MICHIGAN STATE UNIVERSITY

Project Plan Presentation

Building Shipments using Machine Learning

The Capstone Experience

Team RPM

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From Students…

…to Professionals

Project Sponsor Overview

- Founded in 2012
- Headquartered in Royal Oak, Michigan
- 50k+ vehicles transported per month
- Source of transportation for major motor OEMs

RPM

Project Functional Specifications

- Create the most optimized shipment routes
  - Routes with the least number of stops required
- Help with load efficiency
- Reduce overall shipment costs
- Calculate chance of success for each shipment

Project Design Specifications

- Landing (Home) Page
  - Describes sponsor services and project overview
- Orders Entry Page
  - Allows user to upload input file or create order
- Orders Page
  - Shows all the vehicles ready to be processed in a shipment
- Shipments Page
  - All the optimized shipments ready to be shipped
- Shipment Info Page
  - Will include all the information regarding the shipment

Screen Mockup: Landing Page

RPM

teamrpm-optimizing-shipments.com

RPM

Home | Shipments | Orders | Login >

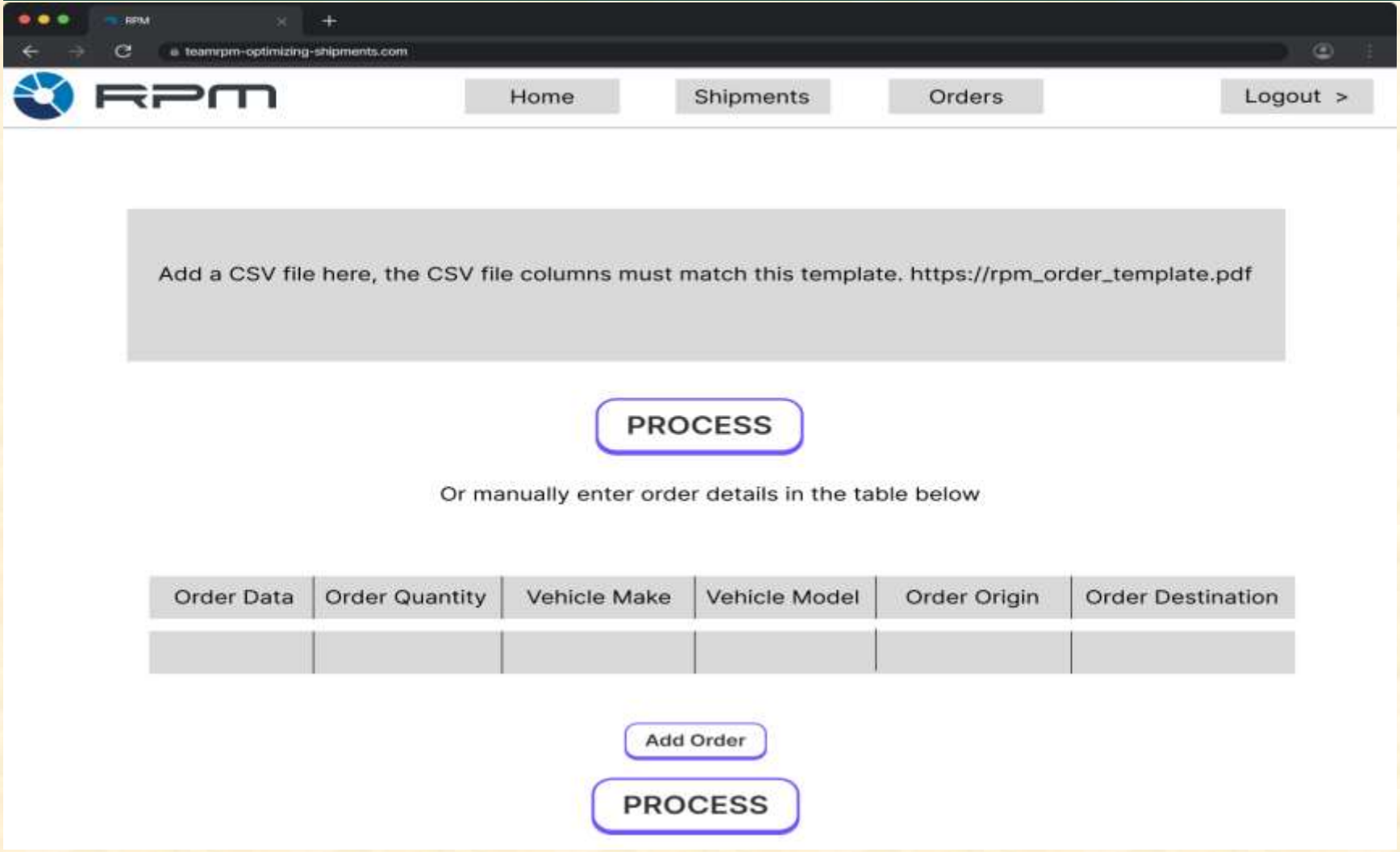
Shipment Optimizer By Team RPM

With 7.5k+ vehicle carriers and more than 50k vehicles transported each month, RPM Freight Systems (RPM), established in 2012 and with its headquarters in Royal Oak,
Michigan, is one of the top freight transportation firms worldwide. Therefore, it should come as no surprise that significant automakers like Tesla, Ford, and General Motors favor RPM. RPM aims to deliver on time and efficiently with such expensive and large goods, and they are constantly looking for methods to streamline their processes.
RPM is looking to improve their workflow by optimizing routes for drivers to reduce the number of stops they make while transporting vehicles. This will save time, money and keep
drivers happy as it will reduce the time spent out of the vehicle, and increase the time spent driving and making money.

