**KOLHAPUR INSTITUTE OF TECHNOLOGY'S**
**COLLEGE OF ENGINEERING (AUTONOMOUS), KOLHAPUR**

# Department of
# Artificial Intelligence & Machine Learning

## PE - 1 : Internet of Things Analytics UAME0524

### Unit – III
### Setting Up Raspberry Pi/Ardunio to Create Solution

# TOPICS COVERED

1. **Introduction to Raspberry Pi**

2. **Raspberry pi models**

3. **Raspberry pi interfaces**

4. **Features of Raspberry Pi**
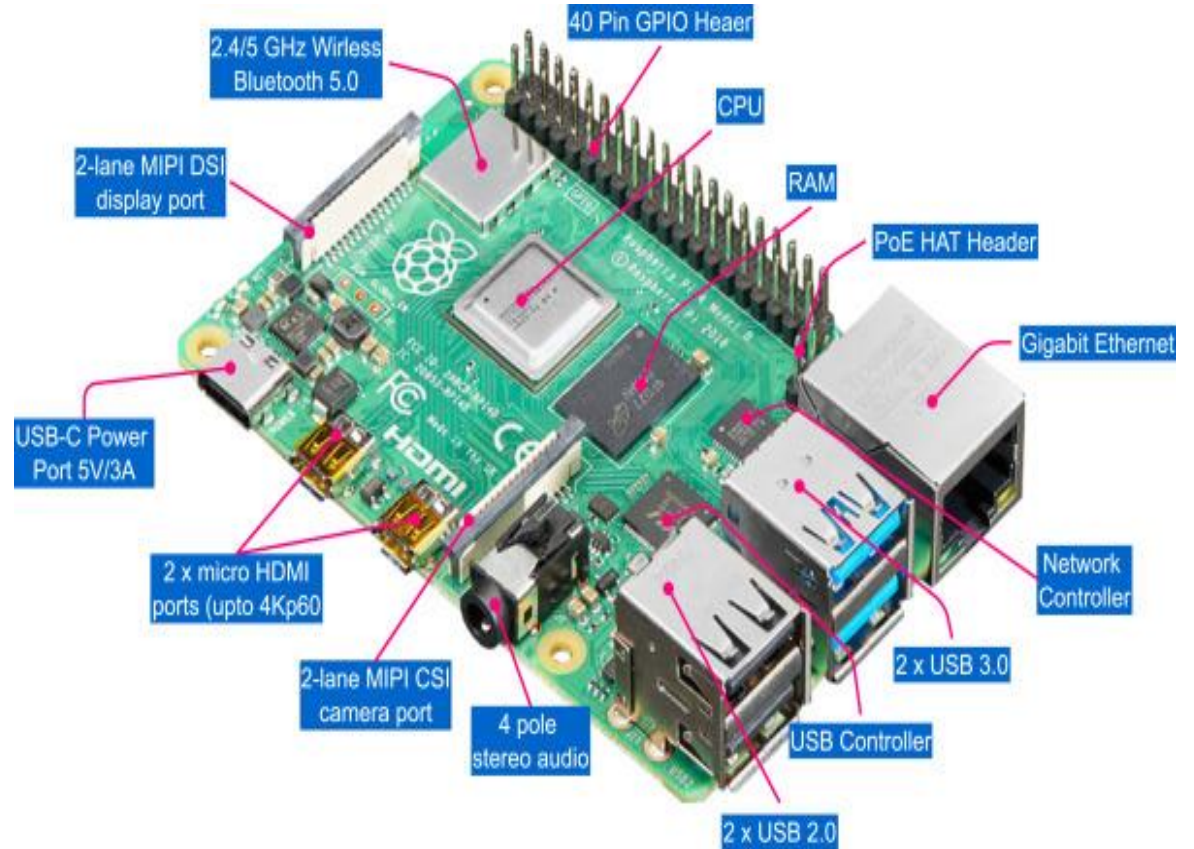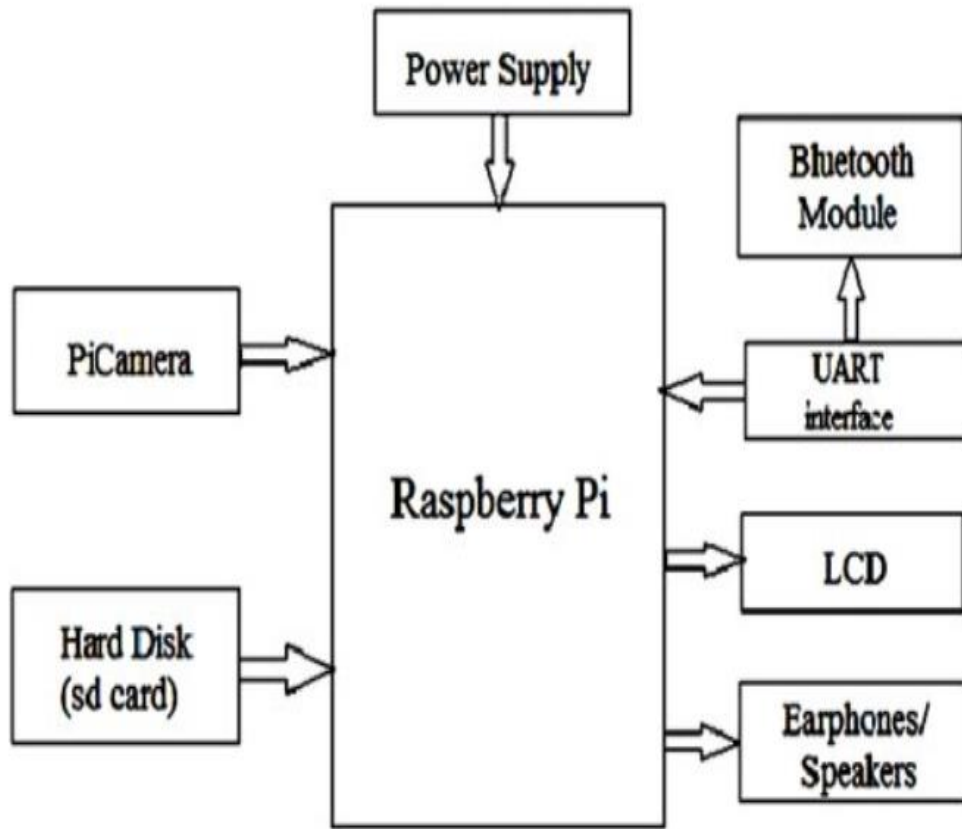
5. **Interfacing LDR with Raspberry Pi**

