



NSF Early Career Professionals Workshop on Exploring the Frontiers of Cyber-Physical Systems



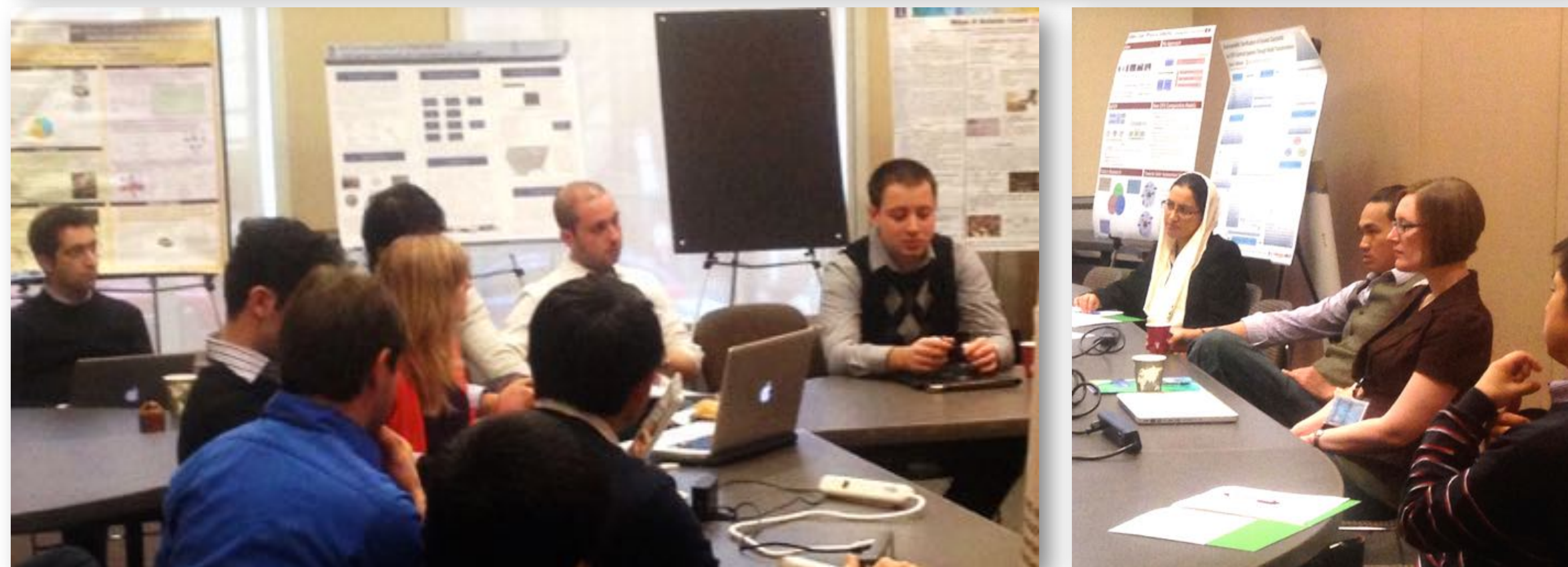
Presenter/Participant: Ann Majewicz

Assistant Professor, Department of Mechanical Engineering, University of Texas At Dallas

Aim: To foster innovative, thought-provoking discussions exploring new frontiers of CPS among early-career professionals (senior graduate students and recent Ph.D.'s).

Highlights:

- First CPS workshop targeting early career professionals.
- Participants across academia, industry, and government, with expertise in CPS, energy, transportation, and healthcare.



Interest and Participation:

- Received over 80 position papers.
- Invited 50 workshop participants.

Organization of the Event:

- 2 workshop plenary talks from senior researchers (45 minutes)
- 6 invited talks from early career CPS researchers (15 minutes)
- 9 oral highlight presentations selected among participants (5 minutes)
- 48 interactive poster presentations from all participants
- 9 break-out sessions for 1.5 hour discussions

Workshop Plenaries:

- *William Colglazier*, Science & Technology Advisor to the U.S. Secretary of State
"The Role of Science and Technology in Achieving a Prosperous and Sustainable Future for All People"
- *Ruzena Bajcsy*, Professor, University of California, Berkeley
"Hybrid Systems as the Framework for Interaction Between Human and Cyber-Physical Systems"

Discussion Topics:

Foundations	Theories for Distributed Design	Foundations of Security	Big Data: Balancing Privacy and Mining
Critical Infrastructure and Systems	Interoperability	Safe and Trustworthy Systems	Automation and Human-in-the-loop
CPS Applications	Energy and Transportation	Robotics	New CPS Domains and Applications

