

Big Brother

Low Level Design

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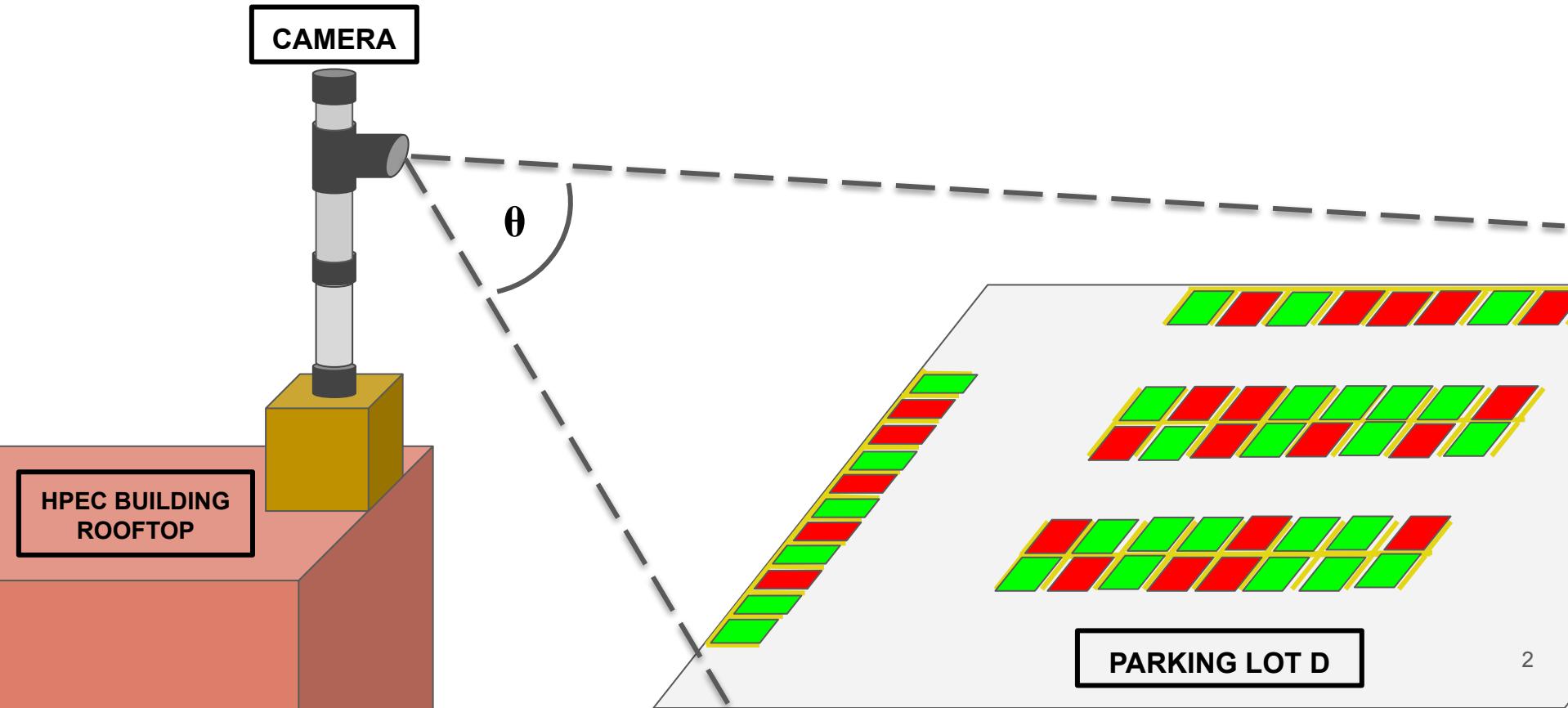
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Project Advisor - Professor Miller

