Consider your project. Your aim is to identify and manage the requirements in a computer-based system.

**1. In a paragraph, write down the objective of your project? Focus on the questions "What is the criteria for our project to become successful". Next, write down the key stakeholders of your project.**

The criteria for our project to be successful is the ability for the driver of a Tesla Model Y vehicle to keep their hands off the wheel and have the car self-drive without assistance smoothly and without accidents. This system has a multitude of stakeholders such as the programming team at Tesla, Tesla shareholders, owners of a Tesla who use the autopilot system and finally passengers who will be in the car as it drives itself. This is a critical project since the lives of the public are at stake so it is essential that development of such a system prioritizes safety and quality of the feature above all else. Keeping the driver safe while also driving on its own without any accidents will be key indications of success involving this particular system.

**2. List 5 functional software requirements**

5 functional requirements can include the following, auto-direction with the steering wheel that keeps the car on the road, object detection around the vehicle that ensures no crashing, automatic gas usage so that the car remains on the speed limit without the driver having to push the gas pedal, automatic brake usage so that the vehicle will automatically begin to brake in accordance to a stop or traffic, and finally a system that detects roads, roadlines, and different terrain features so that the vehicle can stay on the road in its lane without failure.

**3. List 5 non-functional software requirements**

5 non-functional requirements can include the following, fast yet smooth responsiveness to incoming object or traffic, smooth handling of the wheel rather than sharp direction changes, system keeps car under the speed limit, easy to switch system on and off for driver, absolutely no issue or errors for detection system.

5 non functional requirements -  respond to user inputs such as button clicks,text field inputs, etc, also should be up and running 24/7, protect users personal information,

**4. Are there any environmental requirements? If yes identify the system requirements based on the following**
**System requirements = software requirements + domain requirements (environment)**
Environmental Requirements for a Self-Driving Car (Tesla Model Y):

1. Geographical Environment:
   - The self-driving car should be designed to operate in a wide range of geographical environments, including urban areas, suburban settings, highways, and rural roads.
   - It should be able to handle various weather conditions, including rain, snow, fog, and sunny days.
   - The car should adapt to different terrains, such as paved roads, gravel roads, and dirt roads.

2. Traffic Conditions:
   - The system must be capable of navigating through various traffic scenarios, including heavy traffic, intersections, roundabouts, and pedestrian crossings.
   - It should adhere to local traffic rules and regulations, including speed limits and right-of-way rules.

3. Obstacle Recognition:
   - The self-driving car should be able to detect and respond to a wide range of obstacles, such as other vehicles, pedestrians, cyclists, and stationary objects like road signs and construction barriers.

4. Communication with Infrastructure:
   - The system may require communication with traffic signals, road infrastructure, and other connected vehicles to enhance safety and efficiency.

5. Sensor Range and Accuracy:
   - The car's sensors (e.g., cameras, lidar, radar) must provide sufficient range and accuracy to perceive the environment, even in challenging conditions.

6. Mapping:
   - The system needs access to accurate map data to navigate efficiently, including high-definition maps and real-time map updates.

system requirements based on these environmental requirements:

System Requirements for a Self-Driving Car (Tesla Model Y):

1. Software Requirements:

- Perception and Object Recognition: The software should be able to process data from sensors to recognize and classify objects in the car's environment.
- Decision-Making:The software must make real-time decisions based on sensor data, traffic rules, and navigation objectives.
- Path Planning:The system should be capable of planning safe and efficient paths for the vehicle, considering its surroundings.
- Control System:There must be a control system to execute the planned maneuvers, including acceleration, braking, and steering.

2. Domain Requirements (Environment):

- Adaptive Algorithms: The system should adapt to different environmental conditions, such as adjusting behavior in rain or snow.

