

Objective:

Install Arduino IDE and OPEnS Lab Loom to update your Smart Rock's firmware to the latest version.

Upon completion of this activity, you will also have all the tools necessary to customize the code on your Smart Rock, if you so wish to in the future.

Supplies/Equipment needed:

- Arduino Feather M0 proto board
- Micro USB cable
- Computer w/ internet connection



[NOTE: The Arduino Feather M0 does not need to be connected to anything else but it also does not matter if things are connected to it, the program should upload just fine either way]

Procedure:

1. Install the Arduino IDE
 - a. Windows and Mac: Download and install the latest version of the [Arduino IDE](#). On the Software page, scroll down to find the download link for your

respective operating system. If installing on Windows, download the Windows Installer.

- b. If installing on Linux, see the official [Linux install guide](#)

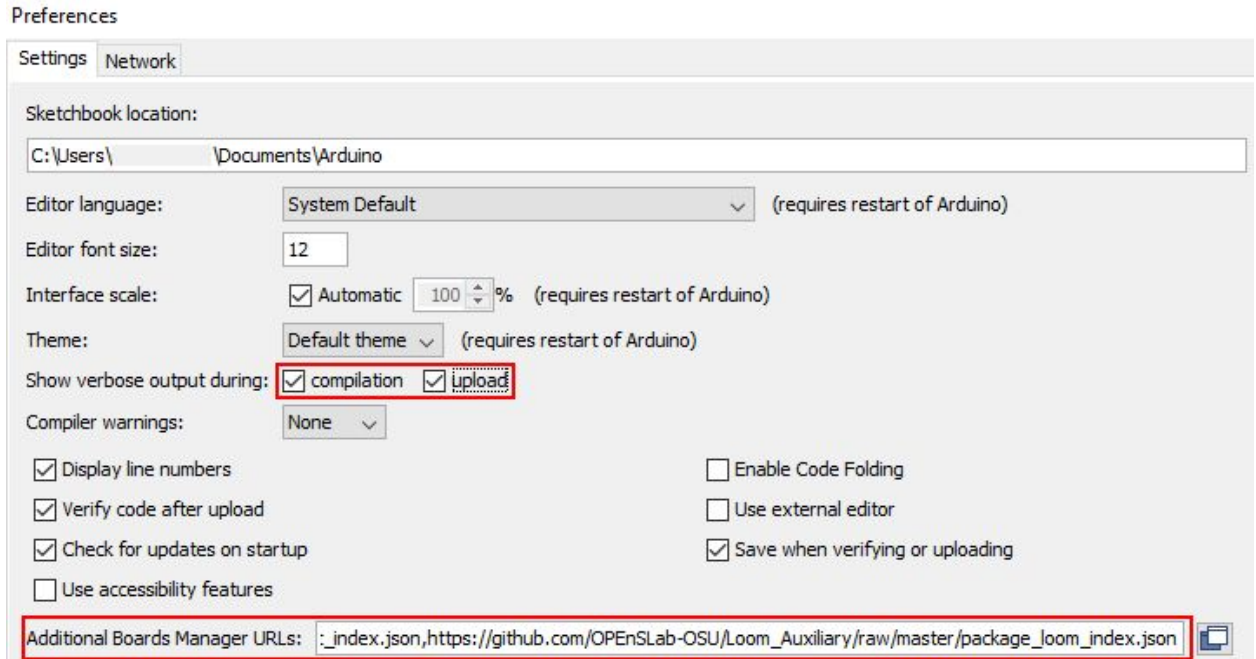
Download the Arduino IDE



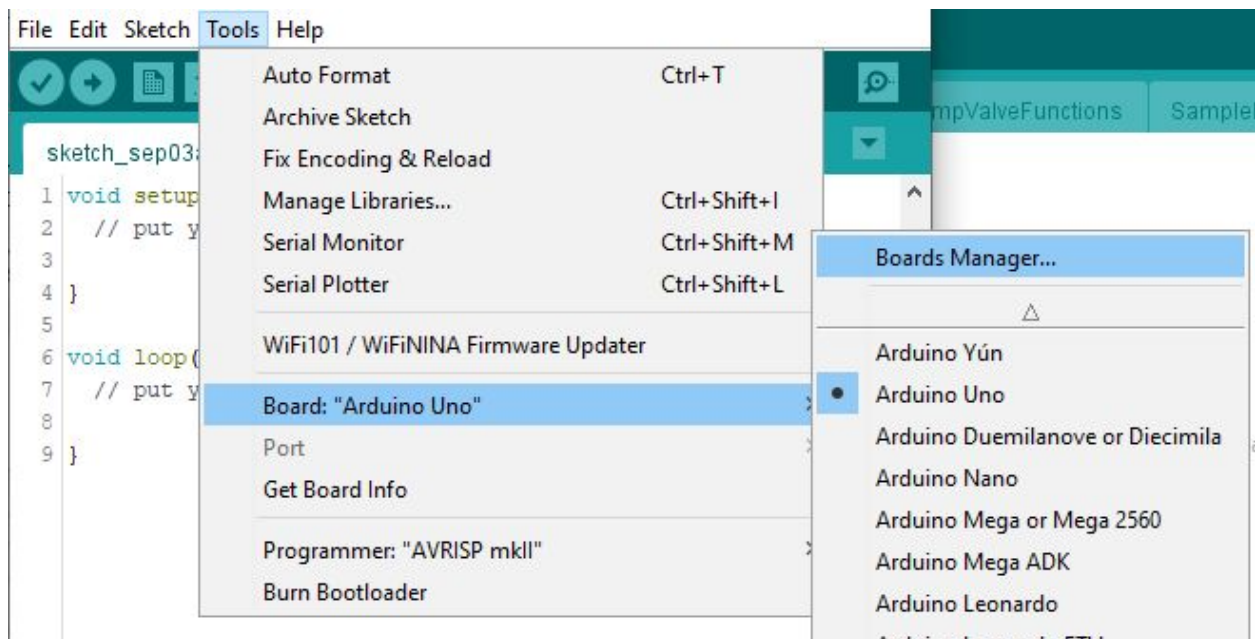
The screenshot shows the Arduino IDE download page. On the left, there is a large teal circle containing the Arduino logo (an infinity symbol with a minus sign on the left and a plus sign on the right). To the right of the logo, the text reads: **ARDUINO 1.8.13**. Below this, it says: "The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board. Refer to the [Getting Started](#) page for Installation instructions."

On the right side of the page, there is a teal sidebar with white text. It lists the following options: **Windows** Installer, for Windows 7 and up; **Windows** ZIP file for non admin install; **Windows app** Requires Win 8.1 or 10 with a "Get" button; **Mac OS X** 10.10 or newer; **Linux** 32 bits; **Linux** 64 bits; **Linux** ARM 32 bits; **Linux** ARM 64 bits; **Release Notes**; **Source Code**; and **Checksums (sha512)**.