Concept

LEGEND:
Vacant Spot = 
Occupied Spot = 

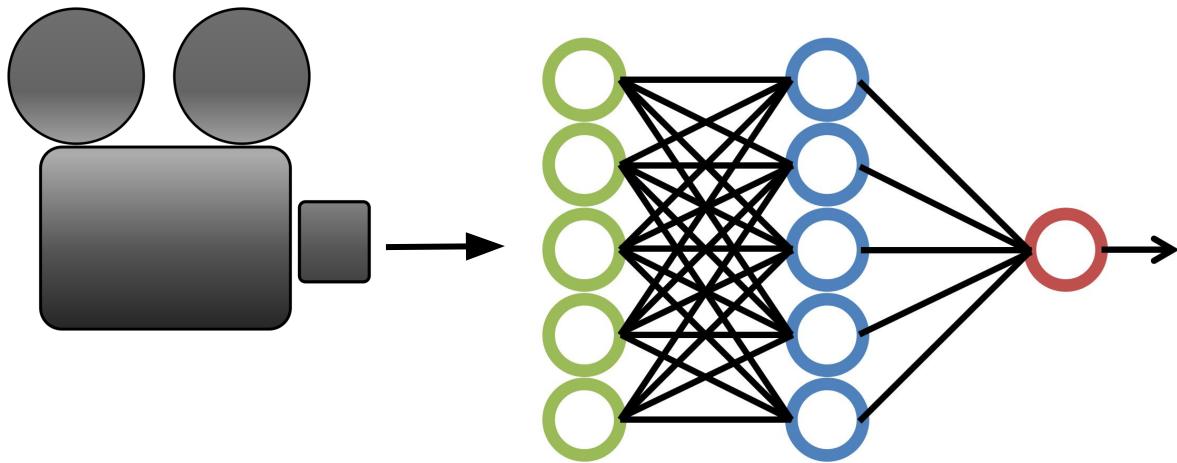


Concept

Input Parking Lot Images

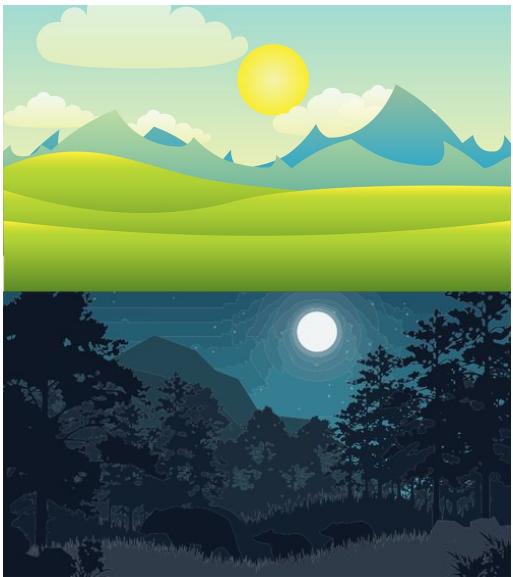
Convolutional Neural Network

Parking Spot Availability App



Constraints

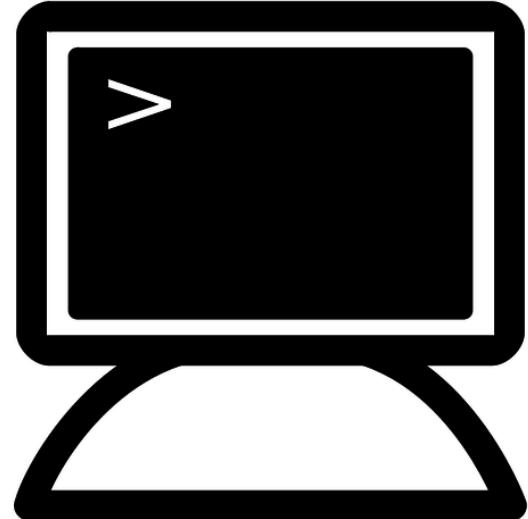
