



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

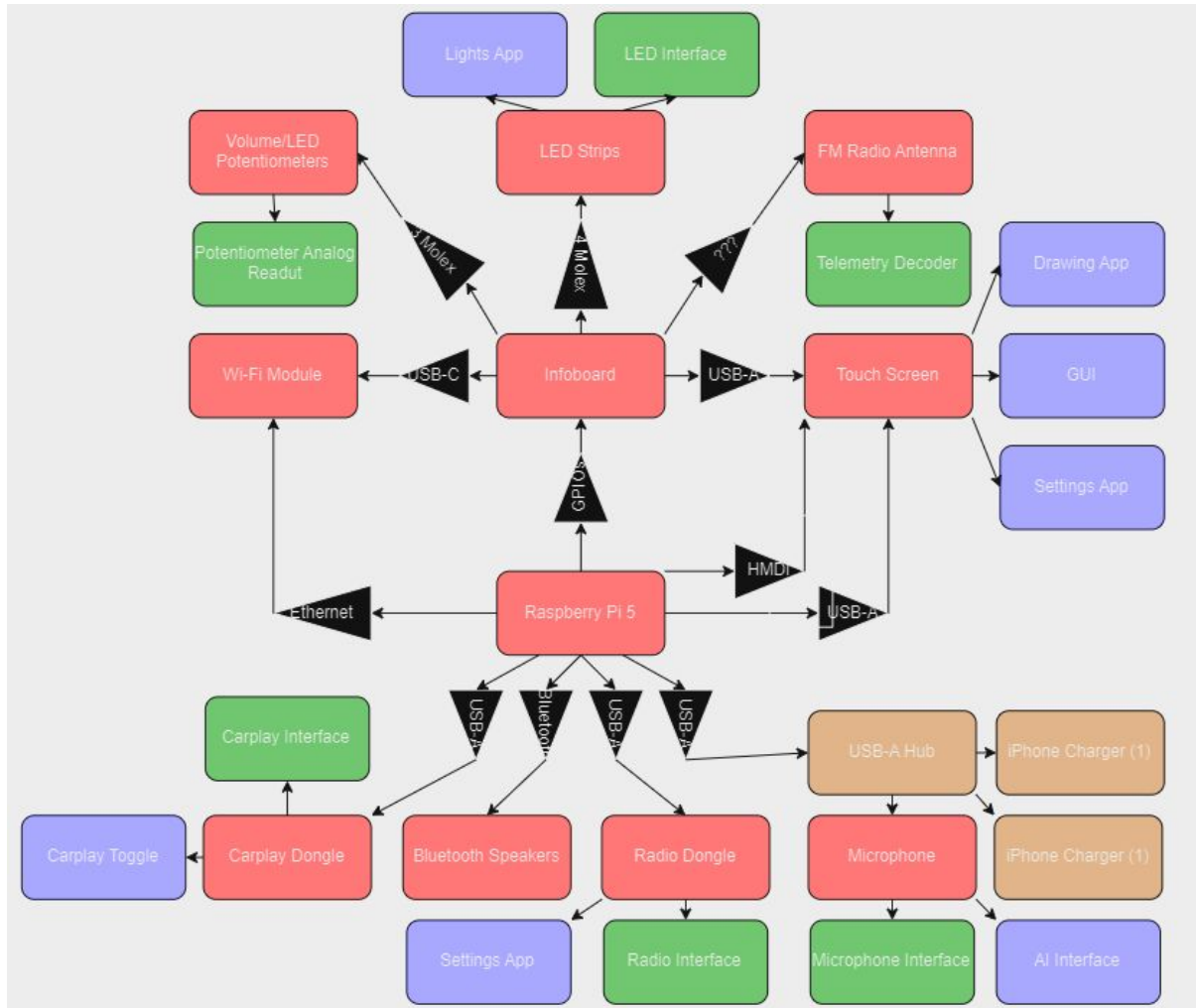
iPhone Chargers

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



3V3 power	1	2	5V power
GPIO 2 (SDA)	3	4	5V power
GPIO 3 (SCL)	5	6	Ground
GPIO 4 (GCLK0)	7	8	GPIO 14 (TXD)
Ground	9	10	GPIO 15 (RXD)
GPIO 17	11	12	GPIO 18 (PCM_CLK)
GPIO 27	13	14	Ground
GPIO 22	15	16	GPIO 23
3V3 power	17	18	GPIO 24
GPIO 10 (MOSI)	19	20	Ground
GPIO 9 (MISO)	21	22	GPIO 25
GPIO 11 (SCLK)	23	24	GPIO 8 (CE0)
Ground	25	26	GPIO 7 (CE1)
GPIO 0 (ID_SD)	27	28	GPIO 1 (ID_SC)
GPIO 5	29	30	Ground
GPIO 6	31	32	GPIO 12 (PWM0)
GPIO 13 (PWM1)	33	34	Ground
GPIO 19 (PCM_FS)	35	36	GPIO 16
GPIO 26	37	38	GPIO 20 (PCM_DIN)
Ground	39	40	GPIO 21 (PCM_DOUT)

