

Big Brother

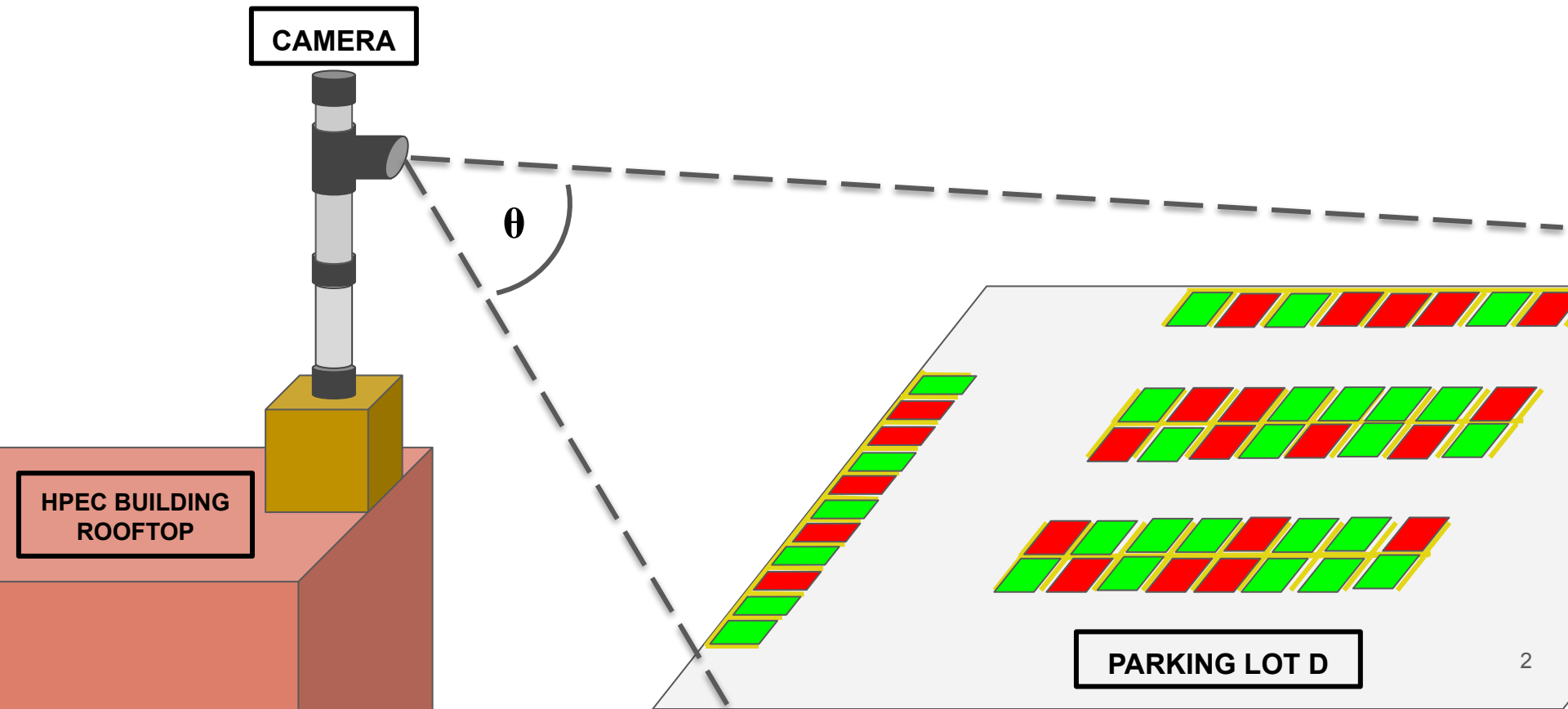
Low Level Design

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Project Advisor - Professor Miller