Lighting & Visibility



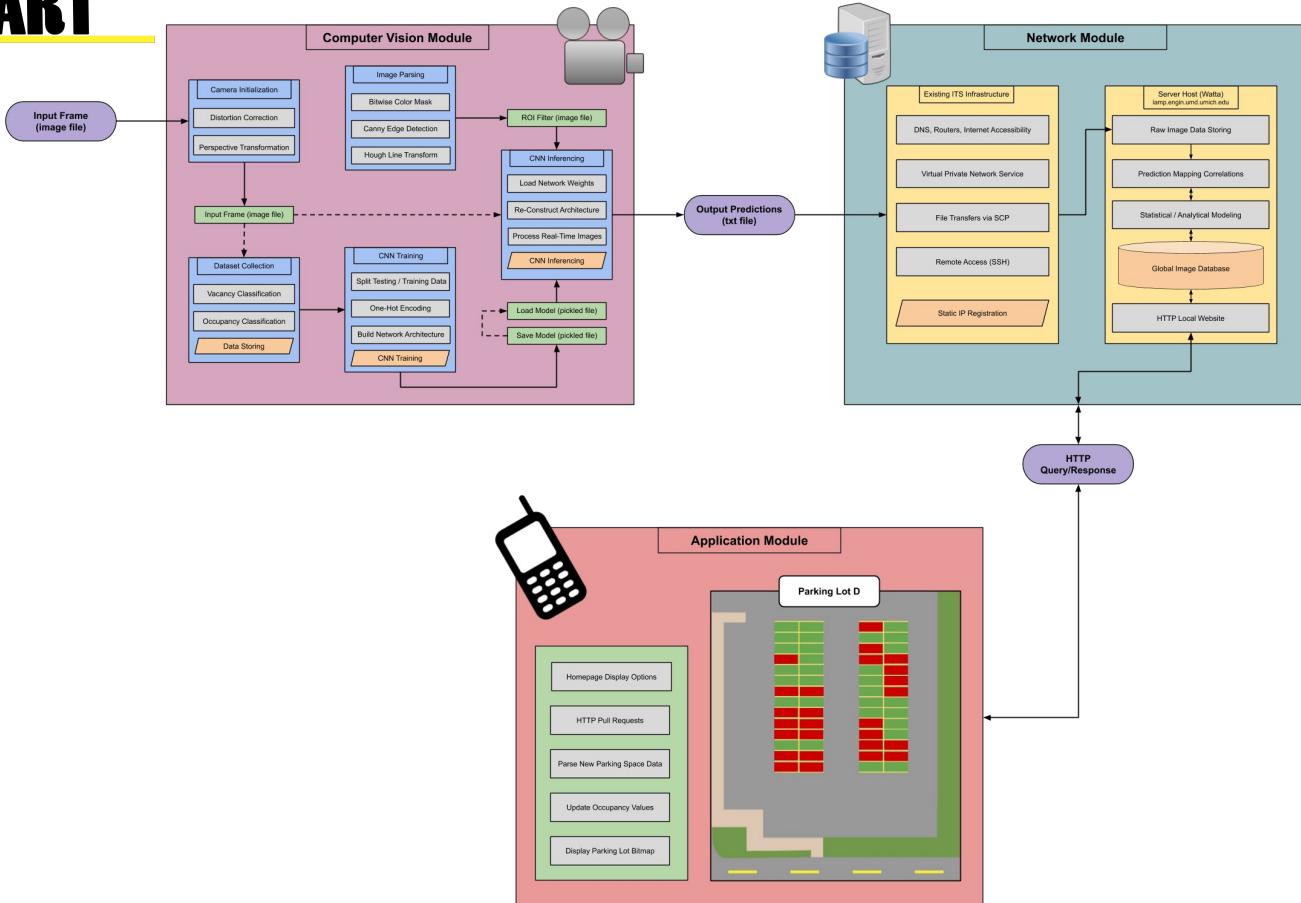
Power Management



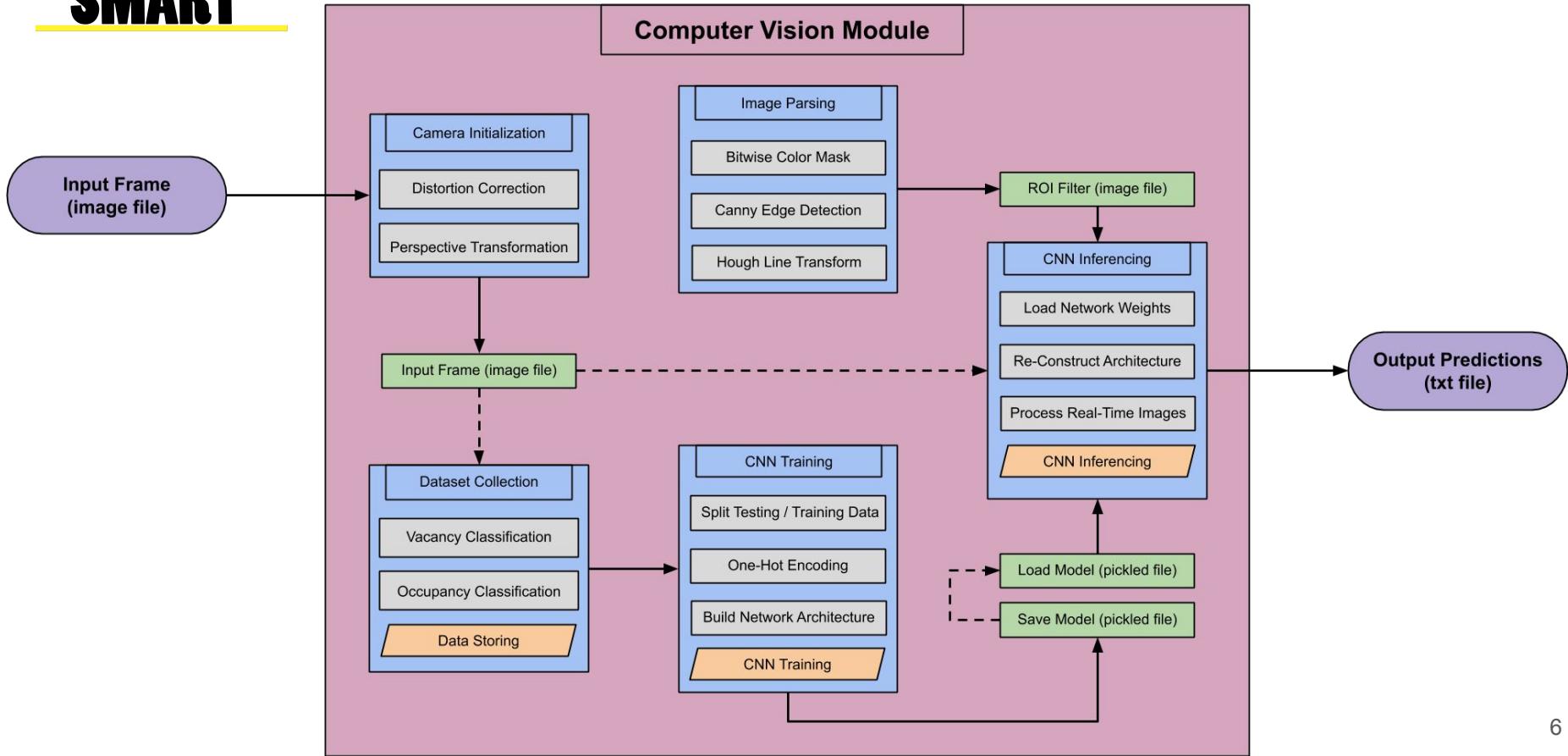
Accessibility



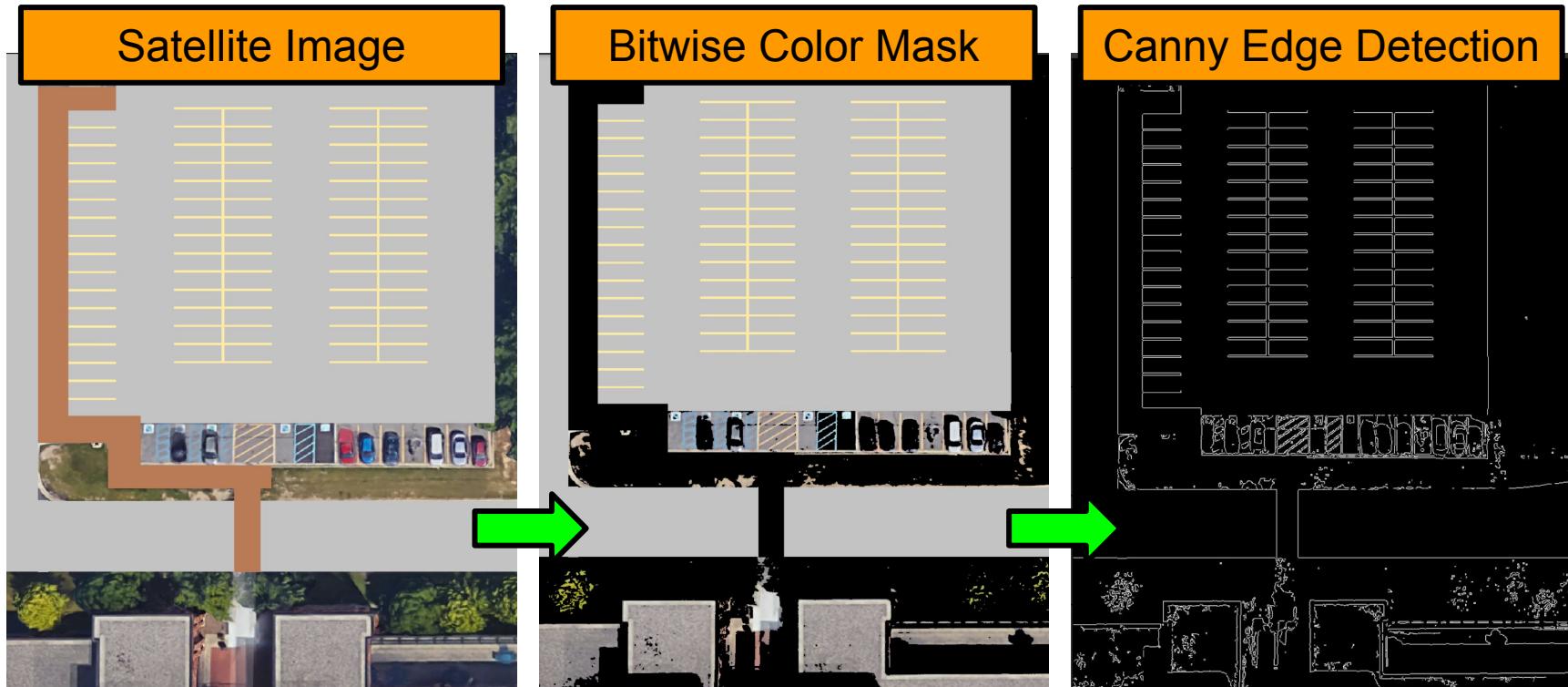
Module Overview



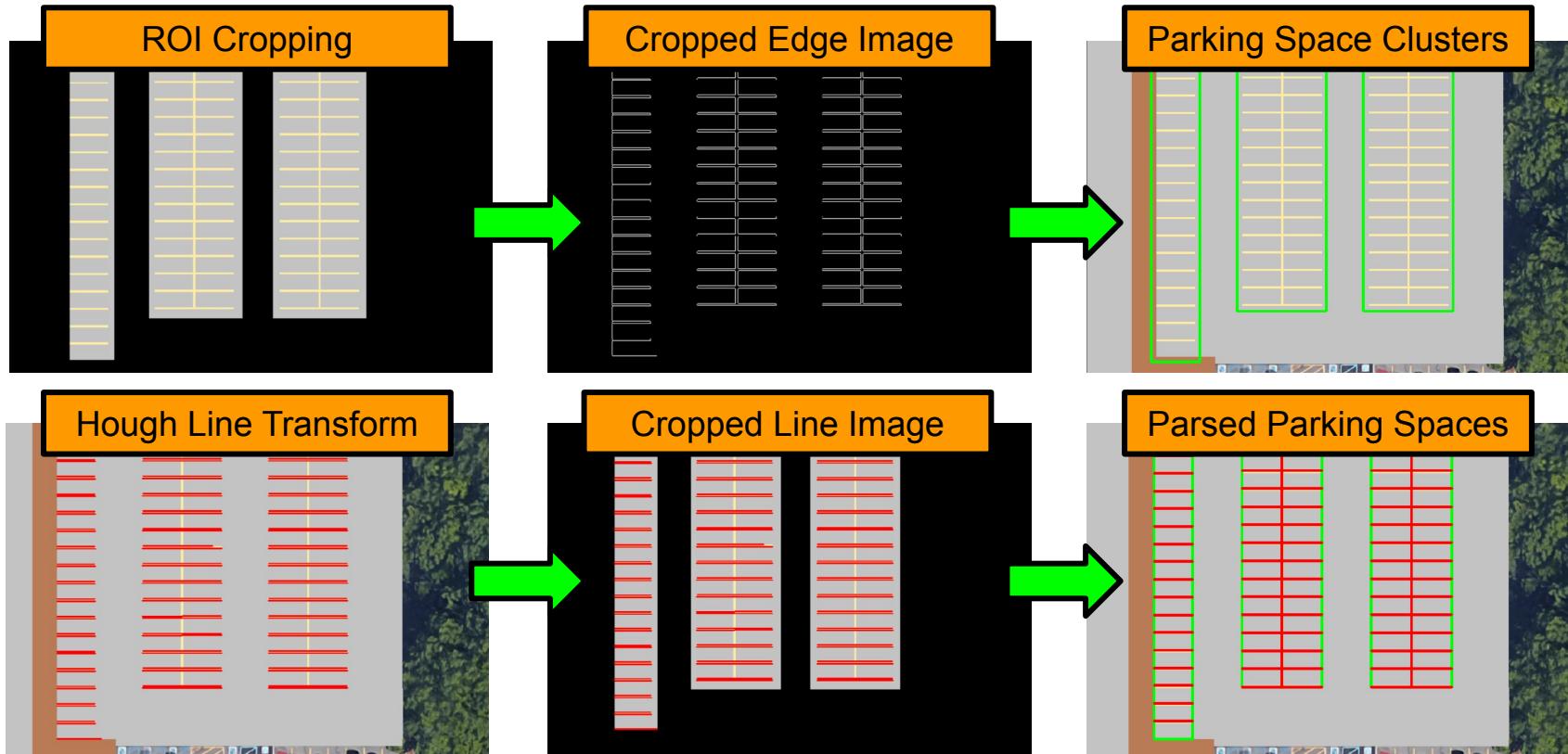
Computer Vision Module (4.1, 4.4)



