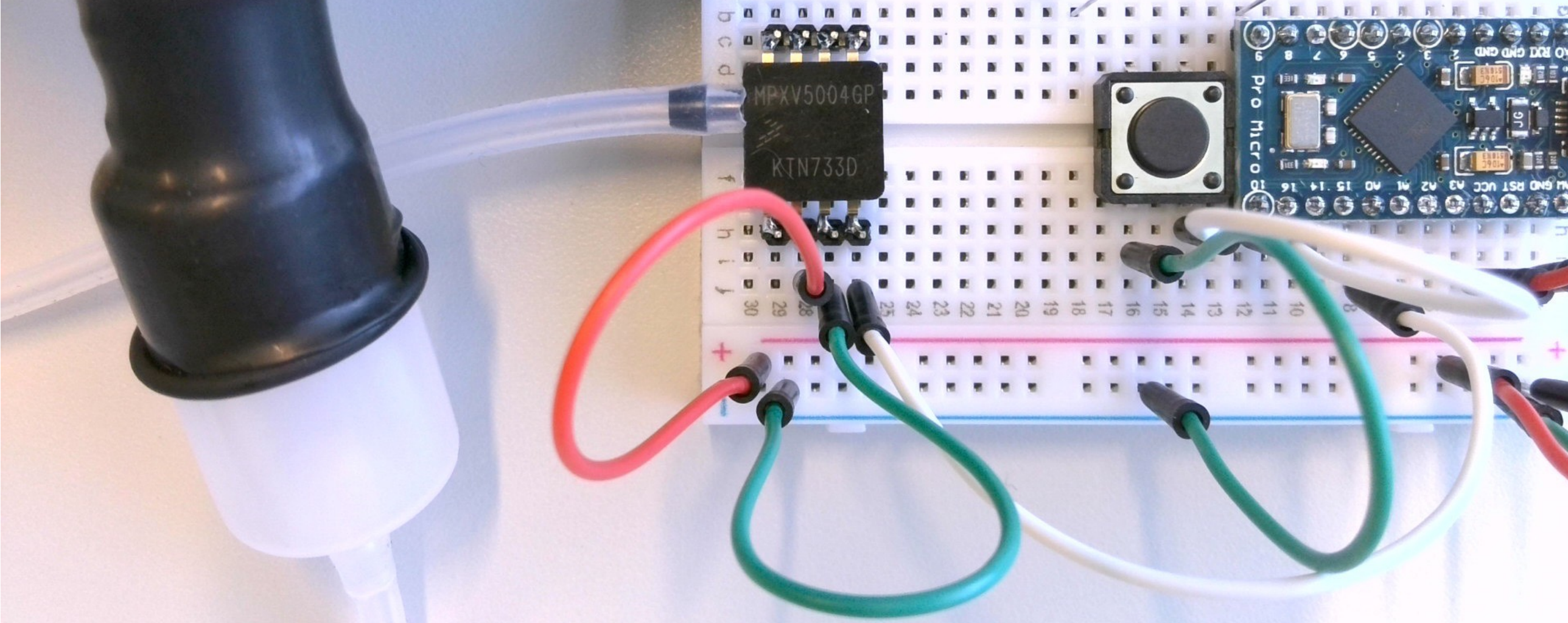
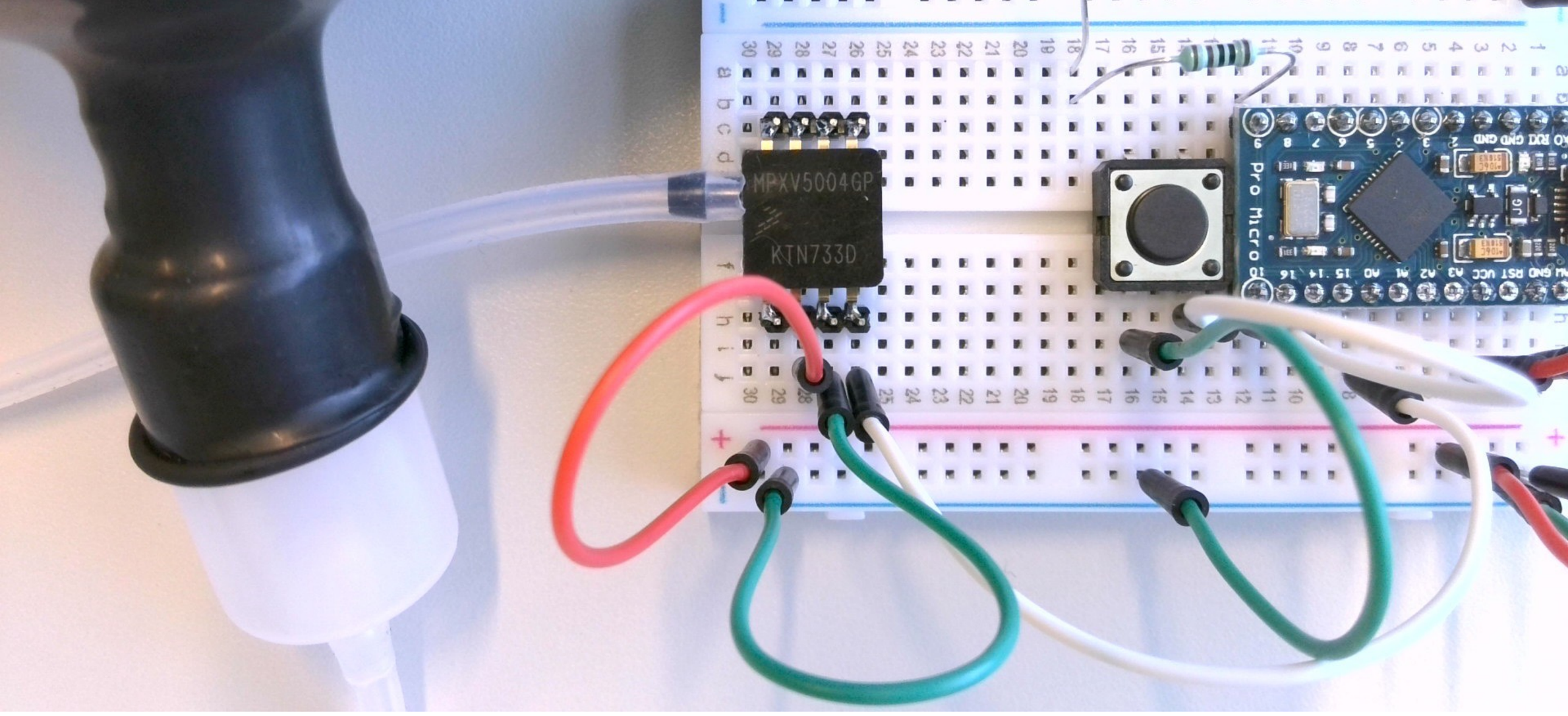


DEFORMATION

UWTMC

Matt Borland - 2019

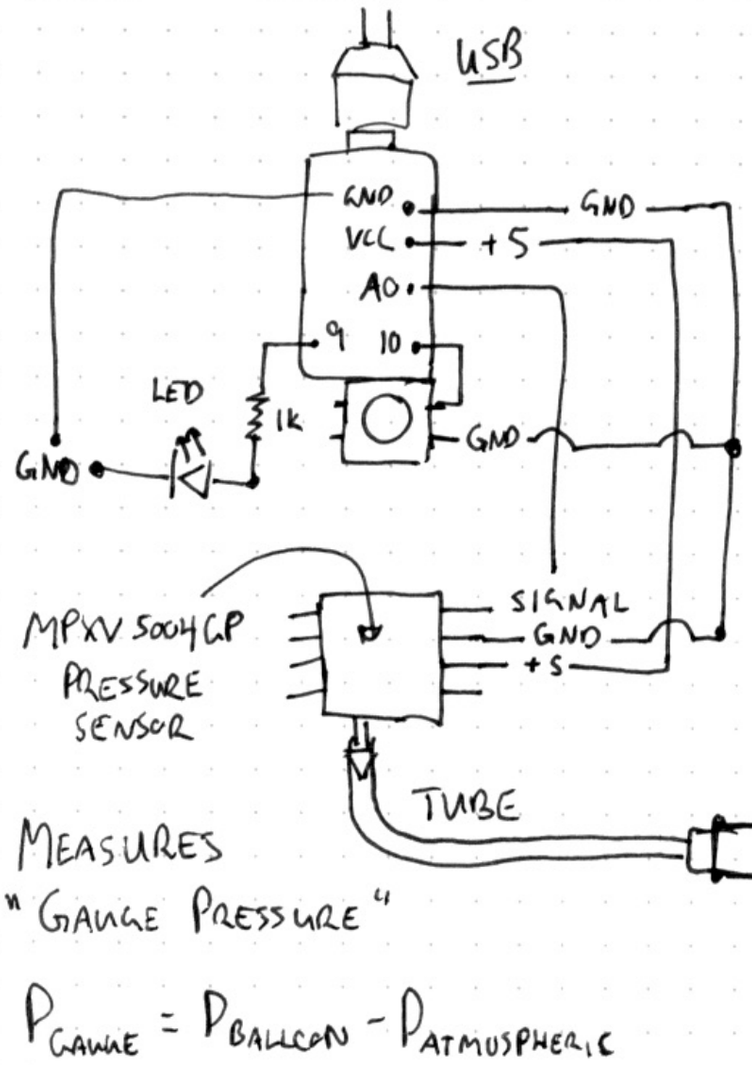


WE'RE MAKING MUSICAL BALLOONS THAT USE DEFORMATION TO CREATE MUSIC

We'll use sensors to measure RATE of deformation and AMOUNT of deformation, then convert those to MIDI messages which your computer will then turn into musical sounds!

Check out a fancier version of this here: https://vimeo.com/326637479

UWTMC DEFORMATION



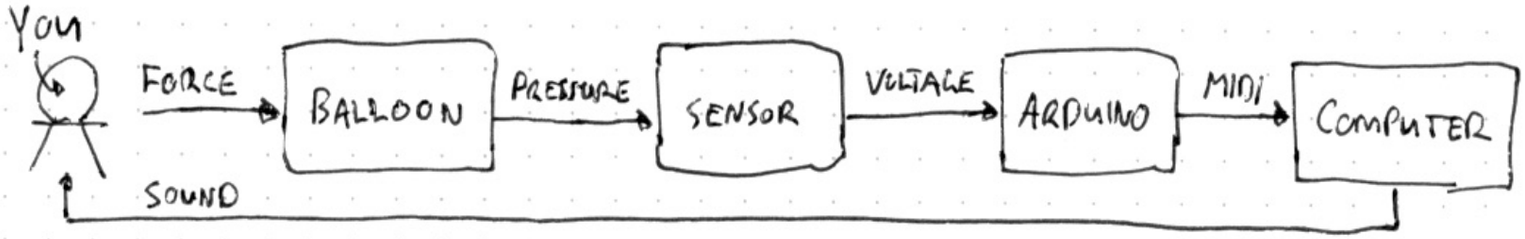
MEASURES "GAUGE PRESSURE"

$P_{GAUGE} = P_{BALLOON} - P_{ATMOSPHERIC}$

CONVERTED TO AN ANALOG VOLTAGE (0-5v) READ BY THE ARDUINO AND TURNED INTO VALUES (0-1023) WHICH ARE USED TO DECIDE WHICH MIDI MESSAGES TO SEND

BE CAREFUL! HOOKING THIS UP WRONG WILL RUIN THE SENSOR!

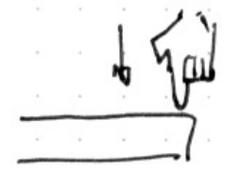
SQUEEZING INCREASES THE PRESSURE INSIDE THE BALLOON



MIDI: MUSICAL INSTRUMENT DIGITAL INTERFACE

WE SEND TWO TYPES OF MESSAGES TO OUR COMPUTERS TO BE TURNED INTO SOUNDS.

① NOTE ON



PRESS THE KEY

NOTE OFF

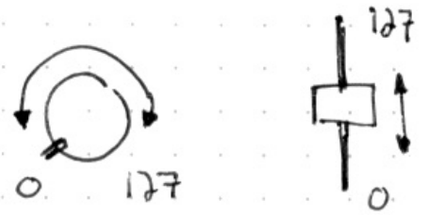
RELEASE THE KEY

CHANNEL 1-16

VELOCITY 0-127

PITCH 0-127

② CONTROL CHANGE



POSITION OF A KNOB OR A SLIDER.

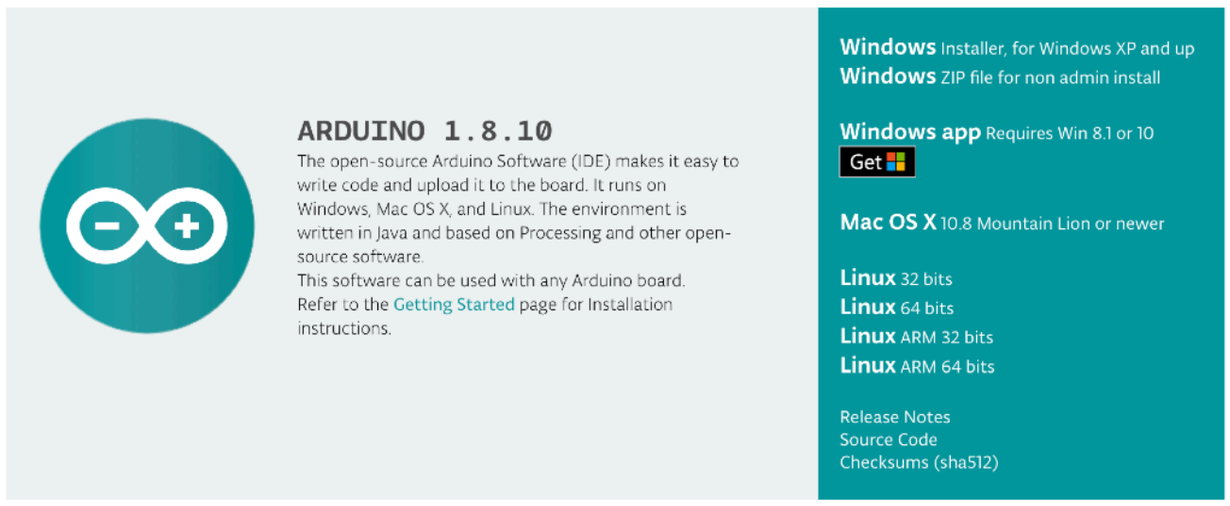
CHANNEL	,	CC NUM	,	VALUE
1-16		0-127		0-127

↖ 128 KNOBS!

DOWNLOADS

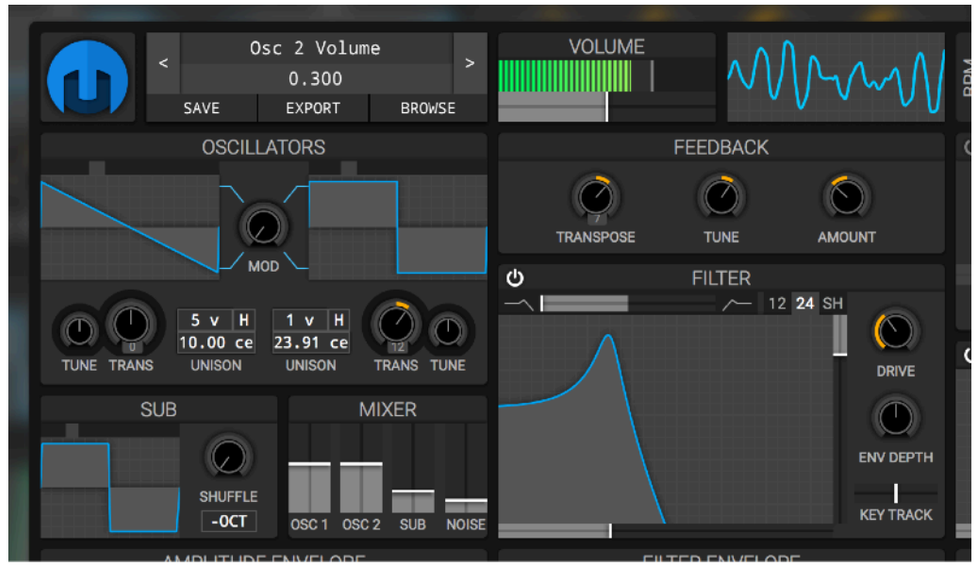
You need two pieces of software. Both are free and multi-platform!

Download the Arduino IDE



Arduino IDE - a software platform used to program your microcontroller.

https://www.arduino.cc/en/Main/Software



Helm - a software synthesizer to make musical sounds with your computer.

https://tytel.org/helm/

FILES

Workshops this term are at CML! All sessions run 3:30-5:30pm at Critical Media Lab, located in Communitech, 151 Charles St. W., Kitchener.