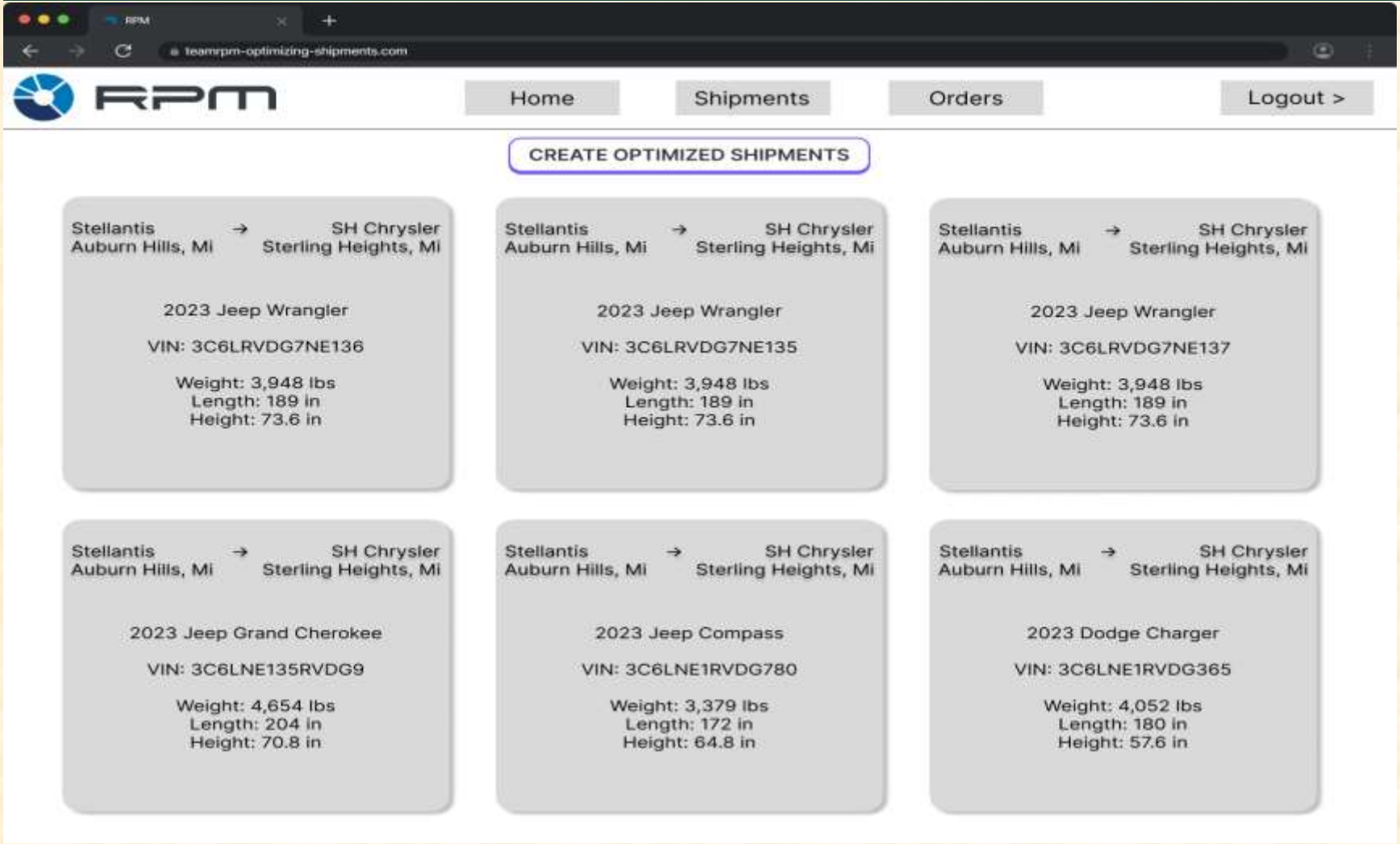
Our Project

Our project aims to address RPM's shipment optimization issue utilizing machine learning.