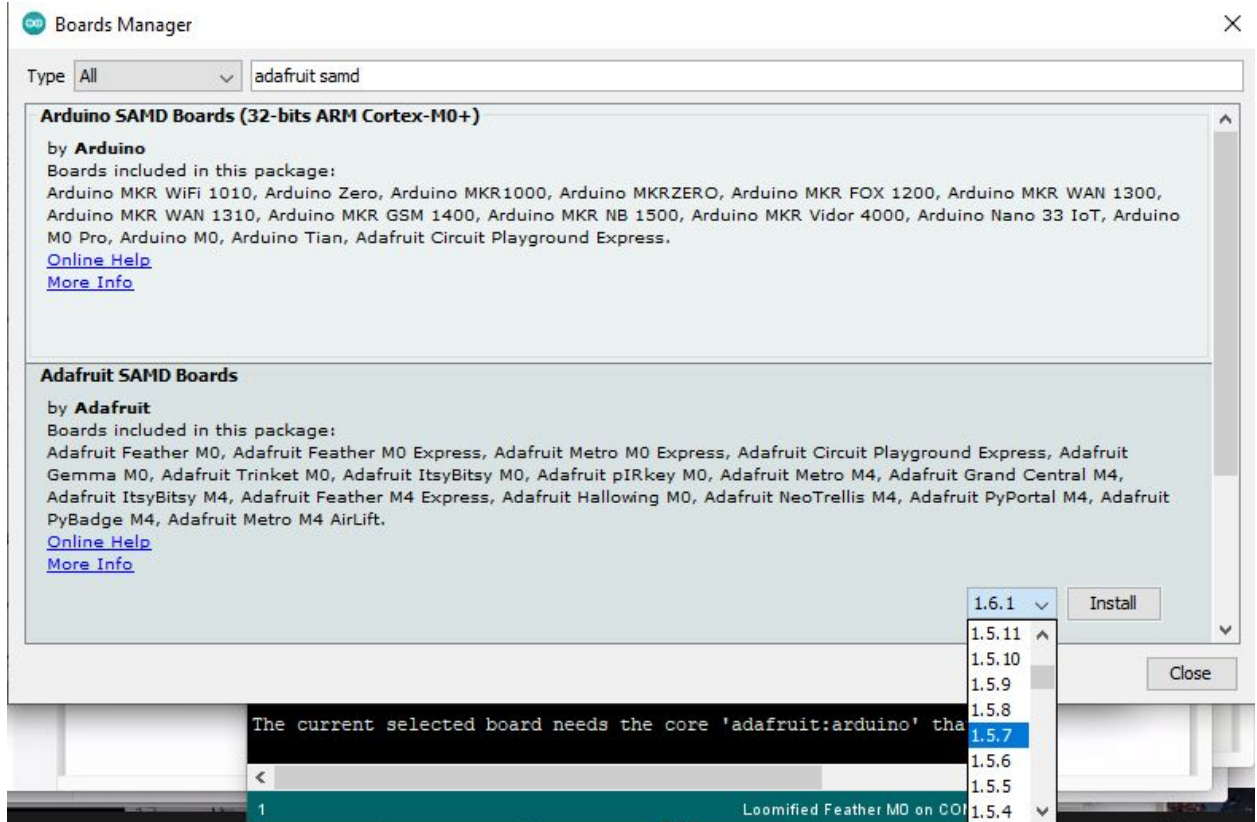
- c. Once the download is complete, double click on the downloaded installer and follow the steps that are presented to you in the installer.
2. Set up preferences and import board profiles (also see instructions from [Loom](#))
- a. Start the Arduino IDE and navigate to File->Preferences (Windows/Linux), Arduino->Preferences (MacOS/OSX)
 - b. Turn on verbose output for compilation and upload (first red box in image below)