# Introduction

✓ Raspberry Pi is the name of a series of single-board computers made by the Raspberry Pi Foundation, a UK charity that aims to educate people in computing and create easier access to computing education.

✓ The Raspberry Pi launched in 2012, and there have been several iterations and variations released since then.

✓ The original Pi had a single-core 700MHz CPU and just 256MB RAM, and the latest model has a quad-core CPU clocking in at over 1.5GHz, and 4GB RAM.

✓ The price point for Raspberry Pi has always been under $100 (usually around $35 USD), most notably the Pi Zero, which costs just $5.

# Raspberry Pi models

✓ There have been many generations of the Raspberry Pi line: from Pi 1 to 4, and even a Pi 400.

✓ There has generally been a Model A and a Model B of most generations.

✓ Model A has been a less expensive variant, and tends to have reduced RAM and fewer ports (such as USB and Ethernet).

✓ The Pi Zero is a spinoff of the original (Pi 1) generation, made even smaller and cheaper.

- Pi 1 Model B (2012)
- Pi 1 Model A (2013)
- Pi 1 Model B+ (2014)
- Pi 1 Model A+ (2014)
- Pi 2 Model B (2015)
- Pi Zero (2015)
- Pi 3 Model B (2016)
- Pi Zero W (2017)
- Pi 3 Model B+ (2018)
- Pi 3 Model A+ (2019)
- Pi 4 Model A (2019)
- Pi 4 Model B (2020)
- Pi 400 (2021)

# Architecture of Raspberry Pi

# Raspberry Pi Interfaces

**Serial :** The Serial interface on Raspberry Pi has receive (Rx) and transmit (Tx) pins for communication with serial peripherals.

**SPI :** Serial Peripheral Interface (SPI) is a synchronous serial data protocol used for communicating with one or more peripheral devices. in an SPI connection, there are five pins on Raspberry Pi for SPI interface :

- **MISO (Master in slave out)** – Master line for sending data to the peripherals.
- **MOSI (Master out slave in)** – Slave line for sending data to the master.
- **SCK (Serial Clock)** – Clock generated by master to synchronize data transmission
- **CE0 (Chip Enable 0)** – To enable or disable devices
- **CE0 (Chip Enable 1)** – To enable or disable devices

