

Integrating Best-Practices for Aviation Accident Reporting into DMV Accident Reports for Ground Autonomous Vehicles

Sky O. Eurich, Dr. Francesca M. Favaro
San Jose State University, RiSA²S Lab



Problem Statement

The CA DMV mandates the reporting of two types of situations:

- Accidents reports: 1-page summary of the event of a collision (*form OL 316*)
- Yearly reports of all disengagements, failures for situations that did not lead to an accident, but are still flagged as system failures, and thus potentially dangerous to the public (*now form OL 311R*)

GOAL: Improve current regulations by leveraging best-practices from the aviation field related to:

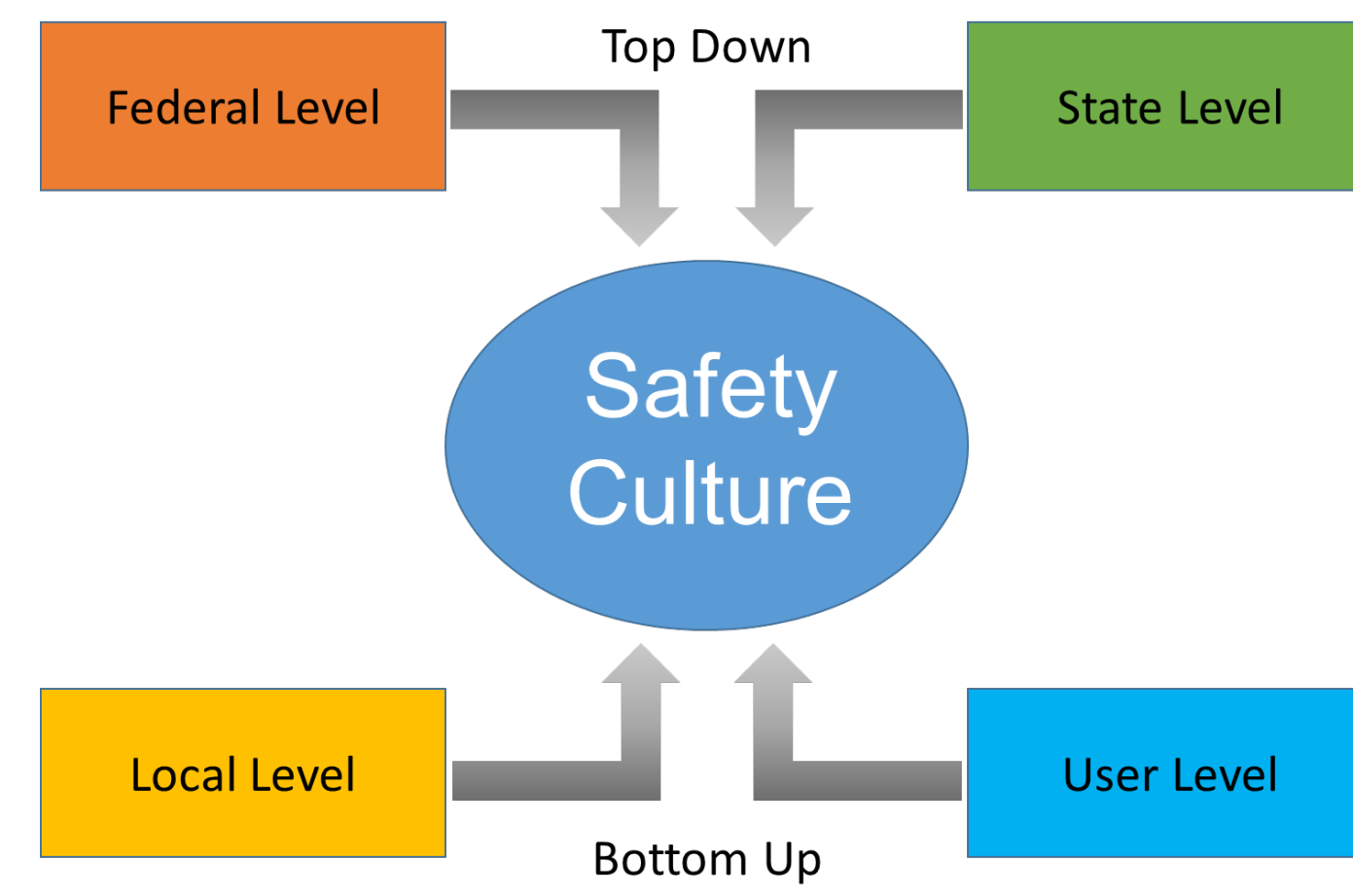
- Establishing a solid **safety culture** to account for new technology and the new role of human operator (back up, remote control center)
- Ensuring **consistency in report formatting** to include unified taxonomies towards the creation of a new template