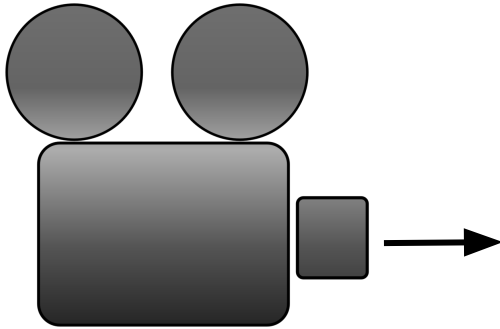
Concept

LEGEND:
Vacant Spot = 
Occupied Spot = 

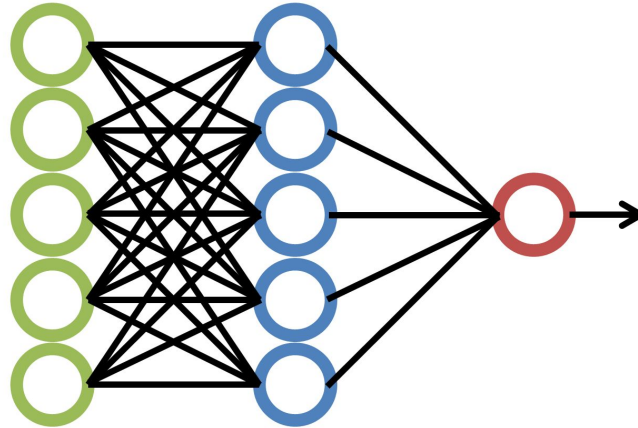


Concept

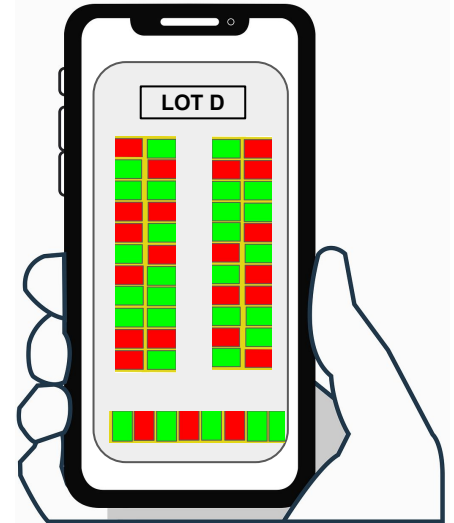
Input Parking Lot Images



Convolutional Neural Network

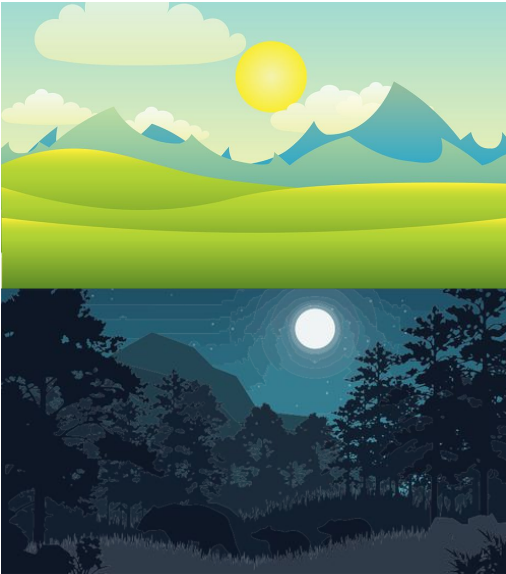


Parking Spot Availability App



Constraints

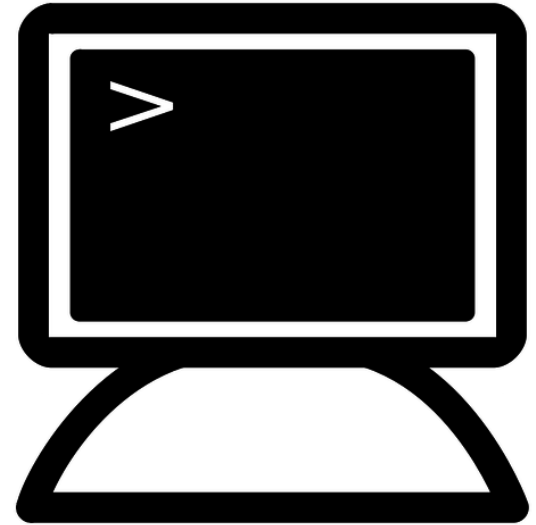
