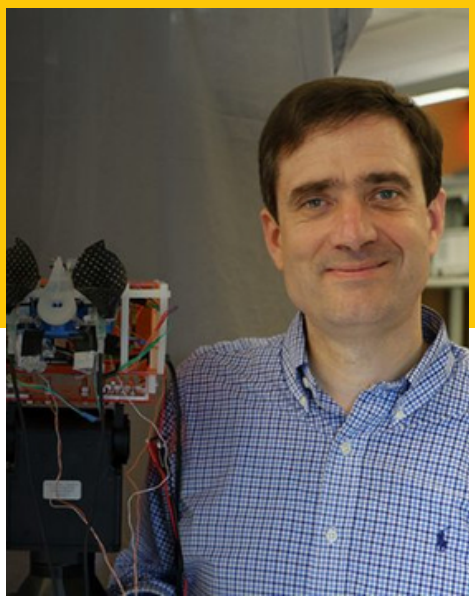
SPCEET RESEARCH SEMINAR SERIES



Dr. Rolf Mueller

Rolf Mueller has studied various aspects of bat biosonar from the perspectives of biophysics and bioinspired engineering for about 20 years and has (co)authored over 120 peer-reviewed, full-length publications on the topic. In particular, he has worked on statistical signal processing of sonar signals in complex, natural environments, biosonar beamforming, as well as biomimetic sonar systems. The overarching goal of his current research is meeting the sensory information needs of autonomy in complex natural environments. To achieve this, he is focusing on dynamic information encoding in the physical domain using soft-robotics replicas of bat biosonar and extracting useful information from complex "clutter" echoes using deep-learning techniques. In addition, he has a growing research program on the kinematics of bat flight. He is currently a professor in the Mechanical Engineering Department at Virginia Tech and directs the Bioinspired Science and Technology (BIST) Center, an interdisciplinary effort that involves over 40 faculty members from across the university. In his international efforts, he directs the University of Brunei - Virginia Tech International Laboratory that is dedicated to the engineering analysis of biosonar, flight, and system integration in bats. He has been a Fellow of the Acoustical Society of America since 2019.

BATS, ROBOTS, AI & THE QUEST FOR AUTONOMY IN NATURAL ENVIRONMENTS

Accomplishing useful tasks in complex natural environments poses the highest-level challenge for autonomous systems. Bat species that rely on a combination of biosonar sensing and flapping flight to navigate dense vegetation are exceptional model systems for these abilities since they routinely navigate complex habitats in a dexterous, reliable, and highly parsimonious fashion where all sensory information about the environment is conveyed by one-dimensional echo trains received at the two ears. Applying a combination of biomimetic robotics and deep-learning data analysis can shed light on how bats encode and extract the sensory information that they need to navigate in dense vegetation and explain capabilities such as location identification and passageway finding. Furthermore, analysis of bat behavior combined with soft-robotic reproduction has reveal a new nonlinear encoding mechanism for target direction. Future work will target the complexity of maneuvering flight in bats and its integration with biosonar sensing.

Date:

Wednesday, April 17th

Time:

11:15AM - 12:15 PM

Location:

Q-314