Analogous aviation safety reporting forms can guide the development and improvement of current DMV required reporting methods

- NTSB aviation accident reporting (NTSB Form 6120.1)
- NASA Aviation Safety Reporting System incident reporting

A Need for Safety Culture

- Currently there is no system in place for **sharing** defect/error information across users and/or manufacturers

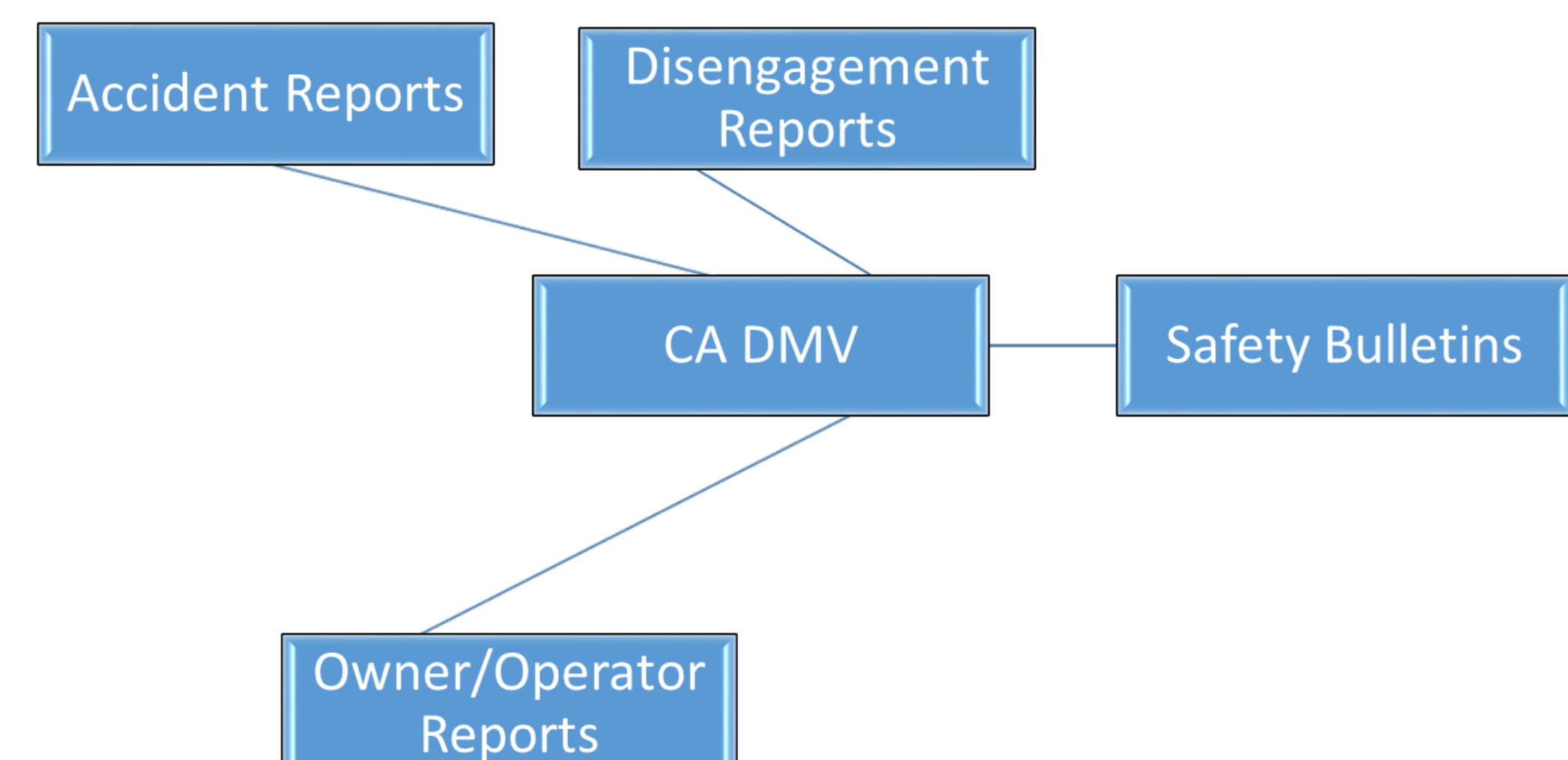


Key ingredient to establish safety culture

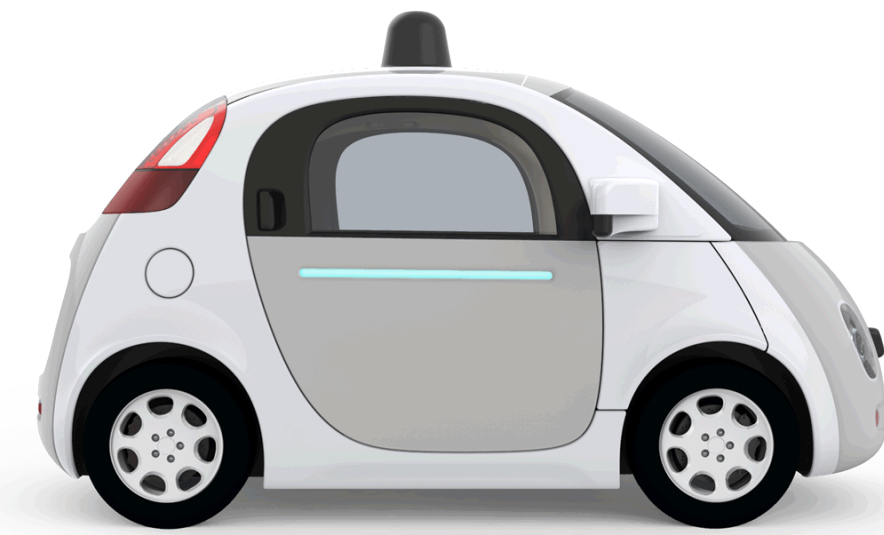
Did other drivers experience the same malfunction?



