1146-14-351   **Joe Kileel*** (`jkileel@math.princeton.edu`), Princeton University, Program in Applied Computational Mathematics, Princeton, NJ. *Statistical estimation under group action, with applications to cryo-electron microscopy.*

In many applied contexts, the task is to estimate latent variables from noisy observations involving unknown rotations. One challenging example comes from cryo-electron microscopy (cryo-EM), recognized by the 2017 Nobel Prize in Chemistry, where the objective is to estimate a 3D molecule from highly noisy 2D projection images taken from unknown viewing directions.

In this talk, we introduce an abstract framework for statistical estimation under noisy group actions. We prove, for this class of problems, sample complexity relates to invariant rings and secant varieties, while method-of-moments is sample-efficient. In special cases, we find a computationally-efficient algorithm for inverting moments, using tensor decomposition and polynomial solving. The approach is validated on a real cryo-EM dataset.

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