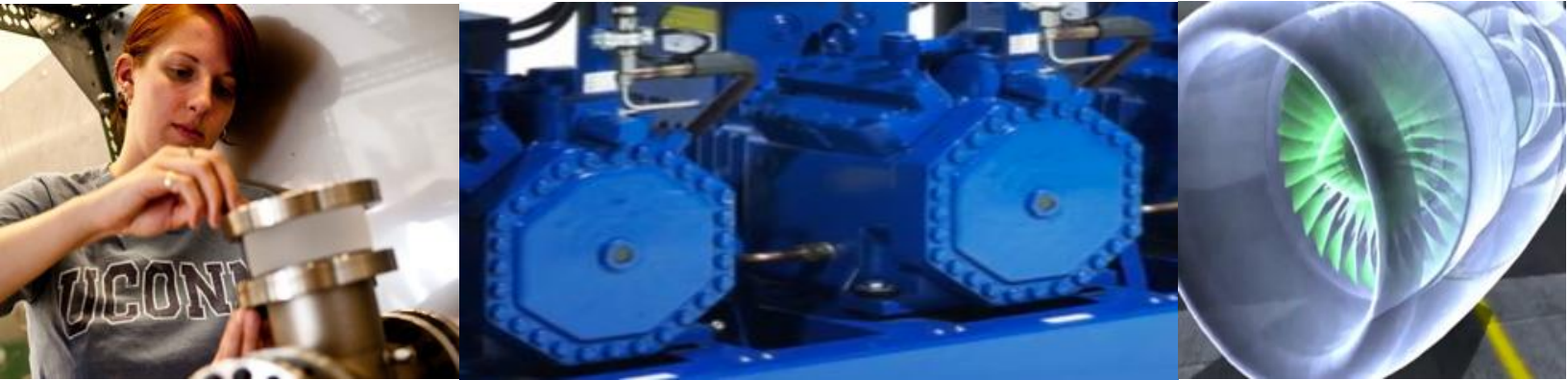# UTC Institute for Advanced Systems Engineering
Seminar Series

Tuhin Sahai
United Technologies Research Center

SCALABLE ALGORITHMS FOR COMPLEX NETWORKS

Friday, April 18, 2014   4:00 – 5:00 p.m.   Storrs Campus, UTEB 150

Abstract: Next generation energy and aerospace systems such as smart grids, building systems, communication networks and UAV swarms give rise to high dimensional mathematical models with complex interconnections and dynamic interactions. This makes the task of designing and analyzing such systems particularly challenging. In this work, we will develop decentralized solutions for analysis and uncertainty quantification of large networks. Motivated by standard problems and approaches in continuous spaces, we will construct scalable algorithms for graph clustering. It will be demonstrated that graph clustering aids in the development of scalable methods for simulating and propagating uncertainty through high dimensional differential algebraic equations (DAEs). In particular, our scalable algorithms are iterative schemes that rely on graph partitioning for finding "weak connections" that accelerate convergence. These algorithms will be demonstrated on models of aircraft communication networks, building systems and social networks.

Speaker Bio: Tuhin Sahai is a Staff Research Scientist at the United Technologies Research Center (UTRC), broadly interested in the design, analysis and uncertainty quantification of complex systems. Of particular interest are large networks of continuous and discrete dynamical systems that tend to be analytically and computationally intractable. Typical application areas include energy efficient buildings, smart grids, social networks, UAV swarms, next generation electrical and communication networks for aircraft, sensor networks and MEMS oscillator networks. At UTRC, Tuhin serves as a principal investigator for DARPA's GUARD-DOG program on scalable analysis of social networks in MapReduce. Tuhin's work on decentralized clustering received the 2012 Technical Excellence Award, the highest individual award at UTRC for contributions to Science and Engineering. In 2013, he was invited by the National Academy of Engineering (NAE) to attend the Frontiers of Engineering Symposium and won the 2014 NAE Grainger Award. Prior to joining UTRC, Tuhin earned his Ph.D. in January 2008 from Cornell University, where he was a McMullen Fellow and won the H.D. Block teaching award. Tuhin received his Masters and Bachelors in Aerospace Engineering from the Indian Institute of Technology, Bombay in 2002.