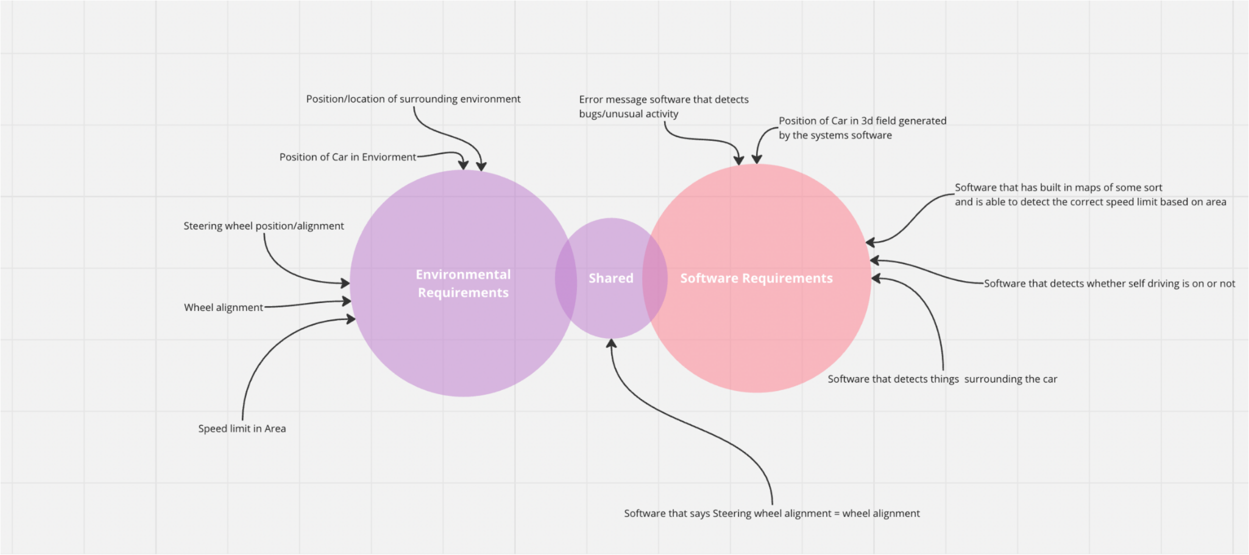
-Mapping Interface:  The system must communicate with a mapping service to obtain up to date maps and accurate localization data.

- Communication Protocols: Implement communication protocols to interact with other vehicles, infrastructure, and traffic management systems when required.

- Weather Tolerance: The software should include algorithms to handle adverse weather conditions and maintain safe operation.

These system requirements are driven by both the software components needed for self-driving functionality and the domain requirements related to the specific environmental occurrences a self-driving car like the Tesla Model Y might run into.

**5. Draw the software-environment diagram for the various requirements of your Project**


Position/location of surrounding environment
Position of Car in Enviorment
Steering wheel position/alignment
Wheel alignment
Speed limit in Area
Environmental Requirements
Shared
Software Requirements
Error message software that detects bugs/unusual activity
Position of Car in 3d field generated by the systems software
Software that has built in maps of some sort and is able to detect the correct speed limit based on area
Software that detects whether self driving is on or not
Software that detects things surrounding the car
Software that says Steering wheel alignment = wheel alignment

## 6. Identify critical conflicts to your project

Critical conflicts and challenges related to self driving cars:

**Safety:**

* Conflict: Determining the liability in case of accidents involving self-driving cars can be difficult. It's hard to pinpoint who to assign the blame to the manufacturer, the software developer, the owner, or a combination of these people ?

* Resolution: Establishing clear safety and liability frameworks and insurance policies to address these issues is needed. Government regulations and industry standards can play a role in shaping liability rules.

*** Ethical problems:**

* Conflict: Self-driving cars may face situations where they must make ethical decisions, such as choosing between protecting the occupants or pedestrians. Resolving these moral dilemmas is challenging.

* Resolution: Defining ethical guidelines for self-driving car behavior and engaging in public discussions to shape these guidelines can help address these conflicts.

*** Technical Challenges:**

* Conflict: Ensuring the reliability and accuracy of sensors, software, and hardware components is critical for safety. Failures in these components can lead to accidents.

* Resolution: Rigorous testing, redundancy in critical systems, and continuous improvement of technology are essential to mitigate technical conflicts.

*** Data Privacy and Security:**

* Conflict: Self-driving cars generate vast amounts of data, including location, behavior, and sensor data. Protecting this data from cyberattacks and ensuring passenger privacy can be challenging.

