Infotainment Education

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Infotainment Components

SOFTWARE

- Carplay Toggle
- AI Interface
- GUI
- Lights App
- Drawing App
- Settings App

FIRMWARE

- Telemetry Decoder
- Potentiometer Analog Readut
- LED Interface
- Carplay Interface
- Microphone Interface
- Radio Interface

HARDWARE

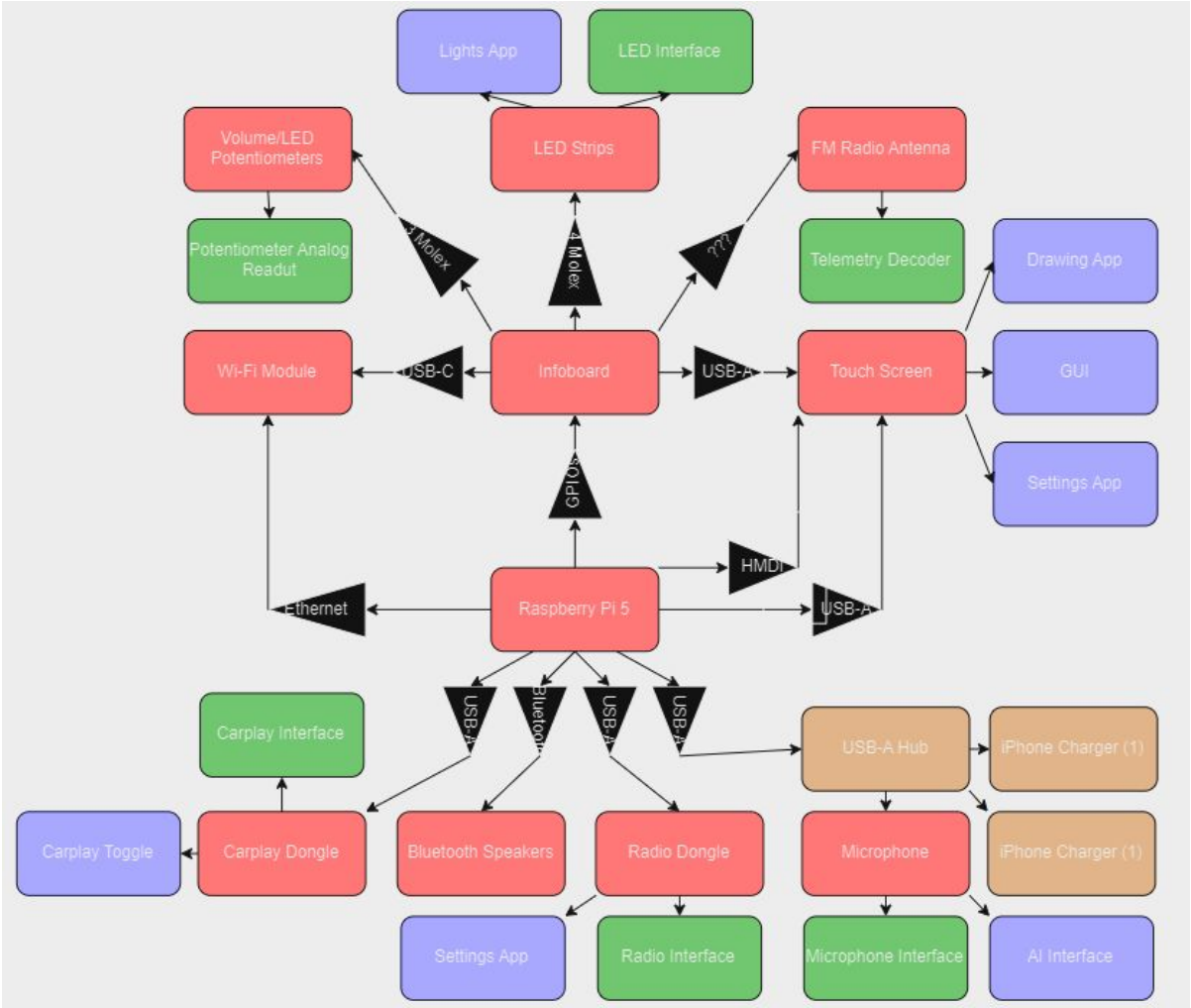
- Radio Dongle
- Infoboard
- Wi-Fi Module
- FM Radio Antenna
- Bluetooth Speakers
- Raspberry Pi 5
- Carplay Dongle
- Touch Screen
- Infoboard
- Microphone
- LED Strips
- Volume/LED Potentiometers