Computer Vision Module (4.1, 4.4)



Computer Vision Module (4.1, 4.4)

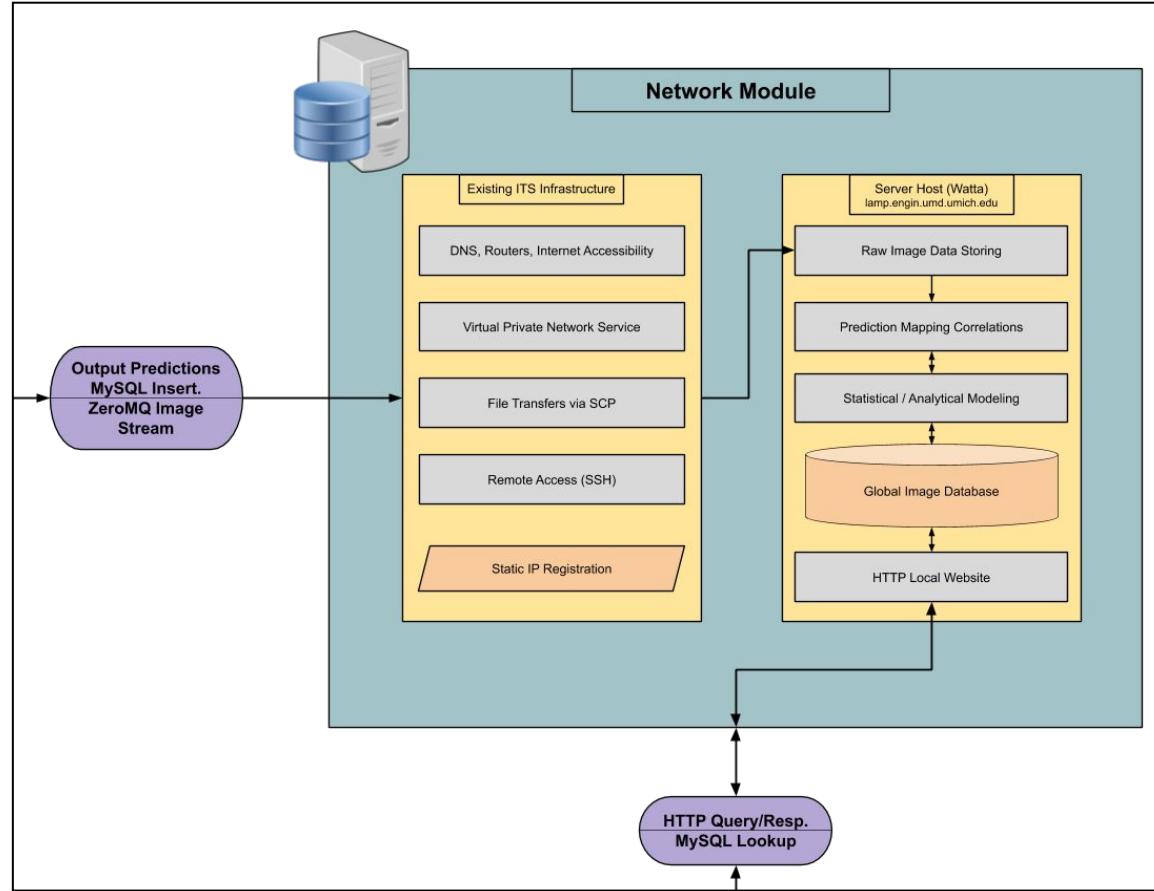


Computer Vision Module (4.1, 4.4)

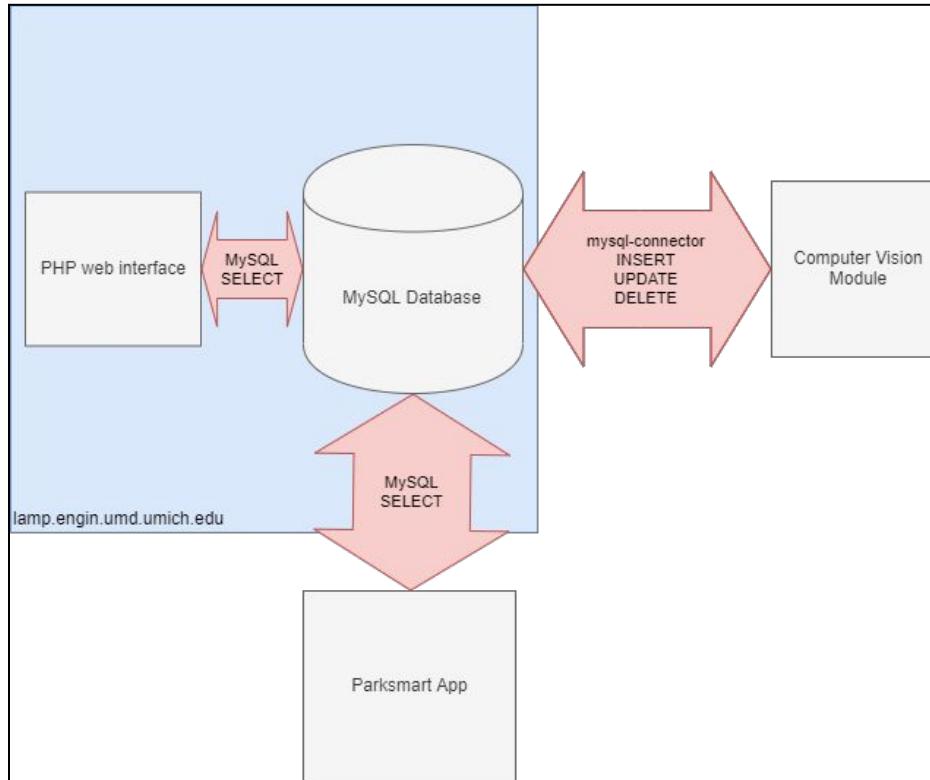
1	18	19	48	49
2	20	21	50	51
3	22	23	52	53
4	24	25	54	55
5	26	27	56	57
6	28	29	58	59
7	30	31	60	61
8	32	33	62	63
9	34	35	64	65
10	36	37	66	67
11	38	39	68	69
12	40	41	70	71
13	42	43	72	73
14	44	45	74	75
15	46	47	76	77
16				
17				

Parking Space ID Dictionary

Network Module (4.2)