 - c. Find "Additional Boards Manager URLs" dialog box and copy/paste the following urls:
`https://adafruit.github.io/arduino-board-index/
package_adafruit_index.json,https://github.com/OPENSLab-OSU/
Loom_Auxiliary/raw/master/package_loom_index.json`



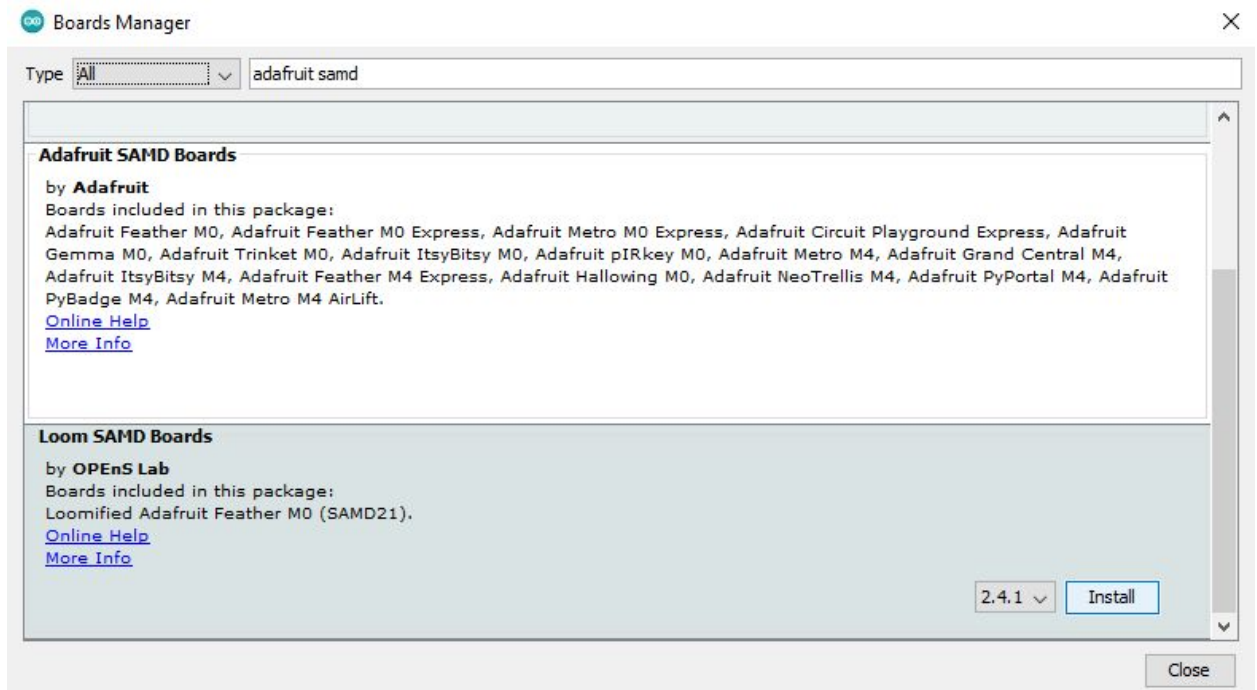
- d. Click OK, close and reopen the IDE
- e. Navigate to Tools→ Board→ Boards Manager