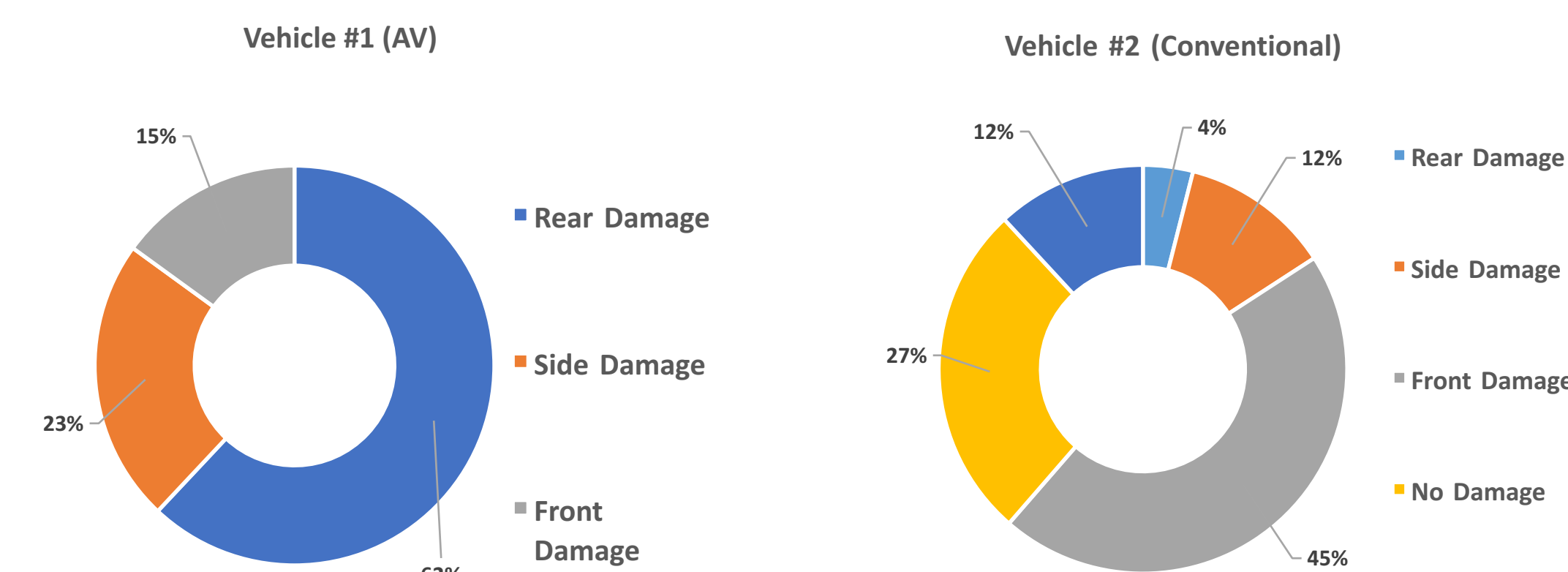
- Promote a safety culture regarding AVs, from the regulatory level to the individual user level
- Create an **online portal** for user-based safety and incident reporting, similar to how the Aviation Weather Center shares pilot reports (*PIREPs*) online and with federal agencies



CA DMV Accident (OL316)

