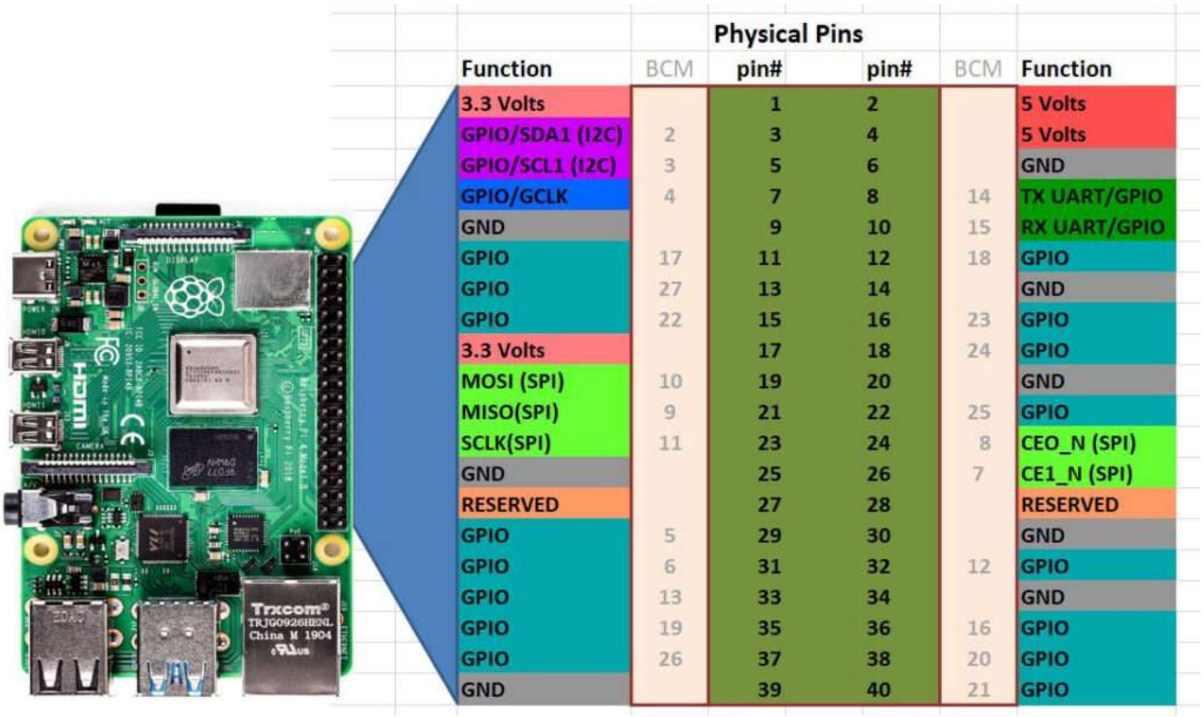
1. Setup and Configuration of Edge Devices

Raspberry Pi/Jetson Nano installation, SSH, GPIO control

Lab: EDGE COMPUTING LAB (23A39605)
Reference / Issue: Inform Assistant Professor Obula Raju
College: Andhra Engineering College



		Physical Pins			
Function	BCM	pin#	pin#	BCM	Function
3.3 Volts		1	2		5 Volts
GPIO/SDA1 (I2C)	2	3	4		5 Volts
GPIO/SCL1 (I2C)	3	5	6		GND
GPIO/GCLK	4	7	8	14	TX UART/GPIO
GND		9	10	15	RX UART/GPIO
GPIO	17	11	12	18	GPIO
GPIO	27	13	14		GND
GPIO	22	15	16	23	GPIO
3.3 Volts		17	18	24	GPIO
MOSI (SPI)	10	19	20		GND
MISO(SPI)	9	21	22	25	GPIO
SCLK(SPI)	11	23	24	8	CEO_N (SPI)
GND		25	26	7	CE1_N (SPI)
RESERVED		27	28		RESERVED
GPIO	5	29	30		GND
GPIO	6	31	32	12	GPIO
GPIO	13	33	34		GND
GPIO	19	35	36	16	GPIO
GPIO	26	37	38	20	GPIO
GND		39	40	21	GPIO

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Raspberry Pi / Jetson Nano Installation, SSH Access, and GPIO Control

A. Operating System Installation

Raspberry Pi

Download the **Raspberry Pi OS** using the Raspberry Pi Imager tool.
Flash the OS to an SD card (16GB+ recommended).
Enable **SSH** and configure **Wi-Fi** during flashing (optional using Imager advanced options).
Insert SD card → Power on → Device boots with default credentials.

