

**Title:** Inversion of Multiplicative Compound Operator - Its Role in a Dynamical System

**Speaker:** Dr. Debojyoti Dey (Technion - Israel Institute of Technology)

**Date:** 21 August 2026 (Friday)

**Time:** 5PM

**Room:** RM101, Rameev Motwani Building

**Abstract:**

The multiplicative and additive compound matrices are classical objects in linear and multilinear algebra and play an important role in several fields, including geometry, graph theory, algebraic topology, dynamical systems, and control theory. In this talk, I will briefly introduce a linear time-invariant dynamical system and the notion of positive realization. Further, I will generalize the positiveness into cone invariance lifted to an exterior product space. While the broader problem is to find such a cone of interest, we focus in this talk on a part of it (based on our work <https://arxiv.org/pdf/2605.27682>), where we study the problem of determining a matrix whose  $k$ th multiplicative compound, with  $k > 1$ , is a prescribed matrix  $M$ . The cardinality of the set of matrices whose  $k$ th multiplicative compound equals  $M$  is characterized in terms of  $\text{rank}(M)$ . On the one hand, if  $\text{rank}(M) \leq 1$ , it is observed that there exist infinitely many such matrices for which a complete characterization is determined. On the other hand, if  $\text{rank}(M) > 1$ , then there exists a unique matrix — up to an overall sign — whose compound is  $M$ . We also provide an algorithm, polynomial in the dimension of the prescribed matrix, for finding a matrix whose compound equals  $M$ .

**Speaker Bio:**

Debojyoti Dey is a postdoctoral researcher at the Technion - Israel Institute of Technology, since he completed his PhD degree from the Department of CSE, IIT Kanpur in 2025. His research interests lie in non-linear / non-convex optimization, differential geometry, and statistical learning.

This talk is based on joint work with Prof. Christian Grussler, Department of AE, Technion-IIT, and Dr. Ron Ofir, Postdoctoral researcher, Yale University.