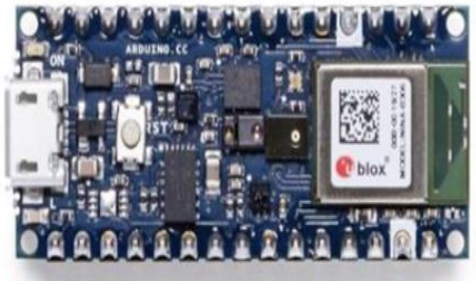
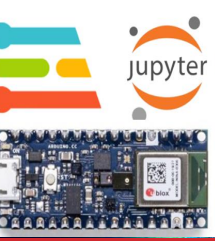


AI

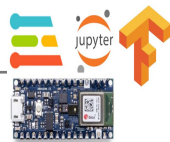
SOFTWARE SETUP

Dennis A. N. Gookyi



CONTENTS

- Course Organization and Syllabus



ARDUINO

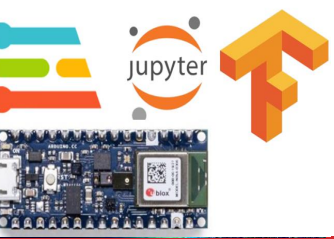
- Arduino describes itself as "an open-source electronics platform based on easy-to-use hardware and software."
- In large part, this description is fitting, as the company designs and sells a collection of microcontroller development boards that simplify the deployment of embedded hardware alongside a software framework that abstracts away all but the most relevant considerations for your application
- What is under-represented by this description is the role that the surrounding community plays in enabling many plug-and-play experiences given the number and quality of auxiliary hardware modules, support libraries, and tutorials that have and continue to be produced within Arduino's ecosystem
- One thing we'd like to acknowledge here is that Arduino's mission of creating easy-to-use hardware and software has the necessary tradeoff of limiting the feature set of its development environment to the essentials

INTEGRATED DEVELOPMENT ENVIRONMENT (IDE)

- As is true for all forms of programming, an integrated development environment or IDE, is an application with a feature set that facilitates software development generally or within a particular niche

- The Arduino Desktop IDE is highly specific in the sense that it is intended to facilitate software development for a specific set of microcontroller boards, in C++

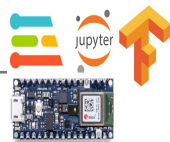
- Within the niche of IDEs for embedded software, there is a noticeable dichotomy between light-weight applications, (like Arduino's IDE) that minimize functionality and abstract away details in the name of simplicity and full-featured IDEs (like Visual Studio Code) that exist to support industry professionals



ARDUINO IDE

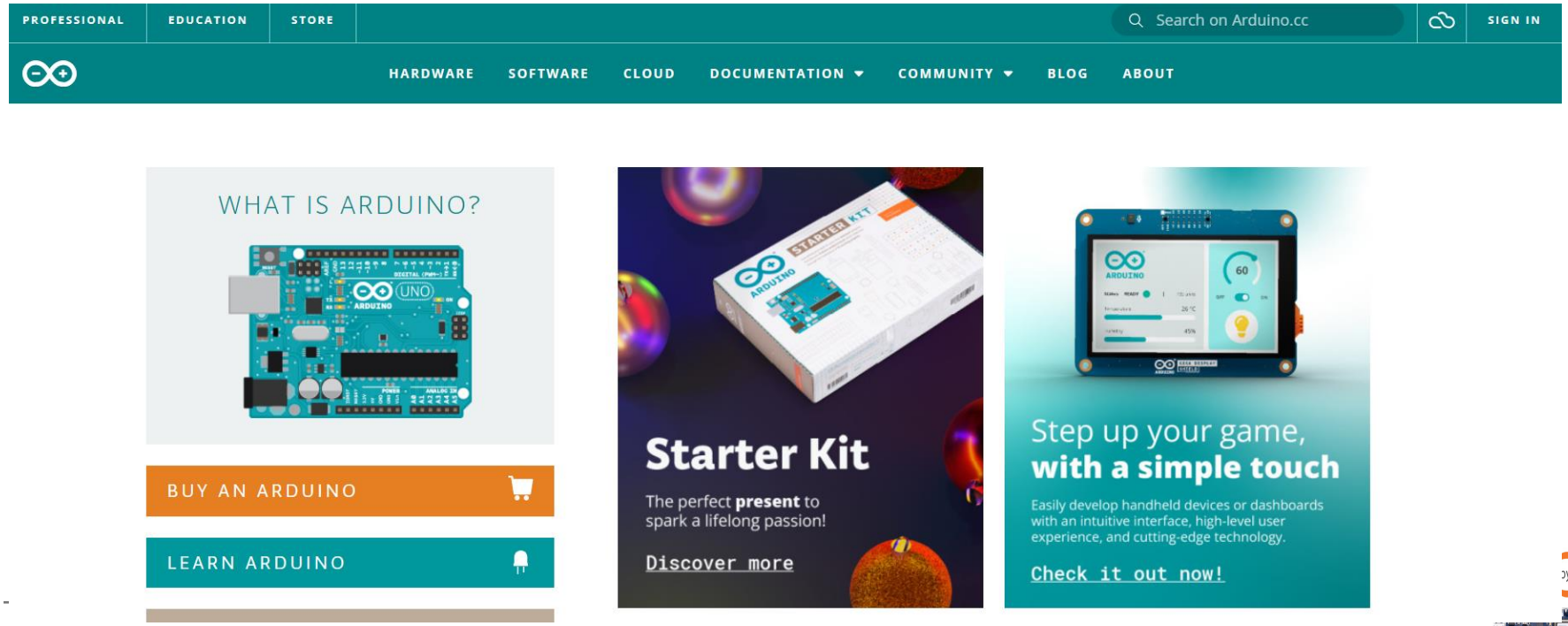
- The Arduino IDE is a lightweight development environment with features that permit you to very quickly manipulate microcontroller development boards

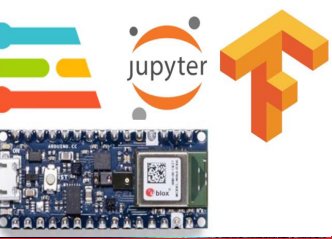
- While there is a cloud-based offering (the Arduino Create Web Editor) as well as a so-called Arduino Pro IDE that is in development, this course will make use of the standard Arduino Desktop IDE



INSTALLING ARDUINO IDE

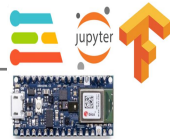
- Navigate to https://www.arduino.cc/ and at the top of the page select Software and click Downloads
- Click on the download link appropriate for your machine
- There is no obligation to contribute, you can click 'Just Download' to proceed





