iValet Initial Proposal

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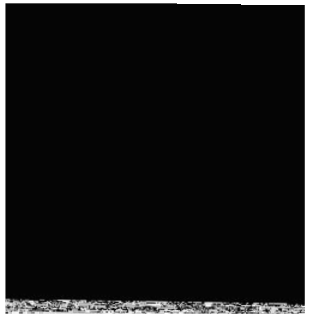
Parking Problem

- Drivers spend 17h per year on average searching for parking



Fuel + Emissions + Time

$345/year

Objective

- Address the difficulty in finding empty parking spaces
- User-friendly application
- Directs drivers to next available parking spot

Components

- Camera
  - e-CAM24_CUNX - Color Global shutter Camera
  - e-CAM50_CUNX - 5.0 MP NVIDIA® Jetson Xavier™ NX/NVIDIA® Jetson Nano™ Camera
  - 13 MP, 30 fps Color Camera Rolling Shutter
- Processor
  - Nvidia Jetson Nano Developer Kit
- Site hosting
  - Netlify

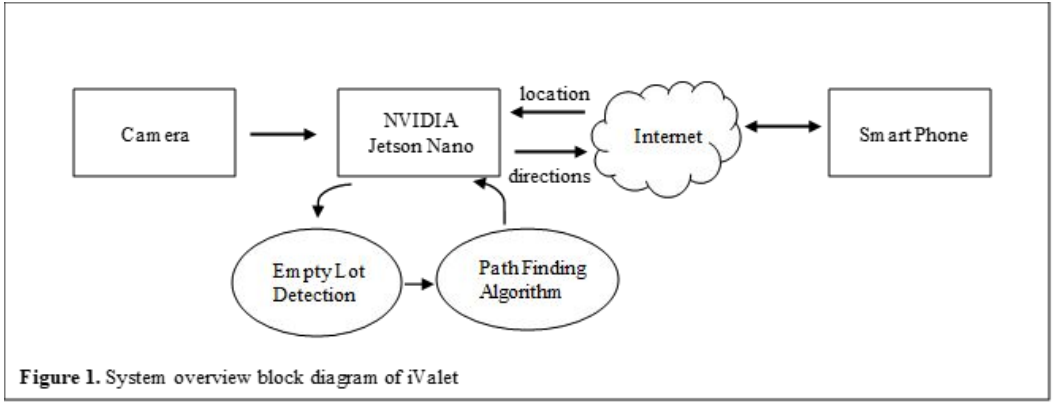


Figure 1. System overview block diagram of iValet

Camera Options

e-CAM24_CUNX - Color Global shutter Camera

Frame Rate: 65-120 fps

Operating Voltage: 3.3V +/- 5%

Power Consumption:
0.66W-0.92W

Weight: 21g

e-CAM50_CUNX - 5.0 MP NVIDIA® Jetson Xavier™ NX/NVIDIA® Jetson Nano™ Camera

Frame Rate: 28-100 fps

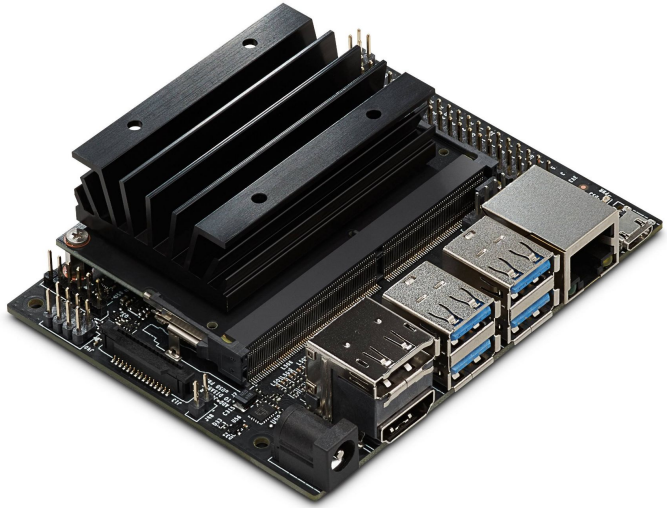
Operating Voltage: 3.3V +/- 5%

Power Consumption:
0.95W-1.62W

Weight: 17.5g

Nvidia Jetson Nano Developer Kit

- Designed to be a portable AI and machine learning computer
  - Main storage: microSD card slot
  - 40 pin expansion header
  - 5V power through Micro-USB or DC Barrel Jack
  - Gigabit Ethernet Port
  - 4 USB 3.0 ports
  - HDMI Output
  - Device Mode through Micro-USB
  - DisplayPort Connector
  - MIPI CSI-2 camera connectors