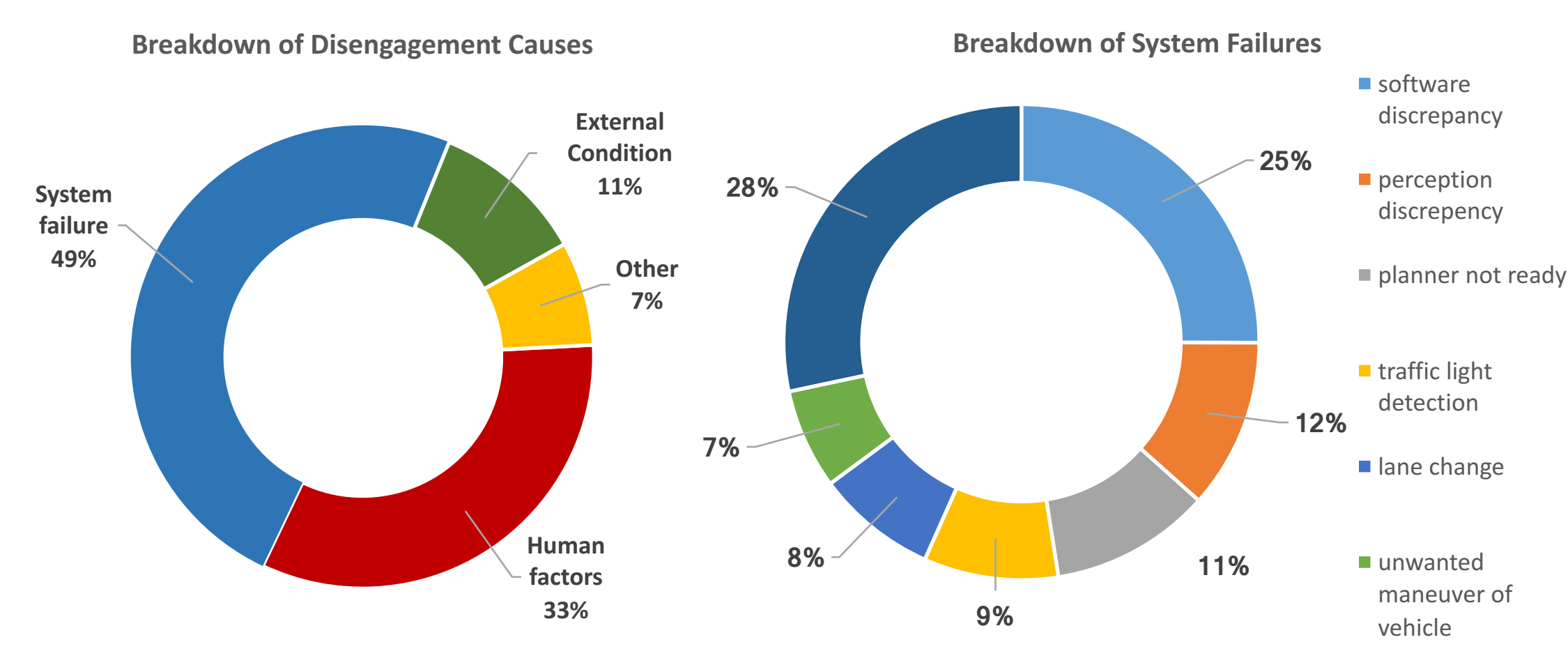


- Can be improved with clear instructions on how to fill out the form, to include definitions of terminology used
 - What constitutes minor vs major damage?
- Does not include section for detailed information about the AV involved



CA DMV Disengagement (OL311R)

- Can be made stronger with a unified taxonomy when reporting disengagement cause and two-layered chain of causality



NTSB Accident Report (6120.1)



- Highly detailed instructions with definitions of terminology used within the report
- Includes sections for exhaustive information about the vehicle suffering the accident:
 - e.g. engine & TBO, landing gear, additional equipment and instruments
- Includes manufacturer information for various components and on-board equipment
- Provides reporter with exhaustive weather, surface conditions, lighting, environment, and location options
- Reporting options for pilot experience, total hours, time in type and certifications

ASRS Incident Report

- Incorporates end users into aviation safety practices and facilitates a safety culture at all levels
- Includes Coding Taxonomy and Abbreviation supplements
- Provides reporter with the ability to list detailed weather information
 - Database includes optional search parameters and outputs multiple file types
- Suggests reportable information about the chain of events and human performance considerations

Proposed Changes

Current AVs incidents and accidents reporting method can be improved by tackling the following ingredients:

- Take into account software contributions to failure mechanisms and **two-layered chain of causality** for software failures