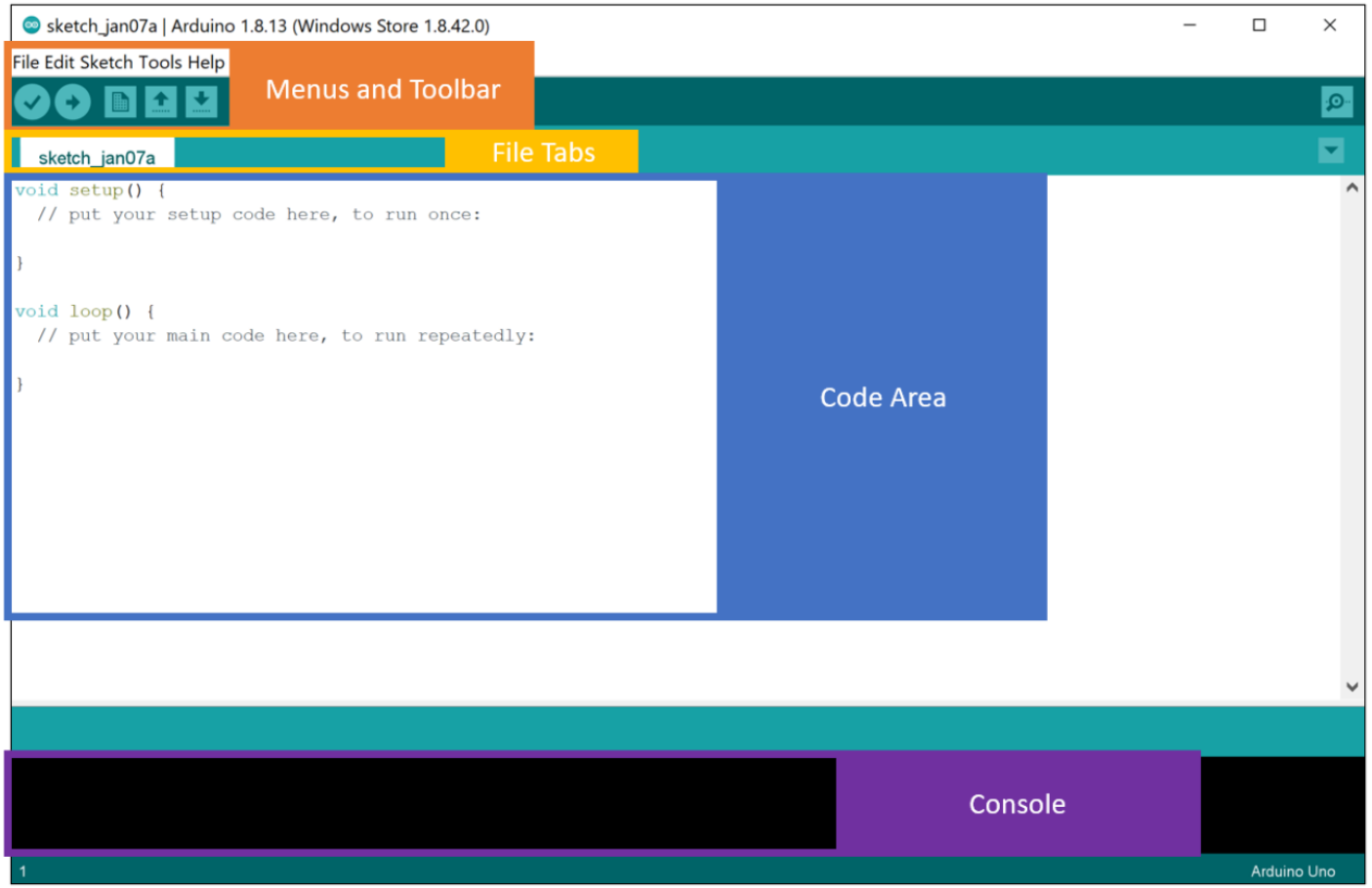
INSTALLING ARDUINO IDE

- Operating specific installation instructions vary, so if what follows isn't self evident, you can find guidance, by OS, at the following links:
  - Windows
    - https://docs.arduino.cc/software/ide-v1/tutorials/Windows
  - Mac OS X
    - https://docs.arduino.cc/software/ide-v1/tutorials/macOS
  - Linux
    - https://docs.arduino.cc/software/ide-v1/tutorials/Linux