Sept. 18th: Deformation - MIDI Balloons: Deformation Files.zip

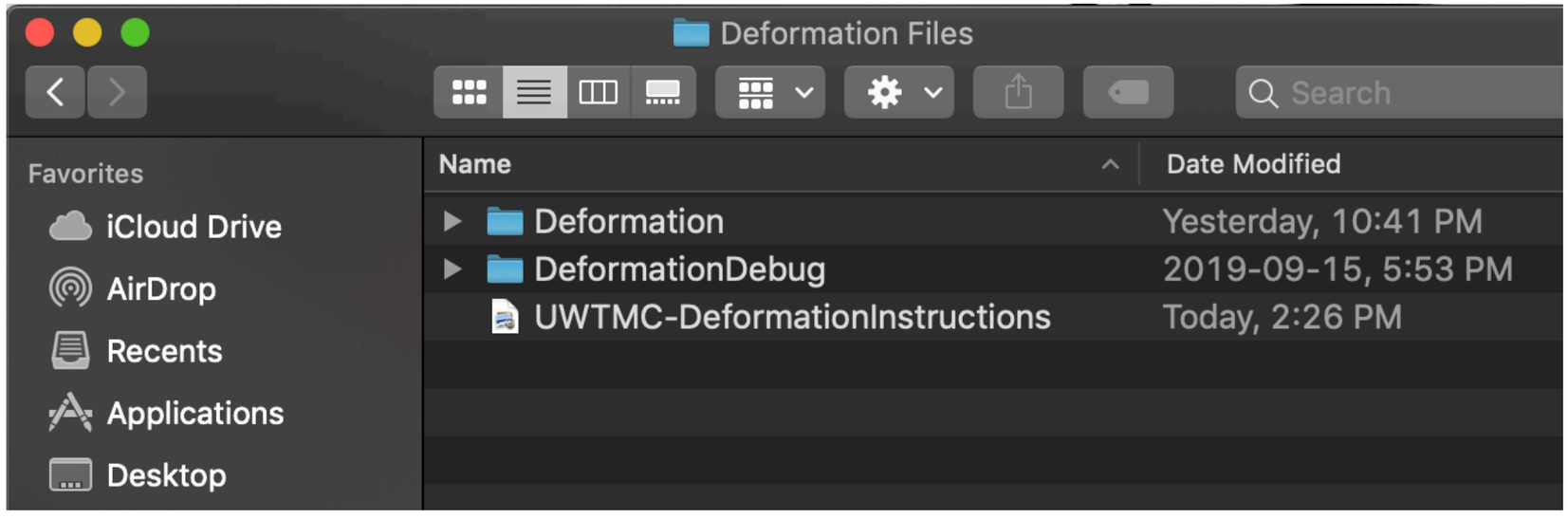
Oct. 2nd: Gravity - Shruti Box

Oct. 23rd: Continuity - Seaboard and Bop Pad

Nov. 6th: Complexity - Modular Synthesis

Nov. 20th: Exploration - Co-play Patch Tables

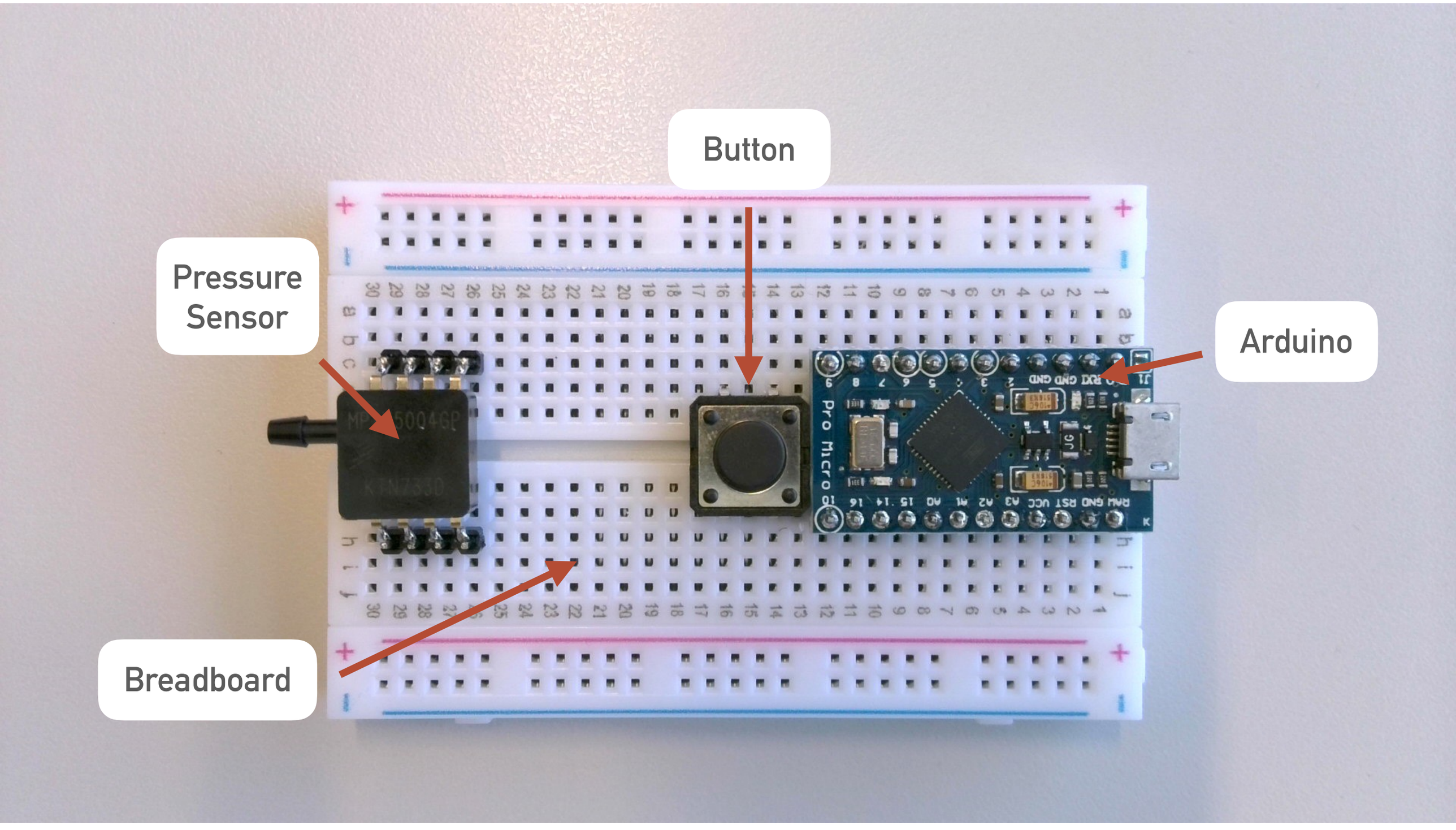
Files are available as a ZIP at https://uwtmc.com



LET'S DO IT!

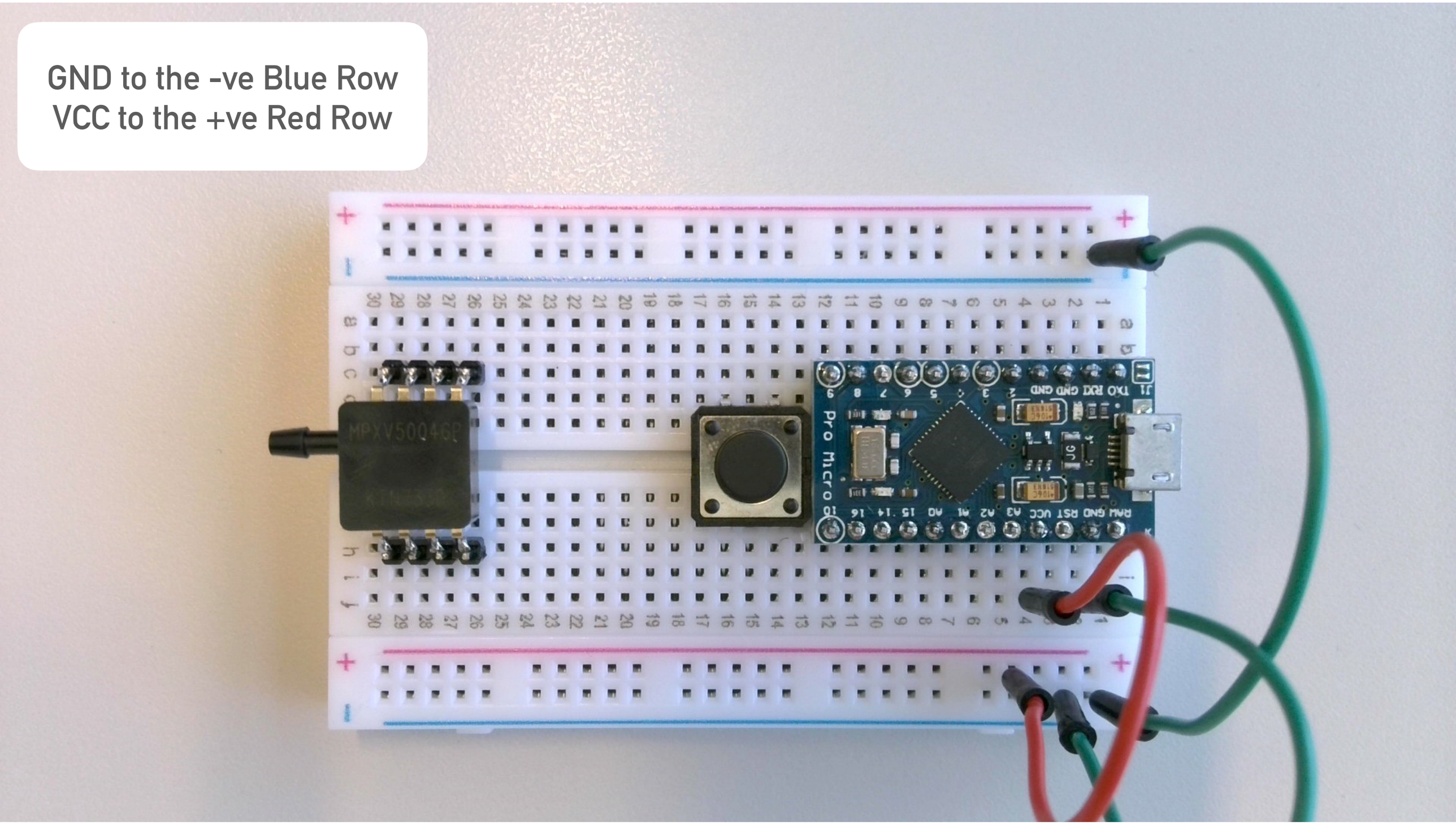
Matt will explain everything, so follow along with him on the big screen. Ask questions if you're unsure - other people are probably in the same boat.

HOOKING UP YOUR SENSORS! FOLLOW MB ON THE PROJECTOR

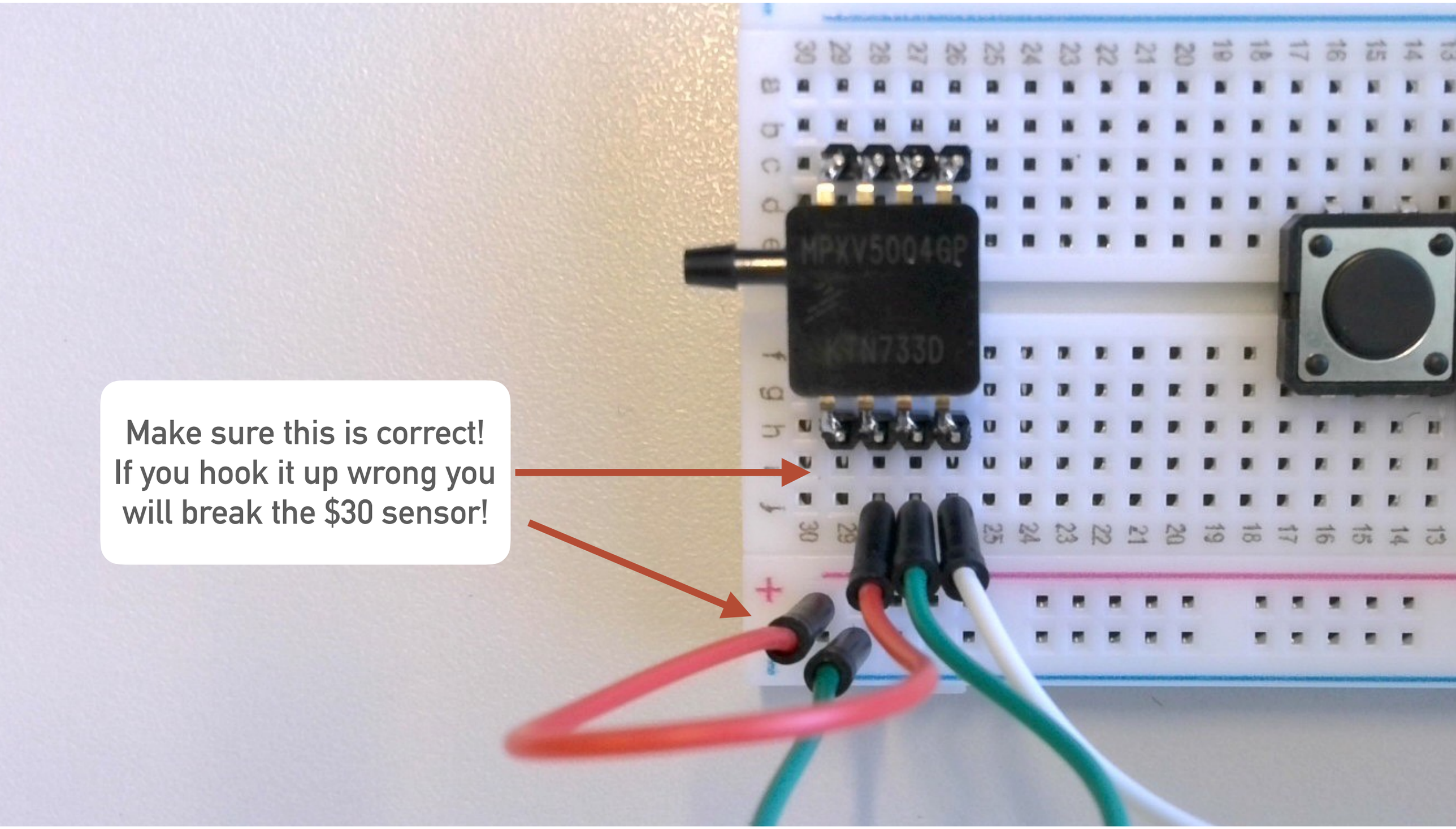


HOOKING UP YOUR SENSORS! POWER

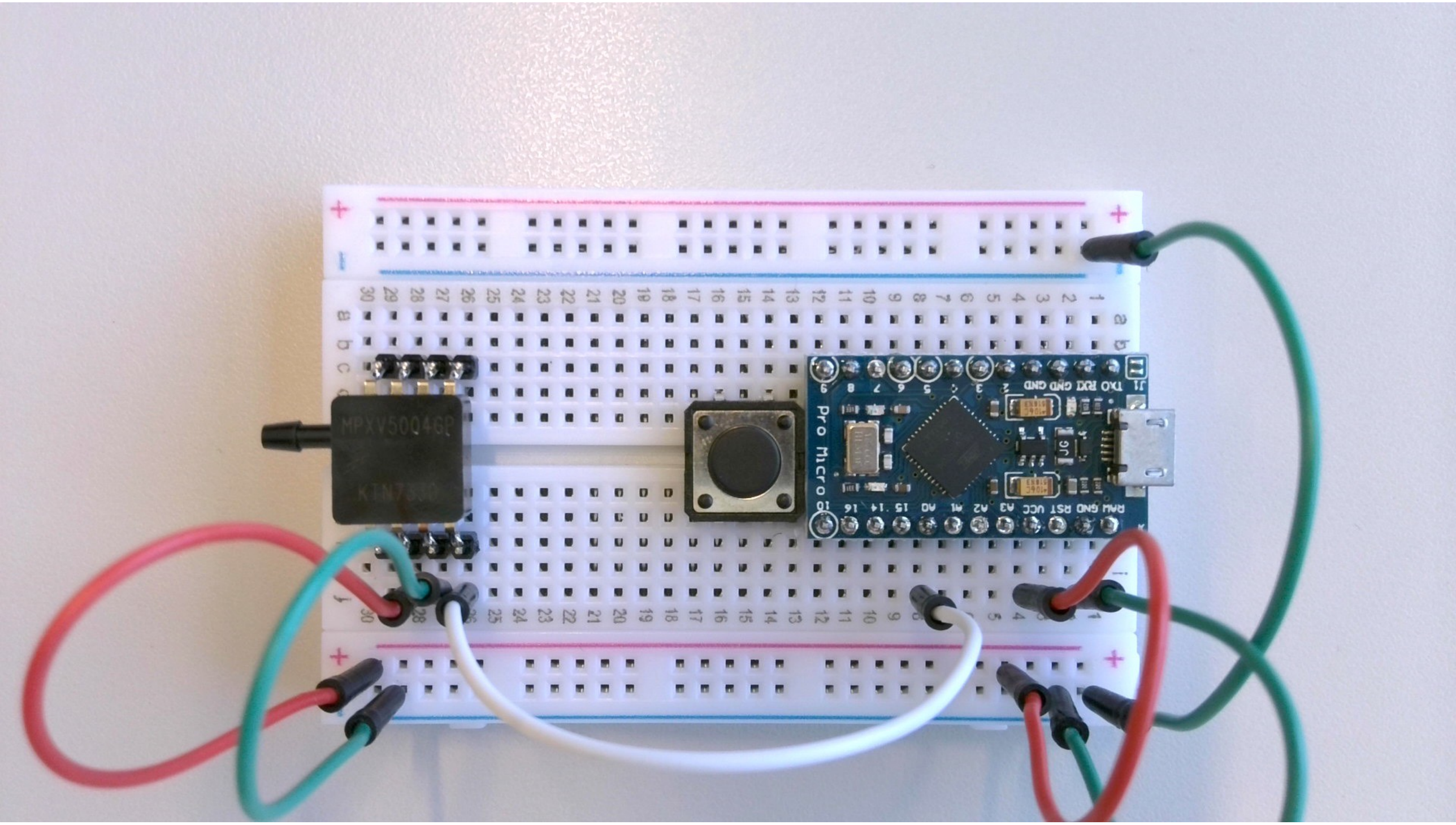
GND to the -ve Blue Row
VCC to the +ve Red Row



