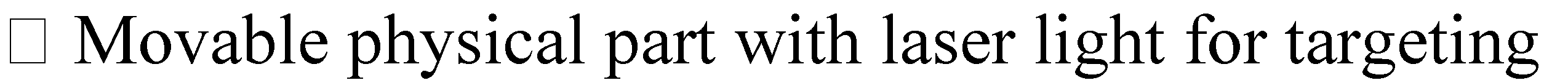
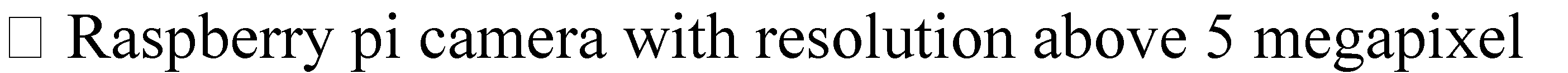
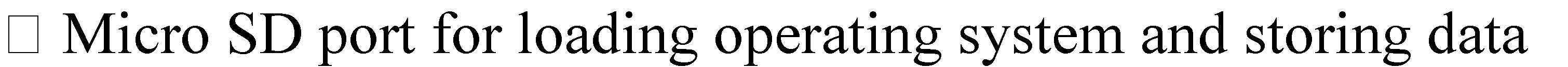
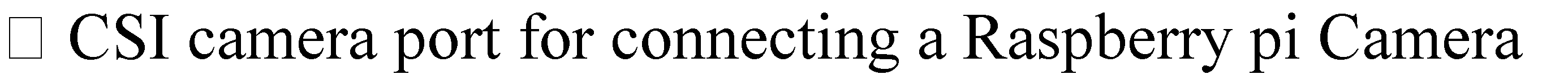
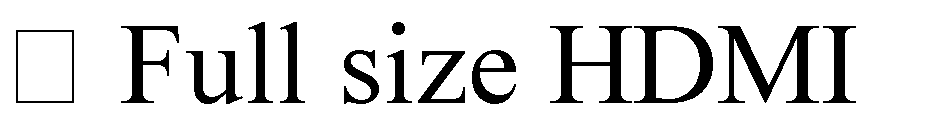
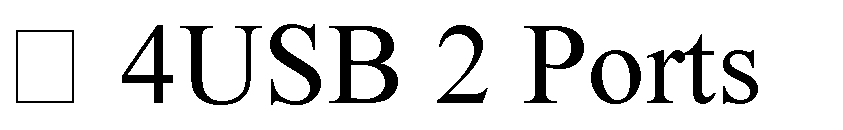
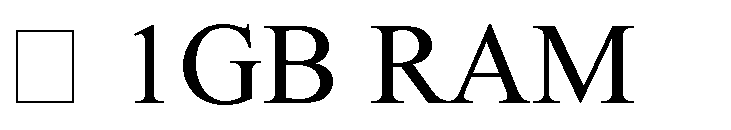
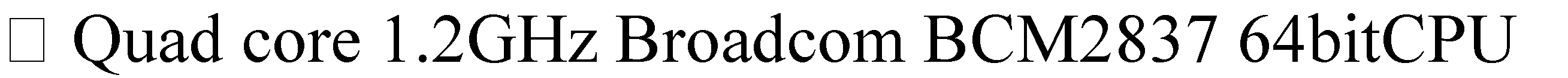
# **OPERATING ENVIRONMENT**

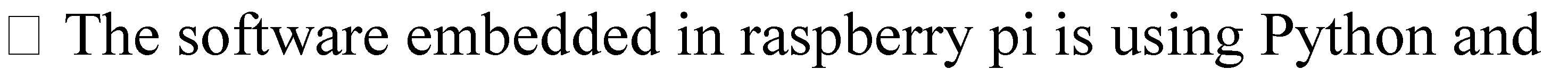
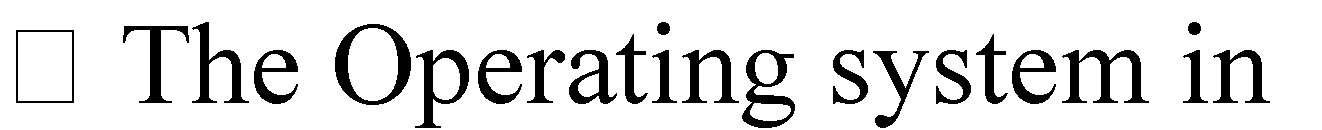
**4.1 Hardware Requirements:**

