

# University of Washington Advanced Driver Assist System



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GOAL: Provide autopilot features to improve safety, sustainability, control and performance without sacrificing the driver's freedom

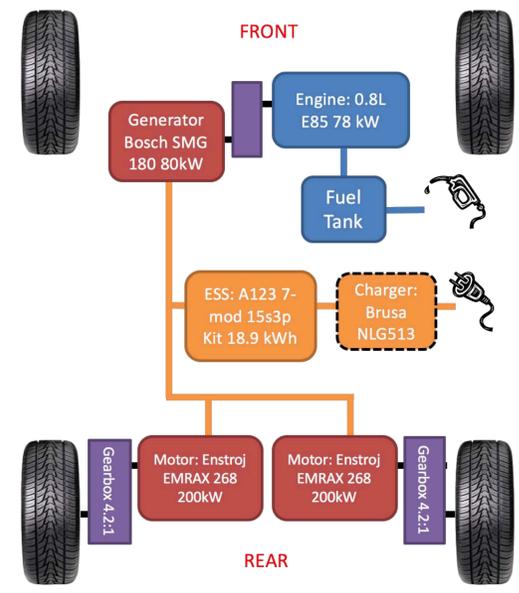
## Camaro Architecture

- Performance**
- 0-60 mph: 5.3s
  - 50-70 mph: 2.9s
  - Top Speed: 137 km/h (85 mph)
  - EV Range: 80 km (50 miles)
  - Power: 400 kW (536 hp)
  - Torque: 4200 Nm (3098 lb ft)

- Unique Characteristics**
- Torque Vectoring
  - Electric Drivetrain

## Target Market

- Baby Boomers** - Camaro is nostalgic, embodies freedom
- Millennials** - Tech savvy, sustainable and data driven
- Region** - Northwest, West Coast
- Economic** - Upper-middle class



## ADAS Functionality

ADAS Features			
Type	Feature	Source	Progress
Detection	Driver's Face	Camera / IR	Demo
	Street Sign	Camera	Demo
	Lanes	Camera	Prototype
	Vehicle	Camera / Ultrasonic	Prototype
	Weather	Rain Sensor / GPS / 4G	Started
	Pedestrian	Camera	Started
	Cyclist	Camera	None
Warnings	Ambient Light	ALS	None
	Backup Assist	Camera / Ultrasonic	Finished
	Distraction	Camera / IR	Demo
	Sleep	Camera / IR	Demo
	Battery / Fuel	CAN	Prototype
	Blindspot	Ultrasonic	Started
	Speed Limit	CAN / 4G	Started
	Maintenance	CAN	Started
Assistance	Lane Departure	Camera / Ultrasonic	None
	Proximity	Ultrasonic	None
	Predictive Parking	4G / Mobile App	Demo
	Driver Score	App Development	Started
Android Auto	App development	None	
Vehicle Logs	CAN / App Development	None	

**ADAS Motivation**  
While we plan on providing standard ADAS features (lane, object, sign detection), We are interested in innovating new ways to assist the driver. As demonstrated by our predictive parking and driver awareness embody this mindset.

**ADAS Interaction**  
People don't buy a dual motor, torque vectored Camaro to let ADAS tell them how to drive. Our ADAS will function as a reference for warnings and data critical to safety, performance and sustainability.

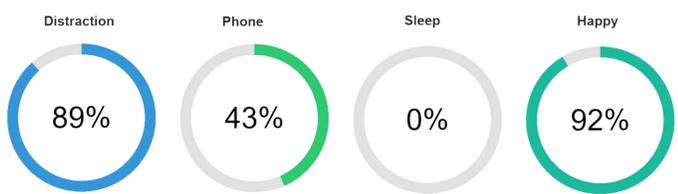
*Our ADAS enables the driver to focus on the freedom of the roads*



## Driver Awareness

Knowledge is power. With the advent of data driven apps and services, we think it is time to bring this to the automotive space. We collect information about how the driver behaves and drives and display it using simple score metrics, historical plots, and map overlays. This data can be gamified, shared over social media, or used to optimize performance and sustainability.

With these metrics, we compute an overall warning factor (above) that can be used to enable ADAS features, or prevent incidents. All real-time data is accessible via dashboard (below), and historical data is available in the app



## Mobile App

Data from our ADAS systems and CAN bus will be aggregated in our AWS cloud server and accessible by drivers via mobile app. Users will be able to explore their data in innovative ways including map overlays, timelines and responsive plots.

