

ParkSense

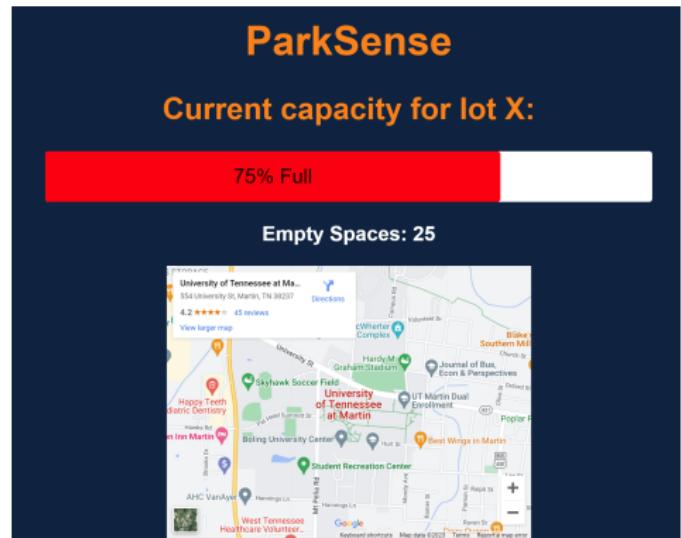
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What is ParkSense?

- ① Web Dashboard



- ② Object Detection

Motivation

Background

- ① Address a Campus Issue
- ② Parking Shortage



Technology

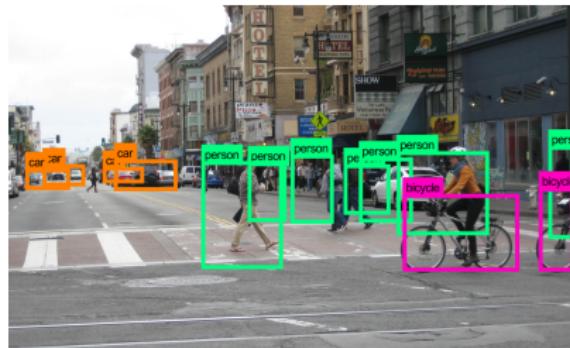
- ① Computer Vision and Deep Learning
 - (a) OpenCV
 - (b) Ultralytics: YOLOv8

- ② Hardware
 - (a) Raspberry Pi 2 Model B+
 - (b) Raspberry Pi Camera Module



What is Computer Vision?

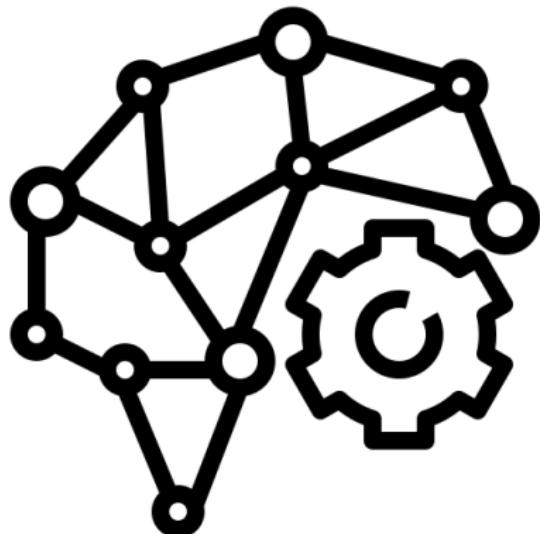
- ① Subset of Artificial Intelligence (AI)
 - (a) Allows the Computer to "See"
 - (b) Crucial for Object Detection
- ② How Does It Work?
 - (a) Image Acquisition and Processing
 - (b) Paired With a Model



What is Deep Learning?

- ① Subset of Machine Learning
 - ⓐ What's the Difference?
 - ⓑ Allows the Ability to Adapt and Learn on Data

- ② Why Do We Need It?
 - ⓐ Receives Labelled Data-set
 - ⓑ Iterates Over Data-set
 - ⓒ Forms a Model for Use

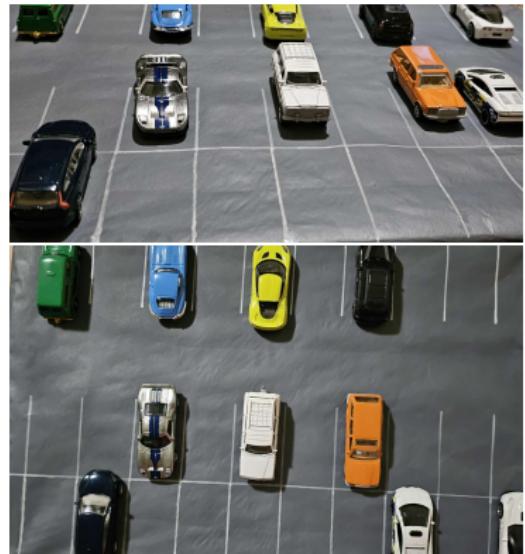


Goals

- ① Provide a Web Dashboard with Lot Information
 - ⓐ Current Spot Availability
 - ⓑ Predictive Trends
- ② Set Precedent for Similar Projects
 - ⓐ Training Custom Data Sets with Machine Learning
 - ⓑ Portable Computing and Networking

