

Graduate Seminar



Programming circuits and materials with nucleic acids

Elisa Franco

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Mechanical Engineering
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4:30 pm Scaife Hall 125

Abstract:

Cells have unique abilities to sense, process, and actuate based on environmental stimuli: their molecular components are constantly running many parallel programs that ensure correct growth, motion, reshaping, and repair in response to external inputs. How can we harness such powerful toolkit of DNA, RNA, and proteins to create the next generation of molecular computers and smart biomaterials? I will describe our work in this area, which is centered on the combination of nucleic acids nanotechnology and dynamical systems theory. First, I will summarize our efforts in the design and synthesis of synthetic molecular clocks, essential devices to synchronize biochemical events. Specifically, I will describe the challenges arising in scaling up clock-driven circuits. Second, I will outline our progress in using dynamic molecular networks to direct adaptive self-assembling systems. Third, I will outline ideas to build biomolecular feedback systems for homeostatic behavior and disturbance rejection.

Bio:

Elisa Franco is an Assistant Professor in Mechanical Engineering at UC Riverside. She received a Ph.D. in control and dynamical systems from the California Institute of Technology, Pasadena in 2011. She also received a Ph.D. in automation and a Laurea degree (cum laude) in power systems engineering from the University of Trieste, Italy. She received her B.S. and M.S. (Laurea Degree) in Power Systems Engineering from the University of Trieste (Italy) in 2002, summa cum laude.

Dr. Franco's main interests are in the areas of biological feedback networks and DNA nanotechnology. In particular, her research focuses on bottom-up design and synthesis of controllers, sensors and actuators in biochemical reaction networks, using nucleic acids and proteins. In the past, Dr. Franco worked in the field of cooperative control and distributed estimation.

She is the recipient of an NSF CAREER award and a Hellman Fellowship.

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