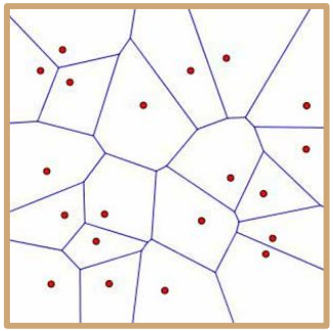


Overall Budget

e-CAM24_CUNX Global shutter Camera	Camera	$149.00
e-CAM50_CUNX 5.0 MP Camera	Camera	$99.00
NVIDIA Jetson Nano Developer Kit	Computation/Processing	$99.00
	Total	$347.00

Design Concept

Voronoi Diagram
Source: American Mathematical Society



- Algorithm
  - Problems:
    - Process parking lots image
      - Handled by OpenCV (open-source library for image processing and machine learning)
    - Map available spaces
      - Use Voronoi diagrams to divide parking lots into sections
      - Create flags to differentiate between taken, and soon to be taken, and filled spaces
    - Help users find a spot
      - Data from the Voronoi diagram will be used to update the pathfinding algorithm
      - Path to each space will be calculated using the A* method
        - Most valuable when finding the optimal route between 2 points
        - Typically deployed when routing to a specific location

Design Concept

- User Interface
  - A webpage that will be accessed via QR code

Home Screen

Car ID info

Model:

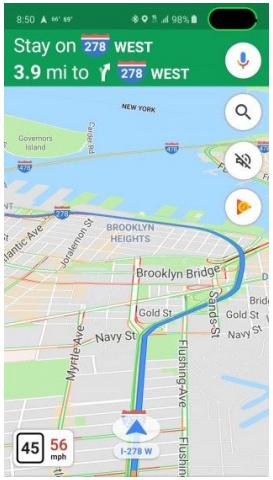
Color:

License Plate:

Find a Spot

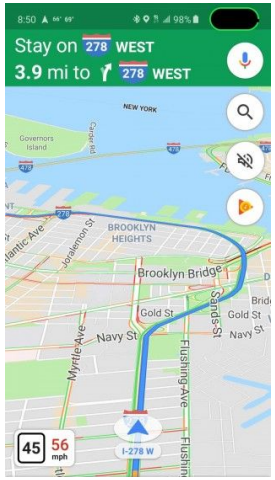
Find where you parked

Navigate to Slot

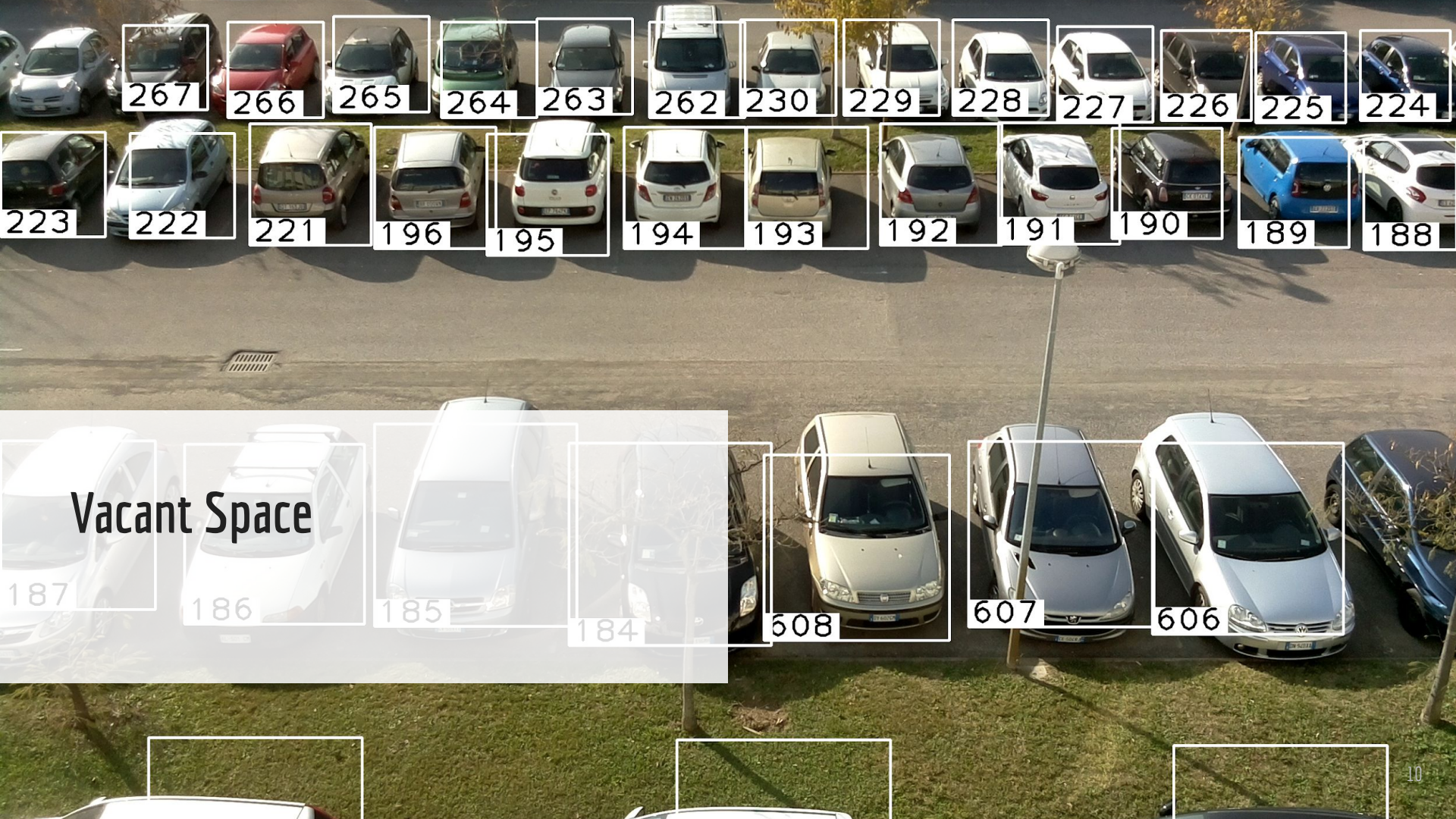


Will you be parked here?