**I2C :** The I2C interface pins on Raspberry Pi allow you to connect hardware modules. **I2C interface** allows synchronous data transfer with just two pins – **SDA (data line)** an **SCL (Clock Line)**.
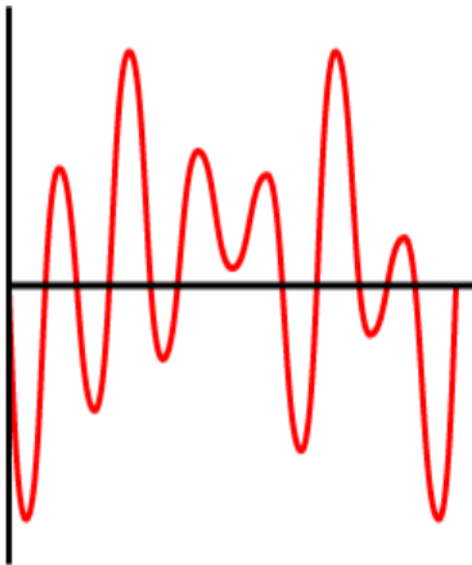
# Features of Raspberry Pi

✓ Low cost: The basic Raspberry Pi board costs around $35.

✓ Easy to use: It has a user-friendly operating system and pre-installed software applications.

✓ Versatile: It can run several operating systems, including Linux, Ubuntu Mate, and Windows 10 IoT Core.

✓ Connectivity: It has built-in support for Ethernet, Wi-Fi, and Bluetooth.

✓ GPIO pins: It has a set of GPIO (general purpose input/output) pins, allowing you to control electronic components.

✓ Energy-efficient: It reduces the risk of hardware failures and prolongs the lifespan of the device.

✓ Supports multiple sensors: It can support multiple sensors at once.

✓ Supports all types of codes: It has a Linux desktop environment that allows you to code in almost any language.

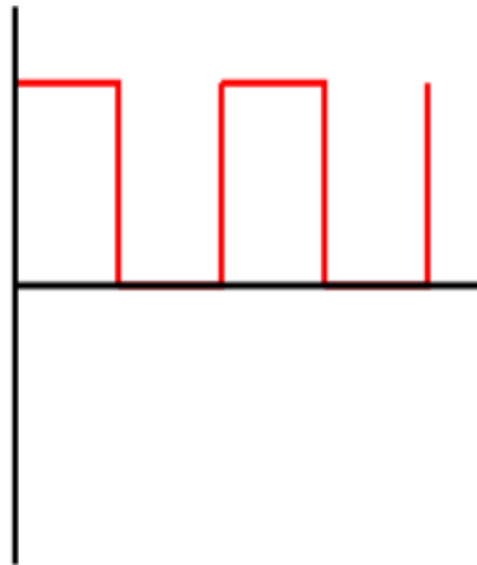✓ Can be used as a portable computer: You can attach a display to Raspberry Pi to make it a pocket computer.

# Interfacing Light Sensor(LDR) with Raspberry Pi

- ✓ A Light Dependent Resistor (LDR) is a sensor that can detect the amount of light in its surroundings.

- ✓ The Light Dependent Resistor is a sensor that changes its resistance when it is exposed to different levels of light.

- ✓ It can be interfaced with the Raspberry Pi by connecting it in series with the GPIO pins.

- ✓ The LDR is a voltage divider, which means that when the light intensity increases, the voltage at the output decreases.