B. Remote Access (SSH Configuration)

On Raspberry Pi

Enable SSH:

```
sudo systemctl enable ssh
sudo systemctl start ssh
```

Connect from your laptop:

```
ssh pi@<device-ip>
```

To find device IP:

```
ifconfig
```

C. GPIO (General Purpose Input/Output) Control

Raspberry Pi (Python – RPi.GPIO or GPIO Zero)

Example using RPi.GPIO:

```
import RPi.GPIO as GPIO
import time

GPIO.setmode(GPIO.BCM)
GPIO.setup(18, GPIO.OUT)

while True:
   GPIO.output(18, True)
   time.sleep(1)
   GPIO.output(18, False)
   time.sleep(1)
```

D. Additional Recommended Setup

Setup **VNC** for GUI remote access.
Setup **Docker** for deploying applications.
Create **virtual environments** for Python projects.
Use **systemd services** to auto-run scripts on boot.
Configure **I2C, SPI, UART** interfaces as needed.

E. Typical Use Cases

AI object detection (Jetson Nano + camera).
IoT sensor hub (Raspberry Pi + GPIO sensors).
Edge inference for ML models.
Robotics and industrial automation.
Home automation systems.

```
pi@raspberrypi:~ $ pinout

,--------------------------------.
| oooooooooooooooooooo J8   +======
| 1ooooooooooooooooooo  PoE |   Net
|  Wi                   1o +======
|  Fi  Pi Model 4B  V1.4 oo      |
|       ,----. +---+        +====
| |D|    |SoC | |RAM|        |USB3
| |S|    |    | |   |        +====
| |I|    `----' +---+          |
|                |C|      +====
|                |S|      |USB2
| pwr   |hd|   |hd| |I||A|    +====
`-| |---|m0|---|m1|----|V|-------'
```

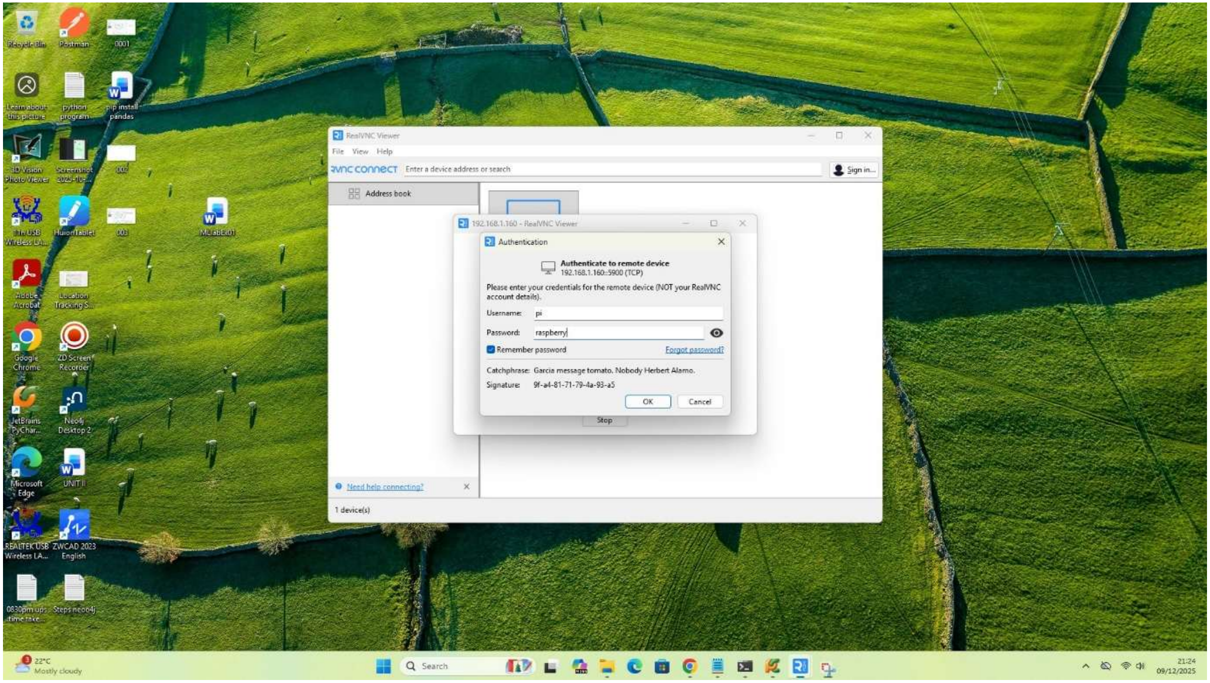
```
Revision           : d03114
SoC                : BCM2711
RAM                : 8GB
Storage            : MicroSD
USB ports          : 4 (of which 2 USB3)
Ethernet ports     : 1 (1000Mbps max. speed)
Wi-fi              : True
Bluetooth          : True
Camera ports (CSI) : 1
Display ports (DSI): 1

J8:
   3V3  (1) (2)  5V
 GPIO2  (3) (4)  5V
 GPIO3  (5) (6)  GND
 GPIO4  (7) (8)  GPIO14
   GND  (9) (10) GPIO15
GPIO17 (11) (12) GPIO18
GPIO27 (13) (14) GND
GPIO22 (15) (16) GPIO23
   3V3 (17) (18) GPIO24
GPIO10 (19) (20) GND
 GPIO9 (21) (22) GPIO25
GPIO11 (23) (24) GPIO8
   GND (25) (26) GPIO7
 GPIO0 (27) (28) GPIO1
```

