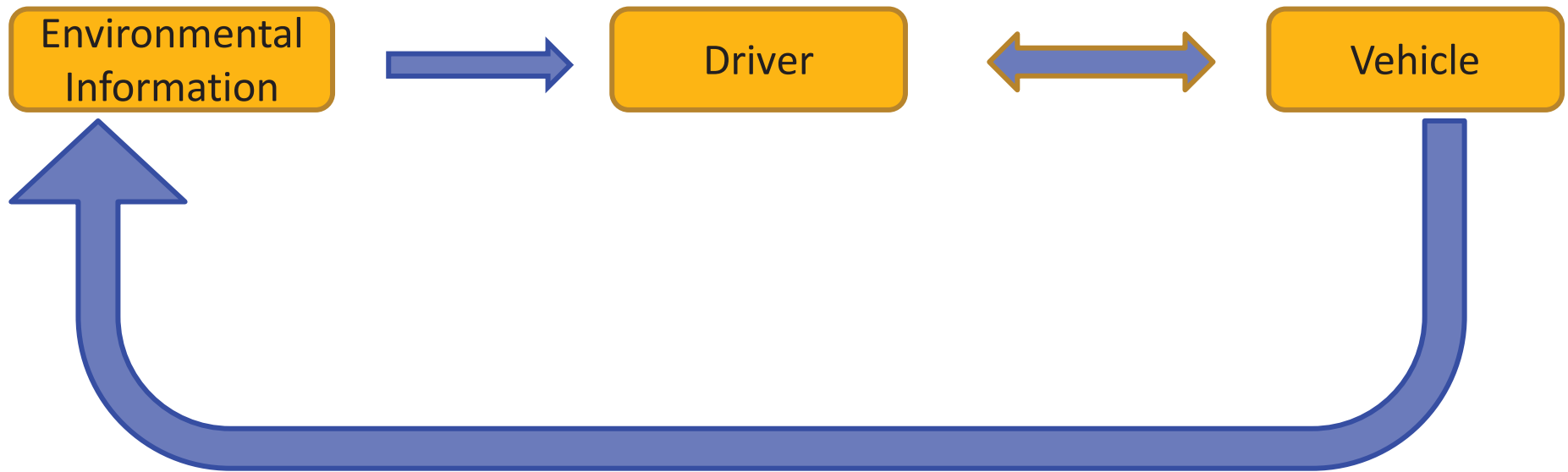

Human Drivers in Autonomous Vehicles

Rui Ni, Ph.D.