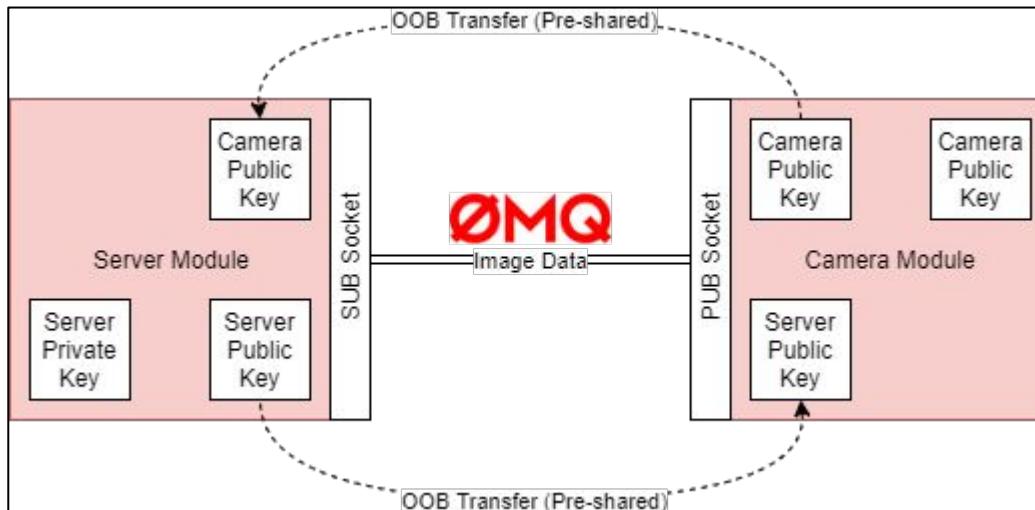
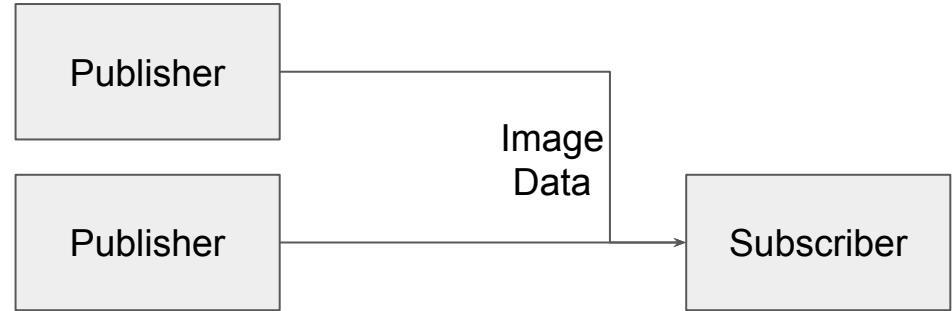


Network Module (4.2)

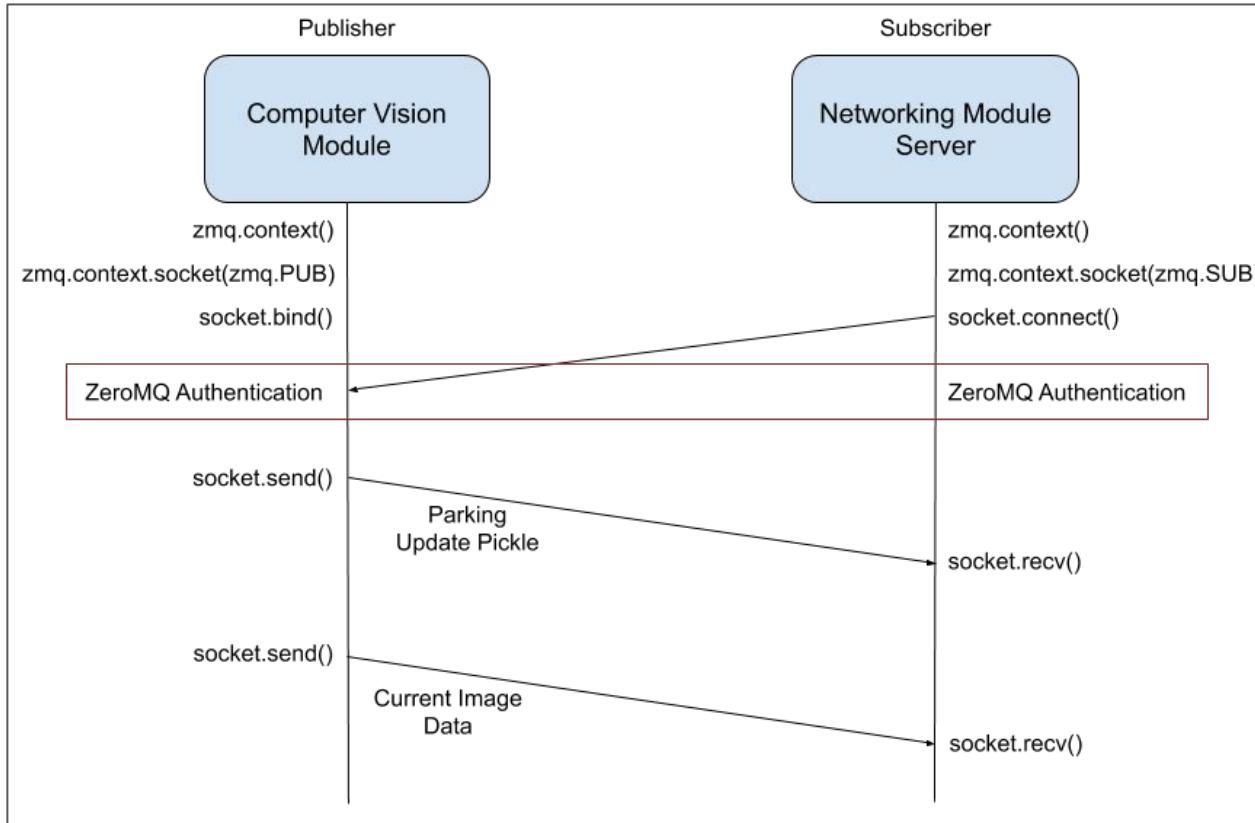


Network Module (4.2)

