Field Data Collection with Consumer Available Driver Support Systems

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Research Objectives:

1) Collect **a new source of Level 2 (L2) partial driving automation naturalistic driving study (NDS) data** that will be available to the public for future research.
2) Include a **variety of L2 vehicle** systems.

2023 Corolla Cross
Toyota Safety Sense 3.0

2023 Honda CR-V
Honda Sensing

2021-2023 Ford Mach-E
Co-Pilot360 2.0 Active
(required for BlueCruise)

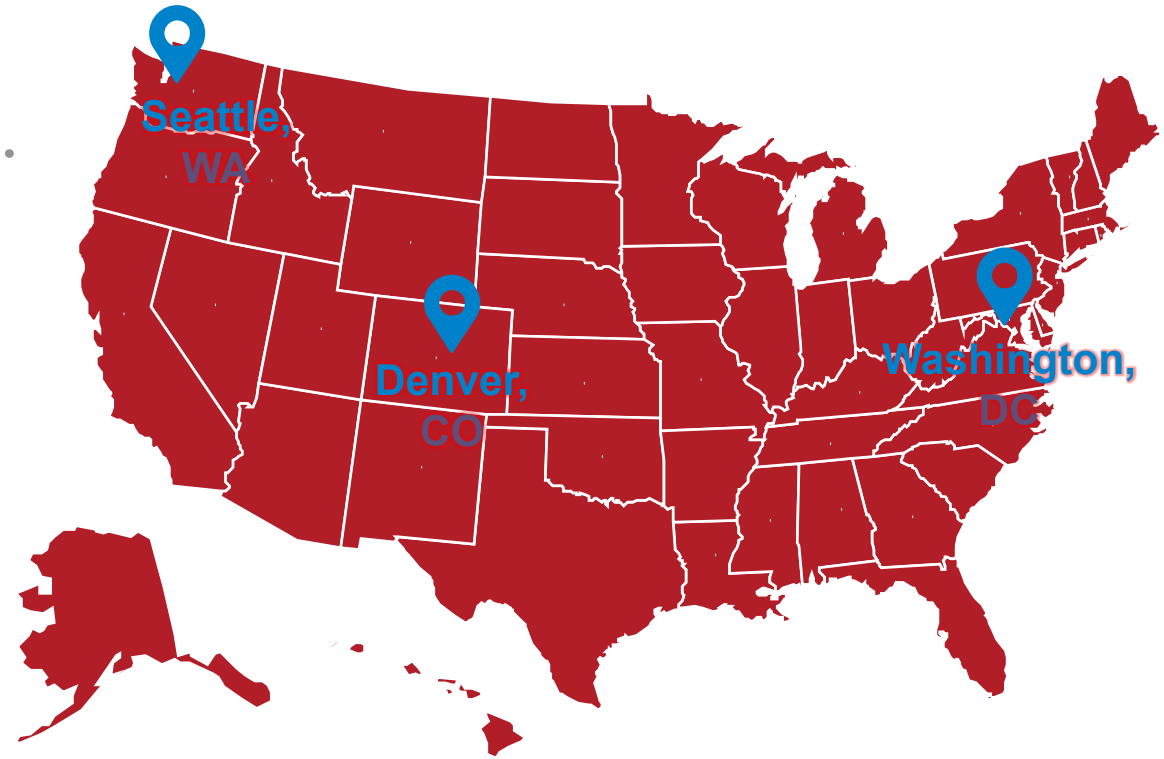
2023 Tesla Model 3
Full Self-Driving

2023 Subaru Outback
Eyesight 4.0

2023 Kia Sportage
Drive Wise
(w/ Highway Driving Assist)

Research Objectives:

3) Include a **representative** cross-section of drivers.
4) Provide **continuous and long-term assessment** of driver behavior.

