

Smart Park

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Need:

With a high volume of commuting students at UCSC, and limited parking options; finding an available parking spot can be hard during peak hours

Goal:

Help students find available parking spots with less hassle during peak hours.

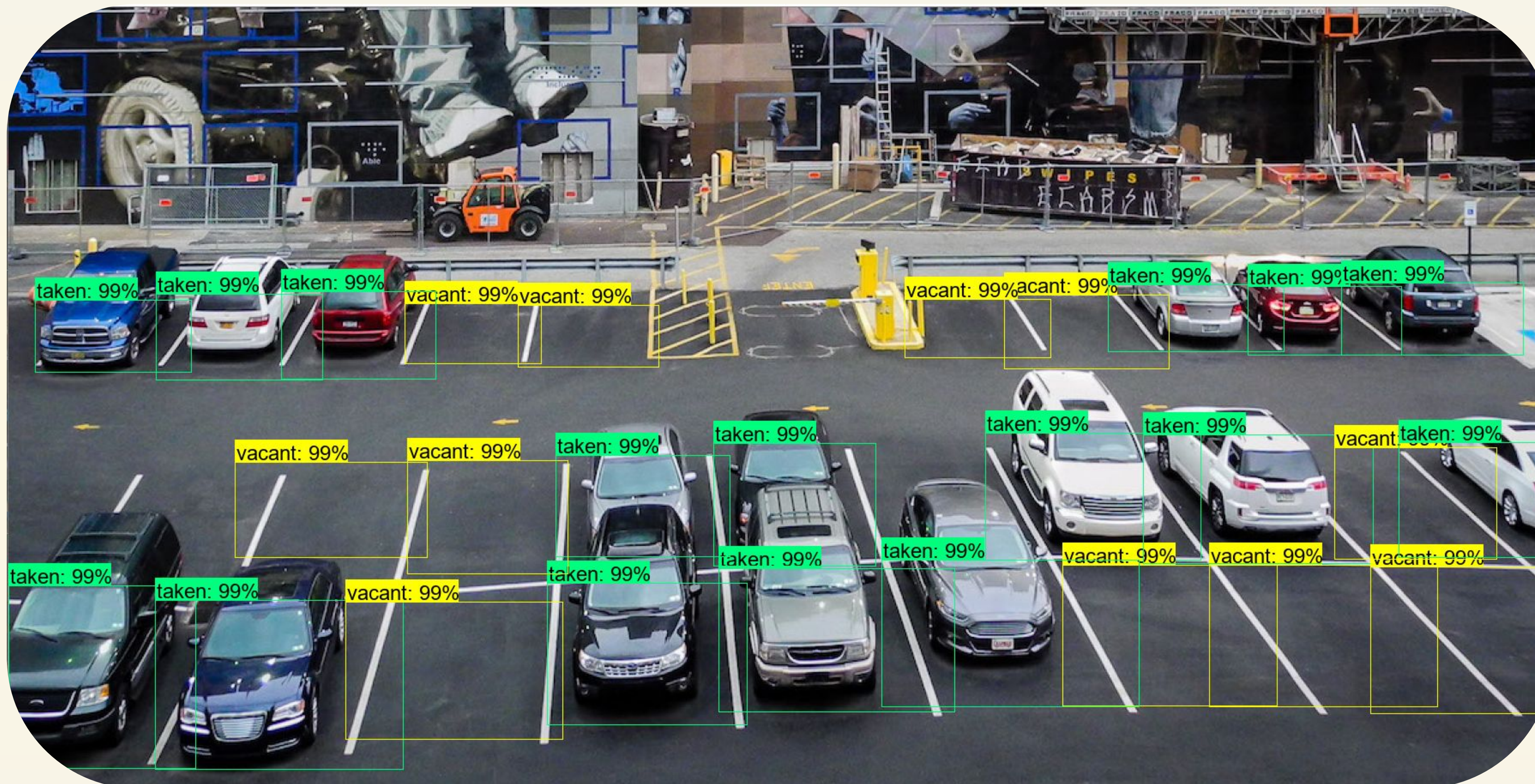
Design Objective:

Manufacture a low-cost, low-power parking lot system that will detect open parking spaces in clear conditions. This product will track multiple parking spaces per sensor, and have moderate maintenance during extended use.

