



Company Information

Company Name	<i>Daimler Truck</i>	Date Submitted	<i>07/14/2025</i>
Project Title	<i>Design of a Machine Learning Vision System for Axle Installation (Daimler_AXLE)</i>	Planned Starting Semester	<i>Fall 2025</i>

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	1	Electrical	
Computer	4	Systems	

Company and Project Overview:

Daimler Truck is one of the world's largest commercial vehicle manufacturers, with more than 35 primary locations around the world and around 100,000 employees. The company brings seven vehicle brands under one roof:

[Mercedes-Benz](#) (light, medium and heavy trucks as well as city, intercity and touring coaches) and [Setra](#) (intercity, long-distance and premium coaches) are our traditional European brands; our U.S. brands [Freightliner Trucks](#) (trucks in weight classes 5 to 8 for a wide range of commercial vehicle applications), [Western Star](#) (heavy trucks for specialized and long-haul transports) and [Thomas Built Buses](#) (light- to medium-duty buses); and our Asian brands [BharatBenz](#), based in Chennai, India (trucks in the weight classes 9 to 55 t and medium- and heavy-duty buses) and [FUSO](#), headquartered in Japan (trucks and buses for Asia, Middle East, Africa, Europe and Latin America).

The Mount Holly Truck Manufacturing plant produces the full line of Freightliner medium-duty Business Class® M2 / SD models. As a truck chassis goes through the build process, the chassis frame is upside down to facilitate installation of axles and drivelines. Later in the process, when the truck is completely built, it goes through an alignment process where almost every truck is



adjusted in some fashion. The goal of the project is to create a vision system that can measure axle orientation during installation to eliminate most of the adjustments made later. Axle installation is performed with a bridge crane and hoist system that can accommodate many different axle variations. The concept is the same for all, use the hoist to pick the axle(s) up with a chain sling assembly and transfer to the chassis.



Project Requirements:

The objective of the project is to use an open-source YOLO (You Only Look Once) deep learning model to identify the chassis frame and rear axle(s) and measure axle perpendicularity and lateral offset to the frame as well as centering of the bridge crane over the chassis. Cameras for the vision will need to be attached to the bridge crane and likely need to move back and forth with the hoist. The system must provide real-time visual feedback to operators to let them know if they are within tolerance and which direction adjustment any adjustment may be needed. Axles and a chassis frame will be provided for system development if needed. The project team will need to determine an appropriate YOLO model, procure a workstation, camera(s) and mounting

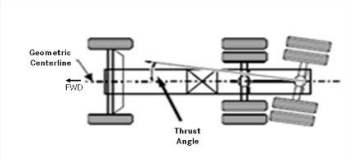
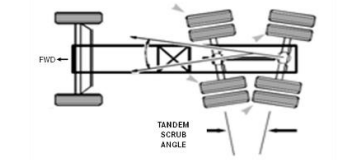
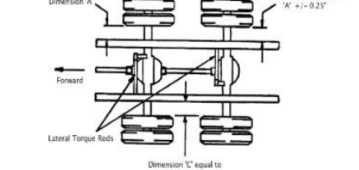


hardware.

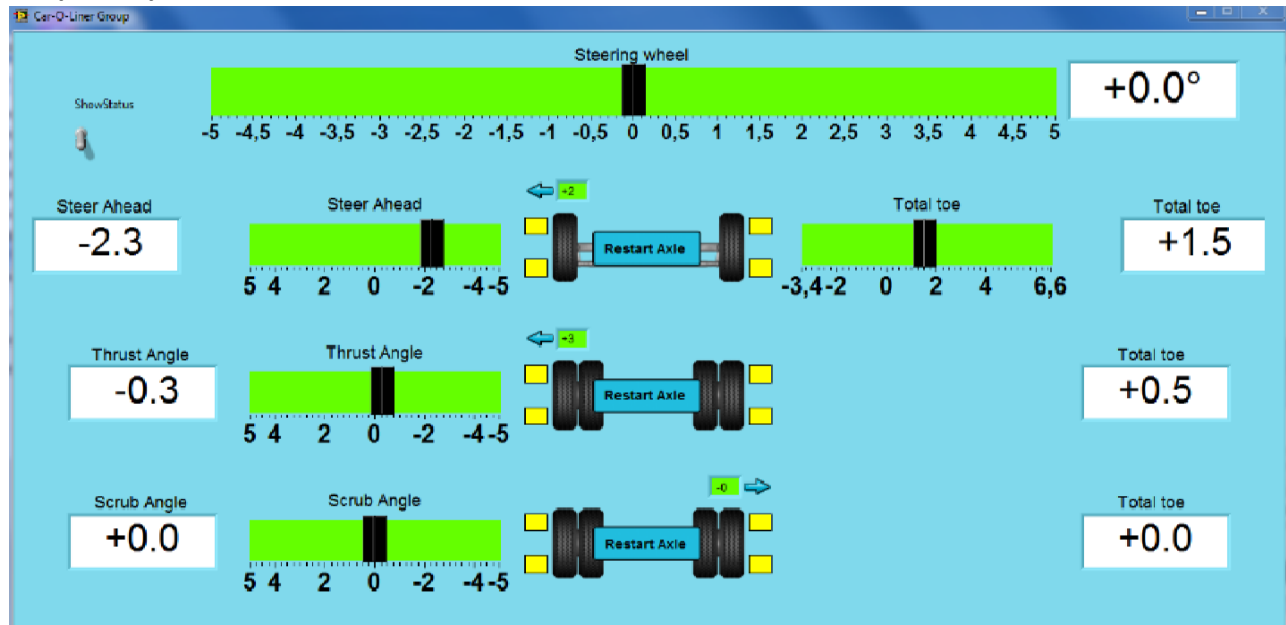
Axle Installation:



Specifications:

Description	Units	Target / Tolerance
	degrees	0 ± 0.18
	degrees	0 ± 0.08
	inches	0 ± 0.25

Sample Output:



Expected Deliverables/Results:

- Source Code, workstation, and peripheral devices
- Working application that displays axle orientation with key measurements during the axle installation process.

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. It is also a mandatory part of this Program that the Industry supporter attend the 2 expos to grade their team's performance. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- .NET, C#, and Java for application development
- Python programming, deep learning, and data annotation for YOLO customization
- Ability to travel to DTNA in Mt Holly as required for data gathering and testing validation