

Invited Talk Abstract

ICOML 2026 | July 27–29, 2026

Efficient Global Polynomial Optimization for Machine Perception**David M. Rosen***Northeastern University*

Date	July 29, 2026
Time	15:30–16:00
Session	Session 8
Venue	S102, Lecture Hall, Gong-Guan Campus, NTNU

Abstract

Many fundamental perception and state estimation tasks in robotics and computer vision are naturally formalized as high-dimensional polynomial optimization problems (POPs) that are known to be computationally hard (NP-hard) to solve in general. Nevertheless, in this talk we present a novel class of certifiably correct estimation algorithms that are provably capable of efficiently recovering verifiably globally optimal solutions in many practical settings. In brief, our approach is based upon convex relaxation: first, we develop semidefinite relaxations whose minimizers we prove provide exact, globally optimal solutions to the original POP for sufficiently small measurement noise; next, we describe specialized, structure-exploiting semidefinite optimization algorithms that enable even large-scale instances of these relaxations to be solved efficiently in practice. We illustrate the design of this class of methods using the fundamental problem of pose-graph optimization (a mathematical abstraction of robotic navigation) as a motivating example, demonstrating that our approach enables the recovery of certifiably globally optimal solutions of POPs involving tens to hundreds of thousands of variables in a matter of seconds.