Dates: March 13-14, 2014

Location: American Geophysical Union, 2000 Florida Ave. NW, Washington, DC 20009

Workshop chair:

Sertac Karaman,
Assistant Professor of Aeronautics and Astronautics, Massachusetts Institute of Technology

Steering Committee:

Michael Branicky,
Dean, School of Engineering, University of Kansas
William Colglazier,
Science & Technology Adviser to the U.S. Secretary of State

Program Committee:

Kostas Bekris (Rutgers University)
Sairaj Dhole (University of Minnesota)
Gavin Garner (University of Virginia)
Sertac Karaman, Massachusetts Institute of Technology
Necmiye Ozay (University of Michigan)
Andre Platzer (Carnegie Mellon University)
Ufuk Topcu (University of Pennsylvania)

Government Sponsors:

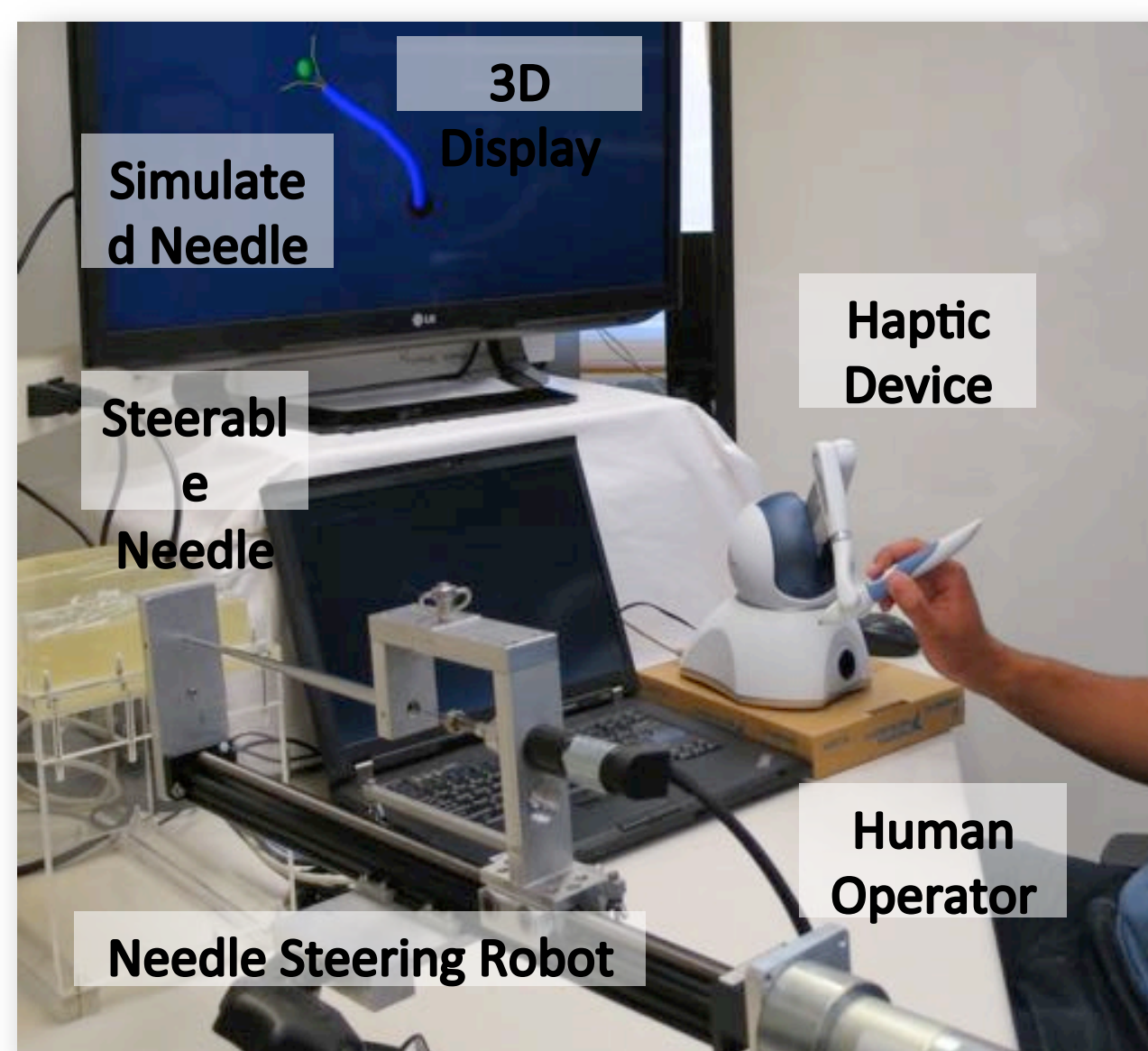
David Corman, Sylvia Spengler, and Tho Nguyen (NSF)

