Abstract
Sensor-based in situ quality assurance is a critical area of research in complex systems and processes, such as additive manufacturing (AM). Due to multiple physio-mechanical process interactions, heterogeneous sensors are typically required to detect evolving process/system anomalies. The high volume, variety, and velocity of data acquired by sensors leads to the so-called curse of dimensionality. Accordingly, the key research question of this talk is: how to fuse information from multidimensional sensor signals for monitoring and prognosis? This question permeates diverse domains, for instance, classifying geometric integrity of AM parts from laser scans; detection of drifts in aerosol jet printing; and identification of epileptic seizures from electroencephalography (EEG) signals, among others. An approach to answer this question is to map a multidimensional signal as an un-weighted, undirected network graph. Based on three experimental case studies from two domains, namely, additive manufacturing and neurophysiology it is demonstrated that this graph theoretic signal processing approach offers an effective means to monitor complex bio-physical systems in a data rich environment.

BIOGRAPHY
Prahalad K. Rao is currently an Assistant Professor in the SSIE department at SUNY Binghamton. His research focuses on sensor-based monitoring of complex systems, e.g., additive manufacturing, ultraprecision nano-manufacturing, and neurophysiology. He was recently (2015) awarded a NSF grant (CMMI 1538059) for applying graph theoretic techniques towards monitoring of neurophysiological anomalies.