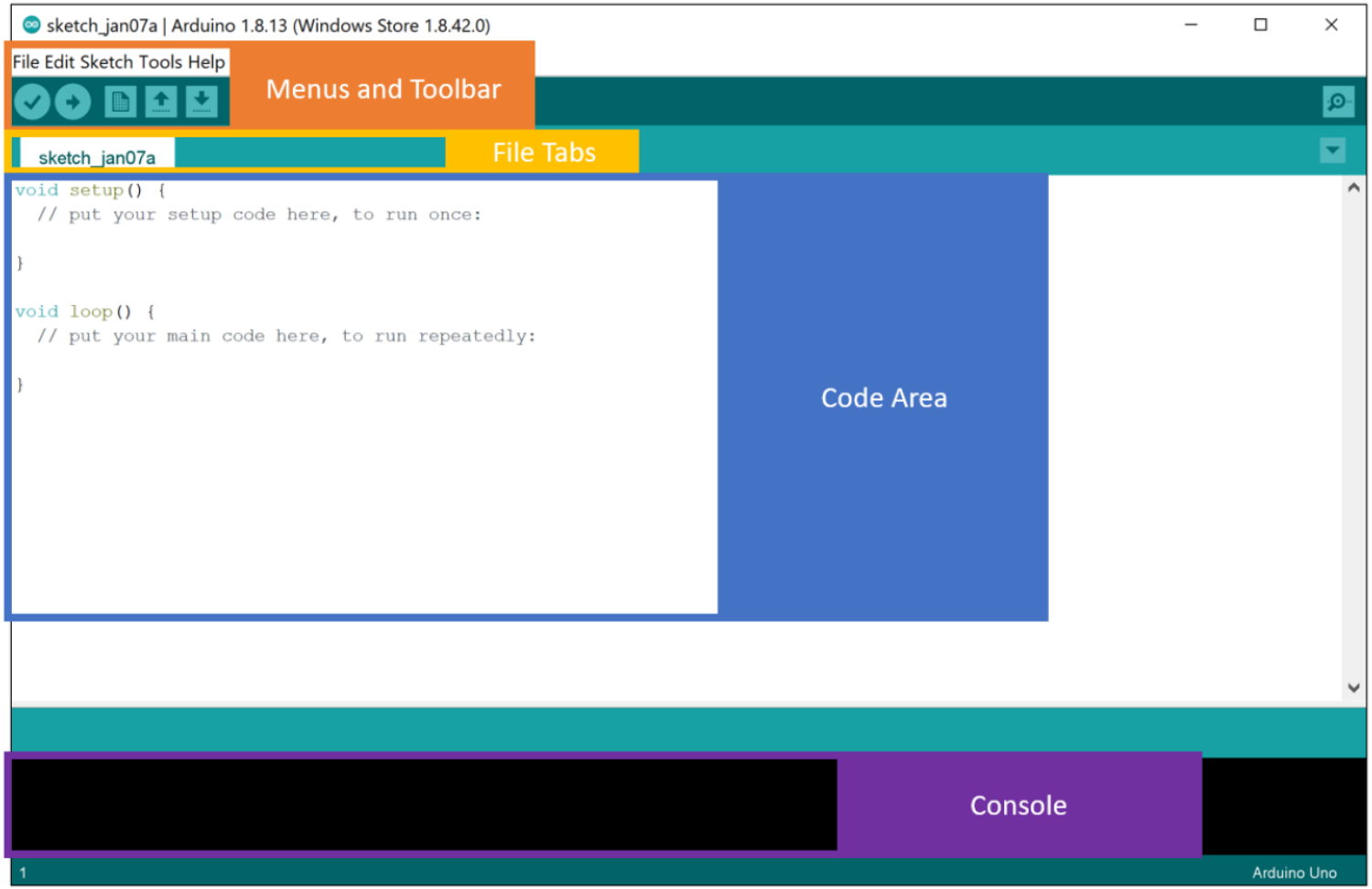
ARDUINO IDE

- A Quick Tour of the IDE
  - When you first open the IDE you will see a screen that looks something like the above screenshot



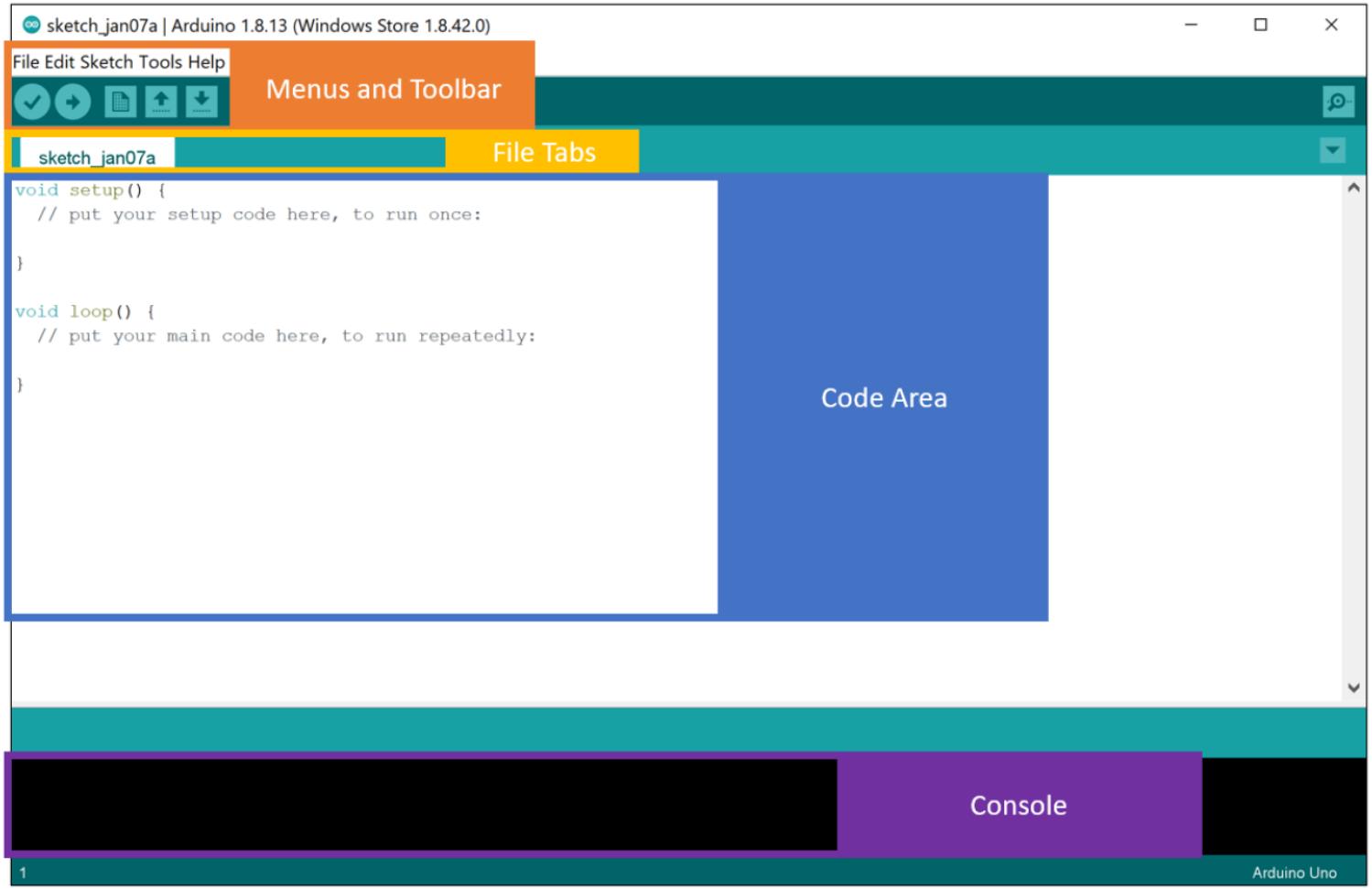
ARDUINO IDE

- A Quick Tour of the IDE
  - Up at the top of the IDE you will find the menus and the toolbar