ACCESSORIES

- iPhone Chargers
- USB-A Hub
- Infotainment Housing

Full System Overview

- Infotainment Housing encapsulates all of these components

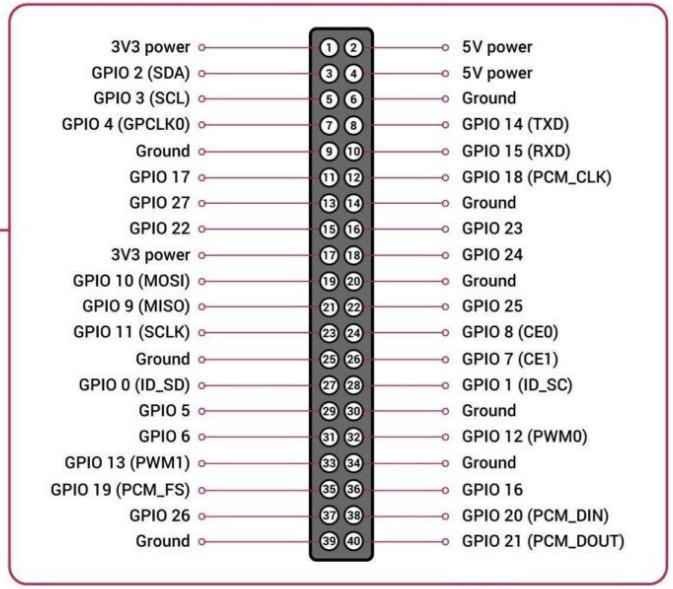


Raspberry Pi 5

- Microcontroller + PC
- Smooth Add-ons
- Extensive Documentation
- Small, fast

Use Arduino/STM32?