Driving Safety

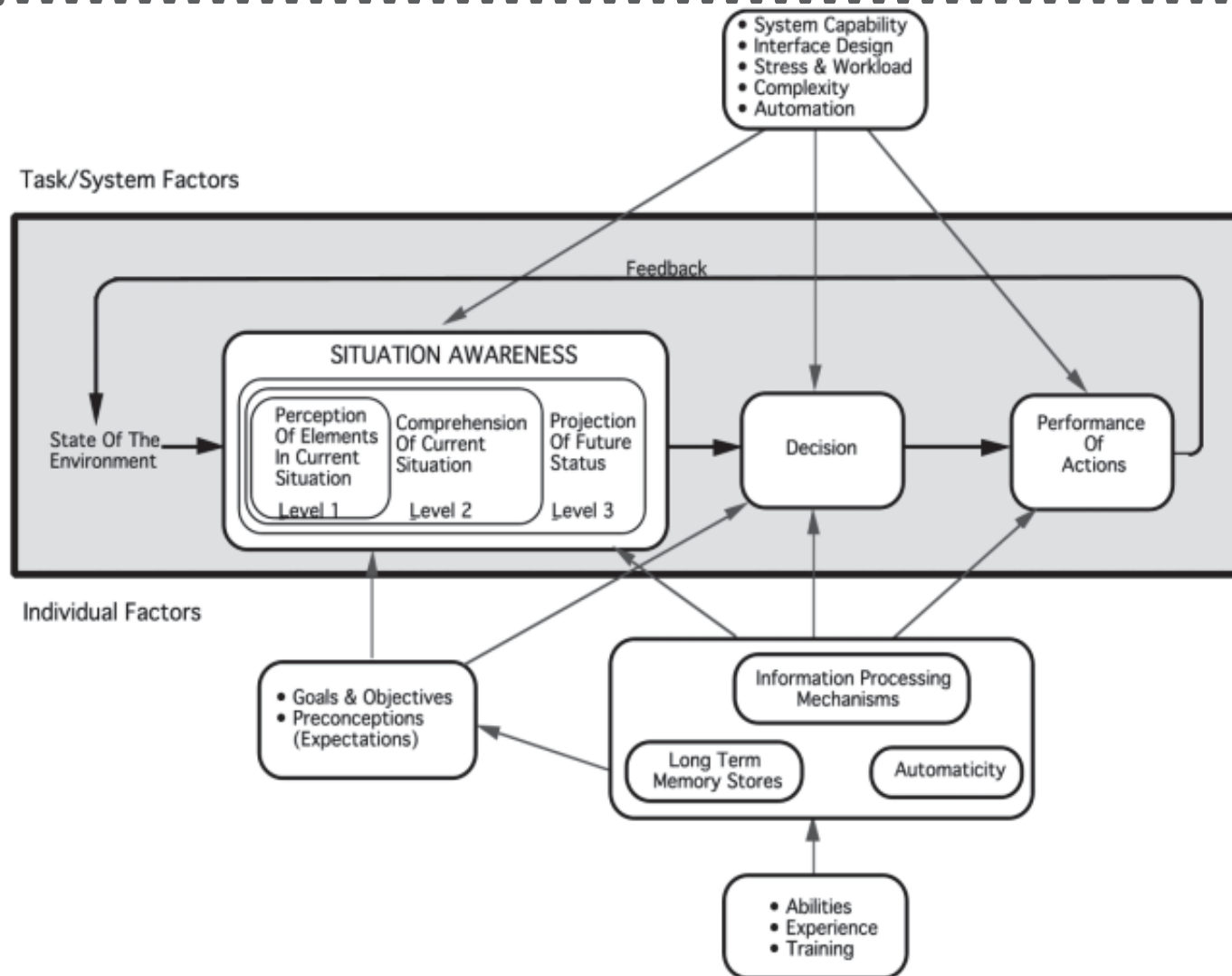
- 40,000+ roadway fatalities in 2016, 2017, and 2018 (*National Safety Council*)
- \$242 billion --- economic cost of traffic crashes (2010), including reported and unreported crashes (NHTSA)