- Make more informative by requiring information on **mileage driven** prior to disengagement
 - A factor that contributes to disengagement and affects the response times of safety drivers who act as 'backup' for the autonomous systems
 - Percentage in manual mode vs. autonomous mode
- Definition of an **official taxonomy**
 - Manufacturers' reports include a wide ranging set of disengagement causes, most of which are not clearly defined and are uninterpretable to everyone else
 - Collaboration with manufacturers is needed to pool together a list of terms employed and associated definitions
- Inclusion of **disengagement frequency** (disengagements per miles driven) along with historical trends
 - Monthly rates in addition to yearly one
- Inclusion of detailed location information in each report type (beyond the type of road – similar to accident form)
- Inclusion of detailed weather information in each report (similar to accident form)
- Inclusion of **technical specs** and information about test vehicle

Currently no requirement to report LIDAR, RADAR, GPS or other guidance systems being used

Need to better adopt SAE levels of autonomy and include indication in the report

- Define driver **reaction time to disengagements** so that manufacturers report the same information (which input) and re-include its reporting within the regulations
- Create **searchable database** with multiple output formats (.csv, .xlsx etc)

Info and Contacts

Email: sky.eurich@sjsu.edu

Email: francesca.favaro@sjsu.edu

<http://www.sjsu.edu/people/francesca.favaro/>

This research was funded by the Central-RSCA program of San Jose State University