Follow-Up Activities:

- Sponsored 8 participants to attend CPS Week in Berlin, Germany. (*April 2014*)
- Preparing report with participatory effort of all attendees. (*Exp. December 2014*)

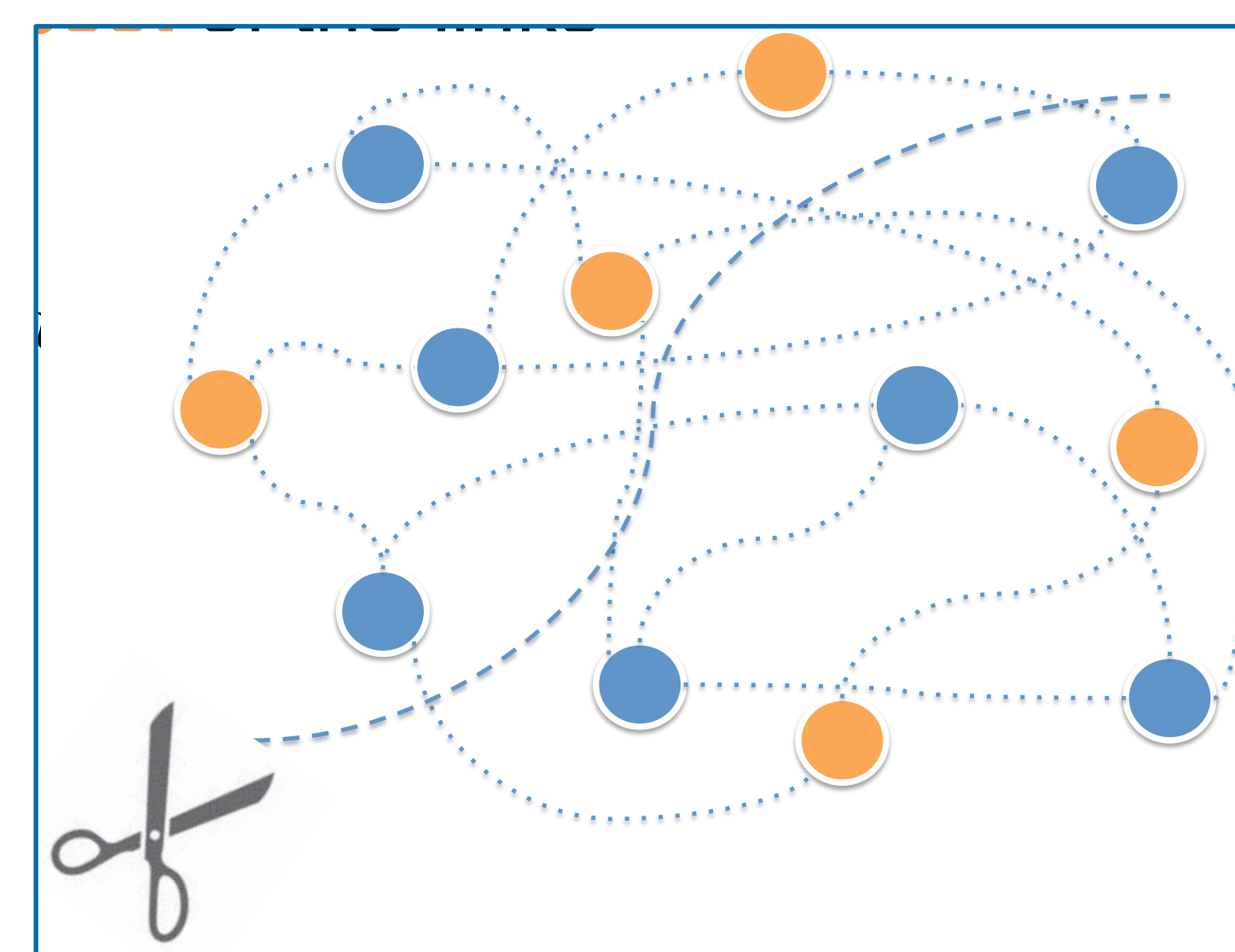
Representative Poster Topics:

