

# DESIGNING FOR PEDESTRIAN SAFETY

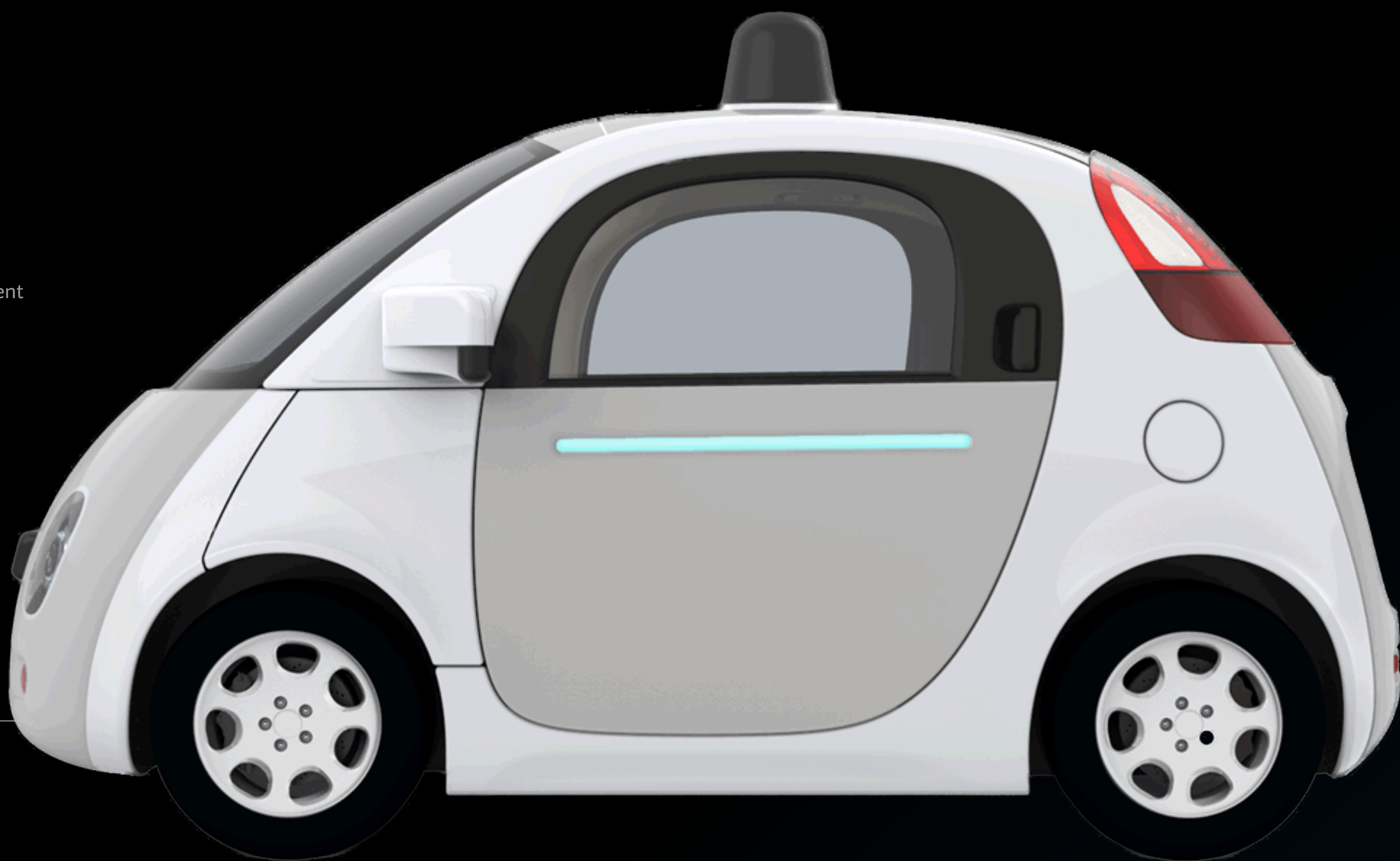
design 100, team 8

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## Introducing A.V.I.C.S, a prototype for self-driving car communication.

IN JANUARY, San Diego was chosen as one of the 10 nationally-approved testing grounds for autonomous cars by the US Department of Transportation. Three regions will be used: the I-15 Express Lanes, the South Bay Expressway and the City of Chula Vista.