Driving Safety



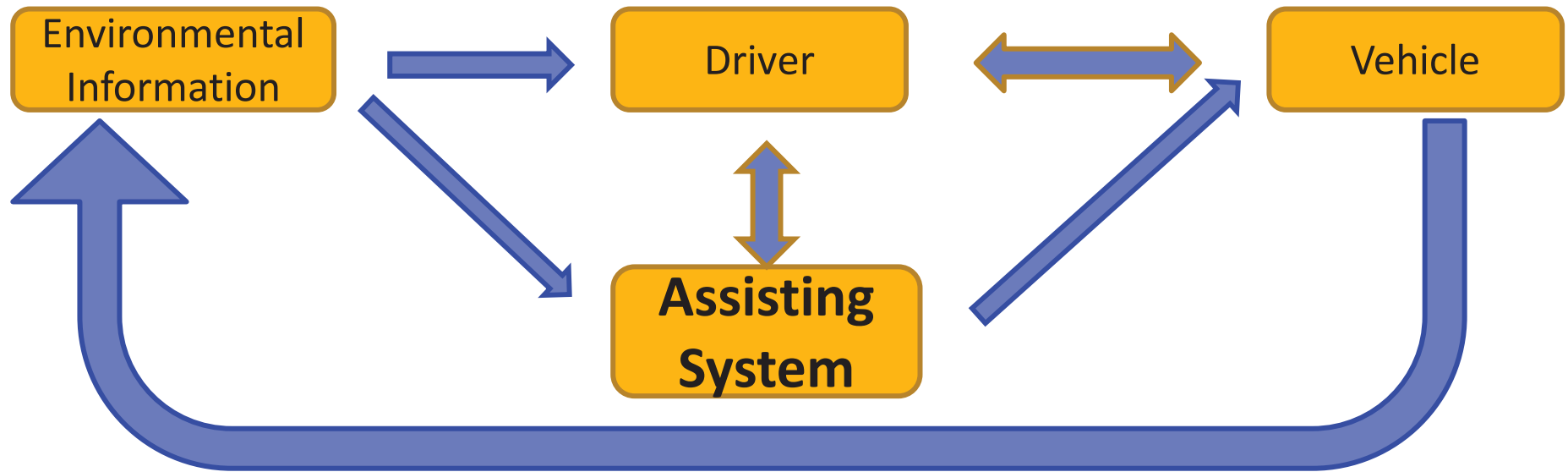
94% of accidents caused by human error

Human's Factors in Accidents



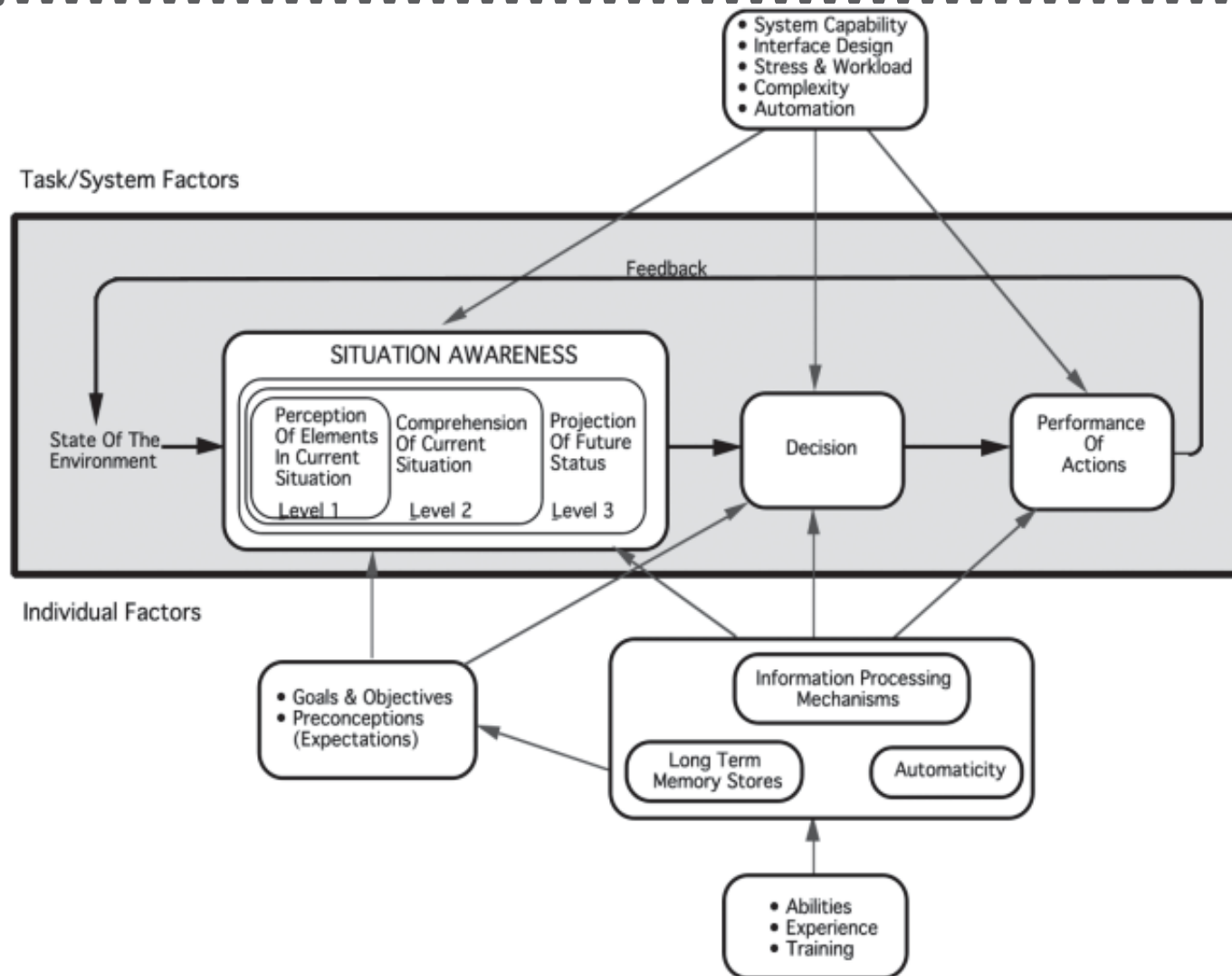
The information-processing model of Situation Awareness (Endsley, 1995)