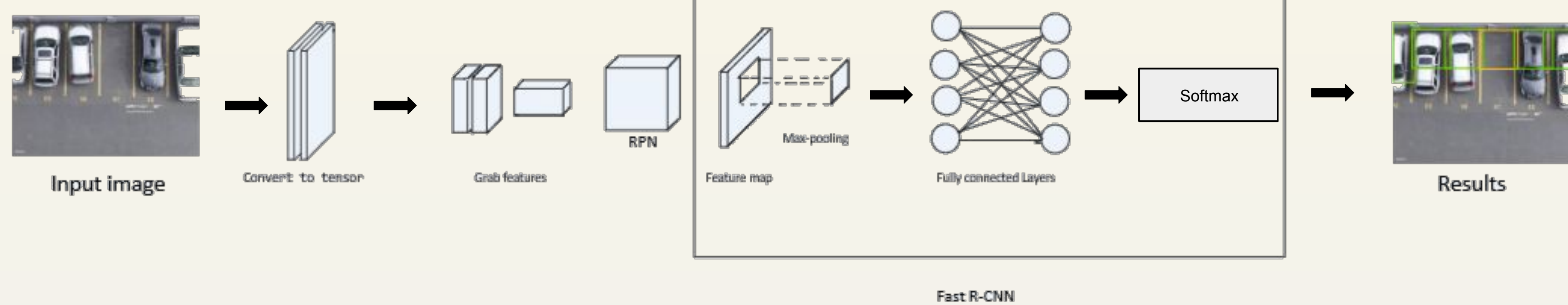
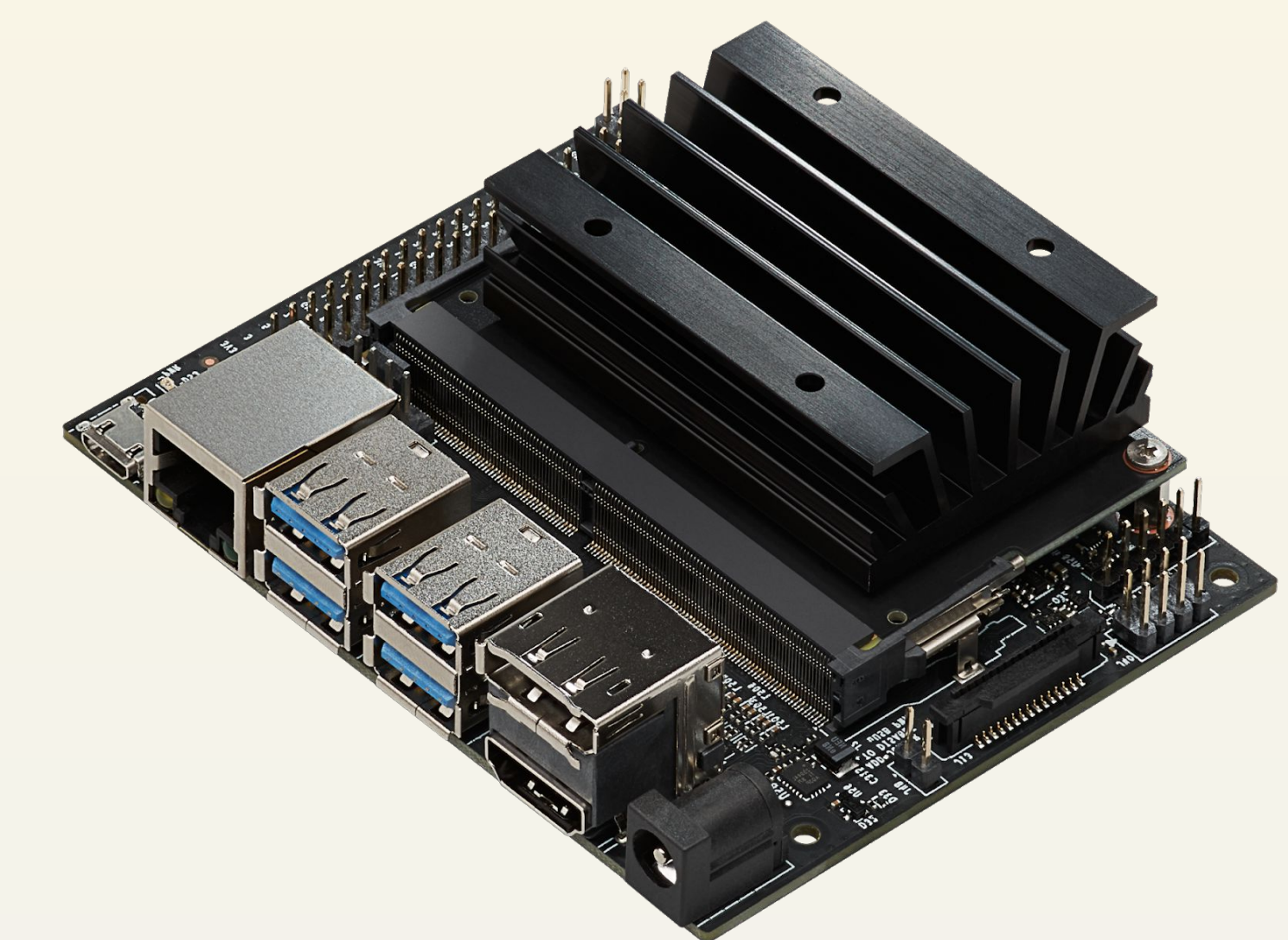
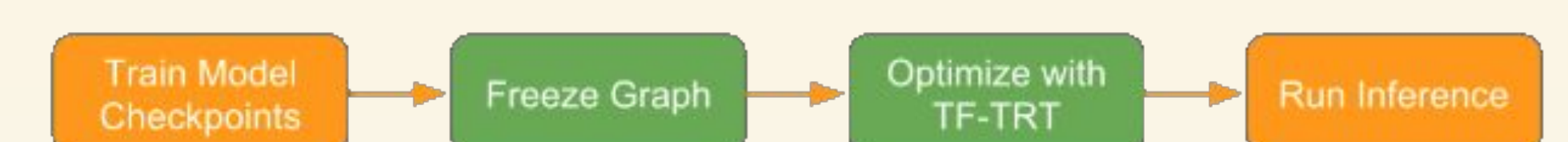
Client(s):