The system completely works on raspberry pi 3+



**Raspberry pi**

**4.2 Software requirements:**

 Anaconda. stalled in raspberry pi is Windows base operating

system



## 4.3 Tools And Platforms

### 4.3.1 Python

Is a powerful high level, object oriented programming language created by Guido van Rossum . It has simple easy to use syntax, making it the perfect language for someone trying to learn computer programming for the first time. It has wide range of applications from web development (like: Django and Bottle), scientific and mathematical computing (orange, sympy, Numpy) to desktop graphical user interface (Pygame, Panda3D). The syntax of the language is clean and length of the code is relatively short. It’s fun to work in python because it allows you to think about the problem rather than focusing on the syntax.

**Why python was created?**

In late 1980s, Guido van Rossum was working on the Amoeba distributed operating system group. He wanted to use an interpreted language like ABC (ABC has simple easy to understand syntax) that could access the Amoeba system calls. So he decided to create a language that was extensible.

This led to design of a new language which was later named Python.

**Features of Python**

A simple language which is easier to learn, Python has a very simple and elegant syntax. It’s much easier to read and write Python programs compared to other languages like: C++, Java, C#. Python makes programming fun and allows you to focus on the solution rather than syntax.

1. **Free and open-source:**

You can freely use and distribute Python, even for commercial use. Not only can you use and distribute software’s written in it, you can even make changes to the Pythons source code. Python has a large community constantly improving it in each iteration.

1. **Portability:**

You can move Python programs from one platform to another, and run it without any changes. It runs seamlessly on almost all platforms including Windows, Mac OS X and Linux.

1. **Extensible and Embeddable:**

Suppose an application requires high performance. You can easily combine pieces of C/C++ or other languages with Python code. This will give your application high performance as well as scripting capabilities which other languages may not provide out of the box.

1. **A high-level, interpreted language:**

Unlike C/C++, you don’t have to worry about daunting tasks like memory management, garbage collection and so on. Likewise, when you run Python code, it automatically converts your code to the language your computer understands. You don’t need to worry about any lower-level operations.

1. **Large standard libraries to solve common tasks:**

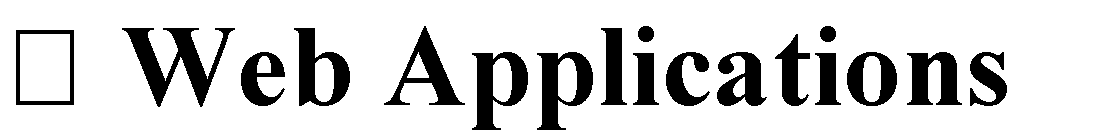
Python has a number of standard libraries which makes life of a programmer much easier since you don’t have to write all the code yourself. For example: Need to connect MySQL database on a Web server? You can use MySQL dB library using import MySQL dB .Standard libraries in Python are well tested

and used by hundreds of people. So you can be sure that it won’t break your application.

1. **Object-oriented:**

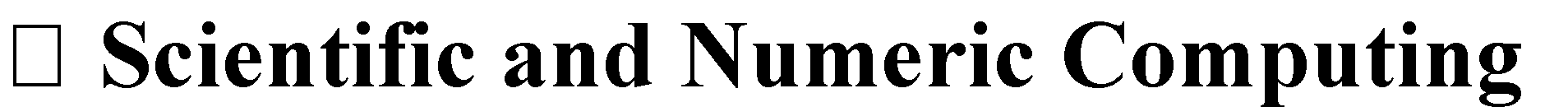
Everything in Python is an object. Object oriented programming (OOP) helps you solve a complex problem intuitively. With OOP, you are able to divide these complex problems into smaller sets by creating objects.

## Applications of Python



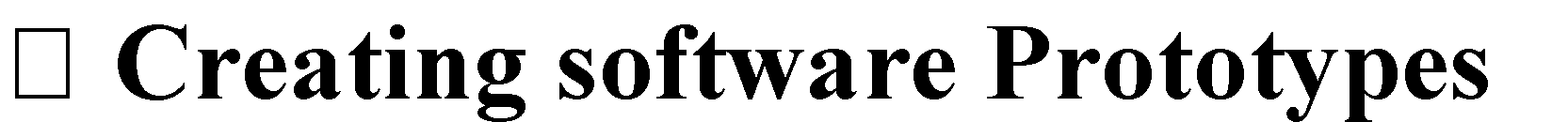
You can create scalable Web Apps using frameworks and CMS (Content Management System) that are built on Python. Some of the popular platforms for creating Web Apps are: Django, Flask, Pyramid, Plone and Django CMS.