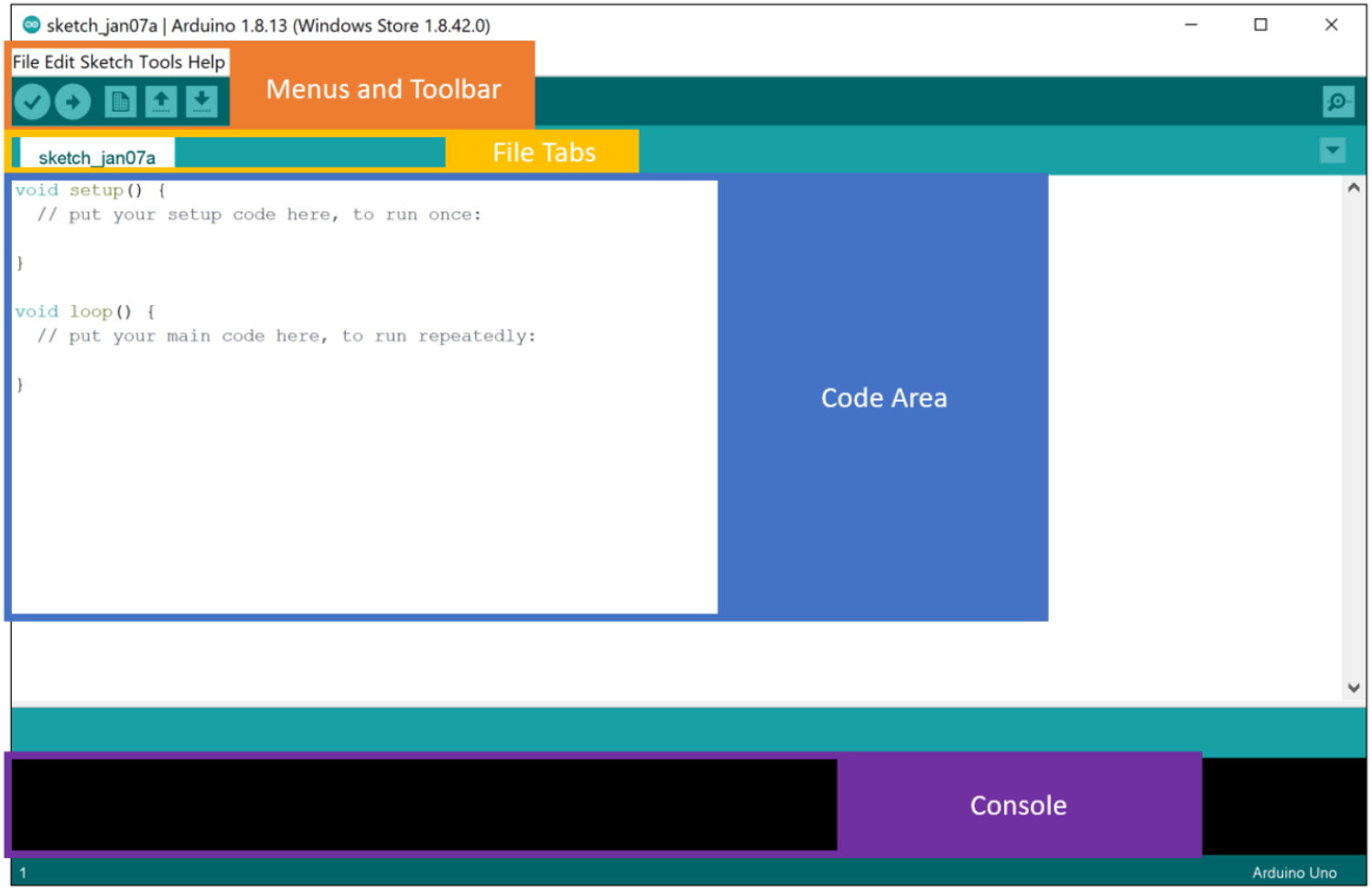
ARDUINO IDE

- A Quick Tour of the IDE
  - Below that you will find the file tabs



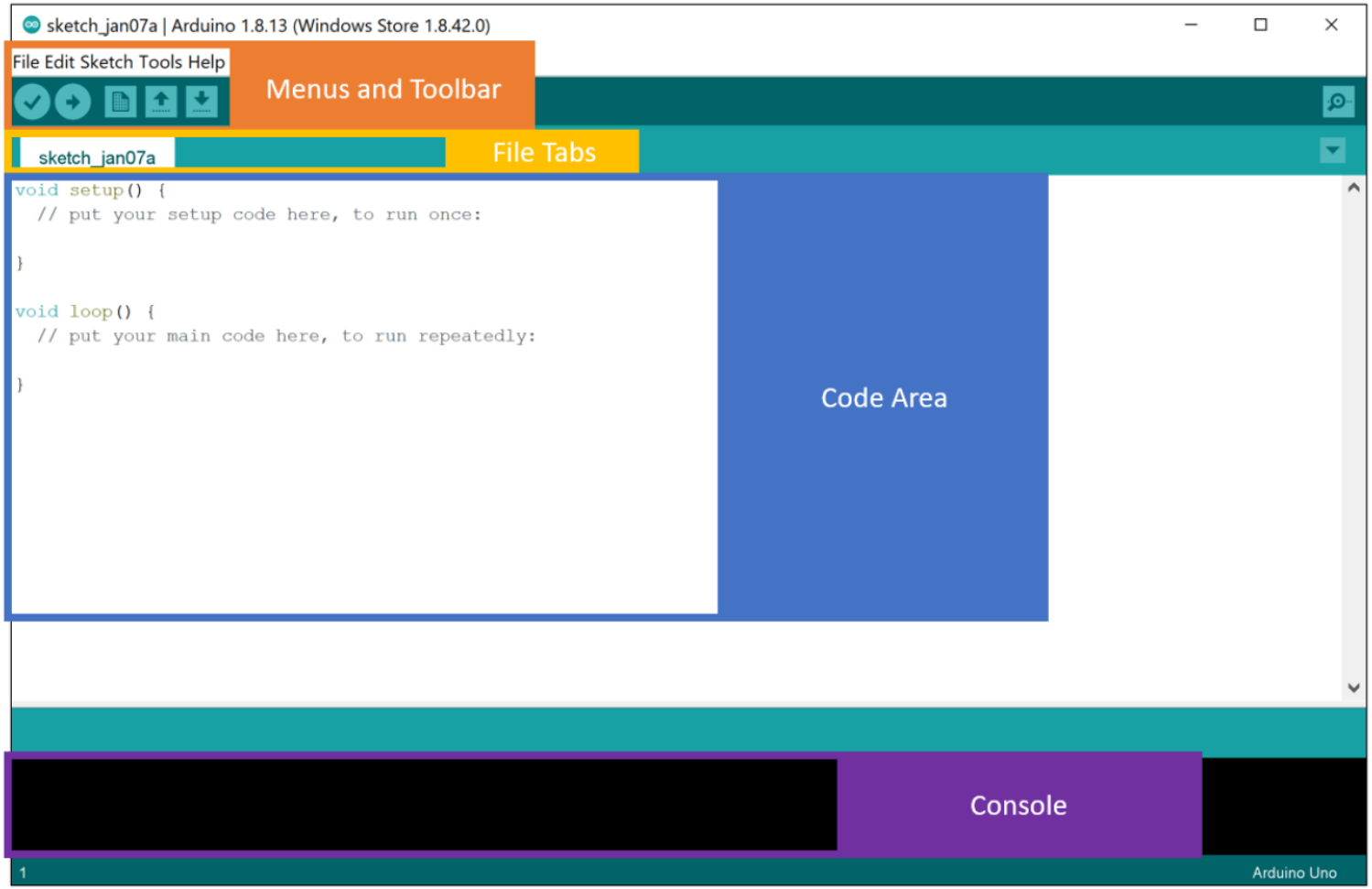
ARDUINO IDE

- A Quick Tour of the IDE
  - In the middle of the screen you will see the large code area