With the growing industry behind autonomous vehicles, a future with widespread consumer operated autonomous vehicles is rapidly approaching. However people are not yet completely comfortable with having these vehicles on busy streets and constantly being around large amounts of people. This transitional period is underdeveloped and highly ambiguous. To ease the confusion between the mistrust with autonomous vehicles and the inhabitants of busy cities we have designed A.V.I.C.S. Our solution is an interface on the exterior of the vehicle that communicates the car's intent to outside moving entities. There are two components to the vehicle's communication, an icon that is displayed in the center of the window that communicates to pedestrians what the car expects them to do and a detection system that lets pedestrians know if the car is aware of their presence. With these combined systems people and the car will be able to understand each other clearly and keep accidents and vehicle hold ups to a minimum.



## USER RESEARCH

### INTERVIEWS

WE interviewed a variety of people including academics, regular citizens from San Diego and the Bay Area, and an Uber Driver. The idea was to get a wide spread of opinions from of mixture of experts and laymen in order to feel out all possible issues. We felt there was value in examining both empirically-tested issues from academics and gut-reaction concerns from citizens equally, since both factors will come into play when future laws and regulations are implemented.

BREAKDOWN OF INTERVIEWEE TYPES



- ACADEMICS (4)
- CITIZENS (3)
- RIDESHARE PROVIDERS (1)

We identified four major interview takeaways:

- **AWARENESS OF CHANGE**  
People know that autonomous vehicles are coming however they have not received enough exposure and first hand experience
- **TRUST ISSUES**  
With little knowledge about how the autonomous vehicles function people do not have enough information to form habits on how to interact with them
- **PERFORMANCE CONSISTENCY**  
Autonomous vehicles have proven to function very consistently on freeways and areas of low traffic however the "first and last mile" still presents an issue where the vehicle encounters too many factors that can cause conflict or there are large groups of people that can act unpredictably.
- **TRANSITION PERIOD**  
In the coming years autonomous and human driven vehicles will have to drive alongside each other, new habits will be formed as people get used to interacting with these vehicles and having clearly identifying systems and features will help the development of these behaviors

### PERSONAS



#### Herman Hermans

Herman is a 65 year old retiree native San Diegan.

#### MOTIVATIONS

Herman drives occasionally, and his transportation goals are to drive safely and be mobile and independent.

#### CONCERNS

Herman is not keen on the concept of autonomous cars because he's not confident in their ability to handle edge cases and he trusts his own driving ability above all else.



#### Sophia Sofi

Sophia is a 22 year old student living in the Bay Area.

#### MOTIVATIONS

She commutes daily to school, and her goals are to not crash. She is not a confident driver and has been in accidents before.

#### CONCERNS

She's slightly concerned about the reliability of self-driving cars, but benefits: the convenience of having a personal car, not having to drive, and utilizing her commute time outweigh that concern.



#### Lucas Lukus

Lucas is a 35 year old rideshare provider living in SD.

#### MOTIVATIONS

Lucas drives as a job, and he wants job safety. He is also concerned about a future controlled by machines.

