

# GridSAFE: Cyber Simulation of Grid Attacks with AI Anomaly Detection

Team: SDMAY-08

Client: Nellie Leaverton

Adviser: Dr. Julie Rursch

Members: Nellie Leaverton, Jason Di Giovanni,  
Evan Booze, Brant Gicante, Kyle Maloney, Anthony Nehring

# Table of contents

01

Problem  
Statement

02

Project  
Overview

03

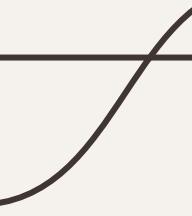
Requirements

04

Software  
Progress

05

Hardware  
Progress

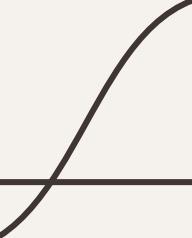


---

01

# Problem Statement

What problem we are addressing.



---

There is a growing need for awareness  
about cyber attacks on critical  
infrastructure within academia.



# 02

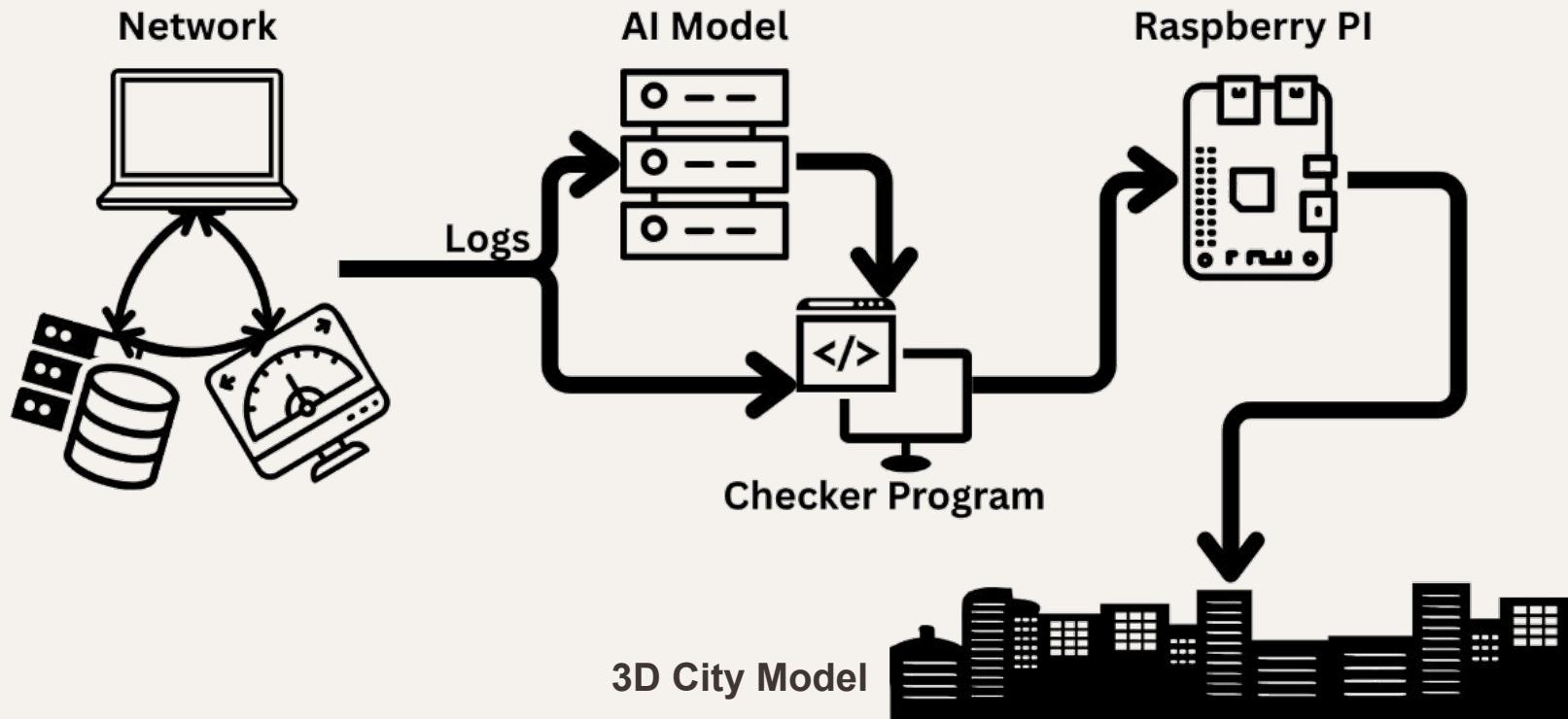
# Project Overview

How we will address the problem.

---

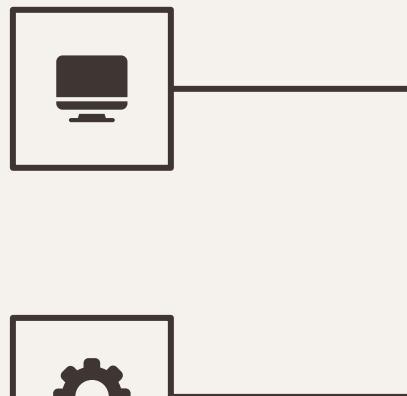
Creating a learning aid educators can use  
to teach students about cyber attacks on  
critical infrastructure.

# Project Flowchart



# Parallel Development

Software



City

# 03

# Requirements

What our project requires in software and hardware.