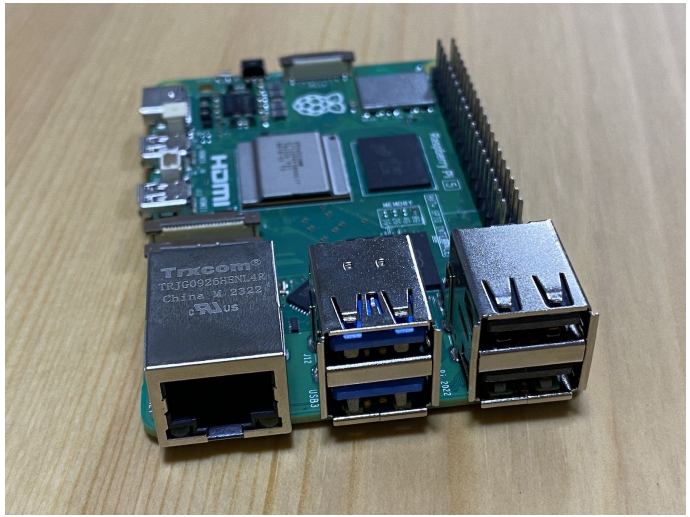
- No “modern” interface



40 GPIO Pins Description of Raspberry Pi 5

USB-A Connections

- Same as your computer
- Plug-and-Play
- 4 on Raspberry Pi 5



USB-A Implementations

Microphone

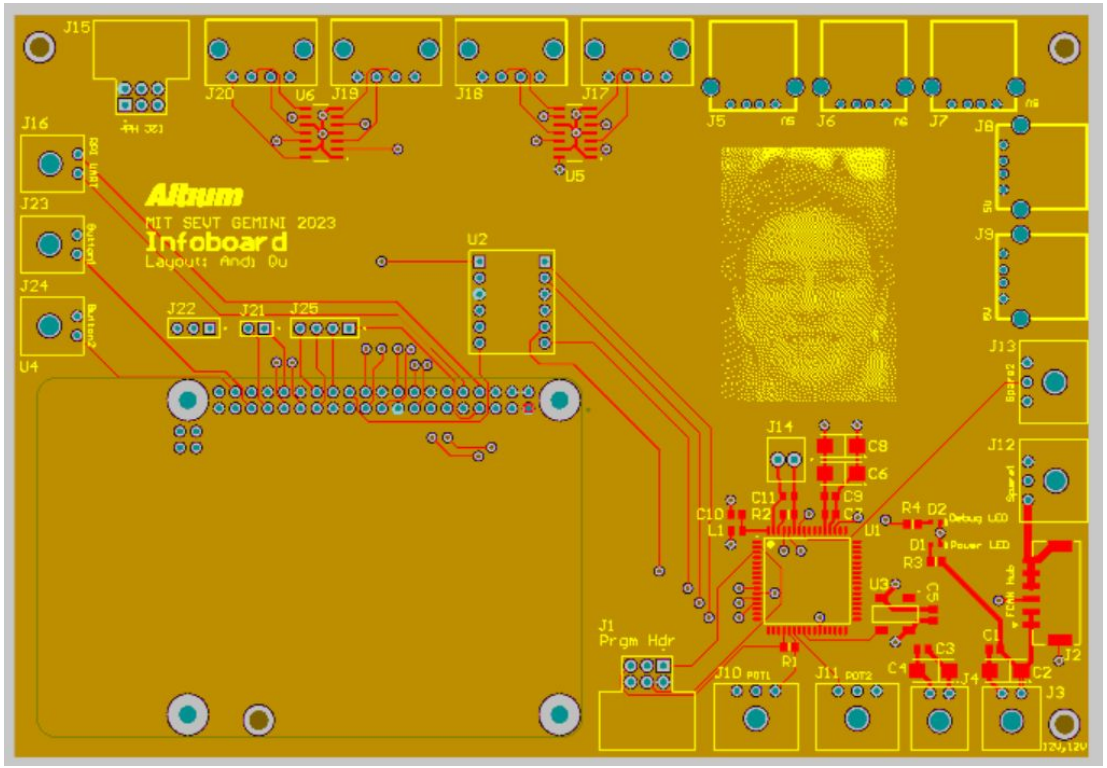
Chargers

Radio

Carplay

Infoboard

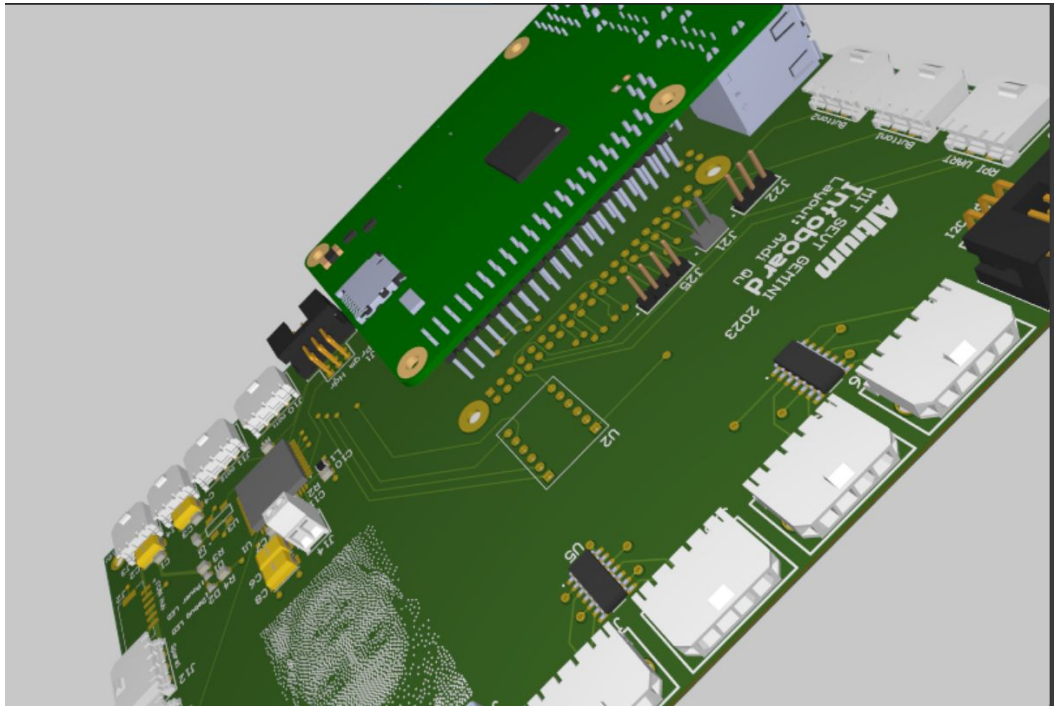
- Pi GPIO pins
- Analog inputs
- Power distribution