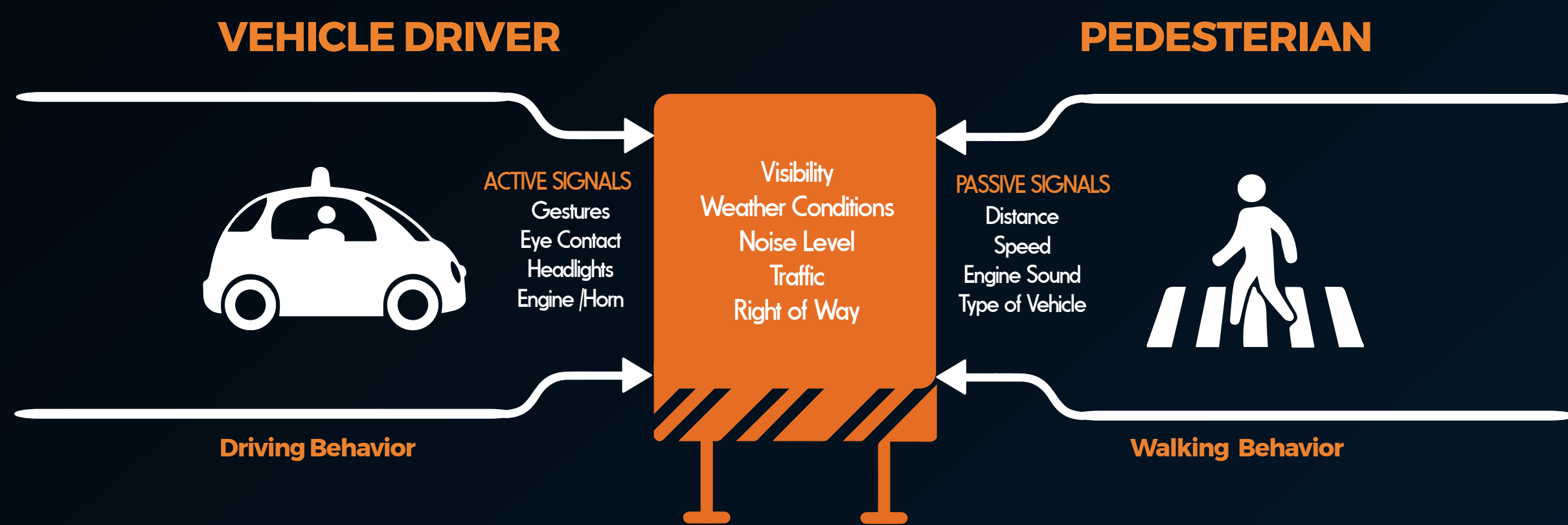
#### CONCERNS

Lucas is concerned about the loss of transportation jobs, as well as the loss of control that will happen when self-driving cars take over the streets.

### PROBLEM STATEMENT

Through assessing interviews and personas, we picked up on three key insights that helped shape our solution.

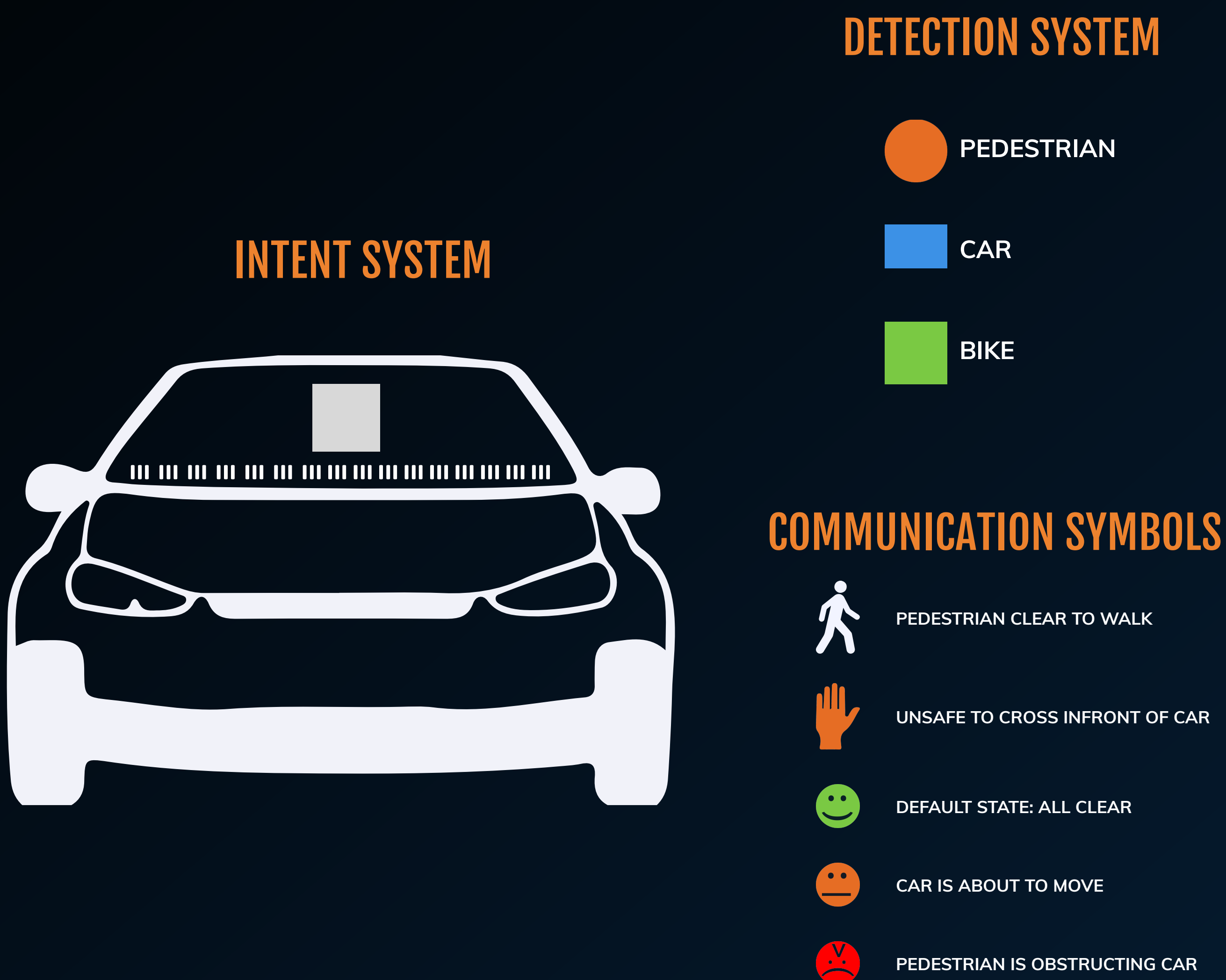
- Safety and reliability of self-driving cars is a perennial concern
- People feel they will suffer from a loss of control and are uncomfortable putting their lives in the hands of a machine
- Humans need direct feedback when communicating with a machine to instill confidence