## ADAS Technology

### Software

- Python: Machine learning, server and processing
- Matlab / OpenCV: Computer vision and prototyping
- React.js and Electron: Display and front end
- AWS Cloud: Data storage

### Sensors

- Ultrasonic sensors: Blind spot and parking
- Stereo Cameras: Sign and lane tracking
- IR sensors: Night sensing
- GPS and 4G sensor: Internet and geolocation
- Light and rain sensor: Environment conditions

## S32V Hardware

In years 3 and 4, we will begin porting our ADAS prototypes and demos to the NXP S32V development board (shown left).



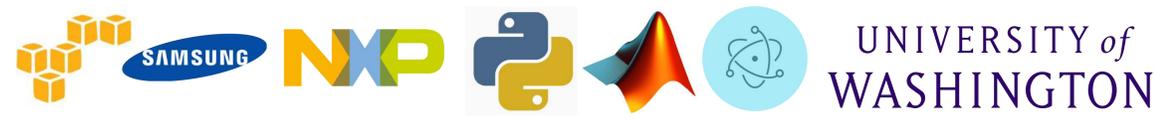
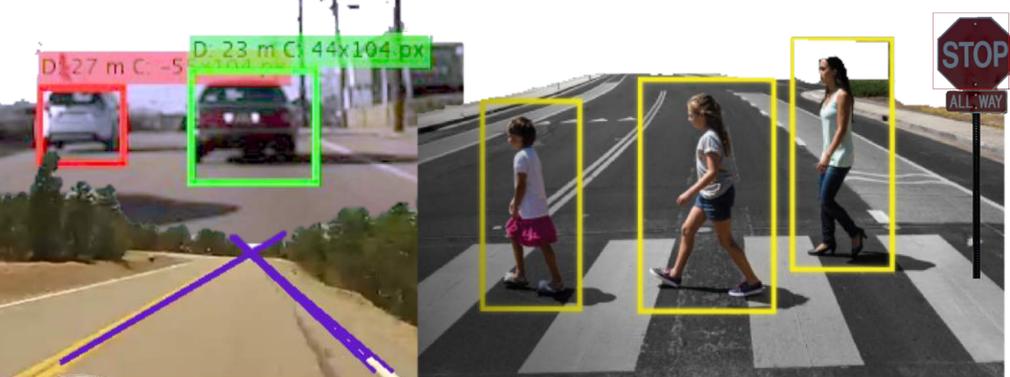
## Car Simulator

To test our prototype algorithms in realistic driving scenarios, we modified a car simulator to take control via software. This enables rapid prototyping and validation while the Camaro is assembled by engineers. This simulator is capable of sending and receiving CAN from the S32V hardware.

## Predictive Parking Assist

- What if there was something like google maps that could take you straight to an empty parking spot?
- Our technology aims to make parking easier for drivers and reduce urban congestion by keeping cars off the road
- We are building a mobile app that predicts regions with open parking based off historical data
- A user will be able to input a destination and other options such as a preferred walking distance and a route to the ideal parking location is calculated and displayed.
- Routes can prioritize time, parking cost and walking distance so the user gets the ideal directions for their situation
- Our solution uses predictive analytics to route users to areas with open parking. This will not only decrease the time the user has to spend driving, it will also alleviate bad city traffic and urban emissions

*No one is attempting to solve this problem in the way that we are.*



## Target Market

### Baby Boomers: Muscle Car Enthusiasts

- Baby Boomers are growing older and have a strong focus on safety
- The Camaro holds connotations of freedom that has been instilled over decades
- Many care about environment and how it will effect for their children and grandchildren

#### Snapshot: Boomers in Washington



#### Where are the top 5 percenters?

Among the 50 most-populous U.S. cities, Seattle ranks fifth for average household income of the top 5 percent.



#### Snapshot: Boomers in Oregon



## Millennials: Tech-savvy & Green Centric

- Millennials are very involved with social media
- Extremely conscious about the environment
- Have a desire to have the cutting edge technology
- Use and share lots of data