Lighting & Visibility



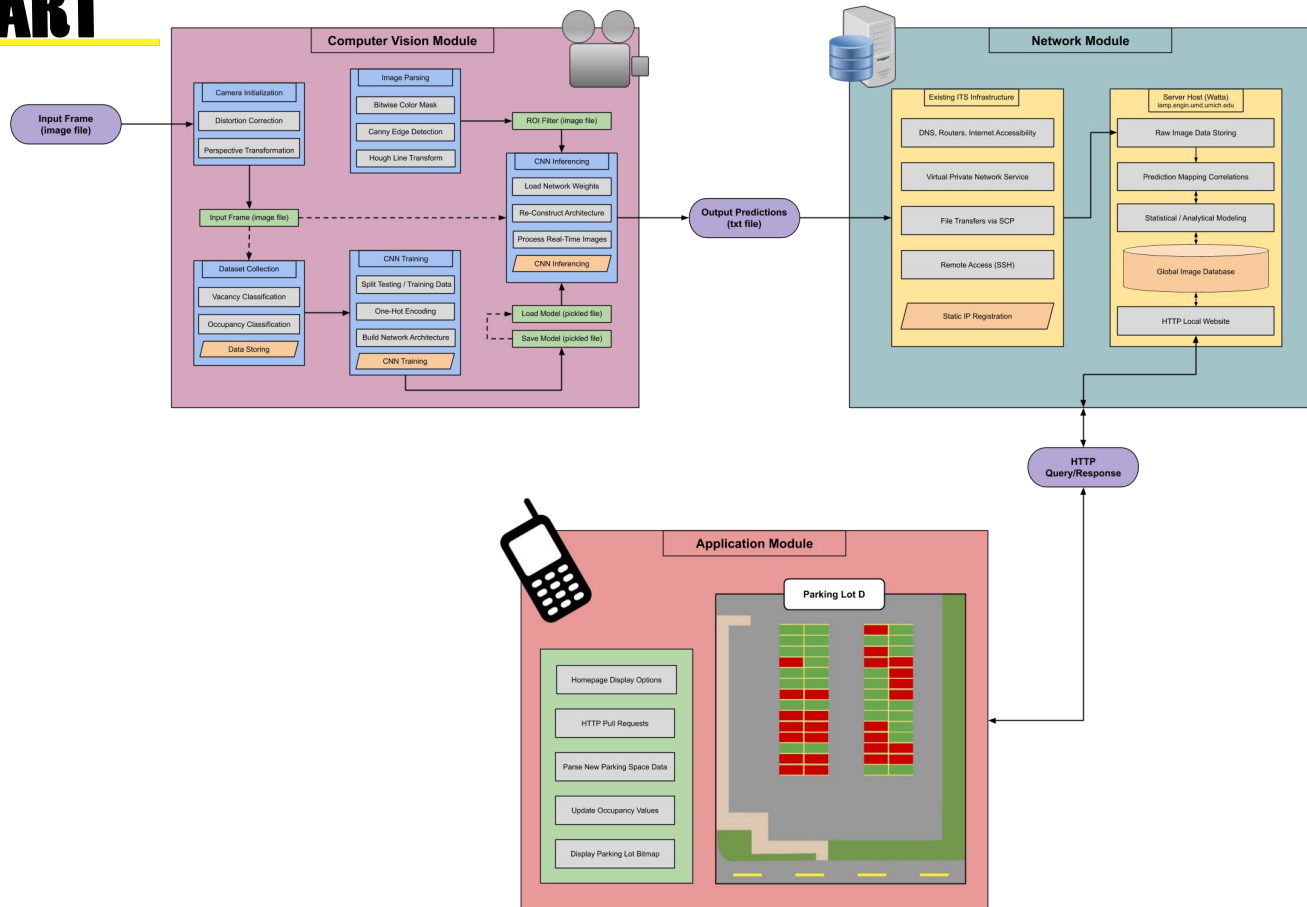
Power Management



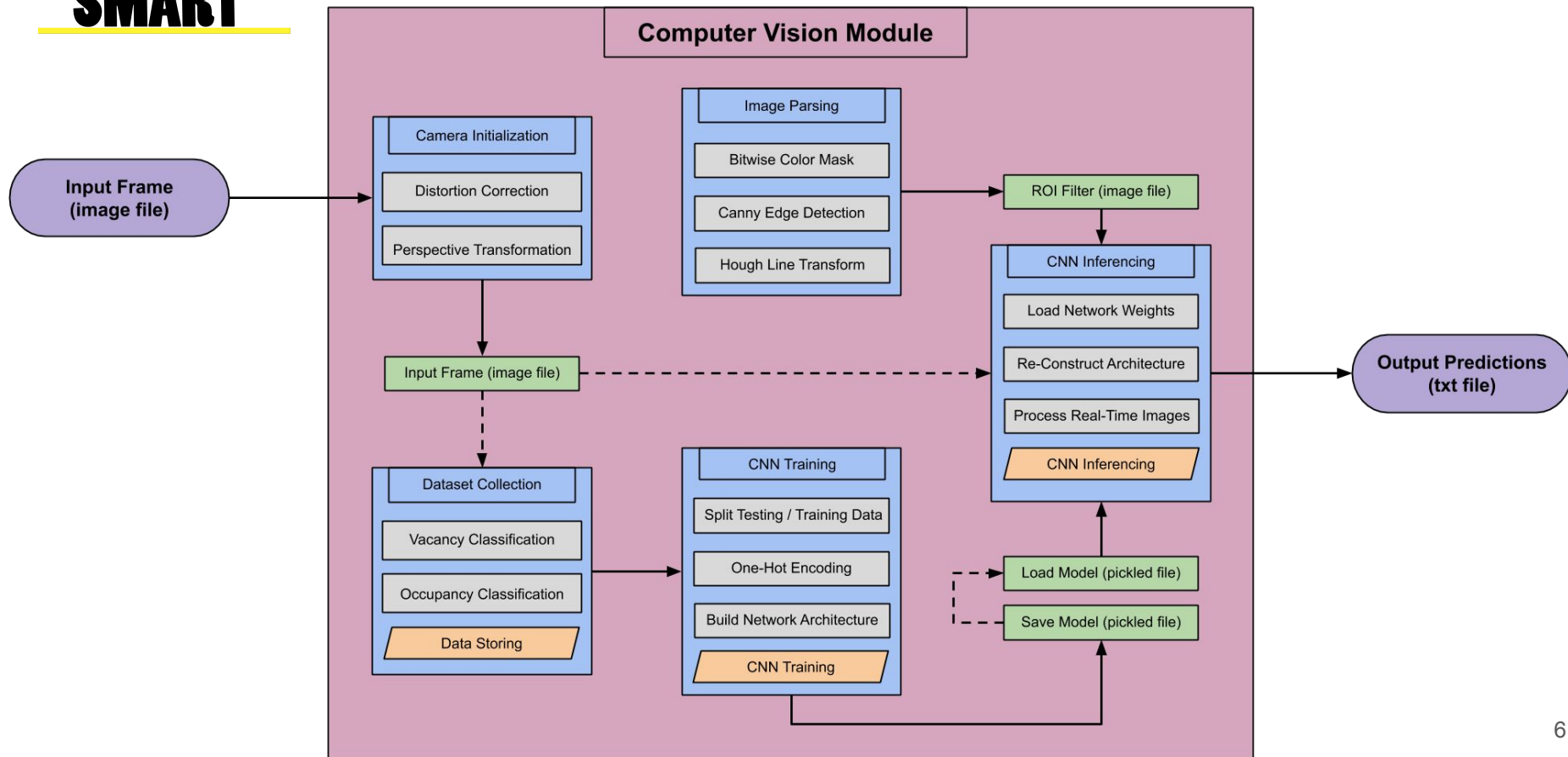
Accessibility



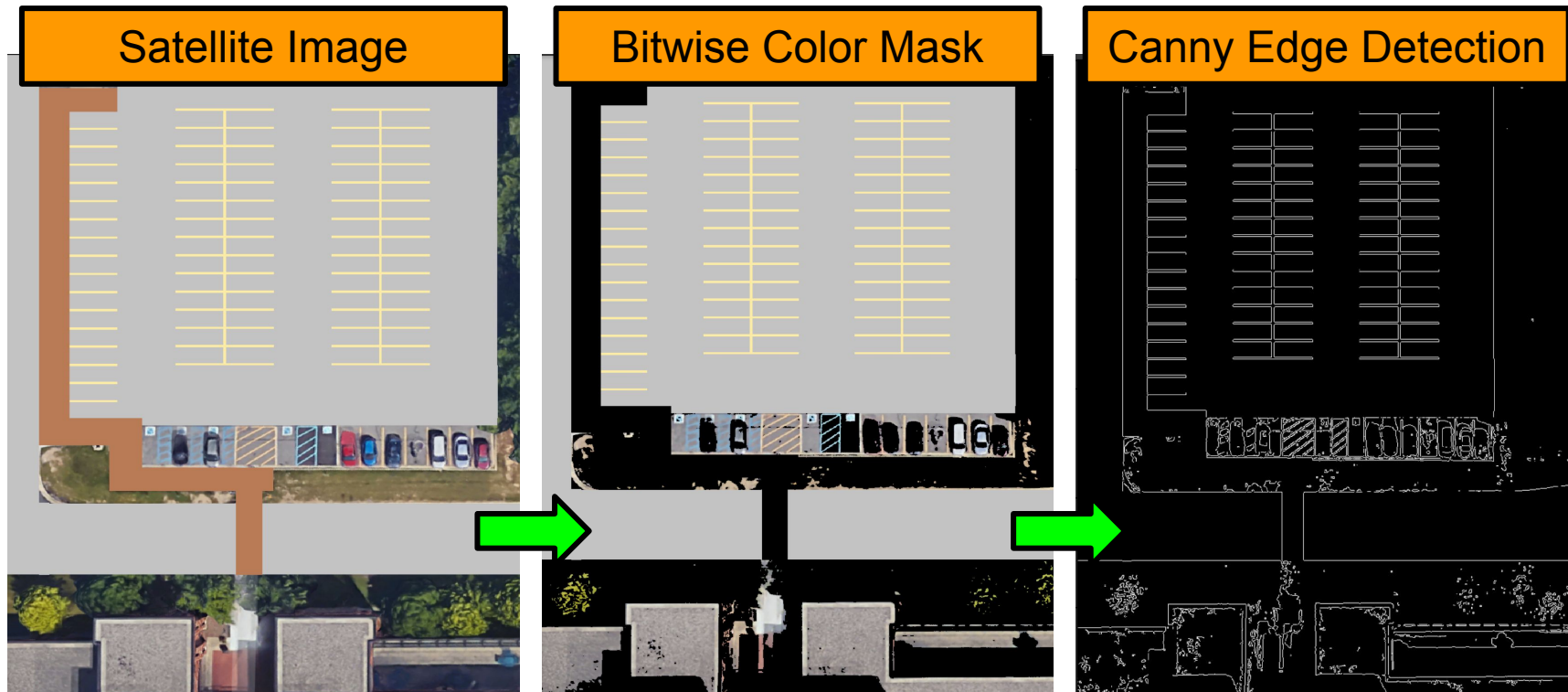
Module Overview



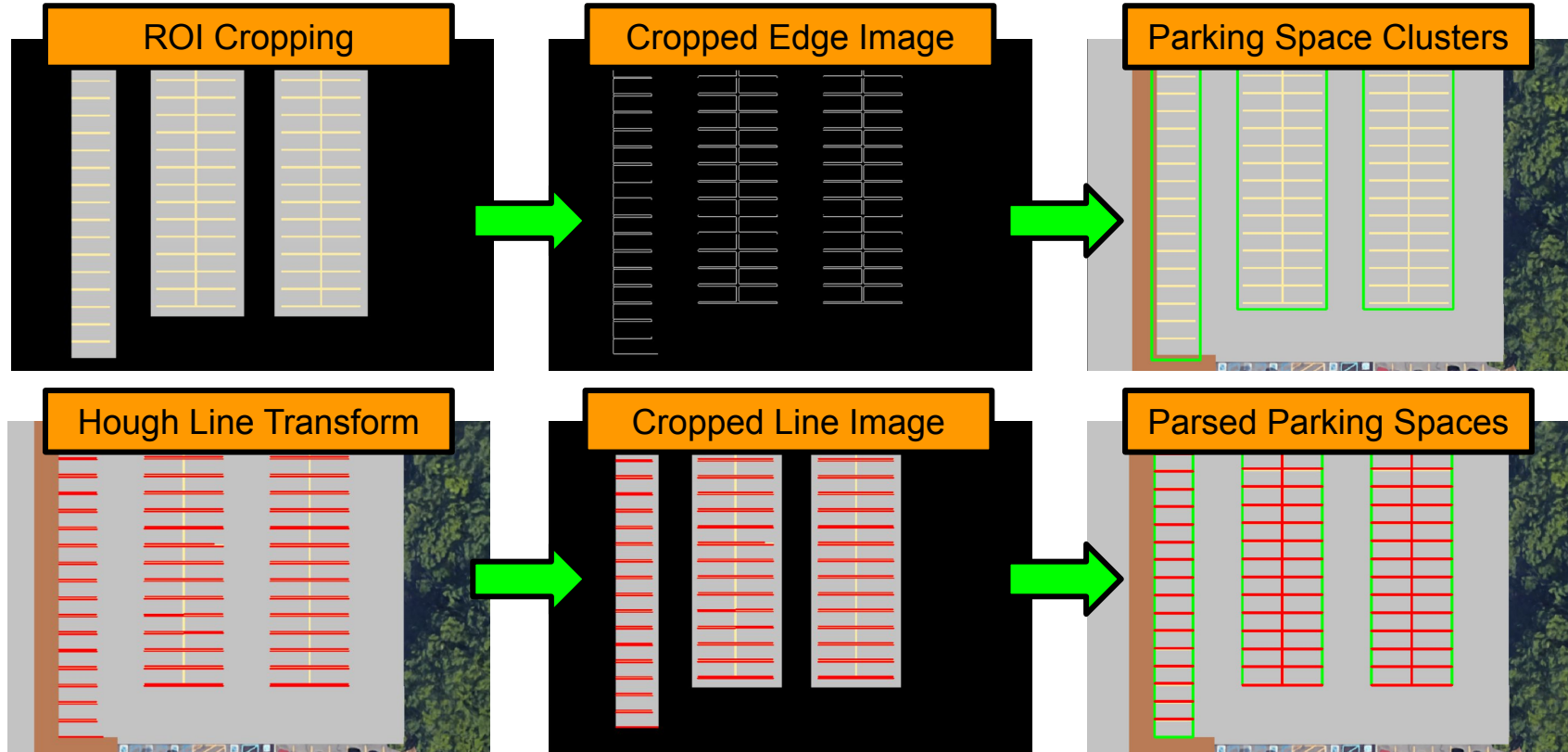
Computer Vision Module (4.1, 4.4)



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Computer Vision Module (4.1, 4.4)

