1.1 Problem Statement

Our project is attempting to continue the development of self-driving vehicles for purposes such as crash detection, crash prevention, and artificial intelligence learning. We are striving to ensure a vehicle can drive through multiple types of obstacles, even those that might not necessarily be on a road, to ensure system adaptability and decision-making.

1.2 Requirements & Constraints

Requirements:

- Weekly meetings with the individual team, and periodic meetings between all Race of Doom teams.
- The full design document must be complete by the end of Semester 1.
- Actual design requirements are still in the works.
- The general idea is to modify an existing car with new specs so every car team starts at the same point.
- A functional car must be fully operational by the end of Semester 2.

Constraints:

- Both cars must cost less than $1,000 to build, modify, and develop. This is subject to change pending funding from Caterpillar.
- The car should be able to sense its environment using a variety of sensors installed on the vehicle.
- Cars should be somewhat autonomous: the car can only move forward or backward by user input, and steering will be determined by sensors on the car.
- Car communications security must be student-built to allow testing of the cyber security aspect of the project.
- Each of the obstacles for the car should be overcome as quickly as possible to win the race.

1.3 Engineering Standards

What Engineering standards are likely to apply to your project? Some standards might be built into your requirements (Use 802.11 ac wifi standard) and many others might fall out of design. For each standard listed, also provide a brief justification.

IEEE 802.11 (Wi-Fi) Standards: IEEE 802.11 standards for Wi-Fi communication are relevant for remote control and data exchange between the remote control devices and the cars.

ISO 6469 - Safety of Electrically Propelled Road Vehicles: While the vehicles are small in scale, if they are electrically powered, ISO 6469 might still apply to address electrical safety aspects, especially if they use lithium-ion batteries or other electrical components.

IEEE 1275 - Open Firmware Standard for Embedded Systems: If the remote control cars use embedded systems or microcontrollers, adherence to relevant firmware standards can be important for compatibility and reliable operation.

Radio Frequency (RF) Standards: Depending on the communication technology used for remote control, there may be specific RF standards that apply to ensure proper signal transmission and interference avoidance.

Electromagnetic Compatibility (EMC) Standards: EMC standards can be relevant to ensure that the operation of the remote control cars does not interfere with other electronic devices and vice versa.

1.4 Intended Users and Uses

Who benefits from the results of your project? Who cares that it exists? How will they use it? Enumerating as many "use cases" as possible also helps you make sure that your requirements are complete (each use case may give rise to its own set of requirements).

We will be working with the lab at Iowa State and their new vehicles that have the ability to self-drive based on sensing and recognition. This research will also be shared with Caterpillar, who will be assisting in funding our project.

Self-driving vehicles are an ever-growing industry, and creating more test cases like these is instrumental in the growth of these vehicles to minimize risk and promote machine learning.