Sites like Mozilla, Reddit, Instagram and PBS are written in Python.



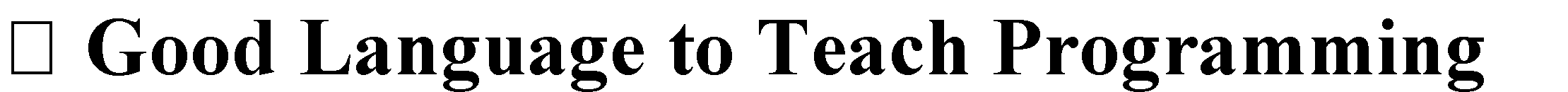
There are numerous libraries available in Python for scientific and numeric computing. There are libraries like: SciPy and NumPy that are used in general purpose computing. And, there are specific libraries like: EarthPy for earth science, AstroPy for Astronomy and so on.

Also, the language is heavily used in machine learning, data mining and deep learning.



Python is slow compared to compiled languages like C++ and Java. It might not be a good choice if resources are limited and efficiency is a must.

However, Python is a great language for creating prototypes. For example: You can use Pygame (library for creating games) to create your games prototype first. If you like the prototype. You can use language like C++ to create the actual game.



Python is used by many companies to teach programming to kids and newbies.

It is a good language with a lot of features and capabilities. Yet, it’s one of the easiest language to learn because of its simple easy-to-use syntax.

### 4.3.2 ANACONDA

**Anaconda** is a [free and open-source](https://en.wikipedia.org/wiki/Free_and_open-source) distribution of the [Python](https://en.wikipedia.org/wiki/Python_(programming_language)) and [R](https://en.wikipedia.org/wiki/R_(programming_language)) programming languages for [scientific computing](https://en.wikipedia.org/wiki/Scientific_computing) [(data science,](https://en.wikipedia.org/wiki/Data_science) [machine learning](https://en.wikipedia.org/wiki/Machine_learning) applications, large-scale data processing, [predictive analytics,](https://en.wikipedia.org/wiki/Predictive_analytics) etc.), that aims to simplify [package management](https://en.wikipedia.org/wiki/Package_management) and deployment. The distribution includes data-science packages suitable for Windows, Linux, and macOS. It is developed and maintained by Anaconda, Inc., which was founded by Peter Wang and [Travis Oliphant](https://en.wikipedia.org/wiki/Travis_Oliphant) in 2012. As an Anaconda, Inc. product, it is also known as **Anaconda Distribution** or **Anaconda Individual Edition**, while other products from the company are Anaconda Team Edition and Anaconda Enterprise Edition, which are both not free.

Package versions in Anaconda are managed by the [package management system](https://en.wikipedia.org/wiki/Package_manager) [*conda*.](https://en.wikipedia.org/wiki/Conda_(package_manager)) This package manager was spun out as a separate open-source package as it ended up being useful on its own and for other things than Python. There is also a small, bootstrap version of Anaconda called **Miniconda**, which includes only conda, Python, the packages they depend on, and a small number of other packages.

#### Anaconda Navigator

Anaconda Navigator is a desktop [graphical user interface (GUI)](https://en.wikipedia.org/wiki/Graphical_user_interface) included in Anaconda distribution that allows users to launch applications and manage conda packages, environments and channels without using [command-line commands.](https://en.wikipedia.org/wiki/Command-line_interface) Navigator can search for packages on Anaconda Cloud or in a local Anaconda Repository, install them in an environment, run the packages and update them. It is available for [Windows,](https://en.wikipedia.org/wiki/Windows) [macOS](https://en.wikipedia.org/wiki/MacOS) and [Linux.](https://en.wikipedia.org/wiki/Linux)

The following applications are available by default in Navigator:

* [JupyterLab](https://en.wikipedia.org/wiki/Project_Jupyter#JupyterLab)
* [Jupyter Notebook](https://en.wikipedia.org/wiki/Project_Jupyter#Jupyter_Notebook)
* QtConsole
* [Spyder](https://en.wikipedia.org/wiki/Spyder_(software))
* [Glue](https://en.wikipedia.org/wiki/Glue_(software))
* [Orange](https://en.wikipedia.org/wiki/Orange_(software))
* [RStudio](https://en.wikipedia.org/wiki/RStudio)
* [Visual Studio Code](https://en.wikipedia.org/wiki/Visual_Studio_Code)

**Tackle any challenge:** Anaconda solutions are serious technology for real data science and ML applications. Anaconda is versatile - you'll be ready to solve problems you don't even know you have yet.

