Dr. Kalyan Piratla Receives $500,000 NSF Grant for CRISP

Critical Resilient Interdependent Infrastructure Systems and Processes

**Background:** Critical infrastructures such as water, power and gas supplies are crucial for our economic prosperity, security and health. These infrastructures are inherently interdependent resulting in the possibility that a minor disturbance in one infrastructure can cascade into a regional outage across multiple infrastructures. This fear is worsened by the increased dependence of these critical infrastructures on data networks, computing and control systems which are vulnerable to cyber-attacks. There is a dearth of knowledge on predictive modeling of infrastructure interdependencies and the resulting cascading failures that are optimally compatible with cognitive aptitudes of humans involved in decision making.

**Project Description:** Dr. Piratla and his team received a research grant from the National Science Foundation as part of the CRISP program to develop a novel framework for modeling collaborative adaptive capabilities that are driven by human cognitive abilities and preferences in order to minimize the risk of cascading failures across infrastructure systems. This project entails:
(a) developing mental models of how infrastructure operators perceive emerging crises, (b) developing real-time virtual simulation models of critical infrastructures that are continuously validated by data from the SCADA systems, and (c) leveraging computational intelligence techniques to rapidly predict near-future system states for enabling time-bound adaptive control.

The cyber-physical-psychological interplay investigated in this project will have widespread benefits to infrastructure managers, emergency response teams and policy makers enabling them to more effectively deal with emerging crises.