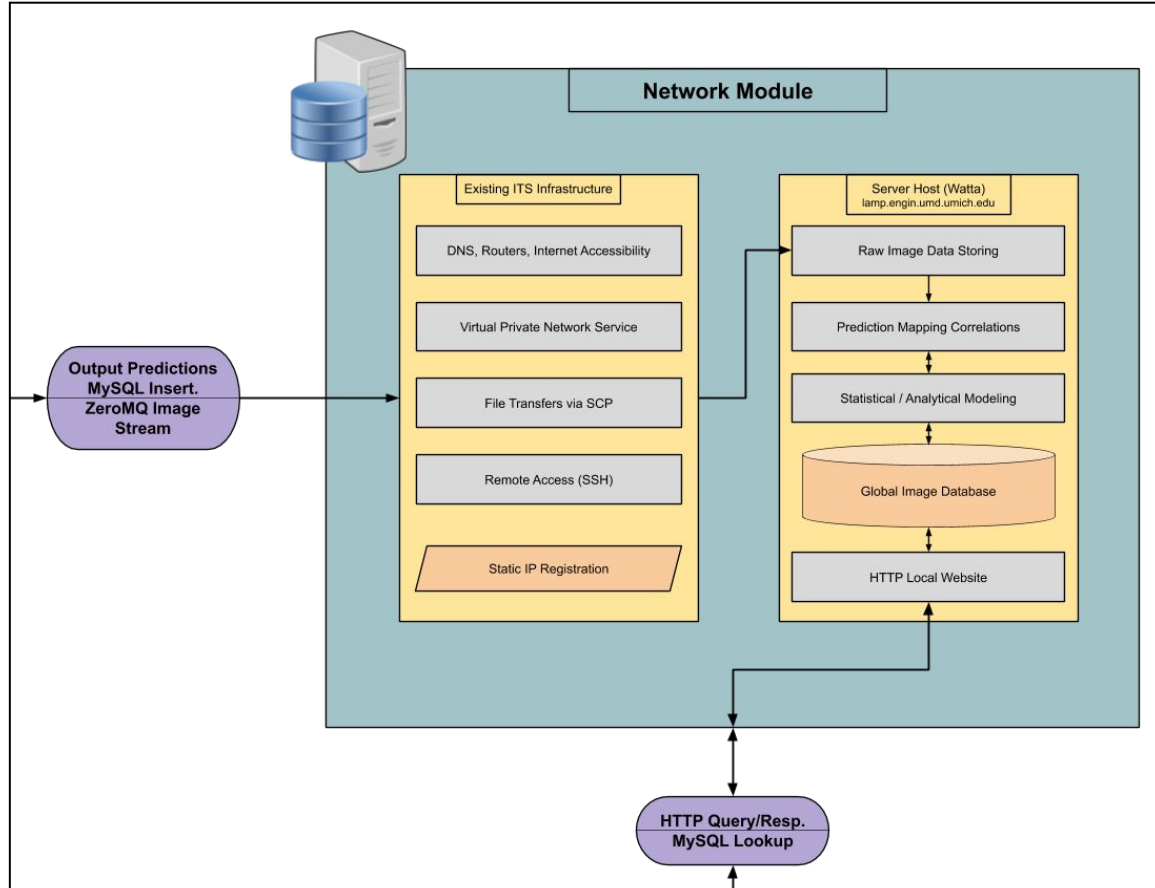


Computer Vision Module (4.1, 4.4)

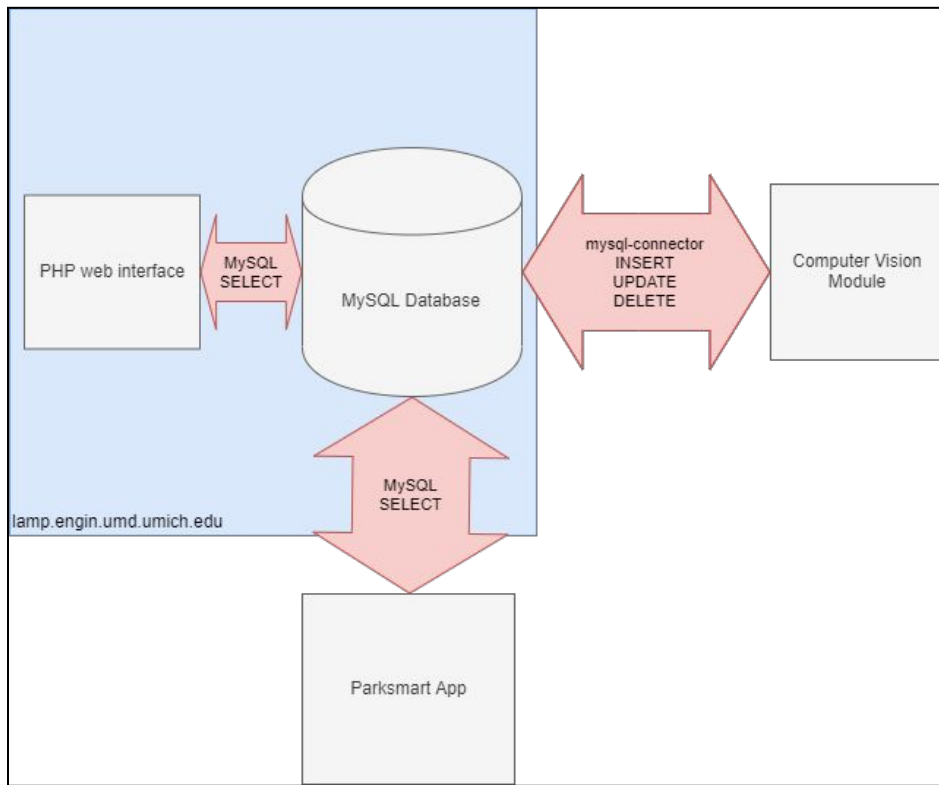
1	18	19	48	49
2	20	21	50	51
3	22	23	52	53
4	24	25	54	55
5	26	27	56	57
6	28	29	58	59
7	30	31	60	61
8	32	33	62	63
9	34	35	64	65
10	36	37	66	67
11	38	39	68	69
12	40	41	70	71
13	42	43	72	73
14	44	45	74	75
15	46	47	76	77
16				
17				