Navigate Back

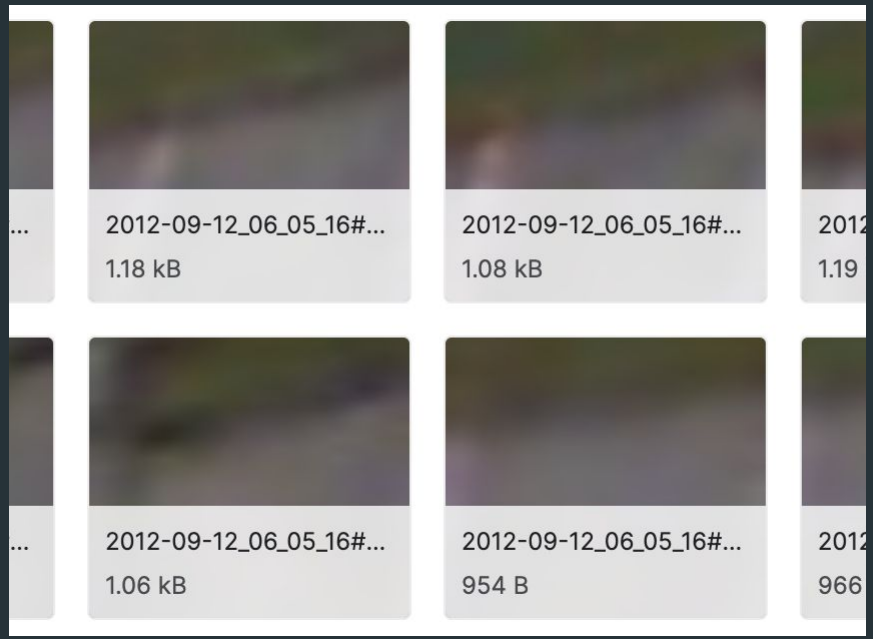


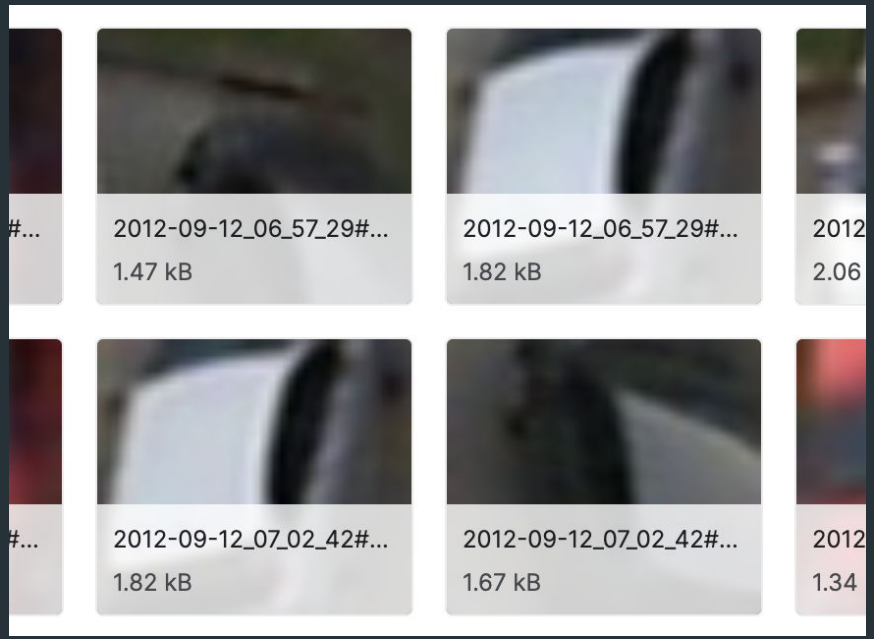
Thank you!