Human Health



Intuitive Human-in-the-Loop Control for Medical Cyber-Physical Systems
Ann Majewicz, Stanford University

Defense



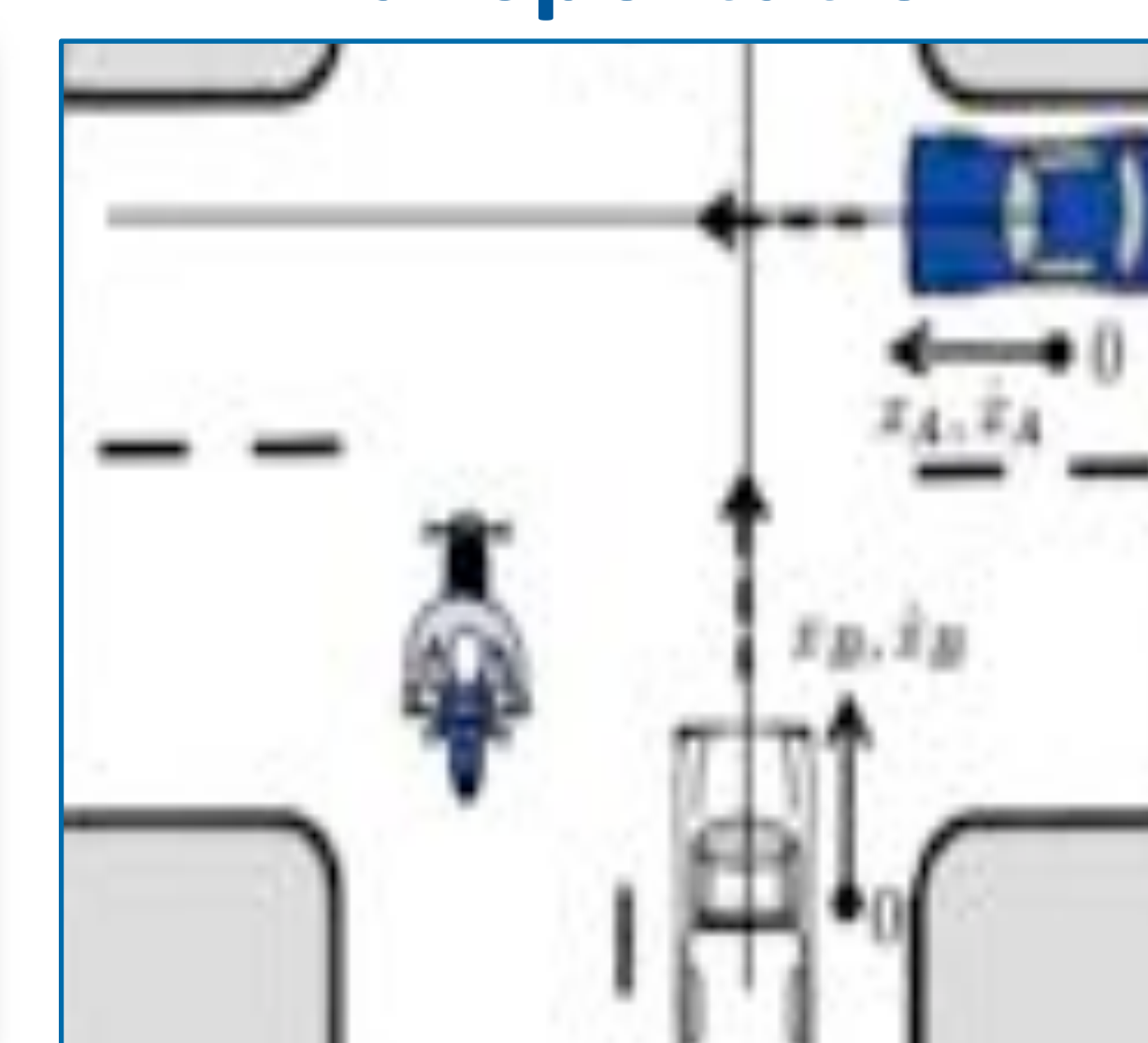
Efficient Information Spread Control in Cyber-Physical Systems
Ali Khanafer, University of Illinois at Urbana-Champaign