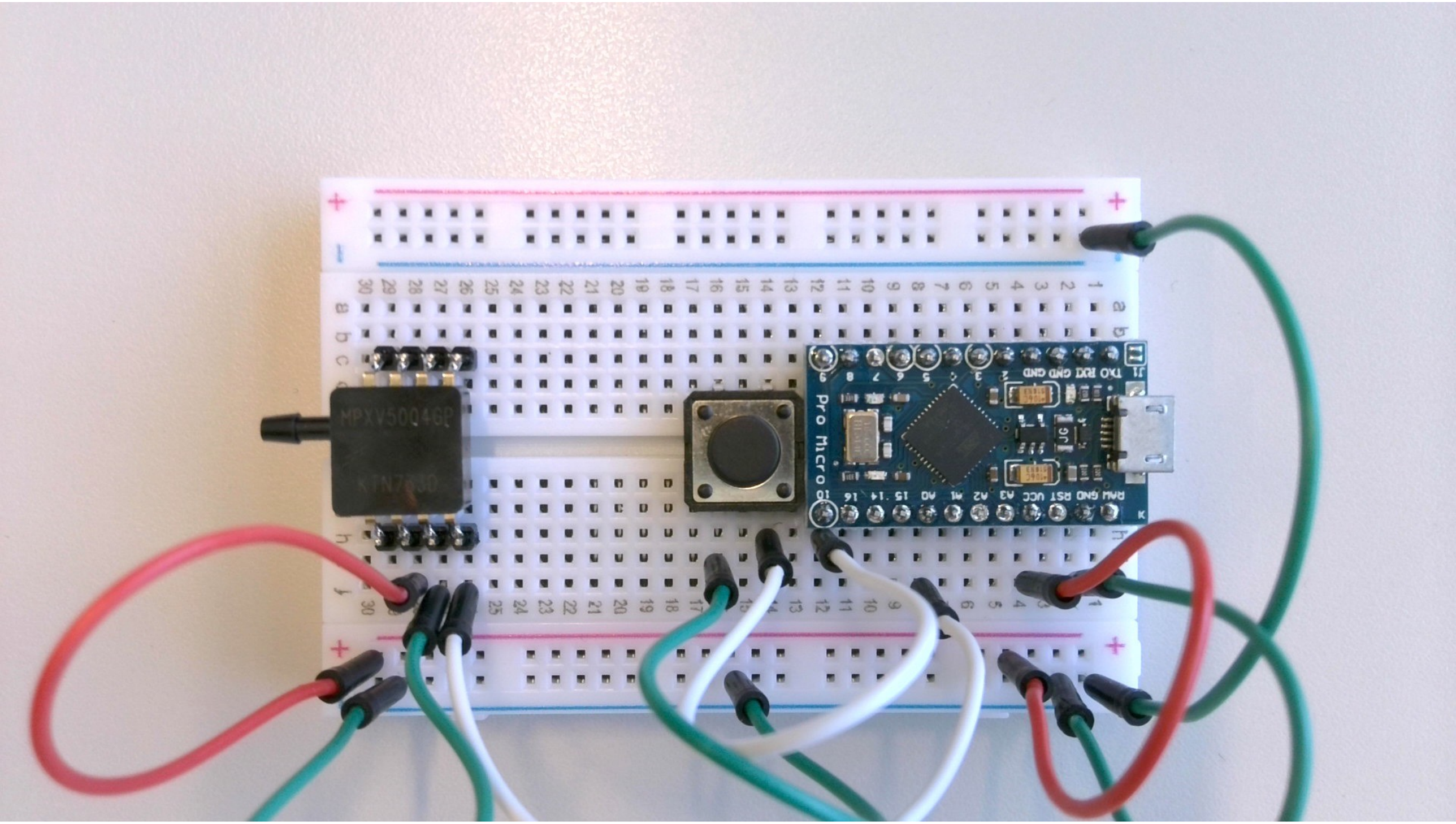
HOOKING UP YOUR SENSORS! PRESSURE



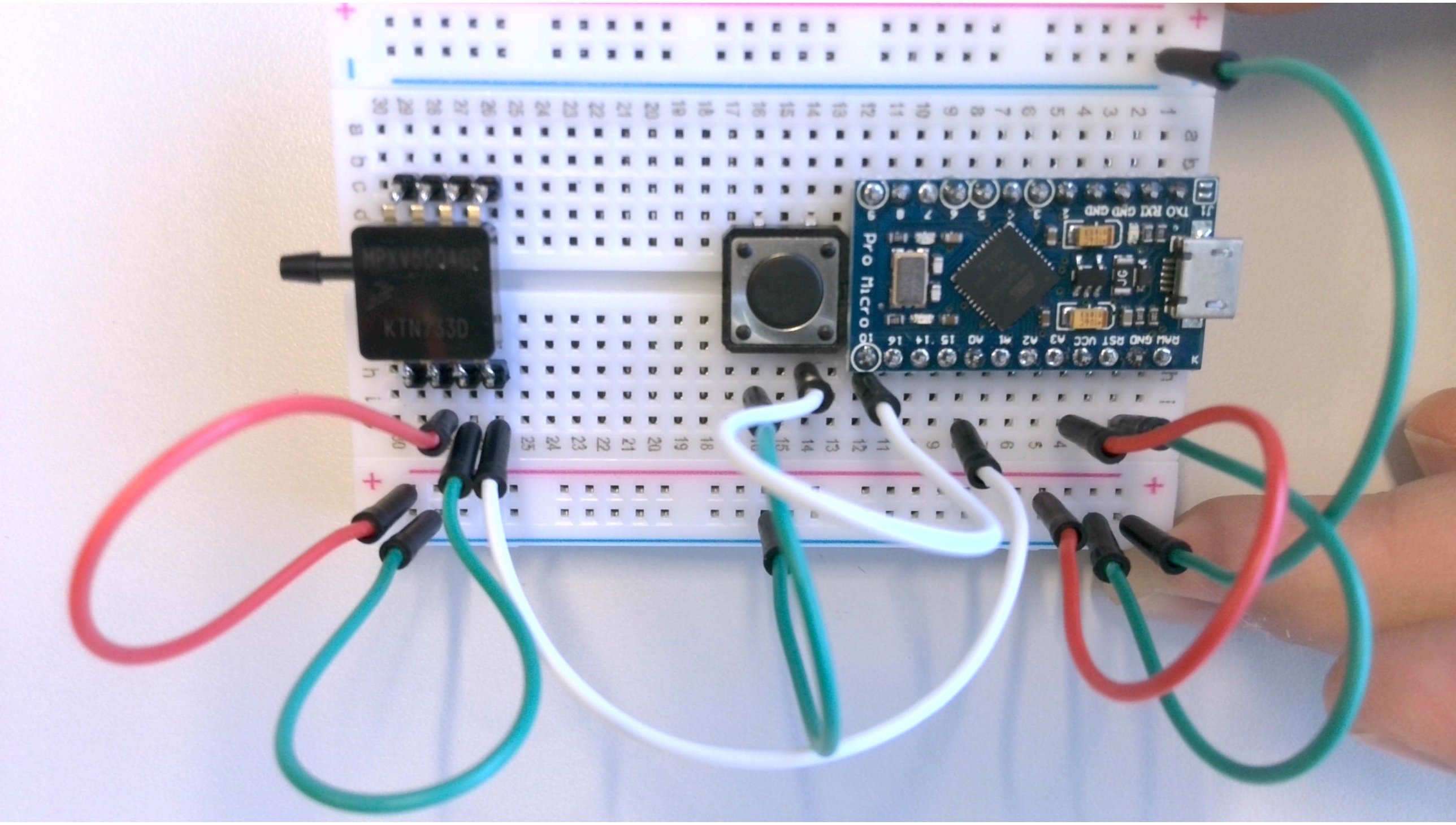
HOOKING UP YOUR SENSORS! PRESSURE SENSOR



