ROBO DYNAMICS


Build Your Own Robot

# Chapter 1
# Introduction to Arduino

# What is Arduino

- Arduino is a project, open-source hardware, and software platform used to design and build electronic devices.
- It designs and manufactures microcontroller kits and single-board interfaces for building electronics projects.

# What is Arduino

- The Arduino is a single circuit board, which consists of different interfaces or parts.
- The board consists of the set of digital and analog pins that are used to connect various devices and components, which we want to use for the functioning of the electronic devices.
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# What is Arduino

- Most of the Arduino consists of 14 digital I/O pins.
- The analog pins in Arduino are mostly useful for fine-grained control.
- The pins in the Arduino board are arranged in a specific pattern.
- The other devices on the Arduino board are USB port, small components (voltage regulator or oscillator), microcontroller, power connector, etc.
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# What is Arduino

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# Arduino Board

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# Arduino Board

- The designs of Arduino boards use a variety of controllers and microprocessors
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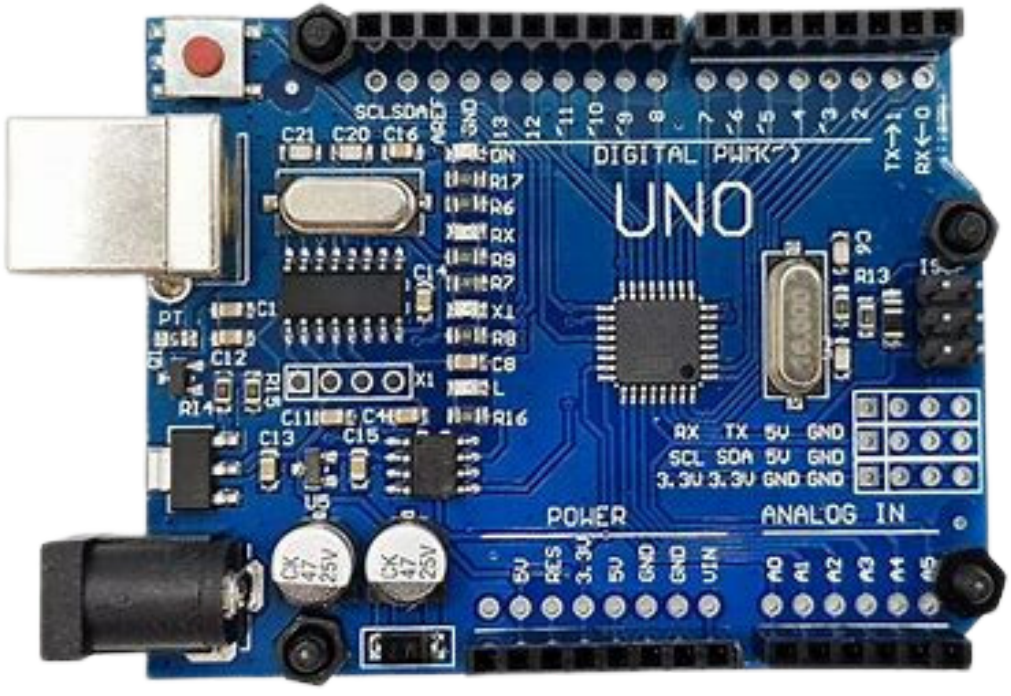

# Arduino Board

- The Arduino board consists of sets of analog and digital I/O (Input / Output) pins, which are further interfaced to breadboard, expansion boards, and other circuits.
- Such boards feature the model, Universal Serial Bus (USB), and serial communication interfaces, which are used for loading programs from the
- computers

# Arduino IDE

- It also provides an IDE (Integrated Development Environment) project, which is based on the Processing Language to upload the code to the physical board.
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# Use of Arduino

- Finger button
- Button for motor activation
- Light as a sensors
- LED button
- Designing
- The Building of electronic devices
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# Features

- Arduino programming is a simplified version of C++, which makes the learning process easy.
- The Arduino IDE is used to control the functions of boards. It further sends the set of specifications to the microcontroller.
- Arduino does not need an extra board or piece to load new code.
- Arduino can read analog and digital input signals.
- The hardware and software platform is easy to use and implement.

