Data-Driven Autonomous Monitoring of Massive Scaled Spatiotemporal Processes

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Abstract:
Unmanned Aerial Systems are envisaged to revolutionize monitoring of massive scale stochastic processes, such as the flux of CO_2 over landscapes above CO_2 storage sites, and dynamically evolving battlespaces. However, to realize this vision, UAS must autonomously adapt to real-world uncertainties and dynamical changes using streaming data in the presence of cyber-physical constraints. In this talk I will present an overview of new data-driven modeling and distributed monitoring paradigms for adaptive autonomy in uncertain spatiotemporally varying environments. On the data-driven modeling front, I will present a nonparametric modeling paradigm termed as Evolving - GP (E-GP), being designed for learning both abrupt and long-term changes in spatiotemporally evolving systems. On the distributed inference front, I will also present inference and UAS based sampling algorithms for distributed teams of mobile and static agents in the presence of cyber-physical constraints, such as limited communication range or flight-endurance. The new models and algorithms have been validated on real-world large datasets, and are expected to lead to autonomous UAS for modeling and monitoring massive scaled spatiotemporally evolving phenomena.

Biography:
Girish Chowdhary is an assistant professor at Oklahoma State University, and the director of the Distributed Autonomous Systems laboratory at OSU. He holds a PhD from Georgia Institute of Technology. He was a postdoc at the Laboratory for Information and Decision Systems (LIDS) of the Massachusetts Institute of Technology for about two years. Prior to joining Georgia Tech, he also worked with the German Aerospace Center's (DLR's) Institute of Flight Systems for around three years. Girish's ongoing research interest is in theoretical insights and practical algorithms for adaptive autonomy over massive spatiotemporal scales, with a particular focus on applications in Unmanned Aerial Systems. He has authored over 70 peer reviewed publications in adaptive and fault tolerant control, sequential decision making and mission planning, aircraft system identification, distributed sensing and inference, Bayesian nonparametric learning for control, and vision aided navigation and control. He has led the development and flight-testing of over 10 research UAV platform. UAV autopilots based on Girish’s work have been designed and flight-tested on six UAVs, including by independent international institutions.

Light refreshments will be served.