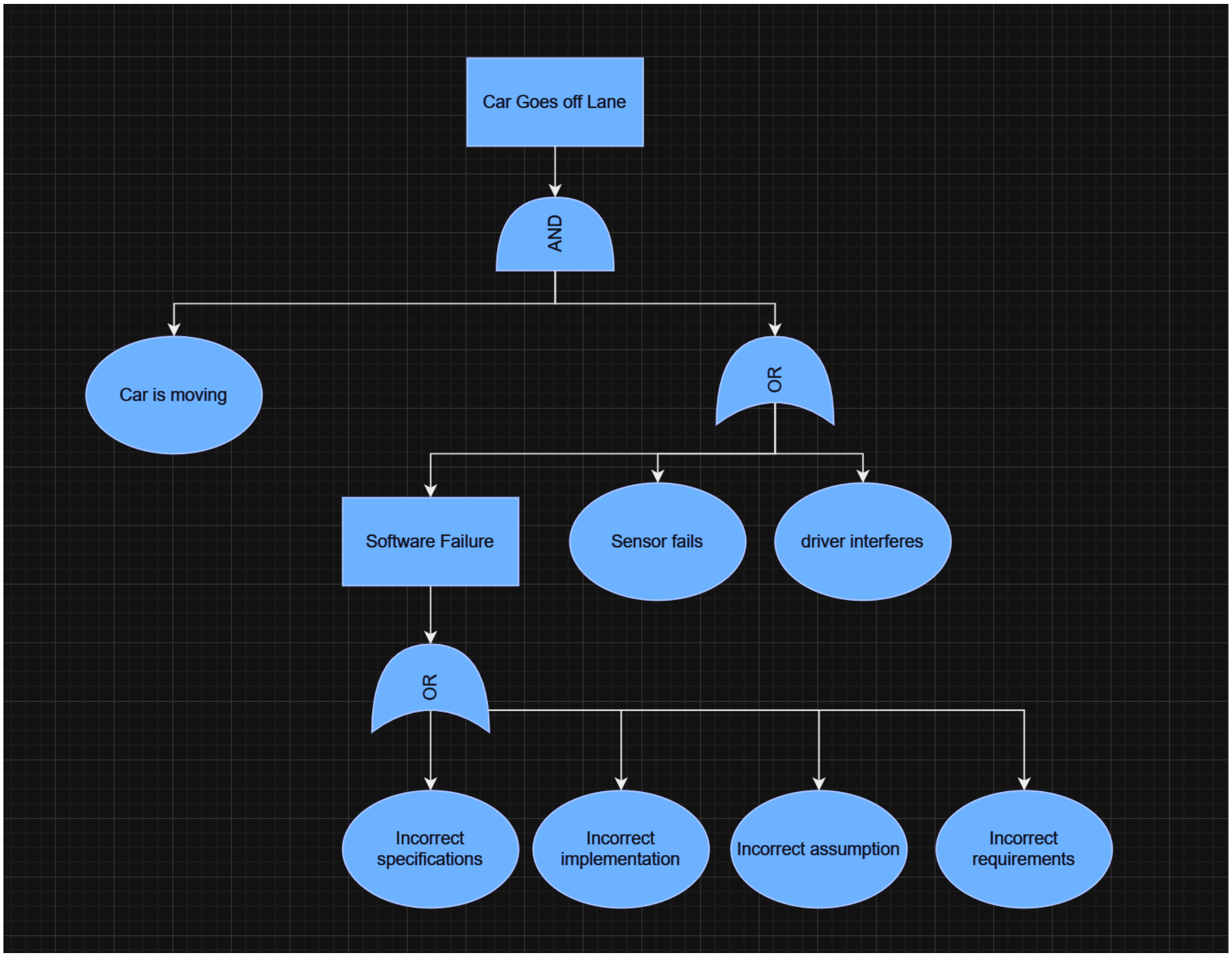
* Resolution: Implementing robust cybersecurity measures and adhering to data protection laws are crucial for addressing privacy and security conflicts.