**Platform used- WINDOWS**

Microsoft Windows, commonly referred to as Windows, is a group of several [proprietary](https://en.wikipedia.org/wiki/Proprietary_software) [graphical](https://en.wikipedia.org/wiki/Graphical_user_interface) [operating system](https://en.wikipedia.org/wiki/Operating_system) families, all of which are developed and marketed by [Microsoft.](https://en.wikipedia.org/wiki/Microsoft) Each family caters to a certain sector of the computing industry. Active Microsoft Windows families include [Windows NT](https://en.wikipedia.org/wiki/Windows_NT) and [Windows IoT;](https://en.wikipedia.org/wiki/Windows_IoT) these may encompass subfamilies, e.g. [Windows Server](https://en.wikipedia.org/wiki/Windows_Server) or [Windows Embedded Compact](https://en.wikipedia.org/wiki/Windows_Embedded_Compact) (Windows CE). Defunct Microsoft

Windows families include [Windows 9x,](https://en.wikipedia.org/wiki/Windows_9x) [Windows Mobile](https://en.wikipedia.org/wiki/Windows_Mobile) and [Windows Phone.](https://en.wikipedia.org/wiki/Windows_Phone)

Microsoft introduced an [operating environment](https://en.wikipedia.org/wiki/Operating_environment) named *Windows* on November 20, 1985, as a graphical [operating system shell](https://en.wikipedia.org/wiki/Operating_system_shell) for [MS-DOS](https://en.wikipedia.org/wiki/MS-DOS) in response to the growing interest in [graphical user interfaces](https://en.wikipedia.org/wiki/Graphical_user_interface) (GUIs). Microsoft Windows came to [dominate](https://en.wikipedia.org/wiki/Dominance_(economics)) the world's [personal computer](https://en.wikipedia.org/wiki/Personal_computer) (PC) market with [over 90% market share,](https://en.wikipedia.org/wiki/Usage_share_of_operating_systems) overtaking [Mac OS,](https://en.wikipedia.org/wiki/Classic_Mac_OS) which had been introduced in 1984. [Apple](https://en.wikipedia.org/wiki/Apple_Inc) came to see Windows as an unfair encroachment on their innovation in GUI development as implemented on products such as the [Lisa](https://en.wikipedia.org/wiki/Apple_Lisa) and [Macintosh](https://en.wikipedia.org/wiki/Macintosh) (eventually settled in court in Microsoft's favor in 1993). On PCs, Windows is still the most popular operating system. However, in 2014, Microsoft admitted losing the majority of the overall operating system market to [Android,](https://en.wikipedia.org/wiki/Android_(operating_system)) because of the massive growth in sales of

Android [smartphones.](https://en.wikipedia.org/wiki/Smartphone) In 2014, the number of Windows devices sold was less than 25% that of Android devices sold. This comparison, however, may not be fully relevant, as the two operating systems traditionally target different platforms. Still, numbers for server use of Windows (that are comparable to competitors) show one third market share, similar to that for end user use.

As of February 2020, the most recent version of Windows for

PCs, [tablets](https://en.wikipedia.org/wiki/Tablet_computers) and [embedded devices](https://en.wikipedia.org/wiki/Embedded_system) is [Windows 10,](https://en.wikipedia.org/wiki/Windows_10) version 2004. The most recent version for [server computers](https://en.wikipedia.org/wiki/Server_(computing)) is [Windows Server,](https://en.wikipedia.org/wiki/Windows_Server) version 2004. [A specialized version of Windows](https://en.wikipedia.org/wiki/Xbox_One_system_software) also runs on the [Xbox One](https://en.wikipedia.org/wiki/Xbox_One) [video game console.](https://en.wikipedia.org/wiki/Video_game_console)

**How does Windows differ from other operating systems?**

Windows refers to a meta-family of graphical operating system that Microsoft developed and marketed globally. It comprises of many operating systems families with each catering for a specific computing industry sector. Among the active families of Windows include Windows Embedded, Windows NT and Windows Phone. These can have subfamilies like Windows Server or [Windows](https://www.intervalzero.com/products/rtos-platform-vision/)

[CE.](https://www.intervalzero.com/products/rtos-platform-vision/) As an operating environment, Windows was introduced by Microsoft on 20th November 1985.