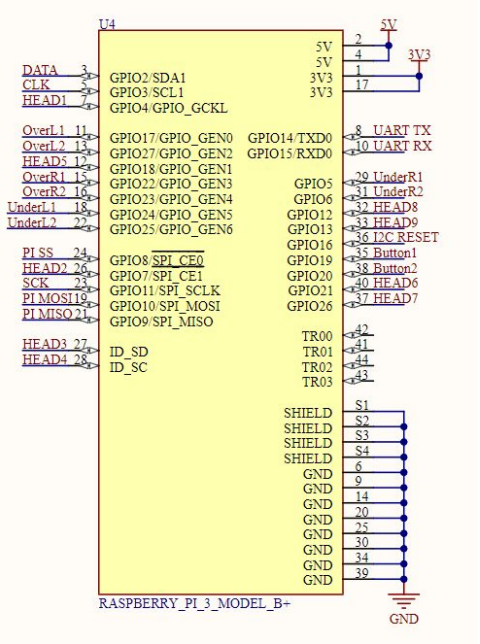
Infoboard Goals

a) Optimize size
b) Adapt to STM32
c) Telemetry+Power acquisition

Infoboard-Pi Interface



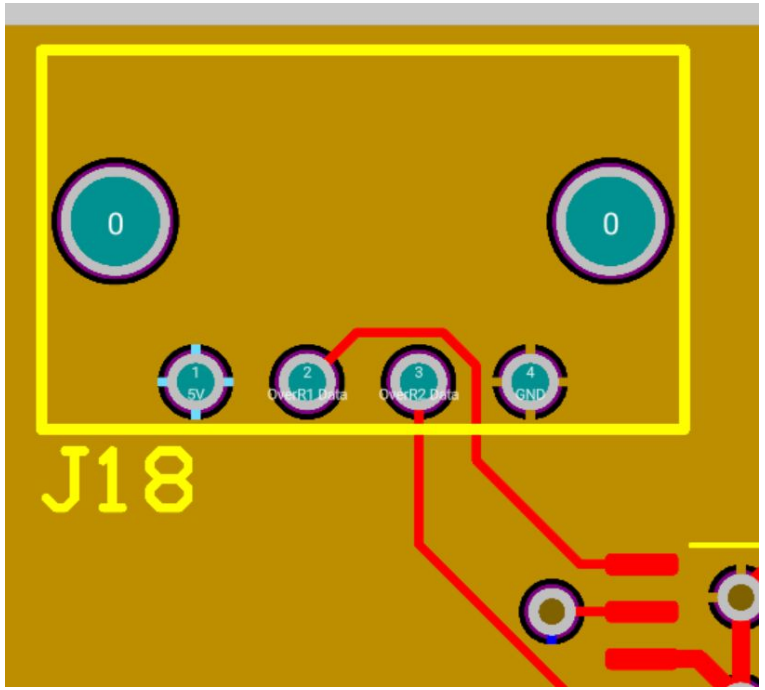
- Pi pins aligned
- STM32 ADC
- Functionality on Altium



Altium Exercise

Open Altium -> Infoboard -> SCH
Open Altium -> Infoboard -> PCB

Find components J18 and zoom into it. You will see blue circles with text in them (these represent wire names). Figure out where each name originally came from (Raspberry Pi? AT90CAN? Another “J” component?)