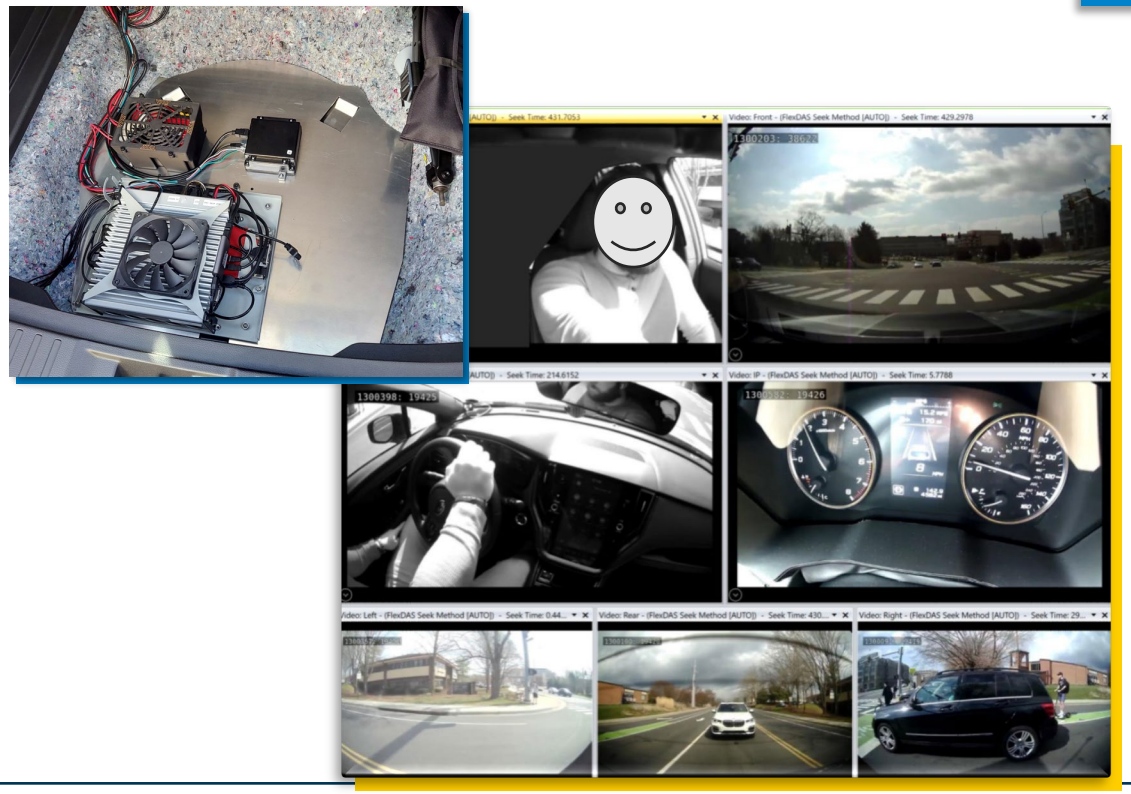


48 Participants/Site = 144 Total

18 months of Data Collection

Research Objectives:

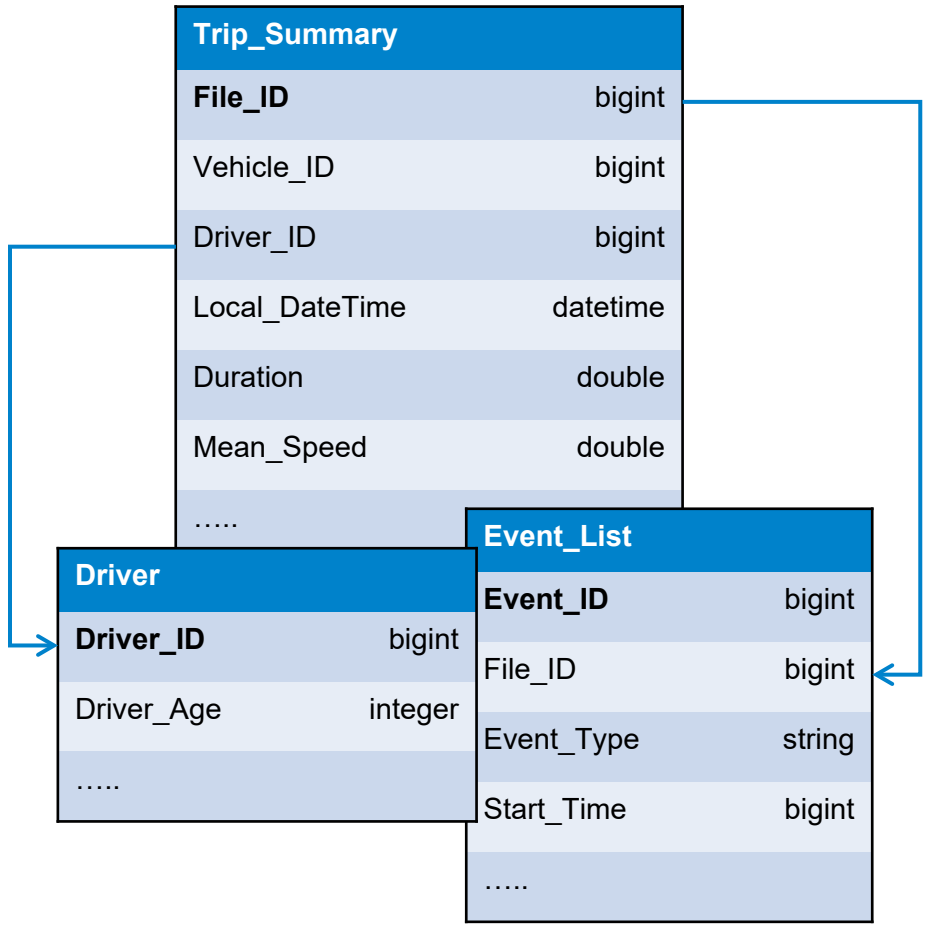
5) Provide **NDS data** in a **continuous, time series** format
6) **Enrich data** with other relevant data sources and analysis techniques.