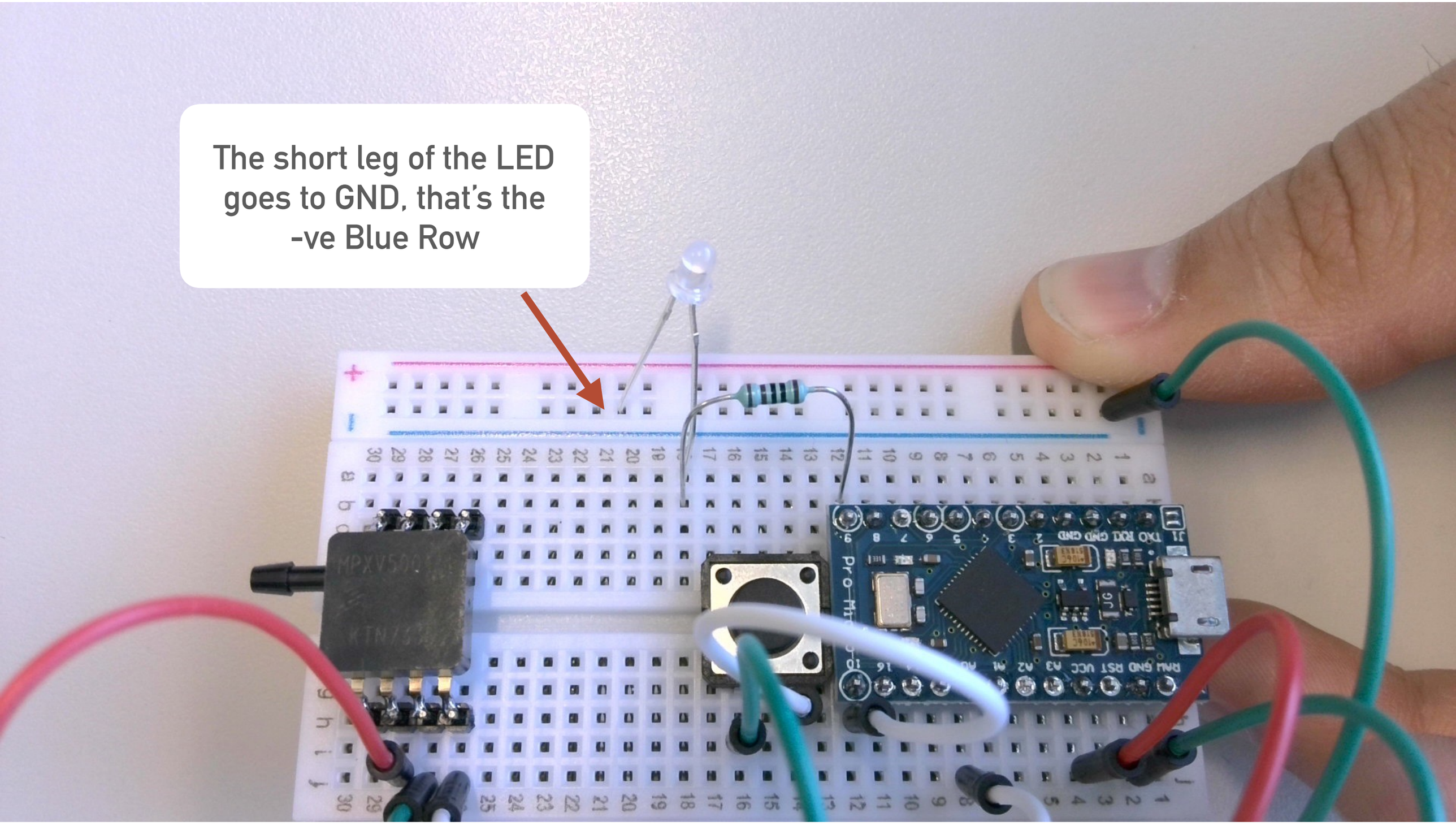
HOOKING UP YOUR SENSORS! BUTTON



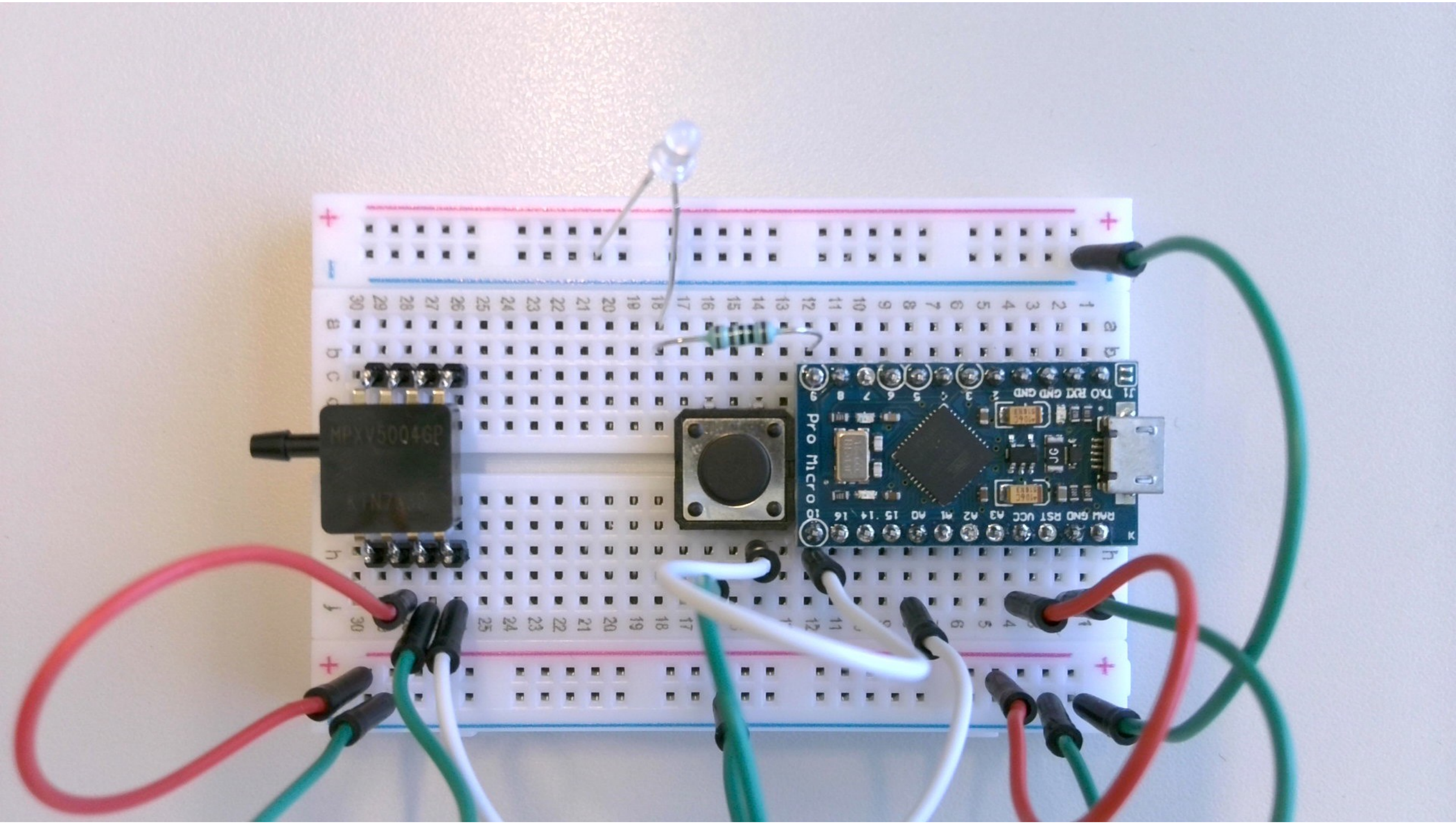
HOOKING UP YOUR SENSORS! BUTTON



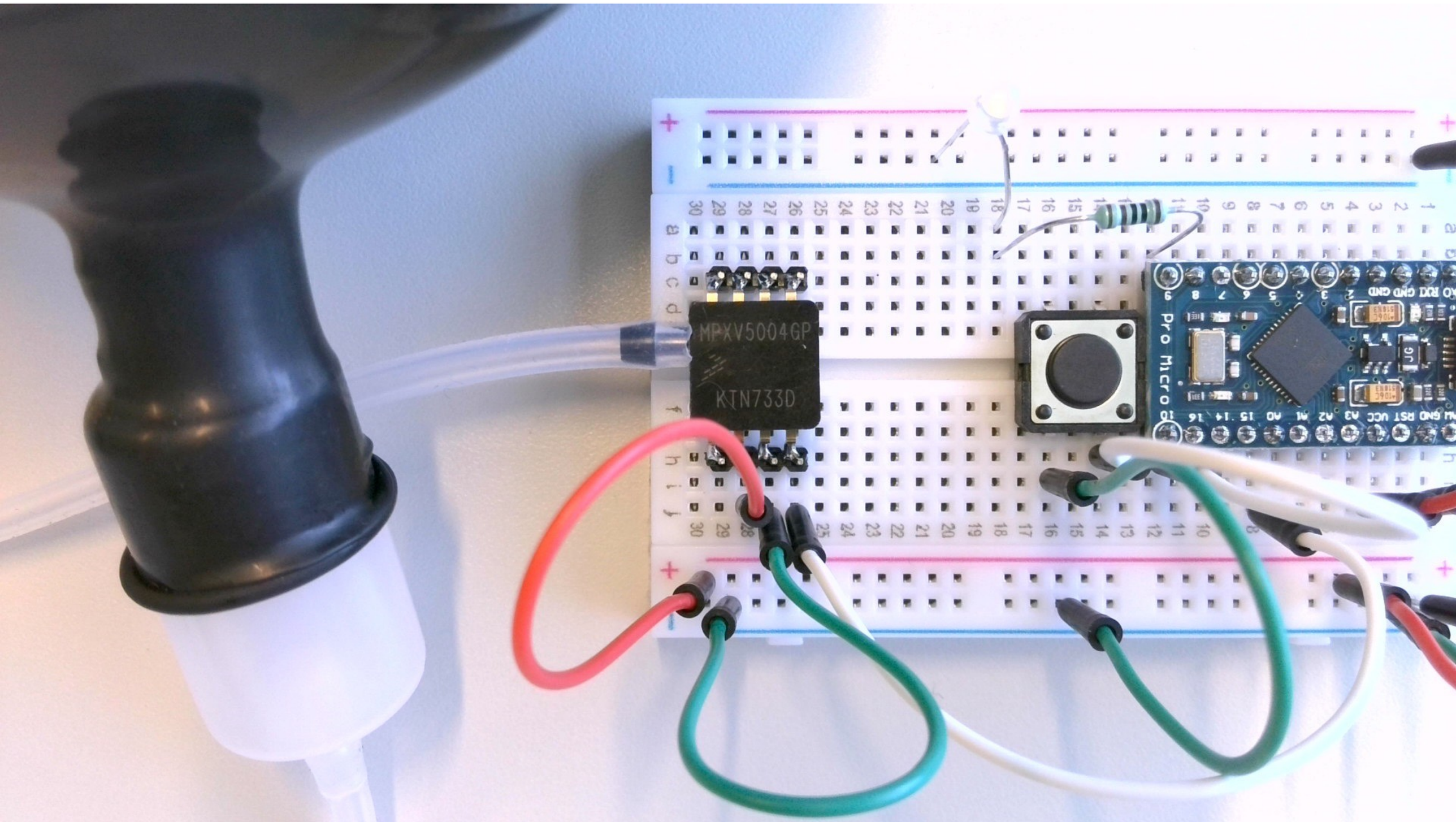
HOOKING UP YOUR SENSORS! LED



HOOKING UP YOUR SENSORS! LED



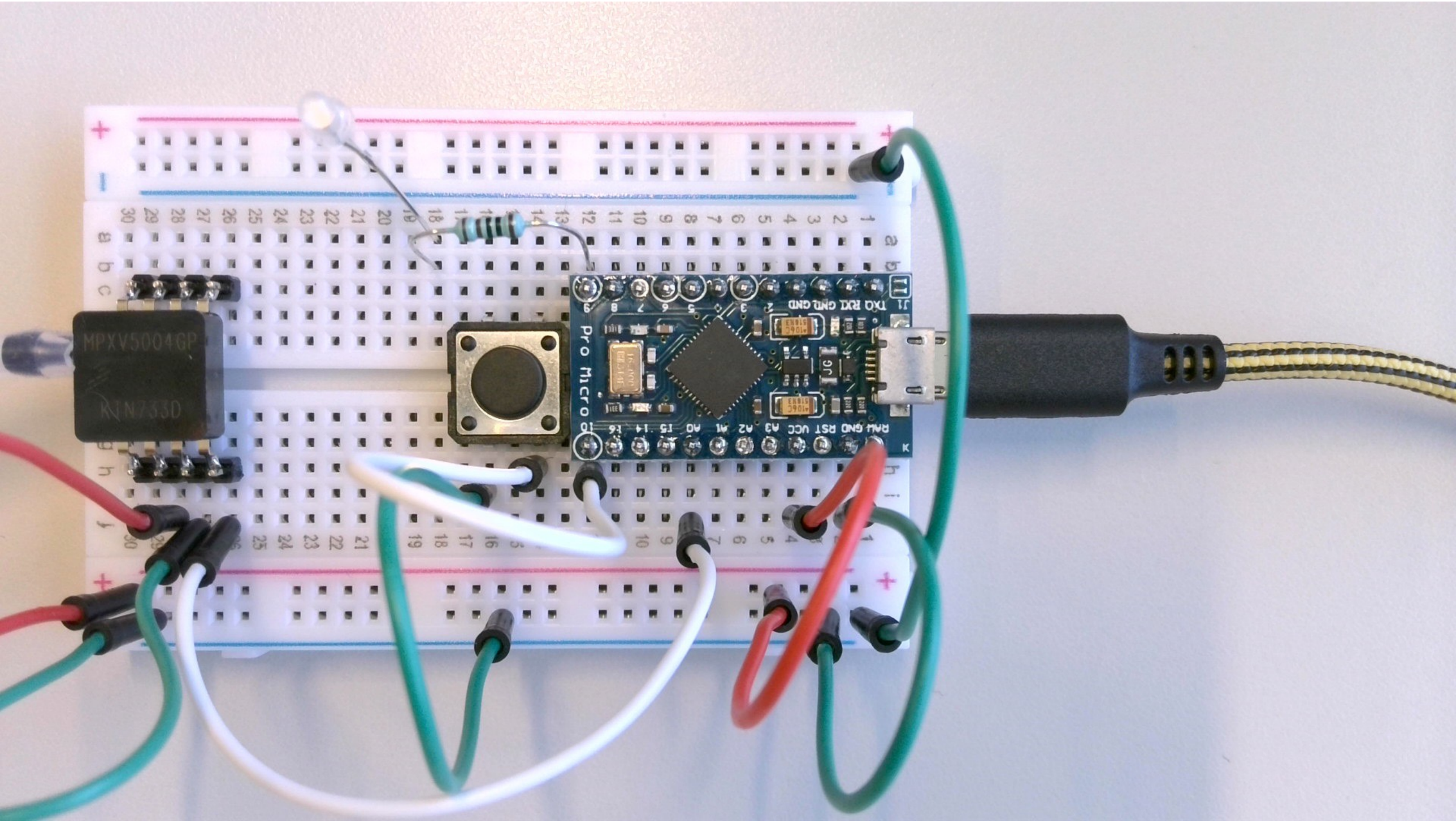
HOOKING UP YOUR SENSORS! ATTACH A BALLOON



SAFETY CHECK!

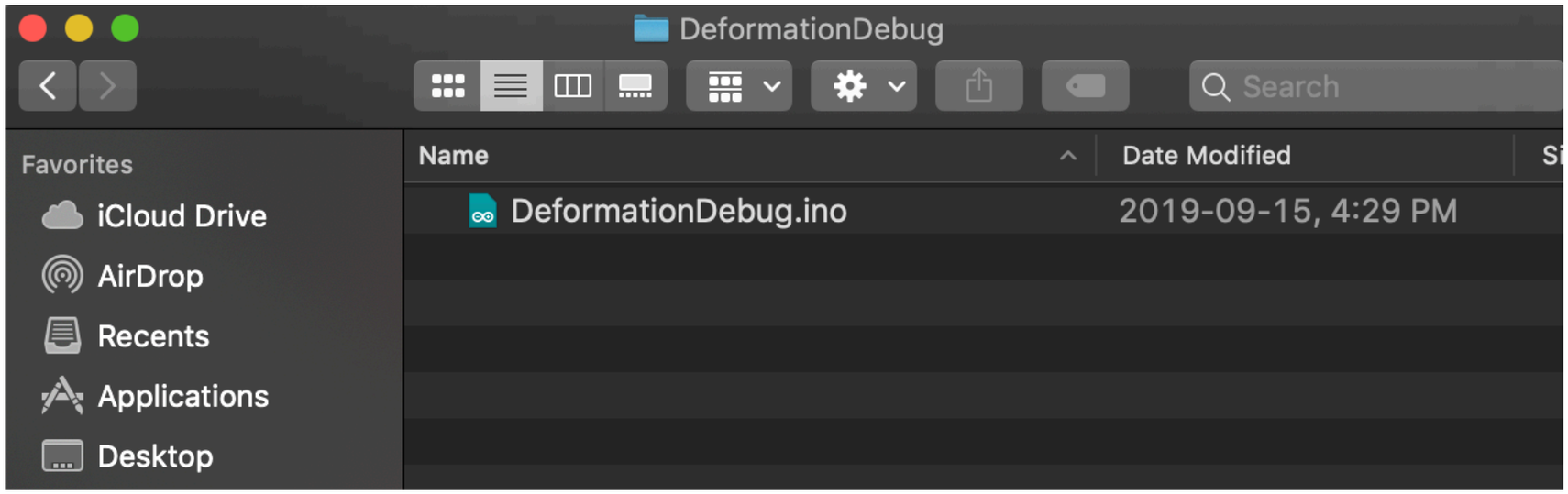
BEFORE PLUGGING THE USB CABLE INTO YOUR COMPUTER GET MATT TO CHECK YOUR BOARD SO YOU KNOW IT'S SAFE AND NOTHING WILL BREAK!

HOOKING UP YOUR SENSORS! PLUG IN USB



ON YOUR COMPUTER

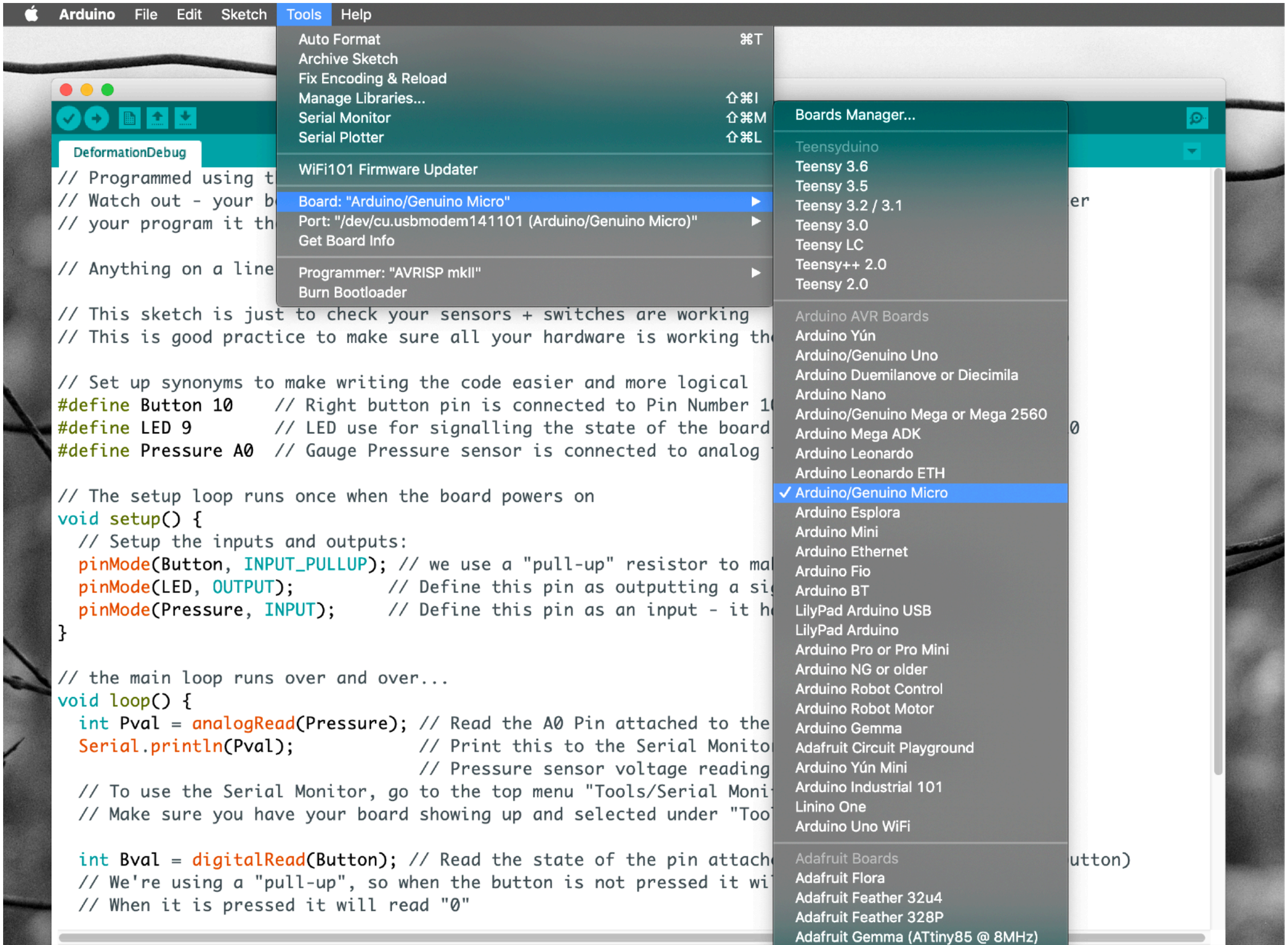
Launch Arduino and open "DeformationDebug.ino"



Arduino IDE - a software platform used to program your microcontroller.