Parking Space ID Dictionary

Network Module (4.2)

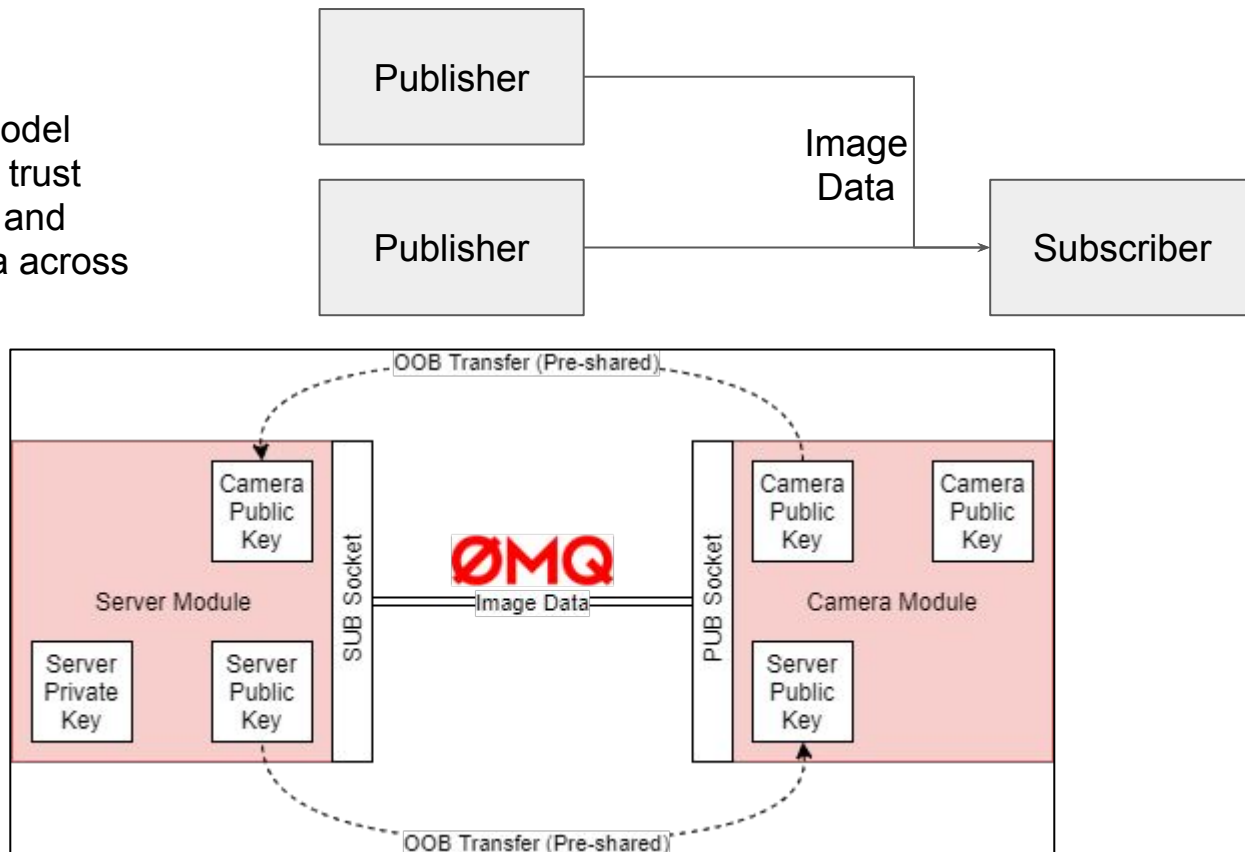


Network Module (4.2)