Driving Safety and Semi-Automation



- Advanced driving assistance system
 - Adaptive cruise control
 - Collision warning/avoidance system
 - Lane departure warning/correcting
 - Blind-spot warning

AI Factors in Accidents



The information-processing model of Situation Awareness (Endsley, 1995)

Is Autonomous Vehicle safe?

	Human-controlled driving	Autonomous Vehicle
miles driven	3,174,408,000,000 /2016 (NHTSA)	<2,000,000 (2018) <20,000,000 in total (Pcmag.com)
Fatalities per 100 Million Vehicle Miles Traveled	1.18 (NHTSA) (NHTSA)	6 since 2016 (Wikipedia.org)

Autonomous Vehicle Accidents



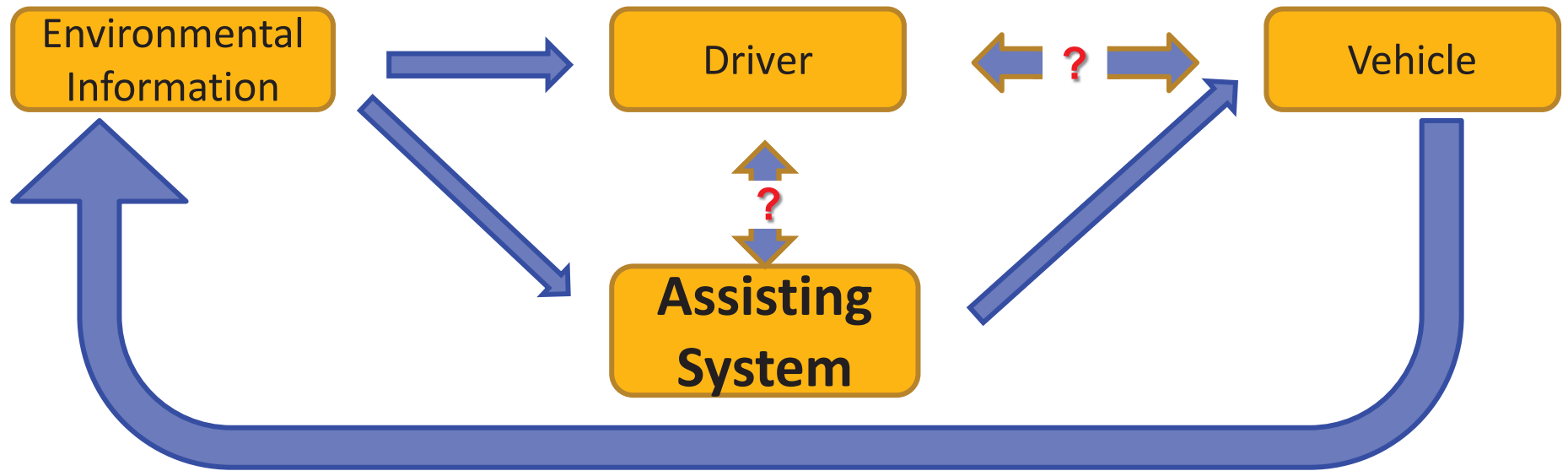
Environmental Factors

	Human-controlled driving	Autonomous Vehicle
Distance	9cm at 300 m	2 cm at 300m
Night/Dawn/Dusk	18,103 (2016)	X
Glare	X	X
Rain	2,148 (2016)	X
Snow / Sleet	445 (2016)	X