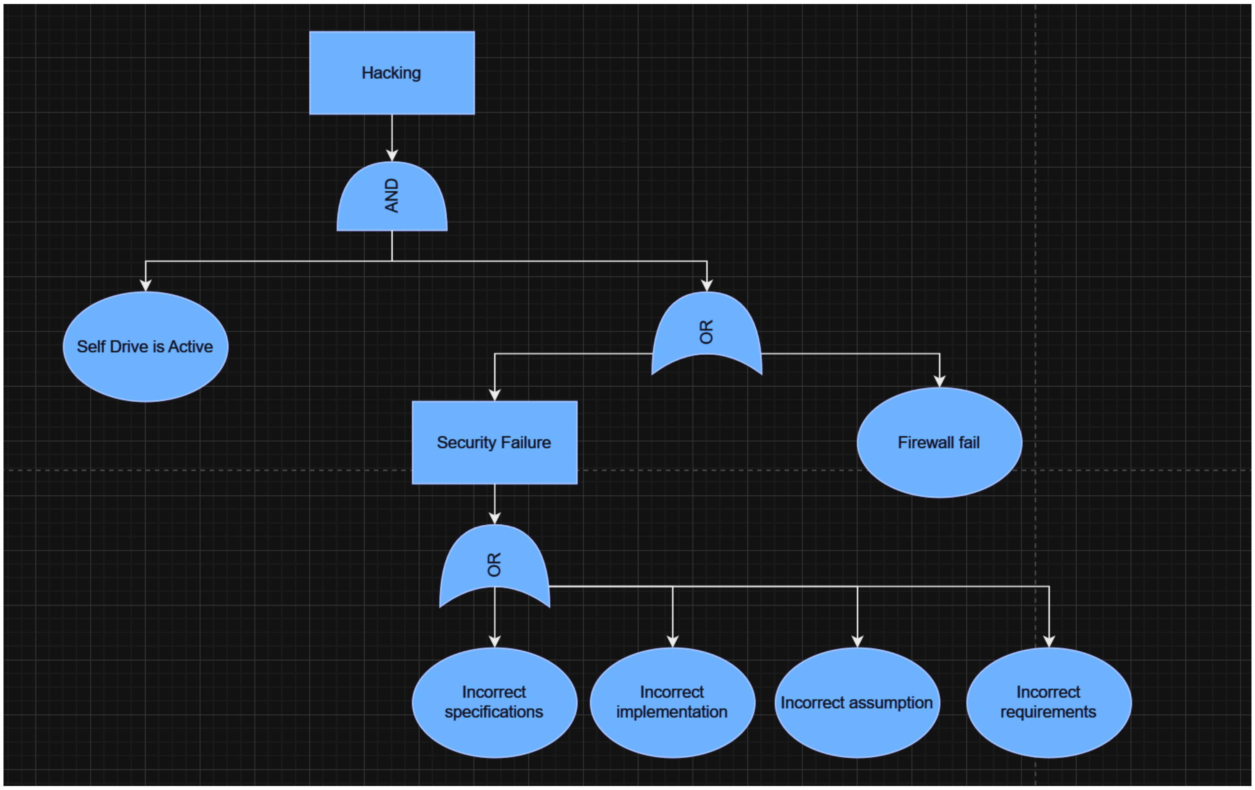
*** Legal Issues:**

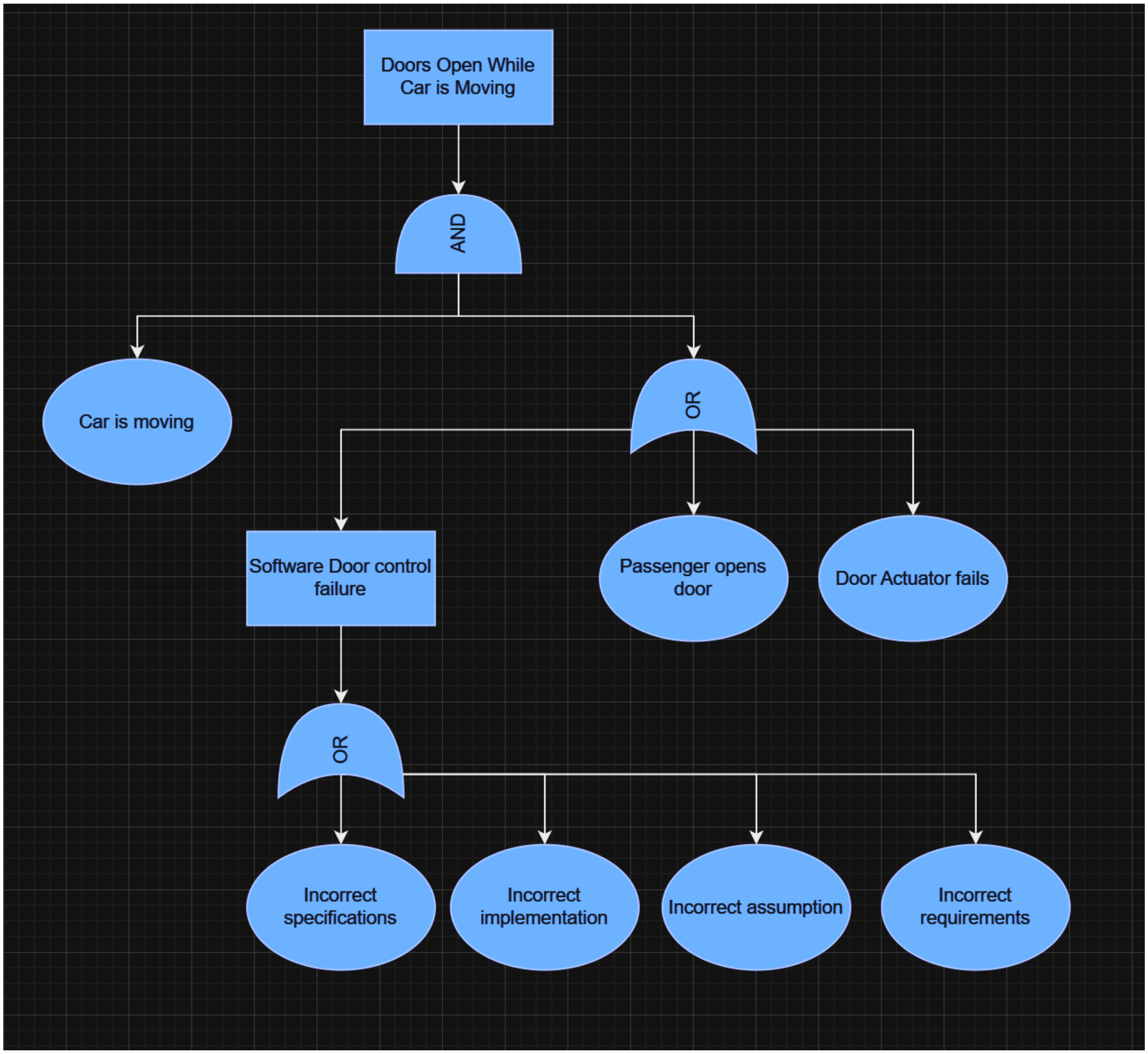
* Conflict: The lack of specific/standardized regulations for self-driving cars can hinder their deployment and create uncertainty.

