

國立中央大學數學系

專題演講

主 講 人：張逸塵博士 (Isuzu – Technical Center of America, Inc. (ITCA))

演講題目：Matrix Lie Theory for the Robotician

演講茶會：2025年02月20日(星期四) 3:30 p.m. ~ 4:00 p.m.

茶會地點：中央大學鴻經館M306

演講時間：2025年02月20日(星期四) 4:00 p.m. ~ 5:00 p.m.

演講地點：中央大學鴻經館M107

Abstract：

In this talk, we provide an accessible introduction to Lie Theory, requiring minimal prior knowledge, and highlight its foundational role in advanced robotic applications. We begin with intuitive examples of Lie groups, such as unit complex numbers and 2D rotation matrices, illustrating their use in representing rotations and transformations. Building on these, we introduce unit quaternions and rigid transformation groups, emphasizing their significance in robotic motion representation. Key theoretical concepts—including groups, manifolds, tangent spaces, Lie algebras, exponential and logarithmic maps, and adjoint matrices—are explored, with a focus on their integration into calculus for operations like derivatives, Jacobians, and uncertainty management. The practical relevance of Lie Theory is demonstrated through topics such as perturbations, covariance handling, and integration methods in both continuous and discrete time. These techniques are illustrated with examples of EKF-based localization and smoothing for mobile robots, where motion and measurement models are combined with Jacobian computations.