Here Check Status Of GPIO Pins

```
pi@raspberrypi:~ $ raspi-gpio get
BANK0 (GPIO 0 to 27):
GPIO 0: level=1 fsel=0 func=INPUT pull=UP
GPIO 1: level=1 fsel=0 func=INPUT pull=UP
GPIO 2: level=1 fsel=0 func=INPUT pull=UP
GPIO 3: level=1 fsel=0 func=INPUT pull=UP
GPIO 4: level=1 fsel=0 func=INPUT pull=UP
GPIO 5: level=1 fsel=0 func=INPUT pull=UP
GPIO 6: level=1 fsel=0 func=INPUT pull=UP
GPIO 7: level=1 fsel=0 func=INPUT pull=UP
GPIO 8: level=1 fsel=0 func=INPUT pull=UP
GPIO 9: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 10: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 11: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 12: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 13: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 14: level=0 fsel=0 func=INPUT pull=NONE
GPIO 15: level=1 fsel=0 func=INPUT pull=UP
GPIO 16: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 17: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 18: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 19: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 20: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 21: level=0 fsel=0 func=INPUT pull=DOWN
GPIO 22: level=0 fsel=0 func=INPUT pull=DOWN
```

Login Pi Via SSH or **VNC**



Authenticate to remote device
192.168.1.160::5900 (TCP)

Please enter your credentials for the remote device (NOT your RealVNC account details).