University of California, Transportation and Parking Service

Machine Learning: Faster R-CNN Model



- Modified pre-trained detection model, to identify vacant/taken spots using transfer learning
- Trained with images from custom small-scale parking lot model
- Overlay bounding box on original frame indicating spot availability and confidence
- Compressed original prediction graph into a TensorRT model for microprocessor
- Inference at real-time using Jetson Nano



CAD Design:

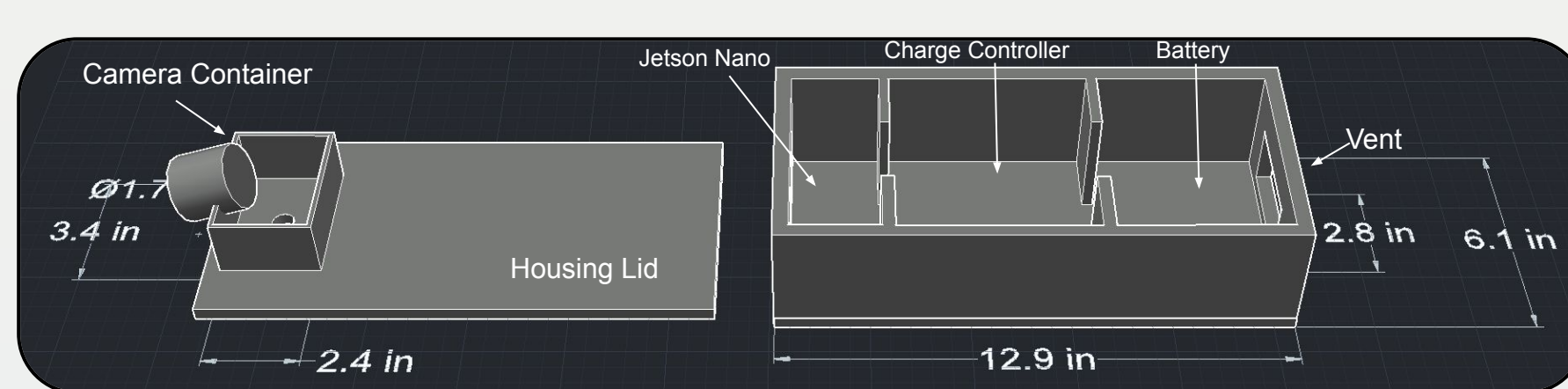