ARDUINO IDE

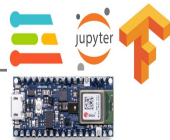
- A Quick Tour of the IDE
  - at the bottom of the screen you'll find the console



INSTALLING THE BOARD FILES

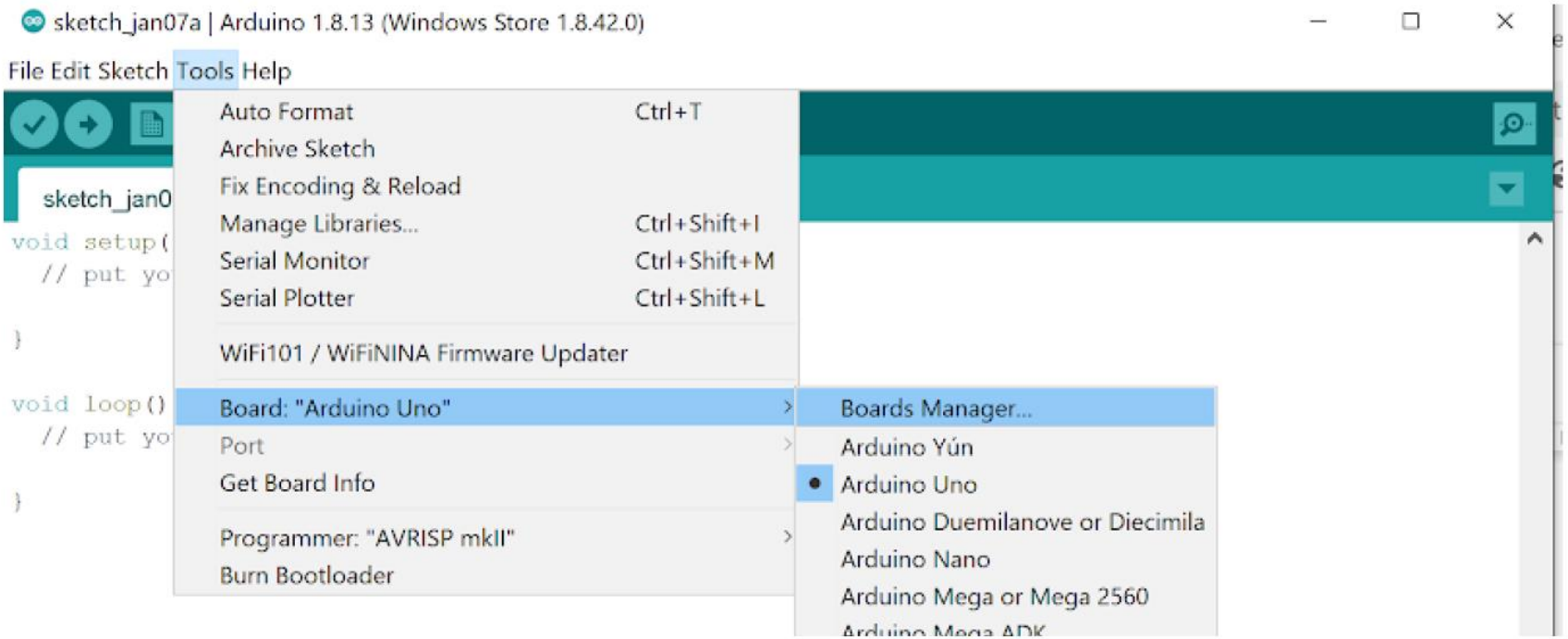
- One of the primary advantages that the Arduino ecosystem affords is the portability of code you write for one or another board within their line-up or even in porting code to affiliate boards

- This is made possible by the support files organized in the Boards Manager, which coordinates a download and installation of files that detail the Arduino functions that are defined for that particular board (which is how hardware differences between boards are abstracted) as well as compiler or l inker details specific to the given board



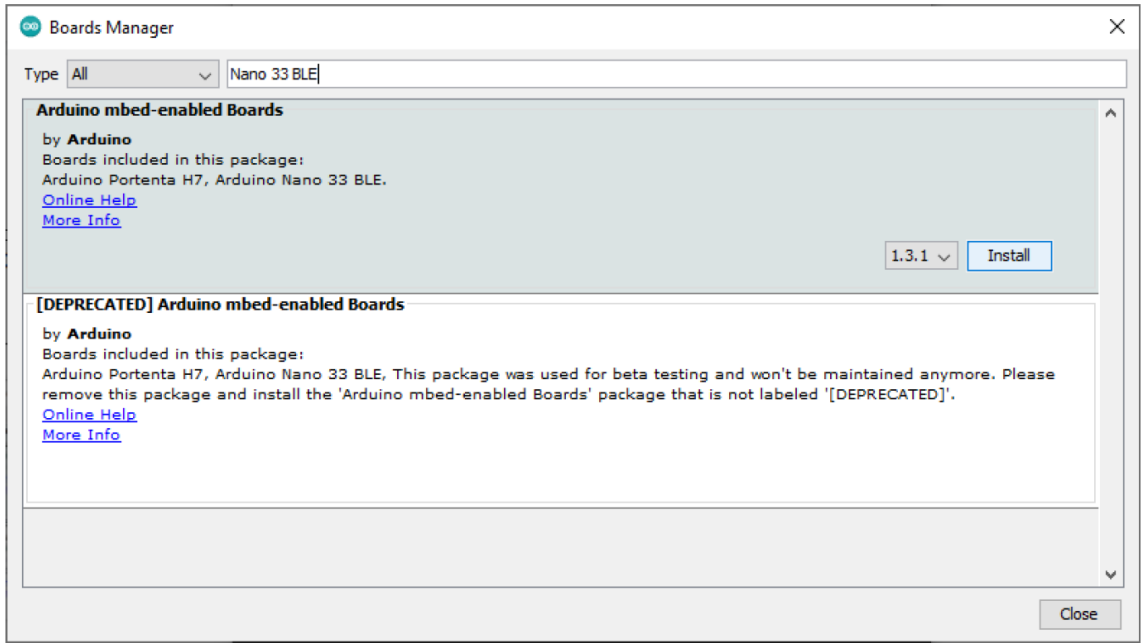
INSTALLING THE BOARD FILES

- Installing board files Arduino Nano 33 BLE Sense
  - Open the Boards Manager, which you can find via the Tools drop-down menu
  - Navigate, as follows: Tools → Board → Boards Manage
    - Note that the Board may be set to "Arduino UNO" by default