- e. Type in “adafruit samd” and install the **Arduino SAMD Boards (32-bits ARM Cortex-M0+)** version 1.6.1 or later, **Arduino SAMD Boards** version 1.5.7 (not current version).

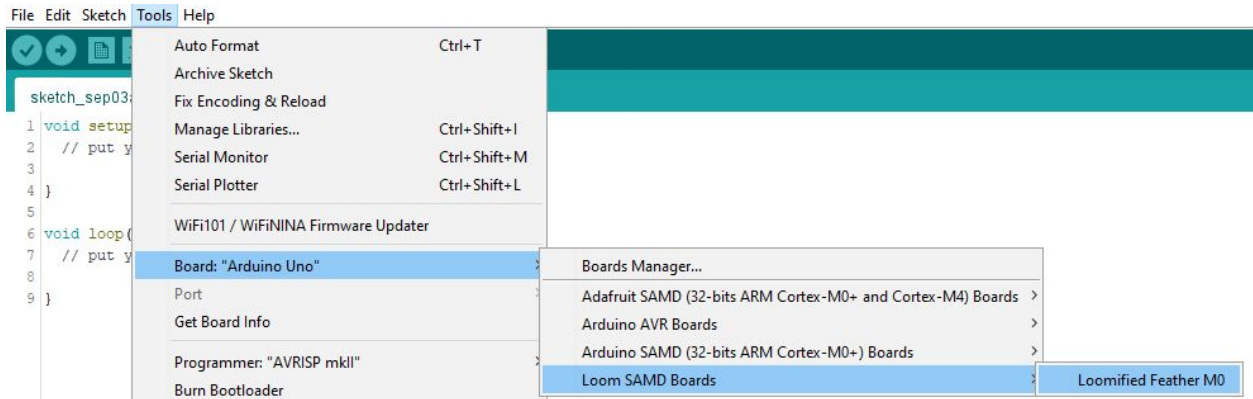


e. Scroll down to install the **Loom SAMD Boards**. Always install the latest version of this board.

