



# Driver 2.0

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## Team Info

- Team Member:
  - Vasu Bhog - [bhogvu@mail.uc.edu](mailto:bhogvu@mail.uc.edu)
  - ChaoYang Zhu - [zhucy@mail.uc.edu](mailto:zhucy@mail.uc.edu)
  - Chunjie Pan - [pance@mail.uc.edu](mailto:pance@mail.uc.edu)
- Project Advisor:
  - Dr. Wen Ben Jone - [jonewb@ucmail.uc.edu](mailto:jonewb@ucmail.uc.edu)
  - Frank Zhou - [zhoxu@ucmail.uc.edu](mailto:zhoxu@ucmail.uc.edu)

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## Problem

There have been millions of car crashes over the years due to distracted drivers and dangerous objects. Car crashes are continuously increasing and the issue is with drivers that are not aware or distracted. We need to find a solution that everyday drivers can utilize instead of buying a completely new vehicle.

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## Solution

A device that can detect and notify drivers about dangerous objects and distractions on the road in order to reduce the likelihood of a crash along with increasing safety.

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## Project Abstract

Billions of people still drive on the road and have barely any assistance from smart devices to help them while driving. There is a continuous increase in crashes over the years, and there are more and more drivers that are getting on the road. Our project will aim at creating a simple interface based device that will use computer vision and machine learning to detect dangerous situations and objects on the road. This will decrease the probability of crashes and injury, as well as increase the awareness of the driver.

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## Goals statements

- Create/Utilize devices such as Raspberry PI to process driving data
- Utilize camera feed data to detect objects, drivers swaying, and road signs to enhance the driver's safety
- Create an interface to help drivers in all types of conditions

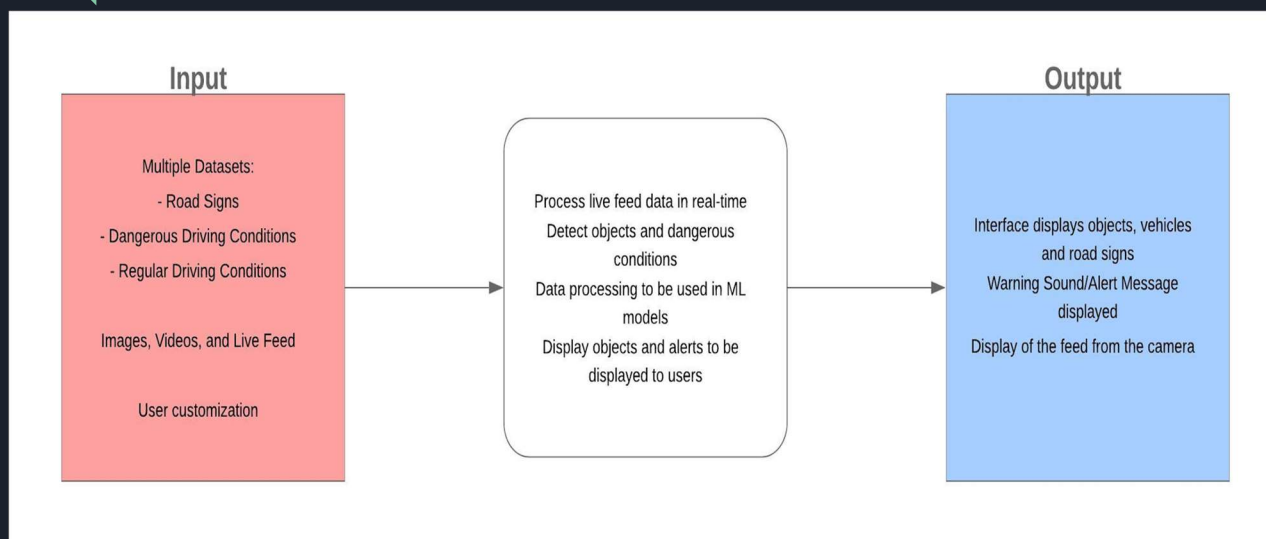
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## User Stories

- As a driver, I want to be able to utilize the device to enable smart detection of dangerous road objects and conditions.
- As a passenger, I want to be able to help navigate and aid the driver using the device and ensuring that the driver is aware.
- As a device owner, I will be able to utilize the advanced modeling that detects driver swaying and fatigue, as well as road sign detection.