Vacant Space

Data - Kaggle Data Base





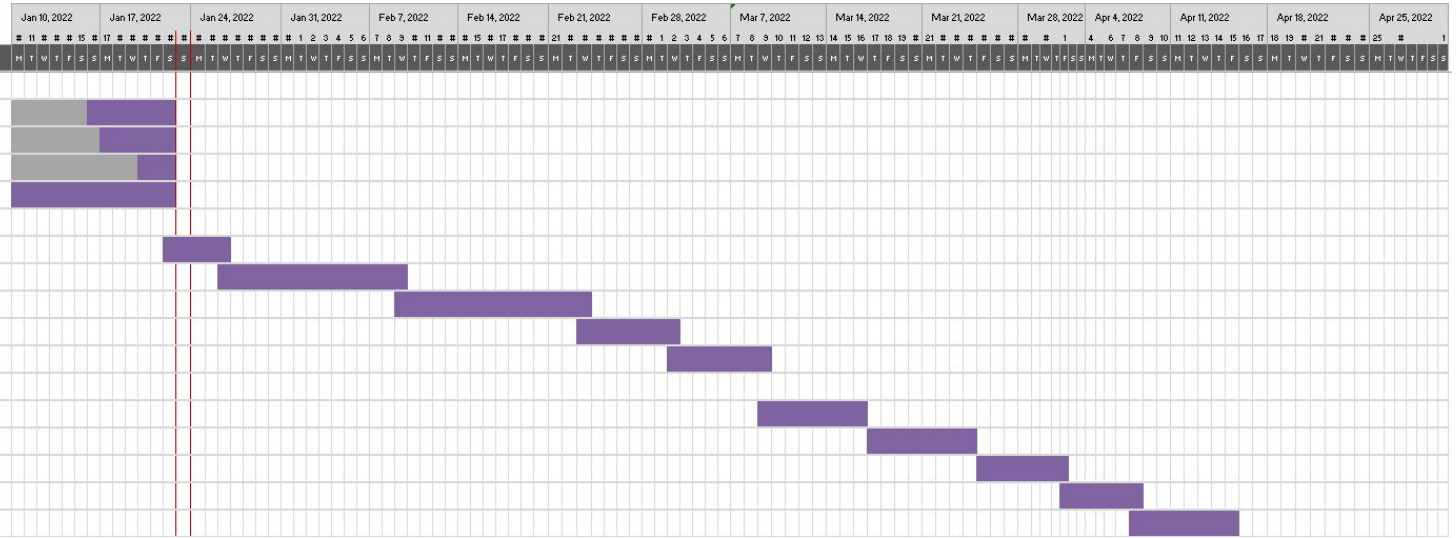
Full Schedule

iValet

Project Start: Mon, 1/10/2022

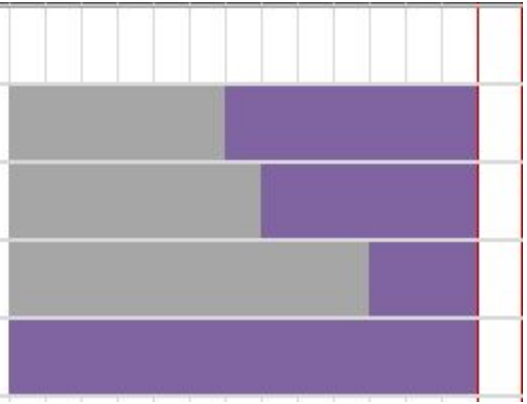
Display Week: 1

TASK	PROGRESS	START	END
Organize (Week 1- 2)			
Disscuss Plans with Advisor	50%	1/10/22	1/22/22
Figure Out Budget	60%	1/10/22	1/22/22
Find Testing Site	80%	1/10/22	1/22/22
Start Technical Section		1/10/22	1/22/22
Small Scale Testing			
Prototype Discussion		1/22/22	1/26/22
Data		1/26/22	2/9/22
Hardware and Model		2/9/22	2/23/22
Testing		2/23/22	3/2/22
Adjust Model		3/2/22	3/9/22
Large Scale Testing			
Final Product Discussion		3/9/22	3/16/22
Adjust Model		3/17/22	3/24/22
Train		3/25/22	4/1/22
Testing		4/1/22	4/8/22
Adjust Model		4/8/22	4/15/22



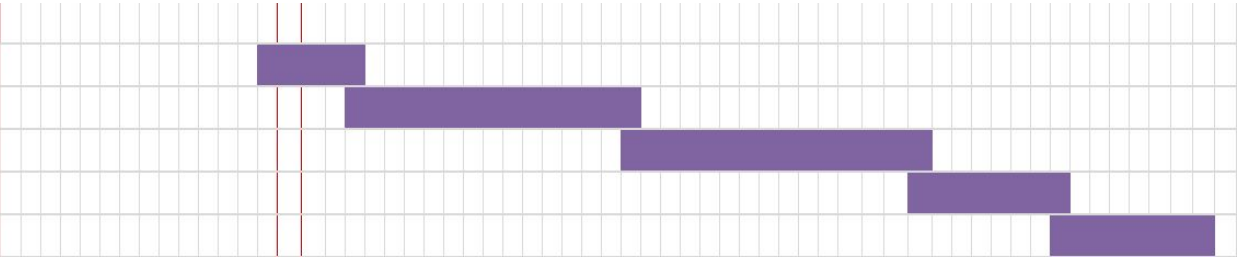
Organization

Organize (Week 1- 2)				
Disscuss Plans with Advisor	50%	1/10/22	1/22/22	
Figure Out Budget	60%	1/10/22	1/22/22	
Find Testing Site	80%	1/10/22	1/22/22	
Start Technical Section		1/10/22	1/22/22	



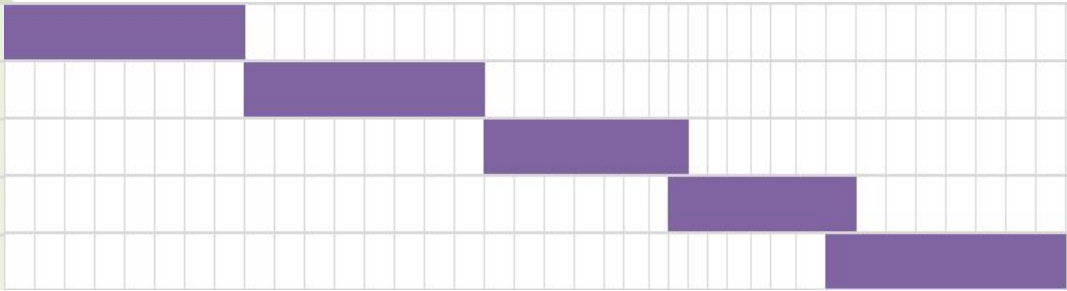
Design and Initial Testing Schedule

Small Scale Testing		
Prototype Discussion	1/22/22	1/26/22
Data	1/26/22	2/9/22
Hardware and Model	2/9/22	2/23/22
Testing	2/23/22	3/2/22
Adjust Model	3/2/22	3/9/22

