Abstract:

Autonomous perception, navigation, and manipulation in agricultural fields present significant challenges: plant growth patterns are affected by weather, climate, nutrition, pests, pathogens, weeds, and more; lighting, glare, occlusions, and dust complicate traditional imaging methods; where crops such as grain and corn can be neatly arranged in rows, many orchards, especially on a smaller scale, represent much more cluttered environments and complicated terrain. The current prevalent method in robotics is to deal with these issues through big data and added computation, sophisticated sensing, and more dexterous actuation. In this talk I will argue for a different approach to digital agriculture in which robotic systems are carefully optimized for the task at hand, leading to simpler and more robust yet potentially more powerful solutions. Examples will include holistic integration of vision- and tactile-based mobile sensors for vineyard yield estimation, bio-hybrid collectives for improved yield in pollen-limited strawberry plants; and instrumented colonies of managed bees for environmental monitoring and landscape planning.

Bio:

Kirstin Petersen is an Assistant Professor in the School of Electrical and Computer Engineering at Cornell University, with field appointments in Mechanical and Aerospace Engineering and Computer Science. Her lab, the Collective Embodied Intelligence Lab, is focused on design and
coordination of large robot collectives able to achieve complex behaviors beyond the reach of an individual, and corresponding studies on how social insects do so in nature. Major research topics include swarm intelligence, embodied intelligence, soft robotics, and bio-hybrid systems towards applications spanning autonomous construction, human-swarm interaction, and digital agriculture. Before Cornell, Petersen completed a M.Sc. in modern artificial intelligence with the University of Southern Denmark, a Ph.D. with the Wyss Institute for Biologically Inspired Engineering at Harvard University, and a postdoc with the Physical Intelligence Department at the Max Planck Institute for Intelligent Systems. Her work was nominated among the top 10 scientific breakthroughs of 2014 by Science, and she was named one of Robohub’s 25 women in robotics in 2018.

**Background on the Cornell Initiative for Digital Agriculture:**

An interdisciplinary group of Cornell University faculty began meeting in early 2017 to formulate an Initiative for Digital Agriculture (DA), believing that Cornell is uniquely equipped to lead in this emerging arena that will benefit the public for generations. We define DA to mean the application of computational and information technologies coupled with nanotechnology, biology, systems engineering and economics to both the research and operational sides of agriculture and food production. With approximately 100 faculty from 5 Cornell colleges participating, we are collaborating with external stakeholders to shape and implement a research agenda for DA that will build a pipeline of discovery and innovations for the next 10+ years. Please contact Tim Vanini at tv37@cornell.edu with any questions.