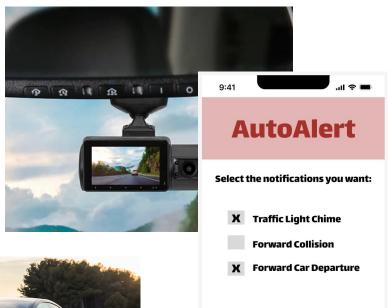
Use Case: Problem + Project Intro

- Non-luxury cars and older cars don't have access to high-end safety features
- Bridge gap with affordable solution via dash cam that detects traffic lights, lanes, and obstacles that connects to mobile app that alerts driver





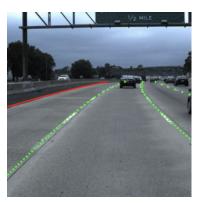


Select the volume:

Use Case: Application + ECE Areas

- 1. Light chime alert
- 2. Lane detection
- 3. Forward collision alert
- 4. Forward car departure alert

Implemented with software + hardware







Use Case Requirements (1)

Light Chime Alert

- Correct traffic light accuracy (multi-lane situation, different kinds of lights): "90%
- Notification sounds within 2s after turning green
- Tesla: 1s

Lane Detection

- Able to detect lane position up to 99% accuracy
- Road quality
 - Bad (Construction, Closed Lanes, Faded/No Lines):
 90%
 - o Good: 99%

Use Case Requirements (2)

Forward Collision Alert

- Up to **50m** in front
- Active above 3 MPH up to 40
 MPH
- Alert up to 99% accuracy

Forward Car Departure Alert

- Notification sounds when car in front moves 10ft+
- Other luxury car: detect car that moves 10ft+ when stationary

Technical Challenges (1)

Light Chime Alert

- Unable to detect traffic light position / type of traffic light (specific to right-turn only, etc)
- Risk Mitigation: Modify nearest-light algorithm

Lane Detection

- Unable to correctly identify left and right lanes
- Risk Mitigation: Reviewing openCV code, improving video processing code

Technical Challenges (2)

Forward Collision Detection

- Alert doesn't go off on time, driver crashes into car
- Alert goes off too frequently
- Risk Mitigation: Chip allocation – have one chip dedicated to forward collision

Leaving Car Detection

- Unable to detect car
- Car detection goes off when not necessary
- Risk Mitigation: Chip allocation – add more sensors to detect cars

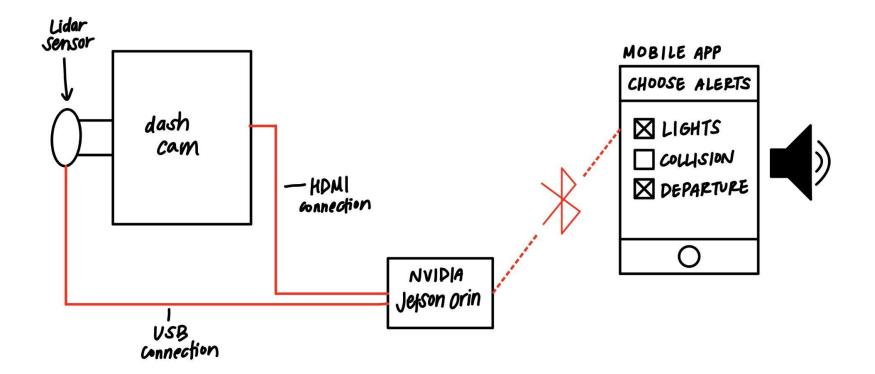
Solution Approach

- Hardware: NVIDIA Jetson Orin
- Software: Mobile development (Swift), object detection (OpenCV)
 - Mobile app: notification sound + selecting what notifications user wants
- Other:
 - Dash Cam
 - TeraRanger Evo 60 Lidar Sensor
 - Power source for hardware + dashcam
 - Wire connections (USB, HDMI)





Solution Approach: Diagram



Testing, Verification, and Metrics (1)

Light Chime Alert

- Drive around with model running to see whether or not light changes are properly detected
- Measure how long notification takes
- % of accuracy (how many lights the alert is successful on)

Lane Detection

 Drive around with model running and see whether or not adjacent lanes are properly detected

Forward Collision Detection

 Use two toy cars and mount system to cars to safely simulate and test this since we can't do this in real life

Leaving Car Detection

- Drive around with model running and see whether or not leaving cars are properly detected
- Measure how long notification takes
- % of accuracy (how many lights the alert is successful on)

Testing, Verification, and Metrics (2)

Demo

- Building track indoors
- 2 RC cars, 1 that holds system of dash cam and "box" and the other to simulate interactions between two cars



Division of Tasks and Labor

Ankit

Lane detection

Connections between camera, hardware, and software

Emily

detection

Forward collision

Forward car departure detection

Eunice

Equipment

procurement

Traffic light detection

Mobile application development

Schedule

AutoAlert GANTT Chart

PROJECT TITLE	AutoAlert	COMPANY NAME	ECE Capstone Fall 2024
PROJECT MANAGER	Ankit, Emily, Eunice	DATE	8/26/24

													PROP	OSAL	PHA	SE											DI	SIGN	PHAS	E			
WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION	PCT OF TASK COMPLETE		WEEK 1				WEEK 2			7	WEEK 3			WEEK 4					WE	WEEK 5			WEEK 6				WEEK 7	
						001111 22.12	М	T I	W R	F	М	T W	R	F N	1 T	W	R	F	м	T W	/ R	F	М	Т	W R	F	М	T V	V R	F	мт	w	R F
1	Proposal																																
1.1	Team Composition Form	Ankit L	8/26/24	8/28/24	2	100%																											
1.2	Abstract	Eunice L	8/29/24	9/4/24	5	100%																											
1.3	Website Initialization	Emily S	9/10/24	9/14/24	4	90%																											
1.4	Proposal Presentation Slides	Eunice L	9/10/24	9/15/24	5	70%																											
1.5	Proposal Presentation	Ankit L	9/15/24	9/18/24	3	0%						Ī			Ī							Ī				Ī							
1.6	Peer Review	Eunice L	9/15/24	9/18/24	3	0%																											
2	Design																																
2.1	Design Presentation Slide		9/19/24	9/29/24	10	0%	П																										
2.2	Design Presentation		9/30/24	10/2/24	2																												
2.3	Peer Review		9/30/24	10/2/24	2	0%																											
2.4	Design Review		10/3/24	10/11/24	8	0%													1														
3	Development																												1115/20011111				
3.1	Equipment Procurement	Eunice L	10/11/24	10/21/24	10	0%												- 1															

Link: **GANTT Chart**