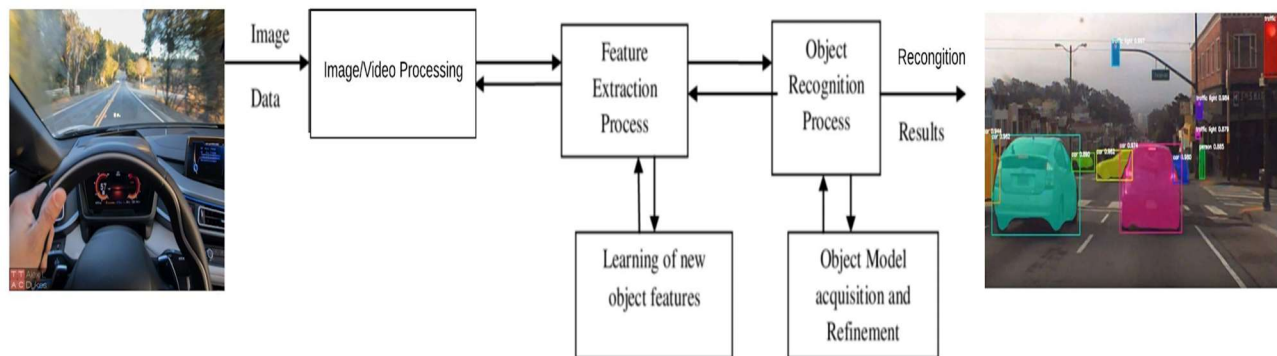
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## Design Diagram



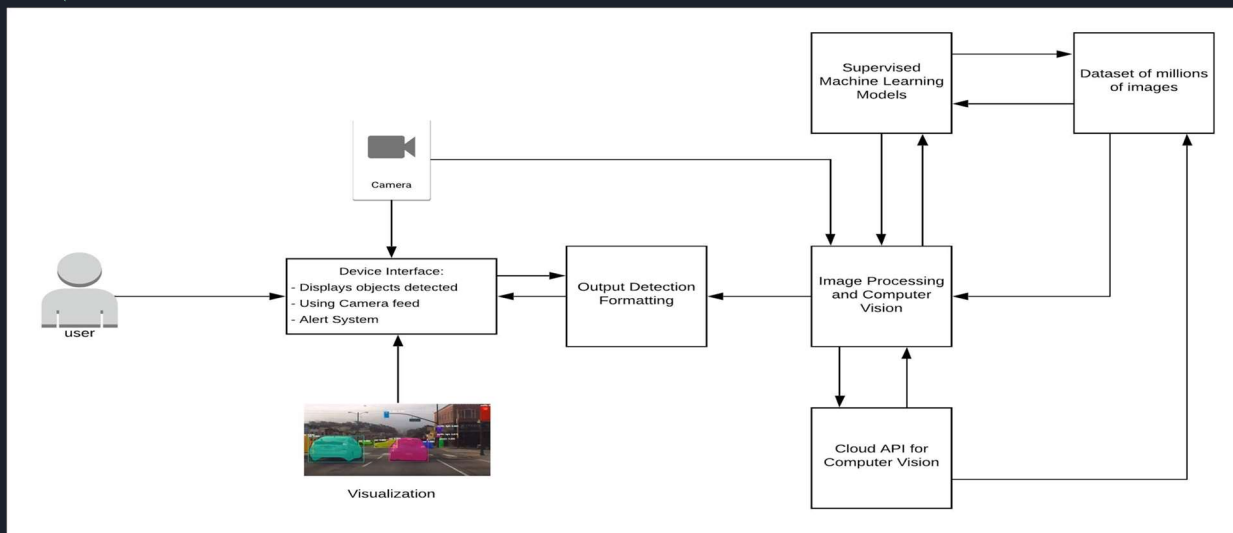
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## Design Diagram 2



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## In Depth Design Diagram



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## Project Constraints

### Economic Concerns

- Our solution will cost us money as we need to purchase parts to create the device. In order the users end cost would be low, we will utilize inexpensive devices. We are not limited to any organization or facility as we will be using open source frameworks.

### Social Concerns

- Safety is of the utmost importance when it comes to driving therefore ensuring our project will be able to positively impact the safety of driving is our main focus.
- Our machine will help drivers use ML and Computer Vision to attain a higher level of safety through alerting the driver of oncoming danger.