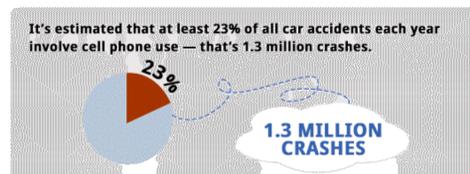
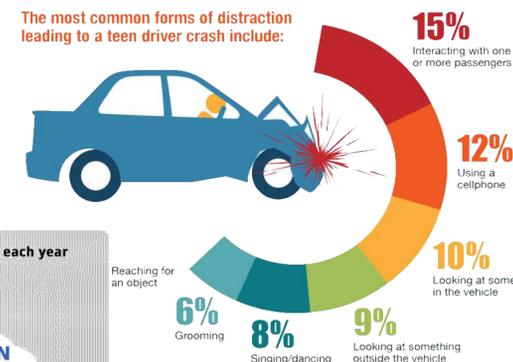
## Numbers That Matter

### Texting and Driving

- Five seconds is the average time your eyes are off the road while texting. When traveling at 55mph, that's enough time to cover the length of a football field blindfolded.
- Texting and driving is now the leading cause of death among teenagers

*What if your car knew when you were texting or distracting while driving?*

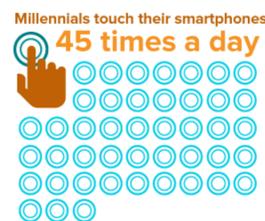
### 6 OUT OF 10 teen crashes involve driver distraction.



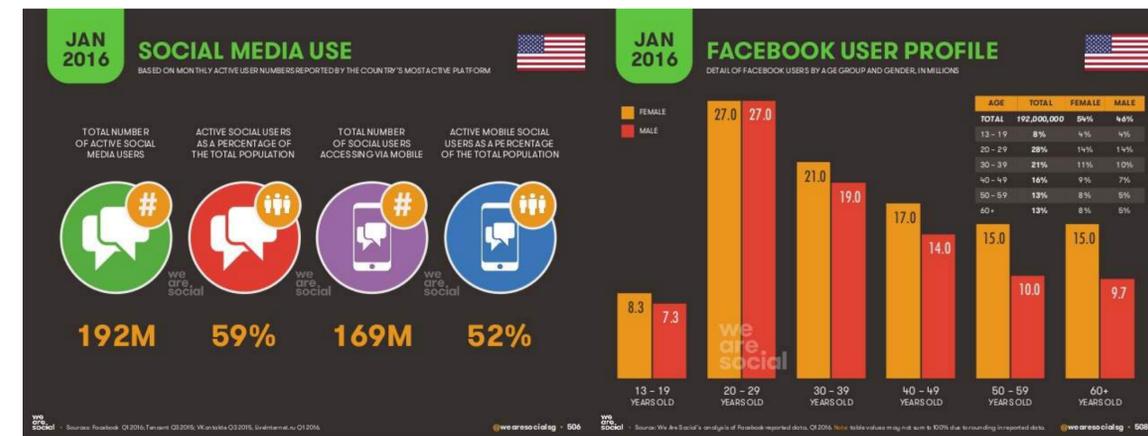
### Drowsy Driving

- Falling asleep is an often overlooked danger that everyone has experienced at some point

*What if your car could switch on autopilot or pull over for you if you appear to be drowsy?*

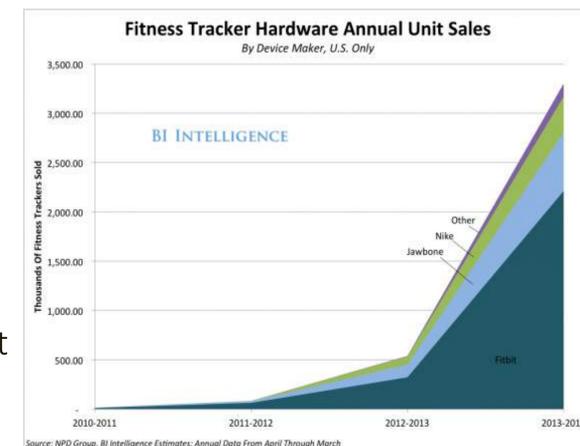


## Data Driven Social Media Apps



## Social Media Apps

- Social media is most popular with millennials, but growing in popularity for baby boomers
- Millennials are more likely to share data over social media
- Consumers show increasing interest in data driven apps, such as fitness apps



*Apps related to vehicle performance, sustainability and safety have great market potential*



## Cruising for Space

- As we all know, driving downtown in urban areas is awful
- Traffic and parking is often the main reason people avoid downtown
- The typical driver spends 106 days of their life searching for a parking space
- Vehicle traffic also has a significant effect on the environment and air quality
- Cities are only getting bigger and the problem will only get worse if there are no changes to the traffic flow and organization

*What if there was something like google maps that could take you straight to an empty parking spot?*