# History

- In 2005, Massimo Banzi, David Cuartielles, David Mellis, and another IDII student supported the ATmega168 to the Wiring platform.
- They further named the project as Arduino

# Microcontroller

- The most essential part of the Arduino is the Microcontroller, which is shown below:
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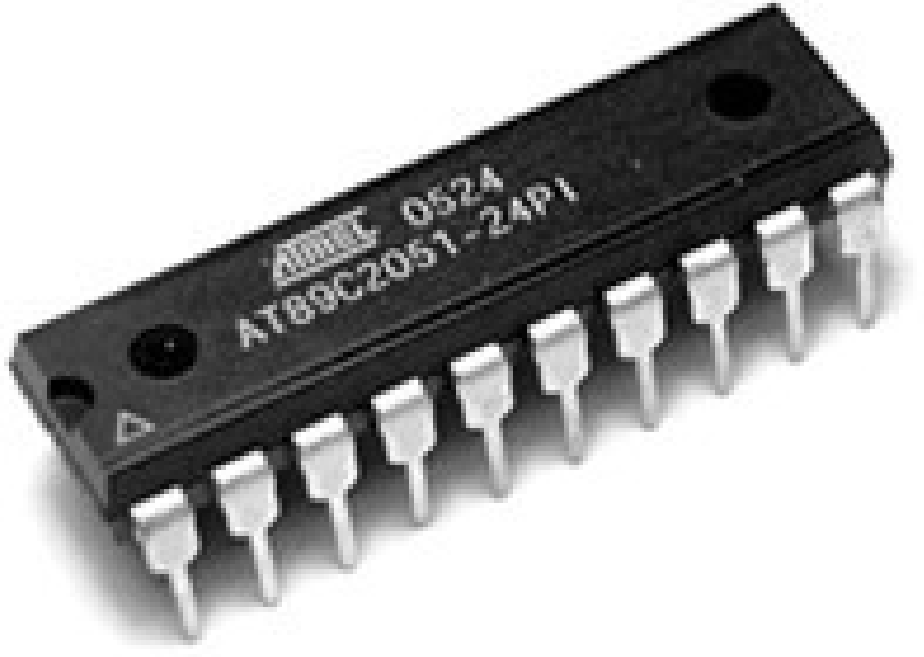

# Microcontroller

- Microcontroller is small and low power computer. Most of the microcontrollers have a RAM (Random Access Memory), CPU (Central Processing Unit), and a memory storage like other computer systems.
- It has very small memory of 2KB (two Kilobytes). Due to less memory, some microcontrollers are capable of running only one program at a time.
- It is a single chip that includes memory, Input/Output (I/O) peripherals, and a processor.
- The GPIO (General Purpose Input Output) pins present on the chip help us to control other electronics or circuitry from the program.
-

# Electronic devices around us

- We have many electronic devices around us. Most of the appliance consists of the microcontroller for its functioning. Let's discuss some of the examples.
  - Microcontroller present in Microwave Oven accepts the user input and controls the magnet run that generate microwave rays to cook the food and displays the output timer.
  - Modern cars also contain dozens of microcontrollers working in tandem (one after another) to control functions like lighting, radio interface, etc.
    -

# Arduino Boards

There are variety of Arduino board used for different purposes. The board varies in I/O pins, size, etc.

The various components present on the Arduino boards are

- Microcontroller
- Digital Input/Output pins
- USB Interface and Connector
- Analog Pins
- Reset Button
- Power button
- LED's
- Crystal Oscillator
- and Voltage Regulator.

Some components may differ depending on the type of

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# Popular Arduino Boards

- **Arduino UNO**
- **Arduino Nano**
- **Arduino Mega**
- **Arduino Due**
- **Arduino Bluetooth**
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# Pre-requisites

- The requirement to learn Arduino is the basic knowledge of C and C++ programming language.
- A basic understanding of circuits, Microcontrollers, and Electronics is also essential.
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# Audience

- **The Arduino is intended for use by students, engineers, and hobbyists.**
- **The basic knowledge of electronic components and programming is required before beginning with the Arduino Tutorials.**
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# Arduino Download