Fig. Housing Unit

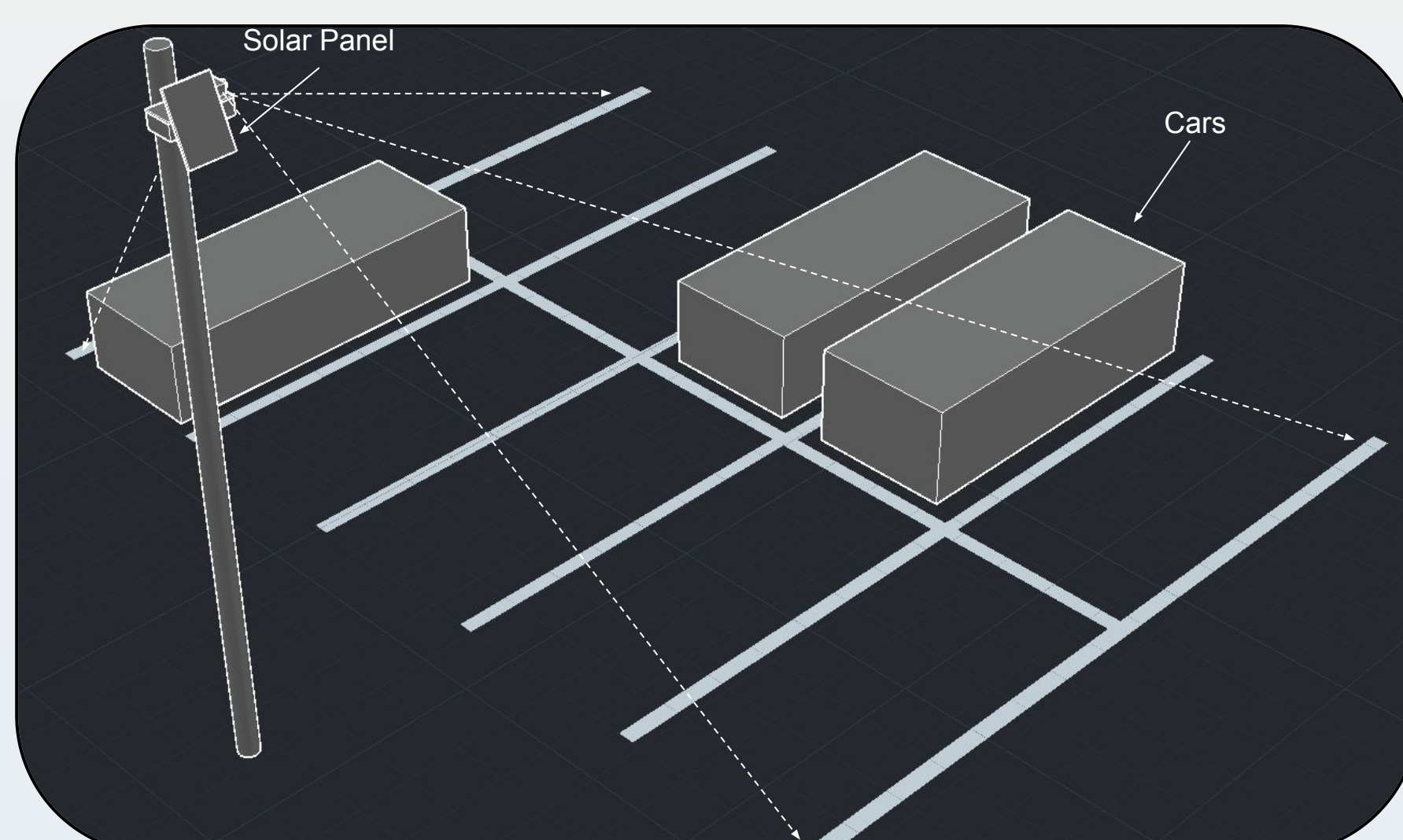


Fig. Parking Lot Render

- Parking lot render simulates camera coverage.

Acknowledgements:

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App:



- App provides campus map overview of selectable parking lots
- Any lot selection will provide the user with detailed lot of vacant/occupied parking spots
- On the selected parking lot page, "Update" button provides an update on parking spots

Communication Interface:

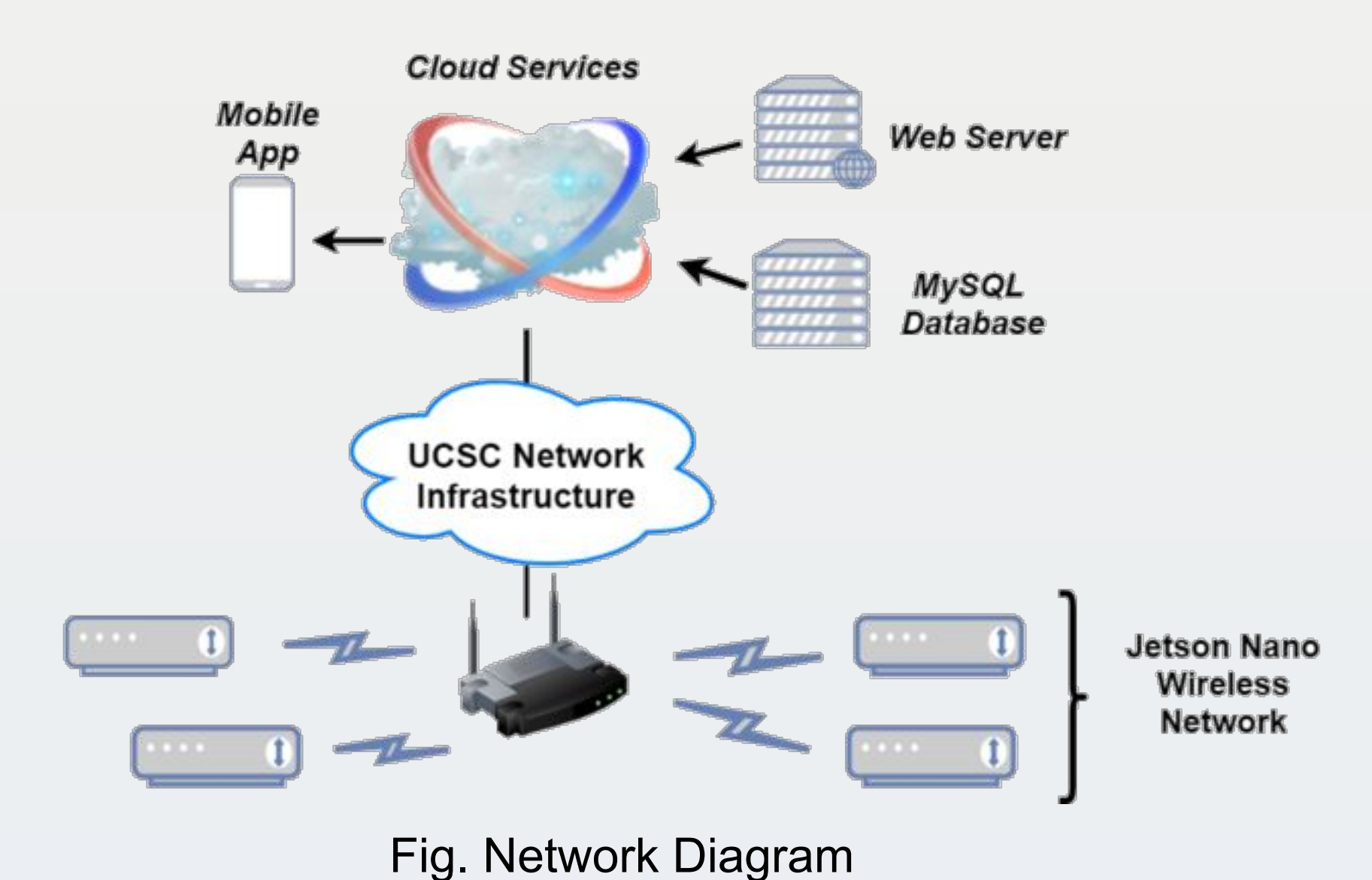


Fig. Network Diagram

- 1) Mobile App sends a query request to the Web Server
- 2) The Web Server connects to MySQL and forwards the request to MySQL
- 3) MySQL receives the request and sends