ECE4873 Project Summary

Project Title	iValet
Team Members (names and majors)	Faiza Yousuf – Computer Engineering Wei Xiong Toh – Electrical Engineering Kelin Yu – Electrical Engineering Yunchu Feng – Computer Engineering
Course & Section **Primary Advisor**	ECE 4872-L04 Dr. Patricio Antonio Vela
Semester	2022 Spring Course: ECE 4872
Web Site URL	Website Pending
Project Abstract (250-300 words)	Finding a place to park can be difficult or time-consuming. Having an automated system to help users navigate to a parking space, and remember where they parked, would especially help in large parking lots, like in amusement parks or stadiums. A camera will be set up in a convenient location (potentially a nearby building) which has a clear view of the entire parking lot. Then, using the data from these cameras, the software finds out the constraints of the lot, such as: the edges of the parking lot, the empty spots, the size of each spot, if the spot is special (a disabled spot for example), if any spots are reserved, and if any are obstructed. Users will consult a user interface from their smart phones (a webpage). That interface will direct users to the closest available spot. When the driver wants to return, the interface will help them navigate to their car, in case they have forgotten where they parked. The software used for this object detection method is going to be a combination of CNN using TensorFlow and OpenCV. To train the model, there are many data repositories and other resources publicly available from similar projects. The program will be constantly running on a desktop acting as a server, with data going into a database. The data will be processed by a path-finding algorithm (likely A*) to determine the most optimal route to get a user's destination. The interface will likely be designed using HTML and Javascript (and mostly the React library).

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List **codes** and **standards** that significantly affect your project. Briefly describe how they influenced your design.	Codes: 1.Video Recording Laws – "Ga. Code 16-11-62(2) says it is a crime to use a hidden camera or another device to photograph, observe or record someone else while that person is in a private place away from public view. To lawfully record these activities, a person must gain the consent of all parties in the video or photographs." Chanco Schiffer Law, LLC. 2021. Georgia's Video Recording Laws. [online] Available at: <https://www.chancoschiffer.com/blog/2019/august/georgia-s-video-recording-laws/> [Accessed 22 October 2021]. Standards: 1. Wireless communication – HTTP, TCP 2. Image/video storage – PNG, JPEG, MP4 3. Web app – TCP, HTTP, HTML, JavaScript
List at least two significant **realistic design constraints** that applied to your project. Briefly describe how they affected your design.	1. Installing the camera at a high position to capture an aerial view of a parking lot will be challenging. If the camera is not high enough, the trajectory will have an angle to the ground, making it difficult to detect the shape and size of cars. There might also be other obstacles such as trees or buildings blocking the view of the parking lot. 2. Finding a large enough parking lot to regularly test and implement the design is unlikely. The system may need to be tested on a smaller lot depending on accessibility provided.
Briefly explain two **significant trade-offs** considered in your design, including options considered and the solution chosen.	1. When implementing a camera, it is difficult to position it so it overlooks the parking lot with an aerial view, and any blind spots (trees, debris, etc.) will influence accuracy. Using a drone might be a possibility, but it cannot carry out long-term detection. Instead of these two ideas, a parking lot can be separated into different zones and use several cameras to detect certain areas. Another option, if possible, is only surveying parking lots surrounded by buildings with rooftop access. 2. Instead of recording numerous instances of data (for things like recognizing different vehicles), that data will be supplemented with online resources.
Briefly describe the **computing aspects** of your projects, specifically identifying **hardware-software** tradeoffs, interfaces, and/or interactions. *Complete if applicable; required if team includes*	Computing Aspects: 1. The OpenCV library, Mask-R CNN algorithm, and Yolo algorithm will be used for computer vision. 2. A parking lot dataset from Kaggle (and other datasets as needed) will be used for testing. It contains 700k photos of parking lot in different weather. 3. A path planning algorithm to direct drivers to available parking spaces. 4. Using several cameras to take photos of different areas of a big parking lot because of the limited field of view of a single camera. 5. A server and SQL database is needed to host the web application data. 6. The Google Maps API may be used in the UI

CmpE majors.	

ECE International Program

(Only groups with one or more International Program participants need to complete this page)

Project Title	

Global Issues (Less than one page)	(10 point font, single spaced)