Environment



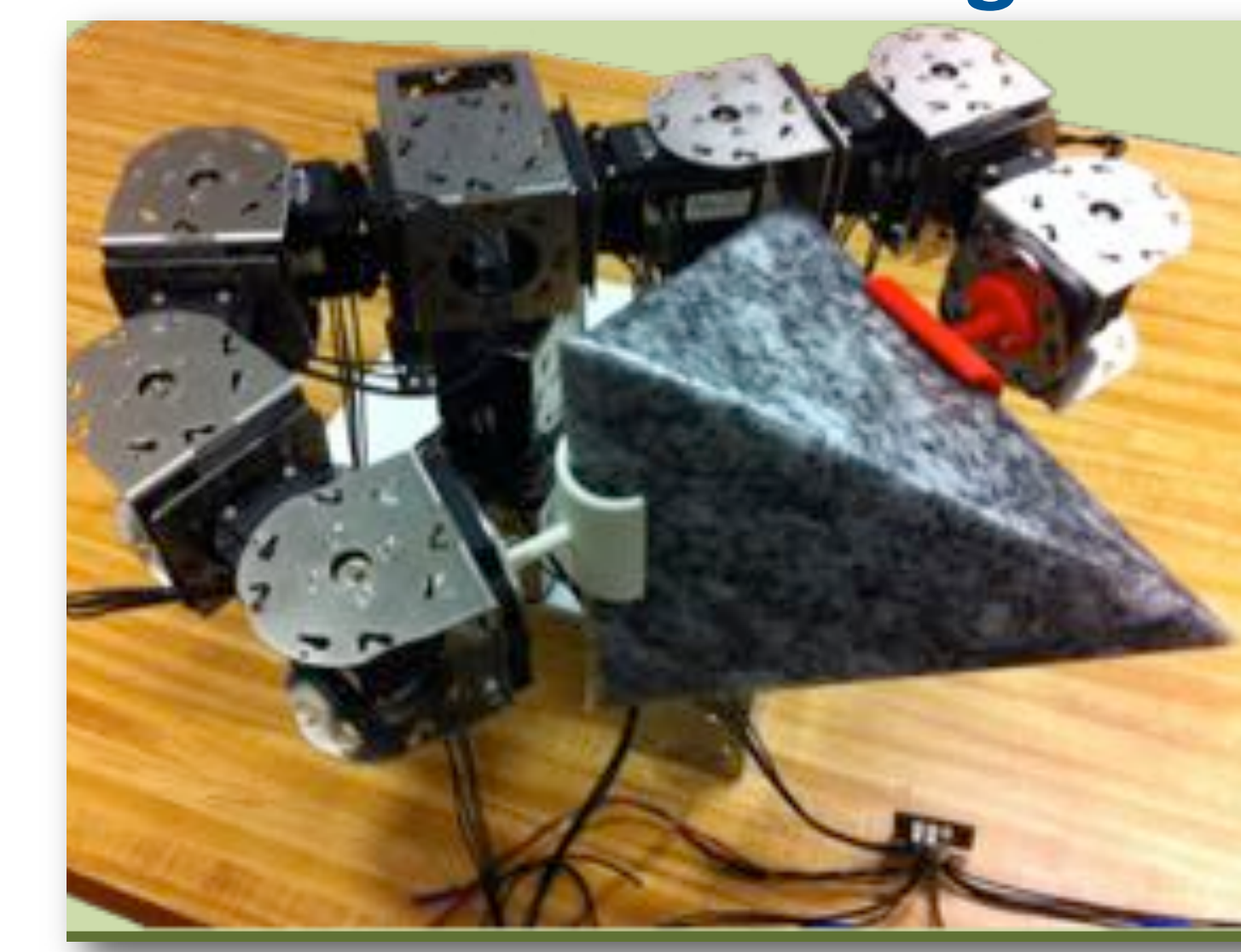
Data-driven Wildlife Ecology, Habitat Management and Environmental Sensing
Robert MacCurdy, Cornell University