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

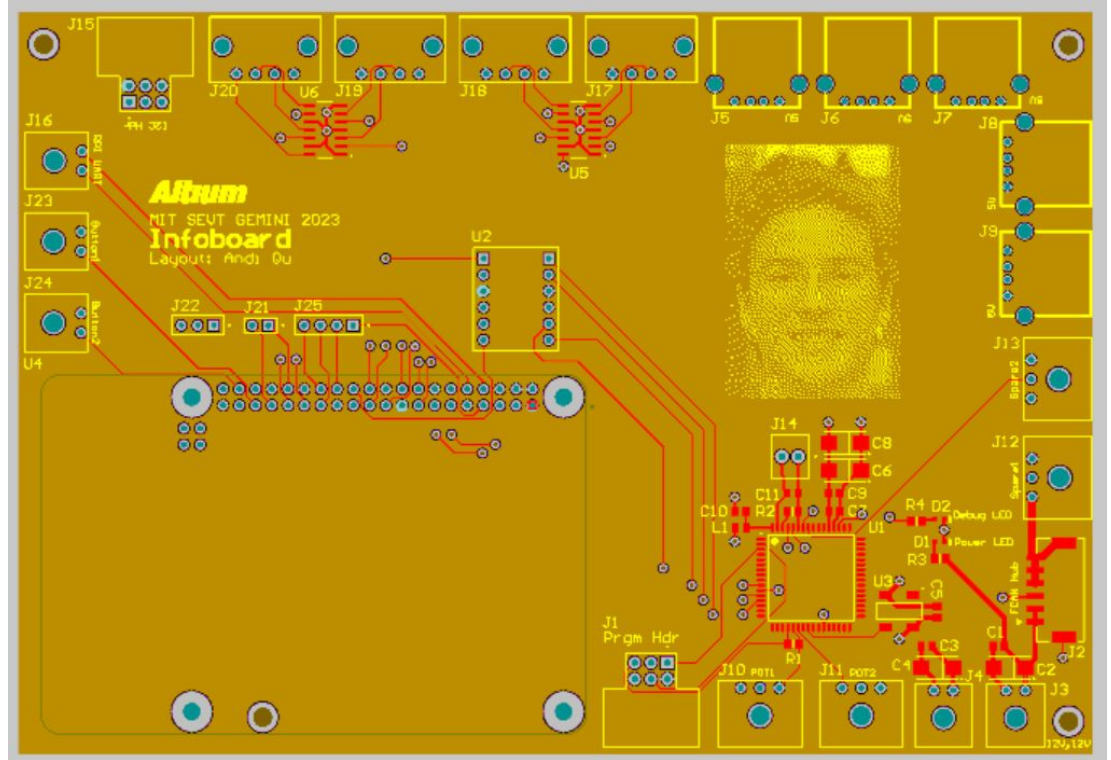


Infoboard

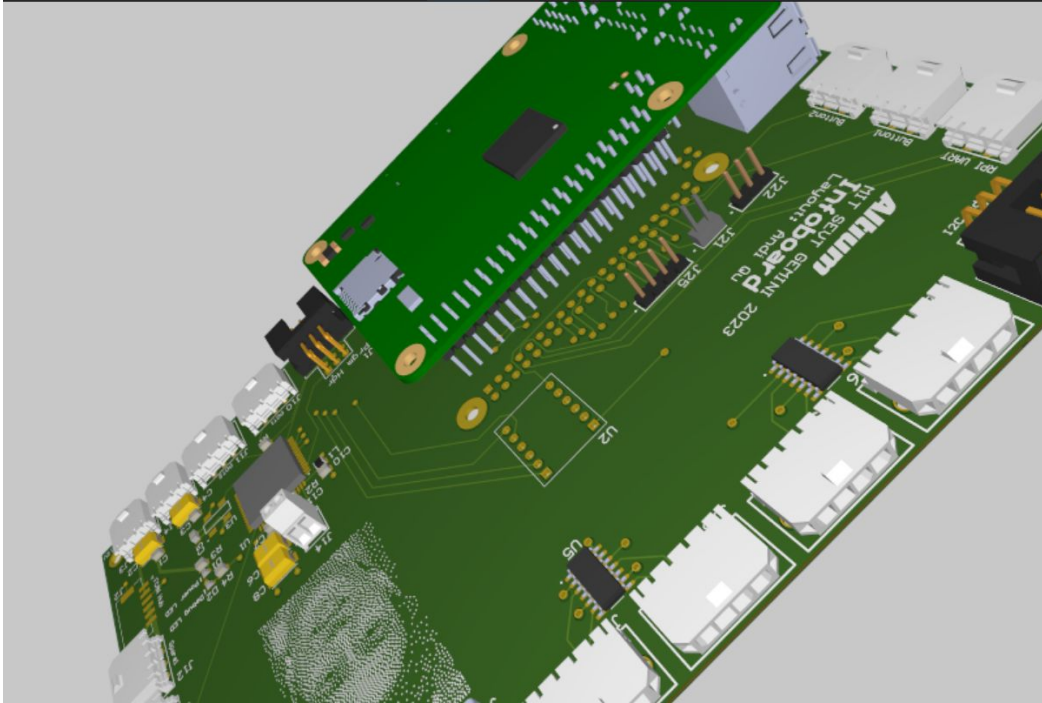
- Pi GPIO pins
- Analog inputs
- Power distribution

Infoboard Goals

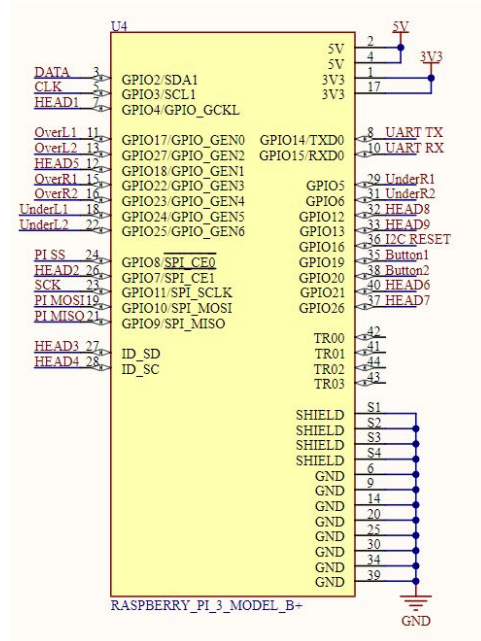
- Optimize size
- Adapt to STM32
- Telemetry+Power acquisition