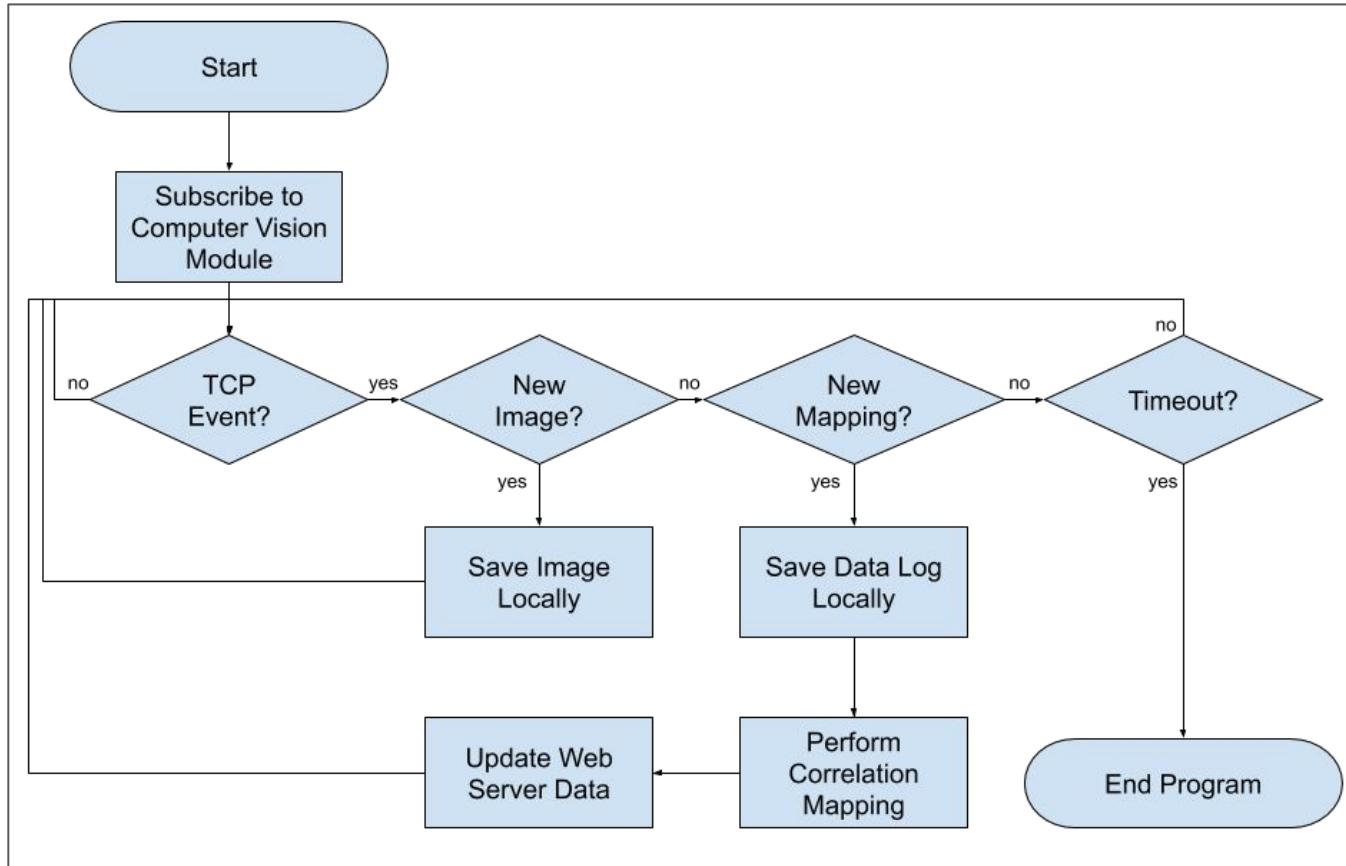
- Publisher-Subscriber Model
- Certificates to establish trust
- TCP sockets to publish and subscribe to image data across the network
- Certificates transferred manually with SSH



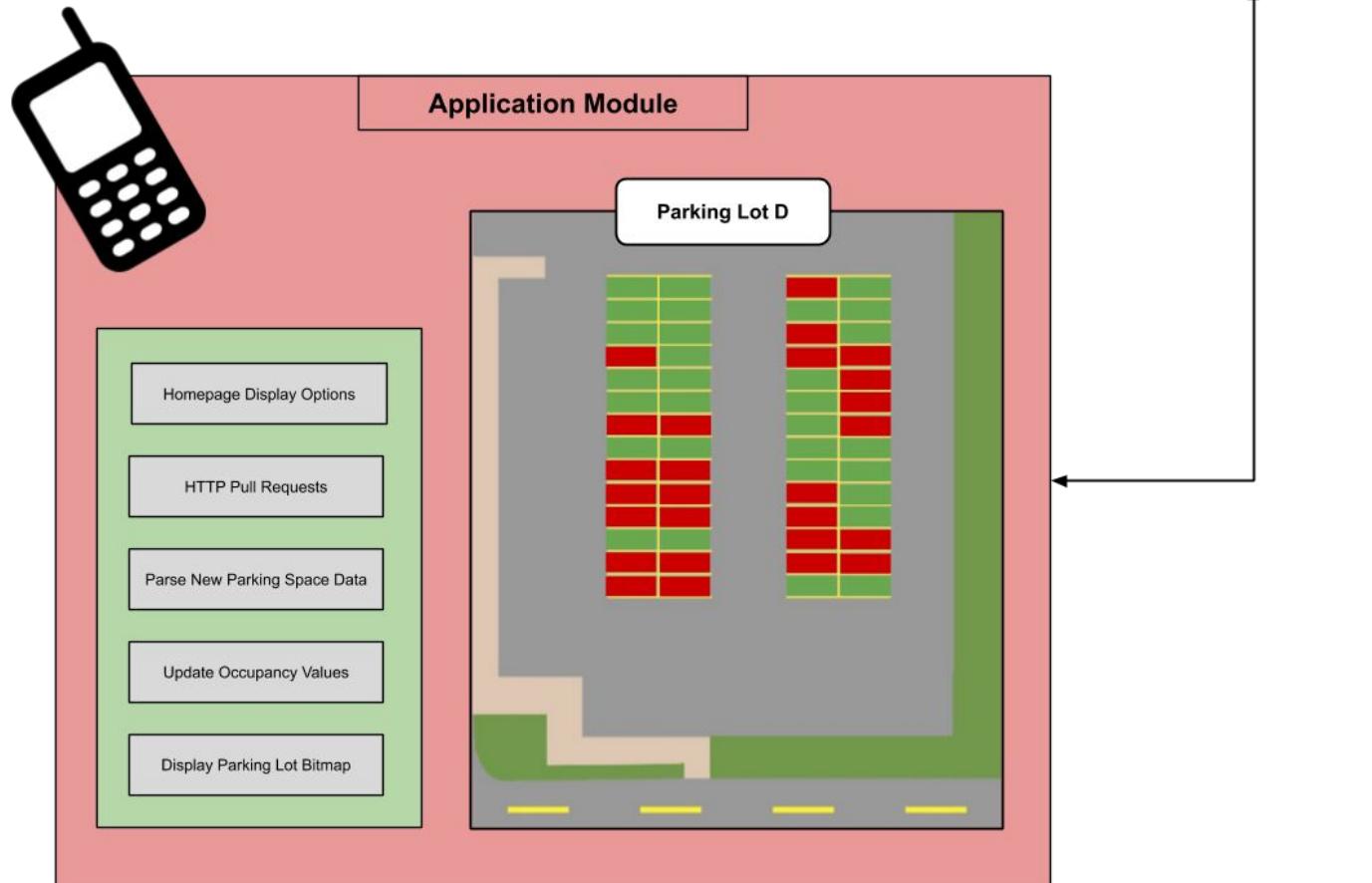
Network Module (4.2)



Network Module (4.2)