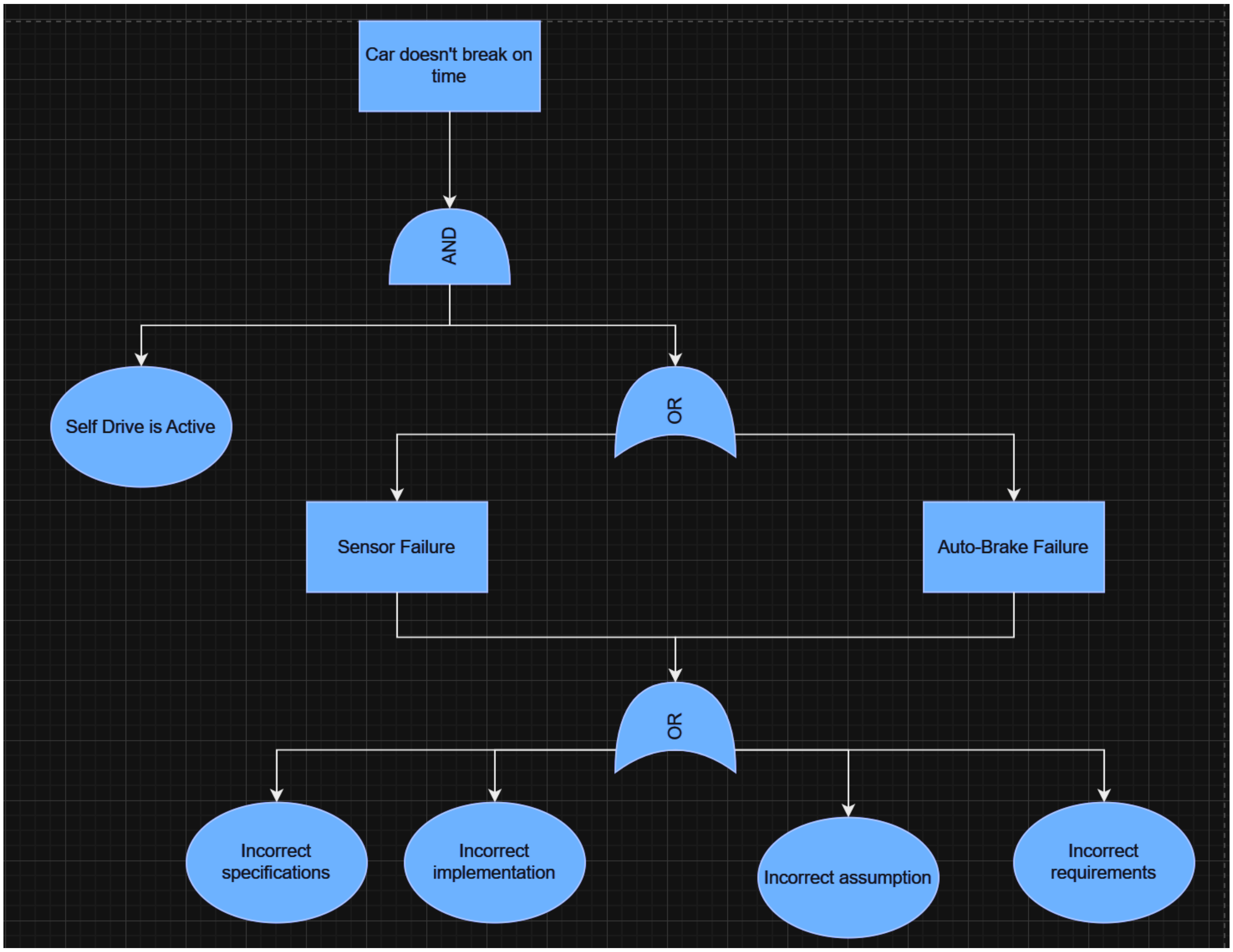
* Resolution: Governments and industry stakeholders need to work together to establish clear, consistent, and adaptable regulatory frameworks that support the development and deployment of autonomous vehicles.