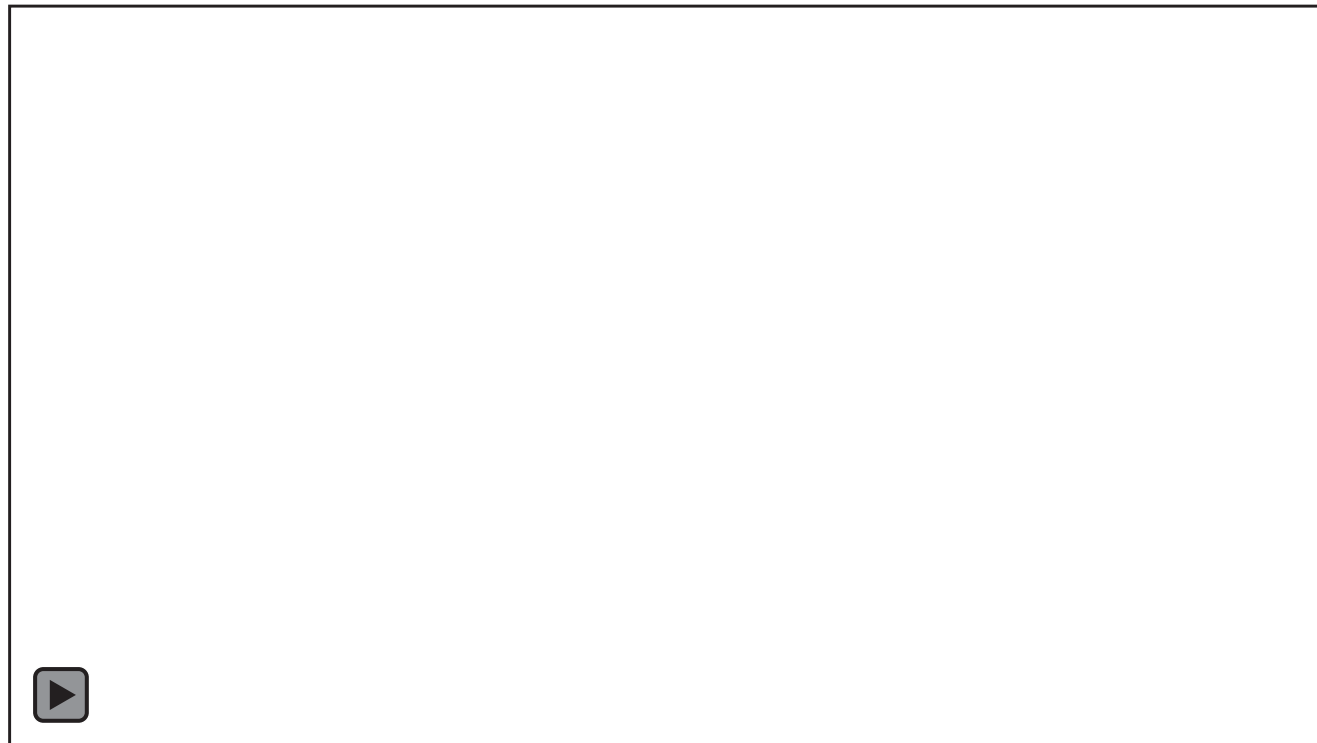
Human Factors

	Human-controlled driving	Autonomous Vehicle
Age	X	X
Fatigue	X	X
Drowsiness	X	X
Distraction	X	X
Inattention	X	X