An operating system is in most cases pre-loaded in a computer when purchasing it. Although many people use operating systems that are pre-loaded in their computers, you can upgrade or change the operating system of your computer. Windows is perhaps the most popular operating system for personal computers globally. It is available in different versions including Windows 10, Windows 8, Windows 7 and Windows Vista. Windows is very popular because it is preloaded in majority of the new personal computers.

The major reason why Windows is so popular is because it was embraced by many enterprises early. Since it was used by many businesses first, it naturally filtered into homes because most people are familiar with it and used to it at the office. Reliability has not been an issue that could hinder Windows from becoming popular. People who have criticized the reliability of Windows appear to misunderstand the point. While developing Windows, Microsoft realized that for it to be successful, it must provide many features, such as ease of use and reliability. This has enhanced the intuitive nature of the [Windows PC,](https://www.intervalzero.com/newsevents/intervalzero-to-showcase-real-time-single-pc-operations-on-windows-10-for-iot-at-embedded-world-2016) making it very popular.

**How was Windows created?**

This is where it all started for Windows. The original [Windows](https://www.theguardian.com/technology/windows) 1 was released in November 1985 and was Microsoft’s first true attempt at a graphical user interface in 16-bit.

Development was spearheaded by Microsoft founder Bill Gates and ran on top of MS-DOS, which relied on command-line input.

It was notable because it relied heavily on use of a mouse before the mouse was a common computer input device. To help users become familiar with this odd input system, Microsoft included a game, Reversi (visible in the screenshot) that relied on mouse control, not the keyboard, to get people used to moving the mouse around and clicking onscreen elements.

### 4.3.3 Platform used: RASPBERRY PI 3+

The Raspberry Pi 3+ operates in the open source ecosystem: it runs Linux (a variety of distributions), and its main supported operating system, Raspbian, is open source and runs a suite of open source software. The Raspberry Pi Foundation contributes to the Linux kernel and various other open source projects as well as releasing much of its own software as open source.

**Raspberry Pi 3+ Specifications**

* SoC: Broadcom BCM2837
* CPU: 4× ARM Cortex-A53, 1.2GHz
* GPU: Broadcom Video Core IV
* RAM: 1GB LPDDR2 (900 MHz)
* Networking: 10/100 Ethernet, 2.4GHz 802.11n wireless
* Bluetooth: Bluetooth 4.1 Classic, Bluetooth Low Energy
* Storage: micro SD
* GPIO: 40-pin header, populated
* Ports: HDMI, 3.5mm analogue audio-video jack, 4× USB 2.0, Ethernet, Camera Serial
* Interface (CSI), Display Serial Interface (DSI)

**Applications of Raspberry Pi**

* + Hobby projects.
  + Low cost PC/tablet/laptop
  + IOT applications
  + Media center
  + Robotics
  + Industrial/Home automation
  + Server/cloud server
  + Print server
  + Security monitoring
  + Web camera
  + Gaming
  + Wireless access point
  + Environmental sensing/monitoring (e.g. WEATHER STATION)

**How to Use RASPBERRY PI 3**

RASPBERRY PI is simply a COMPUTER ON A SINGLE BOARD so it cannot be used like ARDUINO development boards. For the PI to start working we need to first install OPERATING SYSTEM. This feature is similar to our PC. The PI has dedicated OS for it; any other OS will not work.

We will discuss the programming of PI in step by step below:

1. Take the 16GB micro SD card and dedicate it specifically for PI OS.
2. Choose and Download OS software] (‘NOOBS’ recommended for beginners )
3. Format the SD card and install OS on to the SD memory card using convenient methods.
4. Take the SD card after OS installation and insert it in PI board.
5. Connect monitor, keyboard and mouse
6. Power the board with micro USB connector
7. Once the power is tuned ON the PI will run on the OS installed in the memory card and will start from boot.
8. Once all drivers are checked the PI will ask for authorization, this is set by default and can be changed.
9. After authorization you will reach desktop where all application program development starts.

**Raspberry Pi 3 Technical Specifications**