Username: pi

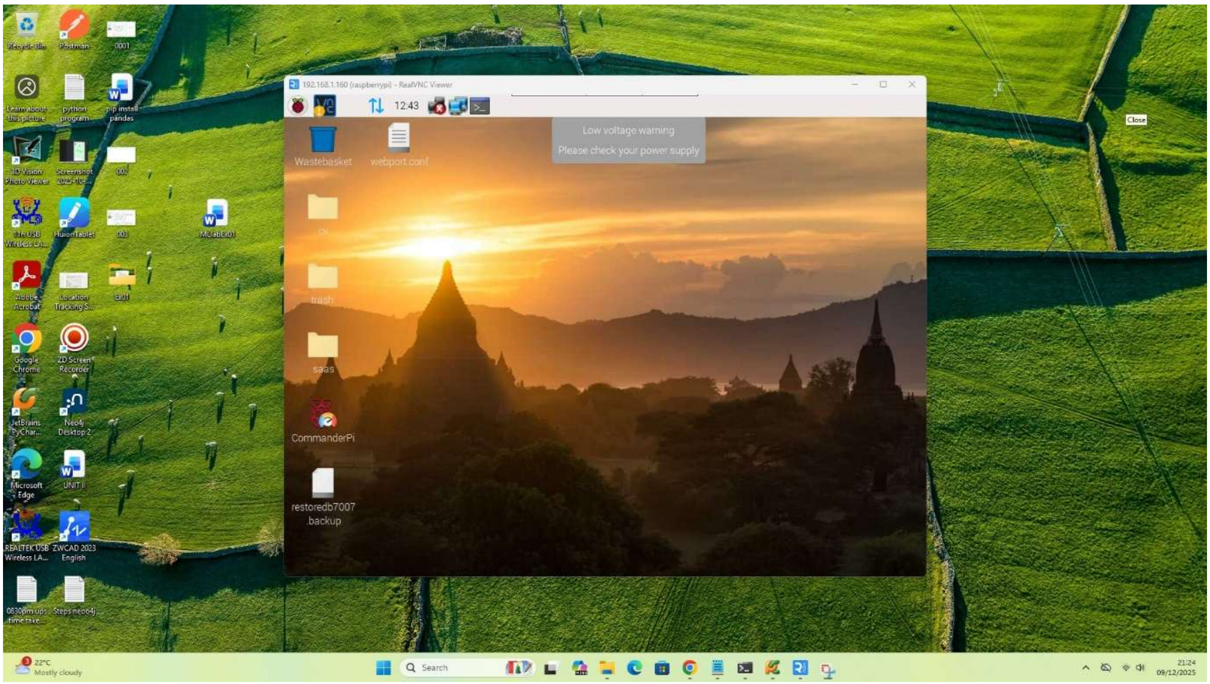
Password: raspberry

☑ Remember password   Forgot password?

Catchphrase: Garcia message tomato. Nobody Herbert Alamo.

Signature: 9f-a4-81-71-79-4a-93-a5

After Login Get This Check GPIO Pin Lookup

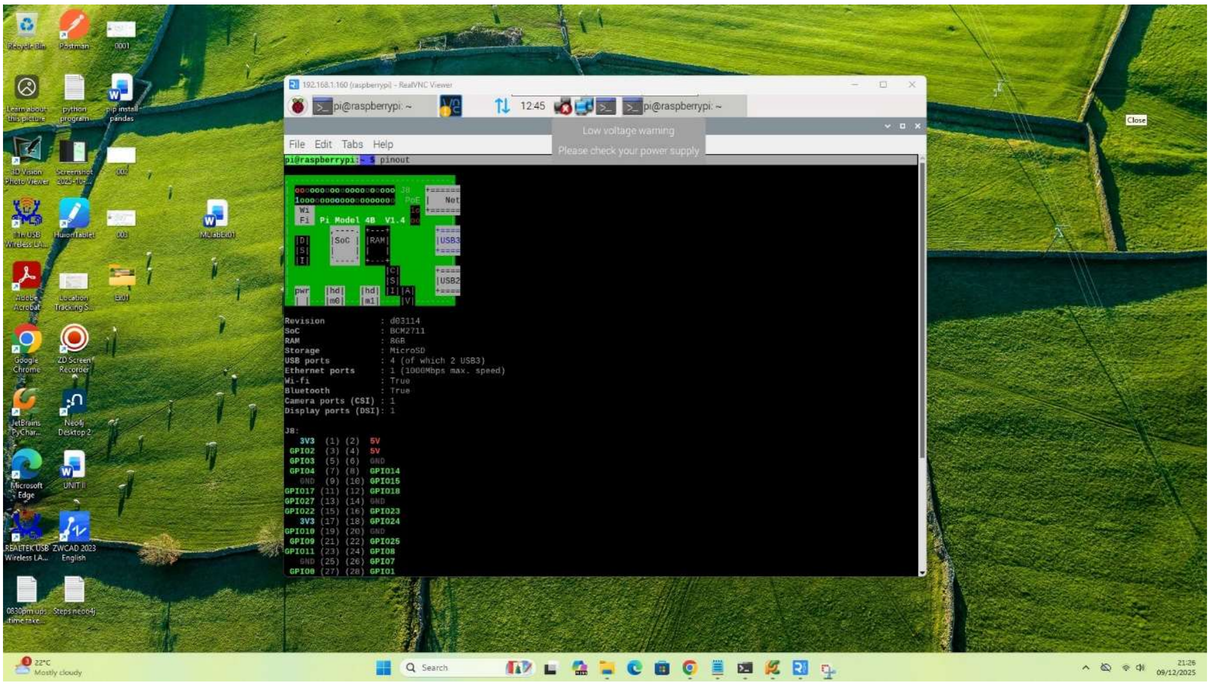


192.168.1.160 (raspberrypi) - RealVNC Viewer

Low voltage warning

Please check your power supply

GPIO PIN Layout



Low voltage warning

Please check your power supply

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  oooooooooooooooooooo J8     +======
  1ooooooooooooooooooo  PoE   |   Net
   Wi                         +======
   Fi  Pi Model 4B  V1.4
         +----+  +----+         +====
  |D|    |SoC |  |RAM|          |USB3
  |S|    |    |  |    |         +====
  |I|    +----+  +----+
                      |C|       +====
                      |S|       |USB2
  pwr   |hd|   |hd|   |I| |A|   +====
  | |   |m0|   |m1|       |V|

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