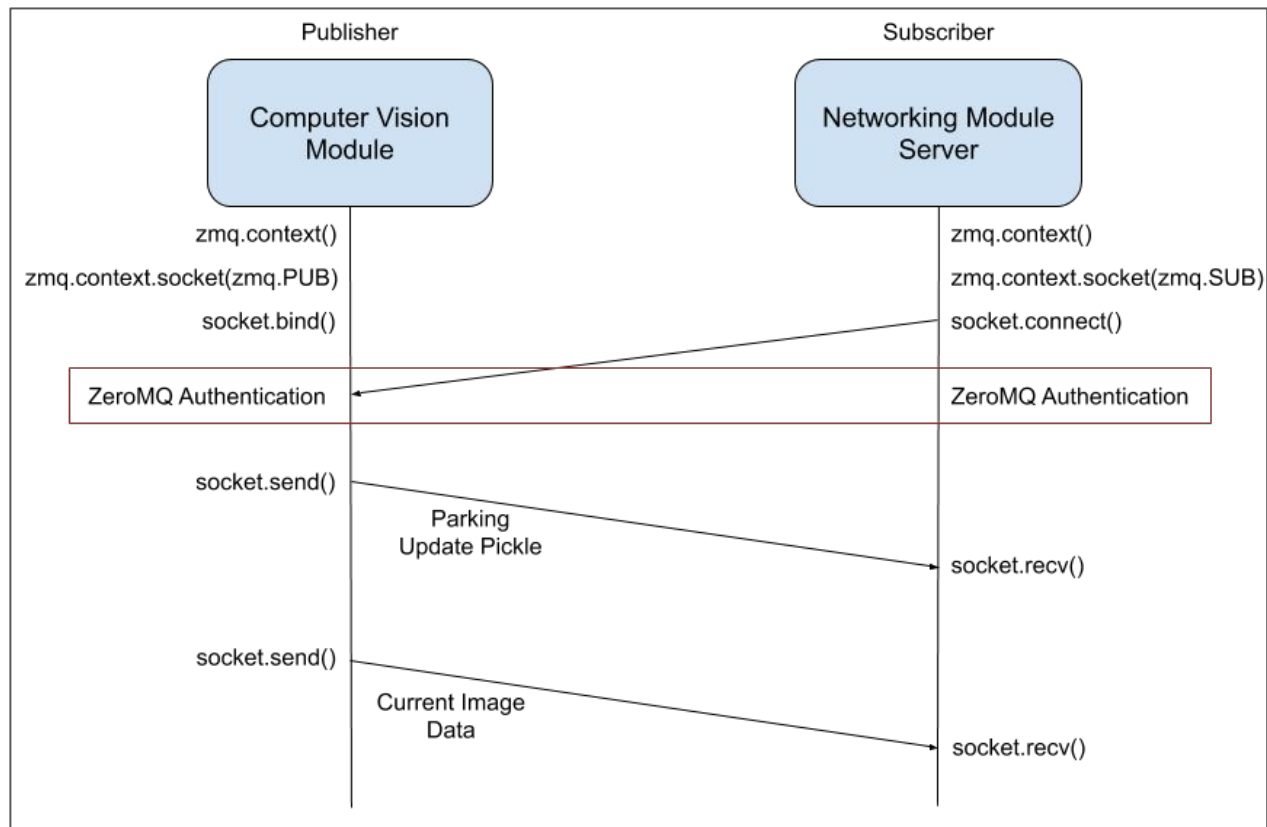


Network Module (4.2)

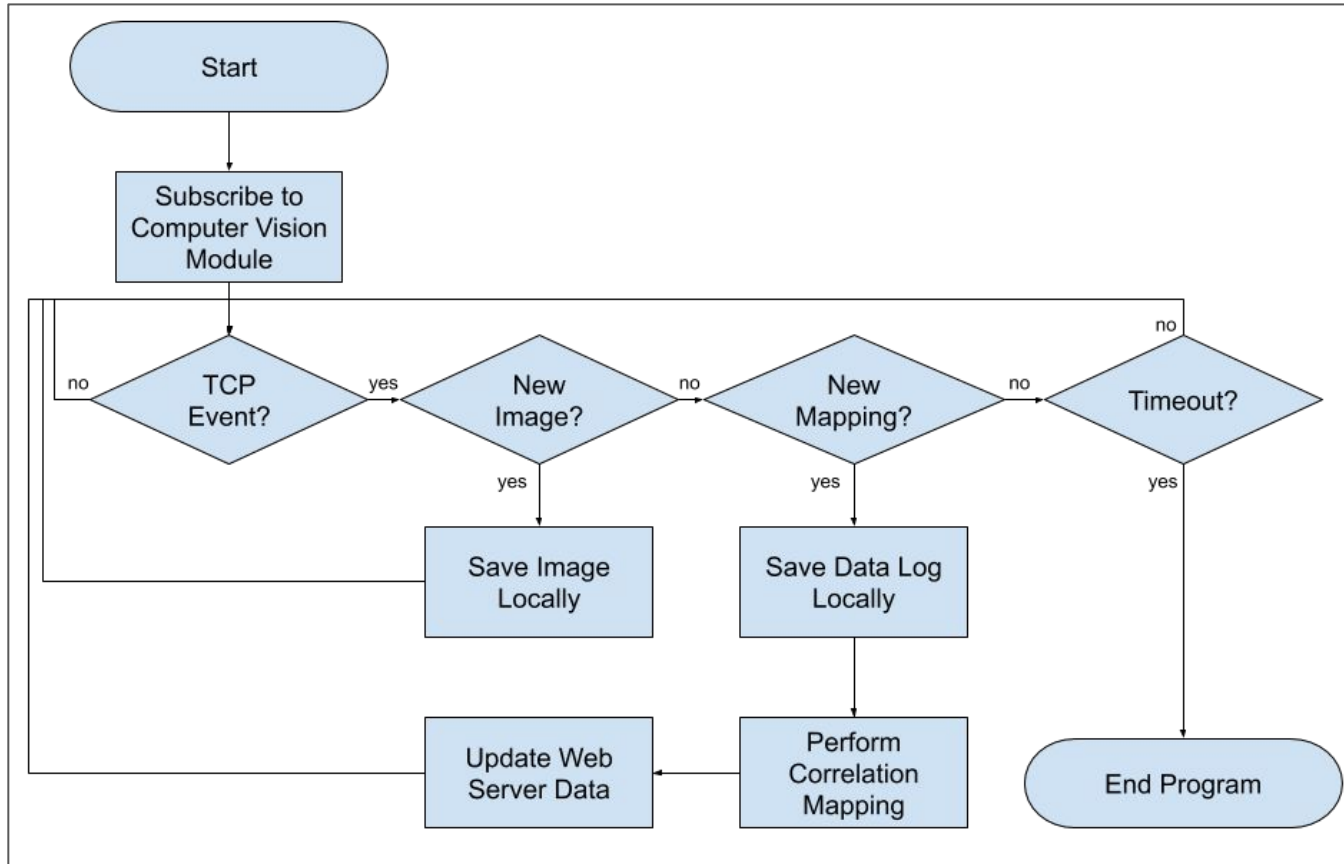
- Publisher-Subscriber Model
- Certificates to establish trust
- TCP sockets to publish and subscribe to image data across the network
- Certificates transferred manually with SSH



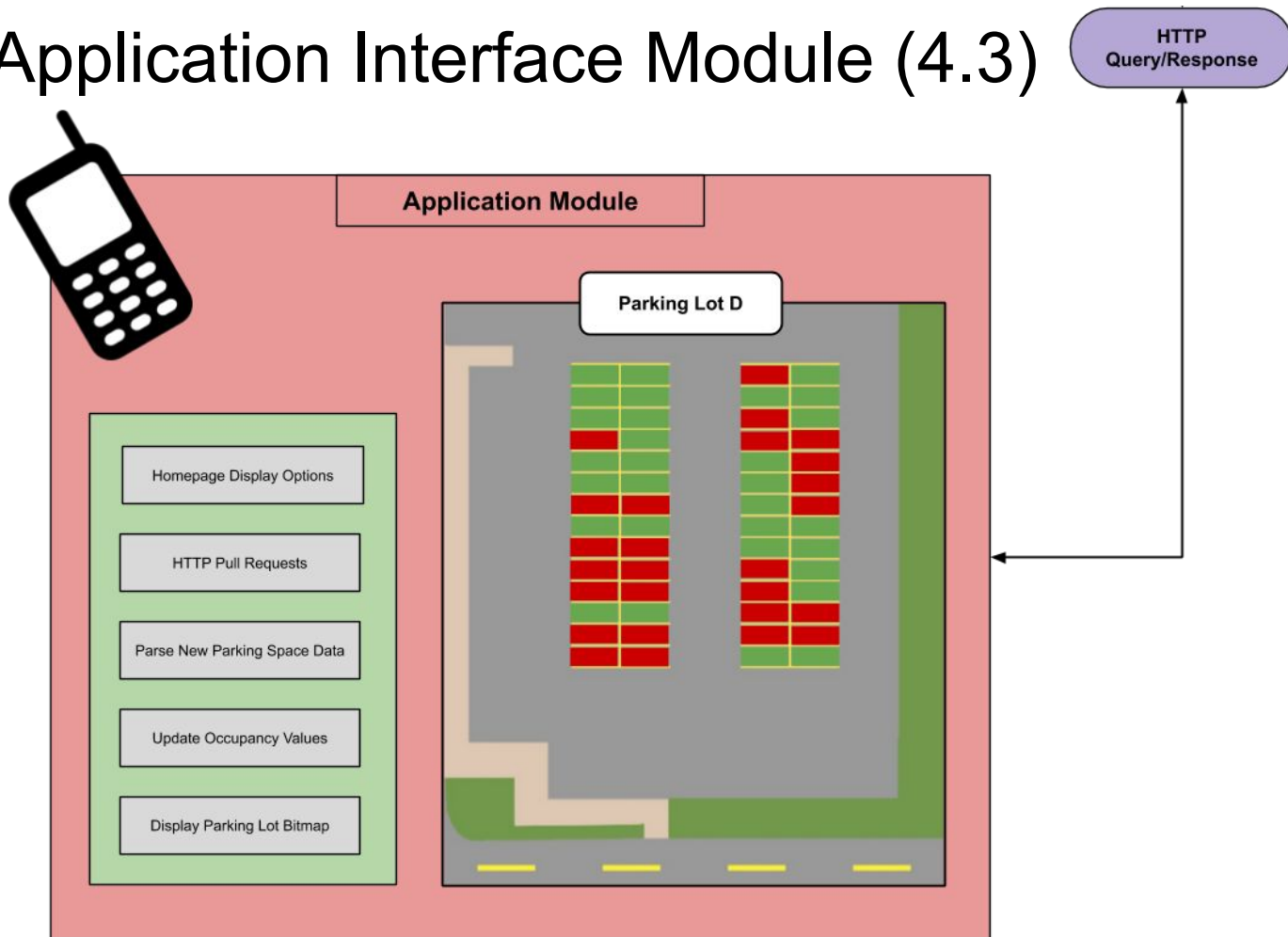
Network Module (4.2)