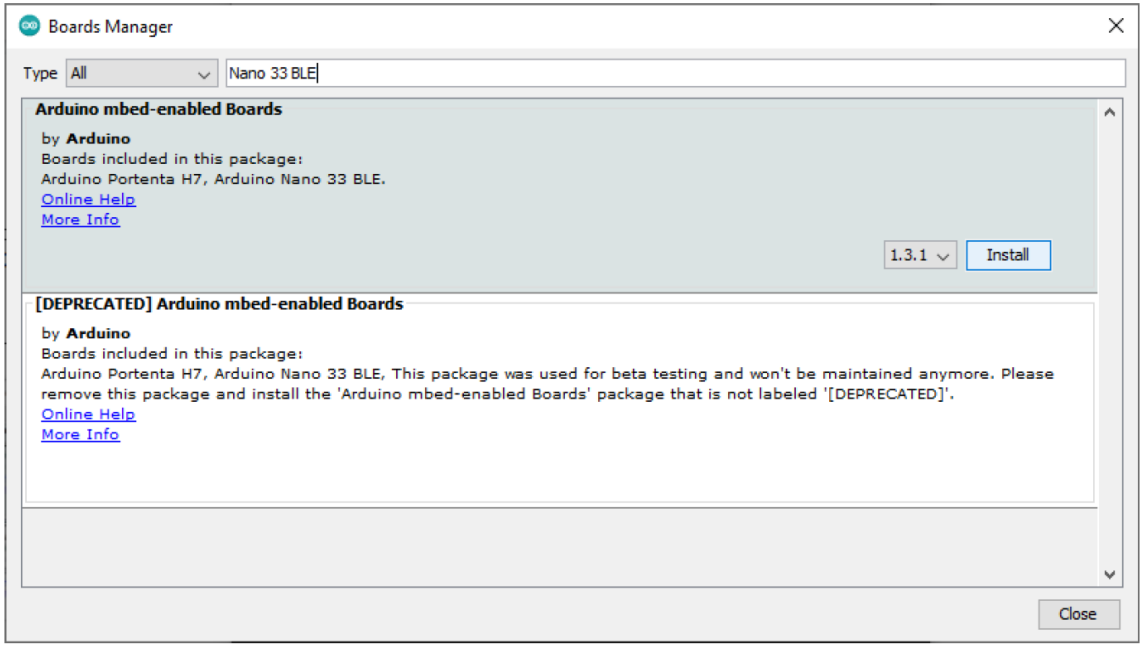
INSTALLING THE BOARD FILES

- Installing board files Arduino Nano 33 BLE Sense
  - In the Boards Manager dialog box, use the search bar at the top right to search for "Nano 33 BLE" which should bring up two results
  - We're interested in the first result (as shown), named "Arduino mbed-enabled Boards" (without the DEPRECATED tag)
  - Make sure Version 1.3.1 is selected and then click "Install"



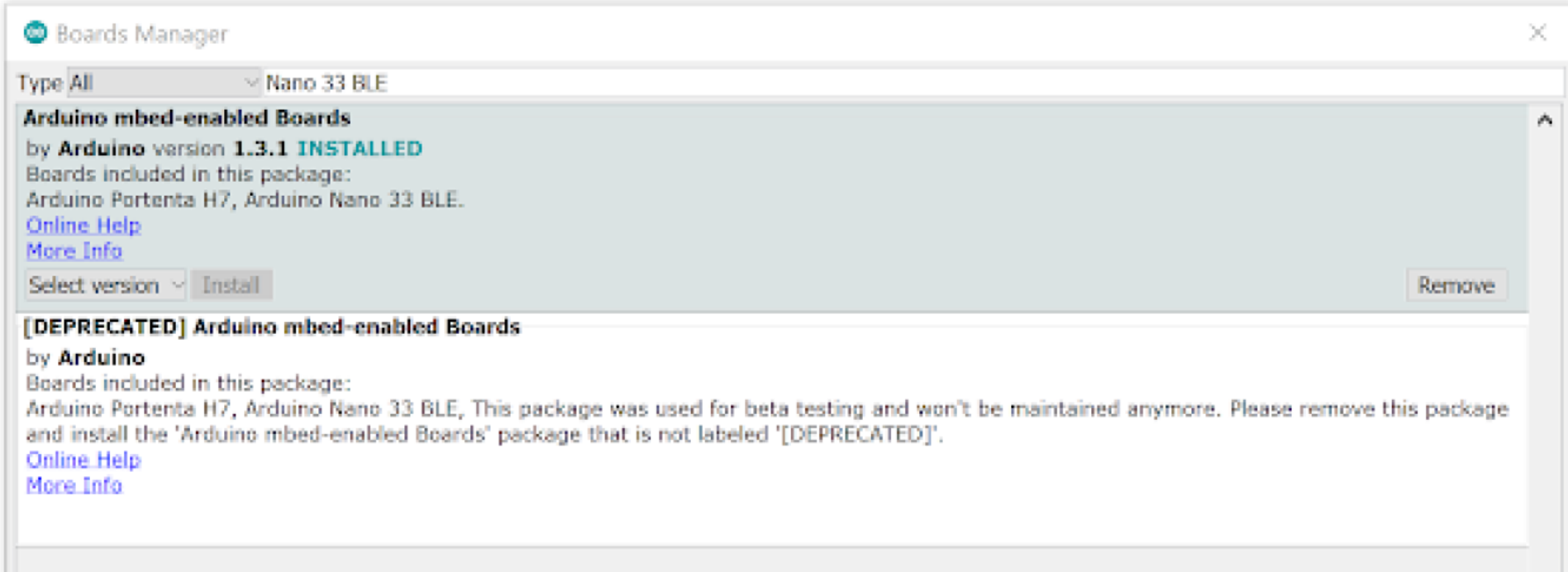
INSTALLING THE BOARD FILES

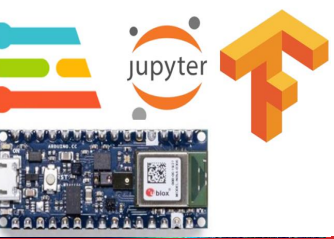
- Installing board files Arduino Nano 33 BLE Sense
  - As the install process progresses you will see a blue completion bar work its way across the bottom of the Board Manager window
  - Be patient, you may need to install USB drivers which requires you to approve an administrator privileges popup which can take a couple minutes to appear



INSTALLING THE BOARD FILES

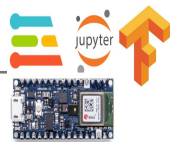
- Installing board files Arduino Nano 33 BLE Sense
  - After you have successfully installed the board if you exit and re-open the Board Manager and search again for "Nano 33 BLE" you will now see a green INSTALLED next to the library and the option to "Remove" the library or install a different version