- The Arduino software (IDE) is open-source software.
- We are required to write the code and upload the code to the board to perform some task.
- The Arduino IDE software can be used with any type of Arduino boards.
- The software is available for various operating system such as, Windows, Linux, and Mac OS X.
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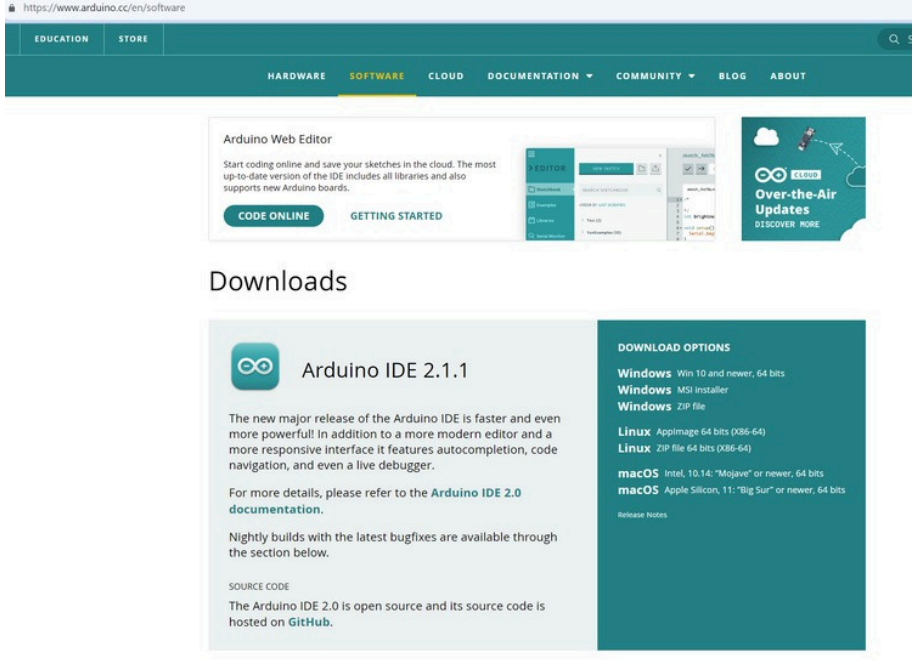
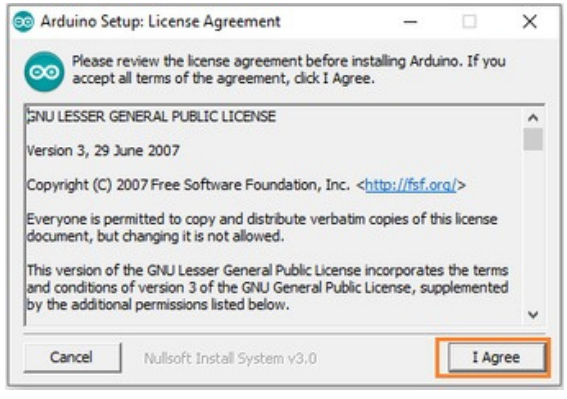
# Arduino Download Steps

- Go to the official website of Arduino (https://www.arduino.cc/) > Click on SOFTWARE < click on DOWNLOADS, as shown below
- Click on the 'Windows Installer' as we are operating with the Windows. We can select the Linux or Mac OS X, accordingly.



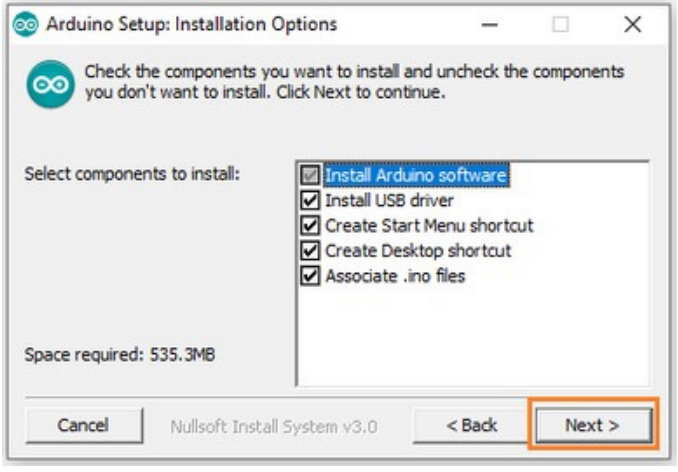
# Arduino Download Steps

- Click on the 'Windows Installer' as we are operating with the Windows. We can select the Linux or Mac OS X, accordingly.
- download the software
- Open the downloaded file
- Grant permission to the Arduino Software on your computer Accept the license by clicking on 'I Agree' button, as shown
- below

