# Scalable and Customizable Intent Inference and Motion Planning for Socially-Adept Autonomous Vehicles

NRI:FND: Scalable and Customizable Intent Inference and Motion Planning for Socially-Adept Autonomous Vehicles

PI: Wenlong Zhang, Co-PIs: Yi Ren and Yezhou Yang. Arizona State University. (2019-2022)
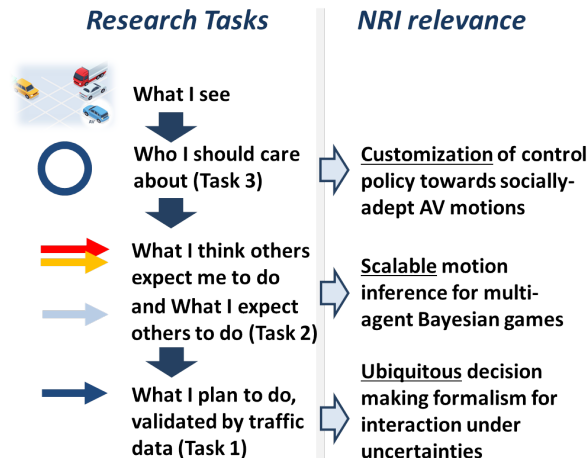
Challenge

- AV-HV interaction is an incomplete-information and differential game
- How to compute Bayesian equilibria for intent inference and motion planning?
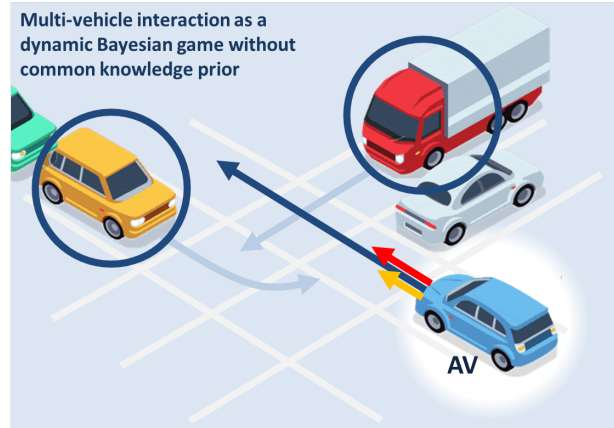
Solution

- Modeling mutual intent inference
- Incorporating vehicle dynamics
- Exploring various definitions for courtesy and social adeptness
- Analyzing convergence and stability of AV-HV interactions

Multi-vehicle interaction as a dynamic Bayesian game without common knowledge prior

Research Tasks | **NRI relevance**

What I see

Who I should care about (Task 3) → **Customization** of control policy towards socially-adept AV motions

What I think others expect me to do and What I expect others to do (Task 2) → **Scalable** motion inference for multi-agent Bayesian games

What I plan to do, validated by traffic data (Task 1) → **Ubiquitous** decision making formalism for interaction under uncertainties

Scientific Impact

- New theory of mind models for social interaction (e.g., driving)
- Mathematical definition of social adeptness
- New hardware-software v&v platform

Broader Impact

- $80 billion invested in AV industry (2017-2019)
- New interdisciplinary course on AVs
- Foster collaboration between academia and industry through open-source v&v platform
- Safety and efficiency of human-machine systems (AVs, collaborative manufacturing, robotic surgery, search and rescue)