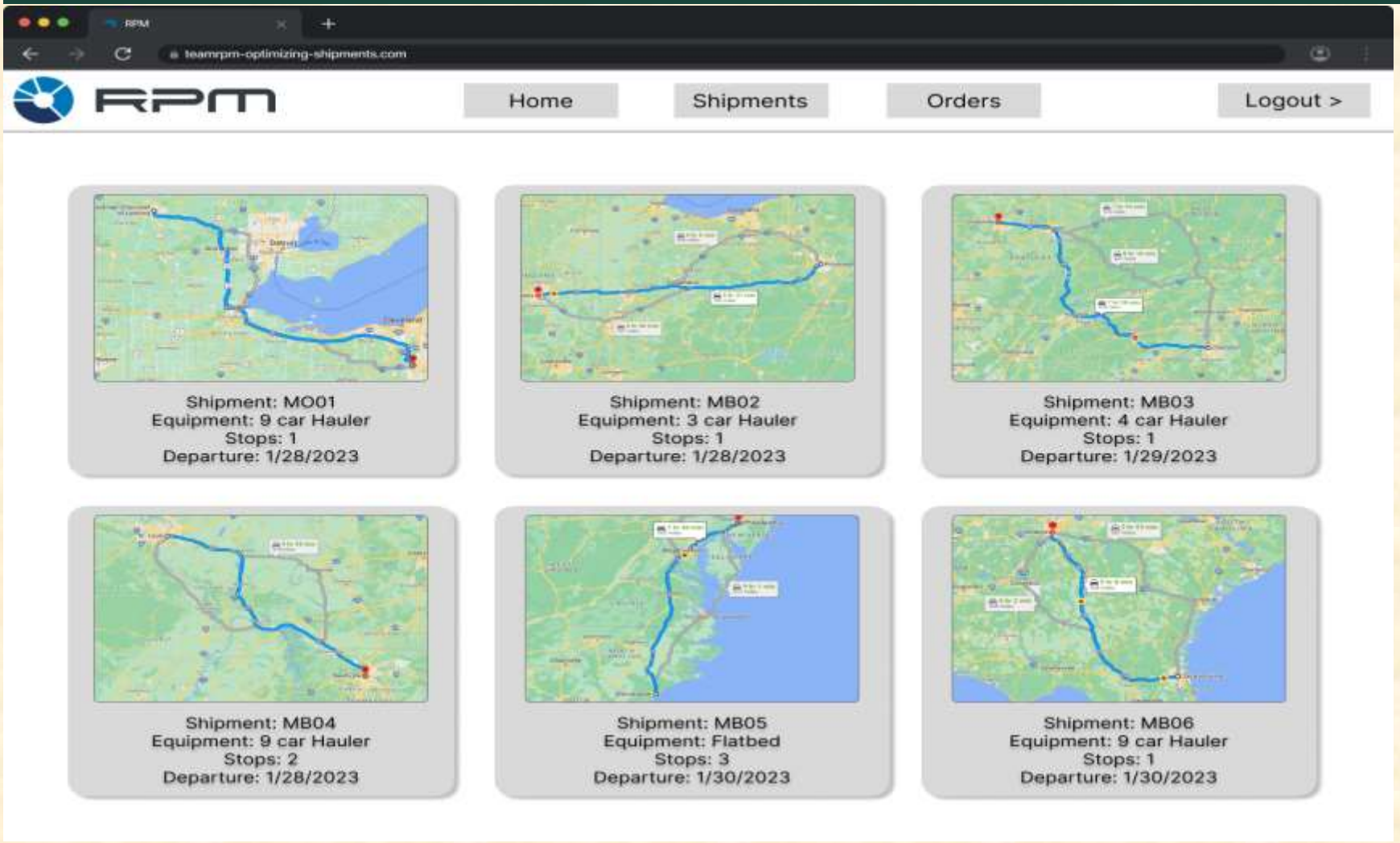
Screen Mockup: Orders Entry Page



Screen Mockup: Orders Page



Screen Mockup: Shipments Page



Screen Mockup: Shipment Info Page

RPM

teamrpm-optimizing-shipments.com

RPM

Home | Shipments | Orders | Logout >

Shipment Information

Shipment Number:	M001
Origin:	Lansing, Michigan
Drop Off:	Akron, Ohio
Departure Date:	1/28/2023
Delivery Date:	2/1/2023
Status:	IN TRANSIT
Customer:	Stellantis
Equipment Type:	9 Car Hauler
Transport VIN:	3C6LNEIJ7812
Number of Stops:	1