# Software & Analytics



## Software Requirements

- Configurable & modular design
- Cover at least **10/15** attacks
- At least **80-90%** accuracy



# Hardware Requirements Reference

## Flaws

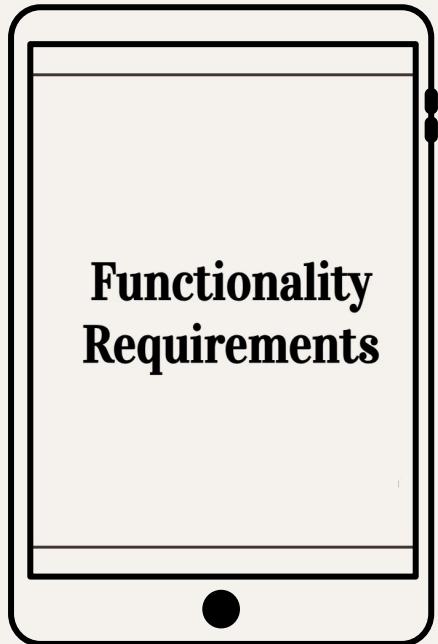
- Weak LEDs
- Small base plate/building holes
- Low quality prints

# Hardware Requirements Reference

## Improvements

- Larger Holes in base plate
- Larger Holes in 3D prints
- Better prints
- Stronger LEDs





# Hardware Requirements

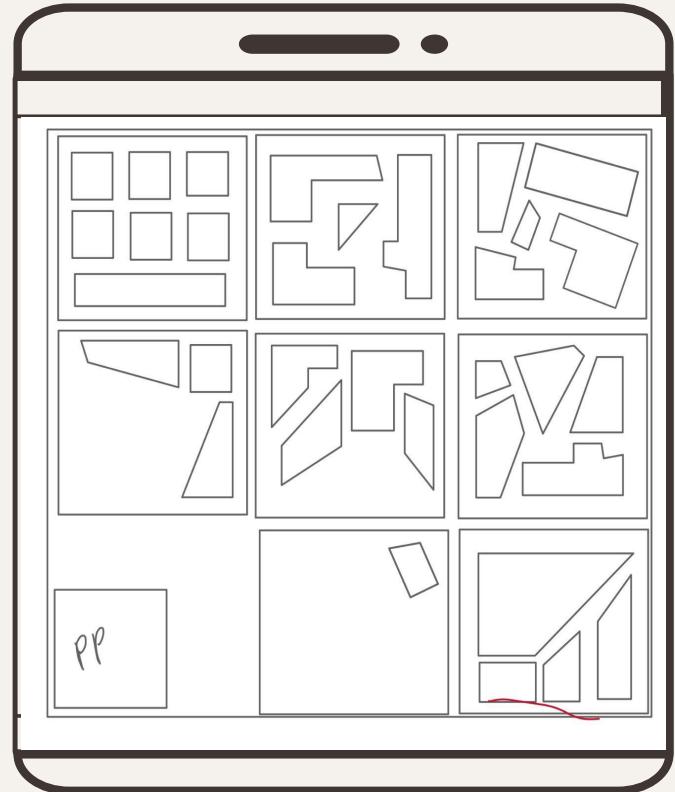
- **<2 sec.** Time it takes to change LED colors.
- **100% accuracy** when changing colors according to the JSON data.
- Receive **Real Time** data
- **Blue LEDs** - Fail Safe Mode

# Physical Design

## Hardware Requirements

### Final

- **3x3 ft** - Baseboard
- **Plastic, Plexiglass, or Wood** - Non-conductive materials
- **1-7"** - Building height
- **Highlighting** - Priority Buildings
- **9** Districts