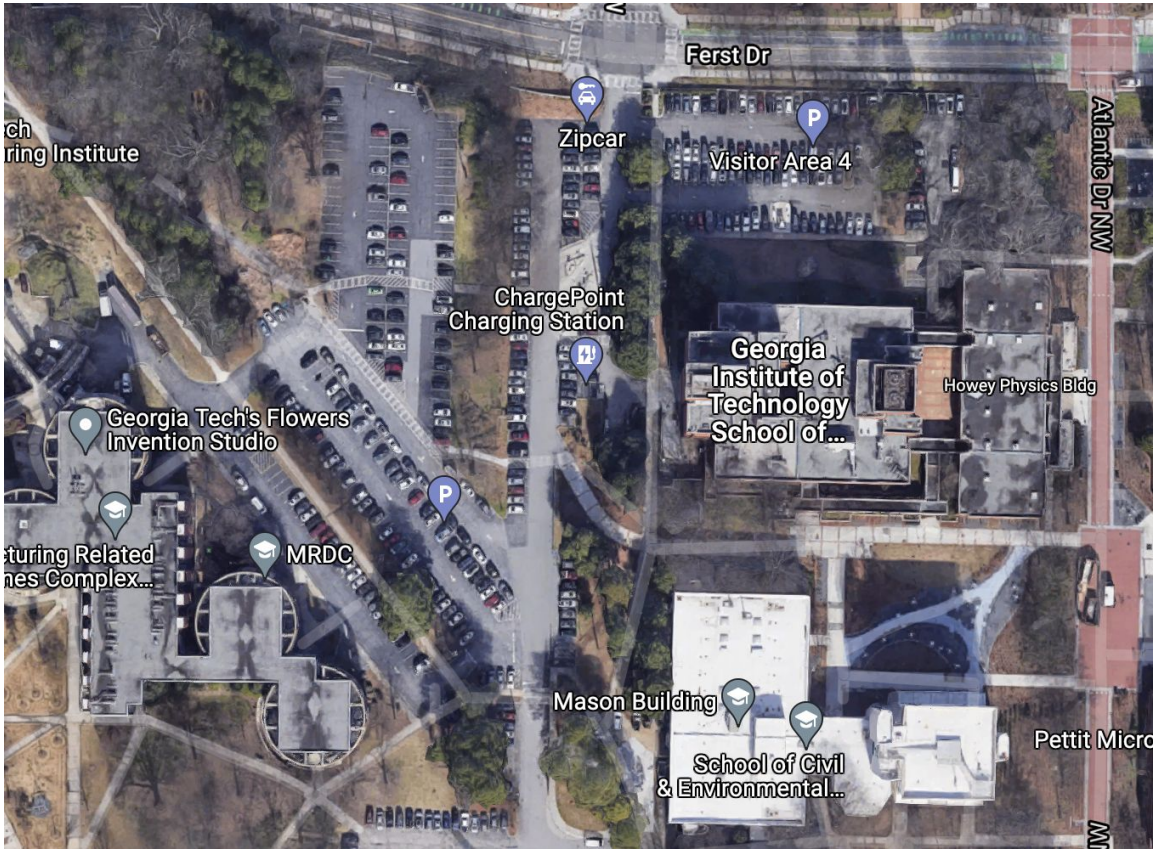


Testing and Redesign Schedule

Large Scale Testing		
Final Product Discussion	3/9/22	3/16/22
Adjust Model	3/17/22	3/24/22
Train	3/25/22	4/1/22
Testing	4/1/22	4/8/22
Adjust Model	4/8/22	4/15/22



Testing Sites



XTREME

g lot
Campus Recreation
Center Parking Deck
Open
Starter Bikes At
Georgia Tech
Used bicycle shop
Outdoor Recreation
Georgia Tech
Closed
GT Rec Volleyball
Closed
Freshens at CRC
Temporarily closed
750
750
Georgia Tech
Campus Recreation...
Gym classes, pools
& a lazy river
Tech Pkwy NW

Team Member Assignments

- Group Leader/Financial Manager: Wei Xiong
- Webmaster: Faiza Yousuf
- Hardware Technical Lead: Kelin
- Software Technical Lead: Yunchu Feng