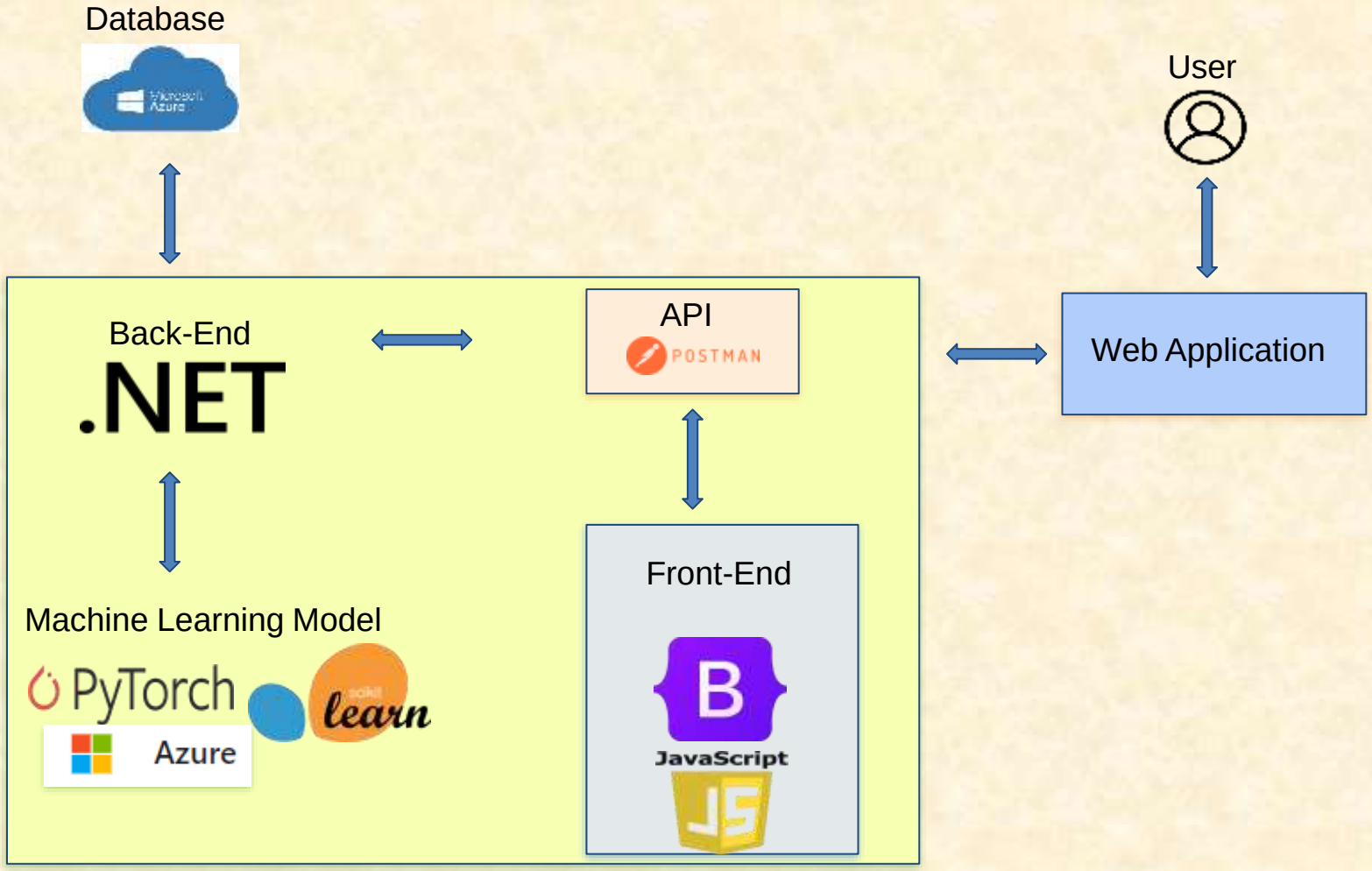
Orders Information

VIN	Make	Model	Year	Weight	Height
3C6LRVDG7NE135	Jeep	Wrangler	2023	3,948 lbs	73.6 in
3C6LRVDG7NE136	Jeep	Wrangler	2023	3,948 lbs	73.6 in
3C6LRVDG7NE137	Jeep	Wrangler	2023	3,948 lbs	73.6 in
3C6LNE135RVDG9	Jeep	Grand Cherokee	2023	4,654 lbs	70.8 in
3C6LNE135RVDG4	Jeep	Compass	2023	3,379 lbs	64.8 in
3C6LNE1RVDG365	Dodge	Charger	2023	4,052 lbs	57.6 in
3C6LNE1RVDG205	Jeep	Cherokee	2023	3,967 lbs	66.2 in
3C6LNE1RVDG780	Jeep	Compass	2023	3,379 lbs	64.8 in

Project Technical Specifications

- ASP.NET Core using MVC template
  - Framework helpful for building web apps and APIs
- Front-end
  - HTML, CSS, JS, Bootstrap library
- Back-end
  - SQL, Azure ML, PyTorch, Scikit-learn
- Other technologies
  - C#, Jupyter Notebook, Pandas

Project System Architecture



Project System Components

- Software Platforms / Technologies
  - DBVisualizer/SQL Server Management Studio
  - ASP.NET Core SDK
  - Postman
  - Azure ML
  - Microsoft Azure SQL Database
- Development Environments and Languages
  - Visual Studio Code
  - C#, HTML, CSS, JS, Python

Project Risks

- Receiving Skew data/Duplicate data.
  - The skew data causes the model to reduce the accuracy.
  - The team will first pool all the order files, get them under a standard format discussed with RPM
- Choosing Effective Attributes For Machine Learning Model Training
  - Choosing the most effective attributes to help us train and get the best optimal solution.
  - We will conduct statistical analysis on checking the validity of new attributes such as AIC or BIC analysis if we have decided to implement the linear regression model for instance.
- Training Load Times
  - We want to make sure that the training of the models won't take a long time to process and give us the most accurate and optimized shipments.
  - After each process, we will re-train the model with the new data included to continually improve the model's accuracy.
- Customer Order Data Format and Inconsistencies
  - Some customer data may be uploaded in a different format than others. This poses a significant risk as we choose which data points to consider in our machine learning model.
  - We will work to create a data format that will be easy to use.

Questions?