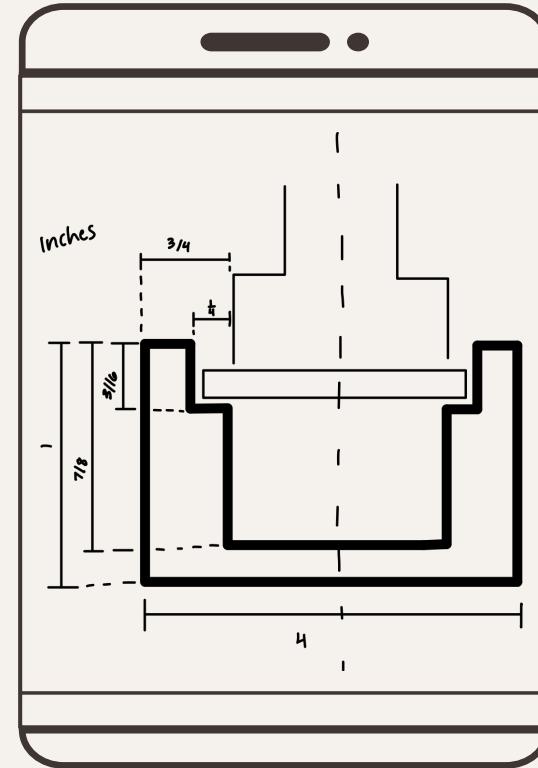


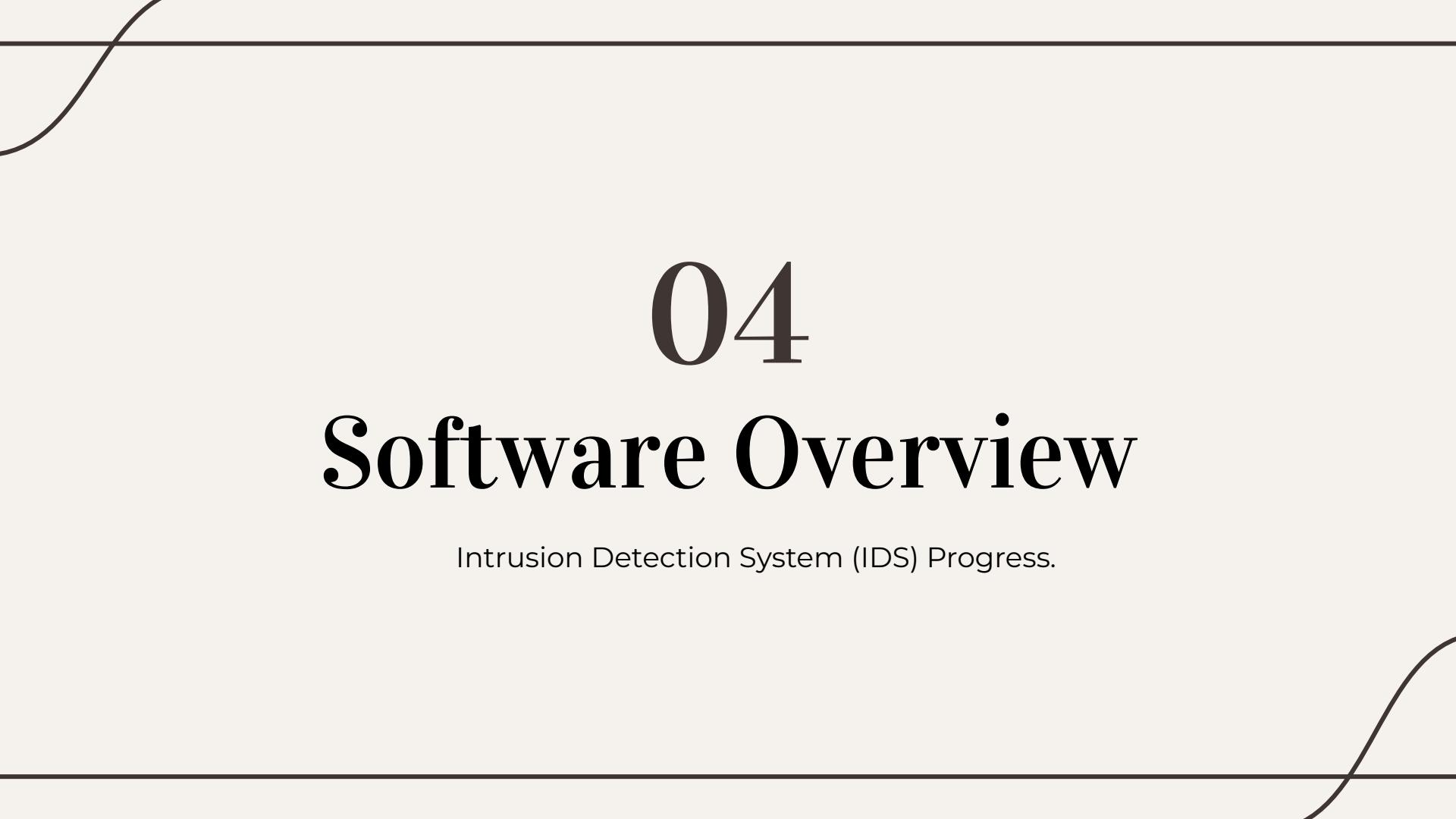
# Physical Design

## Hardware Requirements

### Prototype

- 4" x 4 " baseboard
- Plastic, Plexiglass, Wood -  
Non-conductive materials
- Enclosed wiring
- 1-7" - Buildings





# 04

# Software Overview

Intrusion Detection System (IDS) Progress.

# Log Data

- Hadoop Distributed File System (HDFS) Logs
- Rapid Data Transfers

```
081109 203616 147 INFO dfs.DataNode$PacketResponder: PacketResponder 2 for block blk_-8013855621109800549 terminating
081109 203616 147 INFO dfs.DataNode$PacketResponder: Received block blk_-8013855621109800549 of size 67108864 from /10.251.43.115
081109 203616 148 INFO dfs.DataNode$PacketResponder: PacketResponder 1 for block blk_3461505966191484945 terminating
081109 203616 148 INFO dfs.DataNode$PacketResponder: Received block blk_3461505966191484945 of size 67108864 from /10.251.31.85
081109 203616 150 INFO dfs.DataNode$PacketResponder: PacketResponder 0 for block blk_-8013855621109800549 terminating
081109 203616 150 INFO dfs.DataNode$PacketResponder: Received block blk_-8013855621109800549 of size 67108864 from /10.250.10.6
081109 203616 152 INFO dfs.DataNode$PacketResponder: PacketResponder 2 for block blk_-2828839543885026602 terminating
081109 203616 152 INFO dfs.DataNode$PacketResponder: PacketResponder 2 for block blk_-5175722170941249815 terminating
081109 203616 152 INFO dfs.DataNode$PacketResponder: Received block blk_-2828839543885026602 of size 67108864 from /10.251.65.203
081109 203616 152 INFO dfs.DataNode$PacketResponder: Received block blk_-5175722170941249815 of size 67108864 from /10.251.126.22
081109 203616 153 INFO dfs.DataNode$PacketResponder: PacketResponder 0 for block blk_3461505966191484945 terminating
081109 203616 153 INFO dfs.DataNode$PacketResponder: PacketResponder 1 for block blk_-2828839543885026602 terminating
081109 203616 153 INFO dfs.DataNode$PacketResponder: Received block blk_-2828839543885026602 of size 67108864 from /10.251.65.203
081109 203616 153 INFO dfs.DataNode$PacketResponder: Received block blk_3461505966191484945 of size 67108864 from /10.250.5.161
081109 203616 154 INFO dfs.DataNode$PacketResponder: PacketResponder 0 for block blk_-2828839543885026602 terminating
081109 203616 154 INFO dfs.DataNode$PacketResponder: PacketResponder 0 for block blk_6021477756386488418 terminating
081109 203616 154 INFO dfs.DataNode$PacketResponder: PacketResponder 0 for block blk_9210346052555304090 terminating
081109 203616 154 INFO dfs.DataNode$PacketResponder: PacketResponder 2 for block blk_541458502420960920 terminating
081109 203616 154 INFO dfs.DataNode$PacketResponder: Received block blk_-2828839543885026602 of size 67108864 from /10.251.109.209
081109 203616 154 INFO dfs.DataNode$PacketResponder: Received block blk_541458502420960920 of size 67108864 from /10.251.91.15
081109 203616 154 INFO dfs.DataNode$PacketResponder: Received block blk_6021477756386488418 of size 67108864 from /10.251.90.134
081109 203616 154 INFO dfs.DataNode$PacketResponder: Received block blk_9210346052555304090 of size 67108864 from /10.250.13.240
081109 203616 155 INFO dfs.DataNode$PacketResponder: PacketResponder 1 for block blk_4623571410782847630 terminating
081109 203616 155 INFO dfs.DataNode$PacketResponder: Received block blk_4623571410782847630 of size 67108864 from /10.251.71.68
081109 203616 156 INFO dfs.DataNode$PacketResponder: PacketResponder 1 for block blk_1780513736067213693 terminating
081109 203616 156 INFO dfs.DataNode$PacketResponder: PacketResponder 1 for block blk_2455917203220074754 terminating
081109 203616 156 INFO dfs.DataNode$PacketResponder: Received block blk_1780513736067213693 of size 67108864 from /10.251.106.214
081109 203616 156 INFO dfs.DataNode$PacketResponder: Received block blk_2455917203220074754 of size 67108864 from /10.250.15.198
081109 203616 156 INFO dfs.DataNode$PacketResponder: Received block blk_9210346052555304090 of size 67108864 from /10.251.123.20
081109 203616 157 INFO dfs.DataNode$PacketResponder: PacketResponder 0 for block blk_4623571410782847630 terminating
081109 203616 157 INFO dfs.DataNode$PacketResponder: PacketResponder 0 for block blk_-5175722170941249815 terminating
```