Questionnaires	Months		
	0	6	18
Demographic Questions Level 2 Background Locus of Control	●		
Medical Conditions Risk Homeostasis	●		●
Attitudes on Level 2 Conceptualization of Level 2	●	●	●

Research Objectives:

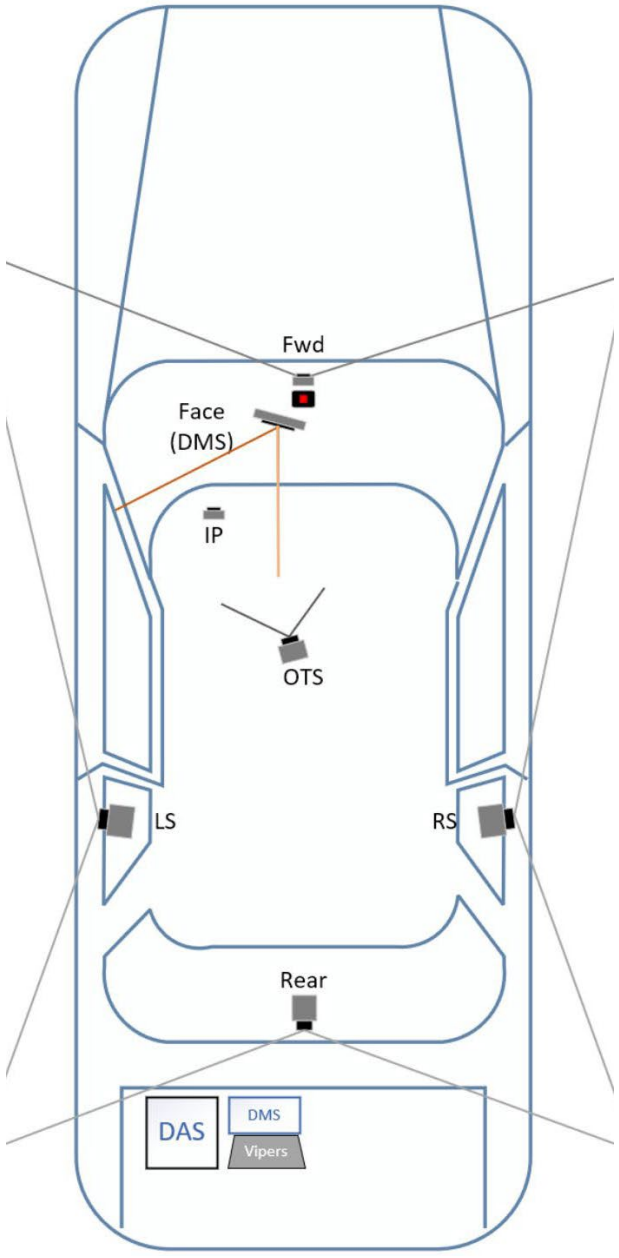
7) Manage data collection efforts to continually assess data quality, **identify key driving events**
8) Provide a variety of relevant **descriptive statistics** at the study, vehicle/participant, and trip level
9) Analyze data to **answer a set of research questions**