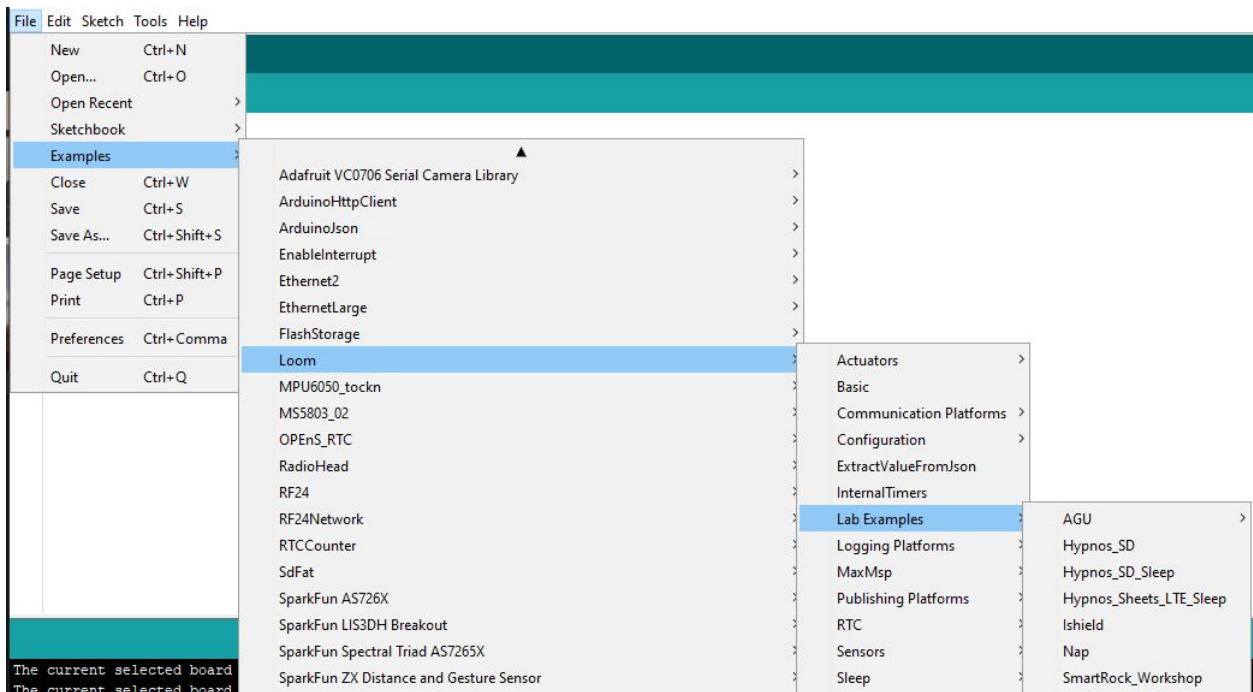


f. Close the Boards Manager

3. Select the **Loomified Feather M0** as your board
 - a. Navigate to Tools->Board->Loom SAMD Boards, the Loomified Feather M0 boards should be listed, select the Loomified Feather M0



4. Now that your Arduino IDE and board profile is set up, in your Arduino IDE using the tabs in the upper left corner of the IDE window, navigate to: **File → Examples → Loom → Lab Examples** → and click on: **SmartRock_Workshop**



5. Instantly the SmartRock_Workshop program and config file should be loaded in your IDE window.

SmartRock_Workshop | Arduino 1.8.13

File Edit Sketch Tools Help

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SmartRock_Workshop config.h

```
//////////////////////////////////////

// This is a basic example that demonstrates usage of the Hypnos board
// Deep sleep functionality.

// The Hypnos board includes
// - SD
// - DS3231 RTC
// - Ability to power of peripherals

// Further details about the Hypnos board can be found here:
// https://github.com/OPEnSLab-OSU/OPEnS-Lab-Home/wiki/Hypnos

//////////////////////////////////////

#include <Loom.h>

// Include configuration
const char* json_config =
#include "config.h"
;

// Set enabled modules
LoomFactory<
    Enable::Internet::Disabled,
    Enable::Sensors::Enabled,
    Enable::Radio::Enabled>

Done Saving.
readWord(addr=0xe000ed00)=0x410cc601
readWord(addr=0x41002018)=0x10010305
writeWord(addr=0xe000ed0c,value=0x5fa0004)
<
81
```

6. Changing sampling time for **Mode A**
 - a. In the SmartRock_Workshop program, scroll down to the section of code below (starting line 74)

```
SmartRock_Workshop  config.h
73
74 void loop()
75 {
76     //re-enable pin upon wake up
77     pinMode(switchPin, INPUT);
78
79     //////////////////////////////////////
80     //change interval depending the on position of pin
81     //interval is the variable that gets passed to TimeSpan function below
82     switchPos = digitalRead(switchPin);
83     int secs = 0;
84     int mins = 0;
85     if (switchPos == HIGH) {
86         mins = 1200;
87     }else{
88         secs = 1;
89     }
90     //////////////////////////////////////
```

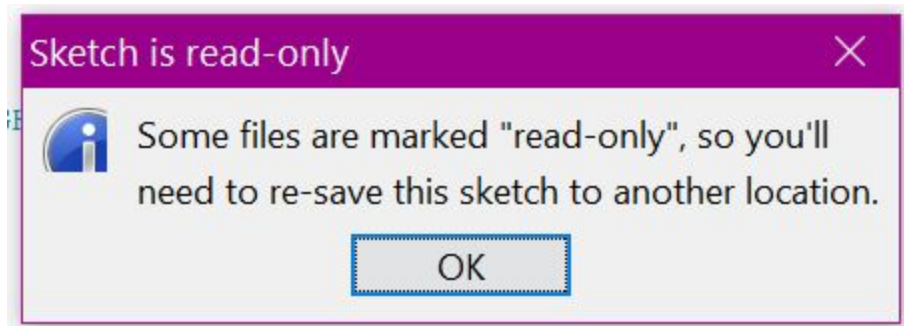
Notice, the highlighted section of code is incorrect, the value should **not** be 1200.

