

TECHNICAL COMMITTEE FOR

MODEL-BASED OPTIMIZATION FOR ROBOTICS



<https://www.tcoptrob.org/>

2024-2025 TC Seminar Series

Zoom: <https://columbiauniversity.zoom.us/j/91247893326?pwd=L2JWU21aQzc4cU1ZQklEb0QrWGQvdz09>

Time: February 6^h, 2025, 9 AM EDT



Prof. Ian Abraham
Yale University

Optimality and Robustness in Robotic Exploration

Abstract:

Effective exploration is a vital component in the success of robotic applications in ocean and space exploration, environmental monitoring, and search and rescue tasks. This talk presents a novel formulation of exploration that permits optimality criteria and performance guarantees for robotic exploration tasks. We define the problem of exploration as a coverage problem on continuous (infinite-dimensional) spaces based on ergodic theory and derive control methods that satisfy various notions of optimality and robustness such as asymptotic coverage, set-invariance, time-optimality, and reachability in exploration tasks. Last, we demonstrate successful execution of the approach on a range of robotic systems and present an outlook on novel directions for robot learning..

Biography:

Ian Abraham is an Assistant Professor in Mechanical Engineering with courtesy appointment in the Computer Science Department at Yale University. His research group is focused on developing real-time optimal control methods for data-efficient robotic learning and exploration. Before joining Yale, he was a postdoctoral researcher at the Robotics Institute at Carnegie Mellon University in the Biorobotics Lab. He received his PhD. and M.S. degrees from Northwestern University and the B.S. degree from Rutgers University. During his Ph.D. he also worked at the NVIDIA Seattle Robotics Lab where he worked on GPU accelerated robust model-based control. His work has been recognized through several best paper awards and was awarded the 2023 NSF CAREER award.