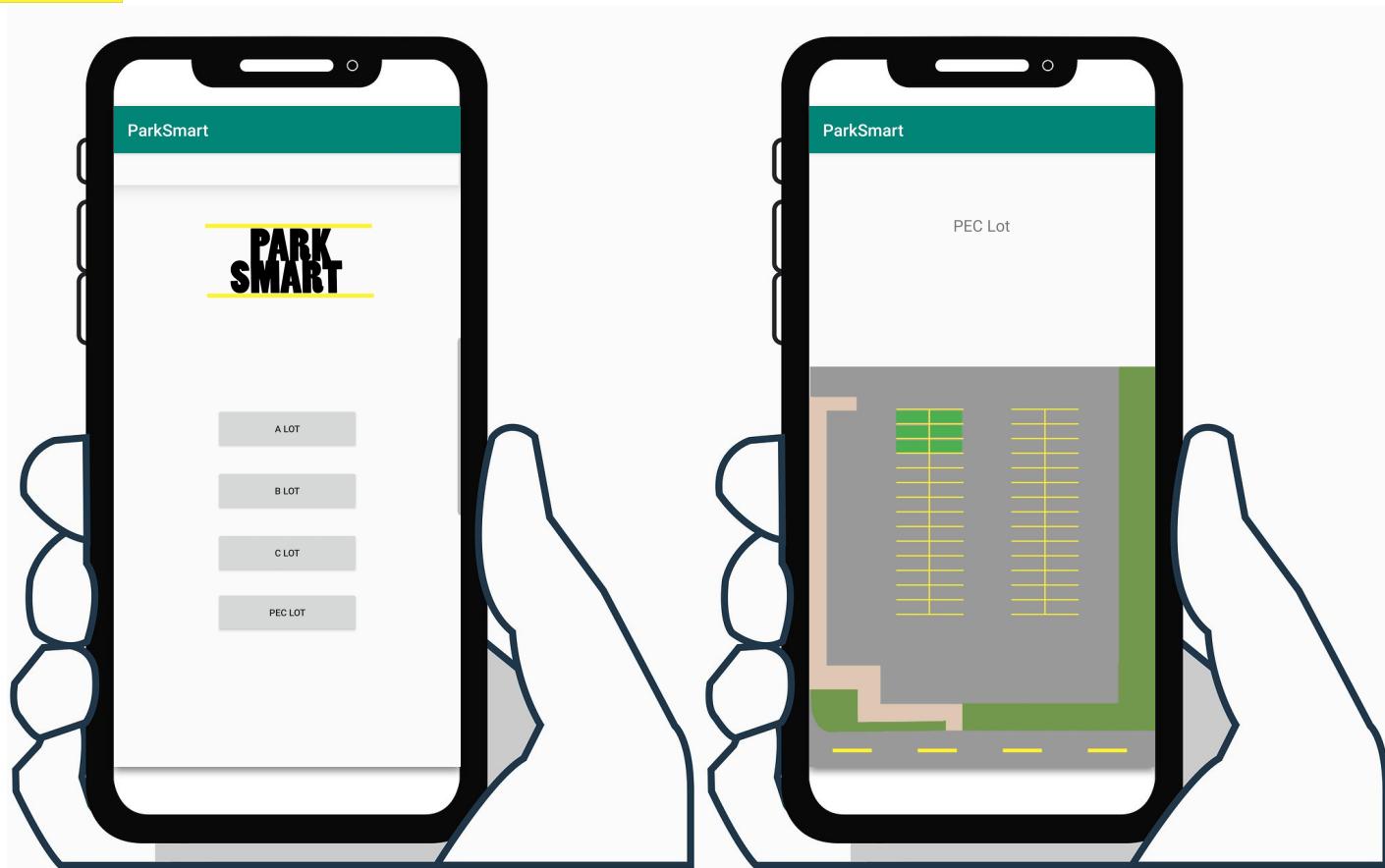


Application Interface Module (4.3)

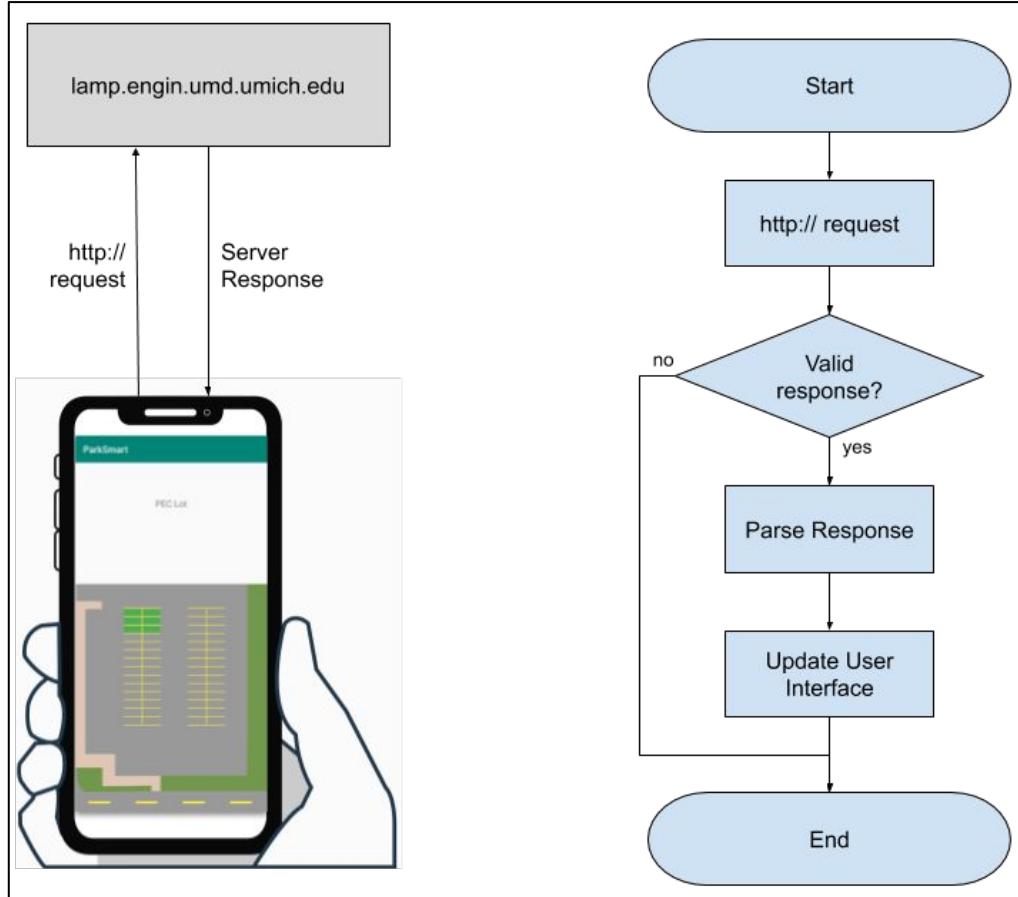




Application Interface Module (4.3)



Application Interface Module (4.3)



Enclosure (4.4)