7. Change this value to 20 (or time period of your choice) and press Control-S to save the change to the file

```
void loop()
{
    //re-enable pin upon wake up
    pinMode(switchPin, INPUT);

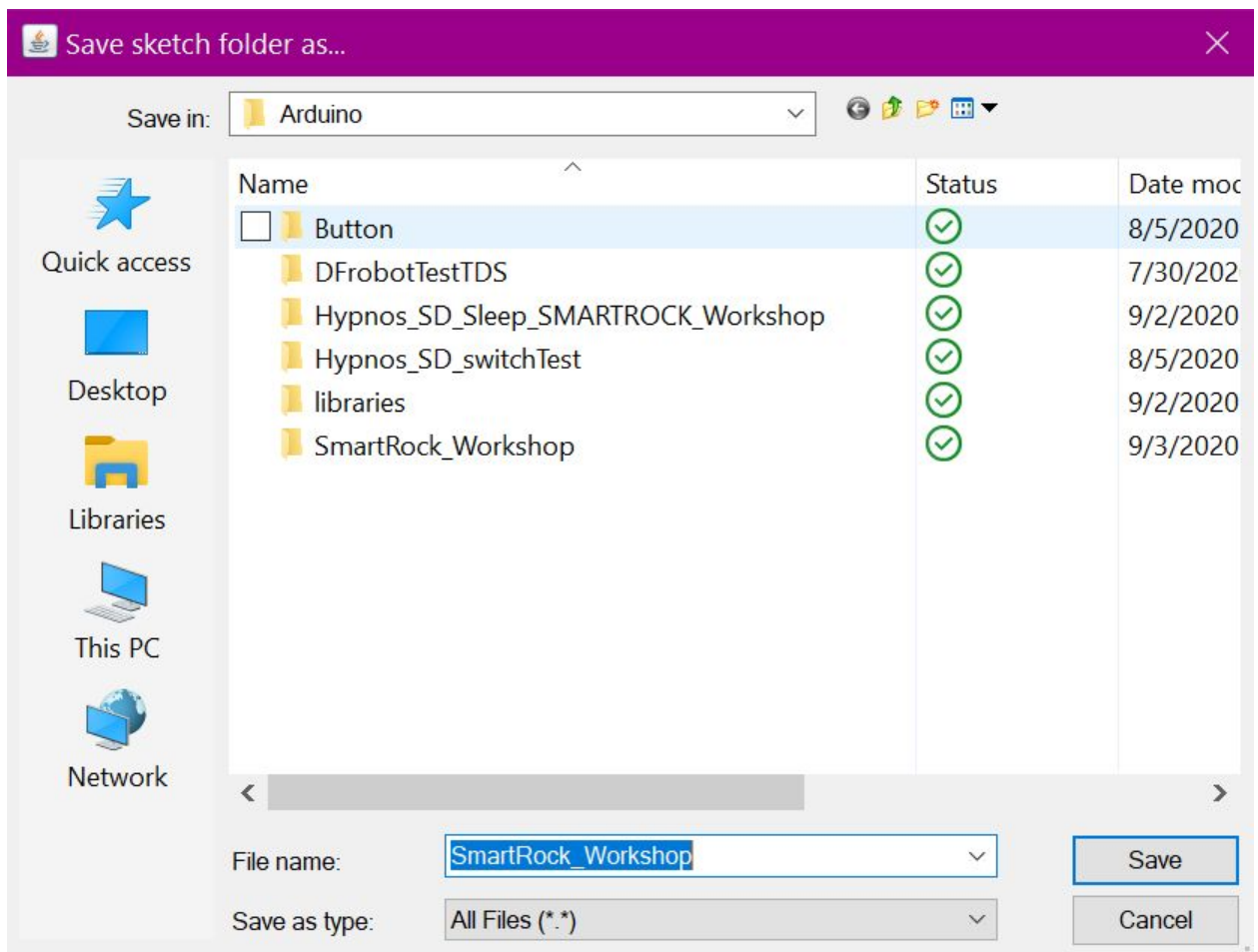
    //////////////////////////////////////
    //change interval depending the on position of pin
    //secs and mins are the variables that get passed to the TimeSpan
    switchPos = digitalRead(switchPin);
    int secs = 0;
    int mins = 0;
    if (switchPos == HIGH) {
        mins = 20;
    }else{
        secs = 1;
    }
    //////////////////////////////////////
```

