Girish Chowdhary
University of Illinois

"The Robots are Coming – to your Farm!
AKA: Autonomous and Intelligent Robots in Unstructured
Field Environments"
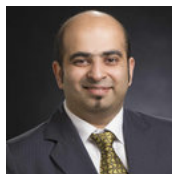
Thursday, March 21, 2019
12:00-12:50
CIT 477 Lubrano

Abstract: What if a team of collaborative autonomous robots grew your food for you? In this talk, I will demonstrate some key theoretical and algorithm advances in adaptive control, reinforcement learning, collaborative autonomy, and robot-based machine vision my group is working to bring this future a lot nearer! Equipment manufacturers have been automating large agricultural equipment – tractors, harvesters, and even excavators; but automating large equipment only addresses a part of the agricultural labor crisis. Large equipment cannot be used in wet, muddy, and uneven fields; or when the crop canopy grows; and is expensive. Furthermore, practices like blanket spraying, tilling, and the increasing size of equipment are leading to critical sustainability problems: Herbicide resistant weeds, soil compaction, increasing carbon footprints, and pesticide runoff are just a few of these problems. Teams of small aerial and ground robots could be a potential solution to these problems, but fully autonomous agricultural robots that operate without supervision for weeks, months, or entire growing season are not yet practical. I will discuss my group's theoretical and practical work towards this challenging problem. I will talk about our lightweight, compact, and highly autonomous field robot TerraSentia. I will also discuss new algorithms for enabling robust long-duration autonomy in harsh, changing, and uncertain environments, including deep learning for robot machine vision, coordinated weeding algorithms, deep reinforcement learning, and transfer learning for deep reinforcement learning domains.

Girish Chowdhary is an assistant professor at the University of Illinois at Urbana-Champaign with the Coordinated Science Laboratory, and the director of the Distributed Autonomous Systems laboratory at UIUC. At UIUC, Girish is affiliated with Agricultural and Biological Engineering, Aerospace Engineering, Computer Science, and Electrical Engineering. He holds a PhD (2010) from Georgia Institute of Technology in Aerospace Engineering. He was a postdoc at the Laboratory for Information and Decision Systems (LIDS) of the Massachusetts Institute of Technology (2011-2013), and an assistant professor at Oklahoma State University's Mechanical and Aerospace Engineering department (2013-2016). He also worked with the German Aerospace Center's (DLR's) Institute of Flight Systemsfor around three years (2003-2006). Girish's ongoing research interest is in theoretical insights and practical algorithms for adaptive autonomy, with a particular focus on field-robotics. He has authored over 90 peer reviewed publications in various areas of adaptive control, robotics, and autonomy. On the practical side, Girish has led the development and flight-testing of over 10 research UAS platform. UAS autopilots based on Girish's work have been designed and flight-tested on six UASs, including by independent international institutions. Girish is an investigator on NSF, AFOSR, NASA, ARPA-E, and DOE grants. He is the winner of the Air Force Young Investigator Award, the Aerospace Guidance and Controls Systems Committee Dave Ward Memorial award, and several best paper awards, including a best systems paper award at RSS 2018 for his work on the agricultural robot TerraSentia. He is the co-founder of EarthSense Inc., working to make ultralight outdoor robotics a reality.

Host: George Konidaris/HCRI