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Dr. Sachit Butail
ECE Seminar
Tuesday, March 8th, 2016
11:30AM-12:30PM, 202 ECEC

Learning From and About Animal Behavior: From Natural to Engineered Collectives

Abstract: Many animal species demonstrate some kind of emergent phenomena when individuals come together as a group: fish school to avoid predators, mosquitoes swarm to mate, and humans form lanes to avoid collisions as they cross each other on a street. While inferring the local interaction rules in animal groups has inspired the design of multi-robot systems, quantifying these interactions has led to novel control strategies to improve the navigation and safety of the animals themselves. A first step towards engineering collective behavior is to measure it. In this talk, I will describe methods for measuring the dynamics and interactions of animal groups. These include nonlinear estimation methods for reconstructing individual trajectories of schooling fish and swarming mosquitoes, machine learning for abstracting collective motion of animal groups, and an information-theoretic approach to identify leader-follower pairs in zebrafish. I will then investigate the feasibility of regulating the collective response of fish with a free-swimming bio-inspired robot, and the motion of pedestrian crowds with a social robot. In each case, I will discuss future directions extending these results to address open problems in crowd management, swarm robotics, and bio-inspired autonomy.

Bio: Sachit Butail received his Ph.D. in 2012 in Aerospace Engineering from University of Maryland, College park where his dissertation was on the motion reconstruction of animal groups using methods from estimation theory and computer vision. From 2012 to 2014, he was a postdoctoral fellow in New York University where he worked on problems in collective behavior and animal-robot interactions using methods from machine learning, time-series analysis, and information theory. His research interests are in the areas of dynamical systems, bio-inspired autonomy, collective behavior, and robotics. He is currently an adjunct faculty at IIIT-Delhi, where he directs the Natural and Engineered Collectives Research group.