8. When you save the file, a message will pop up, warning you that the file is read only.

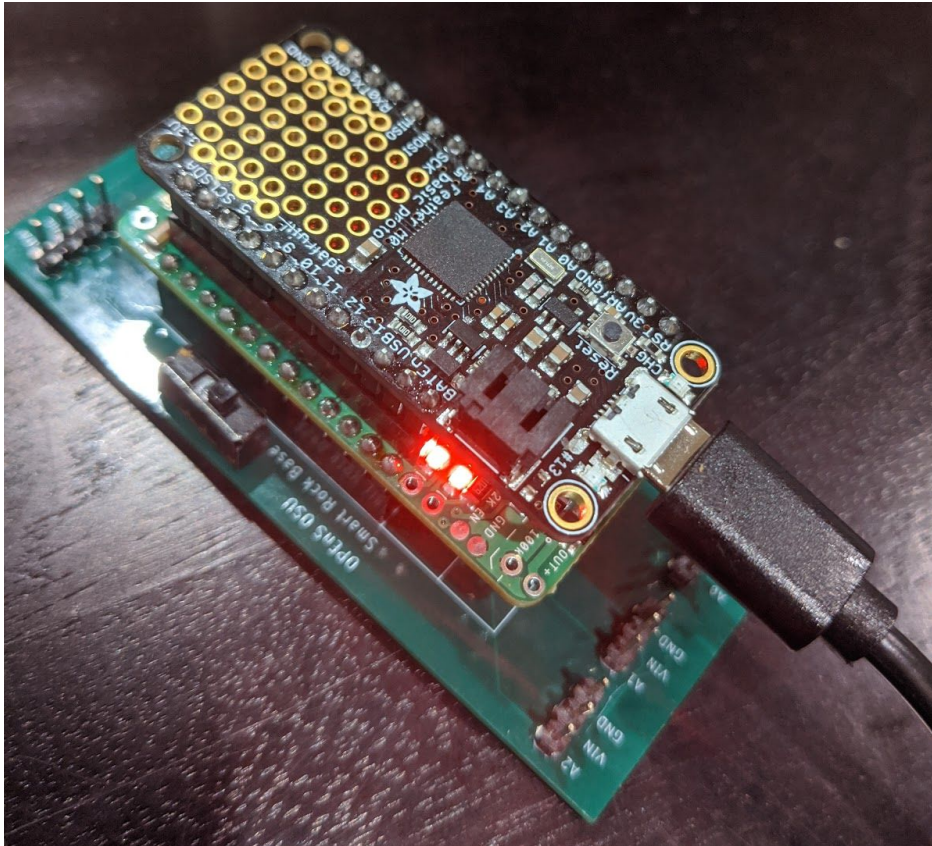


Press OK.

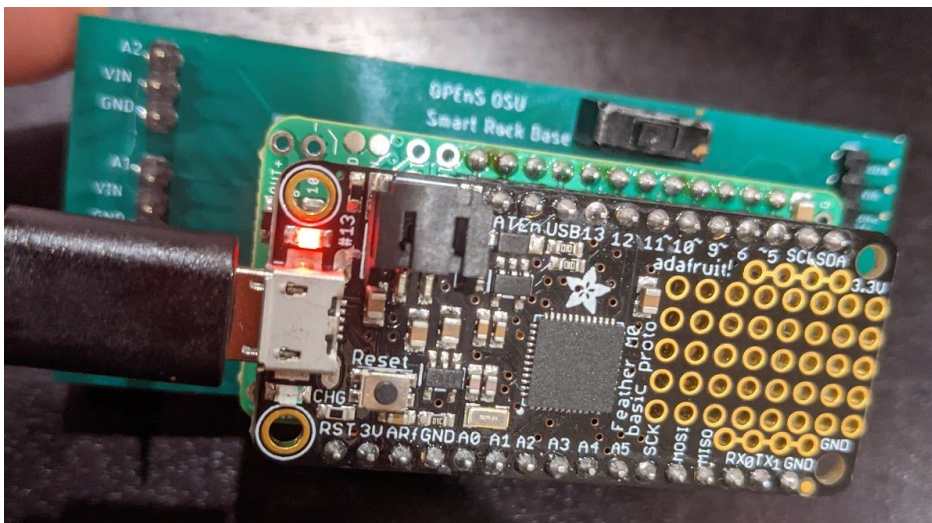
9. Next, it will prompt you in which location on your computer to save the sketch. You can select anywhere but the default location (Documents/Arduino on Windows) should be good enough. Do not edit the name of the file.



