

# Smart Parking System with Raspberry Pi & AWS

Dalair Franzen – Capstone Project

## Purpose of the System

This smart parking system allows users (e.g., students, staff, visitors) to see real-time parking spot availability via a simple web interface. The system is designed to reduce confusion, save time, and improve parking efficiency on campus.

## How It Works (Behind the Scenes – Simplified)

- A Hall Effect sensor detects whether a vehicle is in a parking spot.
- The Arduino reads this sensor and sends a signal to the Raspberry Pi.
- The Pi sends that signal to AWS IoT Core via MQTT.
- AWS Lambda processes the data and updates the status in DynamoDB.
- A static HTML page polls the database and displays real-time spot availability.

## How to Use It

1. Trigger the Sensor (Demo Use Case):
  - Place a small magnet near the sensor to simulate a car entering.
  - Remove the magnet to simulate a car leaving.
2. View the Web Interface:
  - Open the index.html file from the web\_frontend/ folder on any web browser.
  - The page shows a grid of parking spots:
    - O = Available
    - X = Occupied
3. See Real-Time Updates:
  - When the sensor is triggered, the web interface updates instantly.
  - No need to refresh the page.

## System Requirements

- Web browser (Chrome, Firefox, Edge, etc.)
- Raspberry Pi must be powered on and running the script
- Internet connection (for AWS interaction)

## **Known Limitations**

- The frontend is a static HTML page and does not include user authentication.
- The grid layout is manually defined—not dynamically scalable to 1000+ spaces.
- AWS free-tier limits may affect performance in long demos or high traffic.
- This version assumes only one sensor per spot.

## **Troubleshooting Tips**

Problem: Web UI not updating

Solution: Check that the Pi is powered and running the script

Problem: Sensor not detecting magnet

Solution: Ensure magnet is close enough and sensor is properly connected

Problem: Grid always shows 'O'

Solution: Confirm data is reaching DynamoDB via MQTT and Lambda

Problem: Page shows blank data

Solution: Make sure DynamoDB table is populated and API Gateway is active