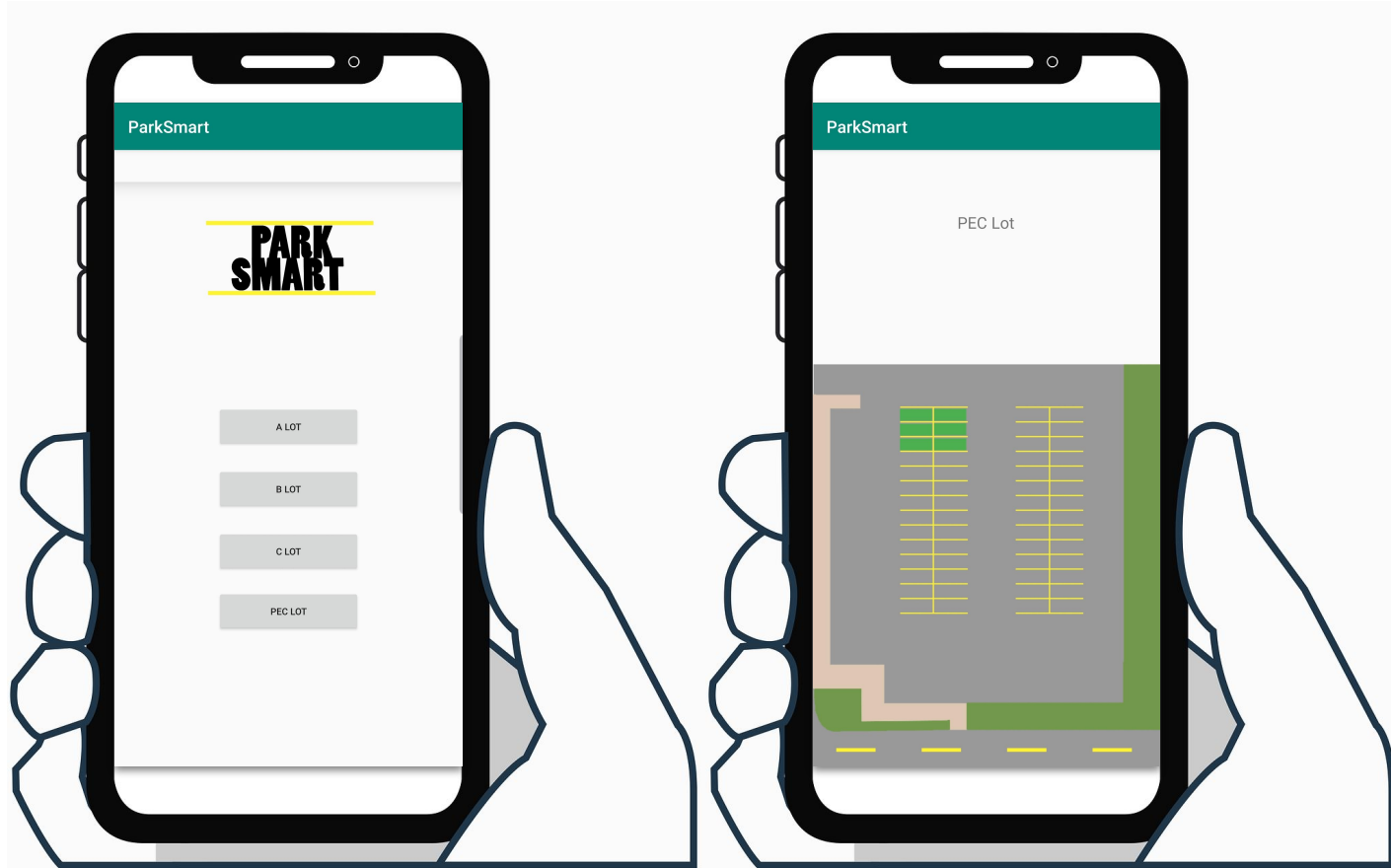
Network Module (4.2)