The Parking Lot

- ① Using a Mockup
- ② Easier to Manipulate
 - a) Creating the Dataset
- ③ Looks Fairly Similar to a Real Lot



The Data-set

① Contains 20 Images

- (a) Around 18 Empty Instances in Each Image or about 350 in Total
- (b) 10 Taken Instances in Each Image or 200 in Total

② Annotated Using RoboFlow

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The Annotation Process

- ① Every Instance Must Have an Annotation
- ② Includes Using Bounding Boxes
 - ⓐ Serves as a Guide
- ③ Export in YOLOv8 Format

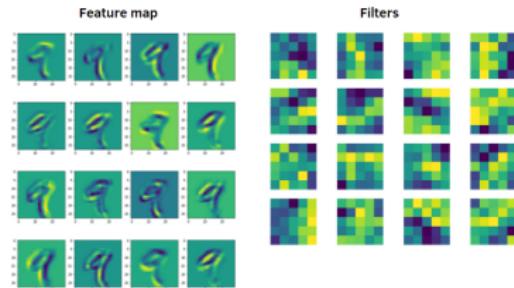


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The Model

- ① Current Custom Model:
"testmodel250"
- ② Contains Needed Weights
- ③ How Weights are Determined



Data Pipeline

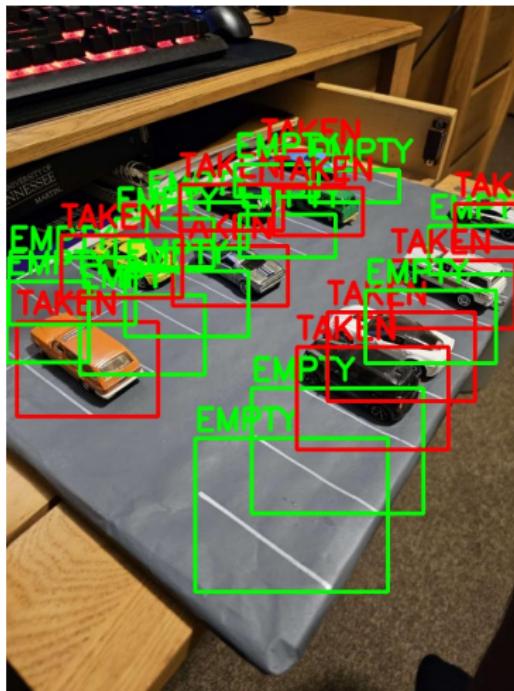
- ① Data Collection
- ② Server Event Handler
- ③ Client Updated



```
Project/Program$ cat data.txt  
17 Emptys, 6 Takens
```



Demonstration



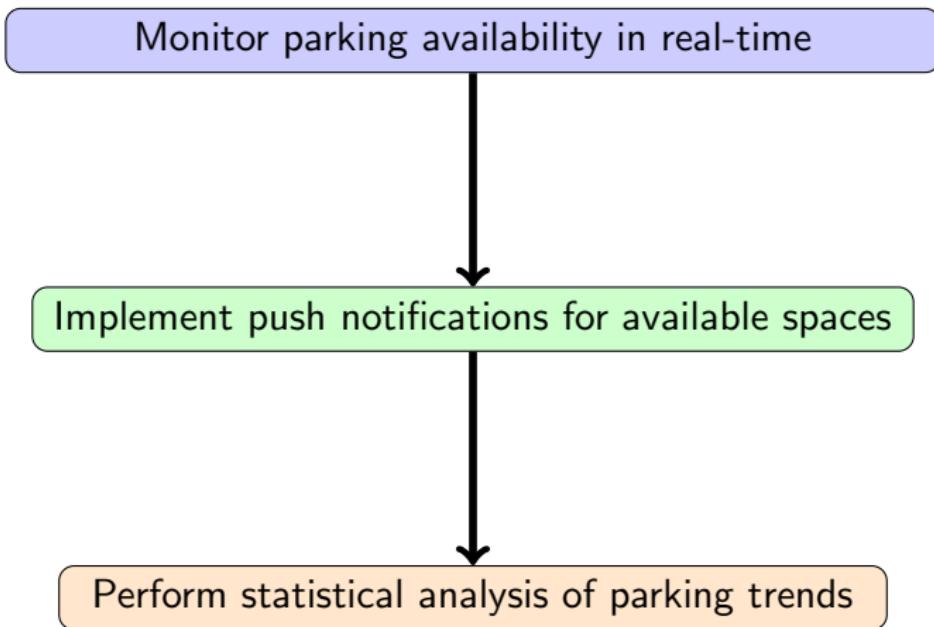
Webpage

Challenges

- ① New Territory
 - (a) No experience with computer vision and machine learning
- ② Compiling and running code on low power devices
- ③ Building a stable model under varied conditions



Future Work



Any Questions?

Questions? Comments?

Further project/author information:

Please visit our GitHub repository for more details:

github.com/Spencek7746/Senior-Design-Project