https://www.arduino.cc/en/Main/Software

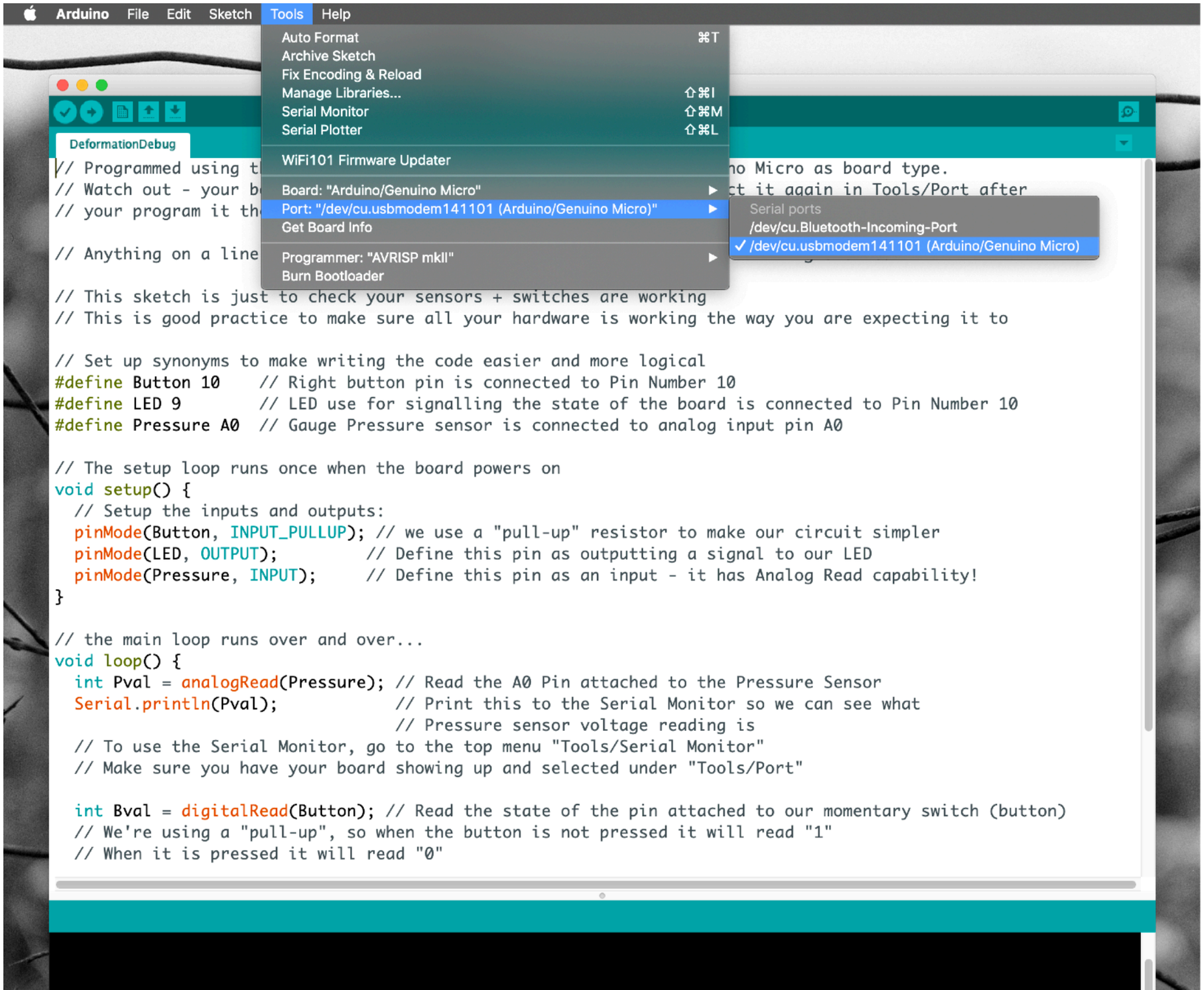
PROGRAM YOUR DEVICE – BOARD TYPE



PROGRAM YOUR DEVICE – PORT

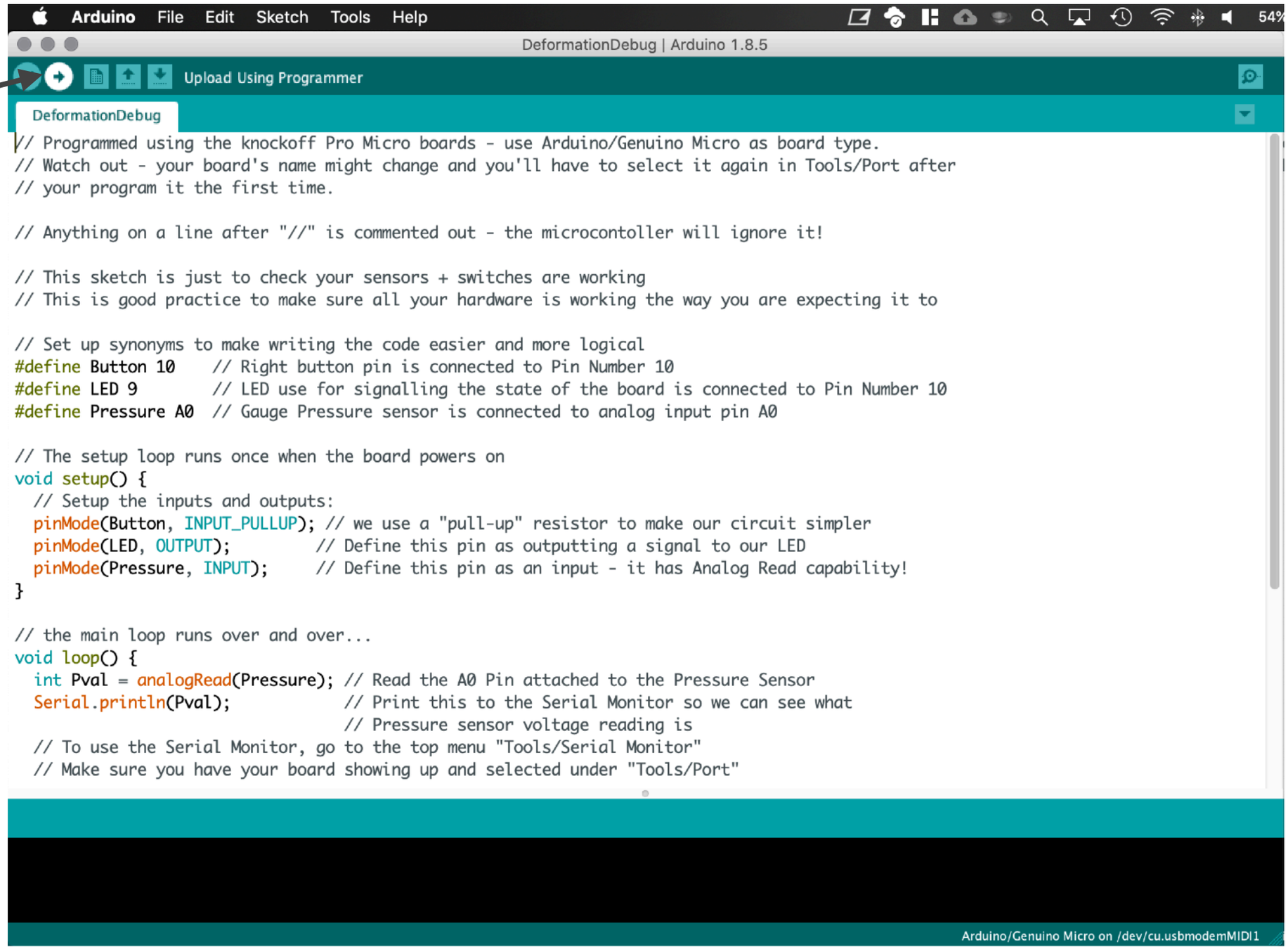
Sometime this name changes after programming, so you may need to reselect this from time to time.

If you get an error that says "board not found" you should check it's plugged in and that your port is selected correctly.

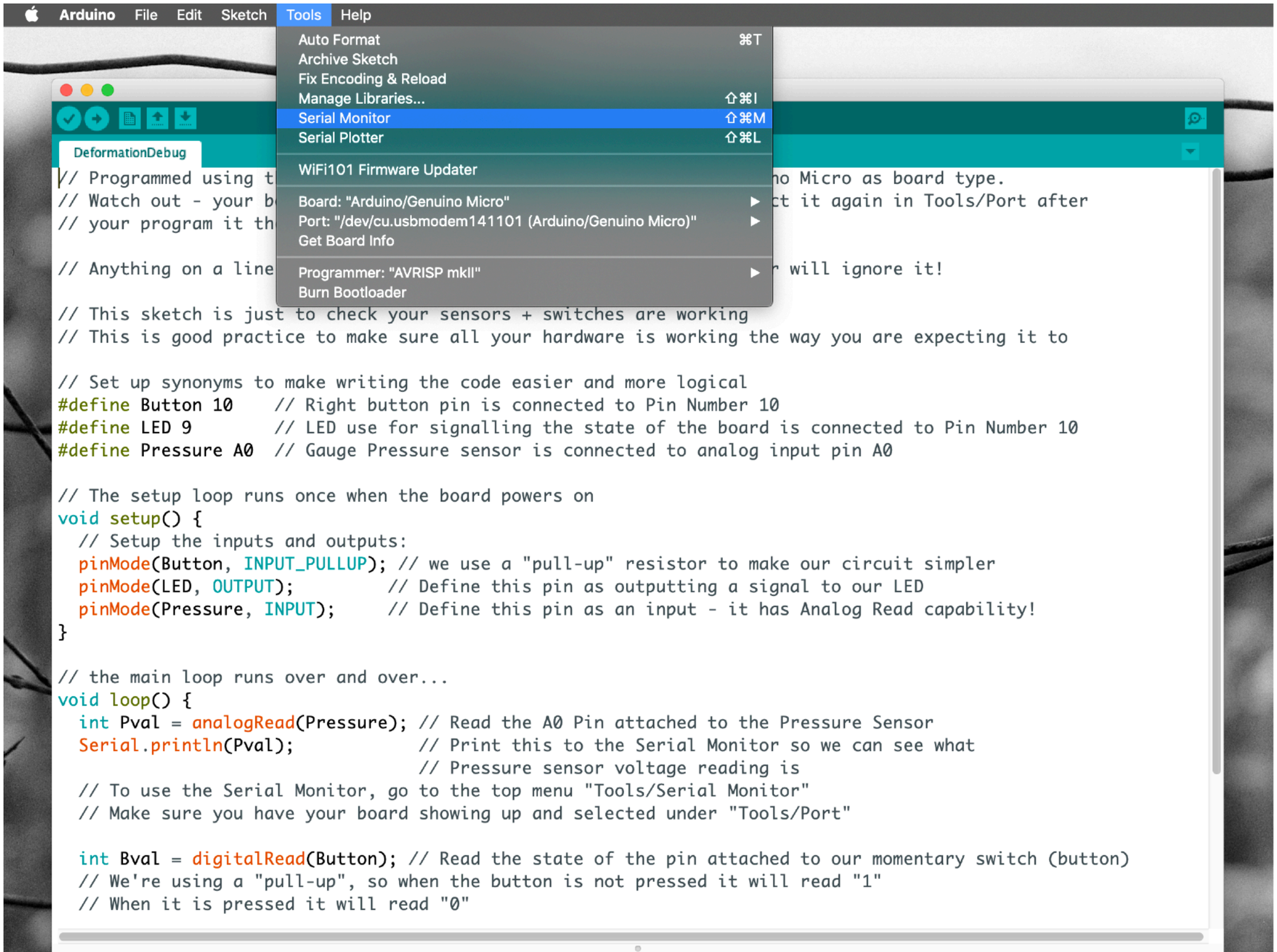


PROGRAM YOUR DEVICE – DEFORMATIONDEBUG.INO

With your arduino plugged in, press the ARROW button to compile the code and send it to the arduino.



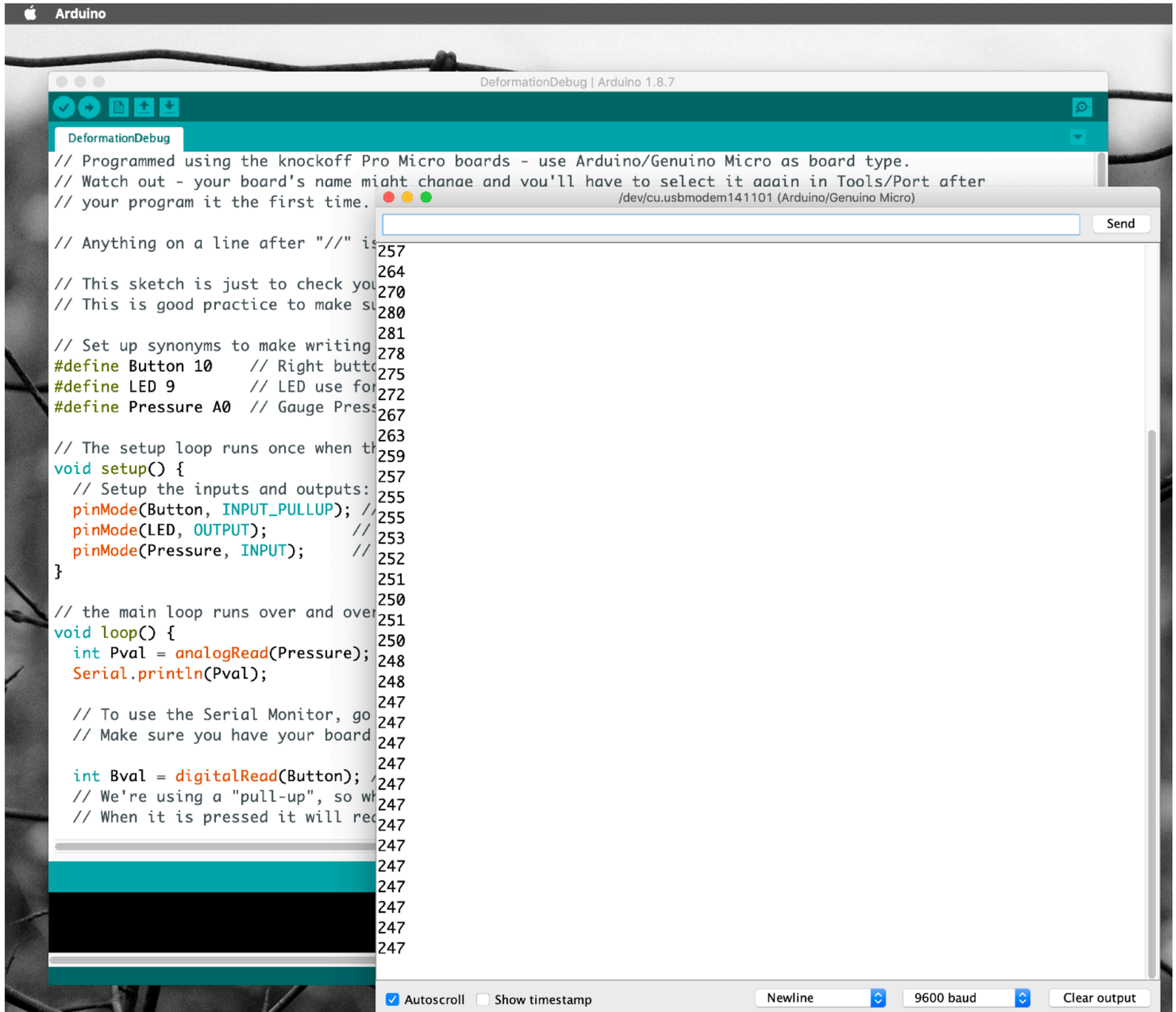
PROGRAM YOUR DEVICE – MONITOR THE SERIAL PORT



PROGRAM YOUR DEVICE – CHECK PRESSURE READING

Squeeze your balloon and see how the values change!

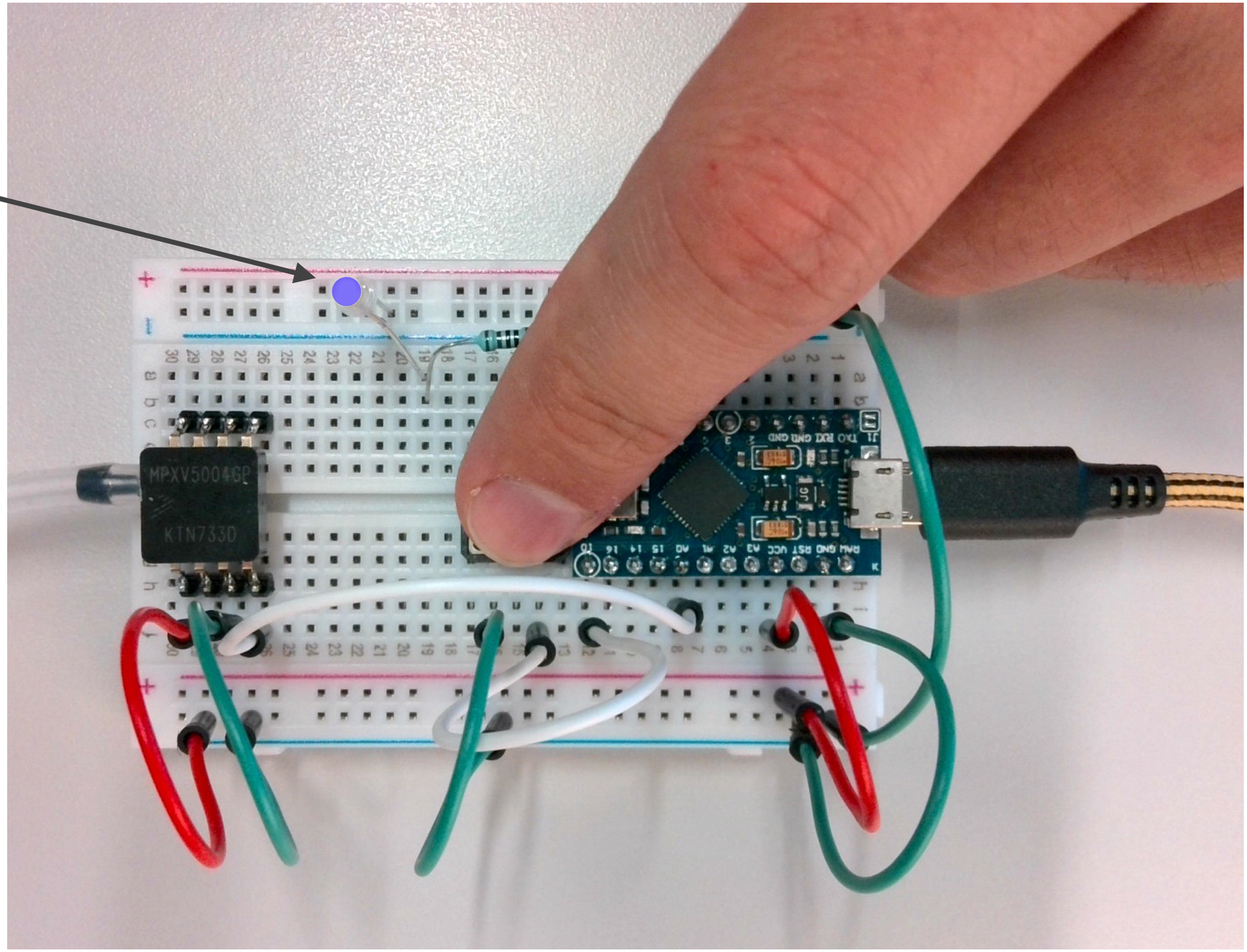
This is printing out the analog voltage output by the sensor and converted to a number between 0-1023.



PROGRAM YOUR DEVICE – CHECK BUTTON AND LED

Without the button pressed the LED should be bright blue.

When you press the button the LED should turn off.