the response back to the Web Server
- 4) The Web Server parses the response and forwards it to the Mobile App

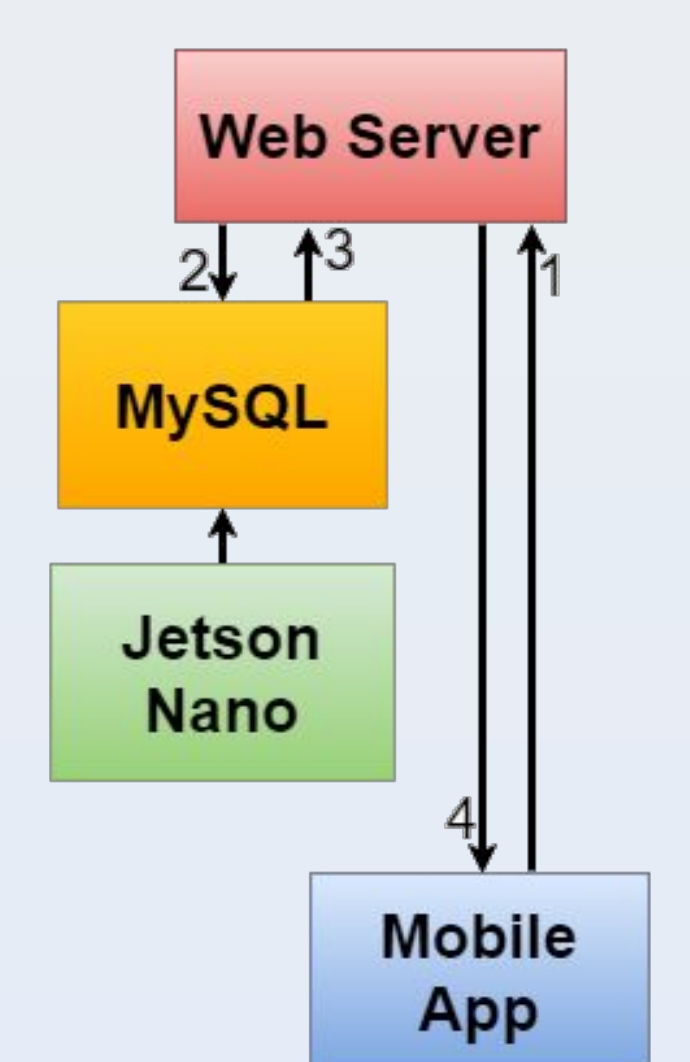


Fig. Data Flow

Note: Jetson sends periodic updates when status of spots change