# AI

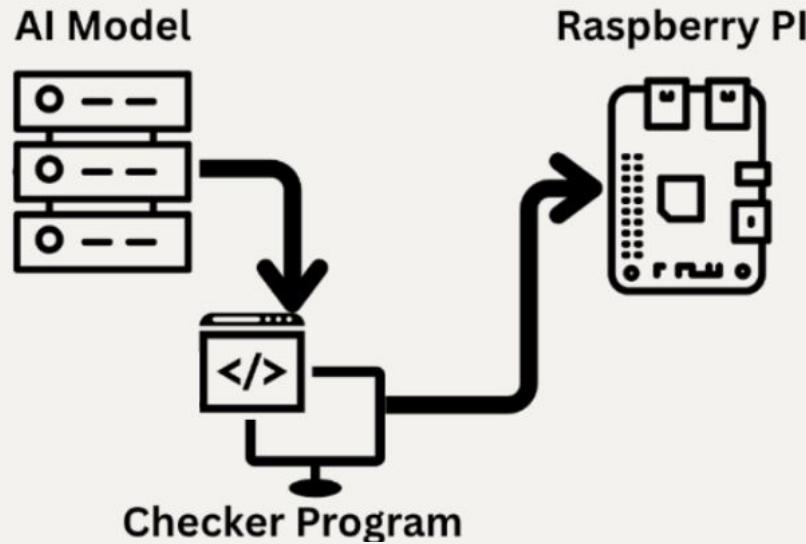
Anomaly  
Detected

```
==== Anomaly Distribution ====  
is_anomaly  
True    201  
Name: count, dtype: int64  
Saved gridsafe_output.json  
(venv)
```

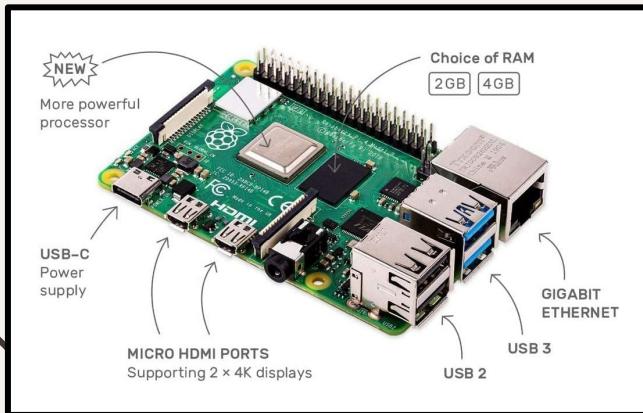
Anomaly Not  
Detected

```
==== Anomaly Distribution ====  
is_anomaly  
True    0  
Name: count, dtype: int64  
Saved gridsafe_output.json  
(venv)
```

# Data Processing



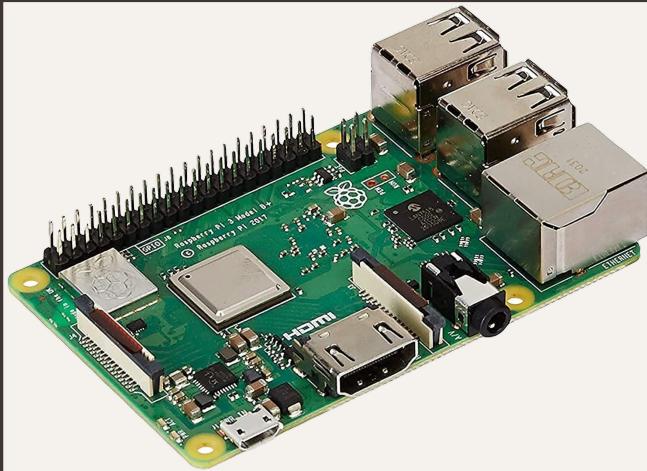
# Raspberry 3B+ Vs Raspberry 4B



CPU  
Architecture  
RAM  
Networking  
GPU  
Power Supply  
GPIO Pins

	3B+	4B
CPU	1.2GHz	1.5GHz
Architecture	64-bit	64-bit
RAM	1 GB	2 GB
Networking	Wifi	Wifi
GPU	VideoCore IV	VideoCore IV
Power Supply	5V / 2.5A	5V / 3A
GPIO Pins	40 pins	40 pins

