Stony Brook University

Department of Civil Engineering

College of Engineering and Applied Sciences

FALL 2022 SEMINAR SERIES (joint with MEC)

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Friday, September 16th, 1:00 – 1:55 PM
Frey Hall Room 201

When Zebrafish Met Engineering

Abstract

Zebrafish are gaining momentum as the third millennium laboratory species for the investigation of several functional and dysfunctional biological processes in humans, including the fundamental mechanisms modulating emotional patterns, learning processes, and individual and social response to alcohol and drugs of abuse. Dynamical systems and robotics offer a powerful range of theoretical and experimental approaches that can advance our understanding of this animal model. In this talk, we report recent advances on: (i) the design of biomimetic robotic fish to elicit highly-controllable and customizable stimuli for laboratory experiments on zebrafish behavior; (ii) the formulation of a new data-driven modeling framework to study zebrafish behavior within unprecedented “in silico” experiments that can help reduce the number of animals in preclinical studies; and (iii) the integration of information-theoretic tools to unravel leader-follower interactions in groups of zebrafish and measure fear response to predators. The presentation is intended to expose neuroscientists to toolbox of methodological innovations that can enhance their experiments, while offering engineers an overview of fundamental mathematical and technological advancements that can find applications beyond the study of zebrafish.

Speaker Biography

Maurizio Porfiri is an Institute Professor at New York University Tandon School of Engineering, with appointments in the Center for Urban Science, where he is serving as the Director, and Progress and the Departments of Mechanical and Aerospace Engineering, Biomedical Engineering, and Civil and Urban Engineering. He received M.Sc. and Ph.D. degrees in Engineering Mechanics from Virginia Tech; a “Laurea” in Electrical Engineering and a Ph.D. in Theoretical and Applied Mechanics from Sapienza University of Rome and the University of Toulon. He is engaged in conducting and supervising research on complex systems, with applications from mechanics to behavior, public health, and robotics.