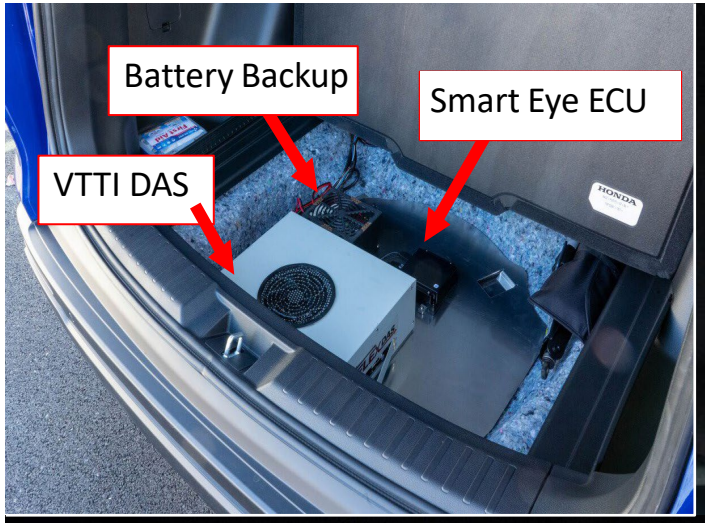


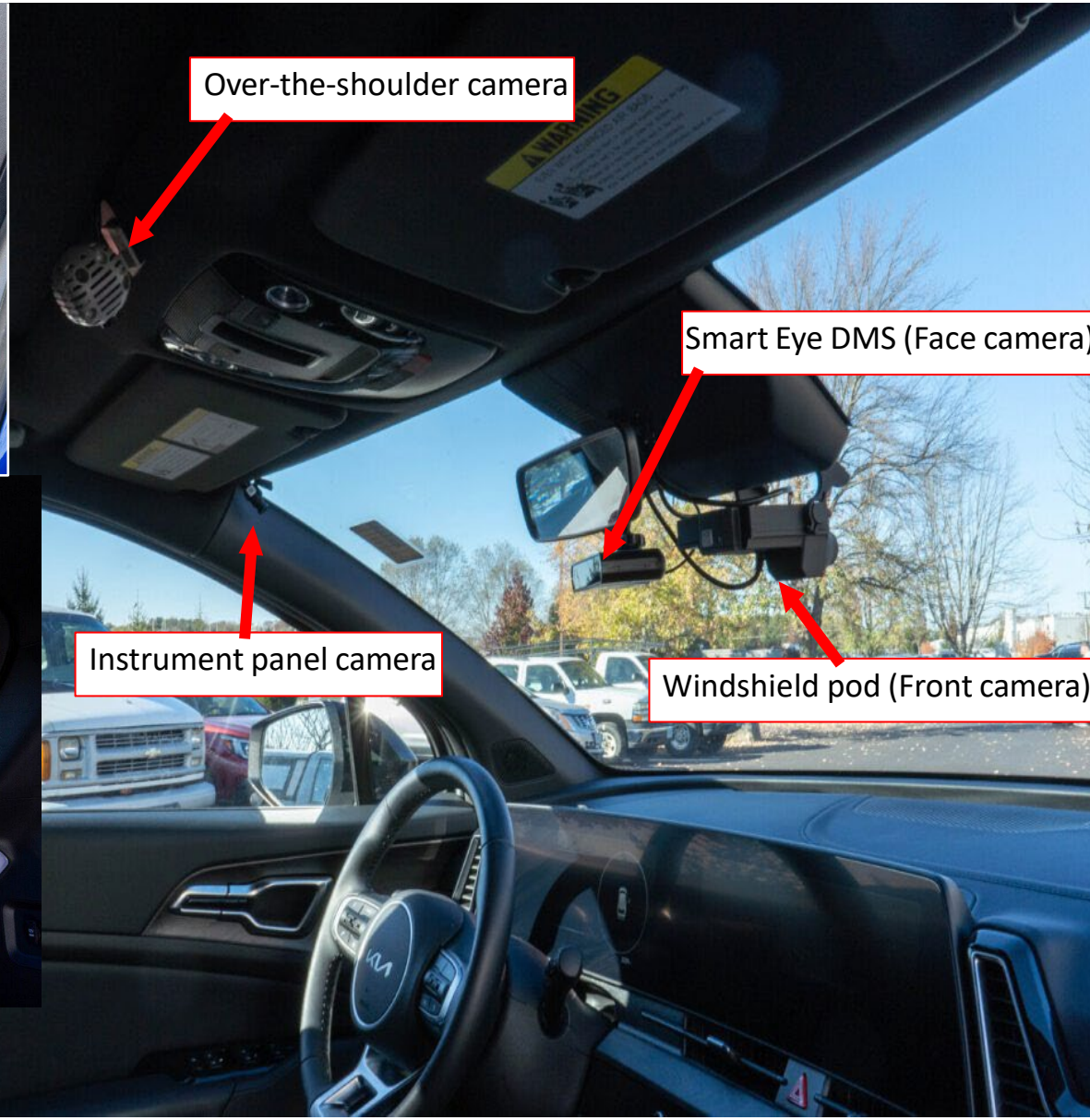
	DC/NOVA	Denver	Seattle	Total
 Ford Mach-E	8	8	8	24
 Honda CR-V	8	8	8	24
 Subaru Outback	8	8	8	24
 Toyota Cross	8	8	8	24
 Tesla Model 3	8	8	8	24
 Kia Sportage	8	8	8	24
Total	48	48	48	144

