CAREER: Formal Methods for Human-Cyber-Physical Systems

Award #1942836 (6/15/2020 – 5/31/2025)

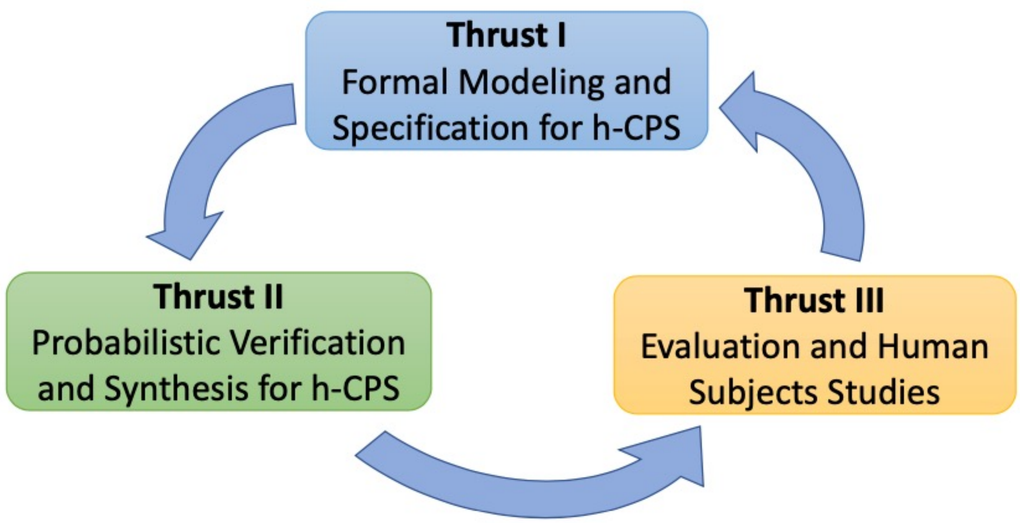
Lu Feng, University of Virginia

Challenge:

- How do we verify the safety of human-CPS, accounting for the uncertainty and variability of human behaviors?
- How do we synthesize CPS controllers that adapt to human intentions and preferences, and generate human interpretable explanations?

Solution:

- Data-driven modeling of driver takeover behavior [CHI'2021]
- Contrastive explanations for MDP planning [IROS'2020]
- Multi-objective controller synthesis with uncertain human preferences [FM'2021 submission]



Scientific Impact:

- Develop theory, methods, and tools for the formal specification, verification and synthesis of human-CPS that account for the uncertainty and variability of human behaviors, intentions, and preferences

Broader Impact:

- Potential to improve safety, increase user satisfaction, and cut development cost
- Develop new CPS graduate course