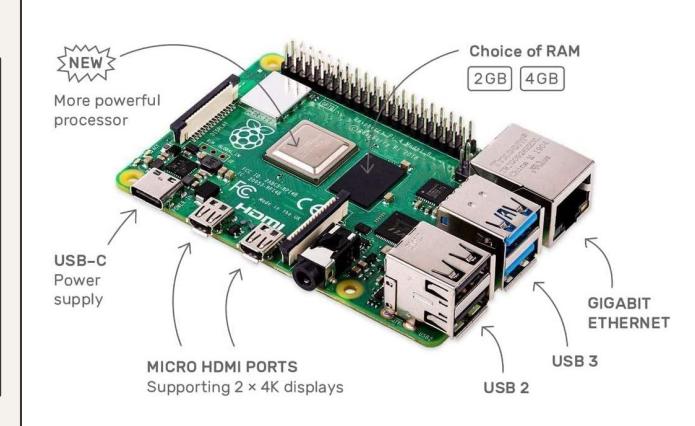
# Raspberry Pi 3B+



Raspberry Pi 3B+



Raspberry Pi 3B+

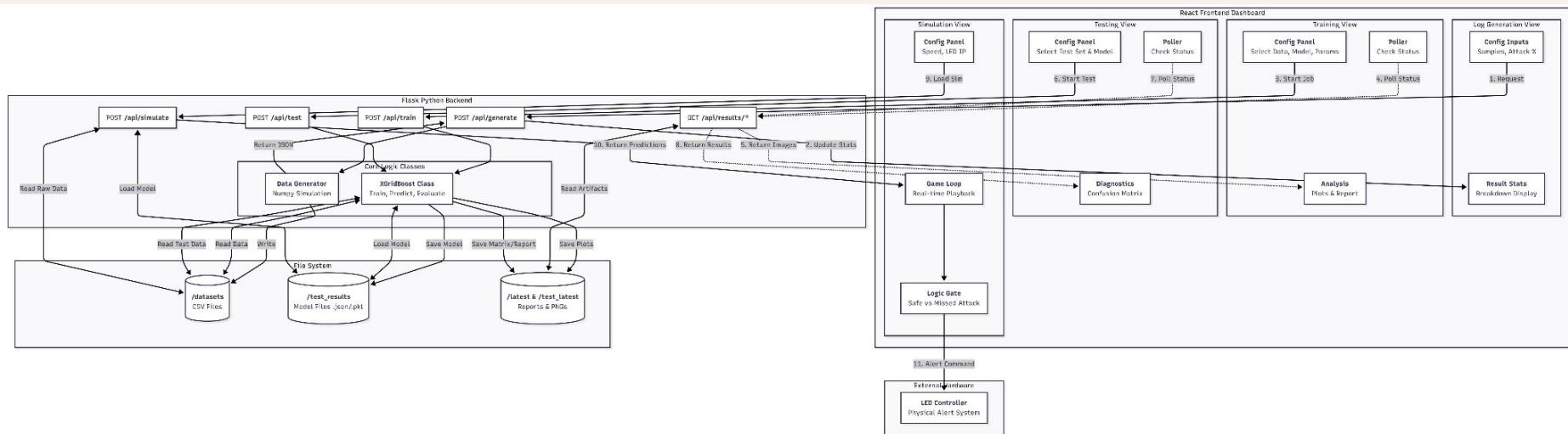


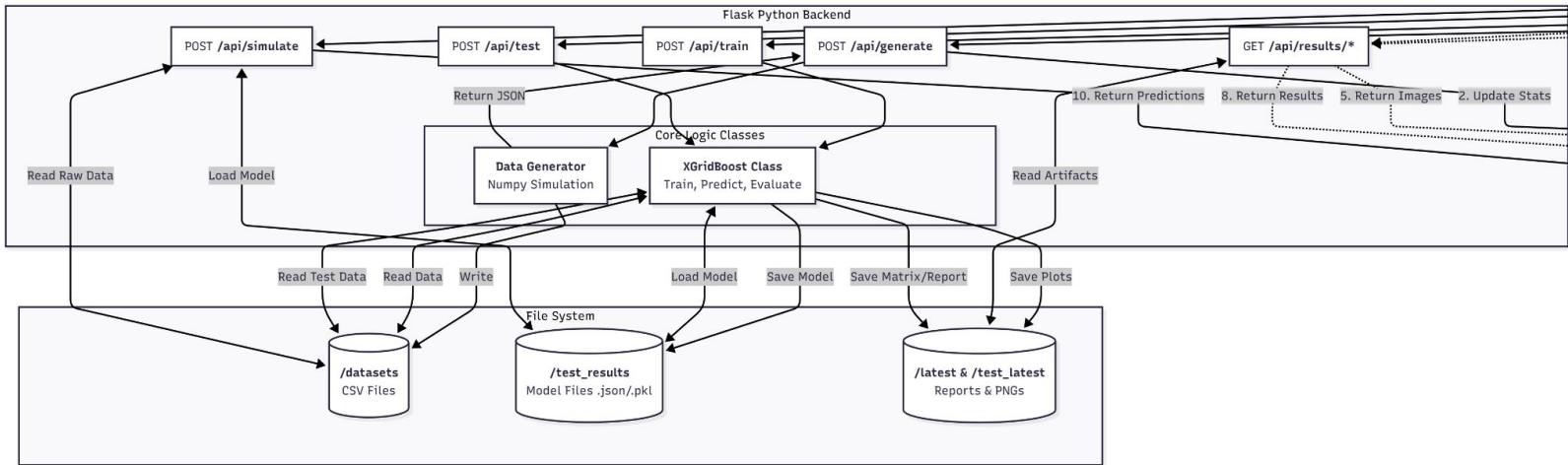
Raspberry Pi 4B

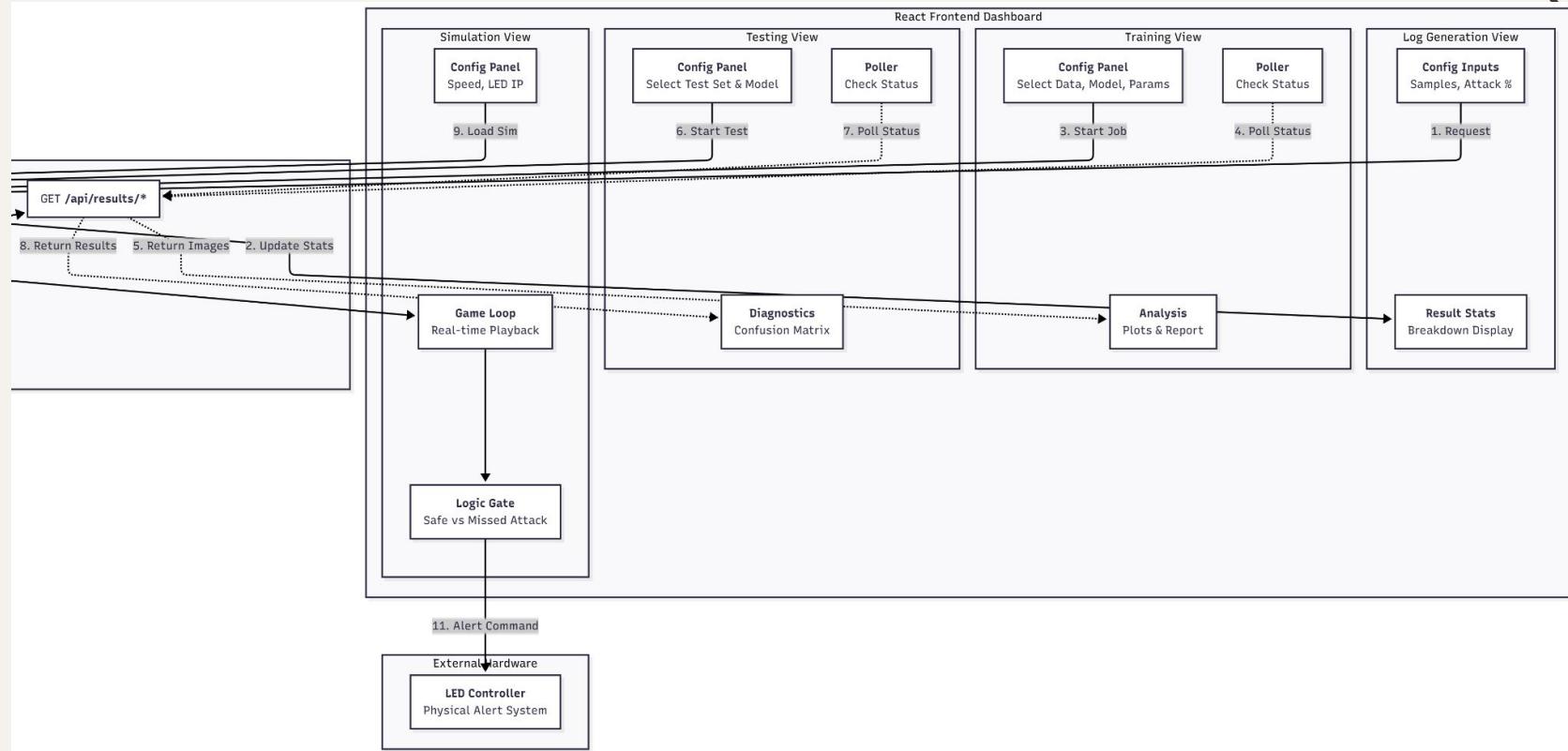
# Raspberry 3B+ Vs Raspberry 4B

	3B+	4B
CPU	1.2GHz	1.5GHz
Architecture	64-bit	64-bit
RAM	1 GB	2 GB
Networking	Wifi	Wifi
GPU	VideoCore IV	VideoCore IV
Power Supply	5V / 2.5A	5V / 3A
GPIO Pins	40 pins	40 pins

# Putting it all together







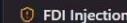