Driving Safety and Semi-Automation



Hazardous Scenarios



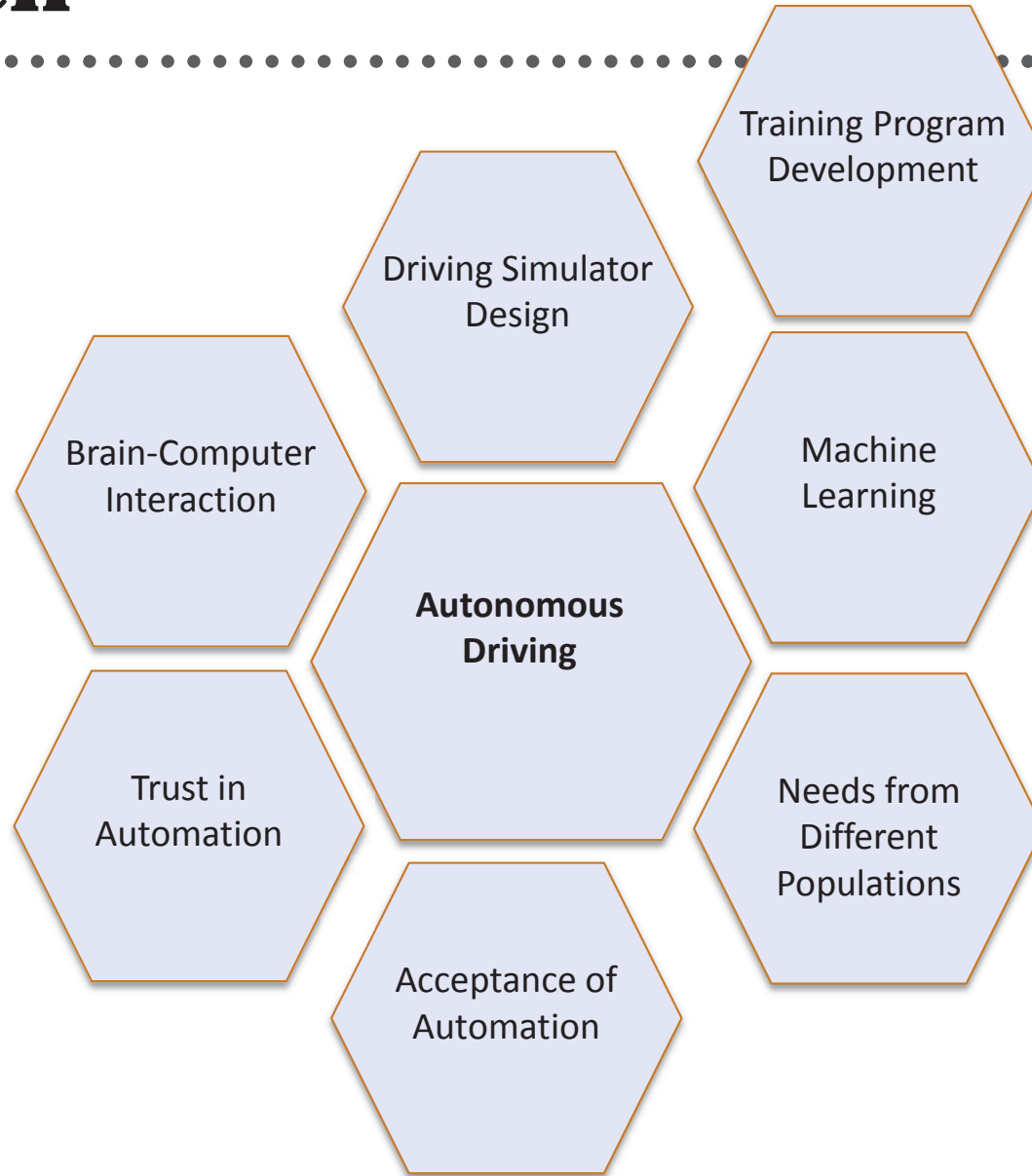
Driving Simulator



Simulator and Real-World Research



Vision of Autonomous Driving Research



Challenges & Opportunities

- Resources
 - Data-sharing
 - Testing platform
- Supports
 - Manufactures
 - Government
 - Insurance
 - Engineering
 - Human Factors

Thank you!