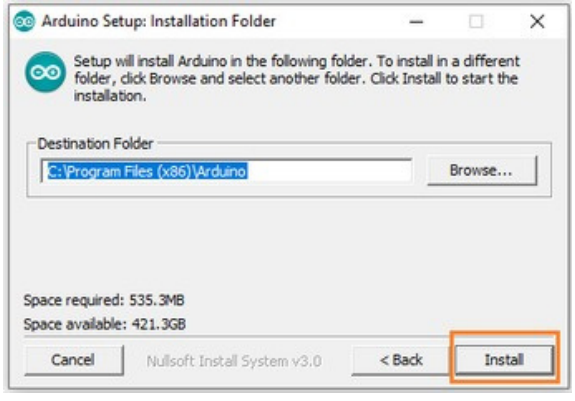


# Arduino Download Steps

- **Click on the Next Button**

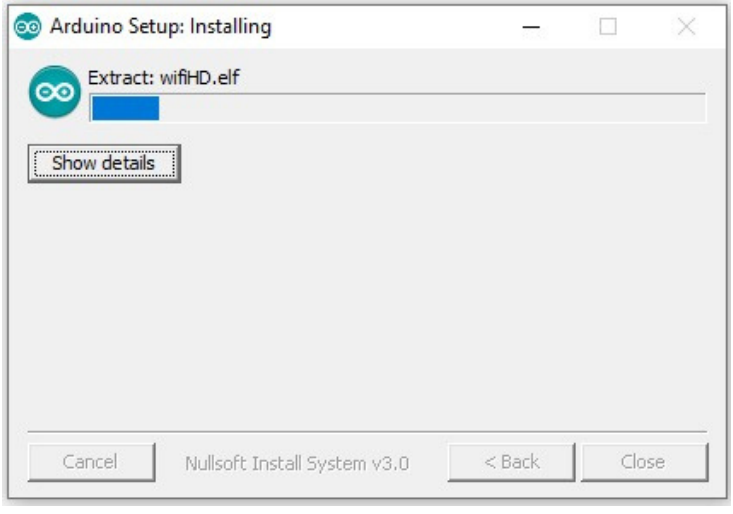



- **The window specifying the location of the installed folder will appear. Click on the 'Install' button. It is shown**
- **below.**



# Arduino Download Steps

- **The installing process of Arduino will start, as shown below**




- **Now, we have to accept the security for the installation. We are required to accept the security Installation three times**
- **The installation process is now completed.**
- **Click on close button**

# Arduino Download Steps

- **The Arduino IDE software will appear on your desktop, as shown below:**

# Arduino IDE

- Now, open the Arduino software
- The Arduino IDE environment is written in the programming language named as Java. So, we need to allow access to the Java Platform
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# Arduino IDE

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- Accept the license by clicking on the 'Allow access' button.
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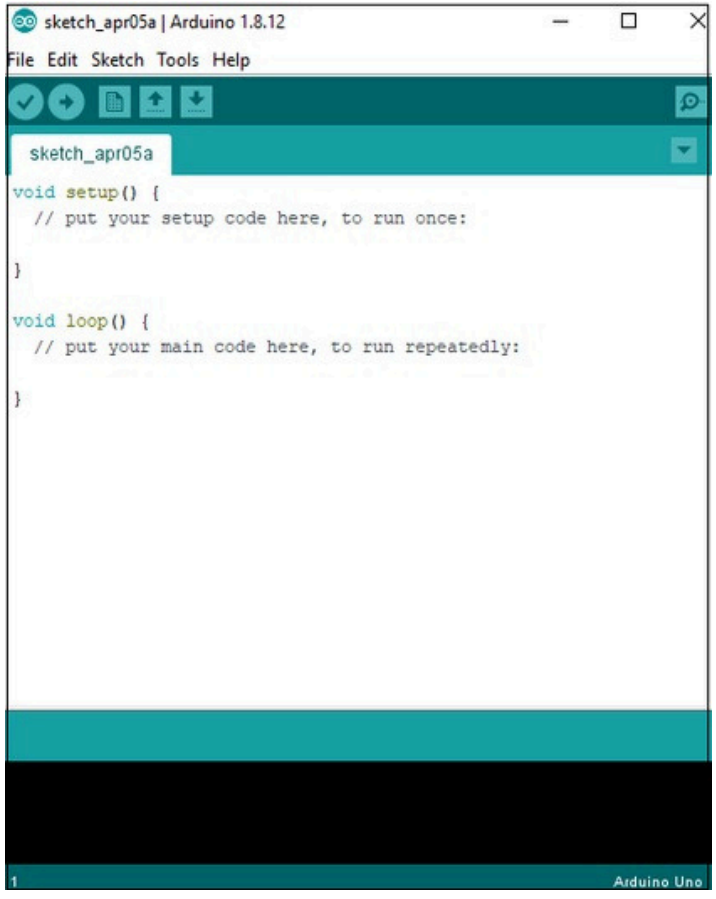
# Arduino IDE

- **The Arduino window will appear as**



# Arduino IDE

- **The Arduino window will appear as**