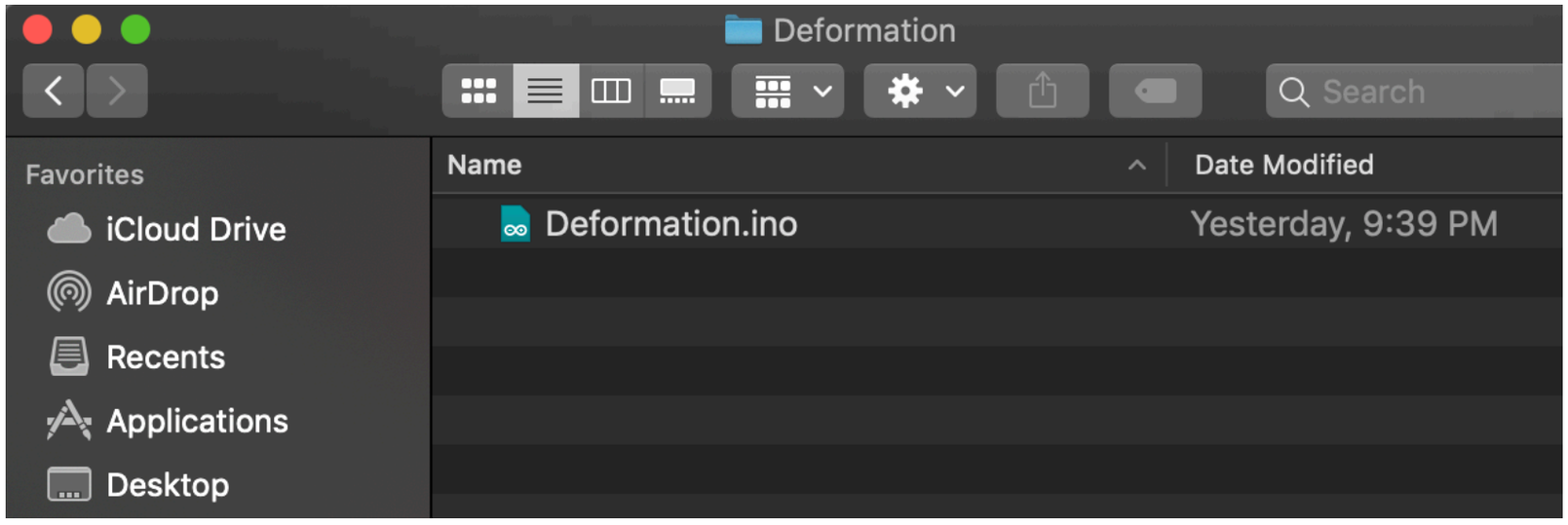
PROGRAM YOUR DEVICE – DEFORMATIONDEBUG.INO

If your button changed the LED from on to off, and your serial monitor values changed when you squeezed your balloon, you're good to go!

If it didn't, get some help to figure out what's wrong with how you hooked things up on your breadboard!

OPEN A FILE

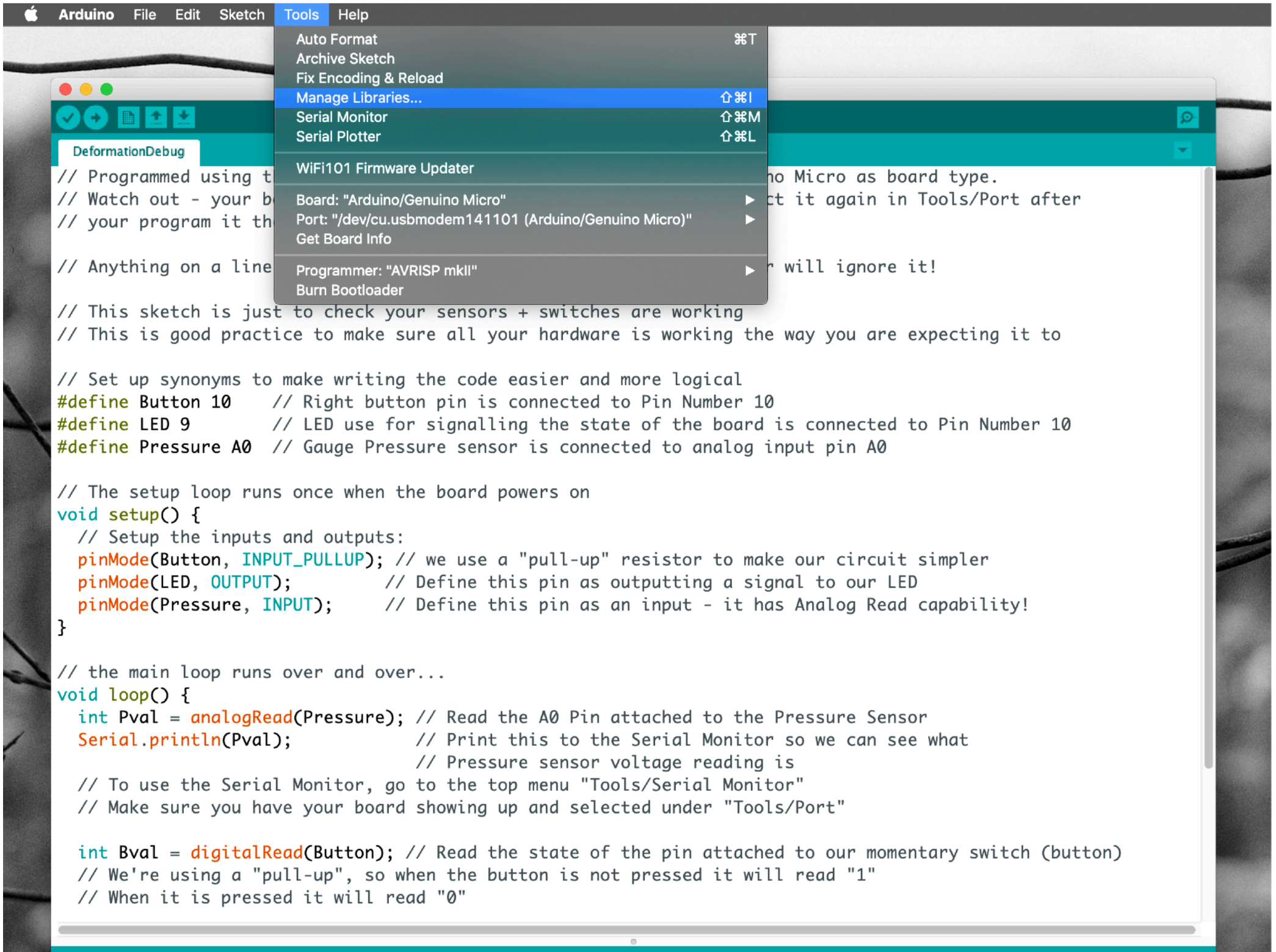
Launch Arduino and open "Deformation.ino"



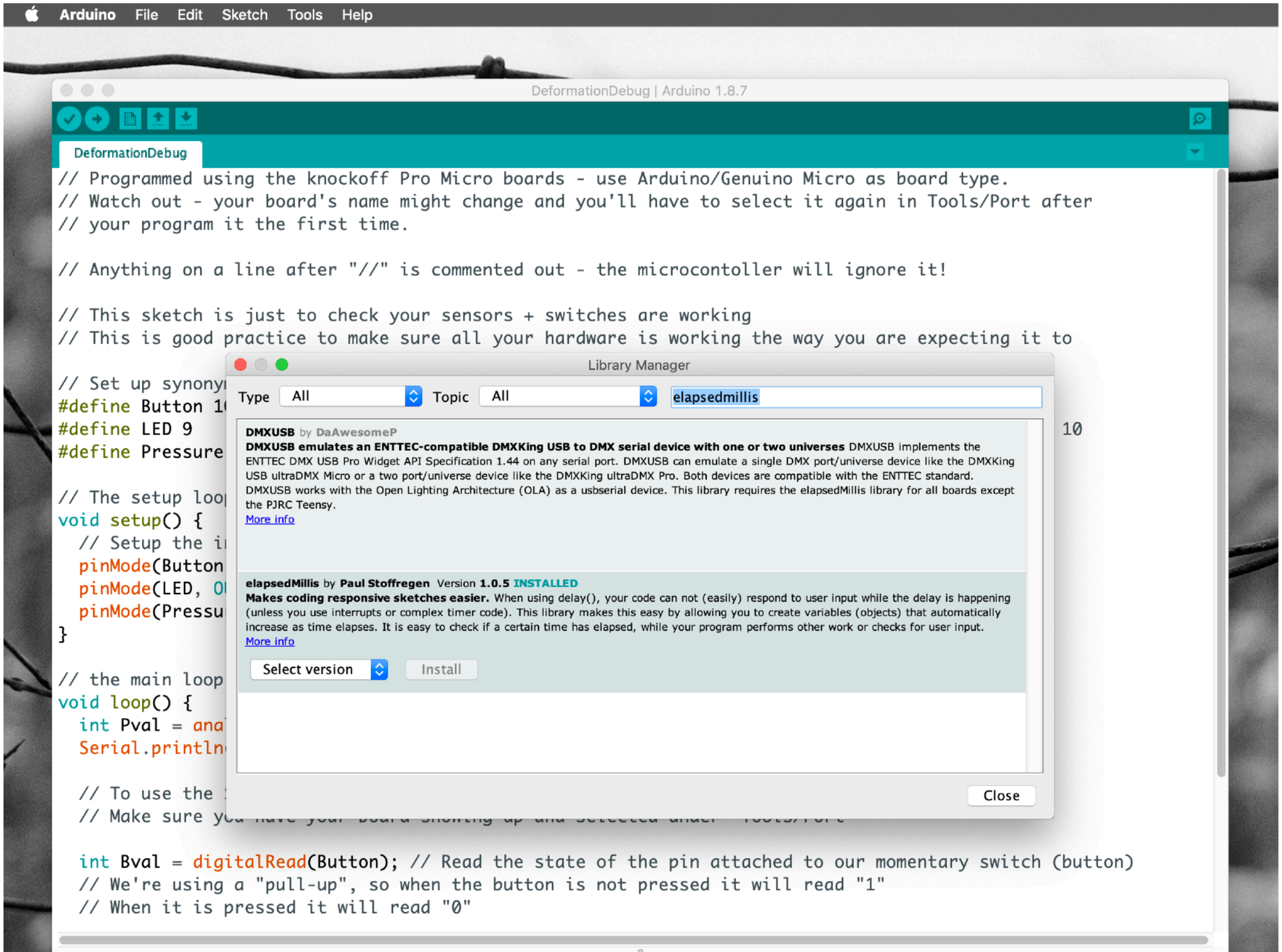
Arduino IDE - a software platform used to program your microcontroller.