Transportation



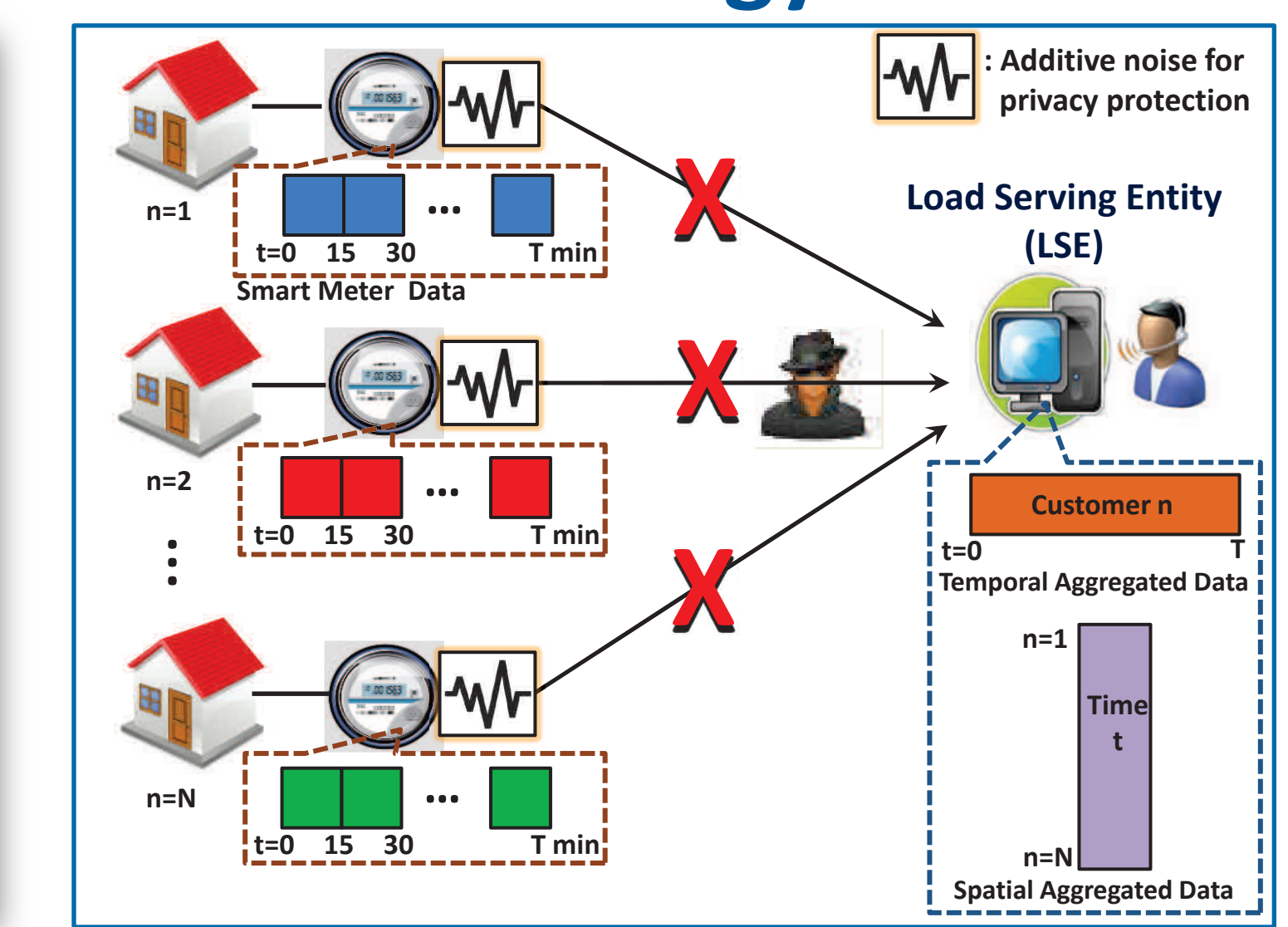
Safety Hybrid Control with Intention Inference in Transportation CPS
Sze Zheng Yong, Massachusetts Institute of Technology

Manufacturing



Cyber-Physical System for Material Handling
Jun Seo, University of Pennsylvania

Energy



A Framework for the Impact Analysis of Data Quality/Integrity/Privacy in Cyber-Physical Electric Energy Systems
Dae-Hyun Choi, Texas A&M University

Future Technical Challenges in CPS:

- Reliability and efficiency in dynamic, uncertain environments
- Modeling and predicting human user intent
- Detecting/mitigating security breaches and system failures
- Sharing control authority between human users and CPS
- Developing open platforms and protocols to promote accessibility and interoperability

Important Discussion Topics between CPS Researchers and Policy-Makers:

- Acceptable tradeoffs between user privacy and data utility. Should different standards exist for research vs. commercial use?
- Liability in human-in-the-loop CPS - human operator, system, or designer?
- Ethical considerations for modifying human behavior through CPS (e.g., energy consumption incentives, transportation rerouting, altering health and well-being choices etc.).
- Informing public about CPS privacy, security, trustworthiness, and utility concerns.