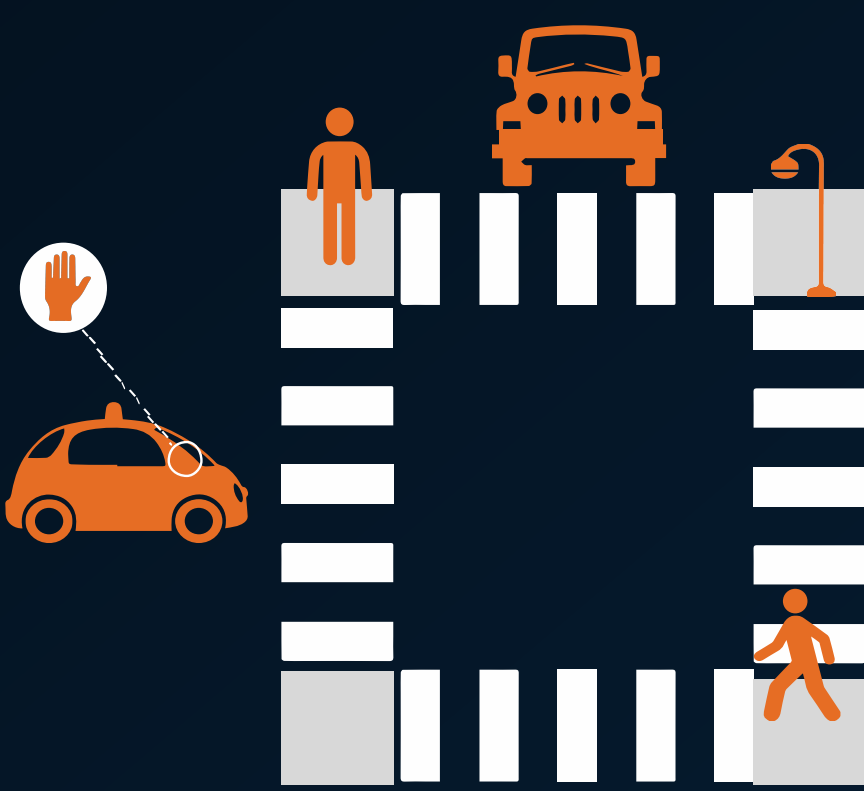
How can we establish communication between pedestrians and autonomous vehicles?

## SOLUTION

Our solution is an exterior interface that communicates the car's intent to outside moving entities. There are two components, an icon that is displayed in the center of the window that communicates to pedestrians what the car expects them to do and a detection system that lets pedestrians know if the car is aware of their presence.



### PROTOTYPE OF SYSTEM CAPABILITIES



#### USE CASE #1

Pedestrian is about to cross at a four-way intersection and the AV sends a signal (the hand icon) to stop.



#### USE CASE #2

The bicycle is about to cross, the AV is at a complete stop and sends a signal (the green smiley face) indicating it is clear to cross.



#### USE CASE #3

Pedestrian on phone is in the middle of the crosswalk obstructing traffic. Cars send out warning signal (angry face).