Audio System

Surround-sound effect
Bluetooth w/Pi

Supports:

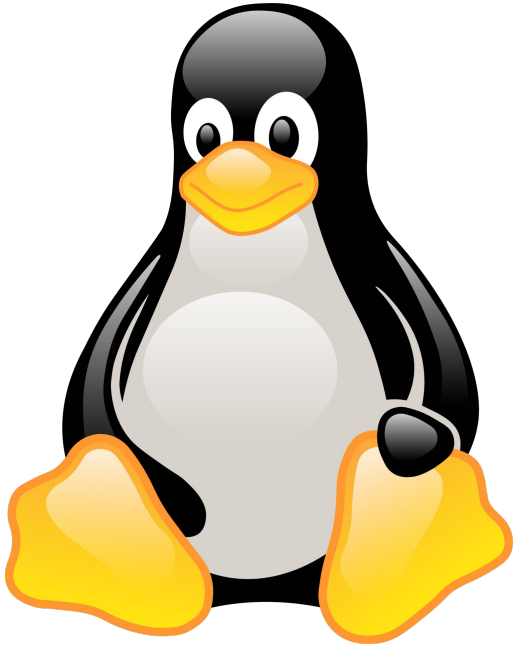
- AI Assistant
- Navigation
- Spotify
- Phone Calls

Firmware

Pi 5 uses Linux [Terminal Temple | Online Terminal Simulator]

Why use the terminal?

- VSCode terminal unreliable
- More customization options
  - Open infotainment on boot-up
  - Download certain packages
  - Manipulate *anything*

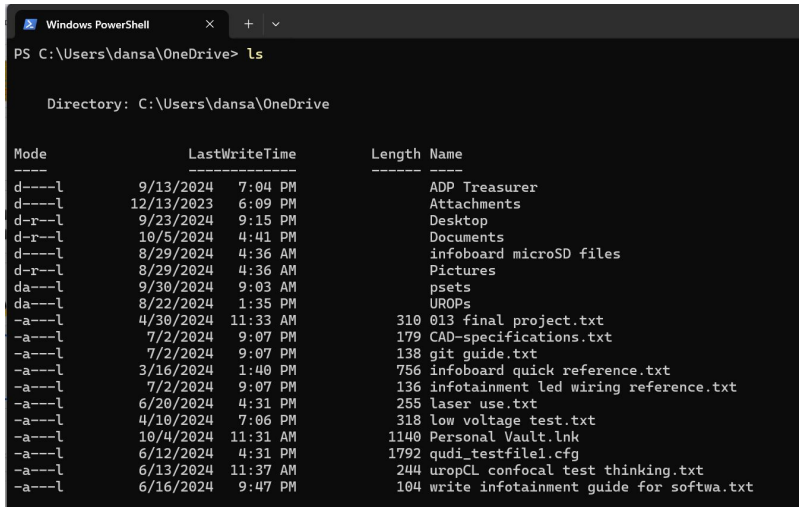


BashScript Basics - Directories

What is a “directory”?

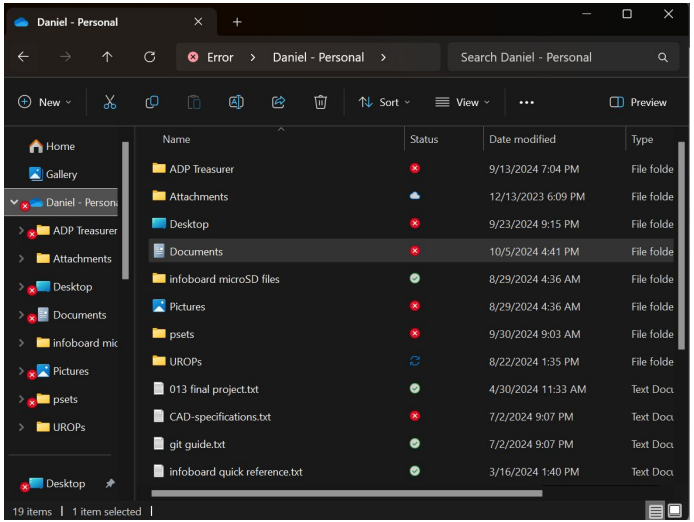
- It’s essentially what you see when you open your computer folder app, just more bare-bones/ “to the point”

Terminal



Same folder names!