https://www.arduino.cc/en/Main/Software

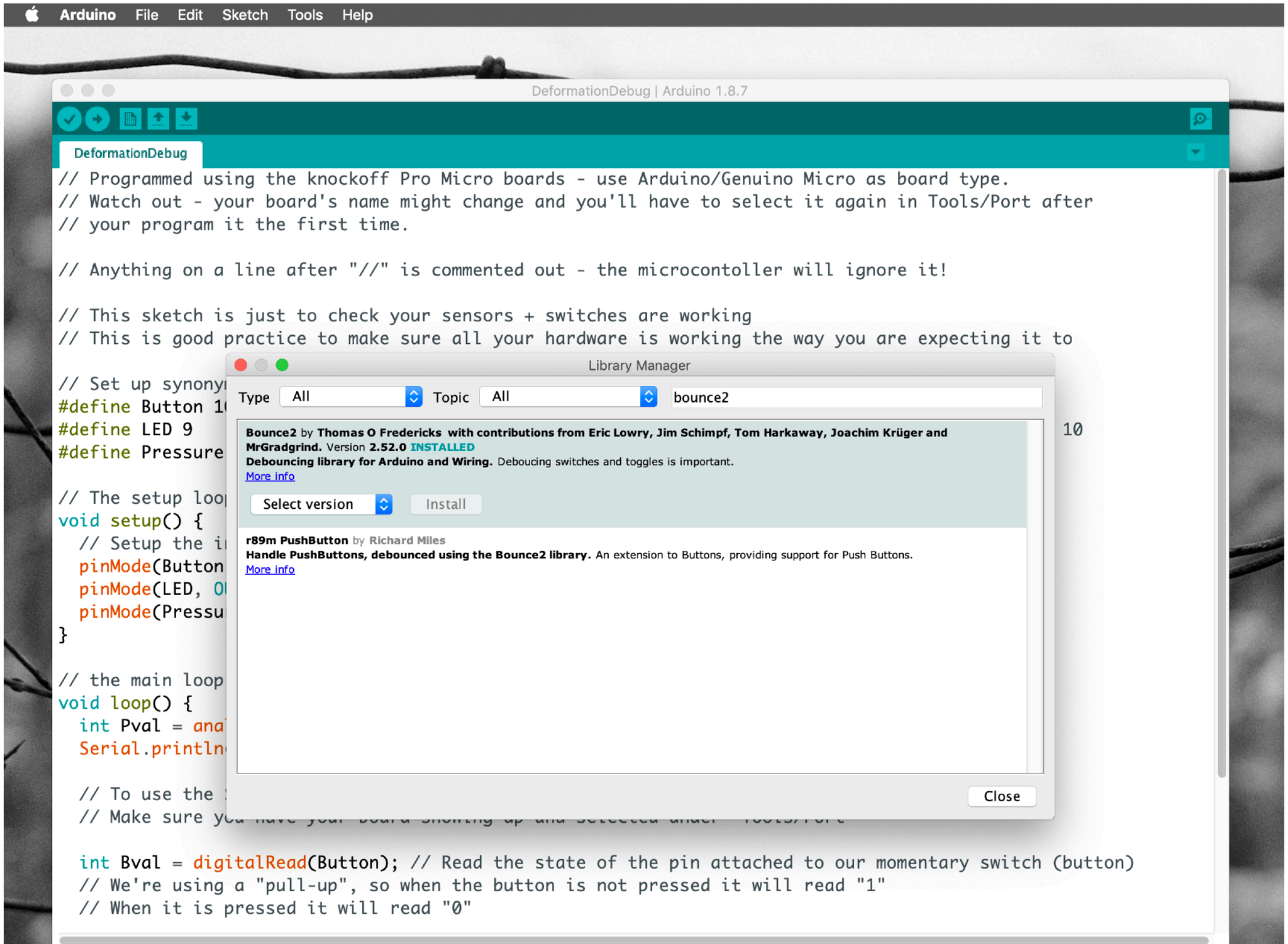
LIBRARIES – INSTALL THESE TO ADD FUNCTIONS TO YOUR PROGRAM



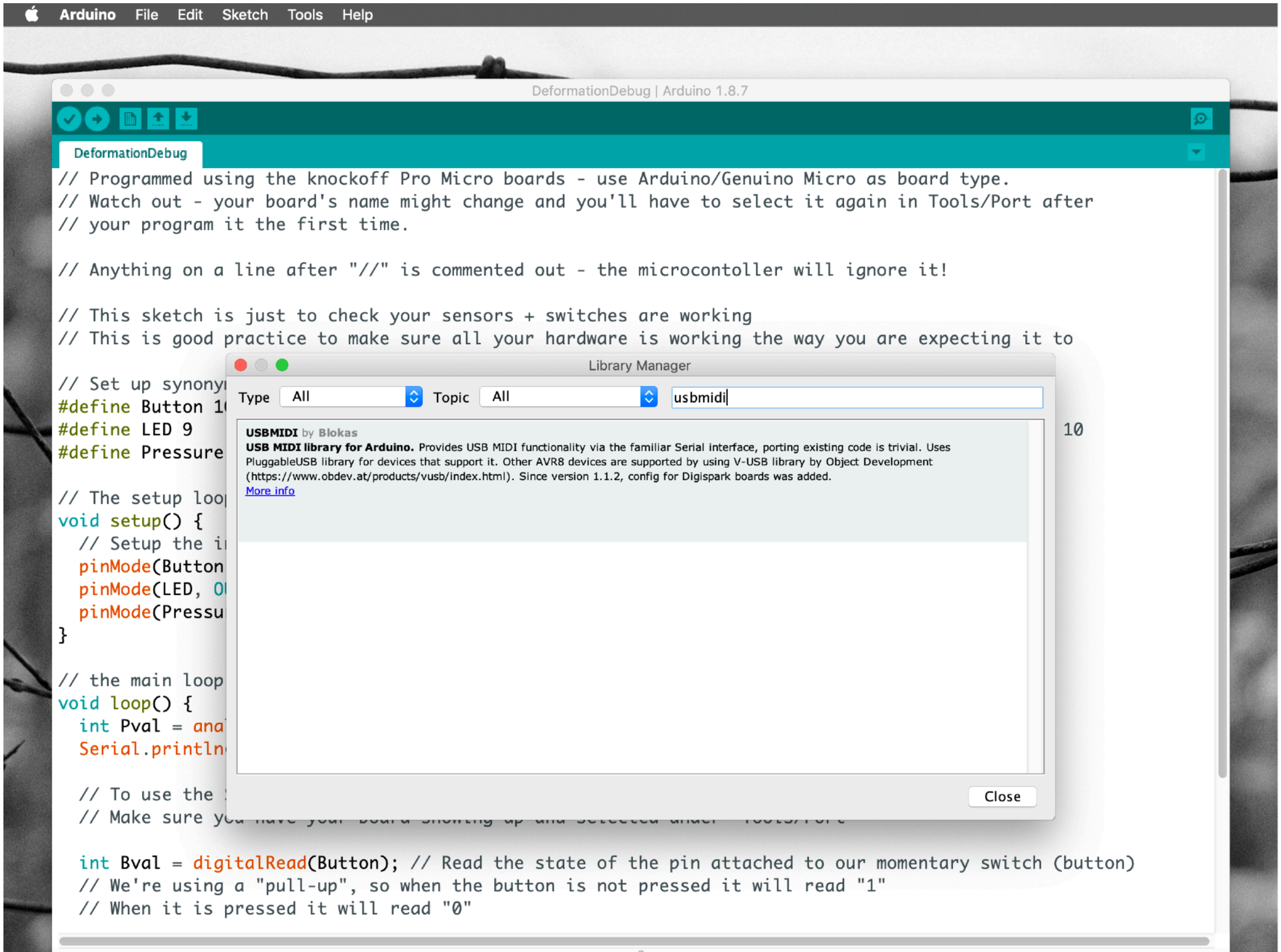
LIBRARIES – ELAPSEDMILLIS



LIBRARIES – BOUNCE2

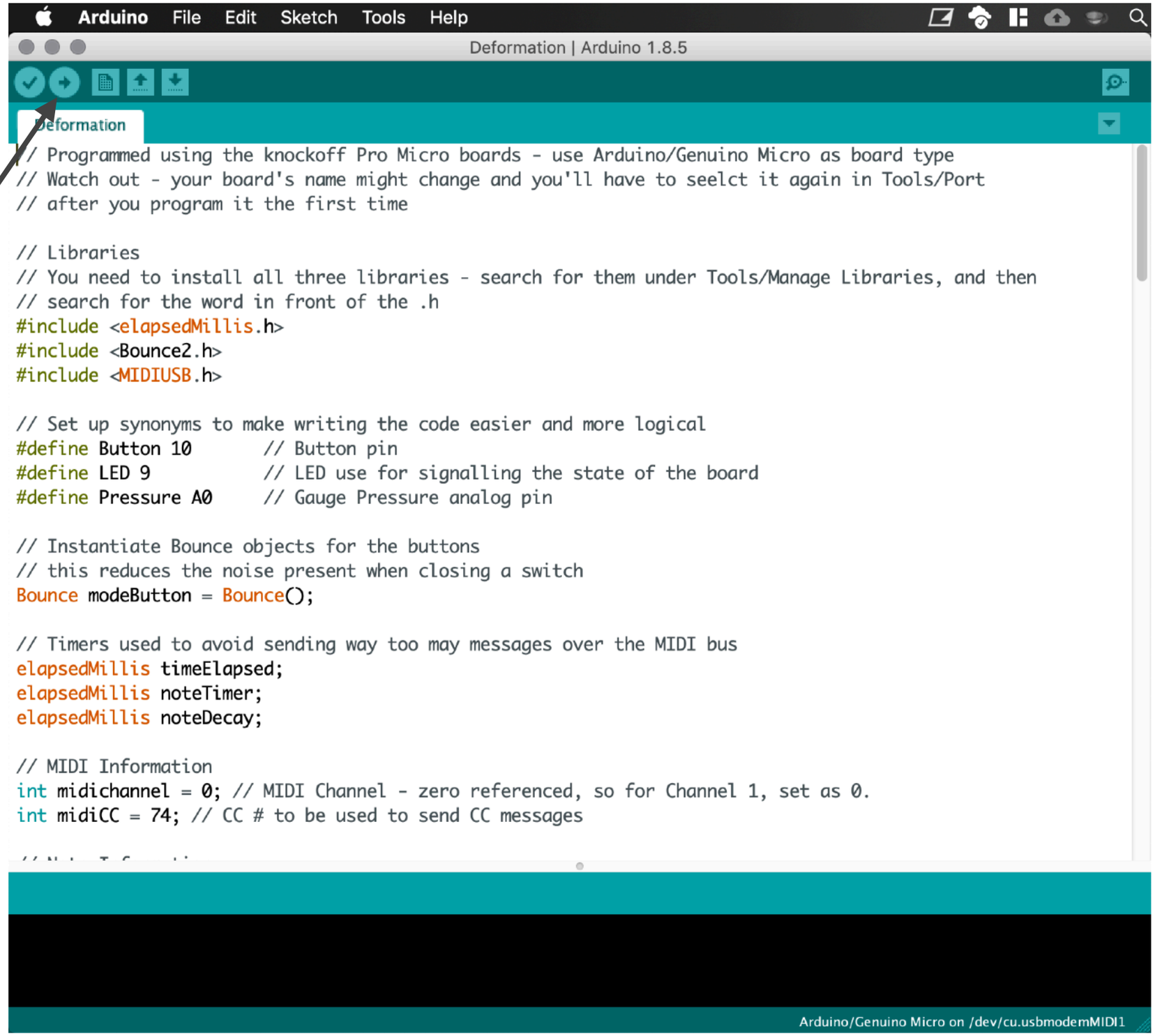


LIBRARIES – USBMIDI



PROGRAM YOUR DEVICE – DEFORMATION.INO

Now program your board with the actual code. This will send out MIDI messages to your computer that HELM will turn into sounds.



PROGRAM YOUR DEVICE – MODES

Pressing your button will cycle through the modes:

***MODE 0** - low LED*

Send MIDI Notes

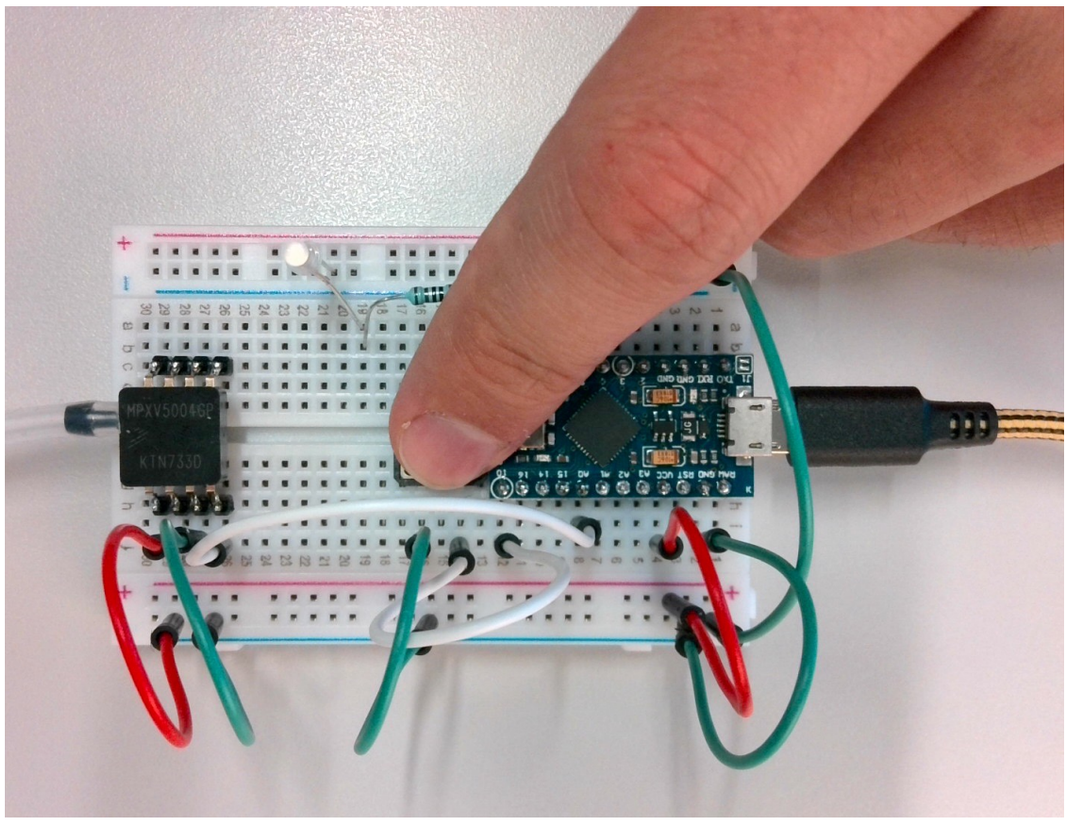
Send MIDI CC

***MODE 1** - med LED*

Send MIDI CC

***MODE 2** - high LED*

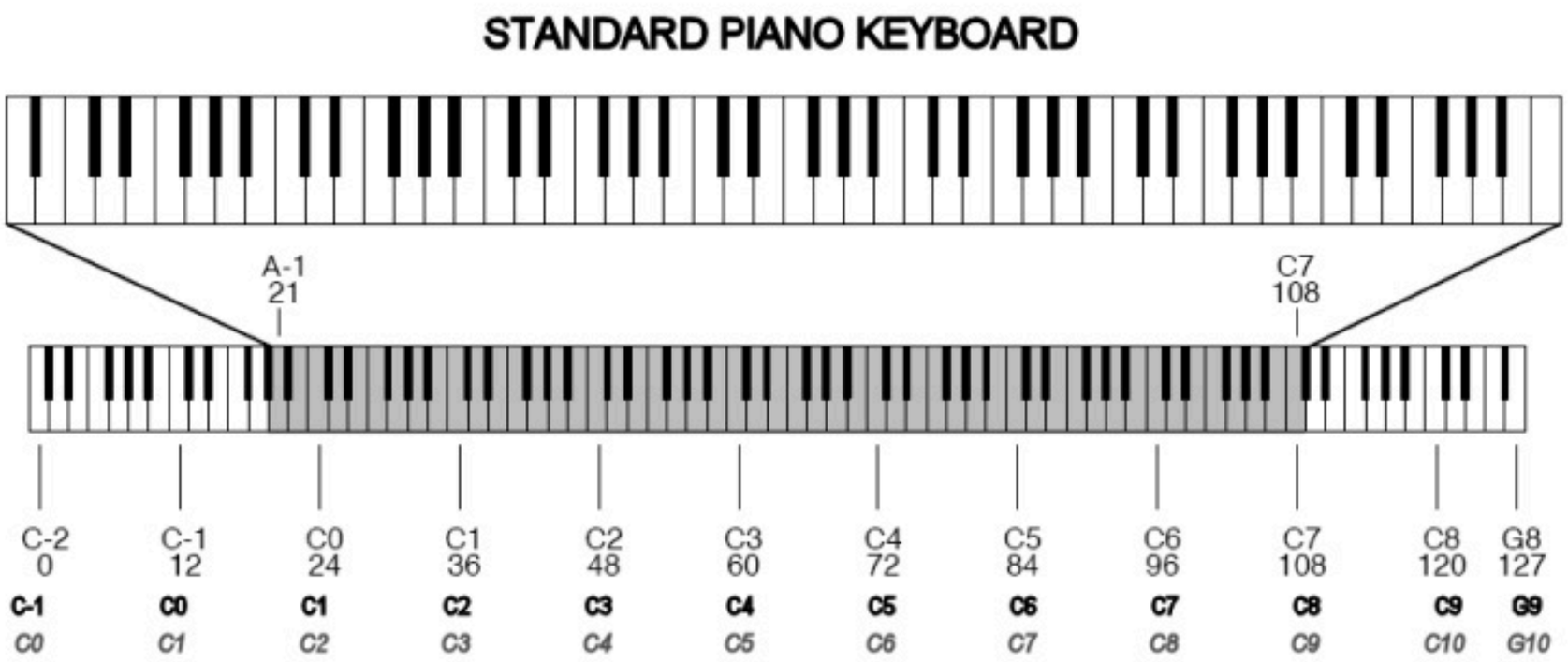
Set the High Pressure value - make sure you squeeze the balloon in this mode so the pressure range is set properly.



CHANGE YOUR NOTES!

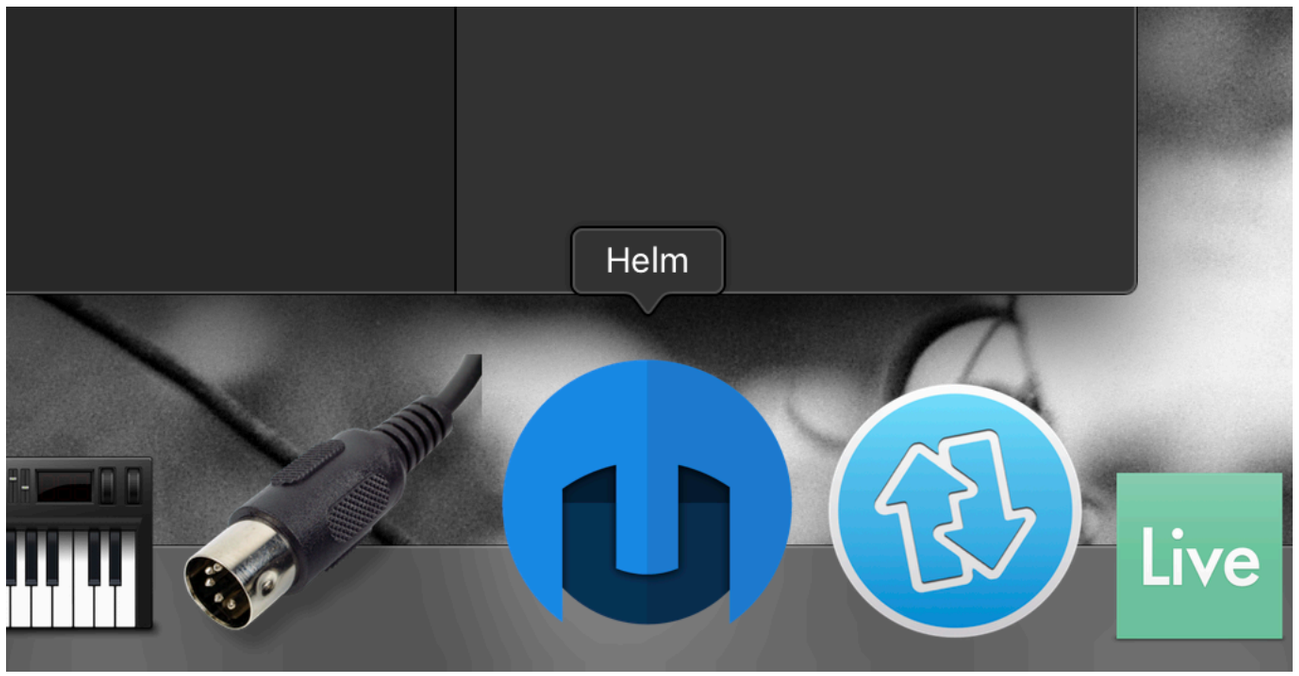
Each squeeze will trigger a note randomly from a set of pre-selected notes. You can change what those notes are and how many are in the set. If you make any changes you need to reprogram your arduino with the updated code.

```
// Note Information
// Pitch defines notes using MIDI note numbers - 60 is middle C, valid pitches are 0-127
// 0 is super low,and 127 is super high! Be wise about the pitches you include!
byte pitch[] = {60, 64, 67, 71, 72}; // You can change which pitch plays by changing these MIDI Note Numbers
int numNotes = 5; // this variable MUST match the number of notes in the pitch array in the previous line
```



https://en.wikipedia.org/wiki/MIDI

OPEN HELM – SOFTWARE SYNTHESIZER

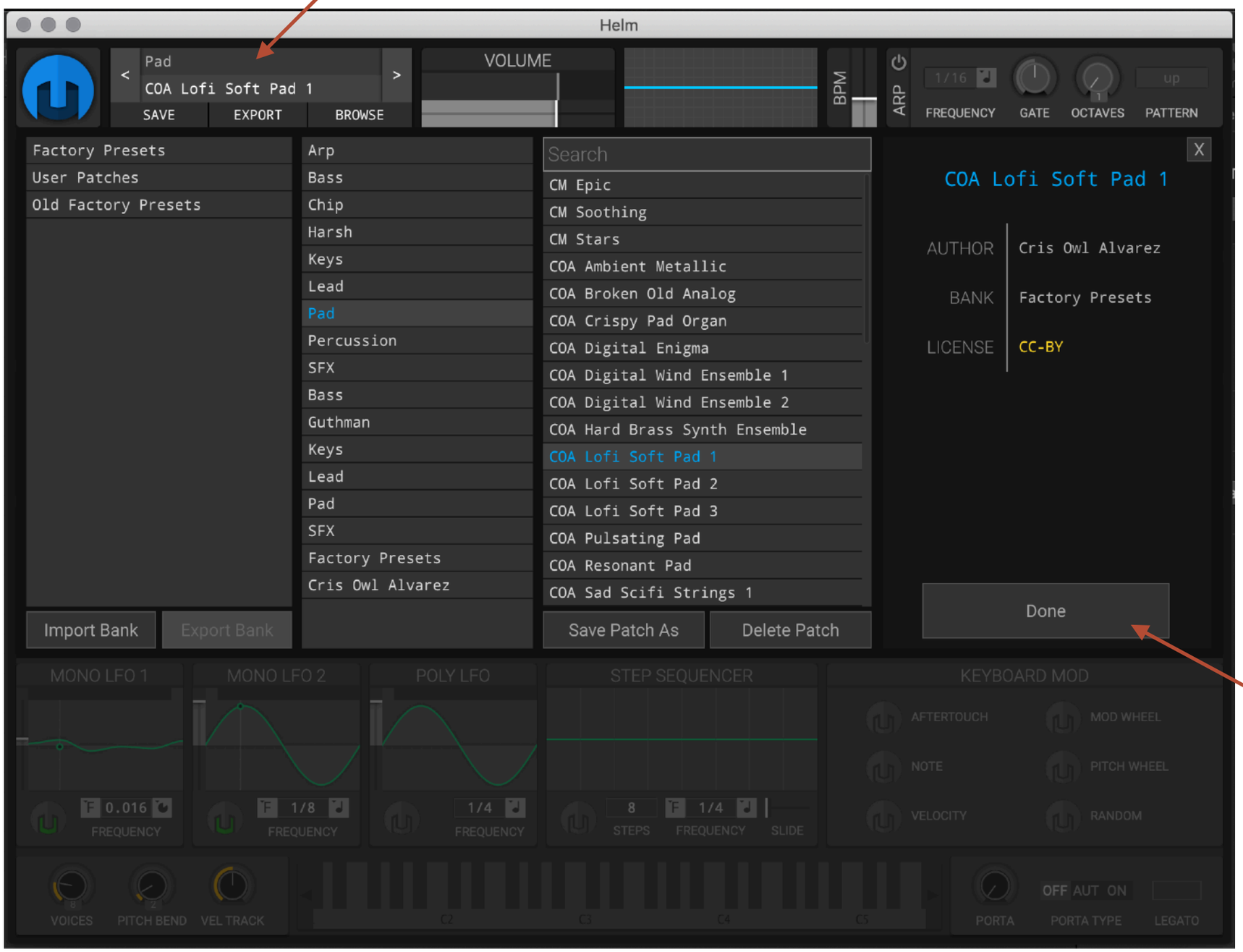


Helm - a software synthesizer
to make musical sounds with
your computer.