- ✓ The LDR has two leads and one lead must be connected to ground for it to produce a stable reading.
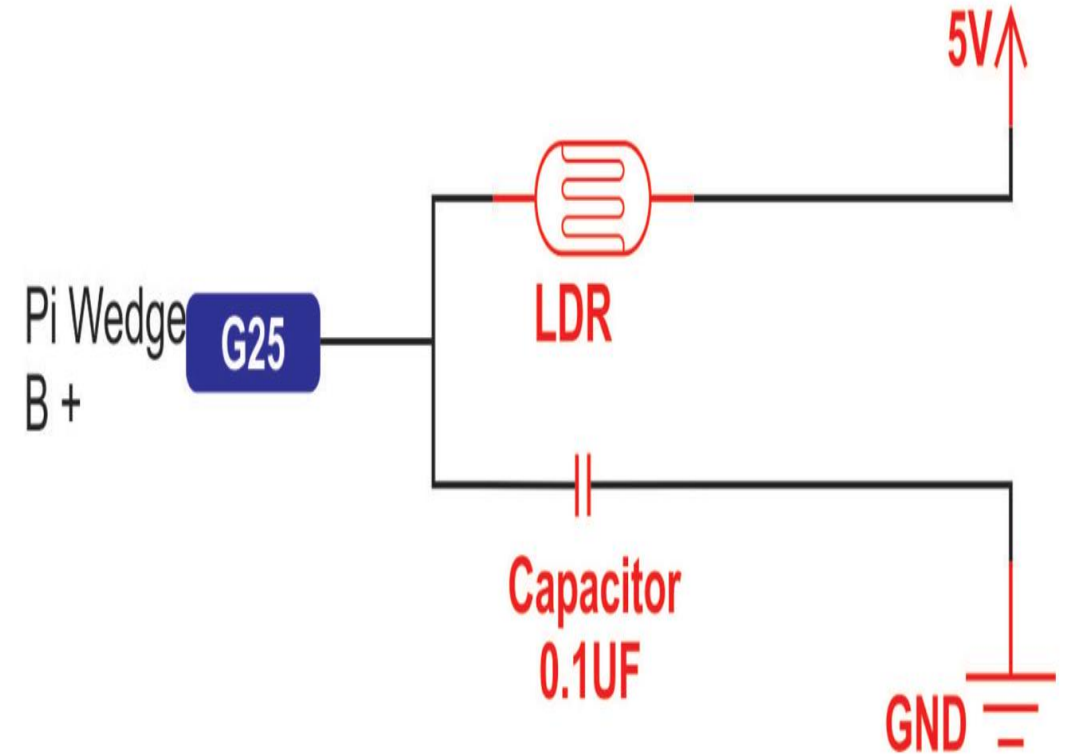
# Interfacing Light Sensor(LDR) with Raspberry Pi



Analogue inputs could be given a range of voltages, anywhere from 0V up to 3.3V.

Digital inputs are either on or off. Any voltage above 1.8V is considered on, and below that is considered off.

# Arduino UNO

- ✓ It is a microcontroller board developed by Arduino.cc and is based on Atmega328 Microcontroller.

- ✓ The first Arduino project was started in Interaction Design Institute Ivrea in 2003 by David Cuartielles and Massimo Banzi with the intention of providing a cheap and flexible way for students and professionals to learn embedded programming.

- ✓ Arduino UNO is a very valuable addition in electronics that consists of a USB interface, 14 digital I/O pins(of which 6 Pins are used for PWM), 6 analog pins and an Atmega328 microcontroller.

- ✓ It also supports 3 communication protocols named Serial, I2C and SPI protocol.

# Applications of Arduino UNO

- ✓ Security and defense
- ✓ Embedded System
- ✓ Digital Electronics and Robotics
- ✓ Weighing machines
- ✓ Parking Lot Counter
- ✓ Medical instrument
- ✓ Traffic Light Count Down Timer
- ✓ Home Automation
- ✓ Industrial Automation
- ✓ Emergency Light for Railways

# Sensors in Arduino Kit

- ✓ **Light sensor** - The light sensor is used to control the light. It is used with LDR (Light Dependent Resistor) in Arduino.
- ✓ **Ultrasonic sensor** - The ultrasonic sensor is used to determine the distance of the object using SONAR.
- ✓ **Temperature sensor -** The temperature sensor is used to detect the temperature around it.
- ✓ **Knock Sensor** - The knock sensor is used to pick the vibrations of the knocking. It is a common category of a vibration sensor.
- ✓ **Object Detection Sensor** - It is used to detect the object by emitting infrared radiations, which are reflected or bounced back by that object.
- ✓ **Tracking Sensor** - It allows the robots to follow a particular path specified by sensing the marking or lines on the surface.

# Sensors in Arduino Kit

- **Metal Touch Sensor**

It is suitable for detecting the human touch.

- **Water Level Sensor**

It is used to measure the water or the depth of the water level. It is also used to detect leaks in containers.

- **Vibration Sensor**

The vibration sensor is used to measure the vibrations.

- **Air Pressure sensor**

It is commonly related to meteorology, biomedical fields.

# Sensors in Arduino Kit

- ✓ **Humidity sensor** - The humidity sensor is used to monitor weather conditions.

- ✓ **Motion sensor** - The motion sensor detects the movement and occupancy from the human body with the help of Infrared radiation.

- ✓ **Vibration sensor** - The vibration sensor is used to detect the vibrations.

- ✓ **Sound sensor** - The sound sensor is suitable to detect the sound of the environment.

- ✓ **Pressure Sensor** - The pressure sensor is used to measure the pressure. The sensor in Arduino measures the pressure and displays it on the small LCD screen.

- ✓ **Magnetic field sensor** - The magnetic field sensor measures the magnetic field strength and produces a varying voltage as the output in Arduino.

# Thank You