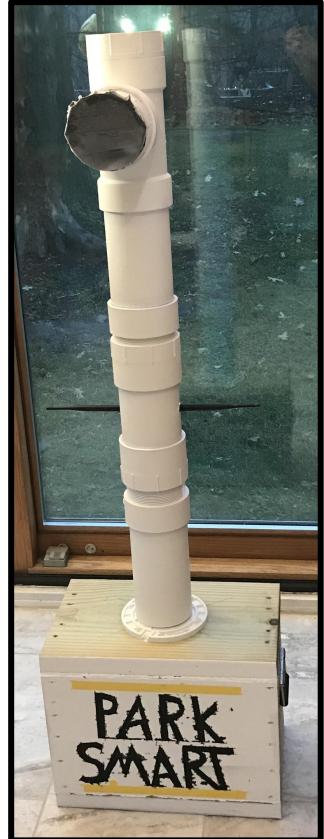
Bottom



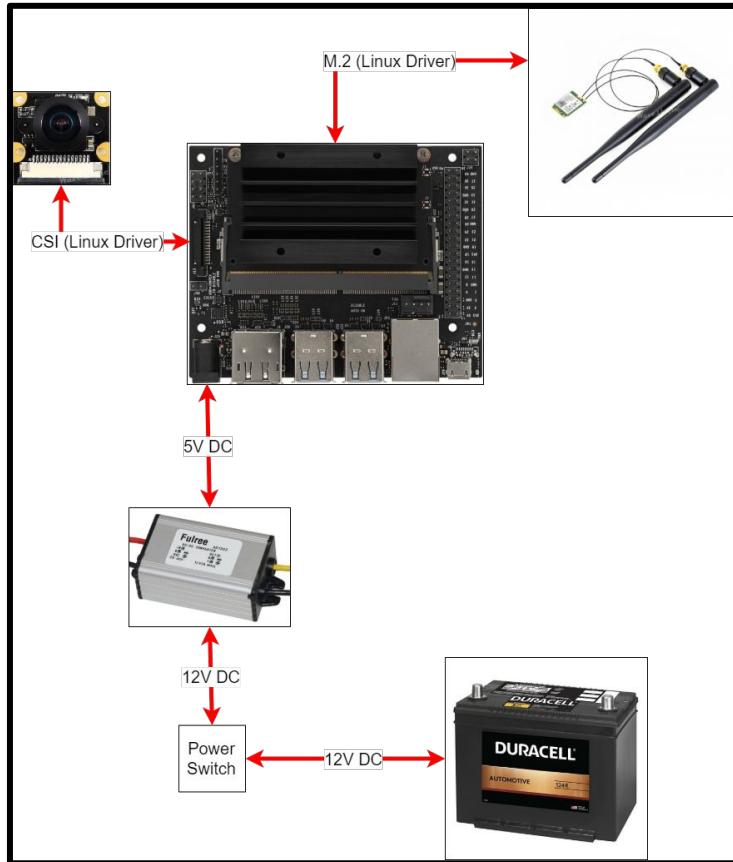
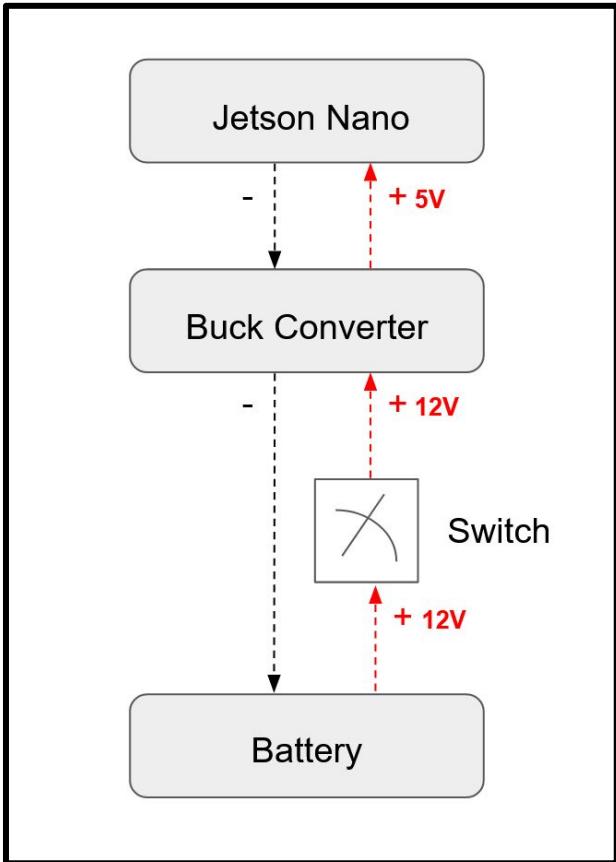
Top



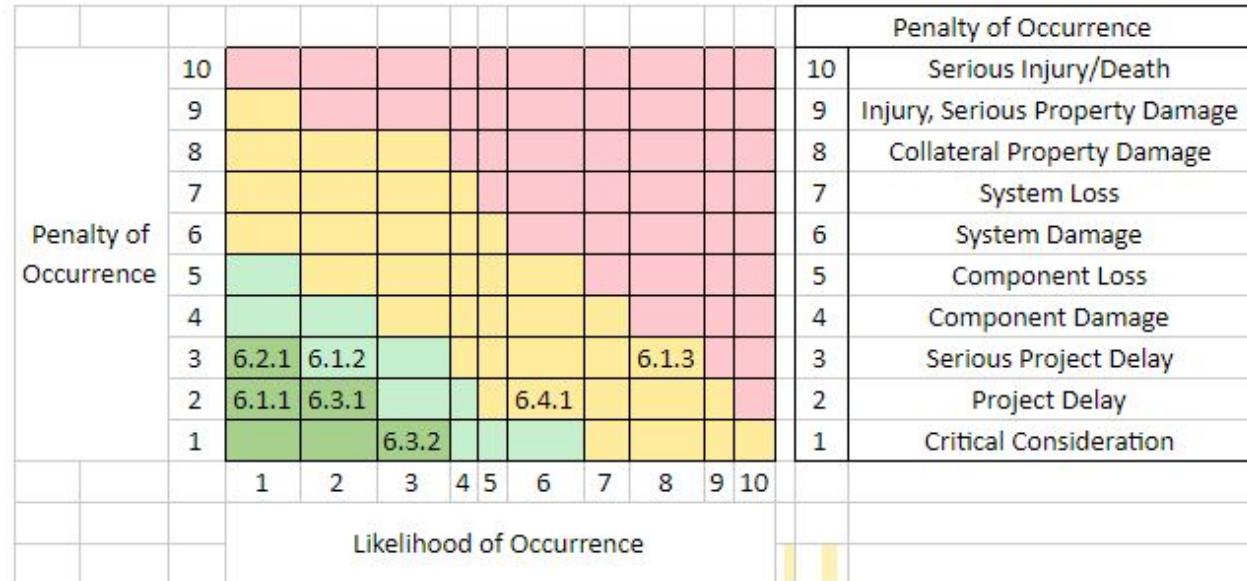
Full Structure



Wiring Diagram (4.4)



Risk Assessment & Mitigation



Safety Features

- Hardware switch to turn the Camera Module On/Off
- System Containment sealed to prevent damage from weather conditions
- System Isolation: Wireless Connection and battery Operation
- Roof access by certified personal
- Remote data logging prevents loss in system failure
- Authentication/Encryption to protect system data



Excursions

~~6.3.1.1 Wireless Excursion~~

6.3.1.2 Wireless Range Excursion

6.3.2 OpenCV Excursion

~~6.3.3.1 Web Server Hosting Excursion~~

6.3.3.2 App Development Excursion

~~6.3.3.3 ZQM and CurveZQM Evaluation Excursion~~

6.3.3.4 Website Hosting Evaluation Excursion

~~6.3.4.1 Campus Access to Information Gathering Location~~

6.3.4.2 Placement and Data Acquisition Excursion

Budget

module	no	Item	Vendor	Model/Part No.	Unti Cost	Qty	Sub Total Cost
Vision	1	wideangle camera	Waveshare	IMX219-160 Camera	30	1	30
Vision	2	mount			30	1	30
Vision	3	case & fan			22	1	22
Image Processing	4	microcomputer board	NVIDIA	Jetson Nano	100	1	100
Image Processing	4	256 GB MicroSD	Amazon	MB-ME256GA	40	1	40
Comm	6	jetson NIC	Waveshare	AC8625 NIC	25	1	25
Power Management	7	TBD				TBD	+
Total Cost Estimates							267+

Master Schedule