Folders App



BashScript Basics - Directories

ls {“list”: lists all directories from current}

```
terminal@terminal-temple ~ $ ls
Documents       Downloads       Music           Pictures
```

cd __NAME__ {“change directory”: shift directory to one specified}

```
terminal@terminal-temple ~ $ cd Documents
terminal@terminal-temple Documents $
```

cd .. {“back directory”: goes back 1 directory}

```
terminal@terminal-temple Documents $ cd ..
terminal@terminal-temple ~ $
```

Special command: code . {opens folder items in vscode}

BashScript Exercise + Useful Tips

Open Terminal Temple | Online Terminal Simulator and play around with the commands in the previous slide

Pointers

1) If you're ever trying to do anything more than changing directories, there's probably a StackOverflow thread or video that exists on your exact problem. Use the internet!
2) Commands sometimes complain about "permissions." To override this, put "sudo" before your commands. "sudo" essentially overrides permissions
3) Make note of your directories! Sometimes something won't work because you just arent in the correct spot!
4) If stuff doesn't work, ask ChatGPT. THERE IS ZERO SHAME!!!

Software

Python!

Why?

1) Thousands of *CRISP* user-made packages
2) Easy-to-use + read
3) 6.100A Background

Example Documentation:

numpy · PyPI

Example Documentation: NumPy

Python!

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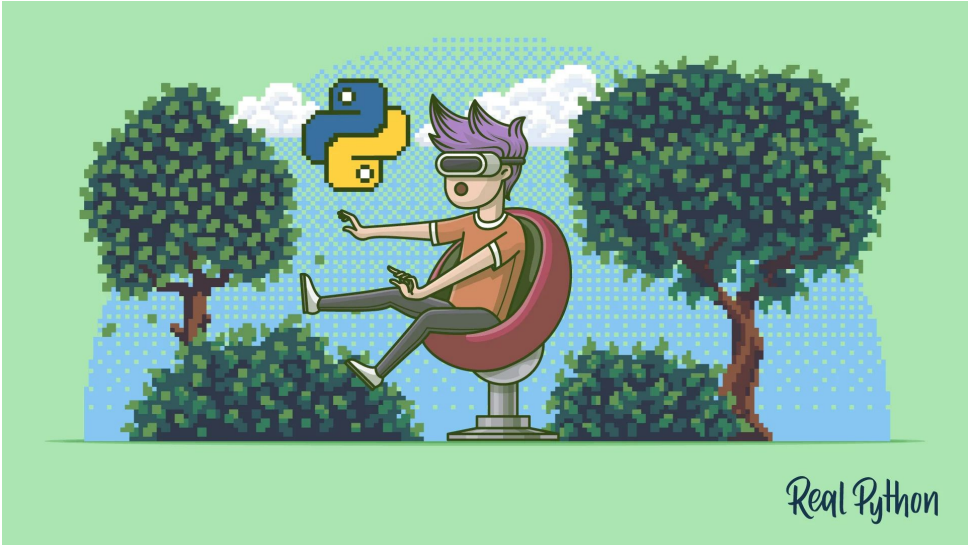
Virtual Environments (venv)



Theoretical Scenario:

a) Script 1 → numPy 2.0
b) Script 2 → numPy 2.6

Why does this happen?

1. Un-updated packages
2. Version-specific tools

How to resolve?

Virtual Environments!

Importance of venv?

Makes package installations “local” to a specified “environment”
“pip install” without a virtual environment installs “globally”

WITHOUT venv	
Globally installed packages: numPy 2.6	Script 1 Success!
	Script 2 FAIL!

OR

Globally installed packages: numPy 2.0	Script 1 FAIL!
	Script 2 Success!

WITH venv		
Globally installed packages: numPy 2.6	venv1: numPy 2.0	Script 1 Success!
	venv2: numPy 2.6	Script 2 Success!

Fall 2024 - Spring 2025 Projects

- Advanced AI
- Smooth GUI
- Phone Screen-Sharing
- Size Optimization
- FM Radio
- Solstice WiFi
- Infoboard Redesign
- Telemetry Display
- Enhanced Volume Control
- Whatever you can think of, we will consider!