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## Current state of project

1. Discussed with Professor Frank about our project and got feedback from additional professors.
2. Researched the object detection and Raspberry Pi.
3. Learning OpenCV and it utilization with different programming languages.
4. Practicing object detection using Python and Java.

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## Expected Accomplishments for the end of this term

- Understand OpenCV and practice object detection using Python/Java and Raspberry PI.
- Research how to train a machine learning model to detect road objects and dangerous conditions.
- Research methods to detect multiple objects in image, video, and live feed to improve the model and device.

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## Timeline for the Project

Dates	Milestones	Tasks
Dec 02 2019 - Dec 27 2019	Create a program that detects objects in driving video data	1,2,3,4,5
Dec 30 2019 - Jan 10 2020	Connect the program to the camera to read live feed data	6,7
Jan 13 2020 - Jan 24 2020	Setup the program to be used with Raspberry Pi	8,9
Jan 27 2020 - Feb 14 2020	Create an alert interface and program that triggers when objects are detected	10,11
Feb 17 2020 - Mar 20 2020	Implement more desired features	12

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## Timeline and Milestone 1

- MileStone 1:
  - Create a program that detects speed limit in a video/live feed
- Task:
  1. Understand OpenCV and practice object detection using Python or web application
  2. Research how to train a machine learning model to detect road objects
  3. Research methods to detect multiple objects in image, video, and live feed
  4. Write the neural network code to be used to learn and recognize dangerous car conditions
  5. Train the neural network with training and validation sets of dangerous objects

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## Timeline and Milestone 2

- MileStone 2:
  - Connect the program to the camera to read live feed data
- Task:
  6. Set up a camera to be connected to live feed driving data
  7. Write a program to detect objects as they move in the camera

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## Timeline and Milestone 3

- MileStone 3:
  - Setup the program with Raspberry Pi
- Task:
  8. Connect Camera with Raspberry Pi
  9. Get the full system to run on Raspberry Pi in a “live” environment

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## Timeline and Milestone 4

- MileStone 4:
  - Create an alert interface/program that triggers when object detected
- Task:
  10. Write code to notify the user of the alerted object through Raspberry Pi and interface screen
  11. Create an alert interface/program when an object is detected

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## Timeline and Milestone 5

- MileStone 5:
  - Implement more desired features
- Task:
  12. Detect road swaying and dangerous driving through lane detection

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## Division of Work

Vasu:

- OpenCV detection and setup
- ML models
- Utilizing setup/models for final system

Chunjie:

- Raspberry PI
- Camera live feed/Interface
- Connecting interface with final system

ChaoYang:

- Research for multiple object detection
- Enhancing neural network
- Connecting results to final system

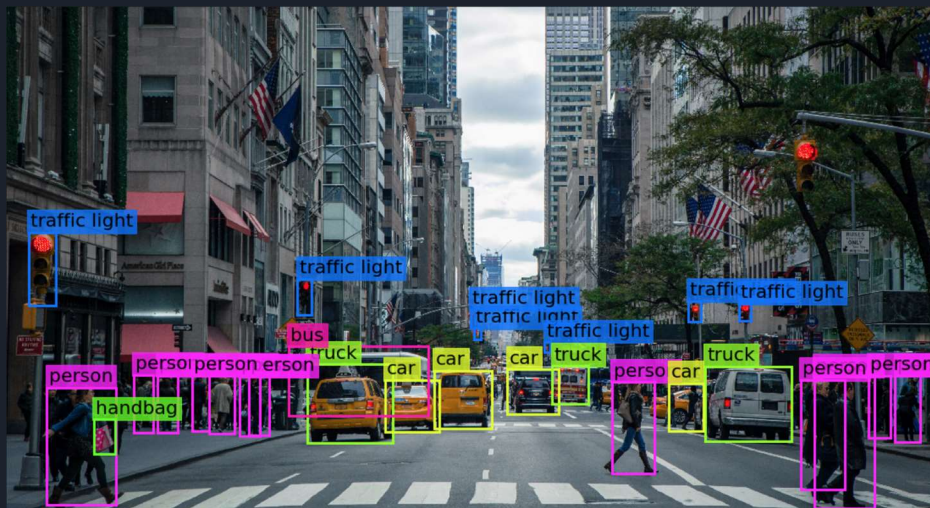
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## Expected Demo at Expo




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## Expected Demo at Expo



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# Credits

Follow our progress on our

Github Repo: <https://github.com/VasuBhog/Senior-Project>

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