First CCC Workshop on
Cyber-Social Learning Systems

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Thank You

- Chuck Friedman

- Organizing committee

- CCC and CRA

- NSF

- And you

Deep Societal Challenges

- **Healthcare**: costly, blunt, low-performing, unsafe: 100-400K deaths from avoidable errors in US annually

- **Education**: costly, blunt, affected by factors outside system (e.g., poverty), contributing to a nation at risk (c.f., Thomas Jefferson)

- **Cities/Communities**: inequities in criminal justice; inefficient transportation, energy systems, services;

- **Energy/Environment:** Atmospheric warming, sea rise, storm intensification, impacts on cities, resource depletion

- **Defense**: Strategic/deterrent advantages of second "offset" fading as adversaries rapidly develop; US now seeking to create "third offset"

- **Biosecurity:** CRISPR/Cas-9 and related advances combined with rapid global transportation create threat of emergent pathogens and need for world-wide bio-surveillance & control

- **Etc.**

Breakthrough Capabilities

- **Computer science and engineering**
  - CPS, big data / machine learning / artificial intelligence, software, simulation, visualization, etc.
  - Understanding of complex systems, properties and tradeoffs, stakeholder value propositions, uncertainty, learning systems
- **Social, behavioral, economic, and other sciences**
  - Behavioral economics, mechanism design, cog. science, etc.
  - Theories of learning, adaptation, and evolution (e.g., Valiant)
  - Technology altering our ability to observe, understand, predict, and influence human/social phenomena at scale
- **Implementation-oriented sciences and translational research**
  - Implementation science, smart service systems, MINDSPACE, etc

A Challenge

- These advances in isolation are not sufficient

- Integrate and anneal concepts, methods, and tools from across these disciplines to develop principles, methods, and tools for transforming critical systems into cyber-social learning systems exhibiting breakthroughs in function, performance, evolution, trustworthiness, and trust, across domains and scales, and in ways consistent with the values of an open, democratic society

Compare & Contrast with CPS

- A model for an initiative in CSLS, but with major differences
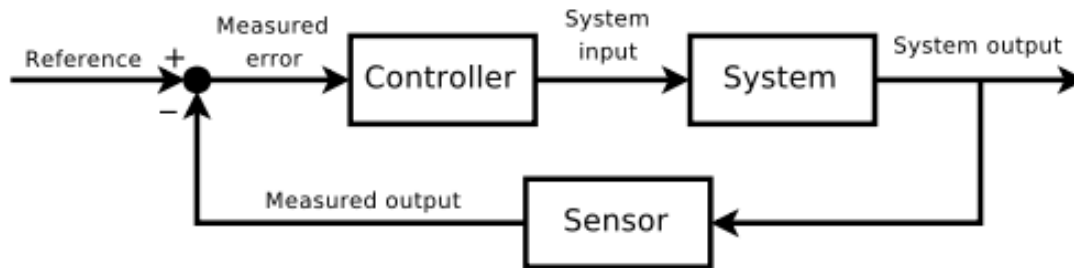
- Non-sentient physical phenomenon is "plant" to be controlled
- Major improvements in system function and performance
- People often treated simplistically (e.g., as utility optimizers)

People Aren't Plants

- … above the level of physiological processes

- Intentionality, agency, autonomy, emotion, hedonism, bounded rationality, fast and slow thinking, learning and adaptation, evolutionary instincts, deeply held culture & practices, ethics, laws, regulatory frameworks, incentive systems, enforcement mechanisms, etc

- Cyber-social integration will likely require principles that are fundamentally different than those, rooted in the integration of computing and control theory, underlying CPS

This Workshop

- A *sampling* of "coming in" perspectives (short talks)
- Discussion groups organized both across and within fields
- Lots of time planned in sessions for plenary discussion
- Laying the groundwork for follow-ons in October and January
- To advise the research community and policy makers
- A remarkable group of remarkable people