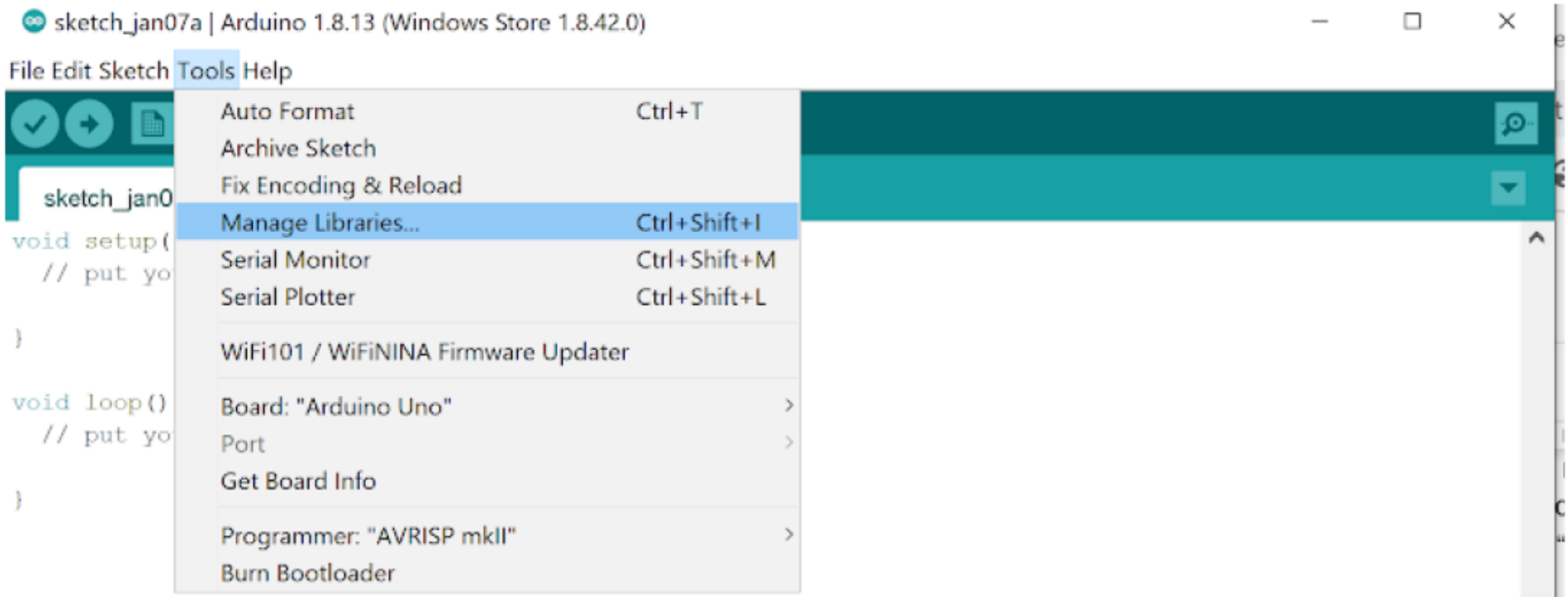
INSTALLING THE LIBRARIES

- Another advantage of the Arduino ecosystem is the availability of a wide array of libraries for performing various tasks, such as interfacing with a sensor module or manipulating data using common algorithms
- There are many libraries that can be accessed from within the Library Manager in the Arduino IDE
- Check here for a complete list
  - https://www.arduino.cc/reference/en/libraries/



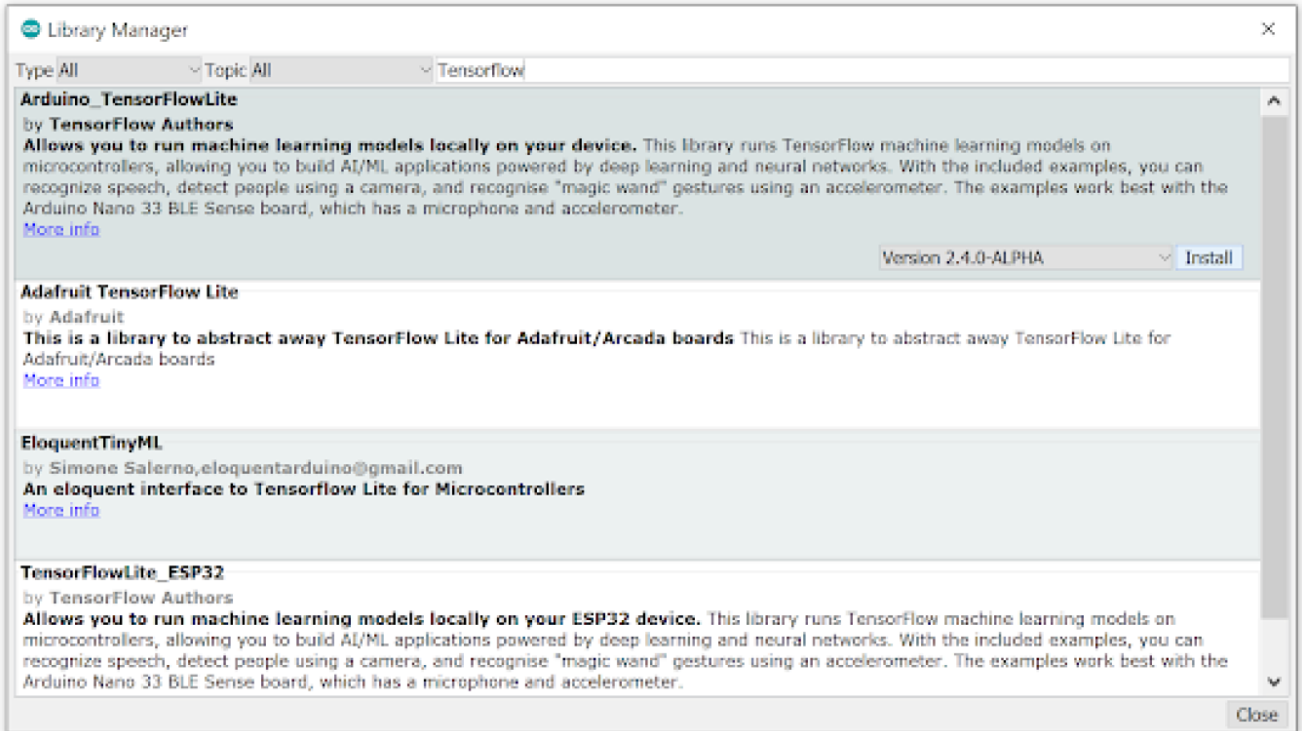
INSTALLING THE LIBRARIES

- Open the Library Manager, which you can find via the Tools drop-down menu
- Navigate as follows: Tools → Manage Libraries