10. Now, plug in your Micro USB cable into the computer and then into your Micro USB port.

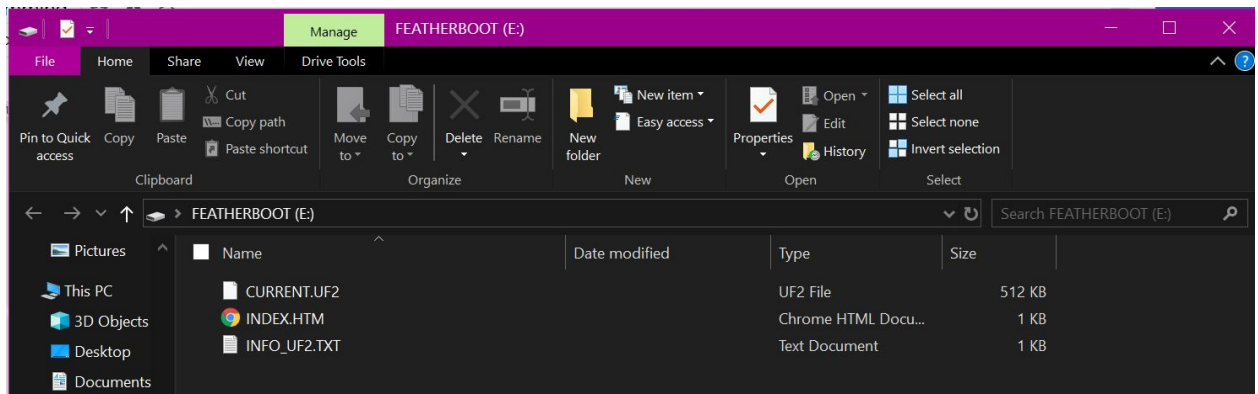


11. Find the **Reset** button on top of the Feather m0 proto board, right next to the Micro USB port



12. Press the **Reset** button **twice, quickly**. This will set the Feather m0 into **upload mode**. The LED on top should be gently pulsing. Your computer might make a confirmation

sound that a USB drive has been connected. Also, the window pictured below might pop up as well.



Ignore this and simply exit out of this window.

13. Next, in your Arduino IDE, using the tabs in the upper left corner, navigate to:

Tools → Port → click on: COMx (Adafruit Feather M0)

[NOTE: The x in COMx could be any number and might be different each time you connect the board for upload mode, this is not of major importance, 99% of the time you'll only have one port to select and shouldn't be very confusing]

14. Now, if you've followed all the steps up to now, you are ready for upload! In the upper left corner of the Arduino IDE, find the **Upload** button (horizontal arrow, next to the check mark symbol) and click on it.



15. Your program should now be compiling!

[illegible]

[NOTE: This process can take quite a while! Sometimes 5 to 10 minutes! This is normal!]

16. When the program is finally finished compiling and uploading to the Feather m0 board, the LED on top of the board should flash rapidly. And your output in the console should look similar to the image below

```
Done uploading.
checksumBuffer(start_addr=0x2a000, size=0x1000) = e71c
checksumBuffer(start_addr=0x2b000, size=0x1000) = fcd9
checksumBuffer(start_addr=0x2c000, size=0x1000) = 49ca
checksumBuffer(start_addr=0x2d000, size=0x70) = be53
Verify successful
done in 0.242 seconds
CPU reset.
readWord(addr=0)=0x20002dd8
readWord(addr=0xe000ed00)=0x410cc601
readWord(addr=0x41002018)=0x10010305
writeWord(addr=0xe000ed0c,value=0x5fa0004)
```

17. And you are done! Your Feather M0 board should now be fully reprogrammed. You can disconnect the cord and assemble your Smart Rock electrical components (i.e. stacking boards, reconnecting sensors) and verify that your Smart Rock is fully operational.