### DATA GENERATION CONFIG

Total Logs (Master Limit)

5000

## DISTRIBUTION PREVIEW

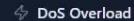
90.0% NORMAL



500

Logs

10.0% of Total



0

Logs

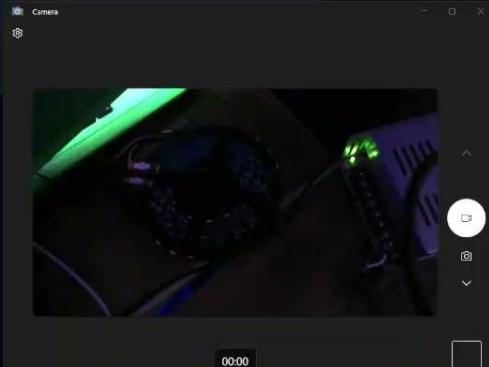
0.0% of Total

Generate Dataset



## Ready to Generate

Adjust attack parameters to create custom scenarios.



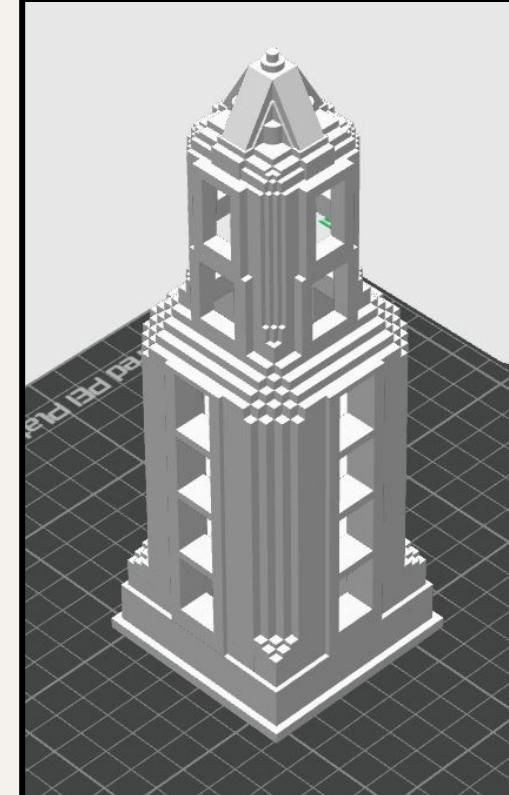
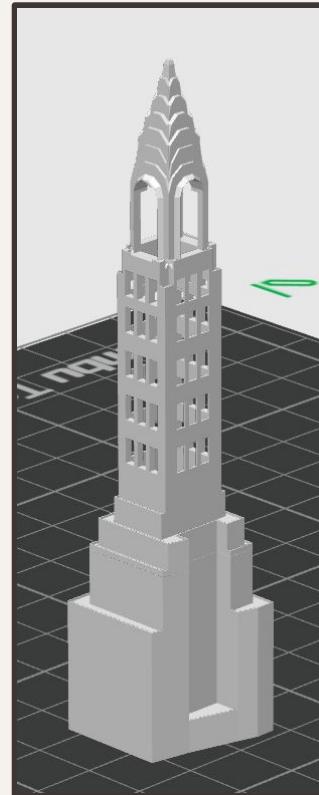
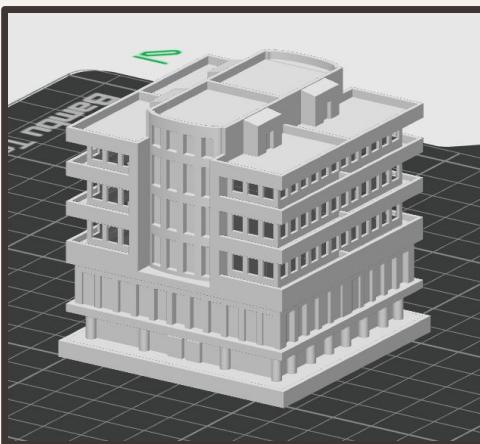


