Societal Scale Cyber Physical Systems

The scope of the research agenda of Cyber Physical Systems (CPS) has expanded to include the Internet of Things (IoT), Mechanism and Incentive Design, Resilience and Cyber Security, and data analytics for Big Data arising from CPS Systems. Much work has been done in recent years on the evolution of ‘Action Webs’; moreover, closing the loop around IoT networked sensors. These networked control systems are fast-becoming the next generation societal-scale. Societal Scale CPS systems need to offer new data oriented service models, be robust, fault tolerant, and able to operate through cyber-attacks. Thus, the agenda of Societal Scale CPS Systems very much expands on IoT. Additionally, the advent of Societal Scale CPS Systems is causing the emergence of new models for monetization for the offering of new data oriented services. In this lecture, the rudiments of a theory of resilient societal CPS systems will be discussed, including the modeling of utility based privacy and security. Further, the discussion will also focus on the provision of economic incentives to private entities which own individual action webs to address issues of “under investment in the common good”. More technically, this is a mechanism design procedure for helping bridge the gap between the non-cooperative Nash equilibrium of multiple players and the societal optimum strategy.

The lecture is based on Dr. Sastry’s joint work with several researchers and past and ongoing students.