- Up to 18 months per participant
- Initial 6-month enrollment, followed by…
- 12-month extension if meeting study needs.
- Recruitment-related issues may occur due to vehicle YMM specificity, L2 use requirements, site, balancing, etc.
- Monitoring experimental design. Adjusting it and recruitment as needed in coordination with NHTSA.
- Status, challenges, adjustments described over next few slides.

Instrumentation Overview







Instrumentation Challenges

- Running wires through tight channels
- Tight interior panels
- Clean power source
  - Auto Stop
  - Dynamic charging systems
  - Electric vehicles
  - True ‘ignition’/on signal
- Camera Installation / interference with factory sensors
  - Forward factory cameras/sensors
  - Infrared from DMS
  - Mounting locations

High Data Rate/LTE

- High data rate in a naturalistic study
- Full HD forward camera, high bitrate to avoid image noise
- Uploading data via 4g LTE link
  - Large on-board storage for buffering
  - Ability to upload after data collection ends by using the battery backup
  - Ability to modify / prioritize upload order

Bitrate comparison

8mbps

4mbps

Camera Comparison

HDR

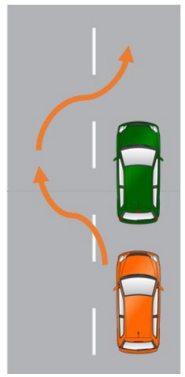
Standard

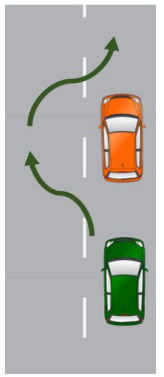
Day

Night

Driving Script (examples)

1. Vehicle feature instruction & acclimation (first leg of trip)
2. Passing with turn signal
   A. Lead Vehicle sets ACC 5 mph below speed limit
   B. Lead Vehicle remains in right lane
   C. Following Vehicle with ACC activated makes lane change and passes Lead Vehicle with turn signal
   D. Repeat with newly positioned vehicles





3. Passing **without** turn signal (repeat above without turn signals)

4. ACC Following Distance/headway
   A. Lead Vehicle and Following Vehicle separated by a suitable gap (to allow a slow approach from the Following Vehicle)
   B. Lead Vehicle sets ACC 5 mph below speed limit
   C. Lead Vehicle remains in right lane
   D. Following Vehicle approaches from behind at varying following distance/headway settings
   (adjusting dependent upon specific vehicle)
   E. Repeat with newly positioned vehicles

Current Progress

- Started data collection
  - DC/NOVA
  - Denver
  - Seattle

- Data sharing
  - Methods to protect CBI and PII
  - Infrastructure to host data

Thank you

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