Infoboard-Pi Interface



- Pi pins aligned
- STM32 ADC
- Functionality on Altium

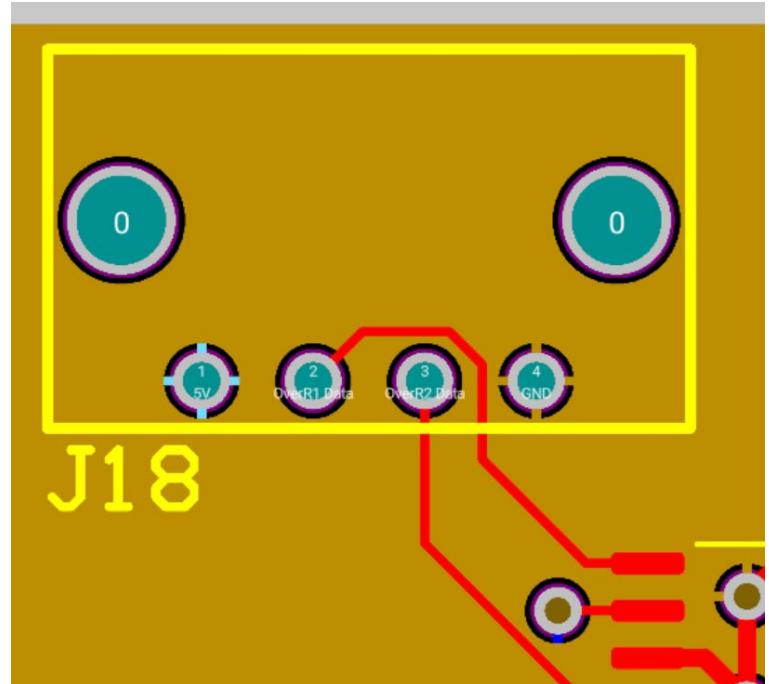


Altium Exercise

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

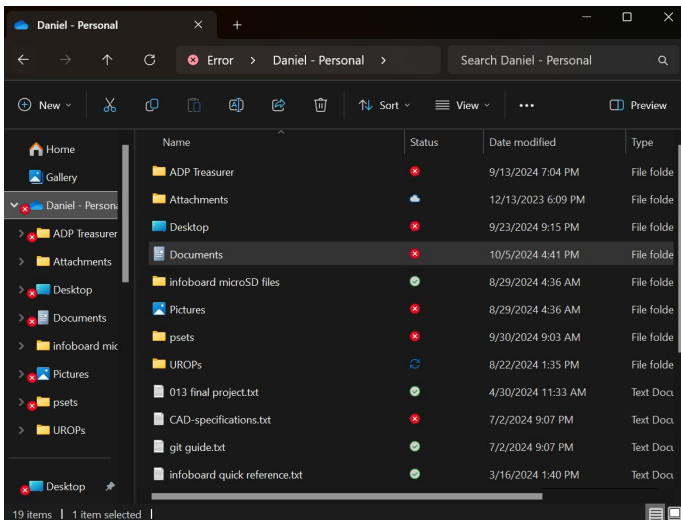
```
Windows PowerShell
PS C:\Users\dansa\OneDrive> ls

Directory: C:\Users\dansa\OneDrive

Mode                LastWriteTime         Length Name
----                -
d-----l      9/13/2024   7:04 PM                ADP Treasurer
d-----l     12/13/2023   6:09 PM                Attachments
d-r--l      9/23/2024   9:15 PM                Desktop
d-r--l      10/5/2024   4:41 PM                Documents
d-----l     8/29/2024   4:36 AM          infoboard microSD files
d-r--l      8/29/2024   4:36 AM                Pictures
da--l      9/30/2024   9:03 AM                psets
da--l      8/22/2024   1:35 PM                UROPs
-a--l      4/30/2024   11:33 AM                310 013 final project.txt
-a--l      7/2/2024    9:07 PM                179 CAD-specifications.txt
-a--l      7/2/2024    9:07 PM                138 git guide.txt
-a--l      3/16/2024   1:40 PM                756 infoboard quick reference.txt
-a--l      7/2/2024    9:07 PM                136 infotainment led wiring reference.txt
-a--l      6/20/2024   4:31 PM                255 laser use.txt
-a--l      4/10/2024   7:06 PM                318 low voltage test.txt
-a--l      10/4/2024   11:31 AM                1140 Personal Vault.lnk
-a--l      6/12/2024    4:31 PM                1792 qudi_testfile1.cfg
-a--l      6/13/2024   11:37 AM                244 uropCL confocal test thinking.txt
-a--l      6/16/2024   9:47 PM                104 write infotainment guide for softwa.txt
```

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 aren't 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!

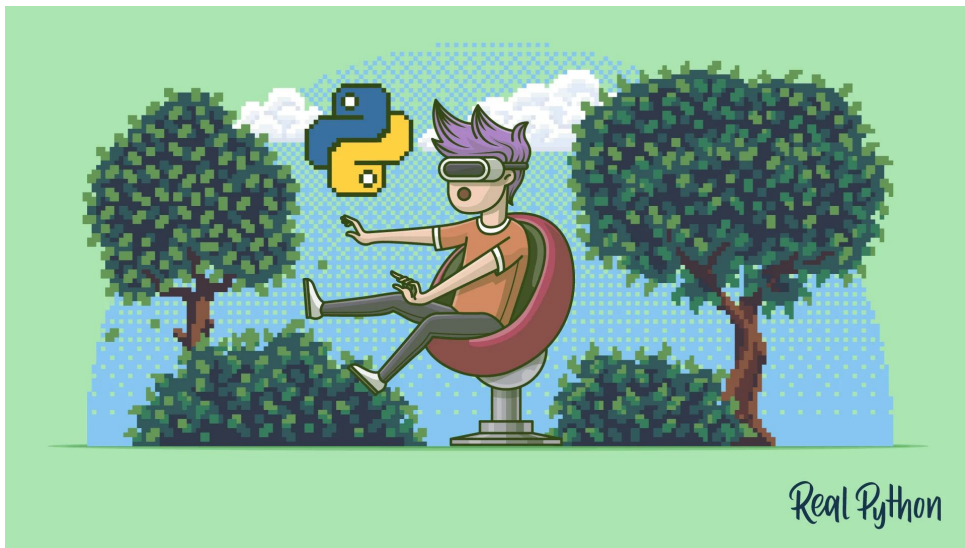
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Example Documentation:

[numpy · PyPI](#)

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!