# 05

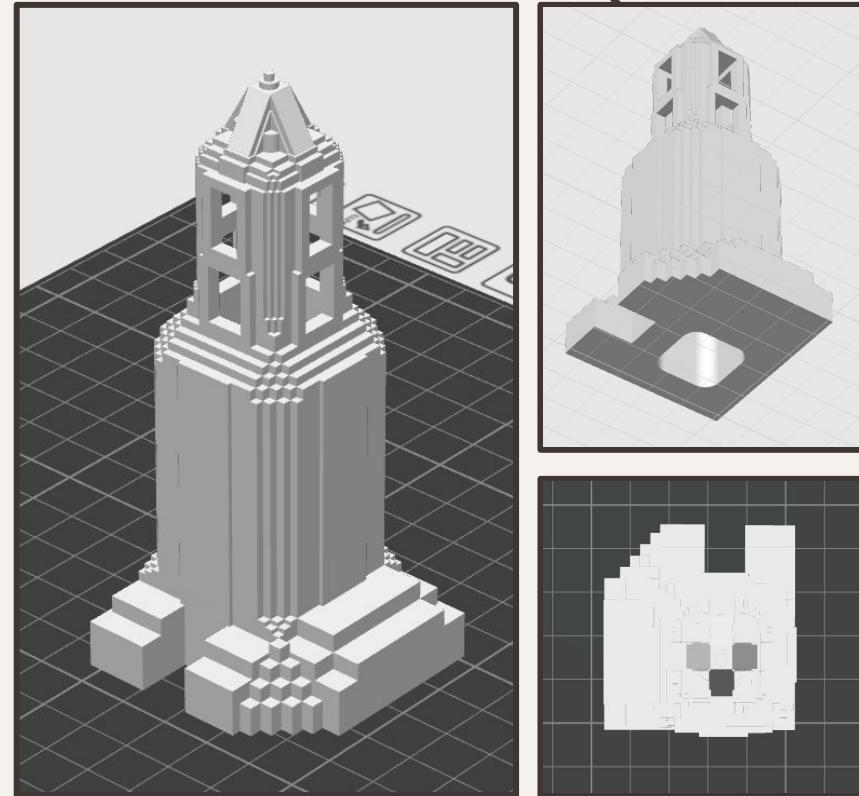
# Hardware Overview

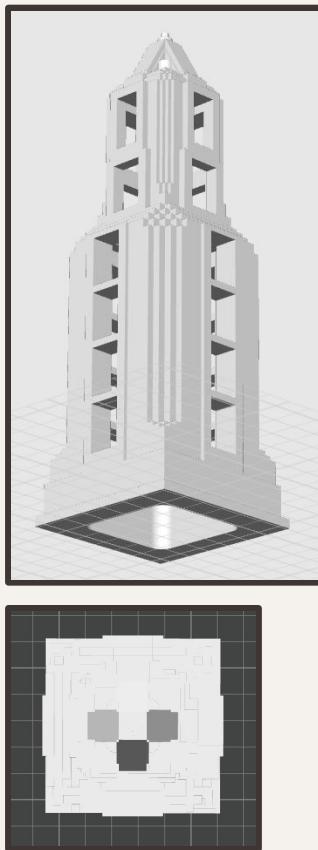
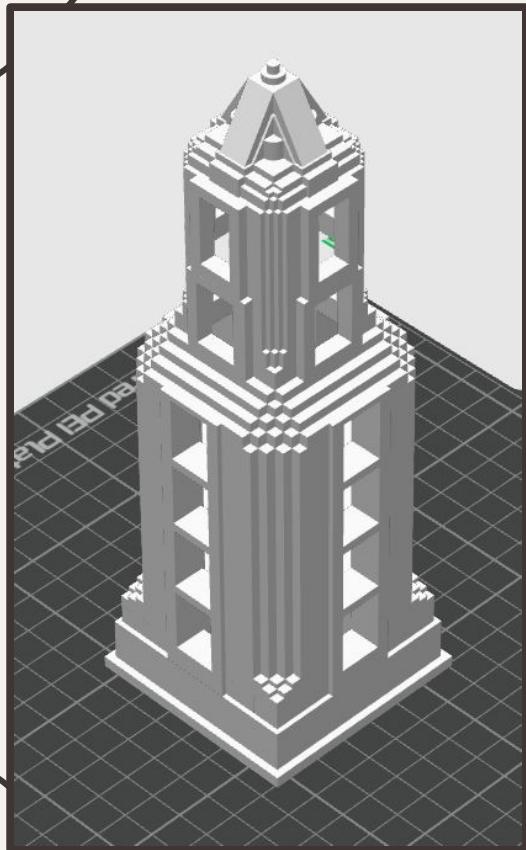
3D buildings, Raspberry Pi, and prototype progress.