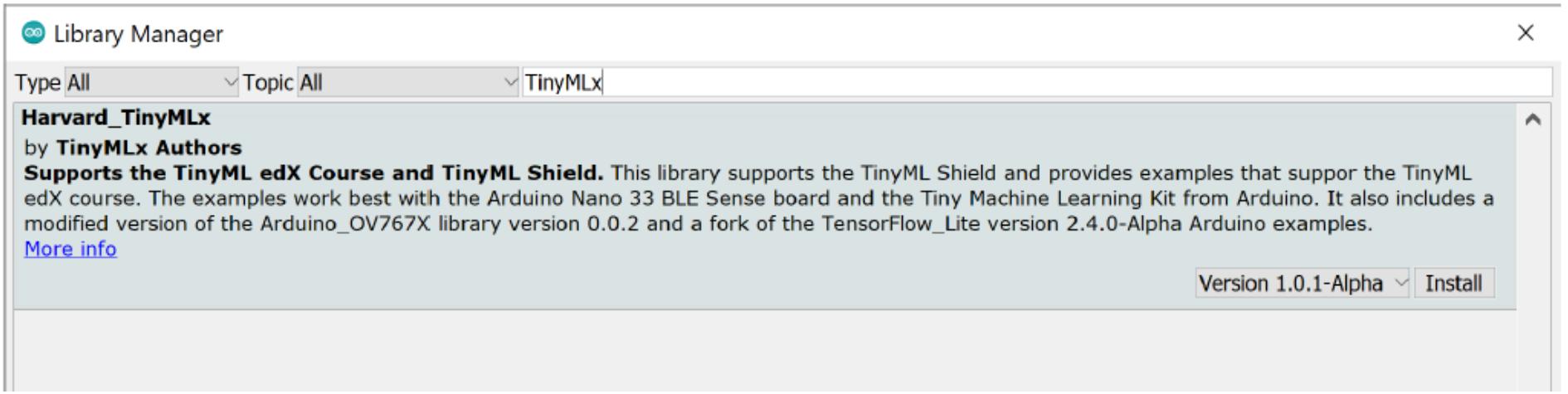
INSTALLING THE LIBRARIES

- In the Library Manager dialog box, use the search bar at the top right to search for the libraries
  - The Tensorflow Lite Micro Library
    - Search Term: Tensorflow
    - Library Name: Arduino_TensorFlowLite
    - Version: 2.4.0-ALPHA



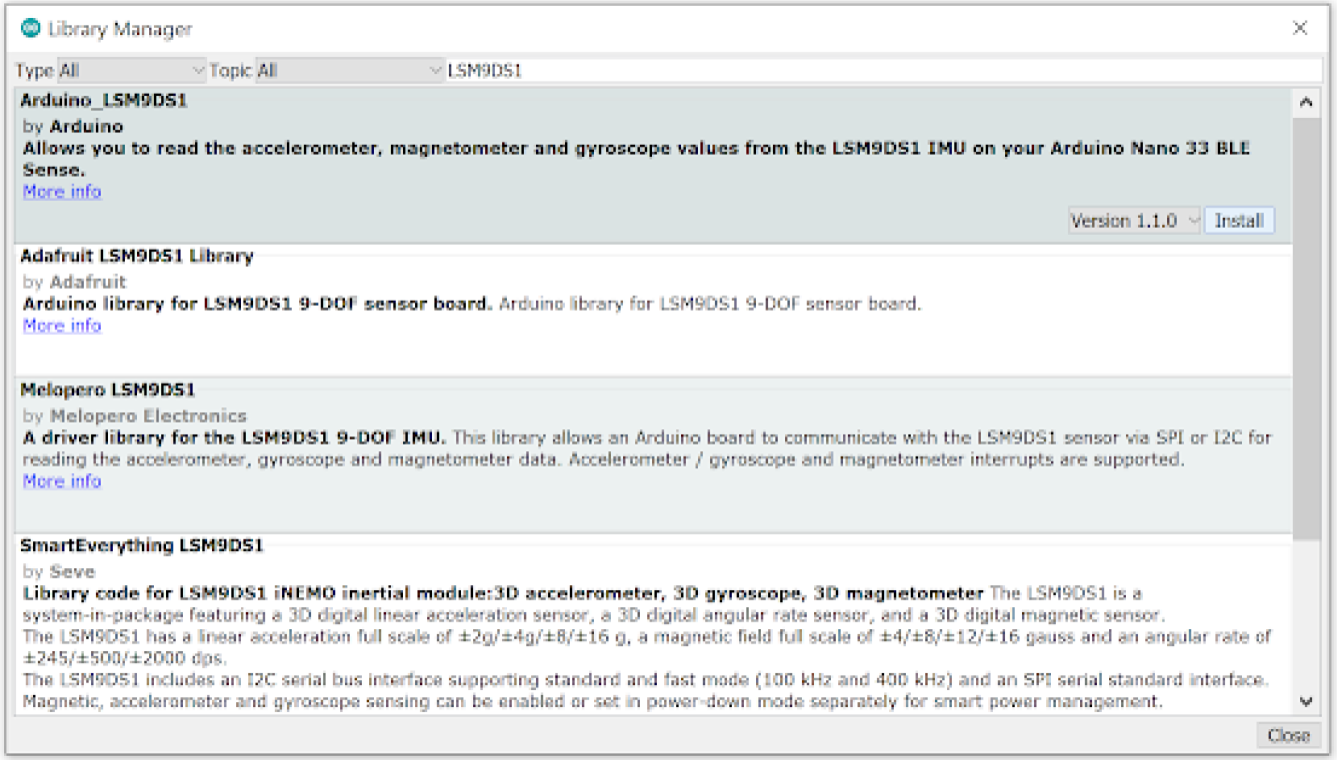
INSTALLING THE LIBRARIES

- In the Library Manager dialog box, use the search bar at the top right to search for the libraries
  - The Harvard_TinyMLx Library
  - Search Term: TinyMLx
  - Library Name: Harvard_TinyMLx
  - Version: 1.0.1



INSTALLING THE LIBRARIES

- The library that supports the accelerometer, magnetometer, and gyroscope on the Nano 33 BLE sense
  - Search Term: LSM9DS1
  - Library Name: Arduino_LSM9DS1
  - Version: 1.1.0The Harvard_TinyMLx Library



INSTALLING THE LIBRARIES

- ArduinoBLE
  - Search Term: ArduinoBLE
  - Library Name: ArduinoBLE
  - Version: 1.1.3