**7. Identify 4 risks related to your project and draw the risk tree for them. Also try to identify the risk cut set from the tree.**


Car Goes off Lane
AND
Car is moving
OR
Software Failure
Sensor fails
driver interferes
OR
Incorrect specifications
Incorrect implementation
Incorrect assumption
Incorrect requirements


Hacking
AND
Self Drive is Active
OR
Security Failure
Firewall fail
OR
Incorrect specifications
Incorrect implementation
Incorrect assumption
Incorrect requirements


Doors Open While Car is Moving
AND
Car is moving
OR
Software Door control failure
Passenger opens door
Door Actuator fails
OR
Incorrect specifications
Incorrect implementation
Incorrect assumption
Incorrect requirements


Car doesn't break on time
AND
Self Drive is Active
OR
Sensor Failure
Auto-Brake Failure
OR
Incorrect specifications
Incorrect implementation
Incorrect assumption
Incorrect requirements

**8. Work with your team to find alternative requirements like the library case study of subscribing to journals? Once found, determine the quantitative evaluation of the alternatives based on at least 3 Non-Functional-Requirements. You can provide weightage points and criteria points for the options yourself as a team. Complete the table and state which option is better.**

| Non-Functional Req | Weight | Self Driving - Tesla Y | Manual |
|---|---|---|---|
| Response time to other cars & traffic lights | 0.10 | 0.20 | 0.30 |
| Route / Lane Management | 0.40 | 0.70 | 0.70 |
| Priority of vehicles Vehicles | 0.50 | 0.90 | 0.70 |
| Total | 1 | 0.75 | 0.66 |

**9. Consider the SE-451 project on which you are working during this semester. Extract six requirements from your project that might need to be prioritized in view of overall value, assign weightages for their contribution to the project relative to each other, and perform requirement prioritization using the AHP process.**

| Func Reqs | Detects traffic light changes | Priority of cars and actions | Auto-Brake | Gives location in Real Time | Manage Car Routes | Speed Handler |
|---|---|---|---|---|---|---|
| Detects traffic light changes | 1 | 2 | 1 | 9 | 5 | 1 |
| Priority of cars and actions | 0.5 | 1 | 1 | 4 | 2 | 1 |
| Auto-Brake | 1 | 1 | 1 | 9 | 4 | 1 |
| Gives location in Real Time | .11 | .25 | .11 | 1 | .17 | .14 |
| Manage Car Routes | .2 | .5 | .25 | 6 | 1 | .14 |
| Speed Handler | 1 | 1 | 1 | 7 | 7 | 1 |

Priority Ranking -

1. Detect Traffic light Changes - 26.3%
2. Speed Handler-25.2%
3. Auto Brake-22.6%
4. Priority of Cars and actions-16.1%
5. Manage Car routes- 7.2%
6. Gives location in real time-2.7%