# 3D Buildings



# Iteration 1: 3D Buildings Koin Building





# Iteration 2: 3D Buildings Koin Building

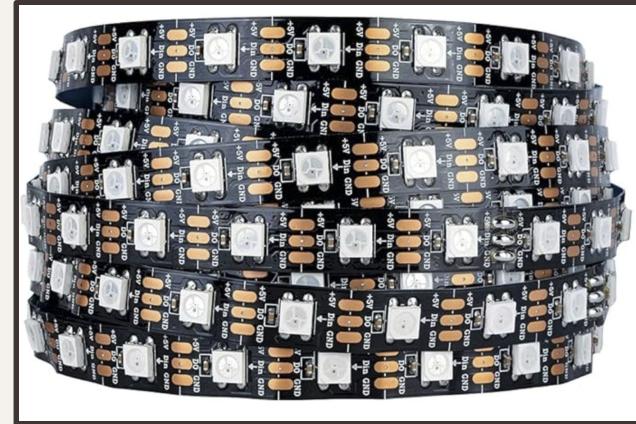
# LEDs



Individually Addressable  
LEDs

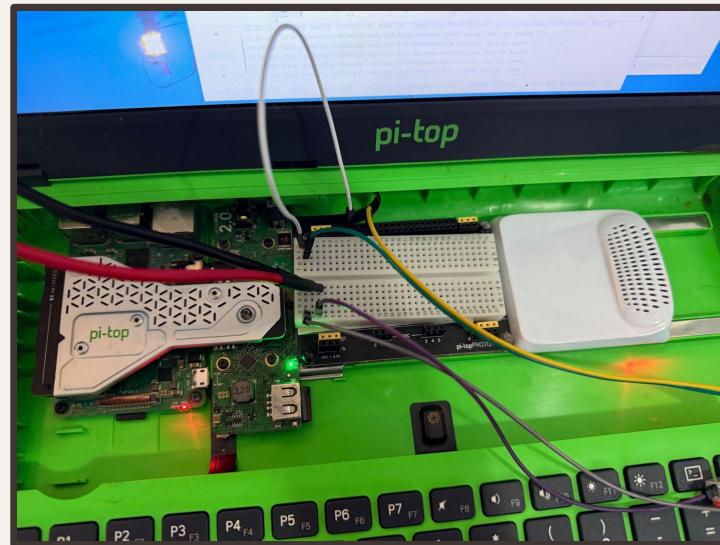
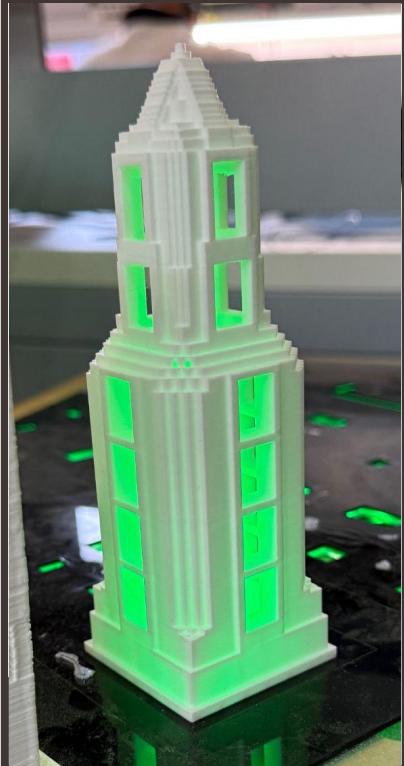
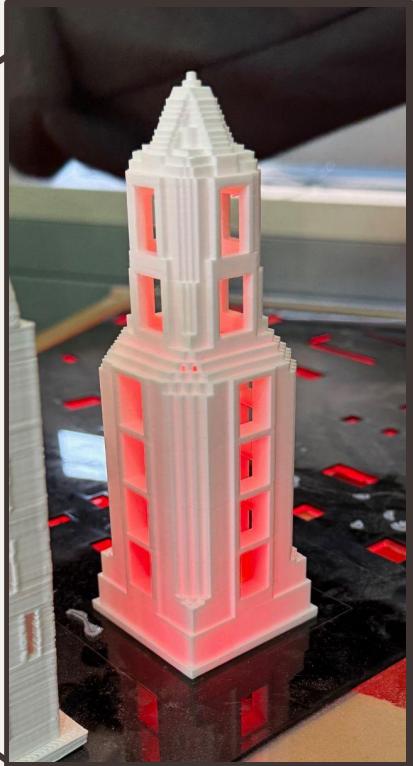


LED Lighting COBs  
Engines Modules



SEZO WS2812B ECO LED  
Strip Light

# New 3D City Progress



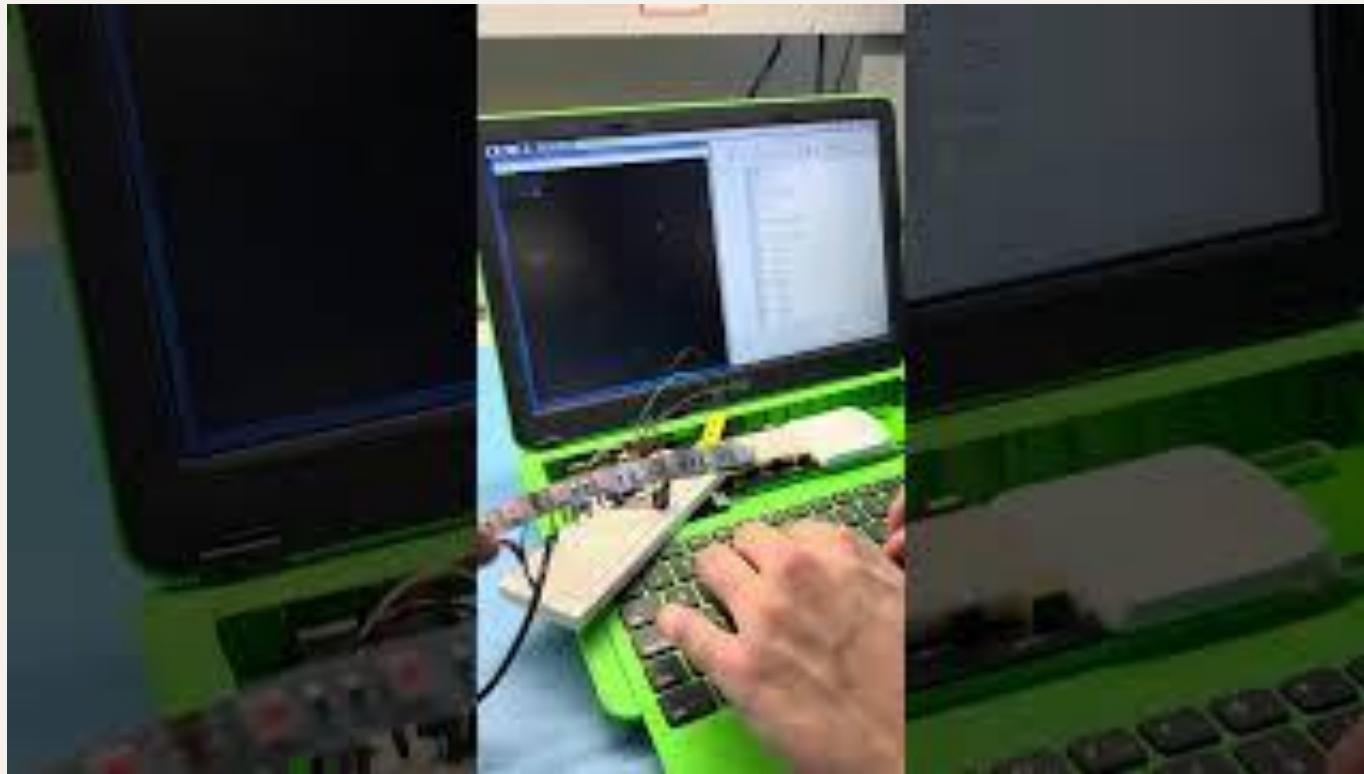
# 3D Prototype



# Video Demo



# Video Demo



# Thank You

Any questions?

---

# Works Cited

Sitts, Levi. *Skyscraper Chess Set*. Printables.com, <https://www.printables.com/model/20297-skyscraper-chess-set>. Accessed 10 Oct. 2025.