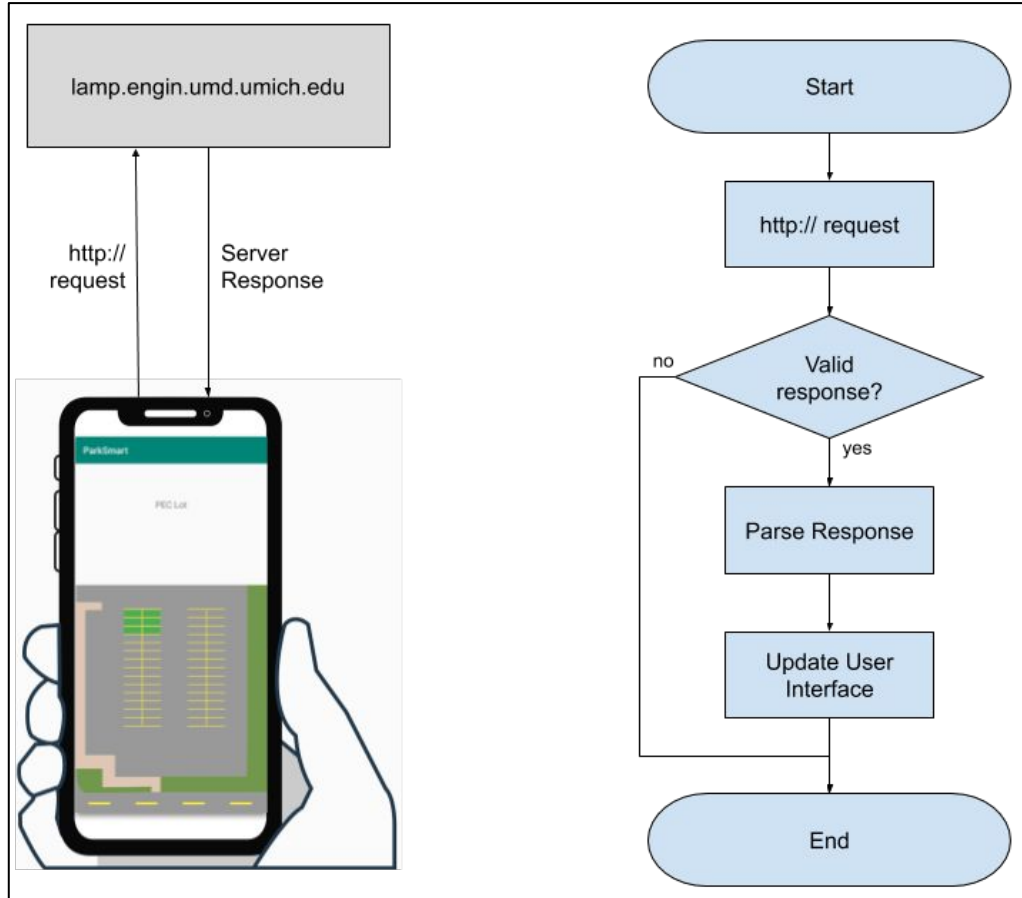
Application Interface Module (4.3)



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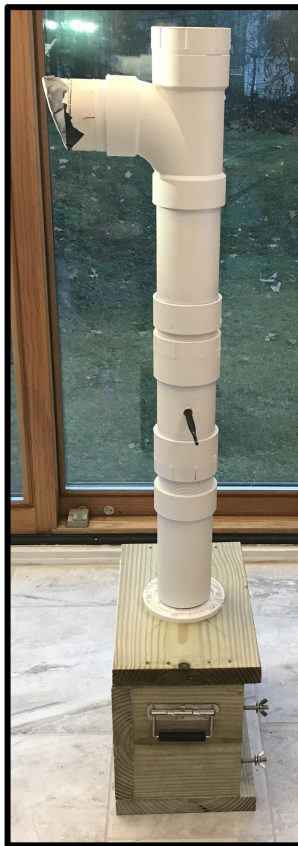
Enclosure (4.4)



Bottom

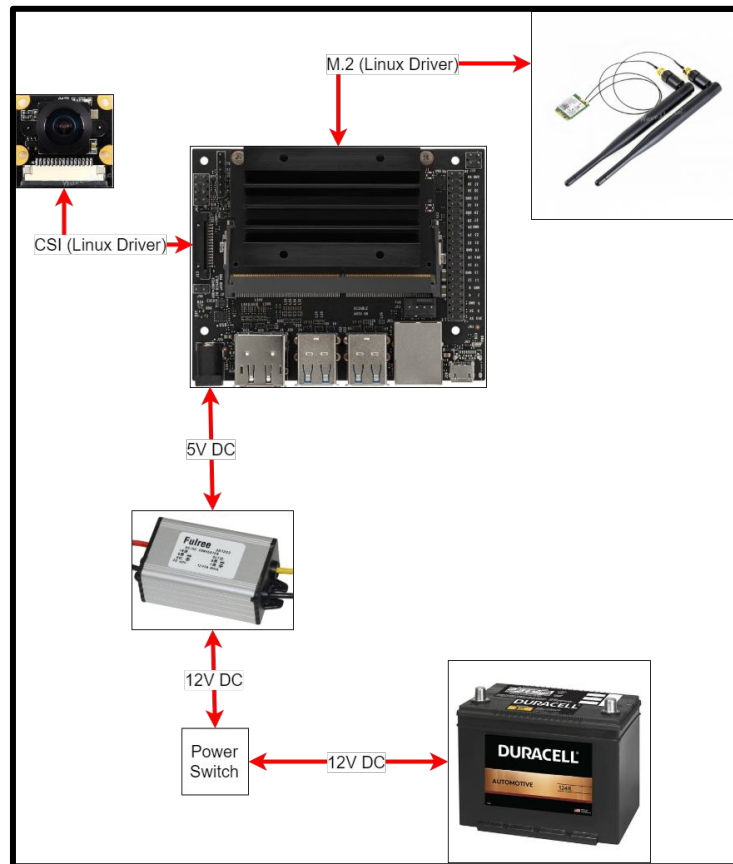
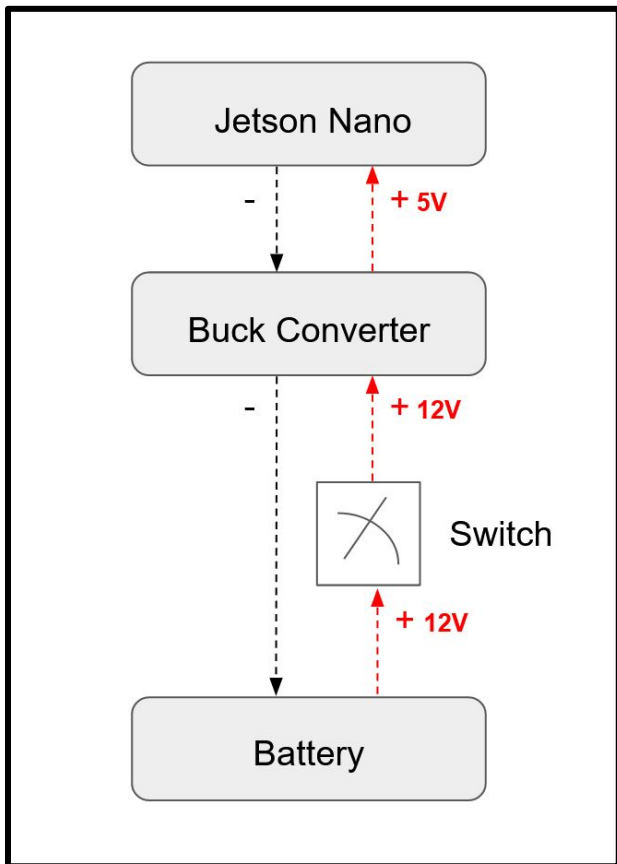


Top



Full Structure

Wiring Diagram (4.4)



Risk Assessment & Mitigation

												Penalty of Occurrence	
Penalty of Occurrence	10											10	Serious Injury/Death
	9											9	Injury, Serious Property Damage
	8											8	Collateral Property Damage
	7											7	System Loss
	6											6	System Damage
	5											5	Component Loss
	4											4	Component Damage
	3	6.2.1	6.1.2						6.1.3			3	Serious Project Delay
	2	6.1.1	6.3.1			6.4.1						2	Project Delay
	1			6.3.2								1	Critical Consideration
		1	2	3	4	5	6	7	8	9	10		
Likelihood of Occurrence													

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

