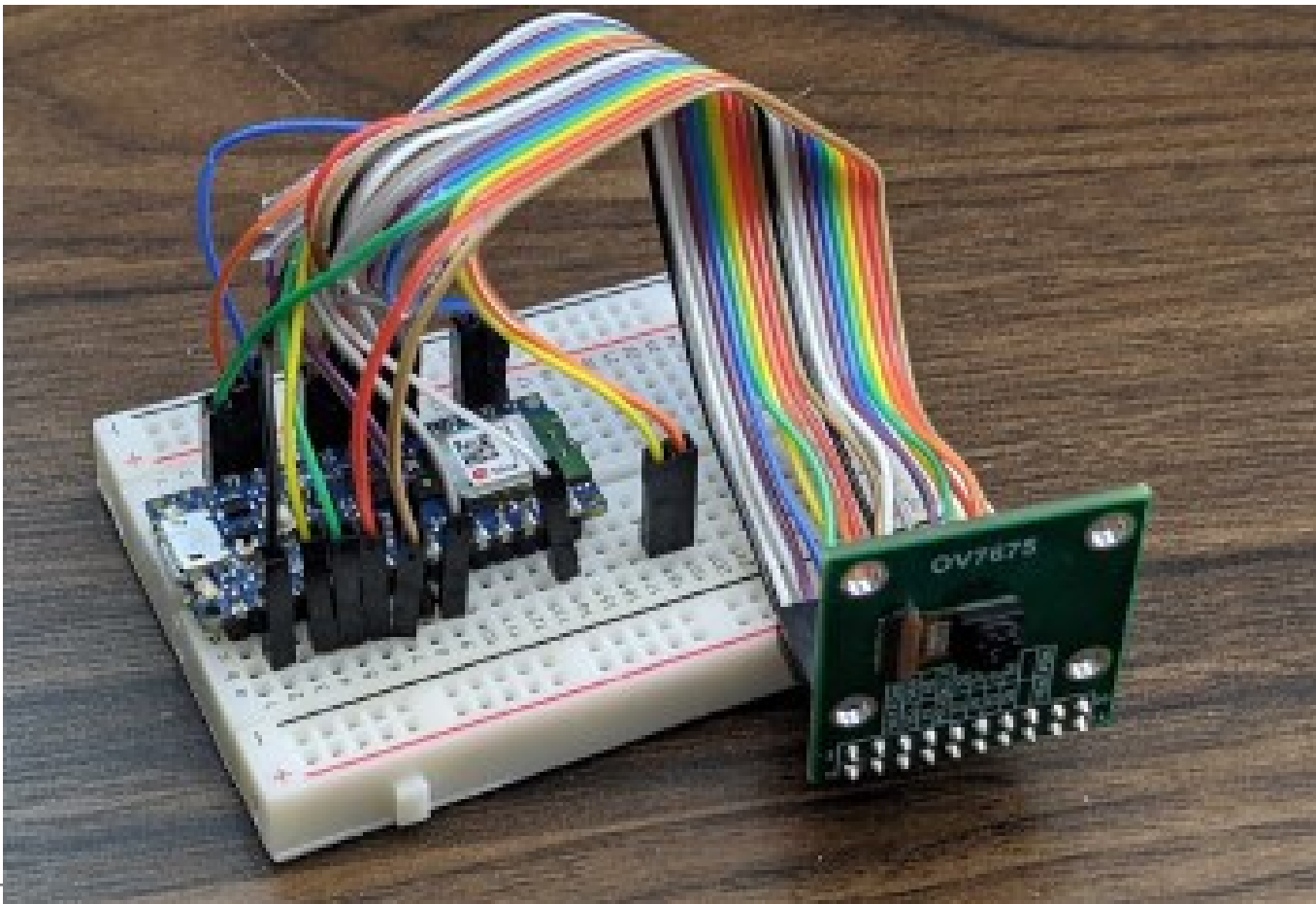
Description	Camera Module Pin	Microcontroller Board Pin
VCC / 3.3V	1	3.3V
GND	2	GND
SIOC / SCL	3	SCL / A5
SIOD / SDA	4	SDA / A4
VSYNC / VS	5	D8
HREF / HS	6	A1
PCLK	7	A0
XCLK	8	D9
D7	9	D4
D6	10	D6
D5	11	D5
D4	12	D3
D3	13	D2
D2	14	D0/RX
D1 (may be labeled D0)	15	D1/TX
D0 (may be labeled D1) <sup>1</sup>	16	D10
NC	17	—
NC	18	—
PEN / RST	19	A2
PWDN / PDN	20	A3





# HARDWARE SETUP - WIRING UP OFF-THE-SHELF PARTS

- ❖ When done wiring up the camera, the setup should look like the diagram below





# HARDWARE SETUP - WIRING UP OFF-THE-SHELF PARTS

- ❖ Finally, use the provided USB cable (type-A to microB) to connect the Nano 33 BLE Sense development board to your machine
- ❖ If your PC only features type-C USB ports, you will need to obtain an adaptor