https://tytel.org/helm/

SETUP HELM

Click here to open the menu to select a sound

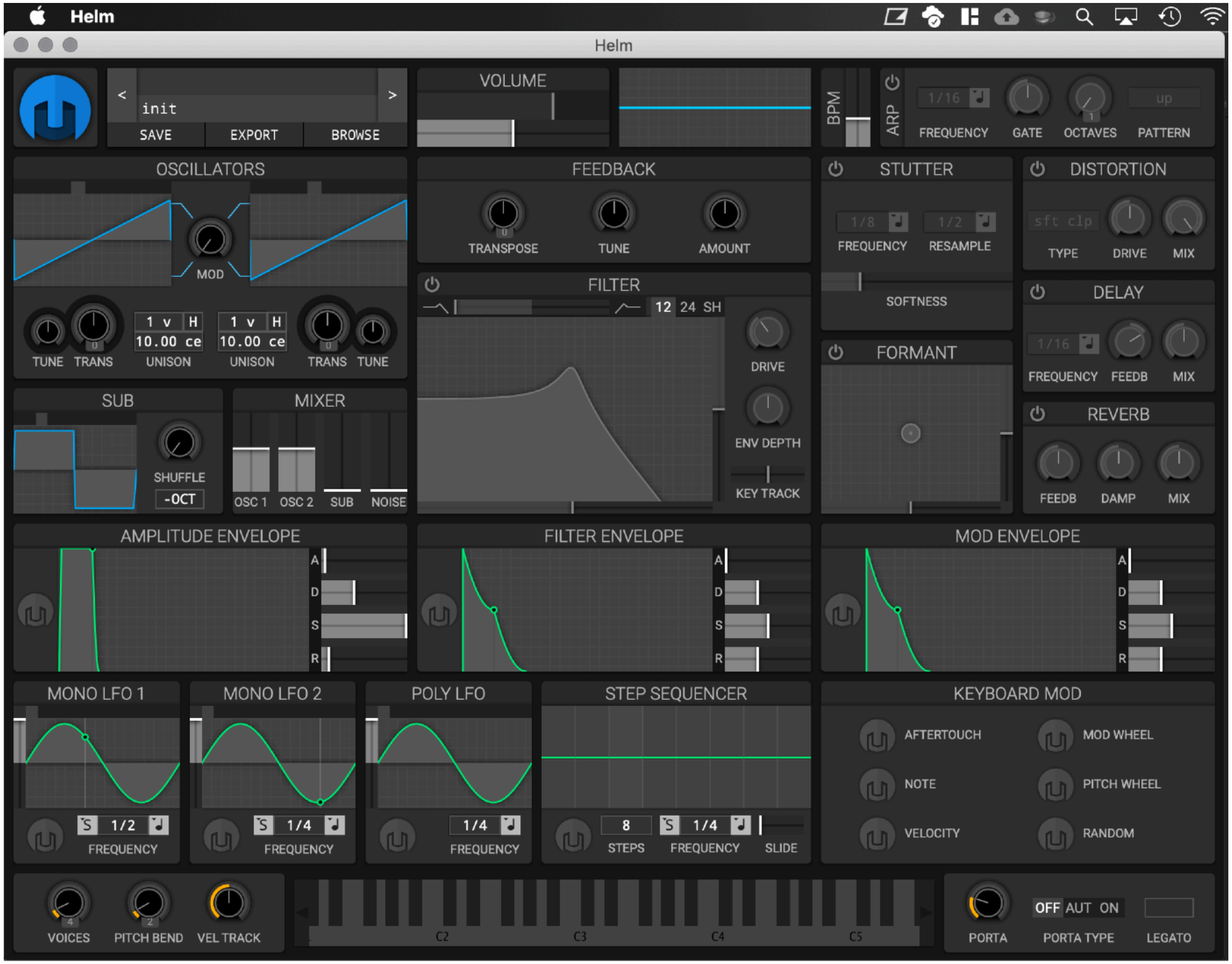


Make sure your laptop's speakers are on and turned up!

Squeeze your balloon quickly to send notes to Helm!

Try different sounds, then click done.

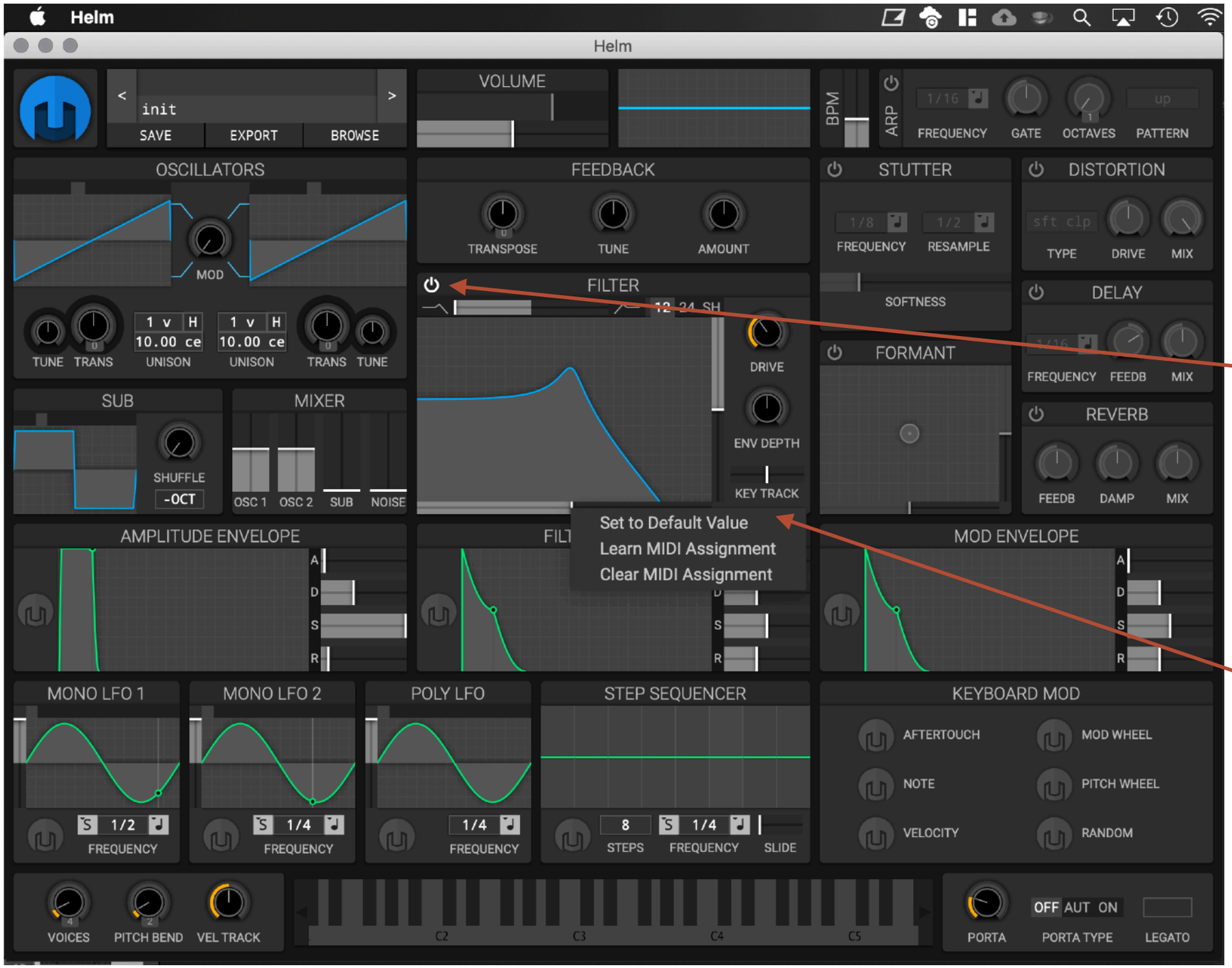
SETUP HELM



Make sure your laptop's speakers are on and turned up!

Squeeze your balloon quickly to send notes to Helm!

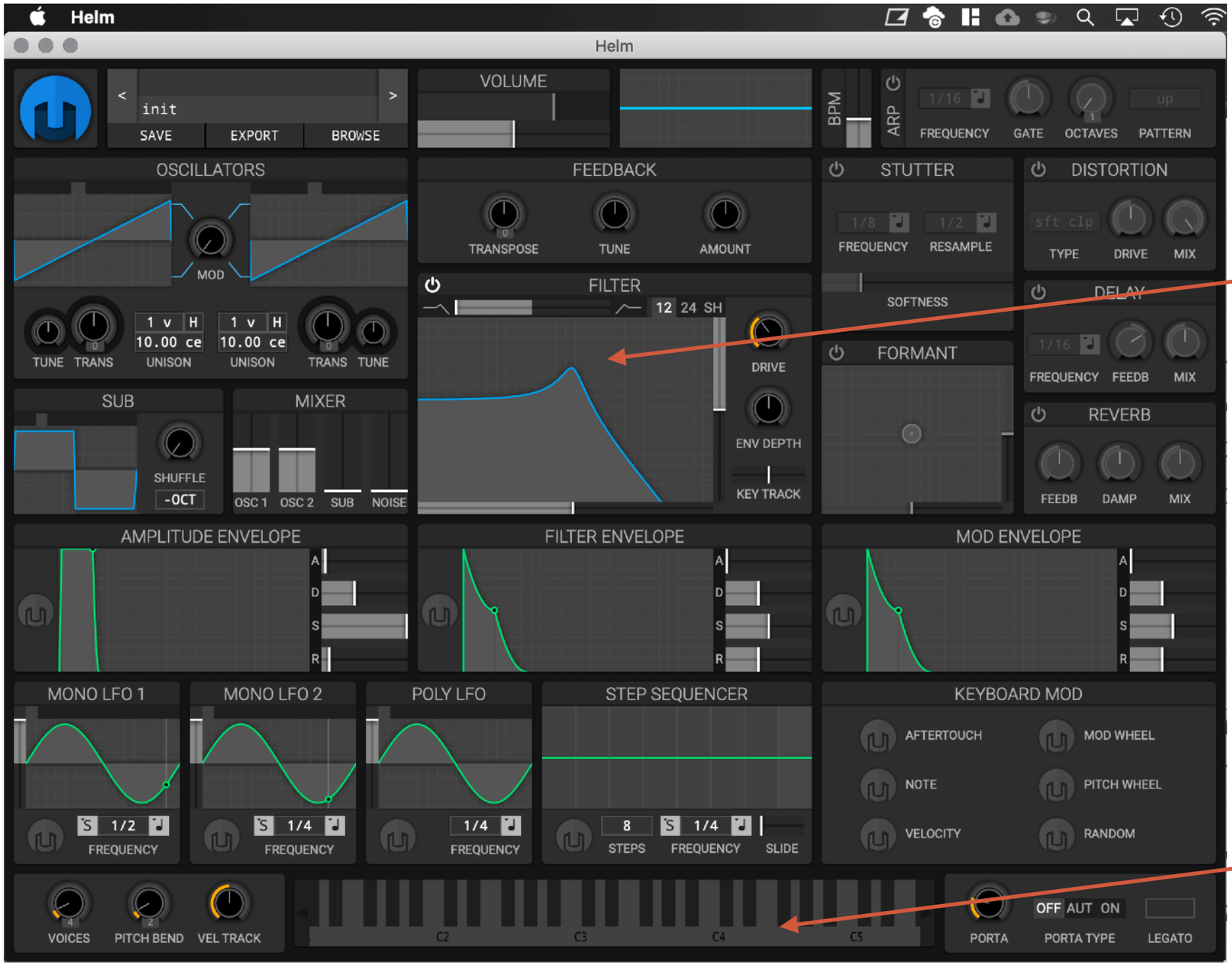
SETUP HELM



Make sure the filter is on - it shouldn't be greyed out. If it is greyed out, click the ON button here.

Right Click the bar below the filter, then click "Learn MIDI Assignment"

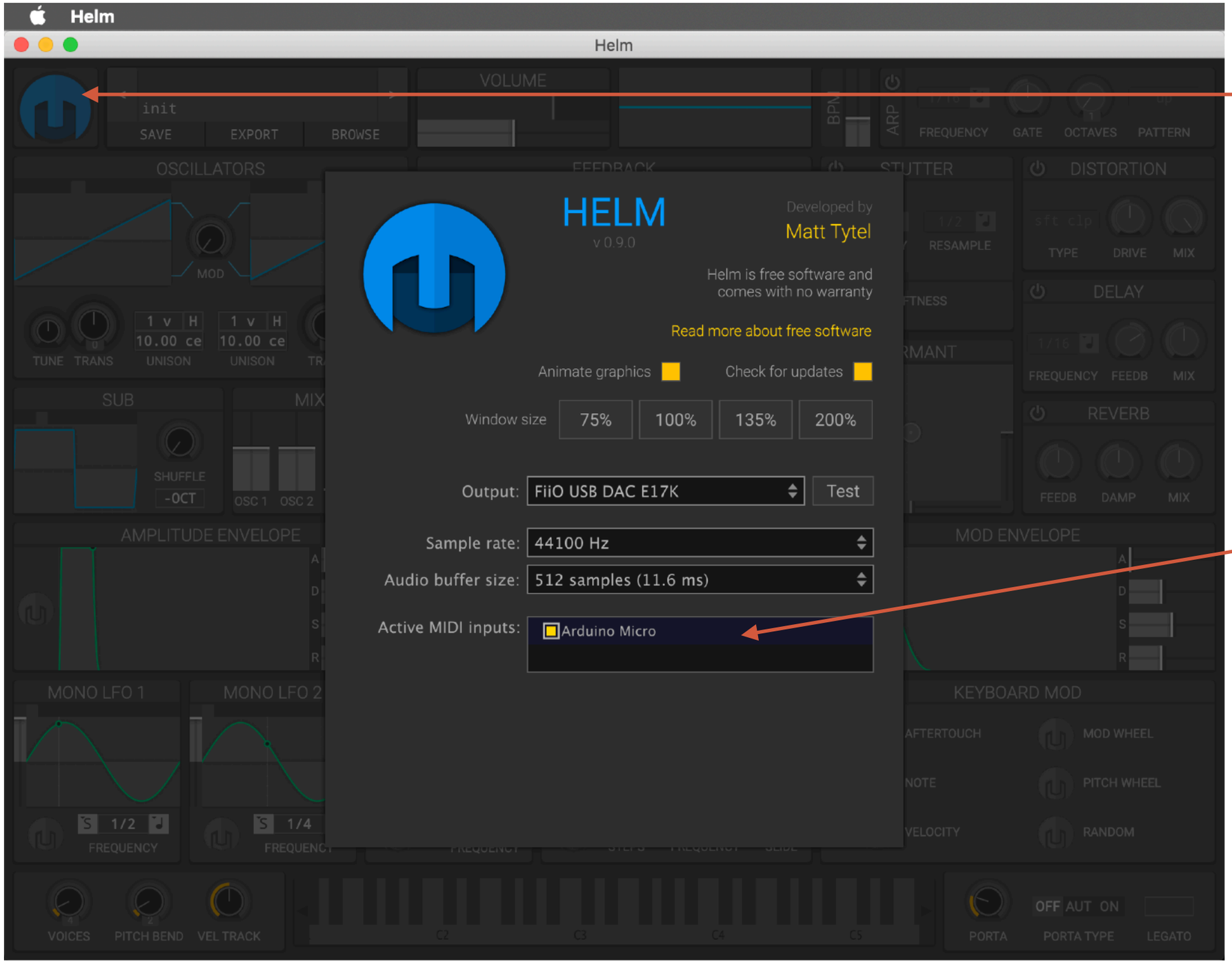
SETUP HELM



You should see the filter peak move back and forth as you squeeze your balloon!

You should see the keys of the piano lighting up as you squeeze your balloon!

NOT WORKING? CHECK THE MIDI PORT



Click the HELMet to get this dialog to open.

You should see "Arduino Micro" as a MIDI input, with a yellow box showing it is selected.